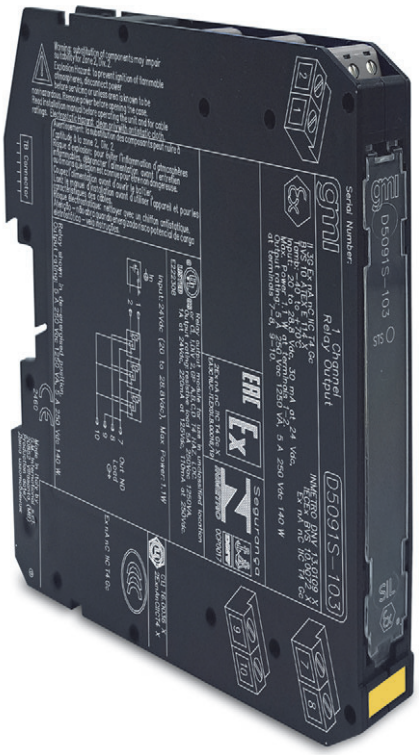


INSTRUCTION MANUAL

SIL3 Relay Out Module for 5 A ND Loads, DIN-Rail and Termination Board, Model D5091S-103

Characteristics

General Description:

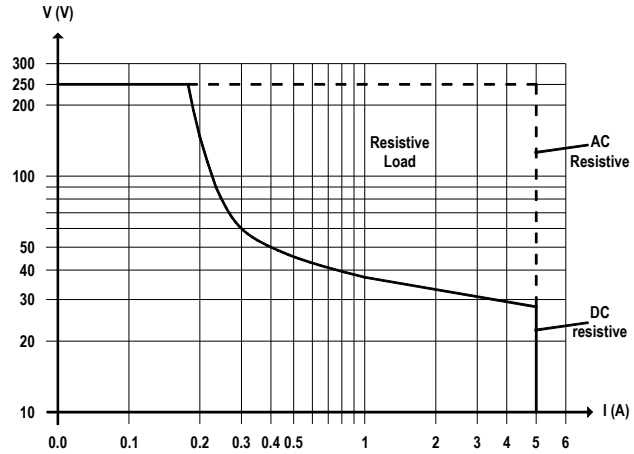
The D5090-103 is a relay module suitable for switching safety related circuits, up to SIL 3 level, for high risk industries. It provides isolation between input and output contacts. It makes available two NO contacts for Normally Energized (NE) loads, in order to disconnect the load on both supply lines, and a NC contact for service purpose. This model is specifically designed to reach high functional safety at minimum power consumption.
Compatibility with specific DO cards with pulse testing needs to be verified.
Mounting on standard DIN-Rail or on customized Termination Boards, in Safe Area / Non Hazardous Location or in Zone 2 / Class I, Division 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.

Technical Data

Isolation (test voltage): In/Outs 2.5 kV.
Input: 24 Vdc nom (20 to 28.8 Vdc), reverse polarity protected. Relay coils are internally protected with suppressor diodes.
Current consumption: 30 mA @ 24 Vdc, typical.
Power dissipation: 0.72 W @ 24 Vdc, typical.
Output: 1 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), gold plated.
Contact rating: 5 A 250 Vac 1250 VA, 5 A 250 Vdc 140 W (resistive load), 1 A 24 Vdc, 220 mA 125 Vdc, 110 mA 250 Vdc for UL.
Contact min. switching current: 1 mA.
Contact inrush current: 6 A @ 24 Vdc, 250 Vac.
DC and AC load breaking capacity:



Mechanical / electrical life: 5 * 10^6 / 3 * 10^4 operation, typical.
Operate / release time: 55 / 30 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: temperature limits -40 to +70 °C.
Operating relative humidity: relative humidity 95 %, up to 55 °C.
Max altitude: 2000 m a.s.l.
Storage temperature: temperature limits -45 to +80 °C.

Safety description:

ATEX: II 3G Ex ec nC IIC T4 Gc
IECEx / INMETRO: Ex ec nC IIC T4 Gc
UL: NI / I / 2 / ABCD / T4
C-UL: NI / I / 2 / ABCD / T4
EAC-EX: 2Ex ec nC IIC T4 Gc X.
CCC: Ex ec nC IIC T4 Gc
non-sparking electrical equipment.
-40 °C ≤ Ta ≤ 70 °C.
Approvals:
BVS 10 ATEX E 114 conforms to EN60079-0, EN60079-7, EN60079-15.
IECEx BVS 10.0072 X conforms to IEC60079-0, IEC60079-7, IEC60079-15.
INMETRO DNV 13.0109 X conforms to ABNT NBR IEC60079-0, ABNT NBR IEC60079-7, ABNT NBR IEC60079-15.
UL & C-UL E222308 conforms to UL 61010-1, UL 121201 for UL and CAN/CSA C22.2 No. 61010-1-12, CSA C22.2 No. 213-17 for C-UL.
EAЭC RU C-IT.AA87.B.01310/24 conforms to GOST 31610.0, GOST 31610.7, GOST 31610.15.
CCC n. 2020322316000978 conforms to GB/T 3836.1, GB/T 3836.3, GB/T 3834.8
TUV 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.

