

*5 in 1*

# Anemometer, Humidity meter Light Meter, Thermometer Sound level meter

Model : LM-8102



Your purchase of this 5 in 1 METER marks a step forward for you into the field of precision measurement. Although this METER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.



**OPERATION MANUAL**

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# 1. FEATURES

- \* 5 in 1 professional measuring instrument: Anemometer, Hygrometer, Type K Thermometer, Light meter. Sound level meter.
- \* Anemometer use low-friction ball bearing mounted wheel design provides high accuracy.
- \* Light meter use exclusive photo diode and color correction filter light sensor, spectrum meets C.I.E. photopic.
- \* Type K thermometer use standard type K (NiCr-NiAl) thermocouple input jack suitable for all kinds of type K probe.
- \* Humidity meter use high precision humidity sensor with fast response time.
- \* Sound level meter's characteristic is simulated as " Human Ear Listing" response, used the " A " frequency weighting and " Fast " time weighting to meet IEC 61672 class 2.
- \* Sound level meter can cooperate the external 94 dB sound calibrator and just press the front buttons to make the calibration
- \* Built- in microprocessor circuit assures excellent performance and accuracy.
- \* Concise and compact buttons arrangement, easy operation.
- \* Memorize the maximum and minimum value with recall.
- \* Hold function to freeze the current reading value.
- \* °C/°F detection by pressing button on the front panel.
- \* Lux/Feet-candle selection by pressing front button.
- \* Air velocity measuring units selection by pressing button on the front panel for five kinds of units.
- \* Multi channel display for relative humidity and temperature measured values or air velocity and temperature measured values at the same time.
- \* Zero button design makes light meter calibration.
- \* Rough housing case suitable for handling with one hand,

## 2. SPECIFICATIONS

### 2-1 General Specifications

Display	LCD display, LCD soze : 41.5 x 31.5 mm.
Measurement	5 in 1 : <i>Anemometer ( Air velocity + Temp. )</i> <i>Humidity ( %RH + Temp. )</i> <i>Light</i> <i>Thermometer ( type K )</i> <i>Sound level</i>
Operating Humidity	Max. 80 %RH.
Operating Temperature	0 to 50° C (32 to 122° F)
Over Input Display	Indication of "- - - -"
Data Output	RS 232/USB PC serial interface. <i>* Connect the optional RS232 cable  UPCB-02 will get the RS232 plug.</i> <i>* Connect the optional USB cable  USB-01 will get the USB plug.</i>
Power Supply	DC 1.5 V battery ( UM4, AAA ) x 6 PCs, Or DC 9V adapter input. @ AC/DC power adapter is optional.
Power Consumption	Anemometer : Approx. DC 11 mA. Other functions : Approx. DC 7.5 mA.
Weight	335 g/0.74 LB ( battery included ).
Dimension	HWD 248 x 70 x 34 mm ( 9.8 x 2.8 x 1.3 inch).
Standard Accessory	Instruction Manual..... 1 PC
Optional Accessories	Carrying case, Type K Temperature probe, Sound Calibrator/SC-941. USB cable/USB-01, RS232 cable/UPCB-02, Data Acquisition software, SW-U801-WIN

## 2-2 Electrical Specification ( 23 ± 5°C )

### **Anemometer ( Air velocity/Temp. )**

<i>Measurement</i>		<i>Range</i>	<i>Resolution</i>
Air velocity	ft/min	80 to 5910 ft/min	1 ft/min
	m/s	0.4 to 30.0 m/s	0.1 m/s
	km/h	1.4 to 108.0 km/h	0.1 km/h
	MPH	0.9 to 67.0 mile/h	0.1 MPH
	knots	0.8 to 58.3 knots	0.1 knots
	Temperature ( Semiconductor )	32 to 122 °F 0 to 50 °C	0.1 °F 0.1 °C

<i>Measurement</i>	<i>Range</i>	<i>Accuracy</i>
Air velocity	80 to 5910 ft/min	$\leq 20 \text{ m/s} : \pm 3\% \text{ F.S.}$ $> 20 \text{ m/s} : \pm 4\% \text{ F.S.}$
	0.4 to 30.0 m/s	
	1.4 to 108.0 km/h	
	0.9 to 67.0 mile/h	
	0.8 to 58.3 knots	
	32 to 122 °F	± 2.5 °F
	0 to 50 °C	± 1.2 °C

