

# INSTRUCTION MANUAL

## Quadruple Repeater Power Supply DIN-Rail Model D1012Q

## Characteristics

**General Description:** The quadruple channel DIN Rail Repeater Power Supply D1012Q provides a fully floating dc supply for energizing conventional 2 wires 4-20 mA transmitters located in Hazardous Area, and repeats the current in Safe Area to drive a load.

**Function:** 4 channels I.S. analog input for 2 wires loop powered transmitters, provides isolation between input versus output and supply, and current (source mode) output signal.

On demand it is possible to supply the following combination of input/output: 2 independent input // 2+2 independent groups of output or 1 input // 4 outputs.

**Signalling LED:** Power supply indication (green).

**EMC:** Fully compliant with CE marking applicable requirements.

## Technical Data

**Supply:** 24 Vdc nom (20 to 30 Vdc) reverse polarity protected, ripple within voltage limits  $\leq 5$  Vpp.

**Current consumption @ 24 V:** 160 mA with 20 mA output typical.

**Power dissipation:** 2.3 W for 4 channels with 24 V supply voltage and 20 mA output typical.

**Max. power consumption:** at 30 V supply voltage, 4.0 W for 4 channels.

**Isolation (Test Voltage):** I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV.

**Input:** 4 to 20 mA (2 wire Tx current limited at  $\approx 22$  mA).

**Transmitter line voltage:** 14.0 V typical at 20 mA with max. 30 mVrms ripple.

**Output:** 4 to 20 mA, on max. 300  $\Omega$  load source mode, current limited at 20.6 mA.

**Response time:** 500 ms (10 to 90 % step change).

**Output ripple:**  $\leq 30$  mVrms.

**Performance:** Ref. Conditions 24 V supply, 250  $\Omega$  load,  $23 \pm 1$  °C ambient temperature.

**Calibration accuracy:**  $\leq \pm 0.1$  % of full scale.

**Linearity error:**  $\leq \pm 0.05$  % of full scale.

**Supply voltage influence:**  $\leq \pm 0.05$  % of full scale for a min to max supply change.

**Load influence:**  $\leq \pm 0.05$  % of full scale for a 0 to 100 % load resistance change.

**Temperature influence:**  $\leq \pm 0.01$  % on zero and span 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 95 %.

**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

**INMETRO:** [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I

Uo/Voc = 21.5 V, Io/Isc = 93 mA, Po/Po = 496 mW

at terminals 13-14, 15-16, 9-10, 11-12.

Um = 250 Vrms, -20 °C  $\leq$  Ta  $\leq$  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.

INMETRO DNV 13.0108 X conforms to ABNT NBR IEC60079-0, ABNT NBR IEC60079-11.

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,

EA3C RU C-IT.HA67.B.00113/20 conforms to GOST 31610.0, GOST 31610.11, GOST 31610.15.

CL 16.0034 X conforms to ДСТУ 7113, ГОСТ 22782.5-78, ДСТУ IEC 60079-15.

DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications.

**Mounting:**

EN/IEC60715 TH 35 DIN-Rail.

**Weight:** about 140 g.

**Connection:** by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup>.

**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.

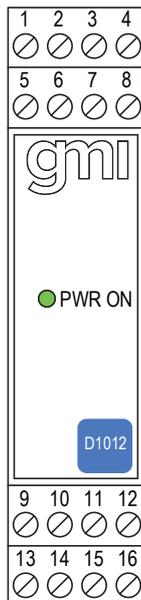
**Protection class:** IP 20.

