

HAL CORPS

(ISO 9001:2015 CERTIFIED)

PRODUCT OVERVIEW



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TMS



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TOMST® Dataloggers TMS

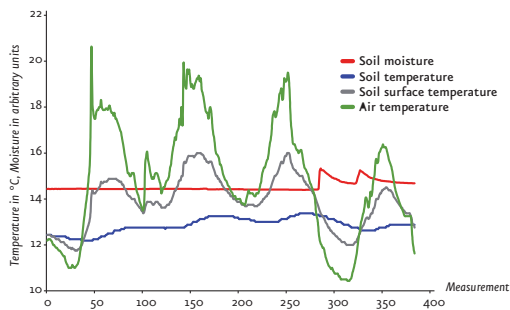
Technical details:

1. Temperature measured using temperature sensor MAXIM/ DALLAS Semiconductor DS7505U+, with resolution of 0.0625°C and with accuracy of $\pm 0.5^\circ\text{C}$.
2. The moisture sensor measures slowing down of a signal with changes in the permeability of the environment at a frequency of 100-200MHz. This method (TDT) is largely independent of salinity and temperature. The measuring error in a similar environment does not exceed 1%.
3. Capacity of the data loggers is 32MBit, i.e. over to 500 000 values can be stored. Over 14 years of measurements every 15 minutes. Real time measured using a crystal of 32.768kHz, with the accuracy of $\pm 2\text{min./month}$.
4. Battery - LS 14500 Primary lithium-thionyl chloride cell with a capacity 3.6V/2.6Ah. The battery will last for at least 10 years.
5. Size: 29cm / Weight: 108g

The TMS dataloggers have a wide range of applications for **research** in the fields of biology, ecology, soil sciences, hydrology, climatology etc. It can also be used in **agriculture, horticulture and forestry** – monitoring growing conditions in the field, greenhouse, growth chambers etc. Other possible applications include monitoring conditions in **grain stores** and any other places where it is important to monitor the course of moisture and temperature. Currently, we have wide experience with their use in a range of field conditions within several research projects around the world - studies of climatic inversion in deep sandstone valleys, monitoring soil moisture and temperatures in wet meadows, sandy habitats and mountain forests. It is also used for identification of optimal growth conditions at Energy Plantations.



TOMST® since 1995
TMS since 2009



TMS

Course of temperature and soil moisture over 4 days measured every 30 minutes.

TOMST® Dataloggers TMS



Standard TMS unit

is measuring temperature in 3 different levels in a depth of -6, +2 and +15 cm and measuring the soil moisture as well.

TMS Long

is a prolonged version of the standard TMS device. The upper pipe with thermosensor No.3 is manufactured in sizes 20, 30, 40 cm.

Buriable TMS unit

is built from 2 parts. The first part is soil moisture and two temperature meters and this part can be buried deep into the ground. Second part is a data downloading probe and the 3rd thermo meter. These two parts are connected by cables, mainly used for measuring in depths.

Standard length: 0,5 m / 1 m / 2 m.

Thermologger

is version of the TMS datalogger, designed for measuring air temperature. It consists of one thermosensor and it is possible to hang it on trees.

Point Dendrometer

measures stem diameter changes $< 1 \mu\text{m}$ in user defined intervals (step by $0,27 \mu\text{m}$). It can measure changes in wood and bark separately. Also, the dendrometer is able to measure air temperature.

TMS dataloggers for measuring air and soil temperature and soil moisture.

Need to measure air and soil temperature and soil moisture in many locations over extended time periods?

TMS dataloggers:

- Offer unique possibility to measure soil and air temperature and soil moisture in any extreme conditions.
- TMS loggers are durable, autonomous and require minimal maintenance. Can collect and store data for over 10 years without battery replacement and data extraction (over 500 000 events ~ 14 years of measurements every 15 minutes).
- No need for any additional special equipment - single measuring units are physically independent. The data will be stored in the logger even when e.g. moved by wild animals.
- The extraction of data is very easy and quick via a USB cable using our TMD adapter.
- Offers the possibility of added external sensor allowing measurements in any distance/height from the central logger or remote data download when buried in depth underground.
- Currently, we have wide experience with their use in several research projects in Europe, America, Africa, Australia and Asia.
- High precision of measurements, insensitive to soil conditions.
- Are cheap compared to other commercial dataloggers.
- The company TOMST® has operated on the market since 1995. Main activities of the company concern research, development and production of electronic equipment.



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TOMST® since 1995
TMS since 2009



IFL INTEGRATED FLUOROMETER AND GAS EXCHANGE SYSTEM

- Light weight, battery operated with Graphical Display.
- Measured Parameters : CO₂, Water Vapour, PAR, Leaf & Air Temp., Stomatal Conductance, Transpiration, Photosynthetic Rate, C_i, Atmospheric Pressure and all chlorophyll fluorescence parameters.
- Measurement of leaf absorptance, transmittance and chamber leakage for more accurate and reliable data.
- Data Storage : 2 GB SD Card, downloading through USB or Card reader.
- Battery backup for 10 hours.
- Large touch screen, colour, graphic display.
- Gas exchange measurements can be presented in either ppm/mbar or $\mu\text{mol mol}^{-1}\text{m}^{-2}\text{s}^{-1}$.



AP4 AUTOMATIC POROMETER

- Portable Instrument for Measurement of Stomatal conductance/Resistance, PAR, RH & Leaf Temp.
- Inbuilt Data Storage for 1500 data sets with facility for 30 character note with each reading.
- Conductance : 5.0-1200 $\text{mmol/m}^2/\text{s}$ & Resistance : 0.2- 40.0 s/cm.
- RH : 0-100% PAR : 0-2500 micromol / m^2/s .
- Display : 8x40 Character LCD display.
- Battery Back up : 20 Hours duration.
- Qwerty Keypad for easy operation.
- Calibration Plate as standard accessory.

