

# User Manual



## Professional Dual-Laser Infrared Thermometer with 50:1 Distance-to-Sight Ratio, Data Logging with Bluetooth® Smart App, Single Type K Input, and Temperature Alarm

with NIST-Traceable Calibration

### Model 20250-25



THE STANDARD IN PRECISION MEASUREMENT

## **Introduction**

The Digi-Sense Professional Dual-Laser Infrared Thermometer with Bluetooth® Connectivity (model 20250-25) with 50 to 1 distance-to-sight ratio offers fast response and high accuracy. This heavy-duty IR meter is ideal for a wide range of applications including food preparation, safety and fire inspection, plastic molding, marine, HVAC, and fleet maintenance. Advanced features include internal data logging, USB interface for data transmission, temperature alarm, adjustable emissivity, temperature differential, data Hold, Max/Min/Avg readings, and auto power-off. The meter also supports contact measurement through a type K thermocouple input. The instrument is fully tested and calibrated to NIST-traceable standards. Careful use of this meter will provide years of reliable service.

## **Unpacking**

Check individual parts against the list of items below. If anything is missing or damaged, please contact your instrument supplier immediately.

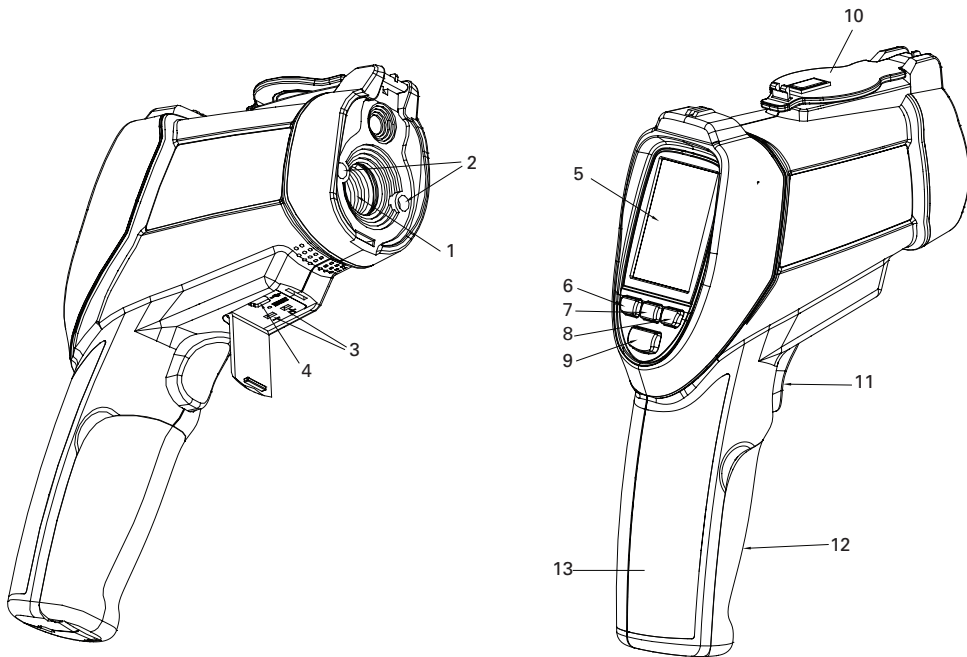
1. Meter
2. One type K flexible probe
3. Software
4. Tripod
5. Carrying case
6. One 9 V battery
7. User manual
8. NIST-traceable calibration report with data

## **Key Features**

- Bluetooth interface
- User-friendly mobile app
- 50:1 Distance-to-sight ratio
- 1% basic accuracy
- Dual laser sighting
- Internal data logging up to 32K IR readings
- Contact measurements via type K thermocouple input
- Precise noncontact IR measurements
- Rapid detection function
- Adjustable emissivity from 0.10 to 1.0
- User-selectable °C or °F units
- Automatic data Hold
- MAX/MIN/AVG temperature displays
- Temperature differential
- High and low alarms (audible)
- Automatic selection range and display resolution
- Trigger lock
- Backlight Dot-matrix display
- Automatic power-off to conserve battery life

