



INSTRUCTION MANUAL

SIL 2 Resistance Repeater, DIN-Rail
Models D5072S-087, D5072D-087



Characteristics

General Description:

The single and dual channel Isolating Repeater D5072S-087 and D5072D-087 accepts a resistance/RTD or transmitting potentiometer sensor, located in Hazardous Area, and repeats the resistance, with isolation, to Safe Area, suitable for applications requiring SIL 2 (according to IEC 61508:2010) in safety related systems for high risk industries.

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.

Fault Detection:

D5072S-087 and D5072D-087 modules are able to detect the breakage of any Input sensor line (Burnout).

Functional Safety Management Certification:

G.M. International is certified by TÜV to conform to IEC61508:2010 part 1 clauses 5-6 for safety related systems up to and included SIL3.



Technical Data

Supply:

Voltage: 24 Vdc nom (18 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp, 2 A time lag fuse internally protected.

Current consumption @ 24 V: 35 mA (D5072S-087), 37 mA (D5072D-087) typical with 1 mA excitation current.

Power dissipation @ 24 V: 0.85 W (D5072S-087), 0.9 W (D5072D-087) typical with 1 mA excitation current.

Isolation:

Test voltage: I.S. In/Out 2.5 KV; I.S. In/Supply 2.5 KV; I.S. In/I.S. In 500 V; Out/Supply 500 V; Out/Out 500 V.

Input:

Type: 2-3-4 wire (4 wire only for D5072S-087) RTD/Resistance or 2-wire transmitting potentiometer.

Integration time: from 50 ms to 500 ms depending on sensor and fast/slow integration.

Resolution: 10 m Ω .

Input range: 0 to 4 k Ω .

Measuring RTD current: ≤ 0.15 mA.

Fault:

Type: Burnout / Internal fault. Output reflects fault condition via highscales (450 Ω) value forcing. Fault condition is also signaled via BUS and red LED on front panel.

Output:

Type: 2-3-4 wire (4 wire only for D5072S-087) Resistance.

Transfer characteristic: linear or custom; optional using of multiplication factor.

Response time: 10 to 90 % step: ≤ 10.0 ms (slow integration time), ≤ 1.2 ms (fast integration time).

Output range: 0 to 400 Ω .

Excitation current (I_e): 0.1 to 10 mA.

Performance:

Ref. Conditions: 24 V supply, 23 ± 1 °C ambient temperature, slow integration mode, 4 wires (for D5072S-087) or 3 wires (for D5072D-087) configuration for RTD, input/output range 10 to 400 Ω .

Input to output, after calibration:

Calibration and linearity accuracy with input standard range:

< 200 m Ω typical (Excitation Current ≥ 1 mA);

< 300 m Ω typical (0.5 mA \leq Excitation Current < 1 mA).

Temperature influence with input standard range:

± 20 m Ω /°C, typical (Excitation Current ≥ 1 mA).

Compatibility:

CE mark compliant, conforms to Directives:

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 [ia Ga] IIC T4 Gc, II (1)D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I; **IECEx / INMETRO:** Ex ec [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 nA [ia Ga] IIC T4 Gc; **C-UL:** NI / I / 2 / ABCD / T4, AIS / I, II, III / 1 / ABCDEFG, Ex nA [ia Ga] IIC T4 Gc X

EAC-EX: 2Ex ec [ia Ga] IIC T4 Gc X, [Ex ia Da] IIIC, [Ex ia Ma] I.

CCC: Ex ec [ia Ga] IIC T4 Gc; [Ex ia Ga] IIC; [Ex ia Da] IIIC

UKR TR n. 898: 2ExnAiaIIC T4 X, Exial X

associated apparatus and non-sparking electrical equipment.

D5072S-087: $U_o/V_{oc} = 7.2$ V, $I_o/I_{sc} = 23$ mA, $P_o/P_o = 40$ mW, $U_i/V_{max} = 12.8$ V, $C_i = 0$ nF, $L_i = 0$ nH at terminals 7-8-9-10.

