TSM - Temperature Sensor Meter

Product Overview

The Temperature Sensor Meter (TSM) and Thermistor Sensor Meter (TRM) are stand-alone logging instruments for the measurement of air, soil, solution, leaf, canopy or surface temperature.

The TSM can support up to 5 Everest Interscience Infrared Thermometers. The Thermistor Sensor Meter (TRM) can support up to 10 Thermistors. For all sensors temperature is recorded as degrees Celsius.

The TSM and TRM are fully self-contained units requiring power input from a 20W solar panel (field applications) or 24V power supply (glasshouse applications).

Communication is via a USB port or wireless connectivity. The TSM and TRM are IP-65 rated and have a Windows driven GUI interface for complete logging solutions including look-up tables, scripts and sensor calibration capabilities.

Breakout Box, ICT Instrument and THERM-SS (TRM1)

Therm-Micro on leaf surface

Applications

- Plant physiology (leaf and canopy temperature)
- Soil, air and fluid temperature
- Thermistor strings for borehole monitoring
- Concrete temperature during drying
- Building energy use studies

Features

- Stand-alone, wireless data logging, low power requirement
- Up to 10 sensor capacity
- Precise measurements of temperature
- Flexible sensor calibration, look-up tables, and user scripts
- IP-65 weather proof rated

The TSM and TRM are ideally used in combination with the SFM sap flow meter (tree water use), PSY stem psychrometer (plant water potential), SMM soil moisture meter, SOM soil oxygen meter and the ICT International automatic weather station.

Solutions for soil, plant & environmental monitoring

ICT INTERNATIONAL

www.ictinternational.com

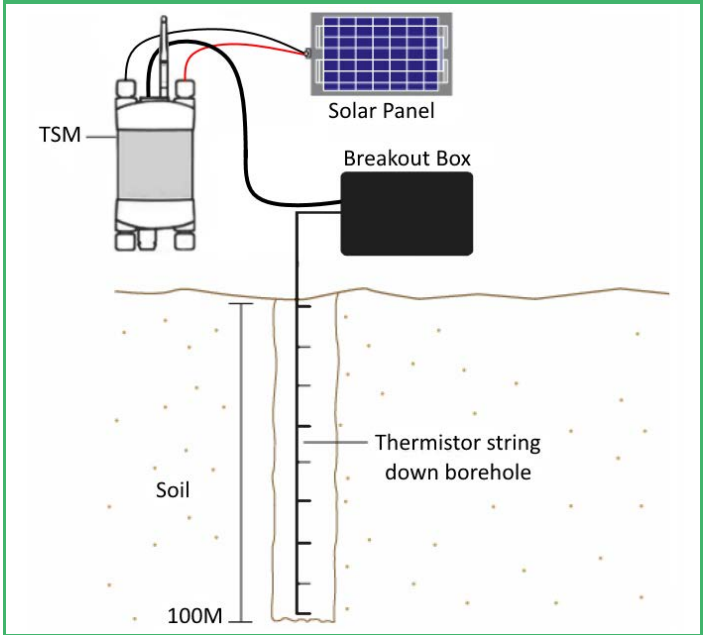
Ph: +61 2 6772 6770 sales@ictinternational.com.au

