EN T121
2 WIRE - LOOP POWERED AND ISOLATED TRANSMITTER FOR TERMORESISTANCE AND THERMOCOUPLE.

GENERAL DESCRIPTION
The T121 instrument converts and transmits the input read into a normalized signal current for 4..20 mA loop. The signal input may come from thermocouple J, K, R, S, T, B, E, N (EN 60584) sensors or RTD (thermoresistances) like Pt100 (EN 60751), Ni100 (DIN 43760), Pt500, Pt1000; T121 besides can read voltages and resistances. The RTD input may be with 2,3 or 4 wire connection.

GENERAL FEATURES
- High precision.
- 16 bit resolution.
- Isolation 1500 Vac.
- Compact size and fast connection with spring terminals.
- Configuration by PC with dedicated software downloadable at www.seneca.it

THECNICAL FEATURES
Output/Power supply

Operating voltage :	7..30 V_{DC}
Current output :	4..20 mA
Load Resistance :	1 KΩ @ 26 V_{DC}, 21 mA (see on pag. 2: Load resistance vs minimum functioning voltage diagram)
Resolution :	2 µA (> 13 bit)
Output in case of over-range	102,5% of full scale (see the table on pag. 5)
Output in case of fault :	105% of full scale (see the table on pag. 5)
Current output protection :	~ 30 mA

Potentiometer input

Value of potentiometer :	Resistance of potentiometer up to 1700 Ω without external resistor.
Exitation current :	375 µA.
Input inpedance :	10 MΩ

TC input

Input impedance:	10 MΩ
Cold junction compensation:	-40..100 ± 1,5 °C; Settable.
Sensor fault detection :	YES, Settable

Ingresso mV

Input impedance :	10 MΩ

RTD / Resistance inputs

Exitation current :	375 µA
Maximum cable resistance :	25 Ω
Influence cable resistance :	0,003 Ω/Ω

Other features

Network freq. Rejection :	50 Hz and 60 Hz (Minimum 60 dB)
Error caused by EMI (*) :	< 0,5 %
Insulation:	1500 V
Sampling Time :	300 ms
Response time (10..90 %) :	<620 ms
Degree protection :	IP 20
Sensor fault detection :	YES
Environmental conditions :	Temperature -40..+85 °C
	Humidity 30 - 90 % at 40°C (non-condensing)
	Altitude: up to 2000 m.a.s.l
Storage Temperature:	-40..+105 °C
Connections :	Spring terminals
Conductor Section :	0,2..2,5 mm^2
Wire stripping :	8 mm
Box:	Nylon / glass, (black colour)
Dimensions :	20,0 mm x ϕ 40,0 mm

Standards :	CE	EN61000-6-4/2002-10 (elettromagnetic emission, industrial environment)
		EN61000-6-2/2006-10 (eletromagnetic immunity, industrial environment)

Diagram: Load resistance vs minimum functioning voltage

$R_{Load}=((U-7)/0.021)$

Minimun functioning voltage U (V_{DC})
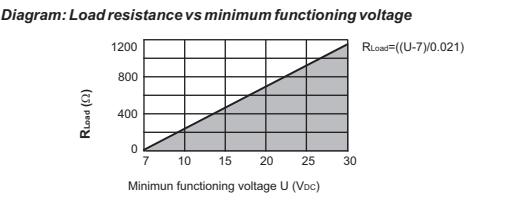
Table range of input

