Acknowledgements

Thank you for choosing this Wahl Instruments high accuracy measuring instrument. Wahl has been providing high quality, high accuracy measuring instruments for over 50 years. Because of this, we are able to continue our policy of continuous innovation, which has served our customers so well for the last 50 years. Wahl Instruments encourages your comments and would willingly accept any suggestions from you to help us to perfect our know-how and improve our future products.

LIMITED GUARANTEE
LIMITED LIABILITY

Manufacturer warrants TC621 Thermocouple Temperature Calibrator to be free from defects in material or workmanship under normal use and service for a period of 12 months from date of purchase. The Manufacturer agrees to repair or replace any product, which upon examination is revealed to have been defective due to faulty workmanship or material if returned to our factory, transportation charges prepaid, within the above stated warranty period. This warranty is in lieu of all other warranties, expressed or implied and of all obligations or liabilities on its part for damages including but not limited to consequential damages, following the use or misuse of instruments sold by the Manufacturer. No agent is authorized to assume for Manufacturer any liability except as set forth above.

REGISTRATION at www.palmerwahl.com/register

Registration is fast and easy. In about a minute you can have your product automatically registered for Warranty Protection and our Calibration Reminder service. Let Palmer Wahl help you protect your investment, and maintain product accuracy and compliance with ISO and other quality standards.

Questions? Call Customer Service at 1-800-421-2853 or 828-658-3131
Or email: register@palmerwahl.com
The TC621 was checked mechanically and electrically prior to delivery. The necessary precautions have been taken to ensure it reaches the user without being damaged.

The standard accessories are the following:

- This user’s guide
- 4 AA batteries (1.5V)
- A hand strap
- A conduit

If the product needs to be returned, use the original packaging where possible and indicate as clearly as possible the reasons for the return in a note accompanying the device.

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A. GENERAL

A.1 Introduction

The TC621 is a pocket thermocouple temperature calibrator (compliant with EC standards). It is especially designed for calibration and maintenance. It makes it possible to measure and to emit electrical measurements and to simulate temperatures both on site as well as in a laboratory. It performs voltage and temperature measuring and emission functions (continuous or LF ramps).

The TC621 features a large number of related functions which extend its range of application, including:

• Generation of default values, increases, single or cyclic ramps.
• Storage of acquisitions and display in the form of tables or trend curves.
• Use of calibrated sensors with their coefficients of correction

A range of improvements facilitates its operation:

• Rapid access to all functions.
• Intuitive user interface.
• 160x160 graphic display
• Connection via 4 mm safety plugs or a miniature flat plug.
• Power supply via 4 AA batteries or rechargeable batteries with internal charger (Optional).

The device is housed in an ABS case with protective boot.

A.2 Parts

General characteristics:

• Portable device powered by 4 AA batteries (pack of Ni-MH storage batteries, 1.7 Ah optional).
• Hand strap for carrying and use on-site
• Graphic liquid crystal display: 160 x 160 pixels.
• Choice of language used for messages and programming of functions, gauges and parameters via 6-key keyboard + 1 navigator.
• Backlit display accessible via a keyboard key, with the possibility of automatic black-out after a specific programmable period of inactivity.
• Appearance: ABS case (elastomer-sheathed).
• Dimensions: 157 mm x 85 mm x 45 mm (without coating).
• Weight: 306 g without coating.
• IP54 tightness in compliance with standard EN 60529

Options:

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>12436-01</td>
<td>Pack of batteries + charger</td>
</tr>
</tbody>
</table>

A.3 Safety

A.3.1 Compliance with safety standards

The device complies with the applicable standards in force on the subject of electrical safety (EN 61010) as well as on the electromagnetic compatibility of the electrical measuring instruments (EMC: EN61326).

These instructions for use contain information and warnings which must be observed by the user to protect the latter against the dangers of electricity, to ensure the safe operation of the device and to protect it against any mishandling which could damage or compromise the safety of use of the device.

A.3.2 Environmental conditions

In accordance with publication CEI 359: operating category I.

Range of application of standards from 0 to 2,200 m.

Reference temperature range: 23°C ± 5°C, relative humidity: 45 % to 75 %.

Nominal operating range: -20°C to +50°C, relative humidity: 20 % to 80 % non-condensing.

Operating range limit: -15°C to +55°C, relative humidity: 10 % to 80 % (70 % at 55°C).

Storage and transport temperature range limit: -30°C to + 60°C (without the batteries).

A.3.3 Worn devices

Worn electrical devices can pollute the environment. We recommend you refrain from disposing of this device in an ordinary waste bin, but rather that you use the recycling circuits available locally.

A.3.4 Device destruction procedure

Opening the device: unscrew the screw on the battery compartment, followed by the 5 screws securing the 2 shells. Separate the 2 shells. Separate the PCB from the upper shell.

With regard to the batteries, you will find them in the battery compartment (see commissioning chapter).

In the case of the pack of batteries, there are 2 contaminants: NI-MH (Nickel-Metal Hybride) batteries and a PCB. Separate these 2 items.

A.3.5 Instructions

The device was designed to operate safely if the instructions provided in the accompanying documents are followed. Any other use may jeopardize the safety of the operator. Any use other than those specified in the instructions is therefore dangerous and forbidden.

A.3.6 Making measurements

The measuring leads and wires must be in good condition and must be replaced if their insulation appears faulty (insulating material cut, burned, etc.).

Never exceed the protection value limits indicated in the specifications.

Before changing function, disconnect the measuring wires from the external circuit. When voltage measurements are being made, even weak ones, keep in mind that the circuits may feature a dangerous voltage for the operator compared to the ground.

Do not make any measurements when the device is linked up to another device using the USB link or when the batteries are being charged.

A.3.7 Defects and abnormal stresses

Every time you believe the protection may have been compromised, switch off the device and prevent it from being switched back on unexpectedly.

