

+ Type k Temp, Pt 1000 ohm Temp,

# ELEVATOR TACHOMETER

Model : DT-2337



Your purchase of this ELEVATOR TACHOMETER 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

- \* Multi-functions, one instrument combine Photo Tachometer (RPM, rev/s) & Contact Tachometer ( RPM, rev/s,m/min.,m/s,cm/s,km,m,km/h,ft/min. ,in/min. ),Stroboscope ,Type K Thermometer, Pt 1000 Thermometer.
- \* High intensity white light beam for photo tachometer, safety and save the power energy.
- \* Wide measuring range from 0.5 to 100,000 RPM.
- \* 0.5 RPM resolution for the measured value < 1000 RPM.
- \* High precision with 0.05% accuracy.
- \* The last value, max., value, min. value will be stored into the memory automatically & can be obtained by pressing REC Button.
- \* Large LCD display.
- \* High visible LCD display gives RPM reading exactly with no guessing or errors & saves battery energy.
- \* This tachometer used the exclusive one chip MICRO-COMPUTER LSI circuit & crystal time base, offer the high accurate measurement & fast sampling time.
- \* The use of durable, long lasting components, including a strong, light weight ABS plastic housing, assures almost maintenance free performance for many years.
- \* The housing cabinet has been carefully shaped to fit comfortable in either hand.

## 2. SPECIFICATIONS

### 2-1 General Specifications

|                       |   |
|-----------------------|---|
| Display               | 43 mm x 33 mm LCD, 5 digits.<br>5 digits with display unit.   |
| Measurement           | 1.Photo Tachometer : (RPM, rev/s )<br>2.Contact Tachometer : ( RPM, rev/s,m/min.,m/s,cm/s,km,m,km/h, ft/min.,in/min. )<br>3. Stroboscope, 4. Type K Thermometer,5. Pt 1000 Thermometer.   |
| Operating Humidity    | Max. 80% RH.  |
| Operating Temperature | 0 to 50 °C ( 32 to 122 °F )   |
| Over Input Display    | Indication of "- - - -"   |
| Power Supply          | UM3-AA X 4 ( DC 4.5 V battery )   |
| Power Consumption     | Approx. DC 52 mA  |
| Weight                | 240g/0.53LB (Meter only)  |
| Dimension             | HWD 207 x 67 x 39 mm (81.5 x 26.3 x 15.3 inch).   |
| Time base             | Quartz crystal.   |
| Circuit               | Exclusive one-chip of microcomputer LSI circuit.  |
| Memory                | Last/Max./Min. value.   |
| Accessories Included  | Hard carrying case ..... 1 PC.<br>Reflecting tape marks<br>( 600 mm )..... 1 PC.<br>RPM adapter ( CONE )..... 1 PC.<br>RPM adapter ( FUNNEL )..... 1 PC.<br>Surface speed test wheel..... 1 PC.<br>Operation manual..... 1 PC.<br>Surface speed test wheel Connecting rod..... 1 PC.                      |
| Optional Accessories  | AC to DC adapter..... 1 PC.<br>USB cable (USB-01)..... 1 PC.<br>RS232 cable (UPCB-02)..... 1 PC.<br>Data acquisition software (SW-U801-WIN)..... 1 PC.<br>Excal data acquisition software(SW-E802)..... 1 PC.<br>Type K Temp. probe : TP-01 , TP-02A ,TP-03 , TP-04<br>TP-1000 (Pt-1000 ohm Temp. probe.) |

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

**Photo Tachometer**

|                                     |  |
|-------------------------------------|--|
| Measurement & Range                 | <i>Photo Tachometer :</i><br>5 to 99,999 RPM.  |
| Resolution                          | RPM:<br>0.5 RPM ( < 1,000 RPM ).<br>1 RPM ( ≥ 1,000 RPM ).   |
| Accuracy                            | ±( 0.05% + 1 digit ).  |
| Photo Tachometer detecting distance | 50 to 150 mm/2 to 6 inch. (typical max. 300 mm/12 inch, depending upon ambient light).<br><i>* Spec. of detecting distance are that under the size of reflecting tape is 10 mm square &amp; the measuring RPM value is 1,800 RPM. The max. &amp; min. detecting distance may change under different environment, different reflecting tape or the measuring RPM beyond 1800 RPM.</i> |

