



INSTRUCTION MANUAL

5 A SIL 3 NC contact Relay Output Module
for NE or F&G/ND Load,
with full diagnostic and Modbus, DIN-Rail,
Power Bus and Termination Board, Model D5295S



Characteristics

General Description: The D5295S 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. A wide compatibility towards different DCS/PLC is guaranteed: driving line pulse testing, executed by DCS/PLC, is permitted by a dedicated internal circuit, to prevent relay and LED flickering. Internal relay coil short circuit is detected by the module. D5295S has 2+2 SPST relay contacts connected in parallel and then in series to avoid spurious trip and to increase availability (see function diagram). High availability SIL 3 Safety Function for NE load or F&G / ND load is available at Terminal Blocks 13-14. When the driving signal is high (24 Vdc), the relay is energized, contacts at terminals 13-15 and 14-16 are open and load is de-energized. When the driving signal is low (0 Vdc), the relay is de-energized, contacts at terminals 13-15 and 14-16 are closed, the load is energized. Load is isolated from supply on both polarities: +/AC, -/AC.

Load and Line Diagnostic: Line and load short/open circuit detection is provided, with solenoid resistance measurement, even in presence of series connected diodes. A patented proprietary resistance measuring technique performs the load short and open circuit diagnosis in de-energized load status, for DC or AC supply systems. Load RMS voltage (before and after its energization) and current are measured by the module. Load voltage, current and resistance can automatically be acquired from field. User configurable limits set the minimum and maximum values of load resistance, supply voltage (DC or AC) and load current. Earth leakage detection on both AC phases is available in de-energized load condition. The fault in the field is directly mirrored to the PLC DO: few systems may exceptionally require an external resistor at terminals 7 and 8. All diagnostic conditions, that detect a fault on line and load, open the fault relay contacts and are also available from a RS485 Modbus output to identify any specific fault. Diagnostic functions with fault relay NO contacts are SIL 2 rated according to IEC 61508:2010 Ed.2 (Route 2H). Mounting on standard DIN-Rail, with or without Power Bus, or on customized Termination Boards, in Safe Area / Non Hazardous Location or in Zone 2 / Class I, Division 2 or Class I, 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

Supply: 24 Vdc nom (21.6 to 27.6 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp, 2 A time lag fuse internally protected.

Current consumption @ 24 V: 45 mA typical, with channel energized and no fault.

Power dissipation: 1.1 W typical.

Isolation (Test Voltage): Output/Input 2.5 KV; Output/Supply 2.5 KV;
Output/Fault Outputs 2.5 KV; Output/RS485 Modbus 2.5 KV;
Input/Supply 500 V; Input/Fault Output 1 500 V; Input/Fault Output 2 2.5 KV;
Input/RS485 Modbus 500 V; Supply/Fault Output 1 500 V;
Supply/Fault Output 2 2.5 KV; Supply/RS485 Modbus 500 V.

Input: 24 Vdc nom (21.6 to 27.6 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.

Current consumption @ 24 V: 40 mA (with mirror and no fault).

Power dissipation @ 24 V: 1 W (with mirror and no fault).

Output: voltage free 2+2 SPST relay contact (2 paralleled contacts in series) at terminals 13-15 and 14-16, open when relay energized, close in de-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). Min. switching current 1 mA.

Contact inrush current: 6 A at 24 Vdc, 250 Vac.

Mechanical / Electrical life: $5 \times 10^6 / 3 \times 10^4$ operation, typical.

Operate / Release time: 8 / 4 ms typical.

Bounce time NO / NC contact: 3 / 8 ms, typical.

Frequency response: 10 Hz maximum.

Fault detection: load and line short/open circuit monitoring

Short output detection: programmable load resistance (5 Ω to 49 K Ω typical).

Open output detection: programmable load resistance (5 Ω to 49 K Ω typical).

Fault signalling: voltage free NE 1 + 1 SPST relay contacts (closed in normal status), output de-energized (contacts opened) in fault condition. Fault contact can be reversed via software.

Fault 1 output rating: 500 mA 30 Vac 15 VA, 500 mA 50 Vdc 25 W (resistive load).

