D5091

4 A SIL 3 Relay Output Module for ND Load with ND or NE Relay condition DIN-Rail & Termination Board, Model D5091S

Characteristics:

General Description:

The single channel Relay Output, D5091S is a relay module suitable for the switching of safety related circuits, up to SIL 3 level according to IEC 61508 for high risk industries.
It provides isolation between input and output contacts.
Two mutually exclusive (by DIP-Switch programming) monitoring circuits are provided:

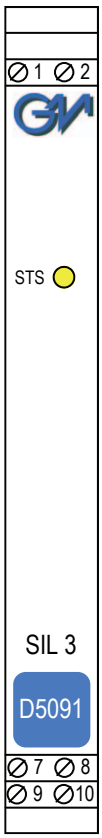
1) line input monitoring, to allow DCS/PLC line monitoring function: when enabled, the module permits a wide compatibility towards different DCS/PLC. Driving line pulse testing, executed by DCS/PLC, is permitted by a dedicated internal circuit, to prevent relay and LED flickering.
2) low voltage input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

D5091S provides 1 SPDT contact for two different safety functions:

1) SIL 3 Safety Function for Normally De-Energized load (energized in fail safe state) is available at Terminal Blocks 7-8. The driving signal is normally low (0 Vdc), the relay is normally de-energized, contact is open and load is de-energized. The safety function is met when the driving signal is high (24 Vdc), the relay is energized, contact is closed and load is energized. At Terminal Blocks 9-10 is also available a service contact (for service load) with opposite (not SIL) function.
2) SIL 3 Safety Function for Normally De-Energized load (energized in fail safe state) is available at Terminal Blocks 9-10. The driving signal is normally high (24 Vdc), the relay is normally energized, contact is open and load is de-energized. The safety function is met when the driving signal is low (0 Vdc), the relay is de-energized, contact is closed and load is energized. At Terminal Blocks 7-8 is also available a service contact (for service load) with opposite (not SIL) function.

Mounting on standard DIN-Rail or on customized Termination Boards, in Safe Area or in Zone 2.

Front Panel and Features:



- SIL 3 according to IEC 61508 for Tproof = 6 / 12 yrs (10 / 20 % of total SIF) for ND load with ND relay (terminals 7-8).
- SIL 3 according to IEC 61508 for Tproof = 10 / 20 yrs (10 / 20 % of total SIF) for ND load with NE relay (terminals 9-10).
- SIL 2 according to IEC 61508 for Tproof = 20 yrs (10 % of total SIF).
- PFDavg (1 year) 1.58 E-05, SFF 99.10 % for ND load with ND relay.
- PFDavg (1 year) 7.01 E-06, SFF 99.60 % for ND load with NE relay.
- Installation in Zone 2.
- 1 SPDT contact for 2 different Safety Functions:
  1) SIL 3 for ND load (energized in fail safe state) with ND relay condition (energized in fail safe state)
  2) SIL 3 for ND load (energized in fail safe state) with NE relay condition (de-energized in fail safe state)
- 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 Certifications.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks or customized Termination Boards.

Ordering Information:

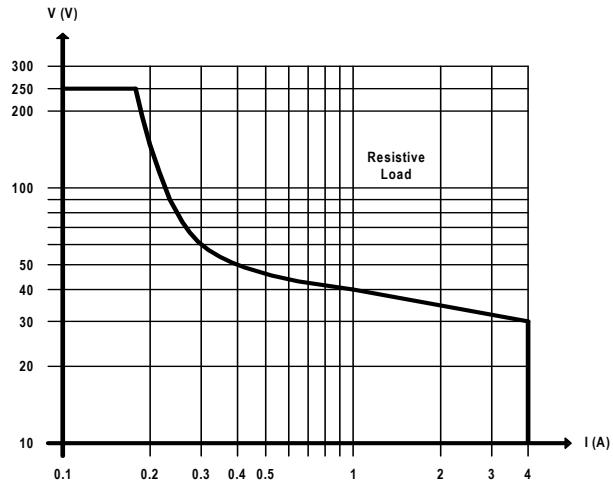
Model: D5091S

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.

