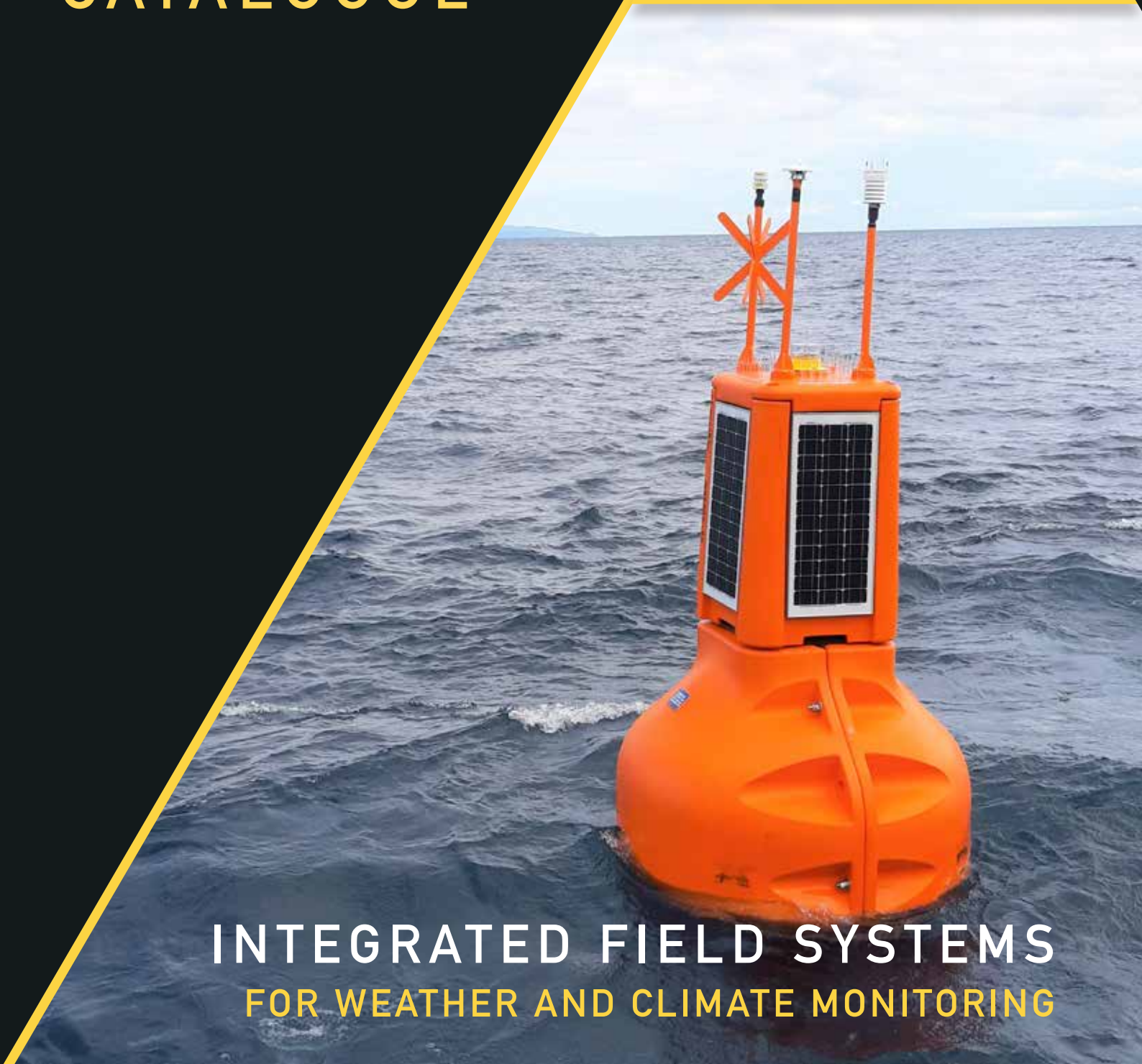
WAGTECH PROJECTS
TRACE2O

HYDROMET CATALOGUE

1ST EDITION



INTEGRATED FIELD SYSTEMS

FOR WEATHER AND CLIMATE MONITORING

INTRODUCTION

Our mission at Wagtech Projects and Trace2o is to develop, manufacture and supply unique and innovative solutions to our customers. We aim to help communities become better prepared for hydromet hazards and provide support to Government agencies who want to enhance their networks.

We provide turnkey solutions for our customers, which means we not only supply cutting-edge hardware, but also offer consultancy, system integration, installation, commissioning and comprehensive in-country training. This is possible through our global network of trained engineers based in our own offices or those of our agents and distribution partners.

In addition to our expertise in hydromet services we also manufacture and supply: portable water quality kits, mobile laboratories, air quality monitoring solutions and a full range of agronomical equipment.

“Hydrological and meteorological hazards are responsible for 90% of total disaster losses worldwide. With population growth, rapid urbanization and climate change, this is projected to become more severe.”

– The World Bank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WATER LEVEL

5M ALUMINIUM STAFF GAUGE

A simple and lightweight 5m aluminium levelling staff with 5-sections for clearly showing a numerical readout of surface water level.

KEY FEATURES

- Five durable telescopic sections
- Abrasion resistant anodised surface coating
- Weather and corrosion resistant imprinting
- Reliable wear resistant polycarbonate lock buttons
- Easily dismantled for cleaning
- Clear cm graduations and mm graduations
- 1.24m closed length
- Printed black and red on white for height measuring
- Protective bag included

DESCRIPTION	PART NUMBER
5m Aluminium Staff Gauge	EN26-200

DIP METER

The Water Level Meter is industry standard equipment for the exact measurement of water level in groundwater observation wells.

Simple yet reliable measurements, the probe is lowered down into the pipe or well by means of the hand crank. When the sensor makes contact with water, a visual or acoustic (optional) signal is given off at the unit. The water level can then be read off from the measuring tape, which goes to centimetre accuracy.

Material of Probe	Made of stainless steel and nickel-plated brass, easy to clean
Recommended Storage Temperature	5°C to 30°C
Protection Class of Probe	IP68, permanently pressure tight
Protection Class of Tape Drum	IP64, splash-proof
Probe Dimensions	Ø15mm x L95mm
Power Supply	4 x 1.5V; Size: C

TAPE LENGTH	PART NUMBER	TAPE LENGTH	PART NUMBER
20m	EN26-210	150m	EN26-216
50m	EN26-212	200m	EN26-218
100m	EN26-214		

FIXED WATER LEVEL LOGGER

These multi-parameter water level loggers have been specifically designed for long-term deployment.

There are two options available depending on which parameters you want to measure:

1. Water Level + Temperature Only
2. Water Level + Temperature, Salinity & Conductivity

The loggers include their own internal lithium battery for years of self-supplied power and a large internal memory for year upon year of data. This means no data cable is required, just attach the logger to a Kevlar deployment cord.

The logger collects data at user-defined intervals and stores the information in its internal memory – it can take up to 1 reading per second and store up to 500,000 readings at once. Made from titanium, the logger is built for deployment in all environments from fresh groundwater to salty marine waters. To download the recorded data, simply retrieve the logger and connect it to a PC or a handheld GPS meter.

KEY FEATURES

- Highly accurate
- Barometric pressure compensation via a separate Baro sensor
- USB and SDI-12 / Modus direct output
- Corrosion resistant and rugged titanium body
- Battery life up to 10 years
- Data telemetry available (please enquire)

DESCRIPTION	PART NUMBER
Water level and temperature logger. Supplied as a complete package including sensor, Baro compensation sensor, 10m deployment cord* and USB PC kit. Only one package needed per 10km radius – if multiple sensors needed, order separately below.	EN26-250
Water level, temperature, salinity & conductivity logger. Supplied as a complete package including sensor, Baro compensation sensor, 10m deployment cord*, EC calibration solution and USB PC kit. Only one package needed per 10km radius – if multiple sensors need, order separately below.	EN26-252
Water Level and Temperature sensor with 10m deployment cord	EN26-260
Water Level, Temperature, Salinity & Conductivity sensor with 10m deployment cord	EN26-262

*If longer cord lengths are required, please enquire.

TECHNICAL SPECIFICATION

Operational Temperature	-20°C to 80°C
Battery Type & Life	3.6V lithium; up to 10 years
Memory Capacity	8MB; 500,000 readings
WATER LEVEL + TEMPERATURE ONLY	
Diameter	22.2mm
Length	186mm
Weight	120g
Fastest Logging Rate	10 per second
WATER LEVEL + TEMPERATURE, SALINITY & CONDUCTIVITY	
Diameter	22mm
Length	260mm
Weight	250g
Fastest Logging Rate	10 per second

	ACCURACY	RESOLUTION	RANGE
Water Level	±0.05% FS	0.005% FS or 1mm (whichever is greater)	100m
Temperature	±0.1°C	0.01°C	Operational:-20-80° C (-4-176° F)
Salinity	±1% reading or ± 0.1 unit (if greater)	0.01PSU / 0.01 ppt	0- 70 PSU / 0- 70 ppt (g/Kg)
Conductivity	±1% reading or ±1µS (whichever is greater)	1µS	0- 200mS/cm (0- 200,000µS/cm)

PORTABLE ECHO SOUNDER

The portable echo sounder is a low cost single beam water depth instrument, which is used by surveyors engaged in river, lake and inshore hydrographic surveying.

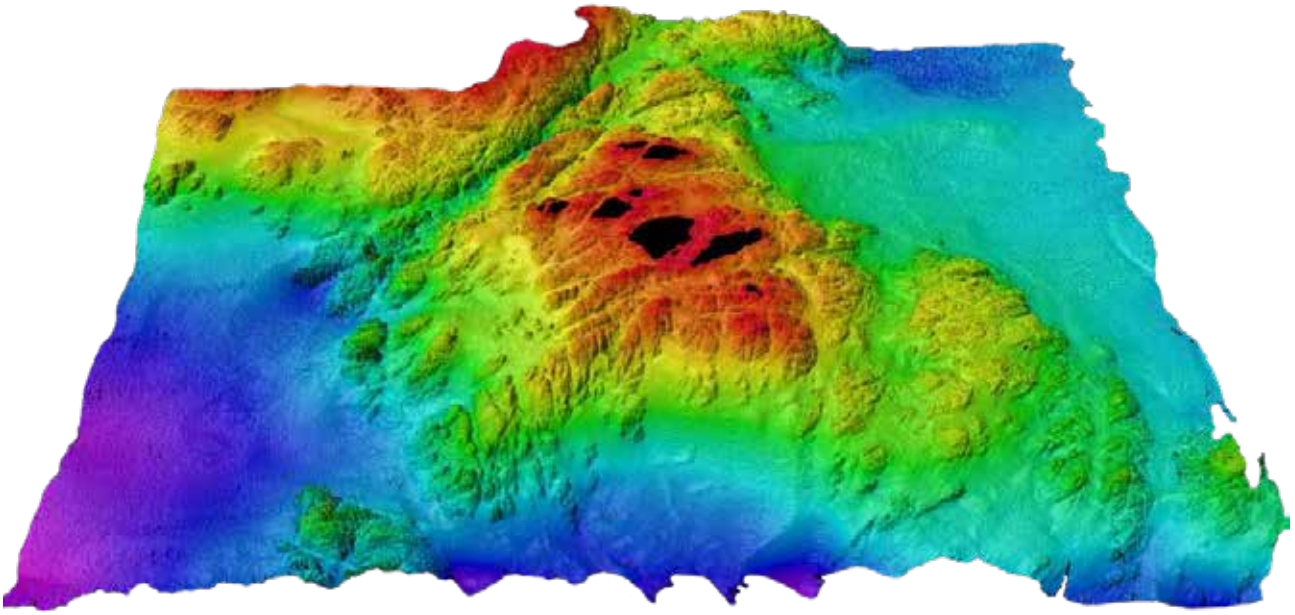
The unit is sold as a complete package and includes transducer, serial leads internal battery charger and a heavy duty carrying case.

- Measures water depths down to 75m
- Lightweight and easy to use in a small boat
- Internal memory stores data for processing
- Graphic LCD display shows depth data continuously
- Can be connected to separate GPS equipment if required

TECHNICAL SPECIFICATION

Transducer Frequency	200kHz
Beam Spread	8-10 degrees
Depth Range	0.30m to 75m (software limited)
Accuracy	+/-0.025m (RMS)
Battery Life	8-12 hours between charges
Standby Battery Life	10,000 hours
Temperature Range	0°C to 45°C
Overall Dimensions	100mm x 220mm x 45mm / 0.75kg

DESCRIPTION	PART NUMBER
Echo sounder with transom mount active transducer, software, serial leads, charger and rugged carry case	EN26-118



WATER LEVEL RADAR SENSOR

This water level sensor is a highly accurate measuring device to measure the surface water level without direct contact.

FEATURES & BENEFITS:

- Contact-free, maintenance free system
- Measurement range: 15m or 35m
- Near blanking zone: 0.5m
- High accuracy: +/- 2mm
- Compact design
- Independent of environmental influences (e.g. temperature, wind)
- Easy integration into existing systems
- Vandalism secure design does not attract attention
- Interfaces: 4 to 20mA, SDI-12 is available as an option

MEASURING PRINCIPLE

The so-called pulse procedure sends a short microwave impulse to the water surface. Afterwards the sensor remains in standby for a short time. Within this time the water reflects the pulses to the integrated evaluation system. The run time of the impulses corresponds directly to the distance to the current surface water level.

TECHNICAL SPECIFICATION

GENERAL	
Dimensions	153mm x 325mm x 200mm
Weight	3kg
Power Supply	9.6 to 36 VDC
Operating Temperature	-40°C to 80°C
Measurement Frequency	26GHz (K-Band)

LEVEL MEASUREMENT	
Measurement Range	0 to 15m / 0 to 35m
Resolution	1mm
Accuracy	± 2mm
Near Blanking Zone	0.5m
Holdback Time	60s (after power on)
Step Response	<3s (time after a sudden change in the measured distance to max. 0.5m)
Output	4 to 20mA = 0 to 15m / 0 to 35m

DESCRIPTION	PART NUMBER
15m Water Level Radar Sensor	EN26-270
35m Water Level Radar Sensor	EN26-272

WATER LEVEL & VELOCITY RADAR SENSOR

This is a sensor for continuous discharge measurement of rivers, open channels and canals with known cross-section profile. The sensor uses innovative radar technology to measure velocity, water level and discharge. It enables reliable, non-contact measurement without the need for structural work in the water.