SUNSCAN CANOPY ANALYSIS SYSTEM (CANOPY ANALYSER)

- Battery operated PAR base instrument to measure and calculate the Leaf Area Index PAR (Photosynthetically Active Radiation) & related parameters
- Direct display of LAI, PAR, Transmitted PAR, Diffused PAR, Zenith Angle
- Usable in clear, cloudy and changeable weather conditions
- Active Area : 1m x 13 mm wide sensor spacing 15.6mm
- Spectral Range : 400-700 nm
- Max Reading : 2500 $\mu\text{mol/m}^2/\text{s}$
- Data Storage : 1 Million Readings
- Display : 1/4 VGA sunlight Readable colour screen
- Data Download through USB Cable/ Direct USB Drive port using any Pen drive
- Operating System : windows mobile 6.5



HEMIVIEW TREE CANOPY ANALYSIS SYSTEM

- Battery operated 20 megapixel, digital SLR camera fixed with fish eye lense (180°) to measure the Leaf Area Index and related parameters of Trees/Tall Canopies.
- Data Storage : 4GB Removable SD Cards.
- Self Levelling Mount.
- Digital Display, No PC is required in the field for the operation.
- Image resolution : 20 megapixels
- Ideal for tall Irregular canopies.
- Results stored in Excel format.

LCi-T PORTABLE PHOTOSYNTHESIS SYSTEM (IRGA)



- Light weight, battery operated with color touch screen LCD display.
- Measured Parameters : CO₂, Water Vapour, PAR, Leaf & Air Temp., Stomatal Conductance, Transpiration, Photosynthetic Rate, Ci, Atmospheric Pressure, GPS Location etc.
- Wide Variety of Leaf Chambers to suit all type of samples like for Broad, Narrow, Conifer, Canopy, Soil CO₂, Fruits Chamber.
- Data Storage : 8 GB SD Card, downloading through USB or Card reader.
- Battery backup for 10 hours.
- Range CO₂ : 0-2000ppm H₂O : 0-75mb
- Supplied with light source as standard accessory.
- GPS to pinpoint your data.

LCpro-T PORTABLE PHOTOSYNTHESIS SYSTEM (IRGA)

- Light weight, battery operated with Graphical Display and Micro climate control for CO₂, Water Vapour, Light & Temp.
- Controls - CO : 0-2000ppm, RH : 0-75mb, PAR : upto 2000 $\mu\text{mols m}^{-2} \text{sec}^{-1}$.
- Temp: $\pm 15^{\circ}\text{C}$ from ambient temp.
- Measured Parameters : CO₂, Water Vapour, PAR, Leaf & Air Temp., Stomatal Conductance, Transpiration, Photosynthetic Rate, Ci, Atmospheric Pressure.
- Wide Variety of Leaf Chambers to suit all type of samples like for Broad, Narrow, Conifer, Canopy, Soil CO₂, Fruits Chamber.
- Data Storage : 8 GB SD Card, downloading through USB port or Card reader.
- Range CO₂ : 0-3000ppm H₂O : 0-75mb PAR : 0-3000 $\mu\text{mols m}^{-2} \text{sec}^{-1}$
- GPS to pinpoint your data.



CCM300 CHLOROPHYLL CONTENT METER

- Light weight, field portable, battery operated instrument for measurement of relative chlorophyll content (mg/m^2)/ CFR (Chlorophyll Fluorescence Ratio).
- Colour Display, Touch Screen, 2GB internal Memory, Data Averaging facility.
- CCM300 is suitable for all type of samples like leaves, stems, flowers, fruits, mosses, small grasses, Cactus, Algae etc.
- Each measurement takes only 5 seconds to perform and is presented as Chlorophyll. Fluorescence Ratio (CFR) or relative chlorophyll content in mg/m^2 .
- Resolution : 0.01 or 1mg/m^2 .
- Measurement area : Fiberoptic Probe with 3mm diameter.

CCM200 Plus CHLOROPHYLL CONTENT METER with In-built GPS

- Light weight, field portable, battery operated instrument for measurement of relative chlorophyll content as Index value In-built GPS Facility.
- LCD Graphic Display, internal Memory for 1,60,000 data sets.
- Data Averaging facility, Data Download through USB port.
- Measurement area : 1cm dia circle.
- Battery : 9v Alkaline Battery.
- Resolution : 0.1 CCI.
- Sample Acquisition time : 2-3 Seconds.
- Repeatability : $\pm 1\%$.
- Weight : 162 g.



OS5p+ MODULATED CHLOROPHYLL FLUOROMETER

Field Potable, Battery Operated, Light Weight for Measurement Of Fluorescence Parameters

- **Y(II)**: Quantum Photosynthetic Yield of PSII (or F_v/F_m' or Y)
- **ETR**: Electron transport rate
- **PAR**: Photosynthetically Active Region value
- **T**: Leaf temperature
- F_v/F_m : Maximum Photochemical efficiency of PSII.
- F_v/F_o : A more sensitive detector of stress F_o : Minimum fluorescence
- F_m : Maximal fluorescence. F_v : Variable fluorescence.
- F_{ms} (or F_m'): Maximal fluorescence with actinic illumination at steady state fluorescence.
- F_s (or F): Fluorescence under steady state conditions (prior to saturation pulse).
- $rETR_{MAX}$: A measure of a leaf's photosynthetic capacity or maximum electron transport rate is the initial slope of line at low PAR values created by relating ETR to PAR. It provides a measure of quantum efficiency.
- $I_k = rETR_{MAX}/\alpha$: A measurement of the light intensity where light saturation dominates, or the minimum saturation level.
- **Hendrickson Quenching with NPQ (standard)**: Y(NPQ), Y(NO), Y(II), NPQ, F_v/F_m .
- **OJIP - Strasser Protocol**:
Data storage: 1GB removable SD card
Battery backup: 12 Hours continuous operation
Universal PAR clip suitable to wide variety of Leaf samples.



