CASELLA
CEL

PROFESSIONAL METEOROLOGICAL INSTRUMENTS

NOTES

CONTENTS

01 BACKGROUND & HISTORY

Regent House Circa 1920's

Finishing Shop

200 YEARS OF CASELLA HISTORY

Cesare Tagilabue established the company in Holborn, London in 1799 during the reign of George III. Within just a few years Louis Pascal Casella joined Cesare in a partnership and the new Casella name was born.

In the early years the product ranges being exported around the world included exploration, navigation, photographic, meteorological and medical research instruments. Our early customers included Charles Darwin and Dr. Livingstone.

During the 19th century, the product range continued to grow and Casella exhibited instruments including theodolites and surveying equipment at the first 'Great Exhibition' held in the Crystal Palace, Hyde Park London in 1851.

As the two World Wars of the last century raged, our expertise in optics, compasses and photogrammetry equipment was put to good use by the military. By the 1950's Casella had designed and built a significant amount of dust monitoring equipment for the deep mining industry, including a number of industry standard products.

Show Room

CEL HISTORY

CEL Instruments have been manufacturing high quality instrumentation for the measurement of noise and vibration since the early 1970's. Originally formed from the company Computer Engineering Limited, a British company specialising in the design and manufacture of computer related equipment, CEL rapidly became well known for designing state of the art noise products in the UK.

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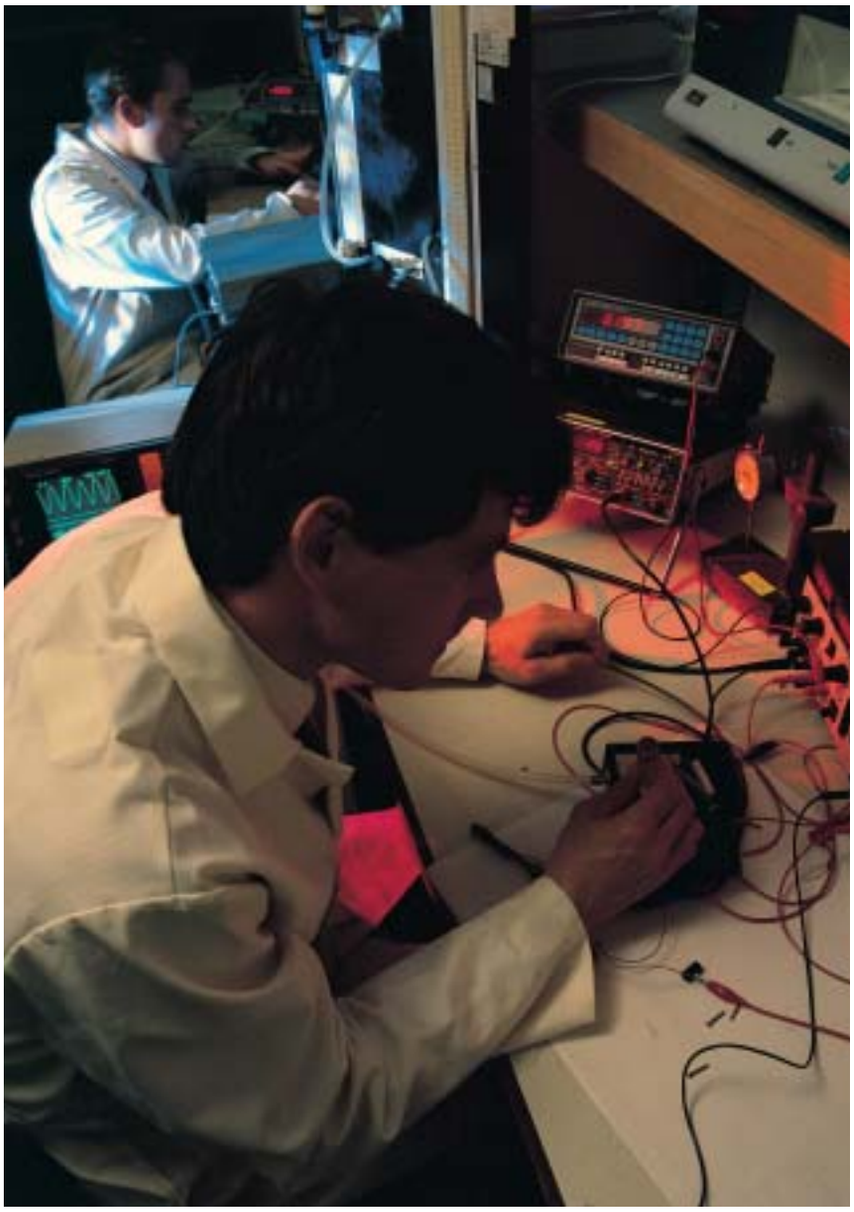
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490



In 1998, Casella acquired CEL Instruments, manufacturers of innovative noise monitoring equipment. The natural synergy formed from this integration allows Casella CEL to offer a broader and more comprehensive product range to both the occupational and environmental market sectors.

To keep one step ahead of an ever-changing market, Casella CEL is committed to an extensive programme of ongoing research and product development. The development programme involves considerable integration with Industry and Research bodies, to ensure the utilisation of the latest techniques and technologies available. It is this commitment that has enabled us to build an impressive product portfolio, allowing us to focus on the following areas:

Air Quality

Indoor Air Quality

Professional Meteorology

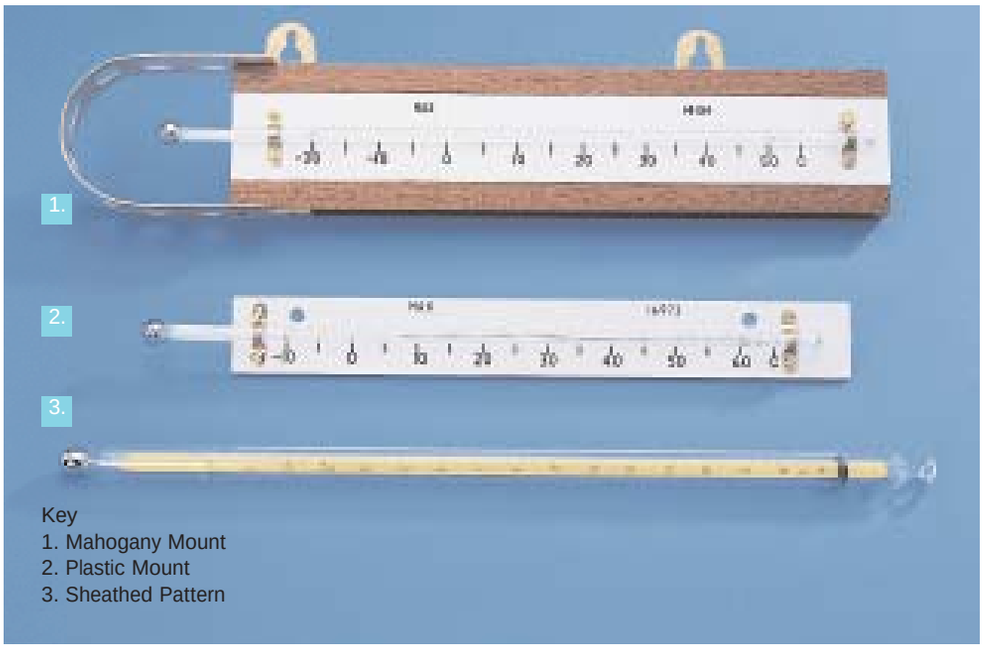
Recreational Meteorology

Noise

From our modern facilities in the UK we work continuously to improve and expand our business. Our products are now exported world-wide through an extensive network of distributors and agents. With measurement division offices in both America and Spain, and with further expansion planned, this confirms Casella CEL as a truly International organisation.

Casella CEL is part of Casella Measurement - A division of the Casella Group.

'We have a commitment to you the customer to provide a 'total' service, which exceeds your expectations'



Key
1. Mahogany Mount
2. Plastic Mount
3. Sheathed Pattern

AIR THERMOMETERS

There are three types of ambient air thermometer, Maximum, Minimum and Ordinary.

Maximum

A Maximum thermometer indicates the highest temperature reached since the last time the instrument was reset.

Minimum

A Minimum thermometer indicates the lowest temperature reached since the last time the instrument was reset.

The Maximum and Minimum thermometers are available in three different types:

- Sheathed Pattern
  Made to BS 692 : 1990, each thermometer stem is marked with divisions and figures. It is then fused to an outer glass sheath, which seals it to prevent condensation occurring.
- Mahogany Mount
  This stem divided thermometer is backed by a laminated plastic scale marked with indelible figures. The thermometer and scale are mounted on a polished mahogany frame with brass bulb guard and hanging plates.
- Plastic Mount
  Made from a stem-divided thermometer mounted on a weather resistant plastic scale with indelible figures and two fixing holes.

Ordinary

An Ordinary thermometer indicates current ambient air temperature and is available in two types:

- Sheathed Pattern
  Made to BS 692 : 1990, each thermometer stem is marked with divisions and figures. It is then fused to an outer glass sheath, which seals it to prevent condensation occurring.
- Solid Stem Pattern
  This is made from a stem-divided thermometer mounted on a weather resistant plastic scale with indelible figures and two fixing holes.

Applicable Standards

BS 692 Meteorological thermometers

Specification	MAXIMUM THERMOMETERS		
	Mahogany Mount	Plastic Mount	Sheathed Pattern
Expected accuracy (-40 to <0°C)	-0.3°C	-0.3°C	-0.3, +0.2°C
Expected accuracy (0 to +65°C)	-0.2°C	-0.2°C	-0.2°C
Scale length (nominal)	200mm	190mm	195mm
Divisions	0.5°C	0.5°C	0.5°C
Scale range	See Ordering Information		
Dimensions (nominal)	340 x 90 x 25mm	285 x 35 x 16mm	340 x 13mm (dia)
Weight	340g	113g	70g

Ordering Information	MAXIMUM THERMOMETERS		
Range -10 to +65°C	C7209/18	B7592/7	M106202
Range -20 to +50°C	C7209/19	B7592/8	M106203
Range -10 to +65°C with calibration certificate	M105312	M105314	M105310
Range -20 to +55°C with calibration certificate	M105313	M105315	M105311

Specification	MINIMUM THERMOMETERS		
		Mahogany Mount	Plastic Mount
Sheathed Pattern			
Expected accuracy (-40 to <0°C)	±0.25°C	±0.25°C	±0.25°C
Expected accuracy (0 to +55°C)	±0.25°C	±0.25°C	±0.25°C
Scale length (nominal)	200mm	190mm	195mm
Divisions	0.5°C	0.5°C	0.5°C
Scale range	See Ordering Information		
Dimensions (nominal)	340 x 90 x 25mm	285 x 35 x 16mm	340 x 13 xmm (dia)
Weight	340g	113g	70g

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Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

Ordering Information	MINIMUM THERMOMETERS		
Range -25 to +50°C	C7711/15	B7602/12	M106204
Range -35 to +40°C	C7711/16	B7602/13	M106205
Range -25 to +50°C with calibration certificate	M105306	M105308	M105304
Range -35 to +40°C with calibration certificate	M105307	M105309	M105305

Specification	ORDINARY THERMOMETERS	
	Sheathed Pattern	Solid Stem
Pattern		
Expected accuracy (-40 to <0°C)	-0.3, +0.2°C	-0.3°C
Expected accuracy (0 to +55°C	-0.2°C	-0.2°C
Scale length (nominal)	195mm	190mm
Scale divisions	0.5°C	0.5°C
Scale range	See Ordering Information	
Dimensions (nominal)	330 x 13mm	285 x 35 x 16mm
Weight	70g	113g

Ordering Information	ORDINARY THERMOMETERS
Sheathed Pattern, range -20 to +55°C	M106001
Sheathed Pattern, range -30 to +45°C	M106002
Sheathed Pattern, range -20 to +55°C with calibration certificate	M105301
Sheathed Pattern, range -30 to +45°C with calibration certificate	M105303
Solid Stem Pattern, range -20 to +55°C	B6886/11
Solid Stem Pattern, range -30 to +45°C	B6886/12
Solid Stem Pattern, range -20 to +55°C with calibration certificate	M105302
Solid Stem Pattern, range -30 to +45°C with calibration certificate	M105300

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

EARTH THERMOMETERS

There are three types of earth thermometers, Sheathed Pattern, Insulated Pattern and Angle Pattern. All three types have depth ranges suitable for taking temperature measurements both on and below the surface of the earth.

SHEATHED PATTERN

This is used for depths up to 3 metres and consists of a solid stem thermometer fitted into a transparent glass sheath. Each depth is established by inserting a steel tube into the ground and lowering the thermometer by the chain down into the tube. The thermometer bulb is embedded in paraffin wax to give a slow response time enabling it to be withdrawn to take readings.