**Dimensions:** Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

## Ordering information

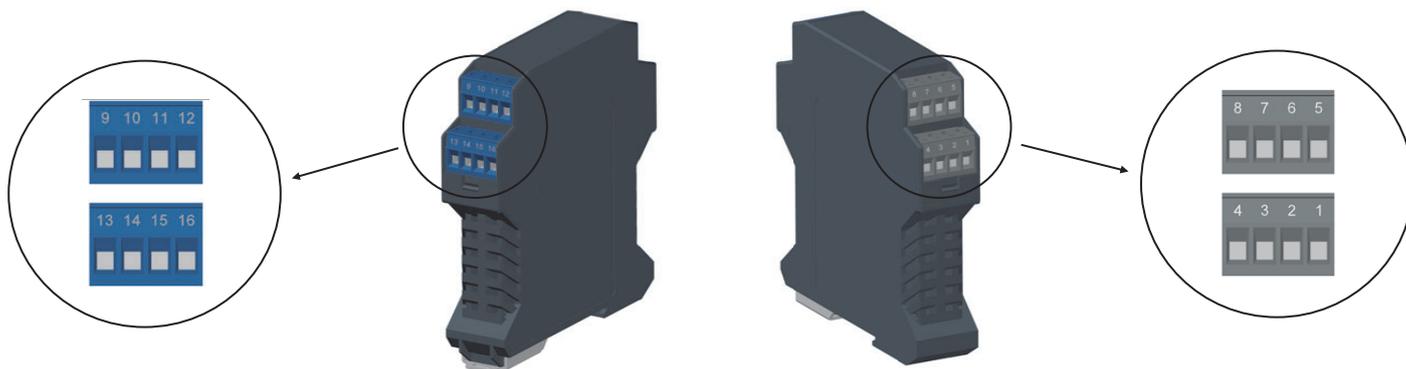
Model: D1012Q

## Front Panel and Features



- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- Quadruple channels for 2 wires Transmitters.
- 4-20 mA Input, Output Signal.
- Input and Output short circuit proof.
- High Accuracy.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- ATEX, IECEx, FM & FM-C, INMETRO, EAC-EX, UKR TR n. 898 Certifications.
- Type Approval Certificate DNV and KR for maritime applications.
- High Reliability, SMD components.
- High Density, four 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

<b>9</b>	+ Input Ch 3 for 2 Wire Transmitters
<b>10</b>	- Input Ch 3 for 2 Wire Transmitters
<b>11</b>	+ Input Ch 4 for 2 Wire Transmitters
<b>12</b>	- Input Ch 4 for 2 Wire Transmitters
<b>13</b>	+ Input Ch 1 for 2 Wire Transmitters
<b>14</b>	- Input Ch 1 for 2 Wire Transmitters
<b>15</b>	+ Input Ch 2 for 2 Wire Transmitters
<b>16</b>	- Input Ch 2 for 2 Wire Transmitters

### SAFE AREA

<b>1</b>	+ Output Ch 1 for Current Source mode
<b>2</b>	- Output Ch 1 and Ch 2 for Current Source mode
<b>3</b>	+ Power Supply 24 Vdc
<b>4</b>	- Power Supply 24 Vdc
<b>5</b>	+ Output Ch 2 for Current Source mode
<b>6</b>	- Output Ch 3 and Ch 4 for Current Source mode
<b>7</b>	+ Output Ch 3 for Current Source mode
<b>8</b>	+ Output Ch 4 for Current Source 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 ( $U_i/V_{max}$ ,  $I_i/I_{max}$ ,  $P_i/P_i$ ) are not exceeded by the safety parameters ( $U_o/V_{oc}$ ,  $I_o/I_{sc}$ ,  $P_o/P_o$ ) of the D1012 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 ( $C_o/C_a$ ,  $L_o/L_a$ ,  $L_o/R_o$ ) given in the Associated Apparatus parameters for the effective gas group. See parameters on enclosure side and the ones indicated in the table below:

D1012 Terminals		D1012 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 14	$U_o / V_{oc} = 21.5 \text{ V}$	$\leq$	$U_i / V_{max}$
Ch2	15 - 16			
Ch3	9 - 10			
Ch4	11 - 12			
Ch1	13 - 14	$I_o / I_{sc} = 93 \text{ mA}$	$\leq$	$I_i / I_{max}$
Ch2	15 - 16			
Ch3	9 - 10			
Ch4	11 - 12			
Ch1	13 - 14	$P_o / P_o = 496 \text{ mW}$	$\leq$	$P_i / P_i$
Ch2	15 - 16			
Ch3	9 - 10			
Ch4	11 - 12			

