DELTA-T DEVICES

WEATHER STATIONS
PRODUCT INFORMATION

Delta-T Weather Stations are in use all over the world. Application areas include agriculture, hydrology, ecology and meteorology.

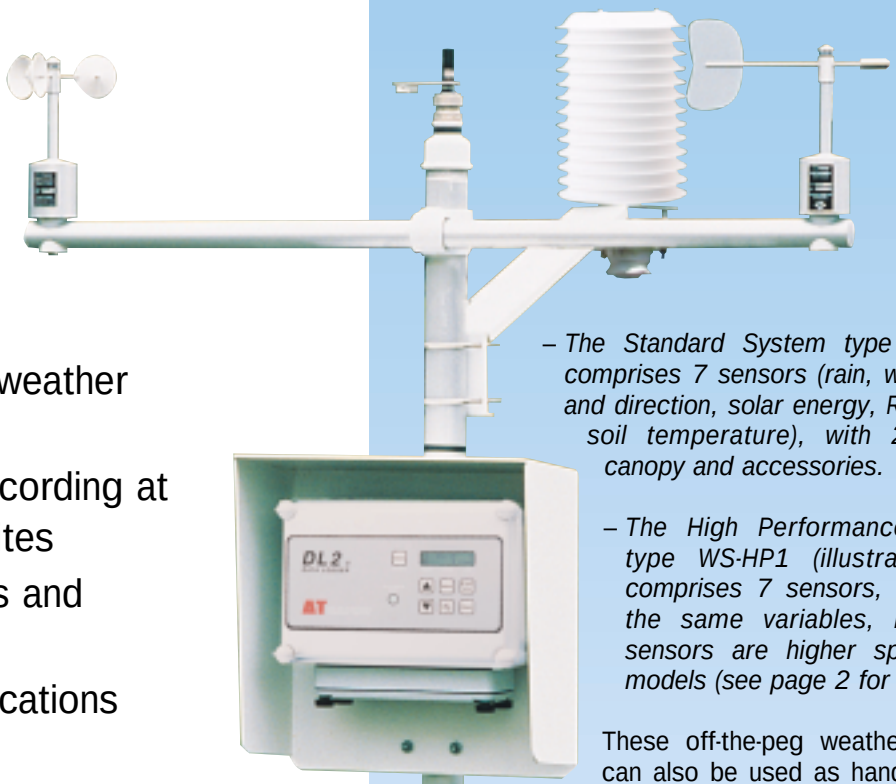
Whatever the application, Delta-T can help you select the best combination of sensors, data logger and accessories.

- Field proven in severe weather conditions worldwide
- Unattended weather recording at remote and exposed sites
- Wide choice of sensors and accessories
- GSM modem communications

Automatic weather stations from Delta-T can be as simple or as complex as your application requires. Even after installation, it's easy to expand or adapt the system; the additional hardware and software can be installed by the user, in the field.

All systems are based on the dependable DL2e Data Logger which has the power and flexibility to handle almost any environmental sensor.

Off-the-peg systems are available for the most popular sensor combinations:



– The Standard System type WS-STD1 comprises 7 sensors (rain, wind speed and direction, solar energy, RH, air and soil temperature), with 2m mast, canopy and accessories.

– The High Performance System type WS-HP1 (illustrated) also comprises 7 sensors, measuring the same variables, but some sensors are higher specification models (see page 2 for details).

These off-the-peg weather stations can also be used as handy building blocks when specifying simpler or more complex environmental monitoring systems.

Simple systems If your application requires just a few sensors, Delta-T can offer a suitable, minimised system with or without a mast. In our experience, many such systems are later expanded to include additional sensors, and this is easy to do with the DL2e Logger.

Complex systems Delta-T has extensive experience of supplying complex weather stations. These often involve a wide range of inputs, including soil moisture sensors and hydrological sensors. These Environmental Monitoring Systems can involve hundreds of sensors at multiple sites – please see pages 2 and 3 for details.

Wimbledon Centre Court

One of the most valuable "crops" in the world is the grass surface on which international sporting events take place. Whether the sport is soccer, rugby, golf or lawn tennis, the grass has to be in the best possible condition to withstand periods of intensive use. At Wimbledon, the Centre Court is rarely used outside the famous annual Tournament, but during these 2 or 3 weeks it really takes a pounding.

