SIL 2 Temperature Signal Converter, Duplicator, Adder/Subtractor DIN-Rail Models D1072S, D1072D

Characteristics:

General Description:

The single and dual channel DIN Rail Temperature Signal Converter D1072S and D1072D 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.
Duplicator function provides two independent outputs for the single input.
Adder, subtractor, low/high selector functions provides two independent outputs representing input A, input B, input A plus input B, input A minus input B, low/high selector.

Function:

1 or 2 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.
Duplicator, adder, subtractor, low/high selector function provided.
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.

Signalling LEDs:

Power supply indication (green), burnout (red).

Configurability:

Totally software configurable, no jumpers or switches, input sensor, connection mode, burnout operation, mA or V output signal, 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:
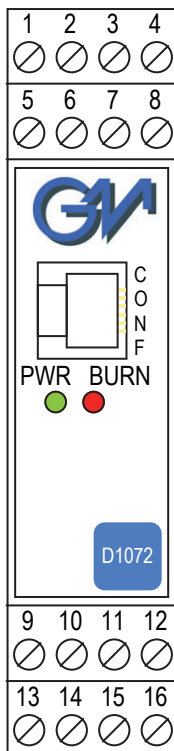
- SIL 2 according to IEC 61511 (for current output)
  D1072S: Tproof = 2 / 5 years (10 / 20 % of total SIF)
  PFDavg (1 year) 3.35 E-04, SFF 76.12 %;
  D1072D: Tproof = 2 / 5 years (10 / 20 % of total SIF)
  PFDavg (1 year) 3.74 E-04, SFF 76.40 %.
- Input from Zone 0 (Zone 20), Division 1, installation 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.
- Duplicated output for single channel input.
- Adder, Subtractor, low/high Selector.
- 16 characters tag for each channel.
- 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, TÜV Certifications.
- Type Approval Certificate DNV and KR for marine applications.
- High Reliability, SMD components.
- High Density, two channels 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:	D1072			
1 channel		S		
2 channels		D		
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: 12-24 Vdc nom (10 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 Vpp.
Current consumption @ 24 V: 70 mA for 2 channels D1072D, 45 mA for 1 channel D1072S with 20 mA output typical.
Current consumption @ 12 V: 140 mA for 2 channels D1072D, 80 mA for 1 channel D1072S with 20 mA output typical.
Power dissipation: 1.5 W for 2 channels D1072D, 1.0 W for 1 channel D1072S with 24 V supply voltage and 20 mA output typical.
Max. power consumption: at 30 V supply voltage, overload condition and PPC1090 connected, 2.1 W for 2 channels D1072D, 1.4 W for 1 channel D1072S.
Isolation (Test Voltage): I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; I.S. In/I.S. In 500 V; Out/Supply 500 V; Out/Out 500 V.
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.
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.
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 II 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, 9-10-11-12.
Ui/Vmax = 18 V, Ci = 6 nF, Li = 0 nH at terminals 13-14-15-16, 9-10-11-12.
Um = 250 Vrms, -20 °C ≤ Ta ≤ 60°C.
Approvals:
DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11, EN60079-26, EN61241-11,EN50303, IECEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11, IEC60079-26, IEC61241-11,
IMQ 09 ATEX 013 X 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), UL60079-15 ("n" Zone 2), ANSI/ISA 12.12.01 (Div.2) 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), CSA-C22.2 No. 213-M1987 (Div. 2) and CSA-E60079-15 ("n" Zone 2) for C-UL, refer to control drawing ISM0141 for complete UL and C-UL safety and installation instructions, FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 ANSI/ISA 12.12.02, ANSI/ISA 60079-0, ANSI/ISA 60079-11 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-236198-02, SIL 2 according to IEC 61511.
DNV and KR Type Approval Certificate for marine applications.
Mounting: T35 DIN Rail according to EN50022.
Weight: about 170 g D1072D, 140 g D1072S.
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 13-14-15-16, 9-10-11-12				
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

MODEL D1072D

In 1 — TC / TC
Reference Junction Compensator Option 91
13, 14, 15, 16

In 2 — TC / TC
Reference Junction Compensator Option 91
9, 10, 11, 12

3 + / 4 - Supply 12-24 Vdc
Source I — Source V — Out 1 (1, 2)
Source I — Source V — Out 2 (5, 6)

