INSTRUCTION MANUAL

SIL 3 - SIL 2 Digital Output
Loop/Bus Powered DIN-Rail
Models D1040Q, D1041Q, D1042Q, D1043Q,

SIL Applications

For Safety Related System and SIL2, SIL3 Applications according IEC61508 & IEC61511 Standards refer to “Functional Safety Manual” document number ISM0071

Characteristics

General Description: The D104* series are quad channel DIN Rail Digital Output Modules enabling a Safe Area contact, logic level or drive signal, to control a device in Hazardous Area, providing 3 port isolation (input/output/supply). Typical applications includes driving signalling LED’s, visual or audible alarms to alert a plant operator or driving a solenoid valve or other process control devices. It can also be used as a controllable supply to power measuring or process control equipments in Hazardous Area. Output channels can be paralleled if more power is required; 2 or 3 channels in parallel (depending on the model) are still suitable for Gas Group II C. Four basic models meet a large number of applications: it is possible to obtain 16 different combinations of safety parameters and driving currents.
Function: 4 channels I.S. actuated indipendently or in parallel to operate Hazardous Area loads from contacts, logic levels or drive logics in Safe Area providing 3 port isolation (input/output/supply), loop or bus powered.
Signalling LEDs: Power supply indication (green), outputs status (yellow).
Field Configurability: Contact / logic levels inputs, loop powered operating mode, configurable by external wiring.
EMC: Fully compliant with CE marking applicable requirements.

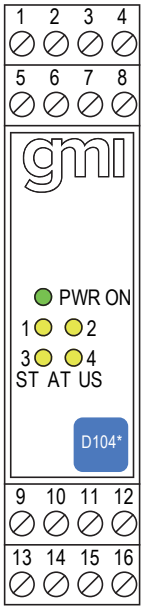
Technical Data

Supply: 24 Vdc nom (21.5 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 130 mA with four channels energized at nominal load, 150 mA with short circuit output (90 mA type D1041Q).
Power dissipation: 2.3 W (1.9 W type D1041Q) with 24 V supply voltage and four channels energized at nominal load.
Max. power consumption: at 30 V supply voltage and short circuit output, 4.0 W (2.4 W type D1041Q).
Isolation (Test Voltage): I.S. Out/In 1.5 KV; I.S. Out/Supply 1.5 KV; In/Supply 500 V.
Input: switch contact, logic level common positive or common negative or loop powered.
Trip voltage levels: OFF status ≤ 1.0 V, ON status ≥ 6.0 V (maximum 30 V).
Current consumption @ 24 V: 3 mA (≈ 10 KΩ input impedance).
Output: D1040Q: 22 mA at 13.2 V per channel (20.5 V no load, 334 Ω series resistance).
D1041Q: 10 mA for LED driving per channel (20.5 V no load, 484 Ω series resistance).
D1042Q: 22 mA at 14.5 V per channel (20.5 V no load, 273 Ω series resistance).
D1043Q: 22 mA at 9.8 V per channel (20.5 V no load, 484 Ω series resistance).
Short circuit current: ≥ 24 mA per channel (26 mA typical), ≤ 15 mA per channel for D1041Q (13 mA typical).
Response time: 20 ms (power up in 600 ms typical in loop powered mode).
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
D1040Q single channel parameters:
Uo/Voc = 23.6 V, Io/Isc = 72 mA, Po/Po = 424 mW at terminals 13-14,15-16,9-10,11-12.
D1041Q single channel parameters:
Uo/Voc = 23.6 V, Io/Isc = 49.6 mA, Po/Po = 292 mW at terminals 13-14,15-16,9-10,11-12.
D1042Q single channel parameters:
Uo/Voc = 23.6 V, Io/Isc = 88.2 mA, Po/Po = 519 mW at terminals 13-14,15-16,9-10,11-12.
D1043Q single channel parameters:
Uo/Voc = 23.6 V, Io/Isc = 49.6 mA, Po/Po = 292 mW at terminals 13-14,15-16,9-10,11-12.
For channels in parallel see Safety Parameters tables
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.
UL & C-UL E222308 conforms to UL913, UL 60079-0, UL60079-11, UL60079-15,
ANSI/ISA 12.12.01 for UL and CSA-C22.2 No.157-92, CSA-E60079-0, CSA-E60079-11, CSA-C22.2 No. 213 and CSA-E60079-15 for C-UL.
FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810,
ANSI/ISA 12.12.02, ANSI/ISA 60079-0, ANSI/ISA 60079-11 and
C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15,
EXIDA Report No. GM04/10-26 R002, SIL 2 / SIL 3 according to IEC 61508, IEC 61511.
Please refer to Functional Safety Manual for SIL applications.
DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications.
Mounting:
EN/IEC60715 TH 35 DIN-Rail.
Weight: about 130 g.
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

