technology for safety

D1093

SIL 3 Relay Output Module with Line and Load diagnostics DIN-Rail Model D1093S

Characteristics:

General Description:
The single channel DIN Rail Relay Output D1093S is a relay module suitable for the switching of safety related circuits, up to SIL 3 level according to IEC61508:2010 Ed. 2, for high risk industries. It provides isolation between the input and output contact.
D1093S provides 1 DPST contact for normally energized loads and 1 SPST contact for normally de-energized loads.
Compatibility with specific DO cards with pulse testing needs to be verified.
This relay module is not suitable for low-current consumption applications (system-to-system signalling, driving LEDs, etc.).

Diagnostic:
Line breakage detection for NE and ND load conditions.
Provides 1 SPST normally energized relay contact (closed) for fault indication.
It de-energizes (open contact) in case of load or line fault.

Function:
1 relay for safety related circuits, provides isolation between input/output/fault.
D1093S provides 1 DPST for NE loads and 1 SPST for ND loads.
SIL 3 Safety Function for NE load (de-energized in safe state) is available at Terminal Blocks 5-6; in this case, the safety function is met when the relay is de-energized (open contact).
SIL 3 Safety Function for ND load (energized in safe state) is available at Terminal Blocks 7-8; in this case, the safety function is met when the relay is energized (closed contact).

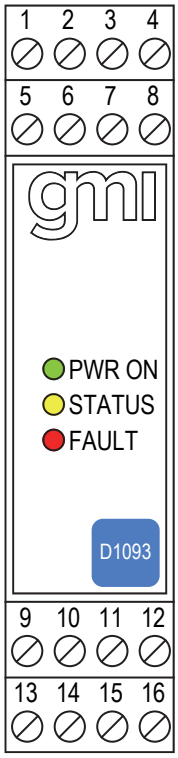
Signalling LEDs:
Power supply indication (green), relay status (yellow), line fault (red).

EMC:
Fully compliant with CE marking applicable requirements.

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.

FSM SIL 3

Front Panel and Features:



- SIL 3 according to IEC 61508:2010 Ed. 2 for Tproof = 14 / 20 years (≤10% / >10 % of total SIF) with NE Load.
- SIL 3 according to IEC 61508:2010 Ed. 2 for Tproof = 9 / 20 years (≤10% / >10 % of total SIF) with ND Load.
- PFDavg (1 year) 7.02 E-06, SFF 99.03 % with NE Load.
- PFDavg (1 year) 1.03 E-05, SFF 97.61 % with ND Load.
- SIL 3 Systematic capability.
- Installation in Zone 2, Division 2.
- Line and Load open diagnostic in NE and ND conditions.
- 1 DPST contact for NE load and 1 SPST contact for ND load.
- 5 A inrush current at 30 Vdc / 250 Vac.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1.
- ATEX, IECEx, FM & FM-C, EAC-EX, UKR TR n. 898, TÜV Certifications.
- Type Approval Certificate DNV and KR for maritime applications.
- TUV Certification for SIL.
- TUV Functional Safety Certification.
- High Reliability, SMD components.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.

Ordering Information:

Model:	D1093S	
Power Bus enclosure		/B

Power Bus and DIN-Rail accessories:

DIN rail anchor MCHP065	DIN rail stopper MOR016
Terminal block male MOR017	Terminal block female MOR022

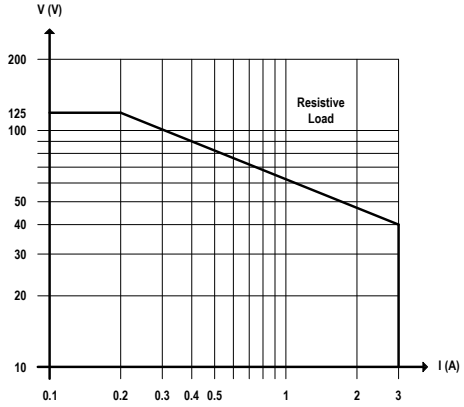
Technical Data:

Supply: 24 Vdc nom (20 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 25 mA typical.
Power dissipation: 0.6 W with 24 V supply voltage and fault relay energized, typical.
Max. power consumption: at 30 V supply voltage and fault relay energized, 0.9 W.

