

GUIDELINE ON THE USE OF ELECTRONIC EQUIPMENT IN HAZARDOUS AREAS ON MINES

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1. Descriptions:

Intrinsically Safe (I.S)

An intrinsically safe system comprises of two or more items of intrinsically safe apparatus, together with the interconnecting cables, in which any spark or thermal effect, either in the apparatus or in the connecting cable, in normal working conditions or under prescribed fault conditions, is incapable of igniting a prescribed mixture of flammable gas and air.

The words 'Intrinsically Safe' imply that a certificate of intrinsic safety has been granted by the Certification Authority, either for the intrinsically safe system as a whole or for the individual items of apparatus. In the latter case, the certificate for the principal item of apparatus would define the type of , or limiting parameters of, the power supply to be used, and the limiting parameters of the connecting cables, the method of connection, and any connections to other apparatus that may be permitted.

In both cases the intrinsically safe system is properly defined, the main difference being that a single certificate might be issued for the items of apparatus when they are submitted for approval as a system whereas the second approach normally involves apparatus carrying separate certificate numbers.

Megger

Insulation tester

Permit System

A mine must have a Safe Work Procedure whereby the operation of un-certified equipment in a hazardous area is defined. It is a formal system whereby a responsible person declares and records the hazardous areas safe for such equipment to enter, during use and on exiting hazardous areas.

2. Scope:

As mining operations become more mechanized, information required from these machines also increases. Optimization can only take place if adequate information is available.

Information gathering takes place through various means and due to the diversity of these methods, a large variety of equipment types are being introduced.

Downloading, configuring or testing of systems in hazardous areas is becoming complicated and requires equipment to be certified safe for use in hazardous areas or ensuring the area is declared safe via a permit procedure.

This note serves to inform industry of the risks involved and the recommended practice to be followed.

3. **History:**

Older type machinery and equipment testing equipment were certified Intrinsically Safe for storage and transport and the use of these testers were covered under the Flame Proof (FLP) equipment procedures whereby the area in close vicinity to the equipment is declared safe before any FLP enclosure is opened in a hazardous area.

Insulation testing was also done through a safe working procedure whereby the complete unit under test is declared safe in a hazardous area. (Complete length of cable in a hazardous area)

Today, the use of electrical and electronic equipment in hazardous areas has increased drastically. The increase is not restricted to machines but includes supporting service equipment (i.e. communications etc).

4. **Latest development:**

As expected, today with the increase of intelligent/automated equipment, certification of the diverse array of equipment becomes a mammoth task and in some cases totally impractical and/or costly (No value adding).

As risk management drives all operations, the risk of igniting flammable gas has to be eliminated, reduced or removed.

5. **Recommendation:**

In order to eliminate the risk,

- The equipment has to be removed from the hazardous area, or
- The flammable gas has to be eliminated by dilution, or
- Equipment design techniques cannot cause ignition of the flammable gas (Intrinsically Safe)

It is therefore more cost effective to address the issue through the following process:

- Equipment used on an ad-hoc basis,
- Equipment permanently installed.

5.1 **Equipment used on an ad-hoc basis:**

Equipment used in this way are listed as follows:

- Laptops and plug in devices
- Meggers
- Cameras
- Personal electronic equipment
- Surveillance equipment
- Programmers
- Once off measurements
- Data loggers
- Recorders
- RF transmitters, wireless, Infrared transmitters/detectors

The use of this equipment should be done under a permit system whereby the hazardous area is declared safe. (Eliminate the flammable gas by dilution)

It is important to note that this equipment can build up a static charge before being connected or interfaced and by transporting the equipment through a hazardous area, ignition of the flammable gas can occur and it is recommended that this equipment never be transported through a hazardous area except under a permit system.

Use of testers in hazardous areas

Testers referred to are

- Multimeters

- Meggers (Insulation testers)
- Deadline testers

Electricians on a more frequent basis use multimeters, Meggers and deadline testers. (1000V systems) Storage and transport have to be covered by I.S. certification for testers used up to 1000V.

The procedure during use still has to be undertaken under a permit system. It has been determined that confusion exists amongst maintenance personnel in the field that users of certified testers believe that the use of certified testers are safe for use under all conditions pertaining to hazardous areas. This is a misconception and users of test equipment have to note that no test procedure is certified I.S. (Note: This instrument is certified but not the procedure). A safe work procedure covering the use of this equipment under a permit system has to be generated by users.

Meggers used for systems higher than 1000V are not certified I.S. The transport, storage and user must be properly managed and can enter hazardous areas only under a permit system.

5.2 Equipment installed permanently

Equipment installed permanently has to be certified I.S. As the industry is moving towards IEC standards, compliance to I.S “ia” has to be met by industry.

A category ‘ia’ system would remain intrinsically safe with two applied faults on the system while a category ‘ib’ system will be unsafe with two faults applied but intrinsically safe with only one. The test authorities determine the types of faults being applied. The faults applied take into consideration the type of system, it is important to note that intrinsically items may have a category ‘ia’ when utilised as per the inspection authority certificate but may not retain those characteristics when connected to other intrinsically safe items when not approved as a system.

Equipment used normally used in this manner are:

- Handheld methenometers
- Environmental systems, detectors and sensors
- Radio communications
- Data loggers used for monitoring systems
- Remote control systems
- Laser guides
- Equipment powered from cap lamp batteries

6. Conclusion:

As indicated, it is important for industry to formulate a Safe Work Procedure to ensure that this guideline is applied. Depending on the Risk Assessment, explosion protected equipment can be used.

Equipment issued to electricians for use as safety equipment should be issued under a register. Failure could result in the used of uncertified equipment being used.

7. References:

Comments supplied by HM Principal Inspector of Engineering in UK Mines.
SANS 086-2
SANS 60079-11