Pepperl+Fuchs GmbH – Lilienthalstrasse 200 – 68307 Mannheim – Germany

Please indicate the following contact information for publication:
Tel.: +49 621 776-2222, Fax: +49 621 776-27-2222, www.pepperl-fuchs.com, pa-info@de.pepperl-fuchs.com
Editorial contact: Christa Blas (extension: -1420, fax: -1108), cblas@de.pepperl-fuchs.com

Intrinsic Safety in Zone 2

Up-to-date applications for intrinsic safety Ex ic

Intrinsic safety is a well established method of protection for electrical circuits in hazardous areas. In the past Zone 2 hazardous areas employed energy limiting ignition protection type Ex nL (energy limited). Compared to protection type Ex i (intrinsic safety), Ex nL has contradictory requirements that have led to some ambiguity regarding the correct dimension and construction of electrical circuits. The new type of protection Ex ic intrinsic safety will replace the existing Ex nL type of protection as of the year 2011. This article explores the improvements that can be realized by combining this new standard with Remote I/O.

Electrical equipment for use in the safe area or in Zone 2 hazardous areas will have intrinsically safe circuits reaching into Zone 1 and even Zone 0. These circuits must satisfy Ex ib or Ex ia requirements. Circuits which remain in Zone 2 only need to conform to the easier protection level Ex ic.

Ignition protection type Ex ic (IEC 60079-11:2006) is very similar to and a replacement for explosion protection type Ex nL (energy limited to IEC 60079-15:2005). The latter will be replaced by the next edition in 2012, so that the type of protection nL will become obsolete in 2013/2014 after a transition period of 2 or 3 years. Plants put in operation using Ex nL continue to conform to the standards to which they have been designed. This includes minor updates and modifications, for which Ex ic-rated equipment can be used as one-to-one replacements when Ex nL will cease to exist. For new plants and major upgrades the new standard Ex ic must be used.

<<Fig. 1>>

About intrinsic safety (Ex ic) with LB Remote I/O

Zone 2 installations employing Ex ic are required to conform to the demands of intrinsic safety already known for protection methods for Zone 0 and 1. They are to name but a few:

- Separation of exposed conductive parts of intrinsically safe and other non intrinsically safe circuits by 50 mm clearance
- Ex ic circuits must be marked. If this is to be done by color a light blue marking must be used
- Validation of intrinsic safety Ex ic through Entity

Validation according to Entity requires a comparison of safe voltage (Uo), current (Io) and power levels (Po) of the module output with respective input values for the connected field devices as well as calculating and observing limits for inductance and capacitance of any connected device or cable.

<<Table 1>>

Fundamentally, the way LB Remote I/O modules are designed remains the same. LB in-/output modules and their connection to the field devices is as easy to plan, install, and maintain as ever. All existing installations continue to be valid.

Simple yet elegant product design for ease of use in Zone 2

The field circuits of the LB Remote I/O modules were originally designed to satisfy Zone 0 and Zone 1 requirements. Therefore it was easy to modify them to comply with Ex ic specifications. Basically the demands rely on similar principles with the exception that Ex ic does not have to consider fault conditions but is permitted to concentrate on normal operation. Therefore the previously nL approved field circuits of the LB Remote I/O modules can now provide Ex ic ignition protection as long as the nL field circuits have already been installed according to the same requirements as for ia or ib field circuits in accordance with IEC 60079-14. Service and maintenance will then be possible without a hot work permit.

<<Fig. 2>>

Other Consequences for Users

Loop validation follows the regular procedures for intrinsic safety according to the Entity concept. Intrinsic safety Ex ic for Zone 2 enables live work on the field circuits of the devices while the plant is in operation – all without the need for a hot work permit.

LB Remote I/O modules provide Ex ic ignition protection with higher safety parameters for inductance and capacitance while keeping the same values for the maximum voltage, current, and power as for Ex ib circuits.