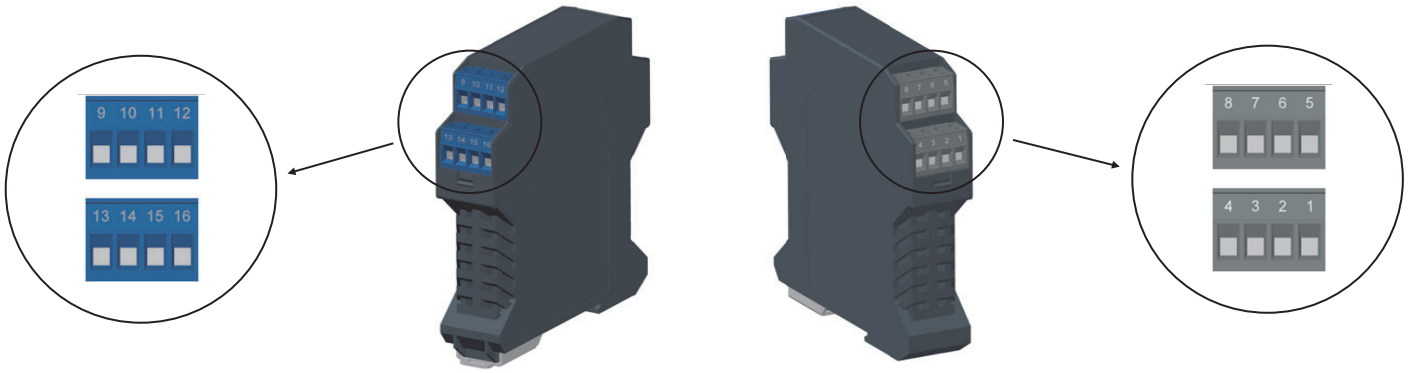
Model: D104*Q		
22 mA at 13.2 V (per channel)	0	
10 mA for LED driving (per channel)	1	
22 mA at 14.5 V (per channel)	2	
22 mA at 9.8 V (per channel)	3	
Power Bus enclosure		/B

Front Panel and Features



- SIL 3 according to IEC 61508, IEC 61511 in Loop Powered mode for Lifetime = 10 years.
- SIL 2 according to IEC 61508, IEC 61511 in Bus Powered mode for Tproof = 2 / 5 years (10 / 20 % of total SIF).
- PFDavg (1 year) 0.00 E-00, SFF 100 % (Loop Powered mode).
- PFDavg (1 year) 3.64 E-04, SFF 80.12 % (Bus Powered mode).
- Output to Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- Voltage input, contact, logic level, common positive or common negative, loop powered or bus powered.
- Flexible modular multiple output capability.
- Output short circuit proof and current limited.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- ATEX, IECEx, UL & C-UL, FM & FM-C 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

9	+ Output Ch 3 for Selenoid Valve or + Output Ch 3 for LED
10	- Output Ch 3 for Selenoid Valve or - Output Ch 3 for LED
11	+ Output Ch 4 for Selenoid Valve or + Output Ch 4 for LED
12	- Output Ch 4 for Selenoid Valve or - Output Ch 4 for LED
13	+ Output Ch 1 for Selenoid Valve or + Output Ch 1 for LED
14	- Output Ch 1 for Selenoid Valve or - Output Ch 1 for LED
15	+ Output Ch 2 for Selenoid Valve or + Output Ch 2 for LED
16	- Output Ch 2 for Selenoid Valve or - Output Ch 2 for LED

SAFE AREA

1	-/+ Input Ch 1 for Control
2	-/+ Input Ch 1, Ch 2, Ch 3 and Ch 4 for Control
3	+ Power Supply 24 Vdc
4	- Power Supply 24 Vdc
5	-/+ Input Ch 2 for Control
6	Loop powered, all output channels ON
7	-/+ Input Ch 3 for Control
8	-/+ Input Ch 4 for Control

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 D104* 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:

D104* Terminals		D104* Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device Parameters
Ch1	13 - 14	D104*	Uo / Voc = 23.6 V	≤	Ui / Vmax
Ch2	15 - 16				
Ch3	9 - 10				
Ch4	11 - 12				
Ch1	13 - 14	D1040	Io / Isc = 72.0 mA	≤	Ii/ Imax
Ch2	15 - 16	D1041	Io / Isc = 49.6 mA		
Ch3	9 - 10	D1042	Io / Isc = 88.2 mA		
Ch4	11 - 12	D1043	Io / Isc = 49.6 mA		
Ch1	13 - 14	D1040	Po / Po = 424 mW	≤	Pi / Pi
Ch2	15 - 16	D1041	Po / Po = 292 mW		
Ch3	9 - 10	D1042	Po / Po = 519 mW		
Ch4	11 - 12	D1043	Po / Po = 292 mW		

D1040 Terminals		D1040 Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	13 - 14	Co / Ca = 130 nF	(IIC-A, B)	≥	Ci / Ci device + C cable
Ch2	15 - 16	Co / Ca = 970 nF	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Co / Ca = 3.5 µF	(IIA-D)		
Ch1	13 - 14	Lo / La = 6.8 mH	(IIC-A, B)	≥	Li / Li device + L cable
Ch2	15 - 16	Lo / La = 27.4 mH	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / La = 54.8 mH	(IIA-D)		
Ch1	13 - 14	Lo / Ro = 83.9 µH/Ω	(IIC-A, B)	≥	Li / Ri device and L cable / R cable
Ch2	15 - 16	Lo / Ro = 335.9 µH/Ω	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / Ro = 671.9 µH/Ω	(IIA-D)		

D1041 and D1043 Terminals		D1041 and D1043 Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	13 - 14	Co / Ca = 130 nF	(IIC-A, B)	≥	Ci / Ci device + C cable
Ch2	15 - 16	Co / Ca = 970 nF	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Co / Ca = 3.5 µF	(IIA-D)		
Ch1	13 - 14	Lo / La = 14.2 mH	(IIC-A, B)	≥	Li / Li device + L cable
Ch2	15 - 16	Lo / La = 57.0 mH	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / La = 114.0 mH	(IIA-D)		
Ch1	13 - 14	Lo / Ro = 121.9 µH/Ω	(IIC-A, B)	≥	Li / Ri device and L cable / R cable
Ch2	15 - 16	Lo / Ro = 487.6 µH/Ω	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / Ro = 975.3 µH/Ω	(IIA-D)		

