6.3 Order List

When ordering from this list, please quote the catalogue reference number.

178031C	Anemometer standard
178032C	Anemometer standard + Heater
178033C	Anemometer standard + Conduit
178034C	Anemometer standard + Heater + Conduit
178035C	Windvane standard
178036C	Windvane + Heater
178037C	Windvane + Conduit
178038C	Windvane + Heater + Conduit
178050B	Sensor Interface Module

Each sensor is supplied complete with a 01-178015A Mounting Bracket.

ALTERATION WITHOUT NOTICE

Please note that the contents of this manual may be subject to alteration without notice.

ANEMOMETER & WINDVANE Wind Speed & Direction Sensors

User Handbook
HB 3276-03

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6. MAINTENANCE

6.1 Routine Care

Cleaning may be carried out using a soft damp cloth. Solvents or other cleaning products should not be used.

Apart from cleaning, no other regular maintenance is required, as the number of moving parts is so few and the bearings on the main spindle are sealed against dust etc.

If the average wind speed is low and weather conditions moderate it is estimated that six years life can be expected from the bearings. With a higher than average wind velocity and a bad exposure, for example near the sea, then 4 to 5 years might be expected. At the end of this time it is recommended that the bearings be replaced with new ones. Consult Casella CEL Service Department.

6.2 Service

We recommend factory service by technicians trained and equipped to repair your instrumentation.

Casella CEL's in house service department offers a comprehensive range of repair and calibration services, designed to effect a fast and efficient back-up for all our products. The Service Department is operated under the scope of our BSI registration for products manufactured by us. We will however, undertake the repair of other manufacturers equipment.

For further information please contact the service department at our Bedford headquarters. We will be happy to provide quotations for individual repairs or provide annual maintenance under contract. Should you wish factory repair assistance, send your equipment in a package equivalent to the original packaging. Insure to full value and ship pre-paid. Include a letter giving full details with your packing list.

Send to: CASELLA CEL LIMITED
(Service Department)
Regent House
Wolseley Road
Kempston
Bedford
MK42 7JY
United Kingdom

If purchased outside of the United Kingdom, please return to your distributor.

Standard Interfacing

RS 232:	±9 V, 4800 baud, 8 data 1 stop bit, no parity, as per wind direction sensor, output load 3 kΩ minimum.
RS 485 / RS 422:	Differential output, 5 V no load, 1.5 V minimum (RS 485), 2 V minimum (RS 422).

Once connected, operate the monitoring system as decribed in the relevant system operating instructions.

1. INTRODUCTION

Performance and reliability are the key characteristics of these wind speed and direction sensors from Casella CEL.

Competitively priced for OEM users, these high quality sensors are housed within compact units that can be used in conjunction with each other via a wind sensor interface module. Both meet Meteorological and WMO requirements. Harsh environmental conditions present no problem to the units - they're manufactured from anodised aluminium.

The Casella Anemometer and Windvane are professional sensors intended to provide reliable and accurate measurement of wind speed and direction, combining traditional Casella quality with modern electronics. They have been developed to offer very smooth and reliable mechanical operation with a minimum of maintenance.

The rotational speed of the Anemometer is monitored using a non-contacting design that provides an output directly proportional to wind speeds up to 75 m/sec. The output is suitable for feeding monitoring systems such as the Casella Automatic Weather Station.

The Windvane incorporates the very latest technology, using a giant magneto resistive (GMR) sensor to offer accurate and frictionless sensing. It has an electrical output proportional to the direction of the wind. The output, with no deadband at north, is also suitable for feeding monitoring systems such as the Casella Automatic Weather Station.

In addition, an NMEA serial output can be made available from the Windvane containing both wind direction and wind speed information updated four times per second. When used with the Sensor Interface module, reliable long distance communications can be provided.

Versions of both sensors are available with heaters, with 2.55 m of conduit and with heater plus conduit.

2. ANEMOMETER - WIND SPEED SENSOR

The sensitive anemometer is based upon a three-cup rotor design. An infra-red light source and optical sensor provide 20 pulses from 0 to 5 V per revolution.

The frequency of the pulses is directly proportional to the wind speed.

Figure 1 shows the general arrangement of the standard wind speed sensor.

Versions are available with additional features as follows.