Specification	SHEATHED PATTERN
Thermometer range	-10 to +45°C
Expected accuracy	±0.5°C
Scale length	165mm
Divisions	0.5°C
Dimensions	355 x 20mm (dia)
Weight	170g
Tube dimensions	32mm internal diameter, 75mm top flange diameter
Tube depths	300mm, 600mm, 1.2m and 3m
Weight	0.5, 1, 2 and 5kg
Ordering information	
Thermometer (tube to be ordered separately)	M106105
Thermometer with calibration certificate	M105325
300mm tube	B6974/1
600mm tube	B6974/2
1.2m tube	B6974/4
3m tube	B6974/10

INSULATED PATTERN

This pattern is used by Meteorological Services throughout the world. Each thermometer is mounted on a black enamelled, mild steel support stand and is angled at 30° to enable it to be read in situ.

Specification	INSULATED PATTERN						
Range	-10 to +55°C						
Expected accuracy	±0.2°C						
Scale length	300mm						
Divisions	0.2°C						
Dimensions	340 x 20mm diameter (above ground)						
Weight	Surface	50mm	100mm	200mm	300mm	500mm	1m (depth)
	65g	70g	75g	87g	100g	125g	190g
Tube Specification							
Dimensions	300 x 180 x 25mm (above ground)						
Weight	722g						
Ordering Information (stand to be ordered separately)							
Surface measurement	M106107						
50mm depth	M106108						
100mm depth	M106109						
200mm depth	M106110						
300mm depth	M106111						
500mm depth	M106112						
1m depth	M106113						
Mild steel stand	M106114						

ANGLE PATTERN

The angle pattern is the simplest type of earth thermometer. Each thermometer lies flat along the ground with the bulb at right angles to the scale. The bulb is inserted directly into the ground and allows for in situ readings to be taken.

Specification	ANGLE PATTERN			
Thermometer range	-5 to +40°C			
Expected accuracy	±0.2°C			
Scale length	140mm			
Divisions	0.5°C			
Dimensions	340 x 20mm (dia)			
Weight	50mm	100mm	200mm	300mm (depth)
	26g	27g	26g	31g
Ordering Information				
50mm depth	M106101			
100mm depth	M106102			
200mm depth	M106103			
300mm depth	M106104			
50mm depth with calibration certificate	M105321			
100mm depth with calibration certificate	M105322			
200mm depth with calibration certificate	M105323			
300mm depth with calibration certificate	M105324			

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Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

04 THERMO-HYGROGRAPHS

THERMOHYGROGRAPHS

Thermohygrographs continuously record both the temperature and the relative humidity of the atmosphere against time by drawing coloured traces onto a chart. There are two models available; the ‘standard’ and the ‘deluxe’. The Thermohygrograph standard model is the more practical instrument and is slightly more accurate on temperature.

The deluxe model is more elegant in appearance and is generally used in public areas such as receptions, public buildings, museums and libraries. Both styles are provided with a daily/weekly/monthly quartz clock, which can be set by the user.

Applications

- Museums
- Libraries
- Storage areas

Applicable Standards

BS 1339 Definitions, formulae and constants relating to the humidity of air

Application story – The National Museum of Science and Industry

Established in 1857 as the South Kensington Museum, the Science Museum in London is a major attraction to all ages of visitor interested in science, medicine, technology and industry and serves over 1.5 million visitors every year.

With such a broad diversity of priceless and often unique exhibits, many of which date back hundreds of years, artefact conservation and protection is a primary concern. Like many museums around the world, the Science Museum in London has used Casella CEL Thermohygrographs for a number of years. The temperature and humidity levels taken from these instruments, are crucial in helping to maintain the correct environment for preservation of the museum’s valuable exhibits.

Specification	THERMOHYGROGRAPH
STANDARD MODEL	
Accuracy	Temperature: ±1% of full scale
	Humidity: ±3% between 20 and 80%RH
Range	Temperature: 50°C span between -10°C and +50°C (see chart range below)
	Humidity: 0 to 100%RH
Time scale	Daily: 25 hrs @ 11.25mm/hr
	Weekly: 168 hours @ 1.6mm/hr
	Monthly: 31 days @ 8mm/day
Sensitivity	1°C = 1.64mm, 1%RH = 0.82mm
Chart size	300 x 90mm
Dimensions	350 x 150 x 160mm
Weight	3.2kg
DELUXE MODEL	
Accuracy	Temperature: ±2% of full scale
	Humidity: ±3% between 20 and 80%RH
Range	Temperature: 50°C span between -10°C and +50°C (see chart range below)
	Humidity: 0 - 100%RH
Time scale	Daily: 25 hrs @ 11.25mm/hr
	Weekly: 168 hours @ 1.6mm/hr
	Monthly: 31 days @ 8mm/day
Sensitivity	1°C = 1.64mm, 1%RH = 0.82mm
Chart size	300 x 90mm
Dimensions	300 x 165 x 145mm
Weight	3.62kg

Ordering Information

STANDARD MODEL	
Thermohygrograph with 2 pens each for temperature & humidity	M109014
Thermohygrograph with 2 pens each for temperature & humidity and calibration certificate	M109015
All charts must be ordered separately	
Box of 200 daily charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 449)	M107404
Box of 200 daily charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 450)	M107405
Box of 200 weekly charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 513)	M107408
Box of 200 weekly charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 514)	M107409
Box of 200 monthly charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 617)	M107415
Box of 200 monthly charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 613)	M107414
DELUXE MODEL	
Thermohygrograph with 2 pens each for temperature & humidity	M109016
Thermohygrograph with 2 pens each for temperature & humidity and calibration certificate	M109017
All charts must be ordered separately	
Box of 200 daily charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 700)	M107301
Box of 200 daily charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 705)	M107302
Box of 200 weekly charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 720)	M107304
Box of 200 weekly charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 725)	M107305
Box of 200 monthly charts, 0 to +50°C, 0 to 100%RH (chart ref. no: 755)	M107310
Box of 200 monthly charts, -10 to +40°C, 0 to 100%RH (chart ref. no: 750)	M107309

Accessories and Spares

STANDARD MODEL	
Black (short) temperature pens (pack of 2)	M118004
Red (long) humidity pens (pack of 2)	M119003
1.5V battery	016004
DELUXE MODEL	
Black (short) humidity pens (pack of 2)	M118004
Red (long) temperature pens (pack of 2)	M119003
1.5V battery	016604
For spare charts, please see ‘Ordering information’	

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

ADVANCED INSTRUMENT SHELTER

This new shelter offers many improved features and benefits over the traditional wooden Stevenson Screens.

Key features:

- Eliminates costly maintenance
- Reduced cost over product life time
- Padlock-able doors, front and rear
- Robust and secure construction
- Rapid assembly in the field
- Suitable for tropical climates
- Optional door-stays
- Improved airflow compared with wooden screens*
- Lower levels of internal radiation compared with wooden screens
- Resistance to UV radiation and acid rain atttack
- Resistance to fungal and termite attack
- Easy cleaning

* Based upon wind tunnel test comparisions with the existing UK Met Office Stevenson Screen.

Maintenance-free housing for meteorological monitoring

Extensive and painstaking research, development and testing bring you the Advanced Instrument Shelter, a maintenance-free solution to protecting your temperature and humidity instrumentation anywhere in the world.

The shelter is manufactured from durable plastic and plastic-coated aluminium, materials and coatings that are especially selected for their outstanding resistance to severe long-term weathering.

Each instrument is assembled by hand and subjected to rigorous quality control procedures throughout the production process. These shelters are your perfect partners for both manual and automated observation.

Specification	ADVANCED INSTRUMENT SHELTER		
Construction	Polyester powder coat with chromatic pre-treatment over aluminium frame for UV and salt spray resistance, Injection moulded louvers with enhanced UV inhibitor, Stainless steel fittings, Door hinges with stainless steel pins.		
Dimensions	Width	Height	Depth
Internal	492mm	411mm	313mm
External	670mm	567mm	500mm
Ordering information			
Screen	M113011		
Stand	131026A		

STANDARD STEVENSON SCREEN

The purpose of a meteorological screen is to shield instruments against precipitation and direct heat radiation from outside sources, while still allowing air to circulate freely around them. The screen creates, as near possible, a uniform environment in relation to the air outside.

The Stevenson screen is designed to hold Maximum and Minimum thermometers of the mahogany-frame pattern as well as a Kew Pattern Hygrometer, but can readily be adapted to accept equivalent thermometers of other patterns. The screen is available in finished form, ready for use and is manufactured from high quality, seasoned wood. The front panel hinges at the bottom to form a door, and is retained in the horizontal position by two safety chains. The door can be padlocked shut. The whole screen is painted with several coats of white paint to reflect radiation.

Specification	STANDARD STEVENSON SCREEN
Dimensions	Screen (internal): 445 x 240 x 405mm
	Screen (external): 580 x 420 x 540mm
	Iron stand: 480 x 300 x 1280mm
Weight	Screen: 14kg
	Iron stand: 22.6kg

Ordering Information	
Stevenson Screen (thermometers and stand not included)	M113004
Iron stand	M113008

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk


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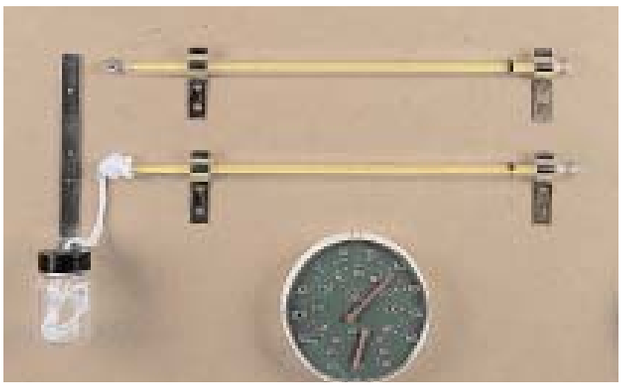
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1. KEW PATTERN HYGROMETER

This is a high quality hygrometer using accurate stem-divided, mercury-filled thermometers which are made with consideration to BMO patterns. The thermometers are fitted to laminated plastic mounts which have been engraved with thermometer divisions. The mounts themselves are then fitted onto a laminated plastic back-plate, moulded from high strength, 'warp-resistant' plastic.

A metal bracket attached to the back plate, supports the water reservoir from which a cotton wick runs and is threaded around a circle of muslin covering the bulb of one of the thermometers. The bulb is kept constantly wet by capillary action.

2. SIMPLE PATTERN HYGROMETER

This instrument is based upon the design of the Kew Pattern Hygrometer but does not have the laminated plastic back-plate. The thermometers, mounts, water reservoir, accuracy and principles of operation are the same.

3. SHEATHED PATTERN HYGROMETER

This instrument consists of two sheathed thermometers, manufactured to BS 692, together with supporting brackets and an arrangement of water reservoir, wick and muslin to keep one bulb constantly wet. The inner divided tube is supported in its sheath by a rubber ring at the top and by fusing the two together between the bulb and the lowest graduation.

For information on relative humidity calculation tables, please contact Casella CEL.

For information on the temperature and humidity measurement using Casella CEL Thermohygrographs and Whirling Hygrometer, contact Casella CEL.

Specification	KEW PATTERN	SIMPLE PATTERN	SHEATHED PATTERN
Accuracy (fitted into a Stevenson Screen) (Dependent on temperature and wet bulb depression or surrounding conditions)	±1 - 2%	±1 - 2%	±1 - 2%
Thermometers Scale length approx. divided at 0.5°C increments	180mm	180mm	195mm
Dimensions	300 x 140 x 50mm	285 x 35 x 15mm	330 x 13 x 13mm
Weight	800g	113g	70g

Ordering information			
Screen	M113011		
Range -20 to +55°C with simple slide rule and wick	M112065	M112063	M112060
Range -20 to +55°C with simple slide rule, wick and calibration certificates	M105349		M105327

Accessories and spares	
Thermometer, range -20 to +55°C	B6886/11
Thermometer, range -20 to +55°C with calibration certificate	M105302
Muslin wicks (pack of 50)	M112053
Replacement water reservoir	A7544/Z
Simple slide rule	M112011
BMO style slide rule	M112012
Hygrometric tables	M112009

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

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Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

WHIRLING HYGROMETER

This instrument provides a simple and effective way to measure relative humidity in air. The wet and dry bulb thermometers are held in a slotted frame which is whirled at speed around the handle to give a high and reasonably constant rate of air flow.

For additional information on the Whirling Hygrometer, contact Casella CEL.

For further information on temperature and relative humidity measurement using Casella CEL instruments, contact Casella CEL.

Applicable Standards

BS 2842 Specification for Whirling Hygrometer

BS 1339 Definitions, formulae and constants relating to humidity of the air

Specification	WHIRLING HYGROMETER
Accuracy	Approximately 2%RH (dependent on temperature, wet bulb depression and correction of thermometer errors)
Thermometers	Scale length approx. 100mm, divided at 0.5˚C increments
Range	-15 to +40˚C, -5 to +50˚C
Dimensions	230 x 145 x 30mm
Weight	200g

Ordering Information	
Whirling Hygrometer -15 to +40˚C with simple slide rule and wick	M112020
Whirling Hygrometer -15 to +40˚C with simple slide rule, wick and NAMAS calibration certificate for each thermometer	M105337
Whirling Hygrometer -5 to +50°C with simple slide rule and wick	M112022
Whirling Hygrometer -5 to +50°C with simple slide rule, wick and NAMAS calibration certificate for each thermometer	M105334

Accessories and spares	
Leather carrying case	M112027
Plastic carrying case	M112028
Simple slide rule	M112011
Pack of 100 wicks	M112035
1 replacement thermometer -15 to +40˚C	– TM4
1 replacement thermometer -15 to +40˚C with NAMAS calibration certificate	M105347
1 replacement thermometer -5 to +50˚C	– TM5
1 replacement thermometer -5 to +50˚C with NAMAS calibration certificate	M105316

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

All traditional rain gauges are manufactured using copper and non-ferrous materials for maximum life.

