

MESHGUARD HAZARDOUS-AREA CERTIFICATIONS

INTRODUCTION

Portable and fixed electrical devices like RAE Systems gas monitors that are used in potentially flammable environments need to be made safe so that they cannot deliver enough energy (via hot surfaces or a spark, for example) to ignite a flammable mixture of air, gas, and vapors.

In order to prove that equipment has been designed for use in hazardous environments, manufacturers submit units to national and international testing facilities, who test the equipment and issue certifications of conformity. After equipment manufacturers receive the certificates of conformity from the testing agencies, all manufactured units are labeled with the appropriate certification levels.

Equipment manufacturers employ various methodologies when it comes to certifying their equipment. This article focuses on RAE Systems' MeshGuard product family, and details the industry-leading certification practices employed by RAE Systems.



Figure 1: RAE Systems MeshGuard Controller and Detector.

Hazardous Location Classifications

Before discussing certification practices, it is important to understand the classification of hazardous environments. Note that the following paragraphs provide a brief overview. For a complete description of hazardous-area locations, refer to RAE Systems Technical Note TN-161, available at www.raesystems.com.

Hazardous locations are places where the possibility of fire or explosion exists because flammable gases, vapors, fine dusts, or fibers and flyings are in the air. In the U.S., the National Electrical

Code (NEC) segregates hazardous environments into classes, divisions and groups:

Class I, Division 1 (CI, D1): locations where a flammable atmosphere is expected during normal operations. An example is the mixing area of a flammable paint manufacturer.

Class I, Division 2 (CI, D2): locations where flammable vapors are confined within closed containers or closed systems from which they can escape only in the case of accidental rupture or breakdown. An example is the warehouse area of a flammable paint manufacturer. Normally, the flammable paints are contained in 55-gallon drums or metal cans, but a forklift could puncture a drum, leading to a flammable atmosphere.

Class II locations are for combustible dust, and **Class III** locations are for ignitable fibers and flyings.

The European Union has introduced its own set of standards to classify hazardous locations and instrument safety levels. The ATEX Directive 94/9/EC outlines the safety requirements to be fulfilled by all equipment, electrical and non-electrical, installed anywhere in hazardous areas within the E.U. The directive, voluntary since 1994, became mandatory in July 2003.

In the ATEX directive, areas are designated by equipment group. A Roman numeral 1 (I) is used to designate equipment that will be used in underground mines. A Roman numeral 2 (II) is used to designate equipment used in non-mining, or above-ground, operations.

Each equipment group is further subdivided into equipment categories based on the protection characteristics of the equipment. The category designation for equipment group II also identifies the hazardous location zones in which the equipment can be used (0, 1, 2 for gaseous environments or 20, 21, 22 for dust environments).

For non-U.S., non-E.U. regions, there is also IECEx certification, which uses equipment categories similar to ATEX.

Many equipment manufacturers have certifications for multiple areas on the same product in order to better serve international markets. RAE Systems' MeshGuard product family has U.S., Canada, ATEX, and IECEx certifications and is currently in use on six continents.

MeshGuard Certifications

The MeshGuard product family was designed and certified to be used in the most stringent hazardous environments.

In the U.S. and Canada, all products in the MeshGuard family are certified to:

- C1 D1, groups A,B,C,D, T4.

In Europe, all products in the MeshGuard family are ATEX certified to:

- II 1G Ex ia IIC T4 (Ga)
- I M1Ex ia I (Mining)

In other regions of the world, all products in the MeshGuard family are IECEx certified to:

- Ex ia IIC T4
- Ex ia I (Mining)



Figure 2: MeshGuard Detector equipment certification label.

Designing products for the most stringent environments allows safety personnel to deploy and transport MeshGuard equipment in virtually all hazardous environments.

Equipment that is certified to a lesser standard, C1D2 or Zone 2, may require additional operational procedures and cause potential safety risks for users who have multiple safety zones per location. In locations where C1D1 and C1D2 safety zones are in close proximity to each other, users must be vigilant and not enter zones for which the equipment is not certified.

With MeshGuard, users do not encounter this problem, as the entire MeshGuard product family is certified to the highest safety standards and can be freely transported in and out of virtually all hazardous locations at any given facility.

Equipment Vs. Component Certification

Another aspect of the MeshGuard certification that ensures maximum safety is the fact that all of the products in the MeshGuard family have equipment certification.

In recent years, some manufacturers have created safety products by taking third-party components that have been component certified, and then assembled them into a product. Products that have been designed with only component safety certifications may not be acceptable to all users and may not be compliant with standard requirements or national regulations.

The safety ratings of individual components are often altered when they are combined or used with other components. Having only component certifications on safety equipment is not considered the best practice in the safety industry because of the potential risks involved of improperly mixing and matching third-party components.

Component certifications often contain special wording on the certificate of conformity that indicates additional requirements for the user such as "The acceptability of the end use of the component is to be determined by the notified body performing the evaluation." Any piece of equipment that carries only component certification should be used with extreme caution and should be considered a "use at your own risk" item by safety personnel.



Figure 3: Component certification of housing and component certification of sensor module. Note that there is no equipment-level certification that includes both of these components.

Most manufacturers use equipment certification rather than component certification. With equipment certification, manufacturers can still use individually certified third-party components, but once the components are assembled into a single piece of equipment, the manufacturer re-certifies the completed assembly. Equipment certification ensures that a qualified certification agency has tested and verified all relevant safety aspects of the completed assembly. Upon re-certification, the testing agency issues a formal certificate of compliance specific to the equipment that was tested. Many manufacturers post the certificates of compliance on their website. Equipment certification is considered a safety industry best practice and is the most reliable piece of information that safety personnel have to ensure that equipment meets their desired level of hazardous-area safety.

In order to ensure proper safety standards, users should carefully assess the safety certification labels to make sure that it has been certified as a complete unit. For ATEX or IECEx certified products, the product certification is shown by specific certification numbers that indicate the assessment and certification of the complete instrument, regardless of whether certified components are applied. Equipment labels should be carefully studied to determine whether the certification covers the intended use of the equipment.

Entity Parameters

Some safety systems, like the MeshGuard product family, are highly configurable. It would not be practical to apply for individual equipment certification on every possible combination of MeshGuard products.

For highly configurable systems, RAE Systems uses entity parameter certification. With entity parameters, all system components are individually tested and certified. However, in addition to the standard certification markings, each unit is marked with a set of entity parameters. The entity parameters state the maximum electrical characteristics of any piece of equipment that can be connected to the unit in question. All pieces of equipment that are connected in the system must be marked with matching entity parameters. Entity parameter certification allows users maximum flexibility in system configuration while also retaining the highest required levels of hazardous-area safety approvals.



Figure 4: RAE Systems PowerPak U.S. and Canada hazardous-area certification label with clearly marked entity parameters.

CONCLUSION

RAE Systems MeshGuard product family has the highest level of hazardous-area approvals for gases and vapors in virtually all regions of the world. Every product in the MeshGuard family has been tested and approved by national and international testing agencies. All products have individual equipment certification labels as well as entity parameter approvals to allow for maximum safety and maximum flexibility.

REFERENCES

- RAE Systems Technical Note TN-161
- NFPA 70 National Electrical Code (NEC)
- ATEX Directive 94/9/EC