

# Precision Biological Temperature Meter

BTM-4x series

User Manual

**SUPERTECH** Instruments

## General Description

BTM-4x Precision Biological Temperature Meter is a research grade temperature meter with long term monitor function. It is compatible with any PC-based data acquisition (DAQ) system due to its analog voltage output.

BTM-4x is optimized for biological measurements. The measurable temperature range is wide enough to cover every biological research application. It has been designed to be applicable even in the most sophisticated and noise-sensitive electrophysiological experiments.

A delicate feature of the BTM-4x Precision Biological Temperature Meter is that it is optimized for seriously shielded environments. The sensor-related input stage of the BTM-4x is located in a small, separated equipment, called Pt100 Signal Conditioner & Transducer Box. In this small box there are such electronic circuits, what operate with smooth DC currents only. As a result, Pt100 Signal Conditioner & Transducer Box emits extremely small, practically zero hum noise into the biological subject. This design fulfils all the special requirements of any sophisticated electrophysiological applications, even in close position to high impedance recording electrodes, for instance patch clamp setups.

BTM-4x Precision Biological Temperature Meter has:

- Extremely high resolution
- Excellent linearity
- Fast recording speed due to the wide bandwidth of its electronic circuits and low thermal time constant of its tiny temperature sensor
- Very good long term stability

BTM-4x equipment has been designed to employ the standard and popular Pt100 temperature sensors. Pt100 sensors are standardized products. They are available in many different sizes and forms. They are widely used in the industry, so they are quite cheap. In spite of this, they have got excellent linearity and surprisingly good long-term stability.

Supertech Instruments provides tiny Pt100 sensors with extremely low thermal time constant for high speed recording. This advantageous feature allows you to connect it to any target to be measured without disturbing the original thermal situation.

## Specifications

Full-scale range of measurement: - 100 to + 200 Centigrade

Resolution:

0.1 Centigrade at the front plate LCD

0.01 Centigrade at the analog voltage output

Worst-case error of the full scale value: < 1 %

Linearity error maximum: < 1 %

Scale factor choice at the analog voltage output:

100 mV / Centigrade

10 mV / Centigrade

Analog output impedance: 300 Ohms

Dimensions of the ACC-2x equipment: 160 x 200 x 65 (Width x Depth x Height)

Mains voltage: 100 - 120V or 220 - 240V (chosen by an internal selector switch, fixed in the factory)

Power consumption: 30 VA

Weight: 1.2 kg

## **Accessories**

AC power cord

Pt100 Signal Conditioner & Transducer Box

1.8 meter long extension cable for the Signal Conditioner & Transducer Box

Pt100 temperature sensor should be ordered as a separate item, because there are several different models available.

BNC cable to the PC-based DAQ system (optional)

## **Security Rules**

Most of the measuring equipments manufactured by Supertech Instruments, including BTM-4x Precision Biological Temperature Meter, are for experimental and/or lab animal purposes only and are not intended for human use.

In many of the biological measurement situations you should establish an invasive connection between the subject (animal) and the temperature sensor. To do this you must strictly follow the legal animal protection rules.

The equipment is supplied from the 115 / 230 VAC / 50 (or 60) Hz mains system. This is a dangerous voltage! All general electrical security precautions should be kept in mind during the usage of the equipment.

Electrical safety measurements of proper operation of the 115 / 230 VAC mains electric system (from the equipments have been supplied) is the sole responsibility of the user.

## **First Time Installation and Setup**

In switched off state of the BTM-4x Precision Biological Temperature Meter please connect all the cables: the extension cable between the BTM-4x unit and the Signal Conditioner & Transducer Box and the BNC cable to your PC-based DAQ system. Connect the Pt100 temperature sensor to the 2-pole input screw terminal of the Signal Conditioner & Transducer Box. Connect the BTM-4x unit to the power point with the AC power cord. Establish the appropriate thermal connection of the Pt100 sensor to the target. Switch on the BTM-4x equipment and the system is ready to use.

## **Front Panel Controls**

3.5 digit LCD display with backlight to show the measured temperature in Centigrade.

Mains switch at the right side.

## **Connectors at the Back Side**

There is the AC input socket at the left side. Connect it to the 115 / 230 VAC mains system with the appropriate AC power cord.

The actually selected AC supply voltage is indicated above the AC input socket by tiny colored squares. This setting is fixed in the factory and can be changed by the factory only.

Analogue Output: BNC connector to the PC-based DAQ system. If you want to record the changes of temperature in long term, this output is the point where you can get an analog voltage representing the temperature. The front panel digital LCD display shows the momentary temperature only. The scale factor can be changed internally by the appropriate jumper. Before opening the equipment case you must switch off the BTM-4x unit and you must disconnect the AC power cord.

On the most right side of the back plate there is the 4-pin socket of the 4 to 20 mA Current Loop Interface. This very reliable industrial standard signal interconnection protocol is used for the communication between the BTM-4x unit and the Signal Conditioner & Transducer Box.

## **Calibration**

BTM-4x equipment is calibrated by the factory. You can check its calibration any time by using two bottles of liquids with different, known temperatures.

Two trivial and very accurate temperature references are the melting ice and the boiling water. If you can find any other two temperature references closer to your measurement range, you can get even better linearity during the calibration.

You should immerse the Pt100 sensor into the two bottles of liquids alternatively. During these changes you can see the two temperatures on the front panel LCD. You can measure the two temperatures with much better resolution at the Analog Output. After immersing the sensor from one liquid to the other you should wait for the stabilization of its temperature.

If you are not satisfied with the correctness of your BTM-4x Precision Biological Temperature Meter, you can refine the calibration. On the Pt100 Signal Conditioner & Transducer Box you can see two holes (3 mm of diameter) drilled. Behind these holes there are two helical potmeters. Their functions are Gain and Zero, as indicated on the box. With Gain you can adjust the scale factor in a small range. With Zero you can adjust the temperature offset of the measuring circuitry. By some iteration you can adjust the system to be very accurate.

## **Warranty**

Supertech Instruments gives you 5 years of full warranty for electronic products and 3 years of full warranty for mechanical products by default. Longer warranty periods can also be defined and agreed (the actual conditions should be discussed before placing the order).

Supertech Instruments gives you full warranty for its products against defects in materials or workmanship as long as the equipment has been subjected to normal and proper use. During the warranty period, faulty products will be repaired or replaced free of charge provided they are returned to our workshop. Postage of the warranty repair actions is paid by the Customer. The exceptions are the Vibration Isolation Tables. There are special conditions introduced for repairing of Vibration Isolation Tables (see the appropriate User Manual). Supertech Instruments will undertake the servicing and calibration after the expiration of the warranty period for a nominal fee.

The warranty does not cover the faults made by the user.

## **Further information sources**

Technical hotline via email (all of them work):

[office@superte.ch](mailto:office@superte.ch)

[office@supertechinstruments.co.uk](mailto:office@supertechinstruments.co.uk)

[office@super-tech.eu](mailto:office@super-tech.eu)

International technical hotline on the phone: +36 20 9234 386

For further technical information please visit our websites. Supertech Instruments continuously uses several websites with the same content. Please use that one, which is the easiest for you to remember:

[www.superte.ch](http://www.superte.ch)

[www.supertechinstruments.co.uk](http://www.supertechinstruments.co.uk)

[www.supertech-instruments.co.uk](http://www.supertech-instruments.co.uk)

[www.supertech-instruments.com](http://www.supertech-instruments.com)

[www.super-tech.eu](http://www.super-tech.eu)