FEATURES AND BENEFITS

- Non-contact, maintenance free measurement system
- No structural work is necessary in the water
- No threat to the system through flooding
- Low power consumption enables operation using solar cells
- Recognition of flow direction
- Recognition of hysteresis-effects
- Measurement in backwater situations
- Measures even where weed growth prevails and sensor is not affected by turbidity
- Measurement in tidal waters
- Automatic angle measurement
- Optional: analogue outputs from 4 to 20mA
- Data logging and telemetry available

APPLICATION

Thanks to the non-contact radar technology, the measuring equipment is not susceptible to contamination, debris or driftwood in the water. Furthermore, the non-contact measurement warrants very low maintenance and fail-safe operation especially during high water or flooding.

IMPLEMENTATION

The sensor can be simply mounted on bridges, on roofs of closed canals or channel superstructures. The riverbed should be as stable as possible in order to warrant consistent measurement. A visible swell must be evident on the surface of the water.

MEASURING PRINCIPLE

The non-contact radar technology determines the water surface flow velocity using the Doppler frequency shift method and furthermore the water level is established by a travel time measurement. With known cross section profile the discharge Q of the water can then be calculated on basis of the continuity equation: $Q = vm \cdot A(h)$

TECHNICAL SPECIFICATION

GENERAL	
Dimensions	338mm x 333mm x 154mm
Weight	5.4kg
Protection Class	IP67
Power Supply	6 to 30V
Power Consumption	Standby approx. 1mA (at 12V); active operation approx. 140mA
Operating Temperature	-35°C to 60°C
Misc	Over voltage protection, reverse power protection, lightning protection
Digital Interface	1 x SDI-12; 1 x RS485 or Modbus

WATER LEVEL	
Measurement Range	0 to 15m or 0 to 35m
Resolution	1mm
Radar Frequency	26Ghz (K-Band)
Radar Opening Angle	10°

VELOCITY	
Measurement Range	0.1 to 15m/s
Accuracy	±0.01m/s; ±1%FS
Resolution	1mm/s
Direction Recognition	±
Measurement Duration	5 to 240s
Measurement Interval	8s to 5h
Measurement Frequency	24GHz (K-Band)
Radar Opening Angle	12°
Distance to Water Surface	0.5 to 35m
Necessary Minimum Wave Height	3mm

DESCRIPTION	PART NUMBER
15m Water Level & Velocity Radar Sensor (sensor only)	EN26-274
15m Water Level & Velocity Radar Sensor (data logging and transmission)	EN26-276
35m Water Level & Velocity Radar Sensor (sensor only)	EN26-278
35m Water Level & Velocity Radar Sensor (data logging and transmission)	EN26-280

BOREHOLE INSPECTION CAMERA

This self-contained, high-powered underwater inspection camera can record bright, crystal clear 1080p HD video for over 4 hours.

It is an ideal instrument for well inspectors, well drillers, hydrogeologists and other professionals who require to view the condition of wells, drains, boreholes, vertical shafts and open bodies of water.

KEY FEATURES:

- Most portable borehole camera on the market
- Records over 4 hours of footage on a single charge
- Long-term logging mode – leave in the well and record 20s clips every hour for up to a month
- Insert the microSD into a smart phone, tablet or PC for video play back

KIT COMES COMPLETE WITH EVERYTHING YOU NEED, INCLUDING:

- Camera Probe Centralizer Kit (with clamp, and interchangeable 10cm & 15cm guides)
- Screwdriver for changing centralizer guides
- 1m USB-C charging cable with wall plug
- 64GB microSD with SD card adapter
- SD Card removal assistance tool
- User manual
- Ultra-rugged Carrying Case (IP67)

TECHNICAL SPECIFICATION

Battery	Rechargeable Li-ion
Camera Resolution	1920 x 1080p HD
Frame Rate	30FPS
Video Format	MP4
Field of View	170 x 360 degrees
LED Ring	7 Ultra-bright LED's
Brightness	3 adjustable brightness levels
Rating	IP68 (up to 300m for unlimited time)
Operating Temperature	-20°C to 60°C
Probe Dimensions	ø32mm x 195mm
Probe Weight	325g
Case Dimensions	321mm x 229mm x 111mm

DESCRIPTION	PART NUMBER
Borehole Inspection Camera; 150 meter complete with Polyethylene tape, 32mm stainless steel camera probe, probe holder, 18cm display monitor, centralizer, rechargeable batteries and charger, SD card, DVR, rugged wheeled roller case.	EN26-300
Borehole Inspection Camera; 300 meter complete with Polyethylene tape, 32mm stainless steel camera probe, probe holder, 18cm display monitor, centralizer, rechargeable batteries and charger, SD card, DVR, rugged wheeled roller case.	EN26-400

FLOOD WARNING

Flooding is a continuous threat for many people around the world, and in recent years the weather is becoming more erratic and less predictable due to climate change. Now, many areas are suffering from regular and severe flooding.

TRACE-EWS

Early Warning Systems (EWS) play an important role in mitigating the impacts of flooding. As the name suggests, the system is designed to assess the risk of floods during periods of heavy rainfall and notify communities at risk. Once warned, the community can take mitigatory or evasive measures.

At Wagtech Projects-Trace2o, we know that Early Warning Systems (EWS) can be varied in terms of cost and complexity. In addition to our standard off the shelf solutions, we can also provide a bespoke EWS service for a given area or topography. Typically, this will involve building a software model of the area that is capable of simulating flood scenarios. Complementing the software, field monitoring equipment such as automatic rain gauges and river level sensors are then installed in key locations. Using a combination of software modelling and real time data, flooding can be predicted and warnings sent out to vulnerable communities. Warnings can include text messages, emails or audible sirens.

In rural or developing areas, a Community-based EWS (CBEWS) that disseminates information using locally relevant communication methods can sometimes be the most effective. These systems are developed in collaboration with local communities, which will lead to ownership, through training and education. At the end of the project, the community adopts the operating and maintenance of the system promoting sustainability.

Please feel free to contact us and we will be happy to discuss potential solutions with you.

FLOOD EARLY WARNING SYSTEM

The Trace-EWS functions as both an early flood warning system, providing instant alerts to rising water levels and as a continuous water level monitor.

DESCRIPTION	PRODUCT CODE
Trace-EWS	EN30-100

This cost effective and extremely simple system requires no regular maintenance and no annual subscription. The Trace-EWS uses a water level sensor to record small changes in the water level and temperature using a highly sensitive sensor and thermistor. Using a wireless telemetry system, alerts are communicated via SMS or email notification when your pre-set limits have been exceeded, therefore warning of rising water. The unit can be interrogated at any time for level readings by sending an SMS or email to the unit enabling real time monitoring.

In addition to the SMS messaging, all data is recorded by the device and stored for daily distribution via email; should you wish to plot the historical trend in water and temperature level. Configurable through SMS and email messages using predefined commands, or a complete settings email can be sent from the included PC application direct to the device. The unit features a barometric pressure sensor, to fully compensate the data against changes in air pressure, allowing it to measure level changes as small as 10mm.

TECHNICAL SPECIFICATIONS

	ACCURACY	RESOLUTION
WATER LEVEL	±0.05%FS	0.005%FS or 1mm (whichever is greater)
TEMPERATURE	±0.1°C	0.01°C
NETWORK TECHNOLOGY	GSM, GPRS	
FREQUENCY BANDS	GSM 850/900/1800/1900	

FLOW MEASUREMENT

FLOW MASTER

The flow master is a highly accurate low cost water velocity instrument for measuring flows in open flow channels and partially filled pipes. It has been extensively used by water professionals for over 30 years due to its excellent reliability and performance.

The Flow Master consists of the protected Turbo Prop positive displacement sensor, coupled with the expandable probe handle to the digital display. The instrument is ideal for storm water run-off studies, sewer flow measurements, measuring flows in rivers and streams, and monitoring velocity in ditches and canals.

KEY FEATURES

- Accurate and low cost
- Lightweight and rugged
- Debris shedding turbo prop
- Rain proof digital readout
- Padded carry case
- Displays true average velocity instantaneously

TECHNICAL SPECIFICATIONS

Range	0.1 to 0.61m/sec
Accuracy	0.03m/sec
Operating Temperature	-20°C to 70°C
Sensor Type	Turbo-prop propeller with magnetic pick up
Data Logger	30 sets, min, max, ang
Weight	4kg
Power	Internal batteries
Battery Life	Approx. 5 years

DESCRIPTION	PART NUMBER
Flow Master; 1.1 to 1.8m pole length	EN26-102
Flow Master; 1.7 to 4.3m pole length	EN26-104

FLOW METERS

Current Flow Meters are suitable for use in a wide variety of environments ranging from major rivers to small streams, fresh and salt water or effluent. Measurements can be made for river gauging, open channel flow, pollution and hydrometric studies.

The Digital Display Unit (DDU) offers real time and averaged display of velocity with data logging. Data can be downloaded to a PC via the RS232 interface using the cable supplied. The DDU comes with an LCD display with optional backlight sealed to IP65 and weighing less than 1kg.

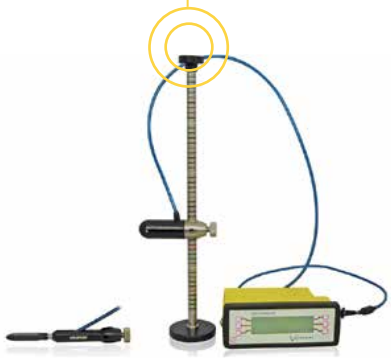
KEY FEATURES

- Robust, easy to use and low maintenance
- Reliable and accurate velocity readings
- Wide measurement range
- Calibrated in accordance with BS3680

	LARGE METER	SMALL METER
Velocity Range	0.03 to 10m/s	0.04 to 5m/s
Accuracy	±1.5% reading above 0.15m/s ±0.004m/s below 0.15m/s	±2.5% reading above 0.5m/s ±0.001m/s below 0.5m/s
Impeller	125mm dia. x 0.27m pitch	50mm dia. x 0.10m pitch
MATERIALS		
Motor body	Black Acetal	
Impeller	High impact styrene	
Impeller shaft	Stainless steel on jewelled bearing	

DESCRIPTION	PART NUMBER
Large current flow meter – wading set, consisting of; large flow meter, DDU, 3 x 0.5m stainless steel wading rods, base plate, direction knob, 2m cable and carrying case.	EN26-106
Large current flow meter – suspension set, consisting of; large flow meter, suspension bar DDU, 35m suspension cable and carry case.	EN26-108
Small current flow meter – wading set, consisting of; small flow meter, DDU, 3 x 0.5m stainless steel wading rods, base plate, direction knob, 2m cable and carrying case.	EN26-110
Small current flow meter – suspension set, consisting of; small flow meter, suspension bar DDU, 35m suspension cable and carry case.	EN26-112

ELECTROMAGNETIC FLOW METERS



This small electromagnetic flow meter has been designed specifically for use in open channels where fouling by weed or sewage can be a problem.

It is a high precision instrument which can be relied upon to give accurate readings (+/-0.5% of reading plus zero stability) over a wide flow range (+/-5m/sec) in only 5cm of water. The control display unit provides a choice of averaging modes, standard deviation of the data and a logging facility of recording up to 999 averaged readings.

Two sensor types are available to suit different application requirements. One for measuring speeds in water depths of 15cm or more and one for 5cm or more. Both offer excellent durability, reliable accurate data and are suitable for use in clean water and dirty or difficult environments. Both instruments are calibrated to NAMAS traceable standards for speeds up to 1m/s.

SUPPLIED WITH

- 3m cable
- Control display unit (with logging facility)
- Wading rod set c/w 3 x 0.5 graduated rods
- Base
- Direction knob
- Operation manual
- Large carry case

	CYLINDRICAL TYPE	FLAT TYPE
GENERAL		
Range	-5m/s to 5m/s	-5m/s to 5m/s
Accuracy	±0.5% of reading plus 5mm/s	±0.5% of reading plus 5mm/s
Zero Drift	±0.004m/s below 0.15m/s	<5mm/s
Sensing Volume	Sphere of approx 120mm Ø around sensor	Cylinder of approx 20mm Ø x 10mm height
Minimum Depth	15cm	5cm
DISPLAY UNIT		
Dimensions	250mm x 160mm x 100mm	
Weight, kg	2kg	
Rating	IP67	
Rating	8 x alkaline C cells, lasting for up to 37 hours	
WADING SET		
Dimensions	620mm x 420mm x 340mm	
Weight	9kg	

DESCRIPTION	PART NUMBER
Electromagnetic Flowmeter wading set, single axis sensor (Cylindrical Type)	EN26-114
Electromagnetic Flowmeter wading set, single axis sensor (Flat Type)	EN26-116

WATER VELOCITY RADAR SENSOR

This water velocity sensor has been designed for contact-free measurements of the surface flow of rivers and channels by means of radar technology.

FEATURES AND BENEFITS

- Maintenance free
- No structural work is necessary in the water
- Simple integration into existing systems
- No threat to the system through flooding
- Low power consumption
- Recognition of flow direction
- Near blanking zone 0.5m
- Non-contact and fast measurement
- Own measurement interval or externally triggered
- Independent of environmental influences

APPLICATION

The radar sensor is used in hydrographic studies and water management, and is applied in open rivers, streams or channels. It is ideal for velocity measurement tasks where the use of conventional contact flow meters is either problematic or not possible, for example at sites which are hard to reach or carry highly turbid water. It is installed above the water surface, which means the system requires no maintenance and works reliably during periods of high flow, debris, driftwood and/or turbidity.

IMPLEMENTATION

The sensor boasts a low power consumption and high reliability for permanent recording of the flow velocity. The compact design and the contact-free measurement principle by means of radar technology allows easy and uncomplicated mounting and usage.

MEASURING PRINCIPLE

The measurement of flow velocity is based on the principle of the Doppler frequency shift. The sensor emits a radar signal and compares its frequency with the one of the reflected signal from the water surface. The frequency is shifted proportional to the surface flow velocity. Those signals are collected, evaluated and the medial surface flow velocity is determined.

