



INSTRUCTION MANUAL

10 A SIL 3 Relay Out Module for ND Load
with NE Relay condition (48 Vdc coil voltage)
DIN-Rail & Term. Board, Model D5291S-097



Characteristics

General Description: The single channel Relay Output, D5291S-097 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.

The input channel requires 48Vdc voltage signal to drive the relay coils.

D5291S-097 provides 1 SPDT contact for the following safety function:

SIL 3 Safety Function for Normally De-Energized load (energized in fail safe state) is available at Terminal Blocks 13-15. The driving signal is normally high (48 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 13-14 is also available a service contact (for service load) with opposite (not SIL) function.

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.).

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

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

Input: 48 Vdc nom (42 to 54 Vdc).

Current consumption @ 48 V: 30 mA with relay energized, typical.

Power dissipation: 1.5 W with 48 V input voltage and relay energized, typical.

Isolation (Test Voltage): Input/Output 2.5 KV.

Output: voltage free SPDT relay contact.

Terminals 13-15, open in normally energized condition, closed when relay is de-energized (safe state).

Service load output (not SIL) at terminals 13-14 is normally open when relay is de-energized, closed in energized relay condition

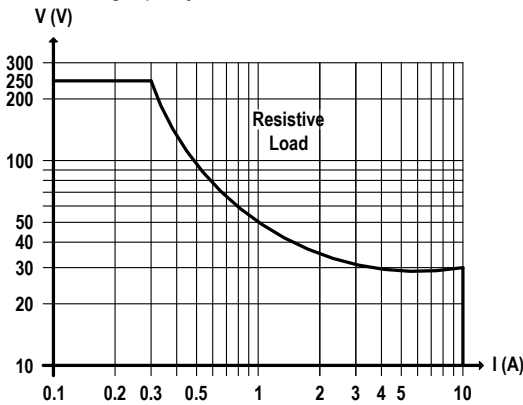
Contact material: Ag Alloy (Cd free) or AgSnO₂.

Contact rating: 10 A 250 Vac 2500 VA, 10 A 250 Vdc 300 W (resistive load).

Contact inrush current: 16 A at 24 Vdc, 250 Vac.

Contact min. switching current: 100 mA.

DC Load breaking capacity:



Mechanical / Electrical life: 10 * 10⁶ / 5 * 10⁴ operation, typical.

Operate / Release time: 15 / 5 ms typical.

Frequency response: 10 Hz maximum.

Compatibility:

CE mark compliant, conforms to Directive:
2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.

Environmental conditions:

Operating: temperature limits - 40 to + 60 °C, relative humidity 95 %, up to 55 °C.

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

Approvals:



TÜV Certificate No. C-IS-272994-01 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.

Mounting:

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

Weight: about 165 g.

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

Location: installation in Safe Area.

Protection class: IP 20.

Dimensions: Width 22.5 mm, Depth 123 mm, Height 120 mm.

Ordering Information

Model: D5291S-097

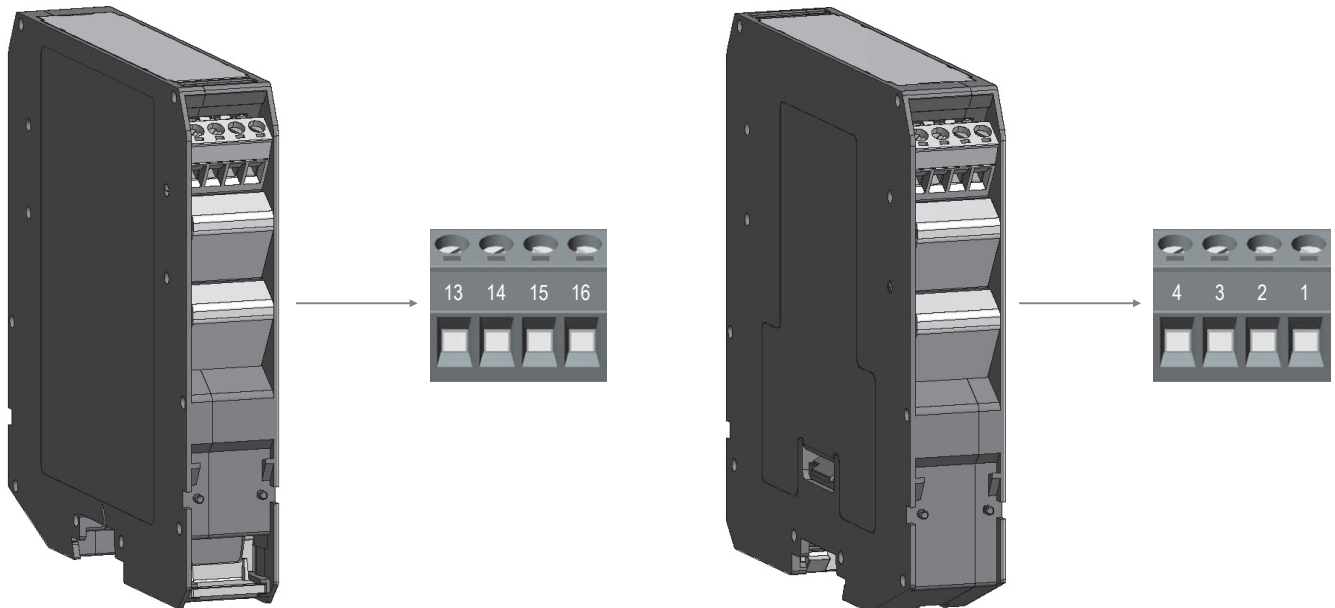
DIN-Rail accessories: Cover and fix MCHP196

Front Panel and Features



- SIL 3 (low demand mode of operation), for ND load with NE relay condition (terminals 13-15), according to IEC 61508:2010 Ed. 2 with Tproof = 14 / 20 yrs ($\leq 10\%$ / $> 10\%$ of total SIF) and PFDavg (1 year) $7.02 \text{ E-}06$, SFF 98.91%.
- SIL 3 (high demand mode of operation), for ND load with NE relay condition (terminals 13-15), according to IEC 61508:2010 Ed. 2 with PFH = $1.60 \text{ E-}09 \text{ h-}1$
- Systematic capability SIL 3.
- Installation in Safe Area.
- 10 A SIL 3 contact for ND load and contact for service purpose.
- 16 A inrush current at 24 Vdc / 250 Vac.
- Input/Output isolation.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- TÜV Certification.
- TÜV Functional Safety Certification.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks or customized Termination Boards.