OS1p MODULATED CHLOROPHYLL FLUOROMETER

Field Potable, Battery Operated, Light Weight for Measurement Of Fluorescence Parameters

- **Y**: Quantum Photosynthetic Yield of PSII (or $\Delta F/F_m'$ or Y(II))
- **ETR**: Electron transport rate (w/optional clip)
- **PAR**: Photosynthetically Active Region value (with optional PAR clip)
- **T**: Leaf temperature (with optional PAR clip)
- F_v/F_m : Maximum Photochemical efficiency of PSII
- F_v/F_o : A more sensitive detector of stress F_o : Minimum fluorescence
- F_m : Maximal fluorescence F_v : Variable fluorescence
- F_{ms} (or F_m'): Maximal fluorescence with actinic illumination
- F_s (or F): Fluorescence under steady state conditions (prior to saturation pulse)
- **Multi-Flash with F_m' correction and ETR correction**
- **Optional PAR Clip**
- Provides PAR and leaf temperature. It should be purchased for Y(II) and ETR measurements
- Data storage: 1GB removable SD card
- Battery backup: 12 Hours continuous operation
- Universal PAR clip suitable to wide variety of Leaf samples

ACM-200Aplus ANTHOCYANIN METER

- Light weight, field portable, battery operated instrument for measurement of ANTHOCYANIN in Leaves and Flowers.
- LCD Graphic Display, internal Memory for 1,60,000 data sets.
- Data Averaging facility.
- Data Download through USB port.
- Measurement area : 1cm dia circle.
- Battery : 9v Alkaline Battery.
- Resolution : 0.1 CCI.
- Sample Acquisition time : 2-3 Seconds.



Os30p+ STRESS SCREENING DEVICE (Chlorophyll Fluorometer)

- Hand held battery operated instrument for the measurement of Photochemical efficiency (Fv/Fm) Fv/F0 and OJIP analysis.
- Measured parameters: Fo, Fm, Fv/Fm, Fv/Fo, O, K, J, I, P, tFm, A, Mo and PI/ABS.
- Sampling rate: Variable from 10µS to seconds.
- Storage capacity: Up to 160,000 data sets and hundreds of experimental traces.
- Detection system: Related pulse excitation detection with high resolution sampling mode for Kautsky induction curve recording.

FV/FM METER

A compact and affordable Fv/Fm meter for dark adapted measurements Fv/Fm is a test that allows the measurement of the maximum potential quantum efficiency of Photosystem II if all capable reaction centres are open.

Technical Specifications

- **Fast measurements** : Fv/Fm, Fv/Fo, Fo, & Fm
- **Lighting conditions** : Dark adapted conditions only
- **Light sources** : Red LED Saturation flash array up to 6,000 umoles
- **Red modulated light source** : Modulated frequency is set at the factory. The red LEDs peak at 660nm with a cut off filter at 690nm
- **Sensors** : Pin Photodiode with a 700nm to 750nm band pass filter
- **Storage Capacity** : 2 Gigabyte of non-volatile flash memory, supporting almost unlimited data sets
- **Output** : USB comma delineated files may be opened in Excel
- **User Interface** : Menu driven with arrows
- **Display** : Graphic black and white display 132 x 32 pixels
- **Power Supply** : 8 hour USB lithium ion battery is standard, but any USB battery can be used.



MPM 100 MULTI PIGMENT METER

- Measures: Chlorophyll Content, Anthocyanin Content, Flavonol Content & NFI (Nitrogen-Flavonol Index)
- The MPM-100 or “Multi-Pigment-Meter”, uses a combination of techniques to measure these very different parameters, in proven ways, at the same time.
- Standard LED wavelengths:
 - Chlorophyll content: T850nm / T720nm
 - Flavonol content: F660nm / F325nm
 - Anthocyanin content: F660nm / F525nm
 - NFI: (T850nm/T720nm) / (F660nm/F325nm)

Technical Specifications

- Measurement Area: 9.5mm diameter circle
- Distance from edge of measuring head to measurement area: 9mm
- Repeatability: +/- 1%
- Noise: <+/- 2%
- Fluorescence Detector: Single channel Si Photodiode with detection from 720nm to 900nm range
- Transmittance Detectors: Single channel Si Photodiode with diffuser to measure from 405nm to 950nm
- Detection: Modulated light digitally controlled to minimize background detection
- Temperature compensation included for light source and detector
- Storage Capacity: 4GB of non-volatile flash memory
- Modes: Single point measurement, averaging of 2 to 8 measurements, median and mean values
- User Interface: 240 x 320px color touchscreen Output: USB 1.1
- GPS: Location accuracy range: 0.3m to 2.5m. Longitude, latitude, number of satellites and DOP



PLANT STRESS KIT

Compact and affordable Y (II)/ETR & Fv/Fm meters One case, two instruments. One for measuring light adapted Quantum Yield of PSII or Y(II) and one for dark adapted Maximum Potential Quantum Efficiency of PS (II) or Fv/Fm



Features

- Y(II) and ETR corrected for absorbance
- Leaf absorbance using RGB sensors
- PAR and leaf temperature measured
- Fm' correction according to Loriaux 2013
- Long-term fluorescence monitoring mode
- Rapid measurement of large populations –
- Lightweight dark adaption clips –
- Graphic Fv/Fm trace display –
- Compact, ergonomic design –
- Measurements from the same known state.

Parameters measured Y(II) and Fv/Fm

- Y(II): Quantum Photosynthetic Yield of PS(II)
- ETR: Electron transport rate
- PAR: Photosynthetically active radiation
- T: Leaf temperature
- FMS (or FM'): Maximum fluorescence at steady state
- FS (or F): Fluorescence under steady state
- Loriaux 2013 correction of ETR and FM'
- α : Leaf absorptance & transmittance
- RH: Relative humidity 5% to 95% (+/-2% over the range)
- Monitor mode: Fv/Fm, Y(II), ETR, absorptance, PAR, T, RH and ETR
- Fv/Fm: Maximum potential quantum efficiency of PSII
- Fv/Fo: A normalised ratio that may be used to improve stress detection
- Fo: Fluorescence after dark adaption
- Fm: Maximum fluorescence during a saturating pulse following a period of dark adaption
- Ft: Instantaneous fluorescence

Y (II) Meter

A compact and affordable light adapted Y(II) & ETR meter Quantum Yield of PSII or Y (II) is a test that allows the measurement of the efficiency of Photosystem II under actual light adapted