TECHNICAL SPECIFICATION

GENERAL	
Dimensions	241mm x 246mm x 154mm
Weight	2.7kg
Protection Class	IP67
Power Supply	6 to 30V
Power Consumption at 12V	Standby approx. 1mA; active operation approx. 11mA
Operating Temperature	-35°C to 60°C
Misc	Over voltage protection, reverse power protection, lightning protection
Digital Interface	1 x RS 485 or Modbus; 1 x SDI-12

VELOCITY	
Measurement Range	0.1 to 15m/s
Accuracy	±0.01 m/s; ±1% FS
Resolution	1mm/s
Direction Recognition	±
Measurement Duration	5 to 240s
Measurement Interval	8s to 5h
Measurement Frequency	24GHz (K-Band)
Radar Opening Angle	12°
Distance to Water Surface	0.5 to 35m
Necessary Minimum Wave Height	3mm

DESCRIPTION	PART NUMBER
Water Velocity Radar Sensor	EN26-180

WATER QUALITY & LEVEL

MAJI SYSTEMS

Wagtech Projects-Trace2o offer an impressive range of single and multi-parameter water quality testing instruments, suitable for a range of requirements, from portable testing to long-term deployment.

The Maji Systems cater for all budgets and are an ideal choice for those that want to step up their monitoring practices and are concerned with water quality.

Single-Parameter Instruments

MAJI-LITE

The Maji-Lite is a portable single-parameter meter which has the ability to measure any one of 8 common parameters.

The range of available electrodes are fully interchangeable making the Maji-Lite highly versatile. The sensor is housed in a rugged and pocket-sized aluminium body meaning it is an ideal solution for measuring water quality in the field. The socket can house any of the 8 optical electrodes, which are:

- Turbidity
- Chlorophyll
- Blue Green Algae (fresh water)
- Blue Green Algae (salt water)
- Rhodamine
- Fluorescein
- CDOM/FDOM
- Refined Oil (hydrocarbons)

For electrode specifications, see page 33.

PROBE SPECIFICATION

Rating	IP68
Immersion Depth	Up to 100m
Operating Temperature	-5°C to 70°C
Dimensions	Ø24mm x 250mm
Weight	400g

DESCRIPTION	PART NUMBER
Maji-Lite package including probe, GPS Maji-meter, a 3m tough cable with connectors at both ends and various accessories all supplied in a rugged carry case. *Electrode not included and must be ordered seperately, see page 33.	EN27-100

Portable Multi-Parameter Instruments

MAJI PROBES

The Maji Probes are portable units for on-the-spot measurements of water quality and depth.

All probes are constructed from tough marine grade aluminium that has been hard anodised, making them suitable for use in both fresh and salt waters. They consist of an aluminium probe, 3m cable and a hand-held Maji-Meter. If longer cable lengths are required, please contact us.

To carry out water quality analysis the probe is simply lowered into the water and the results are displayed on the hand-held device. The meter has inbuilt GPS to record the exact location in which the results were taken and has the capacity to store over 1000 data sets.

KEY FEATURES & BENEFITS

- Wide range of water quality parameters
- Easy calibration
- Low maintenance
- Built-in GPS
- Ability to incorporate ISE and Optical electrode testing simultaneously
- Robust marine grade aluminium
- IP68 waterproof

PARAMETERS

For electrode specifications, see p32-33.

STANDARD PARAMETERS

- pH
- DO
- EC
- Temperature
- Water Level
- ORP
- TDS
- Resistivity
- Salinity
- SSG

OPTIONAL PARAMETERS

Ion-Selective Electrodes (ISE)

- Ammonium (& Ammonia)
- Calcium
- Chloride
- Fluoride
- Nitrate

Optical Electrodes

- Turbidity
- Blue Green Algae (fresh water)
- Blue Green Algae (salt water)
- Rhodamine
- Fluorescein
- CDOM/FDOM
- Refined Oil (hydrocarbons)
- Chlorophyll

Four models of Maji Probe are available, which vary according to the number of additional ports available for ISE and optical electrodes.

MAJI-500

The Maji-500 offers the essential parameters for water quality monitoring. Supplied as a complete package, you are provided with everything you need to start your analysis.

The Maji-500 measures the standard parameters except Water Level – instead it includes Turbidity, making it a water quality-only probe. It does not have the capability of adding additional parameters, unlike the Maji-1000 and above.

PROBE SPECIFICATIONS

Rating	IP68
Immersion Depth	Up to 50m
Operating Temperature	-5°C to 70°C
Dimensions	Ø42mm x 290mm
Weight	700g

DESCRIPTION	PART NUMBER
Maji-500 package including probe, GPS Maji-meter, tough 3m meter cable, calibration solutions and accessories. All housed in a rugged carry case for easy storage and transport.	EN27-200

MAJI-1000

The Maji-1000 is the smaller of our multi-parameter probes which allow additional electrodes to be added. It comes with 10 common water quality testing sensors as standard and two auxiliary ports for the option to add either, 2x ion selective sensor (ISE), or 1x optical sensor & 1x ISE. This means 12 parameters can be measured simultaneously.

Just like all of our other portable Maji Probes, it is supplied as a package meaning you have everything you need to start testing.

PROBE SPECIFICATIONS

Rating	IP68
Immersion Depth	Up to 100m
Operating Temperature	-5°C to 70°C
Dimensions	Ø42mm x 290mm
Weight	700g

DESCRIPTION	PART NUMBER
Maji-1000 package including probe, GPS Maji-meter, tough 3m meter cable, calibration solutions and accessories. All housed in a rugged carry case for easy storage and transport. Up to 2 additional electrodes (2x ISE probes or 1x ISE and 1x optical) can be ordered seperately, see page 33.	EN27-300

MAJI-2000

The Maji-2000 builds on the Maji-1000 by offering the ability to add up to 4 additional electrodes, while still including all 10 standard Maji parameters.

Unlike the Maji-1000, these sockets are unrestricted, meaning they can house either ISE or optical electrodes. In total 14 parameters can be measured simultaneously.

PROBE SPECIFICATIONS

Rating	IP68
Immersion Depth	Up to 100m
Operating Temperature	-5°C to 70°C
Dimensions	Ø55mm x 340mm
Weight	950g

DESCRIPTION	PART NUMBER
Maji-2000 package including probe, GPS Maji-meter, tough 3m meter cable, calibration solutions and accessories. All housed in a rugged carry case for easy storage and transport. Up to 4 additional (unrestricted) electrodes can be ordered seperately, see page 33.	EN27-400

MAJI-3000

The Maji-3000 is our largest and most advanced multi-parameter probe which comes with the 10 standard Maji parameters included, and offers the ability to add up to 6 unrestricted electrodes.

This makes the probe capable of measuring up to 16 individual parameters simultaneously, resulting in a powerful water quality monitoring device.

PROBE SPECIFICATIONS

Rating	IP68
Immersion Depth	Up to 100m
Operating Temperature	-5°C to 70°C
Dimensions	Ø77mm x 440mm
Weight	1350g

DESCRIPTION	PART NUMBER
Maji-3000 package including probe, GPS Maji-meter, tough 3m meter cable, calibration solutions and accessories. All housed in a rugged carry case for easy storage and transport. Up to 6 additional (unrestricted) electrodes can be ordered seperately, see page 33.	EN27-500

Fixed Site with Manual Data Collection

MAJI-SONDE

The Maji-Sonde is an all-in-one multi-parameter device, which features built-in data logging, internal power and a sensor cleaning system.

This means it is ideal for discrete long term deployment, using only a Kevlar deployment cord without the need for cables or auxiliary equipment at ground level. The Maji-Sonde measures the 10 standard parameters and has the ability to add up to 6 unrestricted additional electrodes.

The internal lithium-ion batteries used in the Maji-Sonde are able to provide up to 180 days of continuous logging, and the internal memory has the ability to store up to 150,000 full data sets. Whenever you need to retrieve your water quality data, simply pull the Maji-Sonde out from the water and connect to a PC.

Logging regimes are configured using the PC/laptop software included.

Full features include:

- Retrieval of logged data
- Full calibration of the instrument with report generation
- Logged data output to spreadsheet and text files
- Setup utility
- Site name and GPS geotagging

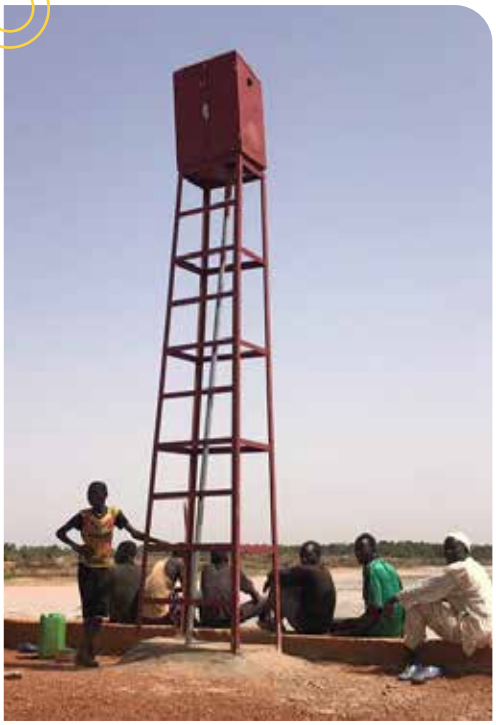
PROBE SPECIFICATIONS

IP	IP68
Depth	Up to 100m
Temperature	-5°C to 70°C
Dimensions	Ø77mm x 635mm
Weight	3400g (inc. batteries)
Batteries	2 x 3.6V Lithium D cells, life greater than 9 months.
Memory Capacity	150,000 full data sets

DESCRIPTION	PART NUMBER
Maji-Sonde supplied with the 10 standard Maji parameters, internal memory, deployment key, USB cable and PC software. Requires 2 x 3.6V Lithium D cells and cord – not included. Up to 6 additional (unrestricted) electrodes can be ordered seperately, see page 33.	EN27-600
10m non stretch Kevlar deployment cord including clips.	EN27-602
20m non stretch Kevlar deployment cord including clips.	EN27-604
30m non stretch Kevlar deployment cord including clips.	EN27-606
50m non stretch Kevlar deployment cord including clips.	EN27-608

Fixed Site with Data Telemetry

MAJI-STAT



The Maji-Stat is an all-in-one fixed site monitoring system with the ability to monitor up to 16 parameters simultaneously. It is an ideal solution for continuous monitoring of boreholes, rivers and dams.

The system uses a self-cleaning Maji-3000 probe permanently fixed in the water course by a 10m cable for continuous logging with minimal maintenance. Also included is a solar-powered data hub with battery, a data telemetry system and one-year access to our online data management hub. This results in a fully self-sustaining system where data is automatically collected, recorded, transmitted and displayed online with no human interaction.

Existing infrastructure can be used to house the data hub, probe and solar panel or Wagtech Projects - Trace2o can provide bespoke solutions tailored to the specific location. Full installation, commissioning and training is available upon request.

DATA LOGGING & TRANSMISSION FEATURES

- Channels can be configured as triggers/alarms
- One dedicated channel for battery voltage
- Rapid data transmission
- Uses local phone network (GPRS/3G/4G) – if signal fails, data is stored locally
- SDI-12, RS-232 and RS-485 compatible

PROBE SPECIFICATIONS

Rating	IP68
Immersion Depth	Up to 100m
Operating Temperature	-5°C to 70°C
Dimensions	Ø77mm x 440mm
Weight	1350g

DESCRIPTION	PART NUMBER
Maji-Stat with data logging and telemetry, consisting of the Maji-3000 probe, 10m cable, solar powered data hub with battery, data telemetry system, one-year web data hosting, GPS Maji-meter and all necessary accessories. Up to 6 additional (unrestricted) electrodes can be ordered seperately, see page 33.	EN27-700

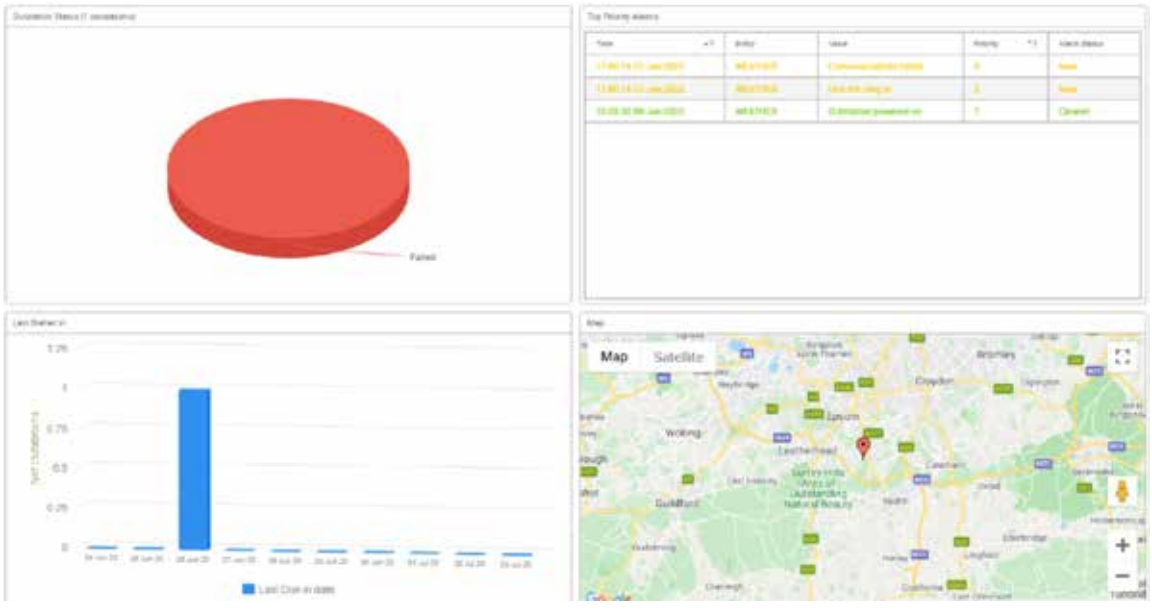
DEWMS - DATA EARLY WARNING MANAGEMENT SYSTEM

