



# TxIsoRail-HRT

## TEMPERATURE TRANSMITTER - OPERATING MANUAL – V1.1x D

### INTRODUCTION

The **TxIsoRail-HRT** is a configurable DIN rail mount temperature transmitter widely required in various industrial processes. Its universal input can be configured to read RTDs, thermocouples and mV signals.

It converts the input signal into a 4-20 mA linear output proportional to the configured range. The **TxIsoRail-HRT** uses the HART® communication protocol over the 4-20 mA output current loop.

The input and output are electrically isolated, enhancing their performance and user and system safety.

### SPECIFICATIONS

**Sensor input:** User defined. The supported sensors are listed in **Table 1**, along with their maximum measurement and minimum retransmission ranges.

**Thermocouples:** Types J, K, R, S, T, N, E and B according to IEC 60584 (ITS-90).

Impedance >> 1 MΩ

**Pt100:** Excitation 0.15 mA,  $\alpha = 0.00385$ , according IEC 60751 (ITS-90).

**Pt1000:** Excitation 0.20 mA,  $\alpha = 0.00385$ , according IEC 60751 (ITS-90).

**NTC R<sub>25</sub>:** 10 kΩ ± 1 %,  $\beta_{25/85} = 3435$

**Voltage:** 0 to 50 mVdc. Impedance >> 1 MΩ

Sensor Type	Maximum Measurement Range	Minimum Retransmission Range
Thermocouple K	-150 to 1370 °C (-238 to 2498 °F)	50 °C (90 °F)
Thermocouple J	-100 to 760 °C (-148 to 1400 °F)	50 °C (90 °F)
Thermocouple R	-50 to 1760 °C (-58 to 3200 °F)	200 °C (360 °F)
Thermocouple S	-50 to 1760 °C (-58 to 3200 °F)	200 °C (360 °F)
Thermocouple T	-160 to 400 °C (-256 to 752 °F)	50 °C (90 °F)
Thermocouple N	-270 to 1300 °C (-454 to 2372 °F)	50 °C (90 °F)
Thermocouple E	-90 to 720 °C (-130 to 1328 °F)	50 °C (90 °F)
Thermocouple B	500 to 1820 °C (932 to 3308 °F)	200 °C (360 °F)
Pt100	-200 to 650 °C (-328 to 1202 °F)	30 °C (54 °F)
Pt1000	-200 to 650 °C (-328 to 1202 °F)	30 °C (54 °F)
NTC	-30 to 120 °C (-22 to 248 °F)	10 °C (18 °F)
Voltage	0 to 50 mV	3 mV

**Table 1** – Sensors accepted by the transmitter

**Switch-on delay:** < 10 s with factory damping filter configured. The accuracy is only guaranteed after 15 min.

**Terms of reference:** Ambient: 25 °C (77 °F); voltage: 24 Vdc, load: 250 Ω. 15 minutes required for stabilization time after configuration.

**Temperature Effect:**

**NTC:** < 0.11 % FS / 25 °C (77 °F)

**Other sensors:** < 0.05 % FS / 25 °C (77 °F)

(FS = Full Scale)

**Response time:** Typical 6 s using factory damping filter. This is the maximum time between a temperature step being applied in the input and the output reaching 90 % of the corresponding value.

**HART Protocol Version:** 7

**RTD cable resistance effect:** 0.005 °C / Ω

**Maximum allowable cable resistance for RTD:** 25 Ω

**Accuracy:** Calibration error in relation to sensor measuring range.

Sensor Type	CURRENT LOOP		HART	
	Typical Error	Maximum Error	Typical Error	Maximum Error
Pt100 (-200 to 650 °C)	0.08 %	0.15 %	0.05 %	0.15 %
Pt1000 (-200 to 650 °C)	0.07 %	0.15 %	0.04 %	0.15 %
K, J, R, S, T, N, E, B	0.07 % (*)	0.15 % (*)	0.04 % (*)	0.15 % (*)
mV	0.07 %	0.15 %	0.04 %	0.15 %
NTC	0.20 °C (0.36 °F)	0.45 °C (0.81 °F)	0.15 °C (0.27 °F)	0.45 °C (0.81 °F)

**Table 2** – Input accuracy

(\*) **Add cold junction compensation:**  $\pm 1$  °C (1.8 °F).