D1042 Terminals		D1042 Associated Apparatus Parameters		Must be	Hazardous Area/ Hazardous Locations Device + Cable Parameters
Ch1	13 - 14	Co / Ca = 130 nF	(IIC-A, B)	≥	Ci / Ci device + C cable
Ch2	15 - 16	Co / Ca = 970 nF	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Co / Ca = 3.5 µF	(IIA-D)		
Ch1	13 - 14	Lo / La = 4.5 mH	(IIC-A, B)	≥	Li / Li device + L cable
Ch2	15 - 16	Lo / La = 18.2 mH	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / La = 36.5 mH	(IIA-D)		
Ch1	13 - 14	Lo / Ro = 68.6 µH/Ω	(IIC-A,B)	≥	Li / Ri device and L cable / R cable
Ch2	15 - 16	Lo / Ro = 274.4 µH/Ω	(IIB-C)		
Ch3	9 - 10				
Ch4	11 - 12	Lo / Ro = 548.9 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

To increase the power to the load, it is possible to connect output channels in parallel. The table below indicates the corresponding configurations:

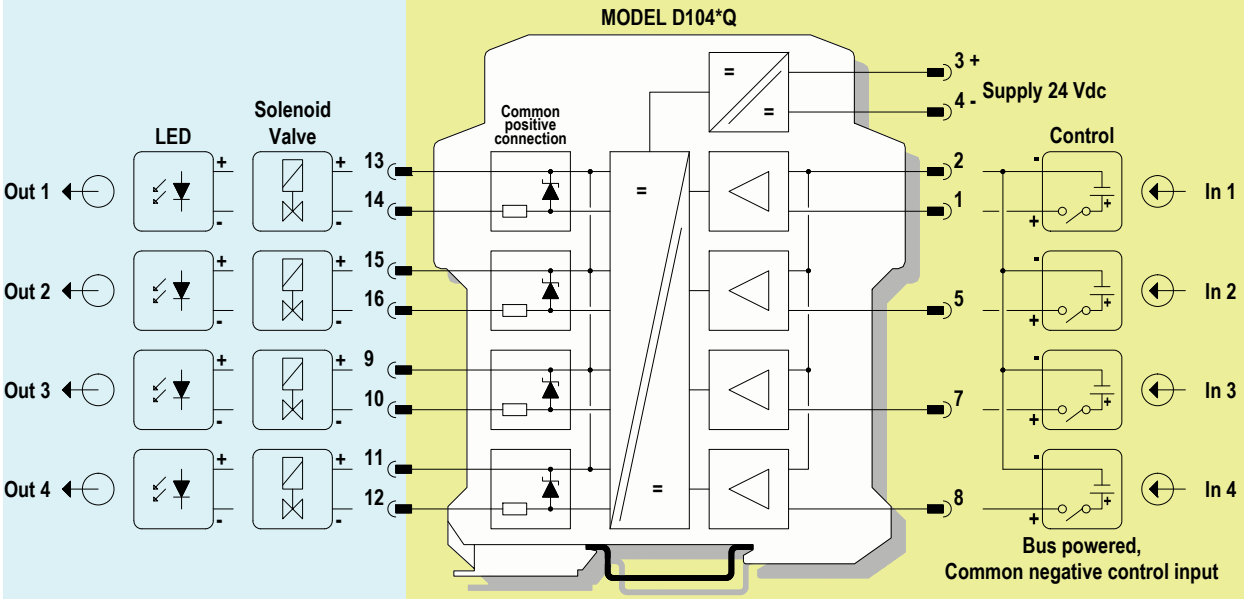
	D104* Associated Apparatus Parameters 2 channels in parallel				D104* Associated Apparatus Parameters 3 channels in parallel				D104* Associated Apparatus Parameters 4 channels in parallel			
	D1040	D1041	D1042	D1043	D1040	D1041	D1042	D1043	D1040	D1041	D1042	D1043
Io / Isc mA	144.0	99.2	176.4	99.2	216.0	148.8	264.6	148.8	288.0	198.4	352.8	198.4
Po / Po mW	847	584	1038	584	1271	875	1556	875	1674	1167	1674	1167
Lo / La mH (IIC-A, B)	1.7	3.6	1.1	3.6	NA	1.6	NA	1.6	NA	NA	NA	NA
Lo / La mH (IIB-C)	6.8	14.4	4.5	14.4	3.0	6.4	2.0	6.4	1.7	3.6	1.1	3.6
Lo / La mH (IIA-D)	13.7	28.9	9.1	28.9	6.0	12.8	4.0	12.8	3.4	7.2	2.2	7.2
Lo / Ro µH / Ω (IIC-A, B)	41.9	60.9	34.3	60.9	NA	40.6	NA	40.6	NA	NA	NA	NA
Lo / Ro µH / Ω (IIB-C)	167.9	243.8	137.2	243.8	111.9	162.5	91.4	162.5	83.9	121.9	68.6	121.9
Lo / Ro µH / Ω (IIA-D)	335.9	487.6	274.4	487.6	223.9	325.0	182.9	325.0	167.9	243.8	137.2	243.8