The experts responsible for these surfaces need to measure and react to the environmental variables that profoundly affect grass growth and health. At Wimbledon a Delta-T Weather Station and soil moisture sensors help to ensure that the grass is in optimal condition for the opening day.

Choosing the best system for your needs is easy – just select one of the options below:

Standard System type WS-STD1

The Standard System (shown on this page) is the lowest cost option. Nevertheless it is dependable, rugged and suitable for research applications in demanding environments. In fact the logger, mast and some of the sensors are the same as those found in the High Performance System.

The Standard System can be used as a starting point for other configurations – by varying the sensors types, the power supply, the data collection method, the mast height and many other accessory options.

The system includes the following: DL2e Logger (64k readings in memory), M2 Mast and assembly kit, AN4 Standard Anemometer, WD4 Standard Windvane, RG2 Compact Raingauge, RG-BP Baseplate for the RG2, ES2 Solar Energy Sensor, ST1 Soil Temperature Probe and the RHT2nl combined RH and Air Temperature Sensor. For sensor performance details, please see specifications pages.

High Performance System type WS-HP1

The High Performance System (shown on front page) is for applications where the greatest accuracy and durability is required. It differs from the Standard System by having superior sensors for rainfall, soil temperature and wind speed and direction, and an enlarged memory in the DL2e Logger.

As with all Delta-T Weather Stations, the High Performance System can be used as the starting point for creating other configurations – whether simpler or more complex.

The system includes the following: DL2e Logger (128k readings in memory), M2 Mast and assembly kit, AN1 durable Anemometer, WD1 durable Windvane, RG1 aerodynamic pattern Raingauge, RGB1 Levelling Baseplate for RG1, ES2 Solar Energy Sensor, ST2 Precision Soil Temperature Probe and the RHT2nl combined RH and Air Temperature Sensor. For sensor performance details, please see specifications pages.

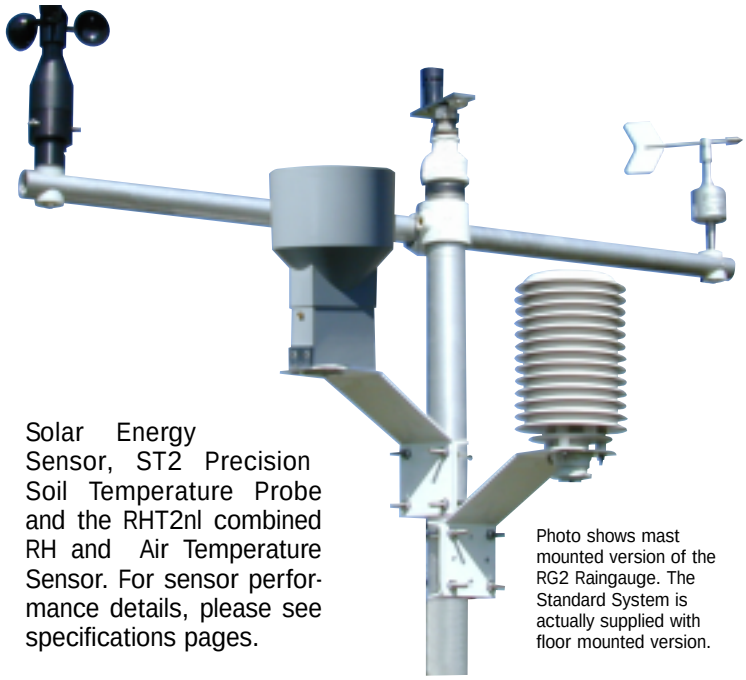


Photo shows mast mounted version of the RG2 Raingauge. The Standard System is actually supplied with floor mounted version.

Custom Systems

Many applications require a weather station or environmental monitoring system that is put together as a special package. Delta-T has vast experience in this area and can advise on all aspects of system specification.

The following pages describe the sensors we offer and a range of power supply, data logging and communication options. However, this is not a complete list, and we welcome enquiries for other sensors and accessories. In particular, Delta-T specialises in **soil moisture measurement** and can supply sensors such as the ThetaProbe; the soil moisture range is fully described in our catalogue ***Soil and Plant Water Measurement***, which also includes **sap flow sensors**. Delta-T soil moisture and sap flow sensors are fully compatible with the DL2e Data Logger and are often included in environmental monitoring systems.