TSM - Temperature Sensor Meter

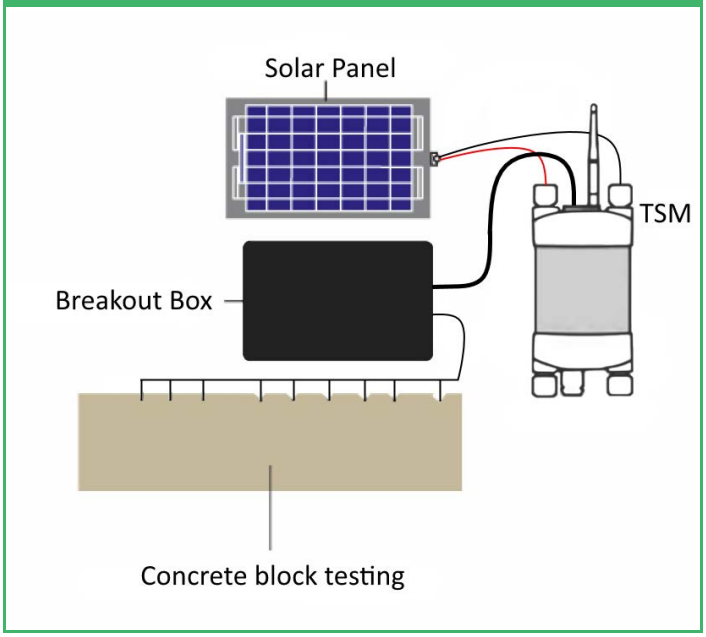
More Details

- The TSM and TRM are stand-alone instruments and do not need extensive cables and power requirements. All data is stored within the unit on a removable MicroSD card.
- Communication with the TSM and TRM are made either with a USB or wireless connection. Wireless is capable of distances up to 250m.
- In conjunction with an ICT web-based controller, the TSM, TRM and/or individual sensors can be controlled remotely. Real-time, live measurements can be made remotely from any location with internet access. Data can be logged directly onto a remote computer or stored in the field on an ICT log server which can then be accessed via the internet.
- The TSM and TRM have GUI based and extremely user-friendly configuration software for Windows and Mac. Custom calibration equations or data can be entered and edited via the software. Real-time measurements, diagnostics and sensor configurations can easily be made.
- The TSM and TRM have a 2 wire, non-polarised bus for power input. There is no chance of incorrect wiring of positive and negative voltage because the TSM and TRM are non-polarised.
- The TSM and TRM have an internal lithium-polymer battery that is kept charged by an external power supply (solar panel or mains). The instrument has an internal voltage regulation for maximum power reliability.
- The TSM and TRM are IP-65 rated and have been demonstrated to operate in extreme environmental conditions. Units are being used in diverse environments from hot Australian deserts, tropical Amazon rainforests, temperate German forests, Indian agricultural fields and North American Arctic cold.

Thermistor strings used for borehole monitoring and concrete block testing



Thermistor strings used for concrete block testing



Compatible Thermistor & Temperature Sensors

Temperature (Thermistor) Sensors - Use with TRM (Thermistor Sensor Meter)

THERM-SS

- Thermistor strings available
- Stainless steel embodied thermistor. Standard cable lengths: 5m, 30m, 50m. Custom lengths available.
- Measurement range: -40 to 100°C
- Accuracy: ±0.05°C
- Resolution: 0.01°C

THERM-EP

- Thermistor strings available
- Epoxy embodied thermistor. Standard cable lengths: 5m, 30m, 50m. Custom lengths available.
- Measurement range: -40 to 80°C
- Accuracy: ±0.05°C
- Resolution: 0.01°C

THERM-MICRO

- Micro scale measurements of temperature
- Non-destructive sampling of leaf temperature
- Measurement range: -40 to +125°C
- Accuracy: ±0.2°C
- Resolution: 0.01°C

Temperature (Voltage) Sensors - Use with TSM (Temperature Sensor Meter)

4000L

- Everest Interscience Infrared Sensor
- Highly accurate with automatic corrections based on subject radiation and sky radiation.
- Measurement range: -10 to +100°C
- Accuracy: ±0.5°C
- Resolution: 0.1°C

Note: TSM can also measure solar radiation or PAR radiation of the crop canopy at the same time as Infrared temperature.