Isolation (Test Voltage):
Output/Input 2.5 KV; Output/Supply 2.5 KV; Output/Fault Output 2.5 KV; Input/Supply 500 V; Input/Fault Output 500 V; Fault Output/Supply 500 V.

Input: 24 Vdc nom (20.4 to 27.6 Vdc) reverse polarity protected.
Current consumption @ 24 V: 50 mA with relay energized, typical.
Power dissipation: 1.2 W with 24 V input voltage and relay energized, typical.
Max. power consumption: at 27.6 V input voltage and relay energized, 1.5 W.

Output: voltage free relay contact, normally open.
Contact material: Ag Alloy (Cd free).
Contact rating: 3 A 250 Vac 750 VA, 3 A 125 Vdc 120 W (resistive load).
Contact inrush current: 5 A at 30 Vdc, 250 Vac.
Contact min. switching current: 10 mA.
DC Load breaking capacity:



Mechanical / Electrical life: 50 * 10^6 / 1 * 10^5 operation, typical.
Operate / Release time: 5 / 3 ms typical.
Bounce time NO / NC contact: 3 ms.
Frequency response: 10 Hz maximum.

Fault detection:
De-energized fault signal: ≤ 100 µA continuous (typical 65 µA).
De-energized open output detection: load resistance ≥ 350 KΩ (current ≤ 30 µA).
De-energized no fault detection: load resistance ≤ 250 KΩ
Energized open output detection: load current ≤ 10 mA (no fault detection ≥ 25 mA).
Fault signalling: voltage free NE SPST relay contact (output de-energized in fault condition).
Contact rating: 3 A 250 Vac 750 VA, 3 A 125 Vdc 120 W (resistive load).
Contact inrush current: 5A at 30Vdc, 250Vac. ***Contact min. switch. current:*** 10mA.
Response time: 200 ms typical.

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 95 %.
Storage: temperature limits - 45 to + 80 °C.