	Input	Range	Calibration error	EMI(*)	Span	Resolution	Standard
Thermocouple	J	-210..1200 °C	0,1 %	< 0,5 %	50 °C	5 µV	EN 60584
	K	-200..1372 °C	0,1 %	< 0,5 %	50 °C	5 µV	EN 60584
	R	-50..1768 °C	0,1 %	< 0,5 %	100 °C	5 µV	EN 60584
	S	-50..1768 °C	0,1 %	< 0,5 %	100 °C	5 µV	EN 60584
	T	-200..400 °C	0,1 %	< 0,5 %	50 °C	5 µV	EN 60584
	B(**)	0..1820 °C	0,1 %	< 0,5 %	100 °C	5 µV	EN 60584
	E	-200..1000 °C	0,1 %	< 0,5 %	50 °C	5 µV	EN 60584
	N	-200..1300 °C	0,1 %	< 0,5 %	50 °C	5 µV	EN 60584
RTD	Ni100	-60..250 °C	0,1 %	< 0,5 %	20 °C	6 mΩ	DIN 43760
	Pt100	-200..650 °C	0,1 %	< 0,5 %	20 °C	6 mΩ	EN 60751
	Pt500	-200..650 °C	0,1 %	< 0,5 %	20 °C	28 mΩ	
	Pt1000	-200..200 °C	0,1 %	< 0,5 %	20 °C	28 mΩ	
Voltage	mV	-150..150 mV	0,1 %	< 0,5 %	2,5 mV	5 µV	
Potent.	Ω	0..1700 Ω	0,1 %	< 0,5 %	10 %	0.0015 %	
Resist.	Ω	0..400 Ω	0,1 %	< 0,5 %	10 Ω	6 mΩ	
Resist.	Ω	0..1760 Ω	0,1 %	< 0,5 %	50 Ω	28 mΩ	

Table of accurry measure : The greater of the sun of (A+B) and C

Type input	A : % of measure	B : % of Span	C : Minimum
Thermocouple J,K,T,N,E	0.05 %	0.05 %	0.5 °C
Thermocouple B, R, S	0.05 %	0.05 %	1 °C
RTD (***)	0.05 %	0.05 %	0.1 °C
Resistance F.S. = 400 Ω	0.05 %	0.05 %	40 mΩ
Resistance F.S. = 1760 Ω	0.05 %	0.05 %	200 mΩ
Voltage mV	0.05 %	0.05 %	15 µV
Potentiometer	0.05 %	0.05 %	0.01 %
Temperature Coefficient :	0.005 % / °C		

* EMI : Electtromagnetic interferences.
** TC B : between 0..250 °C the measure is null.
***RTD : Errors calculate on the value of the resistive sensor.

Configurazione di Fabbrica
The instrument is set by the factory with the following configuration (except for other indications on the box):

TC wiring	→ @ 3+, 4-
Cold junction compensation	→ YES
Input filter	→ Disable
Reversed output	→ NO
TC type	→ K
Measurement Range Start	→ 0 °C
Measurement Full- Scale	→ 1000 °C
Output signal in case of fault	→ Towards the top of the output range.
Over-Range	→ YES: at 2,5 % over-range values is acetable; at 5% over-range value is considered a fault.

Custumized Setting by PC and accessories
The configuration by PC use (see the drawing below) is possible with the following accessories:
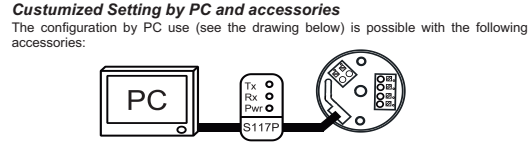
S117P: USB to RS232/TTL
PM002411: connection cable between S117P and T121
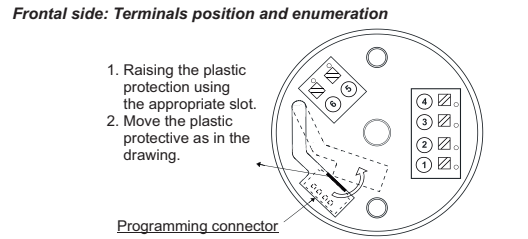**EASYLP**: Dedicated programming software.

The module may be programmed even if it is not supplied by the 4..20 mA loop, since the power supply is provided through the programmer by programming connector.
Once the user has at his disposal the above listed accessories, the following parameters may be set :

%Start and Full scale values of measure.

%RTD Connection: 2 wires, 3 wires or 4 wires.

%Measurement filter: Disable.

%Output: Normal (4..20 mA) or reversed (20..4 mA).

%Type input.

%Cable Resistance Compensation for 2 wires measurement.

%Output signal in case of fault: towards the bottom of the output range or towards the top of
the output range.

It is besides possible the calibration of the output scale. .

