



WINMATE



WHITEPAPER

ZONE I EXPLOSION- PROOF TABLETS

Enabling Safe and Mobile Operations in High-Risk Gas Environments

Winmate – Your Best-Mate in Rugged Solutions

1. INTRODUCTION: WHAT EXPLOSION-PROOF MEANS IN ZONE I GAS ENVIRONMENTS

Explosion-proof equipment is designed to operate safely in environments where an explosive atmosphere may be present. In industrial safety regulations, an explosion occurs only when three conditions exist simultaneously: a “flammable material”, a “source of ignition”, and “oxygen”. Flammable gases or vapors—such as hydrocarbons, solvents, or chemical vapors—provide the combustible material. Oxygen is naturally present in ambient air. The remaining variable is the ignition source, which may originate from electrical sparks, hot surfaces, or abnormal device behavior.

Hazardous area classification systems are intended to control this risk by ensuring that equipment does not become a potential ignition source. Within gas hazardous locations, Zone I refers to areas where flammable gases or vapors are likely to be present during normal operation. This distinguishes Zone I from lower-risk areas, where explosive atmospheres occur only infrequently or under abnormal conditions.

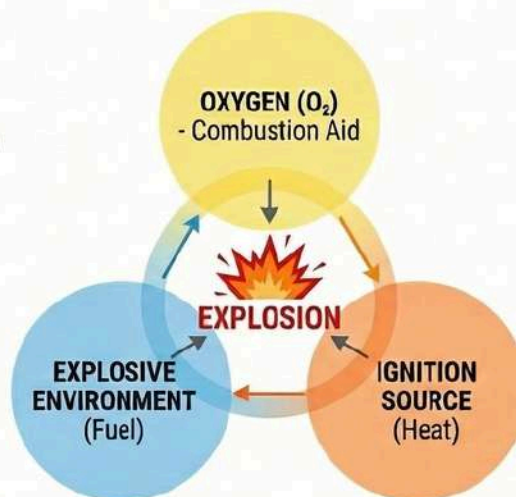
Because the presence of flammable gas is assumed as part of normal operation, equipment used in Zone I must be designed, certified, and deployed with a conservative safety philosophy. Devices are evaluated not only on performance, but on predictable behavior under defined operating conditions. The objective of explosion-proof design is therefore not to eliminate flammable atmospheres, but to ensure that equipment does not introduce ignition risk when such atmospheres exist.

This white paper focuses on Zone I gas environments and the role of explosion-proof tablets in supporting modern industrial operations within these regulated conditions.

The Science of Explosion: The Fire Triangle & Prevention

Explosive Environment

- Flammable/combustible gas (CI)
- Flammable liquid vapor (CI)
- Combustible dust/fiber (CII)
- Flammable fly floc (CIII)



Ignition Source

- Spontaneous combustion (chemical reaction)
- Sparks (electrical, mechanical)
- Arc (equipment itself or field wiring)
- Surface heat source (equipment itself or field wiring)
- Static electricity
- Electric shock
- Adiabatic compression, shock wave
- Ionizing radiation
- Electromagnetic radiation

EX-PROOF ELECTRICAL EQUIPMENT: DESIGNED TO ELIMINATE ONE OF THE THREE ELEMENTS (USUALLY THE IGNITION SOURCE) TO PREVENT EXPLOSIONS.

2. COMMON PHYSICAL ENVIRONMENTS CLASSIFIED AS ZONE I

Zone I gas hazardous areas are found across multiple industries where flammable gases or vapors are routinely present. These environments are often integral to core production or research activities, making safe and reliable equipment essential.

Oil refineries and petrochemical plants are among the most common Zone I environments. Areas surrounding processing units, distillation columns, pump skids, and valve manifolds may experience continuous or periodic release of flammable hydrocarbons during normal operation. Personnel working in these areas require access to operational data, inspection records, and work instructions while remaining within certified safety limits.

Mining and resource extraction sites also contain Zone I areas, particularly where combustible gases are released during extraction or processing. Underground facilities, gas handling zones, and equipment interfaces may all fall under Zone I classification, requiring certified mobile devices for inspection and documentation tasks.

