INSTRUCTION MANUAL

5 A SIL 3 Relay Output Module for NE Load, DIN-Rail and Termination Board, Models D5098S, D5098D

technology for safety

Characteristics

General Description:

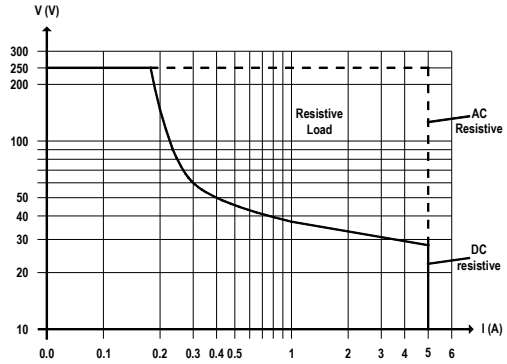
The single and dual channel D5098S and D5098D Relay Output modules are suitable for the switching of safety related circuits, up to SIL 3 level according to IEC 61508:2010 Ed.2, for high risk industries.
They provide isolation between input and output contacts.
D5098S provides one NO contact for normally energized loads and one NC contact for service purposes.
D5098D provides two NO contacts for two normally energized loads and two NC contact for service purposes.
Mounting on standard DIN-Rail or on customized Termination Boards, in Safe Area or in Zone 2.

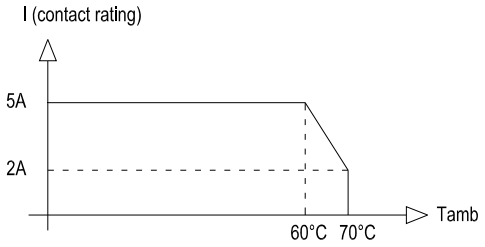
Functional Safety Management Certification:

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.

Technical Data

Input: 24 Vdc nom (21.6 to 27.6 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 45 mA for D5098S, 25 mA/channel D5098D typical (D5098D could be incompatible with PLC/DCS DO cards, requiring a load impedance below 1 kΩ).
Power dissipation @ 24 V: 1.1 W for D5098S, 0.6 W/channel for D5098D typical.
Isolation (Test Voltage): Output/Input 1.5 KV; Input/Input 500 V; Output/Output 1.5 KV
Outputs: 1 voltage free SPDT relay contact identified with outputs: Out 1 (NO contact) terminals 7-8 and Service Load Out 1 (NC contact) terminals 7-11;
1 voltage free SPDT relay contact identified with outputs Out 2 (NO contact) terminals 9-10 and Service Load Out 2 (NC contact) terminals 9-12 (only for D5098D).
Terminals 7-8 (Out 1) and 9-10 (Out 2, only for D5098D) are open when relay is de-energized , closed in energized relay condition.
Service load outputs (not SIL) at terminals 7-11 and 9-12 (only for D5098D) are normally closed 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 (resistive load). Min.switching current 1 mA.
Contact inrush current: 6 A at 24 Vdc, 250 Vac.
DC and AC Load breaking capacity:





Mechanical / Electrical life: 5 * 10^6 / 3 * 10^4 operation, typical.
Operate / Release time: 30 ms / 30 ms typical.
Frequency response: 10 Hz maximum.
Compatibility:
CE mark compliant, conforms to Directives: 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.
Max altitude: 2000 m a.s.l.
Safety Description:
ATEX: II 3G Ex ec nC IIC T4 Gc
IECEx: Ex ec nC IIC T4 Gc
EAC-EX: 2Ex nA nC IIC T4 Gc X
CCC: Ex ec nC IIC T4 Gc
non-sparking electrical equipment. -40 °C ≤ Ta ≤ 70 °C.
Approvals:
IMQ 17 ATEX 009 X conforms to EN60079-0, EN60079-7, EN60079-15.
IECEx IMQ 17.0006X conforms to IEC60079-0, IEC60079-7, IEC60079-15.
EAЭC RU C-IT.EX01.B.00018/19 conforms to GOST 31610.0, GOST 31610.15.
CCC n. 2020322316000978 conforms to GB/T 3836.1, GB/T 3836.3, GB/T 3834.8
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.
DNV Type Approval Certificate No. TAA00001U0 and KR No.MIL20769-EL002 Certificates for maritime applications.
Mounting:
EN/IEC60715 TH 35 DIN-Rail or on customized Termination Board.
Weight: about 150 g D5098D, about 110 g D5098S.
Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm^2.
Location: installation in Safe Area or Zone 2, Group IIC T4
Protection class: IP20.
Dimensions: Width 12.5 mm, Depth 123 mm, Height 120 mm.