MODEL D1072D

In 1 — Pot. / 4 wire RTD / 3 wire RTD
13, 14, 15, 16

In 2 — Pot. / 4 wire RTD / 3 wire RTD
9, 10, 11, 12

3 + / 4 - Supply 12-24 Vdc
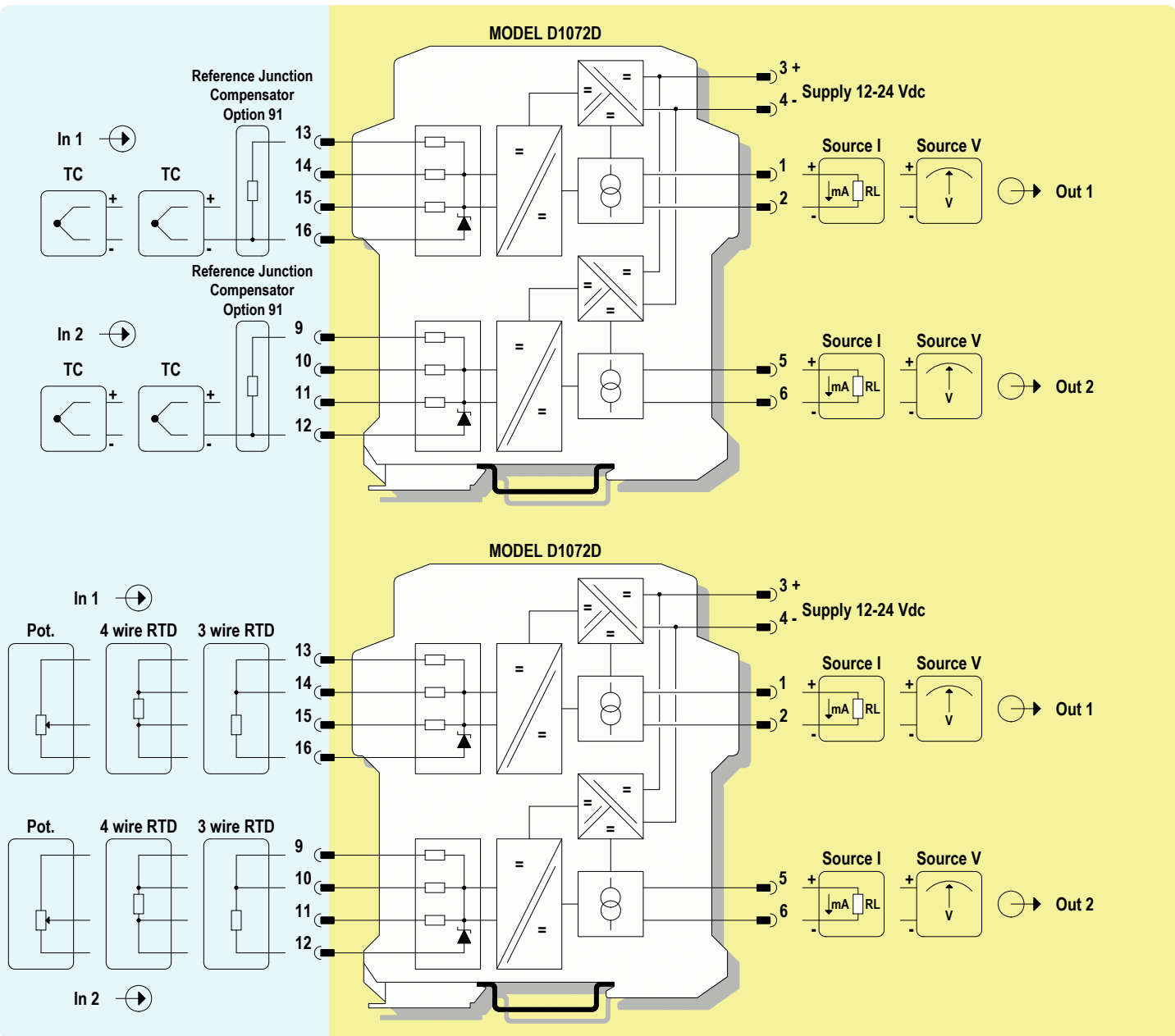Source I — Source V — Out 1 (1, 2)
Source I — Source V — Out 2 (5, 6)

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 D1072D (Duplicator)