The protection may be impaired in the following cases, for example:

✔ The device is visibly worn.
✔ The device is no longer able to make precise measurements.
✔ The device was stored in unfavorable conditions.
✔ The device has undergone severe stresses during transport.
A.3.8 Definitions

A.3.8.1 Definition of the category and degree of pollution

CAT II 60V: This notion of categories determines the maximum voltage which can be applied to the measuring inputs (it is also referred to as the overvoltage category). For the TC621, the ceiling overvoltage is (DC or AC)

POL 2°: The notion of pollution determines the clearance between circuits. Degree 2 authorizes temporary conductivity caused by condensation.

A.3.8.2 Table of symbols used

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Attention: see the accompanying documents</td>
</tr>
<tr>
<td>⬤</td>
<td>Earth</td>
</tr>
<tr>
<td>☑️</td>
<td>Compliant with the European Union directives</td>
</tr>
<tr>
<td>CAT II Pol 2</td>
<td>Category II, Pollution 2. Maximum common mode voltage compared with the ground=60V</td>
</tr>
</tbody>
</table>

A.4 Maintenance

The device must always be repositioned in accordance with the instructions provided herein. Any incomplete or incorrect assembly could compromise the safety of the operator.

The authority responsible must regularly ensure that all safety-related items are not worn and ensure all the preventive maintenance operations required are performed.

Before opening the device for any maintenance operations, you must make sure that all the wires are disconnected from the appliance.

All adjustments, maintenance and repair work on the open device must be avoided as much as possible and, when these are indispensable, they must be performed by qualified staff, who are well aware of the risks involved.

B. Using the instrument

In order to use the device in all the safety required, all operators must read the paragraph on safety carefully, along with the paragraph below.

B.1 Power-up

The device is delivered with 4 AA batteries of 1.5V each. It is wise to place these batteries in the compartment provided for this purpose. To open up the compartment, unscrew the screw on the back of the box. Once the batteries are in place, screw the cover back on.

Observe the polarity: an incorrect battery positioning could damage the device. The correct polarity is indicated inside the compartment. The figure below illustrates how to open the battery compartment as well as the correct positioning of each battery.

To turn the unit ON, press the ON/OFF key until the first "Checking EEPROM" screen comes up. (This may require pressing and holding the key for up to 5 seconds.)

To turn the unit OFF, press the ON/OFF key until the "Instrument in power off mode" screen comes up. Please note: instruments, whose serial number ends in "B", will not retain the time and date when powered off. If time and date need to be retained, the unit can be put in standby mode.

To enter standby mode, press both the HOLD and ON/OFF buttons until the screen displays "Instrument in standby mode".

To return to normal operating mode from standby mode, press the ON/OFF key until the original screen comes up. Please allow a minimum of 10 seconds between going into standby mode and returning from it.

B.1.1 The keyboard

The keyboard features:

- 2 function keys (F1 and F2) for the selection of the various menus displayed on the screen.
- The navigator, consisting of 4 arrows (up (↑), down (↓), right (→), left (←))
- A clear key (CLEAR).
- A device on/off and backlighting on/off key (ON/OFF).
- A validation key (VAL).
- A HOLD key allows you to suspend a process temporarily (when pressed briefly). If you press it longer, this key makes it possible to switch from measuring mode to emission mode and vice-versa.
B.1.2 The measuring and simulation terminals

The TC621 is fitted with 2 safety bushes (4 mm in diameter) and a miniature flat plug for thermocouples. This wiring is used both in measurement and emission mode (non-simultaneous).

B.1.3 The USB connector

The TC621 is fitted with a USB connector (mini B) intended for uploading new software versions and device adjustment.

B.1.4 The screen

The TC621 is fitted with a graphic LCD display with backlighting. The display resolution is 160 x 160 pixels. In normal operating conditions, the display is divided up into seven horizontal fields:
- The 1st field indicates the operating mode (Measurement or emission).
- The 2nd field indicates the date, time and battery charge.
- The 3rd field is reserved for icons indicating the operating mode (related functions: Scaling, filtering...etc).
- The 4th field indicates the operating mode, the gauge and certain related functions.
- The 5th field indicates the value of the measurement or of the emission. These values are expressed in mV, °C, °F or as a %.
- The 6th field indicates (in measurement mode) the min., average and max. values of the measurement.
- Lastly, the 7th field indicates the functionality of keys F1 and F2.
The table below provides a definition of each pictogram displayed on the screen:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission mode in increases</td>
<td>Emission mode in single ramp</td>
</tr>
<tr>
<td>Emission mode in cyclic ramp</td>
<td>Scaling</td>
</tr>
<tr>
<td>Filtering</td>
<td>%PE function (Pére Échelle: Full Scale)</td>
</tr>
<tr>
<td>Error Condition</td>
<td>Incremental mode using the arrows</td>
</tr>
<tr>
<td>- - - - - - - -</td>
<td>Battery life indicator</td>
</tr>
<tr>
<td>+ : - - - - -</td>
<td>Acquisition in progress (the value on the right of the pictogram indicates the number of values recorded)</td>
</tr>
</tbody>
</table>

The table below provides a definition of each symbol of the function keys:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tab key</td>
<td>Open a drop-down list</td>
</tr>
<tr>
<td></td>
<td>Close a drop-down list</td>
</tr>
<tr>
<td></td>
<td>Delete the selected item</td>
</tr>
<tr>
<td></td>
<td>Clear the selection</td>
</tr>
<tr>
<td></td>
<td>Add the item being edited</td>
</tr>
</tbody>
</table>

**B.1.5 Getting started (after power-up)**

On power-up (inserting the batteries or pack of batteries), the device is automatically turned on (loading the software in the memory). At this stage, we advise against connecting the device to an external circuit. To avoid any signal conflicts, the device switches to measurement mode.

**B.1.6 Operating modes**

There are 2 different operating modes:

- Thermocouple measurement (displayed in mV, °C or °F).
- Simulation of thermocouple/voltage emission (value displayed in mV, °C or °F).

