

# SMARTMETER

## PORTABLE TEMPERATURE METER - INSTRUCTIONS MANUAL – V1.0x



### 1 INTRODUCTION

SmartMeter is a portable temperature meter with high-contrast LCD. The Smart Meter housing enables industrial environment or bench-top operation and provides a belt carrying fixture. It supports 2 temperature sensors with independent and concurrent display of measured values. It provides the capability of reading 0-50 mV electric signals with configurable indication scale.

Difference between channels, relative measure, minimum, maximum and average values, hold and alarm functions are also available. It also features an auto power off resource in case the device is idle, in order to extend battery life.

The device is supplied with a K-type thermocouple with 1.5 m cable.

#### 1.1 UNPACKING

The meter is supplied in proper packaging that offers suitable protection during transit and storage. Unpack with care. Upon delivery, make sure that there is no damage to the instrument, and that there are no missing items.

Within packaging, you should find, besides the manual, the meter and a K-type thermocouple sensor.

### 2 SPECIFICATIONS

Input types and max. indication range

J thermocouple .....	- 100 to 760 °C
K thermocouple.....	- 150 to 1,370 °C
T thermocouple.....	- 160 to 400 °C
E thermocouple.....	-90 to 720 °C
N thermocouple .....	- 270 to 1,300 °C
R thermocouple .....	- 50 to 1,760 °C
S thermocouple.....	- 50 to 1,760 °C
B thermocouple.....	500 to 1,820 °C
Pt100 .....	- 200 to 600 °C
Voltage 0-50 mV .....	- 1,999 to 9,999 (Adjustable)

All input types are factory calibrated. NBR 12771, Pt100 NBR 13773/97 (IEC-751) (385) calibrated thermocouples.

Accuracy:	Thermocouples: .....	0.25 % F.S. ± 1 °C
	Pt100:.....	0.2 % F.S. ± 1 °C
	0-50 mV: .....	0.2 % F.S. ± 1 digit

Resolution:..... 0.1 °C

Sampling rate:..... 2 timer per second

Input impedance:..... > 10 MΩ (Thermocouples, 50 mV)

Pt100 excitation current:.....0.165 mA

Power supply: .....

AC / DC adapter .....

Estimated autonomy:..... 400 hours (alkaline battery)

Dimensions:..... 165 x 73 x 36 mm

Weight:.....205 g

Protection: .....

### 3 CONNECTIONS

Female input connectors suitable for RTD / TC compensated connectors, as shown below.

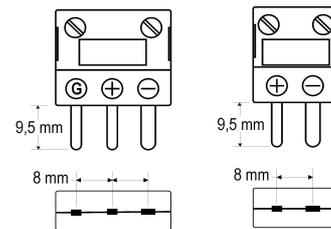


Figure 01 — Meter supported connectors

Only two input terminals are used to connect thermocouples. Input terminals have different size holes, which prevent inappropriate installations.

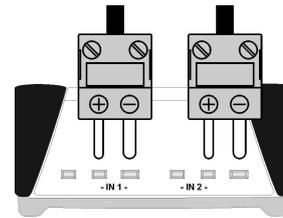


Figure 02 — Thermocouple connection

All three terminals are used for Pt100 (RTD)

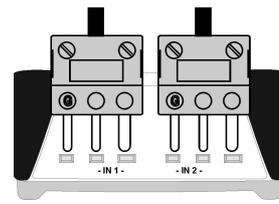


Figure 03 – Pt100 connectors sensors

The Pt100 internal connections should be made as shown in figure below.

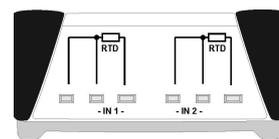


Figure 04 — Internal connections of Pt100 sensors

For the 0-50 mV signal, installation should comply with the following connections:

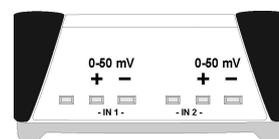


Figure 05 — 0-50 signal connection

## 4 OPERATION

The meter features two input channels. Channel readouts are updated two times per second. Channel 1 readouts are shown in the largest digits and channel 2 readouts are shown in the smallest digits, as Figure 07 shows. Channel 02 can be turned-off by operator.

