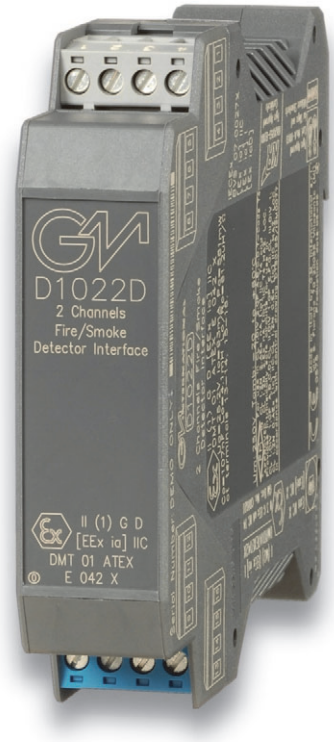


INSTRUCTION MANUAL

Loop Powered Current Repeater
DIN-Rail Models D1022S, D1022D

Characteristics

General Description: The D1022S or D1022D is a loop-powered single or dual channel isolated current repeater. It can be used to interface transmitter, to drive I/P converter, fire and smoke detectors or similar switched resistor systems, located in Hazardous Area, requiring a wide output current range (from 1 to 40 mA) to operate properly. When drive I/P converter, positioner, display a current source is connected to the input terminals, while interfacing transmitter or fire and smoke detector a voltage source with current readback can be connected. The transmitter current is sinked from the input terminals operating as a transparent interface. For fire and smoke detector, the triggering of a detector causes a corresponding change in the Safe Area circuit current. A field open circuit reflects a high impedance to the control device circuit.
The unit has reverse input polarity protection and ≤ 1 % accuracy.
Function: 1 or 2 channels I.S. analog current repeater for transmitters, I/P converter or fire-smoke detectors providing input-output isolation.
EMC: Fully compliant with CE marking applicable requirements.

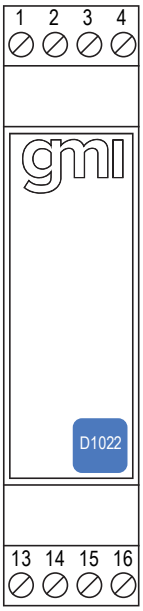
Technical Data

Supply: No supply voltage required because loop-powered.
Power dissipation: ≤ 1.1 W per channel at 40 mA, 30 V loop supply.
Isolation (Test Voltage): I.S. Out/In 1.5 KV; I.S. Out/I.S. Out 500 V; In/In 500 V.
Output Signal to Hazardous Area:
Output: 1 to 40 mA.
Output characteristic (typical):
Vout = (Vin - 1.5) - (0.4 x Iout) for 6 V < Vin < 23 V.
Vout = 22 - (0.4 x Iout) for 23 V < Vin < 30 V.
4-20 mA output on load of 100 to 600 Ω; Accuracy ≤ 1 %.
Response time: 50 ms (10 to 90 % step change).
Input Signal to Safe Area:
Operating voltage range: 6 to 30 V (loop powered).
Input current: 1 to 40 mA (loop powered).
Voltage drop-out: 9.5 V at 20 mA and with 500 Ω load.
Open circuit consumption: ≤ 0.4 mA at 20 V.
Performance:
Reference ambient temperature conditions: 23 ± 1 °C.
Current transfer error: ≤ 400 µA (6 V <Vin< 23 V; 1 mA <Iout< 40 mA).
Temperature influence: ≤ ± 0.01 % for a 1 °C change.
Compatibility:
CE mark compliant, conforms to Directive:
2014/34/EU ATEX, 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.
Environmental conditions:
Operating: temperature limits -20 to + 60 °C,
relative humidity max 90 % non condensing, up to 35 °C.
Storage: temperature limits – 45 to + 80 °C.
Safety Description:
ATEX: II (1)G [Ex ia Ga] IIC, II (1)D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I; II 3G Ex ec IIC T4 Gc
IECEx: [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I; Ex ec IIC T4 Gc
Uo/Voc = 25.2 V, Io/Isc = 93 mA, Po/Po = 581 mW at terminals 13-14, 15-16.
Um = 250 Vrms, -20 °C ≤ Ta ≤ 60 °C.
Approvals:
DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11.
IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11.
IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-7.
IECEx IMQ 13.0011X conforms to IEC60079-0, IEC60079-7.
FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 and
C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15,
DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications.
Mounting:
EN/IEC60715 TH 35 DIN-Rail.
Weight: about 125 g D1022D, 110 g D1022S.
Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm^2.
Location: Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4,
Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