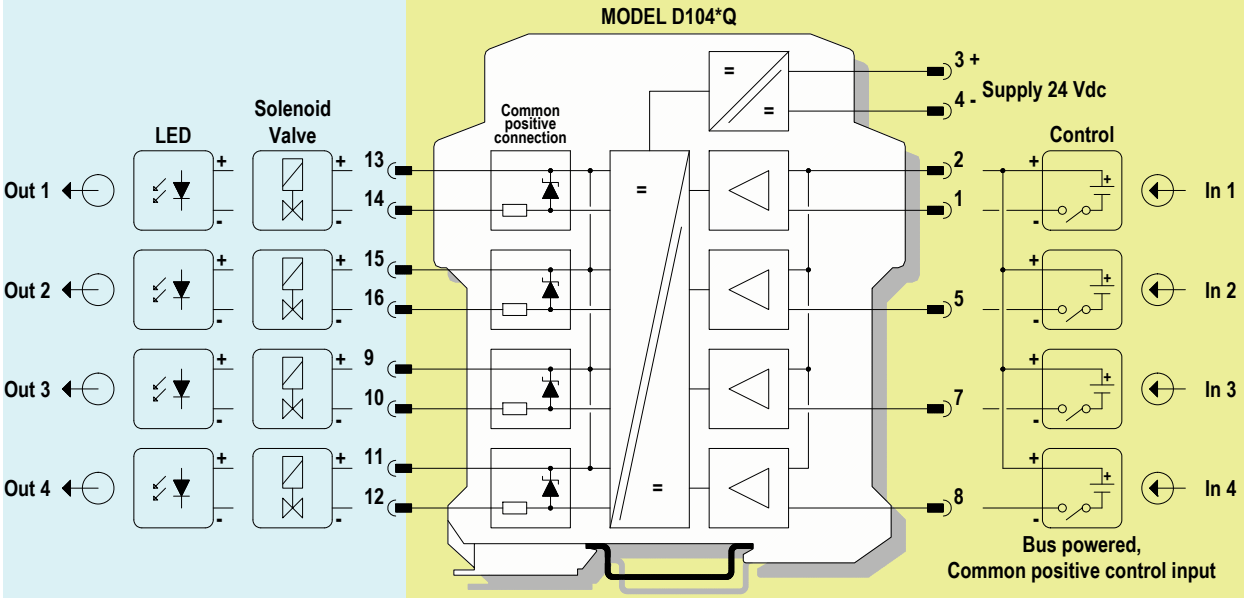
For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1% of the Co and Lo parameters of the Associated Apparatus (excluding the cable), then 50% of Co and Lo parameters are applicable and shall not be exceeded (50% of the Co and Lo become the limits which must include 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).