Fault 2 output rating: 3 A 250 Vac 750 VA, 3 A 125 Vdc 120 W (resistive load).

Response time: 3/4 sec typical.

Modbus Output: measure data, load and line diagnostic monitoring. Modbus RTU protocol up to 115.2 Kbit/s with RS-485 connection on terminal blocks and Power Bus connector.

Terminating impedance: 100 Ω software selectable.

Transmission speed: 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 Kbit/s.

Transmission cable length: ≤ 1200 m up to 93.75 Kbit/s, ≤ 1000 m up to 115.2 Kbit/s.

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 - 40 to + 70 $^{\circ}$ C, relative humidity 95 %, up to 55 $^{\circ}$ C.

Storage: temperature limits - 45 to + 80 $^{\circ}$ C.

Safety Description:



ATEX: II 3G Ex nA nC IIC T4 Gc.

IECEX: Ex nA nC IIC T4 Gc

FM: NI / I / 2 / ABCD / T4

FMC: NI / I / 2 / ABCD / T4

EAC-EX: 2ExnAnCIICT4 X.

UKR TR n. 898: 2ExnAnCIICT4 X.

non-sparking electrical equipment. -40 $^{\circ}$ C \leq Ta \leq 70 $^{\circ}$ C.

Approvals:

BVS 10 ATEX E 114 conforms to EN60079-0, EN60079-15.

IECEX BVS 10.0072 X conforms to IEC60079-0, IEC60079-15.

UL & C-UL E477485 conforms to ANSI/UL508

FM and FMC conforms to Class 3600, 3611, 3810, ANSI/ISA-60079-0, ANSI/ISA-60079-15, C22.2 No.142, C22.2 No.213, C22.2 No. 60079-0, C22.2 No. 60079-15 (pending).

Conforms to GOST 30852.0, 30852.14 (pending).

CUL 16.0036 X conforms to DCTV 7113, DCTV IEC 60079-15.

TUV Certificate No. C-IS-236198-04, SIL 3 conforms to IEC61508:2010 Ed.2.

TUV Certificate No. C-IS-722160171, SIL 2 conforms to IEC61508:2010 Ed.2 (Route 2H) for Line and Load Diagnostic Functionalities with fault relay NO contacts.

TUV Certificate No. C-IS-236198-09, SIL 3 Functional Safety Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

Patent No. 0001406495, released on 28/02/2014, valid for 20 years.

Mounting: EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board.

Weight: about 235 g.

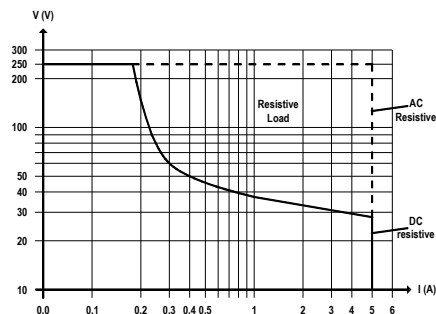
Connection: by polarized plug-in disconnect screw terminal blocks to accommodate terminations up to 2.5 mm².

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 or Class I, Zone 2, Group IIC, T4.

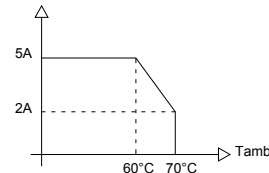
Protection class: IP 20.

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

DC Load breaking capacity:



I (contact rating)



Programming

The module is fully programmable to set the operation parameters from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software. Measured values and diagnostic alarms can be read on both serial configuration or Modbus output line.