*Remark :*

*ft/min : feet per minute*

*MPH : miles per hour*

*m/s : meters per second*

*knots : nautical miles per hour*

*km/h : kilometers per hour*

### **Type K Thermometer**

<i>Measurement</i>	<i>Range</i>	<i>Resolution</i>
Temperature ( Type K )	-148 to 2372 °F	0.1 °F
	-100 to 1300 °C	0.1 °C

<i>Measurement</i>	<i>Range</i>	<i>Accuracy</i>
Temperature ( Type K )	-148 to 2372 °F	± (1% rdg + 2°F)
	-100 to 1300 °C	± (1% rdg + 1°C)

## ***Hygrometer ( Humidity/Temp. )***

<i>Measurement</i>		<i>Range</i>	<i>Resolution</i>
Humidity	%RH	10 to 95 %RH	0.1 %RH
	Temperature	32 to 122 °F	0.1 °F
	( Semiconductor )	0 to 50 °C	0.1 °C

<i>Measurement</i>	<i>Range</i>	<i>Accuracy</i>
Humidity	10 to 95 %RH	< 70 %RH : ± 4 %RH ≥ 70 %RH : ± ( 4%rdg + 1.2 %RH )
	32 to 122 °F	± 2.5 °F
	0 to 50 °C	± 1.2 °C

## ***Light***

<i>Measurement</i>		<i>Range</i>	<i>Resolution</i>
Light	Lux	0 to 2,200 Lux	1 Lux
		1,800 to 20,000 Lux	10 Lux
* auto range	Ft-cd	0 to 204.0 Fc	0.1 Ft-cd
		170 to 1,860 Fc	1 Ft-cd
Temperature ( Type K )		-148 to 2372 °F	0.1 °F
		-100 to 1300 °C	0.1 °C

<i>Measurement</i>	<i>Range</i>	<i>Accuracy</i>
Light	0 to 20,000 Lux	± 5% rdg ± 8 dgt
	0 to 1,860 Fc	
Temperature ( Type K )	-148 to 2372 °F	± (1% rdg + 2°F)
	-100 to 1300 °C	± (1% rdg + 1°C)

*Remark : Ft-cd : feet candle*

## Sound Level

Measurement Range	35 to 130 dB, Auto range																			
Resolution	0.1 dB.																			
Measurement Frequency	31.5 Hz to 8,000 Hz.																			
Weighting	Frequency Weighting	Characteristics of " A " frequency weighting network. * A weighting : The characteristic is simulated as " Human Ear Listing " response.																		
	Time Weighting	" Fast " time weighting.																		
Accuracy (23± 5 °C)	Characteristics of " A " frequency weighting network meet IEC 61672 class 2. Under 94 dB input signal, the accuracy are : <table border="1" style="margin-left: 40px; margin-top: 10px;"> <tr><td>31.5 Hz</td><td>± 3.5 dB</td></tr> <tr><td>63 Hz</td><td>± 2.5 dB</td></tr> <tr><td>125 Hz</td><td>± 2.0 dB</td></tr> <tr><td>250 Hz</td><td>± 1.9 dB</td></tr> <tr><td>500 Hz</td><td>± 1.9 dB</td></tr> <tr><td>1 K Hz</td><td>± 1.4 dB</td></tr> <tr><td>2 K Hz</td><td>± 2.6 dB</td></tr> <tr><td>4 K Hz</td><td>± 3.6 dB</td></tr> <tr><td>8 K Hz</td><td>± 5.6 dB</td></tr> </table>		31.5 Hz	± 3.5 dB	63 Hz	± 2.5 dB	125 Hz	± 2.0 dB	250 Hz	± 1.9 dB	500 Hz	± 1.9 dB	1 K Hz	± 1.4 dB	2 K Hz	± 2.6 dB	4 K Hz	± 3.6 dB	8 K Hz	± 5.6 dB
31.5 Hz	± 3.5 dB																			
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500 Hz	± 1.9 dB																			
1 K Hz	± 1.4 dB																			
2 K Hz	± 2.6 dB																			
4 K Hz	± 3.6 dB																			
8 K Hz	± 5.6 dB																			
Calibrator	B & K (Bruel & kjaer), multi-fuction acoustic calibrator, model : 4226.																			
Microphone	Electric condenser microphone.																			
Size of microphone	1/2 inch standard size.																			
Data Hold	Hold function to freeze the display value.																			
Optional Accessories	94 dB Sound Calibrator, Model : SC-941																			