Ordering information

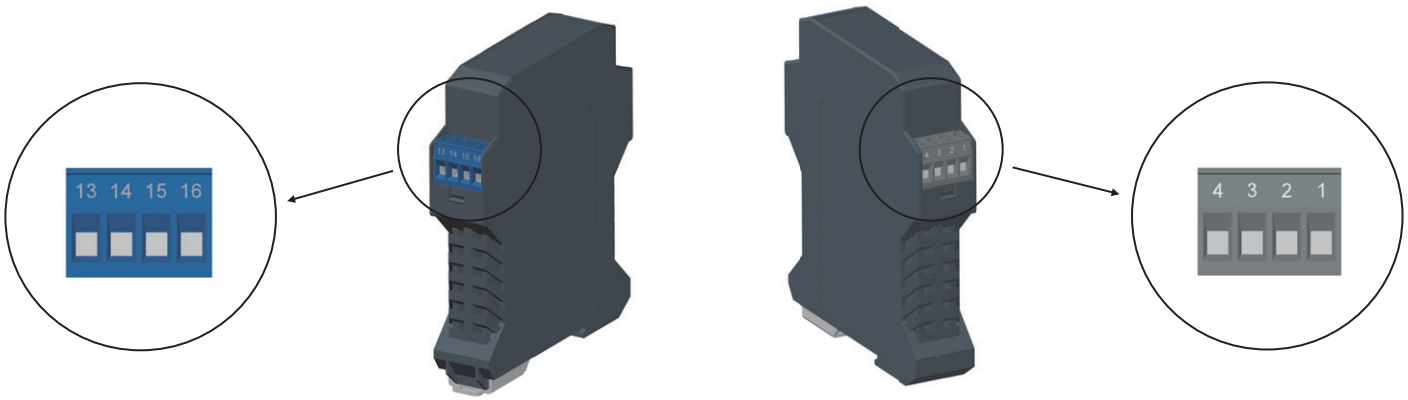
Model:	D1022	
1 channel		S
2 channels		D

Front Panel and Features



- Output to Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- Wide operating current range from 1 to 40 mA.
- Field open circuit detection.
- Input/Output isolation.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- ATEX, IECEx, FM & FM-C Certifications.
- Type Approval Certificate DNV and KR for marine applications.
- High Reliability, SMD components.
- High Density, two channels per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Terminal block connections



HAZARDOUS AREA	
13	+ Output Ch 1 for Fire / Smoke Detectors or + Output Ch 1 for 2 Wire Transmitters or + Output Ch 1 for I/P Converter
14	- Output Ch 1 for Fire / Smoke Detectors or - Output Ch 1 for 2 Wire Transmitters or - Output Ch 1 for I/P Converter
15	+ Output Ch 2 for Fire / Smoke Detectors or + Output Ch 2 for 2 Wire Transmitters or + Output Ch 2 for I/P Converter
16	- Output Ch 2 for Fire / Smoke Detectors or - Output Ch 2 for 2 Wire Transmitters or - Output Ch 1 for I/P Converter