In response to the global need for improved Hydromet systems for mitigating the damaging effects of climate-induced hazards, Wagtech Projects-Trace2o offers a Data Early Warning Management System (DEWMS) available with the Maji-Stat. This software not only acts as a flood early warning system, but it also provides analysis of your water quality data. Full features include:

- Early warning alerts when water levels exceed specified limits
- Water level and quality data analysis via a purpose-built cloud-based platform
- Visualisation of data in charts and graphs for the identification of problem areas
- Monitor system performance to identify when sensors require calibration or replacement
- Export data to Excel

FEATURES & BENEFITS

FEATURES	BENEFITS
Gather data electronically and instantly upload to a central system	Saves time and avoids human error when recording data
Instantly access data in a single dashboard anywhere in the world	Improves efficiency and speeds up data analysis
Management of networks with map view	Ensures all stations are functioning as they should
User-customisable early warning alerts for rising water levels	Enables early preparation and mitigation of flooding
Data encryption and user-specific log-ins	Ensures high-level data security and full traceability
Visualisation of results in graphical form	Allows identification of problem areas and prioritisation of remedial action



DESCRIPTION	PART NUMBER
DEWMS (one year access)	EN27-750

STANDARD PARAMETERS

INCLUDED WITH ALL MAJI-PROBES, MAJI-SONDE AND MAJI-STAT

DISSOLVED OXYGEN	
Range	0 – 500.0% / 0 – 50.00mg/L
Resolution	0.1% / 0.01mg/L
Accuracy	0- 200%: ± 1% of reading. 200%- 500%: ± 10%

CONDUCTIVITY (EC)	
Range	0 – 200mS/cm (0- 200,000µS/cm)
Resolution	3 Auto-range scales: 0 – 9999µS/cm, 10.00 – 99.99mS/cm, 100.0 – 200.0mS/cm
Accuracy	±1% of reading or ±1µS/cm if greater (see note 2)

TDS*	
Range	0 – 100,000mg/L (ppm)
Resolution	2 Auto-range scales: 0 – 9999mg/L, 10.00 – 100.00g/L
Accuracy	±1% of reading or ±1mg/L if greater (see note 2)

RESISTIVITY*	
Range	5Ω•cm – 1MΩ•cm
Resolution	2 Auto-range scales: 5 – 9999Ω•cm, 10.0 – 1000.0KΩ•cm
Accuracy	±1% of reading or ±1Ω•cm if greater (see note 2)

SALINITY*	
Range	0 – 70PSU / 0 – 70.00ppt (g/Kg)
Resolution	0.01PSU / 0.01ppt
Accuracy	±1% of reading or ±0.1 unit if greater (see note 2)

SEAWATER SPECIFIC GRAVITY*	
Range	0 – 50σt
Resolution	0.1σt
Accuracy	±1.0σt

PH	
Range	0 – 14pH / ±625mV (see note 3)
Resolution	0.01pH / ±0.1mV
Accuracy	±0.1pH / ±5mV

ORP	
Range	±2000mV (see note 3)
Resolution	0.1mV
Accuracy	±5mV

TEMPERATURE	
Range	-5˚C – +50˚C (23˚F – 122˚F)
Resolution	0.1˚C/F
Accuracy	±0.5˚C

DEPTH	
Range	75mm to 100m
Resolution	±0.5% FS
Accuracy	1cm

* Readings calculated from EC and temperature electrode values

PROBE CONFIGURATIONS

PRODUCT	NUMBER OF ELECTRODES
Maji-Lite	1 Optical
Maji-500	10 standard (minus Water Level, plus Turbidity)
Maji-1000	10 standard + 2x ISE or 1x ISE & 1x Optical
Maji-2000	10 standard + up to 4 unrestricted
Maji-3000, Maji-Sonde & Maji-Stat	10 standard + up to 6 unrestricted

OPTIONAL PARAMETERS

ION SELECTIVE ELECTRODES (ISE)

AMMONIUM / AMMONIA†	
Range	0 – 9,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00 – 99.99mg/L, 100.0 – 9,000mg/L
Accuracy	±10% of reading
CHLORIDE	
Range	0 – 20,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00 – 99.99mg/L, 100.0 – 20,000mg/L
Accuracy	±10% of reading
FLUORIDE	
Range	0 – 1,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00- 99.99mg/L, 100.0 – 999.9mg/L
Accuracy	±10% of reading
NITRATE	
Range	0 – 30,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00- 99.99mg/L, 100.0 – 29,999.9mg/L
Accuracy	±10% of reading
CALCIUM	
Range	0 – 2,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00 – 99.99mg/L, 100.0 – 2,000mg/L
Accuracy	±10% of reading

OPTICAL ELECTRODES

TURBIDITY	
Range	0 – 3000NTU
Resolution	2 Auto-range scales: 0.0 99.9NTU, 100 – 3000NTU
Repeatability	±2% of reading
CHLOROPHYLL	
Range	0 – 500µg/L (ppb)
Resolution	0.01µg/L
Repeatability	±2% of reading
PHYCOCYANIN (FRESHWATER BLUE-GREEN ALGAE)	
Range	0 – 300,000 cells/mL
Resolution	1 cell/mL
Repeatability	±2% of reading
PHYCOERYTHRIN (MARINE BLUE-GREEN ALGAE)	
Range	0 – 200,000 cells/mL
Resolution	1 cell/mL
Repeatability	400 cells/mL

RHODAMINE WT DYE	
Range	0 – 500µg/L (ppb)
Resolution	0.01µg/L
Repeatability	±5% of reading
FLUORESCEIN DYE	
Range	0 – 500µg/L (ppb)
Resolution	0.01µg/L
Repeatability	±5% of reading
REFINED OIL	
Range	0 – 10,000µg/L (ppb)
Resolution	0.1µg/L
Repeatability	±10% of reading
CDOM/FDOM	
Range	0-2,000mg/L (ppm)
Resolution	2 Auto-range scales: 0.00- 99.99mg/L, 100.0- 2,000mg/L
Repeatability	±10% of reading or 2ppm (whichever is greater)

† Ammonia readings are calculated from Ammonium, pH and temperature electrode values.

LAKES & COASTAL MONITORING

Multi-Parameter Sea and Lake Buoy

HYDROMET BUOY

The Sea and Lake Buoy is our completely user-customizable, turn-key metocean data collection buoy platform.

The buoy allows the measurement of a variety of physical parameters (user customizable: directional waves, current profiles, turbidity, temperature, salinity, and meteorological parameters, other sensors may be implemented at the user's request). The internal wave measurement module has been strongly validated with long-term intercomparing studies against Datawell buoys. The buoy features a real-time module for visualization of data on a dedicated website or shore station. It is autonomously powered thanks to its solar panels.

KEY FEATURES

- Entirely in PEHD: no corrosion, excellent resistance over time
- Integration of high-quality sensors
- Data acquisition system
- Transmission by GPRS
- Mooring line scaled and designed for the associated site

DESCRIPTION	PRODUCT CODE
Hydromet Buoy	EN30-200

MOORING

Based on our experience in buoy deployment, we choose the best mooring for the conditions on site (chain and rope, S-shape for deep water with a sub-surface buoy).

ENERGY AUTONOMY

The buoy has 4 x 55W solar panels and one battery in order to be completely autonomous.

SIGNALISATION

The buoy has a St Andrew crew, a flash (rhythm O.D.A.S. 'Ocean Data Acquisition System') and reflectors.

GPS / AUTOMATIC SYSTEM ALERT

As standard, the buoy is equipped with a GPS module to provide its exact location in real time (every 30 minutes). The buoy has an automatic system alert – if the GPS point is further than 250m from the deployment location (maximum excursion of the buoy), then an alert is sent via SMS and email to the client.

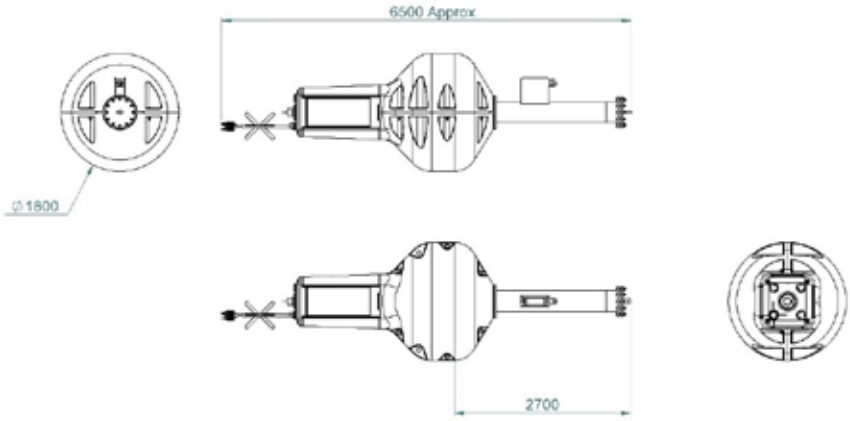
PARAMETERS

Directional Waves	Internal motion sensor
Current Profile	55kHz or 250kHz (depending on the depth)
Meteorological	Wind speed and direction, humidity, air temperature, barometric pressure, rain and solar radiation
Physico-Chemical	Salinity, temperature, turbidity and dissolved oxygen
Evaporation	To be calculated using other onboard parameter values
Location	GPS module to provide its location every 30 minutes with an alarm via SMS if GPS location is further than from the deployment location

For technical specifications, see pages 36 and 37

BUOY SPECIFICATIONS

Real-Time Transmission	GPRS (+ internal datalogger)
Mooring	Adapted to deployment depth
Colour	Orange, with sensor masts painted reflective red and white
Weight without Mooring	800kg max
Diameter	1.8m
Materials	PolyEthylene HD / syntactic foam (in order to not disturb instrument compass)
Protection	Protection against vandalism



DIRECTIONAL WAVES

Wave parameters are calculated thanks to an internal motion sensor with algorithms. The internal wave measurement module has been strongly validated with long-term intercomparing studies. Data is sent in real time and stored inside an internal buoy datalogger. Processed data will be provided in real time every 30 minutes.

Range (Hs)	±20m
Accuracy (Hs)	5cm
Range (Tp)	1.6 to 30s
Range (Dir)	0 to 360°
Accuracy (Dir)	±3°

CURRENT PROFILE

The current profile measurement is made with a Signature 55kHz or 250kHz (depending on the depth), deployed on the keel of the buoy. Current profilers operate by sending out short acoustic pulses from two or more acoustic beams. The acoustic echo reflected from moving particles is shifted in frequency (Doppler shifted) in proportion to the particle velocity. The echo is then processed to find the Doppler shift, the scaling is adjusted with the measured speed of sound in the liquid (hence the temperature measurement).

Current Meter	55kHz	250kHz
Max Range	600m	150m
Blanking Distance	2m	0.5m
Call Size	1 to 8m	5 to 20m
Measurement Range	1 or 5m/s	2.5 or 5m/s
Accuracy	±0.1cm/s	±0.1cm/s

METEOROLOGICAL

The following meteorological parameters are measured using an Automatic Weather Station, installed at the top of the HydroMet Buoy. These parameters are measured and recorded every 10 minutes.

WIND: SPEED	
Range	0 to 60m/s
Response Time	0.25s
Available Variables	Average, maximum and minimum
Accuracy	±3% at 10m/s
Output Resolution	0.1m/s
WIND: DIRECTION	
Azimuth	0 to 360°
Response Time	0.25s
Available Variables	Average, maximum and minimum
Accuracy	±3% at 10m/s
Output Resolution	1°
BAROMETRIC PRESSURE	
Range	600 to 1100hPa
Accuracy	±0.5hPa (0 to 30°C), ±1hPa (-52 to 60°C)
Output Resolution	0.1hPa
AIR TEMPERATURE	
Range	-52°C to 60°C
Accuracy	±0.3°C
Output Resolution	0.1°C

RELATIVE HUMIDITY	
Range	0 to 100%RH
Accuracy	±3%RH (0 to 90%RH), ±5%RH (90 to 100%RH)
Output Resolution	0.1%RH
PRECIPITATION: RAINFALL	
Collecting Area	60cm2
Output Resolution	0.01mm
Field Accuracy for Long Term Accumulation	Better than ±5%, weather dependent
PRECIPITATION: RAINFALL INTENSITY	
Range	0 to 200mm/hr
SOLAR IRRADIANCE	
Spectral Range (50% Points)	285 to 2800nm
Sensitivity	7 to 14µV/W/m2
Operational Conditions	-40°C to 80°C
Maximum Solar Irradiance	4000W/m2
Field of View	180°

PHYSICO-CHEMICAL

Physico-chemical parameters are measured by the integration of sensors on the keel of the HydroMet Buoy.

TURBIDITY	
Accuracy	±0.12NTU
Range	0 to 1000NTU
Resolution	0.015NTU
DISSOLVED OXYGEN	
Accuracy	1% or 0.02ppm (whichever is greater)
Resolution	0.01%/DO content; 0.001ppm
SALINITY	
Range	0 to 60g/kg
Accuracy	±0.01g/kg
Resolution	0.001g/kg
TEMPERATURE	
Range	-5°C to 45°C
Accuracy	±0.002°C (-5 to 35°C), ±0.01°C (35 to 45°C)
Resolution	0.0001°C

Specifications provided are for our standard HydroMet Buoy. Please contact us if you have a specific requirement and we will work with you to create a bespoke system.

METEOROLOGY

AUTOMATIC WEATHER STATIONS

TRACEMET®

TraceMet is a range of Automatic Weather Stations (AWS) that have been carefully designed for the collection of accurate and reliable data on atmospheric, soil, plant and surface water conditions. With a choice of 6 models, there is a weather station for every situation. Whether you need an entry-level system for just meteorological parameters, or a premium AWS for measuring agrometeorological conditions, there is a model for you.

TraceMet® Benefits

AERODYNAMIC RAIN GAUGES

The unique design of the TraceMet Tipping Bucket rain gauge increases measurement accuracy by capturing more rainfall than traditionally shaped cylindrical gauges. The precision-engineered UV-resistant gauges minimise out-splash and reduce rainfall losses caused by evaporation. The depth, diameter, and angle of the funnels have all been extensively tested and researched to give optimum accuracy in the field.