D5072D-087: $U_o/V_{oc} = 7.2$ V, $I_o/I_{sc} = 16$ mA, $P_o/P_o = 27$ mW, $U_i/V_{max} = 12.8$ V, $C_i = 0$ nF, $L_i = 0$ nH at terminals 7-8-9, 10-11-12.

$U_m = 250$ Vrms or Vdc, -40 °C $\leq T_a \leq 70$ °C.

Approvals:

BVS 12 ATEX E 053 X conforms to EN60079-0, EN60079-7, EN60079-11; IECEx BVS 12.0050X conforms to IEC60079-0, IEC60079-7, IEC60079-11.

INMETRO DNV 13.0110 X conforms to ABNT NBR IEC60079-0, ABNT NBR IEC60079-7, ABNT NBR IEC60079-11.

UL & C-UL E222308 conforms to UL913, UL 60079-0, UL60079-11, UL60079-15, UL121201 for UL

and CSA-E60079-0, CSA-E60079-11, CSA-E60079-15 and CSA-C22.2 No. 213 for C-UL.

EAЭC RU C-IT.AA87.B.00765/21 conforms to GOST 31610.0, GOST ,31610.7 GOST 31610.11.

CCC n. 2020322316000978 conforms to GB/T 3836.1, GB/T 3836.3, GB/T 3834.4

CUL 16.0036 X conforms to ДСТУ 7113, ГОСТ 22782.5-78, ДСТУ IEC 60079-15.

TÜV Certificate No. C-IS-722160171, SIL 2 conforms to IEC61508:2010 Ed.2 .

SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

DNV Type Approval Certificate No. TAA00001U0 and KR No.MIL20769-EL002 Certificates for maritime applications.

Mounting:

EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board.

Weight: about 135 g D5072D-087, 130 g D5072S-087.

Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm².

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 12.5 mm, Depth 123 mm, Height 120 mm.

Programming

The module is fully programmable. Operating parameters can be changed from PC via PPC5092 adapter connected to USB serial line and SWC5090 software.

Measured values and diagnostic alarms can be read on both serial configuration or Modbus output line.

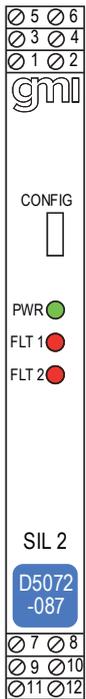
SWC5090 software also allows the Monitoring and Recording of values. For details please see SWC5090 manual ISM0154.

Ordering Information

| | | |
|------------|-------|------|
| Model: | D5072 | -087 |
| 1 channel | S | |
| 2 channels | D | |

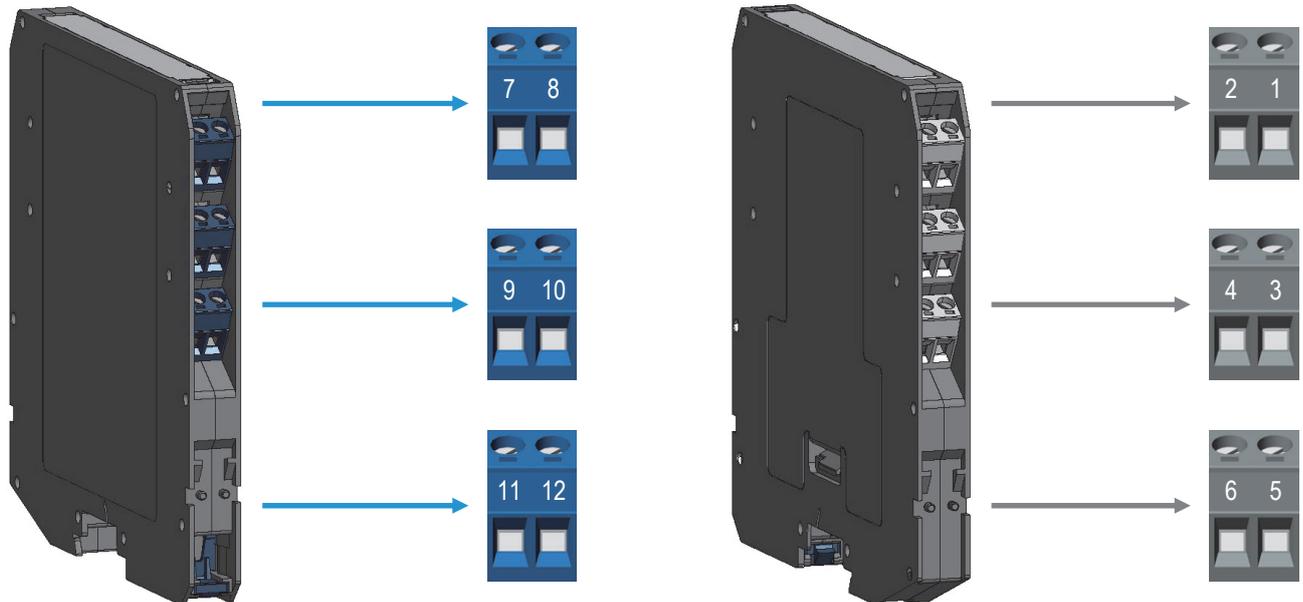
Power Bus and DIN-Rail accessories:
 Connector JDFT049 (mandatory for D5072D-087, optional for D5072S-087)
 Bus Mounting Kit OPT5096 (mandatory for D5072D-087, optional for D5072S-087)

