

2 in 1
THERMOMETER
Infrared thermometer+Type K

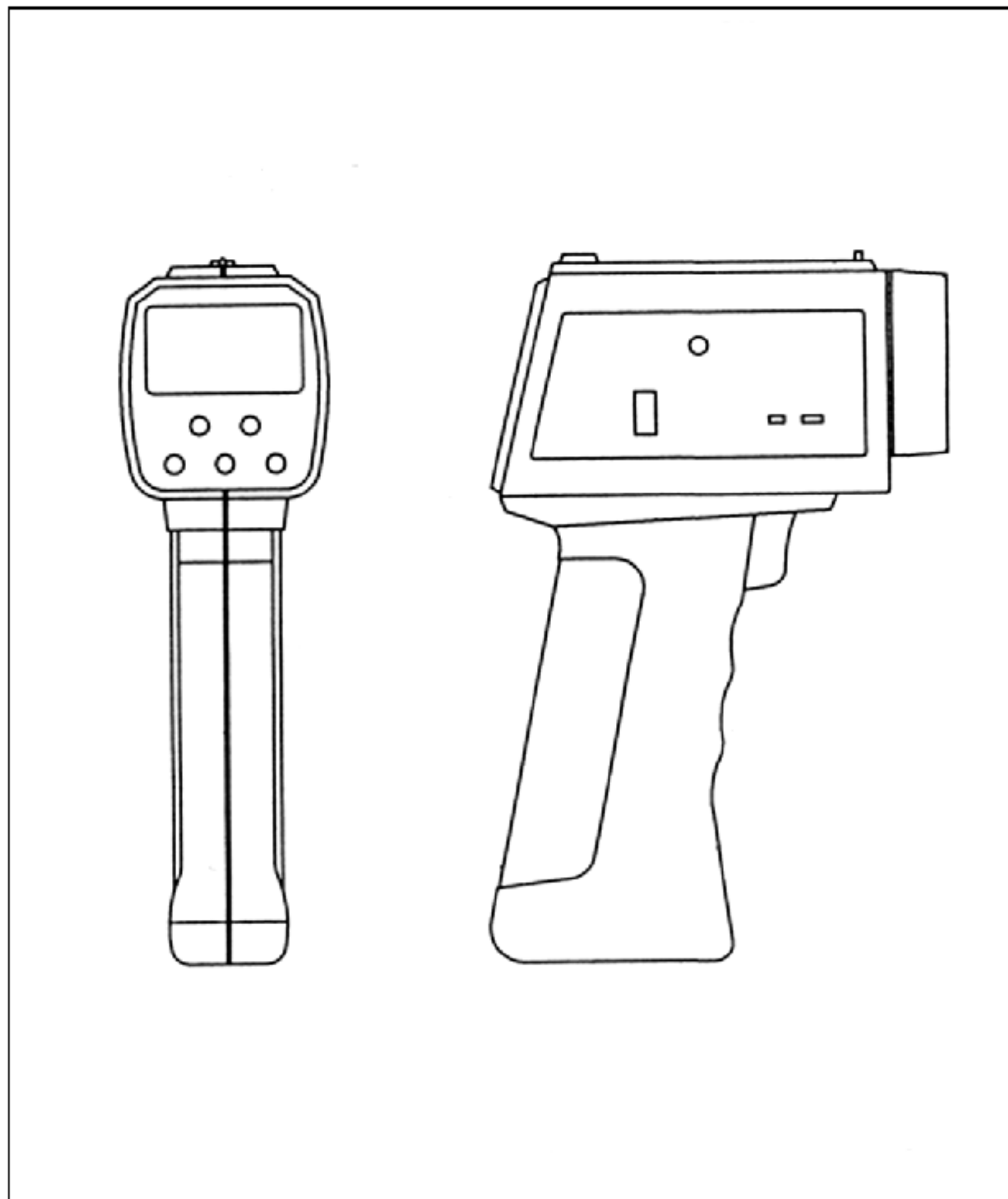


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1. FEATURES

- * 2 in 1, Infrared thermometer + Type K thermometer.
- * Microcomputer circuit with high performance.
- * Wide temperature measuring range.
- * Build in °C & °F select button on the front panel.
- * Data hold function for stored the desired value on display.
- * Memory function to record the maximum & minimum reading with recall.
- * Build the REL button, useful for relative measurement.
- * Sensor select button on the front panel, easy to change different type probe.
- * Infrared thermometer, non-contact temperature measurement, -20°C to 400°C (-4°F to 752°F).
- * 0.1°C display resolution both for the measurement of IR thermometer and Type K thermometer.
- * Emissivity adjustment for IR thermometer.
- * Safety LED target light guide for IR thermometer.
- * RS 232 data output, easy cooperate with computer.
- * Optional data acquisition software for data record.
- * Auto power shut off saves battery life.
- * Built-in low battery indicator.
- * Heavy duty & compact housing case with stand.
- * Operates from 006P DC 9V battery.