Industrial laboratories and pilot plants represent another important category. Laboratories handling volatile chemicals, solvents, or reactive gases may be classified as Zone I, especially in test chambers, reaction zones, or material handling areas. In these settings, mobility and accurate data capture are critical, but conventional consumer devices are not permitted.

Additional Zone I scenarios may include chemical storage areas, gas compressor stations, and energy infrastructure facilities. Across all these environments, the common requirement is the ability to perform field-level tasks safely in locations where flammable gas presence is expected rather than exceptional.



3. APPLICATION OF EXPLOSION-PROOF TABLETS IN ZONE I OPERATIONS

Explosion-proof tablets are designed to support handheld, human-centric tasks within Zone I hazardous areas. Rather than replacing fixed control systems, these devices complement existing infrastructure by enabling safe mobility and real-time access to information at the point of work.

In refinery and petrochemical environments, Zone I tablets are commonly used for inspection and routines. Operators can follow digital checklists, verify equipment status, and scan 2D barcodes to confirm asset identity or maintenance history. This reduces reliance on paper documentation and improves traceability.

Built-in camera functionality enables personnel to capture visual records of equipment conditions, leaks, corrosion, or abnormal findings directly in the field. These images support maintenance planning, compliance documentation, and communication with remote engineering teams once data is synchronized outside the hazardous area.

In mining and industrial laboratory settings, explosion-proof tablets support data collection, verification, and procedural guidance. Workers can reference operating procedures, log measurements, and document test results without leaving the Zone I area repeatedly, improving efficiency while minimizing exposure time.

Across all scenarios, the tablet functions as a certified interface for observation, documentation, and guided execution. Its value lies in enabling safe digital workflows in environments where standard mobile devices are prohibited.



4. OPERATING SYSTEM SUPPORT AND PLATFORM FLEXIBILITY

Industrial customers often have diverse software requirements driven by existing systems, cybersecurity policies, and in-house development capabilities. For this reason, operating system flexibility is an important consideration for explosion-proof tablets used in Zone I environments.

Current solutions support both Android and Linux-based operating systems. Android is widely adopted for mobile applications and user-friendly interfaces, making it suitable for standardized inspection or workflow applications. However, not all customers prefer or are able to deploy Android-based platforms.

Linux-based operating systems, as open-source platforms, offer greater flexibility for customization, long-term maintenance, and integration with proprietary or legacy systems. For customers with in-house development teams, Linux enables deeper control over application behavior, security policies, and lifecycle management. This can be particularly valuable in regulated industries where system longevity and software consistency are critical.

By supporting multiple operating systems, Zone I explosion-proof tablets can adapt to varied deployment strategies rather than forcing customers into a single software ecosystem.

5. CONCLUSION: STRENGTHENING THE PRODUCT PORTFOLIO WITH ZONE I TABLETS

Historically, many rugged tablet solutions focused primarily on Zone II hazardous environments, where flammable gases are present only under abnormal conditions. While suitable for many applications, these devices cannot be deployed in higher-risk areas where explosive atmospheres are expected during normal operation.

The introduction of Zone I explosion-proof tablets extends safe mobility into environments previously limited to fixed or highly specialized equipment. By addressing the regulatory and operational requirements of Zone I gas hazardous areas, these tablets enable broader digital transformation while maintaining strict safety compliance.

From a product strategy perspective, adding Zone I tablets strengthens the overall hazardous-area portfolio. It allows organizations to deploy a consistent mobile computing approach across multiple risk classifications, improving operational continuity and simplifying device management. As a result, Zone I tablets play a key role in completing a comprehensive, future-ready industrial mobility solution.