Available diagnostic functions:

| Load status | Load voltage | Load open circuit | Load short circuit | Load to earth leakage | Internal coil short |
|-------------|--------------|-------------------|--------------------|-----------------------|---------------------|
| OFF | PF | PF | PF | PF | F |
| ON | PF | PF | PF | PF | |

F = available function

PF = available function with programmable thresholds

Ordering information

Model: D5295S

Power Bus and DIN-Rail accessories:

Connector JDFT050

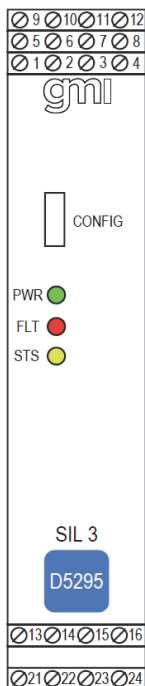
Terminal block male MOR017

Cover and fix MCHP196

Terminal block female MOR022

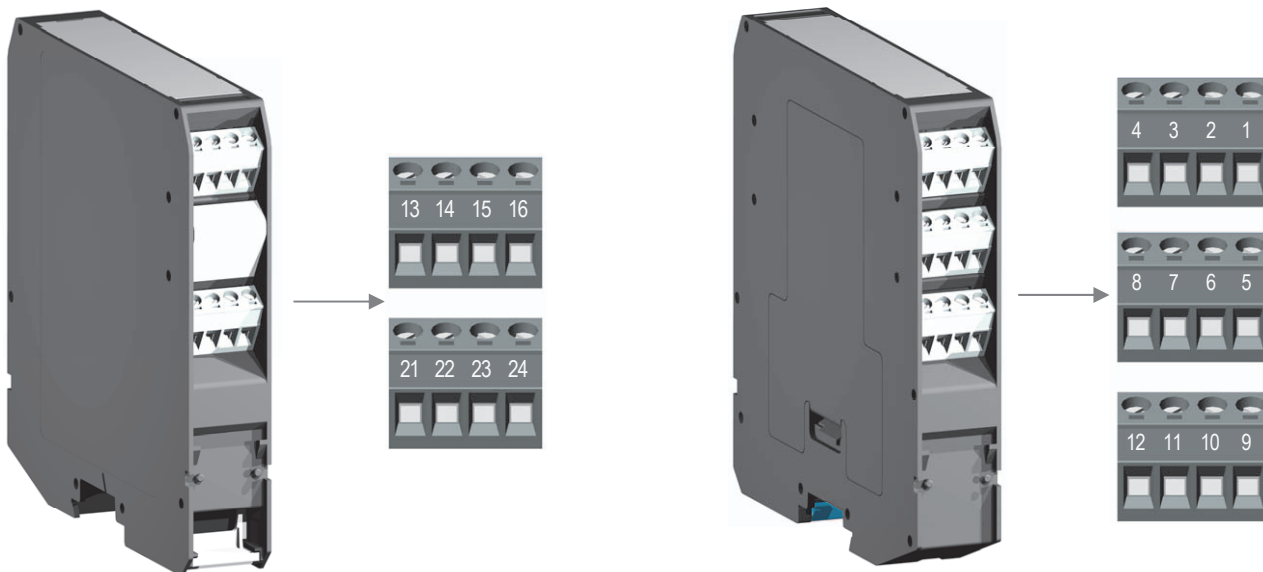
Operating parameters are programmable from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software.

Front Panel and Features



- SIL 3 according to IEC 61508:2010 Ed. 2 with Tproof = 7 / 20 yrs ($\leq 10\%$ / $> 10\%$ of total SIF) for NE Load, PFDavg (1 year) 1.391 E-05, SFF 97.81% .
- SIL 3 according to IEC 61508:2010 Ed. 2 with Tproof = 11 / 20 yrs ($\leq 10\%$ / $> 10\%$ of total SIF) for F&G/ND Load, PFDavg (1 year) 8.47 E-06, SFF 99.20% .
- SIL 2 according to IEC 61508:2010 Ed. 2 (Route 2H) with Tproof = 4 / 8 years ($\leq 10\%$ / $> 10\%$ of total SIF), PFDavg(1year) 2.24E-04, DC 76.09%, SFF 86.49% for diagnostic with fault relay NO contact.
- SC 3: Systematic Capability SIL 3.
- Installation in Zone 2 / Division 2.
- Compatible with DCS/PLC pulse testing.
- Internal relay coil short circuit detection.
- Line and Load short/open circuit detection.
- The fault in the field is directly mirrored to the PLC DO.
- Solenoid resistance measurement even in presence of serial connected diodes (patented resistance measuring technique).
- RMS voltage (before and after load energization) and load current measurement .
- Automatic acquisition of voltage, current and load resistance values.
- Earth leakage detection on both ac phases in de-energized load condition.
- 5 A high availability SIL 3 contacts for NE or F&G/ND load.
- 6 A inrush current at 24 Vdc / 250 Vac.
- Input/Output/Supply isolation.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- ATEX, IECEx, UL & C-UL, UKR TR n. 898, TÜV Certifications.
- FM, FMC, EAC-EX Certifications (pending).
- TÜV Functional Safety Certification.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks, with or without Power Bus, or customized Termination Boards.