2. SPECIFICATIONS

2-1 General Specifications

Display	<i>Dual display with annunciator :</i> * Main display : 10 mm (0.4") LCD, 5 digit. * Small display : To show the emissivity value.
Sensor Type	<i>1. Infrared thermometer</i> (Non contact temperature measurement) <i>2. Type K thermometer</i>
Functions	°C, °F, Data hold, Memory (Max., Min.), Relative measurement, Emissivity adjustment (IR thermometer).
Resolution	0.1 degree.
Circuit	Exclusive microcomputer circuit, the software build in linearity correction instead the traditional hardware circuit.
Emissivity Adjustment	Range : 0.20 to 1.00. Adjustment by pushing button on front panel.
Target Guide	Red LED light, safety.
Probe Input Socket	Standard 2 pin thermocouple socket.

Sampling Time	Approx. 1 second.
Hold Function	To freeze the display reading value.
Memory Recall	Memorize the Maximum, Minimum reading with recall.
Offset Adjustment	Available for thermocouple thermometer offset adjustment by pushing button on front panel.
Over Indication	Show " – – – – ".
Data Output	RS232 PC serial interface.
Power Supply	Alkaline or heavy duty type, DC 9V battery, 006P, MN1604 (PP3) or equivalent.
Power Consumption	Approx. DC 12 mA (w/o tagret light on). Approx. DC 28 mA (with target light on). <i>* Above consumption value is caculated under the function of IR thermometer.</i>
Operating Temperature	0 to 50 °C (32 to 122 °F).
Operating Humidity	Less than 80% RH.
Weight	260 g/0.57 LB.
Dimension	195 x 120 x 57 mm. (7.7 x 4.7 x 2.2 inch).
Standard Accessory	Operational manual..... 1 PC.
Optional & accessories (Refer page 18)	Hard carrying case Model : CA-06
	RS232 cable Model : UPCB-02
	Application software, windows version. Model : SW-U801-WIN

2-2 Electrical Specifications

A. Infrared Thermometer

Resolution/ ranges	0.1°C – 20 °C to 400 °C
	0.1 °F – 4 °F to 752 °F
Accuracy	<p>± 3 % of reading or ± 3°C (5 °F), which ever is greater.</p> <p>* Accuracy test under the measurement range within – 10 °C to 350 °C .</p> <p>* Meter operating temp. within 23 ± 5 °C and the emissivity value of measurement target set to 0.95.</p> <p>* Spec. tested under the 20 cm dia. black body, the measuring distance from the probe sensing Head is 30 cm.</p> <p>* Spec. tested environment : RF Field Strength less than 3 V/M and frequency less than the 30 MHz.</p>
Temp. Sensor	Thermocouple pie.
Emissivity Setting	<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	<p>D/S : Approx. 7:1.</p> <p>D – Distance, S – Spot.</p>

B. Type K Thermometer

Sensor Type	Resolution	Range	Accuracy
Type K	0.1 °C	–100.0 to 1300.0 °C	$\pm (1 \% + 1 ^\circ\text{C})$
	0.1 °F	–148.0 to 2372.0 °F	$\pm (1 \% + 2 ^\circ\text{F})$
<i>Remark :</i> <i>a. Accuracy value is specified for the meter only.</i> <i>b. Accuracy test is based on the environment temperature of $23 \pm 5^\circ\text{C}$.</i> <i>c. Linearity Correction :</i> <i>Memorize the thermocouple's curve into the CPU circuit.</i>			

