GM INTERNATIONAL TECHNOLOGY FOR SAFETY

D1073

SIL 2 Temperature Signal Converter and Trip Amplifiers DIN-Rail Model D1073S

Characteristics:

General Description:

The single channel DIN Rail Temperature Signal Converter and Trip Amplifier D1073S accepts a low level dc signal from millivolt, thermocouple or RTD temperature sensor, 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 mV, thermocouples, 3-4 wires resistance thermometers, transmitting potentiometers, provides 3 port isolation (input/output/supply) and current (source mode) or voltage output signal.
The programmable RTD line resistance compensation allows the use of 2 wires RTDs or error compensation for 3-4 wires RTDs. Reference junction compensation can be automatic, with option 91, or fixed by software setting.
In addition it provides two SPST relay alarm contacts with adjustable alarm trip point.

Signalling LEDs:

Power supply indication (green), burnout (red), alarm A (red), alarm B (red).

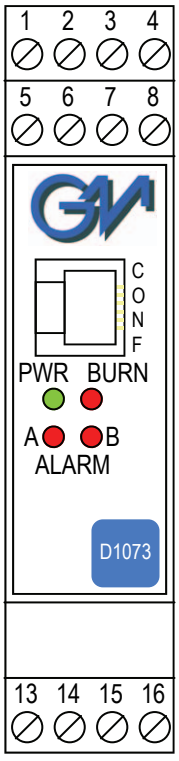
Configurability:

Totally software configurable, no jumpers or switches, input sensor, connection mode, burnout operation, mA or V output signal, 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.
A 16 characters tag can be inserted using 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 = 3 / 6 years (10 / 20 % of total SIF).
- PFDavg (1 year) 3.33 E-04, SFF 83.9 % using analog output.
- PFDavg (1 year) 2.85 E-04, SFF 88.7 % using trip amplifiers.
- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- mV, thermocouples, RTD or transmitting potentiometers Input Signal.
- Programmable RTD line resistance compensation.
- Reference Junction Compensation automatic or fixed (programmable value).
- 0/4-20 mA, 0/1-5 V, 0/2-10 V Output Signal temperature linear or reverse.
- 16 characters tag.
- Two independent trip amplifiers.
- Output for burnout detection.
- Common burnout detection available when using Power Bus enclosure.
- 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.
- 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:	D1073S	
Power Bus enclosure		/B
Reference Junction Compensator (TC input)		OPT91

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.
NOTE: for thermocouple sensor input, the Reference Junction Compensator is required for automatic ambient temperature compensation. It has to be ordered as OPT91, it will be supplied separately and it has to be connected to the input terminal blocks as indicated in the function diagram.

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: millivolt or thermocouple type A1, A2, A3, B, E, J, K, L, Lr, N, R, S, S1, T, U or 3-4 wires RTD Pt100, Pt200, Pt300 to DIN43760, Pt100 (0.3916), Ni100, Ni120 or Pt500, Pt100, Pt50, Cu100, Cu53, Cu50, Cu46 (russian standard) or 3 wires transmitting potentiometer (50 Ω to 20 KΩ).
Integration time: 500 ms.
Resolution: 5 µV on mV or thermocouple, 1 µV thermocouple type B, R, S, S1, 2 µV thermocouple A1, A2, A3, 20 mΩ on RTD, 0.05 % on transmitting potentiometer.
Visualization: 0.1 °C on temperature, 10 µV on mV, 0.1 % on potentiometer.
Input range: within rated limits of sensor (-10 to + 80 mV).
Measuring RTD current: ≤ 0.5 mA.
RTD line resistance compensation: ≤ 10 Ω.
RTD line resistance error compensation: - 5 to + 20 Ω, programmable.
Thermocouple Reference Junction Compensation: automatic, by external sensor OPT91 separately ordered, or fixed programmable from - 60 to + 100 °C.
Thermocouple burnout current: ≤ 30 nA.
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 condition signalled by red front panel LED.
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 on mV or transmitting potentiometer, temperature linear or reverse on temperature sensors.
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).
ON-OFF delay time: 0 to 1000 s, 100 ms step, separate setting.
Hysteresis: 0 to 5 °C for temperature sensor input, 0 to 50 mV for mV input, 0 to 50 % for potentiometer input (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: ≤ ± 40 µV on mV or thermocouple, 200 mΩ on RTD, 0.2 % on potentiometer or ± 0.05 % of input value.
Temperature influence: ≤ ± 2 µV, 20 mΩ, 0.02 % or ± 0.01 % of input value for a 1 °C change.
Ref. Junction Compensation influence: ≤ ± 1 °C (thermocouple sensor).
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 = 9 mA, Po/Po = 24 mW at terminals 13-14-15-16.
Ui/Vmax = 18 V, Ci = 6 nF, Li = 0 nH at terminals 13-14-15-16.
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 ISM0142 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,
TUV Certificate No. C-IS-204194-02, 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 mm^2.
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 13-14-15-16				
Uo/Voc = 10.8 V	IIC	2.134	468	1510
Io/Isc = 9 mA	IIB	14.994	1874	6050
Po/Po = 24 mW	IIA	65.994	3749	12100

