GM INTERNATIONAL TECHNOLOGY FOR SAFETY

D1053

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).

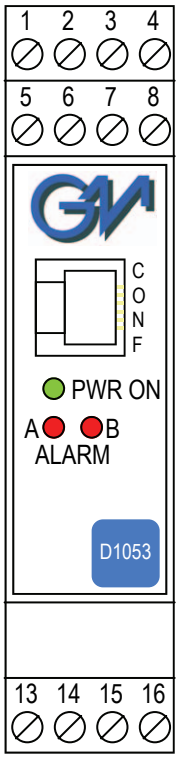
Configurability:

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, Russian and Ukrainian 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 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

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:
II (1) G [Ex ia Ga] IIC, II (1) D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I, II 3G Ex nA IIC T4, [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I associated electrical apparatus.
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, EN60079-26, EN61241-0, EN61241-11, IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11, IEC60079-26, IEC61241-0, IEC61241-11,
GM International CRR028 conforms to EN60079-0, EN60079-15,
UL & C-UL E222308 conforms to UL913 (Div.1), UL 60079-0 (General, All Zones), UL60079-11 (Intrinsic Safety "i" Zones 0 & 1) for UL and CSA-C22.2 No.157-92 (Div.1), CSA-E60079-0 (General, All Zones), CSA-E60079-11 (Intrinsic Safety "i" Zones 0 & 1) for C-UL, refer to control drawing ISM0138 for complete UL and C-UL safety and installation instructions,
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,
Russia according to GOST 12.2.007.0-75, R 51330.0-99, R 51330.10-99 [Exia] IIC X,
Ukraine according to GOST 12.2.007.0,22782.0,22782.5 Exia IIC X,
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 and KR Type Approval Certificate for marine applications.

Mounting: T35 DIN Rail according to EN50022.
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	IIC	2.135	2541	3520
Io/Isc = 4 mA	IIB	14.995	10167	14090
Po/Po = 11 mW	IIA	65.995	20335	28180

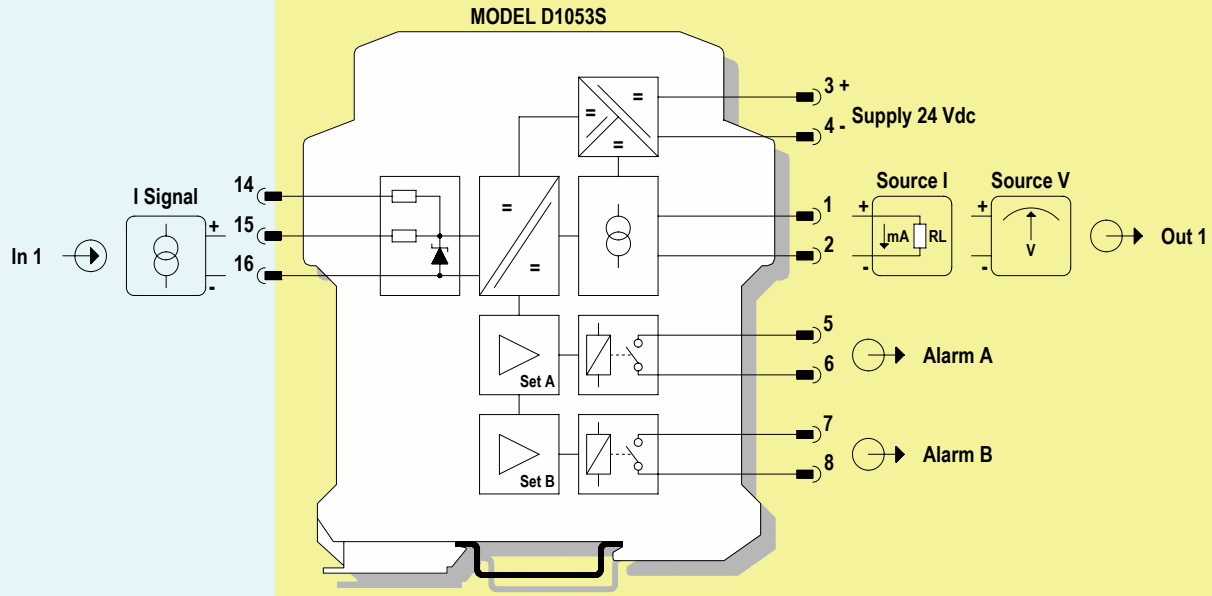
NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G
IIB equal to Gas Groups C, D, E, F and G
IIA equal to Gas Groups D, E, F and G