Features

- Y(II) and ETR corrected for absorptance
- Leaf absorptance using RGB sensors
- PAR and leaf temperature measured
- Fm' correction according to Loriaux 2013 environmental and physiological conditions.
- Long-term fluorescence monitoring mode
- 2Gb of on-board memory with USB output

Parameters Measured

- Y(II): Quantum Photosynthetic Yield of PS(II)
- ETR: Electron transport rate
- PAR: Photosynthetically active radiation
- T: Leaf temperature
- FMS (or FM'): Maximum fluorescence at steady state
- FS (or F): Fluorescence under steady state
- Loriaux 2013 correction of ETR and FM'
- α : Leaf absorptance & transmittance
- RH: Relative humidity 5% to 95% (+/-2% over the range)
- Monitor mode: Fv/Fm, Y(II), ETR, absorptance, PAR, T, RH and ETR



AUTOMATIC WEATHER STATION GP1 Type

- GP1 Data Logger : battery operated, easy to install and easy to handle. Pre-wired ready to use.
- Fix for Air Temp, RH, Wind speed, Wind Direction, Rainfall, Radiation.
- Data Logger GP1 stores 6,00,000 data sets with option of recording from 1 sec to 24 hours.
- Option to record minimum/ maximum/ average data
- Data downloading through RS 232-USB or GPRS modem with cloud facility
- 2 meter tripod mast
- Pre-loaded sensor library in the programme for easy operation.
- Can be operated through 9 volt battery without solar panel or through 12v battery and solar charging option.



AUTOMATIC WEATHER STATION GP2 Type & DATA LOGGER

- GP2 Data Logger : 16 channel data logger, 12 analog and 4 digital channels
- Sensors for Air Temp, RH, Wind speed, Wind Direction, Rainfall, Solar Radiation, Soil Temperature, Soil Moisture, Surface wetness, sunshine, atmospheric pressure, net radiation etc.
- Data Logger GP2 stores 2.5 million (4mb) data sets with option of recording from 1 sec to 24 hours.
- Option to record minimum/ maximum/ average data
- Data downloading through USB, GPRS modem and cloud facility
- 2 meter mast and cross arm accessories
- Pre-loaded sensor library in the programme for easy operation.
- Can be operated through 12v battery and solar charging option.

DATA LOGGERS

The GP1 Data Logger is a compact research grade data logger with smart irrigation control capability

- High accuracy 7 channel data logging
- Smart relay suitable for irrigation control
- Waterproof IP67 enclosure
- 600,000 readings
- Operated through Internal 9V battery and option to connect with 12 V Battery and solar power charging.
- Compatible with all Environmental sensors like RH/Temp, Wind speed, Wind direction, Rainfall, Solar radiation, Soil temperature, Soil moisture etc.
- Data downloading through RS232-USB, GPRS modem facility.



GP2 DATA LOGGER AND CONTROLLER .

The GP2 is a powerful, weatherproof, research grade data logger with unique features for recording and controlling field experiments

Features

- 12 differential channels
- High performance microvolt sensitivity
- 2.5 Million Data Storage Capacity
- Flexible configuration
- Versatile communication options
- Excellent analog accuracy
- Powerful Script Editor
- Virtual channels
- Unique program Simulator
- Data visualisation
- Operated through Internal 1.5V X 6 battery and option to connect with 12 V Battery 12 V Battery and solar power charging.
- Compatible with all Environmental sensors like RH/Temp, Wind speed, Wind Direction, Rainfall, Solar Radiation, Soil Temperature , Soil Moisture, Net Radiometer, Albedometer, Sunshine sensors, Surface Wetness
- Data downloading through RS232-USB, GPRS modem facility.



PROFILE PROBE SOIL MOISTURE METER

- Battery operated, research grade instrument for measurement of soil moisture at different depths down to 1 meter and 1/2 meter.
- PR2/6 : 10,20, 30, 40, 60, 100 cm depth (1 meter probe).
- PR2/4 : 10, 20, 30, 40 cm depths. (1/2 meter probe).
- User selectable output : % Volumetric, m^3/m^3
- Facility to store 5 user specific soil calibration.
- Single probe with independent sensors at different depths.
- LCD display to view the data before you store it.
- Access tube installation tool kit and Extraction tool kit supplied with the instrument.
- Data storage and downloading facility.

SDI-12 Version

The PR2 SDI-12 is a new digital alternative to the well-established analogue PR2 Profile Probe. It shares the many strengths of the analogue PR2 soil moisture probe, but with the addition of SDI-12 compatibility - allowing integration into new and existing SDI-12 systems.

- Multiple PR2 SDI-12s can be connected to a compatible data logger via a single cable
- Enables the creation of low cost highly flexible sensor networks
- Compatible with existing PR2 access tubes and auguring kits
- Conforms to industry standard SDI-12 (v1.3) spec
- Flexible integration with 3rd party SDI-12 hardware
- New low power design; ideal for remote sites



WET SENSOR KIT

- It measures Water content, EC, Temperature of the Soil.
- User selectable output : % Volumetric , m^3/m^3 of water content.
- Facility to store 5 user specific soil calibration.
- LCD display to view the data before you store it.
- Direct insertion in the soil.
- Maximum Sensor length : 7 cm.
- 3 Parameters with single insert.



WET 150 KIT

- WET150 Kit is a portable and rugged solution for researchers who need to assess moisture and salinity conditions in soils and substrates.
- The Kit makes fast soil/substrate measurements of three crucial variables that influence plant growth: moisture content, temperature*, and electrical conductivity (EC) – a strong indicator of the general nutrient level.
- The WET150 Meter is a lightweight and easy to use readout-only device (no data recording or other complications). Operation of the kit is straightforward – the user inserts the WET150 into the soil or substrate and presses the “Read” button on the meter to take and display the measurement.
- The WET150 Sensor comes complete with calibrations for mineral and organic soils plus perlite, coir, peat, and mineral wool substrates soils.

