

INSTRUCTION MANUAL



MMW-005 **Solid State Wind Sensor**

Dec 2010



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TABLE OF CONTENTS

1. Introduction.....	2
2. Principle of Operation	3
3. Specifications	3
4. Installation	4
5. Wiring	6
5.1. Output String According to NMEA 0183:.....	7
6. CR1000 Example Program	7
7. Maintenance	9

TABLE OF FIGURES

Figure 1 MMW-005 Sensor & Mounting Base	2
Figure 2 Integrated Circuit	2
Figure 3 C2410 Mounting Bracket	4
Figure 4 Mounting Base Separated from Sensor	5
Figure 5 Mounting Base Attached.....	5
Figure 6 True North Orientation Mark	6
Figure 7 MMW-005 Mounted	6

1. Introduction

The MMW-005 is a solid state wind sensor type (Figure 1), which uses a specialized chip to measure wind speed and wind direction based on the temperature differences across the chip surface. These temperature differences are processed by a small microprocessor in the sensor, resulting in a serial signal for the indication of wind direction and wind speed. The output signal of the sensor is RS-422 and is standardized according to NMEA-0183



Figure 1 MMW-005 Sensor & Mounting Base

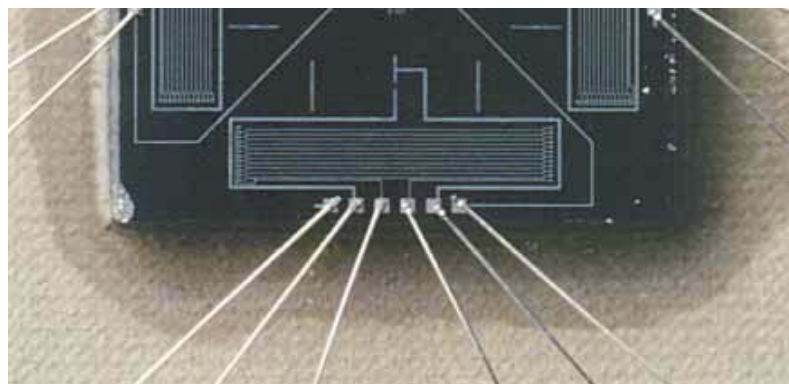


Figure 2 Integrated Circuit

2. Principle of Operation

The Solid State Wind sensor uses a temperature sensitive element to measure wind direction and wind speed. The sensing element shown in Figure 2 consists of a specially designed ceramic plate which incorporates an integrated circuit (IC). The IC temperature is maintained at a constant value above ambient temperature. Two pairs of thermocouples are mounted on the IC at right angles.

If there is airflow, the thermocouples measure the temperature difference over the IC surface. These values are then converted to a measure of the wind speed and direction. Guide discs along the top and bottom of the sensor ensure that wind passes through the sensor in the correct manner. Mathematical processing by the microprocessor and signal conditioner results in a RS422 signal for wind speed and wind direction according to the NMEA 0183 standard. The wind sensor has no moving parts, which assures a long lifespan with only a minimum of maintenance.

3. Specifications

Operating Range:	Wind speed : 0...90 km/hr
Min. wind speed:	0.72 km/hr (<i>values < 0.72 = 0 km/hr</i>)
Wind direction:	0..360° <i>Values for wind direction at wind speed < 1.8 km/hr = not valid</i>
Inaccuracy:	Wind speed : 1.8 km/hr \pm 3% @ 20°C
Wind direction:	\pm 3° @ 20°C
Response time:	< 1 second
Stabilization time:	< 1 hour after switching on
Dimensions:	Ø 120 mm, height 105 mm
Weight:	200 grams
Material:	Stapron N
Operating temp.:	-25 to +70°C
Static discharge:	The instrument is protected against outside inductive

Water ingress:	interference up to a discharge power of 600 Watt Sealed to IP65
Mounting:	Vertically, free-standing
Connection:	4-wire cable (0.34mm ²), shielded
Supply voltage:	12 V DC +/- 10%
Power consumption:	125 mA maximum continuous
Communication Output:	RS-422 (NMEA 0183 protocol) serial
Baud rate:	4800
Data bits:	8
Stop bits:	1
Parity:	none

4. Installation

The MMW-005 is mounted to either a horizontal or vertical pipe with the use of the C2410 Mounting Bracket (Figure 3). The C2410 can be mounted to a pipe with an outside diameter ranging from 0.75 inches to 2.0 inches.