**Contact Tachometer**

| Mesurement unit | Mesurement Range                  | Resolution      | Accuracy             |
|-----------------|-----------------------------------|-----------------|----------------------|
| RPM             | 0.5 ~ 999.5<br>1000 ~ 19999       | 0.5<br>1        | ±( 0.05% + 1 digit ) |
| rev/s           | 0.008 ~ 16.658<br>16.658 ~ 333.31 | 0.008<br>0.01   | ±( 0.05% + 1 digit ) |
| m/min.          | 0.05 ~ 99,95<br>100.0 ~ 1999.9    | 0.05<br>0.1     | ±( 0.05% + 1 digit ) |
| cm/s            | 0.08 ~ 166.58<br>166.6 ~ 3333.1   | 0.08<br>0.2     | ±( 0.05% + 1 digit ) |
| m/s             | 0.0008 ~ 1.6658<br>1.666 ~ 33.331 | 0.0008<br>0.001 | ±( 0.05% + 1 digit ) |
| km              | 0.0000 ~ 99999                    | 0.0001 ~ 1      | ±( 0.05% + 1 digit ) |

|         |                              |               |                      |
|---------|------------------------------|---------------|----------------------|
| m       | 0.0008 ~ 99999               | 0.0001 ~ 1    | ±( 0.05% + 1 digit ) |
| km/h    | 0.003 ~ 5.997<br>6 ~ 119.99  | 0.003<br>0.01 | ±( 0.05% + 1 digit ) |
| ft/min. | 0.1 ~ 327.8<br>328 ~ 6559    | 0.1<br>1      | ±( 0.05% + 1 digit ) |
| in/min. | 1.9 ~ 3935.0<br>3937 ~ 78736 | 1.9<br>4      | ±( 0.05% + 1 digit ) |

NOTE: When using test wheel, accuracy can be affected as much as 0.5% of reading.

### Stroboscope Tachometer

|                    |  |                                 |  |
|--------------------|--|---------------------------------|--|
| Flash adjust range | 100 to 99,990 RPM/FPM.<br>* <i>RPM</i> : round per minute.<br>* <i>FPM</i> : flash per minute. |                                 |  |
| Resolution         | 0.1 RPM :<br>< 1,000 RPM.  | 5 RPM :<br>≥ 30,000-50,000 RPM  |  |
|                    | 1 RPM :<br>≥ 1,000-30,000 RPM  | 10 RPM :<br>≥ 50,000-99,990 RPM |  |
| Function buttons   | Digital rotate knob,<br>x 2 button, ÷ 2 button,<br>+ button, - button,                         |                                 |  |
| Accuracy           | ±(0.1 % + 2d)  |                                 |  |

### Type K thermometer

| Sensor Type | Resolution | Range              | Accuracy             |
|-------------|------------|--------------------|----------------------|
| Type K      | 0.1 °C     | -50.0 to 1300.0 °C | ± ( 0.4 % + 0.5 °C ) |
|             |            | -50.1 to -100.0 °C | ± ( 0.4 % + 1 °C )   |
|             | 0.1 °F     | -58.0 to 2372.0 °F | ± ( 0.4 % + 1 °F )   |
|             |            | -58.1 to -148.0 °F | ± ( 0.4 % + 1.8 °F ) |

### p t 1000 Ω thermometer

| Unit | Range        | Resolution | Accuracy |
|------|--------------|------------|----------|
| °C   | -10 to 70 °C | 0.1 °C     | ± 1.2 °C |
| °F   | 14 to 158 °F | 0.1 °F     | ± 2.2 °F |

\* Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.