3. FRONT PANEL DESCRIPTION

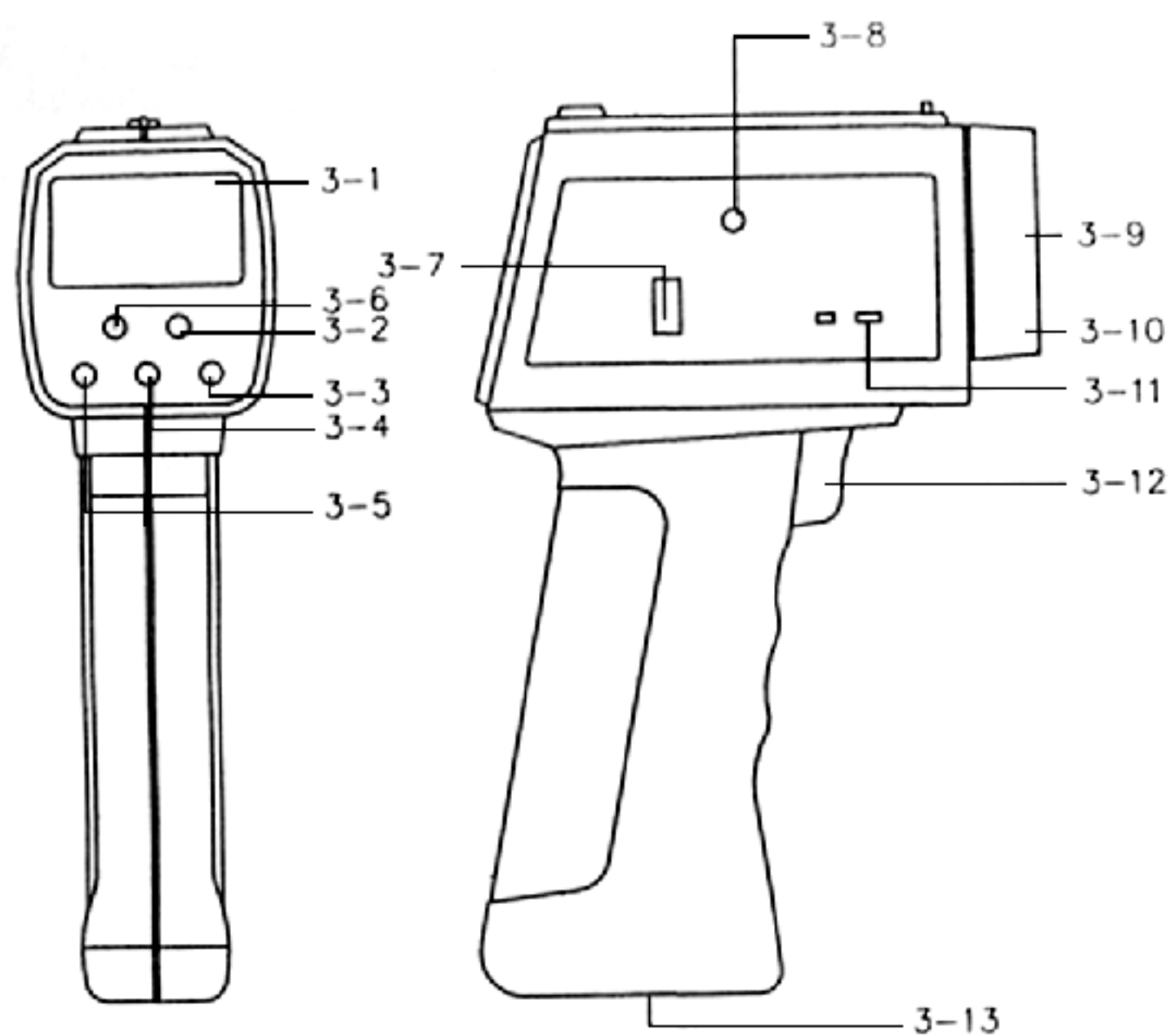


Fig. 1

- 3-1 Display.
- 3-2 °C/°F Button (Up Button)
- 3-3 Emissivity Button (Target guide Button)
- 3-4 Rel. Button (Down Button)
- 3-5 Rec. Button
- 3-6 Hold Button
- 3-7 Sensor Button
- 3-8 RS232 Output Socket
- 3-9 IR Sensing Head
- 3-10 Target Light Guide
- 3-11 Type K Input Socket
- 3-12 Operation (Power On/Off) Switch
- 3-13 Battery Compartment/Cover

4. IR MEASURING PROCEDURE

4-1 General IR Measurement

Measuring consideration of the " Emissivity "

All objects emit invisible energy. The amount of energy is emitted proportional to the object's temperature & its ability to emit energy. This ability called emissivity 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 probe of this IR THERMOMETER senses energy and calculates the temperature based on the amount of IR energy it receives.