SAFE AREA	
1	+ Input Ch 1 for Current Source mode or + Input Ch 1 for Current Sink mode
2	- Input Ch 1 for Current Source mode or - Input Ch 1 for Current Sink mode
3	+ Input Ch 2 for Current Source mode or + Input Ch 2 for Current Sink mode
4	- Input Ch 2 for Current Source mode or - Input Ch 2 for Current Sink mode

Parameters Table

In the system safety analysis, always check the Hazardous Area/Hazardous Locations devices to conform with the related system documentation, if the device is Intrinsically Safe check its suitability for the Hazardous Area/Hazardous Locations and gas group encountered and that its maximum allowable voltage, current, power (Ui/Vmax, Ii/Imax, Pi/Pi) are not exceeded by the safety parameters (Uo/Voc, Io/Isc, Po/Po) of the D1022 series Associated Apparatus connected to it. Also consider the maximum operating temperature of the field device, check that added connecting cable and field device capacitance and inductance do not exceed the limits (Co/Ca, Lo/La, Lo/Ro) given in the Associated Apparatus parameters for the effective gas group. See parameters on enclosure side and the ones indicated in the table below:

D1022 Terminals		D1022 Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 14	Uo / Voc = 25.2 V		≤	Ui / Vmax
Ch2	15 - 16				
Ch1	13 - 14	Io / Isc = 93 mA		≤	Ii/ Imax
Ch2	15 - 16				
Ch1	13 - 14	Po / Po = 581 mW		≤	Ii/ Imax
Ch2	15 - 16				
D1022 Terminals		**D1022 Associated Apparatus Parameters**		**Must be**	**Hazardous Area/ Hazardous Locations Device + Cable Parameters**
Ch1	13 - 14	Co / Ca = 107 nF	(IIC-A, B)	≥	Ci / Ci device + C cable
Ch2	15 - 16	Co / Ca = 820 nF	(IIB-C)		
		Co / Ca = 2.9 µF	(IIA-D)		
Ch1	13 - 14	Lo / La = 4.1 mH	(IIC-A, B)	≥	Li / Li device + L cable
Ch2	15 - 16	Lo / La = 16.4 mH	(IIB-C)		
		Lo / La = 32.8 mH	(IIA-D)		
Ch1	13 - 14	Lo / Ro = 61.2 µH/Ω	(IIC-A, B)	≥	Li / Ri device and L cable / R cable
Ch2	15 - 16	Lo / Ro = 244.9 µH/Ω	(IIB-C)		
		Lo / Ro = 489.8 µH/Ω	(IIA-D)		

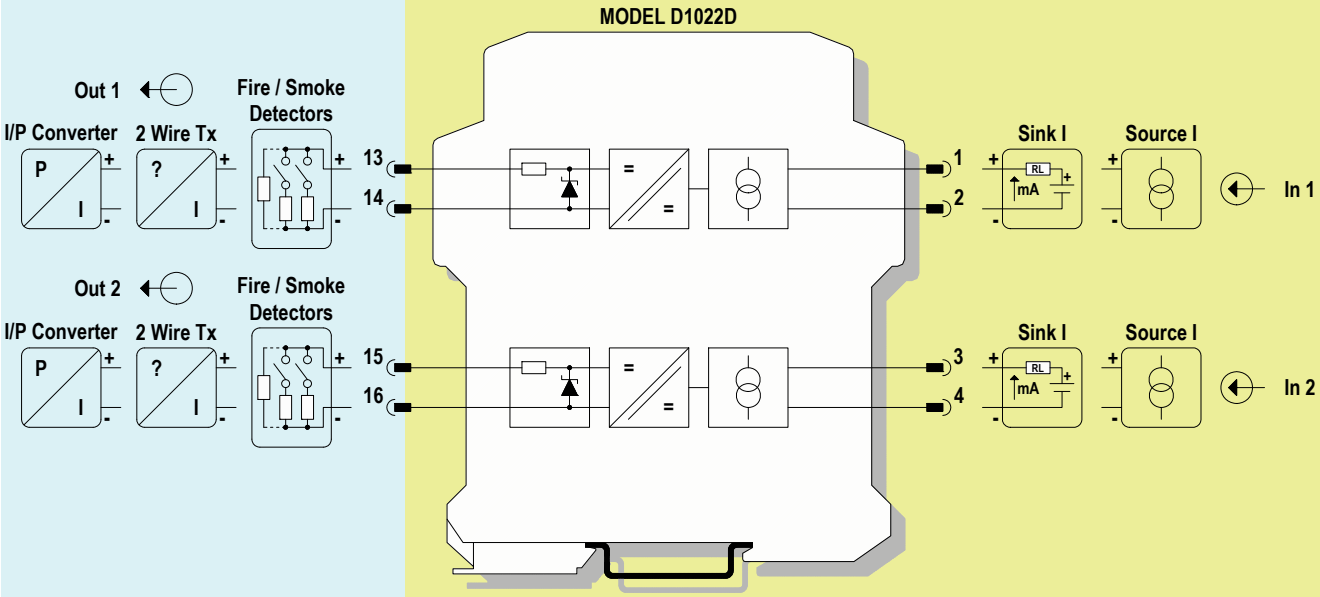
NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G
IIB equal to Gas Groups C, D, E, F and G
IIA equal to Gas Groups D, E, F and G