### 3. FRONT PANEL DESCRIPTION

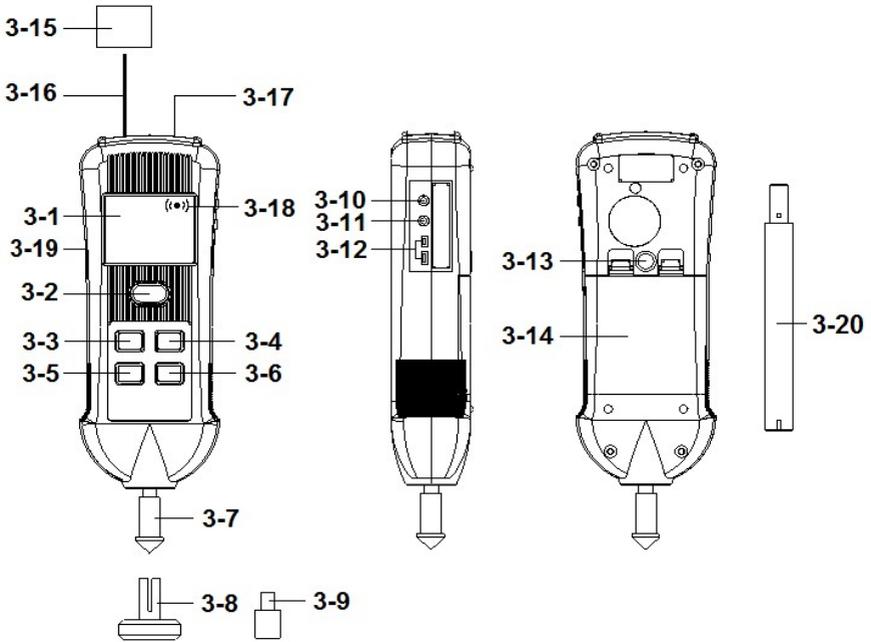


Fig. 1

- |  |  |
|--|--|
| 3-1 Display Reflecting mark              | 3-14 Battery Compartment/Cover               |
| 3-2 Power button                         | 3-15 Reflecting Mark                         |
| 3-3 HOLD/▲ button                        | 3-16 Photo led light beam                    |
| 3-4 REC/DOUBLE button                    | 3-17 Stroboscope flash light (red) indicator |
| 3-5 UNIT/▼ button                        | 3-18 Monitor indicator                       |
| 3-6 Function button                      | 3-19 DC 9V adapter socket                    |
| 3-7 RPM Adapter                          | 3-20 Surface Speed Test Wheel                |
| 3-8 Surface Speed Test Wheel             | Connecting rod                               |
| 3-9 Funnel type rubber for RPM adapter   |  |
| 3-10 RS-232 Output Terminal              |  |
| 3-11 pt 1000Ω probe Terminal             |  |
| 3-12 Thermocouple(type k) probe Terminal |  |
| 3-13 Tripod Fix Nut                      |  |

## 4. PHOTO TACHOMETER MEASURING PROCEDURE

- 1) Power On the meter by pressing and hold the " Power button " ( 3-2, Fig. 1 ) >1.5 seconds , the LCD will light.
- 2) Press the " Function button " ( 3-6, Fig. 1 ) once in sequence until to the " Photo RPM " function be selected, in the same time the " Photo light beam " ( 3-16, Fig. 1 ) will be generated.
- 3) Apply a " Reflecting mark " ( 3-15, Fig. 1 ) to the object being measured. and align the " Photo light beam " ( 3-16, Fig. 1 ) with the applied target. Verify that the " Monitor Indicator " ( 3-18, Fig. 1 ) lights when the target pass through the light beam.

### ***Measuring consideration :***

If the measured RPM values is very low ( for example less than 50 RPM ), recommend to attach more " Reflecting Marks " average to the object. It will get the real RPM with high resolution, precisely & fast sampling time when divided the reading values by the no. of the " Marks ".

## 5. CONTACT TACHOMETER MEASURING PROCEDURE

### **5-1 RPM measurement**

- 1) Power On the meter by pressing and hold the " Power button " ( 3-2, Fig. 1 ) >1.5 seconds, the LCD will light.
- 2) Press the " Function button " ( 3-6, Fig. 1 ) once in sequence until to the " Contact RPM " function be selected.
- 3) Lightly pressing the " RPM Adapter " ( 3-7, Fig. 1 ) against the center hole on the hole of the measured rotating axis.

#### ***Measuring consideration :***

Making the contact RPM measurement due to different kind measured rotating axis, it may changed the rubber for RPM adapter from " CONE " type to " FUNNEL " type ( 3-9, Fig. 1 )

### **5-2 Surface Speed Measurement**

- 1) Power On the meter by pressing the " Power button " ( 3-2, Fig. 1 ) > 1.5 sec., the LCD will light.
- 2) Short Press the " Function button " ( 3-6, Fig. 1 ) once again and again until lcd display show the " touch " text, then short press the "UNIT Button" to select the Surface Speed Measurement unit " m/min ", " ft/min " or " in./min. " .
- 3) Change the " RPM Adapter " instead of the " Surface Speed Test Wheel " ( 3-8, Fig. 1 ).
- 4) Simply attaching the surface speed test wheel to the detector. approx. 2 sec. the display reading will be stabilizes.

