UT-ONE B03A

3-Channel Thermometer Readout

BATEMIKA
measurement solutions

UT-ONE B03A

- ❖ Three channel temperature measurement
- ❖ High accuracy, stability and repeatability
- ❖ Platinum resistance thermometers
- ❖ Thermistors
- ❖ Thermocouples
- ❖ Air temperature and relative humidity
- ❖ Banana connectors for maximum flexibility
- ❖ User-friendly colour display with touchscreen
- ❖ USB and RS232 communication interface
- ❖ External supply and battery operation
- ❖ Single or continuous measurements
- ❖ Standard and custom probe characterization
- ❖ Acquisition software and LabVIEW drivers included free of charge

UT-ONE B03A

3-Channel Thermometer Readout

BATEMIKA
measurement solutions

UT-ONE B03A

UT-ONE B03A is a precise 3-channel thermo-meter readout, which provides stable and accurate temperature measurements with thermistor, thermocouple and platinum resistance probes.

UT-ONE B03A is designed as a laboratory benchtop instrument, but its compact size, convenient carrying handle and battery operation makes it suitable also for accurate onsite measurements.

UT-ONE B03A measurement circuit is based on a precise 24 bit analog to digital converter, which in combination with internal ultra-stable resistance and voltage references, provides excellent performance characteristics.

UT-ONE B03A has a 3.2" colour display with 320x240 resolution and a touchscreen feature. Intuitive user interface provides full control over its configuration and measurements.

UT-ONE B03A is a member of the UT-ONE family of thermometer readouts, which share common accuracy specifications, remote interface commands and applications software, but have different display, interface and housing options, as well as different number of main channels to best suit end-user requirements and needs.

UT-ONE B03A probes

UT-ONE B03A supports all types of thermos-meter probes that are most commonly used in thermometry applications.

Platinum resistance probes

UT-ONE B03A can measure platinum resistance thermometers in the range from 1 Ω to 800 Ω. This covers the full range of commonly used Pt-100 and Pt-25 sensors. Additionally, Pt-1000 sensors can be measured using the thermistor ranges. UT-ONE B03A supports both industrial

and standard platinum resistance thermo-meters by providing Callendar-Van Dusen, polynomial and ITS-90 probe characterizations.

Thermistor probes

UT-ONE B03A can measure thermistors in the range from 100 Ω to 40 kΩ. Recommended thermistor types are 3K and 10K. UT-ONE B03A supports Steinhart-Hart and basic exponential probe characterization.

Thermocouple probes

UT-ONE B03A can measure both base and noble metal thermocouples. Thermocouple cold-junction compensation can be performed using the internal temperature sensor or with external cold junction at fixed temperature (typically 0 °C).

Ambient conditions probe

UT-ONE B03A provides support for an optional external probe for measurement of air temperature and relative humidity. Ambient conditions probe can be attached directly or via extension cable. Its applications range from monitoring ambient conditions during test or calibrations, to making basic verifications of climatic chambers, climate control rooms, etc. For calibrations with modest uncertainty requirements, ambient conditions probe can also be used as a reference instrument for relative humidity calibration.

UT-ONE B03A features

UT-ONE B03A was designed with many specific features that simplify its use in both simple temperature measurements and advanced temperature-related procedures. You may now focus on your measurement problem, your instrument will work flawlessly in any situation.

Temperature coefficient correction

UT-ONE B03A takes advantage of internal references with extremely low temperature

coefficients, which are typically in the range of a few ppm/°C. In addition, each unit is individually calibrated in the temperature range from 10 °C to 36 °C. The measured temperature coefficients are used in combination with the internal temperature sensor to automatically correct drifts due to temperature variations, resulting in temperature coefficients well below 1 ppm/°C.

Thermal emf compensation

Thermal emf is a parasitic voltage, which occurs with temperature gradients on junctions of different metals. This may introduce significant errors in temperature measurements. UT-ONE B03A is using the full current reversal technique to eliminate any influence of thermal emf in resistance measurements.

Cold junction compensation

Thermocouples are in principle differential thermometers, measuring the temperature difference between the hot and cold junction. To achieve best accuracy, cold junction can be placed in a mixture of water and ice, effectively fixing it at 0 °C. Although this method is the most accurate, it is also cumbersome and often impractical. UT-ONE B03A features also the technique of internal cold-junction compensation. The temperature of the cold junction is measured using the internal digital temperature sensor and the measured emf reading is corrected accordingly in firmware. Although this method introduces additional errors, it is much more convenient for measurements with less stringent accuracy requirements.