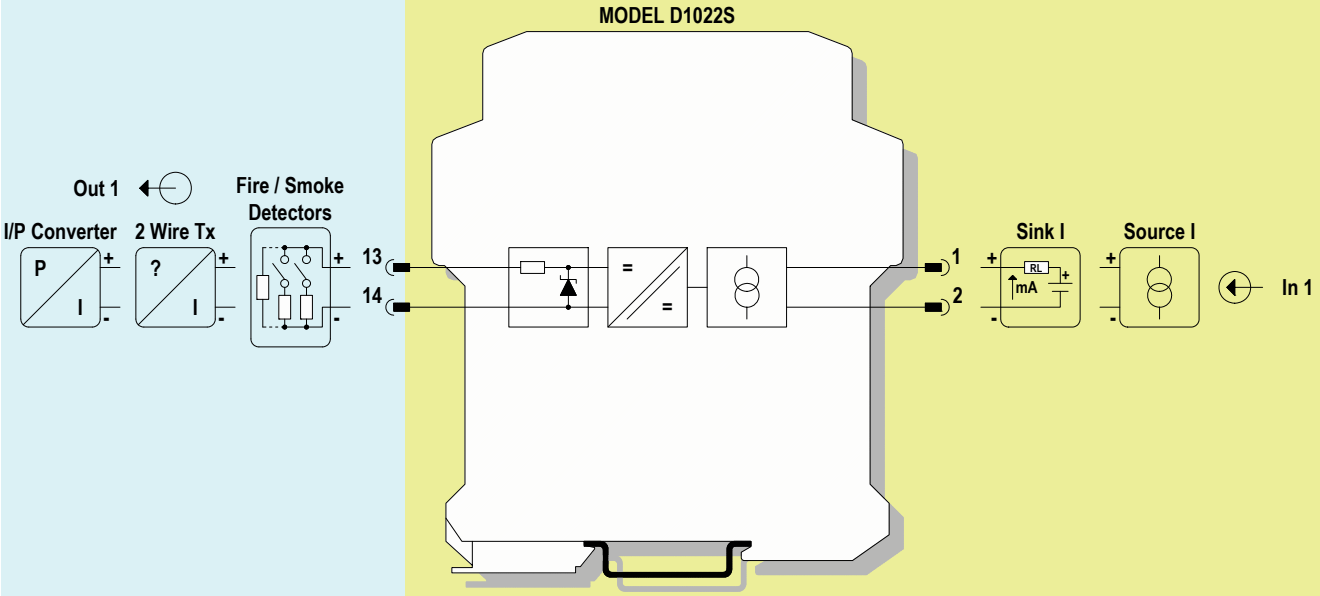
For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1% of the Co and Lo parameters of the Associated Apparatus (excluding the cable), then 50% of Co and Lo parameters are applicable and shall not be exceeded (50% of the Co and Lo become the limits which must include the cable such that Ci device + C cable ≤ 50 % of Co and Li device + L cable ≤ 50 % of Lo). The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups I, IIA, IIB and 600 nF for Group IIC. If the cable parameters are unknown, the following value may be used: Capacitance 200 pF per meter (60 pF per foot), Inductance 1 µH per meter (0.20 µH per foot).
The Intrinsic Safety Entity Concept allows the interconnection of Intrinsically Safe devices approved with entity parameters not specifically examined in combination as a system when the above conditions are respected.
For Division 1 and Zone 0 installations, the configuration of Intrinsically Safe Equipment must be FM approved under Entity Concept (or third party approved);
for Division 2 installations, the configuration of Intrinsically Safe Equipment must be FM approved under non-incendive field wiring or Entity Concept (or third party approved).