Solutions for soil, plant & environmental monitoring

ICT INTERNATIONAL

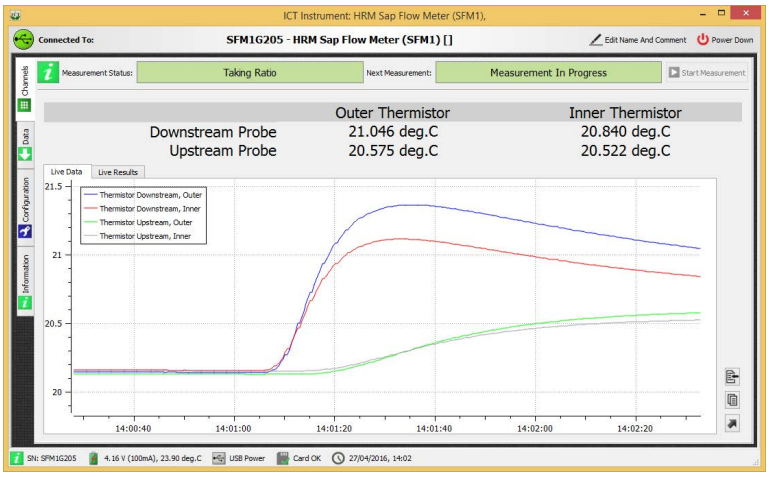
www.ictinternational.com

Ph: +61 2 6772 6770 sales@ictinternational.com.au

Software & Communication

Software

Overview
ICT International instruments have customised software support. The software acts as an interface between the user, instrument and sensors. Each instrument has software pre-configured for the sensors it supports.

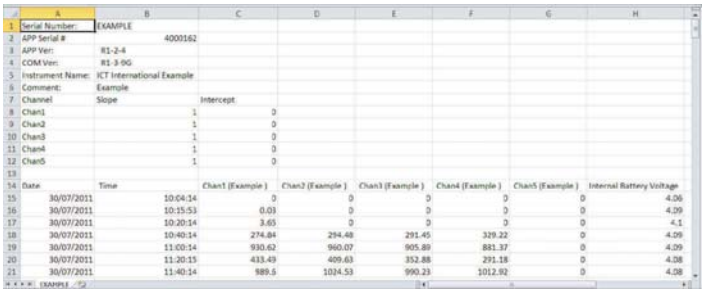


Software Overview

Look up Table
A look-up-table is a linear conversion from a mV output from the sensor into any conversion units. A minimum of two values are needed: the lowest mV output and the highest mV output.

Script
For more complex conversions, such as a exponential, logistic or polynomial equations, users can enter a script. The scripting language is unique to ICT yet is simple, logical and extremely user friendly.

Self Calibration
Individual sensors can be calibrated using the ICT International software. A minimum three point calibration curve is required. Statistical analysis of calibrated data is automatically performed. Calibration curves can be saved, retained and modified. Calibration of individual sensors allows absolute precision data collection.

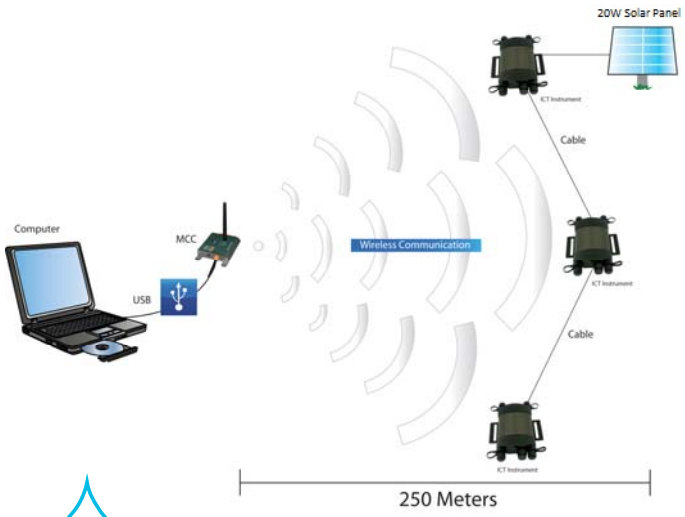


Example Output File

Communication

MCC

- Wireless communication with any ICT International instrument within 250m
- Portable, easy-to-use via ICT International software interface.
- Connects directly into any Windows or Mac based computer via USB cable.
- Multiple port channels, such as SDI-12, for highly flexible interfacing between ICT International instruments and third party devices.