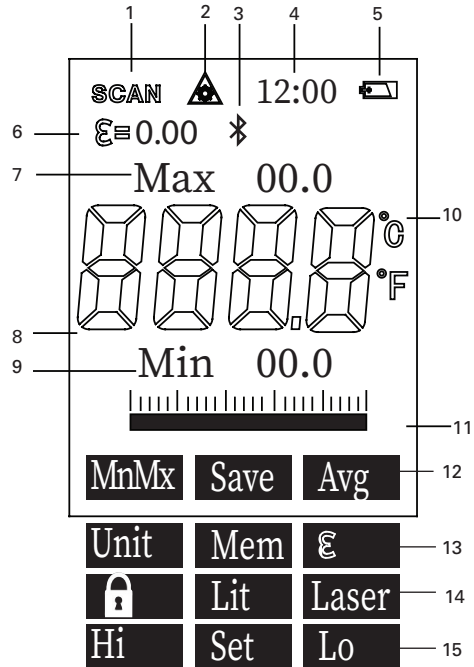
## Meter Description

1. IR sensor
2. Laser pointer beam
3. Type K thermocouple input
4. USB power port
5. Dot-matrix display
6. F1 / Down ▼ button
7. F2 button
8. F3 / Up ▲ button
9. MODE button
10. Lens cover with magnetic lock
11. Measurement trigger
12. Battery cover
13. Handle grip



## Display Layout

1. SCAN/HOLD measuring indicator
2. Laser pointer indicator
3. Bluetooth icon (transmit data)
4. Current time
5. Low-battery indicator
6. Emissivity or type K temperature readout
7. MAX or AVG icons
8. Current temperature readout
9. MIN or DIF icons
10. °C and °F temperature icons
11. Bar graph
12. Menu - Level 1
13. Menu - Level 2
14. Menu - Level 3
15. Menu - Level 4



## How it Works

Infrared thermometers measure the surface temperature of an object. The unit's optics sense emitted, reflected, and transmitted energy, which is collected and focused onto a detector. The unit's electronics translate the information into a temperature reading which is displayed on the unit. The laser is used for aiming purposes only.

### Field of View

Make sure that the target is larger than the unit's spot size. The smaller the target, the closer you should be to it. When accuracy is critical, make sure the target is at least twice as large as the spot size.

### Distance and Spot Size

As the distance (D) from the object increases, the spot size (S) of the area measured by the unit becomes larger.

### Locating a Hot Spot

To find a hot spot, aim the thermometer outside the area of interest, then scan across with an up-and-down motion until you locate the hot spot.

### Emissivity

Emissivity is a term used to describe the energy-emitting characteristics of materials. Most (90% of typical applications) organic materials and painted or oxidized surfaces have an emissivity of 0.95 (preset in the unit). Inaccurate readings will result from measuring shiny or polished metal surfaces. To compensate, cover the surface to be measured with black tape or flat black paint. Allow time for the tape to reach the same temperature as the material underneath it. Measure the temperature of the tape or painted surface. (Refer to table on facing page.)

### Good Measuring Practices

Holding the meter by its handle, point the IR sensor toward the object whose temperature is to be measured. The meter automatically compensates for temperature deviations from ambient temperature. Keep in mind that it will take up to 30 minutes for the IR sensor to stabilize if going from ambient temperatures to a much higher (or lower) temperature measurement.

### Reminders

- The unit is not recommended for measuring shiny or polished metal surfaces (stainless steel, aluminum, etc.). See **Emissivity** above.
- The unit cannot measure through transparent surfaces such as glass. It will measure the surface temperature of the glass instead.
- Steam, dust, smoke, etc. can prevent accurate measurement by obstructing the unit's optics.