Function Diagram

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

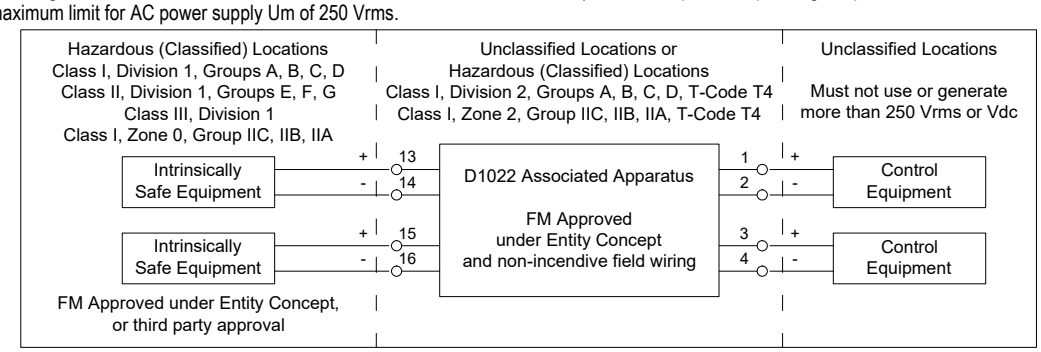
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4

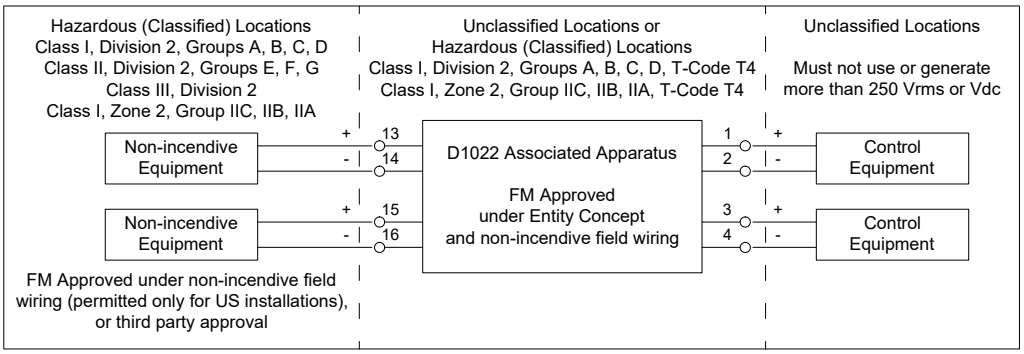




Warning

D1022 series are isolated Intrinsically Safe Associated Apparatus installed into standard EN/IEC60715 TH 35 DIN-Rail located in Safe Area/ Non Hazardous Locations or Zone 2, Group IIC, Temperature Classification T4, Class I, Division 2, Groups A, B, C, D, Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA Temperature Code T4 Hazardous Area/ Hazardous Locations (according to FM Class No. 3611, CSA-C22.2 No. 213-M1987, CSA-E60079-15) within the specified operating temperature limits Tamb -20 to +60 °C, and connected to equipment with a maximum limit for AC power supply Um of 250 Vrms.