1. SNOWDON RAIN GAUGE

The Snowdon gauge is a popular, general purpose rain gauge. The collection aperture has an accurately turned bevelled rim to minimise splashing.

WMO Commission for Instruments and Methods of Observation No. 727

2. OCTAPENT RAIN GAUGE

This high capacity gauge is suitable for use at remote sites where daily access is impractical. It is manufactured with consideration to BS 7843 part 2.1. Bradford-type gauges are also available on request.

3. SPLAYED BASE RAIN GAUGE

This rain gauge is similar to the Snowdon gauge but has a splayed base for greater stability.

Applicable Standards

BS 7843 Guide to acquisition and management of MET precipitation data recorders parts 1 and 2

Specification	SNOWDON RAIN GAUGE	OCTAPENT RAIN GAUGE	SPLAYED BASE RAIN GAUGE
Diameter of aperture	127mm	127mm	127mm
Rainfall capacity – Glass bottle	75mm	680mm	75mm
glass bottle + inner can	140mm		140mm
Dimensions	140 diameter x 460mm high	330 diameter x 680mm high	216 diameter x 490mm high
Weight	2.9kg (with bottle)	5.7kg (with bottle)	3.5kg (with bottle)
Ordering information			
Rain gauge with inner can and collection bottle (measuring jar not included)	M114001	A8447/Z	M114003
Accessories and spares			
Collection bottle	M114017	M114017	M114017

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

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APPLICATION STORY
Environment Agency Kent
Splayed Base Rain Gauge

ENVIRONMENT AGENCY

In Kent the Environment Agency have a countywide network of some 200 rain gauges. Many of these are kept in private gardens, some in water company compounds. The gauges are read daily at 9.00am by an observer and in the case of private individuals the information is sent in to the Environment Agency at the end of the month.

Data collected is for the proceeding month, giving the Environment Agency daily rainfall data and its distribution, enabling analysis of rainfall events, for example heavy rainfall events are usually localised. This information helps with flood prediction and warning as well as water resource management, which are major parts of the Environment Agency's responsibility to the local population. The information for the month is then passed on to the Meteorological Office for evaluation.

The Met. Office approves nearly every rain gauge site and reviews each site once every two years. They check that the rain gauge is properly situated, i.e. not over shadowed by buildings or vegetation.

Casella CEL rain gauges are used for several reasons

- Use of a Meteorological Office approved design.
- Robust - people have been known to accidentally 'mow' their rain gauge.
- Established reputation.

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

MEASURING JARS

Three types of measuring jars are available; Flat, Tapered and Camden. Tapered and Camden jars have additional measuring divisions in the bottom section. The Flat and Camden jars have flanged bases to enable them to stand vertically.

Ordering Information — MEASURING JARS

	Rain gauge	Pattern Aperture (dia)	Rainfall	Divisions Capacity	Additional Division	Dimensions (dia x ht)	Weight
M114008	127mm	Camden	10mm	0.1mm	0.05mm	76 x 250mm	283g
M108007	127mm	Flat	10mm	0.1mm		60 x 200mm	140g
M114010	127mm	Tapered	10mm	0.1mm	0.05mm	44 x 280mm	115g
M114011	127mm	Flat	10mm	0.1mm		75 x 200mm	125g
M114012	127mm	Flat	25mm	0.5mm		75 x 260mm	170g
M114013	127mm	Flat	50mm	0.5mm		100 x 380mm	397g

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

NATURAL SIPHON RAINFALL RECORDER

The Natural Siphon Rainfall Recorder provides a continuous graphical record of rainfall against time and can be supplied with either a daily or weekly clock.

Applicable Standards

BS 7843 Guide to acquisition and management of MET precipitation data recorders parts 1 and 2

WMO Commission for Instruments and Methods of Observation No. 727

TILTING SIPHON RAINFALL RECORDER

The Tilting Siphon Rainfall Recorder provides a continuous graphical record of rainfall against time.

Specification	NATURAL SIPHON RAINFALL RECORDERS	
	LARGE APERTURE	SMALL APERTURE
Diameter of aperture	203mm	128.5mm
Area of aperture	323.7cm^2	129.7cm^2
Rainfall capacity	Unlimited	Unlimited
Siphoning occurs	10mm intervals	25mm intervals
Siphoning time	12 - 15 seconds	12 - 15 seconds
Time scale	Daily: 127mm/hr Weekly: 18mm/hr	Daily: 315mm/hr Weekly: 45mm/hr
Charts	300 x 90mm	300 x 90mm
Dimensions	635 x 305mm	635 x 305mm
Weight	8.2kg	8.2kg
Clock	8-day spring driven (daily or weekly rotation)	8-day spring driven (daily or weekly rotation)
Max. rainfall easily distinguishable	Daily: 172mm/hr Weekly: 18mm/hr	Daily: 315mm/hr Weekly: 45mm/hr
Ordering information		
203mm diameter, daily clock*	M114019	N/A
203mm diameter, weekly clock*	M114020	N/A
128.5mm diameter, daily clock*	N/A	M114021
128.5mm diameter, weekly clock*	N/A	M114022
* Supplied with 2 pens. All charts must be ordered separately		
Accessories and spares		
200 daily charts (0 - 10mm) for 203mm diameter aperture	M107804	N/A
200 weekly charts (0 - 10mm) for 203mm diameter aperture	M107803	N/A
200 daily charts (0 - 25mm) for 128.5mm diameter aperture	N/A	M107801
200 weekly charts (0 - 25mm) for 128.5mm diameter aperture	N/A	M107802
Pack of 2 pens	M114027	M114027
Anti-frost safety disc for float chamber	6049/A32	6049/A32
Change wheels (weekly to daily clock)	M114025	M114025
Change wheels (daily to weekly clock)	M114026	M114026

Specification	TILTING SIPHON RAINFALL RECORDERS	
	LARGE APERTURE	SMALL APERTURE
Diameter of aperture	287.3mm	128.5mm
Area of aperture	648.3cm2	129.7cm2
Rainfall capacity	Unlimited	Unlimited
Siphoning occurs	Every 5mm	Every 25mm
Siphoning time	6 to 10 seconds	6 to 10 seconds
Time scale	11.4mm/hr	11.4mm/hr
Charts	300 x 90mm	300 x 90mm
Dimensions	Approx. 860 x 500mm (dia)	Approx. 860 x 500mm (dia)
Weight	24.1kg	23.5kg
Clock	8-day spring driven	8-day spring driven
Ordering Information		
Daily temperate model, supplied with 2 pens	M114028	
Daily tropical model, supplied with 2 pens	M114029	
Charts must be ordered separately		
Accessories and spares		
200 daily charts (DLY 0.5mm) for temperate model	M107805	
200 daily charts (DLY 0.25mm) for tropical model	M107806	
Pack of 2 pens for either temperate or tropical models	M118004	
Transparent template to determine duration and rate of rainfall	M114030	

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

Tipping bucket rain gauge

Advanced tipping bucket rain gauge

TIPPING BUCKET RAIN GAUGE

The Casella CEL Tipping Bucket Rain Gauge is a reliable and extremely robust transducer, designed as a stand-alone sensor for operation within an existing logging system, such as the Casella CEL Automatic Weather Station. The body and funnel are made from aluminium alloy with an accurately machined septum ring at the top giving an aperture of 400cm^2. The tipping bucket mechanism is mounted inside the body on a cast aluminium-alloy base, incorporating a built-in spirit level to ease correct positioning.

The rain gauge comprises a divided bucket assembly, which is pivoted at the centre. Rain collects in one side of the bucket, which then tips when a predetermined volume of water has been collected. The tipping action discharges the collected water and repositions the opposite side of the bucket under the discharge nozzle ready for filling. The bucket tips are monitored by means of a sealed reed switch, capable of indefinite operation, thus ensuring that this instrument has a long working life.

Applicable Standards

BS 7843 Guide to acquisition and management of MET precipitation data recorders part 1 and 2

ADVANCED TIPPING BUCKET RAIN GAUGE

Key Features

- 0.2 & 0.5mm bucket size
- Double output relay contacts
- 5mm diameter drop tube
- Bucket adjusting studs increased to M6
- Retained hexagonal headed long base-mounting screws for additional security
- Bucket painted BS 14C39 green
- Quick-release terminal blocks and military spec external connectors rated to IP67 fitted to underside for rapid exchange in the field
- Heater can be retro-fitted to a pre-drilled base

Introduction

A new version of the Casella CEL Tipping Bucket Rain Gauge has been specifically adapted to meet the requirements of the UK Environment Agency's specification, is available to customers.

This gauge has been specifically adapted to meet the framework directive of the UK Enviroment Agency for operating tipping bucket rain gauges.

Connection to logging equipment is via IP67 rated quick-release connectors under the base plate.

Extended mounting screws are fitted to raise the base plate above ground level.

The rain gauge calibration complies with Method 1 of BS 7483.

Specification	TIPPING BUCKET RAIN GAUGE
Bucket sizes	0.1, 0.2 or 0.5mm
Aperture	400cm^2
Accuracy	±1% @ 1 litre/hr
Weight	2.6kg
Ordering information	
0.1mm Tipping Bucket Rain Gauge (light rainfall)	102471E
0.2mm Tipping Bucket Rain Gauge (moderate rainfall)	100000E
0.5mm Tipping Bucket Rain Gauge (heavy rainfall)	100573E

Specification	ADVANCED TIPPING BUCKET RAIN GAUGE
Bucket sizes	0.2 or 0.5mm
Aperture	400cm^2
Accuracy	±1% at 1 litre/hour
Capacity	Unlimited
Operating temperature range	-20˚C to 85˚C
Thermostat range	-20˚C to 40˚C
Transducer	Magnet/Reed switch
Cable rating	2A at 24V AC, 4-Core
Connector rating	IP67
Output	Contact closure
Bucket adjusting studs	M6
Weight	2.6kgm
Ordering information	
0.2mm Advanced Tipping Bucket Rain Gauge	103755E

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

RAINFALL LOGGING SYSTEM

The Casella CEL Rainfall Logging System utilises the Tipping Bucket Rain Gauge with an in-built datalogger. The system enables rainfall data to be recorded and stored in the memory as real-time information.

Once measured, the rain water is automatically discharged from the rain gauge and therefore does not overflow when left for long periods of time. The rainfall data is transferred from the logger using a PC or laptop. PC software and a communication lead are provided with each system, enabling the user to produce daily and monthly tables and histograms.

An internal alkaline battery, having a typical life expectancy of up to 3 years, is used to power the system. A lithium battery provides protection of the logged data in the event of main battery failure or replacement. The datalogger is only active during actual rainfall and remains dormant during dry spells to conserve both memory and main battery reserves. During rainfall periods, data will be recorded with a time resolution of one minute and presented as total rainfall occurring within the given minute.

For example if the logger of a 0.2mm model logs 3 tips in 1 minute, it will show a result of 0.6mm rainfall for that minute. The memory has the capacity for almost 100 hours of continuous rainfall.

Applicable Standards

BS 7843 Guide to acquisition and management of MET precipitation data recorders parts 1 and 2

WMO commission for instruments and methods of observation No. 727

INTEGRAL APPLICATION SOFTWARE

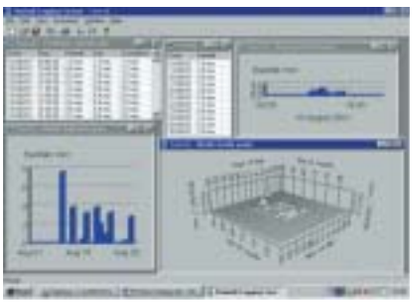
Casella CEL Integral application software provides users of Casella CEL rainfall logging systems with a powerful and versatile Windows program for the accumulation, processing and presentation of rainfall data. It can also import data from Casella's current RLS application (which it replaces).

Once data has been downloaded from a logger it provides a large number of ways to view / interrogate the data.

The Rainfall Logging System application allows you to view rainfall data in three different tabular formats, and three different graphical formats. All of which can be printed or copied into a word processor package to produce reports. It can also calculate rainfall totals and the maximum hourly rainfall rate.