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

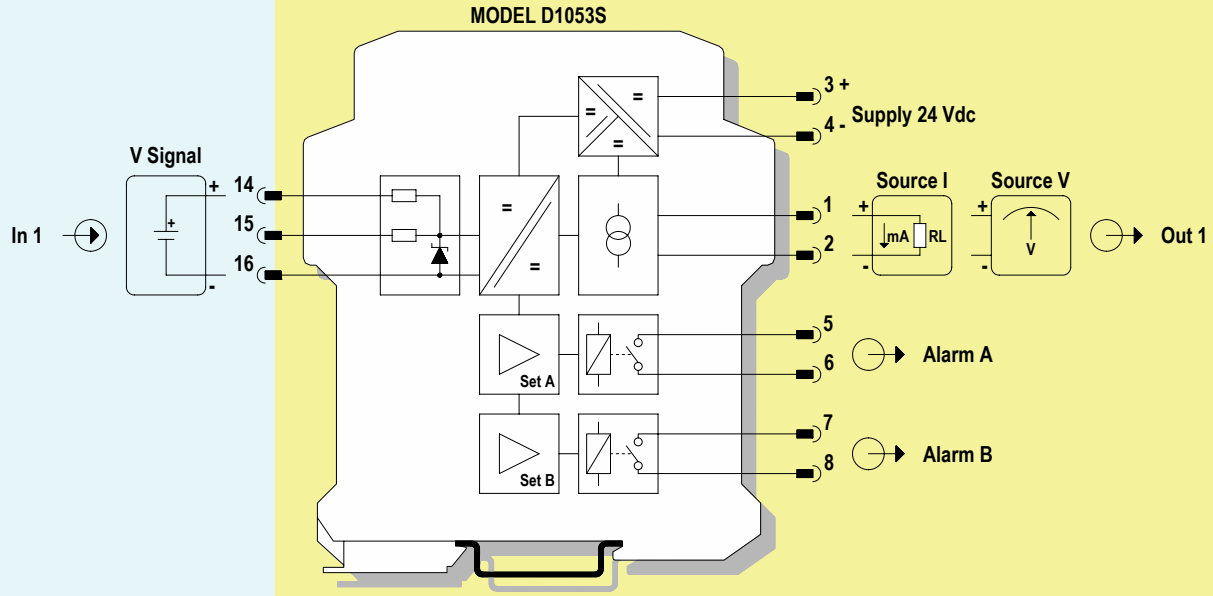


For SIL applications, alarm contacts must be used in series with equal configuration.
Relay contact shown in de-energized position

Function Diagram:

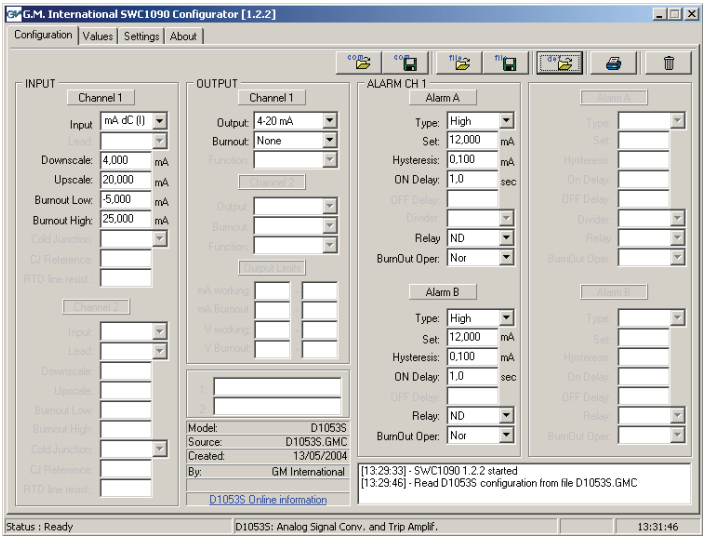
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

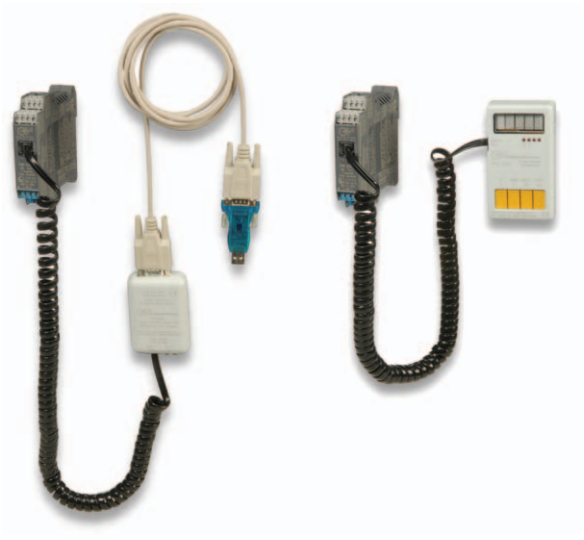
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



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.