Auto ranging

UT-ONE B03A has six subranges for any of the PRT, thermistor or thermocouple measurement range, allowing optimal measurements over a wide dynamic range. A complex acquisition algorithm determines the optimal subrange for each reading, at no time or accuracy cost. Optionally, a fixed subrange may be selected for advanced measurement requirements. Each subrange extends approximately 20% above nominal limits, further increasing flexibility and reliability.

Self-heating evaluation

Self-heating occurs when the measurement current dissipates heat and additionally warms up the sensor. This phenomenon is inherent to all resistance measurements and can result in errors ranging from a few mK to several tens of mK. UT-ONE B03A features two selectable measurements currents on each resistance range, which enable the evaluation and in some cases correction of the self-heating error.

External reference resistor

UT-ONE B03A supports the use of external reference resistor, which can be connected to one of the three main channels. The acquisition algorithm measures both the unknown and reference resistance, which enables it to eliminate any internal short-term or long-term drifts. If the temperature coefficient of the reference resistor is provided, UT-ONE B03A can even automatically compensate the temperature drift of the reference resistance.

Connectors

UT-ONE B03A features gold-plated banana-style connectors for the connection of thermometer probes on three main channels. These connectors support the use of probes with banana plug, spade lug or bare wire termination. Additionally, thermocouples can also be connected using the standard mini thermocouple connector. These connectors provide the most flexible way to connect any thermometer probe, without being limited to a connector solution of a particular manufacturer.

UT-ONE B03A

3-Channel Thermometer Readout

BATEMIKA
measurement solutions

Probe characterizations

UT-ONE B03A supports all commonly used probe characterizations for PRTs, thermistors and thermocouples. User may choose between probe characterization with standard coefficients and probe characterizations with coefficients obtained in the calibration of particular probe.

Communication interfaces

UT-ONE B03A provides a USB and serial communication interface for the connection with a computer. UT-ONE B03A can be fully controlled and configured via communication interface. Communication protocol is fully described in the user manual, and a set of LabVIEW drivers is provided to accelerate custom software development.

Data logging

UT-ONE B03A provides a data logging feature, which logs all readings on an internal SD card. Logged readings can be reviewed directly on the UT-ONE B03A display or transferred to computer via communication interface. Internal memory allows storage of over 67 million readings, which is a life-time storage for most practical applications.

Battery operation

UT-ONE B03A features an internal recharge-able LiPo battery, which enables approximately 8 hours of standalone operation. This time can be further extended by placing the UT-ONE B03A in sleep mode, which disables the display, but continues to perform measurements.

User interface

UT-ONE B03A features a 3.2" colour touch-screen display, which enables the presentation of measurement data in various format and full configuration of acquired temperatures. Most notably, you may view the measured temperatures on a zoomable graph in combination with numeric values. Data can also be reviewed from data logged to internal logging memory.

UT-ONE B03A user interface

Where is applicable?

UT-ONE B03A thermometer readout is designed as a general-purpose high-precision thermometer with superb flexibility, which allows its use in many different applications, ranging from thermometer calibrations to precise temperature measurements.

Thermometer calibrations

UT-ONE B03A can be used as a working standard in calibration by comparison of thermometers. Reference thermometer probe can be connected to one of the main channels to determine the true value of temperature. The thermometer under calibration can be connected to one of the remaining main channels or, in case of indication thermometers, it can be read directly. The calibration procedure can be performed manually, with UT-ONE B03A implementing the temperature correction of the reference thermometer probe, or by using a dedicated calibration software, which automates the entire calibration procedure.

UT-ONE B03A

3-Channel Thermometer Readout

BATEMIKA
measurement solutions

Test procedures

UT-ONE B03A can be used as a precise thermometer in a wide variety of test procedures, where accurate determination of temperature is relevant to the test result. Combing high accuracy with 3-channel capacity provides an excellent tool for automating procedures with high throughput and reliable results.

Precise temperature measurement

Do you need to determine the precise value of temperature in your research and development activity? Maybe in more than one point? Perhaps you are also interested in observing the temperature trends in a convenient graph? You can do this and much more with UT-ONE B03A, both in standalone mode or using a dedicated measurement software on a connected computer.

Long-term monitoring

Do you need to make precise long-term monitoring of temperature and optionally relative humidity? UT-ONE B03A can make measurements without interruptions for days, months or years, storing them to the internal SD card memory. Stored measurements can be reviewed directly on the UT-ONE B03A display, or transferred to computer using a dedicated application.

