

TEMP-U2

**Addon Card for Recording
Temperature and Voltage**

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Caution!!!

Please read the [risk assessment document](#) before operating the potentiostat.

Prevent the inputs of the potentiostat from electrostatic discharge (ESD)! ESD may damage the potentiostat. ESD-related damages are not covered by the warranty of the potentiostat. The user must make sure to discharge his-/herself from any electrical charge before touching the potentiostat (TIP: use grounded ESD-matts).

Maintain the maximum input voltage of the device and the selected voltage range.

Use electrically insulated thermocouples.

Do not expose the TEMP-U2 card to heat.

1 Introduction

TEMP-U2 is a member of the extension board family available for the Zahner potentiostats. Generally, the extension boards support data acquisition and process control in parallel to the electrochemical experiments. For details, please refer to the [Signal Acquisition manual](#).

TEMP-U2 enables the acquisition of electrical signals from two thermocouples and two high-impedance voltage input channels. The typical applications of TEMP-U2 are temperature measurements by direct connection of thermocouples and electrochemical potential measurements from connected auxiliary electrodes.

Unless otherwise noticed, the TEMP-U2 is delivered pre-configured for two NiCrNi (type K) thermocouples with a temperature range of -200 °C to $+1372\text{ °C}$ and two voltage inputs in the range of $\pm 8\text{ V}$. Both temperature channels are cold junction compensated. All channels are bandwidth-limited using anti-aliasing filters.