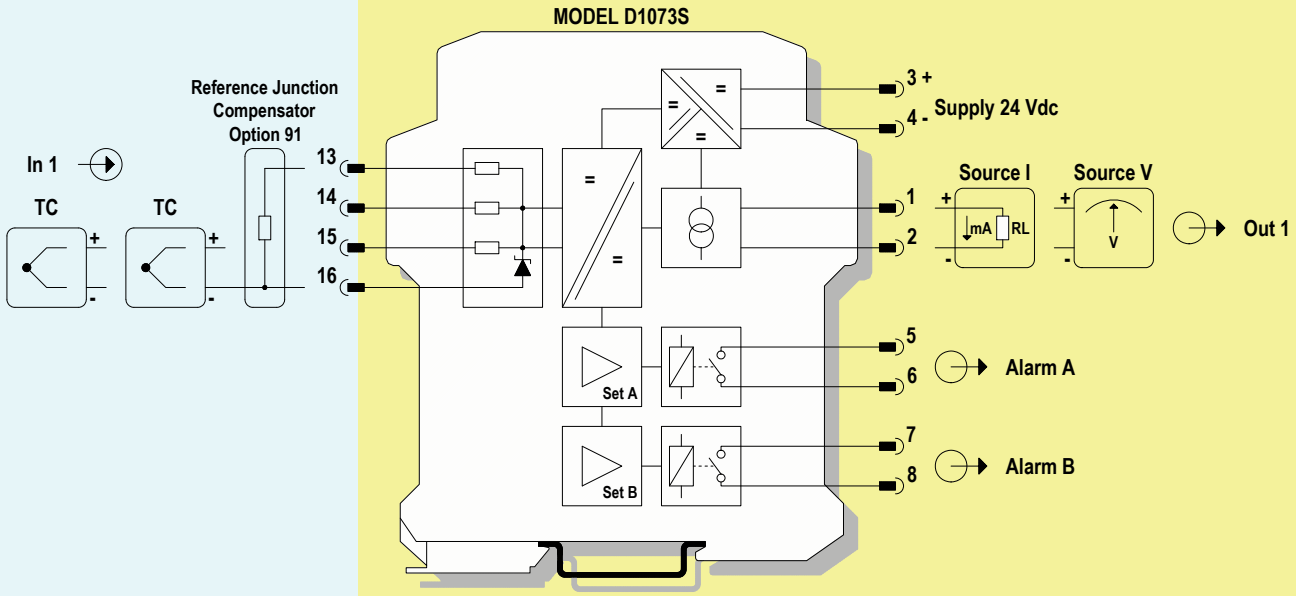
NOTE for USA and Canada:
IIC equal to Gas Groups A, B, C, D, E, F and G
IIB equal to Gas Groups C, D, E, F and G
IIA equal to Gas Groups D, E, F and G