For every application, the following factors have to be assessed and then optimised, to produce the best solution, bearing in mind the budget available.

CUSTOM SYSTEMS CHECKLIST		
Sensors and mountings		
• Sensor type	• Number of each sensor	• Mast height and positioning
• Sensor mountings	• Cable lengths and routing	• Environmental conditions
Loggers and enclosures		
• Number of logger inputs	• Logger input types	• Logger memory requirement
• Weatherproof enclosures	• Physical security	• Input protection
Communications and data retrieval		
• Notebook computers	• Psion hand-held computer	• RS232 cable extensions
• GSM Modem	• Land-line (PSTN) modem	• Line drivers (RS422)
Power		
• Total power requirements	• Battery or mains supply	• Recharging systems (including solar)

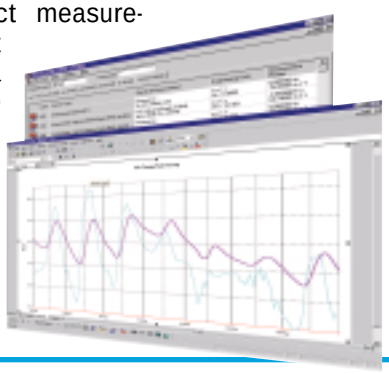
The DL2e Data Logger

At the heart of any Delta-T Weather Station or Environmental Monitoring System is the DL2e field data logger. The DL2e is easy to use, dependable and ideally suited to remote site applications. The basic DL2e comes with 15 differential analogue channels, 2 digital inputs and 2 relay outputs. The standard memory holds 64k readings, upgradeable to 128k. The DL2e can power and log a wide range of sensor types, and can be expanded to accept up to 60 differential analogue or counter channels.

A separate 4 page leaflet on the DL2e is available on request, or from our website.

Powerful Windows software

The DL2e is supplied with Ls2Win Software as standard. This 32-bit Windows software makes it easy to set up recording intervals, select measurement units and carry out data collection. For data analysis, Ls2Win uses the power of Excel to import, display and graph logger datasets.



Communications and data retrieval Delta-T offers a range of communication solutions. The simplest approach is to collect data on-site with a notebook computer, but in many cases a cable or modem link will be required. Delta-T can supply the following options.

- *RS232* A weatherproof RS232 cable can be used to connect the logger to a PC. Maximum length is 50m.
- *RS422* Low power line-drivers are installed at each end of the RS422 cable to permit logger to PC communications at up to 2 km.
- *Modems* Ls2Win Software supports GSM modem and land-line communications, enabling automatic data collection from remote sites. Ls2Win provides easy, pre-configured, desk-top connections using any installed modem. Data can be collected on demand or, alternatively, using Windows Scheduler and a GSM phone or land line (PSTN) connection, data can be automatically collected from one or more loggers at regular intervals (known as "polling"). A leaflet on modem selection is available on request or from our website.
- *Hand-held computer* Optional "Attach" software allows a Psion Workabout hand-held computer to collect data and load configurations into the DL2e (Attach is available free of charge from our website).

Evapotranspiration Software type ET2 is available to calculate crop water requirements and potential ET from meteorological data. FAO Penman-Monteith and other Penman methods are supported. Further information is available on request or at our website.

Power supplies

For many applications the DL2e Logger's internal batteries (6 x AA cells) are sufficient to power the entire system for several months, but when more power is required these alternatives are available:

Mains power

The DL2e Logger has a weatherproof LEMO socket that can accept 7 – 15V DC from a mains power adaptor. This is a convenient and secure method of operation. In the event of a power failure, the logger defaults to its internal batteries.