1.1 Packing List

- TEMP-U2 Addon Card
- Manual

2 TEMP-U2: Technical Data

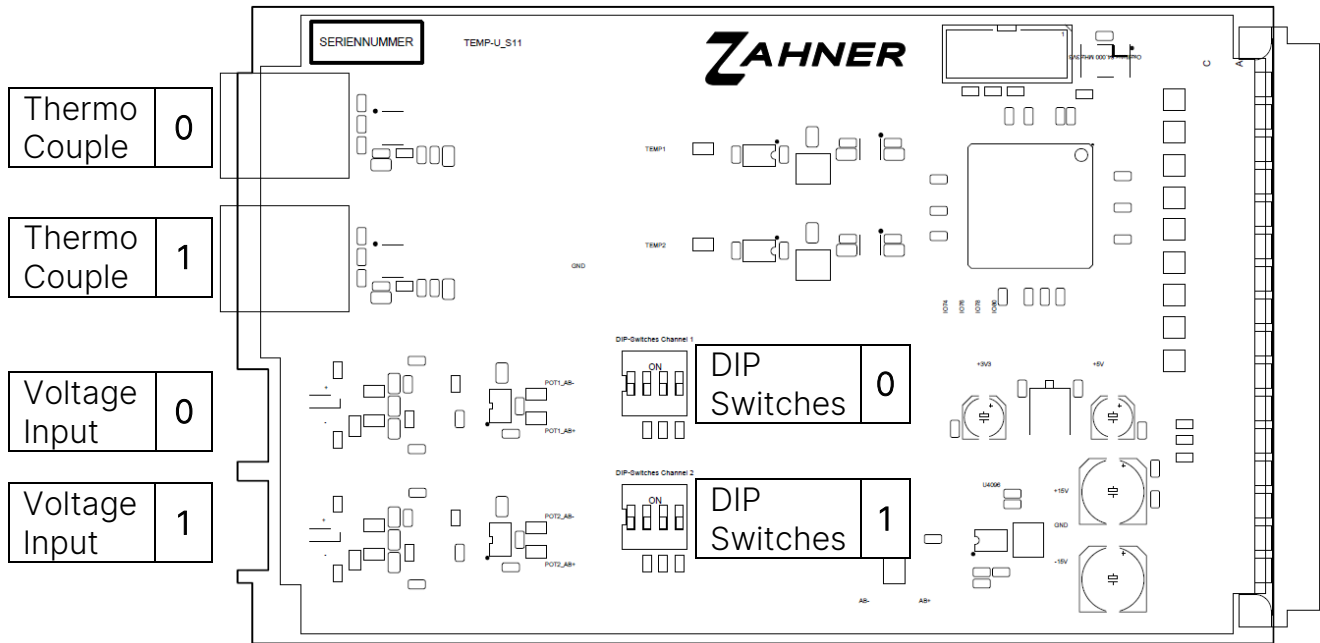
2.1 Temperature Inputs

| | |
|-----------------------------|--|
| Socket: | miniature, IEC, type K |
| Isolation: | non-isolated (insulated thermocouple required) |
| Temperature Range: | depending on the thermocouple type (see caption 2.4) standard type K (NiCrNi): -200°C to +1020°C |
| Cold Junction Compensation: | automatic (internally), range -20°C to +85°C; tolerance $\pm 0.7^\circ\text{C}$ |

2.2 Voltage Inputs

| | |
|------------------------|--|
| Socket: | BNC |
| Input Resistance: | $10^{12} \Omega / 10^5 \Omega$, switchable |
| Input Range: | $\pm 16 \text{ V}$, $\pm 8 \text{ V}$ (standard configuration), $\pm 4 \text{ V}$, $\pm 2 \text{ V}$, $\pm 1 \text{ V}$, $\pm 500 \text{ mV}$, $\pm 250 \text{ mV}$, switchable |
| Offset Voltage: | $\pm 0.5 \text{ mV} \pm 0.1\%$ full scale |
| Input Current: | $\pm 50 \text{ pA}$ maximum if $100 \text{ k}\Omega$ input resistance is not switched on |
| Bandwidth: | 300 Hz |
| Max Isolation Voltage: | $\pm 12 \text{ V}$ |

2.3 Cards Overview



2.4 Supported Thermocouples

| Type | Wires | Temperature Range | Info |
|------|--------------|-------------------|---|
| K | NiCr-Ni | -200°C to +1020°C | Standard configuration for TEMP-U2 addon card |
| J | Fe-CuNi | -210°C to +1200°C | Other configurations on request |
| N | NiCrSi-NiSi | -200°C to +1300°C | (reconfiguration only by manufacturer) |
| E | NiCr-CuNi | -200°C to +1000°C | |
| T | Cu-CuNi | -200°C to +400°C | |
| R | Pt13Rh-Pt | -50°C to +1768°C | |
| S | Pt10Rh-Pt | -50°C to +1768°C | |
| B | Pt30Rh-Pt6Rh | +250°C to +1820°C | |

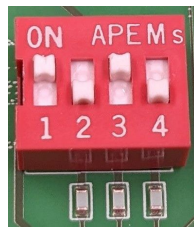
3 Thales Software Configuration

The input impedance of the voltage input channels can be hardware adapted according to the user's requirement by individually changing the sensitivity (signal amplification) for the inputs. Optional scaling, linearization of the primary measurement data and assignment of physical meanings are defined in the data acquisition set-up menu and with switches on the TEMP-U2 board. It defines the data flow from a selected hardware channel into a logical channel.

3.1 Voltage Inputs

The voltage for each channel is measured between the central pin and the BNC shielding of the respective channel. The input voltage range of both voltage channels can be configured independently with the corresponding DIP switches:

Top: ON
Bottom: OFF



The picture shows the following DIP switch configuration:
#1 = ON, #2 = OFF, #3 = ON, #4 = OFF

Example left-hand side:

± 1 V input range with 100 k Ω grounding resistance

DIP#1 configures the **input impedance**:

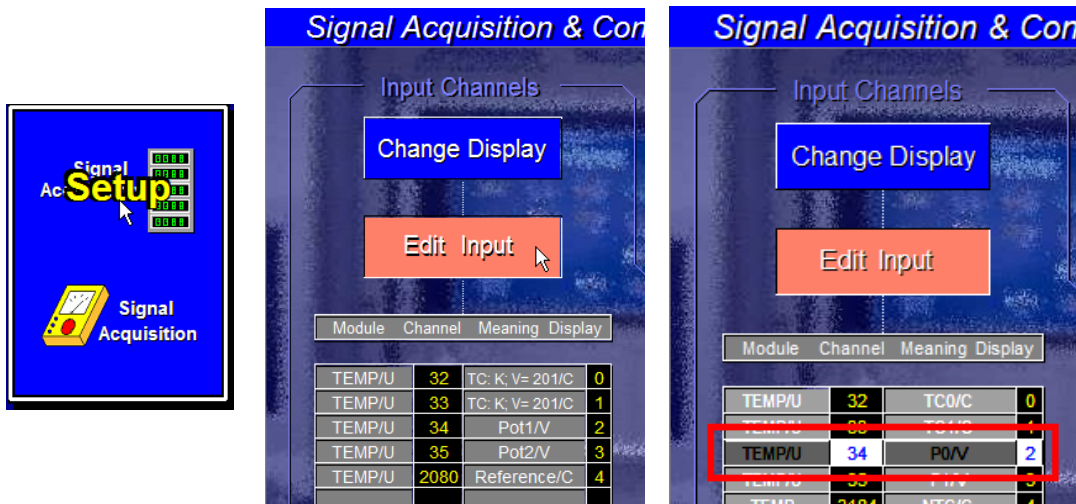
ON = BNC shield is high-ohmic (100 k Ω) grounded

OFF = both differential sense lines floating

Sometimes, high-ohmic grounding of a floating auxiliary electrode (i.e., a pH electrode) helps in minimizing the noise & eliminates unwanted oscillations leading to quality measurements. In contrast, a floating input prevents ground loops in grounded objects.

DIP#2-#4 configures the **input voltage range**. See the configuration dialog on the next page for further details.

To display the voltage correctly, the gain setting in the Thales software has to match the hardware configuration of the TEMP-U2 card. To set the gain, select the "Signal Acquisition Setup" from the Thales main window and then click the "Edit Input" button in the Signal Acquisition Setup window and select the desired voltage channel.



In the configuration dialog enter the following settings:

Signal channel: Redefinition (#0=off)

channel #: 34

module #: 5

meaning: P0

unit: V

display format: -#.###

polynom order: 1

offset: 0

gain: 2.5e-4

coefficient #2: 0

coefficient #3: 0

coefficient #4: 0

coefficient #5: 0

coefficient #6: 0

coefficient #7: 0

coefficient #8: 0

coefficient #9: 0

OK Cancel

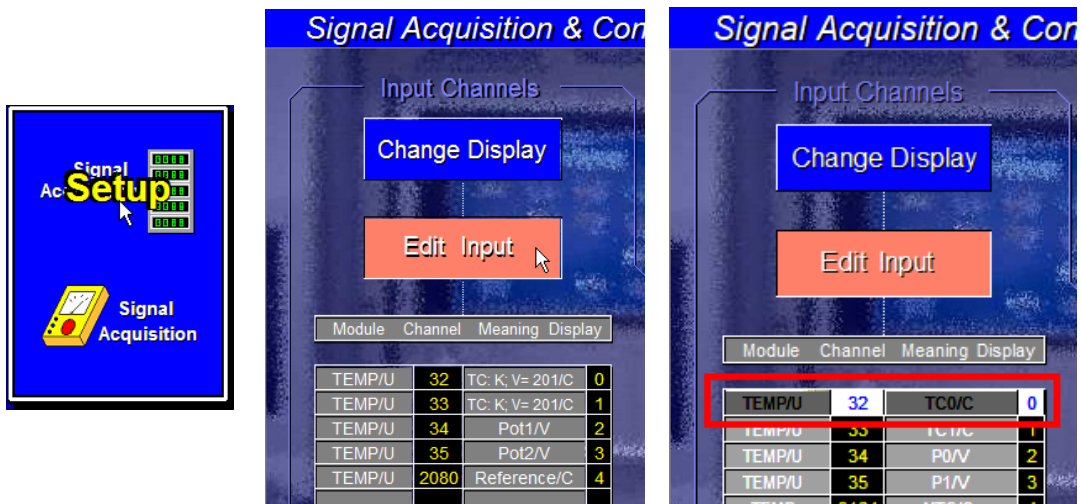
| Channel | TEMP-U2 card #1 | TEMP-U2 card #2 | TEMP-U2 card #3 | TEMP-U2 card #4 |
|---------|-----------------|-----------------|-----------------|-----------------|
| P0 | 34 | 38 | 42 | 46 |
| P1 | 35 | 39 | 43 | 47 |