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

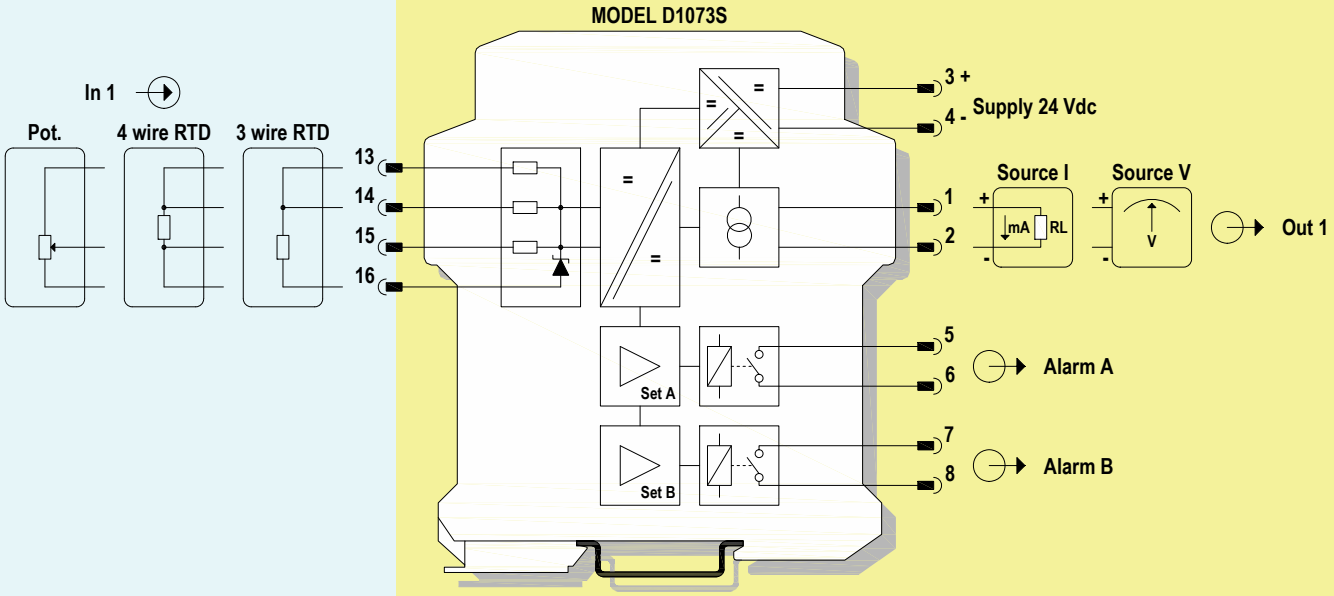


For SIL applications, alarm contacts must be used in series with equal configuration.
Relay contact shown in de-energized position

Function Diagram:

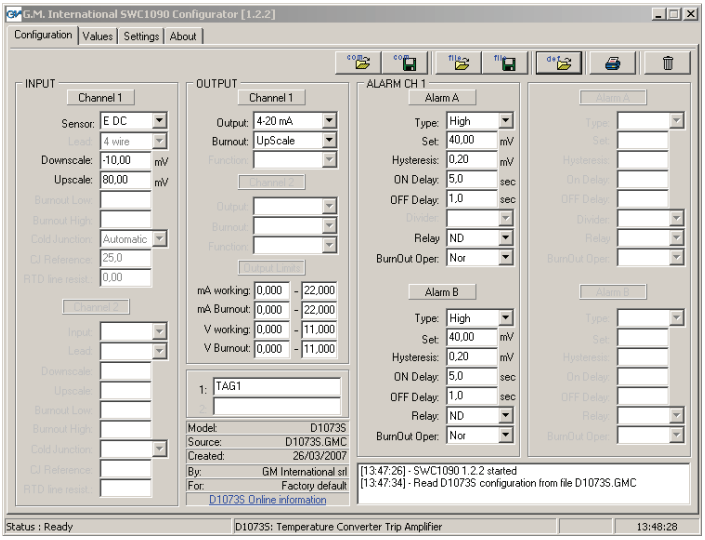
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

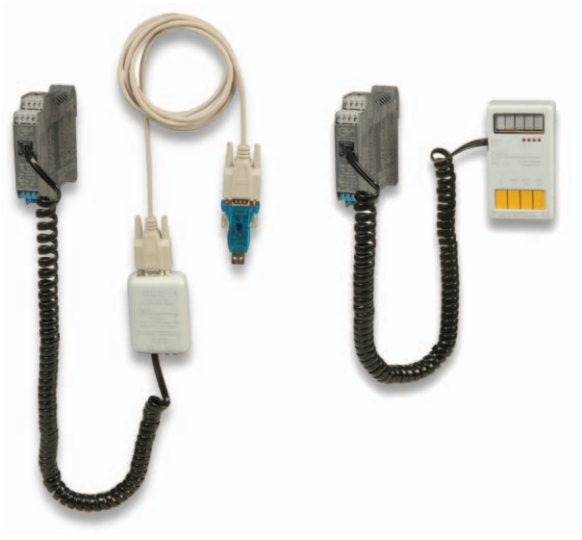
SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4



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:

Sensor: input sensor type

- ☐ TC A1 thermocouple to STI90, GOST R8.585 2001 range from –10 to +2500 °C
- ☐ TC A2 thermocouple to STI90, GOST R8.585 2001 range from –10 to +1800 °C
- ☐ TC A3 thermocouple to STI90, GOST R8.585 2001 range from –10 to +1800 °C
- ☐ TC B thermocouple to STI90, NBS125, GOST R8.585 2001 range from +50 to +1800 °C
- ☐ TC E thermocouple to STI90, NBS125, GOST R8.585 2001 range from –250 to +1000 °C
- ☐ TC J thermocouple to STI90, NBS125, GOST R8.585 2001 range from –200 to +750 °C
- ☐ TC K thermocouple to STI90, NBS125, GOST R8.585 2001 range from –250 to +1350 °C
- ☐ TC L thermocouple to SIPT68, DIN43710 range from –200 to +800 °C
- ☐ TC Lr thermocouple to STI90, GOST R8.585 2001 range from –200 to +800 °C
- ☐ TC N thermocouple to STI90, NBS121, GOST R8.585 2001 range from –250 to +1300 °C
- ☐ TC R thermocouple to STI90, NBS125, GOST R8.585 2001 range from –50 to +1750 °C
- ☐ TC S thermocouple to STI90, NBS125, GOST R8.585 2001 range from –50 to +1750 °C
- ☐ TC S1 thermocouple type S1 to SIPT68, russian range from –50 to +1600 °C
- ☐ TC T thermocouple to STI90, NBS125, GOST R8.585 2001 range from –250 to +400 °C
- ☐ TC U thermocouple to SIPT68, DIN43710 range from –200 to +400 °C
- ☐ Pt 100 thermoresistance α=385 to SIPT68, IEC751 range from –200 to +850 °C
- ☐ Pt 200 thermoresistance α=385 to SIPT68, IEC751 range from –150 to +400 °C
- ☐ Pt 300 thermoresistance α=385 to SIPT68, IEC751 range from –150 to +250 °C
- ☐ Pp 100 thermoresistance α=392 to SIPT68, ANSI range from –200 to +625 °C
- ☐ Pi 500 thermoresistance α=391 to SIPT68, russian range from –200 to +75 °C
- ☐ Pi 100 thermoresistance α=391 to SIPT68, russian range from –200 to +650 °C
- ☐ Pi 50 thermoresistance α=391 to SIPT68, russian range from –200 to +650 °C
- ☐ Ni 100 thermoresistance to SIPT68, DIN43760 range from –50 to +180 °C
- ☐ Ni 120 thermoresistance α=672 to SIPT68, russian range from –75 to +300 °C
- ☐ Cu 100 thermoresistance to SIPT68, russian range from –50 to +200 °C
- ☐ Cu 53 thermoresistance to SIPT68, russian range from –50 to +180 °C
- ☐ Cu 50 thermoresistance to SIPT68, russian range from –50 to +200 °C
- ☐ Cu 46 thermoresistance to SIPT68, russian range from –200 to +650 °C
- ☐ Pot 3 wires transmitting potentiometer, 50 Ω to 20 KΩ, range from 0 to 100 %
- ☐ E DC millivolt signal range from –20 to +85 mV

Lead: input sensor connection type (thermoresistance only)

- ☐ 3 wire 3 wires connection type
- ☐ 4 wire 4 wires connection type

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

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

Cold Junction: reference junction compensation type (thermocouple only)

- ☐ Automatic ambient temperature compensation automatic by OPT91 sensor
- ☐ Fixed programmable temperature compensation at fixed temperature

CJ Reference: temperature compensation value (Cold Junction type Fixed only), range from –60 to +100 °C.

RTD line resist: line resistance error compensation value (thermoresistance only), range from –5 to +20 Ω.

INPUT TAG SECTION:

1: channel tag

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 mA Burnout or V Burnout lower value
- ☐ Upscale analog output is forced at mA Burnout or V Burnout higher value

Output Limits: current or voltage analog output normal working range limits or burnout detection range limits:

mA working: current analog output range in normal working condition.

mA Burnout: current analog output lower and higher value for burnout signalation.

V working: voltage analog output range in normal working condition.

V Burnout: voltage analog output lower and higher value for burnout signalation.

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 °C for temperature sensor input; 0 to 50 mV for voltage input, 0 to 50 % for potentiometer 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.

OFF Delay: time for which the input variable has to be in normal condition before the alarm output is deactivated; 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.