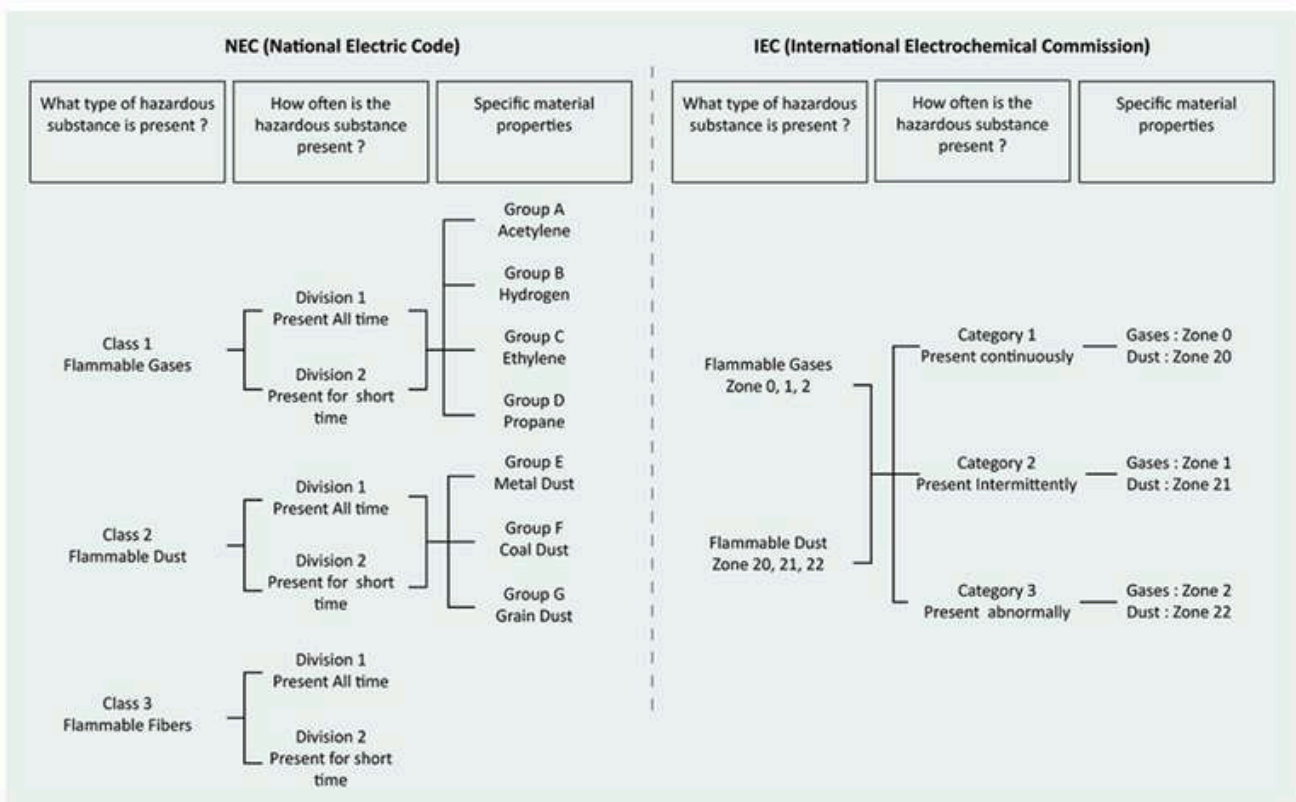


M101QZ

10.1” Qualcomm® 6490 Android ATEX Rugged Tablet

Key feature

1. Qualcomm® 6490 (Octacore 2.7 GHz), Support 15 years longevity till 2036
2. 10.1” 1920 x 1200 750 high brightness display with P-CAP Touch
3. Support Android 13 / Linux Ubuntu
4. Support Barcode reader, front/rear camera, NFC for data collection
5. Support 5G red-cap, Wi-Fi , BT for Wireless connection
6. IECEx: Ex ib IIC T5 Gb
7. ATEX: Ex II 2G Ex ib IIC T5 Gb
8. Class I, Division 1, Group A, B, C, D, T5 Certification





About Us

With over 30 years of industry experience, Winmate is a global leader in rugged computing and intelligent edge solutions. From rugged tablets and rugged laptops to panel PCs, industrial displays, Edge AI systems, and robotic controllers, our products are built to support demanding environments across industries. We specialize in providing tailored solutions and hardware customizations to meet the unique needs of customers in sectors such as industrial automation, defense, logistics, automotive, and more. Backed by in-house testing laboratories and a strong global distribution network, Winmate ensures reliable performance, long-term support, and proven durability.

For more information about Winmate, please visit our website: www.winmate.com

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