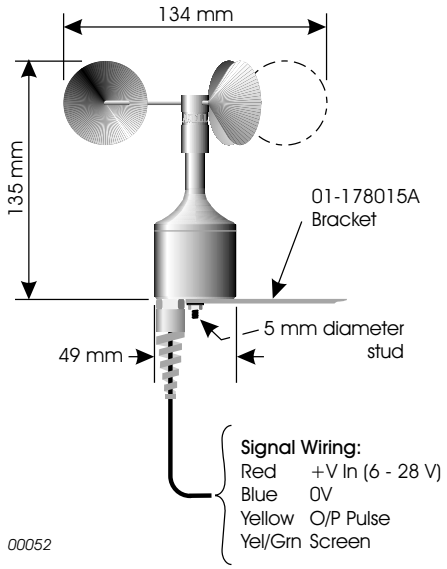

Figure 1: Anemometer wind speed sensor

178031C	Anemometer with 4.5 m cable,
178032C	Anemometer plus heater and two 4.5 m cables,
178033C	Anemometer with 3.25 m cable in a 2.55 m reinforced conduit,
178034C	Anemometer plus heater and two 3.25 m cables in 2.55 m reinforced conduits.

The main casing of the anemometer wind speed sensor has an M5 x 18 mm stud that can be used for fixing it to the mast top or to the bracket supplied for alternative mounting arrangements.

All sensors are delivered as standard with a mast Mounting Bracket with pre-drilled Ø 5.1 mm mounting holes for the sensors. Whatever screwed adapter or flange is employed at the junction between anemometer and mast or bracket, a locknut must be used for full security. The standard model has a single gland and connecting cable with wires colour coded as shown in Figure 1.

The models supplied with a heater have an additional gland and connecting cable for the heater supply. This has connectors coded as shown in Figure 2.

10	Direction Out: 0 - 1.8 V
11	Signal Ground
12	Speed Out: 0 - 2 V

Table 4: SKT4 - Instrument Power

Pin Number	Application
1	+V in (6 - 28 V)
2	Power Ground
3	Shield Ground

Notes 1: Shield Ground should be connected to Power Ground at the instrument's power supply.

2: Twisted pair wires are preferred to connect the signal outputs of the Interface Module with other equipment. Connect one wire of each pair to signal ground and carry the signal via the other wire of the pair.

3: Use "comms ground" as the return signal for RS 232 output or as the "common" signal for RS 422/RS 485 connection..

5.2 Interface Specifications

General

Supply voltage:	6 - 28 V DC.
Power consumption:	12 mA approx. excluding loop currents and sensor loads.

4 - 20 mA Loop Only: Speed and Direction

Output compliance:	(Supply voltage - 1.5 V) minimum.
Maximum permissible load:	Depends on supply voltage, 180 Ω at 6 V, 470 Ω at 12 V, 1000 Ω at 24 V, 1200 Ω at 28 V.
Safety current limit:	27 mA.

DC Output Voltages Only

Output impedance:	470 Ω.
Wind speed output:	0 - 2 V DC for 0 - 75 m/s wind speed.
Wind direction output:	0 - 1.8 V DC for 0 - 359° wind direction.

The following tables list connections to the four sockets in the 178050B Sensor Interface Module.

Table 1: SKT1 - Wind Speed

Pin Number	Application	Colour
1	Shield Ground	-
2	Signal Ground	-
3	Speed In	Yellow
4	+Vin (6 - 28V)	Red
5	Signal Ground	Blue
6	Shield Ground	Yellow / Green

Table 2: SKT2 - Wind Direction

Pin Number	Application	Colour
1	NMEA Output	Green
2	Signal Ground	-
3	Direction In	Yellow
4	Signal Ground	White
5	+V in (6 - 28 V)	Red
6	Power Ground	Black
7	Shield Ground	Yellow / Green
8	Speed In	Blue

Table 3: SKT3 - Output

Pin Number	Application
1	Direction Out: 4 - 20 mA
2	Signal Ground
3	Speed Out: 4 - 20 mA
4	Signal Ground
5	RS 485 Channel B
6	Comms Ground
7	RS 485 Channel A
8	RS 232 Out
9	Shield Ground