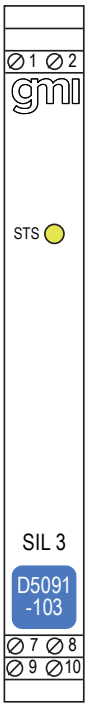
Mounting: EN/IEC60715 TH 35 DIN-Rail or on customized Termination Board.
Weight: about 125 g.
Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm² (13 AWG).
Location: installation in Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4 or Class I, Division 2, Group A,B,C,D, T4.
Protection class: IP 20.
Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

Ordering information

Model: D5091S-103

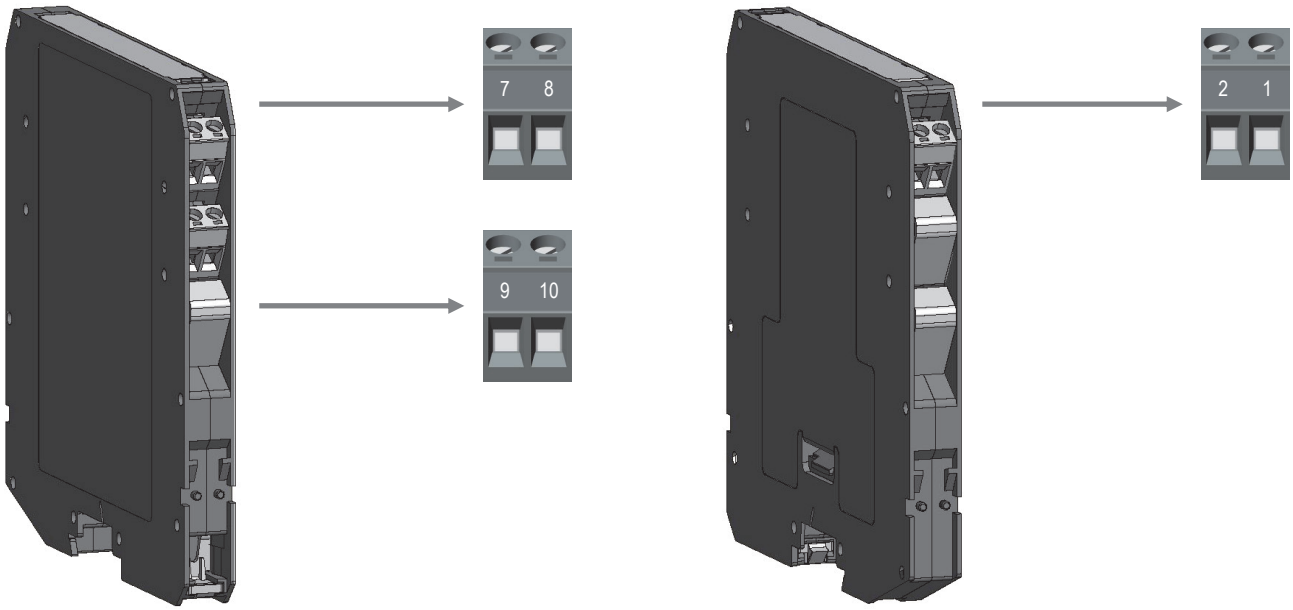
Power Bus and DIN-Rail accessories:
DIN-Rail stopper MCHP196

Front Panel and Features



- SIL 3 (low demand mode of operation) according to IEC 61508:2010 Ed.2 with Tproof = 6/20 years (≤ 10 / >10 % of total SIF) for ND load with ND relay (terminals 7-8).
- SIL 3 (low demand mode of operation) according to IEC 61508:2010 Ed.2 with Tproof = 14/20 years (≤ 10 / >10 % of total SIF) for ND load with NE relay (terminals 9-10).
- SIL 3 (high demand mode of operation) according to IEC 61508:2010.
- SC 3: Systematic Capability SIL 3
- Installation in Zone 2/Div. 2
- Up to 5 A functional / 6 A inrush current
- Low current consumption
- Service contact available
- Input/Output isolation

