About ICT International

ICT International has been providing monitoring solutions for soil, plant and environmental research since 1982.

The company’s integral strength in supplying world class soil, plant and environmental monitoring instrumentation comes from the extensive scientific knowledge base of ICT International sales and engineering team, allowing ICT International to supply the most appropriate solutions required to meet customer applications.

Logging Platforms for Scientific & Commercial Applications

This catalogue demonstrates instrumentation built on the ICT International logging platform. This platform has been specifically created to enable the development of monitoring solutions for soil, plant and environmental research. These solutions demand sophisticated electronics, to function in often rugged and remote locations and data to be available globally. This demands great understanding, passion and belief in the science. ICT International has very closely engaged with leading scientists in the world in this endeavour.

The opportunity now exists for customers to utilise this instrumentation, in its current form, as demonstrated in this catalogue or to engage and co-operate with ICT International to further develop this logging platform into instrumentation and opportunities to use past research or to assist in future endeavours. This platform enables customers to focus on the science with ICT International as a co-operative partner providing support. In this regard ICT International welcomes your enquiry.
Solutions for Soil Moisture Monitoring

SMM Soil Moisture Meter

A stand-alone logging instrument for continuously monitoring the volumetric moisture content of soils. SMM Soil Moisture Meter supports up to 10x Soil Moisture Sensors with a calibrated accuracy of ± 1%.

MP306 & MP406 Soil Moisture Sensor

ICT International’s soil moisture sensors are based on the standing wave principle. The MP306 and MP406 Soil Moisture Sensors are highly accurate and have a 0.01% resolution when used with the SMM Soil Moisture Meter or MPKit. Made of stainless steel, the sensor is very rugged and has a lifespan of 10+ years, when buried in continuous monitoring applications.

MPKit Portable Soil Moisture Sensor

The MPKit enables portable, rapid and accurate sampling of volumetric soil water content (%). The time it takes for a measurement is three seconds. Data is stored on the hand held unit and can be downloaded into an Excel file via the MPKit software. The MPKit is typically used with the MP406 Soil Moisture Sensor.
Solutions for
SOIL WATER POTENTIAL

SMM Soil Moisture Meter

ICT International provides the only solution for the *simultaneous measurement of soil water potential and soil water content*. With a soil water characteristic curve, the SMM can be programmed to measure soil water potential and soil water content in one location via an MP306 or MP406 Soil Moisture Sensor.

A data set and graph displaying *simultaneous measurement of soil water potential and soil water content* is on page 8.

STM Soil Tension Meter

The STM Soil Tension Meter measures soil matric potential via a vacuum transducer connected to a tensiometer. The STM can support up to 5x tensiometers with an accuracy of ±1% and resolution of 0.01 kPa.

Measurement ranges:
± 7 kPa; ± 100 kPa; -100 to +200 kPa.

Tensiometers for Soil Columns

The STM Soil Tension Meter is ideally suited to measure water potential in soil columns. Engineers and Scientists can use the ICT2100F Micro Tensiometer or larger standard tensiometers. All data can be transferred by wireless to a central computer in the laboratory. Accuracy: ±1%. Resolution: 0.01 kPa. Measurement ranges: ± 7 kPa; ± 100 kPa; -100 to +200 kPa.
AIM Automatic Infiltration Meter

The AIM Automatic Infiltration Meter is an automated solution for the measurement of infiltration rate in soils. The AIM is a convenient solution for infiltration measurements that saves researchers time. The AIM relieves researchers of the need to manually monitor their infiltrometer with a stop-watch and notepad.

SOM Soil Oxygen Meter

ICT International’s SOM Soil Oxygen Meter is the ideal solution for the continuous monitoring of soil, landfill and compost oxygen content. The SOM can support up to 10 x ICT02 Soil Oxygen Sensors. Each ICT02 sensor is individually calibrated for highly accurate soil oxygen content measurements.