Terminal block connections

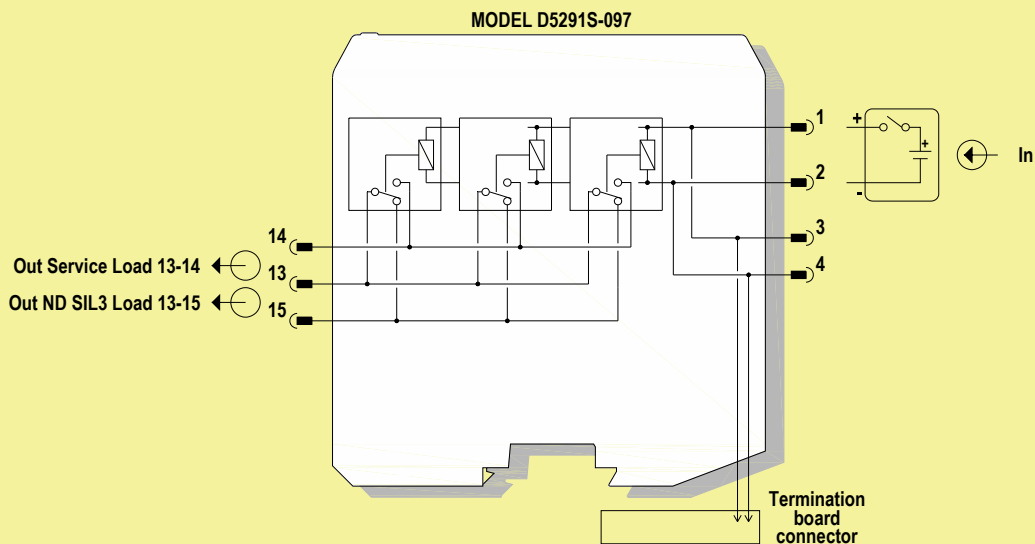


SAFE AREA

13	SPDT Output Common
14	SPDT Output Normally Open Contact
15	SPDT Output Normally Close Contact
16	Not used

1	+ Input
2	- Input
3	+ Input
4	- Input

SAFE AREA



Relay contact shown in de-energized position
Terminal 13-15 is closed, Terminal 13-14 is open.

SIL3 Safety Function for ND load (energized in fail safe state) is available at terminal blocks 13-15;
In this case, the Safety Function is met when the relay is de-energized (closed contact).

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

Warning

D5291S-097 is an electrical apparatus installed into standard EN50022 T35 DIN-Rail located in Safe Area within the specified operating temperature limits Tamb - 40 to +60 °C. D5291S-097 must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards, following the established installation rules.

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.

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

D5291S-097 relay module is suitable for the switching of safety related circuits, providing isolation between the input and output contacts.

D5291S-097 provides 1 SPDT contact for the following safety function:

SIL 3 Safety Function for Normally De-Energized load (energized in fail safe state) is available at Terminal Blocks 13-15. The driving signal is normally high (48 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 13-14 is also available a service contact (for service load) with opposite (not SIL) function.

A "RELAY STATUS" yellow led lights when input is powered, showing that relay is energized.

Installation

D5291S-097 is a relay output module housed in a plastic enclosure suitable for installation on T35 DIN-Rail according to EN50022 or on customized Termination Board.

D5291S-097 unit can be mounted with any orientation over the entire ambient temperature range.

Electrical connection of conductors up to 2.5 mm² 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.

The wiring cables have to be proportionate in base to the current and the length of the cable.

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, as an example (application for a single D5291S-097):

Connect positive input at terminal "1" and negative input at "2" (positive input at terminal "3" and negative input at "4" are provided for daisy chain connection to the next module).

Connect positive or AC load supply line to SPDT Output Common pole (terminal "13").

Connect SIL 3 Normally De-Energized load between negative or AC load supply line and the terminal "14" (when relays are normally de-energized), as previously shown in the Functional Safety applications.

Installation and wiring must be in accordance to the relevant national or international installation standards, make sure that conductors are well isolated from each other and do not produce any unintentional connection.

Connect SPST relay contacts checking the load rating to be within the contact maximum rating (10 A 250 Vac 2500 VA, 10 A 250 Vdc 300 W resistive load).

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

The enclosure provides, according to EN60529, an IP20 minimum degree of mechanical protection (or similar to NEMA Standard 250 type 1) for indoor installation, outdoor installation requires an additional enclosure with higher degree of protection (i.e. IP54 to IP65 or NEMA type 12-13) consistent with the effective operating environment of the specific installation.

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.

Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.

Relay output contact must be connected to load non exceeding category II overvoltage limits.

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.

Start-up

Before powering the inputs of unit check that all wires are properly connected, also verifying their polarity. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Enabling input, the corresponding "RELAY STATUS" yellow led must be lit and load circuit must be according to the connection required.

Indeed, disabling each input, the corresponding "RELAY STATUS" yellow led must be turned off and load circuit must change the status.