ONWA®

KW-360

OPERATOR'S MANUAL

Ultrasonic Weather Station

CE FC

CONTENTS

FOREWORD

Thank you for choosing ONWA KW-360 ultrasonic weather station. This product does not have any moving parts, does not require maintenance and does not require calibration.

KW-360 is a powerful, lightweight product with no moving parts. This sensor measures wind speed and direction, temperature, humidity, air pressure and altitude. This product can be interfaced with a computer, with ONWA 99 series products or other products with format for communications with a weather station.

In order to fully take advantage the use of this product. We recommend reading this operation manual completely before using the unit.

Again, Thank you for choosing ONWA.

1.QUICK SETTING

If you will be using the KW-360 with another ONWA product and to know how you will be able to correctly link the RS-232 in the computer, please refer to the following chapters:

Chapter 4: Data Format
Chapter 8: Installation

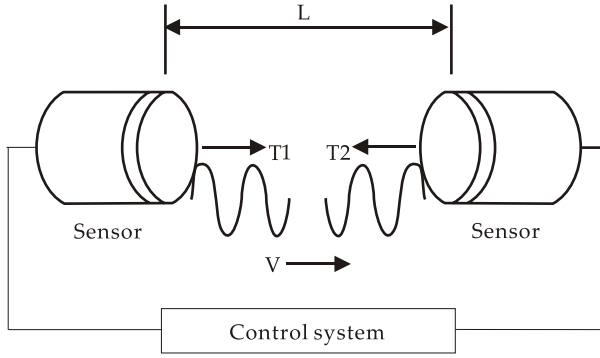
If you have already installed the unit and is successfully using the KW-360,we still recommend that you further read this manual and its chapters to fully take advantage of KW-360 and get the best results.

2.SPECIFICATIONS

Wind speed	
Range	0~40m/s
Precision	±2%（at 12m/s）
Resolution	0.01m/s
Measurement Unit	m/s
Wind	
Range	0 ~ 359.9°
Resolution	0.1°
Temperature	
Temperature measurement range	-20℃ ~ +75℃
Temperature measurement accuracy	±0.5℃
Temperature resolution	0.1℃
Measurement Unit	℃
Humidity	
Humidity measurement range	10% ~ 99.9%
Humidity measurement accuracy	±2%RH (25℃)
Humidity resolution	0.1%RH
Pressure	
Measurement unit	Pa
Measurement range	30000 ~ 110000Pa
Altitude	
Measurement unit	m
Measurement range	+9000m ~ 0m
Communication format	
Hardware interface	RS232、RS485
Baud rate	2400、4800、9600、19200、38400
Working environment	
Waterproof grade	IP65
Working temperature	-20℃ ~ +75℃
Storage temperature	-30℃ ~ +80℃
Working humidity	<5% ~ 100%
Electromagnetic compatibility	IEC60945
Input source	10.5VDC ~ 40.5VDC
Mechanical properties	
Size / weight	165×165×140（L×W×H）mm <1kg

3.WORKING PRINCIPLE

The principle behind KW-360 is mainly through the measurement of the transmission time of the ultrasonic wave from the S sensor to the N sensor, in comparison to the Transmission time from the N sensor to the S Sensor.(N= North, S= South). In Addition, comparing the transmission time from W to E and E to W, vice versa. (W= West, E= East). For Example, If the wind is blowing from the North, the travel time of the ultrasonic wave from N to S will be shorter than the time it will travel from S to N, and also from W to E and E to W. The speed and direction of the wind can be measured by calculating the transmission time difference between the two points.



$$T2 = \frac{L}{C - V} \qquad T1 = \frac{L}{C + V}$$

$$V = \frac{L}{2}\left\{\frac{1}{T1} - \frac{1}{T2}\right\} \qquad C = \frac{L}{2}\left\{\frac{1}{T1} + \frac{1}{T2}\right\}$$

L= Sensor surface spacing

C= Ultrasonic velocity

V= Air velocity

T1、T2 = Ultrasonic transmission time

4.DATA FORMAT

4.1 NMEA-0183 (default setting)

• Wind speed

```
$OWMWV , 57.8，R , 30.64，M , A * 2E
         |    |    |    |    |    |
         1    2    3    4    5    6
```

1 = Wind direction

2 = Reference standard, R = Relative, T = True

3 = Wind speed

4 = Wind speed unit (M=m/s)

5 = State, A = Data valid

6 = Checksum

• Humidity

```
$OWXDR , H , 58.6 , P , 2 * 69
         |    |    |    |    |
         1    2    3    4    5
```

1 = Sensor type (H = Humidity sensor)

2 = Measurement data

3 = Unit (P=Relative Humidity)