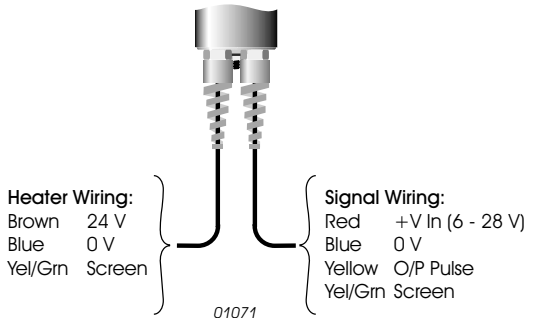

Figure 2: Connections for anemometer versions with heaters

2.1 Anemometer Specifications

Transducer type:	Optical interrupter
Maximum wind speed:	75 m/s
Starting velocity:	Typically 0.3 m/s
Distance constant:	3.5 m/s
Time constant:	Typically <0.5 s
Output calibration:	12.75 Hz/m/s
Resolution:	7.84 cm
Output signal:	0 - 5 V pulses
Pulses/revolution:	20
Non-linearity:	<±0.6%
Accuracy:	±0.3 m/s below 3 m/s ±1% over 3 m/s
Supply voltage:	6 to 28 V DC
Power consumption:	3 mA
Stabilisation time:	<1 s from power up
Operating temperature:	-20 to +70°C
Heater option:	24 V DC / AC, 100 Ω 6 W
Connecting cable;	4.5 m without conduit 3.25 m with conduit
Conduit:	2.55 m

3. WINDVANE - WIND DIRECTION SENSOR

The Windvane is a small lightweight GMR design that offers a rapid response to changes in wind direction. The analog output changes from 0 to 1.8 V as the wind direction changes from 0 to 359°.

An NMEA output enables direct connection of sensors to the Casella Multimet display system. When the sensors are connected together as described in Chapter 5, the digital output message will contain both speed and direction data. This output provides reliable long distance digital transmission when used with the sensor interface module.

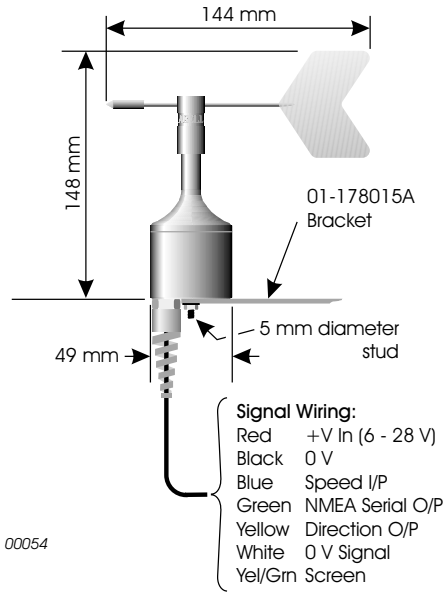

Figure 3: Wind-vane wind direction sensor

Figure 3 shows the general arrangement of the standard wind direction sensor. Versions are available with additional features as follows.

178035C	Windvane with 4.5 m cable,
178036C	Windvane plus heater and two 4.5 m cables,
178037C	Windvane with 3.25 m cable in a 2.55 m reinforced conduit,
178038C	Windvane plus heater and two 3.25 m cables in 2.55 m reinforced conduits.

The main casing of the Windvane has an M5 x 18 mm stud that can be used for fixing it to the mast top or to the bracket supplied for alternative mounting arrangements.

All sensors are delivered as standard with a mast Mounting Bracket with pre-drilled Ø 5.1 mm mounting holes for the sensors. Whatever screwed adapter or flange is employed at the junction between windvane and mast or bracket, a locknut must be used for full security. The standard model has a single gland and connecting cable with wires colour coded as shown in Figure 4.

5. SENSOR INTERFACE MODULE

5.1 Connection

The Sensor Interface Module converts standard sensor outputs into formats suitable for long distance transmission (4 - 20 mA, RS 232, RS 485).

Separate 0 - 2 V and 0 - 1.8 V voltage outputs are also available for the wind speed and wind direction sensors. These can be adjusted, but it should be noted that doing so will also affect the calibration of the 4 - 20 mA loop outputs.

The four multi-turn potentiometers on the printed circuit board have the following functions.

R41	set "4 mA" level on 4 - 20 mA output (wind direction),
R24	set "4 mA" level on 4 - 20 mA output (wind speed),
R32	set "20 mA" level on 4 - 20 mA output OR set DC output voltage span (wind direction),
R2	set "20 mA" level on 4 - 20 mA output OR set DC output voltage span (wind speed).