Ordering information

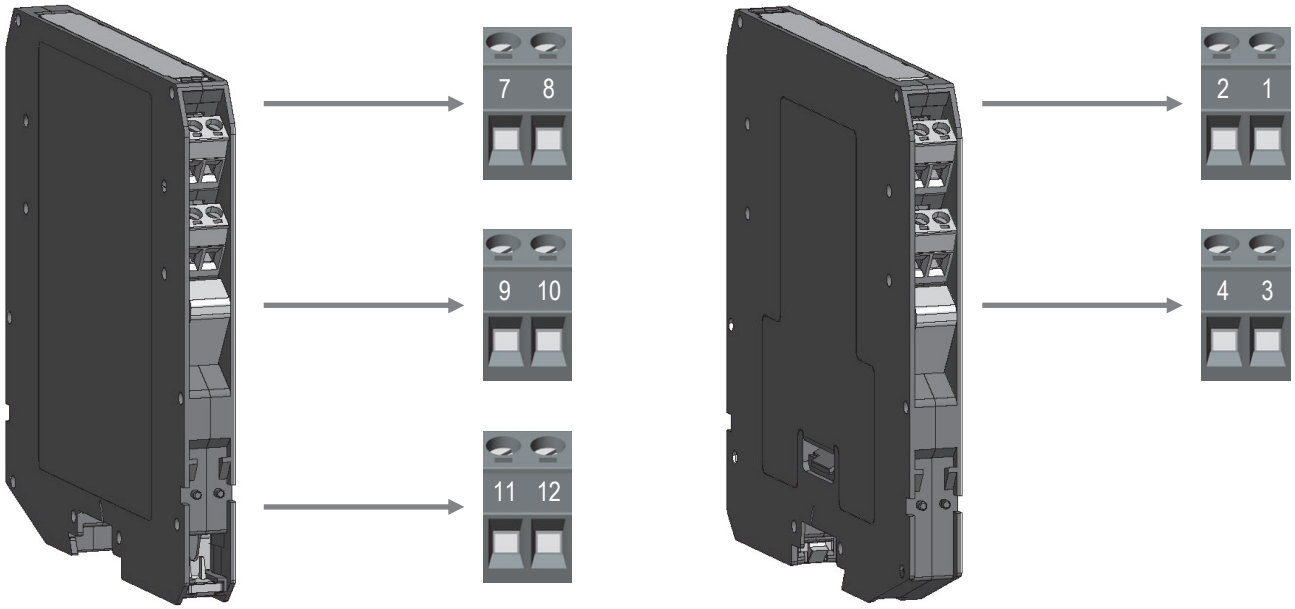
Model:	D5098	
1 channel		S
2 channels		D

DIN-Rail accessories: Cover and fix MCHP196

Front Panel and Features

- SIL 3 (low demand mode of operation) for NE Load according to IEC 61508:2010 Ed.2, with Tproof = 14 / 20 yrs (10 / 20 % of total SIF) and PFDavg (1 year) = 7.02 E-06, SFF = 98.71 %.
- SIL 3 (high demand mode of operation) for NE Load according to IEC 61508:2010 Ed.2, with PFH = 1.60 E-09 h^{-1}.
- Systematic capability SIL 3.
- Installation in Zone 2.
- Compatible with DCS/PLC pulse testing.
- SIL 3 contact for NE Load and contact for service purposes.
- 6 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.
- ATEX, IECEx, EAC-EX, CCC, 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.