Rechargeable 12V batteries

Battery type	Capacity	Mountings / housings	Mains charger type*
LBK1	1.8 Ah	mounts on side of DL2e Logger	LBC1
LBAT1	7.0 Ah	can fit inside M2-Enclosure	LBATC1
LBAT2	38 Ah	requires protective box eg BTBOX2	LBC2
LBAT3	115 Ah	requires protective box eg BTBOX2	LBC2

*Specify mains voltage required

Solar Recharging systems

Panel type	Power rating	Matched bracket for mast mounting
SOL1	5W	SOL1B
SOL2	10W	SOL2B
SOL3	35W	SOL3B *

*NB bottom edge of this panel must rest on ground

Solar charging systems are supplied complete with a voltage regulator, casing, cabling and waterproof connectors. Mounting brackets, rechargeable batteries and battery boxes are ordered separately.

Delta-T can assist with calculating the power requirements of any combination of sensors and loggers, including the correct sizing of solar panels for specific geographical locations. If the power needs are substantial, we can also advise on cabling, connections and power handling (see following).

Enclosures, cable routing and power handling

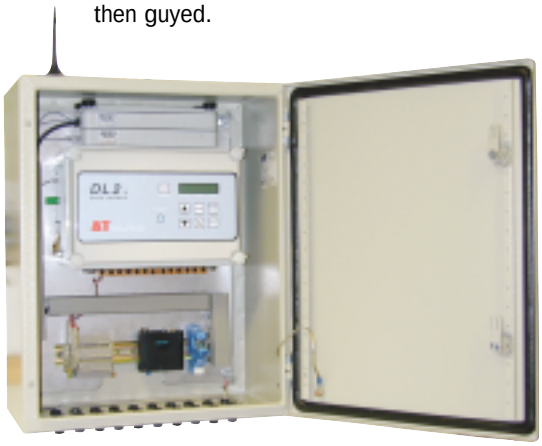
Complex systems can involve large numbers of cables and even larger numbers of terminal connections. There may also be modems, solar panels, external batteries and relays to wire-in. To assist customers we can supply Weatherproof Enclosures, type M2-ENCL, with optional wiring kits.

The M2-ENCL-K1 is a 12V kit for the M2-Enclosure; it includes a fully assembled back-plate mounted wiring system, with DIN-rail, trunking, sensor power distribution and fused input power terminals. The M2-ENCL-K2 is similar, but includes a mains distribution panel, for mains powered systems.

Masts

Delta-T masts come complete with everything needed to assemble and install them on-site. The standard model (the M2) is 2m high, but 3m, 4m, 6m and 10m can also be supplied. We can quote for customised masts with, for example, additional cross arms or non-standard fixings.

The 10m mast is a pump-up model, for convenient installation. The sections are simply pumped up, locked and then guyed.



DL2e Logger, GSM modem and antenna, 12V wiring kit and relay, solar power regulator and LBK1 rechargeable battery pack, installed in Weatherproof Enclosure type M2-ENCL.

Sensors

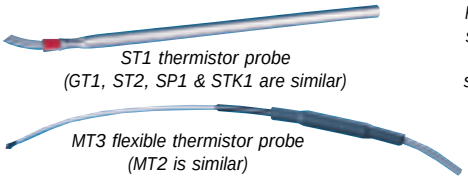
- A wide range of sensors for meteorological, environmental and industrial measurements
- Complete sensor packages for special applications on request

Temperature

Type	Description		Measuring range (°C) *[a]*	Probe error	Over	Logger input type	Logger error *[b]*	Probe length/dia. (mm)	Cable details §
ST1 GT1	General purpose thermistor probe, stainless steel sheath, 6s response (GT1 has same spec.)	Water resistant sheath, suitable for burial, e.g. in measuring soil temperature	-50 to 150	±0.2°C	0-70°C	3WR	±0.14°C	125/4.8	5m/2w
ST2	Precision thermistor probe, stainless steel sheath, 6s response		-50 to 150	±0.1°C	0-70°C	3WR		125/4.8	5m/2w
SP1	General purpose Pt100 probe, stainless steel sheath, for temperatures up to 300°C		-50 to 300	±0.6°C	0-70°C	4WR	±0.43°C	125/4.8	5m/4w
STK1	General purpose K type thermocouple probe, stainless steel sheath, for temperatures up to 250°C		-50 to 250	±1.5°C	0-70°C	DIF	±1.0°C	125/4.8	5m/2w
ST3	Thermistor probe with sealed sheath and leads suitable for continuous freshwater immersion		-20 to 80	±0.1°C	0-70°C	3WR	±0.14°C	125/4.8	5m/2w
BT1	Thermistor probe with sealed sheath and leads suitable for continuous sea water immersion		-20 to 80	±0.1°C	0-70°C	3WR		150/5.0	5m/2w
MT2	Vinyl-dipped thermistor probe, fast response, suitable for leaf temperature		-50 to 150	±0.1°C	0-70°C	3WR		2.5 dia	5m/4w
MT3	Flexible miniature thermistor probe, catheter style with fast response		0 to 120	±0.1°C	0-70°C	3WR		100/2.0	5m/2w
AT2	Precision thermistor air temperature sensor. Louvred solar radiation shield optional *[c]*		-30 to 70	±0.1°C	0-70°C	3WR		not applic.	3m/2w