THETA PROBE SOIL MOISTURE METER

- Battery operated, portable instrument for measurement of Soil Moisture content.
- Direct insertion in the soil.
- Extension Tubes upto 1 meter used for deeper depth.
- Inbuilt Data Storage facility.
- Digital display. % Volumetric, m^3/m^3
- Operated through 9v battery.
- Accuracy: $\pm 1\%$
- Frequency: 100MHz.
- Maximum Sensor length: 6 cm.



SM 150T SOIL MOISTURE PROBE

- Battery operated, portable instrument for measurement of Soil Moisture.
 - Digital Display
 - Research grade sensor at a greater price
 - Robust and Durable
 - Moisture accuracy is 3% (after soil specific calibration)
 - Built-in temperature sensor achieves 0.5°C accuracy.
- Please note that the HH150 Meter supplied with the SM150 Kit is a readout-only device. If PC connectivity for data storage and download is a requirement, the SM150T should be used with the HH2 Moisture Meter instead.
 - NB: When used in portable mode the SM150T Sensor does not provide temperature indication

ACE SOIL CO₂ EXCHANGE SYSTEM / SOIL RESPIRATION SYSTEM

- Automatic Soil CO₂ Soil Respiration measurement system. It Measures Soil CO₂ Exchange, (Respiration Rate).
- Soil Temp, Soil Moisture and PAR (Photosynthetically Active Radiation).
- IRGA located near to Soil Chamber for fast response.
- Measurement Range CO₂ : 0-896ppm (differential open/close system).
- Measurement PAR : 0-3000 micromol/m²/s
- Option to measure Soil Temperature at 6 points & Moisture at 4 points.
- Operated through 12v, 7Ah battery for portable use.
- Data Storage: 2GB SD Card.
- Chamber automatically opens and closes between measurements
- CE can be used for short term as well as long term measurements.
- Data storage and download: through removable SD card. Easy data download without any specific software.
- **Zero / ambient option** : For more accurate NCER data, and absolute ambient CO₂ measurements each Station can be fitted with a Zero/ambient CO₂ concentration option. This includes a CO₂ stripper column that provides a zero CO₂ reference for each experiment.
- **Complete system** : Each ACE Station is a complete, fully integrated soil flux measurement system comprising the aluminium soil chamber, heat reduction parasol and arm that pivots from the control console, where measurements are both displayed and recorded. Each ACE Station can operate fully independently for single point measurements. The power efficient ACE Station can be powered by battery,



EGA60 LAB MODEL, (Multi-sample soil respiration system)

- Dual CO₂/H₂O analysis
- SD card data storage and USB output
- Up to 24 soil samples with one unit
- Flow maintained to all selected channels
- Flexible channel selection
- CO₂: 0-2000ppm, 1ppm resolution Infrared gas analysis
- H₂O: 0-75mbar, 0.1mbar resolution
- Analogue output: 0-5V or 4-20mA
- Analogue inputs: Seven 0-5V
- Power supply: 230/110V 50/60Hz
- Operating temperature range: 5°C to 45°C
- Recorded data: Removable SD card (1Gb card typically stores 16 million sets of data)
- Display: 240 x 64 graphic LED backlit LCD





AM350 PORTABLE LEAF AREA METER

- Portable instrument for Leaf area, width, maximum length, perimeter, average area, ratio, shape factor.
- Inbuilt Data storage for 2000 data sets. Display : 64x240 LCD graphic display.
- Maximum Measuring width: 103mm with 0.065mm resolution.
- Measurement Units: user selectable (mm/cm).
- Long leaves can be measured on independent white board.
- Leaf Image Display, storage and download facility through USB Port.

WINDIAS IMAGE ANALYSIS SYSTEM

- Lab Model, operated through 220v AC power. compatible with Windows operating system.
- Measures Leaf area, Length, width, perimeter, object count, hole area, disease area.
- Conveyor Belt attachment facility for fast measurement.
- Resolution : 1280 x 1024 pixels.
- Throughout Leave/hour : approx 800 samples.
- Maximum Object size : 1 pixel.
- Maximum sample area : 250 x290 (conveyor attachment).
- 250 x 1000 mm long leaf mode.
- Colour depth : 24bit colour space (16 million colours).
- Lower Price for conveyor belt systems
- LED lighting with adjustable brightness
- Improved seed counting capability
- Enhanced Area of Interest drawing tool

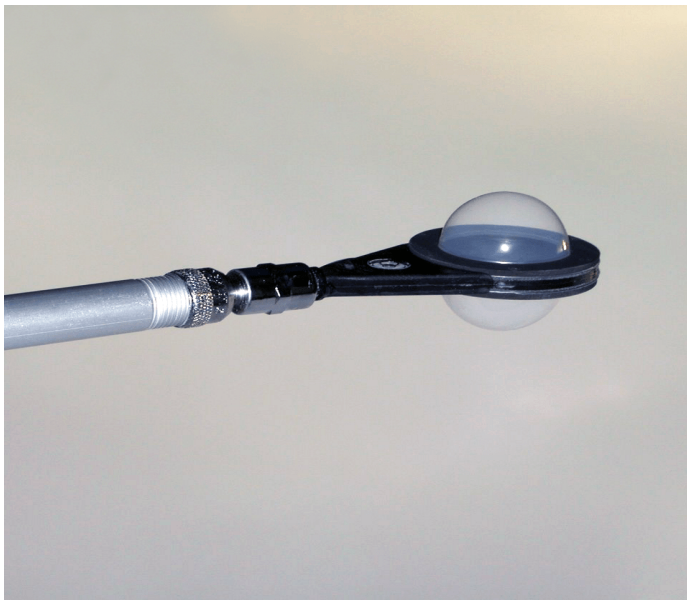


SPN1 SUNSHINE PYRANOMETER

- It measures Global (Total) Diffused and Sunshine hours.
- WMO sunshine threshold : 120 W/m² direct beam.
- No routine adjustment or pollar alignment.
- No moving parts, shade rings, trackers.
- Works at any altitude.
- Spectral Range : 400 - 2700 nm.
- Range : 0-2000W/m².
- Response time : <200ms.
- Resolution : 0.6 W/m² = 0.6Mv.
- Compatibe with GP1 Data logger : 600,000 data storage capacity.