## Emissivity Values

Substance	Thermal emissivity	Substance	Thermal emissivity
Asphalt	0.90 to 0.98	Cloth (black)	0.98
Concrete	0.94	Human skin	0.98
Cement	0.96	Lather	0.75 to 0.80
Sand	0.90	Charcoal (powder)	0.96
Earth	0.92 to 0.96	Lacquer	0.80 to 0.95
Water	0.92 to 0.96	Lacquer (matte)	0.97
Ice	0.96 to 0.98	Rubber (black)	0.94
Snow	0.83	Plastic	0.85 to 0.95
Glass	0.90 to 0.95	Timber	0.90
Ceramic	0.90 to 0.94	Paper	0.70 to 0.94
Marble	0.94	Chromium oxides	0.81
Plaster	0.80 to 0.90	Copper oxides	0.78
Mortar	0.89 to 0.91	Iron oxides	0.78 to 0.82
Brick	0.93 to 0.96	Textiles	0.90

## Setup and Operation

1. Hold the meter by its handle grip and point it toward the surface to be measured.
2. Pull and hold the trigger to turn the meter on and begin testing. The display will light if the battery is good. Replace the battery if the display does not light. Meter automatically powers down after 10 seconds once the trigger is released.
3. While measuring, the **SCAN** icon will appear in the upper left-hand corner of the LCD.
4. Release the trigger and the **HOLD** icon will appear at the top of the LCD, indicating that the reading is being held.

## Mode / Menu Overview

By pressing the **MODE button**, the user can access the devices setting. Each time the **MODE button** is pressed the setup menu advances to the next grouping of features. The table below outlines the different Menu levels and the functions available via the corresponding F keys.

Menu level	<b>F1 Button</b> (Function / Description)	<b>F2 Button</b> (Function / Description)	<b>F3 Button</b> (Function / Description)
1	<b>MnMx</b> (Display Min or Max temperature)	<b>Save</b> (Save reading to memory)	<b>Avg</b> (Display average or differential temperature)
2	<b>Unit</b> (Select the unit °C/°F)	<b>Mem</b> (Review/delete memories)	$\epsilon$ (Set Emissivity)
3	<b>FL</b> (Trigger Lock)	<b>Lit</b> (Adjust backlight brightness)	<b>Laser</b> (Select laser on/off)
4	<b>HI</b> (Set and enable the high alarm)	<b>Set</b> (General settings)	<b>Lo</b> (Set and enable the low alarm)

## Mode / Menu Level 1

### MnMx (Minimum / Maximum)

This function allows the user to access the last saved Min / Max reading taken. The thermometer takes a minimum (MIN) and maximum (MAX) temperature reading each time the trigger is engaged.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **MnMx** (Min / Max) appears.
4. Press the **F1 (MnMx) softkey** to return to MnMx view if display is showing "Avg".

The screen will display the minimum and maximum temperature until another function is chosen. The readings will update each time the trigger is pulled.

MIN = Minimum value of measurement.

MAX = Maximum value of measurement.

### Save

This function allows the user to save the last reading taken.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Save** appears.



4. Press the **F2 (Save) softkey** to enter the Save menu.
5. Press the **F1 (Yes) softkey** to save the reading, or **F3 (Esc) softkey** to escape.

The saved reading includes:

- o Assigned record number
- o IR temperature
- o Emissivity
- o Date/Time

### **Avg (Average or Differential)**

This function allows the user to view the average (AVG) or differential (Dif) temperature each time a reading is taken.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Avg** (Avg / Dif) appears.
4. Press the **F3 (Avg) softkey** to return to Avg view if display is showing "MnMx".

The screen will display the average and differential temperature until another function is chosen. The readings will update each time the trigger is pulled.

AVG = Average value of measurement.

DIF = Differential value of measurement.

## **Mode / Menu Level 2**

### **Unit**

This function allows the user to choose between C (Celsius) or F (Fahrenheit) unit of temperature measurement.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Unit** appears.
4. Press the **F2 (°C) softkey** to set to Celsius or **F3 (°F) softkey** to set to Fahrenheit.