Main data views:

- Summary
- Minute table
- 15 Minute table
- Hour table
- Day table
- Daily hour histogram
- Month day histogram
- Month hourly rain graph



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Specification	TIPPING BUCKET
Bucket sizes	0.1, 0.2 or 0.5mm
Aperture	400cm²
Accuracy	±1% @ 1 litre/hr
Weight	2.6kg

Specification	INTERGAL LOGGER
Clock accuracy	±1 minute per month
Power	Battery operated 1 x PP3 (back up power for memory and clock - lithium PCB cell)
Serial interface	RS232
Internal memory capacity	32K RAM
Dimensions	140 x 100 x 35mm

Ordering Information

Rainfall Logging System with software and communications cable	
0.1mm (light rainfall)	103553D
0.2mm (moderate rainfall)	103552D
0.5mm (heavy rainfall)	103554D

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

HOOK GAUGE EVAPORIMETERS

The Hook gauge evaporimeter measures the rate of evaporation by the change in level from a free water surface in a pan or tank. It is used by meteorologists and water engineers throughout the world, especially in hot, arid countries where water conservation is of vital importance.

The water level in a 'Class A' pan is measured, usually every 24 hours, by adjusting the height of the hook until its point just breaks the surface. The measurement is carried out inside a 'still well' which provides a small area of water surface free from ripples. The still well, made of brass, stands on three levelling screws and has an opening in the base to equalise water levels inside and out. The hook gauge, also brass, rests on top of the well supported by three horizontal arms and has a micrometer head to permit very fine adjustment.

In some applications, the evaporation measurement is correlated with the surface temperature of the water and the wind-run past the tank. When this is required, the floating Maximum/Minimum Thermometer and Cup Counter Anemometer are also used.

PICHE EVAPORIMETER

This simple instrument measures evaporation by volume in a graduated glass tube. The volume of water in the tube reduces as evaporation takes place through a paper disc at the bottom.

Specification	HOOK GAUGE
Range of adjustment	100mm (micrometer moves 1mm per turn)
Resolution	0.2mm
Weight	340g
Still Well Specification	
Dimensions	215 x 254 x 254 mm
Weight	1.8kg
Class 'A' Pan Specification	
Dimensions	Typically 250 x 1200mm (dia)
Weight	16kg
Floating Maximum/Minimum Thermometer Specification	
Range	-30 to +50°C
Resolution	0.5°C
Accuracy	±1°C
Ordering information	
Class 'A' pan	103750C
Hook gauge	C6643/Z
Still well	B6643/1
Accessories and spares	
Floating Max/Min Thermometer with magnet	M115002
Cup Counter Anemometer	D7204/Z

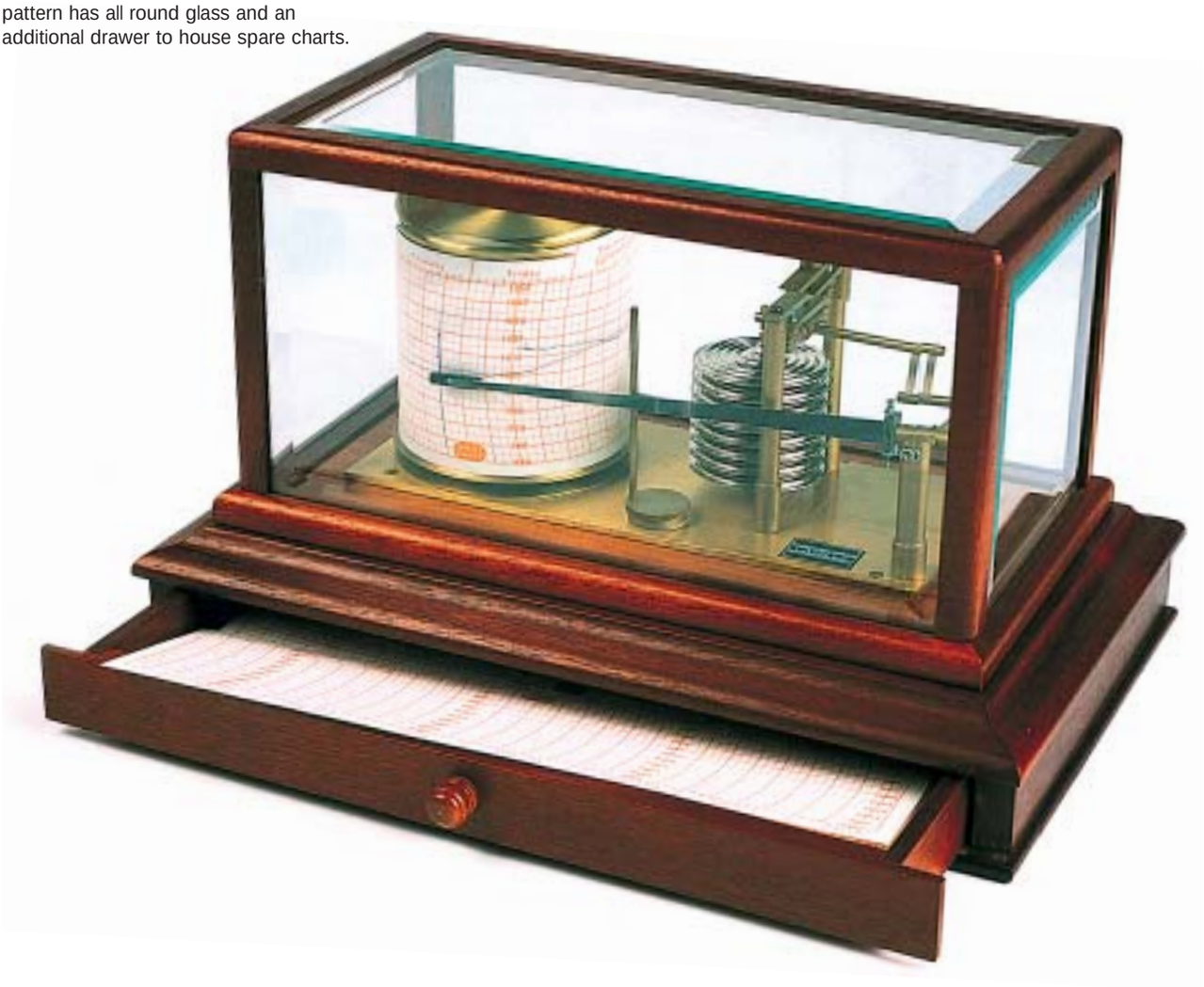
Specification	PICHE EVAPORIMETER
Tube capacity	30ml
Tube scale division	0.1ml
Tube dimensions	320 x 14mm (dia)
Tube weight	50g
Disc diameter	30mm
Disc evaporation surface	10mm^2
Ordering Information	
M112067	Piche evaporimeter with disc retaining clip and 400 discs
Accessories and spares	
Stand	B7215/3
Disc retaining clip	A7215/1
Pack of 400 discs	M112069

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

ANEROID BAROGRAPH

Two versions of the Aneroid Barograph are available; the 'Small Pattern' and the 'Display Pattern'. Both have an 8-day clock and are housed in elegant polished wood cases. The Display pattern has all round glass and an additional drawer to house spare charts.



Specification	DISPLAY PATTERN	SMALL PATTERN
Ranges	950 - 1050mb, 710 - 790mmHg, 28 - 31inHg	950 - 1050mb, 710 - 790mmHg, 28 - 31inHg
Pen travel	75mm	75mm
Sensitivity	1mb = 0.75mm, 1mmHg = 1.0mm, 1inHg = 25.4mm	1mb = 0.75mm, 1mmHg = 1.0mm, 1inHg = 25.4mm
Accuracy	±1mb	±1mb
Time scale	1.66mm/hr, 172 hours total	1.66mm/hr, 172 hours total
Clock	Spring driven, weekly	Spring driven, weekly
Dimensions	370 x 230 x 210mm	310 x 160 x 190mm
Drum size	90 x 93mm (dia)	90 x 93mm (dia)
Chart size	300 x 90mm	300 x 90mm
Weight	5.6kg	3.85kg
Ordering information		
Supplied with weekly clock and 2 pens	M110002	M110004
Supplied with weekly clock, 2 pens and calibration certificate	M110010	M110012
Accessories and spares		
Pack of 2 pens	M118004	M118004
Box of 200 charts range 28 - 31inHg	M107701	M107701
Box of 200 charts range 950 - 1050mb	M107702	M107702
Box of 200 charts range 710 - 790mmHg	M107703	M107703

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

KEW PATTERN BAROMETER

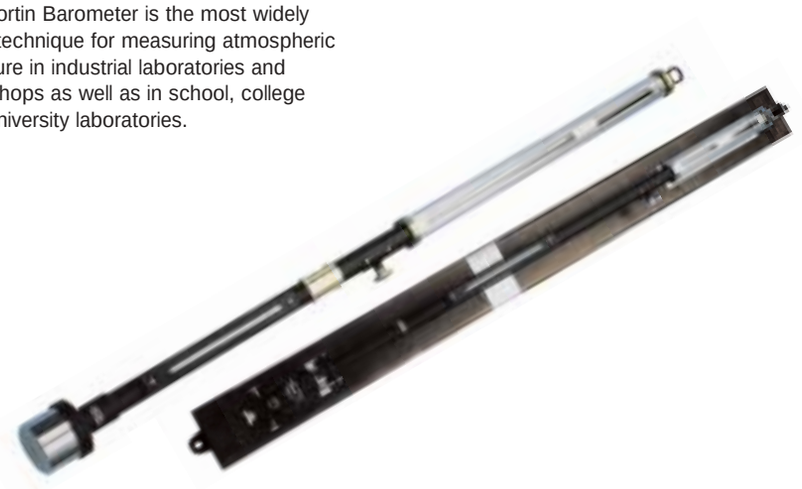
This instrument is made to a British Meteorological Office specification and is the standard type of barometer used in synoptic and climatological weather stations throughout the world. It is also entirely suitable for use in any laboratory or workshop where accurate knowledge of the atmospheric pressure is required.

Principles Of Operation

The Kew Pattern Barometer consists of a column of mercury supported within a vertical glass tube, the top of which is evacuated and sealed. The lower end of the column fits into a cistern containing mercury. The height of the mercury column supported by atmospheric pressure is measured against a graduated scale and vernier.

FORTIN BAROMETER

The Fortin Barometer is the most widely used technique for measuring atmospheric pressure in industrial laboratories and workshops as well as in school, college and university laboratories.



Specification	KEW PATTERN BAROMETER	FORTIN BAROMETER
Effective range	870 to 1060mb	900 to 1060mb
(two ranges per instrument)	650 to 800mmHg/25.7 to 31.2inHg	670 to 800mmHg
Maximum operating altitude	450m	450m
Vernier reads to	0.1mb, 0.05mmHg, 0.002inHg	0.1mb, 0.05mmHg, 0.002inHg
Thermometer range	-10 to +50˚C	-10 to +50˚C
Mercury	Triple distilled and filtered	Triple distilled and filtered
Dimensions	1070 x 65 x 65mm (1090 x 100 x 100mm barometer in case)	1090 x 90 x 90mm barometer on backboard (1250 x 165 x 165mm barometer in case)
Weight	5.89kg (7.25kg barometer in case)	3.62kg (9.5kg barometer in case)
Ordering Information		
Ordinary range, mb and mmHg scales	M101009	M101002
Ordinary range, mb and inHg scales	M101008	
Accessories and Spares		
Carrying case with rubber packings, lock, key and rope handle	M101015	
Carrying case of polished wood with glass front and sides, reflectors, lock and key		M101004

The following barometric sensors are supplied as part of Automatic Weather Stations.

Specification	STANDARD BAROMETER
Transducer	Temperature compensated silicon bridge
Range	800 to 1100mb
Operating temperature range	-10 to +60°C
Supply voltage	9 - 12V nominal (15V max.)
Power consumption	Approx. 10mA @ 12V
Output calibration	Nominally 0 to 1.6V range (800 to 1100mb). Units are individually calibrated and provided with offset and multiplier values.
Supplied with 0.8m of cable	

Specification	PRECISION BAROMETER
Transducer	Silicon bridge
Range	900 to 1100mb
Accuracy (total error band)	±0.3mb over 35°C range
Hysteresis	±0.1mb
Linearity	±0.1mb
Operating temperature range	-20 to +50°C
Supply voltage	9 - 12V nominal (15V max.)
Power consumption	Approx. 60mA @ 12V
Output calibration	Nominally a 1.5V span (900 to 1050mb) within a -2 to +2V range >10mV per mb. 100R output impedance. Units individually calibrated and provided with offset and multiplier values.
Supplied with 0.8m of cable	

Contact Details

Sales Tel: +44 (0) 1234 841468 Fax: +44 (0) 1234 841490
Service Tel: +44 (0) 1234 844146 Fax: +44 (0) 1234 841490 e-mail: info@casella.co.uk

CAMPBELL STOKES SUNSHINE RECORDER

Casella's Campbell Stokes Sunshine Recorder is manufactured to a design based on British Meteorological Office (BMO) specifications. The sphere is made from well-annealed optical glass and the sunshine hours are recorded onto a card, which is inserted into the base of the unit. Each card is marked with hourly intervals and an optional transparent plastic template is also available to help measure the curved trace more accurately.

The instrument is fully adjustable for operation at different geographical latitudes and levelling screws on the base ease installation. Two versions of the sunshine recorder are available, depending upon latitude, please see 'Ordering Information' for more details.

Global Butterfly Conservation

One of Britain's leading manufacturers of weather monitoring equipment has donated a critical accessory from one of its products to enable a Dorset woman to continue vital work in the conservation of butterflies.