4 = Sensor number

5 = Checksum

• Temperature and Air Pressure

```
$OWXDR , C , 27.6 , C , 3 , P , 99834 , P , 4 * 74
        |   |   |  | |    |   |   |  |
        1   2   3  4 5    6   7   8  9
```

1 = sensor type (C = temperature sensor)

2 = temperature measurement data

3 = temperature unit (C=℃)

4 = sensor number

5 = sensor type (P = pressure sensor)

6 = pressure measurement data

7 = air pressure unit (P=Pa)

8 = sensor number

9 = checksum

• Altitude

```
$OWRMZ , 121.8 , M ,2 * 2A
         |     | |  |
         1     2 3  4
```

1 = measurement data

2 = measurement unit (M=meters)

3 = fixed position size (2 = User height 3 = GPS height)

4 = checksum

5.USING ONWA WIND MONITOR

KW-360 can be directly connected to the ONWA KPXX99 series to access the wind monitor (installed in the latest firmware version of KPXX99 series). When connected to the KPXX99 unit, change the mode to access the Wind monitor. In the Wind monitor you can select the wind speed unit in the menu. (Please refer to the KPXX99 user manual)

Important :

• Refer to Chapter 8.5.1 and 8.5.2 for the connection of KW-360 and ONWA KPXX99 (Wind Screen) via RS485 and RS232.

• Must use NMEA format.

• Although ONWA KPXX99 Wind monitor can display wind speed in different units, please make sure the data output of KW-360 must be:

- Wind in m/s
- Temperature in ℃
- Pressure in Pa

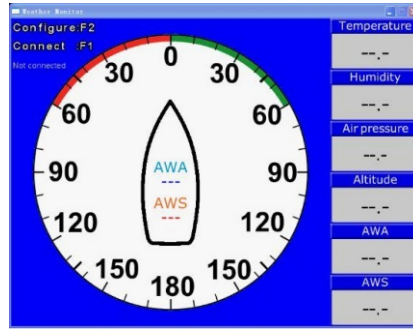
(These are Factory Default Settings)

6.WIND SOFTWARE

ONWA provides a PC Wind Software for the KW-360 unit. Through the software the customer is able to set the baud rate, can display the temperature, humidity, pressure, altitude, wind direction and wind speed data of the KW-360 on the computer,

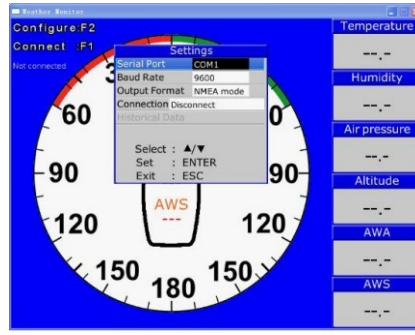
1. KW-360 sends and receives the data when connected to the computer and establishes a two way communication;

2, Run the Wind software, as shown below.

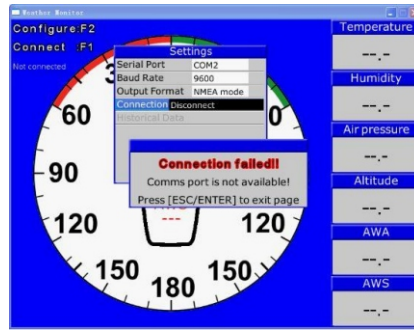


Note: function key F1 is for the connection / disconnection function and does not carry on the data disposition, Function key F2 on the other hand may on the data disposition.

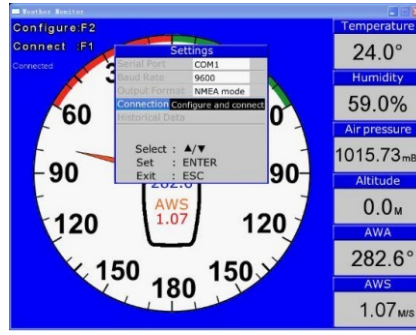
3.When the data line is connected, press F2 function key and a pop up menu will appear. This menu is where the configuration setting may be changed. (KW-360 default baud rate of 9600) . Refer to the diagram below.



4.Set the necessary configuration. Set the appropriate serial port otherwise a "Connection Failed" warning message will appear in the window as shown below.



5.After setting the configuration properly and setting the serial connection options to "configure and connect ", This time the interface in the upper left corner of the state will display" connecting... ". If the configuration is not successful, the state will display "Connection failed! ". The user can disconnect the serial even after further connection configuration is done, or another baud rate configuration was chosen. If the configuration is successful, the state will display" connected "and the column data will display the data shown below:



6.After succesful configuration, the user can press the ESC button to exit the configuration set-up.

