D5232

I.S. SIL2 Switch/Proximity Relay-Out Repeater

Model D5232Q

INSTRUCTION MANUAL

SUMMARY OF CONTENT

1. CHARACTERISTICS

General Description:

The Switch/Proximity Detector Repeater D5232 is a module suitable for applications requiring SIL 2 level in safety related systems for high risk industries. The unit can be configured for switches or proximity detectors, located in Hazardous Area, and repeats the input state to a relay contact in Safe Area. The selectable fault detection circuit is available for proximity sensors or switches equipped with end-of-line resistors. Input-to-output function can be inverted, and signals can be duplicated. Mounting on standard DIN-Rail, with or without Power Bus, in Safe Area / Non Hazardous Location or in Zone 2 / Class I, Division 2 or Class I, Zone 2.

2. TECHNICAL DATA

Supply:

24 Vdc nom (18 to 30 Vdc), reverse polarity protected.
Current consumption: 75 mA @ 24 Vdc with short circuit input and output closed, typical.
Power dissipation: 1.8 W @ 24 Vdc with short circuit input and output closed, typical, excluding output contact dissipation.

Isolation:

I.S. In/Out 2.5 kV; I.S. In/Supply 2.5 kV; Out/Supply 500 V; Out/Out 500 V.

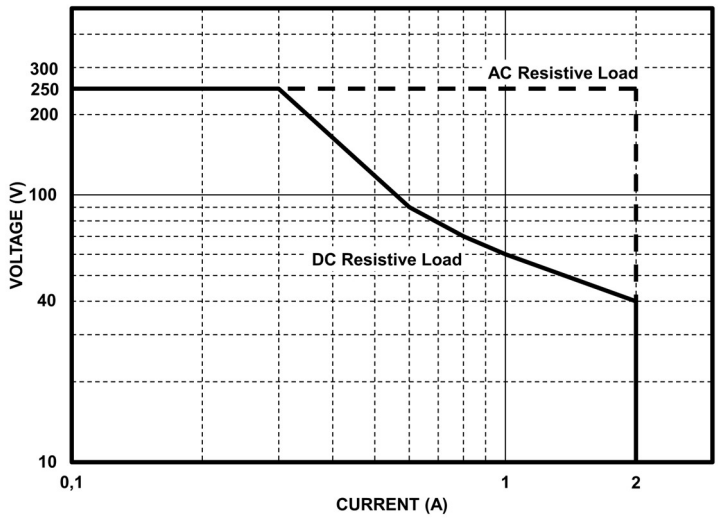
Input:

Voltage source according to NAMUR standard.
Input equivalent source: 7.5 V/1 kΩ typical (7.5 V no load, 7.5 mA short).
Input switching current levels: ON ≥ 2.1 mA, OFF ≤ 1.2 mA.
No fault: input current ≥ 0.35 mA and input resistance ≥ 360 Ω.
Open fault: input current ≤ 0.05 mA.
Short fault: input resistance ≤ 100 Ω.

Output:

Voltage free SPST relay contact.
Contact material: AgNi90/10.
Contact rating: 2 A 250 Vac 500 VA, 2 A 250 Vdc 80 W (resistive load).
Mechanical / electrical life: 15 * 10^6 / 10 * 10^4 operation, typical.
Input-output delay: 20 ms, maximum.
Frequency response: 10 Hz, maximum.

Output typical characteristics:



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 – 40 to + 70 °C, relative humidity 95 %, up to 55 °C.
Storage: temperature limits – 45 to + 80 °C.
Max altitude: 2000 m a.s.l.

Safety Description:

ATEX: II 3(1)G Ex ec nC [ia Ga] IIC T4 Gc, II (1)D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I.
IECEx: Ex ec nC [ia Ga] IIC T4 Gc, [Ex ia Da] IIIC, [Ex ia Ma] I.
UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, AEx ec nC [ia Ga] IIC T4 Gc.
C-UL: NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, Ex ec nC [ia Ga] IIC T4 Gc X.
associated apparatus and non-sparking electrical equipment.
Uo/Voc = 11.2 V, Io/Isc = 12 mA, Po/Po = 34 mW at terminals 13-14, 15-16, 17-18, 19-20.
Um = 250 Vrms, -40 °C ≤ Ta ≤ 70 °C.
Approvals:
UL 24 ATEX 3258X conforms to EN60079-0, EN60079-7, EN60079-11, EN60079-15.
IECEx ULD 24.0021 X conforms to IEC60079-0, IEC60079-7, IEC60079-11, IEC60079-15.
UL & C-UL E222308 conforms to UL61010-1, UL913, UL 121201, UL 60079-0, UL60079-11, UL60079-7, UL60079-15 for UL and CAN/CSA C22.2 No. 61010-1-12, CSA C22.2 No. 213, CAN/CSA C22.2 No. 60079-0, CAN/CSA C22.2 No. 60079-11, CAN/CSA No. 60079-7, CAN/CSA No. 60079-15 for C-UL.
SIL 2 conforms to IEC61508:2010 Ed.2.