On-site measurements

Do you need precision measurement outside your laboratory? Compact and rugged chassis, battery operation and inherent monitoring of ambient conditions make UT-ONE B03A a perfect choice for traceable on-site measurements.

UT-ONE Applications software

UT-ONE Applications is a software package that provides a basic tool for the PC control of any thermometer readout from the UT-ONE family.

UT-ONE Applications installer is included free-of-charge with your UT-ONE thermometer readout, and upgrades are available for download at www.batemika.com. Software is developed in NI LabVIEW and source code for selected applications is available on request for qualified customers. This makes a great starting point for developing your own derived applications to manage your particular measurement problem.

The UT-ONE Applications software package consist of 8 applications, which include basic interfacing and remote control, simple calibration-by-comparison demo, application for validation of climatic chambers, application for reviewing logged data, application for fast digitizing and application for checking of internal drifts and readjustment of internal measurement ranges.

UT-ONE Interface application
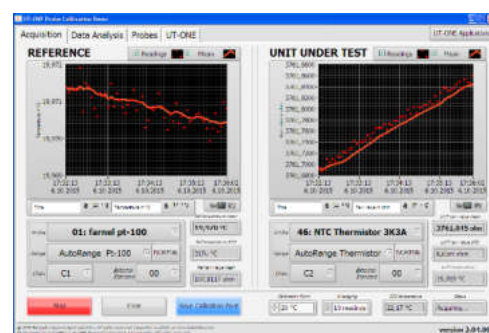
UT-ONE Probe Calibration Demo application

UT-ONE B03A
3-Channel Thermometer Readout

BATEMIKA
measurement solutions

Specifications

General specifications	
Number of main channels	3, consecutive sampling
Probe types for main channels	PRTs, thermistors, thermocouples
Auxiliary channels	Ambient conditions probe, internal CJC thermometer
Sampling period	2 to 240 seconds per channel
Measurement mode	Single or continuous measurements
Probe characterization	Standard and user-defined coefficients
User interface	3.2" colour display with touchscreen
Remote communication interface	USB and RS232
Data logging	67108864 readings (over 4 years at 2 s sampling)
Operating conditions	10 °C to 36 °C, 30% to 70% r.h., non-condensing
Power supply	External 6 V DC, USB power or internal LiPo battery
Power consumption	1 W typical, 2.5 W maximum
Weight	1.5 kg
External dimensions (W x H x D)	160 x 100 x 290 mm

Platinum resistance thermometers	
Probe types	Pt-100, Pt-25, Pt-200, Pt-1000
Temperature range	-200 to 961 °C max, limited by probe properties
Measurement current	1 mA and 0.707 mA DC, full current reversal
Keep-warm current	Automatically set on each main channel
Measurement subranges	25, 50, 100, 200, 400 and 800 Ω, with auto ranging
Probe characterization	Callendar-Van Dusen, polynomial, ITS-90
Typical accuracy	±0.006 °C, more info in detailed specifications
Effective resolution	1 ppm of subrange nominal limit (typical)
Non-linearity	±1 ppm of subrange nominal limit
Short-term drift	±6 ppm of value
Long-term drift	±15 ppm of value
Temperature coefficient	±0.25 ppm/°C

Thermistors	
Probe types	NTC or PTC with nominal resistance 2kΩ, 3kΩ, 10kΩ, …
Temperature range	-100 to 200 °C max, limited by probe properties
Measurement current	20 µA and 14.1 µA DC, full current reversal
Keep-warm current	Automatically set on each main channel
Measurement subranges	1.25, 2.5, 5, 10, 20 and 40 kΩ, with auto ranging
Probe characterization	Steinhart-Hart, exponential
Typical accuracy	±0.001 °C, more info in detailed specifications
Effective resolution	1 ppm of subrange nominal limit (typical)
Non-linearity	±5 ppm of subrange nominal limit
Short-term drift	±8 ppm of value
Long-term drift	±20 ppm of value
Temperature coefficient	±0.5 ppm/°C