Judy Westgate had spent five years recording sunlight hours on a piece of specialist equipment and supplying relevant data to the Butterfly Conservation Society of Great Britain, when a few weeks ago the costly glass globe which forms an integral part of the measuring equipment was stolen.

"I have been a voluntary observer for the meteorological office for 13 years, measuring rainfall and temperature statistics at 8.00 am every morning and passing them to the office for inclusion in nationwide analysis" says Mrs Westgate, a retired market gardener from Fontmell Magna, near Blandford Forum.

"Butterfly Conservation also used this information, but they additionally needed records of sunlight hours to complete their investigations."

"Unfortunately the met office did not supply the appropriate equipment so my family clubbed together and brought it for me. Prices have risen since then and its replacement was going to be costly. However, when I informed Butterfly Conservation of the problem they contacted Casella CEL, who made the original equipment, and very kindly gave me a replacement."

Paul Rubens, Managing Director of Casella CEL, comments: "We naturally receive

many requests to assist in charitable works and we have to turn down a large proportion. In this case we believed that if Mrs Westgate was prepared to dedicate herself in such a manner to the conservation of butterflies, her good efforts should not be thwarted by mean callous thieves who stole something that could have been of little or no use to them."

"We were therefore delighted that we were able to supply an accessory to a piece of equipment orginally purchased some years ago, but still in production within our company."

Specification	SUNSHINE RECORDER
Adjustment for latitude	0 to 65° N or S after selecting correct model
Sphere	101.6mm dia (±1.3mm)
Focal length for Sodium D light	74.9mm ±0.25mm
Dimensions	240 x 187 x 165mm
Weight	4.3kg
Ordering information	
Tropical for latitude 0 to 45° N or S (cards not included)	102271D
Temperate for latitude 45 to 65° N or S (cards not included)	102270D
Accessories and spares	
One years supply of cards (BMO pattern) for use in latitudes up to 65° N or S	M107901
200 summer cards (No 6730) long curved	
200 winter cards (No 6731) short curved	
100 equinoctial cards (No 6732) straight	
Transparent template for measuring length of trace	M114041

SOLARIMETER

The Casella CEL Solarimeter has been designed to measure the intensity of total global solar radiation received at the earth's surface. Total radiation represents both direct and diffused sunlight received from the whole hemisphere.

The solarimeter is a passive device, requiring no power supply and provides a voltage output which may be read by a datalogger or similar reading device and then converted into watts per square metre (W/m^2). The sensor itself is based upon a silicon photo-detector that is housed within a weatherproof, anodised aluminium body and is therefore suited to reliable, long-term operation in outdoor conditions.

Applicable Standards

ISO 9901 Solar energy field pyranometers recommended practice for use

Ordering Information	SOLARIMETER
AWS Solarimeter	187010B

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

HAND ANEMOMETER

This is a compact, portable and passive instrument requiring no power supply or batteries, which gives a direct reading of wind speed in four different scales simultaneously.

A vertical spindle carrying three small plastic cups of 35mm diameter rotates on ball bearings at a rate proportional to wind speed. The anemometer has a handle and two curved feet to prevent damage to the cups when it is laid down.

Applications

- Agriculture
- Recreational activities
- Sailing

CUP COUNTER ANEMOMETER

The Cup Counter Anemometer is a passive instrument that indicates the total run of wind past the observation point via a mechanical counter. The observation window to the mechanical counter is inclined to allow easy reading from below. By observing the counter reading at the beginning and end of any period of interest, the average wind speed during that interval can be calculated. Brass, copper, stainless steel and plastics are used throughout the instrument to ensure freedom from corrosion and a long working life. A conical shield protects the upper spindle bearing from precipitation. The only maintenance required is annual lubrication of the top spindle bearing, as all other bearings are self-lubricating.

Specification	HAND ANEMOMETER	CUP COUNTER ANEMOMETER
Scales	0 to 120km/h	
	0 to 12Beaufort	
	0 to 35m/s	
	0 to 70knots	
Dimensions	205 x 95mm (dia)	305 x 406mm (dia)
Weight	320g	3.6kg
Range		0 to 9999.99km

Ordering information		
Hand anemometer with four scales	M116008	
Cup counter anemometer		D7204/Z

Accessories and spares	
Set of cups	M116007

Contact Details			
Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

WIND SPEED AND DIRECTION SYSTEMS

Essentially there are two systems available for the PC based wind speed direction. System 1 consists of a system designed for short distances transmission where as System 2 is designed for a longer distance transmission rate between the sensors themselves and the PC operating system.

The wind sensing heads utilise latest OEM sensors manufactured by Casella CEL.

The anemometer uses a non-contacting optical encoder transducer providing a pulsed 0-5V output (frequency directly proportional to wind speed).

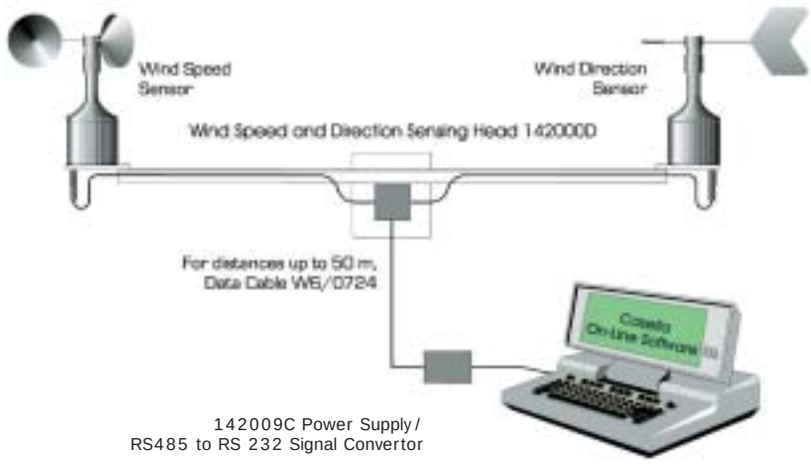
The wind vane employs the very latest Giant Magneto Resistive (GMR) magnetic sensing technology to offer accurate, frictionless sensing with zero dead-band at north.

Both sensors are manufactured from high quality anodised aluminium, which guarantees functional reliability even under the harshest of environmental conditions. The sensors are mounted on a zinc galvanised, steel cross arm using corrosion resistant fittings. U-bolts can be provided for fitting to masts from 50 – 115mm in diameter. Heated versions of both sensors are available if required. (see weather sensor section for further details)

System 1
Transmits data directly into PC over distances up to 50m.

The wind speed and direction sensors are mounted on a cross arm. No sensor interface module is required, merely a junction box. The outputs from the sensors are linked via a Connection Box to the RS 232 port on the PC.

A Universal 12V Power Supply is also included to provide power for the sensors.



142009C Power Supply / RS485 to RS 232 Signal Convertor

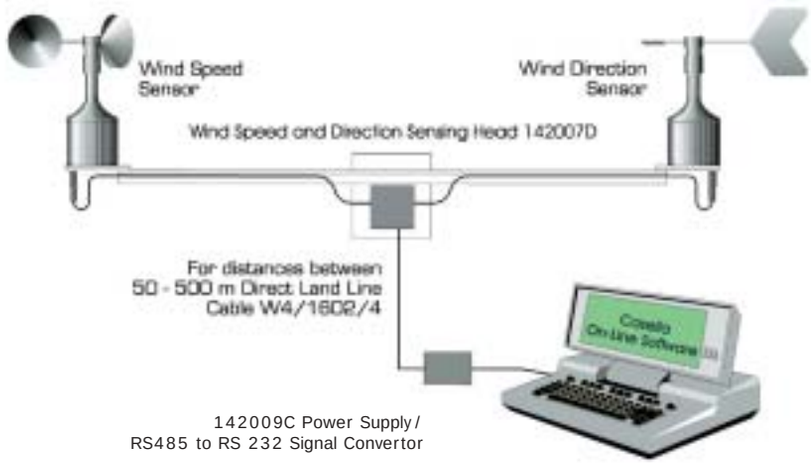
System 2
Transmits data directly into PC over distances between 50 and 500m*.

The wind speed and direction sensors are mounted on a cross arm which includes a signal-conditioning interface that generates an RS 485 output. This output passes via an RS 485 to RS 232 Signal Convertor to the PC.

A Universal 12V Power Supply is also included to provide power for the sensors.

* For distances greater than 500m, please contact the Casella CEL Sales Department.

State cable length when ordering your system.



142009C Power Supply / RS485 to RS 232 Signal Convertor

Online Pro Software

The wind, speed and direction information can be fed to the PC where the Online Pro software enables full manipulation of the data, both historical and real time information. The Online Pro software is a 32-bit programme compatible with most PC set up profiles. It is also available as a networked software programme where additional licences can be purchased.

The screen illustrations show the type of information available on line.

Wind rose screen shot

Software screen shot

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

MULTIMET - WIND

The Multimet Wind is a professional and easy to use system to display and log horizontal wind speed and direction. The system has been designed in response to a need from both industry and meteorologists alike, for a lower cost, professional installation that suits a wide variety of applications. These may include clients with a requirement for either current or historic wind data e.g. chemical sites, heavy industrial emitters, ports, harbours and airfields. Essentially, the Multimet consists of a versatile and compact display system together with a cross arm with wind speed and direction sensors.
(See next page.)

Display

The display system is based upon a clear graphical LCD with a variety of different screens, to present wind data in a clear and unambiguous format. The signal from the sensors is transmitted to a junction box at the rear of the display and a microprocessor performs the required calculations. A high contrast, transflective LCD display with back light facility maintains crystal clarity in all lighting conditions from a darkened radar room, to bright sunlight.

The display screen may be either panel mounted (for typical aviation installations) or contained within an optional freestanding desktop enclosure. The range of data that may be displayed on the screen is as follows:

- Instantaneous wind speed and direction
- 2 minute rolling average wind speed and direction
- 10 minute rolling average wind speed and direction
- 2 or 10 minute maximum and minimum wind speed
- 2 or 10 minute extreme variation of wind direction
- Wind gust warning
- Scrolling wind speed graph

Different display screens are accessed via tactile keys on the front of the display. A user friendly menu system appears on the screen when one of these keys is pressed, allowing simple and quick access to the other screens. These consist of real-time wind speed and direction values in both graphical and numerical formats. For example, wind direction can be displayed as a compass, or as a value. Data can also be displayed in large figures for easy reading at a distance. Where there is a requirement for observing longer time scales, data can be displayed as a scrolling graph, over the preceding hour.

An audible alarm is available whenever the instantaneous or 2 minute wind speed exceeds a user-defined threshold. Logic level output is provided for interfacing to other equipment.

A gust warning message identifies when the peak wind speed exceeds the associated rolling mean wind speed by a programmable limit. CAN™ bus networking protocols are used to network multiple displays via a two wire data transmission link at distances of up to 1.5km between displays.

1.3 MULTIMET WIND SPEED & DIRECTION

Multimet Wind, Speed & Direction Sensing Head

Data and Software

Data may be recorded within the internal flash memory of the unit with a capacity for storing up to 4,500 readings. The user may set the logging interval from 1 to 120 minutes. As an example, data being logged every 10 minutes will give a total storage of over 30 days. Data can then be transferred to an IBM compatible PC via the RS232 interface and interrogated via Windows™ based display and analysis software. This is an easy to use flexible package providing multi-user Windows™ network access to real-time and historical data.

Features

- Low cost, professional system
- Clear, bright, transflective LCD
- Full datalogging capabilities
- Audible and visual alarm facility
- User-friendly display and analysis software
- High quality Met. sensors

Applications

- Industrial emissions monitoring
- Wind monitoring at harbours, airports and helipads
- Wind monitoring for bridge management
- Nuisance dust monitoring for construction sites
- Landfill and waste management sites

Display Specification

Power supply	12V DC supply @ approx. 250mA
Display	160 x 128 transflective graphics LCD with CCFL backlight
Display units	mph, km/h, m/s, knots
Sensor polling	Approx. 5 readings per second
Processed data	Instantaneous value updated every second
	2 and 10 minute rolling averages updated every 5 seconds
	2 and 10 minute maximum and minimum values updated every 5 seconds
	2 and 10 minute and 5 second direction variation sector
Datalogging interval	1 to 120 minutes
Memory capacity	4500 readings
Logged data comprises	Date, time, average, maximum and minimum speed and direction over logging period
Alarms	Instantaneous or 2 minute wind speed, Loss of sensor data
Dimensions	Panel mounting: 110 x 110 x 80mm, Desk top enclosure: 125 x 125 x 133mm

Ordering Information

Wind display unit (panel mount) with power supply unit	175000D
Wind display with enclosure and power supply unit	175001D
Wind speed and direction sensing head	142000D
(Specify length of cable when ordering)	W6/0724

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

Optional memory expansion cards

GSM modem option

Sensus datalogger

Low power radio option

NOMAD

The Nomad from Casella CEL is a truly portable monitoring station supplied in customised carry bags. Specifically designed for ease of transportation, rapid deployment and quality of measurement. Nomad satisfies your professional monitoring needs.

Once on site, the Nomad can be deployed and collecting data in under 5 minutes. Disassembly is just as quick, allowing you to be packed and en-route to the next monitoring location without delay.