*@ Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.*

### 3. FRONT PANEL DESCRIPTION

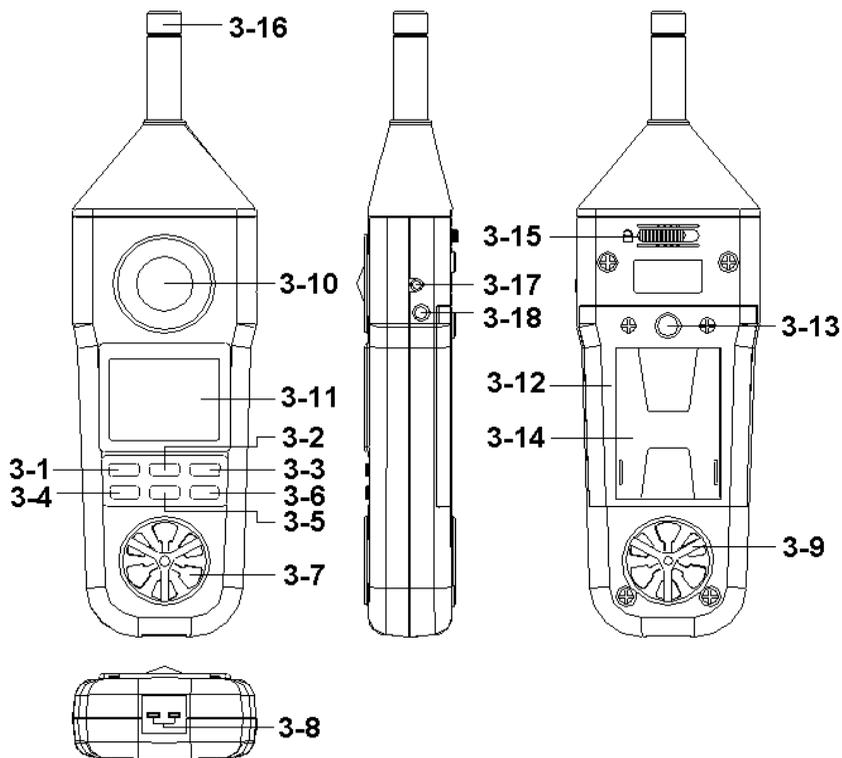


Fig. 1

- |                        |                                  |
|------------------------|----------------------------------|
| 3-1 Power Button       | 3-10 Light Sensor                |
| 3-2 Hold Button        | 3-11 LCD display                 |
| 3-3 Max. / Min. Button | 3-12 Battery Compartment / Cover |
| 3-4 Unit / Zero Button | 3-13 Tripod Fix Nut              |
| 3-5 °C/°F Button       | 3-14 Stand                       |
| Lux/Ft-cd Button       | 3-15 Lock Switch ( no use )      |
| 3-6 Function Button    | 3-16 Sound Probe Head            |
| 3-7 Air Flow Sensor    | 3-17 RS-232 Output Terminal      |
| 3-8 Temp. Input Socket | 3-18 DC 9V Power Adapter         |
| 3-9 Humidity Sensor    | Input Socket                     |

## 4. MEASURING PROCEDURE

### ***4-1 Air Velocity Measurement***

- 1) Power on the instrument by pressing the " Power Button " ( 3-1, Fig. 1 ).
- 2) Select the Anemometer function by pressing " Function Button " ( 3-6, Fig. 1 ) until the display show the the Anemometer unit ( ft/min, m/s, km/h, MPH, knots ).
- 3) Press the " Unit/Zero Button " ( 3-4, Fig. 1 ) to select unit that you want and then face the " Air Flow Sensor " ( 3-7, Fig. 1 ) to the source of wind.

*Remark :*

- \* *The display digits of " Air velocity measurement " are oriented 180° from the other function displays for easy exposure and output reading.*
- \* *The display will show the environment Temp. at the same time.*

- 4) Allow time for the reading to become stable and note the value indicated. From a practical point of view the velocity may fluctuate.

### ***4-2 Temperature Measurement ( Thermocouple )***

- 1) Power on the instrument by pressing the " Power Button " ( 3-1, Fig. 1 )..
- 2) Plug a type K thermocouple probe ( optional ) in the " Thermocouple Input Socket " ( 3-8, Fig. 1 ).
- 3) Select the Temperature function by pressing " Function Button " ( 3-6, Fig. 1 ) unit the Display only show the Temp. unit ( °C or °F ).
- 4) Contact the Thermocouple Sensor Head with measuring object and the reading value will be displayed on the LCD display.