Reference Junction
Compensator
Option 91

In 1

TC   TC

13
14
15
16

3 +
4 - **Supply 12-24 Vdc**

Source I   Source V   Out 1-A
+ mA RL   + V
1
2

Source I   Source V   Out 1-B
+ mA RL   + V
5
6

MODEL D1072D (Duplicator)

In 1

Pot.   4 wire RTD   3 wire RTD

13
14
15
16

3 +
4 - **Supply 12-24 Vdc**

Source I   Source V   Out 1-A
+ mA RL   + V
1
2

Source I   Source V   Out 1-B
+ mA RL   + V
5
6

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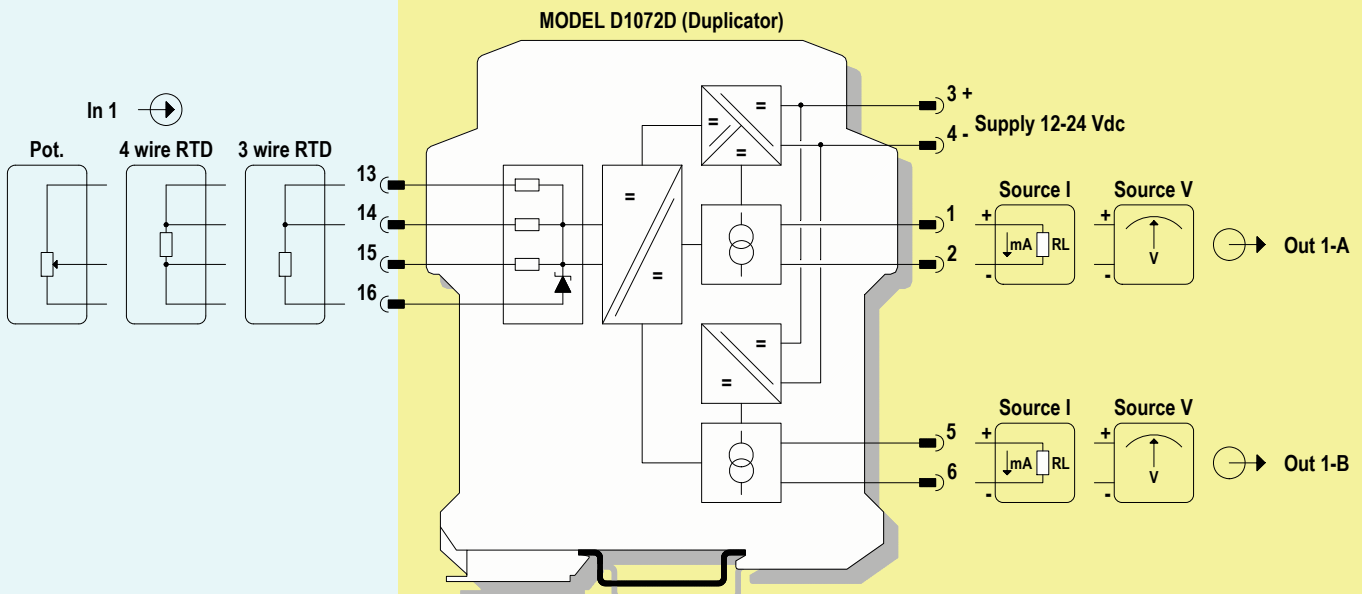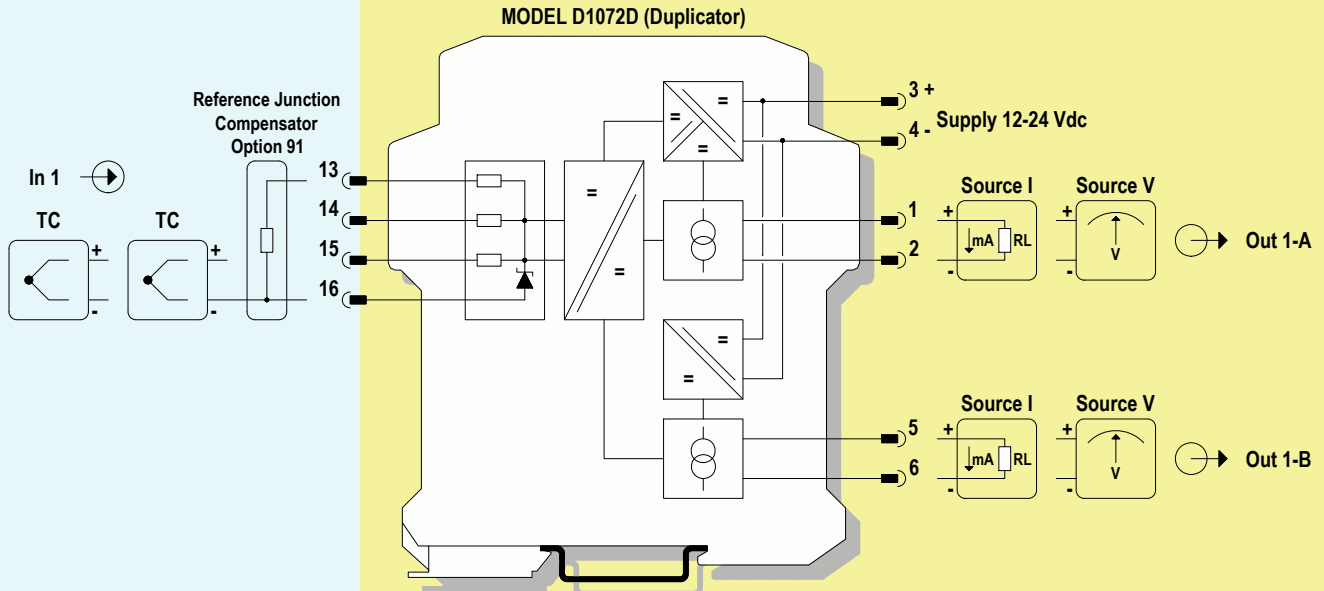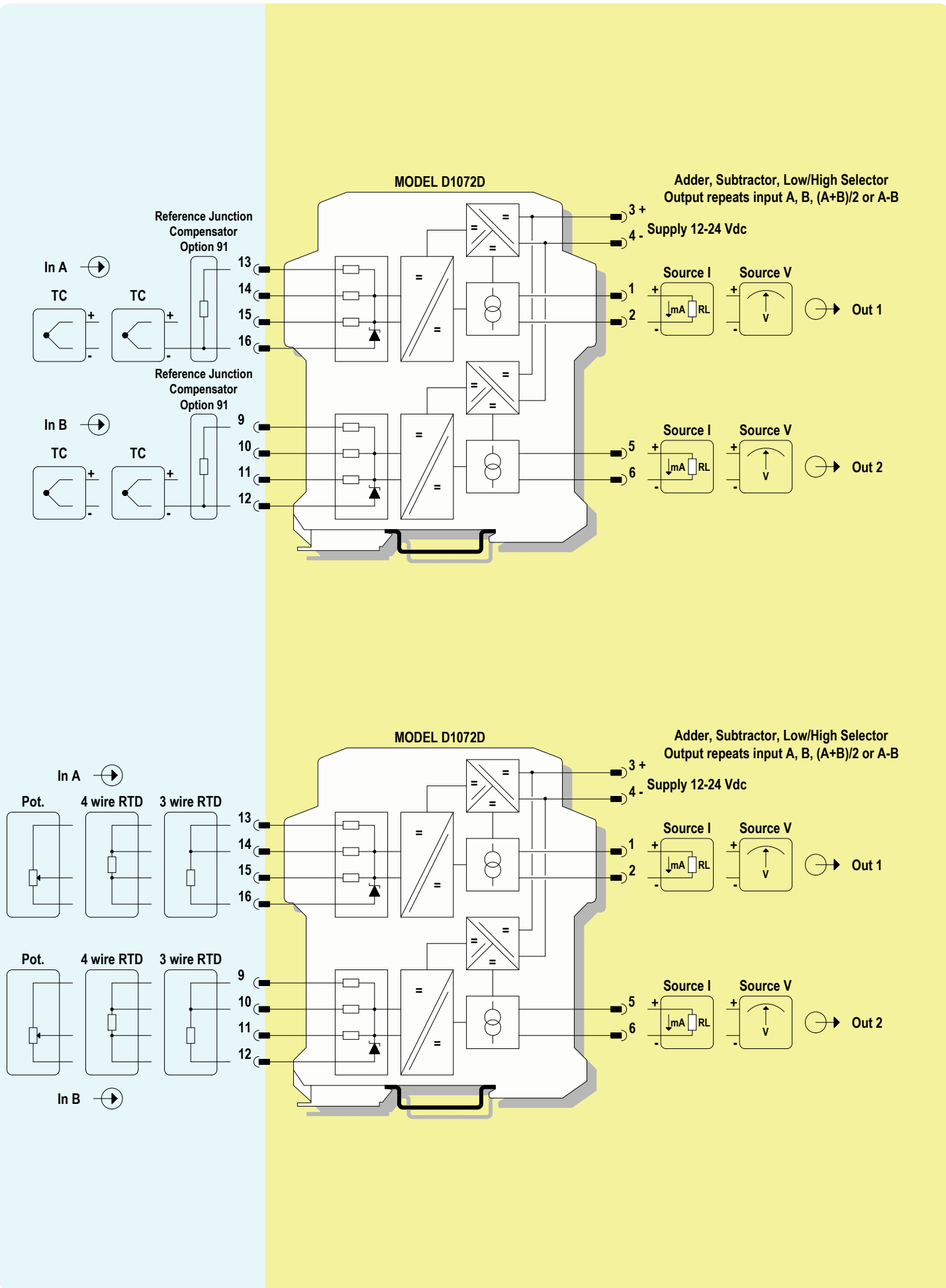
SAFE AREA, ZONE 2 GROUP IIC T4, NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2, GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4