Terminal block connections



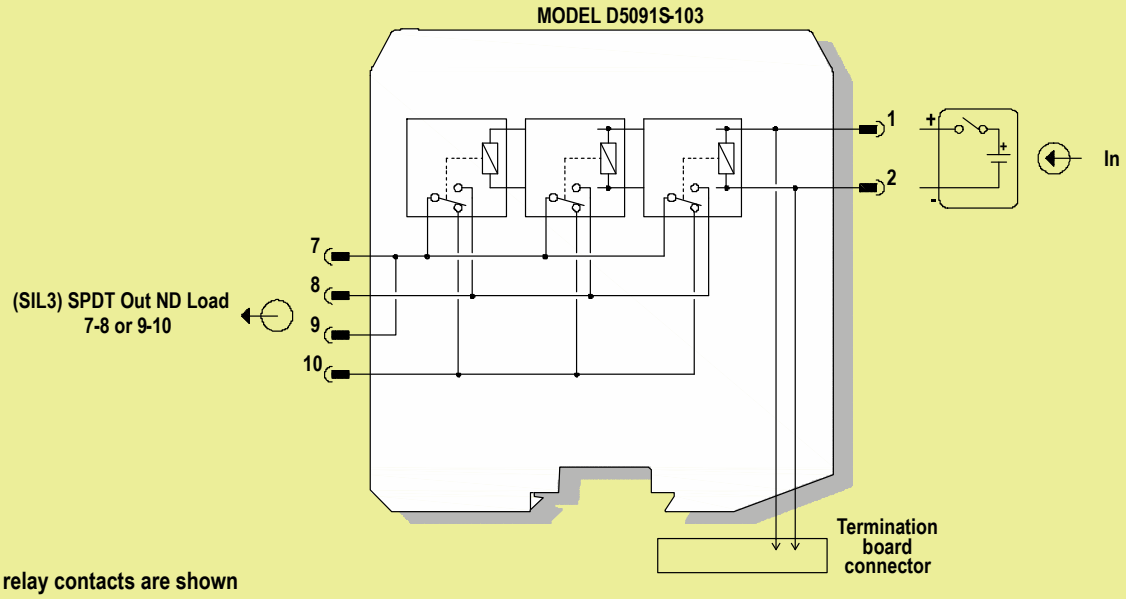
SAFE AREA

7	SPDT Output Common
8	SPDT Output Normally Open Contact
9	SPDT Output Common
10	SPDT Output Normally Close Contact

1	+ Input
2	- Input

Function Diagram

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



All relay contacts are 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.

Warning

D5091-103 series are electrical apparatus installed on EN/IEC60715 TH 35 standard DIN-Rail located in Safe Area/Non Hazardous Locations or Zone 2, Group IIC 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.
D5091-103 series must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)), following the established installation rules. 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 suitability for Zone 2/Division 2. Avertissement: la substitution des composants peut nuire à l'aptitude à la Zone 2/Div. 2. Explosion Hazard: to prevent ignition of flammable atmospheres, disconnect power before servicing or unless area is known to be nonhazardous. Danger d'Explosion: pour éviter l'inflammation d'atmosphères inflammables, débrancher l'alimentation avant l'entretien ou à moins que région est connue pour être non dangereuse.
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. Avertissement: débrancher l'alimentation (couper la tension d'alimentation) et les blocs de jonction enfichables avant d'ouvrir le boîtier pour éviter les chocs électriques lorsqu'ils sont connectés à un potentiel dangereux.
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

D5091-103 series relay module is suitable for the switching of safety related circuits, providing isolation between the input and output contacts.
D5091-103 series 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.

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

Installation

D5091-103 series are relay output module housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail or on customized Termination Board.
D5091-103 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. For USA and Canada installations, 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.
Identify the function and location of each connection terminal using the wiring diagram on the corresponding section, as an example:
Connect positive input at terminal "1" and negative input at "2".
Connect positive or AC load supply line to SPDT Output Common pole (terminal "7" or "9").
Connect SIL 3 Normally De-Energized load between negative or AC load supply line and the terminal "8" (when relays are normally de-energized) or the terminal "10" (when relays are normally energized).
Installation and wiring must be 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.
Connect load relay contacts checking the load rating to be within the contact maximum rating (5 A 250 Vac 1250 VA, 5 A 250 Vdc 140 W resistive load).
To prevent relay contacts from damaging, connect an external protection (fuse or similar), chosen according to the relay breaking capacity diagram from installation instructions.
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, 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 D5091-103 series 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 card modification must be avoided.
All circuits connected to D5091-103 series must comply with the overvoltage category II (or better) according to EN/IEC60664-1.
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.