Display format: signed, 2 significant, 3 decimal

| Gain | Input Voltage Range | DIP#2 | DIP#3 | DIP#4 |
|---------|---------------------|-------|-------|-------|
| 6.25e-5 | ±250 mV | OFF | OFF | OFF |
| 1.25e-4 | ±500 mV | OFF | OFF | ON |
| 2.50e-4 | ±1 V | OFF | ON | OFF |
| 5.00e-4 | ±2 V | OFF | ON | ON |
| 1.00e-3 | ±4 V | ON | OFF | OFF |
| 2.00e-3 | ±8 V | ON | OFF | ON |
| 4.00e-3 | ±16 V | ON | ON | OFF |
| -- | Disabled | ON | ON | ON |

3.2 Temperature Inputs

As standard, both TEMP-U2 temperature channels are configured for NiCrNi (type K) thermocouples. To display the temperature correctly, the gain setting in the Thales software has to match the hardware configurations of the TEMP-U2 card. To set the gain (0.5 for NiCrNi thermocouple), select the "Signal Acquisition Setup" from the Thales main windows. Now click the "Edit Input" button and subsequently select the desired temperature channel.



In the configuration dialog enter the following fixed settings:

Signal channel: Redefinition (#0=off)

channel #: 32

module #: 5

meaning: TC0

unit: C

display format: -####.#

polynom order: 1

offset: 0

gain: -0.5

coefficient #2: 0

coefficient #3: 0

coefficient #4: 0

coefficient #5: 0

coefficient #6: 0

coefficient #7: 0

coefficient #8: 0

coefficient #9: 0

OK Cancel

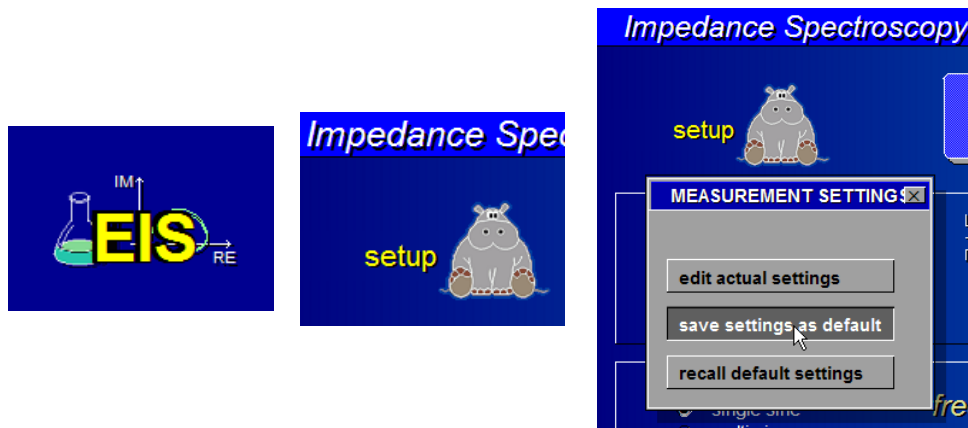
| Channel | TEMP-U card #1 | TEMP-U card #2 | TEMP-U card #3 | TEMP-U card #4 |
|---------|----------------|----------------|----------------|----------------|
| TC0 | 32 | 36 | 40 | 44 |
| TC1 | 33 | 37 | 41 | 45 |

| Parameter | Value |
|--------------------|----------------------------------|
| module | 5 (TEMP-U) |
| meaning | name of temperature channel |
| unit | Physical unit |
| display format | signed, 4 significant, 1 decimal |
| polynom order | 1 |
| offset | 0 |
| gain | -0.5 |
| other coefficients | 0 |

3.3 Save Signal Acquisition Setup

The configuration of the whole Signal Acquisition channel setup may be saved as default so that it can be used every time the Thales software is started. If the configuration of the Signal Acquisition channel is not saved then the user must first set up the channels properly before starting the measurements.

After configuring the channels, select the "EIS" method in the Thales main menu. In the EIS configuration page click the "setup" hippo and select "save settings as default" to save the channel(s) configuration.



The configuration of signal acquisition is now saved in file c:\thales\im6setup.bin.