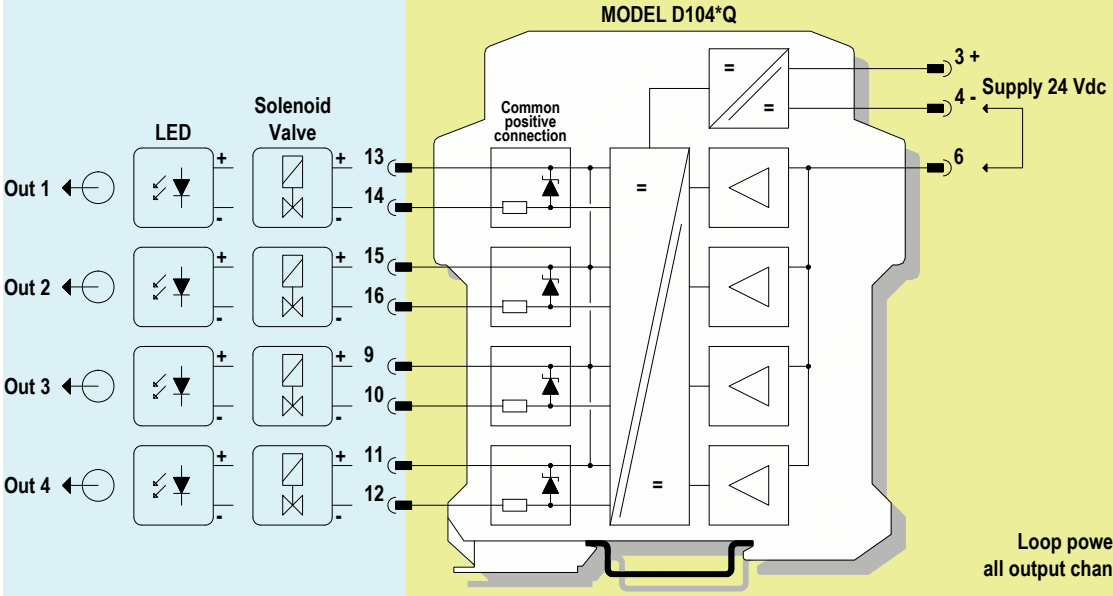
Function Diagram

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



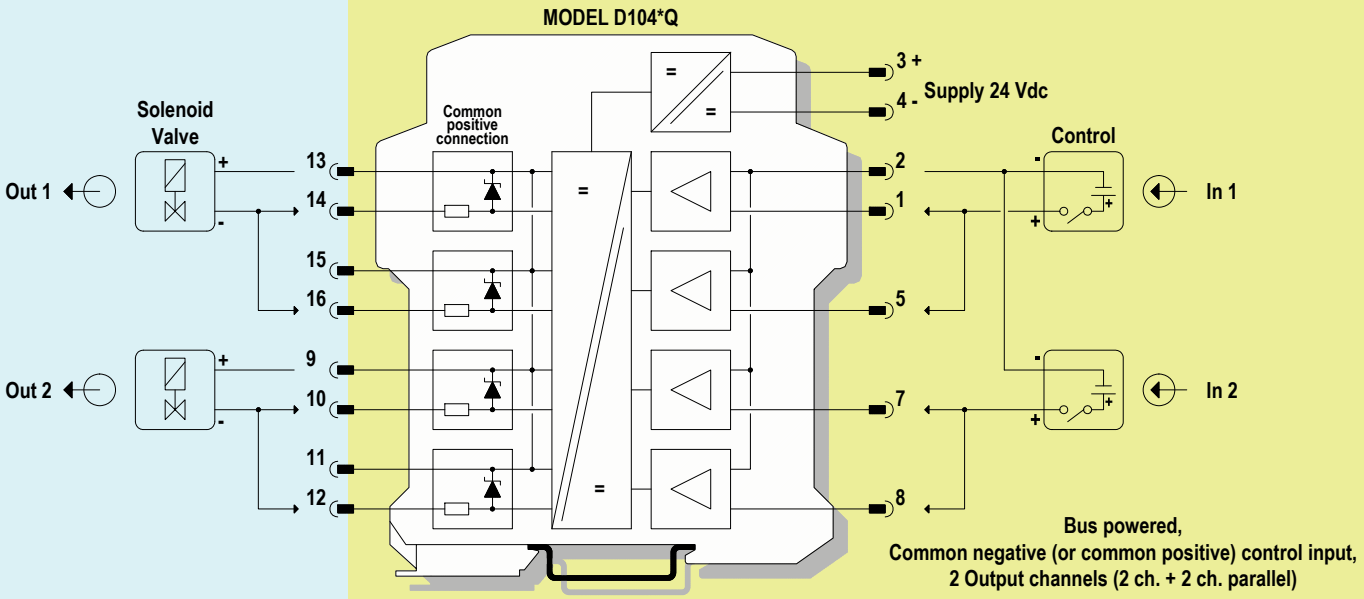




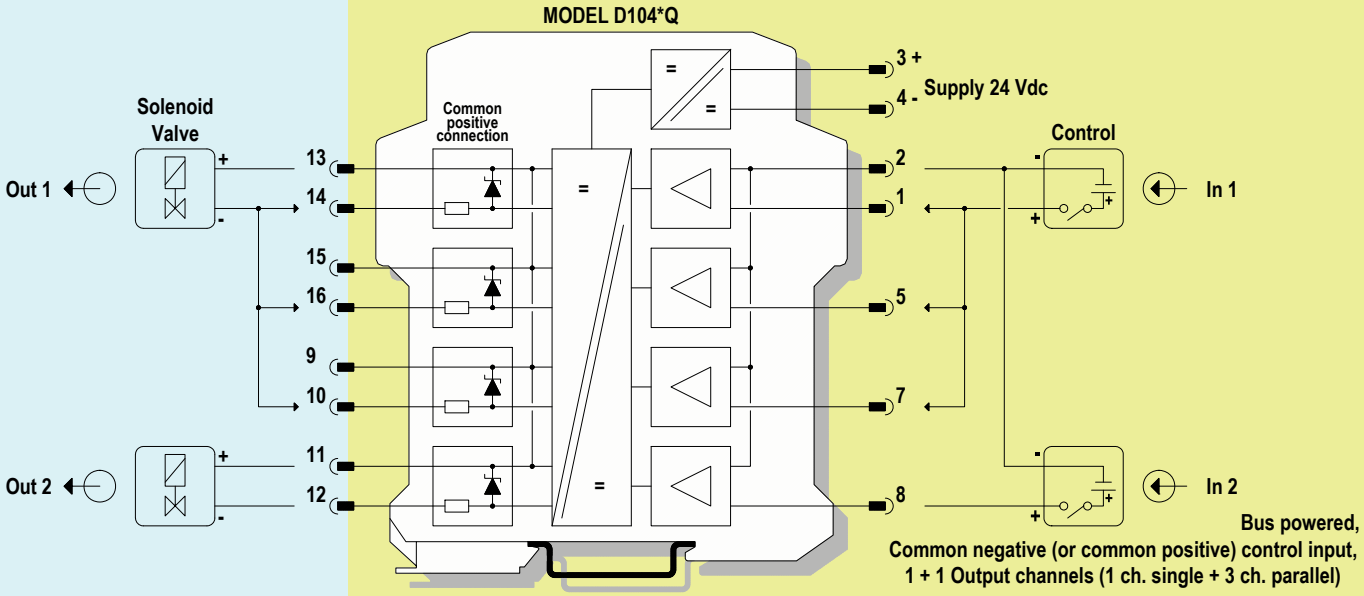
Function Diagram

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

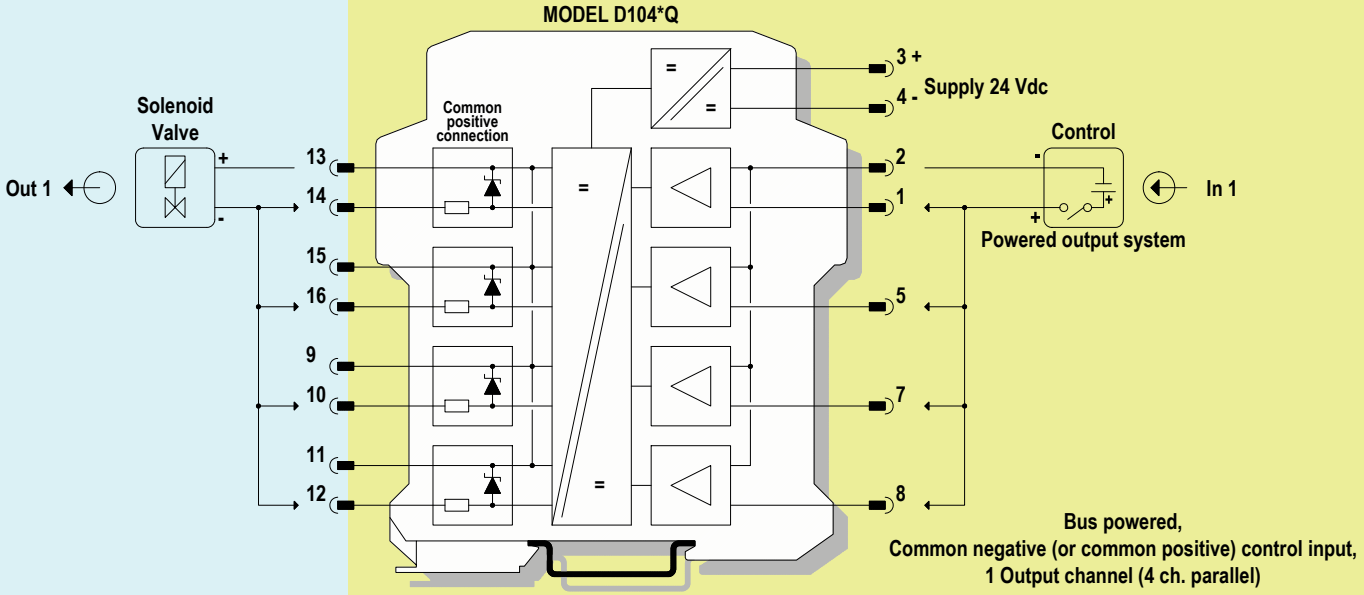
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



Bus powered,
Common negative (or common positive) control input,
2 Output channels (2 ch. + 2 ch. parallel)



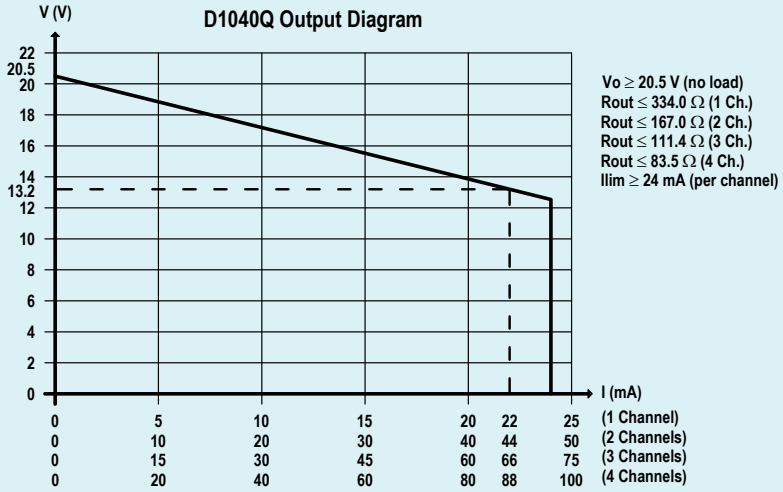