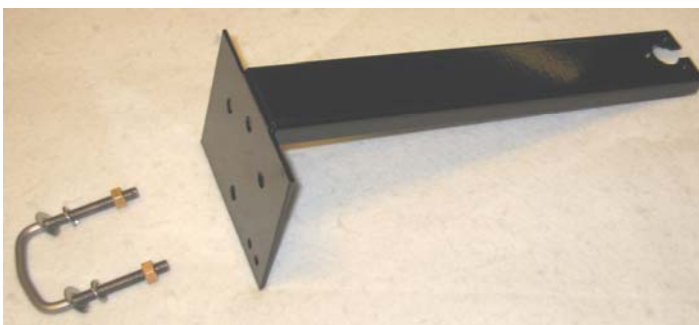


Figure 3 C2410 Mounting Bracket

Begin the installation process by removing the mounting base from the MMW-005 (Figure 4). This can be done by placing one hand under the bottom disk of the sensor. Then with your other hand, grip the mounting base and pull it away from the sensor.

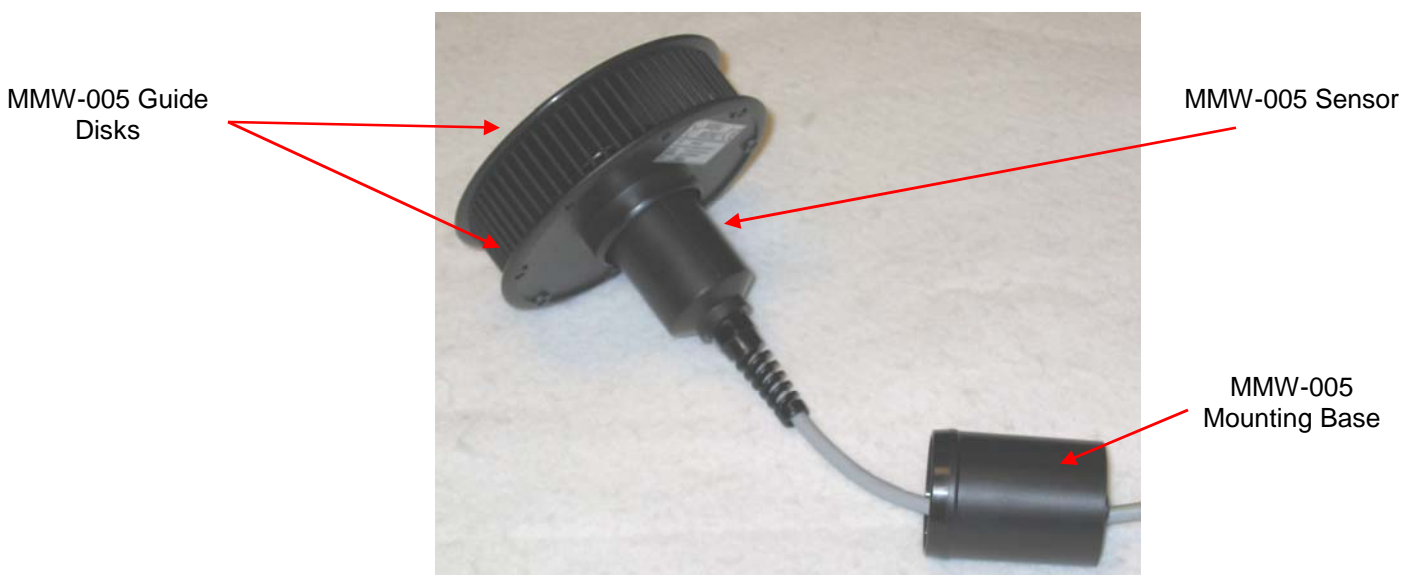


Figure 4 Mounting Base Separated from Sensor

Using the three screws supplied with the C2410 mounting bracket, attach the sensor base to the C2410 (Figure 5). The screws will need to be lined up with the threaded holes located on the mounting bracket. It is recommended to leave the sensor cable in place, as it can slide into the notch provided at the tip of the bracket.



Figure 5 Mounting Base Attached

Before reattaching the MMW-005 to the mounting base make note of the Orientation mark (Figure 6) on the top of the MMW-005. This mark will need to be orientated to **True North** in order to provide an accurate measurement of wind direction. It may be helpful with the orientation process to align the symbol along the length of the C2410 mounting bracket.



Figure 6 True North Orientation Mark

Once the orientation of the MMW-005 has been determined, place the sensor in the mounting base in the required orientation. You will then need to push the sensor into the base until it is completely secured (Figure 7).