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/Output 2.5 KV.
Output: voltage free SPDT relay contact.
Terminals 7-8, open when relay de-energized, close in energized condition.
Terminals 9-10, close when relay de-energized, open in energized condition.
Contact material: Ag Alloy (Cd free).
Contact rating: 4 A 250 Vac 1000 VA, 4 A 250 Vdc 120 W (resistive load).
DC Load breaking capacity:



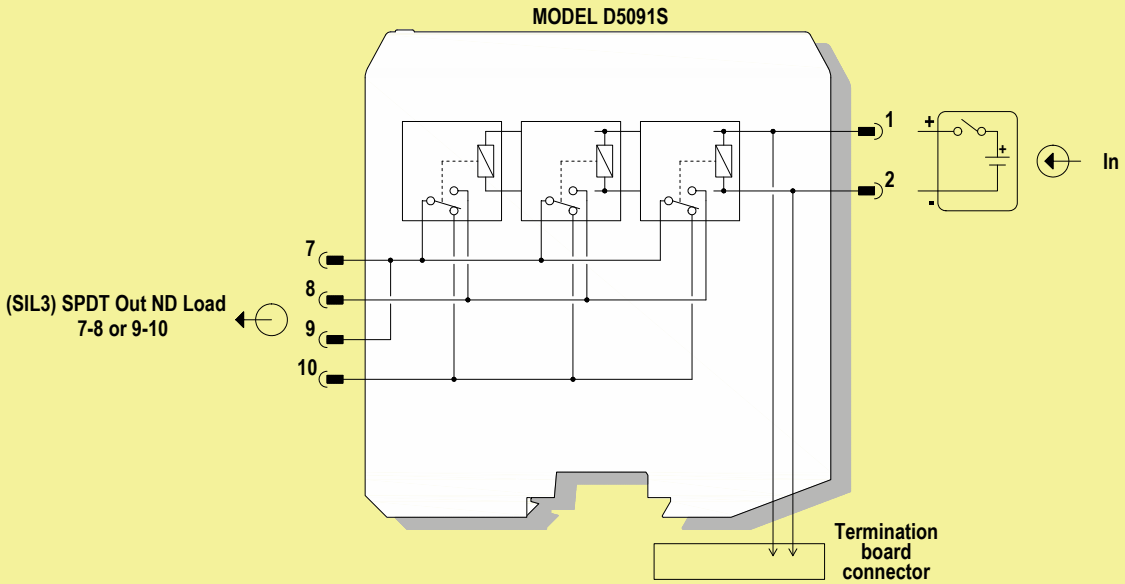
Mechanical / Electrical life: 5 * 10^6 / 3 * 10^4 operation, typical.
Bounce time NO / NC contact: 3 / 8 ms, typical.
Frequency response: 10 Hz maximum.
Compatibility:
CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.
Environmental conditions:
Operating: temperature 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: Ex nA nC IIC T4 Gc
non-sparking electrical equipment.
-40 °C ≤ Ta ≤ 70 °C.
Approvals:
BVS 10 ATEX E 114 conforms to EN60079-15,
IECEx BVS 10.0072 X conforms to IEC60079-15.
Russia according to GOST 12.2.007.0-75, R 51330.0-99, R 51330.10-99, R 51330.14-99 2ExnAnCIICT4 X.
Ukraine according to GOST 12.2.007.0, 22782.0, 22782.3, 22782.5 2ExsIIT4 X.
TUV Certificate No. C-IS-204194-01, SIL 2 / SIL 3 conforms to IEC61508.
Mounting:
T35 DIN-Rail according to EN50022 or on customized Termination Board.
Weight: about 120 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 installation.
Protection class: IP 20.
Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

DIN-Rail accessories: Cover and fix MCHP196

Image:

Function Diagram:

SAFE AREA, ZONE 2 GROUP IIC T4



Relay contact shown in de-energized position
Terminals 7-8 open, terminals 9-10 close.

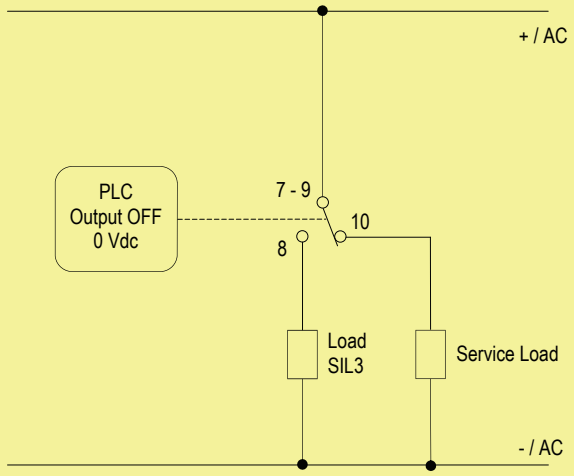
SIL3 Safety Function for ND load (energized in fail safe state) is available at terminal blocks 7-8;
In this case, the Safety Function is met when the relay is energized (closed contact).