D1012 Terminals		D1012 Associated Apparatus Parameters	Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	13 - 14	$C_o / C_a = 176 \text{ nF}$ (IIC-A, B)	$\geq$	$C_i / C_i \text{ device} + C \text{ cable}$
Ch2	15 - 16	$C_o / C_a = 1.2 \text{ } \mu\text{F}$ (IIB-C)		
Ch3	9 - 10			
Ch4	11 - 12	$C_o / C_a = 4.5 \text{ } \mu\text{F}$ (IIA-D)		
Ch1	13 - 14	$L_o / L_a = 4.1 \text{ mH}$ (IIC-A, B)	$\geq$	$L_i / L_i \text{ device} + L \text{ cable}$
Ch2	15 - 16	$L_o / L_a = 16.4 \text{ mH}$ (IIB-C)		
Ch3	9 - 10			
Ch4	11 - 12	$L_o / L_a = 32.8 \text{ mH}$ (IIA-D)		
Ch1	13 - 14	$L_o / R_o = 71.7 \text{ } \mu\text{H}/\Omega$ (IIC-A, B)	$\geq$	$L_i / R_i \text{ device and } L \text{ cable} / R \text{ cable}$
Ch2	15 - 16	$L_o / R_o = 287 \text{ } \mu\text{H}/\Omega$ (IIB-C)		
Ch3	9 - 10			
Ch4	11 - 12	$L_o / R_o = 574 \text{ } \mu\text{H}/\Omega$ (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  $C_i$  and  $L_i$  of the Intrinsically Safe apparatus exceed 1% of the  $C_o$  and  $L_o$  parameters of the Associated Apparatus (excluding the cable), then 50% of  $C_o$  and  $L_o$  parameters are applicable and shall not be exceeded (50% of the  $C_o$  and  $L_o$  become the limits which must include the cable such that  $C_i \text{ device} + C \text{ cable} \leq 50\% \text{ of } C_o$  and  $L_i \text{ device} + L \text{ cable} \leq 50\% \text{ of } L_o$ ). The reduced capacitance of the external circuit (including cable) shall not be greater than  $1 \text{ } \mu\text{F}$  for Groups I, IIA, IIB and  $600 \text{ nF}$  for Group IIC. If the cable parameters are unknown, the following value may be used: Capacitance  $200 \text{ pF}$  per meter ( $60 \text{ pF}$  per foot), Inductance  $1 \text{ } \mu\text{H}$  per meter ( $0.20 \text{ } \mu\text{H}$  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.