The functional and electrical characteristics not to be exceeded are described below:

**B.1.6.1 Constant voltage measurement**

<table>
<thead>
<tr>
<th>Gauge</th>
<th>+100mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution (display)</td>
<td>1 µV or 0.01 °C or 0.01°F</td>
</tr>
<tr>
<td>Scope of range</td>
<td>-10 mV to +100 mV</td>
</tr>
<tr>
<td>Scaling</td>
<td>yes</td>
</tr>
</tbody>
</table>

**B.1.6.2 Voltage emission**

<table>
<thead>
<tr>
<th>Gauge</th>
<th>+ 80 mV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution (display)</td>
<td>1 µV or 0.01 °C or 0.01°F</td>
</tr>
<tr>
<td>Scope of range</td>
<td>-9.5 mV to +80 mV</td>
</tr>
<tr>
<td>Scaling</td>
<td>yes</td>
</tr>
</tbody>
</table>

**B.1.6.3 Electrical characteristics not to be exceeded.**

<table>
<thead>
<tr>
<th>Function</th>
<th>Gauge</th>
<th>Max Vin</th>
<th>Z load</th>
</tr>
</thead>
<tbody>
<tr>
<td>U measurement</td>
<td>100mV</td>
<td>60 V</td>
<td>1000 Ω</td>
</tr>
<tr>
<td>U emission</td>
<td>80mV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. Mode Programming

C.1.1 Voltage or temperature measurement by thermocouple

- The choice of measurement or emission mode is made using the F2 key (mode menu).
- Using the navigation keys (↑ and ↓), position the cursor in the Measurement field going down the menu.
- Confirm your choice using the VAL key.

Note that the Measurement mode is the mode selected by default.

- The function type selection (Thermocouple type) is made using the F1 key (Configuration menu).
- Using the navigation keys (↑ and ↓), position the cursor in the Function field.
- Confirm the latter using the VAL key.

- In the CONFIGURATION MESURE (MEASUREMENT CONFIGURATION) menu, position the cursor in the Coupling field using the F1 key.
- Enter the Coupling menu using the F2 key.
- Choose the type of thermocouple (K, T, J, ...), using the navigation keys (↑ and ↓).

- Press VAL to confirm.
- Using the F1 key, define the Unit by positioning the cursor on it.
- Enter the menu by pressing F2.
- Using the navigation keys (↑ and ↓), choose the unit.
- Press VAL to confirm.

- Attention, the choice of °C or °F is made in the Setup\Preferences\temp unit menu.
- Using the F1 key, define the CSF used by positioning the cursor on it.
- Enter the menu by pressing F2.
- Using the navigation keys (↑ and ↓), choose the CSF (OFF: None, ON: internal or programmed).
- Press VAL to confirm.
- Press VAL (again) to confirm the desired function and go back to the measurement screen.
The **Measurement** mode makes it possible to display the Min (bottom left), Average (bottom centre) and Max values (bottom right) from the last RAZ Min/Max command.

- Access this command by pressing the F1 key.
- Using the navigation keys (↑ and ↓), position the cursor in the RAZ Min/Max field.
- Confirm the latter using the VAL key.

**Note:**
Following a significant thermal shock, it is advisable to allow the device to stabilize its temperature to use the internal reference junction (CSF) with utmost precision.

### C.1.2 Voltage or temperature emission by thermocouple

To access the **Emission** mode:

- The choice of **Emission** mode is made using the F2 key (mode menu).
- Using the navigation keys (↑ and ↓), position the cursor in the Emission field going down the menu.
- Confirm your choice using the VAL key.

Once you have confirmed the Emission mode, define the type of generation:

- Continuous (manual or arrows or default editing).
- Incremental (by step or “manual default”).
- By single ramp (only one ramp emitted).
- By cyclic ramp.
- Synthesizer (“automatic default”).

### Voltage or temperature generation/incremental editing?

- Press the F2 key to display the edit menu.
- Using the navigation keys (↑ and ↓), choose the Arrows edit mode and confirm (VAL key).
- Using the navigation keys to enter the value:
  - ↑ and ↓ to increase or decrease the value
  - ← and → to select the digit to modify (hundreds/tens/unit/decimal place/hundreds).

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/02/2006 12:16:59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IN:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Incremental editing**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the INCREASES mode and confirm (VAL key).
  - Using the navigation key (↑), start the automatic increases phase (following the parameters programmed in the CONFIGURATION/RAMP menu).
  - Using the navigation key (↓), you can decrease automatically starting from the max. programmed voltage (or temperature).
  - Using the navigation key (→), you can increase manually the voltage (or temperature) emitted (following the parameters programmed in the CONFIGURATION/RAMP menu).
  - Using the navigation key (←), you can decrease manually the voltage (or temperature) emitted starting from the max. programmed voltage.

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:17</td>
</tr>
</tbody>
</table>

**OUT:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/02/2006 12:17:24</td>
</tr>
</tbody>
</table>

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUT:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Voltage or temperature generation/manual editing?**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the Manual edit mode and confirm (VAL key).

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUT:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Voltage or temperature generation/arrow editing?**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the Arrows edit mode and confirm (VAL key).
  - Using the navigation keys to enter the value:
    - ↑ and ↓ to increase or decrease the value
    - ← and → to select the digit to modify (hundreds/tens/unit/decimal place/hundreds).

**INT:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IN:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Voltage or temperature generation/arrow editing?**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the Arrows edit mode and confirm (VAL key).
  - Using the navigation keys to enter the value:
    - ↑ and ↓ to increase or decrease the value
    - ← and → to select the digit to modify (hundreds/tens/unit/decimal place/hundreds).

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUT:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Voltage or temperature generation/arrow editing?**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the Arrows edit mode and confirm (VAL key).
  - Using the navigation keys to enter the value:
    - ↑ and ↓ to increase or decrease the value
    - ← and → to select the digit to modify (hundreds/tens/unit/decimal place/hundreds).

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUT:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**

- **Voltage or temperature generation/arrow editing?**
  - Press the F2 key to display the edit menu.
  - Using the navigation keys (↑ and ↓), choose the Arrows edit mode and confirm (VAL key).
  - Using the navigation keys to enter the value:
    - ↑ and ↓ to increase or decrease the value
    - ← and → to select the digit to modify (hundreds/tens/unit/decimal place/hundreds).

