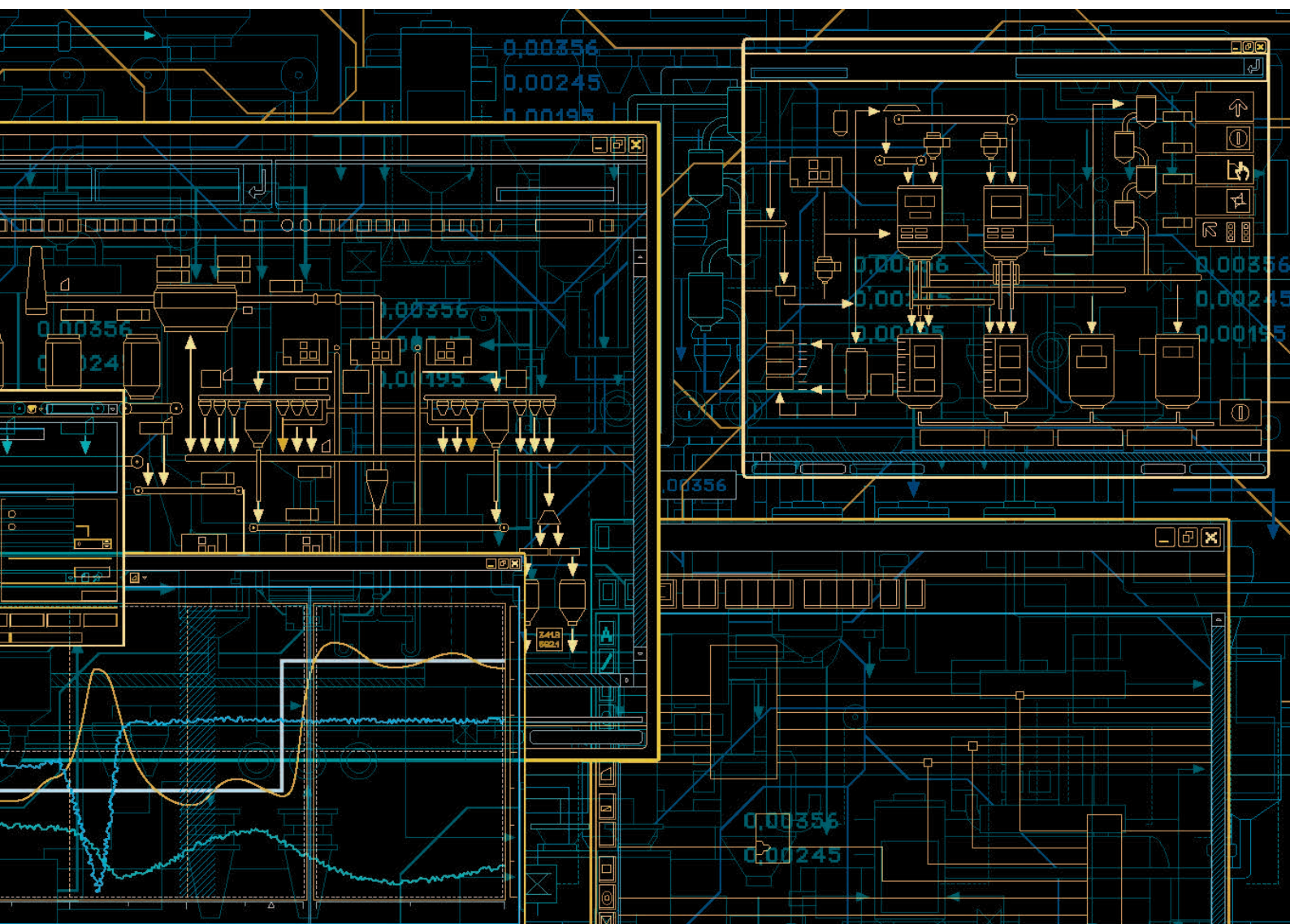


APPLICATION NOTE AN013

Protection for data and signal lines in Intrinsically Safe circuits

ESP AN013 for data and signal line
protectors



Protection for data and signal lines in Intrinsically Safe circuits

Industries such as petrochemical, oil & gas or pharmaceutical face a daily challenge to protect people and property at risk from potentially explosive atmospheres.