## Mem (Memory)

This function allows the user to review or delete saved measurements. Saved data includes temperature, date/time, emissivity, and record numbers.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Mem** appears.
4. Press the **F2 (Mem) softkey** to access the Memory menu.
5. To review readings, press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up through the records.
6. To delete all or an individual record press the **F2 (Del) softkey**.
  - 6.1 Press **F1 (Yes) softkey** to confirm deletion of the viewed individual record or **F3 (Esc) softkey** to escape.
  - 6.2 Press **F2 (All) softkey** to delete all records.
    - 6.2.1 Press **F1 (Yes) softkey** to confirm deletion of all stored records or **F3 (Esc) softkey** to escape.

## Emissivity

This function allows the user to adjust the emissivity value manually or select from a list of materials with pre-defined emissivity values.




**Note:** Default emissivity is 0.95.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **ε** appears.
4. Press the **F3 ε softkey**.
  - 4.1 To adjust the review emissivity value manually, press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up through the values.
  - 4.2 To adjust emissivity through a list of materials with pre-defined emissivity values press **F2 (Tab) softkey**.
    - 4.2.1 To adjust the review materials, press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up through the list. Press **F2 (Ok) softkey** to confirm selection.
  - 4.3 Press the **MODE button** when finished to return to the main menu.

## **Mode / Menu Level 3**

### **Trigger Lock**

This function allows the thermometer to be locked into continuous measurement mode.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until  appears.
4. Press the **F1  softkey** to lock the trigger.
5. Press the **F1  softkey** again to unlock the trigger and resume normal operation.

### **Lit (Backlight)**

This function allows the user to adjust the backlit display. The unit has eight brightness levels.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Lit** appears.
4. Use the **F2 (Lit) softkey** to adjust the backlight brightness. Each time the **F2 (Lit) softkey** is pressed, the display will toggle through the eight brightness settings. The backlight can be disabled using the Setup menu. See "Set" on page 12 for more information.

### **Laser**

This function allows the user to turn on or off the dual lasers equipped.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Laser** appears.
4. Press the **F3 (Laser) softkey** to enable or disable the laser.

**Note:** The laser icon at the top right on the screen will display when active.

## Mode / Menu Level 4

### Hi (alarm)

This function allows the user to program the set point of when the out-of-range high temperature alarm will trigger. An alarm will sound, and the display will flash when the set point is reached.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Hi** appears.
4. Press the **F2 (On/Off) softkey** to turn the alarm on or off.
5. To adjust the alarm set point, press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to desired temperature.

### Lo (alarm)

This function allows the user to program the set point of when the out-of-range low temperature alarm will trigger. An alarm will sound, and the display will flash when the set point is reached.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Lo** appears.
4. Press the **F2 (On/Off) softkey** to turn the alarm on or off.
5. To adjust the alarm set point, press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to desired temperature.

### Set (sub menu)

SET	Time	Set time		
	Date	Set date		
	Backlight	Adjust backlight brightness		
	Buzzer	Button	Enable or disable button sound	
		Alarm	Enable or disable alarm sound	
		Bluetooth	Enable or disable Bluetooth sound	
	Contrast	Adjust display contrast		
	APO time	Adjust auto power-off time		
	Data log	Switch	Enable or disable the data log	
		Sample rate	Set the data log sample rate	
		Delete	Delete all data log	
	Bluetooth	ON/OFF	Enable or disable Bluetooth	

## Time

Function allows user to set and change the time on the thermometer.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Time**.
6. Press the **F2 (Set) softkey** to enter time setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select the desired hour. Press **F2 (Next) softkey** to confirm selection and advance.
  - 6.2. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select the desired minutes. Press **F2 (Ok) softkey** to confirm selection.

**Note:** 24-hour time format.

## Date

Function allows user to set and change the date on the thermometer.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Date**.
6. Press the **F2 (Set) softkey** to enter date setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select year. Press **F2 (Next) softkey** to confirm selection and advance.
  - 6.2. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select the desired month. Press **F2 (Next) softkey** to confirm selection and advance.
  - 6.3. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select the desired day. Press **F2 (Ok) softkey** to confirm selection.

## Backlight

In normal use, the backlight is on. This function will allow the user to turn the backlight on or off by adjusting the brightness level. Turning the backlight off conserves battery power.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Backlight**.
6. Press the **F2 (Set) softkey** to enter backlight setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to adjust the brightness. Press **F2 (Ok) softkey** to confirm selection.

