# SIL 2 Analog Signal Converter and Trip Amplifiers DIN-Rail Model D1053S

## Characteristics:

**General Description:**
The single channel DIN Rail Analog Signal Converter and Trip Amplifier D1053S accepts a voltage or current input from externally powered transmitters, located in Hazardous Area, and converts, with isolation, the signal to drive a Safe Area load. Output signal can be direct or reverse.
Two independent Alarm Trip Amplifiers are also provided. Each alarm energizes, or de-energizes, an SPST relay for high, low, low-startup or burnout alarm functions.
The two alarm relays trip points are settable over the entire input signal range.

**Function:**
1 channel I.S. input from separately powered transmitters, provides 3 port isolation (input/output/supply) and current (source mode) or voltage output signal.
In addition it provides two SPST relay alarm contacts with adjustable alarm trip point.

**Signalling LEDs:**
Power supply indication (green), alarm A (red), alarm B (red).
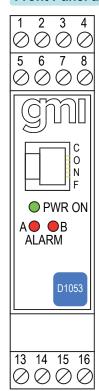
**Configurability:**
Totally software configurable, no jumpers or switches, mA or V input/output signal, linear or reverse, alarm trip point, high, low, low-startup or burnout alarm mode, NE/ND relay operation, hysteresis, delay time, by GM Pocket Portable Configurator PPC1090, powered by the unit or configured by PC via RS-232 serial line with PPC1092 Adapter and SWC1090 Configurator software.
To operate PPC1090 or PPC1092 refer to instruction manual.

**EMC:**
Fully compliant with CE marking applicable requirements.

## Front Panel and Features:



- SIL 2 according to IEC 61508, IEC 61511 using analog output or trip amplifiers for Tproof = 2 / 4 years (10 / 20 % of total SIF).
- PFDavg (1 year) 4.16 E-04, SFF 80 % using analog output.
- PFDavg (1 year) 4.11 E-04, SFF 82 % using trip amplifiers.
- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- 0/4-20 mA, 0/1-5 V, 0/2-10 V Input-Output Signal linear or reverse.
- Two independent trip amplifiers.
- Output for burnout detection.
- High Accuracy, µP controlled A/D converter.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- Fully programmable operating parameters.
- ATEX, IECEx, UL & C-UL, FM & FM-C, INMETRO, EAC-EX, UKR TR n. 898 Certifications.
- Type Approval Certificate DNV and KR for marine applications.
- High Reliability, SMD components.
- High Density, one channel, 2 trips per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

## Ordering Information:

| Model: | D1053S | |
|---|---|---|
| Power Bus enclosure | | /B |

Operating parameters are programmable by the GM Pocket Portable Configurator PPC1090 or via RS-232 serial line with PPC1092 Adapter and SWC1090 Configurator software. If the parameters are provided with the purchasing order the unit will be configured accordingly, otherwise the unit will be supplied with default parameters.

## Technical Data:

**Supply:** 24 Vdc nom (20 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
*Current consumption @ 24 V:* 65 mA with 20 mA output and relays energized typical.
*Power dissipation:* 1.5 W with 24 V supply, 20 mA output and relays energized typical.
*Max. power consumption:* at 30 V supply voltage, overload condition, relays energized and PPC1090 connected, 2.1 W.
**Isolation (Test Voltage):** I.S. In/Outs 1.5 KV; I.S. In/Supply 1.5 KV; Analog Out/Supply 500 V; Analog Out/Alarm Outs 1.5 KV; Alarm Outs/Supply 1.5 KV; Alarm Out/Alarm Out 1.5 KV.
**Input:** 0/4 to 20 mA (-4 to +24 mA reading) separately powered input, voltage drop ≤ 0.5 V or 0/1 to 5 V or 0/2 to 10 V (-2 to +12 V reading) 1 MΩ impedance.
*Integration time:* 100 ms.
*Resolution:* 1 µA on current input, 1 mV on voltage input.
*Visualization:* 1 µA on current input, 1 mV on voltage input.
*Input range:* -4 to +24 mA on current input, -2 to +12 V on voltage input.
**Burnout:** enabled or disabled. Analog output can be programmed to detect burnout condition with downscale or highscale forcing. Alarms can be programmed to detect burnout condition.
*Burnout range:* low and high separated trip point value programmable between -5 to +25 mA on current input and -3 to +13 V on voltage input.
**Output:** 0/4 to 20 mA, on max. 600 Ω load source mode, current limited at 22 mA or 0/1 to 5 V or 0/2 to 10 V signal, limited at 11 V.
*Resolution:* 2 µA current output or 1 mV voltage output.
*Transfer characteristic:* linear or reverse.
*Response time:* ≤ 50 ms (10 to 90 % step change).
*Output ripple:* ≤ 20 mVrms on 250 Ω load.
**Alarm:**
*Trip point range:* within rated limits of input sensor (see input for step resolution).
*Delay time:* 0 to 1000 s, 100 ms step.
*Hysteresis:* 0 to 5 mA on current or 0 to 5 V on voltage (see input for step resolution).
*Output:* voltage free SPST relay contact.
*Contact rating:* 2 A 250 Vac 500 VA, 2 A 250 Vdc 80 W (resistive load).
**Performance:** Ref. Conditions 24 V supply, 250 Ω load, 23 ± 1 °C ambient temperature.
*Input:*
*Calibration and linearity accuracy:* ≤ ± 20 µA on current input or ≤ ± 10 mV on voltage input.
*Temperature influence:* ≤ ± 2 µA, 1 mV of input for a 1 °C change.
*Analog Output:*
*Calibration accuracy:* ≤ ± 0.1 % of full scale.
*Linearity error:* ≤ ± 0.05 % of full scale.
*Supply voltage influence:* ≤ ± 0.05 % of full scale for a min to max supply change.
*Load influence:* ≤ ± 0.05 % of full scale for a 0 to 100 % load resistance change.
*Temperature influence:* ≤ ± 0.01 % on zero and span for a 1 °C change.
**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 -20 to + 60 °C, relative humidity max 90 % non condensing, up to 35 °C.
*Storage:* temperature limits – 45 to + 80 °C.
**Safety Description:**