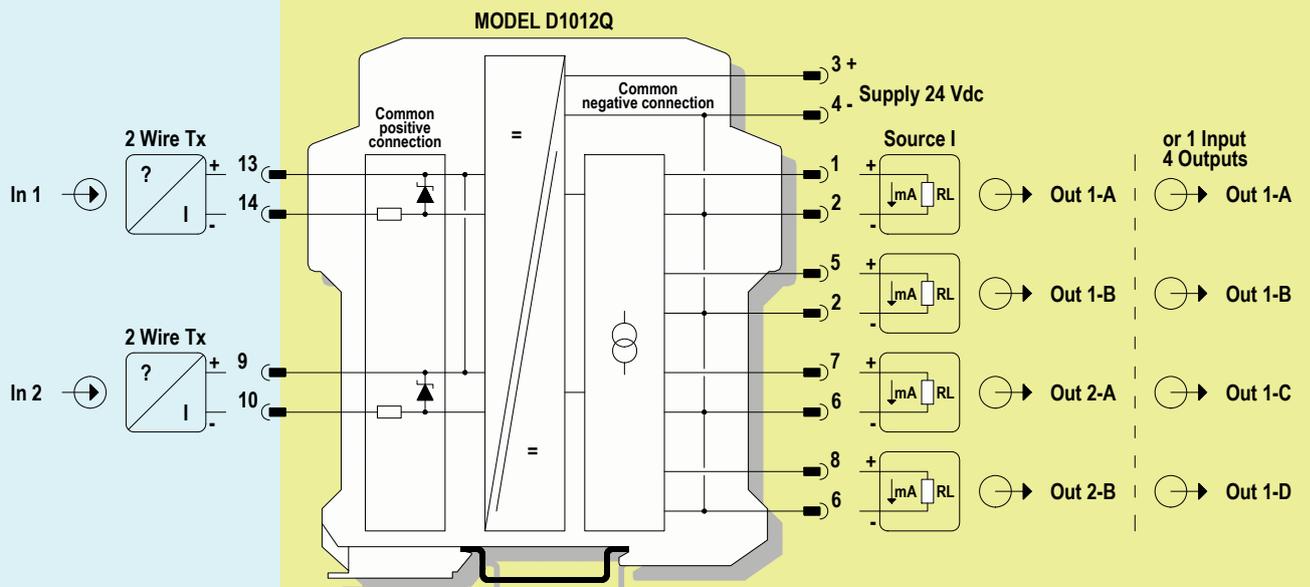
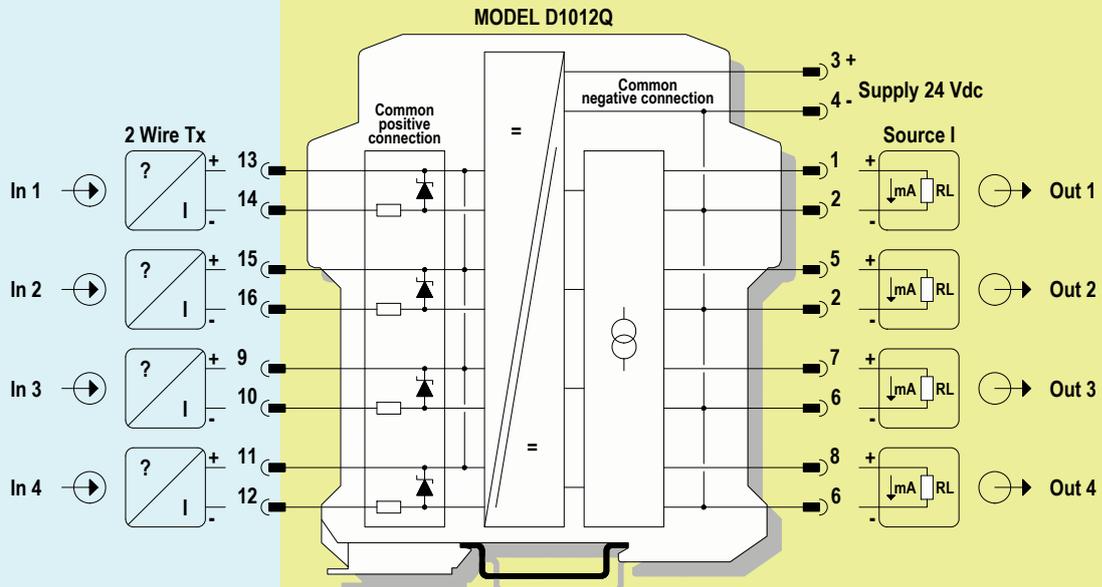
For Division 1 and Zone 0 installations, the configuration of Intrinsically Safe Equipment must be FM approved under Entity Concept (or third party approved);