7.INSTALLATION PREPARATION

7.1 Equipment List

Description	Qty
KW-360 Ultrasonic Weather Station	1
8 core power/data cable(15meters)	1
KW-360 bracket	1
Square iron	1
U type zinc plated iron screw	2
Butterfly shaped steel nut	4
User's Manual	1

7.2 Packaging

When the KW-360 is transported to the installation site, the instrument must be included in the package. Please do not throw away any packaging materials, which can be used for easy transportation.

7.3 Installation requirements

Host system:

The KW-360 communication format (RS232 or Rs485) uses the same serial port, suitable for terminal simulation of software packages, such as 9X windows, Windows 2000, XP windows operating system that comes with a super terminal.

Cable used in connecting KW-360 and host system.

(Different output types have different wire length limits)

Mounting:

KW-360 stand: 40mm diameter,3mm thickness.

For more information please refer to Chapter 8: Installation.

8.INSTALLATION

Do not squeeze the sensor or remove the sensor from the buffer, otherwise Warranty will be void.

8.1 Installation guide

• KW-360 can be used in a variety of harsh environment, without maintenance and calibration.

• Make sure that the KW-360 is not disturbed by other devices, such as radio/radar transmitter, ship engine, generator etc., because these devices may not be in accordance with the general standards.

Guidance:
1. Do not install with any radar scanning device nearby, keep at least 2m distance.

2. It is suggested that the antenna is kept at the following distance:
VHF-1m
MF/HF-5m

• Use the cable provided by ONWA to ensure continuous power supply of KW-360 in operation. If the cable is cut-off, there is no correct connection for the shielding, the electromagnetic capability may be reduced.

• To avoid obstructions such as trees, poles, tall buildings and to avoid turbulence that can affect the accuracy of KW-360. KW-360 is best installed on the side of the prevailing wind.

8.2 Test Bench System

Before using the KW-360, we recommend that users perform a test to ensure that the system is properly installed, In order to check the capability of the unit, compatibility of the power supply with the selected host system and cable(if the correct cable length is achieved) and to check whether the wiring is correct.

8.2.1 Bench Test

• Connect the KW-360 to the host with the data cable and connect to the power source.
• Using a fan, or a hair dryer or any similar equipment that can blow wind, may be used to ensure that the instrument can detect the wind. Now, try blowing the wind in different directions, this test allows you to see if the instrument can work in two axial.
• Note that this is just a quick test, no need for calibration adjustments. When KW-360 is in use, you do not need to re-calibrate.

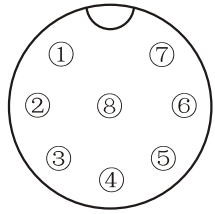
8.3 Electrical part

8.3.1 Cable Length

The following table shows the recommended maximum cable length and baud rate.

Communication format	Baud rate	Maximum cable length
RS232	9600	6.5m
RS485	9600	1km

8.3.2 External Interface



Pin1------RS232IN +	White
Pin2------RS232IN -	Blue
Pin3------RS485 +	Yellow
Pin4------RS485 -	Green
Pin5------POWER INPUT +	Red
Pin6------POWER INPUT -	Black
Pin7------RS232OUT +	Brown
Pin8------RS232OUT -	Grey

8.4 Computer Connection via RS232

Note:

• Some computers with RS232 serial port that has been installed with terminal simulation program such as 9X windows,windows2000 and XP windows super terminal can easily be connected with KW-360.

• The maximum cable length is 6.5m (reference 8.3.1 cable length).

• If there is a need to use longer cable length, we recommend using RS485 output and connect it to the computer via the RS485/232 converter.

KW-360(8 core connector)			Computer serial port (DB9)	
Signal name	Pin		Name	Pin
232OUT +	7	———	RXD	2
232OUT -	8	———	GND	5
232IN +	1	———	TXD	3
232IN -	2	———	GND	5
Power +	5	———	+ DC Power Supply(12V)	
Power -	6	———	-	

8.5 Connection to ONWA KP-XX99 (via Wind Screen)

8.5.1 Connection to any ONWA KP-XX99 through RS 232 interface

KW-360			KPXX99	
Signal name	Pin		Name	Pin
232OUT +	7	———	NMEA0183IN1 +	1
232OUT -	8	———	NMEA0183IN -	2
Power +	5	———	+ DC Power Supply(12V)	
Power -	6	———	-	

8.5.2 Connection to any ONWA KP-XX99 through RS485 interface

KW-360			KPXX99	
Signal name	Pin		Name	Pin
485OUT +	3	———	NMEA0183IN -	2
485OUT -	4	———	NMEA0183IN1 +	1
Power +	5	———	+ DC Power Supply(12V)	
Power -	6	———	-	

8.6 Machinery

Before installation, please refer to the 8.2- Test Bench System.