### ***Measuring Consideration of Temperature Measurement ( Thermocouple )***

- \* Please make sure the polarity is correct when you plug a thermocouple probe in the Temp. input socket.
- \* The temperature difference between thermocouple probe and thermometer will cause an inaccurate measuring result. Therefore, for the best measuring and accuracy performance, whenever change a probe or plug a new probe, thermal equivalent between probe plug and meter's input socket is a necessary condition. Thermal equivalent procedure may take few minutes and apply only when the probe has been exposed to an ambient temperature different from the meter.

### ***4-3 Humidity & Ambient Temperature Measurement***

- 1) Power on the instrument by pressing the " Power Button " ( 3-1, Fig. 1 ).
- 2) Select the Relative Humidity function by pressing " Function Button " ( 3-6, Fig. 1 ) until the Display show the unit ( %RH ).
- 3) The reading value of humidity and temperature that are sensing from the " Humidity Sensor " ( 3-9, Fig. 1 ) will be displayed on the LCD display.
- 4) When the meter is applied in a new environment, a few minutes are required to reach a stable condition.

### ***4-4 Light Measurement***

- 1) Power on the instrument by pressing the " Power Button " ( 3-1, Fig. 1 ).
- 2) Select the Light Measurement function by pressing the " Function Button " ( 3-6, Fig. 1 ) until the light unit ( Lux, Ft-cd ) is displayed.
- 3) Press the " Lux/Ft-cd Button " ( 3-5, Fig. 1 ) to select measuring unit " Lux " or " Ft-cd ".

- 4) The Display will show the lighting value that sensing from the " Light Sensor " ( 3-10, Fig. 1 )

***Zero Offset Adjustment of Light Function :***

- \* For best results zero the light sensor prior to use in a dark environment. Placing the light sensor end of the meter under a desktop or flat surface so as to block any light can accomplish this. Then press the "Unit/Zero Button" ( 3-4, fig. 1 ) to set the meter indication to zero.
- \* Zero point can drift due to environment temperature and battery power change as well as for other reasons. It is recommended that the zero be checked frequently using the above procedure.

***4-5 Sound Level Measurement***

- 1) Power on the instrument by pressing the " Power Button " ( 3-1, Fig. 1 ).
- 2) Select the Sound Level function by pressing the " Function Button " ( 3-6, Fig. 1 ) until the Sound level unit ( dB ) is displayed.
- 3) Hold the instrument in hand and point the " Sound Probe Head /microphone " ( 3-16, Fig. 1 ) at measured noise source, the sound level value ( dB ) will be displayed on LCD.

*\* The sound level measurement is auto range ( 35 to 130 dB ).*

***4-6 Change °C, °F***

During the temperature measurement, if intend to change the temperature unit from " °C " to " °F " or " °F " to " °C " , then just press the " °C/°F Button " once.

## 5. OTHER FUNCTIONS

### ***5-1 Hold Function***

Whenever press the "Hold Button (3-2, Fig. 1)" will freeze the current reading value with a "HOLD" symbol on the display.

### ***5-2 Data Record Function***

- 1) The Data Record function records & displays the maximum and minimum reading values. Start the Data Record function by pressing the " Max./Min. Button " ( 3-3, Fig. 1 ) once. There will be a " REC " symbol on the display.
- 2) With the REC symbol on the display :
  - (a) Press the " Max./Min. Button " ( 3-3, Fig. 1 ) once and the " Max " symbol along with the maximum value will appear on the display.
  - (b) Press the " Max./Min. Button " again, the " Min " symbol along with the minimum value will appear on the display.
  - (c) To exit the memory record function, press the " Max./Min. Button " continuously for at least 2 seconds. The display will revert to the current reading.
  - (d) Clear the Max./Min. value recorded by pressing the " Hold Button " ( 3-2, Fig. 1 ) once. Previous recorded Max./Min. value will be given up and then revert to the REC. function keep on recording.