**Power supply influence:** < 0.005 % / V typical (percentage of the full measure range).

**Output (4-20 mA):** 4-20 mA current, 2-wires; and proportional to the configured range.

**Output Resolution (4-20 mA):** 0.25 μA

**Power supply:** 8.5 to 36 Vdc (output 4-20 mA)

**Maximum load (RL):**  $RL (max.) = (Vdc - 8.5) / 0.0215 [\Omega]$

**Where:** Vdc = Power supply voltage (8.5 to 36 Vdc)

**Operating Temperature:** -40 to 85 °C (-40 to 185 °F)

**Humidity:** 0 to 90 % RH

**It features electrical isolation between input and output:** 1.5 kVrms

**Internal protection against polarity inversion.**

**Cold junction compensation for thermocouples.**

**Connection Wire Cross Section:** 0.14 to 1.5 mm<sup>2</sup>

**Screw Tightening:** 0.8 Nm

**Housing:** ABS UL94-HB

**Protection:** IP20

**Standards and Certifications:** NAMUR NE-43 standard and CE and HART® certifications.

## CONFIGURATION

When the transmitter is used with the factory setting, no further action is required and the transmitter is ready to be installed. Changes to the configuration are possible through the **TxConfig II** software, provided free of charge.

The **TxConfig II** configuration software allows the device configuration. A **TxConfig-HRT** interface is required to allow the communication between a computer and the device. The **Txconfig II** configuration software is continuously updated and new versions can be downloaded at no charge from the manufacturer's website. To install, execute the **TxConfigIISetup.exe** file and follow the instructions.

The interface connects the transmitter to the computer, as shown in **Fig. 1**:

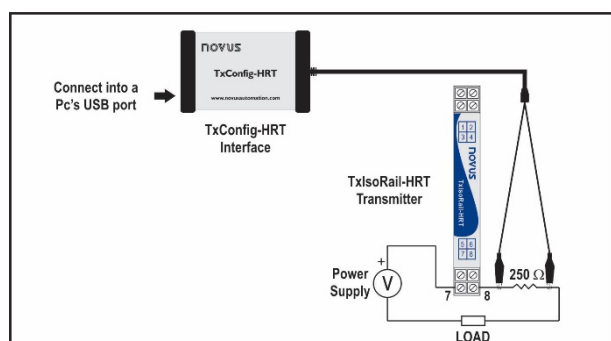


Fig. 1 – TxConfig-HRT interface connection to the TxIsoRail-HRT

## SOFTWARE CONFIGURATION:

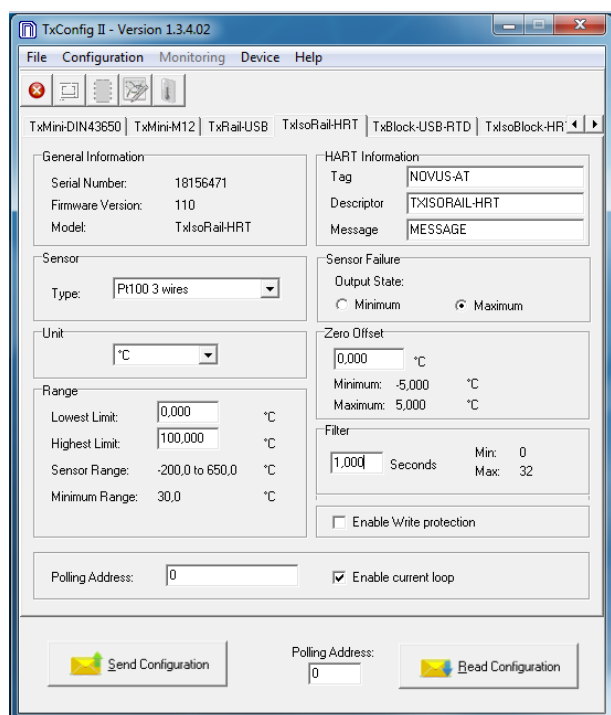


Fig. 2 – TxConfig II software main screen

The fields in the screen mean:

- General Information:** This field shows information that identifies the transmitter. This information should be sent to the manufacturer in an eventual request for technical assistance.
  - Sensor:** Select the type of sensor to be used. See **Table 1**.
  - Unit:** Select the temperature unit to °C (Celsius) or °F (Fahrenheit).
  - Range:** Sets de measurement range of the transmitter.
    - Lowest Limit:** Equivalent temperature for a current of 4 mA.
    - Highest Limit:** Equivalent temperature for a current of 20 mA.
- Sensor Range**
- The values chosen cannot exceed the **Range of Sensor** shown in this field. See **Table 1** of this manual.

## Minimum Range

Do not set a lower band (span) that the **Minimum Range** indicated below in this same field. See **Table 1** of this manual.