Terminal block connections



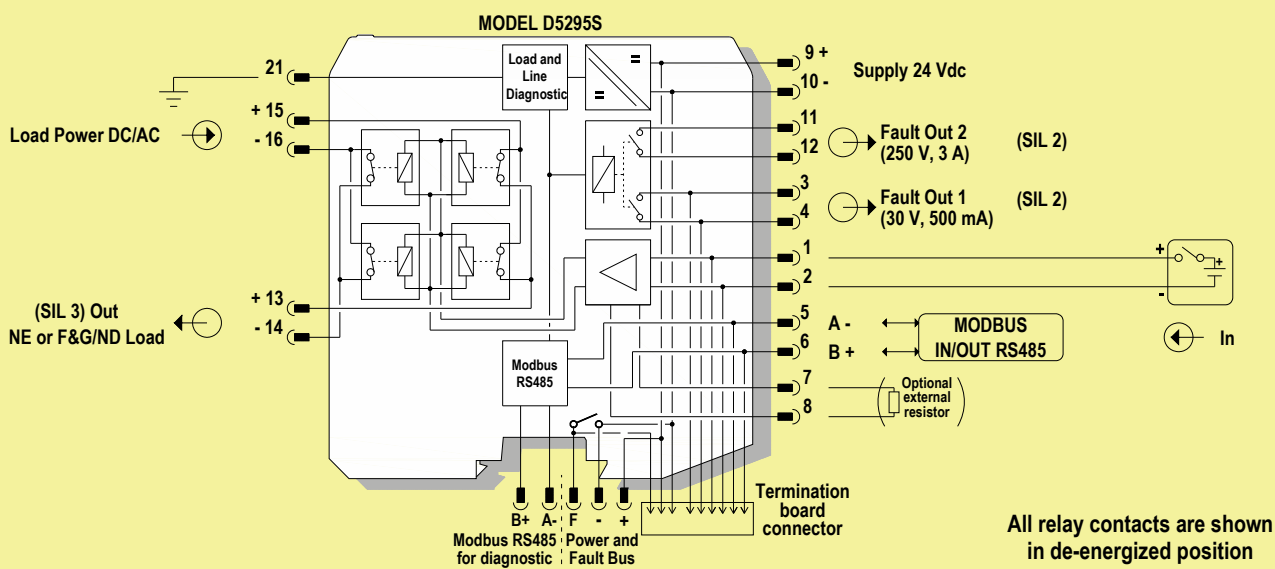
SAFE AREA

| | |
|-----------|---|
| 13 | (SIL 3) + Output NE Load or F&G/ND Load |
| 14 | (SIL 3) - Output NE Load or F&G/ND Load |
| 15 | + Load Power DC/AC |
| 16 | - Load Power DC/AC |
| 21 | Earth |
| 22 | Not used |
| 23 | Not used |
| 24 | Not used |

| | |
|-----------|---------------------------------------|
| 1 | + Input |
| 2 | - Input |
| 3 | (SIL 2) Fault Output 1 (30 V, 500 mA) |
| 4 | (SIL 2) Fault Output 1 (30 V, 500 mA) |
| 5 | A- Modbus Input/Output RS485 |
| 6 | B+ Modbus Input/Output RS485 |
| 7 | (Optional external resistor) |
| 8 | (Optional external resistor) |
| 9 | + Power Supply 24 Vdc |
| 10 | - Power Supply 24 Vdc |
| 11 | (SIL 2) Fault Output 2 (250 V, 3 A) |
| 12 | (SIL 2) Fault Output 2 (250 V, 3 A) |