These atmospheres create hazardous areas, where air mixes with inflammable materials, such as gases, powders, or dusts (for example, petrol fumes during oil refinery), which would combust if ignited.

Hazardous areas must be protected against the risk that a spark or other source of ignition would cause an explosion.

Electrical equipment and systems (such as process control units) therefore present a considerable risk to safety, as they may be subjected to transient overvoltages from lightning or switching events.

Intrinsic Safety/Ex i

A major approach to protecting hazardous areas from dangerous sparking is known as **Intrinsic Safety (IS)**.

Within an IS environment, sparks from electrical equipment and circuitry are prevented through the use of **IS Barriers**, which limit the available electrical energy that could cause an explosion, to below ignition threshold.

IS Barriers are NOT surge protectors but field instruments which are themselves AT RISK from transient overvoltages.

IS circuits therefore need to be protected from transient overvoltages by a suitable (ATEX approved) surge protector.

IEC/ATEX Directives

The IEC and the EU, through the publication of two ATEX Directives, have introduced specifications for determining hazardous areas, and product suitability for use in IS environments.

ATEX Directive **2014/34/EU** covers equipment and protective systems for potentially explosive atmospheres and the health & safety requirements to which they must conform.

Directive **1999/92/EC** covers health & safety of employees at risk from explosive atmospheres and requires the avoidance of ignition in explosive atmospheres, where these atmospheres cannot be fully prevented.

The IEC has established a classification of gases (3 groups: IIA – IIB – IIC), and of temperatures for material used in zones at risk of explosion (6 groups: T1 to T6).

Products for hazardous areas are classified in line with IEC & ATEX to gas group & temperature for application within specific hazardous area zones (see Zone and EX i classification tables opposite).



Gaseous hazardous area zones are defined based on the expectation of a potentially explosive atmosphere occurring:

Zone 0	Hazard is continuously present, for long periods or frequently (> 1000 hours per year)
Zone 1	Hazard is likely to arise occasionally during normal operation (10 – 1000 hours per year)
Zone 2	Hazard is not likely to arise during normal operation, or is of short duration only (< 10 hours per year)

SAFE AREA No hazard is present

Symbol	Suitable for	Category	Tested to
Ex ia	Zones 0, 1, 2	1	EN 50020
Ex ib	Zones 1 & 2	1	EN 50039

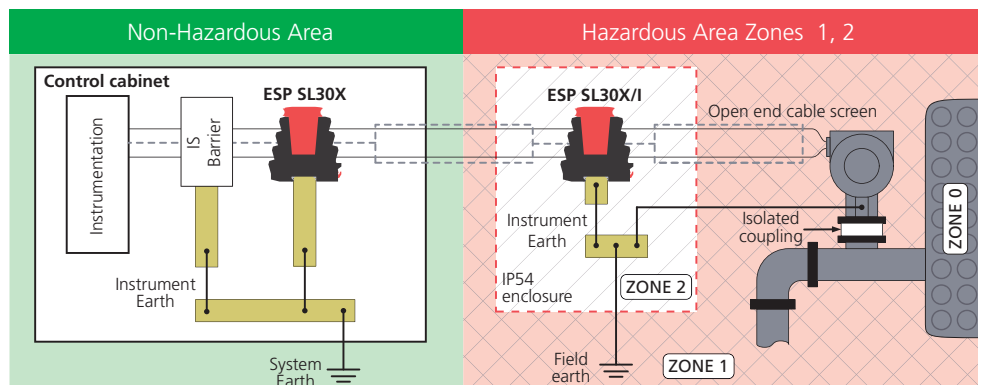


Figure 1: The ESP SL30X Series can provide protection for the instrumentation as well as providing protection for the IS Barrier. The isolated screen version (ESP SL30X/I) should be used in Zone 1, 2.