BF5 SUNSHINE SENSOR

- It measures Global (Total) Diffused and Sunshine hours
- No routine adjustment or pollar alignment required
- No moving parts, shade rings, trackers works at any altitude
- Works at any altitude
- Spectral Range : 400 - 700nm
- Range : 0-2000W/m²
- Output : PAR / ENERGY / LUX (User selectable)
- PAR : 0-2500 micromol/m²/s Energy : 0-1250 W/m²
- Illuminance : 0-200klux
- Compatible with GP1 Data logger : 600,000 data storage capacity



NET RADIOMETER

- Net radiometer is a thermopile sensor head which is exposed to both the downward and upward fluxes of radiation.
- Measuring Range : -0.5 to +1(kW/m²)
- Spectral Range : 0.25-60µm
- Operating Temp: -40 to 60°C
- Sensitivity : 100mV per (kW/m²)
- Field of view- 180° upper and lower sensor
- Compatible with GP1 Data logger. Data Storage capacity for 6,00,000 data sets. Data logging interval option from 1 sec to 24 hours
- Includes data downloading software, data downloading cable, instructions manual and basic spares and accessories.

NET RADIOMETER WITH DISPLAY

NR Lite2 is designed for routine measurement of net radiation which is the balance between incoming and outgoing radiation under outdoor conditions.

The design of the NR Lite2 is unique. The double-sided detector has black conical absorbers with an anti-stick weather resistant protective coating. In contrast to other sensor designs, NR Lite2 requires no fragile plastic domes. This results in a virtually maintenance free design. The vertical stick prevents birds from affecting the output signal.



Specifications

Spectral range (overall)	0.2 to 100 µm = 200 to 100.000 nm
Sensitivity	10 µV/W/m ²
Response time	< 20 s
Operational temperature range	-30 °C to +70 °C

ALBEDOMETER

- It consists of two identical pyranometers that measure the incoming global solar radiation and radiation from the surface below.
- Measuring Range : 0 to 2 (kW/m²)
- Spectral Range : 305 - 2800nm
- Operating Temp : -40 to 80°C
- Sensitivity : 10-35mV per (kW/m²)
- Compatible with GP1 Data logger. Data Storage capacity for 6,00,000 data sets. Data logging interval option from 1 sec to 24 hours
- Includes data downloading software, data downloading cable, instructions manual and basic spares and accessories



SAP FLOW SYSTEM

For sap flow/xylam flow study. Usefull for Crops and Trees Different TDP Needles & Gauges are available to suit all type varieties.

- Easily inserted and removed for reuse.
- Constant heat, thermal dissipation method; not heat pulse.
- Continuous measurement method.
- No waiting periods and no heat pulses.
- Stainless steel needles that are Teflon coated.
- Compatible with most data loggers.
- Differentially wired T- type thermo couples.
- Electronics & connectors sealed / weatherproofed.
- Wires directly to data logger, one differential channel each.
- Ten ft. cables, sensor insulation, and manuals included.

HYDRAULIC CONDUCTANCE FLOW METER (HCFM)

HCFM is designed to perform quantitative root and stem analysis without having to dig up roots or drag limbs back to the lab. In most cases, the analysis of a sample root or shoot is completed in as little as 10 minutes. You can quickly measure the major components of the hydraulic conductance in the soil-plant-atmosphere continuum . One can measure the values of the individual hydraulic resistances, then compute the pattern of water flow and water potentials in the resistance network. Technical Specifications

- Stem Ranges 1 mm to 36 mm diameters
- Flow Rates 0.01 to 350 grams/hr in 5 overlapping ranges
- Conductance 7.7E-08 to 3.5E-04 Kg s-1 MPa-1
- Data Interface USB, USB powered
- Capacity 24 oz. Degassed Water
- Maximum Pressure 90 psi (620 kPa)
- Air Gas Tank 6 cu. ft. (170 liter) with CGA-580 Valve & Connector



PYRANOMETER-MP 200

Pyranometer displays and stores measurements in W/m². Spectral Range 360 to 1120nm, Field of view 180°. The sensor incorporates a silicon-cell photo-diode with a rugged, self-cleaning sensor housing design. Typical applications include shortwave radiation measurement in agricultural, ecological, and hydrological weather networks and solar panel arrays. The meter can store up to 99 averages, once full it will start to overwrite the oldest measurement with new ones.

Technical Specifications :

- Calibration Uncertainty ± 5 %
- Measurement Repeatability Less than 1 %
- Non-stability (Long-term Drift)-Less than 2 % per year
- Non-linearity : Less than 1 % (up to 1750 W/m²)
- Response Time-Less than 1 ms
- **Model : MP-100 Sensor is integrated with meter**



LINE QUANTUM SENSOR-301

- Apogee line quantum sensors measure a spatial average of PAR (Photosynthetically Active Radiation). The sensor housing design features an integrated bubble level and is fully potted making the sensor weatherproof. Typical applications include PPFD
- (Photosynthetic Photon Flux Density) measurement over plant canopies in outdoor environments, greenhouses, and growth chambers, and reflected or under-canopy (transmitted) PPFD measurements in the same environments. Quantum sensors are also used to measure PAR/PPFD in aquatic environments, including salt water aquariums where corals are grown.

Models :

MQ-306 has a separated sensor bar with 6 sensors connected to a hand-held meter via cable

MQ-303 has a separated sensor bar with 3 sensors connected to a hand-held meter via Cable.

INFRARED RADIOMETER MI-210

The MI-210 has a hand-held meter, attached via cable that displays and stores sensor measurements. The sensor has a 22° half-angle field of view and a response time of 0.6 seconds. Typical applications include plant canopy temperature measurement for use in plant water status estimation, road surface temperature measurement of determination of icing conditions, and terrestrial surface (soil, vegetation, water, snow) temperature measurement in energy balance studies.

Models :

MI - 220 :18° half-angle M-230 : 14° half-angle

MI-2HO: 32° horizontal half angle, 13° vertical half angle



UV SENSORS MU-200

The UV Sensor is a hand-held meter, which displays and stores measurements. The sensor incorporates a photodiode that measures combined UVA and UVB radiation. Typical applications include UV radiation measurement in outdoor environments (sensor is not recommended for long-term continuous outdoor deployment), laboratory use with artificial light sources (e.g., germicidal lamps), and monitoring the filter ability and stability of various materials.