Quality construction and an integrated solar-panel gives Nomad the independence required for prolonged operation in isolated or inhospitable environments.

Why a Nomad?

Due to increasing environmental legislation world wide, many industrial activities including construction, demolition and land remediation now have a requirement to monitor local meteorological conditions. Environmental conditions impact on many other areas, including agrochemical research, ecological projects and recreational activities.

The Nomad's portability allows the user to monitor any location and as standard measures: temperature, humidity, pressure, wind speed, wind direction, solar radiation and rainfall.

Features

- Portable and lightweight construction allows for rapid system deployment
- Supplied in protective carry bags
- High quality anodised aluminium and stainless components
- Quality external connectors to IP68
- Latest logging technology records over 149K data sets as standard
- Compact Flash expansion slot for prolonged monitoring applications
- Integrated solar-panel/charger allows extended operation
- Telemetry options include: RS232, RS485, low power radio or global access using GSM modem
- Complete with pre-configured 32-bit Online Pro PC software, for real-time and historic data analysis

Applications

- Environmental consultancy
- Site boundary monitoring
- Landfill sites
- Emergency services
- Military
- Golf courses
- Ports and harbours
- Agrochemical field trials
- Fruit growing
- Airport gliding clubs
- Hydrological studies
- Schools & colleges for field studies
- Geotechnical studies
- Athletics meetings

Operation

Once assembled the Nomad automatically begins recording data based on an internal system profile, this profile is created by the operator using Online Pro PC software and can be modified to suit monitoring needs.

Data is collected and held internally ready for retrieval by the operator. If a Compact Flash card is installed, new and existing data is automatically transferred to the card

Sensus Logger

The heart of the system is the Casella CEL Sensus data logger, which offers powerful functionality and versatility for all applications with user friendly software.

Signal inputs permit almost any transducer and measurement parameter to be configured.

As standard the Sensus will record 149K data sets which equates to over 3 months (recording at 1 minute intervals), although this capacity can be increased using Compact Flash cards.

Telemetry

Various options exist for remote communication and data collection. In its simplest form data can be retrieved directly using a laptop PC or via a direct line cable connection (maximum cable length 500m). For cable free or remote operation low power radios can be deployed (for transmission up to 2Km). For global collection GSM or PSTN modems are supported. Alarm functions may be configured to alert operators using the GSM S.M.S (Sending text message to alert users if required).

Hardware

The Nomad system is comprised of three key components, a lightweight collapsible tripod assembly, Sensus data logger housed in IP67 enclosure (logger, solar panel and rechargeable battery) and detachable sensor array (anemometer, wind vane, temperature, humidity and solar radiation). Barometric pressure is integrated within the Sensus logger and a tipping bucket rain gauge is generally sited adjacent to the system. The system comes complete with ground anchoring kit and compass for correct station orientation. All components are housed within custom designed carry bags for ease of transportation and system protection.

System Expansion

Additional sensors (up to four) can be added to the system through the use of the Nomad 'Sensor extension unit', this attaches directly to the base of the tripod.

Software

The Online Pro software supplied with the system is a full 32-bit package that operates on Windows 95 onwards. It allows both display of data in real-time or retrospective analysis.

Features include: Password protection, e-mail notification of alarms, customised screen layout, networked displays and graphical analysis of data.

Removable senor array

Sensor extension unit

Sensus logger enclosure

Specification (data logger)	NOMAD	
Internal memory	512K	
Number of channels	24 (11 maximum on Nomad systems)	
Logging interval	Adjustable from 5 seconds	
Display	2 line by 20 character LCD for status information	
Communications	RS232, RS485 and Infra red (future enhancement)	
Specification (Sensor)		
Description	Specification	
Wind Speed	Transducer Resolution Accuracy	Optical encoder 7.84cm +0.3m/s below 3m/s, ±1% over 3m/s
Wind Direction	Transducer Resolution Accuracy	GMR 1° <±2 degrees
Temperature	Platinum resistance Accuracy ± 0.3°C @ 0°C, ±0.55 @ 50°C	
Humidity	Capacitive Accuracy ±3%	
Pressure	800 to 1100 silicon bridge <1mB calibration accuracy Temp drift typ. <0.15 mB/°C	
Solarimeter	Silicon detector Resolution 0.1 W/m²	
Rainfall	Tipping bucket rain gauge Resolution 0.2mm Accuracy ±1% @ 1 litre per hour	
Operating Temperature Range		
Nomad	–15°C to +70°C	
Dimension and Weight		
Nomad Deployed	Sensors 2.0m above ground, Tripod base 1.0m diameter	
In carry bags	Case 1: 950mm x 300mm, case 2: 360x380x300, logger case: 350x350x250	
Weight	13kg	

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

Ordering Information

Part No.	Description
187000D	Nomad Weather System
187056D	Nomad Wind System

Accessories

187057B	Sensor extension unit
-CMC30	Compact Flash card (16MB)
-CMC31	Compact Flash to PCMCIA adapter

Telemetry Options

142009C	Land line interface unit (RS485)
W4/1602/4	Cable (specify length, max. 500m)
187079B	Low power radio modem
187082B	GSM modem

Optional Sensors

120620B	Soil Temperature
187081B	Leaf wetness
120680B	Grass temperature

Nomad Weather System includes:

Sensus data logger
Tripod
Internal lead-acid battery
Solar panel
Aerial sensor array
Sensors: Air temperature
Humidity Wind speed
Rainfall Solar radiation
Wind direction
Barometric pressure
Anchoring kit, with tools and compass
Customised carrying cases
Online Pro PC software

Nomad Wind System:

Same as Weather system except only supplied with Wind speed and Wind direction sensors and barometric pressure.

Example screen shots

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Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

AUTOMATIC WEATHER STATION

The Casella CEL Automatic Weather Station (AWS) is a tried and tested solution for the monitoring of a wide range of environmental parameters. Casella CEL systems are in use all over the world, providing continuous meteorological data in extremely harsh environments.

The standard hardware consists of a 2m galvanised steel supporting frame, upon which the electronics and above-ground sensors are mounted. Alternatively, if the sensors need to be mounted more than 2m from the ground, Casella CEL can supply masts of varying heights and specifications.

Sensor cables may be contained within flexible steel conduit to protect them from sunlight, water ingress and insect attack. As the AWS is of a modular design, the process of selecting a suitable system may be subdivided and is outlined as follows:

Sensors

A wide variety of environmental data may be collected using the Casella CEL AWS. Sensors are available for the measurement of basic meteorological parameters such as wind and temperature as well as highly sophisticated radiation sensors and cloud base ceilometers. Other environmental parameters such as water characteristics and gas concentration may also be measured. A full range of sensors is available upon request.

Sensus Logger

The latest 24 channel logger forms the heart of the system. (See next page for details.)

Telemetry

There are a variety of telemetry options available for an AWS system. These are dependent upon the users requirements and are briefly described as:

- Landline
  AWS is connected to the user's PC via a cable providing both power and communications
- Modem/GSM Modem
  For stations that are remote, but have access to a telephone line/GSM network
- Radio
  For stations within 20km of the display site, data is transmitted every 5 - 60 seconds

Power

There are three options available as follows:

- Mains Power
  Through either local mains connection or the landline telemetry option
- Solar Power
  High quality solar panels and battery with adjustable support assembly
- Battery Power
  Heavy duty batteries in a protective enclosure

WATER BALANCE SOFTWARE

In situations where evapotranspiration (ET) parameters are required using Automatic Weather Stations, Casella CEL is able to offer a tailored software package, developed by the Water Management

Group at Cranfield University, Bedfordshire, England. The software comprises two separate programs, which are as follows:

- AWSET
  Used for calculating the reference ET
- BALANCE
  Used for calculating the actual ET and soil water deficit

Features

- Proven, robust and reliable technology
- Tailored to customers requirements
- User friendly and configurable software
- Wide range of sensors
- High accuracy

Applications

- Meteorological monitoring
- Landfill and waste disposal sites
- Water treatment works
- Power stations
- Industrial dust/odour emitters
- Harbours and airports

Applicable Standards

BS 7843 Guide to acquisition and management of meteorological precipitation data

BS 1339 Definitions, formulae and constants relating to the humidity of the air

BMO AWS advice leaflet and RMS Meteorological Applications Vol. 1 and 2

WMO Commission for Instruments and Methods of Observation No. 727

SENSUS DATA LOGGER

The Casella CEL Sensus, is a comprehensively specified universal data logger that can accurately measure inputs from a wide range of sensors.

Key Features

- 24 Digital inputs (via analogue) (upgradeable to 32)
- 16 alarm channels activating 4 alarm output channels
- 16 differential - 24 single analogue channels (8 via expansion socket)
- 4 counter channels
- 512k Flash memory as standard - (15,000 data sets @ 7 channels)
- Compact Flash slot for expansion to 256 MB
- Firmware field-upgradeable
- Built in maths function - allows scaling of signals to engineering units
- EMC and transient suppression filters on all lines
- Integrated lead acid charger - solar regulator system
- Data DOS formatted for drag and drop applications
- Modem alarm dial out facility
- Alarm notification by SMS using GSM modem
- Optional temperature and barometric pressure sensors

It can also be used to control and access data from external intelligent devices via a dedicated RS232 communication port. Its large standard memory (512k) can be extended with Compact Flash memory cards, which also facilitate rapid data downloads directly into DOS files for historical analysis using Online Pro software.

The Casella CEL Sensus is ideally suited for all types of monitoring applications in Research, Scientific, Environmental and Industrial applications.

The logger unit can be supplied individually, networked or as part of an integrated monitoring station from Casella CEL.

Competitive pricing also allows OEM and badging of units if required.

Specification	SENSUS DATA LOGGER
Specifications:	
A-D converter	15-bit, plus-sign (±2.5V, ±250mV and ±25mV ranges)
Counters	32-bit @ 3KHz (50KHz high speed channels)
Calculations in any analysis	8-byte floating point format
Logged values	4-byte floating point format
Calibration	8-term polynomial
Real time clock accuracy	±1 minute per month
Recording interval	5 seconds to 24 hours
Sensor scanning interval	2 seconds to 5 minutes
Memory (internal)	512KB (1 channel, 47662 readings) (7 channels, 14980 readings)
Memory (external)	Up to 256MB
	Using 16MB (1 channel, 1448941 readings) (7 channels, 455381 readings)
Data protection	Internal battery, typically 40 days
	Lithium backed memory, typically 5 years
Serial interface	RS232 (2 off), RS485 (1 off) Speeds 110, 300, 600, 1200, 2400, 4800, 9600 19200, 38400, 57600, 115200 Data bits, stop bits and parity, configurable XON/XOFF flow control
Operating temperature	-20 to +70ÍC
Humidity	0 to 100% (non-condensing)
Enclosure sealing	IP68
Part Number:	183000D
	183027A Online Pro 32-bit software for use with Sensus (OEM)

Ordering Information

As the Casella CEL AWS is built to exact customer specifications, please contact the sales department for more information and a full quotation.

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

NEMESYS

The Casella CEL NEMESYS (NEw MEteorological SYStem) provides an economic solution to satisfy the demand for fully automatic weather monitoring and is therefore, the ideal choice when working on a budget.

The system combines the quality and reliability of the Automatic Weather Station with the "off the shelf" advantages of a fixed specification, ready-to-run package.

The NEMESYS hardware consists of a 3m painted mild steel mast and galvanised steel support base, pre-drilled and suitable for securing to most surfaces. The cross arm used to support the wind sensors is attached to the mast and comes pre-wired for fast and simple installation. Temperature and relative humidity sensors are located on a separate mounting bracket and are shielded from direct solar load by a hard wearing solar radiation screen.

The data acquisition unit (DAU) containing onboard signal conditioning, data processing and storage functions is housed within a metal IP66 rated enclosure, which is in turn, attached to the mast. The sensor cables are enclosed within the cross arm and mast to protect them from physical damage. The raingauge is supplied with 9m of cable.

The NEMESYS is connected to an office based PC via a 'landline' cable. This cable provides both data communications and power supply signals. The 'landline' interface, located adjacent to the PC, powers the system and is directly connected to the PC via a serial port. Data may be recorded directly onto the PC provided the PC is switched on. If the PC is switched off, data is stored in the NEMESYS DAU and may be extracted at a later date, when the PC power is restored.

Cable length requirements are charged as applicable and must be specified when ordering.

ONLINE PRO 32-BIT APPLICATION SOFTWARE

Casella CEL Online Pro Application Software provides users of Casella Automatic Weather Stations, Multimet instruments and Wind Speed and Direction Systems with a powerful and versatile program for the accumulation, processing and presentation of environmental data.

Replacing the earlier Casella CEL Online application, Online Pro has been completely rewritten to take advantage of the 32-bit facilities available from current versions of Windows and provide greater ease of use. This allows the operator to concentrate on the data, while maintaining and extending the flexibility with which data can be gathered and displayed. Data from multiple sources can be viewed on common screens in real time, allowing easy comparison of environmental conditions.

This software integrates the functions of real time data presentation, data archiving and historical presentation into an easily used package. It is designed to run on Windows 95, Windows 98, Windows NT 4, Windows ME, Windows 2000 and Windows XP.