Figure 7 MMW-005 Mounted

The MMW-005 and C2410 can now be mounted to the intended pipe using the provided v-bolt and hardware. Consideration should be given to the proper siting of the sensor to ensure that all potential obstacles are avoided.

5. Wiring

Connections should be made according to Table 1. The wind sensor can be connected directly to the Rx port of the datalogger.

CAUTION Always connect the White lead last.

Wire	Function	Datalogger Connection*
White	Power	+12V
Brown	Power Reference	G
Green	Output Transmit	Rx terminal of Com Port**
Clear	Shield	G

* Wiring valid for CR800 series, CR1000, and CR3000

**Com Port will vary depending on availability. Should be either of C2, C4, C6, or C8 of the CR1000

5.1. **Output String According to NMEA 0183:**

NMEA B = GREEN
 Baud rate = 4800
 Data bits = 8
 Stop bits = 1
 Parity = none

Format: \$WIMWV,ddd,R,ss.s,M,A<CR><LF>

Description:

\$ = Start of sentence
 WI = Device type: Weather Instruments
 MWV = Wind speed and direction
 ddd = Wind direction value [0..359°]
 R = Relative to the vessel (not applicable)
 ss.s = Wind speed value [0..25.5 m/s]
 M = Unit for wind speed [m/s]
 A = Data always valid for MMW-005

6. CR1000 Example Program

The MMW-005 is measured with the use of a datalogger Control Port. The Control Port receives the RS422 data string that the MMW-005 automatically sends approximately once per second. RS422 is an Electronics Industries Association (EIA) recommended standard to extend the RS232 50 foot limit. In this configuration it provides for unidirectional data transmission.

The default units of measure are degrees (wind direction) and meters per second (wind speed). If other units are required then the measurements will need to be manipulated in the datalogger program. The following example shows the

conversion from meters per second to kilometer per hour.
Refer to Table 2 for conversion factors for wind speed.

Table 2. Wind Speed Conversion Factors	
Units	Conversion Factor
Kilometers per Hour	3.6
Knots	1.944
Miles per Hour	2.237
Feet per Second	3.281

```
'CR1000 Series Datalogger

'Declare Public Variables
Public MMW005 As String * 20
Public NBytesReturned
Public MMW005Values (2) As Float

Alias MMW005Values (1) = Wind_Dir
Alias MMW005Values (2) = Wind_Speed

'Define Data Tables
' Note: These tables are examples only. Specific applications may require different outputs.
DataTable (Wnd2Min,True,-1)
  DataInterval (0,2,Min,10)
  '2 minute averages of WindDir and WindSpeed
  WindVector (1,Wind_Speed,Wind_Dir,IEEE4,False,0,0,0)
  FieldNames ("Mean_Horizontal_Wnd_Spd;,Unit_Vector_Mean_Wnd_Dir;,Standard_Deviation_Wnd_Dir")
EndTable

DataTable (Wnd10Min,True,-1)
  DataInterval (0,10,Min,10)
  '10 minute average of WindDir and WindSpeed
  WindVector (1,Wind_Speed,Wind_Dir,IEEE4,False,0,0,0)
  FieldNames ("Mean_Horizontal_Wnd_Spd;,Unit_Vector_Mean_Wnd_Dir;,Standard_Deviation_Wnd_Dir")
EndTable

DataTable (Wnd60Min,True,-1)
  DataInterval (0,60,Min,10)
  'Hourly Averages of Wind Speed and Direction
  WindVector (1,Wind_Speed,Wind_Dir,IEEE4,False,0,0,0)
  FieldNames ("Mean_Horizontal_Wnd_Spd;,Unit_Vector_Mean_Wnd_Dir;,Standard_Deviation_Wnd_Dir")
  Maximum (1,Wind_Speed,FP2,False,True)
  SampleMaxMin (1,Wind_Dir,FP2,False)
EndTable

'Main Program
BeginProg
  SerialOpen (Com1,4800,0,0,10000)
  Scan (5,Sec,0,0)

  'Character 36 is $, and Character 13 is CR.
  SerialInRecord (Com1,MMW005,36,0,13,NBytesReturned,01)
  SplitStr (MMW005Values(),MMW005,"",2,0)

  'Convert Wind Speed from m/s to km/hr
  *** Other Conversion Factors can be used as required ***
  MMW005Values (2) = MMW005Values (2) * 3.6

'Call Output Tables
CallTable (Wnd2Min)
CallTable (Wnd10Min)
CallTable (Wnd60Min)
```

NextScan EndProg

7. Maintenance

The wind sensor has no moving parts, and requires no other maintenance than the cleaning of the sensor itself. The time interval for cleaning will depend on the installation site.