Terminal block connections



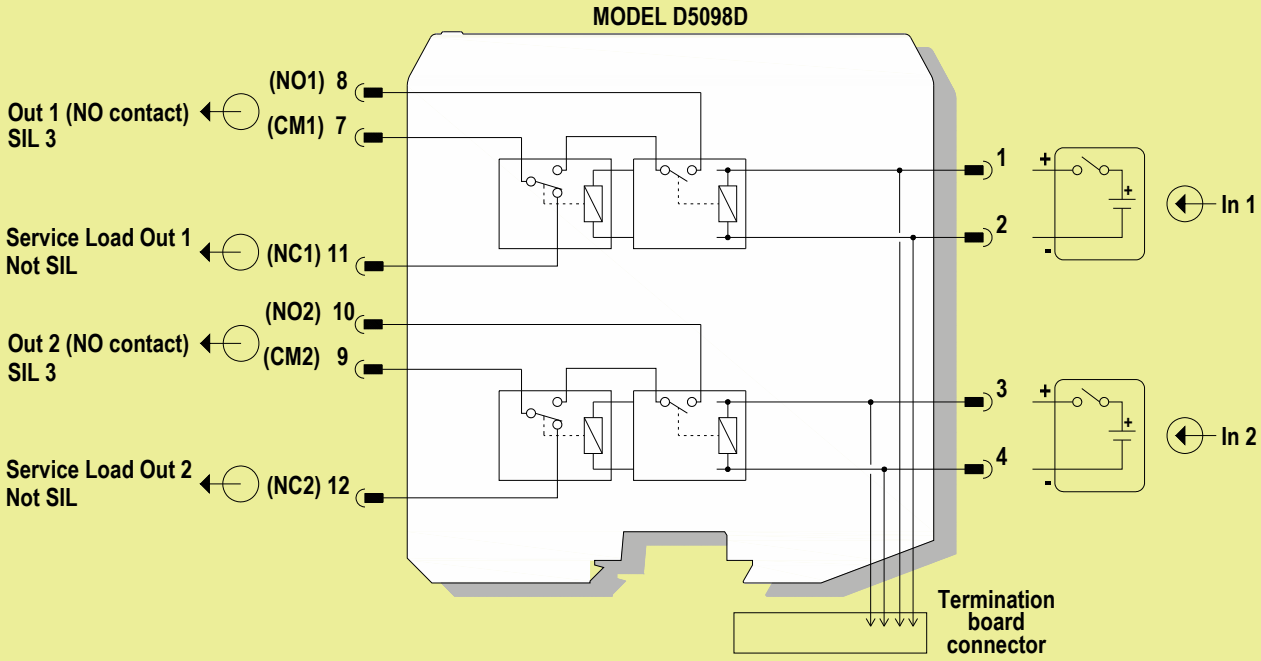
SAFE AREA

7	(CM1) 1st pole of Out 1 (NO contact) for NE Load or (NC contact) for Service	**1**	+ Input
8	(NO1) 2nd pole of Out 1 (NO contact) for NE Load	**2**	- Input
9	(CM2) 1st pole of Out 2 (NO contact) for NE Load or (NC contact) for Service	**3**	+ Input (only for D5098D)
10	(NO2) 2nd pole of Out 2 (NO contact) for NE Load	**4**	- Input (only for D5098D)
11	(NC1) 2nd pole of Out 1 (NC contact) for Service load	**5**	Not used
12	(NC2) 2nd pole of Out 2 (NC contact) for Service load	**6**	Not used