**IN:** Jr = 0.0 °C

<table>
<thead>
<tr>
<th>Configuration Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/02/2006 12:18:17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUT:</th>
<th>Jr = 0.0 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

**Configuration Mode**
Voltage or temperature generation/single ramp editing?
- Press the F2 key to display the edit menu.
- Using the navigation keys (↑ and ↓), choose the SINGLE RAMP mode and confirm (VAL key).

The values emitted are those programmed in the CONFIGURATION/RAMP menu (see the chapter entitled Related functions).

- Using the navigation key (↑), start the automatic increases phase (following the parameters programmed in the CONFIGURATION/RAMP menu).
- Using the navigation key (↓), you can decrease automatically starting from the max. programmed voltage (or temperature).
- Using the navigation key (→), you can increase manually the voltage (or temperature) emitted (following the parameters programmed in the CONFIGURATION/RAMP menu).
- Using the navigation key (←), you can decrease manually the voltage emitted starting from the max. programmed voltage (or temperature).

The Hold key allows you to stop generating or to resume it.
You can resume the generation of the ramp in step-by-step mode by pressing the navigation keys (← and →)
or in automatic generation using the navigation keys (↑ and ↓).
You can delay the emission by a programmable amount of time (in the CONFIGURATION/RAMP/DELAY menu).

Voltage or temperature generation/cyclic ramp editing?
- Press the F2 key to display the edit menu.
- Using the navigation keys (↑ and ↓), choose the CYCLIC RAMP mode and confirm (VAL key).

The values emitted are those programmed in the CONFIGURATION/RAMP menu (see the chapter entitled Related functions).

- Using the navigation key (↑), start the automatic increases phase (following the parameters programmed in the CONFIGURATION/RAMP menu).
- Using the navigation key (↓), you can decrease automatically starting from the max. programmed voltage (or temperature).
- Using the navigation key (→), you can increase manually the voltage (or temperature) emitted (following the parameters programmed in the CONFIGURATION/RAMP menu).
- Using the navigation key (←), you can decrease manually the voltage emitted starting from the max. programmed voltage (or temperature).

The Hold key allows you to stop generating or to resume it.
You can resume the generation of the ramp in step-by-step mode by pressing the navigation keys (← and →)
or in automatic generation using the navigation keys (↑ and ↓).

Voltage or temperature generation/default editing?
The default emission mode is a mode that makes it possible to generate manually the values stored for the synthesizer function.

- Press the F2 key to display the edit menu.
- Using the navigation keys (↑ and ↓), choose the Default values mode and confirm (VAL key).

The Hold key allows you to stop generating or to resume it.
You can resume the generation of the ramp in step-by-step mode by pressing the navigation keys (← and →)
or in automatic generation using the navigation keys (↑ and ↓).

The configuration of the parameters for the ramps and default values is explained in the chapter entitled "Related Functions".

Notes:

Following a significant thermal shock, it is advisable to allow the device to stabilize its temperature to use the internal reference junction (CSF) with the utmost precision.
D. RELATED FUNCTIONS

D.1 Scaling

The scale correction function performs conversion operations between the electrical values measured and the physical values converted. This linearization operation makes it possible to correct partially the errors induced by non-linear sensor/converter systems. The Scaling function makes it possible to define up to 10 right-segments, i.e. 11 points, in order to approach as much as possible the non-linear response curve, and to make the scale corrections according to each segment. The pictogram $\square$ is displayed on the screen in the active window when the scaling function is enabled.

The Define/list of points menu makes it possible to program up to 10 lines of 2 values: X and Y = f(X).

In measurement mode: X = Value measured and Y = Value Displayed.
In emission mode: X = Value displayed and Y = Value emitted.

The lines entered are sorted according to the X in increasing order, to scale an X value, the device seeks the 2 lines n and m=n+1 which frame it, and extrapolates linearly:

$$Y = Y_n + (X - X_n) \times (Y_{m} - Y_{n}) / (X_m - X_n)$$

Use the function keys to edit the points:
- To add a line: enter X and Y, then enable the function key.
- To select a line in a list, use the Up and Down navigation keys.
- To delete a selected line, use the key.
- To move from one field to the next, use the key.

Once the parameters have been set, the scaling is automatically enabled. To disable it, enter the Configuration/Scaling menu, select OFF and confirm by pressing the VAL key.

D.2 Differential measurements

The relative measurement function available on the device makes it possible to cancel a constant or spurious value via programming.

When the relative measurement function is enabled, the symbol $\triangle$ is displayed on the measurement screen.

The NULL/define menu makes it possible to program the value of the Tare (positive or negative). This value is obtained from the measurements.
D.3 Calibrated sensors

The calibrated sensors function of the device makes it possible to use sensors, the calibration (correction) coefficients of which are taken into consideration by the device during measurement.

- Using the F1 key, enter the Configuration menu.
- Select the Calibrated Sensors function, followed by one of the 5 available sensors.

- Enter the sensor information fields. Use the F1 function key to move from one field to the next.

- Confirm your choice using the VAL key.

- To add a value in the table of calibration points, use the keys, enter the calibration points (real value and value read) then confirm using the VAL key.
- Repeat this operation for all the calibration points (maximum of 4).
To delete a line, select it then use the key. To edit a line, select it then use the navigation key (→) to make editing possible.

- Confirm using the VAL key to return to the measurement screen.

To ensure the measurements are made using the calibration coefficients defined earlier, go to the configuration/function menu.

- In the thermocouple field, select sensor1 (SONDE1-SENSOR1 below).

Note: the Calibrated sensors are at the top of the list and their name is preceded by an *.

- Confirm the latter using the VAL key.

The chosen calibrated sensor is displayed in the measurement screen.

---

**D.4 Configuration of default value points**

The configuration of default value points is performed in the configuration/Points menu, obviously providing the default values mode has been confirmed.

