

Intrinsically safe examination of Ethernet-APL Field Switch FISCO installations

Scope:

Pepperl+Fuchs Ethernet-APL Field Switches support the use of field devices with two different physical layers either compliant to Ethernet-APL or IEC 61158-2 MAU types 1 or 3 (Manchester Bus Powered "MBP") at the same ports. Ethernet-APL specifies 2-WISE (IEC TS 60079-47) and MBP based communication systems specify FISCO (IEC 60079-11 and IEC 60079-25) as their intrinsically safe system concepts.

The fundamental difference between the physical layers is that Ethernet-APL permits the connection of one field device to one power supply whilst MBP systems permit the connection of up to 32 field devices to one power supply. Due to the different topologies also the terminology differs. Ethernet-APL uses the term "spur" for the system connected to one power supply compared to the terms "trunk" and "spur" used in MBP systems. The ATEX and IECEx certificates issued for Ethernet-APL switches use generally only the term "spur" independent if the intrinsically safe ports are used in Ethernet-APL systems or in MBP systems.

This document describes the intrinsically safe examination and requirements for Pepperl+Fuchs Ethernet-APL Field Switches type ARS11-B2-IA*, if one FISCO certified field device is connected to a Field Switch spur port through an unterminated trunk. If the trunk is terminated by an FISCO certified terminator then the standard FISCO rules apply as specified in IEC 60079-11 and IEC 60079-25.

Ethernet-APL Field Switches provide up to 24 FISCO rated ports. Each of these ports includes a FISCO power supply and is therefore supplying an independent FISCO system. From the FISCO point of view, each switch port opens a FISCO trunk to which one FISCO certified field device can be connected.

Additionally two Surge Protectors with Li and Ci equivalent to one FISCO field device can be connected to the trunk. The length of the cable between the FISCO power source and the FISCO field device is limited to 1000 m. From a functional, physical layer point of view, the cable length is limited to 120 m because the cable is unterminated at the field device end.

FISCO acc. to IEC 60079-11 and IEC 60079-25 allows interconnection of intrinsically safe apparatus and associated apparatus not specially assessed for such a combination. For the acceptance of the interconnection of the different intrinsically safe circuits of these apparatus, the comparison of the voltage $U_i (V_{max})$ with $U_o (V_{oc})$, the current $I_i (I_{max})$ with $I_o (I_{oc})$, and the power $P_i (P_{max})$ with $P_o (P_{max})$ of the interconnected circuits must demonstrate that $U_i (V_{max})$, $I_i (I_{max})$ and $P_i (P_{max})$ are equal to or greater than $U_o (V_{oc})$, $I_o (I_{sc})$ and $P_o (P_{max})$ of the connected circuits. In addition, the maximum internal capacitance (C_i) and maximum internal inductance (L_i) of each apparatus connected to a FISCO system must not exceed 5 nF and 10 µH respectively.

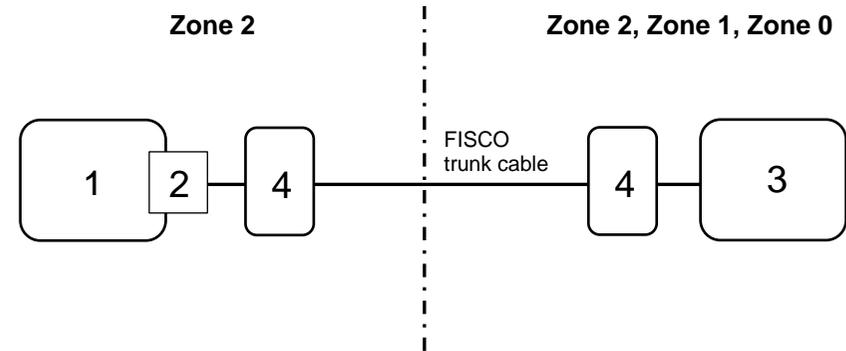
The parameters of the cable must be as follows:

cable resistance R_c : 15...150 Ohm/km
 cable inductance L_c : 0,4...1 mH/km
 cable capacitance C_c : 45...200 nF/km
 $C_c = C_c \text{ line/line} + 0.5 C_c \text{ line/screen}$, if both lines are floating, or
 $C_c = C_c \text{ line/line} + C_c \text{ line/screen}$, if the screen is connected to one line
 Length of cable : ≤ 1000 m

If the above rules are respected, the inductance and the capacitance of the cable will not impair the intrinsic safety of the installation.

Non-hazardous classified area or Hazardous Locations

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- 1 Field Switch
- 2 FISCO power supply port
- 3 FISCO field device
- 4 Surge Protector FISCO certified

Approved Field Switch (1) with FISCO power supply port (2)	
$U_o (V_{oc}) = 14,0 \dots 17,5 \text{ V}$	$C_i \leq 5 \text{ nF}$
$I_o (I_{sc}) \leq 380 \text{ mA}$	$L_i \leq 10 \text{ µH}$
$P_o (P_{max}) \leq 5,32 \text{ W}$	

Approved FISCO apparatus e.g. field device (3) or Surge Protector (4)	
$U_i (V_{max}) = 17,5 \text{ V}$	$C_i \leq 5 \text{ nF}$
$I_i (I_{max}) = 380 \text{ mA}$	$L_i \leq 10 \text{ µH}$
$P_i (P_{max}) = 5,32 \text{ W}$	
Leakage current: ≤ 50µA	

		Only valid as long as released in EDM!		scale:	date: 2022-10-12
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