*ATEX:* II (1)G [Ex ia Ga] IIC, II (1)D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I; II 3G Ex ec IIC T4 Gc
*IECEx:* [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I; Ex ec IIC T4 Gc
*INMETRO:* [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I
Uo/Voc = 10.8 V, Io/Isc = 4 mA, Po/Po = 11 mW at terminals 14-15-16.
Ui/Vmax = 30 V, Ci = 4.5 nF, Li = 0 nH at terminals 14-15-16.
Um = 250 Vrms, -20 °C ≤ Ta ≤ 60°C.
*Approvals:*
DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11.
IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11.
IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-7.
IECEx IMQ 13.0011X conforms to IEC60079-0, IEC60079-7.
INMETRO DNV 13.0108 X conforms to ABNT NBR IEC60079-0, ABNT NBR IEC60079-11.
UL & C-UL E222308 conforms to UL913, UL 60079-0, UL60079-11, UL60079-15, ANSI/ISA 12.12.01 for UL and CSA-C22.2 No.157-92, CSA-E60079-0, CSA-E60079-11, CSA-C22.2 No. 213 and CSA-E60079-15 for C-UL.
FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 and C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15, ЕАЭС RU C-IT.HA67.B.00113/20 conforms to GOST 31610.0, GOST 31610.11, GOST 31610.15.
СЦ 16.0034 X conforms to ДСТУ 7113, ГОСТ 22782.5-78, ДСТУ IEC 60079-15.
EXIDA Report No. GM04/10-27 R003, SIL 2 according to IEC 61508, IEC 61511. Please refer to Functional Safety Manual for SIL applications.
DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications.
**Mounting:** EN/IEC60715 TH 35 DIN-Rail.
*Weight:* about 160 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, Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.
*Protection class:* IP 20.
*Dimensions:* Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

## Parameters Table:

| Safety Description | Maximum External Parameters | | | |
|---|---|---|---|---|
| | Group Cenelec | Co/Ca (µF) | Lo/La (mH) | Lo/Ro (µH/Ω) |
| Terminals 14-15-16 Uo/Voc = 10.8 V Io/Isc = 4 mA Po/Po = 11 mW | IIC | 2.135 | 2541 | 3520 |
| | IIB | 14.995 | 10167 | 14090 |
| | IIA | 65.995 | 20335 | 28180 |

NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G
IIB equal to Gas Groups C, D, E, F and G
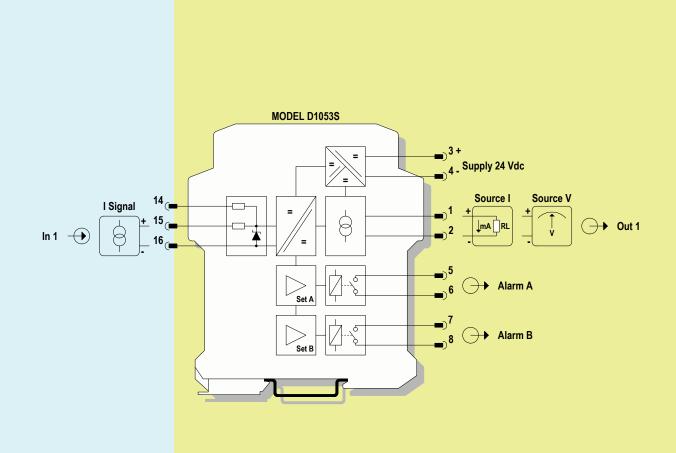IIA equal to Gas Groups D, E, F and G

## Image:



## Function Diagram:

| HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC, HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D, CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1, CLASS I, ZONE 0, GROUP IIC | 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 |
|---|---|



MODEL D1053S

In 1

I Signal

14
+ 15
- 16

3 + 
4 -   Supply 24 Vdc

1
2

Source I    Source V

Out 1

5
6   Alarm A

7
8   Alarm B

Set A

Set B

**For SIL applications, alarm contacts must be used in series with equal configuration. Relay contact shown in de-energized position**