- Using the F1 key, select the configuration/Points menu.
- Confirm using the VAL key.
- Using the F1 key (→) add a new value line to the table.
- Using the navigation keys (↑ and ↓), select the digit that requires editing.
- Using the navigation keys (↑ and ↓), increase the value of the selected digit.
- Confirm the line using the VAL key.

---
You can edit a value already recorded:

- Using the navigation keys (↑ and ↓), select the line requiring editing.
- Press the navigation key (→) to make editing possible.

You can delete a value already recorded:

- Using the navigation keys (↑ and ↓), select the line requiring deleting.
- Press the key to delete the line.

Notes:
A maximum of 100 values can be entered.

This table of values is also used for the Synthesizer mode; consequently all changes to this table entail a change to the synthesizer values.

D.5 Storage of acquisitions in progress.

The TC621 is designed to store 10,000 values in one or more acquisition bursts.

- Using the F2 key, enter the Mode menu.
- Select the Memory function.
- Confirm using the VAL key.

The drop-down list displays the following functions:

**REC.MEASUREMENT:**
Enable the triggering of an acquisition on a case-by-case basis.

If an acquisition has already been opened, then the following screen is displayed:

- If you wish to save it, press the F2 key (YES) to confirm.
  - You are then requested to enter the name of a file. Using the navigation keys (↑ and ↓), scroll down the letters.
  - Using the navigation keys (← and →), move the cursor by one position.
  - Using the F2 key (←), you can delete the characters entered
  - Once you have entered the file name, confirm by pressing the VAL key.

**RUN:**
Launches the storage of data following the parameters set in the "parameters" function. The pictogram is displayed on the measurement screen.

**STOP:**
Stops the storage in progress.

**PARAMETERS:**
Allows you to define:
- the size of the acquisition (max 10,000 values), the sampling period from 0.5 s to 30 Min, and the type of trigger (None, low level, high level).

If you have selected a low level or high level trigger, you must define the trigger level and the number of data to record after this trigger (Post-trigger).
Display burst:
You can display the burst in the form of a table of values or a trend curve.

**Burst 'SALVE':**

<table>
<thead>
<tr>
<th>No</th>
<th>Time</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:00:09.3</td>
<td>26.38</td>
</tr>
<tr>
<td>2</td>
<td>00:00:10.2</td>
<td>26.62</td>
</tr>
<tr>
<td>3</td>
<td>00:00:11.1</td>
<td>26.83</td>
</tr>
<tr>
<td>4</td>
<td>00:00:12.0</td>
<td>27.02</td>
</tr>
<tr>
<td>5</td>
<td>00:00:13.7</td>
<td>27.35</td>
</tr>
<tr>
<td>6</td>
<td>00:00:14.5</td>
<td>27.53</td>
</tr>
</tbody>
</table>

- or place markers so as to display in the form of a graph all the values included between these 2 markers. To do so, press the F2 key (…).

- Using the navigation keys (↑ and ↓), move the cursor to the value to be marked "value 1" and press the F1 key (1>>).

- For the second marker, press the F2 key (…) and using the navigation keys (↑ and ↓), move the cursor to the value to be marked "value 2" and press the F1 key (2>>).

At this level, it is possible to - display the trend curve entirely: press the F2 key (GRAPH).

**Burst 'SALVE':**

<table>
<thead>
<tr>
<th>No</th>
<th>Time</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:00:07.3</td>
<td>25.70</td>
</tr>
<tr>
<td>2</td>
<td>00:00:08.2</td>
<td>26.12</td>
</tr>
<tr>
<td>3</td>
<td>00:00:09.3</td>
<td>26.38</td>
</tr>
<tr>
<td>4</td>
<td>00:00:10.2</td>
<td>26.62</td>
</tr>
<tr>
<td>5</td>
<td>00:00:11.1</td>
<td>26.83</td>
</tr>
<tr>
<td>6</td>
<td>00:00:12.0</td>
<td>27.02</td>
</tr>
<tr>
<td>7</td>
<td>00:00:12.5</td>
<td>27.32</td>
</tr>
</tbody>
</table>

- Press the F2 key twice (…), to reach the GRAPH function, then press F2 to confirm.

**Burst 'SALVE':**

<table>
<thead>
<tr>
<th>No</th>
<th>Time</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>00:00:12.0</td>
<td>27.02</td>
</tr>
<tr>
<td>2</td>
<td>00:00:12.3</td>
<td>27.19</td>
</tr>
<tr>
<td>3</td>
<td>00:00:13.7</td>
<td>27.35</td>
</tr>
<tr>
<td>4</td>
<td>00:00:14.5</td>
<td>27.53</td>
</tr>
<tr>
<td>5</td>
<td>00:00:15.0</td>
<td>27.66</td>
</tr>
<tr>
<td>6</td>
<td>00:00:16.6</td>
<td>27.77</td>
</tr>
</tbody>
</table>

In this particular example, the graph will display values included between positions 10 and 20.
At this level, you can display the whole curve or a zoom around the cursor. The cursor is moved using the navigation keys (↑ and ↓).

Press CLEAR to return to the table of values.

Record burst:
This function makes it possible to record the burst in the memory.

- You are then requested to enter the name of a file. Using the navigation keys (↑ and ↓), scroll down the letters.
- Using the navigation keys (← and →), move the cursor by one position.
- Using the F2 key (MEASURE), you can delete the characters entered.

Once you have entered the file name, confirm by pressing the VAL key.

Open burst:
Allows you to choose a burst among many and to open it to display the values. At this level, you can obtain information on the acquisition burst, such as the number of measurements, the date of acquisition, the sensor used, etc.

New free burst:
Allows you to start a new acquisition burst. If a burst is under way, you will be requested to save it.

Burst management:
Allows you to display all the bursts recorded. At this level, you can delete one or all bursts.

Statistics:
Allows you to find out the number of bursts recorded, the number of bytes free as well as the number of measurements which can be recorded.
D.5.1 Synthesizer configuration

D.5.1.1 Configuration of synthesizer points
The configuration of the synthesizer points is identical to that of the default values.