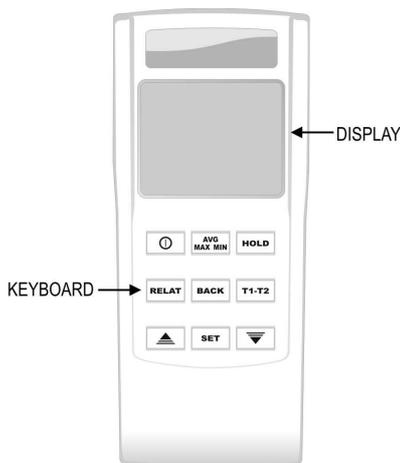


Figure 06 — Meter front panel



Figure 07 — SmartMeter display

### 4.1 TURNING THE METER ON/OFF

Press  $\text{⓪}$  to turn on the meter. To turn off, press for 3 seconds.

The meter basic configuration is factory set, so it can be immediately used with the sensor provided. Factory configuration is: two enabled channels, K-type sensor, one decimal space, zero offset, sound alarm not enabled, auto power off after five minutes, temperature unit in degrees Celsius, 60 Hz filter and channels 1 and 2 for special functions.

### 4.2 FIRST READOUTS

Insert the sensor provided with the meter in the terminals of the required channel and take the sensor leads to the measurement location. Check the indication displayed.

Use the keys to find special functions the meter offers. When using other sensors, check if factory setup is still compliant. If not, access the configuration cycle and change settings.

### 4.3 SPECIAL FUNCTIONS

#### HOLD FUNCTION

It “freezes” the measure reading indication. HOLD is then displayed. It is activated by pressing key  $\text{HOLD}$ . To resume the meter operation, press key  $\text{HOLD}$  again.

#### MIN FUNCTION

It allows the user to retrieve the **minimum** temperature value measured within an interval. An indicator of such condition is displayed in the meter. It is activated by pressing key  $\text{AVG MAX MIN}$ . To resume the meter operation, press key  $\text{AVG MAX MIN}$  again.

#### MAX FUNCTION

It allows the user to retrieve the **maximum** temperature value measured within an interval. An indicator of such condition is displayed in the meter. It is activated by pressing key  $\text{AVG MAX MIN}$ . To resume the meter operation, press key  $\text{AVG MAX MIN}$  again.

#### AVG FUNCTION (average)

It displays the **average** temperature value measured within an interval. An indicator of such condition is displayed in the meter. It is activated by pressing key  $\text{AVG MAX MIN}$ . To resume the meter operation, press key  $\text{AVG MAX MIN}$  again.

**Notes:** Functions MIN, MAX and AVG are accessed via key  $\text{AVG MAX MIN}$ . Values displayed are the ones acquired from the start of an interval of measurements. The interval starts after a *RESET* action. To reset the meter, press and hold key  $\text{AVG MAX MIN}$  for more than 10 seconds. When reset button is pressed, MIN, MAX and AVG values are erased and a new interval starts.

#### RELAT FUNCTION (relative)

When enabled, it will void the measured values and starts to indicate variations from such zeroed values. An indicator of such condition is displayed in the meter. It is activated by pressing key  $\text{RELAT}$ . To resume the meter operation, press key  $\text{RELAT}$  again.

#### T1 – T2 FUNCTION

When enabled, it displays the highest value corresponding to the difference between the value measured through channel 1 and the value measured through channel 2. The indication corresponding to channel 2 is not changed. An indicator of such condition is displayed in the meter. It is activated by pressing key  $\text{T1-T2}$ . To resume the meter operation, press key  $\text{T1-T2}$  again.

**Note:** This function is only enabled when both channels are enabled and operating.

#### ALARMS

The meter has an audible alarm (BEEP) that can inform the operator about an alarm condition. In each channel there can be two indication values, when they are reached the audible alarm is triggered. A visual indicator is also displayed in the meter when the indication is under an alarm condition.

#### LOW BATTERY INDICATOR

A low meter indicator is displayed warning that the battery should be replaced.

#### SET UP

To set up the meter, the user must access the Alarm and Meter Set up cycles, where a series of parameters must be defined.

#### ALARM CYCLE

In the alarm cycle you find the setpoints parameters of the meter alarms. Press  $\text{SET}$  to access this cycle. The meter displays **SPH 1**, the first parameter of the cycle. To access the remaining parameters of this cycle, press  $\text{SET}$  again, until you reach the measures screen.