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



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

Warning

D5295S is an electrical apparatus installed into EN/IEC60715 TH 35 DIN-Rail located in Safe Area or Zone 2, Group IIC, Temperature Classification T4, Hazardous Area (according to EN/IEC60079-15) within the specified operating temperature limits Tamb - 40 to +70 °C. D5295S 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 onhazardous.** 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 channel 5 A Relay Output D5295S 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. D5295S has 2+2 SPST relay contacts connected in parallel and then in series to avoid spurious trip and to increase availability (see function diagram). High availability SIL 3 Safety Function for NE load or F&G/ND load is available at Terminal Blocks 13-14. When the driving signal is high (24 Vdc), the relay is energized, contacts at terminals 13-15 and 14-16 are open and load is de-energized. When the driving signal is low (0 Vdc), the relay is de-energized, contacts at terminals 13-15 and 14-16 are closed and the load is energized. Presence of diagnostic circuit power supply, status of input / output channel (energized or de-energized), as well as any type of fault condition (line and load short/open circuit, relay coil short circuit, etc.) are displayed by related signalling LEDs: green power supply, yellow for status channel and red for fault.

Installation

D5295S is a relay output module housed in a plastic enclosure suitable for installation on EN/IEC60715 TH 35 DIN-Rail, with or without Power Bus or on customized Termination Board. D5295S 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 (**for Zone 2 installations check the area to be nonhazardous before servicing**). 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 24 Vdc power supply positive at terminal "9" and negative at terminal "10".

Connect positive input at terminal "1" and negative input at "2".

Connect Fault output 1 (30 V, 500mA) at terminals "3" and "4" and Fault output 2 (250 V, 3A) at terminals "11" and "12".

Connect A- Modbus RS845 for diagnostic at terminal "5" and B+ at terminal "6".

Connect positive output NE or F&G/ND load at terminal "13" and negative at terminal "14".

Connect positive Load Power DC/AC at terminal "15" and negative at terminal "16".

Connect ground at terminal "21".

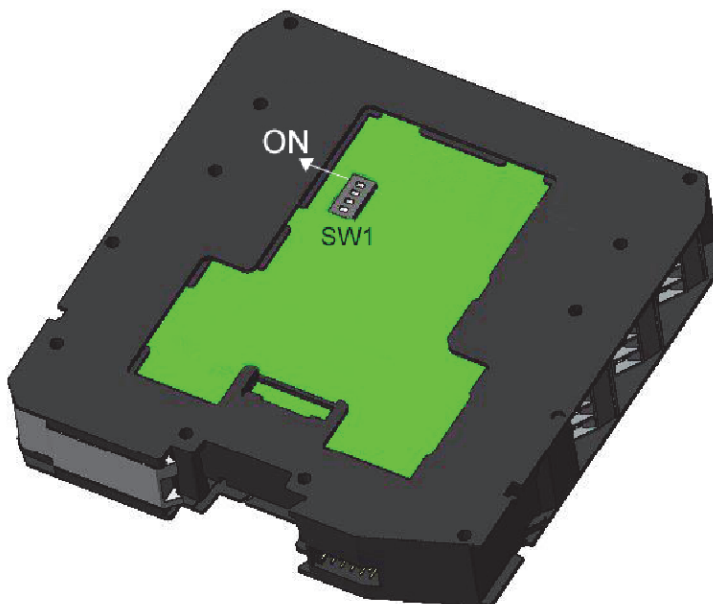
Installation and wiring must be in accordance to the relevant national or international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres Part 14: Electrical installations in hazardous areas (other than mines)), make sure that conductors are well isolated from each other and do not produce any unintentional connection. Connect 2+2 SPST 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 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. **Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of D5295S 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. According to EN61010, D5295 must be connected to SELV or SELV-E supplies. 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

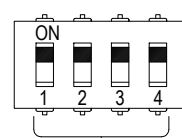
Before powering the unit check that all wires are properly connected, particularly supply conductors and their polarity, input and output wires. Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts. Turn on power for diagnostic circuit, the "power on" green led must be lit. Enabling input, the channel status yellow led must be lit and load circuit must be de-energized because 2+2 SPST relay output contacts are open. Instead, disabling input, the channel status yellow led must be turned off and load circuit must be energized because 2+2 SPST relay output contacts are closed.

