

Characteristics:
General Description:

The single channel Relay Output, D5090S is a relay module suitable for the switching of safety related circuits, up to SIL 3 level according to IEC 61508:2010 Ed.2 for high risk industries.

It provides isolation between input and output contacts.

Three mutually exclusive (by DIP-Switch programming) monitoring circuits are provided:

- 1) line input monitoring, to allow DCS/PLC line monitoring function: when enabled, the module permits a wide compatibility towards different DCS/PLC. Driving line pulse testing, executed by DCS/PLC, is permitted by a dedicated internal circuit, to prevent relay and LED flickering.
- 2) low voltage input monitoring: when enabled, the module reflects a high impedance state to the control unit when the driving voltage is below the specified threshold.
- 3) short circuit fault detection: when enabled, it allows DCS/PLC to detect short circuit fault of module.

D5090S provides two NO contacts for normally energized load and a NC contact for service purpose, in order to switch the NE load on both supply lines.

See the following pages for Functional Safety applications with related SIL value.

Mounting on standard DIN-Rail or on customized Termination Boards, in Safe Area / Non Hazardous Location or in Zone 2 / Class I, Division 2 or Class I, Zone 2.

Functional Safety Management Certification:

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


Front Panel and Features:


- SIL 3 according to IEC 61508:2010 Ed. 2 for Tproof = 14 / 20 yrs ($\leq 10\%$ / $> 10\%$ of total SIF).
- PFDavg (1 year) 7.01 E-06, SFF 99.17 % for NE Load.
- Systematic capability SIL 3
- Installation in Zone 2 / Division 2.
- SIL 3 contact for NE load and contact for service purpose.
- 6 A inrush current at 24 Vdc / 250 Vac.
- Line input monitoring in-field DIP Switch selectable.
- Driving input voltage monitoring.
- Input/Output isolation.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- ATEX, IECEx, UL & C-UL, FM & FM-C, 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 or customized Termination Boards.

Ordering Information:

Model: D5090S

Technical Data:

Input: 24 Vdc nom (21.6 to 27.6 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.

The following monitoring circuits are mutually exclusive:

- 1) **Line input monitoring (DIP-Switch selectable):** to allow DCS/PLC line monitoring function (pulse test).
- 2) **Voltage monitoring (DIP-Switch selectable):** ≥ 21.6 Vdc for normal operation, ≤ 17 Vdc reflects a high impedance (≤ 10 mA consumption) to the control device.
- 3) **Short circuit fault detection (DIP-Switch selectable):** to allow DCS/PLC to detect short circuit fault of module.

Current consumption @ 24 V: 35 mA with relay energized and line input monitoring disabled, 45 mA with relay energized and line input monitoring enabled, typical.

Power dissipation: 0.85 W with 24 V input voltage, relay energized and line input monitoring disabled, 1.1 W with 24 V input voltage, relay energized and line input monitoring enabled, typical.

Isolation (Test Voltage): Input / All Outputs 2.5 KV ; Out 1 / Out 2: 500V.

Output: 1 voltage free SPDT relay contact identified with outputs: Out 1 (NO contact) terminals 7-11 and Service Load Out (NC contact) terminals 9-10;
 1 voltage free SPST relay contact identified with output Out 2 (NO contact) terminals 8-12.

Terminals 7-11 (Out 1) and 8-12 (Out 2) are open when relay is de-energized, closed in energized relay condition.

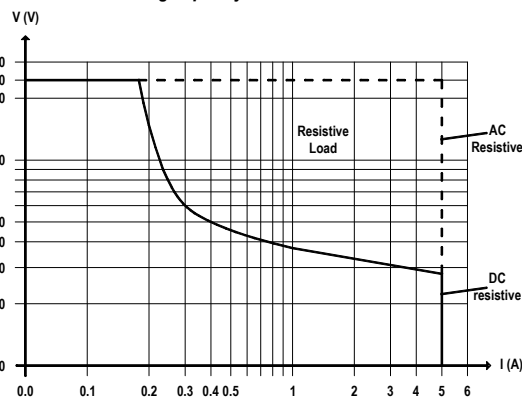
Service load output (not SIL) at terminals 9-10 is normally close when relay is de-energized, open in energized relay condition.

Contact material: Ag Alloy (Cd free), gold plated.

Contact rating: 5 A 250 Vac 1250 VA, 5 A 250 Vdc 140 W Min. Switching current 1 mA.

Contact inrush current: 6 A at 24 Vdc, 250 Vac.