## Buzzer

This function allows the user to enable or disable the button tone, alarm tone and Bluetooth tone.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Buzzer**.
6. Press the **F2 (Set) softkey** to enter buzzer setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select Button, Alarm or Bluetooth.
  - 6.2 Press **F2 (On/Off) softkey** to turn sound on or off for the function.
7. Press the **MODE button** when finished to return to the main menu.

## Contrast

Function allows user to set the contrast level of the display for different environments.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.

5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Contrast**.
6. Press the **F2 (Set) softkey** to enter contrast setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to adjust the contrast value from 30 to 99. Press **F2 (Ok) softkey** to confirm selection.

### **APO time**

Function allows user to set the time interval for when the unit will automatically power off from 7 to 60 seconds. The APO function is set to always on while in Scanning mode, Locked Scanning mode or in locked Data Logging mode.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F3 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **APO Time**.
6. Press the **F2 (Set) softkey** to enter APO Time setting.
  - 6.1. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to adjust the time interval from 7 to 60 seconds. Press **F2 (Ok) softkey** to confirm selection.

### **Data Log**

This function allows the user to activate the data logging function and set the sampling interval from 1 to 3600 seconds (1 hour). The thermometer can store up to 32K readings.

1. Pull the trigger to take a measurement.
2. Release the trigger to stop taking the measurement.
3. Press the **MODE button** until **Set** appears.
4. Press the **F2 (Set) softkey** to enter the Set menu.
5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select Datalog.
6. Press the **F2 (Set) softkey** to enter Datalog.
  - 6.1 Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select Enable, Sample Rate, or Delete.

**Enable** - By selecting the Enable function to the ON position, the data logging function will be activated. The “D” symbol will display on the main screen to indicate when the data logging function is active.

6.2. Press the **F2 (On/Off) softkey** and select ON; the data log function will be turned on.

6.3 Press the Trigger to engage the Trigger Lock. The “D” symbol will display to indicate when the data logging function is active.

6.4. Press the Trigger again to disengage the Trigger Lock.

**Note:** Repeatedly pressing the trigger while the data logging function is active will turn the data logging on and off.

6.5. Press the **F2 (On/Off) softkey** and select OFF; the data log function will be turned off. The “D” symbol will disappear from the display to indicate when the data logging function is no longer active.

**Sample Rate** - Allows the user to set the sampling interval from 1 to 3600 seconds. **Note:** This should be done before enabling the data log feature in the ON position.

6.2. Press the **F2 (Ok) softkey** to enter Sample Rate setting.

6.3 Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to adjust the Sample Rate time.

6.4. Press the **F2 (Ok) softkey** when finished.

**Delete** - Allows the user to delete the data stored in memory.

6.2. Press the **F2 (Del) softkey** to enter Delete setting.

6.2.1 Press the **F2 (Yes) softkey** to delete all stored data.

6.2.2 Press the **F3 (Esc) softkey** to exit without deleting any data.

### **Bluetooth®**

This function allows the thermometer to send real-time data or memory data to a device using the D/S IR Therm smart device app via Bluetooth.

1. Pull the trigger to take a measurement.

2. Release the trigger to stop taking the measurement.

3. Press the **MODE button** until **Set** appears.

4. Press the **F3 (Set) softkey** to enter the Set menu.

5. Press the **F1 (▼) softkey** to toggle down and **F3 (▲) softkey** to toggle up to select **Bluetooth**.

6. Press the **F2 (Set) softkey** to enter Bluetooth setting.

7. Press the **F2 (On/Off) softkey** to turn Bluetooth on or off.



## Thermocouple Probe Operation

1. Insert the thermocouple probe with mini connector into the thermocouple slot located under the front housing beneath the dust cover.
2. Once the thermocouple probe is plugged into the thermometer, the lower display which normally shows the minimum or differential IR temperature will now display "TK" and the reading coming from the thermocoupleprobe.

