SIL 2 Switch/Proximity Detector Repeater O.C. Out, DIN-Rail & Termination Board Model D5231E

Characteristics:

General Description:

The Switch/Proximity Detector Repeater type D5231E is a unit with eight independent channels suitable for applications requiring SIL 2 level (according to IEC 61508) in safety related systems for high risk industries.

The unit can be configured for switch or proximity detector (EN60947-5-6 NAMUR), NO or NC input and for NO or NC floating solid-state relay (photo-MOS) isolated output compatible with logic circuits. Configuration is programmable from PC by the GM Pocket Portable Adapter PPC5092 via USB serial line and SWC5090 Configurator software. Each channel enables a Safe Area load to be controlled by a switch, or a proximity detector, located in Hazardous Area.

Fault detection circuit (configurable by PC) is available for all proximity sensors and switches equipped with end of line resistors. In case of fault, when enabled it de-energizes the corresponding solid-state relay (photo-MOS) and turns the fault red LED on; when disabled the corresponding solid-state relay (photo-MOS) repeats the input line open or closed status as configured.

D5231E has eight inputs and eight independent outputs.
Modbus RTU RS-485 output is available on Bus connector.

Mounting on standard DIN-Rail, with or without Power Bus, or on customized Termination Boards, in Safe Area or in Zone 2.

Front Panel and Features:
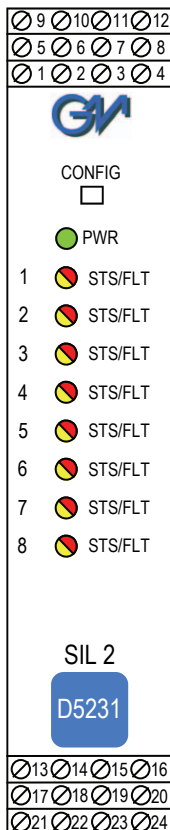
- SIL 2 according to IEC 61508 for Tproof = 5 yrs (10 / 20 % of total SIF).
- 8 fully independent channels
- Input from Zone 0 (Zone 20), installation in Zone 2.
- NO/NC switch/proximity Detector Input, NO/NC solid-state output relay .
- Field open and short circuit detection.
- High Accuracy, µP controlled A/D converter.
- Three port isolation, Input/Output/Supply.
- Modbus RTU RS-485 Output.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1, EN61326-3-1 for safety system.
- Fully programmable operating parameters.
- Any input can be assigned to any number of outputs. Logical output functions available.
- ATEX, IECEx Certifications.
- High Density, eight channels per unit.
- Simplified installation using standard DIN-Rail and plug-in terminal blocks, with or without power Bus, or customized Termination Boards.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Technical Data:

Supply:
24 Vdc nom (18 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp, 2 A time lag fuse internally protected.
Current consumption @ 24 V: 75 mA for 8 channels with short circuit input and solid-state relay (photo-MOS) closed, typical.
Power dissipation: 1.8 W with 24 V supply voltage, for 8 channels with short circuit input and solid-state relay (photo-MOS) closed, typical.

Isolation (Test Voltage):
I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; Out/Supply 500 V.

Input switching current levels:
ON ≥ 2.1 mA (1.9 to 6.2 mA range), OFF ≤ 1.2 mA (0.4 to 1.3 mA range), switch current ≈ 1.65 mA ± 0.2 mA hysteresis.
Fault current levels: open fault ≤ 0.2 mA, short fault ≥ 6.8 mA.
Input equivalent source: 8 V 1 KΩ typical (8 V no load, 8 mA short circuit).

Output:
voltage free SPST optocoupled open-collector transistor (solid-state relay, photo-MOS).
Open-collector rating: 100 mA at 35 V (≤ 1.0 V voltage drop).
Leakage current: ≤ 10 µA at 35 V.
Response time: 500 µs.
Frequency response: 500 Hz maximum.
Modbus Output: Modbus RTU protocol up to 115.200 baud on Bus connector.

Compatibility:
CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

Environmental conditions:
Operating: temperature limits – 40 to + 70 °C, relative humidity 95 %, up to 55 °C.
Storage: temperature limits – 45 to + 80 °C.