Online Pro offers the following display features:

- Real time display showing prevailing conditions that provides critical information for on-site decisions
- Dynamic Data Exchange that allows real-time data to be viewed in another program
- Automatic switching between user specified display screens
- Alarm display
- Save screen image
- Windows bit map (.bmp) image presentation for displaying site maps, company logos, hazards etc
- Multi-section bit maps, where the displayed section is dependant upon the condition of a data input value
- Individual site maps with dynamic wind direction overlay

Plus the following features for User Convenience:

- Password protection
- Comprehensive on-line help
- Automatically display file loading
- Conversion of on-line log file
- Archiving of data to disk at user defined intervals
- Dynamically changing screens including scrolling graphs and alarm warnings
- Production of line graphs based upon historical data
- Tabular report presentation of data files

The versatility of the Online Pro application enables a variety of other parameters to be incorporated and mathematically determined from basic sensor values.

- Linear Scaling maths functions (y=mx +c)
- Vapour pressure and Dew Point calculation, based upon Temperature and Humidity
- Heating / Cooling Degree Day calculations based upon measured temperature values and a user defined threshold
- Rolling averages over user selected time period
- Vectored rolling averages for wind direction
- Cross wind component calculation using wind speed, direction and reference heading

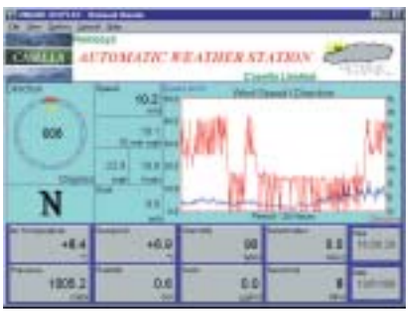
The program enables a maximum of eight customised screen layouts (pages) to be configured to suit your specific requirements. Simple mouse controlled operations enable display elements to be added, customised or deleted.

Data files created by the software employ a standard ASCII plain text format allowing them to be incorporated into many commercial spreadsheet, word processing or data base applications.

The software can be supplied to operate in network mode so that real time values can be accessed and displayed by multiple users.

Real Time Displays

Data from measuring stations configured and connected via Online Pro can be viewed in real-time on a display screen that has eight pages. The data from several measuring stations can be presented on the same page, where the only limitation is the user's ingenuity in positioning the required items on the page.



Example screen display

Specification	NEMESYS
Mast	3m
Enclosure sealing	IP66
Mounting base	Galvanised steel with 4 mounting holes
A-D converter	16-bit (±1.9999V) displayed results = 4.5 digits
A-D accuracy	±0.1% ±1 bit
A-D temperature stability	Typically 20ppm/°C
Counter timer	16-bit (65536 counts/minute) max. freq. 1kHz.
Calculations in any analysis	9 decimal places.
Displayed values	7 characters including decimal point and sign
Calibration	Linear slope and offset table
Real time clock accuracy	±1 minute per month
Recording interval	1 minute to 116 hours 39 minutes
Sensor scan time	0.2 seconds/channel
Memory	38706 bytes.
Memory capacity	16 channel, 1075 records, 1 channel, 6450 records
Operating temperature	-25 to +50°C
Humidity	0 to 100%

Ordering Information	
NEMESYS	170000D

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

CASELLA CEL

Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

Casella CEL offers a diverse range of highly sophisticated sensors to monitor a variety of environmental parameters from wind and temperature to radiation and cloud base. Other environmental parameters such as water characteristics and gas detectors may also be fitted. Many of these sensors have been designed and manufactured in-house based upon many years of experience in the transducer market.

Sensors can be supplied as part of an environmental monitoring system, such as the Automatic Weather Station or separately, as part of a customer's monitoring project. All transducers are supplied with individual calibration details and with a limited amount of interconnecting cable. Longer cable lengths are available on request.

Due to the large number of sensors available, only a small selection of those most commonly used is shown here. Please contact the Casella CEL sales office for a full list and specifications.

WINDSPEED ANEMOMETER

Principles of Operation

Rotational speed is monitored using a non-contact optical chopper design. An infra-red light source and an optical sensor provides a 0–5 volt pulse output. Frequency of this output is directly proportional to the wind speed.

GMR WINDVANE

Principles of Operation

The new Casella CEL Wind Direction sensor incorporates the very latest technology using the principle of Giant Magneto Resistive effect (GMR).

This Magnetic sensing method offers accurate, and frictionless sensing together with high quality anodised aluminium construction. This guarantees functional reliability even under the harshest of environmental conditions and offers considerable cost savings to the end user.

Heater option also available for extension of operating environments.

Specification	WINDSPEED ANEMOMETER	GMR WINDVANE
Transducer type	Optical Encoder	GMR solid state system with microcontroller
Max windspeed	75m/s	75m/s
Starting velocity	typically 0.3m/s	
Distance constant	3.5m/s	typically 2.5 m
Output calibration	12.75 Hz/m/s	
Output signal	0-5v pulses	
Non linearity	<0.6%	
Resolution		1 degree
Aligning Threshold		0.8m/s for dgr offset
Damping ratio		0.25
Distance constant		typically 2.5 m
Undamped natural wavelength		2.2 m
Electrical angle		0-359 degrees – no deadband at north
Accuracy	± 0.3m/s below 3m/sec, ±1% over 3m/s	< ± 2 degrees
Supply voltage	7 to 28VDC	7 to 28VDC
Power consumption	3mA	3mA
Stabilisation time	< 1 sec from power up	< 1 sec from power up
Operating temp range	– 20° to 70°C	– 20° to 70°C
Heater option	24V DC / AC 47 ohms 12W	24V DC / AC 47 ohms 12W

Ordering information	
178031C	Standard OEM Anemometer (4.5m wire only)
178032C	Standard OEM Anemometer with heater (4.5m wire only)
178033C	Anemometer with conduit (2.55m conduit, 3.25m wire)
178034C	Anemometer with conduit and heater (2.55m conduit, 3.25m wire)
178035C	Standard OEM Direction (4.5m wire only)
178036C	Standard OEM Direction with heater (4.5m wire only)
178037C	Direction sensor with conduit (2.55m conduit, 3.25m wire)
178038C	Direction sensor with conduit and heater (2.55m conduit, 3.25m wire)
178050B	Signal Conditioning Interface

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk


Precision barometer


Solarimeter


Soil temperature

Specification	PRECISION BAROMETER
Transducer	Silicon bridge
Range	900 to 1100mb
Accuracy (total error band)	±0.3mb over 35°C range
Hysteresis	±0.1mb
Linearity	±0.1mb
Operating temperature range	-20 to +50°C
Supply voltage	9 - 12V nominal (15V max.)
Power consumption	Approx. 60mA @ 12V
Output calibration	Nominally a 1.5V span (900 to 1050mb) within a -2 to +2V range >10mV per mb
	100R output impedance. Units individually calibrated and provided with offset and multiplier values
	Supplied with 0.8m of cable

Specification	SOLAR RADIATION
Spectral range	0.4 to 1.1µm
Range	0 - 2000W/m²
Response time	<1 second
Cosine response	Typically <10% from normal to 80° of normal
Operating temperature range	-40 to +80°C
Supply voltage	Passive device - no supply required
Output calibration	Typically 55µV/W/m²

Supplied with individual calibration details

Supplied with 5m of cable. Protective steel conduit optional

Specification	SOIL TEMPERATURE
Sensor type	Semi conductor current generator
Measuring range	-40 to +60°C
Calibrated accuracy	±0.5°C (over -20 to +50°C)
Supply voltage	7 to 15V
Power consumption	Typically <1mA
Output calibration	Nominally 1.5V at 0°C and 1.8V at 50°C. Units are individually calibrated and provided with offset and multiplier values.

Supplied with 3m of cable and protective steel conduit

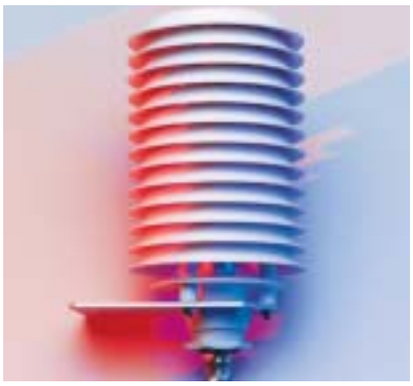
Other sensors include; grass minimum temperature, surface wetness, net global radiation, diffuse radiation, sunshine detector, air quality (for ppm measuring of SO2, NO2, CO2 and CO), quantum radiation (PAR), soil moisture, UVA and UVB radiation and sea water temperature.

Ordering information

As the Casella CEL AWS is built to exact customer specifications, please contact the Sales Department for more information and a full quotation.

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk



Temperature and relative humidity

Rainfall

Standard barometer
A small silicon transducer sensor is now available as a pcb addition to the sensus datalogger

Specification	TEMPERATURE AND RELATIVE HUMIDITY
TEMPERATURE:	
Sensor type	Platinum resistance Pt 1000 RTD
Measuring range	-10 to +60°C
Accuracy	±0.6°C (over -10 to +30°C)
	±0.8°C (over full range)
HUMIDITY:	
Sensor type	Capacitive
Operating range	0 - 100%RH
Accuracy	±3%RH (over measuring range of 10 - 90%RH)
GENERAL:	
Supply voltage	7 to 28V
Power consumption	Typically 2mA @ 12V
Operating temperature range	-10 to +60°C
Output calibration	Temperature: 0 - 1V for -40 to +60°C
	Humidity: 0 - 1V for 0 - 100%RH
	4 - 20mA output available on request, 2 wire loop, 12V lift off 28V maximum

Supplied with 2m of cable. Protective steel conduit optional

Specification	RAINFALL
Transducer	Tipping Bucket
Aperture	400cm²
Resolution	Three models are available:
	0.1mm per tip
	0.2mm per tip
	0.5mm per tip
Accuracy	±1% (@ 1 litre per hour)
Capacity	Unlimited
Maximum tip rate	Approx. 2 tips per second
Operating temperature range	1 to 60°C
Supply voltage	7 - 20V DC
Power consumption	Typically 2 - 3mA
Output calibration	Simple reed switch contact closure, Nil current consumption

Supplied with 9m of cable. Protective steel conduit optional

Specification	STANDARD BAROMETER PRESSURE
Transducer	Temperature compensated silicon bridge
Range	800 to 1100mb
Operating temperature range	-10 to +60°C
Supply voltage	9 - 12V nominal (15V max.)
Power consumption	Approx. 10mA @ 12V
Output calibration	Nominally 0 to 1.6V range (800 to 1100mb). Units are individually calibrated and provided with offset and multiplier values.

Supplied with 0.8m of cable

Contact Details

Sales	Tel: +44 (0) 1234 841468	Fax: +44 (0) 1234 841490	
Service	Tel: +44 (0) 1234 844146	Fax: +44 (0) 1234 841490	e-mail: info@casella.co.uk

Absolute Humidity
Ratio of the mass of water vapour in the air to the total volume of the air (g/m^3).

Absolute Zero
Complete absence of energy and atomic movement defined as 0.00K, -273.15°C, or -459.67°F.

Absorption
The process of transferring matter or energy into another body.

Acclimatisation
The ability of a body to adapt to its thermal environment.

Accuracy
The numerical difference between an instrument reading and the true value of the quantity being measured. Often expressed as limits that will not be exceeded when the instrument is used within it's stated operational conditions, i.e. ±5°C.

Actual Pressure
The atmospheric pressure at the level of measurement.

Advection
The horizontal transport of heat or cold, in the atmosphere, or the oceans. When a warm air mass passes over a cold land or sea surface it causes the air to cool and the water vapour held within it to condense.

Air Temperature
Typically expressed in °C, it is the temperature of the ambient air.

Air Velocity
The magnitude and direction of air flow, typically expressed in metres per second.

Ambient
The surrounding environment atmosphere.

Ambient Monitoring
The monitoring of air quality outside buildings, being representative of the air that the general (or identified) population is breathing.

Ambient Noise
Encompassing sound, at a given location, usually made up from the sounds from many sources, both distant and close-by.

Ambient Pressure
The pressure of the ambient air sometimes referred to as barometric pressure.

Ambient Temperature – ta
The average temperature of the air surrounding an instrument/sensor or experienced by the operative during the work activity. This parameter forms one of the fundamental input values for the calculation of various derived values related to heat stress.

Analogue-To-Digital Converter
A device or circuit which outputs a digital number corresponding to an analogue signal input at that level.

Anemometer
An instrument for measuring the speed of wind or air.

Aneroid Capsule
A thin semi-evacuated metal capsule, which when used in a barometer deforms with changes in pressure. One end being fixed and the other moves a pen on a chart or a hand on a dial. Aneroid means without air.

Area, Effective Radiating (A_r)
The surface area of a body, that exchanges radiant energy with a radiant source, measured in m^2.

Area, Wetted (A_w)
The area of skin covered in sweat, expressed in m^2.

Atmometer
The generic name for instruments used to measure the rate of evaporation of water into the atmosphere.

Audible Sound
Sound of such character as to excite the sensation of hearing.