Ex ic brings intrinsic safety to Zone 2. With its requirements adapted to the risk of explosion protection, it reduces costs and removes ambiguity. Working with LB Remote I/O under these conditions is as easy as for the other two ignition protection types ia and ib.

Summary

The article shows how the new rules for intrinsic safety in Zone 2 are met by existing Pepperl+Fuchs Remote I/O. This simplifies matters for EPCs and end users who can adopt the new methods to arrive at safe and cost effective solutions for many green field installations which feature hazardous areas specified for Zone 2.

About Pepperl+Fuchs

Pepperl+Fuchs is a leading developer and manufacturer of electronic sensors and components for the global automation market. For more than 60 years, our continuous innovation, high quality products, and steady growth has guaranteed us continued success.

One Company – Two Divisions

Pepperl+Fuchs – PROTECTING YOUR PROCESS

The **Process Automation Division** is a market leader in intrinsically safe explosion protection components. We offer comprehensive, application oriented system solutions, including customer specific control cabinet solutions for the process industry. A large selection of components are available from our various product lines: isolation barriers, fieldbus infrastructure, remote I/O systems, HART interface solutions, fill level technology, pressure encapsulation systems, operating and observation, corrosion monitoring, power supply and alarm systems for oil and grease separators, signaling equipment, lighting, and emergency shutdown equipment and accessories.

Pepperl+Fuchs – SENSING YOUR NEEDS

With the invention of the inductive proximity sensor in 1958, the company set an important milestone in the development of automation technology. Under the motto “Sensing your needs”, customers benefit from tailor-made sensor solutions for **factory automation.** The main target markets of the factory automation are machine and plant construction, the automotive industry, storage and material handling, printing and paper industry, packaging technology, process equipment, door, gate and elevator construction, mobile equipment, renewable energies.

The division offers a wide product range of industrial sensors whether it’s inductive, photoelectric or ultrasonic sensors, rotary encoders, identification systems, barcodes, code readers for data-matrix-codes and vision sensors.

Key words: Zone 2, intrinsic safety, energy limited, green field site, cost reduction, hot work permit, loop validation

Authors: Dipl.-Ing. Rene Probst
Standard Expert Remote I/O Systems
Division Process Automation

Dipl.-Ing./D.I.C. Rainer Hillebrand
Manager Product Group Remote I/O Systems
Division Process Automation

Characters: 3,861, without space characters
Characters short text: 604, without space characters
Pictures: No. 7522_110119_02, No. MC7522_1007075_01, No. MC7522_100326_23, No. MC7522_100326_24

January 2011

Fig. 1: Eye catcher

Fig. 2: Zone 2 Remote I/O with intrinsically safe I/O modules

Validating intrinsic safety employing the Entity concept
Entity Limit Value Comparison
$I_o \leq I_i$
$U_o \leq U_i$
$P_o \leq P_i$
$L_0 \quad \geq L_{cable} + \Sigma L_i$
$C_0 \quad \geq C_{cable} + \Sigma C_i$
Indices: 'o': Output value e.g. Analog Output module LB 4002 A 'i' = Input value e.g. field instrument

Table 1: Loop evaluation parameters

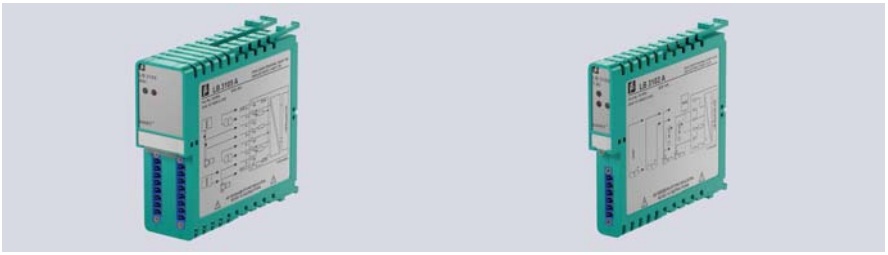

Fig. 3: Ex ia approved I/O modules