INSTALLATION MANUAL

T121

PRELIMINARY WARNINGS

The word **WARNING** preceded by the symbol ⚠ indicates conditions or actions that put the user's safety at risk. The word **CAUTION** preceded by the ⚠ symbol indicates conditions or actions that might damage the instrument or the connected equipment.
The warranty shall become null and void in the event of improper use or tampering with the module or devices supplied by the manufacturer as necessary for its correct operation, and if the instructions contained in this manual are not followed.

	**WARNING**: The full content of this manual must be read before any operation. The module must only be used by qualified electricians. Specific documentation is available using the QR-CODE shown on page 1.
	The module must be repaired and damaged parts replaced by the Manufacturer. The product is sensitive to electrostatic discharges. Take appropriate measures during any operation.
	Electrical and electronic waste disposal (applicable in the European Union and other countries with recycling). The symbol on the product or its packaging shows the product must be surrendered to a collection centre authorized to recycle electrical and electronic waste.

DOCUMENTATION
T121

SENECA

QUALITY MANAGEMENT SYSTEM
ISO 9001:2015

SENECA s.r.l.; Via Austria, 26 – 35127 – PADOVA – ITALY; Tel. +39.049.8705359 - Fax +39.049.8706287

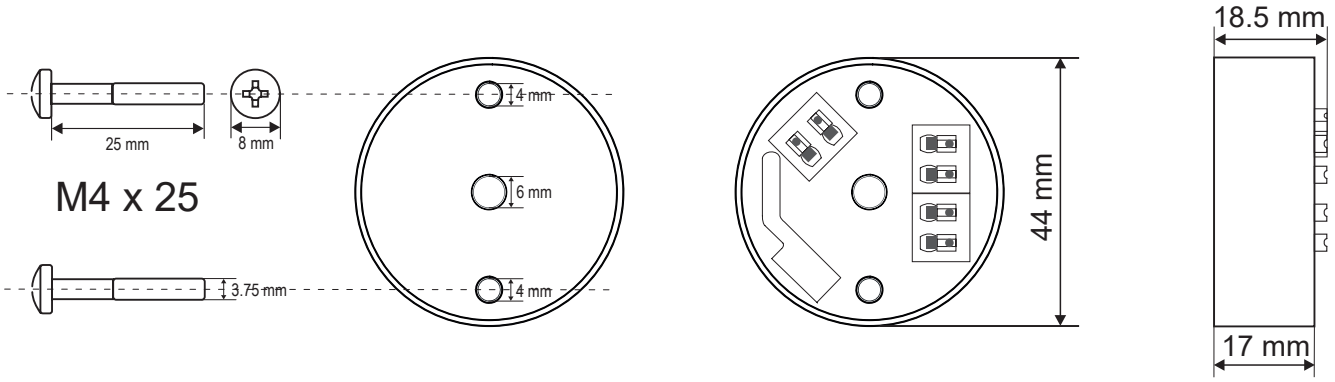
CONTACT INFORMATION

Technical support	supporto@seneca.it	Product information	commerciale@seneca.it

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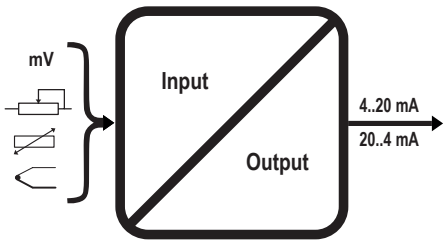
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MODULE LAYOUT