Mounting:

EN/IEC60715 TH 35 DIN-Rail with or without Power Bus.
Weight: about 175 g.
Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm2 (13 AWG).
Location: installation in Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4 or Class I, Division 2, Group A,B,C,D, T4 or Class I, Zone 2, Group IIC, T4.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 123 mm, Height 120 mm.

3. PROGRAMMING

The module is fully programmable to set the operation parameters from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software. Measured values and diagnostic alarms can be read on serial configuration.

SWC5090 software also allows the Monitoring and Recording of values. For details please see SWC5090 manual ISM0154.

4. ORDERING INFORMATION

4.1 Ordering codes

D5232Q: 4 channels

4.2 Accessories

Bus Connector JDFT050, Bus Mounting Kit OPT5096.
Programmable USB serial line Kit PPC5092 + SWC5090.

5. OVERALL DIMENSIONS

6. TERMINAL BLOCK CONNECTIONS

6.1 Hazardous Side

13: + Input Ch 1 for Proximity or Voltage free Contact
14: - Input Ch 1 for Proximity or Voltage free Contact
15: + Input Ch 2 for Proximity or Voltage free Contact
16: - Input Ch 2 for Proximity or Voltage free Contact
17: + Input Ch 3 for Proximity or Voltage free Contact
18: - Input Ch 3 for Proximity or Voltage free Contact
19: + Input Ch 4 for Proximity or Voltage free Contact
20: - Input Ch 4 for Proximity or Voltage free Contact

6.2 Safe Side

1: + Output Ch 1
2: - Output Ch 1
3: + Output Ch 2
4: - Output Ch 2
5: + Output Ch 3
6: - Output Ch 3
7: + Output Ch 4
8: - Output Ch 4
9: + Power Supply 24 Vdc
10: - Power Supply 24 Vdc

7. VERIFICATION OF INTRINSICALLY SAFE CIRCUITS

In the system safety analysis, always check that field device maximum allowable voltage, current and power are not exceeded by the safety parameters of the associated apparatus connected to it. Check also that added connecting cable

and field device capacitance and inductance do not exceed the limits given in the associated apparatus parameters for the effective gas group (Co, Lo, Lo/Ro).

Associated apparatus		Field device
Uo or Voc	≤	Ui or Vmax
Io or Isc	≤	Ii or Imax
Po or Pout	≤	Pi or Pmax
Co or Ca	≥	Ci + Ccable
Lo or La	≥	Li + Lcable
Lo/Ro	≥	Li/Ri and Lcable/Rcable

When used with separate powered intrinsically safe devices, check also that maximum allowable voltage, current and power of the associated apparatus are not exceeded by the safety parameters of the field device.

Associated apparatus		Field device
Ui or Vmax	≥	Uo or Voc
Ii or Imax	≥	Io or Isc
Pi or Pmax	≥	Po or Pout
Ci + Ccable	≤	Co or Ca
Li + Lcable	≤	Lo or La

For installations in which both the Ci and Li of the Intrinsically Safe apparatus exceed 1% of the Co or Ca and Lo or La parameters of the Associated Apparatus (excluding the cable), then 50% of Co or Ca and Lo or La parameters are applicable and shall not be exceeded (50% of the Co or Ca and Lo or La become the limits which must include the cable such that Ci device + C cable ≤ 50 % of Co or Ca and Li device + L cable ≤ 50 % of Lo or La). The reduced capacitance of the external circuit (including cable) shall not be greater than 1 µF for Groups I, IIA (or D), IIB (or C) and 600 nF for Group IIC (or A, B). 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).