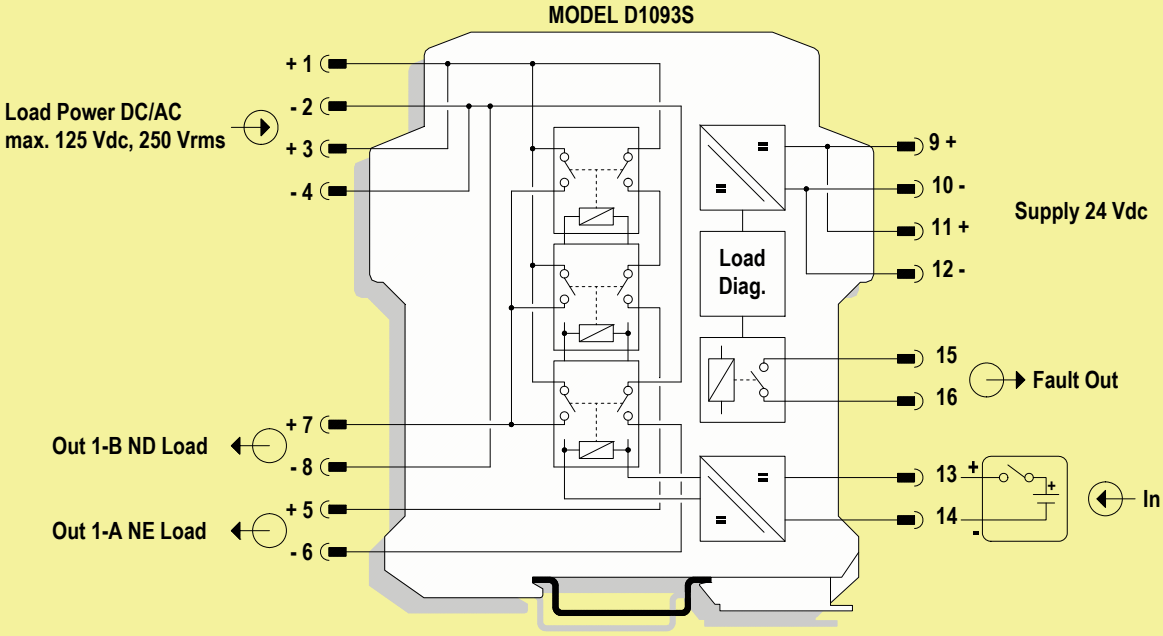
Safety Description:
ATEX: II 3G Ex nAC IIC T4 Gc; ***IECEx:*** Ex ec nC IIC T4 Gc
FM: NI / I / 2 / ABCD / T4, NI / I / 2 / IIC / T4
FM-C: NI / I / 2 / ABCD / T4, NI / I / 2 / IIC / T4
EAC-EX: 2Ex nA nC IIC T4 Gc X
UKR TR n. 898: 2ExnAnCIICT4 X
non-incendive electrical apparatus.
-20 °C ≤ Ta ≤ 60 °C.
Approvals:
IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-7, EN60079-15.
IECEx IMQ 13.0011X conforms to IEC60079-0, IEC60079-7, IEC60079-15.
FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3611, 3810.
ANSI/ISA 12.12.02, ANSI/ISA 60079-0, C22.2 No.142, C22.2 No.213, E60079-0, E60079-15,
EAЭC RU C-IT.HA67.B.00113/20 conforms to GOST 31610.0, GOST 31610.15
СЦ 16.0034 X conforms to ДСТУ 7113, ДСТУ IEC 60079-15.
TÜV Certificate No. C-IS-236198-03 , SIL 3 conforms to IEC61508:2010 Ed.2.
SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.
DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications.

Mounting: EN/IEC60715 TH 35 DIN-Rail.
Weight: about 155 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 22.5mm, Depth 99mm, Height 114.5mm.

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



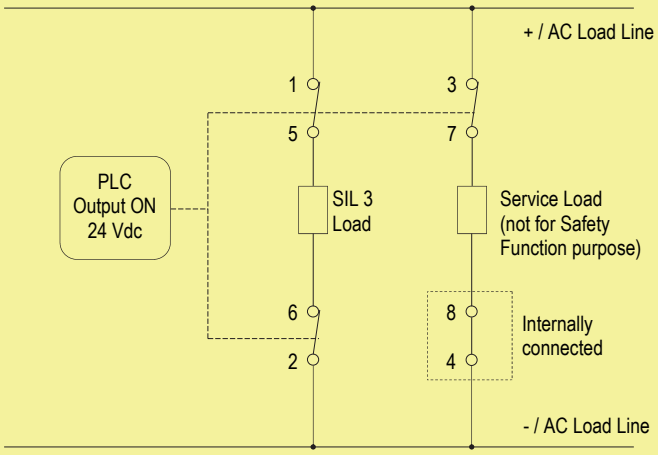
All relay contacts shown in de-energized position

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

Applications:

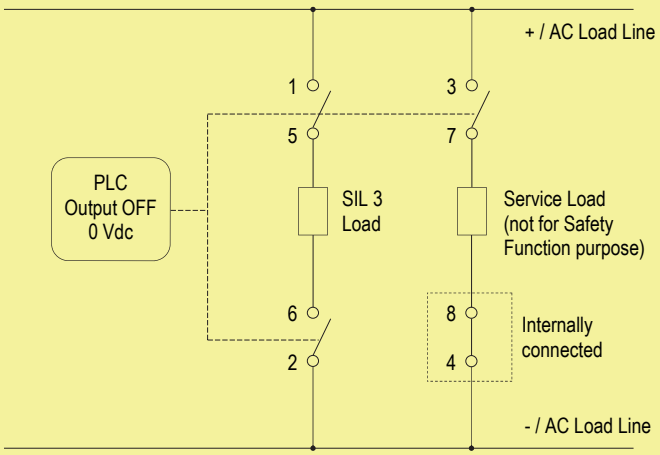
Application for D1093S - Normally Energized relay condition for NE Load