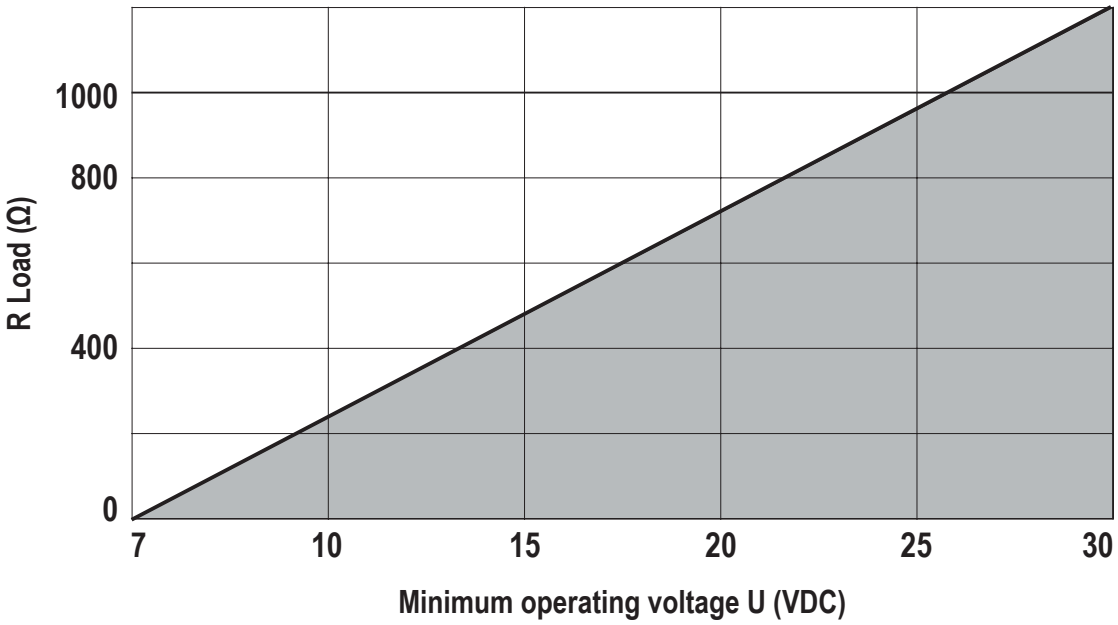
Dimensions LxHxD: 17.5 x 102.5 x 111 mm; **Weight:** 110 g; **Enclosure:** PA6, black

TECHNICAL SPECIFICATIONS

CERTIFICATIONS	
INSULATION	 **1500 Vac**
OUTPUT / POWER	Operating range 7 ÷ 30 Vdc Current output: Loop 4 ÷ 20mAdc Load resistance: 1kΩ @ 26Vdc, 21mA Resolution: 2µA (> 13 bit) Output in case of over-range: 102.5% of full scale Output in case of fault: programmable between 3.4 and 23mA Current output protection
ENVIRONMENTAL CONDITIONS	Temperature: -40 ÷ +85°C; Humidity: 30% ÷ 90% non-condensing; Storage temperature: -40 ÷ +105°C; Degree of protection: IP20.
CONNECTIONS	6 spring clamps for cable from 0.2 to 2.5mm^2 (recommended stripping 8mm) 4-pin TTL serial programming connector
POTENTIOMETER INPUT	Potentiometer value: Potentiometer resistance up to 1700Ω without external resistor Excitation current: 375 µA Input impedance: 10MΩ Fault sensor detection: Yes, it can be deactivated
THERMOCOUPLE INPUT	Input impedance: 10MΩ Cold joint compensation: -40 ÷ 100 ±1.5 °C, can be deactivated Fault sensor detection: Yes, it can be deactivated
INPUT mV	Input impedance: 10MΩ
RTD / THERMOCOUPLE INPUT	Excitation current: 375 µA Fault sensor detection: Yes, it can be deactivated Maximum cable resistance: 25 Ω Influence of cable resistance: 0.0033 Ω/Ω
OTHER SPECIFICATIONS	Sampling period: 300ms Response time (10 ÷ 90%): <620ms Rejection to network frequency: >60dB at 50 and 60Hz EMI error: <0.5% (EMI= Electromagnetic Interference)