[a] The standard range of all cables is -30 to +80°C. Higher temperature cabling can be supplied on request. *[b]* Additional error @ 15-25°C due to Logger.

[c] Radiation temperature error at 1kWm^{-2} irradiance level: 0.4°C at 3m.s1^{-1}, 0.65°C at 2m.s^{-1}, 1.4°C at 1m.s^{-1} or slower (windspeeds).



ST1 thermistor probe (GT1, ST2, SP1 & STK1 are similar)

MT3 flexible thermistor probe (MT2 is similar)

RHT2nl sensor, showing plug-in replacement sensor module. Data sheet available.

All Sensor Tables: key to Logger Input Type

SE Single-ended voltage
DIF Differential voltage
3WR "3-wire" resistance for DL2e
4WR 4-wire resistance with LFW1 card
POT Potentiometer (requires LFW1)
ACR AC resistance (ACD1 + ACS1)
COUNT Digital counter input
DIG Digital status input: Ch61, 62 or DLC1 card.

§ **Cable details:** Cable length/Number of wires. Other cable lengths may be available to order.

Relative humidity

Type	Description	Measuring range	Error	Over	Operating temp. range	Power requirement	Logger input type	Cable details §
RHT2nl *[e]*	Combined Relative humidity with replaceable sensing element (chip) module and Air Temperature sensor in an optional cylindrical louvred solar radiation shielded housing. See AT2 above for temperature spec.	0-100% RH	±2% RH *[d]*	-30 to +70°C	-30 to +70°C	5-32V DC 2mA	DIF	2m/6w
VP1/TM1	Psychrometer. Fan-aspirated temperature sensor with 2 thermistor sensors.	Specifications available on request						

[d] ±2% RH at 23°C (5 to 95% RH), ±2.5% (RH <5% and >95%). Includes hysteresis and non-linearity.

[e] A lower cost RHT2v version is available with a linear 0-1V output. Air temperature error ±0.5°C, based on a PRT temperature element.

Atmospheric pressure

Type	Description *[f]*	Measuring range	Error @ 20°C	Total error including logger @ 20°C	Output range	Sensitivity	Power requirement	Logger input type	Cable details §
BS4 BS4/N	Barometric pressure sensor. For use at low altitude (0-1500m), in weatherproof housing (IP65) As above, for indoor use, non-condensing conditions	600 - 1060 hPa (mbar)	±0.5hPa (resolution 0.1hPa)	±0.6hPa	0 - 2.5V DC (600-1060 hPa) *[g]*	5.435mV per hPa (offset) *[g]*	10-30V DC 4mA max. *[h]*	DIF	3m/4w

[f] BS4 sensors employ a capacitive diaphragm transducer, and operate over -40 to +60°C

[g] DL2e requires precision attenuator/divider to reduce output to 2.0V DC Sensitivity then becomes 4.35mV per hPa (0V output = 600hPa)

[h] Suitable battery pack and solar power supplies are available - please consult Delta-T