Solutions for soil, plant & environmental monitoring

Components

Solar Panel / Power Supply

Field Applications:

- 22W Solar Panel
- 12V Battery

Laboratory / Glasshouse Applications:

- 24V power adapter

Power Supply

Solar Panel

4GB Removable SD Card

- Data stored internally on a 4GB removable MicroSD card.
- Storage for months to years of data.
- Expandable up to 16GB.

Micro SD Card

Breakout Board

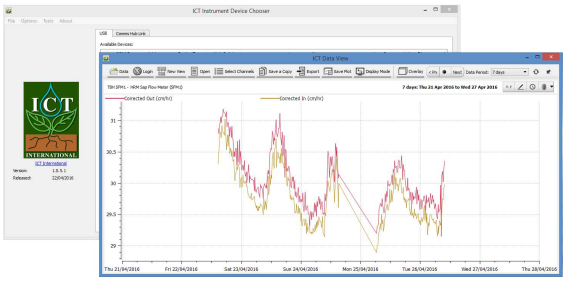
- ICT International instruments can support up to 5 differential sensors or up to 10 single ended sensors.

Differential

Single Ended

GUI Based Software

- Customised software interface between user, instrument and sensors.
- Set logging intervals, parameters and data download.
- Look-up tables, user scripts and custom sensor calibration.



Customised software interface

MCC Wireless / USB Cable

- Communication with instrument is made directly via a supplied USB Cable
- Wireless communication is available with communication distance up to 250m.
- Connect MCC wireless device to USB port of computer.

USB Cable (1.8m length)

MCC Wireless Device

Solutions for soil, plant & environmental monitoring

ICT INTERNATIONAL

www.ictinternational.com

Ph: +61 2 6772 6770 sales@ictinternational.com.au

TSM Specifications

TSM Logging	
Analogue Channels	5 differential or 10 single ended
Resolution	0.00001V-24-Bit
Accuracy	0.001V
Minimum Logging Interval	1 second
Delayed Start	Suspend Logging, Customised Intervals
Sampling Frequency	10Hz
Data	
Communications:	USB, Wireless Radio Frequency 2.4 GHz
Data Storage	MicroSD Card, SD, SDHC & SDXC Compatible (FAT32 Format)
Software Compatibility	Windows 7, 8, 8.1, 10. Mac OS X
Data File Format	Comma Separated Values (CSV) format for compatibility with all software programs
Memory Capacity	Up to 16GB, 4GB microSD card included.
Operating Conditions	
Temperature Range	-40°C to +80°C
R/H Range	0 -100%
Upgradable	User upgradeable firmware using USB boot strap loader function
Power	
Power supply	8-30V DC 2-wire non-polarised bus
Power Consumption	20 mA
Internal Battery Monitoring	Logging internal battery voltage & charging current
Charging Rate	Automatic variable rate of charging to maximise solar panel charging current on full sun days and or under low light cloudy conditions. Variable current 60 mA to 200 mA

Features

Power Management

- Internal Lithium-Polymer Battery
- Power On/Off Switch
- Internal Voltage Regulation
- Optical Isolation Lightning Protection

Logging

- Stand-Alone Logging
- 24-Bit Resolution
- MicroSD Expandable Memory
- USB Connectivity
- Wireless Data Transfer
- IP65 Intrusion Rating
- Free Windows Utility Configuration Software

Applications

- Plant physiology (leaf and canopy temperature)
- Soil, air and fluid temperature
- Thermistor strings for borehole monitoring

Accessories

- MCC
- Quad Band GPRS, GSM, 3-G CDMA Modem

ICT INTERNATIONAL

Solutions for soil, plant & environmental monitoring

www.ictinternational.com

Ph: +61 2 6772 6770 sales@ictinternational.com.au