Output signal Limit	Over-range / Fault ± 2,5 %	Fault ± 5 %
20 mA	20,4 mA	21 mA
4 mA	3,6 mA	< 3,4 mA

(**) See the table above for the corresponding values

Frontal side: Terminals position and enumeration

1. Raising the plastic protection using the appropriate slot.
2. Move the plastic protective as in the drawing.

Programming connector

Electrical connection
Input
The module allows you to read the thermocouple : J, K, R, S, T, B, E, N and thermoresistance : Pt100 (EN 60751), Pt500, Pt1000 Ni100 with 2,3 or 4 wiring connection; besides T121 can be used to read voltage (mV) and resistance.
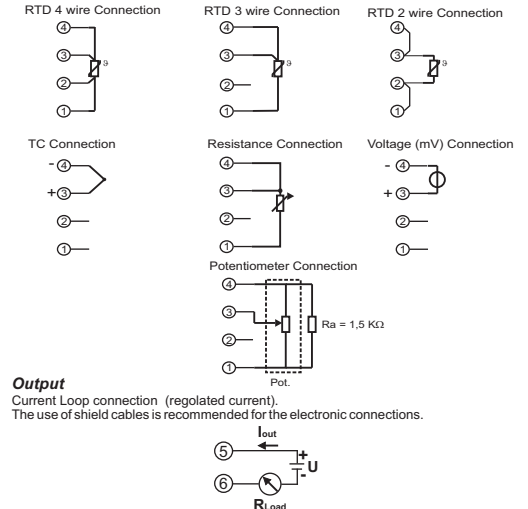
The use of shield cables is recommended for the electronic connections

2-wire connection
This connection can be used for short distances (< 10 m) between module and probe, you should be note that it adds an error (which may be removed by sofware programming) equivalent to the resistance contributed by the connection cables to the measurement.
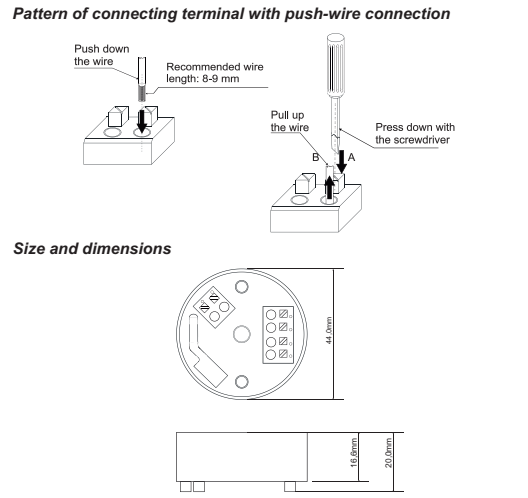The module must be programmed by PC for 2 wires connection.

3-wire connection
This connection can be used for medium-long distances (> 10 m) between module and probe. The instrument performs compensation for the resistance of the connection cables. For a correct compensation the resistance values of each conductors must be the same.
The module must be programmed by PC for 3 wires connection.

4-wire connection
This connection can be used for medium-long distances (> 10 m) between module and probe. Provides the maximum precision because the instrument measure the resistance of the sensor independently of the resistance of the connection cables.
The module must be programmed by PC for 4 wires connection.

Potentiometer input
A potentiometer with resistence between 500..1700 Ω may be connected directly at module. If the potentiometer has a resistance greater than 1,7 KΩ **up to 100 K**Ω, will be necessary to use a resistor in parallel with potentiometer: **Ra equals to 1,5 K** Ω.

RTD 4 wire Connection

RTD 3 wire Connection

RTD 2 wire Connection

TC Connection

Resistance Connection

Voltage (mV) Connection

Potentiometer Connection

Ra = 1,5 KΩ

Pot.

Output
Current Loop connection (regolated current).
The use of shield cables is recommended for the electronic connections.

I_{out}

U

R_{Load}

Note: in order to reduce the instrument's dissipation, we recommend guaranteeing a load

Pattern of connecting terminal with push-wire connection

Push down the wire

Recommended wire length: 8-9 mm

Pull up the wire

Press down with the screwdriver

Size and dimensions

ISO 9001:2008