Wind speed and direction

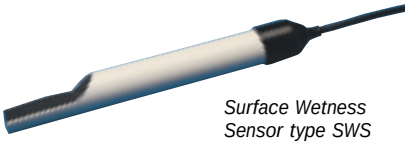
Type	Description	Measuring range	Resolution and error	Output range	Sensitivity	Operating temp. range	Power requirement	Logger input type	Cable details §
AN1	Anemometer, mercury-wetted reed switch type. 3-cup rotor	0.2 - 75m.s^{-1} (170 mph)	1% ±0.1m.s^{-1}	0.2 to 60Hz	0.8Hz per m.s^{-1}	-30 to +55°C	none	COUNT	3m/2w
AN3	Anemometer - high resolution, 3-cup rotor Digital photodiode pulse and Analogue outputs	0.15 - 75m.s^{-1}	1% ±0.01m.s^{-1} 1%	3 to 1500Hz 0 - 2.5V DC	20Hz per m.s^{-1} 33mV per m.s^{-1}	-30 to +70°C	7-28V DC 2.0 mA max	COUNT DIF	3m/6w
AN4	Anemometer, reedswitch activated by non-contact magnet. 3 cup rotor	0.5 - 40m.s^{-1} max 60m.s^{-1}	5%	0.5 to 50Hz	1.25Hz per m.s^{-1}	-25° to +60°C (free of ice)	none	COUNT	5m/2m
WD1	Wind vane. Sturdy and highly responsive, based on 358° micro-torque potentiometer. Wind speed threshold 0.6m/s, 45° to flow	0 to 358 degrees	0.3 degrees ±2° in winds >5m.s^{-1}	0 to 1000Ω nominal	2.8Ω per degree	-50 to +70°C	none	3WR POT	3m/6w
WD4	Wind vane. Non-contact GMR (giant magneto resistive) transducer	0 to 359 degrees *[i]*	<±2°	0 to 1800 mV	5mV per degree	-20 to +70° C	6 to 28V DC 3 mA max	DIF	4m/4w

[i] No dead band at North

Sensors

Precipitation

Type	Description	Max. rate of rainfall	Operating temp. range	Sensitivity	Funnel dia.	Logger input type	Cable details §
RG1	Tipping bucket raingauge. Usually used with Levelling Baseplate type RGB1. (Heated version of RG1 available for use in snow - please ask Delta-T)	500mm in 1 hour	0 to +60°C	0.2mm per tip	254mm	COUNT	6m/2w
RG2	Tipping bucket raingauge with optional accessories for ground or mast fixing. Compact design.	360mm in 1 hour	0 to 50°C	0.2mm per tip	160mm	COUNT	6m/2w



Surface Wetness Sensor type SWS

Stainless Steel Evaporation Pan type EV2/P.

Water depth

Type	Applications	Sensor type	Measuring range *[j]*	Error at 20°C	Operating temp. range	Output voltage	Power requirement	Probe length/dia (mm)	Logger input type	Cable details §
WL1	Pressure transducer water depth probe for depth measurements in sea, lakes, wells, tanks, bore-holes, etc.	Silicon diaphragm transducer	0-350hPa (mbar) or 0-3.57m H_2O	±6mm H_2O *[k]*	-20 to +60°C	100mV at 10V excitation	10V DC regulated, 5mA nominal	96/17.5	DIF (contact Delta-T)	5m/6w vented

[j] For other depths, please enquire

[k] Assuming zero and span offsets are nulled

Surface wetness

Type	Description	Output	Operating temp. range	Sensitivity (distilled water)	Active area (mm)	Probe length/dia (mm)	Power requirement	Logger input type	Cable details §
SWS	Surface wetness sensor for detecting dew or rain. Supplied with 300mm galvanised steel pin for ground fixing	0V dry >1.0V wet	-25 to +55°C	1mm dia. droplet	30 x 15	150/20	8-18V DC 5mA	DIF	2m/4w

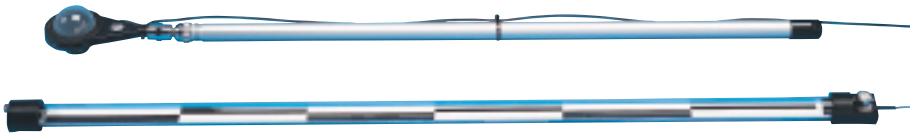
Evaporation

Type	Description	Measuring range	Error & Resolution	Output range	Sensitivity	Power Requirement	Operating temp. range	Logger input type	Cable details §
EV2/G	High precision pressure transducer design with no moving parts. No stilling well requirement	0-250mm water depth	±1mm (typ ±0.5) res. 0.2mm	40 - 200mV	0.64mV per mm	7.5 to 28V dc up to 22 mA	0 to 50°C	DIF	5m/4w vented
EV2/P	Evaporation pan. Class A welded stainless steel with drain plug. 1206mm diameter, 245mm deep.								