D.5.1.2 Configuration of synthesizer parameters
The configuration of the synthesizer parameters is performed in the configuration/Synthesizer/Parameters menu, obviously providing the Synthesizer mode has been confirmed.

Careful, the values (points) must be recorded first

- Once you have selected the configuration/Synthesizer/Parameters (configuration/Synthesizer/Parameters) menu, confirm by pressing the VAL key.

This screen allows you to configure the emission:

First point:
This is the 1st point to be emitted. It is not necessarily the 1st point in the table of values.

Last point:
This is the last point to be emitted. It is not necessarily the last point in the table of values but this point number must be below the number of points recorded.
Should this not be the case, it will be impossible to record the configuration of the synthesizer parameters.

D.5.2 Configuration of the ramp generation
The CONFIGURATION/RAMP menu is used for the generation of ramps by increases, single or cyclic.

→ Ramp by increases configuration?
The figure below illustrates the type of single ramp that can be generated and their parameters:

* The LOW level and HIGH level levels are expressed:
  - As a percentage of the gauge if the scaling mode is ON.
  - In mVolt or in temperature units if the scaling mode is OFF and according to the type of value emitted (voltage or temperature emission).

* The Duration corresponds to the amount of increase time required to go from the Low level to the High level (and vice versa in the case of a decrease). It is expressed in seconds and the max time is limited to 1000s.

* The Time frame corresponds to the amount of time you can have between pressing the emission start key and the actual starting of generation. It is expressed in seconds and the max time is limited to 1000s.
Use the F2 key to move to the next field.

Use the navigation keys to enter the value:
- As a percentage of the gauge if the scaling mode is ON.
- ↑↑ ↑↑ and ↓↓ ↓↓ to increase or decrease the value
- ← and → to choose the hundreds/tens/units/decimal place/hundreds/thousands.

Press VAL to save the parameters.

To quit the menu without saving, press CLEAR.

**Single ramp configuration?**

The figure below illustrates the type of single ramp that can be generated and their parameters:

<table>
<thead>
<tr>
<th>Programming parameters in Single Ramp mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

To : time pressing the generation start key
Td : Time frame
Tdt : Total Time
NB : Low Level
NH : High Level

The LOW level and HIGH level levels are expressed:
- As a percentage of the gauge if the scaling mode is ON.
- In Volt or in temperature units if the scaling mode is OFF and according to the type of value emitted (voltage or temperature emission).

The Total Duration corresponds to the amount of increase time required to go from the Low level to the High level (and vice versa in the case of a decrease). It is expressed in seconds and the max time is limited to 1000s.

---

**Cyclic ramp configuration?**

The figure below illustrates the type of single ramp that can be generated and their parameters:

<table>
<thead>
<tr>
<th>Programming parameters in Cyclic ramp mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

To : time pressing generation start key
Td : Time frame
Tb : Low duration
Tm : Rise (rise time)
Th : High duration
Tf : Drop (drop time)
NB : Low Level
NH : High Level
The **LOW level** and **HIGH level** levels are expressed:
- As a percentage of the gauge if the scaling mode is ON.
- In Volt or in temperature units if the scaling mode is OFF and according to the type of value emitted (voltage or temperature emission).

The **Low Duration**, **Rise**, **High Duration**, **Drop** and **Time frame** durations are expressed in seconds. The max duration is limited to 1000s.

The **Repetitions** field indicates the number of ramps that need to be generated. The number of repetitions is limited to 1000.

### E. Parameter settings

#### E.1 Contrast adjustment

In the **CONFIGURATION/SETUP** menu, you can adjust the display contrast.
- Access this menu using the F1 key.
- Select the **Setup** field using the navigation keys (↑ and ↓), then confirm.
- Select the **Contrast** field using the navigation keys (↑ and ↓), then confirm.
- Using the navigation keys (← and →), increase or decrease the contrast as required.

#### E.2 Date and time setting

In the **CONFIGURATION/SETUP** menu, you can set the time and date.
- Access this menu using the F1 key.
- Select the **Setup** field using the navigation keys (↑ and ↓), then confirm.
- Select the **Date/Time** field using the navigation keys (↑ and ↓), then confirm.

- Use the navigation keys (↑ and ↓) to increase the various parameters.
- Use the navigation keys (← and →) to go to the next field.
- Press **VAL** to confirm.
E.3 “Preferences” setting.

E.3.1 Filtering setting.
In the event of noisy measurements, you can filter the latter to make the value displayed on the screen more stable.

- Access this menu using the F1 key (configuration menu), then confirm.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the Filtering field by pressing the F1 key.
- Four filtering values are available (OFF, 0.5s, 1s and 2s). Select these values using the navigation keys (↑ and ↓).
- Confirm by pressing the VAL key.

E.3.2 Display resolution setting.
In the CONFIGURATION/SETUP/PREFERENCES menu, you can select the desired display resolution:

- Access this menu using the F1 key.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the Resolution field by pressing the F1 key.
- Three types of resolution are available: high (res=1µV), medium (res=10µV) and low (res=100µV).
- Select this resolution using the navigation keys (↑ and ↓).
- Confirm by pressing the VAL key.

E.3.3 Lighting duration setting.
In the same menu (CONFIGURATION/SETUP/PREFERENCES), you can control the duration of the lighting (manual, 10s or 1min). Press the ON/OFF key briefly to turn on the lighting for the selected time, press again briefly to start the timing or to turn off the lighting in the case of the manual mode.

- Access this menu using the F1 key.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the Lighting field by pressing the F1 key.
- Choose the manual or timed mode using the navigation keys (↑ and ↓).
- Confirm by pressing the VAL key.

E.3.4 “Key beeping” setting.
In the CONFIGURATION/SETUP/PREFERENCES menu, you can emit a beeping sound every time a key is pressed:

- Access this menu using the F1 key.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the Key Beeping field using the F1 key.
- Using the navigation keys (↑ and ↓), select the ON or OFF mode then confirm by pressing the VAL key (if the parameter settings are completed or go to the next field using the F1 key).