Front Panel and Features



- SIL 2 according to IEC 61508:2010 (Route 2H) with Tproof = 9 / 20 years ($\leq 10\%$ / $> 10\%$ of total SIF).
- SC 3: Systematic Capability SIL 3.
- Input from Zone 0 (Zone 20) / Division 1, installation in Zone 2 / Division 2.
- 2 or 3 or 4 wire resistance/RTD or 2 wire transmitting potentiometer Input Signal.
- Burnout Fault detection.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety systems.
- ATEX, IECEx, UL & C-UL, INMETRO, EAC-EX, UKR TR n. 898, NEPSI, TÜV Certifications.
- TÜV Functional Safety Certification.
- Type Approval Certificate DNV and KR for maritime applications.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks, with or without Power Bus.
- 250 Vrms or Vdc (Um) max. voltage allowed to the instruments associated with the barrier.

Terminal block connections



HAZARDOUS AREA

SAFE AREA

| | |
|-----------|---|
| 7 | <u>D5072S-087</u> : Input for 3, 4 wire RTD <u>D5072D-087</u> : Input Ch1 for 3 wire RTD |
| 8 | <u>D5072S-087</u> : Input for 2, 3, 4 wire RTD or potentiometer <u>D5072D-087</u> : Input Ch1 for 2, 3 wire RTD or potentiometer |
| 9 | <u>D5072S-087</u> : Input for 2, 3, 4 wire RTD or potentiometer <u>D5072D-087</u> : Input Ch1 for 2, 3 wire RTD or potentiometer |
| 10 | <u>D5072S-087</u> : Input for 4 wire RTD <u>D5072D-087</u> : Input Ch2 for 2, 3 wire RTD or potentiometer |
| 11 | <u>D5072D-087</u> : Input Ch2 for 3 wire RTD |
| 12 | <u>D5072D-087</u> : Input Ch2 for 2, 3 wire RTD or potentiometer |

| | |
|----------|---|
| 1 | <u>D5072S-087</u> : +Output for 3, 4 wire RTD <u>D5072D-087</u> : +Output Ch1 for 2, 3 wire RTD |
| 2 | <u>D5072S-087</u> : +Output for 2, 3, 4 wire RTD <u>D5072D-087</u> : -Output Ch1 for 2, 3 wire RTD |
| 3 | <u>D5072S-087</u> : -Output for 2, 3, 4 wire RTD <u>D5072D-087</u> : +Output Ch2 for 2, 3 wire RTD |
| 4 | <u>D5072S-087</u> : -Output for 4 wire RTD <u>D5072D-087</u> : -Output Ch2 for 2, 3 wire RTD |
| 5 | <u>D5072S-087</u> : +Power Supply 24 Vdc <u>D5072D-087</u> : -Output Ch1 for 3 wire RTD |
| 6 | <u>D5072S-087</u> : -Power Supply 24 Vdc <u>D5072D-087</u> : -Output Ch2 for 3 wire RTD |