TRACELOGGER®

The TraceLogger is a complete high-capacity data logger with 10 universal logging channels which can also be configured as triggers or alarms. It features rapid data transmission over local mobile networks and can be configured to output data to either an FTP or HTTP server. In the event of a network failure, your data would not be lost, thanks to the Tracelogger's on-board storage capabilities. An optional integrated LCD screen allows site engineers to ensure system functionality on-site.

SOLAR POWER SYSTEM

A high-capacity Li-ion 18Ah battery powers the TraceMet systems, including the data logger and associated sensors. However, as Li-ion batteries lose functionality at temperatures exceeding 26°C, the TraceMet systems incorporate a dedicated heat shield. This reduces the damaging effect of excessive heat on the battery and preserves its lifespan. A 30W solar panel is included to provide power, however even in prolonged periods without sunlight the AWS can still function as normal thanks to the high-capacity battery and efficient TraceLogger.

TraceMet® Comparison Chart

ALL STATIONS INCLUDE:

- Advanced 10-channel TraceLogger
- Solar charging system
- 18Ah battery with heat shield
- Ability to output data to the TraceMet AWS Management System
- Data output to FTP or HTTPS server
- Ability to record 7 key meteorological parameters:
  - Solar Radiation
  - Barometric Pressure
  - Wind Speed
  - Wind Direction
  - Relative Humidity
  - Air Temperature
  - Rainfall Intensity

	METEOROLOGICAL	
	ENTRY-LEVEL	PREMIUM
	TM50	TM100
Number of Parameters Measured	7	7
World Meteorological Organization (WMO) Compliant		✓
Transfer of Data to Local Server (FTP or HTTP)	✓	✓
TraceMet AWS Management Software	*	*
System Components		
TraceLogger	✓	✓
Battery, Heat Shield & Solar Charging System	✓	✓
2m Portable Mast	✓	
10m Retractable Mast		✓
Sensors		
Meteorological		
ARG-127 Aerodynamic Rain Gauge with Baseplate	✓	
ARG-314 Aerodynamic Rain Gauge**		✓
RHT1 Relative Humidity & Temperature with Sensor Shield	✓	
RHT2 Relative Humidity & Temperature with Sensor Shield		✓
WSD Wind Speed & Direction	✓	
U-WSD Ultrasonic Wind Speed & Direction		✓
SCP Pyranometer (Solar Radiation)	✓	
SMP3 Pyranometer (Solar Radiation)		✓
BP1 Barometric Pressure	✓	✓
Agrometeorological		
SM150T Soil Moisture & Temperature		
PHYTOS 31 Leaf Wetness		
Hydrometeorological		
LL-MINI Water Level & Temperature		

*Available as an optional extra.

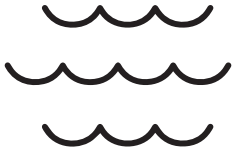
Concrete pedestal required: to be sourced locally **or included if Wagtech Projects is providing the ICT.

In addition to the classic meteorological AWS, we also provide systems for agronomical and hydrological needs:

- TM AGRO adds: soil moisture, soil temperature and leaf wetness
- TM HYDRO adds: water level and temperature

Premium model advantages include:

- WMO compliance
- 10m mast for more reliable data
- Advanced sensors give more accurate measurements



AGROMETEOROLOGICAL		HYDROMETEOROLOGICAL	
ENTRY-LEVEL	PREMIUM	ENTRY-LEVEL	PREMIUM
TM50 AGRO	TM100 AGRO	TM50 HYDRO	TM100 HYDRO
10	10	9	9
	✓		✓
✓	✓	✓	✓
*	*	*	*
✓	✓	✓	✓
✓	✓	✓	✓
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✓	✓	✓	✓
✓	✓		
✓	✓		
		✓	✓

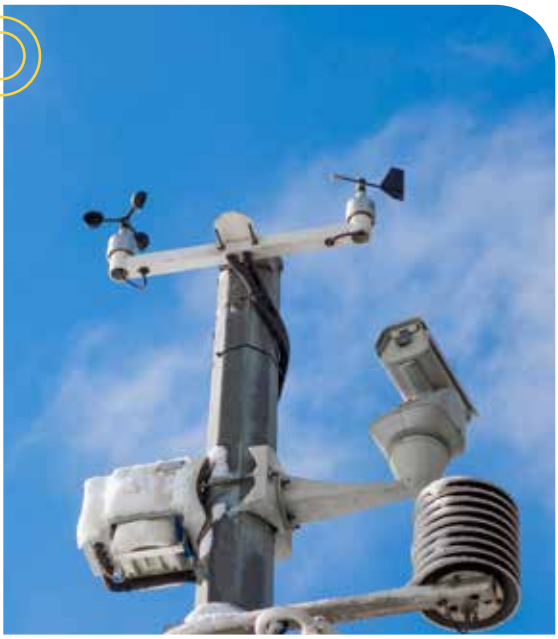
Meteorological Stations

Meteorology is the branch of science concerned with the processes and phenomena of the atmosphere, especially as a means of forecasting the weather. These stations have been designed to measure the key meteorological parameters only – ideal for general weather forecasting and climate monitoring.

TM50

A compact, low-cost AWS suited to local businesses, institutions or individuals who want quality meteorological data but are not concerned with being WMO compliant. Comprises 5 sensors mounted on a 2m mast for measuring 7 meteorological parameters:

- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed



DESCRIPTION	PRODUCT CODE
TM50	EN45-100

DESCRIPTION	PRODUCT CODE
TM100	EN45-110

TM100

A premium, full-scale, WMO compliant AWS ideal for building national meteorological network capacity. This station provides highly accurate meteorological data and is very low maintenance due to the absence of moving parts. Comprises 5 sensors mounted on a 10m mast for measuring 7 key weather parameters:

- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed

For technical specifications, see pages 48 to 54.

Agrometeorological Stations

Agrometeorology is the study of weather and climate information, and its use in enhancing or expanding agricultural crops and/or to increase crop production. These stations enable better agricultural planning and provide up-to-date information on the latest weather conditions which affect plant health.

TM50 AGRO

A compact, low-cost agronomical AWS which builds on the TM50 by adding sensors for leaf wetness and soil moisture and temperature. The TM50 AGRO is suited to local farmers and businesses who want to monitor the key factors affecting the health of their crops to improve yields. Comprises 7 sensors mounted on a 2m mast for measuring 10 parameters:

- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed
- Leaf Wetness
- Soil Moisture
- Soil Temperature

DESCRIPTION	PRODUCT CODE
TM50 AGRO	EN45-200

TM100 AGRO

A premium, WMO compliant agronomical AWS which builds on the TM100 by adding sensors for leaf wetness and soil moisture and temperature. This station is ideal for national government agencies who want to build capacity and identify regional variations in agricultural potential. Comprises 7 sensors mounted on a 10m mast for measuring 10 parameters:

- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed
- Leaf Wetness
- Soil Moisture
- Soil Temperature

DESCRIPTION	PRODUCT CODE
TM100 AGRO	EN45-210

For technical specifications, see pages 48 to 54.

Hydrometeorological Stations

Hydrometeorology studies the transfer of water between the land surface and the lower atmosphere, which affects agriculture, water supply, flood control and power generation. These stations therefore offer vital information which can be used for better community planning and early warning for hydrometeorological hazards.

TM50 HYDRO

A compact, low-cost hydrological AWS which builds on the TM50 with the addition of a water level and temperature sensor. This makes it perfect for small-scale community-based projects, such as flood early warning or reservoir monitoring. Comprises 6 sensors mounted on a 2m mast for measuring 9 parameters:

- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed
- Water Temperature
- Water Level

DESCRIPTION	PRODUCT CODE
TM50 HYDRO	EN45-300

TM100 HYDRO

A premium, WMO compliant hydrometeorological AWS which builds on the TM100 with the addition of a water level and temperature sensor. This configuration is suited to government agencies who want a full-scale AWS tied in with a system for monitoring water levels around the country. Comprises 6 sensors mounted on a 10m mast for measuring 9 parameters:

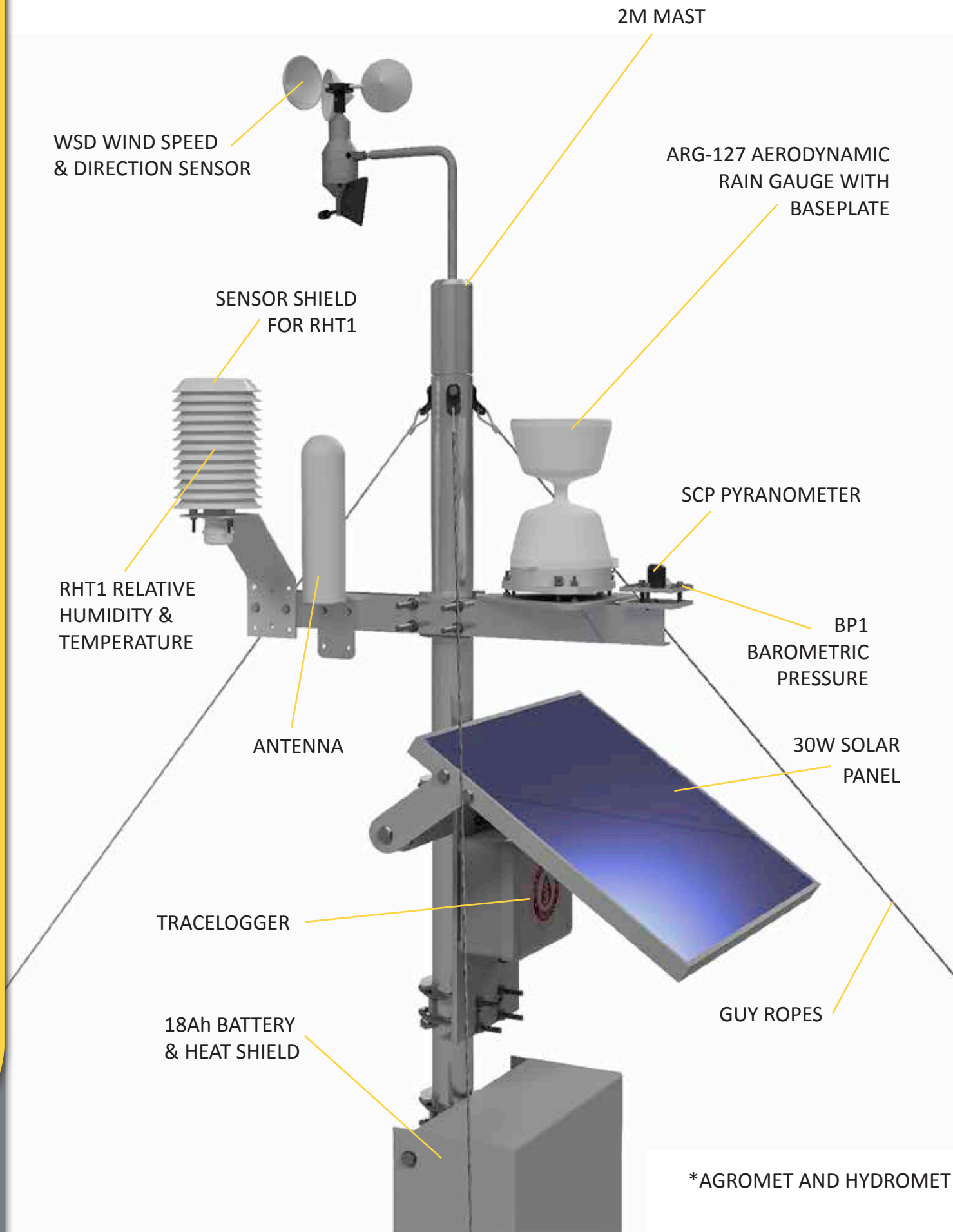
- Air Temperature
- Barometric Pressure
- Rainfall Intensity
- Relative Humidity
- Solar Radiation
- Wind Direction
- Wind Speed
- Water Temperature
- Water Level

DESCRIPTION	PRODUCT CODE
TM100 HYDRO	EN45-310

For technical specifications, see pages 48 to 54.

TM50 Assembly

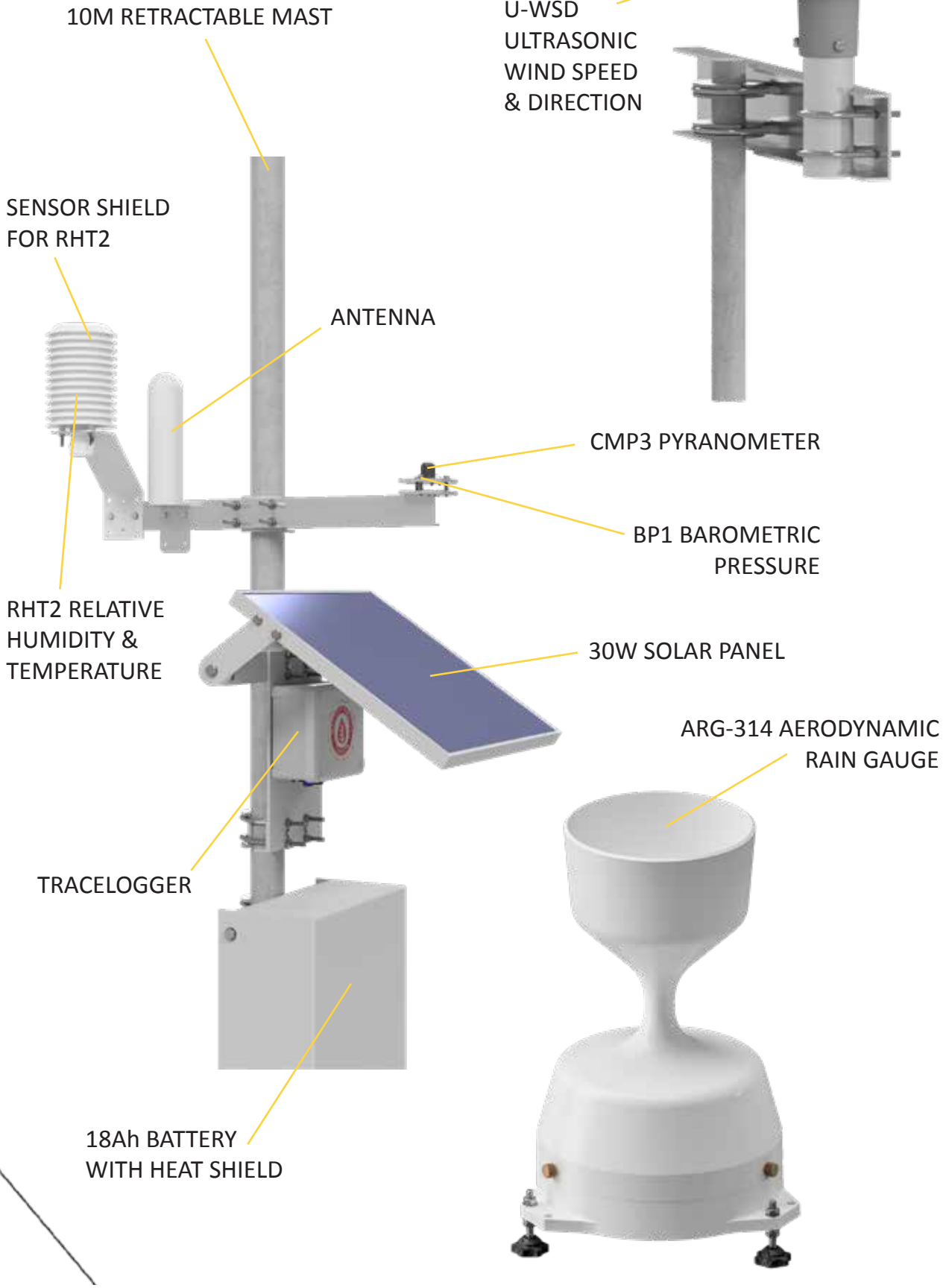
DESCRIPTION	PRODUCT CODE
TM50	EN45-100



*AGROMET AND HYDROMET

TM100 Assembly

DESCRIPTION	PRODUCT CODE
TM100	EN45-110



STATIONS BUILD ON THE TM50 AND TM100 WITH THE ADDITION OF SPECIALISED SENSORS.

