

Measuring Vibration in a Hazardous Area

Guidelines for Intrinsic Safety



Narration

We are glad that you have taken the time to view this self-paced training module on ***Measuring Vibration in a Hazardous Area***.

This is a narrated slide show. The narration can be played through the speakers on your computer. Or, if you do not have speakers or wish not to disturb others around you, the entire narration for each slide will be displayed on the screen in a blue box such as this one.

Enjoy the training.



Objectives

Measuring Vibration in a Hazardous Area, was created and presented by **CTC** (Connection Technology Center, Inc.)

CTC manufactures a full line of Industrial Vibration Analysis Hardware, and Process and Protection Instruments, all backed by the industry's *best warranty*.

After taking this training, Analysts will understand the general principals and guidelines for monitoring machinery vibration in a Hazardous Area. A better understanding of these principles will enable them to perform their job safely, and within the standards set by regulating bodies.



MADE IN THE USA



Definition

Local Regulations and Authorities

The information given in this presentation is a general guideline to Hazardous Area best practices and Intrinsic Safety standards.

The suitability of final installation of any equipment or instrumentation in any hazardous area is to be determined by the authority having local jurisdiction.

Regulations, standards and operating procedures can vary between countries, regions, cities, and even between similar plants within the same city.

Please consult local standards prior to operating in a Hazardous Area.



Definition

Hazardous Areas

These pictures serve as powerful examples of why it is so important to understand and follow Intrinsic Safety standards and operating procedures in **Hazardous Areas**.



MADE IN THE USA

A CTC hivatalos magyarországi képviselőjét a Delta-3N Kft. látja el.
Delta-3N Kft. 7030 Paks, Jedlik Á. u. 2. Tel.: +36-75-510115 Fax: +36-75-510114 www.delta3n.hu

5



VIBRATION ANALYSIS HARDWARE



Hazardous Area



In industrial processes where flammable materials are handled, any leak or spillage may give rise to an explosive atmosphere.

To protect both personnel and facilities, precautions must be taken to ensure that this atmosphere cannot be ignited.

The areas at risk are known as **Hazardous Areas** and the materials that are commonly involved include (but are not limited to) crude oil and its derivatives, natural and man-made process gases, alcohols, plastics, metal dusts, carbon dust, flour, starch, grain, and fibers.



What is Intrinsic Safety ?

Intrinsic Safety is based on the principle that the electrical energy in hazardous area circuits is deliberately restricted. Any electrical sparks or hot spots that may occur in the Hazardous Area must be too weak to cause ignition.

Operating within Intrinsic Safety standards will ensure that Analysts are limiting the voltage and current that can reach the Hazardous Area, thereby minimizing the risk of accidental ignition of the surrounding environment.



System vs. Component Certification

System Certification

A "System Certification" lists components (sensor, cable & barrier for example) that are certified for use together in a Hazardous Area -- all components must be used together as defined in the system. The system is tested and certified as a whole, and therefore, substitution of components is not permitted.

Component Certification

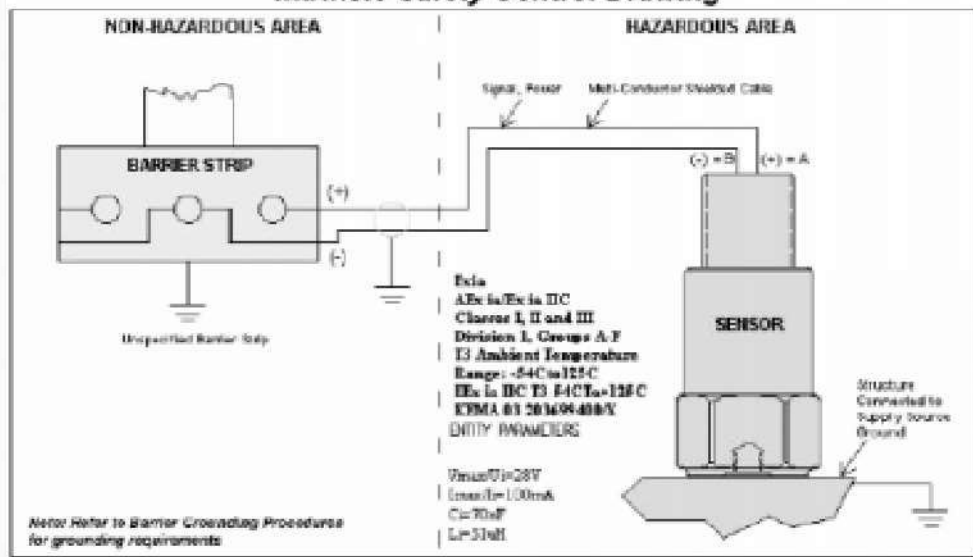
A "Component Certification" tests and certifies an individual component for use in a Hazardous Area when used with other components which meet specific criteria. For example: sensors are rated for use with barriers which must match certain "**Entity Parameters.**"

Entity Parameters are a specific set of electrical specifications that are used to define compatible components for use in a Hazardous Area.



Typical Accelerometer Installation

Intrinsic Safety Control Drawing



It is critically important to consult the Control Drawing associated with any instrumentation to be used in a Hazardous Area.