## Function Diagram:

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
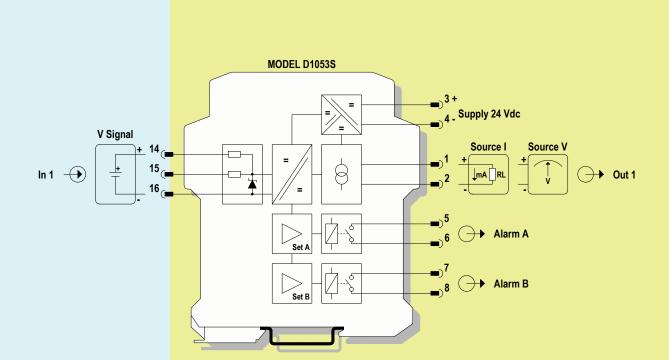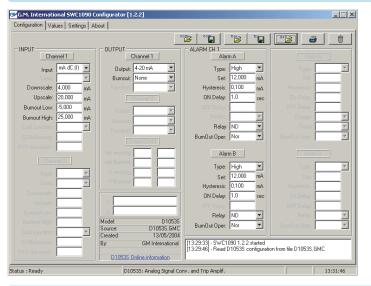CLASS I, ZONE 0, GROUP IIC

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

**MODEL D1053S**

V Signal

In 1

14 +
15
16 -

3 + 
4 -  **Supply 24 Vdc**

Source I    Source V

1
2

Out 1

Set A

5
6    **Alarm A**

Set B

7
8    **Alarm B**

**For SIL applications, alarm contacts must
be used in series with equal configuration.
Relay contact shown in de-energized position**

# Friendly Configuration with SWC1090 Software and PPC1092 Adapter or Pocket Portable Configurator PPC1090:



# Configuration Parameters:

**INPUT SECTION:**

**Input:** input sensor type
- ☐ mA dc (I)     current input, range from –4 to +24 mA
- ☐ V dc (E)     voltage input, range from –2 to +12 V

**Downscale:** input value of measuring range corresponding to defined low output value.

**Upscale:** input value of measuring range corresponding to defined high output value.

**Burnout Low:** low burnout condition trip point value;

below this value a burnout fault condition is activated and the analog output is driven to the configured state (see Burnout in Output Section).

Setting this value outside the measuring range will disable this function.

**Burnout High:** high burnout condition trip point value;

above this value a burnout fault condition is activated and the analog output is driven to the configured state (see Burnout in Output Section).

Setting this value outside the measuring range will disable this function.

**OUTPUT SECTION:**

**Output:** analog output type
- ☐ 4-20 mA     current output range from 4 to 20 mA
- ☐ 0-20 mA     current output range from 0 to 20 mA
- ☐ 1-5 V     voltage output range from 1 to 5 V
- ☐ 0-5 V     voltage output range from 0 to 5 V
- ☐ 2-10 V     voltage output range from 2 to 10 V
- ☐ 0-10 V     voltage output range from 0 to 10 V

**Burnout:** analog output burnout state
- ☐ None     burnout function is disabled;
     analog output represents the input measure as configured
- ☐ Downscale     analog output is forced at zero
- ☐ Upscale     analog output is forced to 22 mA for current output or
     11 V for voltage output

**ALARM SECTION:**

**Type:** alarm type configuration
- ☐ Off     alarm functionality is disabled
- ☐ High     alarm is set to high condition, the alarm output is triggered whenever the input variable goes above the trip point value (Set)
- ☐ Low     alarm is set to low condition, the alarm output is triggered whenever the input variable goes below the trip point value (Set)
- ☐ Low & Sec     alarm is set to low condition with start-up, the alarm output is inhibited until the input variable goes above the trip point value (Set); afterwards it behaves as a Low configuration; typically used to solve start-up issues
- ☐ Burnout     a burnout condition of the input triggers the alarm output

**Set:** input value of measuring range at which the alarm output is triggered

**Hysteresis:** alarm hysteresis value,

valid range: 0 to 5 mA for current input; 0 to 5 V for voltage input

**ON Delay:** time for which the input variable has to be in alarm condition before the alarm output is triggered; configurable from 0 to 1000 seconds in steps of 100 ms.

**Relay:** relay condition
- ☐ ND     the relay is in normally de-energized condition, it energizes (the output contact is closed) in alarm condition
- ☐ NE     the relay is in normally energized condition, it de-energizes (the output contact is opened) in alarm condition

**BurnOut Oper:** alarm status when a burnout condition is detected
- ☐ Nor     the burnout detection on the alarm output is disabled, the alarm follows the condition of the input variable
- ☐ Lock     maintain the same alarm condition as before the burnout detection
- ☐ On     the alarm condition is activated when a burnout is detected
- ☐ Off     the alarm condition is deactivated when a burnout is detected

Each alarm output has independent configurations.