

*LED target light, Emissivity adjustment*

# INFRARED THERMOMETER

Model : TM-959



Your purchase of this I N F R A R E D THERMOMETER 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

- \* Infrared thermometer, non-contact temperature measurement, -30 to 305 °C ( -22 to 581 °F ), precision for non-contact temperature measurement.
- \* Microcomputer circuit with high performance.
- \* Wide temperature measuring range.
- \* Measurement via one operation button, easy to operate.
- \* Built-in °C & °F select switch.
- \* Automatic data hold.
- \* 0.95 default emissivity value.
- \* Emissivity value can be adjusted from 0.2 to 1.00.
- \* Back light LCD display.
- \* LCD show the temperature and the emissivity value at the same time.
- \* Safety red LED target guide.
- \* 0.5 degree display resolution.
- \* Auto power shut off saves battery life.
- \* Built-in low battery indicator.
- \* Compact housing case with stand.
- \* Operates from 006P DC 9V battery.

## 2. SPECIFICATIONS

### ***2-1 General Specifications***

Display	LCD, 29 mm x 33 mm. * Main display show temp. value. * Lower display show emissivity value. * Back Light.
Functions	°C, °F, Auto data hold, Auto power off, Auto LCD back light, Emissivity adjustment.
Measurement Range	-30 to 305 °C ( -22 to 581 °F ),
Resolution	0.5 °C/0.5 °F.
Circuit	Exclusive microcomputer circuit.
Emissivity Adjustment	Adjustment range : 0.20 to 1.00. * 0.95 default emissivity value.
Target Guide	Safety red LED Light.
Sampling Time	Approx. 0.6 second.
Hold and Auto Power Off function	After release the operation switch, display will hold the last measuring value for 10 seconds continuously.
Over Indication	$\geq 305\text{ }^{\circ}\text{C}$ , display will show 305 °C and flashing. $\leq -30\text{ }^{\circ}\text{C}$ , display will show -30 °C and flashing.
Power Supply	DC 9V battery, 006P, MN1604 ( PP3 ) or equivalent, heavy duty or Alkaline.
Power Consumption	with LED target light out : <i>Approx. DC 12 mA.</i>
	with LED target light out : <i>Approx. DC 48 mA.</i>

Operating Temp. and Humidity	0 to 50 °C (32 to 122 °F). Less than 80% RH.
Weight	140 g/0.3 LB ( without battery ).
Dimension	160 x 92 x 45 mm. ( 6.3 x 3.6 x 1.8 inch ).
Standard Accessory	Operational manual..... 1 PC.

## ***2-2 Electrical Specifications***

Measurement Range	-30 to 305 °C ( -22 to 581 °F ),
Resolution	0.5 °C/0.5 °F.
Accuracy	<p>± 3 % of reading or ± 3 °C ( 5 °F), which ever is greater.</p> <p>* Meter operating temp. is within 23 ± 5 °C and the emissivity value of measurement target is set to 0.95.</p> <p>* Spec. is tested under the 20 cm dia. black body, the measuring distance between the probe sensing head and the target is 30 cm.</p>
Temp. Sensor Emissivity Setting	<p>Thermocouple pie.</p> <p>* By push button. Setting range : 0.20 to 1.00.</p> <p>* The default emissivity value is 0.95, which will cover 90% of a typical application.</p>

Measurement Wave length Region	6 to 12 micro meter.
Distance Factor	D/S : Approx. 7:1. D - Distance, S - Spot.