This is an example of the control drawing for a vibration sensor. It shows the placement of the sensor and barrier relative to the Hazardous and non-Hazardous Areas. It also shows grounding requirements and lists the relevant Entity Parameters for:

- Maximum Voltage (V)
- Total Allowable Capacitance of the Circuit (nF)
- Maximum Allowable Current (mA)
- Total Allowable Inductance of the Circuit (μH)

Grounding

Proper grounding is important in
Intrinsically Safe applications:

- Stud mounting is the only acceptable method of mounting a sensor, since the case of the sensor must be grounded. Do not use epoxy pads.
- It is also critical that the cable and barrier are grounded in the non-hazardous area.



Safety Barriers

Intrinsically Safe Accelerometers and Loop Power Sensors typically require the use of an **energy limiting barrier** (such as a Zener Diode Barrier or Galvanic Isolator) to restrict the amount of voltage and current which can enter the Hazardous Area. The barrier allows the power and signal to pass in either direction as required.

The power source and barrier must be located in a non-hazardous area or approved enclosure.

The entity parameters of the appropriate barrier for a given sensor will be specified in the control drawings for each sensor. It is important that the proper barrier is used. For this reason, CTC provides compatible barriers, specified to match applicable entity parameters.



Cabling



Compatible cabling must be used to transmit the power and signal to and from the sensor and barrier.

Due to limitations on total capacitance allowable between components, cable length between the sensor and the barrier is limited to approximately 200 feet based on cable properties.

Local codes and standards may permit approved enclosures to house barriers and power closer to the sensor. Consult barrier enclosure specifications, local codes and proper installation instructions to ensure safe installation.



North American Standards

The CSA Listing with both “US” and “C” identifiers, at the 4 o’clock and 8 o’clock positions respectively signifies that the product bearing the mark complies with US and Canadian standards for Intrinsic Safety (Class 1, Division 1).



Canadian product safety standards (Canadian Standards Association - CSA C22.2 NO 157-92- CAN/CSA - Intrinsically Safe and Non- Incentive Equipment for Use in Hazardous Locations General Instructions No 1)

Complies with U.S. product safety standards (Factory Mutual - FM 3610 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II & III Division 1 Hazardous Locations)



European Standard



The ATEX Directive is the Explosive Atmosphere Directive for the European Union (EU).

The ATEX Directive (from the French "ATmospheres EXplosible") became mandatory beginning July 1, 2003, when it replaced CENELEC as the European Standard for intrinsic safety.

A product bearing the EX mark signifies that it was tested and meets the requirements of prescribed product safety standards.

ATEX EN 50014 - Electrical Apparatus for Potentially Explosive Atmospheres - General Requirements

ATEX EN 50020 - Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety "I"



International Standard



IECEX certified products comply with the standards set forth by the International Electronics Commission (IEC).

IECEX is an international standard for Hazardous Area equipment. Many countries have begun to accept the IECEX standard as a substitute for their local standards.



Comparison

The following chart is for reference only. It compares the three major intrinsic safety standards. This chart can be downloaded at www.ctconline.com in the Technical Resources Section.



Energy Limiting Under Abnormal Conditions

Some sensors will carry a similar certification to Intrinsic Safety. Class 1, Division 2 or ATEX Zone 2 sensors are approved for use in Hazardous Areas which do not normally contain explosive gases, dust or fibers.

These sensors do not typically require energy limiting barriers, and instead utilize strict controls on cable and connectors used.



Summary

- ✓ Intrinsic Safety standards are intended to limit the electrical energy in hazardous area circuits, thereby preventing ignition.
- ✓ Consult control drawings and entity parameters to be sure that components are compatible for use in the proposed environment.
 - Sensors mounted in a Hazardous area must be case-grounded to the machinery to prevent static build up.
 - Safety barriers (such as Zener Diode Barriers or Galvanic Isolators) must be used to limit the amount of energy which can enter the Hazardous Area.
 - Barriers and cable must be properly grounded.
- ✓ Not all “Intrinsically Safe Sensors” are approved in all Intrinsically Safe Environments. Be sure that the sensor you intend to use is rated for your application’s environment, and meets your country’s regulatory standards.



Summary

This presentation has been a general overview of Intrinsic Safety and is not intended to be a substitute for consulting and understanding the local regulatory standards. Please consult the regulatory standards in your region for specific information on your installation, as suitability of final installation is to be determined by the authority having local jurisdiction.



Thank You!

Thank you for taking the time to review this training module.

CTC prides itself on its customer and technical support. CTC employs several Vibration Institute Certified Analysts (**Category 2, Category 3 and Category 4**). It is all part of our commitment to providing the industry's best service and support.

For more technical information, additional white papers, and training materials, we invite you to visit our website at www.ctconline.com, or contact one of our Analysts at (800) 999-5290 (in the US and Canada); or at +1-585-924-5900 (international).



Thank You !

CTC offers a full range of vibration analysis hardware and process and protection instruments for industrial use. Our customers choose us based on:

- Superior Durability
- Accuracy and Performance
- Quick Service (shipping most orders in 3 days)
- Knowledgeable support staff
- Industry's best warranty

Contact us at:

www.ctconline.com

Sales@ctconline.com

(800) 999-5290 US & Canada
+01 (585) 924-5900 International



MADE IN THE USA