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

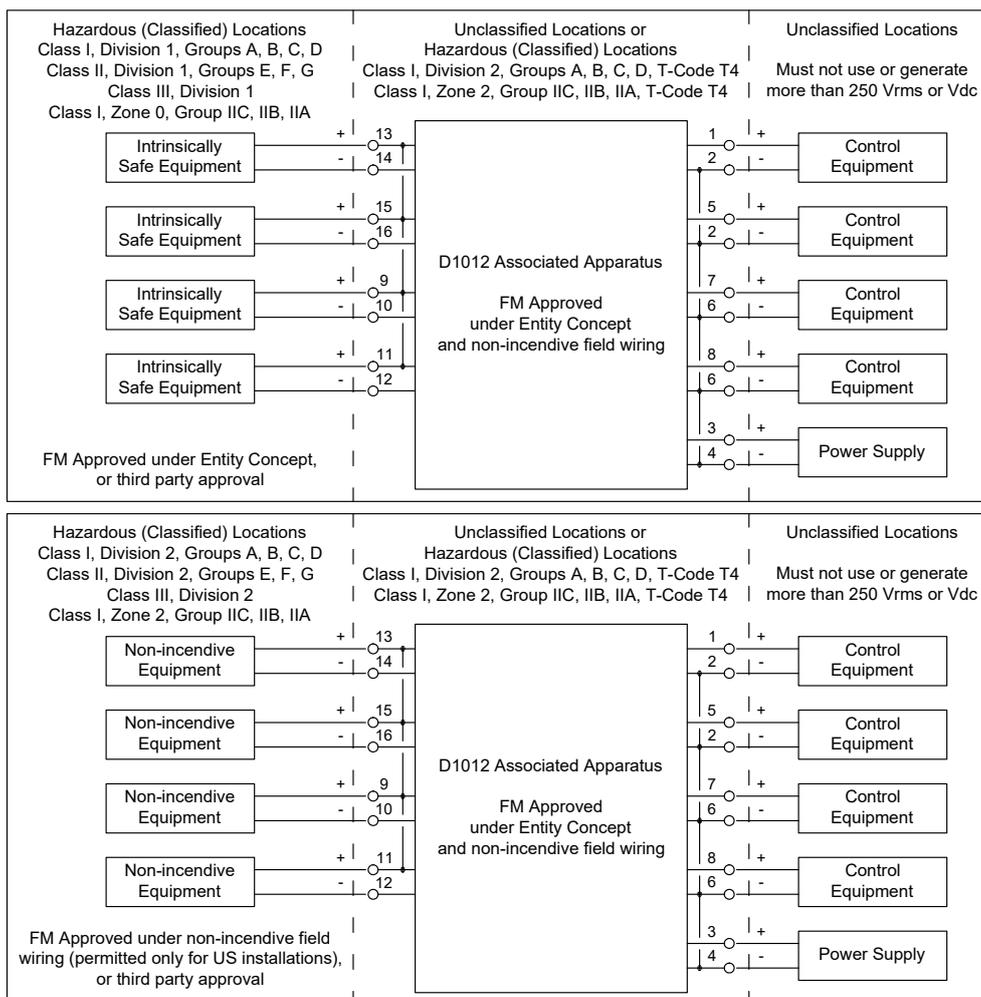
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,  
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,  
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,  
CLASS I, ZONE 0, GROUP IIC

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

D1012 is an 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 D1012 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.

D1012 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

D1012 provides fully floating DC supply for energizing 2 wire 4-20 mA transmitters located in Hazardous Area/Hazardous Locations, and repeats, while isolating, the current to drive a Safe Area/Non Hazardous Locations load. A "POWER ON" green led lits when input power is present.

## Installation

D1012 is a repeater power supply housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail.

D1012 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 mm<sup>2</sup> 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 D1012Q is not available in the Bus optional enclosure.

Moreover the units must be assembled on DIN Rail with a 5 mm spacer (MCHP139).

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 function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:

Connect 24 Vdc power supply positive at terminal "3" and negative at terminal "4".

Connect positive output of channel 1 (mA source mode) at terminal "1" and negative output (common to all channel and with negative of power supply) at terminal "2" or "6".

For other channels connect terminal "5" for channel 2, terminal "7" for channel 3 and terminal "8" for channel 4.

For 2 wire transmitter input, connect the wires at terminal "13" for positive and "14" for negative for channel 1, "15" and "16" for channel 2, "9" and "10" for channel 3, "11" and "12" for channel 4. Note that positive terminal of all channels are in common.

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 D1012 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.

According to EN61010, D1012 series must be connected to SELV or SELV-E supplies.

## Start-up

Before powering the unit check that all wires are properly connected, particularly supply conductors and 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 power, the "power on" green led must be lit, for 2 wire transmitter connection the supply voltage on each channel must be  $\geq 14$  V, output signal should be corresponding to the input from the transmitter. If possible change the transmitter output and check the corresponding Safe Area output.