Safety Description:

ATEX: II 3(1) G Ex nA [ia Ga] IIC T4 Gc, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I
IECEx: Ex nA [ia Ga] IIC T4 Gc, [Ex ia Da] IIIC, [Ex ia Ma] I, associated apparatus and non-sparking electrical equipment.
Uo/Voc = 11.2 V, Io/Isc = 12 mA, Po/Po = 34 mW at terminals 21-13, 21-14, 22-15, 22-16, 23-17, 23-18, 24-19, 24-20.
Um = 250 Vrms, -40 °C ≤ Ta ≤ 70 °C.

Approvals:
ATEX conforms to EN60079-0, EN60079-11, EN60079-15, EN60079-26, IECEx conforms to IEC60079-0, IEC60079-11, IEC60079-15, IEC60079-26. SIL 2 conforms to IEC61508.

Mounting:
T35 DIN-Rail according to EN50022, with or without Power Bus or on customized Termination Board.
Weight: about 145 g.
Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm².
Location: Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4 installation.
Protection class: IP 20.
Dimensions: Width 22.5 mm, Depth 123 mm, Height 120 mm.

Ordering Information:

Model:	D5231	
8 channels		E

Power Bus and DIN-Rail accessories:
Connector JDFT050
Cover and fix MCHP196
Terminal block male MOR017
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.

Parameters Table:

Safety Description	Maximum External Parameters			
	Group Cenelec	Co/Ca (µF)	Lo/La (mH)	Lo/Ro (µH/Ω)
Terminals 21-13, 21-14, 22-15, 22-16, 23-17, 23-18, 24-19, 24-20	IIC	1.84	253	1070
	IIB	12.6	1009	4277
Uo/Voc = 11.2 V	IIA	54	2017	8554
Io/Isc = 12 mA	I	49	3309	14033
Po/Po = 34 mW	iaD	12.6	1009	4277

Image:

Function Diagram:

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC	SAFE AREA, ZONE 2 GROUP IIC T4

MODEL D5231E

voltage free Contact   Proximity

In 1   21 / 13
In 2   14
In 3   22 / 15
In 4   16
In 5   23 / 17
In 6   18
In 7   24 / 19
In 8   20

Common positive connection

9 + / 10 - Supply 24 Vdc
11
12 Common Ch. 1 to 8
1 Out 1
2 Out 2
3 Out 3
4 Out 4
5 Out 5
6 Out 6
7 Out 7
8 Out 8

Modbus RS485

B+ A- F - +
Modbus RS485   Power and Fault Bus

Termination board connector

Resistors R1 - R2 used with voltage free contact required for line fault detection.

Configurating and Monitoring via Software:

Screenshots:

CONFIGURATION
Configuration parameters can be read and written from the module or from saved file.
It is also possible to reset the module configuration to factory default settings.
A report sheet containing complete configuration can be printed.

INPUTS 1 to 8:
Sensor Type:
☐ Proximity
☐ Voltage free contact
Note: To enable line diagnostic on Voltage free contacts, configure sensor as "Proximity" and follow instructions in Section "Operation" of Manual ISM0172.

TAGS 1 to 8:
16 alphanumerical characters.

OUTPUTS 1 to 8:
Source:
☐ Input 1   Output represents Input 1,
☐ Input 2   Output represents Input 2,
☐ Input 3   Output represents Input 3,
☐ Input 4   Output represents Input 4,
☐ Input 5   Output represents Input 5,
☐ Input 6   Output represents Input 6,
☐ Input 7   Output represents Input 7,
☐ Input 8   Output represents Input 8,
☐ Logical function Output represents AND/OR function of selected inputs.

Contact: normal condition of output contact
☐ NC   Normally Closed,
☐ NO   Normally Open.

In case of fault: Output behaviour when Input fault is detected
☐ Ignore   Ignore,
☐ Go On   Switch to ON status (Open when NC, Closed when NO),
☐ Go Off   Switch to OFF status (Closed when NC, Open when NO).

Fault repeater: Output represents Input Fault status

Logical Function: visible only when selected in "Output source"
Select 2 or more (up to 8) Inputs to connect logically.
☐ AND   Output represents AND logical function of selected Inputs,
                   - NO: On AND On = Close; On AND Off = Open; Off AND Off = Open
                   - NC: On AND On = Open; On AND Off = Close; Off AND Off = Close
☐ OR   Output represents OR logical function of selected Inputs
                   - NO: On OR On = Close; On OR Off = Close; Off OR Off = Open
                   - NC: On OR On = Open; On OR Off = Open; Off OR Off = Close

MONITOR
Allows the real-time monitoring of every Input and Output status.
Note that configuration is disabled when Monitoring is active.