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 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 D5072S-087 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 group. See parameters indicated in the table below:

| | D5072-087 Terminals | D5072-087 Associated Apparatus Parameters | Must be | Hazardous Area/ Hazardous Locations Device Parameters |
|------------|-----------------------------------|---|---------|---|
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $U_o / V_{oc} = 7.2 V$ | \leq | U_i / V_{max} |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | | | |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $I_o / I_{sc} = 23 mA$ | \leq | I_i / I_{max} |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | $I_o / I_{sc} = 16 mA$ | | |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $P_o / P_o = 40 mW$ | \leq | P_i / P_i |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | $P_o / P_o = 27 mW$ | | |
| | D5072-087 Terminals | D5072-087 Associated Apparatus Parameters Cenelec (US) | Must be | Hazardous Area/ Hazardous Locations Device + Cable Parameters |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $C_o / C_a = 13.5 \mu F$ $C_o / C_a = 240 \mu F$ $C_o / C_a = 1000 \mu F$ $C_o / C_a = 1000 \mu F$ $C_o / C_a = 240 \mu F$ | \geq | $C_i / C_i \text{ device} + C \text{ cable}$ |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | $C_o / C_a = 13.5 \mu F$ $C_o / C_a = 240 \mu F$ $C_o / C_a = 1000 \mu F$ $C_o / C_a = 1000 \mu F$ $C_o / C_a = 240 \mu F$ | | |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $L_o / L_a = 67 mH$ $L_o / L_a = 268 mH$ $L_o / L_a = 537 mH$ $L_o / L_a = 882 mH$ $L_o / L_a = 268 mH$ | \geq | $L_i / L_i \text{ device} + L \text{ cable}$ |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | $L_o / L_a = 138 mH$ $L_o / L_a = 555 mH$ $L_o / L_a = 1111 mH$ $L_o / L_a = 1822 mH$ $L_o / L_a = 555 mH$ | | |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $L_o / R_o = 875 \mu H/\Omega$ $L_o / R_o = 3500 \mu H/\Omega$ $L_o / R_o = 7000 \mu H/\Omega$ $L_o / R_o = 11480 \mu H/\Omega$ $L_o / R_o = 3500 \mu H/\Omega$ | \geq | $L_i / R_i \text{ device and}$ $L \text{ cable} / R \text{ cable}$ |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | $L_o / R_o = 1290 \mu H/\Omega$ $L_o / R_o = 5160 \mu H/\Omega$ $L_o / R_o = 10330 \mu H/\Omega$ $L_o / R_o = 16950 \mu H/\Omega$ $L_o / R_o = 5160 \mu H/\Omega$ | | |

When used with separately powered intrinsically safe devices, check that maximum allowable voltage, current (U_i/V_{max} , I_i/I_{max}) of the D5072-087 Associated Apparatus are not exceeded by the safety parameters (U_o/V_{oc} , I_o/I_{sc}) of the Intrinsically Safe device, indicated in the table below:

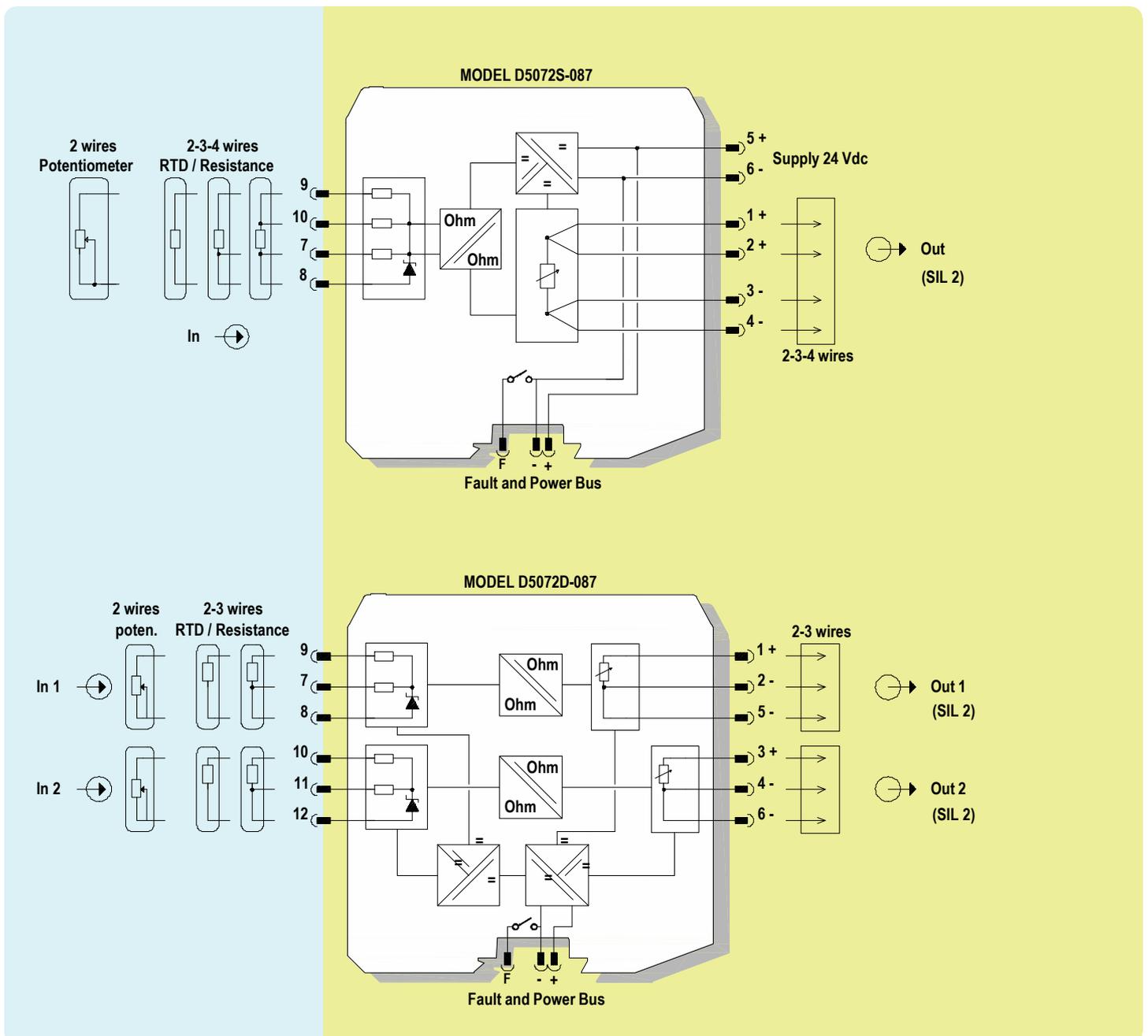
| | D5072-087 Terminals | D5072-087 Associated Apparatus Parameters | Must be | Hazardous Area/ Hazardous Locations Device Parameters |
|------------|-----------------------------------|---|---------|---|
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $U_i / V_{max} = 12.8 \text{ V}$ | \geq | U_o / V_{oc} |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | | | |
| D5072S-087 | Ch1 7 - 8 - 9 - 10 | $C_i = 0 \text{ nF}$, $L_i = 0 \text{ nH}$ | | |
| D5072D-087 | Ch1 7 - 8 - 9 Ch2 10 - 11 - 12 | | | |

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 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).