Protecting data & signal lines

Surge Protection Devices (SPDs) must be installed at all lightning protection boundaries, in line with BS EN/IEC 62305, to protect against transient overvoltages.

Similarly, IS circuits require surge protection at the boundary between the hazardous and non-hazardous area - see Figure 1.

ABB ESP SL**X Series protectors are approved for use in hazardous areas to protect IS circuits and have a group IIC T4 certification, for use with all gas/air mixtures (Classification: **Ex II 2 (1) G, Ex ia [ia Ga] IIC T4 Gb**).

These protectors are suitable for high speed digital communication equipment or systems with long signal lines, where a large number of wires require protection (e.g. process control, 4 – 20 mA loops, fire and gas detectors and shut down systems).

Protectors offer negligible self-capacitance and self-inductance for minimal interference when protecting IS circuits.

Note: ABB ESP SLX protectors provide surge protection on IS circuits only and do not replace the IS barrier itself.**

Installation

Field instrument protection should take place in Zone 1 and as close as practically possible to the Zone 0 boundary, preferably within 1 m to prevent transient overvoltages from entering Zone 0.

The SPD should be housed in the field instrument, or within a suitable protective enclosure, mounted on a separate 35 mm DIN rail to the IS Barriers.

The SPD should be connected in-line (series) with the data communication, signal, measurement, or telephone line, with the dirty line end of the protector connected to the cable carrying the incoming transient overvoltages – see Figure 2.

Cables connected to the clean end should never be routed next to dirty line cables or dirty barrier earth bonds. If rows of SPDs are installed close to each other, dirty line cables (and earth bonds) must be kept at least 5 cm apart from clean cables - refer to installation instructions for further information.

The SPD must not be subjected to thermal and/or mechanical stresses in excess of those permitted in the certification documentation, nor installed in a location where it may be attacked by aggressive substances. Protect from excessive dust, moisture and other contaminants by a suitable enclosure.

Electrical specification	ESP SL15X, ESP SL15X/I ESP SL15XL, ESP SL15XL/I	ESP SL30X, ESP SL30X/I ESP SL30XL, ESP SL30XL/I
Protection level 1 GP1-1224	Combined Category D, C, B	Combined Category D, C, B
Protection boundary	LPZ 0 to LPZ 3	LPZ 0 to LPZ 3
Maximum working voltage UC	15 V	30 V
Line resistance	1 Ω	1 Ω
Current rating	750 mA	750 mA
Bandwidth	45 MHz (-3dB)	45 MHz (-3dB)

Part No.	ABB order code
ESP SL15X	7TCA085400R0065
ESP SL15X/I	7TCA085400R0233
ESP SL15XL	7TCA085400R0066
ESP SL15XL/I	7TCA085400R0235
ESP SL30X	7TCA085400R0071
ESP SL30X/I	7TCA085400R0196
ESP SL30XL	7TCA085400R0073
ESP SL30XL/I	7TCA085400R0236

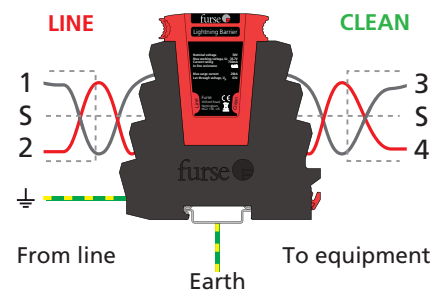


Figure 2: Series connection of ESP SLX surge protectors.**

Lightning protection SPDs in hazardous areas must only be installed, operated and maintained by competent personnel.

SPDs for data and signal lines should form part of an overall Lightning Protection System for the site, including mains surge protection, structural lightning protection, and an appropriate earthing system, as required.

For further information, contact ABB.

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