Technical Specifications

TM50 SENSORS

These sensors are included in the TM50, but can also be purchased separately.

ARG-127 RAIN GAUGE WITH BASEPLATE	
Resolution	0.2mm
WMO Compliant	No
Output	Contact closure (reed switch)
Accuracy	99% up to 120mm/hr
Rainfall Intensity	0 to 2000mm/hr
Operating Temperature	1°C to 70°C
Funnel Diameter	127mm
Funnel Area	127cm²
Height	225mm (245mm w/ baseplate)
Weight	700g (1000g w/ baseplate)
Colour	White (or green if requested)
Material	Robust UV-stabilised plastic (injection moulded)

The ARG-127 is our recommended cost-effective solution for meteorologists and hobbyists or for project work on a budget, but still require scientific standard rain data. The gauge is based on the physical size of the traditional 5" UK Met Office rain gauge with the added benefit of an aerodynamic profile. The ARG127 is a compact solution and an ideal rain measuring instrument for anyone who cares about the quality of their data.

DESCRIPTION	PRODUCT CODE
ARG-127	EN45-600

SCP PYRANOMETER (SOLAR RADIATION)	
ISO 9060:2018	Class C (previously known as second class)
Power Supply	3.3 to 24VDC
Current Draw	10µA
Sensitivity	1.25mV per W m-2
Output Type	0 to 2.5V
Calibration Factor	0.8W m-2 per mV
Calibration Uncertainty	±5%
Repeatability	<1%
Long-Term Drift	<2% per year
Non-Linearity	<1% up to 2000W m-2
Response Time	<1ms
Field of View	180°
Spectral Range	360 to 1120nm
Directional Response	±5% at 75° zenith angle
Temperature Response	0.04 ±0.04% per °C
Operating Environment	-40 to 70C; 0 to 100%RH
Dimensions	Ø30.5mm x 37mm
Weight	140g

The SCP is a silicon-cell pyranometer featuring a silicon-cell detector. It provides accurate and stable global shortwave radiation measurements in a cost-effective package – the result of continual refinement of design.

The sensor incorporates a silicon-cell photodiode with a rugged, self-cleaning sensor housing design, and high-quality cable terminating in pre-tinned pigtail leads for easy connection to dataloggers and controllers. Sensor includes IP68 marine-grade stainless-steel cable connector to simplify sensor removal and replacement for maintenance and recalibration.

DESCRIPTION	PRODUCT CODE
SCP PYRANOMETER	EN45-612

WSD WIND SPEED + DIRECTION	
WIND SPEED	
Calibration	1 contact closure / 1.493m
Reed Detector	Bench tested to a minimum speed of 90m/s.
Start-Up	1m/s typically
Accuracy	2%
Linearity	2%
Contact Rating	50Watts
Supply Voltage	100V DC max.
Supply Current	1A max.
WIND DIRECTION	
Mechanical Travel	360° (endless)
Electrical Travel	355° ±2
Application Range	Up to 60m/s
Accuracy	±3%
Start-Up	<1m/s typically
Resistance Tolerance	±3%
Linearity Tolerance	±0.5%
Temperature Coefficient of Wire	±20ppm/°C
Temperature Range	-20°C to 70°C
Supply Voltage Max	80VDC
Recommended Max Voltage	24VDC
Height	280mm
Max Arc	120mm
Weight	500g

RHT1 HUMIDITY + TEMPERATURE	
Dimensions	Ø22mm x 180mm
Dimensions (probe only)	Ø12mm x 71mm
Housing Classification	IP65
Supply Voltage	7.28VDC
Operating Voltage	5 to 28VDC
Outputs	Analogue or RS485
Power Consumption	1mA average, max. peak 5mA
RELATIVE HUMIDITY	
Range	0 to 100%
Accuracy (at 23 ±5°C)	±5.0%RH
TEMPERATURE	
Range	-40 to +60°C
Accuracy (at 23 ±5°C)	±0.6°C

The wind speed and direction sensor consists of a low-inertia ABS cup assembly for fast response mounted on a dual ballrace-supported stainless steel shaft. The wind direction component of the sensor consists of a dynamically balanced wind vane operating a triple ballrace supported shaft and micro-torque potentiometer.

The WSD produces a contact-closure pulse signal output, which means that most modern data capture units are compatible with these sensors with little or no interfacing. The benefit of this is precise and accurate measurements in all environments.

DESCRIPTION	PRODUCT CODE
WSD	EN45-608

The RHT1 is a product comprising of a temperature and humidity probe and a robust machined acetal body to house the probe within. This combination provides a robust and cost-effective solution for your needs. Using this interchangeable probe allows the sensor to be changed in the field, eliminating down-time. It also means field re-calibration is a thing of the past with the RHT1. The probe also comes with a shield which protects the sensor from the effects of solar radiation, rain and snow.

DESCRIPTION	PRODUCT CODE
RHT1	EN45-604

TM100 SENSORS

These sensors are included in the TM100, but can also be purchased separately.

ARG-314 RAIN GAUGE	
Resolution	0.2mm
WMO compliant	Yes
Output	Contact closure (reed switch) – dual reed switch upgrade available
Accuracy	99% up to 120 mm/hr
Rainfall Intensity	0 to 1000 mm/hr
Operating temperature	1°C to 70°C
Funnel diameter, mm	200
Funnel area, cm2	314
Height, mm	435
Weight, g	2000
Colour	White
Material	Robust UV-stabilised plastic (injection moulded)

The unique aerodynamic shape and profile of the ARG-314 tipping bucket rain gauge increases measurement accuracy by capturing more rainfall than traditionally shaped cylindrical gauges. It is precision-engineered to minimise out-splash and reduce rainfall losses caused by evaporation.

The added benefit of the ARG-314 over the ARG-127 is that it has been extensively researched and tested to give optimum accuracy in the field, resulting in full compliance with WMO standard. This makes it the rain gauge of choice for professional meteorological agencies.

DESCRIPTION	PRODUCT CODE
ARG-314	EN45-602

U-WSD ULTRASONIC WIND SPEED + DIRECTION	
Dimensions	142mm x 163mm
Weight	500g
WIND SPEED	
Range	0 to 60m/s
Accuracy	±2% @ 12m/s
Resolution	0.01m/s
Response Time	0.25 seconds
Threshold	0.01m/s
WIND DIRECTION	
Range	0 to 359° (no dead band)
Accuracy	±2% @ 12m/s
Resolution	1°
Response Time	0.25 seconds

The Ultrasonic Wind Sensor is robust and low cost with no moving parts. This 2-axis ultrasonic wind sensor offers maintenance-free wind speed and direction monitoring for true 'fit and forget' wind sensing. The U-WSD is a genuine low cost alternative to conventional cup and vane or propeller wind sensors, with all of the advantages of solid-state ultrasonic technology. With no moving parts to jam, break or wear out, this ultrasonic wind sensor is ideal for use in harsh weather conditions. It is the ideal 2-axis ultrasonic wind sensor, which provides data via one serial or two analogue outputs.

DESCRIPTION	PRODUCT CODE
U-WSD	EN45-610

SMP3 PYRANOMETER (SOLAR RADIATION)	
ISO 9060:2018	Class C (previously known as second class)
Maximum Operation Irradiance	2000 W/m2
Analogue Output	0 to 1 V
Serial Output	RS-485 Modbus RTU
Serial Output Range	-400 to 2000 W/m2
Response Time (63%)	<1.5 s
Response Time (95%)	<12 s
Spectral Range (20% points)	285 to 3000 nm
Spectral Range (50% points)	300 to 2800 nm
Zero Offset A	<15 W/m2
Zero Offset B	<5 W/m2
Non-Stability	<1% (change/yr)
Non-Linearity	<1.5% (100 to 1000W/m2)
Directional Response	<20 W/m2
Spectral Selectivity	<3% (350 to 1500nm)
Tilt Response	<1% (0 to 90° at 10000W/m2)
Temperature response	<2% (-20°C to 50°C) <4% (-40°C to 70°C)
Field of view	180°
Accuracy of bubble level	<0.2°
Power consumption	55mW
Supply voltage	5 to 30V DC
Operating conditions	-40°C to 80°C, 0 to 100% RH
Environmental rating	IP67

The SMP3 is a thermopile pyranometer, which differs from the technology used in the SCP which is a silicon-cell pyranometer. The difference is that silicon-cell pyranometers have high errors in cloudy conditions, whereas thermopile pyranometers have a much broader and more uniform spectral response, meaning they perform well in all weather conditions.

The SMP3 is a smart thermopile pyranometer with low maintenance and industry standard digital and analogue amplified outputs. Based on proven technology, the SMP3 includes a Modbus® interface, excellent response time and temperature corrected measurement data.

DESCRIPTION	PRODUCT CODE
SMP3	EN45-614

RHT2 HUMIDITY + TEMPERATURE	
Dimensions	Ø15mm x 140mm
Housing Classification	IP65
Supply Voltage	5 to 24VDC / 5 to 16VAC
Outputs	Analogue or Digital
Standard Configuration	0 to 1V
RELATIVE HUMIDITY	
Range	0 to 100%RH
Accuracy	±1.0%RH (at 23 ±0.5°C)
TEMPERATURE	
Range	-50°C to 100°C
Accuracy	±0.2K

The RHT2 is a digital humidity-temperature probe which is most suited to field applications requiring high precision, Class A accuracy. These probes offer versatility by providing either analogue or digital outputs. They are therefore equipped with a high-speed sensor and a new filter technology which offers significantly better protection against the growth of a bio-film.

As with the RHT1, this probe is interchangeable allowing the sensor to be changed in the field, eliminating down-time. This also means that field re-calibration is a thing of the past with the RHT2.

DESCRIPTION	PRODUCT CODE
RHT2	EN45-606

UNIVERSAL SENSORS

Included in all TraceMet stations, but can also be purchased separately.

BP1 BAROMETRIC PRESSURE	
Measurement Range	15 to 115kPa (approx.)
Maximum Pressure Exposure	400kPa
Sensitivity	45.9mV per kPa; 0.459mV per 0.01 kPa
Calibration Factor	0.0218kPa
Measurement Uncertainty	±1.5%
Measurement Repeatability	<0.1%
Non-Linearity	<1%
Warm-Up Time	20ms
Response Time	1ms
Temperature Response	<0.002% per C (approx.)
Operating Environment	-40 to 80°C; 0 to 100%RH
Input Voltage Requirement	5VDC
Output Voltage Range	0 to 5VDC
Current Draw	7mADC
Dimensions	Ø16mm x 120mm
Weight	5g

The BP1 is a compact and affordable barometric pressure sensor, which provides excellent performance in all environments – this is why it has been selected for both the entry-level and premium TraceMet stations. It works well as a stand-alone product or combined with sensors affected by barometric pressure. Typical applications include pressure measurement in weather networks, often for weather forecasting and to correct the output of sensors that are sensitive to pressure changes.

DESCRIPTION	PRODUCT CODE
BP1	EN45-616

AGRONOMICAL SENSORS

The TM50 AGRO and TM100 AGRO are made up of the same sensors as the TM50 and TM100, respectively. However they include the following agronomical sensors, which can also be purchased separately:

SM150T SOIL MOISTURE + TEMPERATURE	
Operating Conditions	50 to 500mS.m-1 (salinity) -40°C to 70°C (temperature)
Output	0 to 1V differential
Rating	IP68
Sample Volume	Ø70mm x 55mm
Dimensions	Ø40mm x 143mm (overall)
Weight	100g
SOIL MOISTURE	
Range	0 to 1m3/m3 (100%)
Accuracy	0.03m3/m3 (±3%)
SOIL TEMPERATURE	
Range	-20°C to 60°C
Accuracy	±0.5°C (0 to 40°C), ±0.75°C (-20 to 60°C)

The SM150T measures soil moisture and temperature with research-grade accuracy. It offers stable, robust and reliable performance at a great price. The advanced patented electronics and tough build quality produce a highly reliable soil moisture sensor with exceptional salinity and temperature stability. The SM150T is engineered to withstand long term burial – the sensor, connectors and cable are all environmentally protected to IP68.