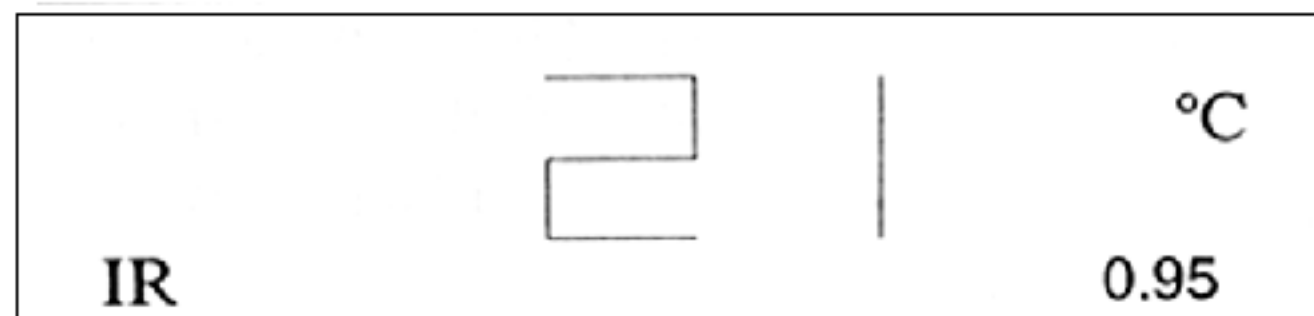
The default emissivity value of 0.95, which will cover 90% of the typical applications.

If the known emissivity value is not 0.95, then the " Emissivity Value " can be adjusted. Adjustment procedures, please refer to " 4-5 " , page 11.

1) Power On :

Power on the meter by pressing the " Operating Switch " (3–12, Fig. 1). The display will show the internal testing code (such as 8L–03..) then zero.

After a while LCD will display the room temperature value approximately & the emissivity value on the right bottom corner LCD.



Remark : Suppose the approx.. room temperature is 21 °C

- * Push the " Operation Switch " once again will power off the meter.*
- * After power on, at the same time will activate the target light from the " Target Light Guide " (3–10, Fig. 1) approx. 10 seconds.*
- * Within approx. 10 minutes, the meter will auto power off.*
- * During the measurement, if push the " Rec. Button " (3–5, Fig 1), the LCD will show the " REC " marker. The meter will make the measurement continuously and not auto power off.*

- 2) Select the " °C " " °F " display unit by push " °C/°F Button " (3– 2, Fig. 1).
- 3) Point the " IR Sensing Head " (3–9, Fig. 1) to the measuring object. The meter will display the spot's temperature values.

Note :

- a) *The displayed value may fluctuate if the meter is shaken or suddenly moved etc. during measurement.*
- b) *The meter automatically compensates for influences by the ambient temperature of the sensor.
The thermometer can measure accurately and quickly when measuring at the normal environment temperature of $23 \pm 5^{\circ}\text{C}$. For a more accurate measurement at other ambient temperatures, allow the unit to stabilize for approx. 30 min. in the new ambient.*
- c) *When low temperature objects are measured directly after high temperature objects, some time is required for the display to stabilize.*

4–2 Target Light Guide

During the IR measurement, push the " Target Light Button " (3–3, Fig. 1) to turn on the LED target light Guide " (3–10, Fig. 1) approx. 10 seconds.
The target light guide is a useful tool to approximately locate the measured target of the IR thermometer.

4–3 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 calculated.

Careful collimating is required when the object is not large enough. If the temperature of the object or a part of it is higher (or lower) than the ambient temperature. After the aiming the probe, move the probe slightly. Ideal collimating is obtained when the display shows a maximum (or minimum) reading. However the emissivity of the object and its ambient must be roughly the same.

4–4 Disturbance

Objects having low emissivity or objects having a low temperature yet high emissivity emit little infrared energy.