Configuration during T-proof testing for functional safety relay and diagnostic applications

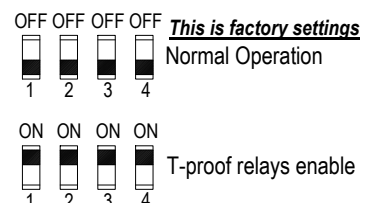
For configuration of T-proof relays and diagnostic circuits testing, some DIP Switches are located on component side of pcb. These switches allow the T-proof relays and diagnostic circuits test (SW1 dip-switch: 1-2-3-4 set "ON" and see "Testing procedure at T-proof for functional safety relay and diagnostic applications" on ISM0442 Safety Manual).



SW1 Dip switch configuration



T-proof relays (dip1 = relay1;
dip2 = relay2; dip3 = relay3;
dip4 = relay4)



WARNING: after T-proof test, dip-switch 1-2-3-4 must be set to "OFF" position for normal operation.

PPC5092 Adapter - Operation

The Pocket Portable Adapter type PPC5092 is suitable to connect the module D5295S to a PC via USB serial line, in order to configure and to monitor the operation parameters by means of SWC5090 software. The PPC5092 unit is connected to D5295S by mini USB and to PC by USB port. This adapter is not ATEX, UL or FM approved and is only to be used in Safe Area/Non Hazardous Locations. Do not use PPC5092 in Hazardous Area/Hazardous Locations. The PPC5092 adapter is powered by the PC (no battery power) when its USB port is plugged into the PC. It has a green LED as power-on indication.

SWC5090 Configuration & Monitoring Software

Configuration parameters:

USER MANUAL SETTINGS: Allowed ranges of the field parameters.

Load Supply Voltage RMS

- Voltage Upper Limit (V): Maximum allowed load RMS voltage
- Voltage Lower Limit (V): Minimum allowed load RMS voltage

Load Current RMS

- Current Upper Limit (A): Maximum allowed load RMS current
- Current Lower Limit (A): Minimum allowed load RMS current

Load OFF Resistance

- Resistance Upper Limit (Ω): Maximum allowed load OFF resistance
- Resistance Lower Limit (Ω): Minimum allowed load OFF resistance

Isolation Resistance

- Resistance Lower Limit (k Ω): Minimum allowed load-to-earth isolation resistance

FAULT CONDITIONS MONITORING (Command Status [ON]): Faults contributing to the output cumulative fault when the driver is on.

- Load Supply Voltage: When checked, the load supply voltage can activate the cumulative fault.
- Coil Integrity: When checked, the short circuit of any coil can activate the cumulative fault.
- Load OFF Resistance: When checked, the load OFF resistance can activate the cumulative fault.
- Isolation Resistance: When checked, the load-to-earth isolation resistance can activate the cumulative fault.

FAULT CONDITIONS MONITORING (Command Status [OFF]): Faults contributing to the output cumulative fault when the driver is off.

- Load Supply Voltage: When checked, the load supply voltage can activate the cumulative fault.
- Load Current: When checked, the load current can activate the cumulative fault.

TAG: Identification of the specific operating loop of the module.

ACQUIRE FUNCTIONS: Acquisition and saving of the diagnostics field parameters.

- Acquire OFF parameters: The currently measured OFF parameters are copied to the USER MANUAL SETTINGS (available only when the driver is OFF).
- Acquire ON parameters: The currently measured ON parameters are copied to the USER MANUAL SETTINGS (available only when the driver is ON).

CONTINUOUS SCAN: Continuous measurement of the field parameters.