### 3. FRONT PANEL & LAYOUT DESCRIPTION

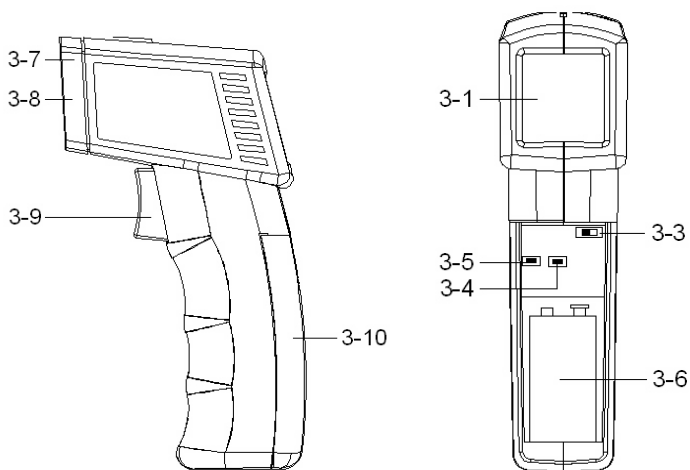


Fig. 1

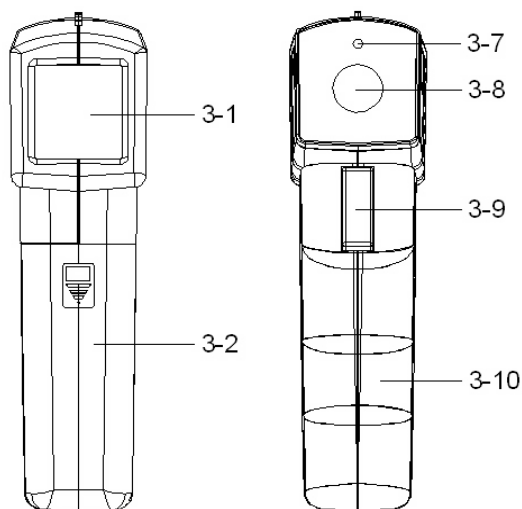



Fig. 1

- 3-1 Display
- 3-2 Battery Cover
- 3-3  $^{\circ}\text{C}/^{\circ}\text{F}$  Select Switch
- 3-4 Down ▼ Button ( Emissivity Adjustment )
- 3-5 Up ▲ Button ( Emissivity Adjustment )
- 3-6 Battery Compartment
- 3-7 LED Target Light Guide
- 3-8 IR Sensing Head
- 3-9 Operation Switch
- 3-10 Handle

## 4. MEASURING PROCEDURE

- 1) One hand hold the " Handle " ( 3-10, Fig. 1 ), use finger to press the " Operation Switch " ( 3-9, Fig. 1 ) continuously.
- 2) Point the " IR Sensing Head " ( 3-8, Fig. 1 ) to the measuring object until meter show the stable temperature values ( approx. 1 to 2 seconds ), release the " Operation Switch ". The Display will hold the measuring value for 5 seconds, then power off automatically.
- 3) Over Indication : When measurement temperature  $\geq 305\text{ }^{\circ}\text{C}$ , display will show  $305\text{ }^{\circ}\text{C}$  and flashing.  
 $\leq -30\text{ }^{\circ}\text{C}$ , display will show  $-30\text{ }^{\circ}\text{C}$  and flashing.

### 4) LED Target Light Guide

- a. When press the " Operation Switch " ( 3-9, Fig. 1 ) to make the temperature measurement, at the same time the meter's head will generate the red " LED Target Light " ( 3-7, Fig. 1 ) within 2 seconds then off to guide the target.
- b. During generating the " LED Target Light " the LCD will show the "  " indicator.



## 5. MEASURING CONSIDERATION

### ***5-1 Emissivity***

- \* All objects emit invisible energy. The amount of energy is emitted in proportion to the object's temperature & its ability to emit energy. This ability is so-called emissivity which is based upon the material that object is made of and its surface roughness. Emissivity values range from 0.2 for a very reflective object to 1.00 for a black body.
- \* The IR THERMOMETER senses energy and calculates the temperature based on the amount of IR energy it receives. The default emissivity value is 0.95, which will cover 90% of the typical applications.
- \* If the known emissivity value is not 0.95, then the " Emissivity Value " can be adjusted. Adjustment procedures, please refer to " 5-4 ", page 9.

### ***5-2 Measurement Field Distance/Spot ( D/S ) value***

- \* The object should be larger than the spot size calculated by the measurement Distance/Spot ratio ( Distance Factor, refer to page 4 ). For accurate measurements, it is recommended that the area to be measured is 1.5 times larger than the spot size.
- \* Careful collimating is required when
  - 1 The object is not large enough.
  - 2 The temperature of the object ( or a part of it ) is higher ( or lower ) than the ambient temperature.After aiming the probe, move the probe slightly, ideal collimating is obtained when the display shows a maximum ( or minimum ) reading.