DESCRIPTION	PRODUCT CODE
SM150T	EN45-620

PHYTOS 31 LEAF WETNESS	
Measurement Speed	10mS
Sensor Type	Frequency domain
Output	320-1000mV @ 3V excitation
Operating Environment	-40°C to +50°C
Power	2.5VDC @ 2mA, to 5 VDC @ 7mA
Cable Length	5m, custom lengths available upon request
Cable Connector Types	3.5mm "stereo" plug or stripped and tinned lead wires (3)
Dimensions	120mm x 58mm x 8mm
Expected Lifetime	2+ years of continuous use
Warranty	One year, parts and labour

The PHYTOS 31 measures leaf surface wetness by measuring the dielectric constant of the sensor's upper surface. It is standardized, calibrated, and designed to detect wetness (presence and duration) and ice formation on the leaf surface. The sensor surface coating is non-hygroscopic, eliminating false wetness detection. The sensor's thin (0.65mm) fiberglass construction closely approximates the overall radiation balance of a healthy leaf, so moisture will condense and evaporate from the sensor at the same rate.

The PHYTOS 31 is ideal for predicting when to spray crops, quantifying water storage in a plant canopy, and in studying and monitoring crops for foliar diseases including rust and blight.

DESCRIPTION	PRODUCT CODE
PHYTOS 31	EN45-618

HYDROLOGICAL SENSORS

The TM50 HYDRO and TM100 HYDRO are made up of the same sensors as the TM50 and TM100, respectively. However they include the following hydrological sensor, which can also be purchased separately:

LL-MINI WATER LEVEL + TEMPERATURE	
Dimensions	Ø22mm x 87mm
Weight	120g
Materials	Stainless steel body, Delrin nose cone
Output	Modbus/RS485, SDI-12
External Power	6 to 24VDC
Fastest Logging & Modbus Rate	10 per second
Fastest SDI-12 Output Rate	1 per second
LEVEL	
Range	0 to 10m
Accuracy	±0.05% FS
Resolution	0.002% FS or 1mm, whichever is greater
TEMPERATURE	
Range	-20°C to 80°C
Accuracy	±0.1°C
Resolution	0.01°C

The LL-MINI is a water level and temperature sensor that provides accurate and reliable data with minimal maintenance. It is constructed using titanium and features sensitive pressure and temperature sensors. It outputs directly in SDI-12 or Modbus (RS-485) meaning you can connect it to any SDI-12 ready logging device. It has no internal power or memory, it's simply a sensor that will send data to your chosen logging device.

DESCRIPTION	PRODUCT CODE
LL-MINI	EN45-622

TRACELOGGER®

The Tracelogger provides an efficient and economical method of remotely logging meteorological, agromet and hydromet sensors.

The Tracelogger is not a standard logger – it has been designed as a convenient way of getting real-time data fast from a remote location to either an HTTP or FTP server. It also saves data to an internal SD-Card for local or back up use.

All the configurations of the Tracelogger are taken care of from text files on the SD Card. This allow easy changes in the field without the need of expensive and complicated equipment or dedicated software.

Operating Range	-40° to 60°C (-40° to 140°F)
Sampling Interval	Individually set for each channel/sensor: 3secs – 24 hr
Reporting Interval (HTTP or FTP)	1 minute up to 24 hours at set intervals
Memory	Internal 2GB or 4GB SD Card provided (SD Card limit of 4GB)
Channels	Ch1: Fixed SDI-12 channel (for certain approved devices) (Note: can log 10 fields of SDI12 data into Ch11 to 20) Ch2: Reserved for internal use Ch3 to 10: Eight mixed use (analogue or digital) channels. (Note: Channels 8, 9 and 10 can measure high frequency pulses). Ch11: Dedicated battery channel Note: certain sensors will need to use one analogue channel for measuring the reference voltage for more accurate measurements. i.e. Wind Direction.
Time Accuracy	±8 seconds per month in 0° to 40°C (32°F to 104°F) range; ±30 seconds per month in-40° to 60°C (-40° to 140°F) range
Power Supply	12VDC
Operating Voltage Range	9-15V range
Internal Modem	Quectel UC20
CPU	16-Bit PIC24E
ADC	12-Bit
Dimensions	180mm x 200mm x 90mm
Environmental Rating	IP65

DESCRIPTION	PRODUCT CODE
TRACELOGGER	EN45-400

TraceMet® AWS Software

The optional TraceMet AWS Management Software is the complete solution for retrieving, recording and analysing meteorological data collected by your weather stations. The software is packed with useful features from viewing trends through automatically generated graphs to managing your network in map view. Although the hardware is able to collect and push data manually, the addition of software which processes and displays your data automatically enhances your ability to forecast and predict weather patterns.

FULL FEATURES INCLUDE

- Data retrieval from locally based server (stand-alone system) or cloud based system
- Auto-updating graphical snapshot display of all main meteorological parameters
- Charts to provide a graphical tool for monitoring the trend of multiple parameters
- Summary window providing an auto-updating daily text summary of conditions with highs and lows
- Monthly and Yearly summaries with calculated statistics
- Ability to push data to a website for public use
- Settings on the AWS console can be controlled from the in-house based workstations
- Logged data may be exported in a variety of text formats for easy compatibility with other programmes
- Alert system with SMS, email, messaging capabilities
- Stations assigned with ID numbers and GPS locations enabling individual system statuses to be determined
- Drill down capabilities with individual stations or clusters

Exact software functionality may be customised according to individual needs; please contact Wagtech Projects or Trace2o for more information.

DESCRIPTION	PRODUCT CODE
AWS SOFTWARE	EN45-700

Mercury-free manual weather station

MERCO-FREE STAT

Merco-Free Stat is a thermometer and barometric package, specifically designed as a replacement system for mercury thermometers which have historically been used by many National Meteorological Agencies.

The system matches or improves upon the physical characteristics (i.e. same diameter) and operational performance (i.e. response times) of traditional mercury thermometers.

The package comprises two thermometers (wet bulb and dry bulb), a barometric sensor, TraceLogger for data logging + transmission and a battery with solar panel charging, all housed in a secure Stevenson screen.

MERCO-FREE STAT CONTENTS
TraceLogger
GSM Modem module
Non-mercury thermometer (dry)
Non-mercury thermometer (wet)
Barometric pressure sensor
Wet bulb kit
Battery system (enclosure, fixings, solar charging controller + heat shield)
Battery
Solar panel
Stevenson screen

ADVANTAGES:

- Comparable physical characteristics and response times to mercury thermometers
- Dedicated TraceLogger for measurement reporting with LCD display
- Logger can be located on the outside, eliminating the need to open the Stevenson Screen
- SD card for recording measurements
- Can easily be inserted into existing infrastructure

TEMPERATURE

Probe Diameter	13mm
Sensor	PT100 (100 Ohms at 0°C,.00385 TCR (alpha) per IEC 60751
Accuracy	Class A per IEC 60751
Range	-50°C to 85°C

BAROMETRIC PRESSURE

Pressure Range (1 hPa= 1 mbar)	500..1 100hPa 600... 1100hPa 800... 1100hPa 800... 1060hPa 600... 1060hPa
Resolution	0.1hPa
Load Resistance	100000 Minimum
Load Capacitance	47nF maximum
Settling Time to Full Accuracy after Start-Up	1s
Response Time to Full Accuracy after a Pressure Step	500ms
Acceleration Sensitivity	Negligible
Accuracy	
Linearity	0.25hPa
Hysteresis	0.03hPa
Repeatability	0.03hPa
Pressure Calibration Uncertainty	0.15hPa
Voltage Calibration Uncertainty	0.7mV
Frequency Calibration Uncertainty	0.3Hz
Total Accuracy At	
+15°C... +25°C (+59F...+77F)	0.3hPa
0°C... +40°C (+32F... +104F)	0.6hPa
-20°C... +45°C (-4F... +113F)	1.0hPa
-40°C... +60°C (-40F ... +140F)	1.5hPa

DESCRIPTION	PART NUMBER
Merco-Free Stat; mercury-free manual weather station	EN45-420

Lightning Detection Systems

LINET

LINET is an independent, ultra-precise and reliable lightning detection system which measures:

- Location of lightning strikes
- Strength and polarity of each stroke
- Emission-height of intra-cloud (IC) strokes

HOW IT WORKS

LINET measures the electromagnetic radiation emitted by lightning strokes with ultra-sensitive lightning sensors, set up at a distance of approximately 150 to 250 km. As the electromagnetic radiation spreads almost at the speed of light, it reaches each of the sensors at slightly varying times. Even though this difference is a matter of mere microseconds (µs), it enables precise calculation of the lightning stroke location. The data recorded by each lightning sensor is transmitted to a central processing server via the internet. This server then calculates the exact geographical position for all the lightning strokes measured and stores them in a database. The results are then made available to the customer in real time. This measurement method is referred to as the Time-of-Arrival (TOA) method.

LINET not only measure the position of the lightning stroke, it also captures their strength and polarity, and the emission-height of intra-cloud (IC) strokes. This expands the lightning information to include a third dimension. This feature is unique around the world for low-frequency long-range lightning detection networks (VLF/LF).

The lightning strokes detected are instantly made available to business customers as data packages of numerical lightning information (LINET data) or smart visualization (LINET view).

KEY FEATURES & BENEFITS

- Efficient coverage of large areas
- Continuous operation in real time
- High location accuracy
- Differentiate between cloud-to-ground and intra-cloud lightning strokes
- Unique value for money
- Easy setup and monitoring
- Economical operation, low cost of ownership

TECHNICAL INFORMATION

LINET systems essentially comprises two modules: several lightning sensors and a central server. The lightning sensors consist of one magnetic field antenna, a GPS module and a field processor. The position of the LINET Field Processor is of little importance as long as a sufficiently fast and stable internet connection is available – an optional secondary server can be installed. A LINET sensor is quick and easy to set up and will be fully operational if power (at least 30W) and a stable internet connection are available.

TECHNICAL SPECIFICATION

Detection	Cloud-to-ground Cloud-to-cloud Intra-cloud lightning discharges
Type of Measurement	Detector network and server
Output	Unique LINET view, Ethernet or serial data
Detection Efficiency	98% for strokes >4kA Even strokes down to <3kA are detected
Optimal Sensor Distance	150 to 250km
Location Accuracy	Average 75m in a well deployed network
False Alarm Rate	<0.1%
Maximum Flash Rate	No limitation
Time of Flash	Microsecond accuracy
Measurement Principle	Detection via TOA principle
Frequency Range	VLF/LF

PHYSICAL SPECIFICATION

FIELD ANTENNA	
Material	Sealed copper and aluminium
Weight	8kg
Size	Crossed loops 40cm diameter, 50cm height
Lifetime	>10 years (standard warranty 1 year)
FIELD PROCESSOR	
Housing Material	Coated aluminium
Weight	1.5kg
Size	15cm x 20cm x 30cm
Lifetime	>10 years (standard warranty 1 year)
GPS ANTENNA	
Weight	0.5kg
Size	Height 15cm, diameter 10cm
Lifetime	>10 years (standard warranty 1 year)

LINET SOFTWARE

LINET DATA

With LINET Data, small as well as large private and public companies can access detailed numerical lightning information. The user can access the data files in real time in various formats via the internet. In addition to standard information pertaining to the location, time and stroke current, LINET reliably differentiates between intra-cloud strokes and cloud-to-ground strokes, and even ascertains the height of intra-cloud strokes. The LINET Data package provides you with:

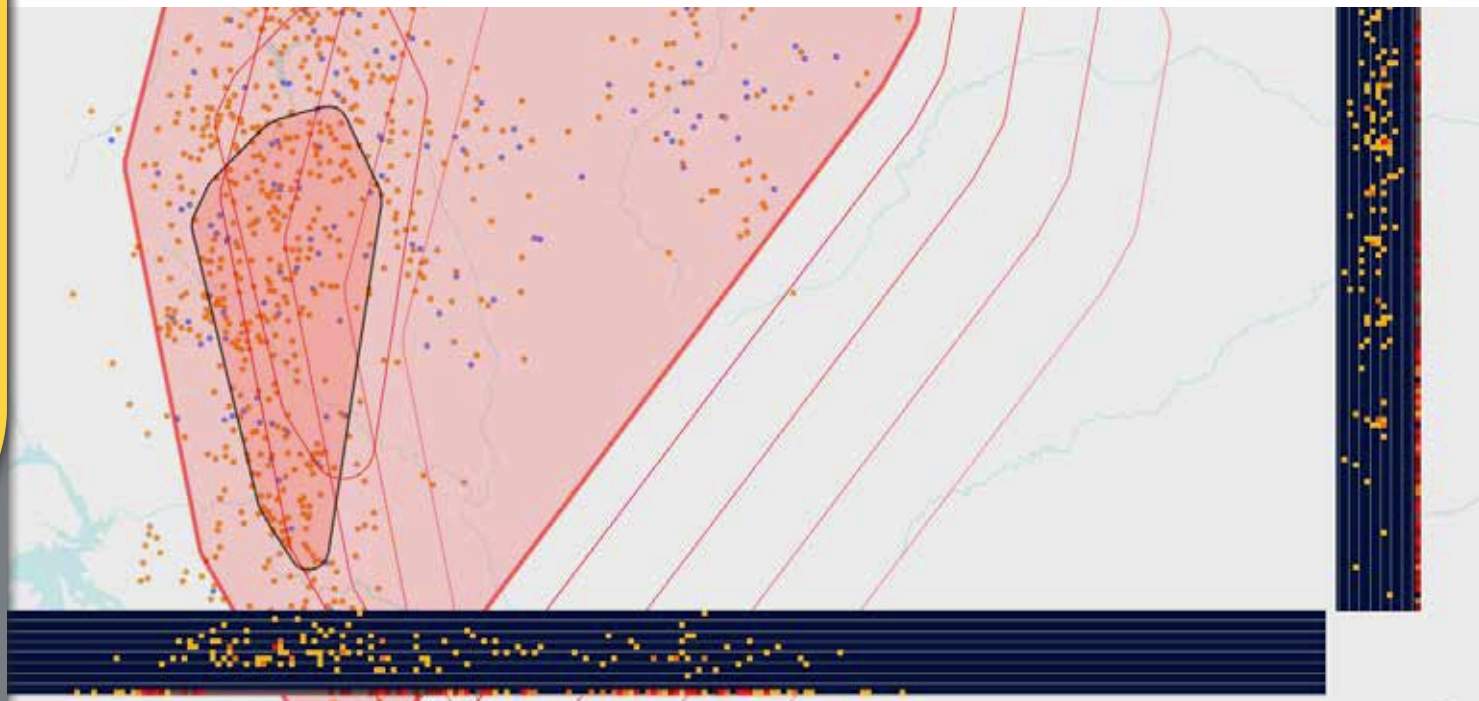
- Date & Time
- Geo-coordinates
- Lightning amperage
- Lightning type
- Emission height of IC strokes

LINET VIEW

LINET View visualizes and analyses the current or historical thunderstorm situation in your web-browser on any device. The application is easy to use and provides many tools for the management of thunderstorm related risks.