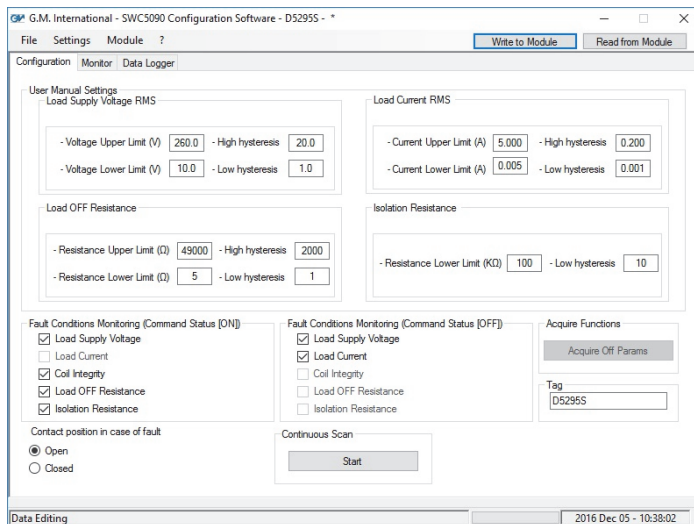
- Start/Stop: Activates/de-activates the measurement of the field parameters.

INVERT FAULT RELAY: When not checked, the output fault contacts open in case of fault. When checked, the output fault contacts close in case of fault.

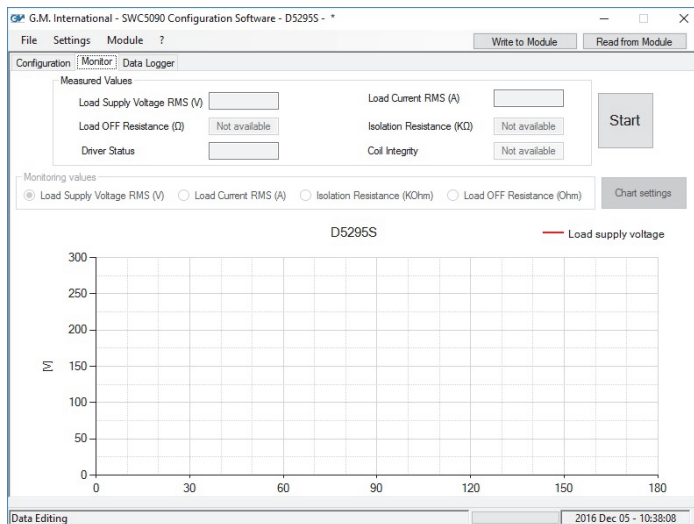
For SIL application, this field must NOT be checked.

Note: For advanced options and details on SWC5090, please refer to ISM0154.

Screenshots:



Configuration



Monitor

Supported ModBus Parameters

D5295S communicates via Modbus RTU-485 protocol. Below are all available registers.