7.1 Intrinsically safe parameters table

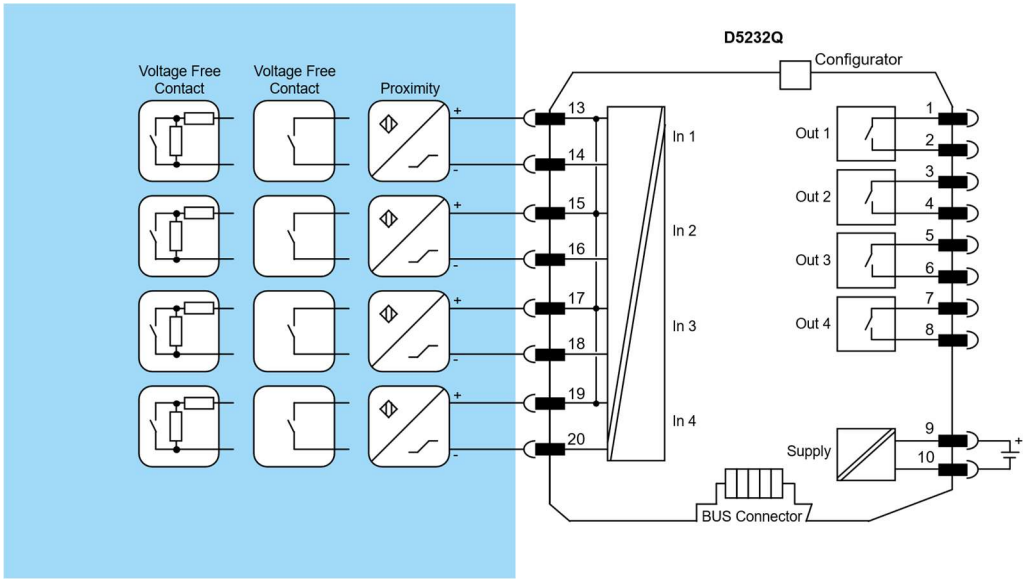
	Group	Co or Ca [uF]	Lo or La [mH]	Lo/Ro [uH/Ω]
Term. 13-14, 15-16, 17-18, 19-20: Uo(Voc)=11.2 V; Io(Isc)=12 mA; Po(Pout)=34 mW Characteristic: linear	IIC (A, B)	1.83	253.4	1074
	IIB (C)	12.5	1000	4299
	IIA (D)	53.9	1000	8599
	I	57.9	1000	14108
	IIIC (E, F, G)	12.5	1000	4299

Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between non-intrinsically safe circuits and intrinsically safe circuits. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is not provided between separated intrinsically safe circuits.

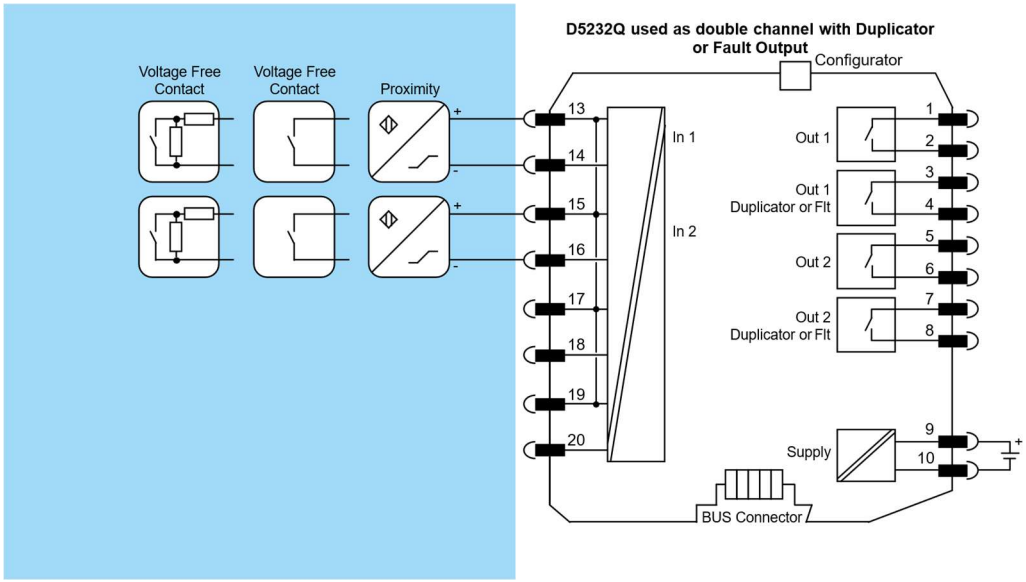
IS parameters listed above comply with all applicable certifications for this product. For details regarding IS parameters of a specific certification, please refer to the certificate itself, that can be found on www.gminternational.com website.

8. FUNCTION DIAGRAM

Hazardous Area *Safe Area/Zone 2/Div. 2*



Hazardous Area *Safe Area/Zone 2/Div. 2*



9. WARNING

D5232 series is an isolated Intrinsically Safe Associated Apparatus installed into standard EN/IEC60715 TH 35 DIN-Rail located in Safe Area or Zone 2, Group IIC, Temperature T4 or Class I, Division 2, Group A, B, C, D, T4 Hazardous Area within the specified operating temperature limits Tamb -40 to +70 °C, and connected to equipment with a maximum limit for power supply Um of 250 Vrms or Vdc. Not to be connected to control equipment that uses or generates more than 250 Vrms or Vdc with respect to earth ground. D5232 series must be installed, operated and maintained only by qualified personnel, in accordance with 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)), following the established installation rules; particular care must 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 or unless area is known to be nonhazardous.