## 5. HART Information:

**Tag:** Field with a brief identification of the equipment (up to 8 characters);

**Descriptor:** Descriptor used by the master to register the data (up to 16 characters);

**Message:** Message used by the master for registering (up to 32 characters);

## 6. Sensor Failure:

It establishes the output behavior, when the transmitter indicates a failure:

**Minimum:** Output current goes to < 3.6 mA (down-scale), typically used for refrigeration.

**Maximum:** Output current goes to > 21.5 mA (up-scale), typically used for heating.

## 7. Zero Offset:

It corrects small deviations presented in the transmitter output, for example, when the sensor is replaced.

## 8. Filter:

Damping filter.

The damping filter changes the response time of the transmitter in order to smooth the variations in the output. The value set in the filter indicates the time interval at which the PV will reach 63 % of its final value.

The factory setting is 1.0 s, and can be changed from 0 s to 32 s. For example, in the case where the temperature should range from 0 °C to 100 °C, if you considering the factory settings, after 1.0 s the temperature value shall be equal to 63 °C. A zero value disables this function.

## 9. Enable Write protection:

When activated, configuration is not allowed.

## 10. Send Configuration:

It applies the new setup. Once sent, the setup will be immediately applied on the transmitter.

## 11. Read Configuration:

Reads the current configuration in the transmitter connected. The screen now presents the current setup that may be changed by the user.

## 12. Polling Address:

Dynamic (i.e., configurable) address that allows devices to be quickly identified on a network.

## 13. Enable Current Loop:

When disabled, the current remains at 4 mA.

## FACTORY SETTINGS

- Sensor: Pt100 3-wire, range 0 to 100 °C
- Sensor failure: Upscale (maximum)
- 0 °C zero correction
- Unit: °C
- Filter: 1.0 s
- Address: 0
- Current Loop: Enabled

	<p>It is possible to configure the device through a third party software and with the help of an FSK modem to perform HART® communication.</p>
	<p>An EDD (Electronic Device Descriptor) file is available, which can be used with compatible systems and allows access to the settings and supervise the transmitter.</p>
<p>To put the devices on the same network (or put them in multidrop mode), they must have different polling addresses and the current loop must be disabled.</p>	

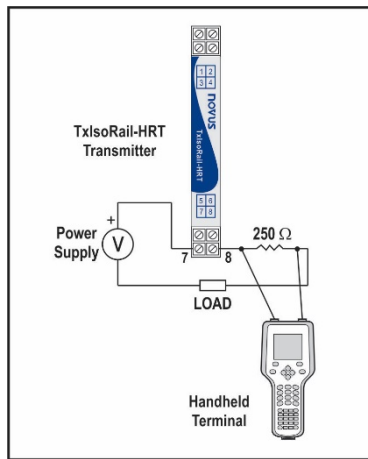


Fig. 3 – Handheld terminal connection

## MECHANICAL INSTALLATION

The **TxIsoRail-HRT** transmitter is suitable to be installed in 35 mm DIN rail. Vibrations, moisture and extreme temperatures, electro-magnetic interference, high voltage and other interferences can permanently damage the unit, and could cause error in the measured value.

## DIMENSIONS

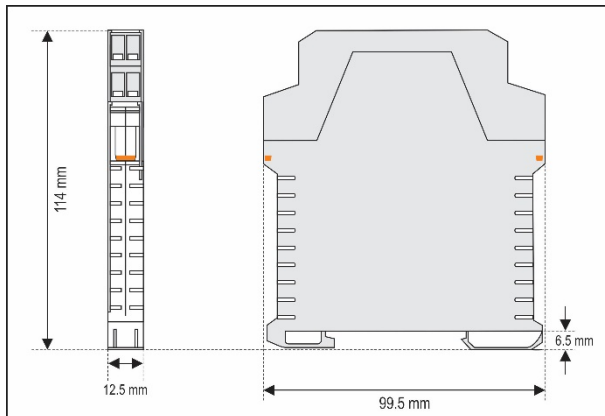


Fig. 4 – Transmitter dimensions

## ELECTRICAL INSTALLATION

The Fig. 5 shows the electrical connections required. The **TxIsoRail-HRT** wiring for thermocouple, RTD, resistance and voltage are done according to the Fig. 4.

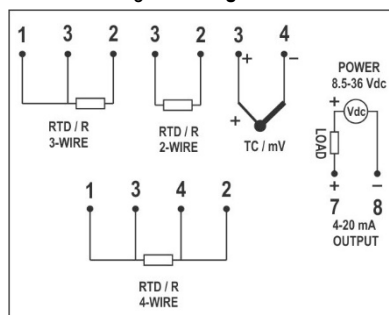


Fig. 5 – TxIsoRail-HRT transmitter electrical connections

**LOAD** represents the 4-20 mA current measuring device (indicator, controller, register, etc.).

- Polyamide enclosure.
- Section of the cable used: 0.14 to 1.5 mm<sup>2</sup>.
- Recommended torque in the terminal: 0.8 Nm.