Function Diagram

SAFE AREA, ZONE 2 GROUP IIC T4

2 Inputs, 2 Loads



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

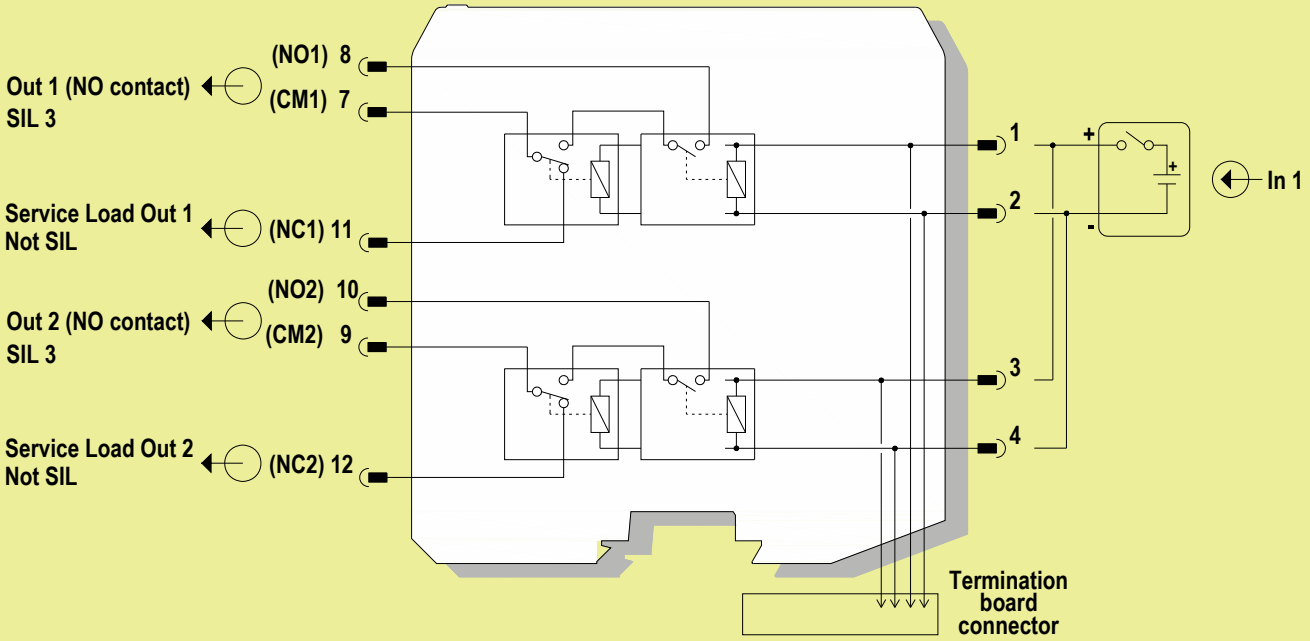
To prevent relay contacts from damaging, connect an external protection (fuse or similar), chosen according to the relay breaking capacity diagram.