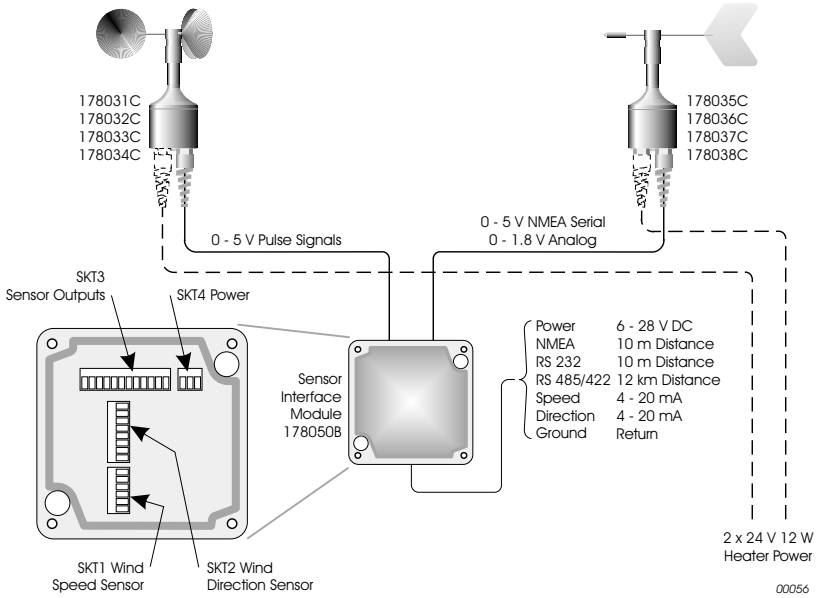

Figure 5: Connections for the anemometer and windvane

Figure 5 illustrates the connection possibities for the various versions of the anemometer and windvane sensors. Connect as appropriate to your system.

4. MECHANICAL INSTALLATION

4.1 The Site

A suitable site must be chosen for the sensors that is free from turbulence caused by trees, buildings, hills etc. The site should not be sheltered so that the sensors do not record the true wind conditions. Neither should the site be unduly exposed in a position such as on the crest of a steep hill where more than the average wind velocity is encountered.

In particular, it should be noted that a **roof does not provide** suitable exposure unless the instruments are mounted well above it. For example, a pitched roof produces strong upward air movement, whose strength varies with the direction of wind relative to the roof angle.

The ideal mounting is a tower, mast or pole about 10 to 15 meters above the mean ground level. This should be even higher if the ground is obstructed by trees buildings etc.

Make sure the Windvane is correctly oriented towards north !

Use the two small recess markers in the base plate and the "N" marker on the instrument case to orient the Windvane towards north.

4.2 The Mast

When deciding on the type of mast to erect, the following points should be considered.

- ¤ Restrict access to the mast to avoid interference and vandalism.
- ¤ Use adequate guy wires to stop vibration, particularly of the top section.
- ¤ Sometimes a mast may be shared with another user who has some other requirement than meteorology.

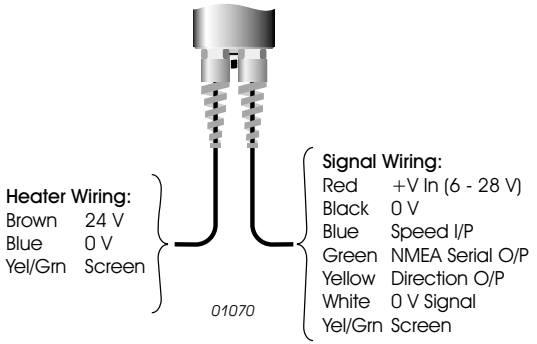

Figure 4: Connections for Wind-vane versions with heaters

3.1 Windvane Specifications

Transducer type:	GMR solid state system with microcontroller
Maximum wind speed:	75 m/s
Resolution:	1°
Accuracy:	<±2°
Aligning threshold:	<0.8 m/s for a 10° offset
Damping ratio:	0.25
Distance constant:	Typically 3.0 m
Undamped natural wavelength:	2.2 m
Repeatability;	0.5% FSD
Electrical angle:	0 to 359° no deadband at North
Nominal output signal:	0 to 1.8 V DC for 0 to 359° representing a 1 s rolling average updated 5 times per second
NMEA serial output:	When anemometer is connected, 0 to 5 V level data containing both direction and speed information updated 4 times per second
Supply voltage:	6 to 28 V DC
Power consumption:	3 mA
Stabilisation time:	<1 s from power up
Operating temperature:	-20 to +70°C
Heater option:	24 V DC / AC, 100 Ω 6 W
Connecting cable;	4.5 m without conduit 3.25 m with conduit