E.3.5 Language setting
In the CONFIGURATION/SETUP/PREFERENCES menu, the interface language can be selected from English, French, German, Italian or Spanish.

- Access this menu using the F1 key.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the LANGUAGE field using the F1 key.
- Using the navigation keys (↑ and ↓), select your desired language then confirm by pressing the VAL key (if the parameter settings are completed or go to the next field using the F1 key).

E.3.6 Temperature unit setting
In the CONFIGURATION/SETUP/PREFERENCES menu, you can choose the temperature unit that will be displayed.

- Access this menu using the F1 key.
- Select the Setup field using the navigation keys (↑ and ↓), then confirm.
- Select the Preferences field using the navigation keys (↑ and ↓), then confirm.
- Select the TEMP unit field using the F1 key.
- Using the navigation keys (↑ and ↓), select the desired unit then confirm by pressing the VAL key.

E.4 “Maintenance” menu

E.4.1 Adjustment from the Maintenance menu
The TC621 may be adjusted using an instrument with a precision of more than 50 ppm.

To adjust the device, go to the Configuration/Maintenance menu, enter the password 9456 and then press the VAL key.

- Using the navigation keys (↑ and ↓), select your desired language then confirm by pressing the VAL key (if the parameter settings are completed or go to the next field using the F1 key).

E.4.2 “Maintenance” menu

As part of the follow-up on measurement quality, the user may be asked to perform a regular check of the performance levels.

This check must take into consideration the customary measurement precautions. The following instructions should be followed.

Any handling operations should be performed in the following reference conditions:

- Temperature of the room: 23°C ± 1°C.
- Relative humidity: 45 % to 75 %.

Following this check, should the user find that one or more characteristics of the device are outside the tolerances specified in chapter E, said user may:

- Either proceed with the appropriate adjustment, according to the following procedure, which requires equipment which features at least the same performance levels as the one used for the previous check.
- Or return the device to the following address for checking and adjustment.

Wahl Instruments, Inc.
234 Old Weaverville Road
Asheville, NC 28804
Phone: 828-658-3131
Fax : 828-658-0728
Email : sales@palmerwahl.com
Using the F1 function key, open the menu to access the following functions:

**Init EEPROM:**
Allows you to initialise part of the EEPROM (Calibrated Sensors Coefficient)

**Measurement:**
Allows you to access the gauge adjustment function (stated as 100 mV).

**Auto Adjustment:**
This function allows you to adjust the emission from the product’s internal measurement gauge. This procedure takes several tens of seconds.

**Measurement CSF:**
This function allows you to adjust the Cold Junction Compensation (CSF). You need to know precisely what the temperature of the reference thermocouple used is, and the latter must be a type K thermocouple.

---

**Adjustment 100mV:**
Point 1
Apply a calibration signal of 3 mV. Indicate the exact value applied and enter it in the "Value Applied" field.

- Confirm each step using the VAL key.

**Correction of CSF:**
Couple used: K - not calibrated
Actual couple temperature: 23.0 °C
CLEAR: Cancel-VAL: Continue
Calibration date:
Should the device undergo calibration, you can enter the date of this calibration and the certificate reference number.

![Calibration information](image1)

E.5 “About the instrument” menu

In the Configuration/Setup/About menu, you can find out:
- The instrument part number
- The Serial number
- The software version
- The name of the company

### F. SOFTWARE UPDATE

The software is updated by the UPG32 program available on CD-ROM supplied with the product. To find out which version of firmware is installed in your unit, use the Configuration → About menu.

The quickest way to find out if an update is available is to visit the Wahl website at www.palmerwahl.com and look at the “Downloads” page.

To update the firmware, proceed as follows:

1. If necessary, install on the PC the USB driver for communication with Wahl Instruments. This driver can be downloaded from our site, along with an information page describing the installation procedure.
2. Disconnect the leads connected to the measurement and simulation terminals.
3. Connect the instrument to the PC using the USB lead.
4. Download and run the firmware update program.
5. Select the language then the file containing the firmware and download in the first stage.

6. Choose the communication parameters that match the parameters of the TC621. The communication port used is a virtual port which does not correspond to a physical port on your computer. The other parameters to be selected are defined in the diagram below.

7. Confirm the update by pressing “OK” and wait for the firmware to load into the unit.
The precision expressions mentioned herein apply from +18°C to +28°C, unless otherwise specified, and are expressed in ± (n % L + C) where L = Reading and C = Constant expressed in practical units, for a confidence interval of 95%.

They apply to a device positioned in the reference conditions defined below:
- Prior power-up of the device for temperature adjustment for 10 minutes
- Following a significant thermal shock, it is advisable to allow the device to stabilize its temperature to use the internal reference junction (CSF) with the utmost precision.

The precision includes the precision of the reference calibrations, the non-linearity, hysteresis, repetitiveness and long-term stability over the time period mentioned.

G.1 Measurement Function

Rated maximum voltage in common mode: 60 VDC or VAC.

G.1.1 Constant voltage

The voltage measurement is made by configuring the device as follows:
- Thermocouple: indifferent. Unit: mV. CSF: OFF.

Gauge | Scope of measurement | Resolution (min) | Precision / 1 year
--- | --- | --- | ---
100 mV | -10 mV to 100 mV | 1 µV | 0.020% L + 3 µV

- Temperature coefficient < 15 ppm L /°C from 0°C to 18°C and from 28°C to 50 °C.
- Rin = 1 MΩ ±1%

G.1.2 Temperature by thermocouple

Type of sensors:
- In accordance with Din 43710 (thermocouples U and L).
- In accordance with the HOSKINS table (thermocouple C).
- In accordance with the ENGELHARD table (platinum thermocouple).