Temperature for Soils, Concrete, Mining and Building Applications

The TSM Temperature Sensor Meter supports up to 10 x thermistors for the measurement of temperature or up to 5 x heat flux plates for thermal properties. Each temperature sensor or heat flux plate is individually calibrated for highly accurate measurements.
SFM1 Sap Flow Meter

ICT International’s SFM1 Sap Flow Meter is the most versatile solution for the measurement of sap flow in small or large woody stems. For the most accurate measurements of high, low and reverse sap flow, the SFM1 Sap Flow Meter utilises the Heat Ratio Method (HRM).

The HRM is suited to many applications including total plant water use, multi-point sampling, hydraulic redistribution, root monitoring and low and reverse flow.

The SFM1 Sap Flow Meter has multiple measurement settings including raw temperature mode, Compensation Heat Pulse Method (CHPM) and Tmax mode. All of these settings can be analysed in Sap Flow Tool - page 7.

HFD Heat Field Deformation Meter

Developed following years of scientific research by Professor Nadezhda Nadezhdina, the HFD Heat Field Deformation Meter precisely measures sap flow in large trees and roots. The needles of the HFD Meter are 10cm in length and have eight measurement points. This design enables the HFD Meter to measure radial sap flow profiles, as well as high, low and reverse sap flow.

The HFD Meter also measures the internal temperatures of trees for climate change research.

Analysis, graphing and visualisation of HFD data in Sap Flow Tool is shown on page 7.
Sap Flow Tool

Sap Flow Principles
- Heat Ratio Method (HRM)
- Heat Field Deformation (HFD)
- Compensation Heat Pulse Method (CHPM)
- Tmax
- Raw Temperature Mode

Features
- 2D and 3D visualisation
- Zoom in and out over various temporal scales
- Dynamic radial profiles for multi-point instruments (HRM and HFD)
- Data visualisation with meteorological variables, plant water potential, soil water content and soil water potential, dendrometers, temperature and more...
- Export raw data, corrected data, and graphs for statistical analysis or presentations
- Windows and Mac version

Data Corrections
- Remove bad data
- Correct for zero-offsets and probe misalignments
- Advanced data filters: transform, interpolate, sum and integrate data, calculate yearly/weekly/daily sums and averages, ...
- Data corrections are always reversible (original data is not modified)
Sap Flow Tool for Data Visualisation

Sap Flow Tool is not only the most comprehensive software for the analysis of sap flow data, but it can also be used to visualise data sets from any source. Sap Flow Tool can handle data from any ICT International instrument, including meteorological data, soil moisture, soil water potential, soil temperature, plant water potential (PSYL Stem Psychrometer), canopy temperature, or dendrometers.

Sap Flow Tool also supports third party data sources through the importation of text files. Data visualisation makes Sap Flow Tool the most versatile and comprehensive software available for plant and soil scientists.
PSY1 Stem Psychrometer

The PSY1 Stem Psychrometer is designed for the continuous and non-destructive measurement of plant water potential. The PSY1 measures at 10 minute intervals for high resolution changes in plant water status. The PSY1 can measure water potential of stems, leaves or roots.

Measurement range: -0.1MPa to -10MPa.
Resolution: 0.01MPa. Accuracy: ±0.1MPa.

The PSY1 Stem Psychrometer has been used on coffee, cotton, eucalyptus, acacia, spruce, citrus, tomato, maize, rose, date and melon, both in the field and in greenhouses.

PSY1 for Leaf Osmotic Potential

The PSY1 Stem Psychrometer can be adapted to measure leaf osmotic potential in the lab or the field. Samples are housed in the Osmotic Potential Insulator to provide thermally insulated measurements.

Measurement range: -0.1MPa to -10MPa.
Resolution: 0.01MPa. Accuracy: ±0.1MPa.
WSM1 Weigh Scale Meter

The WSM1 Weigh Scale Meter continuously measures and logs transpiration in small or large plants with a measurement range from 0.001g to 120kg. Plants are placed on the scale and the weight is logged continuously at user defined intervals or monitored in real time. The amount of weight lost over time is a direct measure of water loss from the plant. Sap flow sensors can be checked and calibrated on small or large plants with the WSM1.

Stem Hydraulic Conductivity

By combining the SFM1 Sap Flow Meter with the PSY1 Stem Psychrometer ICT International has developed an in-situ hydraulic conductivity meter. This technique allows continuous non-destructive logging of hydraulic conductance over days to weeks at a time.