Keys  $\text{▲}$  and  $\text{▼}$  make possible to change the parameters defined.

The parameters of this cycle are:

#### **SPH 1 (Highest setpoint of channel 1)**

Determines a temperature value in channel 1 that when exceeded upwards triggers the meter alarm (BEEP). When the alarm is triggered, the indication **ALARM** is displayed in the meter.

#### **SP L 1 (Lowest setpoint of channel 1)**

Determines a temperature value in channel 1 that when exceeded downwards triggers the meter alarm (BEEP). When the alarm is triggered, the indication **ALARM** is displayed in the meter.

#### **SPH 2 (Highest setpoint of channel 2)**

Determines a temperature value in channel 2 that when exceeded upwards triggers the meter alarm (BEEP). When the alarm is triggered, the indication **ALARM** is displayed in the meter.

#### **SP L 2 (Lowest setpoint of channel 2)**

Determines a temperature value in channel 2 that when exceeded downwards triggers the meter alarm (BEEP). When the alarm is triggered, the indication **ALARM** is displayed in the meter.

## CONFIGURATION CYCLE

To enter the configuration cycle, press **BACK** and **SET**. The meter displays **LYP.1**, the first parameter of the cycle. To access the remaining parameters of this cycle, press **SET**. Keys **▲** and **▼** make possible to change the parameters defined. To access the measures screen, go to the end of this cycle or press keys **BACK** and **SET** again.

The parameters of the configuration cycle are:

### LYP.1

Selects the channel 1 sensor according to Table 1. Channel 1 sensor is chosen regardless of the channel 2 sensor selection.

### LYP.2

Selects the channel 2 sensor according to Table 1. Channel 2 sensor is chosen regardless of the channel 1 sensor selection. Channel 2 indication can be disabled.

Code	Input
<b>oFF</b>	Channel 2 - disabled
<b>0-50</b>	0-50 mV
<b>rtd</b>	Pt100
<b>tc B</b>	B thermocouple
<b>tc S</b>	S thermocouple
<b>tc R</b>	R thermocouple
<b>tc N</b>	N thermocouple
<b>tc E</b>	E thermocouple
<b>tc T</b>	T thermocouple
<b>tc K</b>	K thermocouple
<b>tc J</b>	J thermocouple

Table 1

### dPP.1 (Decimal Point Position)

Enables the display of decimal points for channel 1 measures. Parameter not valid for thermocouples **R**, **S** and **B**. For the 0-50 mV input, defines the decimal point position.

### dPP.2 (Decimal Point Position)

Enables the display of decimal points for channel 2 measures. Parameter not valid for thermocouples **R**, **S** and **B**. For the 0-50 mV input, defines the decimal point position.

### inL.1 (Lowest indication limit of channel 1 for 0-50 mV)

Determines the inferior limit of the user-created meter indication range, when the 0-50 mV input signal is selected. Parameter not displayed for the other input types.

### inH.1 (Highest indication limit of channel 1 for 0-50 mV)

Determines the upper limit of the user-created meter indication range, when the 0-50 mV input signal is selected. Parameter not displayed for the other input types.

### inL.2 (Lowest indication limit of channel 2 for 0-50 mV)

Determines the inferior limit of the user-created meter indication range, when the 0-50 mV input signal is selected. Parameter not displayed for the other input types.

### inH.2 (Highest indication limit of channel 2 for 0-50 mV)

Determines the upper limit of the user-created meter indication range, when the 0-50 mV input signal is selected. Parameter not displayed for the other input types.

### OFFS.1 (Indication Offset, channel 1)

Allows for an offset in the temperature value displayed in channel 1. The offset value is simply added to the value measured by the sensor. The offset can be of 10 % of the selected sensor maximum range, upwards or downwards.

### OFFS.2 (Indication Offset, channel 2)

Allows for an offset in the temperature value displayed in channel 2. The offset value is simply added to the value measured by the sensor. The offset can be of 10 % of the selected sensor maximum range, upwards or downwards.

### bEEP (Beep – Sound alarm)

It enables or disables the sound alarm

**bEEP = no** : disabled

**bEEP = YES** : enabled

**Note:** The **ALARM** message is displayed regardless of the sound alarm status (on or off). To stop beeping while an alarm condition is present, press any key.