MODEL D1072D

Reference Junction Compensator Option 91

In A

TC   TC

Reference Junction Compensator Option 91

In B

TC   TC

Adder, Subtractor, Low/High Selector
Output repeats input A, B, (A+B)/2 or A-B

3 +
4 - **Supply 12-24 Vdc**

Source I   Source V

Out 1

Source I   Source V

Out 2

13
14
15
16

9
10
11
12

1
2

5
6

MODEL D1072D

In A

Pot.   4 wire RTD   3 wire RTD

Pot.   4 wire RTD   3 wire RTD

In B

Adder, Subtractor, Low/High Selector
Output repeats input A, B, (A+B)/2 or A-B

3 +
4 - **Supply 12-24 Vdc**

Source I   Source V

Out 1

Source I   Source V

Out 2

13
14
15
16

9
10
11
12

1
2

5
6

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
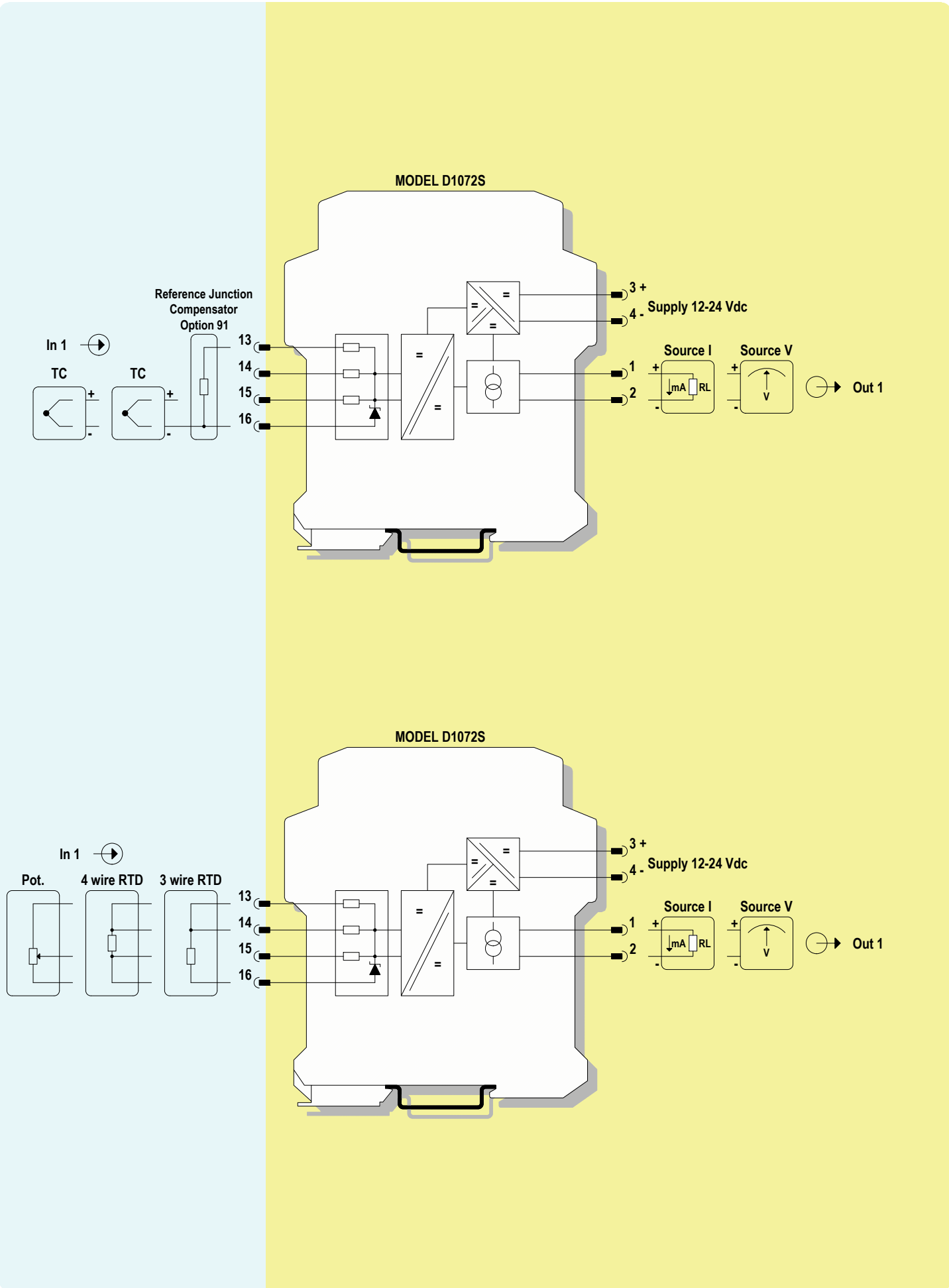
SAFE AREA, ZONE 2 GROUP IIC T4, NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2, GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4
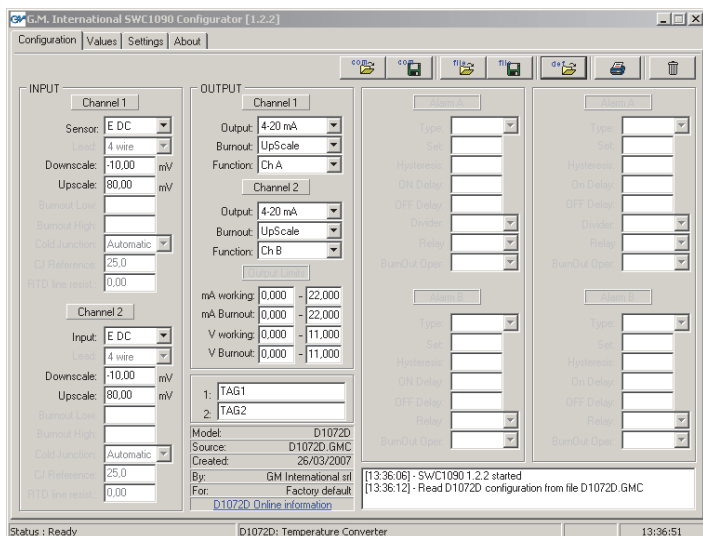
MODEL D1072S

Reference Junction Compensator Option 91

In 1

TC   TC

13 14 15 16

3 +
4 - Supply 12-24 Vdc

Source I   Source V

1
2

mA RL

Out 1

MODEL D1072S

In 1

Pot.   4 wire RTD   3 wire RTD

13 14 15 16

3 +
4 - Supply 12-24 Vdc

Source I   Source V

1
2

mA RL

Out 1

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: first channel tag
2: second channel tag

Each channel has independent configurations.

OUTPUT SECTION:

Output: analog output type

☐ 4-20 mA	current output range from 4 to 20 mA (for SIL applications)	
☐ 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	

Function: analog output function

☐ Ch. A	analog output represents input of first channel	
☐ Ch. B	analog output represents input of second channel	
☐ Add	analog output represents the sum of the two input channels: (A+B)/2	
☐ Sub	analog output represents the difference of the two input channels: A-B	
☐ High Ch	analog output represents the higher of the two input channels	
☐ Low Ch	analog output represents the lower of the two input channels	

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.

Each channel has independent configurations.