8.6.1 Positioning

Generally, KW-360 is mounted on a vertical mounting tube to ensure that the measurement is on the same horizontal plane.
For Indoor use, KW-360 can be installed in any direction that the wind can be measured on different planes.

8.6.2 Alignment

For moving vehicle/boat, the alignment indentation must point forward and be parallel to the centerline of the vehicle/boat. If installed in a Stationary surface, it is recommended that the alignment indentation point toward true north. For alignment, there are 2 triangles in the unit, one is on the support plate, and one on the base for ease of alignment.

Note: use the compass to determine the correct direction for easy installation.

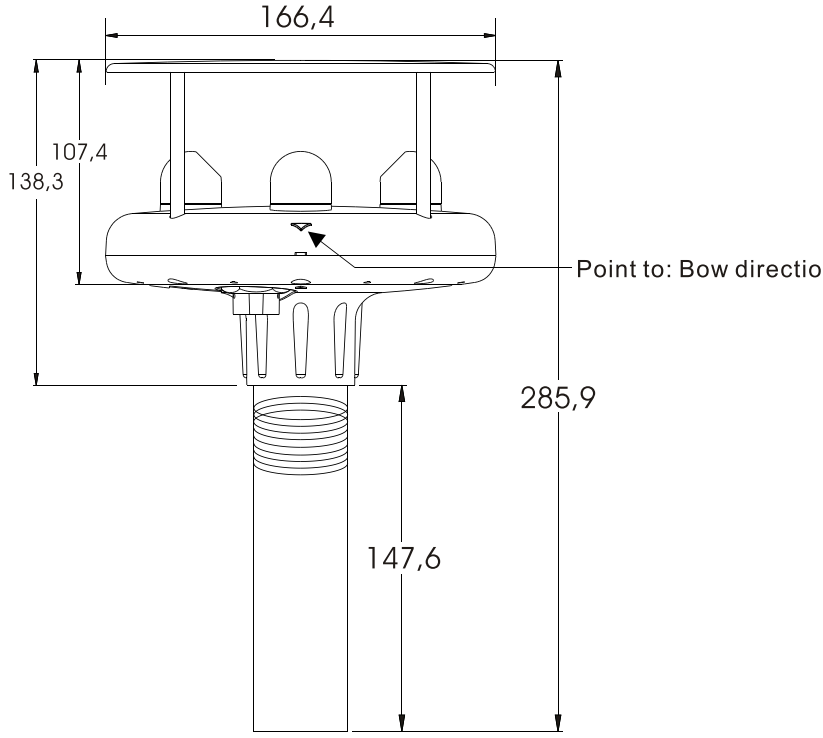
8.6.3 Installation

First step is to install the bracket to the KW-360 unit, locate the corresponding thread of the unit and the bracket for easy installation.

Note: When installing the bracket to the unit, the holder should be tightened.

When installing the bracket in a fixed position, the instrument must be fixed in a vertical pipe installation. The unit is provided with (2) U-shaped screws, a square iron and (4) butterfly nuts, the instrument is then fixed on the mounting pipe.

The customer must ensure that the KW-360 is installed in an open area, in order to avoid obstruction. Do not install the KW-360 next to a high power radar or a radio transmitter device, always take note of the impact of the surrounding electronic interference and it is best to do an initial investigation of the surroundings.



9.MAINTENANCE AND FAULT DETECTION

9.1 Cleaning

If there is dust on the device, the user can use a soft (biodegradable) cloth and gently scrub the scrub the unit. DO NOT use a soluble agent. Carefully scrub the unit to avoid stratching the surface of the instrument. If the instrument is piled up with snow or ice, the user should wait for the slow and natural melting of the ice, DO NOT use any tool to forcely remove the ice to prevent damaging the unit.

9.2 Service

KW-360 does not have any moving parts and does not need to carry out routine maintenance. If the user opens the unit and damages the safety seal of the equipment, warranty will be void

9.3 Fault Detection

Incident	Solution
No Data Output	1. check the power supply voltage(10.5VDC~ 40.5VDC) , and the connecting cable to check if connection is correct. 2. check the KW-360 communication settings, the host system and modify the correct port settings;
Data output error	1. check the KW-360 communication settings and the host system; 2. try to use low baud rate; 3. check the cable length and wire type;
Data display abnormal	Check whether the KW-360's sensors are blocked;

9.4 Return

If the instrument needs to be returned, please carefully pack the instrument in the original packaging, ship to ONWA authorized agents near your location and attach the report for the incident experienced with the instrument.