## Smart Device Software

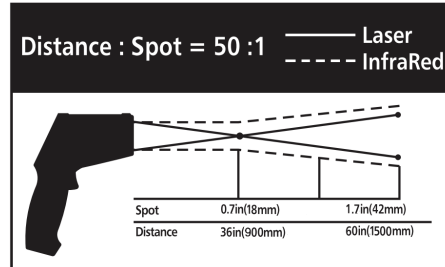
Setup is simple. Download the free D/S IR Therm mobile app to your Android™ or iOS® device. Place the thermometer in Bluetooth® mode and open the app on your device. The meter will be sensed by your device and be listed as an available source that you can select. Once selected, the data sensed by the meter is displayed on your device and some of the instrument functions can be accessed. A full description of its operation is available for download in the app.

## SPECIFICATIONS

IR temperature range	-58 to 3362°F (-50 to 1850°C)
T/C temperature range	-58 to 2498°F (-50 to 1370°C)
Resolution	0.1°F/C below 1000°, 1°F/C above 1000°
IR accuracy	From -58 to 68°F (-50 to 20°C): ±5.4°F (3°C) From 68 to 932°F (20 to 500°C): ±1.0% ± 1.8°F (1°C) From 932 to 1832°F (500 to 1000°C): ±1.5% From 1832 to 3362°F (1000 to 1850°C): ±2.0%
T/C accuracy	From -58 to 32°F (-50 to 0°C): ±3.6°F (±2°C) From 32 to 2498°F (0 to 1370°C): ±0.5% of reading ± 3°F (±1.5°C)
IR response time	150 ms
Emissivity	Adjustable from 0.10 to 1.0
Distance-to-sight ratio (field of view)	D/S = approximately 50:1 ratio (D = distance, S = spot)
Laser	Dual Class 2 (II) lasers
Spectral range	8 to 14 μm
Out-of-range indication	LCD will show "----"
Operating temperature	32 to 122°F (0 to 50°C)
Storage temperature	14 to 140°F (-10 to 60°C)
Weight	17.4 oz (494 g)
Dimensions	7½" x 6" x 2¼" (18.9 x 15.2 x 5.7 cm)
Power	One 9 V battery

## Field of View

The meter's field of view is 50:1, meaning that if the unit is 50 inches from the target, the diameter of object under test must be at least 1 inch. Other distances are shown in the diagram at right. Make sure that the target is larger than the meter's spot size. The smaller the target, the closer you should be to it. When accuracy is critical, make sure the target is at least twice as large as the spot size. As the distance (D) from the object increases, the spot size (S) of the area measured by the meter becomes large. The relationship between distance and spot size is shown above. The focal point is 36" (914 mm). The spot sizes indicate 90% encircled energy.



## Safety

- Use extreme caution when the laser beam is turned on.
- Do not let the laser beam enter your eye, another person's eye or the eye of an animal.
- Be careful not to let the laser beam on a reflective surface strike your eye.
- Do not allow the laser light beam to impinge on any gas which can explode.



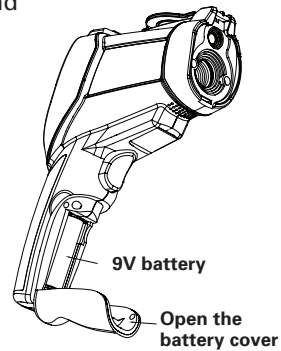
## **Maintenance, Recalibration, and Repair**

### **Cleaning and Storage**

- The meter should be cleaned with a damp cloth and mild detergent when necessary.  
Do not use solvents or abrasives.
- Store the meter in an area with moderate temperature and humidity (refer to the specifications on page 17).

### **Battery Replacement**

If the battery power is insufficient, the **Low-battery** icon will appear on the LCD. Open the battery cover and replace the 9 V battery. Securely close the cover.



**It is recommended that Digi-Sense products are calibrated annually** to ensure proper function and accurate measurements; however, your quality system or regulatory body may require more frequent calibrations. To schedule your recalibration, please contact InnoCal, an ISO 17025 calibration laboratory accredited by A2LA.

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