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LOAD RESISTANCES / MINIMUM OPERATING VOLTAGE



INPUT MEASUREMENT RANGES

TYPE	INPUT	MEASUREMENT RANGE	MINIMUM SPAN	SOLUTION	STANDARD
THERMOCOUPLE	J	-210 ÷ 1200°C	50°C	5µV	EN60584
	K	-200 ÷ 1372°C	50°C	5µV	EN60584
	R	-50 ÷ 1768°C	100°C	5µV	EN60584
	S	-50 ÷ 1768°C	100°C	5µV	EN60584
	T	-200 ÷ 400°C	50°C	5µV	EN60584
	B(*)	0 ÷ 1820°C	100°C	5µV	EN60584
	E	-200 ÷ 1000°C	50°C	5µV	EN60584
	N	-200 ÷ 1300°C	50°C	5µV	EN60584
	L	-200 ÷ 800°C	50°C	5µV	GOST 8.585
RTD	Ni100	-60 ÷ 250°C	20°C	6mΩ	DIN 43760
	Ni120	-80 ÷ 260°C	20°C	6mΩ	DIN 43760
	Ni1000	-60 ÷ 120°C	20°C	6mΩ	DIN 43760
	Pt100	-200 ÷ 650°C	20°C	28mΩ	EN 60751
	Pt500	-200 ÷ 650°C	20°C	28mΩ	
	Pt1000	-200 ÷ 200°C	20°C	28mΩ	
	Cu50	-180 ÷ 200°C	20°C	6mΩ	GOST 6651
	Cu100	-180 ÷ 200°C	20°C	6mΩ	GOST 6651
VOLTAGE	mV	-150 ÷ 150°C	2.5mV	5µV	
POTENTIOMETER	Ω	500Ω ÷ 100kΩ	10%	0.0015%	
RESISTANCE	Ω	0 ÷ 400Ω	10mΩ	6mΩ	
	Ω	0 ÷ 1760Ω	50mΩ	28mΩ	

(*) The measurement of thermocouple B between 0°C and 250°C is zero.

N.B.: EMI: Electromagnetic interference can cause an error of < 0.5% of Span

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Accuracy measurement table: the greater between the value of the sum A + B and the value C

Input Type	A: % of measurement	B: % of Span	C: Minimum
Thermocouple J, K, T, N, E, L	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 0 ÷ 400	0.05%	0.05%	40mΩ
Resistance 0 ÷ 1760	0.05%	0.05%	200mΩ
Voltage	0.05%	0.05%	15µV
Potentiometer	0.05%	0.05%	0.01%

(*) The measurement of thermocouple B between 0°C and 250°C is zero.
(**) RTD: errors calculated on the resistive value of the sensor.

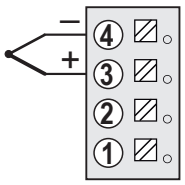
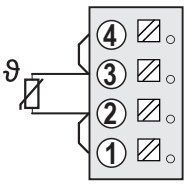
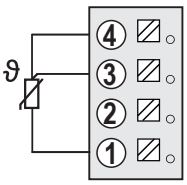
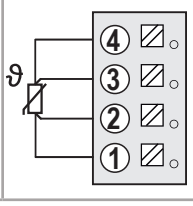
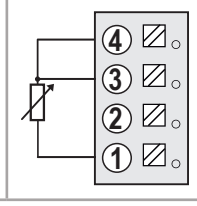
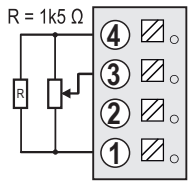
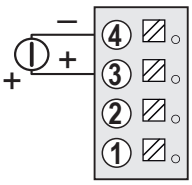
ELECTRICAL CONNECTIONS

⚠ CAUTION

To meet the electromagnetic immunity requirements:
- Use shielded signal cables;
- Connect the shield to a preferential instrumentation earth system;
- Separate shielded cables from other cables used for power installations (transformers, inverters, motors, etc.).

ANALOGUE INPUT:

The module allows for reading temperature inputs such as thermocouples (TC), RTD thermo-resistances with 2, 3 or 4 wire connection and retransmits the input reading on the 4 ÷ 20mA output loop.
The instrument can also be used to read voltages (mV) and resistances (Ω).

Thermocouple Connection	2-wire RTD Connection	3-wire RTD Connection	4-wire RTD Connection	Resistance Connection	Potentiometer Connection	Voltage (mV) Connection
						

2-wire Connection
This connection can be used for short distances (< 10 m) between module and probe. Remember that this connection introduces a measurement error equal to the resistance of the connection cables (which can be eliminated via software). The module must be appropriately programmed from a PC for 2-wire connection.