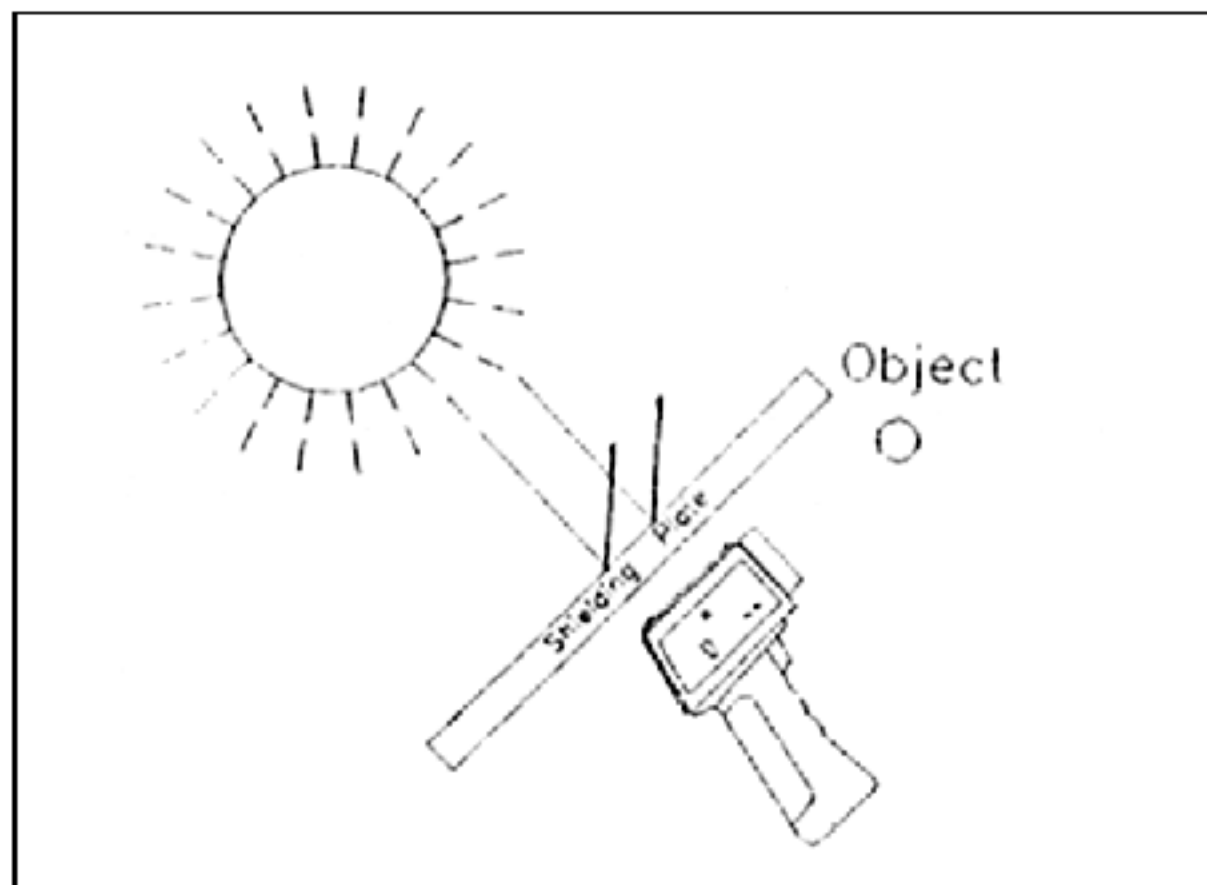


Fig. 2

For this reason, measurements of these objects are 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.

4–5 Emissivity Adjustment

The factory set emissivity value is 0.95. This will cover 90% of most measurement applications. However to match the correct emissivity with the specific value of the object is important in order to obtain the true temperature. 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) Hold the " Emissivity Button " (3–3, Fig. 1) at least 2 seconds continuously. The emissivity value will flash, release the button.
- b) Use the " Down (Rel.) Button " (3–4, Fig. 1), " Up (°C/°F) Button " (3–2, Fig. 1) to adjust the desired emissivity value.

Hold the " Emissivity Button " at least 2 seconds continuously again. The emissivity value will stop flashing. Release the button, the adjustment procedure is complete.

4–6 Special Surfaces

- a) 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 11. (refer to 4–5).
- b) If the surface to be measured is covered by frost or other material, clean it to expose the surface.
- c) 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).

5. Type K THERMOMETER MEASURING PROCEDURE

- 1) During the IR measurement, push " Sensor Button " (3–7, Fig. 1), the display will show the symbol of K.
 - * After the function of " Type K Thermometer " be selected, the meter will make the measurement continuously even release the " Operation Switch ".*
 - * Push the " Operation Switch " once a while will power off the meter.*
- 2) Insert the temp. probe plug into the " Thermocouple Input Socket " (3–11, Fig. 1).
- 3) Select the " °C " " °F " display unit by pushing " °C/°F Button " (3–2, Fig. 1).
- 4) Display will show the temperature reading that measured the probe.

