

LED target light
+ Type K thermometer, 2 in 1



INFRARED THERMOMETER

Model : TM-960



Your purchase of this INFRARED 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

- * 2 in 1, Infrared thermometer + Type K thermometer.
- * Infrared thermometer, non-contact temperature measurement.
- * IR Temp. range : -30 °C to 305 °C.
- * Type K Temp. range : -199.9 °C to 1370 °C.
- * Mini pocket type.
- * High intensity LED target light for IR thermometer, safety.
- * Display resolution :
IR Temp. : 0.5 degree .
Type K Temp. (°C) :
0.1 degree (< 1,000 degree), 1 degree (≥ 1,000 degree).
- * °C, °F internal select with default.
- * IR thermometer with fix 0.95 default emissivity value.
- * IR thermometer with automatic display hold.
- * IR thermometer with safety red LED target guide.
- * IR thermometer with auto power shut off saves battery life.
- * Microcomputer circuit with high performance.
- * Back light LCD display.
- * Built-in low battery indicator.
- * Compact housing case with stand.
- * Operates from 006P DC 9V battery.
- * Optional type K temperature probes :
TP-01, TP-02A, TP-03, TP-04, TP-05.

2. SPECIFICATIONS

2-1 General Specifications

Display	LCD, 29 mm x 33 mm. * Back Light.
Power Supply	DC 9V battery, 006P, MN1604 (PP3) or equivalent, heavy duty or Alkaline.
Operating Temperature	0 to 50 °C (32 to 122 °F).



Operating Humidity	Less than 80% RH.
Weight	150 g/0.33 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.
Optional Accessories	* Type K thermocouple probe. TP-01, TP-02A. TP-03, TP-04, TP-05.

2-2 Electrical Specifications for IR thermometer

Measurement Range	-30 to 305 °C (-22 to 581 °F),
Resolution	0.5 °C/0.5 °F.
Circuit	Exclusive microcomputer circuit.
Emissivity	0.95 default emissivity value.
Target Guide	Safety red LED Light.
Sampling Time	Approx. 0.6 second.
Accuracy	±3 % of reading or ±3 °C(5 °F), which ever is greater. * Meter operating temp. is within 23 ±5 °C and the emissivity value of measurement target is set to 0.95. * Spec. is tested under the 20 cm dia. black body, the measuring distance between the probe sensing head and the target is 30 cm.
Temp. Sensor	Thermocouple pie.
Measurement Wave length Region	6 to 12 micro meter.
Distance Factor	D/S : Approx. 7:1. D - Distance, S - Spot.
Hold and Auto Power Off function	After release the operation switch, display will hold the last measuring value for 10 seconds continuously.



Over Indication	≥ 305 °C, display will show 305 °C and flashing. ≤ -30 °C, display will show -30 °C and flashing.
Power Consumption	Approx. DC 15 mA. * <i>Both LED target and LCD back light ON.</i>

2-3 Electrical Specifications of Type K thermometer

Display Unit	°C, °F.
Resolution	1 °C, 1 °F / 0.1 °C, 0.1 °F.
Thermocouple type	Type K.
Temperature Compensation	Automatic temp. compensation for the cold junction type K thermometer
Linear Compensation	Linear Compensation for the full range.
Probe Input Socket	Standard 2 pin thermocouple socket.
Over Indication	Show " - - - - ".
Sampling Time of display	Approx. 1 second.
Power off	Manual off by push button.
Power Current	Approx. DC 13 mA * <i>LCD back light off.</i>

Resolution	Range	Accuracy
1 °C	1000 to 1370 °C	$\pm (0.5 \% + 1 \text{ } ^\circ\text{C})$
0.1 °C	-50.1 to -999.9 °C	$\pm (0.5 \% + 1 \text{ } ^\circ\text{C})$
	-50.1 to -199.9 °C	$\pm (0.5 \% + 1.2 \text{ } ^\circ\text{C})$
1 °F	1000 to 2489 °F	$\pm (0.5 \% + 1.8 \text{ } ^\circ\text{F})$
	-200 to -372 °F	$\pm (0.5 \% + 2.2 \text{ } ^\circ\text{F})$
0.1 °F	-58.0 to -999.9 °F	$\pm (0.5 \% + 1.8 \text{ } ^\circ\text{F})$
	-58.1 to -199.9 °F	$\pm (0.5 \% + 2.2 \text{ } ^\circ\text{F})$