- Web application on any device
- Visualisation of interactive map
- Real-time & historical data
- Displays lightning strokes, emission height, density, thunder cells and nowcasting
- Statistics (flash distribution, amplitude distribution, height distribution)
- Alarm areas with warning function
- Displays any geographical structure

DESCRIPTION	PART NUMBER
LINET SYSTEMS	EN45-430



PROJECT SUCCESSES

AUTOMATIC WEATHER MONITORING SYSTEMS

CLIENT: Nigerian Meteorological Agency (NIMET)

LOCATION: Nigeria

- Supply of 50 automatic weather stations (AWS), software, telemetry and associated civil works.
- ICT for the entire system and connection to the central monitoring database.
- Potential for the project to be expanded to accomodate 150 additional AWS and 9 automatic weather observing systems (AWOS).

MULTI INSTRUMENT SEA/LAKE BUOYS

CLIENT: Department for Climate Change and Meteorological Services (DCCMS)

LOCATION: Malawi

- DCCMS procured 2 lake buoys from Wagtech Projects for the southern and central/northern parts of Lake Malawi in order to monitor the development of hazardous weather and collect general environmental data.
- Wagtech Projects supplied and provided the ICT for the customised, turn-key Metocean data collection lake buoys.
- The buoys allow measurement of physical parameters such as; directional waves, current profiles, turbidity, temperature, salinity and meteorological parameters. Other sensors can be integrated at the users request.
- Collected data is used for early warning purposes for lake users and to monitor the effects that changing water parameters has on fisheries and health.

AUTOMATIC HYDROMATIC STATIONS

CLIENT: West African Science Service Centre on Climate Change and Adapted Land use (WASCAL)

LOCATION: 10 West African countries
(Bénin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Mali, Niger, Nigeria, Sénegal and Togo)

- WASCAL and its partners are establishing a long-term regional hydro-climate observation network with dense and high quality hydrological and weather/climate information.
- Wagtech Projects supply and ICT of 10 water quality monitoring stations, 50 water level monitoring stations, associated telemetry and software will help strengthen this network.
- Parameters monitored will include water level, temperature, conductivity, pH, DO, turbidity and nitrate.

AUTOMATIC WEATHER MONITORING SYSTEM

CLIENT Southern African Development Community (SADC)

LOCATION 10 Southern African countries
(Botswana, Malawi, Mozambique, South Africa, Tanzania, Zimbabwe, Seychelles, Comoros, Madagascar and Mauritius)

- Supply, delivery and ICT of 40 AWS to SADC Member States.
- The purpose of the project is to increase the capability of SADC countries to respond to climate-induced disasters and to reduce loss of lives and damages of resources and properties.
- AWS's are located at 40 separate locations within the 10 SADC countries and each country has a localised data management server.
- Parameters include rainfall, solar radiation, barometric pressure, wind speed and direction, temperature and relative humidity. This information is visualised and interpreted using customised software.

LIGHTNING DETECTION SYSTEM

CLIENT: Department of Climate Change Meteo Services (UNDP)

LOCATION: Malawi

- Pre-installation survey of sites to determine optimal positioning of equipment.
- ICT of systems and telemetry at 8 separate sites within Malawi.
- Associated Civil works including anti-vandal protection.
- The above system can be remotely monitored from the central system based in Malawi or from the back up unit in Europe.

EQUIPMENT FOR THE SAP-IC PROJECT

CLIENT: Ministry of Water (UNDP)

LOCATION: Burkina Faso

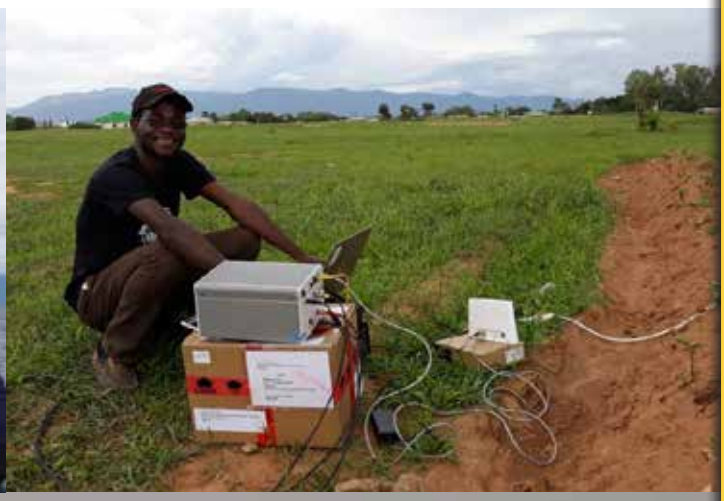
- Supply and ICT for 16 water level monitoring/ early warning flood systems, software, telemetry and associated civil works.
- The early warning system can be remotely monitored from the central system or from a smart phone.
- Supply of Wagtech Projects - Trace2o's water quality testing kits (Aquasafe® WSL50 Pro's).

INSTALLATION, COMMISSIONING AND TRAINING (ICT)

At Wagtech Projects - Trace2o, we place great importance on the technical advice and training support we provide to our prospective and existing customers. We also pride ourselves on our unrivalled installation and commissioning service we offer alongside our HydroMet systems.

We have a strong track record of delivering a quality service throughout the procurement process, which includes manufacturing, shipping, logistics, installation, integration and training of local personnel. We have experience delivering significant projects (both national and inter-governmental), from the installation of 40 automatic weather stations across 10 countries to floating 2 multi-purpose lake buoys. We're able to achieve this level of service due to our impressive global network of trained engineers, based in our regional local offices. Having a local presence also means we are readily available when you need us for after-sales support, which is available in the local language and currency.

Wagtech Projects - Trace2o is very flexible on the level and type of training required by the customer. For those on a tight budget we can provide virtual training, which is easily accessible and inexpensive, or for those who want highly detailed and thorough training we can organise this onsite over a longer period of time.



TERMS AND CONDITIONS

Terms and Conditions of Business Definition and construction "The Seller" shall mean Wagtech Projects Limited, any associated company or subsidiary thereof or any duly appointed agent. These conditions shall be deemed to be incorporated in any contract between the Purchaser and the Seller and shall be construed in accordance with the provisions of English Law prevailing at, on or after the day any order has been accepted by the Seller. Any disputes which may arise in relation to a contract shall be referred to a single arbitrator (who shall act as an expert and not as an arbitrator) in accordance with the Arbitration Act 1950 or any statutory modification on re-enactment thereof for the time being in force: the decisions of such arbitrator shall be final and binding upon the parties to the contract in dispute and his fees shall be borne by the party who appointed him. 1 Acceptance: All orders received shall be understood to be placed in accordance with these Terms and Conditions of Business. In accepting proprietary goods delivered by the Seller the Purchaser shall be deemed to accept the Manufacturers Terms and Conditions of Business as if the Purchaser had been dealing directly with the Manufacturer in addition to the conditions contained herein so far as applicable. Any other terms of business are excluded and no variation of these terms and conditions shall bind the seller unless made in writing and signed by a Director of the company with whom the order is placed. 2 Goods on Approval: Where the Seller has agreed with the Purchaser to supply goods to the Purchaser for the Purchaser's approval prior to acceptance then if the Purchaser decides he does not require the goods he must return them at his own expense to the Seller in good order and condition within 30 days of receipt failing which the Purchaser shall be deemed to have accepted the goods within the Terms and Conditions hereof and shall be bound to pay for the same accordingly. 3 Prices: All quoted prices are es-warehouse unless expressly specified to the contrary and are subject to alteration without notice. The Seller reserves the right to invoice goods at prices prevailing at the date of dispatch plus value added tax (if appropriate) at the appropriate rate. 4 Quotations: All quotations are subject to confirmation. The right is reserved to correct any errors or omission and to re-quote at prices prevailing at the date of dispatch in accordance with Section 3 hereof. A quotation expressed to be for a fixed price remains open for acceptance by the Purchaser within the period stated in the quotation or, if no period is stated, within 30 days of the date of the quotation irrespective of when the quotation is received by the Purchaser. 5 Delivery: Whilst every effort is made to adhere to delivery dates, no liability whatsoever can be accepted for lateness of non-delivery howsoever arising. Deliveries offered ex-stock are subject to goods being unsold at the date of receipt of the Purchasers order. The seller reserves the right to charge for delivery unless otherwise agreed and stated in writing in respect of individual transactions. Liability for any loss or damage in transit howsoever caused is not under any circumstances admitted to the Seller. 6 Delay: Whilst every effort will be made to adhere to delivery dates, delay or failure to maintain a delivery date shall not entitle the Purchaser to rescind or cancel any order or withhold any payment that may be due. 7 Minimum Order Value: The minimum order value for payment in advance or account is £250.00 and for payment by letter of credit £1000.00. 8 Cancellation: The Seller shall be under no obligation to accept amendment, cancellation or rescission of any order or any part thereof, but may nevertheless agree in writing to such amendment, cancellation or rescission upon whatever terms and conditions it chooses to impose. 9 Returned Goods: Items correctly supplied against an order but subsequently returned as no longer required or cancelled too late to halt delivery, at the discretion of the Seller may be returned, at the Purchasers expense, for credit providing the goods are in an unused condition and in the original packing. A restocking charge will be levied for this service. Before returning any goods to our warehouse, approval for such action must be first obtained from an identified member of our sales/customer service staff who will take down details in event of our agreeing to the return, you will then be given a unique goods return number. These goods return number must accompany any goods returned and be included in any paperwork sent to us. If you omit to include this number the returned goods will not be accepted by the seller and will be returned to you at your expense. All returned goods must include all accessories e.g. AC/DC adaptors. Once approval for the return has been given, the goods must be received by the seller within 3 weeks. 10 Warranty: Goods are only guaranteed to the extent of the guarantee (if any) given to the Seller by the actual manufacturers, all other conditions, statements and warranties, express or implied, statutory or otherwise on the part of the Seller are hereby excluded. 11 Title: (a) The title in goods sold to the Purchaser by the Seller shall not pass to the Purchaser until all sums due to the Seller from the Purchaser (whether in respect of those goods or otherwise) have been paid to the Seller. If the Purchaser defaults in paying any such sum the Seller shall be entitled to take such action against the Purchaser as it may be entitled in law or in equity without further reference to the Purchaser. (b) The Purchaser shall have the right before title In the goods has passed, to resell the goods or any part thereof but shall pay to the Seller the proceeds of sale or such part thereof as may be necessary to pay all sums due to the Seller from the Purchaser and until such payment shall hold the proceeds of sale on trust for the Seller. (c) Notwithstanding sub clause (a) of this clause, the goods shall be at the Purchaser's risk from the time they are delivered to the Purchaser.12 Dangerous chemicals and poisons: Chemicals should be handled and used only by trained personnel or under appropriate supervision. No responsibility or liability whatsoever is accepted for any loss arising out of the storage, use or handling of chemicals howsoever caused. The sale of poisons is regulated by the Pharmacy and Poisons Act 1 933, the Poisons List and the Poison Rules and amending legislation from time to time laid or made by any competent authority. 13 Orders: No order can be accepted unless all necessary arrangements have been made to the satisfaction of the Seller regarding import and export licenses and for the provision of payment. 14 Terms of payment: (a) Prices are strictly net and unless other terms have been arranged and agreed in writing by the Seller no deductions can be allowed. The right is reserved (i) to request a remittance with an order, (ii) where new accounts are involved, either to request two trade and Banker's references or to issue Pro-Forma invoices and (iii) to charge interest on any balance from time to time outstanding and due to the seller at 5% per annum over and above the Base Rate from time to time charged by Fortis Bank S.A. /NV. For purchasers enjoying a trading account with the Seller, payment must be received by the Seller within 30 days of the invoice date. If payment has not been received by this time the Seller reserves, in addition to the rights above, the right to suspend further supplies of goods until the overdue amount is cleared. (b) Orders from Purchasers outside the United Kingdom must be covered by an Irrevocable Letter of Credit to cover the purchase price, shipping and other additional costs or charges confirmed by a London Clearing Bank (or a London Merchant Bank subject to the prior written approval of such bank by the Seller) unless other arrangements have been made and agreed in writing. Letters of Credit should allow for part payments and shipments and in the case of orders including chemicals should permit deck or special stowage. 15 Delivery and delay: All orders for overseas shipment are accepted in accordance with the conditions herein before contained, it being understood and agreed that delivery time is the Seller's estimate of the time by which it can have the necessary goods packed and ready for dispatch. The Seller cannot accept any responsibility for delays in dispatch caused through non-availability of shipping space and/or other causes beyond its control. 16 Damage and/or Loss in transit and Insurance: (a) the Seller accepts no responsibility for goods Shipped uninsured and shall not be obliged to claim in respect of damage or loss where, at the Purchaser's request, Insurance arrangements have been made other than the Seller's own open cover with its insurers for the time being. (b) Unless the Seller is specifically instructed otherwise, goods will be insured only against loss or damage in transit for the C.I.F value plus 10%. (c) All claims under the Seller's insurance must be notified in writing to the Seller within 45 days from point of discharge. 17 Import Licenses: Where applicable, the Purchaser's order must specify the number, date of expiry and value of the Import License. It shall be the Purchaser's responsibility to obtain all necessary Import Licenses. 18 Bank Charges, Special Documentation, Fees and Duties: All consular and bank charges, import and customs duties and any taxes arising from or by virtue of the contract and its settlement are the liability of the Purchaser unless specifically agreed in writing by the Seller.

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