SIL3 Safety Function for ND load (energized in fail safe state) is available at terminal blocks 9-10;
In this case, the Safety Function is met when the relay is de-energized (closed contact).

Applications:

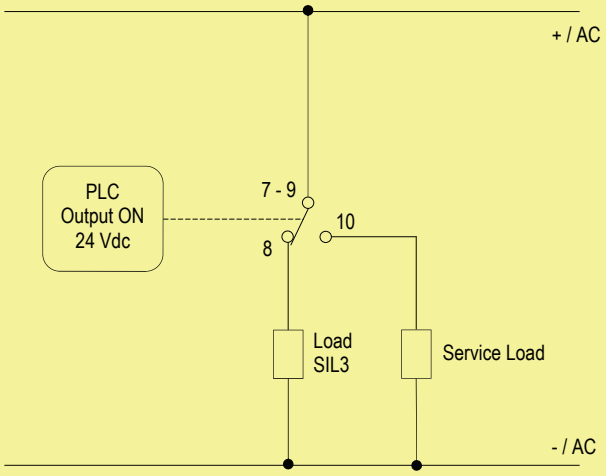
Application for D5091S - SIL Load Normally De-Energized Condition (ND) and Normally De-Energized Relay

Normal state operation



Contact 7-8: in normal operation the relay is de-energized, contact is open, load is de-energized
Contact 9-10: in normal operation the relay is de-energized, contact is closed, service load is energized.

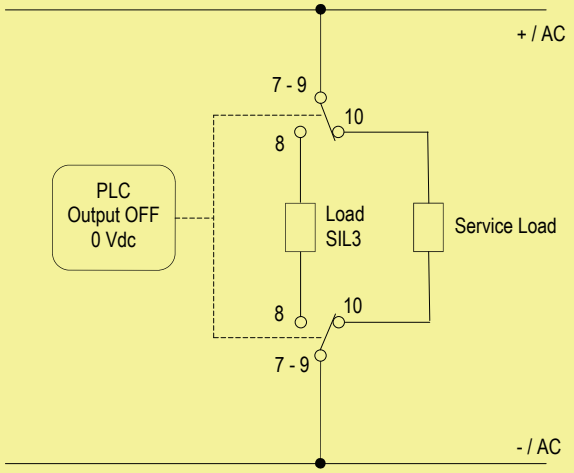
Energized to trip operation



Contact 7-8: the SIL 3 Safety Function is met when the relay is energized, contact is closed, load is energized.
Contact 9-10: relay is energized, contact is open, service load is de-energized.

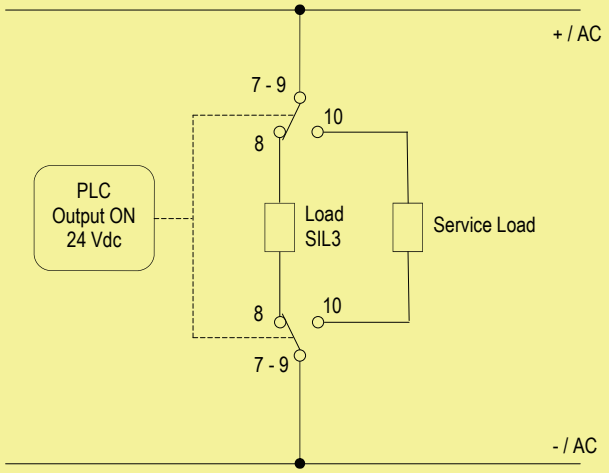
Application for two D5091S - SIL Load Normally De-Energized Condition (ND) and Normally De-Energized Relay with one common driving signal from PLC for the two relays

Normal state operation



Contacts 7-8: in normal operation relays are de-energized, contacts are open, load is de-energized
Contacts 9-10: in normal operation relays are de-energized, contacts are closed, service load is energized.