Technical Specifications :

- Spectral Range- 250-400nm
- Calibration Uncertainty- $\pm 10\%$
- Measurement Repeatability - Less than 1 %
- Non-stability (Long-term Drift) - Less than 3 % per year
- Non-linearity : Less than 1 % (up to $300 \mu\text{mol}/\text{m}^2/\text{s}$)
- Response Time Less than 1 ms
- **Model : MU-100 Sensor is integrated with meter**



OXYGEN SENSOR

The MO-200 is designed to measure 0 to 100 % oxygen and is connected to a hand-held meter via cable that displays and Stores measurements. The wide measurement range allows it to be used for applications either in the soil or in the lab with the diffusion or flow- through head accessories. The sensor is housed in a polypropylene body & electronics are fully potted.

Technical Specifications :

- Measurement Range- 0 to 100% O₂
- Measurement Repeatability $\pm 0.1\%$ at 20.9 % O₂
- Non-linearity Less than 1%
- Oxygen Consumption Rate 2.2 $\mu\text{mol O}$ per day at 20.9% O and 230 C
- Response Time 14s (time required to read 90 % of saturated response)



UNDER WATER FULL SPECTRUM QUANTUM SENSOR- MQ-510

The MQ-510 quantum meter is designed for underwater PAR measurements and already applies the sensor's immersion effect correction factor to the meter readings through firmware. The meter consists of a waterproof quantum sensor attached via waterproof cable to a handheld meter. The waterproof sensor incorporates a blue-enhanced silicon photodiode and custom optical filters with a rugged, anodized aluminium body with acrylic diffuser. The underwater quantum sensor is typically used in salt water aquariums where corals are grown. Note: The handheld meter is not waterproof, only the sensor and cable are waterproof.

Spectral Range : 389nm to 692nm

Measurement Range : 0 to 4000 $\mu\text{mol}/\text{m}^2/\text{s}$

Model : MQ-210 Spectral Range 410nm-655nm



AGRETO Soil Compaction Tester - Penetrometer

Applications :

- Soil Compaction Tester to determine soil compaction on agricultural land
- Ideal for farmers, consultation and research facilities, schools

Technical Details :

- Robust construction, made of stainless steel
- Probe length: 75 cm
- Probe diameter: 12 mm
- Tip 13 mm for firm soil
- Tip 19.5 mm for loose soil
- Adjustable depth limitation
- Depth inscriptions on the probe
- Built-in manometer
- Measuring range from 0 to 400 PSI
- Running display of the measuring value
- Scope of delivery : probe, 2 handles, 2 changeable tips, user manual



CO2 Monitor/Controller (Lambda-T)

Lambda T is a high accuracy CO2 monitor employing a naval twin wavelength, non - depressive infra red optical technique. This quality stable analysis allows to be used for unattended measurement and control of CO2 in green houses, growth chambers and any other application where elevated levels of the gas are required.

Features

Continuous CO2 Monitor and Control, High performance NDIR optical bench, Easy maintenance, and Integral sample pump, Two relay trip points, Digital display, Temperature Corrected.

Technical Specifications :

- Method: Non-dispersive, infra-red Optical technique
- Range: 0 to 2000 ppm, 3000 ppm
- Accuracy: +/- 2% of FSD
- Stability: +/- 2% of FDS over 12 months
- Response time: Electrical: 1 second Gas , from inlet : Typically 3 min full
- Power: 230 V AC

Soil Moisture Sensor with Data Logger

For continuous Monitoring of Soil Moisture/Soil Temperature.

- **Class leading $\pm 1\%$ soil moisture accuracy**
- **Can be buried or used as portable probe**
- **Easy data logger connection (0 – 1 V DC)**

The GP2 is a powerful, weatherproof, research grade data logger with unique features for recording and controlling field experiments GP2 Data Logger and Controller.

Storage, Communication and Power

4 MB of FLASH memory enable storage of 2.5 million readings (typical). Data can be collected by laptop locally via USB/RS232 or remotely using the cellular modem options. The GP2 has 6 alkaline AA internal batteries as standard. External 12 V battery and Solar Power charging options are available.

Compatible Sensors:

- **ML3 Theta Probe: Soil Moisture/ Soil Temp**
- **PR2/6 : Profile Soil Moisture Sensor(6 depths)**
- **WET Sensor: Soil Moisture/EC/Soil Temperature**



Pocket Thermal Imager



The power of a professional grade thermal imager that fits in your pocket.

- Automatically organize and file thermal images with Fluke ConnectR Asset Tagging
- Fully radiometric thermal imager gives you measurement data to the pixel with 120 x 90 infrared resolution (10,800 pixels)
- 3.5" LCD touchscreen display for easy troubleshooting
- Can withstand drop up to 1 meter
- **IP54 enclosure rating**
- **-20 °C to 150 °C temperature measurement range**

HAL CORPS Timelapse Camera/ Phenocam

The Standard system is designed to operate autonomously, with no need for networks or AC mains power. 10-15 watt solar panel is included, which is sufficient for taking at least 200 pictures per day, even in areas of high clouds such as Gulmarg or Manali. In sunny locations such as Delhi or the Kerala Outback, as many as **1000 pictures per day are possible**. While solar power is generally the most reliable and lowest cost option for on-site power with 103degree view of the Landscape.



GERMAN PRECISION OPTICS HD BINOCULARSPASSION 12.5x50



is a flagship product of GPO and it is the perfect blend of size, weight and magnification. The more you see, the more you find. These binoculars gives you a 34% larger field of view than some premium 15x binoculars, and it performs better in low light due to a 7% larger exit pupil. It is 30% lighter in weight, more compact and allows you to glass by hand when needed. All PASSION HD binoculars are high-resolution and high-transmission optics, and carry the industry's best SPECTACULAR LIFETIME WARRANTY.