| Param. Address | Description | Notes | Type ⁽¹²⁾ |
|----------------|--|---------------------|----------------------|
| 0 | G.M. Factory Code | Identification Data | R |
| 1 | Instrument Code | | |
| 2 | Option Code | | |
| 3 | Hardware Release | | |
| 4 | Software Release | | |
| 16 | Modbus Address | Communication Data | R/W |
| 17 | Modbus Baudrate ⁽¹⁾ | | |
| 18 | Modbus Format ⁽¹⁾ | | |
| 64 | Measured Load Voltage ⁽²⁾ | Input Data | R |
| 65 | Measured Load Current ⁽³⁾ | | |
| 66 | Measured Load Resistance (Low 16 bits) ⁽⁴⁾ | | |
| 67 | Measured Load Resistance (High 16 bits) | | |
| 68 | Measured Isolation Resistance ⁽⁵⁾ | | |
| 69 | Driver Status ⁽⁶⁾ | | |
| 70 | Coil Integrity ⁽⁷⁾ | | |
| 72 | Masked Fault Status ⁽¹⁾ | | |
| 101 | Load Voltage Upper Limit ⁽²⁾ | | |
| 102 | Load Voltage Lower Limit ⁽²⁾ | | |
| 103 | Load Current Upper Limit ⁽³⁾ | Input Configuration | R/W |
| 104 | Load Current Lower Limit ⁽³⁾ | | |
| 105 | Load Resistance Upper Limit (Low 16 bits) ⁽⁴⁾ | | |
| 106 | Load Resistance Upper Limit (High 16 bits) | | |
| 107 | Load Resistance Lower Limit (Low 16 bits) ⁽⁴⁾ | | |
| 108 | Load Resistance Lower Limit (High 16 bits) | | |
| 109 | Isolation Resistance Lower Limit ⁽⁵⁾ | | |
| 112 | Fault Mirror Configuration ⁽⁸⁾ | | |
| 113 | Invert Fault Relay ⁽⁹⁾ | | |
| 114 | Load Voltage Upper Hysteresis ⁽²⁾ | | |
| 115 | Load Voltage Lower Hysteresis ⁽²⁾ | | |
| 116 | Load Current Upper Hysteresis ⁽³⁾ | | |
| 117 | Load Current Lower Hysteresis ⁽³⁾ | | |
| 118 | Load Resistance Upper Hysteresis ⁽⁴⁾ | | |
| 119 | Load Resistance Lower Hysteresis ⁽⁴⁾ | | |
| 120 | Isolation Resistance Hysteresis ⁽⁵⁾ | | |
| 224 | Fault Mask (Driver ON) | Fault Conditions | R/W |
| 225 | Fault Mask (Driver OFF) | | |
| 464 | Command execution ⁽¹⁰⁾ | Command | W |
| 548 to 555 | Tag ⁽¹¹⁾ | Tags | R/W |

Parameters Details:

| Address 17: Supported ModBus Baudrates | |
|--|----------|
| Index | Baudrate |
| 0 | 4800 |
| 1 | 9600 |
| 2 | 19200 |
| 3 | 38400 |
| 4 | 57600 |
| 5 | 115200 |

| Address 18: Supported ModBus Formats | |
|---------------------------------------|----------|
| High Byte | Low Byte |
| Bit position | |
| 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | |

Endianness 32 bit Data (0 = Little; 1 = Big)
Termination resistance (1 = enabled)

Supported Modbus Parity:
0 8 data bit, no parity, 1 stop bit
1 8 data bit, even parity, 1 stop bit
2 8 data bit, odd parity, 1 stop bit

| Address 72: Fault status | |
|---------------------------------------|----------|
| High Byte | Low Byte |
| Bit position | |
| 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | |

Coil Integrity
Isolation Resistance
Load Resistance
Load Current
Load Voltage

0= Ok
1= Fault

| Addresses 224-225: Fault conditions | |
|---------------------------------------|----------|
| High Byte | Low Byte |
| Bit position | |
| 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | |

Coil Integrity
Isolation Resistance
Load Resistance
Load Current
Load Voltage

0= Ok
1= Fault

| Address 464: Commands | |
|---------------------------------------|----------|
| High Byte | Low Byte |
| Bit position | |
| 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | |

1 Save Input/Output Configuration
2 Save Modbus Configuration
8 Save Tags

Configuration Parameters:

Each Modbus parameter is described by one 16-bit word.

- (1) See command details on the right.
- (2) Expressed in 100 mV
- (3) Expressed in mA
- (4) Expressed in Ω
- (5) Expressed in k Ω
- (6) 0= OFF; 1= ON
- (7) 0= Fault; 1= Ok
- (8) 0= Fault mirror; 1= Always OFF; 2= Always ON
- (9) 0= no inversion (open: fault, for SIL application); 1= inverted (open: ok)
- (10) All configurations must be confirmed via Addr. 464, see details on the right.
- (11) Tags are composed of 16 characters.

Each address contains 2 chars, starting from left.

(12) Parameter Type:

R= read only
W= write only
R/W= read and write

Configuration parameters:

| Code | Name | Notes |
|------|--------------------------|-------------------------------------|
| 03 | read holding registers | reads a stream of words from memory |
| 04 | read input registers | reads a stream of words from memory |
| 08 | diagnostics: subcode 0 | returns query data |
| 06 | write single registers | writes a word in memory |
| 16 | write multiple registers | writes a stream of words in memory |