Sensor | Scope of measurement | Resolution | Precision / 1 year
--- | --- | --- | ---
R | - 50 to + 150°C | 0.50°C | 0.95°C
- 150 to + 550°C | 0.20°C | 0.40°C
+ 550 to + 1 768°C | 0.10°C | 0.020 % L + 0.30°C
S | - 50 to + 150°C | 0.5°C | 0.85°C
- 150 to + 550°C | 0.2°C | 0.020 % L + 0.4°C
+ 550 to + 1 768°C | 0.1°C | 0.020 % L + 0.3°C
B | + 400 to + 900°C | 0.2°C | 0.95°C
+ 900 to + 1 820°C | 0.1°C | 0.50°C
U | - 200 to - 100°C | 0.05°C | 0.35°C
- 100 to + 600°C | 0.05°C | 0.20°C
L | - 200 to - 100°C | 0.05°C | 0.30°C
- 100 to + 900°C | 0.05°C | 0.20°C
C | - 20 to + 900°C | 0.1°C | 0.30°C
+ 900 to + 2 310°C | 0.1°C | 0.020 % L + 0.15°C
N | - 200 to - 190°C | 0.2°C | 0.60°C
- 190 to - 110°C | 0.2°C | 0.25°C
- 110 to 0°C | 0.05°C | 0.15°C
+ 0 to + 1 300°C | 0.05°C | 0.020 % L + 0.07°C
Platinum | 50 to + 1 400°C | 0.05°C | 0.3°C
Mo | 50 to + 1 410°C | 0.05°C | 0.020 % L + 0.10°C
NiMo/NiCo | - 50 to + 1 100°C | 0.05°C | 0.020 % L + 0.35°C

The precision is guaranteed for a reference junction (JR) at 0°C. With the use of the internal JR (except for thermocouple B), add an additional uncertainty of 0.3°C to 0°C. For the other temperatures, it is a good idea to take into consideration the sensitivity of the thermocouple at the temperature (T) considered, namely an additional uncertainty of 0.3°C*S(0°C)/S(T).

- Temperature coefficient: < 10 % of precision/°C.
- You can, except for thermocouple B, choose the location of the reference junction by programming it on the keyboard:
  - external at 0°C,
  - internal (temperature compensation at the device terminals).
- By programming the temperature.

G.2 Emission function

Rated maximum voltage in common mode: 60 VDC or VAC.

G.2.1 Constant voltage

The voltage emission is made by configuring the device as follows:
- Thermocouple: indifferent. Unit: mV.
- CSF: OFF.

Gauge | Scope of measurement | Resolution (min) | Precision / 1 year
--- | --- | --- | ---
80 mV | -9.5 mV / 80 mV | 1 µV | 0.020% L + 3 µV

- Temperature coefficient < 10 ppm L /°C from 0°C to 18°C and from 28°C to 50 °C.
- Internal resistance: ≤ 1 Ω.
### 6.2.2 Temperature by thermocouple.

**Type of sensors:**
- In accordance with DIN 43710 (thermocouples U and L).
- In accordance with the HOSKINS table (thermocouple C).
- In accordance with the ENGELHARD table (platinum thermocouple).

**Sensor** | **Scope of measurement** | **Resolution** | **Precision / 1 year** |
--- | --- | --- | --- |
K | - 240 to - 50°C | 0.20°C | 0.60°C |
| - 50 to + 120°C | 0.10°C | 0.30°C |
| +120 to + 372°C | 0.05°C | 0.020 % L + 0.11°C |
T | - 240 to - 100°C | 0.20°C | 0.50°C |
| - 100 to - 40°C | 0.05°C | 0.25°C |
| - 40 to + 400°C | 0.05°C | 0.020 % L + 0.10°C |
J | - 210 to + 50°C | 0.05°C | 0.35°C |
| + 50 to + 500°C | 0.05°C | 0.020 % L + 0.11°C |
| + 500 to + 1 200°C | 0.05°C | 0.020 % L + 0.09°C |
E | - 240 to - 100°C | 0.1°C | 0.55°C |
| - 100 to + 40°C | 0.1°C | 0.20°C |
| + 40 to + 1 000°C | 0.05°C | 0.020 % L + 0.06°C |
R | - 50 to + 350°C | 0.50°C | 0.95°C |
| + 350 to + 900°C | 0.20°C | 0.5°C |
| + 900 to + 1 768°C | 0.10°C | 0.020 % L + 0.30°C |
S | - 50 to + 350°C | 0.50°C | 0.90°C |
| + 350 to + 900°C | 0.20°C | 0.020 % L + 0.40°C |
| + 900 to + 1 768°C | 0.10°C | 0.020 % L + 0.30°C |
B | + 400 to + 850°C | 0.20°C | 0.95°C |
| + 850 to + 1 820°C | 0.10°C | 0.50°C |
U | - 200 to - 70°C | 0.05°C | 0.35°C |
| - 70 to + 600°C | 0.05°C | 0.20°C |
L | - 200 to - 70°C | 0.05°C | 0.30°C |
| - 70 to + 600°C | 0.05°C | 0.25°C |
C | - 20 to + 900°C | 0.10°C | 0.35°C |
| + 900 to + 2 100°C | 0.10°C | 0.020 % L + 0.15°C |
N | - 240 to - 100°C | 0.20°C | 0.90°C |
| + 10 to + 250°C | 0.10°C | 0.20°C |
| + 250 to + 1 300°C | 0.05°C | 0.020 % L + 0.09°C |
Platinum | - 100 to + 1 400°C | 0.05°C | 0.35°C |
Mo | + 0 to + 1 375°C | 0.05°C | 0.25°C |
NiMo/NiCo | + 50 to + 1 410°C | 0.05°C | 0.020 % L + 0.35°C |

The precision is guaranteed for a reference junction (JR) at 0°C.
With the use of the internal JR (except for thermocouple B), add an additional uncertainty of 0.3°C to 0°C.
For the other temperatures, it is a good idea to take into consideration the sensitivity of the thermocouple at the temperature (T) considered, namely an additional uncertainty of 0.3°C*S(0°C)/S(T).

- **Temperature coefficient:** < 10 % of precision/°C.
- You can, except for thermocouple B, choose the location of the reference junction by programming it on the keyboard:
  - external at 0°C,
  - internal (temperature compensation at the device terminals),
  - by programming the temperature.