## 6 STROBOSCOPE OPERATION PROCEDURES

### 6-1 STROBOSCOPE OPERATION

- 1) Power On the meter by pressing and hold the " Power button " ( 3-2, Fig. 1 ) >1.5 seconds , the LCD will light.
- 2) Press the " Function button " ( 3-6, Fig. 1 ) once in sequence until to the " SCOPE RPM " function be selected, in the same time the " Stroboscope flash light (red) indicator " (3-17, Fig. 1 ) will be Light.

- 3) The display will show " 100.0 " RPM ( FPM ), it is the default value.

Use the " x 2 button(▲ button) " ( 3-3, Fig. 1 ) or " / 2 button(▼ button) " ( 3-5, Fig. 1 ) to adjust the display value near the estimate setting signal's RF approximately..

\* *Press and hold the " DOUBLE button " then Press " ▲ button " once will double the display value.*

*For example, the display is " 100.0 ", Press and hold the " DOUBLE button " then Press " ▲ button " once, the display will change to " 200.0 ". Operation again, the display will change to " 400.0 ".....*

\* *Press and hold the " DOUBLE button " then Press " ▼ button " once will divide the display value by two.*

*For example, the display is " 400.0 ", Press and hold the " DOUBLE button " then Press " ▼ button " once , the display will change to " 200.0 ". Operation again, the display will change to " 100.0 ".....*

### 6-2 Checking Speed (RPM/FPM)

- 1) Use the " ▲+ button " ( 3-3, Fig. 1 ) , " ▼ - button " ( 3-5, Fig. 1 ) to adjust the exact display value.

- \* Press the " ▲+ button " once will increase the display value.
- \* Press the "▼ - button " once will decrease the display value.
- \* Press and hold the " ▲+ button " or "▼ - button " will fast increase or fast decrease the display value.

- \* If press the button once, the display value will change with high resolution ( change just with 1 digit ).
- \* If press the button continuously, the display value will change with low resolution ( change with more digits ).

**When checking the speed, care must be taken to ensure that the strobe is flashing in unison (one to one) with the object being monitored.**

- 2) The Stroboscope will also stop motion at 2:1, 3:1, 4:1 et., this is normally referred to as harmonics. To ensure unison, turn the dial until two images appear - this will double the actual speed. Then lower the flashing rate until a single and stationary image appears - this is the actual true speed.

### **6-3 Checking Motion**

For motion analysis, simply locate the actual speed as mentioned above and use the " ▲+ button " or " ▼- button " to adjustment slowly up or down ,This will give a slow motion effect allowing complete inspection.

## **7. Type K Thermometer MEASURING PROCEDURE**

- 1) Power On the meter by pressing and hold the " Power button " ( 3-2, Fig. 1 ) >1.5 seconds, the LCD will light.
- 2) Press the " Function button " ( 3-6, Fig. 1 ) (short push) in sequence until to the " TYPE k " function be selected.
- 3) type k probe inserted into the thermocouple probe terminal " thermocouple probe terminal " ( 3-12, Fig. 1 ).
- 4) The display will show type k probe sensing temperature value.

## 8. RTD Temperature MEASURING PROCEDURE

- 1) Power On the meter by pressing and hold the " Power button " ( 3-2, Fig. 1 ) >1.5 seconds, the LCD will light.
- 2) Press the " Function button " ( 3-6, Fig. 1 ) (short push) in sequence until to the " P t " function be selected.
- 3) TP-1000 probes are connected to the pt 1000  $\Omega$  probe terminal " ( 3-11, Fig. 1 ).
- 4) The display will show TP-1000 probe sensing temperature value.