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

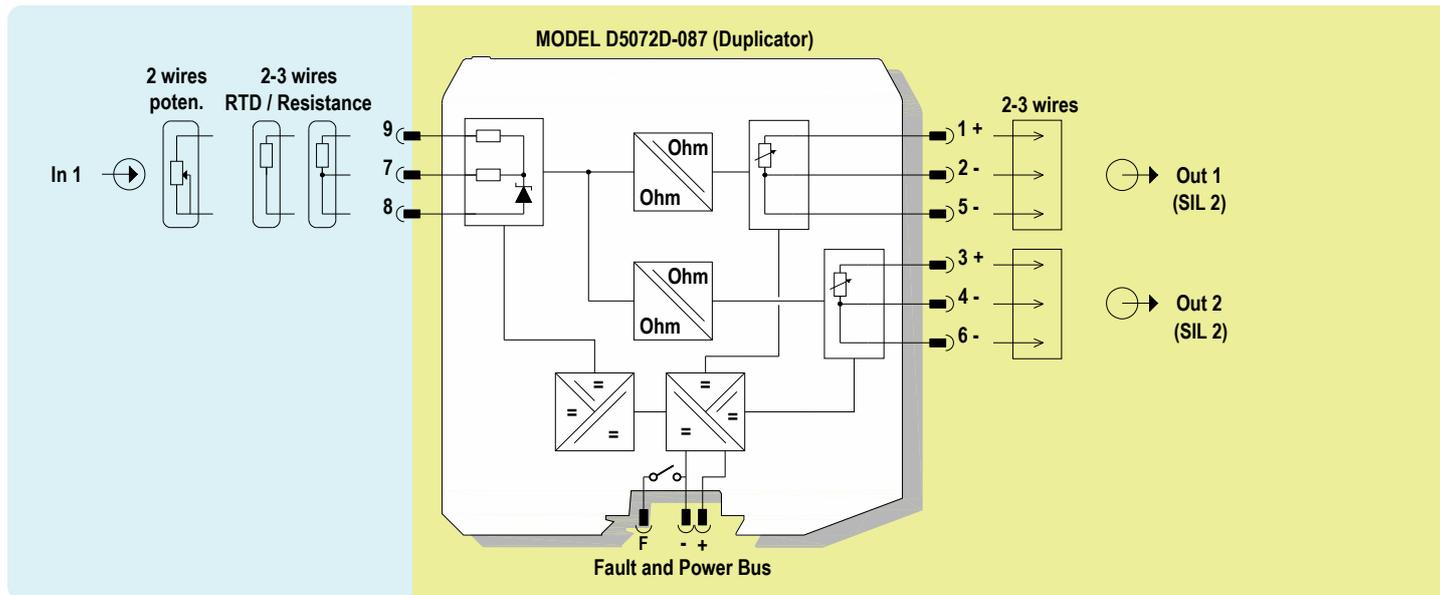
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



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



Warning

D5072-087 series are 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.

D5072-087 series must be installed, operated and maintained only by qualified personnel, 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)), 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 or unless area is known to be nonhazardous.

Warning: substitution of components may impair Intrinsic Safety and suitability for 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 input channel of Resistance Isolating Repeater D5072-087 accepts a 2-3-4 wire RTD (D5072S-087) or 2-3 wire RTD (D5072D-087) temperature or transmitting potentiometer sensor, located in Hazardous Area, and repeats, with isolation, the signal to drive a Safe Area load. Presence of supply power is displayed by a "POWER ON" green signaling LED. Burnout condition is signaled by red front panel LED for each channel. D5072D-087 module has double input and output channel, and can also be programmed to interface a single input and obtain dual output channel (duplicator) or configurable output channel (outputs can repeat the corresponding inputs).

Installation

D5072-087 series are Resistance Isolating Repeater housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus.

D5072-087 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 up to 2.5 mm² (13 AWG) and a torque value of 0.5-0.6 Nm. Use only cables that are suitable for a temperature of at least 85°C. The wiring cables have to be proportionate in base to the current and the length of the cable. In case of installation in zone 2, the connecting cables of non-intrinsically safe circuits must be safely routed in a cable duct or similar. The distance between the pluggable connection terminal and the cable duct should not exceed 500 mm cable length.

On the section "Function Diagram" and enclosure side a block diagram identifies all connections.

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.

The enclosure provides, according to EN60529, an IP20 minimum degree of protection (or similar to NEMA Standard 250 type 1). The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1. When installed in EU Zone 2, the unit shall be installed in an enclosure that provides a minimum ingress protection of IP54 in accordance with IEC 60079-0. 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 60079-0. 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 D5072-087 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.

D5072-087 series must be connected to SELV or PELV supplies.

All circuits connected to D5072-087 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.

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 must be in accordance with the corresponding input signal value. If possible change the sensor condition and check the corresponding Safe Area output.