Function Diagram

SAFE AREA, ZONE 2 GROUP IIC T4

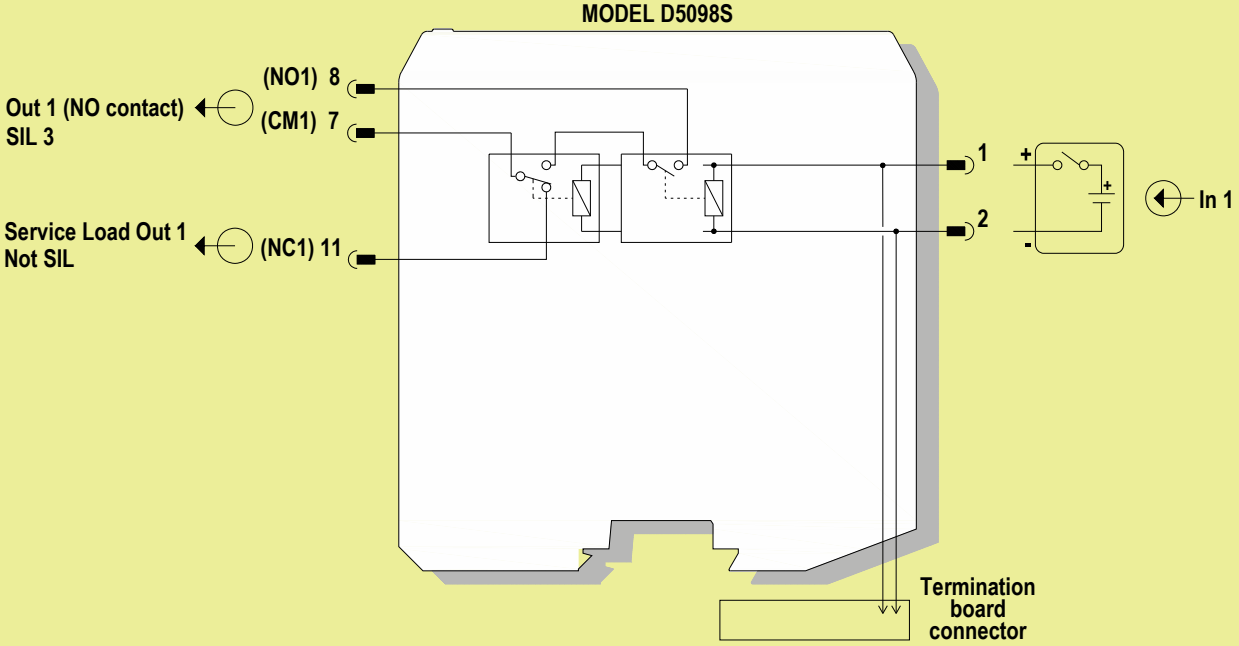
1 Input, 2 Loads

MODEL D5098D



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

MODEL D5098S



Relay contacts shown in de-energized position.
Terminals 7-8 are open; terminals 7-11 are closed.

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

Warning

D5098 series are electrical apparatus installed into standard EN50022 T35 DIN-Rail located in Safe Area or Zone 2, Group IIC, Temperature Classification T4, Hazardous Area within the specified operating temperature limits Tamb - 40 to +70 °C. D5098 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. 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**. **Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.**
Provision shall be assured, external to the equipment by the installation location, to provide a transient protection to not exceeding 120V or 140% of the peak rated voltage (whichever is the greater) at the power supply terminals. 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

The single and dual channel D5098S and D5098D Relay Output modules are suitable for the switching of safety related circuits, up to SIL 3 level according to IEC 61508:2010 Ed.2, for high risk industries. They provide isolation between input and output contacts. D5098S provides one NO contact for normally energized loads and one NC contact for service purposes. D5098D provides two NO contacts for two normally energized loads and two NC contact for service purposes. When driving signals (terminals 1-2 for Channel 1 and 3-4 for Channel 2, only for D5098D) are low (0 Vdc), the relays are de-energized, contacts at terminals 7-8 (for Channel 1) and 9-10 (for Channel 2) are open and loads are de-energized. When driving signals are high (24 Vdc), the relays are energized, contacts at terminals 7-8 and 9-10 are closed and loads are energized. For each channel, presence of status of input / output channel (energized or de-energized) is displayed by yellow LED.

Installation

D5098 series are relay output modules housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail or on customized Termination Board.
D5098 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. 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:
Connect positive input at terminal “1” and negative input at “2” for Channel 1.
Connect positive input at terminal “3” and negative input at “4” for Channel 2 (only for D5098D).
For channel 1 output, connect positive or AC load supply line to contact common pole at terminal “7”.
Always for channel 1 output, connect SIL 3 NE load between negative or AC load supply line and the contact pole at terminal “8”.
In addition, if it’s necessary, connect service load (Not SIL) between negative or AC load supply line and the contact pole at terminal “11”.
For channel 2 output, connect positive or AC load supply line to contact common pole at terminal “9”.
Always for channel 1 output, connect SIL 3 NE load between negative or AC load supply line and the contact pole at terminal “10”.
In addition, if it’s necessary, connect service load (Not SIL) between negative or AC load supply line and the contact pole at terminal “12”.

Installation and wiring must be in accordance to the relevant national or international installation standards (e.g. IEC/EN60079-14 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.
For each contact, 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. 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 D5098 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 D5098 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 unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Enabling each input, the related channel status yellow led must be lit and related load circuit must be energized because relay output contacts are closed. Instead, disabling each input, the related channel status yellow led must be turned off and related load circuit must be de-energized because relay output contacts are open.