Normal state operation

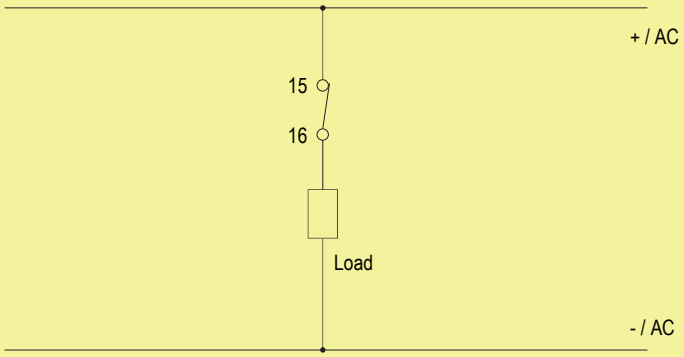


Contacts 1-5 and 2-6: in normal operation the relay is energized, contacts are closed, SIL 3 load is energized.
Contacts 3-7: in normal operation the relay is energized, contact is closed, Service load (not for Safety Function purpose) is energized.
Contacts 4-8: internally connected, cannot be changed.

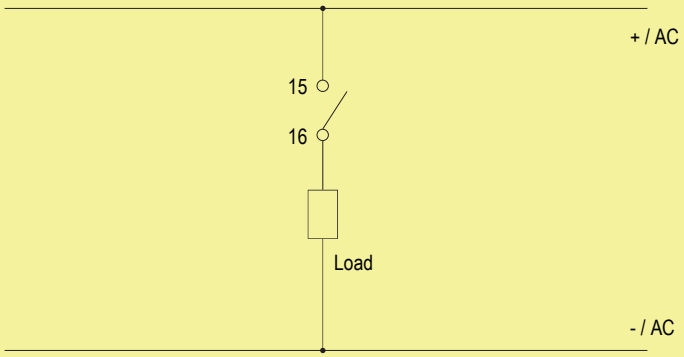
De-energized to trip operation



Contacts 1-5 and 2-6: the SIL 3 Safety Function is met when the relay is de-energized, contacts are open, SIL 3 load is de-energized.
Contacts 3-7: opening of this contact can be used to monitor contacts 1-5 and 2-6. Service load (not for Safety Function purpose) is de-energized.
Contacts 4-8: internally connected, cannot be changed.



Contacts 15-16: Voltage free contact for Line and Load Fault detection.
Can be connected in series with other relay units for common monitoring.
Normally closed when there is not Fault condition.

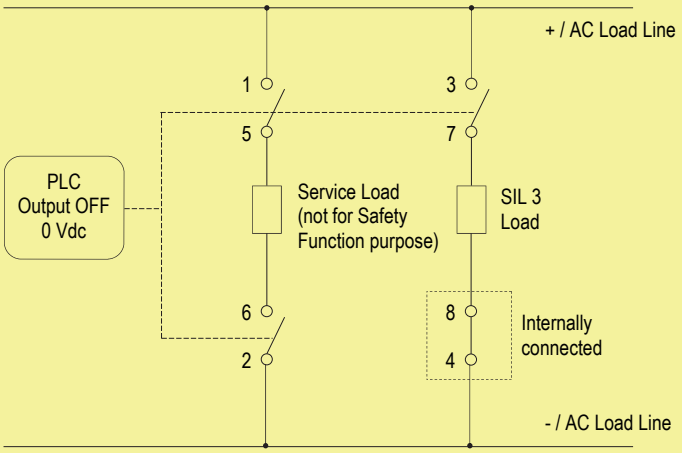


Contacts 15-16: Open in Fault condition.