Continuous Monitoring of the Soil - Plant - Atmosphere Continuum

ICT International provides the only solution for the continuous and non-destructive measurement of the Soil - Plant - Atmosphere Continuum.

Soil - SMM Soil Moisture Meter - see page 4
Plant - PSY1 Stem Psychrometer - see page 9
Atmosphere - AWS Automatic Weather Station - see page 12
Dendrometers for Stem & Fruit Monitoring

DBL60 - Logging Band Dendrometer 60mm - measures stem with a minimum diameter of 80mm.
DBM80 - Manual Band Dendrometer 80mm - manual measurements of stems with a minimum diameter of 80mm.
DEX - Small stems and fruits. Range: 5mm - 200mm. Resolution: 0.0004mm; Accuracy: ±0.05mm

LSM Light Sensor Meter

The LSM Light Sensor Meter supports solar radiation (pyranometer) or photosynthetically active radiation (PAR) sensors. The LSM is ideally suited to measure the fraction of absorbed radiation ($f$) beneath and within plant canopies.

The LINPAR Sensor is designed for the measurement of photosynthetically active radiation (PAR) within plant canopies. There are 33 sensors that are mounted within a 1 metre anodised “U” section tube.

TSM Temperature Sensor Meter

ICT International provides solutions for measuring temperature of plants at the leaf or canopy scale. The TSM Temperature Sensor Meter supports the THERM-MICRO sensor which can measure the temperature of small or large leaves within the leaf boundary layer. The Everest Interscience range of Infrared thermometers measure canopy temperature.
ICT International’s AWS Automatic Weather Station is not just another off-the-shelf-weather station but the most advanced weather station available for serious scientists and researchers.

The AWS Automatic Weather Station has virtual channels for the measurement of important variables such as Penman-Monteith or evapotranspiration, vapour pressure deficit (VPD), dew point and plant disease indices.

If the user has existing algorithms or develops algorithms later in time for their specific application these can be programmed as virtual outputs enabling real time monitoring of their desired calculated parameter. ICT International also wishes to develop future collaborations in this regard.
ICT International has a GSM modem which can collect data from any ICT International logging device or group of devices at an experimental site. Data can be downloaded as files for analysis. Additionally, sensor values, power supply and solar panel output can be monitored in real time. Data can be downloaded anywhere in the world via the internet or GSM network.

MCC1 Wireless Communication Device

The MCC1 Wireless Communication Device connects to any laptop or PC via a USB cable for wireless communication to any ICT Instrument within a line of sight, typically 250m radius. A larger field of influence can be achieved with larger aerials. Communication is two-way, therefore data can be downloaded from the ICT instrument, or settings, such as logging interval, can be changed.

MCC2 Wireless Data Logging Device

The MCC2 Wireless Data Logging device can collect data from any ICT Instrument within a line of sight, typically 250m radius. A larger field of influence can be achieved with larger aerials. All data is stored on a single 2GB SD card in a comma separated file (.csv). SD card data storage enables rapid transfer of data files from many ICT Instruments in the field.
AML Advanced Multi-Function Logger

**INPUTS:**
- 10 digital
- 10 autoranging analogue (24 bit)
- RS485 half duplex
- I²C direct connection of digital sensor IC.
- SDI-12
- Wireless sensors

**OUTPUTS:**
- Battery, regulated and switchmode power supplies for powering sensors

**POWER SUPPLY:**
- Internal rechargeable lithium battery
- Directly powered by solar panel
- Non polarised, lightning protected

**COMMUNICATIONS:**
- 2.4 GHz low power wireless or
- USB
- GSM modem to internet

The AML has been designed with electronics divided into a module that manages power and communication and a module that manages measurements and recording of data. It is a platform which allows new instruments and devices to be quickly developed on top of proven infrastructure.

Logging Platforms for Scientific & Commercial Applications

These environmentally sealed low power data loggers are the basis of ICT International’s technology for environmental monitoring and control applications. This platform can be developed for specific custom applications with globally marketable outcomes. Enquiries in regard to further development either cooperatively or OEM are invited.