3. FRONT PANEL & LAYOUT DESCRIPTION

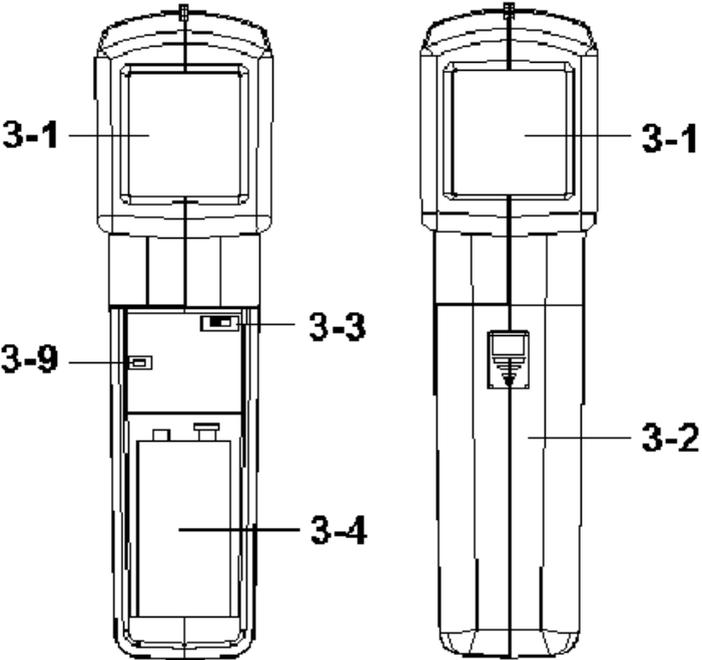


Fig. 1



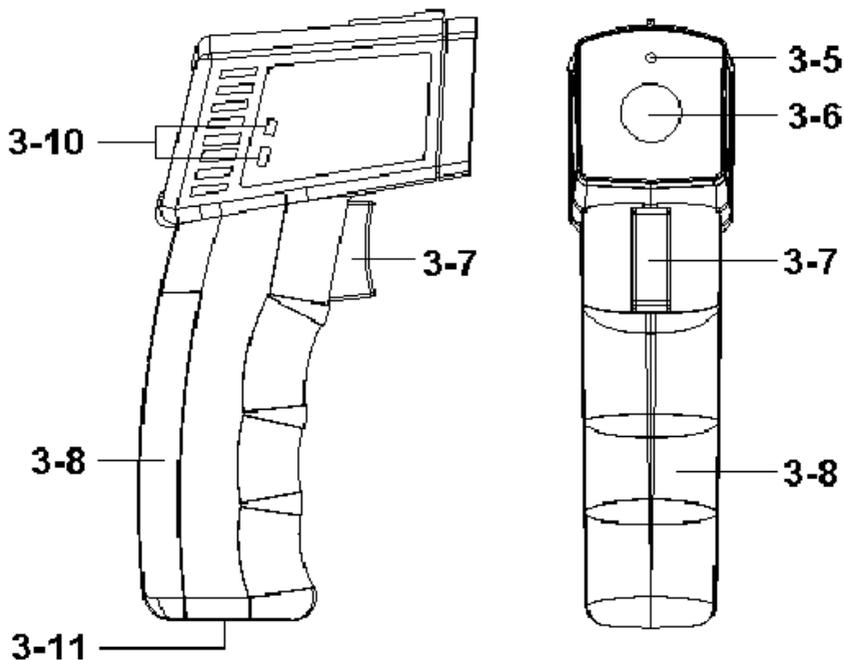


Fig. 1

- 3-1 Display
- 3-2 Battery Cover
- 3-3 IR/Type K Select Switch
- 3-4 Battery Compartment
- 3-5 LED Target Light Guide
- 3-6 IR Sensing Head
- 3-7 Operation Switch
- 3-8 Handle
- 3-9 °C/°F Select Button
- 3-10 Type K thermocouple input socket
- 3-11 Tripod Fix Nut



4. MEASURING PROCEDURE of IR THERMOMETER

- * *Meter is Off.*
- * *Select the " Type K Select Switch " (3-3, Fig. 1) to the " IR " position.*