INPUT STATUS: The status of each input is shown
☐ Open circuit   Open circuit fault (only for Proximity Inputs),
☐ Off   Off,
☐ On   On,
☐ Short circuit   Short circuit fault (only for Proximity Inputs).

OUTPUT STATUS: The status of each output contact is shown
☐ Open
☐ Closed

DATA LOGGER
The status of all Inputs and all Outputs is acquired at constant chosen intervals and saved to user selected file in Comma Separated Value format (.csv).
Note that configuration is disabled when Data Logger is active.

PARAMETERS SETUP:
Days: Number of days to acquire.
Hours: Number of hours to acquire.
Minutes: Number of minutes to acquire.
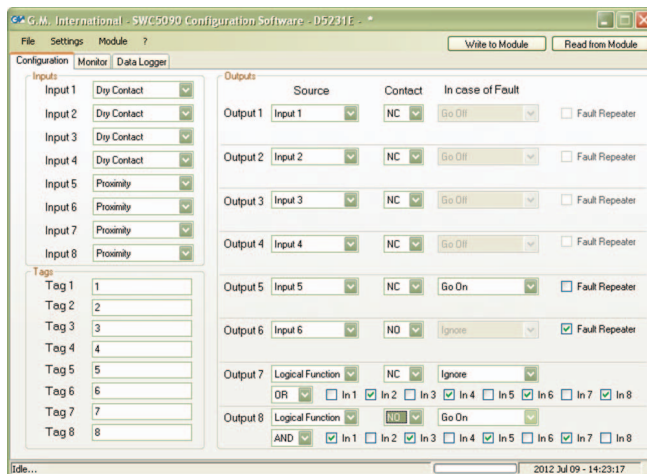**Scan rate:** Frequency interval for acquisitions.

General Notes:
SWC5090 Software can be downloaded for free at www.gmintsrl.com
PPC5092 Adapter is needed to interface PC to D5231E module.
The PC supplies the module via USB, therefore operating power supply (24 Vdc) is not strictly needed when configuring the module.
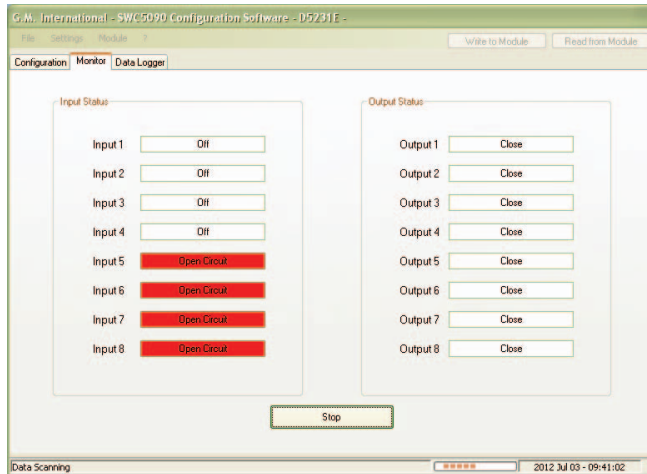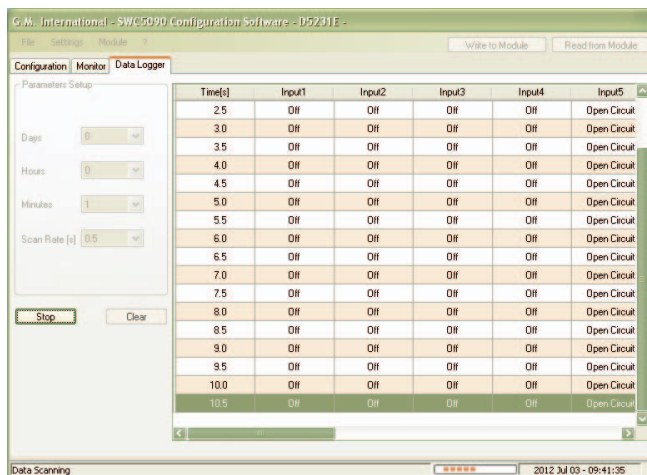

SWC5090 Software and PPC5092 USB Adapter

Input / Output configuration

Input / Output status real-time monitor

Real-time data logging to file