## 9. RECORD OPERATION PROCEDURE

### *Data Record ( Max., Min. reading )*

**Remark : the function stroboscope is except.**

- 1) The data record function records the maximum and minimum readings. Press the " REC Button " ( 3-4, Fig.1 ) once to start the Data Record function and there will be a " REC "Symbol indicator " will be light.
- 2) With the " REC " Symbol is light on the display :
  - a) Press the " REC Button " ( 3-4, Fig. 1 ) once, the " REC and MAX Symbol indicator will be light , and the maximum value will appear on the display.
  - b) Press the " REC Button " ( 3-4, Fig. 1 ) again, the " REC and MIN " Symbol indicator will be light , and the minimum value will appear on the display.
  - c) To exit the memory record function, just press the " REC " button for 1.5 seconds at least. The display will revert to the current reading, Symbol indicator will be quenched.

## 10. ADVANCED SETTING

press the " FUNCTION (SET) Button " ( 3-6, Fig. 1 ) continuously at least Five seconds will enter the " Advanced Setting " mode. then press the " FUNCTION (SET) Button " ( 3-6, Fig. 1 ) once a while in sequence to select the two main function, the display will show :

**POFF**..... Auto power OFF management  
**t-CF**..... Select the Temp. unit to °C or °F

### Remark:

**wait eight seconds or short press " power button " to back measurement.**

### **10-1 Auto power OFF management**

When the lower display show " POFF "

- 1) Use the " ▲ button " ( 3-3, Fig. 1 ) or " ▼ button " ( 3-5, Fig. 1 ) to select the upper text to " yES " or " no ".

**yES - Auto Power Off management will enable.**  
**no - Auto Power Off management will disable.**

- 2) After select the text to " yES " or " no ", press the " REC(Enter) Button " ( 3-4, Fig.1 ) will save the setting function with default.

### **10-2 Select the Temp. unit to °C or °F**

When the lower display show " t-CF "

- 1) Use the " ▲ button " ( 3-3, Fig. 1 ) or " ▼ button " ( 3-5, Fig. 1 ) to select the upper Display text to " C " or " F ".

**C - Temperature unit is °C**  
**F - Temperature unit is °F**

- 2) After Display unit is selected to " C " or " F ", press the " REC(Enter) Button " ( 3-4, Fig.1 ) will save the setting function with default.

## 11. BATTERY REPLACEMENT

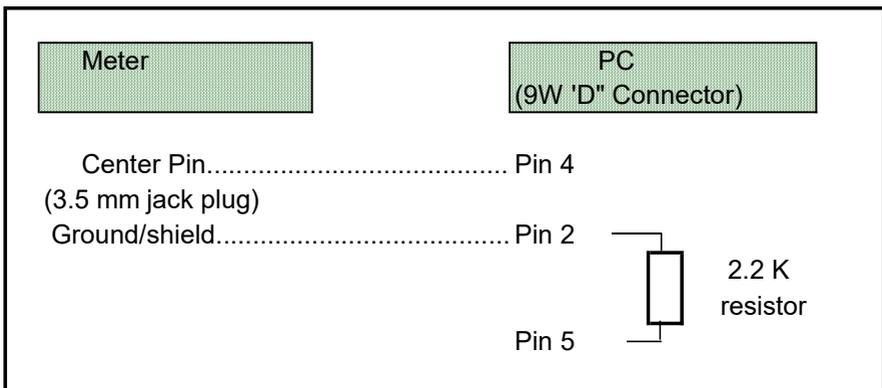
- 1) When the left corner of "  " indicator is light, it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
- 2) take away the " Battery Cover " ( 3-14, Fig. 1 ) from the instrument and remove the battery.
- 3) Replace with DC 1.5 V battery ( UM3, AA, Alkaline/heavy duty ) x 4 PCs, and reinstate the cover.
- 4) Make sure the battery cover is secured after changing the battery.

## 12. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal ( 3-10, 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                                 |               |            |
| D14      | 4  |               |            |
| D13      | 1  |               |            |
| D12, D11 | Annunciator for Display                    |               |            |
|          | ft/min = 11                                | inch/min = 28 | m/min = 60 |
|          | RPM = 27                                   | °C = 01       | °F = 02    |
| D10      | Polarity<br>0 = Positive      1 = Negative |               |            |

|          |   |
|----------|---|
| D9       | Decimal Point(DP), position from right to the left<br>0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP                        |
| D8 to D1 | Display reading, D1 = LSD, D8 = MSD<br>For example :<br>If the display reading is 1234, then D8 to D1 is : 00001234 |
| D0       | End Word  |

**RS232 FORMAT : 9600, N, 8, 1**

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