Energized to trip operation

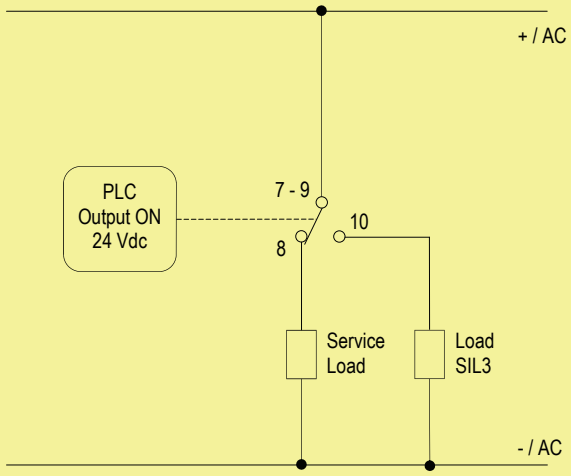


Contacts 7-8: the SIL 3 Safety Function is met when the relays are energized, contacts are closed, load is energized.
Contacts 9-10: relays are energized, contacts are open, service load is de-energized.

Applications:

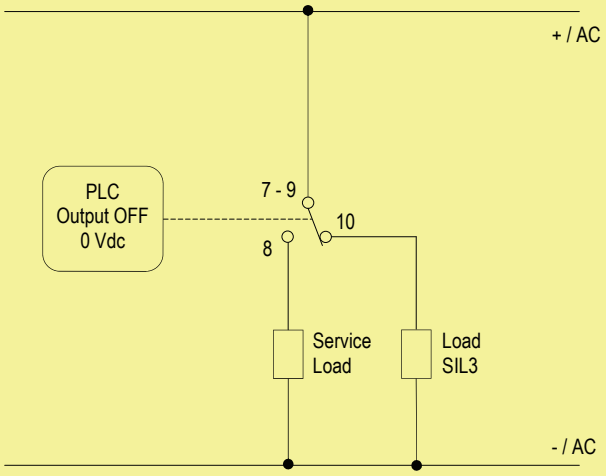
Application for D5091S - SIL Load Normally De-Energized Condition (ND) and Normally Energized Relay

Normal state operation



Contact 7-8: in normal operation the relay is energized, contact is closed, service load is energized
Contact 9-10: in normal operation the relay is energized, contact is open, load is de-energized.

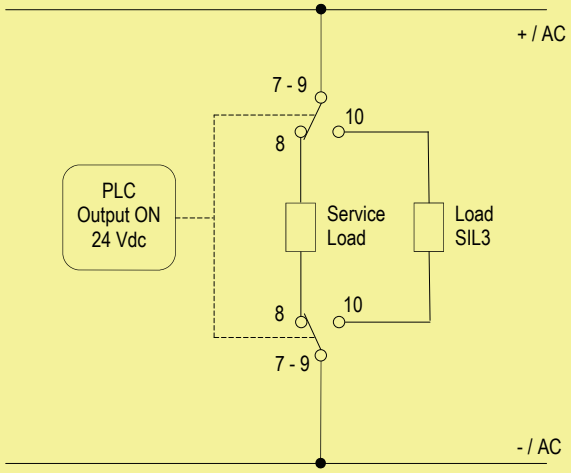
De-energized to trip operation



Contact 7-8: relay is de-energized, contact is open, service load is de-energized.
Contact 9-10: the SIL 3 Safety Function is met when the relay is de-energized, contact is closed, load is energized.

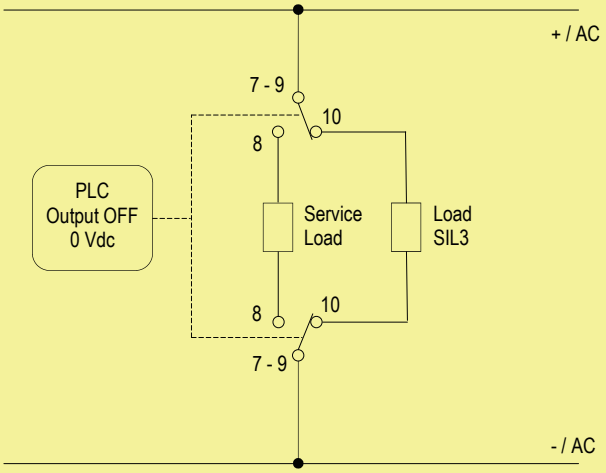
Application for two D5091S - SIL Load Normally De-Energized Condition (ND) and Normally Energized Relay with common driving signal from PLC for the two relays

Normal state operation



Contacts 7-8: in normal operation relays are energized, contacts are closed, service load is energized
Contacts 9-10: in normal operation relays are energized, contacts are open, load is de-energized.

De-energized to trip operation



Contacts 7-8: relays are de-energized, contacts are open, service load is de-energized.
Contacts 9-10: the SIL 3 Safety Function is met when the relays are de-energized, contacts are closed, load is energized.