Solar radiation

A comprehensive range of sensors for Solar and UV radiation measurement, suitable for energy studies and most meteorological, environmental and agronomic applications.

Sensor types ES2, QS2, GS1, GS2 and all UV sensors are cosine corrected.



Solar radiation sensors (from top) Dome Net Radiometer NR2 and Tube Solarimeter TSL

Type	Description	Measuring range	Error	Spectral response	Operating temp. range	Sensitivity	Logger input type	Cable details §
ES2	High quality Si photodiode for solar energy measurements in natural, unobstructed daylight. 30mm dia x 48mm.	0 to 2kW m^{-2}	±3% under standard lamp	400-1050nm	-10 to +60°C	10mV per (kW m^{-2})	SE	5m/2w
QS2	High stability Si photodiode for solar radiation measurements for crop and plant growth. Gives PAR output. Size as ES2	0 to 3 mmol m^{-2} s^{-1}	±5%	400-700nm	-10 to +60°C	10mV/per mmol m^{-2} s^{-1}	SE	5m/2w
TSL	Tube solarimeter based on Monteith pattern thermopile, for measuring solar energy interception, e.g. in crops. Length 970mm	0-1.33 kW m^{-2}	±10% *[l]*	400-2200nm	-30 to +60°C	15mV per (kW m^{-2})	SE	5m/2w
GS1	Dome solarimeter (pyranometer), based on thermopile, for WMO class 2 solar energy reference measurements. Dome 36mm dia	0-2kW m^{-2}	*[m]*	305-2800nm	-40 to +80°C	10-35mV per (kW m^{-2})	SE	5m/2w
GS2	Albedometer using 2 GS1s mounted back-to-back. For measuring both incident and reflected radiation	0-2(kW m^{-2})	*[m]*	305-2800nm	-40 to +80°C	10-35mV per (kW m^{-2})	2 x SE	5m/2w 2 cables
NR2	Dome net radiometer based on thermopile, for reference measurements of net radiation	-0.5 to +1kW m^{-2}	5% at 20°C *[n]*	0.25-60µm	-40 to +60°C	100mV per (kW m^{-2})	SE	7m/2w

[l] over solar spectrum, for sun angle >30°

[m] non-linearity ±2.5% (<1kW m^{-2}). Temperature dependence of sensitivity 6% deviation of output relative to that at 20°C (over -10 to +40°C operating range)

[n] There is no agreed world standard for the calibration of net radiation

Not all sensor types and options can be listed in the space available. For example, some sensors have optional heaters. If you can't see the item you require, please contact us.

Sensors

UV radiation

Type	Description	Measuring range	Peak wavelength	Band-width	Sensitivity (per W m-2)	Power requirement	Size (mm)	Logger input type	Cable details §
UV3pA	A range of 3 UV sensors fitted with a photodiode detector and transimpedence amplifier. Accuracy for all models is ±7.5% at 20°C.	0-150W m^{-2}	373 ± 2nm	31 ± 2nm	1mV	7-15V DC	50mm	DIF	3m/4w
UV3pB		0-150W m^{-2}	313 ± 2nm	26 ± 2nm		2mA	dia x		
UV3pAB		0-200W m^{-2}	360 ± 5nm	72 ± 5nm			48mm		