### ***5-3 Disturbance***

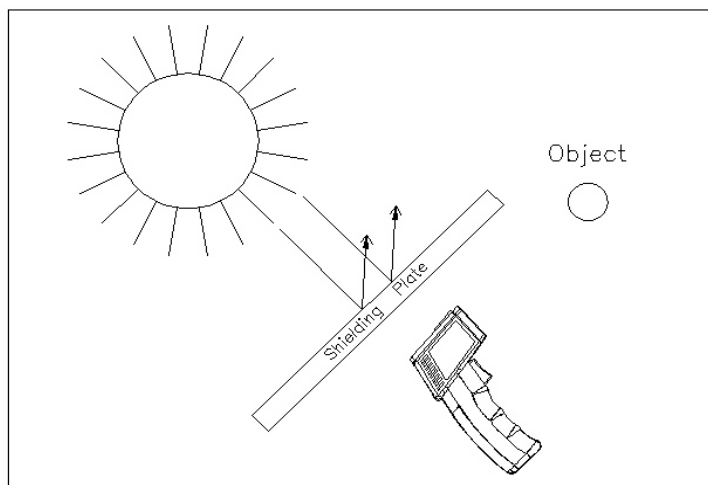


Fig. 2

Under certain measurement case, if the object is adversely effected by powerful infrared energy radiated from nearby objects having high emissivity or high temperature. For example, when such objects are measured in sunlight, erratic measurements can result due to powerful radiated energy from the sun reflecting on the surface of the object and entering the sensor. Then in order to get the exact measuring temperature value, it should install a shielding plate as above Fig. 2.

### **5-4 Emissivity Adjustment**

- \* The emissivity value set by the factory is 0.95 which will cover 90% of most measurement applications. However, select the correct emissivity value in order to obtain the true temperature is important.
- \* When the emissivity of the object is known and its value is not 0.95, it is recommended to adjust the emissivity value to obtain the best accuracy. Adjustment procedures are as following :
  - a. Use finger to press the " Operation Switch " ( 3-9, Fig. 1 ) continuously.
  - b. Use " Down ▼ Button " ( 3-4, Fig. 1 ) and the Up ▲ Button " ( 3-5, Fig. 1 ) to adjust the desired emissivity value.
  - c. After desired emissivity value has been adjusted, release the " Operation Switch " The new emissivity value will be saved to the memory circuit permanently.

The following emissivity of different material for reference :

Aluminum	0.30	Dirt	0.94	Paper	0.95
Asbestos	0.95	Food	0.90	Plastic	0.95
Asphalt	0.95	Frozen Food	0.93	Rubber	0.95
Basalt	0.70	Hot Glass	0.85	Sand	0.90
Brass	0.50	Ice	0.98	Skin	0.98
Brick	0.90	Iron	0.70	Snow	0.90
Carbon	0.85	Lead	0.50	Opaque Steel	0.80
Ceramic	0.95	Limestone	0.98	Textiles	0.94
Concrete	0.95	Oil	0.94	Water	0.93
Copper	0.95	Paint	0.93	Wood	0.94

### ***5-5 Special Surfaces***

- \* If the meter seems to be giving incorrect readings, then the emissivity value for the object may be incorrect. It may be necessary to change the emissivity value. See procedures on page 9. ( refer to 5-4 ).
- \* If the surface to be measured is covered by frost or other material, clean it to expose the surface.
- \* If the surface to be measured is highly reflective, apply masking tape or apply the known " black body paint " ( with an emissivity of 0.95 ).

## 6. BATTERY REPLACEMENT

Battery condition indicator



← Low battery indicator

- 1) When the LCD display show the " Low battery indicator " as above, 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) Slide the Battery Cover ( 3-6, Fig. 1 ) away from the instrument and remove the battery.
- 3) Install a 9 V battery ( heavy duty ) and replace the cover.