Bus powered,
Common negative (or common positive) control input,
1 + 1 Output channels (1 ch. single + 3 ch. parallel)



Bus powered,
Common negative (or common positive) control input,
1 Output channel (4 ch. parallel)

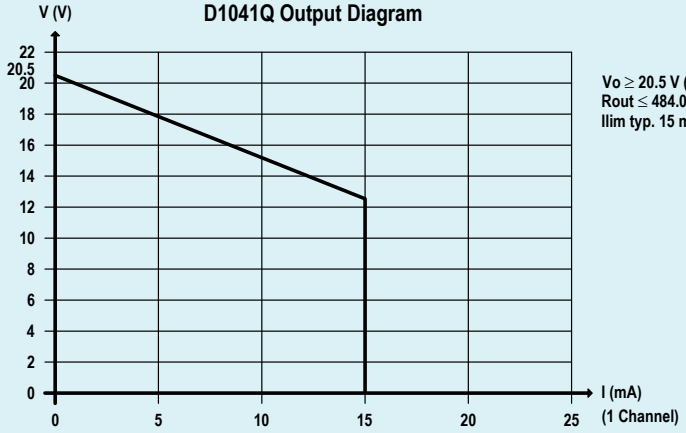
Output Diagram

D1040Q Output Diagram



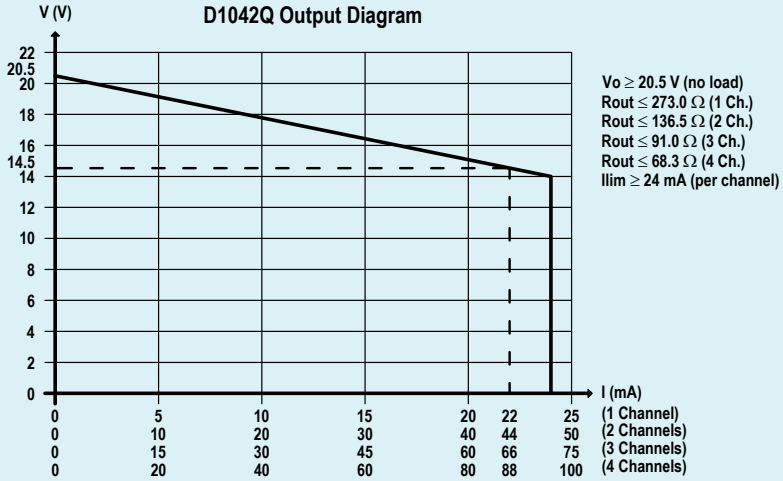
Vo ≥ 20.5 V (no load)
Rout ≤ 334.0 Ω (1 Ch.)
Rout ≤ 167.0 Ω (2 Ch.)
Rout ≤ 111.4 Ω (3 Ch.)
Rout ≤ 83.5 Ω (4 Ch.)
Ilim ≥ 24 mA (per channel)