### Shut (shut-off – Auto power off)

It makes possible to define a time interval in which the meter powers off automatically, provided no key is pressed within the interval.

Adjustable between 3 and 120 minutes.

### unit (Unit – Temperature indication unit)

It defines the temperature unit of the meter.

°C for degrees Celsius and °F Fahrenheit.

### FiLt (Noise filter)

It adapts the meter frequency to the mains voltage in order to optimize the internal noise filter. Such adaptation reduces possible temperature oscillations, resulting from the mains frequency. Options are:

**50** - for 50 Hz mains.

**60** - for 60 Hz mains.

### Func (Special functions)

Defines whether special functions **HOLD**, **AVG**, **MAX**, **MIN** and **RELAT** will be applied to channels 1 and 2 or only to channel 1.

**Ch1** - special functions applied only to channel 1.

**Ch1** - special functions applied to channels 1 and 2

## 4.4 CALIBRATION CYCLE

To enter the calibration cycle, press **BACK** and **SET** for 10 seconds. The meter displays **Soft**, the first parameter of the cycle. To access the remaining parameters of this cycle, press **SET**. Keys **▲** and **▼** make possible to change the parameters defined. To access the measures screen, go to the end of this cycle or press keys **BACK** and **SET** again. The parameters of the configuration cycle are:

### Soft (Software version)

About information. Informs the software review installed.

### BBBB (Serial Number)

About information. Informs the meter serial number. The four larger numbers are the most significant and the smaller the less significant.

### LC.1 (Low calibration Channel 1)

**INPUT OFFSET CALIBRATION:** Adjusts the lowest limit of the input signal indication range (offset). In order to change the indicated value, it may be required to press **▲** or **▼** several times.

### HC.1 (High calibration Channel 1)

**INPUT SPAN CALIBRATION:** Adjusts the highest limit of the input signal indication range (span). In order to change the indicated value, it may be required to press **▲** or **▼** several times.

### CTLo

Adjusts the room temperature where the meter is held. Important information for calculations and meter internal compensation.

**LCC2 (Low Calibration Channel 2)**

**INPUT OFFSET CALIBRATION:** Adjusts the lowest limit of the input signal indication range (offset). In order to change the indicated value, it may be required to press  or  several times.

**HCC2 (High Calibration Channel 2)**

**INPUT SPAN CALIBRATION:** Adjusts the highest limit of the input signal indication range (span). In order to change the indicated value, it may be required to press  or  several times.

**5 CALIBRATION**

The meter is factory calibrated, and recalibration by non-experienced professionals is not recommended. If required, calibration must be performed by expert professionals, who must proceed as it follows:

- a) Configure the type of input to be calibrated: K thermocouple or Pt100 or 0-50 mV.

**Note:** By calibrating K thermocouple, all the remaining thermocouples will be automatically calibrated. Pt100 and 0-50 mV required their own calibration processes.

- b) Access the Calibration cycle.
- c) Apply to the input channel a signal corresponding to a known indication, and slightly over the lowest limit of input type indication.
- d) To access parameter **LCC 1** (or **LCC2**). Use keys  and  until the meter indicates the value corresponding to the applied signal.
- e) Apply to the input channel a signal corresponding to a known indication, and slightly below the highest limit of input type indication.
- f) Access parameter **HCC 1** (or **HCC2**). Use keys  and  until the meter indicates the value corresponding to the applied signal.
- g) Repeat **c** to **f** until no adjustment is further required.

**Note:** While calibrating the meter, observe if the Pt100 excitation current required by the calibrator used is compliant to the Pt100 excitation current used in this instrument. 0.165 mA.

**6 WARRANTY**

The manufacturer products are covered by a 12-month warranty provided the purchaser presents the sales receipt and the following conditions are met:

1. Products are covered for one year from the original date of purchase. Please retain the dated sales receipt as evidence of the date of purchase. You will need it for any warranty service.
2. Within this period, warranty against defects in material and workmanship under normal use is free of charge.
3. For repair, send the product and the sales receipt to our address. Expenses and transportation risks are under the purchaser's responsibility
4. This warranty does not cover any damage due to accident, misuse, abuse, or negligence.