AC / DC Load breaking capacity:



Mechanical / Electrical life: $5 * 10^6 / 3 * 10^4$ operation, typical.

Operate / Release time: 8 / 4 ms typical.

Bounce time NO / NC contact: 3 / 8 ms, typical.

Frequency response: 10 Hz maximum.

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.

Safety Description:

ATEX: II 3G Ex nA nC IIC T4 Gc
 IECEx / INMETRO / NEPSI: Ex nA nC IIC T4 Gc
 FM: NI / I / 2 / ABCD / T4, I / 2 / AEx nA nC / IIC / T4
 FMC: NI / I / 2 / ABCD / T4, I / 2 / Ex nA nC / IIC / T4
 EAC-EX: 2ExnAnCIIC T4 X.
 UKR TR n. 898: 2ExnAnCIIC T4 X.
 non-sparking electrical equipment.
 $-40^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$.

Approvals:

BVS 10 ATEX E 114 conforms to EN60079-0, EN60079-15.
 IECEx BVS 10.0072 X conforms to IEC60079-0, IEC60079-15.
 INMETRO DNV 13.0109 X conforms to ABNT NBR IEC60079-0, ABNT NBR IEC60079-15.
 UL & C-UL E477485 conforms to ANSI/UL508
 FM 3046304 and FMC 3046304C conforms to Class 3600, 3611, 3810, ANSI/ISA-60079-0, ANSI/ISA-60079-15, C22.2 No.142, C22.2 No.213, C22.2 No. 60079-0, C22.2 No. 60079-15.
 C-IT.ME92.B.00206 conforms to GOST 30852.0, 30852.14.
 CU 16.0036 X conforms to DCTV 7113, DCTV IEC 60079-15.
 GYJ14.1406X conforms to GB3836.1, GB3836.8.
 TÜV Certificate No. C-IS-236198-04, SIL 3 conforms to IEC61508:2010 Ed.2.
 TÜV Certificate No. C-IS-236198-09, SIL 3 Functional Safety Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.
 DNV Type Approval Certificate No.A-13625 and KR No.MIL20769-EL002 Certificates for maritime applications.

Mounting:

T35 DIN-Rail according to EN50022 or on customized Termination Board.

Weight: about 125 g.

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.

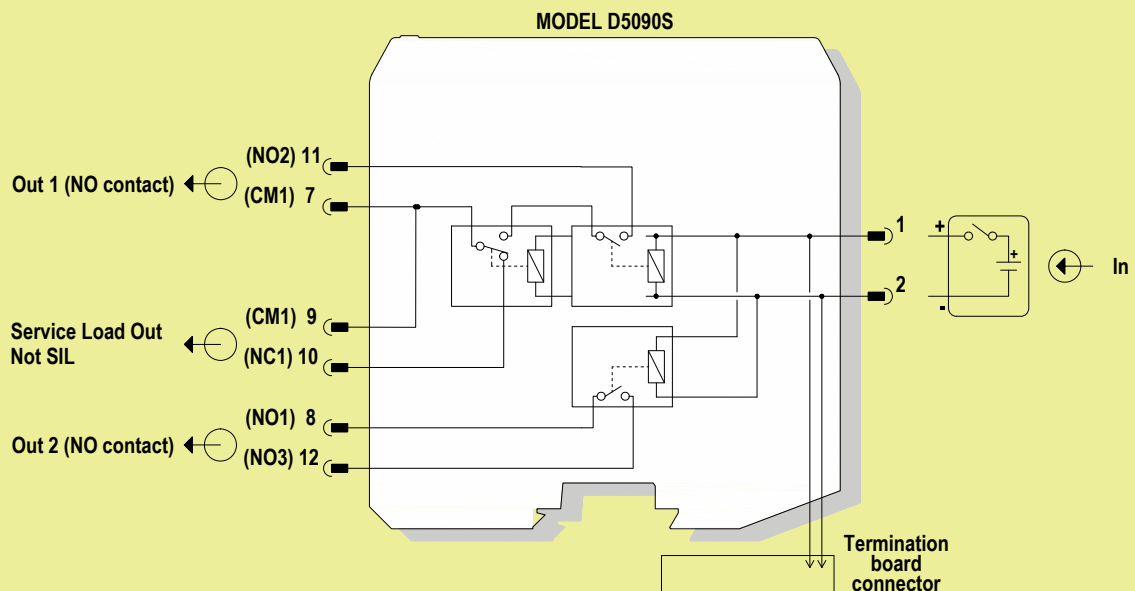
Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

Image:



Function Diagram:

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

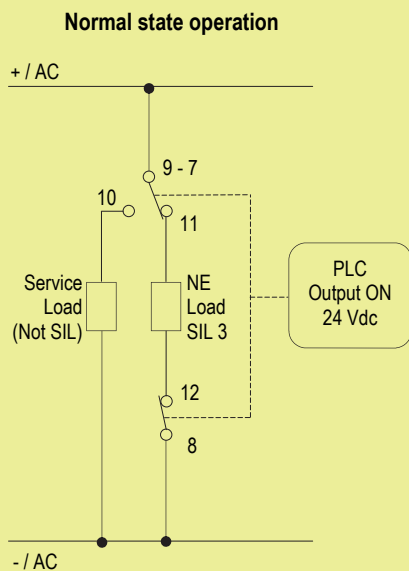


See the following pages for Functional Safety applications with related SIL value.

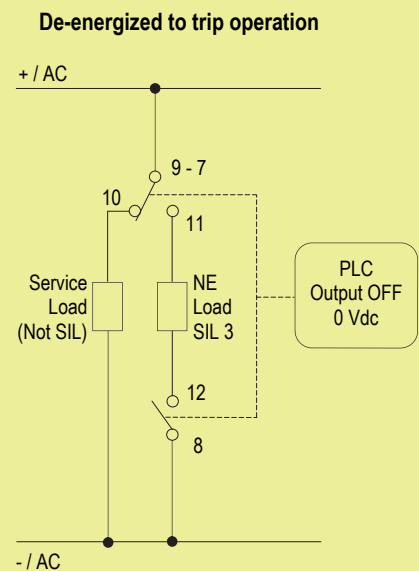
Relay contact shown in de-energized position.
Terminals 7-11 and 8-12 are open; terminals 9-10 are closed.

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

Application D5090S - SIL 3 Load Normally Energized Condition (NE) and Normally Energized Relay, with interruption of both load supply lines



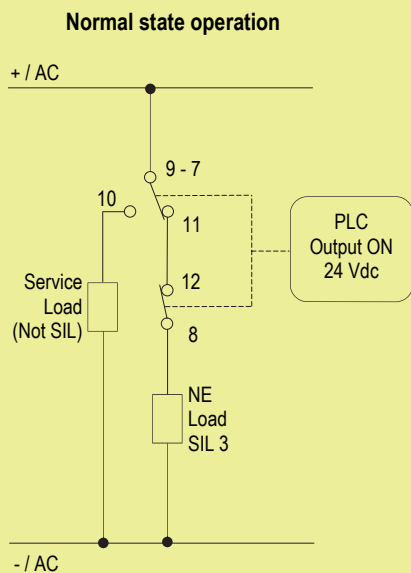
Contacts 7-11 and 8-12: in normal operation relays are energized, contacts are closed, NE load is energized.
Contact 9-10: in normal operation relay is energized, contact is open, service load for NE load is de-energized.



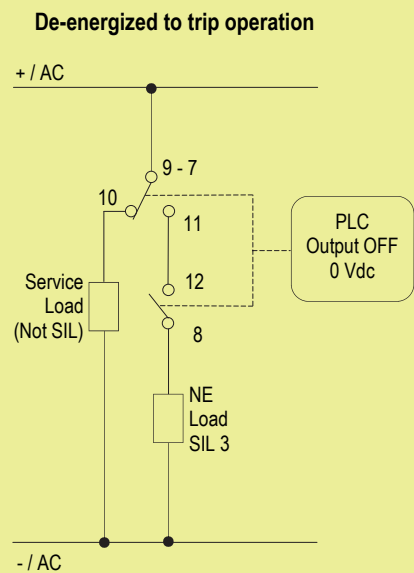
Contacts 7-11 and 8-12: the SIL 3 Safety Function is met when the relays are de-energized, contacts are open, NE load is de-energized.
Contact 9-10: in safe state the relay is de-energized, contact is closed, service load for NE load is energized.

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

Application D5090S - SIL 3 Load Normally Energized Condition (NE) and Normally Energized Relay, with interruption of only one load supply line



Contacts 7-11 and 8-12: in normal operation relays are energized, contacts are closed, NE load is energized.
Contact 9-10: in normal operation relay is energized, contact is open, service load for NE load is de-energized.



Contacts 7-11 and 8-12: the SIL 3 Safety Function is met when the relays are de-energized, contacts are open, NE load is de-energized.
Contact 9-10: in safe state the relay is de-energized, contact is closed, service load for NE load is energized.

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