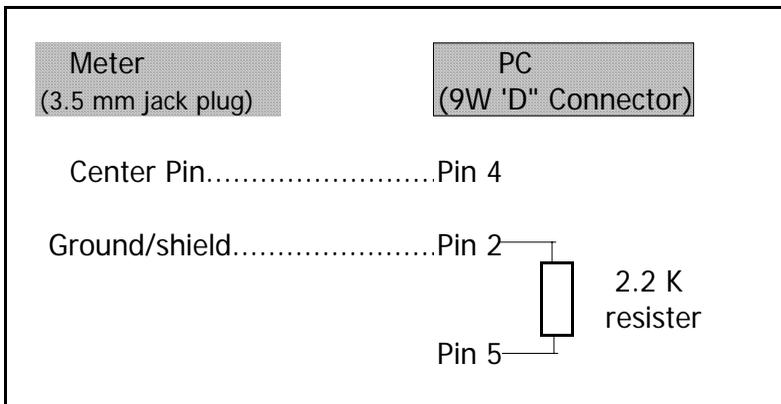
### ***5-3 Auto Power Off Disable***

In order to prolong the battery life, the instrument has "Auto Power Off " function. The meter will switch off automatically if no buttons are pressed for around 10 minutes.

## 6. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-17, Fig. 1 ).

The data output is a 16 digit stream which can be utilized for user's specific application. A RS232 lead with the following connection will be required to link the instrument with the PC serial port.



The 16 digits data stream will be displayed in the following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

**Each digit indicates the following status :**

D15	Start Word = 02		
D14	4		
D13	When send the upper display data = 1 When send the lower display data = 2		
D12 & D11	Annunciator for Display		
	°C = 01	°F = 02	m/S = 08
	km/h = 10	mph = 12	knot = 09
	FPM = 11	%RH = 04	dB = 17
	LUX = 15	Ft-cd = 16	
D10	Polarity 0 = Positive 1 = Negative		
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP		
D8 to D1	Display reading, D8 = MSD, D1 = LSD For example : If the display reading is 1234, then D8 to D1 is : 00001234		
D0	End Word = 0D		

**RS232 setting**

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

## 7. BATTERY REPLACEMENT

- 1) When the LCD display shows "  " symbol, it is necessary to replace the battery. However measurement may still be made for several hours after the low battery indicator appears.
- 2) Open the " Battery Compartment / Cover " ( 3-12, Fig. 1) and remove the battery.
- 3) Install the batteries DC 1.5 V battery, UM4/AAA x 6 PCs, and reinstate the cover.

## 8. OPTIONAL TEMPERATURE PROBE AND OTHER ACCESSORIES

Thermocouple Probe (Type K) TP-01	<ul style="list-style-type: none"> <li>* Measuring Range : -40 to 250 °C ( -40 to 482 °F )</li> <li>* Max. short-term operating temperature:</li> <li>* It's an ultra fast response naked-bead thermocouple suitable for many general purpose application.</li> </ul>
Thermocouple Probe (Type K) TP-02A	<ul style="list-style-type: none"> <li>* Measuring Range : -50 to 900 °C ( -50 to 1650 °F )</li> <li>* Dimension: 10 cm tube, 3.2 mm Dia.</li> </ul>
Thermocouple Probe (Type K) TP-03	<ul style="list-style-type: none"> <li>* Measuring Range : -50 to 1200 °C ( -50 to 2200 °F )</li> <li>* Dimension: 10 cm tube, 8 mm Dia.</li> </ul>
Thermocouple Probe (Type K) TP-04  * <i>surface Temp. probe.</i>	<ul style="list-style-type: none"> <li>* Measuring Range : -50 to 400 °C ( -50 to 752 °F )</li> <li>* Size : Temp. sensing head - 15 mm Dia. Probe length - 12 mm.</li> </ul>

RS232 cable UPCB-02	<ul style="list-style-type: none"> <li>* Isolated RS232 cable.</li> <li>* Used to connect the meter to the computer</li> </ul>
Data Acquisition software SW-U801-WIN	<ul style="list-style-type: none"> <li>* The SW-U801-WIN is a multi displays ( 1/2/4/6/8 displays ) powerful application software, provides the functions of data logging system, text display, angular display, chart display, data recorder high/low limit, data query, text report, chart report.. .xxx.mdb data file can be retrieved for EXCEL, ACCESS., wide intelligent applications.</li> </ul>
94 dB SOUND CALIBRATOR Model : SC-941	<ul style="list-style-type: none"> <li>* Professional, 1 KHz.</li> <li>* Die casting aluminum alloy housing case.</li> <li>* DC 9V batteries x 2 PCs.</li> <li>* Size : round 50 mm Dia. x 82 mm.</li> </ul>
Carrying case CA-05A	<ul style="list-style-type: none"> <li>* Soft carrying case with sash.</li> <li>* 260 x 110 x 55 mm.</li> </ul>