Beaufort Wind Scale
A system of estimating and reporting wind speed with reference to the behaviour of objects such as trees, smoke, and the surface of the sea.

Bel
A unit of level of a power quantity proportional to the base-ten logarithm of the ratio of two values of the quantity, where one value is usually a reference power. In acoustics, sound power is proportional to the square of sound pressure and the bel is also used to express the ratio of two pressures. The reference sound pressure is 20 micropascals.

Black Globe Temperature
The temperature within a matt black, hollow sphere. It monitors the radiant temperature of the ambient air.

Boiling Point
The temperature when a liquid transforms to a gas. For example water boils at 100°C at sea level.

Brownfield Site
An area of land which has previously been used (e.g. industrial buildings) and may therefore be derelict and/or contaminated.

Campbell Stokes Sunshine Recorder
Recognised as the primary standard instrument for sunshine hours recording.

Carbon Dioxide
A colourless, odourless, un-reactive gas commonly produced by combustion and decay. It is also an asphyxiant.

Carbon Monoxide
Formed when carbon is burned in a limited supply of oxygen, resulting in incomplete combustion. It is tasteless, odourless, colourless and extremely toxic.

CE
A mark to identify conformity to European Standards.

Celsius
Temperature scale where the ice point of water is 0°C and the boiling point of water is 100°C at sea level.

Cloud
Formed as air cools to its dew point and relative humidity reaches 100%. The air is cooled by advection or convection, resulting in different cloud types (see Precipitation). Clouds will only exist as long as the rate of condensation is equal or greater than the rate of evaporation of water droplets on the clouds' edges, to the surrounding air.

Clouds can be classified in three ways:
- By shape and structure
- By height of the cloud base
- By amount

Cloud Base
For a given cloud layer, the lowest level in the atmosphere that contains a visible quantity of water droplets.

Communication Port (Comms Port)
A serial or parallel connection used to input/output information from a computer or a piece of hardware.

Convection
The process of heat flow and transfer that involves the movement of the medium itself. For example if a liquid is heated from below, the lower part gets warmer and as a result expands. The warmer liquid is now less dense and therefore rises, to be replaced by the cooler liquid from above. This is in turn heated and the cycle continues.

Convective Heat Transfer (C)
The net heat exchange between a body and it's environment.

Convective Heat Transfer Coefficient (H_C)
The rate of heat transfer between a body and the ambient air per m^2 of skin exposed, expressed as kcal, Btu, or W.

Dew
The formation of moisture droplets on or near the ground. Occurs when an object's temperature has fallen below the dew point temperature of the surrounding air.

Dew Point
The temperature at which the water vapour in the air first starts to condense, typically expressed in °C.

DSE
See Display Screen Equipment

EMC
Electro Magnetic Compatibility – European Standards.

EN
European standard prefix.

EPA
Environmental Protection Agency (USA)

Eutrophication
Occurs when phosphates and nitrates collect in reservoirs/rivers and cause accelerated plant growth, especially surface algae. In turn this prevents light from reaching other plant life, which in time die. The algae's rapid growth and the decomposition of the dead plant matter uses up the available oxygen in the water resulting in widespread bacteria which do not rely upon oxygen. The bacteria produce hydrogen sulphide, a toxic gas, which kills most animal life in the water.

Evaporation
The loss of liquid as it changes from the liquid to gaseous phase:
- Evaporation gauge – *See Atmometer*
- Hook gauge – Used to measure the change in water level in an evaporation pan. Normally placed in a still well, the hook is adjusted till the point just breaks the surface of the water. The change in water level is read off the attached micrometer
- Evaporation pan – A means of observing the change in level of a free water surface for example the Casella CEL class 'A' pan
- Evaporation rate – The volume of liquid

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

water evaporated per unit area in unit time. Usually measured as the depth of liquid lost per unit time for the whole area

- Evaporative power/capacity – A measurement of the degree to which the weather or climate of a region is favourable to evaporation. Normally recognised as the rate of evaporation, under the current conditions, from a surface, which is chemically pure and has the same temperature as the lowest layer in the atmosphere
- Piche evaporimeter – An instrument that uses a filter paper disc as an evaporating element. The amount of water evaporated is read on a graduated tube

Fahrenheit
Temperature scale where the ice point of water is 32°F and the boiling point of water is 212°F at sea level.

Freezing Point
The temperature at which a substance turns from its liquid phase to its solid phase.

Hail
Irregular lumps of ice with diameters normally ranging from 5 to 50mm.

Hydrometeor
A term for atmospheric water in any of its states, i.e. clouds, rain, mists, hail.

Hyperpyrexia
A body core temperature exceeding 40°C (104°F).

Hysteresis
The maximum difference in output for any given input (within the specified range) when the value is approached first with increasing and then with decreasing input signals.

Isobar
An imaginary line connecting points of equal pressure.

Isotherm
An imaginary line connecting points of equal temperature.

Knot
Nautical unit of speed. One nautical mile per hour equals 1.1508 statute miles per hour.

Leachate
The liquid arising from landfill sites, derived directly and indirectly from waste materials. It can be highly polluting.

LUX
The luminescence per square metre, of surface area.

Mains Voltage and Frequency
UK – 230V -10% +5% @ 50Hz
Europe – 220V +10% -5% @ 50Hz
USA – 110V @ 60Hz

Maximum Thermometer
Used to record the maximum temperature over a period of time by having a constriction in the bore just above the bulb as shown below.

The thermometer is mounted at about 5° from the horizontal, with the bulb downwards. To set the thermometer it is grasped firmly about half way along the stem and given a shake by a quick rotation of the wrist as shown above.

Mean Radiant Temperature – tr
Value associated with the radiation temperature in °C experienced by the operative from radiating surfaces. These surfaces act as heat sources that will add to the heat load of the operative and consequently cause the core temperature to rise.

Meniscus
The upper curved surface on a column of liquid due to surface tension.

Micron
1 millionth of a metre, 1 x 10^{-6}m.

Minimum Thermometer
Used to record the minimum temperature over a period of time. When the temperature falls, the surface tension of the column top is high enough to draw the index down the bore. When the temperature rises again the index remains in its lowest position. The minimum temperature is indicated by the end of the index furthest from the bulb. To reset, raise the bulb end so that the index runs along the bore to touch the column end, see below

Mist
Liquid droplets suspended in the atmosphere. Mist reduces visibility to a lesser extent than fog.

Modem - Modulator/Demodulator
A device that allows computers or electrical equipment to communicate using telephone lines.

MSL
Mean Sea Level

Natural Wet-Bulb Temperature
A temperature sensor covered with a wet wick that measures the cooling effect due to evaporation in ambient air conditions.

Parameter
A measured or calculated value.

Particulate
- Aerosol – Liquid or solid particles suspended in air
- Mist or Fog – Liquid aerosol, fog is made up of larger particles than mist
- Dust – Solid particles in the air, produced by an abrasive or mechanical action
- Fumes – Solid particles formed by condensation after volatilisation of welding or flame cutting
- Smokes – Similar size to fumes, produced during combustion

Period Data
A measured sound level data set generated over an interval of observation which is shorter than a run-time interval and which may be repeated many times during the run-time.

PM_{10}
Particulate matter having a mean aerodynamic diameter of 10 microns, usually relates to ambient particulate monitoring.

PPB
Parts Per Billion

PPM
Parts Per Million

Precipitation
Occurs when moisture droplets form in clouds and the up current is no longer able to support them. Rising air causes the water in it to condense.

Pressure (P), hPa, mb.
Barometric pressure is concerned with measuring the weight of air above the measuring device. Typically, high pressure is associated with good weather and low pressure is associated with poor weather.

Measurement is generally related to a common datum point i.e. mean sea level = QNH, runway elevation = QFE.

Pressure, Atmospheric (p_a)
Pressure exerted by the weight of the air, it is 760mmHg at sea level and decreases with altitude and increases with depth

Pressure Drop (Back Pressure)
The differential pressure across a restriction, such as a filter; normally measured in cm of H_2O.

Psychrometer
An aspirated instrument used to measure the water vapour content of the air. Uses a wet bulb and dry bulb thermometer.

Radiant Heat Exchange (R)
Heat exchange by two radiant surfaces at different temperatures.

Radiant Heat Transfer Coefficient (h_r)
The rate of heat transfer between two black surfaces, per unit temperature difference.

Radiation – Solar
- Net Radiation – The difference between incoming and outgoing total radiation
- Net Solar Radiation – The difference between solar radiation directed downward and upward
- Solar Radiation – Total electromagnetic radiation emitted by the sun
- Global Radiation – The total of direct solar radiation and diffuse sky radiation received by a unit's horizontal surface

- Diffuse Solar Radiation – Downward scattered and reflected solar radiation, coming from the whole hemisphere with the exception of the solid angle of the suns disc on a surface perpendicular to the axis of this cone
- Direct Solar Radiation – Radiation coming from the solid angle of the suns disk, opposed to radiation from any other source
- Reflected Solar Radiation – Upward directed solar radiation, reflected by the earth's surface and the atmosphere
- Scattered Radiation – Solar radiation that is scattered by particles in the atmosphere
- Spectral Solar Radiation – Solar radiation of selected wavelengths
- Total Radiation – The sum of Solar and Terrestrial radiation
- Terrestrial Radiation – Total infra-red radiation emitted from the Earth's surface

Rain
Precipitation at least 0.5mm in diameter, may reach 5mm by coalescence, at this point they can no longer be held within the cloud and fall.

Rain Gauges
An instrument to measure the total depth of rain fall over a specified time period.

Real-Time
The monitoring of changes to parameters as they occur.

Relative Humidity (%RH or U)
This term is the ratio between the partial pressure of water vapour and the water vapour saturation pressure. This value is often expressed as a percentage.

Repeatability
The ability of an instrument to record the same consecutive output value, from the same input values operating under the same conditions.

Resolution
Smallest incremental change which can be measured by an instrument.

Response Time
The time it takes an instrument to register a designated percentage (usually 90%) of a step change in the variable being measured.

Run-Time
The measurement time elapsing from start to finish.

Sensor
A device that responds to a change in condition.

Stevenson Screen
Slatted box design to shield meteorological instruments from direct radiation and precipitation.

Still Well
A cylinder placed in a body of water or evaporation pan, to hold a float or hook gauge. It allows water in and out thus providing an accurate representation of the water level, whilst proving a calm level surface to take a measurement from.

Telemetry
The transmission of data over a distance.

Temperature (T)°C
The degree or intensity of heat of a body in relation to others.

Temperature, Core (t_{cr})
Temperature of the tissues and organs of the body, sometimes called Deep Body Temperature.

Temperature, Radiant (t_r)
See Black Globe Temperature

Thermohygrograph
Device for recording temperature and humidity onto a chart.

Charts available:
- Daily
- Weekly
- Monthly

Transducer
A device which converts one form of energy to another, for example wind energy to electrical energy in an anemometer.

Turbulence Intensity
Expressed as a percentage and is calculated from the ratio of the standard deviation to the average measured air flow.

Vapour
Liquid or moisture diffused or suspended in air.

Vaporisation
Process by which a liquid or solid is converted into a vapour by heat/energy. Unlike boiling, which occurs at a fixed temperature, vaporisation can occur at any temperature. Its rate increases with rising temperatures.

Wet Bulb Depression
The difference between the wet and the dry bulb temperatures of a hygrometer.

Wind
- Anabatic wind – An up-slope wind due to local surface heating, opposite of katabatic wind
- Backing – A change in wind direction in a counter clockwise movement, opposite of veering
- Cross wind– Wind speed perpendicular to a given reference heading, for example a runway heading
- Downdraft – A relatively small scale downward moving current of air.
- Downwind – The direction to which the wind is blowing
- Foehn – A warm, dry wind on the lee side of a mountain range, caused by adiabatic compression on descent
- Gravity wind – A wind directed down a slope caused by a greater air density near the slope than at the same level some distance horizontally from the slope. Sometimes called a Katabatic wind
- Gust – Sudden brief increase in the speed of the wind, followed by a lull
- Head wind – Wind blowing in the opposite direction to the heading of a moving object
- Katabatic wind – Any wind blowing down an incline, if warm it is foehn, if cold it is a gravity wind
- Leeward – Side facing away from the wind
- Local level wind sheer – A local variation in the wind direction or speed, i.e. changes from a head wind to a tail wind
- Lull – A momentary decrease in the speed of the wind
- Monsoon – Seasonal wind with a persistent direction, pronounced change in direction between seasons
- Tail wind – A wind blowing in the same direction as a moving object
- Upwind – In the direction from which the wind is blowing
- Veering – A change in wind direction in a clockwise movement, the opposite of backing
- Wind sheer – Local variation of any kind of wind vector
- Windward – Side facing the wind

Wind Velocity
A vector which includes both the wind speed and direction.

CASELLA CEL
Instrumentation
Tel: +44 (0) 1234 844100
Fax: +44 (0) 1234 841490

NOTES

Your local distributor is:

Head Office:
Casella CEL
Regent House
Wolseley Road
Kempston
Bedford
MK42 7JY
UK

Tel: + 44 (0)1234 844100
Fax: + 44 (0)1234 841490
Email: info@casella.co.uk

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