Note :

- * When inserting the probe plug into the temperature input socket, please take care to observe the correct polarity.
- * For greater accuracy, when the probe plug is first inserted into the thermometer socket, or if the probe is changed, the plug must be allowed to stabilize at the temperature of the socket, which is in thermal contact with the cold junction compensation device. This will take a couple of minutes and only applies if the probe plug has previously been exposed to an ambient temperature that is different than the thermometer.

5) Offset Value adjustment :

Caused by the environment temperature change or other reasons.... Then the measuring value may drift few degrees (1, 2 or 3 degrees).

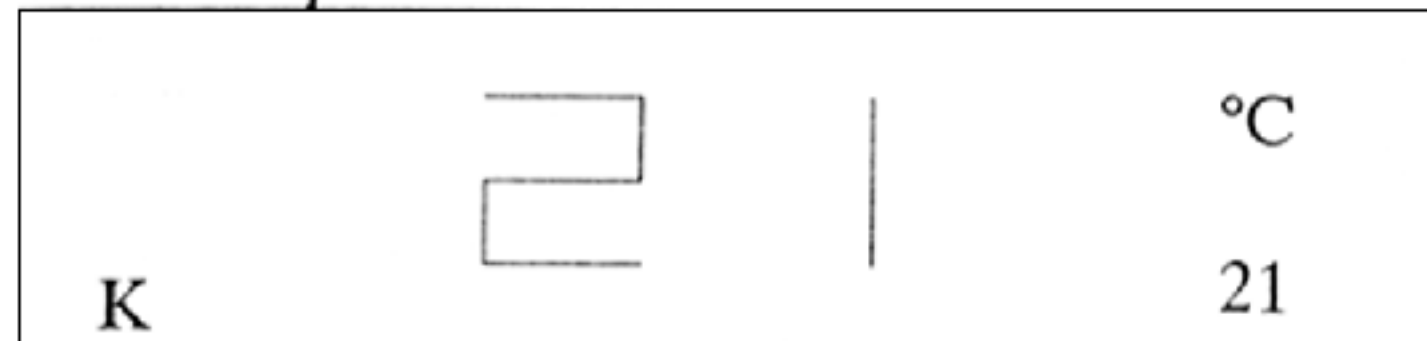
If found that the measuring values exist little deviation especially when measuring the low temperature, then adjust the offset value will make the compensation & let the measured value precisely.

Insert the temp. probe plug into the " Thermocouple Input Socket " (3–11, Fig. 1). The meter will the room temperature approximately.

The offset value adjustment procedures are as following :

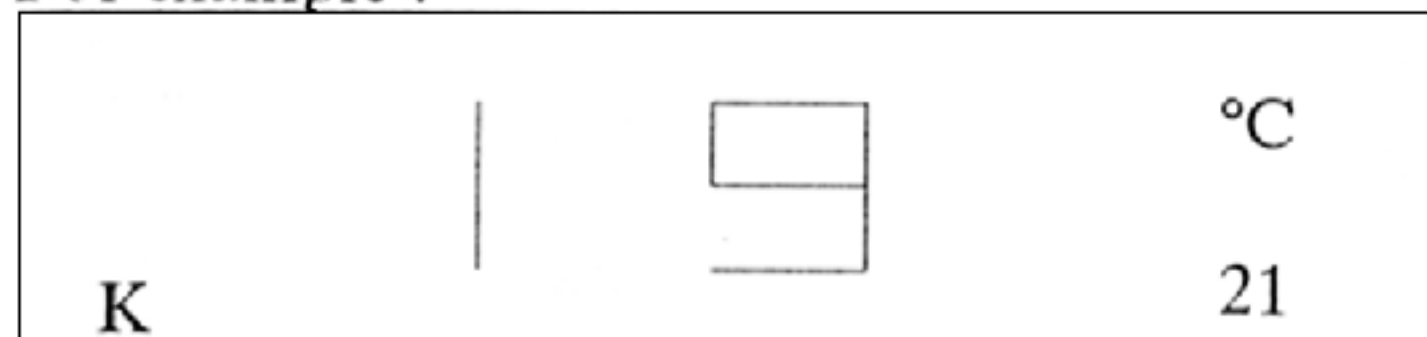
- a) Use two fingers to press the " Hold Button " (3–6, Fig. 1) & " REC Button " (3–5, Fig. 1) together & not release. The small digit (right bottom corner of LCD) will show the same value of main LCD (big digit).