Sunshine duration and solar irradiance

Type	Description	Output types, measuring range and sensitivity and accuracy *[o]*			Output Range *[p]*	Temp	Power Range	Logger require-ment	Cable input type
BF3	Sunshine Sensor for simultaneous outputs of Total and Diffuse radiation and Sunshine Status. Output units can be preset to PAR, Energy or Illuminance units, by the user.	PAR	0-2500 mmol.m^{-2}.s^{-1}	1mV = 1 µmol.m^{-2}.s^{-1}	0-2500mV	-20 to + 50°C with Alkaline cells or -20 to + 70°C Lithium cells	5 to 15V DC 6.5mA, (or 4 x 1.5V AA internal alkaline batteries)	2 x DIF *[q]*	Logger cable for 3 outputs BFDL-05, BFDL-10, BFDL-25, BFDL-50 5m, 10m, 25m, 50m
		Energy	0-1250 W.m^{-2}	1mV = 0.5 W.m^{-2}	0-2500mV				
		Illuminance	0-200 klux	1mV = 0.100 klux	0-2000 mV				
		Sunshine Status *[r]* - analogue	No sun = open circuit, or = 0V Sun = short circuit, or = 3.3V		n/a	n/a		1 x DIG	
		Sunshine Status *[r]*	0-1 Sun Hrs/hr 0-24 Sun Hrs/day		n/a	n/a		1 x DIF	
BF3H	Thermostatically controlled heater option for BF3. Cannot be retro-fitted.	Heater option - requires power	7 to 15V DC 1.5A at 12 V	n/a	n/a	-20°C at 0 m/s wind speed -10°C at 2 m/s wind speed *[s]*	18W at 12V DC 1.5A at 12V	n/a	Heater cable BF3H-C 5m

[o] Accuracy: Total: ±12% Diffuse: ±15% Sun hours: ±10% wrt WMO definition

[p] Use 0.8 attenuator with logger cable to limit input range for DL2e to 0-2000mV max.

[q] 1 channel Total radiation and 1 channel for Diffuse radiation

[r] Available as analogue or digital output.

[s] Lowest snow and ice-free temperatures.

Weather Station masts, enclosures and accessories

M2	Weather Station Mast 2m - Comprises 2m Mast, cross arm, levelling unit, baseplate assembly, DL2e Logger canopy, guy ropes, stakes, assembly kit and user manual.
M2-MIN	M2 Mast excl Logger canopy - Comprises 2m Mast, cross arm, levelling unit, baseplate assembly, guy ropes, stakes, assembly kit and user manual. Excludes DL2e Logger canopy.
S/POLE	2m anodised aluminium pole - Aluminium mast suitable for mounting enclosure. Requires fixing in concrete base.
M2-CA	Cross arm for WS masts. With mounting bracket for Weather Station Masts. Suitable for mounting Wind Speed and Wind Direction Sensors.
WS-CAN	DL2e Logger Canopy - includes 2 x U Bolts and DL2e mounting kit. Supplied as standard with M2 Mast.
ES-MOUNT	Levelling unit for ES2, QS2 and UV3 sensors - Mounting assembly for solar radiation sensors. For use with M2 and M2-MIN masts. Includes bubble level. Supplied as standard with the M2 mast
WS-GRK	Grounding and Rod Strap. Suitable for Delta-T masts.
M2-ENCL-K1	M2 Enclosure Kit (12V system) - Fully assembled back plate mounted wiring system. Fits into M2-ENCL enclosure. Comprises DIN rail, trunking, sensor power distribution and protected input power terminals. Suitable for DL2e Logger.
M2-ENCL-K2	M2 Enclosure Kit (Mains power system) - Fully assembled back-plate mounted wiring system. Fits into M2-ENCL enclosure. Comprises DIN-rail, trunking, sensor power distribution, protected input power terminals and mains distribution panel. Suitable for DL2e Logger.
3m, 4m, 6m and 10 masts are also available - please enquire for further details	

Climate change research - Morecambe Bay

To gain a better understanding of climate change, researchers at the UK Institute of Terrestrial Ecology used a mobile laboratory to analyse emissions of carbon dioxide, methane and nitrous oxide collected at a number of locations on the mudflats. A Delta-T Weather Station provided essential meteorological data that revealed, for example, that rainfall quickly altered the composition of gas emissions, whereas wind speed and direction dictated the build up of trace gases above the mudflats.

As often happens, the Delta-T Logger served more than one purpose: it also recorded soil water content with a ThetaProbe, water table fluctuation via bore-hole pressure transducers and temperature profiles in the soil and estuary sediments with thermistor probes.

The BF3 can measure the Total and Diffuse components of solar radiation, and calculates sunshine status according to the WMO threshold (of 120 Wm^{-2}) in the direct beam. The BF3 does not need to be adjusted or repositioned to track the sun.

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DOC REF: W/STN 06-2002