Applications:

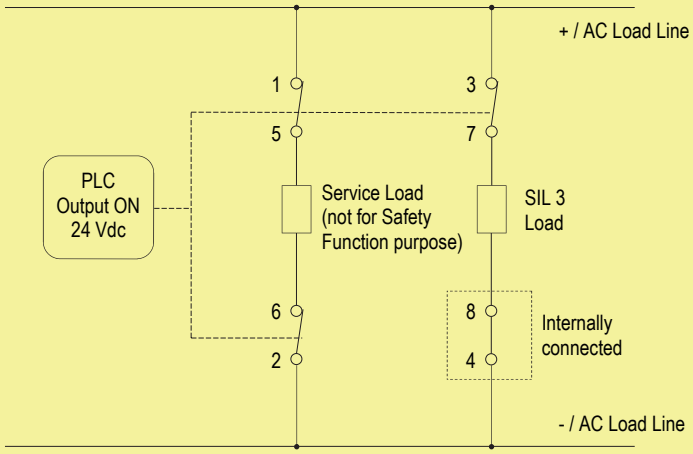
Application for D1093S - Normally De-energized relay condition for ND Load

Normal state operation

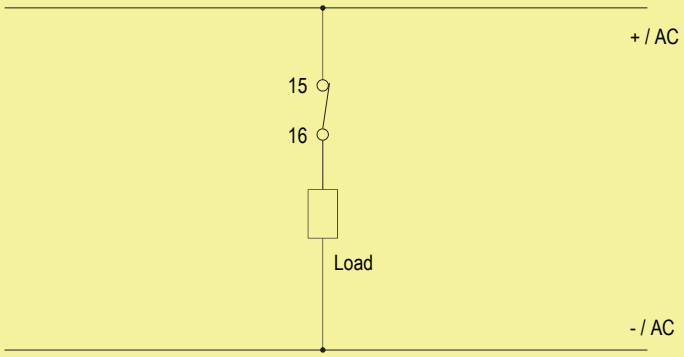


Contacts 1-5 and 2-6: in normal operation the relay is de-energized, contacts are open, Service Load load (not for Safety Function purpose) is de-energized.
Contacts 3-7: in normal operation the relay is de-energized, contact is open, SIL 3 load is de-energized.
Contacts 4-8: internally connected, cannot be changed.

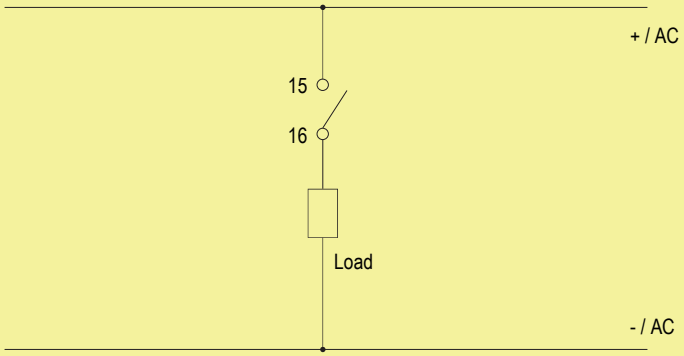
Energized to trip operation



Contacts 1-5 and 2-6: closing of this contact can be used to monitor contacts 3 - 7. Service load (not for Safety Function purpose) is energized.
Contacts 3-7: the SIL 3 Safety Function is met when the relay is energized, contacts are closed, SIL 3 load is energized.
Contacts 4-8: internally connected, cannot be changed.



Contacts 15-16: Voltage free contact for Line and Load Fault detection.
Can be connected in series with other relay units for common monitoring.
Normally closed when there is not Fault condition.



Contacts 15-16: Open in Fault condition.