Note *: The design of this sensor does not allow electrical adjustment. Where the greatest accuracy is not demanded (better than ±2°), these sensors can be interchanged.
However where higher accuracy is required, the setting up procedure given in Section 3.2 can be followed.

Conduit: 2.55 m

Two small recesses in the base plate and an "N" marker on the instrument case identify the position for north.

3.2 Setting Up for Highest Accuracy

The design of this sensor does not allow for electrical adjustment. Where the greatest accuracy is not demanded (better than $\pm 2^{o}$), these sensors can be interchanged. However where higher accuracy is required, an offset, multiplier and voltage per degree can be determined for the sensor as described here.

1. Rotate the windvane head until it gives the lowest direction (yellow) output reading (for example +0.01 V).
   This output indicates the direction of 0^{o}, north.
2. Rotate the head to give the highest reading (for example 1.785 V).
3. Subtract the lowest reading from the highest to obtain the span.
   For example 1.785 - 0.01 = 1.775 V
4. Divide the span by the 359^{o} swept arc to obtain the voltage / degree.
   For example $1.775 / 359 = 0.00495 V/^{o} = 4.95 mV/^{o}$
5. Similarly, divide the arc by the span to obtain the multiplier.
   For example 359 / 1.775 = 202.25
6. Obtain the offset by subtracting the lowest (0^{o}) output from 0 V (i.e just change the sign).
   For example 0 - 0.01 = -0.01 V
   The example gives the following results:
   Reading: $4.95 mV / ^{o}$
   Multiplier: 202.25
   Offset: -0.01 V.

3.3 RS 232 / NMEA Record Output Format

Each wind direction and speed output is the average of the last 4 x 250 ms readings, i.e. a 1 second average over the last second. This is calculated every 250 ms and is followed by a carriage return and newline character. Every 500 ms the following NMEA type record is output.

WSD ddd,ssss,c

where:	16 characters output (inc space, commas and CR/LF).
ddd =	"000"-"359" Direction degrees.
ssss =	"00.0"-"99.9" or "100." to "999." wind speed in m/s. The maximum that can be displayed is approx "159."
c =	"0","1" or "2".

0 =	Uncalibrated.
1 =	Calibrated,
2 =	Calibrated since power on.

Example WSD records:

WSD 125,34.5,0 if never calibrated,
WSD 348,102.,1 if using last calibration stored in E2rom,
WSD 002,07.8,2 if has been calibrated since powered on.

Every 250 ms the following NMEA record is output.

$MHWAS,ddd,w,nnnn,N

where:	21 characters output (inc space, commas and CR/LF).
$ =	Start of all NMEA marine standard messages
ddd =	000 - 180 Degrees left or right from 0 degree direction.
w =	L/R Left/Right of 0 degree position. (Note that 180^{o} is always shown as Right.)
nnnn =	00.0 - 99.9 or 100. - 999. knots wind speed.
N =	Units knots

Example $MHWAS records:

$MHWAS,007,L,35.4,N
$MHWAS,179,R,115.,N

The data output sequence is as follows.

Record Type	**Time (mS)**
WSD	0 ms,
$MHWAS	0 ms will be same data as WSD 0 ms, except the units are changed,
$MHWAS	250 ms,
WSD	500 ms,
$MHWAS	500 ms will be same data as WSD 500 ms, except the units are changed,
$MHWAS	750 ms,
WSD	1000 ms,
$MHWAS	1000 ms will be same data as WSD 100 ms, except the units are changed,
$MHWAS	1250 ms,
Etc.	

Therefore, every 250 ms, either a single line or 2 record lines are output. These are output at 4800 baud 8 data 1 stop no parity with NO handshaking.

The NMEA output of this instrument provides signals between 0 V and +5 V. This is compatible with most RS 232 computer inputs - but is not guaranteed.

For compatibility with all RS 232 computer inputs, use the RS 232 output from the Interface Module.