For example :



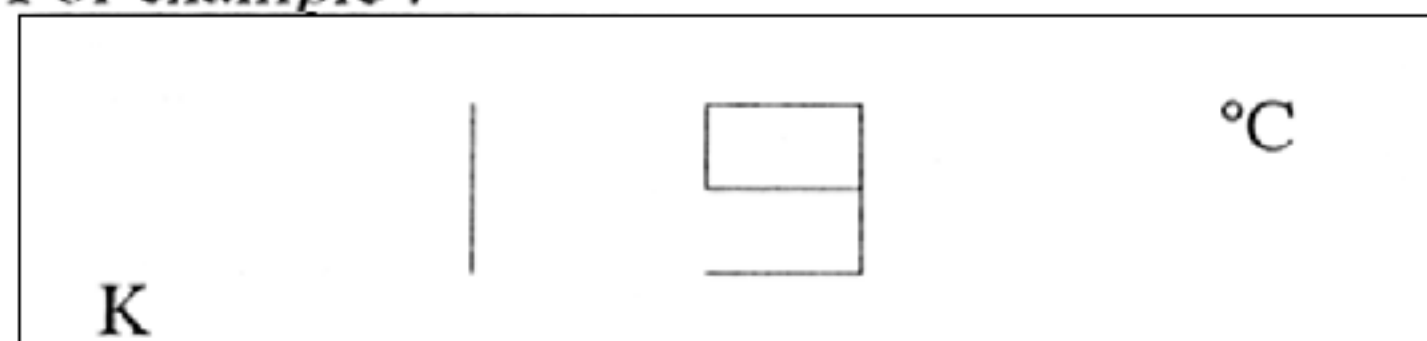
- b) Hold on the " Hold Button " & the " REC Button " at the same time. Use the " Down Button " (3–4, Fig. 1), " Up Button " (3–2, Fig. 1) until the required value appear.

For example :



Then release all buttons, the small digit display (right bottom corner of LCD) will disappear, the offset adjustment procedures are completely finished.

For example :



6. DATA HOLD, RECORD, RELATIVE, AUTO POWER OFF and CONTINUE POWER ON

6-1 Data Hold

- 1) During the measurement, pushing the " Hold Button " (3-6, Fig. 1) will freeze the measured value & the LCD will show " HOLD " symbol.
- 2) Push the " Hold Button " again to cancel the data hold function

6-2 Data Record (Maximum, Minimum reading)

- 1) The DATA RECORD function displays the maximum and minimum readings. To start the DATA RECORD function, press the " Rec Button " (3-5, Fig. 1) once. " Rec " symbol will appear on the LCD display.
- 2) With the " REC " symbol on the display :
 - (a) Push the " Rec Button " (3-5, Fig. 1) once, the " Max " symbol along with the maximum value will appear on the display.
 - (b) Push the " Rec Button " again, the " Min " symbol along with the minimum value will appear on the display.
 - (c) To exit the memory record function, push the " Rec Button " continuously at least 2 seconds. The display will revert to the current reading.

6-3 Relative measurement

- 1) During a measurement, the circuit will memorize the last measured values. If you push the " REL Button " (3-4, Fig. 1) once the display will show zero value and a " REL " symbol appear on the LCD.

- 2) The new measured temperature values will be deducted from the above " Last measured values " automatically.
- 3) To cancel the relative measurement function push the " REL Button " once again. The " REL " marker will disappear.

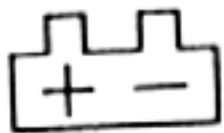
Note :

When using the " Data Hold " and " Data Record " feature the relative function is prohibited.

6-4 Auto power off and the continue power on

- 1) For the function of Thermocouple Thermometer, the instrument has built-in " Auto Power Shut-off " in order to prolong battery life. The meter will switch off within approx. 10 minutes automatically.
- 2) To de-activate this feature and execute the continue power on, select the memory record function during measurement, by pressing the " Rec. Button " (3-5, Fig. 1).