UT-ONE B03A

3-Channel Thermometer Readout

Thermocouples	
Probe types	Type K, J, T, E, N, S, R, B
Temperature range	-200 to 1800 °C max, limited by probe properties
Cold junction compensation	Fixed temperature or internal CJC thermometer
Measurement subranges	15, 30, 60, 125, 250 and 500 mV, with auto ranging
Probe characterization	Differential polynomial for each type
Typical accuracy	±0.1 °C, more info in detailed specifications
Effective resolution	2 ppm of subrange nominal limit (typical)
Non-linearity	±10 ppm of subrange nominal limit
Short-term drift	±30 ppm of value
Long-term drift	±60 ppm of value
Temperature coefficient	±2 ppm/°C
Parasitic emf	±0.5 µV, independent of subrange

External ambient conditions probe (optional accessory)	
Sensor type	Sensirion SHT75
Sampling period	4 seconds
Response time	1 minute (typical)
Probe characterization	Polynomial correction function
Temperature range	-20 to 70 °C
Temperature resolution	0.01 °C
Temperature accuracy	±0.5 °C
Relative humidity range	10% to 90%, non-condensing
Relative humidity resolution	0.05%
Relative humidity accuracy	±2%

Internal CJC thermometer	
Sensor type	Digital temperature sensor
Sampling period	1 second
Response time	10 minutes (typical)
Probe characterization	Polynomial correction function
Temperature range	5 to 45 °C
Temperature resolution	0.01 °C
Temperature accuracy	±0.4 °C
CJC accuracy	±0.5 °C

Specifications apply to UT-ONE readout only and do not include the properties of thermometer probes. Detailed specifications are available at our website.
Batemika is dedicated to constant improvement of our products and associated measurement procedures. We reserve the right to changes without prior notice.

Ordering Information

UT-ONE B03A thermometer readout can be ordered in basic configuration, which includes:

- the thermometer readout unit
- the RS232 and USB communication cables
- the external 6 V DC power supply
- factory adjustment certificate
- LabVIEW drivers and UT-ONE Applications software

Batemika recommends the following items to be ordered with UT-ONE B03A as optional accessories:

- External ambient conditions probe for air temperature and relative humidity
- External reference resistor
- Rugged plastic carrying case
- Elpro and AccuMac temperature probes

Description	Order code
UT-ONE B03A thermometer readout	BH-B003
Ambient conditions probe (air temperature and relative humidity)	BH-B004
External reference resistor	BH-B006
Plastic carrying case	BA-G012
LabVIEW driver and applications	BS-B005
Elpro Pt-100 probe for climatic chamber validation	BH-P035
AccuMac temperature probes	BH-P030

For more information on pricing and ordering our products, visit our website www.batemika.com or send an inquiry to info@batemika.com.

As additional service, we can provide an ISO/IEC 17025 accredited calibration certificate from our partners for the UT-ONE B03A unit and for the ambient conditions probe.

If you require a custom measurement software for automating your calibration or test procedure, contact us at info@batemika.com.
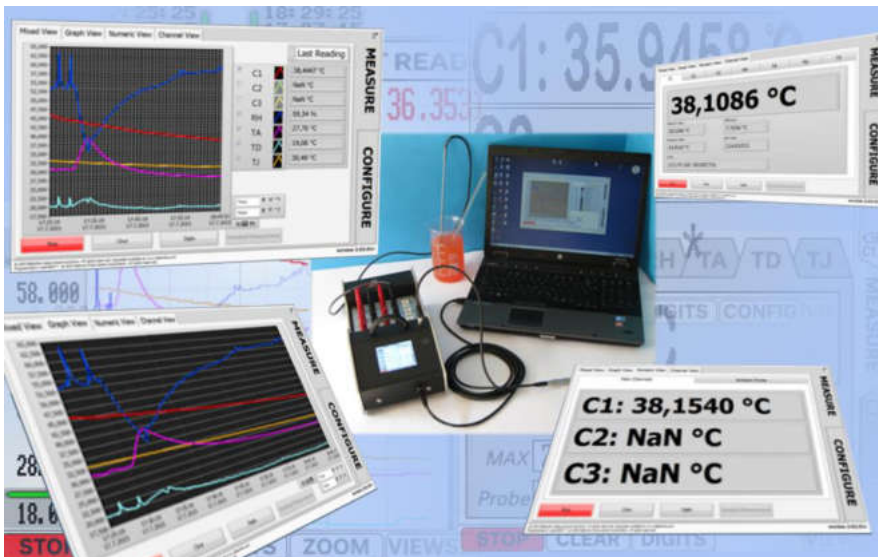
Contact

Batemika, d.o.o.
Slap 57
5271 Vipava
Slovenia, EU
www.batemika.com
info@batemika.com