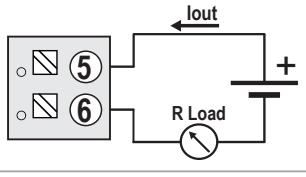
3-wire Connection:
A connection to be used for medium-long distances (> 10 m) between module and probe. The instrument compensates the resistance of the connection cables. To ensure correct compensation, each conductor must have the same resistance. The module must be appropriately programmed from a PC for 3-wire connection.

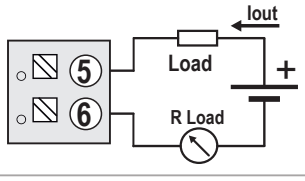
4-wire Connection:
A connection to be used for medium-long distances (> 10 m) between module and probe. It offers maximum precision, in view of the fact that the instrument reads the resistance of the sensor independently from the resistance of the cables. The module must be appropriately programmed from a PC for 4-wire connection.

Potentiometer Connection:
A potentiometer with resistance between 500 and 1.7kΩ can be connected directly to the module. If the potentiometer you want to use has a resistance greater than 1.7kΩ up to a maximum of 100kΩ it will be necessary to use a resistor in parallel with the potentiometer: R =1.5 kΩ.

ANALOGUE OUTPUT:

Current loop connection 4 ÷ 20mA (regulated current).

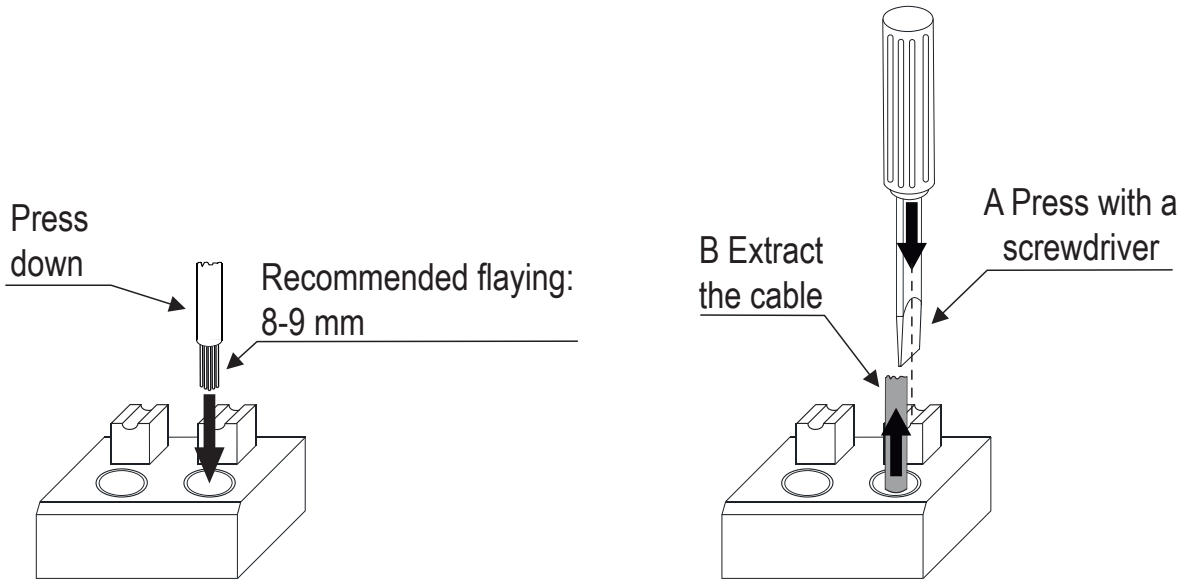




NOTE:
To reduce the dissipation of the instrument it is useful to connect a load >250Ω

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INSERTION AND EXTRACTION FROM SPRING CLAMPS WITH A PUSH-WIRE CONNECTION



SETTINGS

SOFTWARE CONFIGURATION

Configuring the module via PC is possible using the following accessories:
S117P: Opto-insulated, asynchronous USB-TTL, USB-RS232 and USB-RS485 serial converter
EASY-USB: Non-isolated USB-UARTTTL converter
The module can be powered by the programming connector.
Therefore, it is possible to configure the instrument even if disconnected from the 4 ÷ 20 mA loop.
The following parameters can be set by the software:

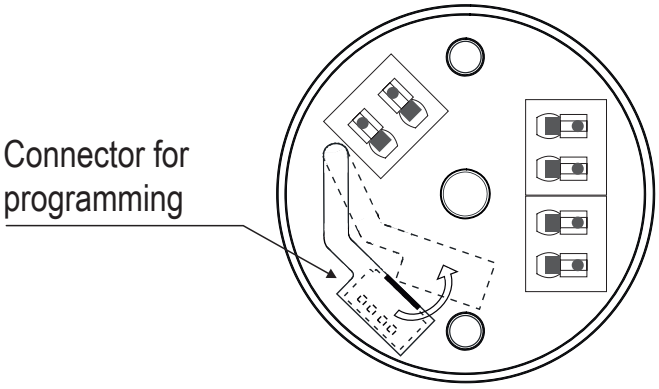
- Measurement scale start and end.
- RTD Connection: 2-wire, 3-wire and 4-wire.
- Measurement filter: Excluded/Included.
- Output: Normal (4 ÷ 20 mA) or Inverted (20 ÷ 4 mA).
- Input type.
- Compensation on cable resistance for 2-wire measurement.
- Setting output value in case of fault: value in mA.
- Cold junction compensation: YES/NO
- Over-Range: NO (Output limited between 0% and 100%) or YES (Output limited between -2.5% and 102.5%).

The following table illustrates the values of the respective parameters.

TABLE OF OUTPUT / OVER-RANGE / FAULT LIMITS

Output limits	Over-range / ± 2.5%	Fault ±5%
20mA	20.4mA	21mA
4mA	3.6mA	< 3.4mA

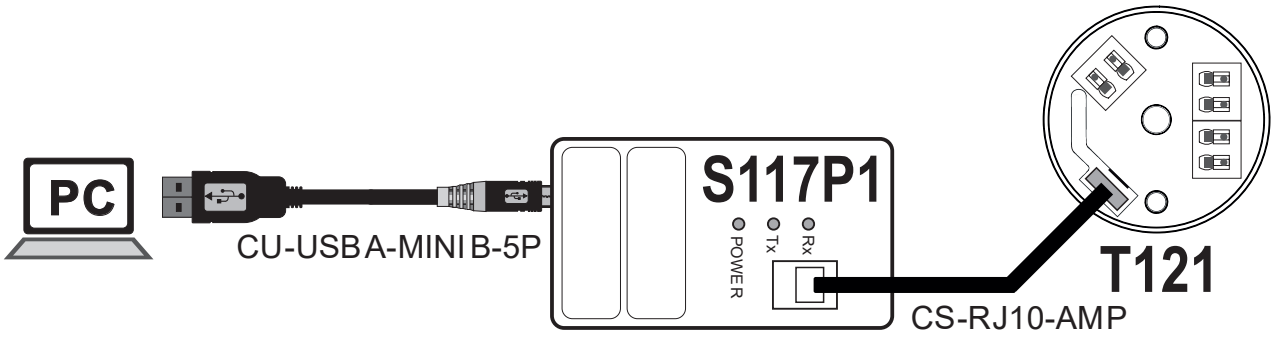
ACCESS TO THE CONNECTOR FOR PROGRAMMING



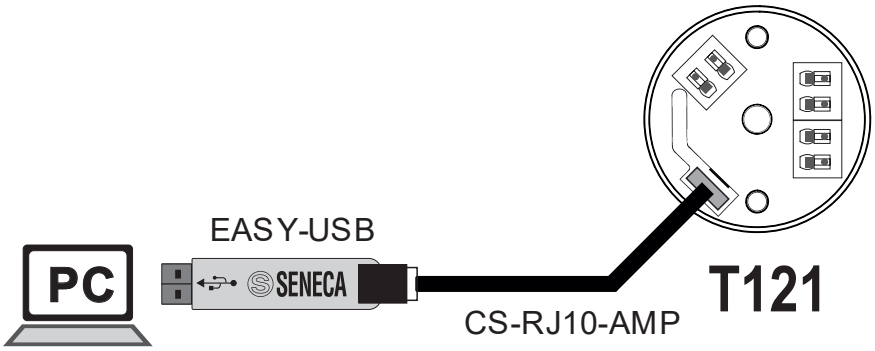
1. Raise the protective plastic using the appropriate slot;
2. Move the protective plastic as per the drawing.