- 1) One hand hold the " Handle " (3-8, Fig. 1), press and hold the " Operation Switch " (3-7, Fig. 1) to make the temperature measurement, at the same time the meter's head will generate the red " LED Target Light " (3-5, Fig. 1) within 2 seconds then off to guide the target.
- 2) Release the " Operation Switch " (3-7, Fig. 1), the measurement value will freeze on the LCD, in the same time, the LCD will also the text " HOLD ".
- 3) During the measurement, if press " °C/°F Select Button " (3-9, Fig. 1) will change the measuring unit from °C to °F (or °F to °C) with default.
- 4) Over Indication : When measurement temperature ≥ 305 °C, display will show 305 °C and flashing.
 ≤ -30 °C, display will show -30 °C and flashing.

5. MEASURING Consideration of IR THERMOMETER

5-1 Emissivity

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.



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 2). 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

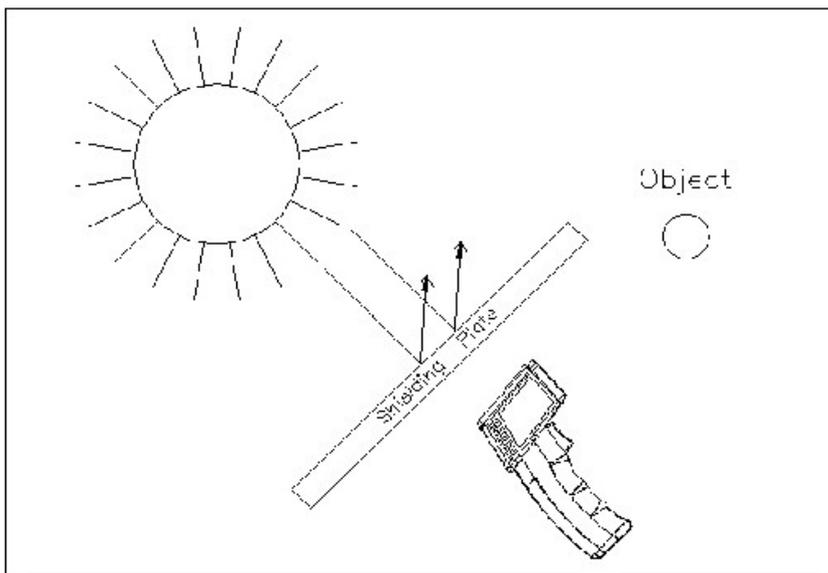


Fig. 2



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 Special Surfaces

- * 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. MEASURING PROCEDURE of Type K THERMOMETER

- * ***Meter is Off.***
- * ***Select the " Type K Select Switch " (3-3, Fig. 1) to the " Type K " position.***

- 1) Press the " Operation Switch " (3-7, Fig. 1) once will power ON the Type K thermometer.
Under meter is ON, if press the " Operation Switch " (3-7, Fig. 1) once again will power Off the meter.
- 2) Insert the Type K temp. probe plug into the " Type K thermocouple input socket (3-10, Fig. 1), Display will show the temperature reading that measured from the probe sensing head..



- 3) Under meter is ON, if press the " Operation Switch " (3-7, Fig. 1) continuously > 2 seconds then release will turn ON the LCD back light.
** LCD back light will turn Off within 3 seconds automatically.*
- 4) During the measurement, if press " °C/°F Select Button " (3-9, Fig. 1) will change the measuring unit from °C to °F (or °F to °C) with default.
- 5) If over range, the LCD will show " - - - - ".

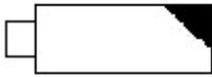
7. MEASURING CONSIDERATION of Type K THERMOMETER

- 1) When insert the probe plug into the " Type K thermocouple input socket " (3-10, Fig. 1), please take care to observe the correct polarity.
- 2) When the temperature probe's plug is first inserted into the input socket or if the probe is changed. For greatest accuracy is to be achieved, the plug must be allowed to stabilize at the environment temperature of the socket, which is in thermal contact with cold junction compensation device achieved. This will take a couple of minutes and only apply if the probe plug has previously been exposed to an ambient temperature different to that thermometer.



8. 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 (3-2, Fig. 1) away from the instrument and remove the battery.
- 3) Install a 9 V battery (heavy duty) and replace the cover.