7. BATTERY REPLACEMENT

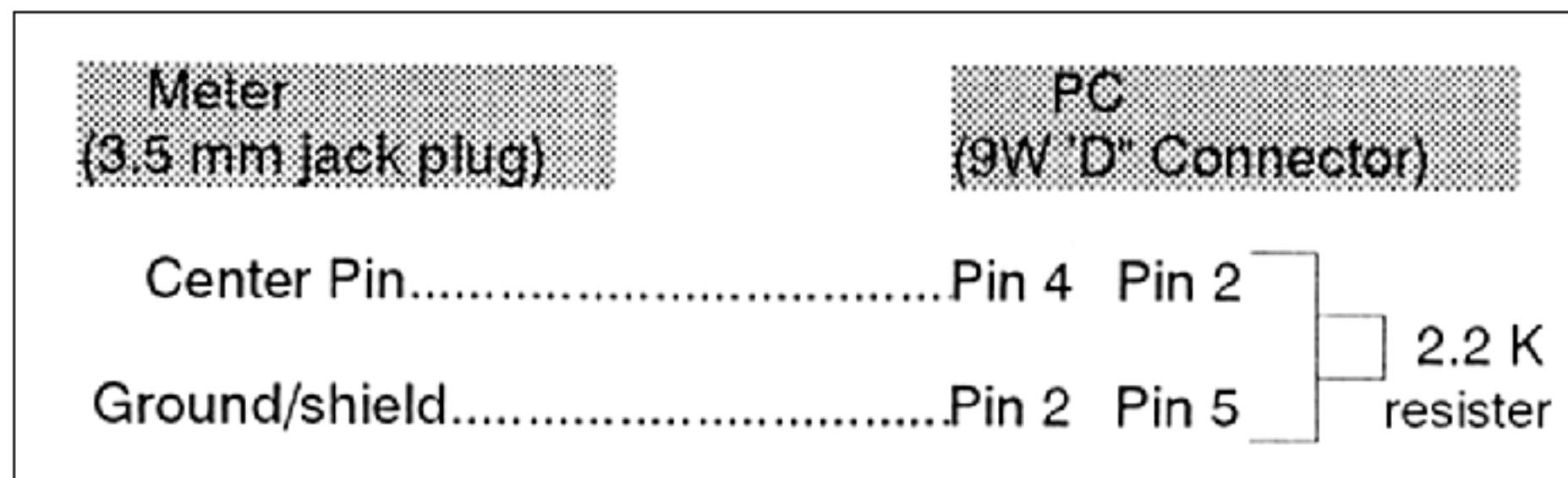
- 1) When the left top corner of LCD display shows " , it is necessary to replace the battery.
However within specification measurements may still be made for several hours after the low battery indicator appears before the instrument becomes inaccurate.
- 2) Open the " Battery Cover " (3-13, Fig. 1) away from the instrument and remove the battery.
- 3) Install a 9 V battery (Alkaline or Heavy duty type) and replace the cover.

8. RS232 PC SERIAL INTERFACE

The instrument features an RS232 output via 3.5 mm Terminal (3–8, Fig. 1).

The connector output is a 16 digit data stream which can be utilized to the user's specific application.

An RS232 lead with the following connection will be required to link the instrument with the PC serial input.



The 16 digit 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 :

D0	End Word
D1 & D8	Display reading, D1 = LSD, D8 = MSD For example : <i>If the display reading is 1234, then D8 to D1 is : 00001234</i>
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = Positive 1 = Negative

D11 & D12	Annunciator for Display		
	°C = 01	°F = 02	
D13	1		
D14	4		
D15	Start Word		

RS232 FORMAT : 9600, N, 8, 1

9. OPTIONAL ACCESSORIES

Thermocouple Probe (Type K)	Model : TP-01 * Measure Range : -40 °C to 250 °C. * Ultra fast response naked-bead thermocouple, general purpose application.
Thermocouple Probe (Type K)	Model : TP-02A * Measure Range : -50 °C to 900 °C. * Dimension: 10 cm tube, 3.2 mm Dia.
Thermocouple Probe (Type K) Surface Probe	Model : TP-04 * Measure Range : -50 °C to 400 °C. * Dimension: 10 cm tube, 8 mm Dia.
Thermocouple Probe (Type K)	Model : TP-03 * Measure Range : -50 °C to 1200 °C. * Size : Temp. sensing head - 15 mm Dia. Probe length : 120 mm.
RS232 cable	Model : UPGB-02 * RS232 cable for connecting between the meter & the computer.
Software	Model : SW-U801-WIN, Windows version. * Software apply as the performance of data logging system & data recorder...
Carrying Case	Model : CA-06, Hard carrying case.