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CONNECTION TO THE CONVERTER FOR S117P1 PROGRAMMING



CONNECTION TO THE CONVERTER FOR EASY-USB PROGRAMMING



FACTORY SETTINGS

The instrument leaves the factory with the following default configuration which corresponds (unless otherwise indicated on the instrument) to:

TC Connection	Spring clamps 3+, 4-
Cold joint compensation	YES
Filter	excluded
Inversion Output	NO
TC type	K
Measurement Scale start	0 °C
Measurement Full scale	1000 °C
Fault output	21 mA
Over-Range	YES (Output limited between -2.5 % and 102.5 %)

USER CONFIGURABLE SENSOR TYPES

SENSOR	TYPE	WORKING RANGE
CUSTOM	mV	± 150mV
	RTD < 400Ω	0 ÷ 400Ω
	RTD < 1760Ω	0 ÷ 1760Ω
	TC	± 150mV
	Potentiometer	500Ω ÷ 100kΩ
	Resistance < 400Ω	0 ÷ 400Ω
	Resistance < 1760Ω	0 ÷ 1760Ω

CUSTOMISATION OF THE INTERPOLATION CURVE

The EASY SETUP software allows for configuring the instrument to linearise even Custom sensors as long as their working range is within the indicated limits.
The curves of some additional sensors are already included in the software.
There is also a tool to correctly configure the S311A product connected to the T121.

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ATEX SAFETY INSTRUCTIONS

The T121 Converter category 3 device is designed to be installed in area 2.
It complies with the following standards:
EN IEC 60079-0.2018; EN IEC 60079-7:2015+A1:2018; EN 60079-31:2014.

⚠ CAUTION

The system can be used in environments with group IIC gases and group IIIC powders, T4 temperature class, maximum surface temperature T=135°C and TAMB= -20°C / +65°C.
Comply with the conditions provided for use in potentially explosive areas: install the device in a case certified as suitable for area 2 (with IP54 minimum degree of protection in ATEX gas areas), and suitable for area 22 (with IP6X minimum degree of protection in ATEX powder areas).

Installation, operation and maintenance can be performed only by qualified personnel. Follow the installation instructions as described in the installation manual.
The K121 Converter must be installed and maintained in compliance with the system and maintenance regulations for environments classified against the risk of explosion due to the presence of gas (example: EN 60079-14, EN 60079-17 or other national regulations/standards).
It is not allowed to open or modify the device. It is not allowed to repair the device, repairs can be carried out only by the manufacturer. In case of malfunctions, contact the manufacturer. Do not subject the device to mechanical and/or thermal loads exceeding the specified limits.

⚠ CAUTION
DO NOT DISCONNECT WHILE LIVE

ELECTRICAL CONNECTIONS:
Electrical connections must be made as stated in the use and maintenance manual. Connect to the T121 Converter only devices designed to operate in:
- area 2 and suitable to the conditions in the place of use (II 3G Ex nA mark)
- area 22 and suitable to the conditions in the place of use (II 3D Ex tc mark).

The manufacturer is not responsible for damages deriving from improper and/or dangerous use.

ATEX MARK The following marking is printed on the product container:

CE Ex

II 3G Ex nA IIC T4 Gc X
II 3D Ex tc IIIC T135°C Dc X
TAMB: -20 ; +65°C

II = group II (surface)
3 = category 3 (area 2/22)
G = explosive atmosphere with gases or vapours explosive atmosphere with dust
D = gas group IIC
IIC = group of conductive powders
IIIC = temperature class
T4 = maximum surface temperature 135°C EPL
T135° = special conditions of use
TAMB = range of ambient temperature -20 ; +65°C