Non-incendive field wiring is not recognized by the Canadian Electrical Code, installation is permitted in the US only. For installation of the unit in a Class I, Division 2 or Class I, Zone 2 location, the wiring between the control equipment and the D1022 associated apparatus shall be accomplished via conduit connections or another acceptable Division 2, Zone 2 wiring method according to the NEC and the CEC. Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground.
D1022 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC) following the established installation rules, particular care shall be given to segregation and clear identification of I.S. conductors from non I.S. ones.
De-energize power source (turn off power supply voltage) before plug or unplug the terminal blocks when installed in Hazardous Area/Hazardous Locations or unless area is known to be nonhazardous. **Warning: substitution of components may impair Intrinsic Safety and suitability for Division 2, Zone 2. Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.** Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury. The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

Operation

D1022 is a loop powered isolated interface to be used with fire, smoke detectors or similar equipment located in Hazardous Area/Hazardous Locations.
It isolates and transfer the absorbed current in Hazardous Area/Hazardous Locations to the control device located in Safe Area/ Non Hazardous Locations.
It has a wide current range to interface several fire and smoke detector with a low drop out voltage from the controller.
The triggering of a detector causes a corresponding current change in the Safe Area/Non Hazardous Locations circuit allowing the controller to monitor the signal.

Installation

D1022 series are loop powered current repeater housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail. D1022 unit can be mounted with any orientation over the entire ambient temperature range, see section “Installation in Cabinet” and "Installation of Electronic Equipments in Cabinet" Instruction Manual D1000 series for detailed instructions. Electrical connection of conductors up to 2.5 mm² are accommodated by polarized plug-in removable screw terminal blocks which can be plugged in/out into a powered unit without suffering or causing any damage **(for Zone 2 or Division 2 installations check the area to be nonhazardous before servicing)**.
The wiring cables have to be proportionate in base to the current and the length of the cable.
On the section “Function Diagram” and enclosure side a block diagram identifies all connections.
Identify the number of channels of the specific card (e.g. D1022S is a single channel model and D1022D is a dual channel model), the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:
For Model D1022S connect positive controller input of channel 1 at terminal “1” and negative at “2”.
For Model D1022D in addition to channel 1 connections above, connect positive input of channel 2 at terminal “3” and negative input at “4”.
For Model D1022S connect fire/smoke detector at terminal “13” for positive and “14” for negative.
For Model D1022D in addition to channel 1 connections above, connect terminal “15” for positive and “16” for negative on channel 2.
Intrinsically Safe conductors must be identified and segregated from non I.S. and wired in accordance to the relevant national/international installation standards (e.g. EN/IEC60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC), make sure that conductors are well isolated from each other and do not produce any unintentional connection. The enclosure provides, according to EN/IEC 60529, an IP20 minimum degree of protection. The equipment shall only be used in an area of at least pollution degree 2, as defined in EN/IEC 60664-1. For hazardous location, the unit shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with EN/IEC 60079-0, that must have a door or cover accessible only by the use of a tool. Units must be protected against dirt,
dust, extreme mechanical (e.g. vibration, impact and shock) and thermal stress, and casual contacts. If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water. **Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D1022 must be cleaned only with a damp or antistatic cloth.**
Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.

Start-up

Before powering the unit check that all wires are properly connected, particularly their polarity, input and output wires, also check that Intrinsically Safe conductors and cable trays are segregated (no direct contacts with other non I.S. conductors) and identified either by color coding, preferably blue, or by marking. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Turn on signal controller, output signal should be corresponding to the input from the fire/smoke detector status.
If possible change the fire/smoke detector condition and check the corresponding signal versus Safe Area controller.