D1041Q Output Diagram



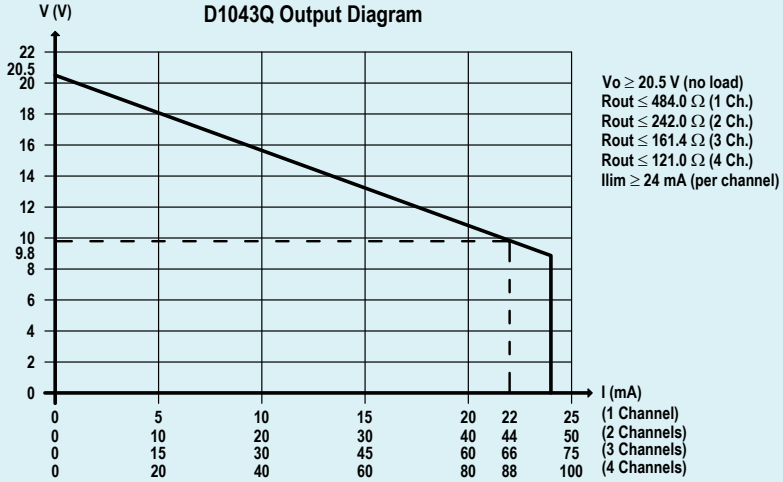
Vo ≥ 20.5 V (no load)
Rout ≤ 484.0 Ω (1 Ch.)
Ilim typ. 15 mA

D1042Q Output Diagram



Vo ≥ 20.5 V (no load)
Rout ≤ 273.0 Ω (1 Ch.)
Rout ≤ 136.5 Ω (2 Ch.)
Rout ≤ 91.0 Ω (3 Ch.)
Rout ≤ 68.3 Ω (4 Ch.)
Ilim ≥ 24 mA (per channel)

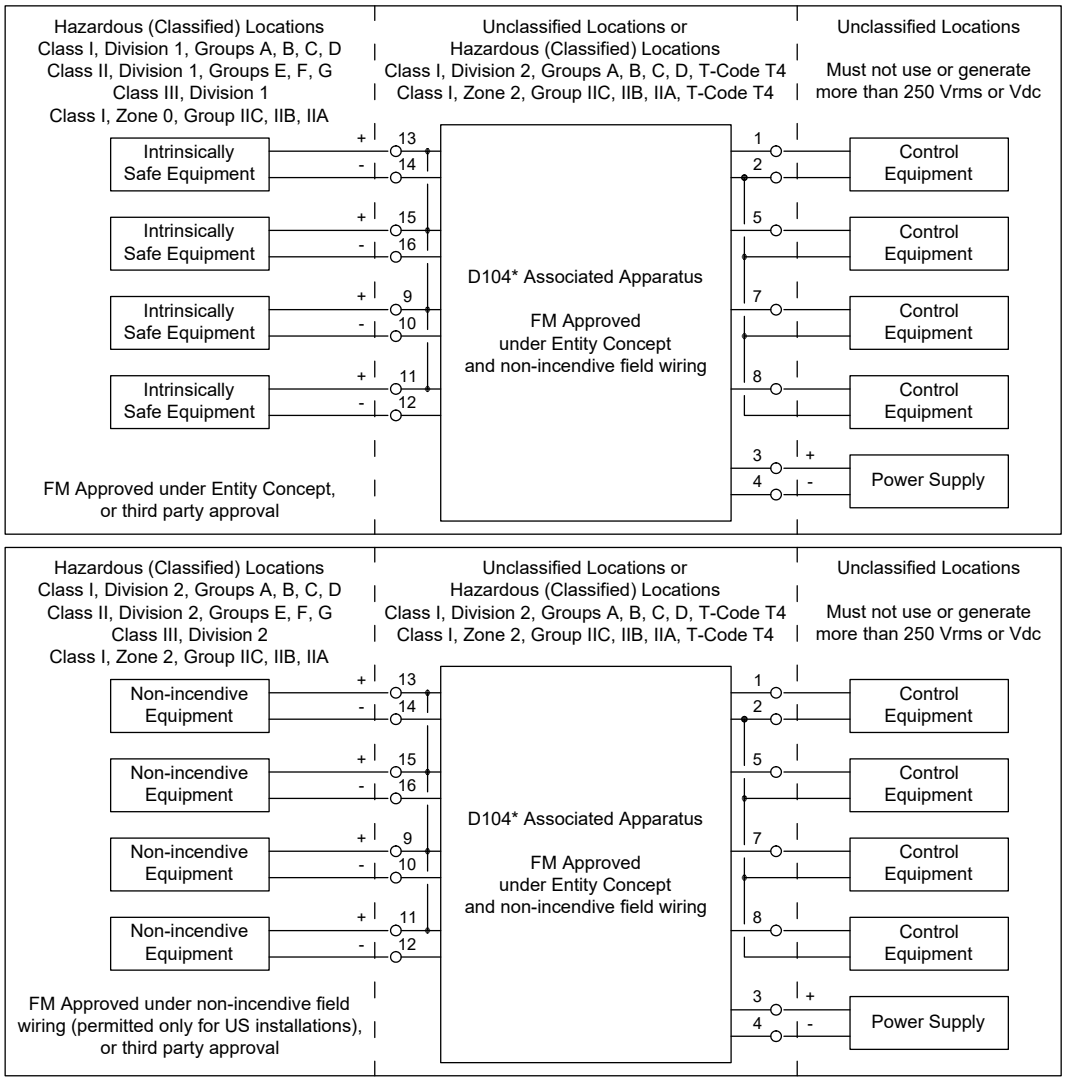
D1043Q Output Diagram



Vo ≥ 20.5 V (no load)
Rout ≤ 484.0 Ω (1 Ch.)
Rout ≤ 242.0 Ω (2 Ch.)
Rout ≤ 161.4 Ω (3 Ch.)
Rout ≤ 121.0 Ω (4 Ch.)
Ilim ≥ 24 mA (per channel)

Warning

D104* 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.