Warning: substitution of components may impair Intrinsic Safety and suitability for Zone 2/Division 2.
Avertissement: la substitution des composants peut nuire à la
sécurité intrinsèque et à l'aptitude à la Zone 2/Div. 2.
Explosion Hazard: to prevent ignition of flammable atmospheres, disconnect power before servicing or unless area is known to be nonhazardous. Danger d'Explosion:
pour éviter l'inflammation d'atmosphères inflammables, débrancher l'alimentation avant l'entretien ou à moins

que région est connue pour être non dangereuse.
Warning: de-energize main power source (turn off power supply voltage) and disconnect plug-in terminal blocks before opening the enclosure to avoid electrical shock
when connected to live hazardous potential. Avertissement: débrancher l'alimentation (couper la tension d'alimentation) et les blocs de jonction enfichables avant
d'ouvrir le boîtier pour éviter les chocs électriques lorsqu'ils sont connectés à un potentiel dangereux.
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.

10. OPERATION

The Switch/Proximity Detector Repeater type D5232Q is a unit with four independent channels suitable for applications requiring SIL 2 level (according to IEC 61508:2010) in safety related systems for high risk industries.

The unit can be configured for switch or proximity detector (EN60947-5-6 NAMUR), NO or NC input and for NO or NC output relay contact. Configuration is programmable from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software. Each channel enables a Safe Area load to be controlled by a switch, or a proximity detector, located in Hazardous Area. Fault detection circuit (configurable by PC) is available for all proximity sensors and switches equipped with end of line resistors. In case of fault, when enabled it de-energizes the corresponding relay and turns the fault red LED on; when disabled the corresponding relay contact repeats the input line open or closed status as configured.

Note: use of voltage free electrical contacts with fault detection enabled (control equipment) requires, near the switch at the end of the line a R1=1 KΩ typical (470 Ω to 2 KΩ range) resistor in series and a R2=10 kΩ typical (5 KΩ to 15 KΩ range) resistor in parallel to the contacts in order to allow the fault detection circuit to distinguish between a condition of contact close/open and a line open/short circuit fault.

11. INSTALLATION

D5232 series module is housed in a plastic enclosure suitable for installation on EN/IEC60715 THDIN-Rail, with or without Power Bus.

D5232 series can be mounted with any orientation over the entire ambient temperature range.

Electrical connection 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 installations check the area to be nonhazardous before servicing)**. Connect only one individual conductor per each clamping point, use conductors from 0.2^2 (24) up to 2.5^2 (13) and a torque value of 0.5-0.6. For USA and Canada installations, use only cables that are suitable for a temperature of at least 75°C. The wiring cables have to be proportionate in base to the current and the length of the cable. USB connector is for configuration and maintenance purpose only, not for use in hazardous locations area.

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.

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)), make sure that conductors are well isolated from each other and do not produce any unintentional connection. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is provided between non-intrinsically safe circuits and intrinsically safe circuits. Isolation in accordance with EN/IEC 60079-11 clause 6.3.13 is not provided between separated intrinsically safe circuits.

Connect alarm contacts checking the load rating to be within the contact maximum rating 2 A 250 Vac 500 VA, 2 A 250 Vdc 80 W (resistive load).

To prevent alarm relay contacts from damaging, connect an external protection (fuse or similar), chosen according to the relay breaking capacity diagram from installation instructions.

The enclosure provides, according to EN60529, an IP20 minimum degree of protection (or similar to NEMA Standardtype). The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC-1. When installed in Zone 2, the unit shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with IEC-0. When installed in a Class I, Zone 2 Hazardous Location, the unit shall be mounted in a supplemental AEx or Ex enclosure that provides a degree of protection not less than IP54 in accordance with UL/CSA-0. When installed in a Class I, Division 2 Hazardous Location, the unit shall be mounted in a supplemental enclosure that provides a degree of protection not less than IP54. The enclosure must have a door or cover accessible only by the use of a tool. The end user is responsible to ensure that the operating temperature of the module is not exceeded in the end use application.

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 D5232 series 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 modification must be avoided. D5232 series must be connected to SELV or PELV supplies. All circuits connected to D5232 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.

Warning: de-energize main power source (turn off power supply voltage) and disconnect plug-in terminal blocks before opening the enclosure to avoid electrical shock

when connected to live hazardous potential.

12. 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. Check that the module has been correctly configured through SWC5090 software. For details please see SWC5090 manual ISM0154. Turn on power, the “power on” green LED must be lit, output signal must be in accordance with the corresponding input signal value and input/output chosen transfer function, Status/fault LED should reflect the input variable condition with respect to configured settings. If possible change the sensor condition and check the corresponding Safe Area output.