GERMAN PRECISION OPTICS GPOTAC 45

The GPOTAC 45 15-45X spotting scope is designed for shooters looking for an advantage in shot placement. It has a custom-designed first-focal plane reticle built for the precision long-range shooter and includes bonus features such as Picatinny rails for supplemental sighting and a honeycomb objective filter lens cap that minimizes objective lens reflection. As a bonus feature, its PLR reticle is matched with the first focal plane PLRi reticle in the GPOTAC 4.5-27x50i riflescope. This creates the ultimate scope and spotter combination.



For orders or detailed information Kindly call us on +91 9086855560 or email us on info@halcorps.com

GERMAN PRECISION OPTICS RANGETRACKER1800



The GPO RANGETRACKER 1800 include a high-transmission optical system coated with proprietary high transmission GPO bright lens coatings, both line of sight and/or True-range adjusted angle distance readings, a Hyper-scan feature that provides three readings per second and Target-seeker technology that offers best or last laser hits. The display is an HCLD system that allows up to 25% more light to get through the optical system, making it usable in low-light situations. It's small, compact, tough and optically brilliant.

ORION OPERA- SMART ENVIRONMENTAL MONITORING STATION

OPERA complete with Zeno Datalogger: a distinctly smart monitoring unit for the environmental impact monitoring of large infrastructures, production companies, mitigation plans. Completely modular, OPERA is smart from configuration flexibility to management and sharing of the data collected. ORION OPERA is a modular smart unit for continuous monitoring of parameters of environmental interest, able to continuously return the measured data on a web platform or in FTP archaization space

Parameters

PM10	PM2.5	PM4	PM1	VOC	NH3	H2S
Noise	CO	CO2	NO2	NO	O3	SO2
Wind speed		Wind direction		Atmospheric pressure		
Solar radiation		UV index		Rain quantity		
Vibration		Elettrosmog		Industrial pollution		
Light pollution		Temperature		Relative humidity		



SPYPOINT LINK-MICRO-S-LTESOLAR CELLULAR TRAIL CAMERA

The LINK-MICRO-S-LTE from SPYPOINT gives you the incredible battery life of our integrated solar panel technology and free LIT-10 rechargeable lithium battery pack, with the value you would expect from our LINK-MICRO family

The LINK-MICRO-S-LTE connects to the LTE cellular network, ensuring that the camera can provide years of service in the ever-evolving landscape of cellular network technology.

- 10 megapixels
- 80-foot detection and flash range
- 0.4 second trigger speed

The LINK-MICRO-S-LTE comes with the new LIT-10 rechargeable lithium battery pack included, which is charged directly by the integrated solar panel. The LIT-10 battery pack replaces the standard battery tray of the LINK-MICRO design, for foolproof installation.



For orders or detailed information Kindly call us on +91 9086855560 or email us on info@halcorps.com

YSI ProDSS Multiparameter Water Quality Meter

Handheld multiparameter instrument with multiple cable options
 The YSI ProDSS (digital sampling system) handheld multiparameter meter provides extreme flexibility with two main cable options.



Parameters Available for the ProDSS Multiparameter Water Quality Meter:

Dissolved Oxygen (optical)	Turbidity	Total Algae-Phycocyanin
Total Algae-Phycocerythrin	pH	ORP/Redox
Conductivity	Specific Conductance	Barometric Pressure
Nitrate	Temperature	Salinity
Total Dissolved Solids	Resistivity	Seawater Density
Total Suspended Solids	Depth	GPS Coordinates
Ammonium	Ammonia	Chloride

IQ turbidity sensor - WTW



Turbidity sensor with ultrasonic cleaning, connectable to the IQ SENSOR NETVisoTurb®:
 Optical turbidity sensors according to nephelometric principle according to EN ISO 7027 for the in-situ use in water/wastewater with ultrasonic cleaning system:

- Ultrasonic cleaning without mechanics
- Extremely low-maintenance
- Highly accurate factory calibration
- High operational safety (sensor check function)
- The ultrasonic cleaning system ensures the low-maintenance and continuously reliable measuring operation of the sensors, which are therefore very suited for extreme applications, such as wastewater treatment plants.

Laboratories Equipments

AIR SAMPLER	FREEZE DRYER	STABILITY CHAMBER	DEEP FREEZER	CONDUCTIVITY METER
ANTIBIOTIC ZONE READER	FUME HOOD	UV LIGHT CABINET	DISTILLATION UNIT	MICROPIPETTES
AUTOCLAVE (Steam Sterilizer)	GEL DOCUMENTATION SYSTEM	VACUUM PUMP (OIL FREE VACUUM PUMP)	DRY BATH INCUBATOR	FILTRATION ASSAMBLY
B.O.D. INCUBATOR	HOT AIR OVEN	VORTEX MIXTURE	ELECTROPHORESIS UNIT	P.C.R. INSTRUMENTS
BIO-SAFETY CABINET	ICE MAKER	WALKING COOLING CHAMBER	MICROSCOPE	ELISA READER
BLENDER (STOMACHER)	INCUBATOR (BACTERIOLOGICAL INCUBATOR)	WATER ACTIVITY METER	MOISTURE BALANCE	COLOR METER
BOMB CALORIMETER	LABORATORY CHAMBER	WATER BATH	MUFFLE FURNANCE	MAGNETIC STIRRER
CENTRIFUGE	LAMINAR AIR FLOW	FOGGER (LAB USE FOGGER)	ORBITAL SHAKER	ELISA WASHER
COLONY COUNTER	LOOP STERILIZER	SONICATOR	PASS BOX	PH METER

Smart classrooms

Digital interactive board maximizes two-way communication through touch screen and allows you to add interactivity to standard signage. The learning environment becomes much more engaging for students. It can be installed in various places including school entrances, classrooms and libraries for teacher and student engagement in classes and effective delivery of teaching materials.



Garden Essentials & HEAVY DUTY EQUIPMENT From CUBCADET USA

**RIDE ON LAWN MOWER
BRUSH CUTTER
SNOW THROWER**



**LAWN MOWER
HEDGE TRIMMER**



**PUSHBACK BRUSH CUTTER
CHAINSAW**



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