## RECOMMENDATIONS FOR INSTALLATION

- Conductors of small electrical signals must be distant from activation or high-tension/current conductors, preferably passing through grounded conduits.
- A specific electrical power supply network should be provided for instruments use only.
- In controlling and monitoring applications, possible consequences of any system failure must be considered in advance.
- RC filters (47 Ω and 100 nF) in inductor charges (contactors, solenoids, etc.) are recommended.

## ELECTRICAL CONNECTIONS

The figures below show the electrical connections required. The terminals 1, 2, 3 and 4 are dedicated to the sensor connection. **LOAD** represents the 4-20 mA current measuring device (indicator, controller, recorder, etc.).

### Pt100 2-WIRE

**Note:** When the Pt100 2-wire the terminals 1 and 3 must be interconnected, according to the figure below.

To use the Pt100 2-wire, you must configure the Pt100 3-wire option in **TxConfig II**.

The Pt100 wire length **should be less than 30 cm** to maintain the measurement error within specifications (electrical resistance).

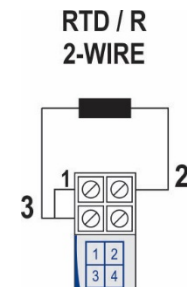


Fig. 6 – Transmitter electrical connections (Pt100 2-wire)

### Pt100 3-WIRE

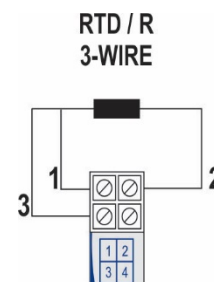


Fig. 7 – Transmitter electrical connections (Pt100 3-wire)

### Pt100 4-WIRE

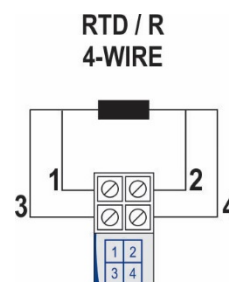


Fig. 8 – Transmitter electrical connections (Pt100 4-wire)

**Pt100 3 and 4-wire / Pt1000 3 and 4-wire:** The use of wires with same length and gauge is recommended for a better resistance compensation. The transmitter compensates up to 25 ohm per wire.

## THERMOCOUPLES

### THERMOCOUPLE SENSOR

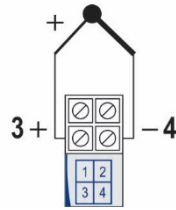


Fig. 9 – Transmitter electrical connections (Thermocouple)

## VOLTAGE (0-50 mV)

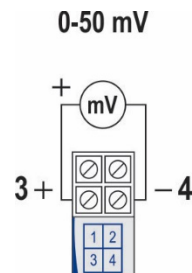


Fig. 10 – Transmitter electrical connections (0-50 mV)

## NTC

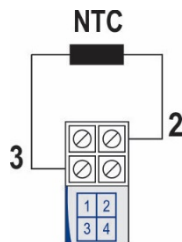


Fig. 11 – Transmitter electrical connections (NTC)

## OUTPUT (4-20 mA)

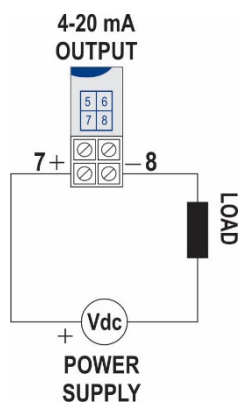


Fig. 12 – Transmitter electrical connections (4-20 mA)

It is important to note that the accuracy of the transmitter refers to the maximum range of the sensor used, regardless of the actual span. Example:

- The sensor Pt100 has a maximum range of -200 to 650 °C and typical accuracy 0.08 %.
- Thus, we can have a typical error up to 0.68 °C (0.08 % of 850 °C).
- This error is the same, no matter if total span is used (-200 to 650 °C) or a narrower user-defined span is used, like 0 to 100 °C.

## WARRANTY

Warranty conditions are available on our website [www.novusautomation.com/warranty](http://www.novusautomation.com/warranty).

## OPERATION

The transmitter is factory calibrated with standardized sensors, not requiring any adjustment by the user.

Fine corrections can be accomplished through the **TxConfig II** software (in units of temperature).

The user may choose the sensor and the span that best fits its application. The sensor span must lie within the range specified for the selected sensor.