NOTE: outputs can be paralleled to increase output power. When combining outputs, consider Safety Parameters matching with the field device and allowable Group as shown in the Safety Parameters Table and check that requirements are met.
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 D104* 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.
D104* 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

Each of the four independent channels of D104* series accepts an input from Safe Area/Non Hazardous Locations (logic level or switch electrical contact connected to common positive or common negative) and provides an output (see the output diagram on data sheet for details of voltage and current to the load) in Hazardous Area/Hazardous Locations to drive Intrinsically Safe loads (solenoid valves, audible alarms, signaling leds etc.). Presence of supply power and status of output (energized or de-energized) are displayed by signaling LEDs (green for power, yellow for status). D104* series has four independent channels. Five actuation modes can be configured by appropriate wiring on the terminal blocks of unit:

Loop Powered	output channels energizes when unit is powered
Normally Open input contact / Normally De energized output, contact with common positive	output energizes by closing contact
Normally Open input contact / Normally De energized output, contact with common negative	output energizes by closing contact
Normally Low logic level / Normally De energized output	output energizes with logic level high
Normally High logic level / Normally Energized output	output de-energizes with logic level low

Installation

D104* series are digital output isolator housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail.
D104* 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 and configurations.
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 at terminal “13” and negative output at “14”.
Connect positive output of channel 2 at terminal “15” and negative output at “16”.
Connect positive output of channel 3 at terminal “9” and negative output at “10”.
Connect positive output of channel 4 at terminal “11” and negative output at “12”.
Connect common input signal at terminal “2” (can be positive or negative).
Connect input signal for channel 1 at terminal “1”.
Connect input signal for channel 2 at terminal “5”.
Connect input signal for channel 3 at terminal “7”.
Connect input signal for channel 4 at terminal “8”.
If output current required is higher than the capability of a single channel (see output diagram on data sheet for details) you can connect two or more channels in parallel by wiring inputs and outputs of two or more channels in parallel and use the combined output, consider however the Gas Group allowable and Safety Parameter matching with the field device for this combined output as shown in the Safety Parameters Table on the data sheet and check that it meets your actual Installation.

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 D104* 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, D104* 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, status led on each channel must be in accordance with condition of the corresponding input line. If possible close and open input lines one at time checking the corresponding status leds condition as well as output to be correct.

Configuration

Input terminal wiring on Safe Area/Non Hazardous Locations allows input/output configuration and operating mode as summarized in tables below:

D104* Configuration in Loop Powered mode		
Input	Jumper	No Connection
Loop Powered	4 - 6	1, 2, 5, 7, 8

The barrier actuates all the four channels when the power supply is applied at terminals 3-4

D104* Configuration in Bus Powered mode with contact input common to power supply voltage (closing contact energizes output)						
Input	Input Type	jumper	Ch. 1	Ch. 2	Ch. 3	Ch. 4
Normally Open Contact	Common on positive	2 - 3	1 - 4	5 - 4	7 - 4	8 - 4
	Common on negative	2 - 4	1 - 3	5 - 3	7 - 3	8 - 3

The barrier actuates the corresponding output channel when the contact is closed (high level to the input terminal).
The current consumption of the single input is ~ 3 mA (up to 30 V supply), take care of power supply dimensioning when using this type of connection.

D104* Configuration in Bus Powered mode with contact input supplied by separate power voltage (closing contact energizes output)					
Input	Common Terminal	Ch. 1	Ch. 2	Ch. 3	Ch. 4
Normally Open Contact	2	1	5	7	8

The barrier actuates the corresponding output channel when the contact is closed (high level to the input terminal).
Connect the positive (or negative) terminal of the power source to common terminal “2”, connect the contact terminal from the negative (or positive) of the power source and the corresponding input terminal of the barrier (“1” for first channel, “5” for second channel, “7” for third channel and “8” for fourth channel). The current consumption of the single input is ~ 3 mA (up to 30 V supply), take care of power supply dimensioning when using this type of connection.

D104* Configuration in Bus Powered mode with Logic Level input (Logic Level HIGH status energizes output)					
Input	Common Terminal	Ch. 1	Ch. 2	Ch. 3	Ch. 4
Logic Level	2	1	5	7	8

The barrier actuates the corresponding output channel when the logic level input goes to HIGH status (≥ 6V or ≤ -6 V respect to common terminal).
Connect the common terminal of the logic level outputs to terminal “2” of the barrier, connect the logic level output terminal to the corresponding input terminal of the barrier (“1” for first channel, “5” for second channel, “7” for third channel and “8” for fourth channel). The current consumption of the single input is ~ 3 mA (up to 30 V driving), take care of driving capability of the logic level output. The maximum current leakage of driver must be ≤ 200 µA to avoid wrong condition of input.