



HIGH PERFORMANCE INFRARED THERMOMETER

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INTRODUCTION



We hope you enjoy using your infrared thermometer! It measures the amount of infrared energy emitted by a target object, and calculates the temperature of that object's surface.

FEATURES

Your thermometer includes:

- Laser sighting
- Adjustable emissivity
- High/Low Alarm
- MAX, MIN, DIF, AVG
- Data Logger (100 points)
- Trigger lock
- Graphic display ... and more!

ACCESSORIES

(optional)



The accessories package for your infrared thermometer, if ordered, includes:

- external power supply
- thermocouple type K
- Windows-based software
- RS232 cable

OPTIONAL POUCH



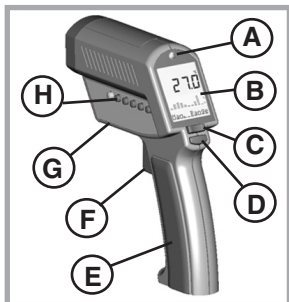
The optional pouch comes with a belt clip and helps to protect your infrared thermometer when not in use.

FUNCTIONS

USER INTERFACE

Function keys and display:

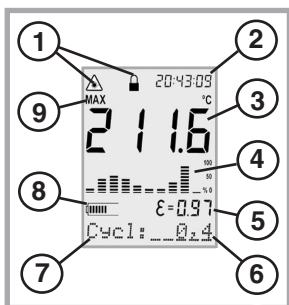
- (A) Visual and audible alarm
- (B) Display
- (C) Up and Down keys
- (D) Enter
- (E) Handle and battery compartment
(DIP switches for adjustments are inside handle)
- (F) Trigger
- (G) Tripod mount
- (H) 6 main function keys



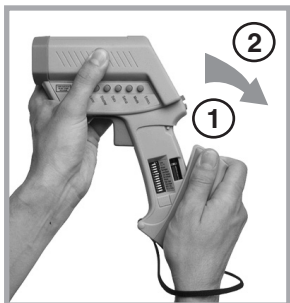
DISPLAY

Displayed functions:

- (1) Laser condition / Lock symbol
- (2) Time (or date)
- (3) Main temperature display
- (4) Graphic display
- (5) Emissivity value
- (6) Status bar
- (7) Mode indicator
- (8) Battery life indicator
- (9) MAX, MIN, DIF, AVG symbols



BATTERIES

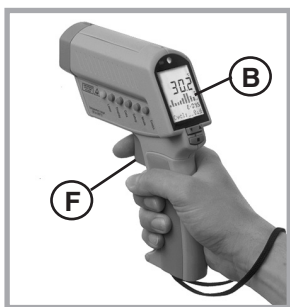


To open the battery compartment, press gently on the top part of the handle (1) to release the catch (2) and pivot the grip as shown in the figure.

Orient the batteries (two alkaline R6 (AA, UM3)) as shown on the housing.

MEASUREMENT

QUICK START



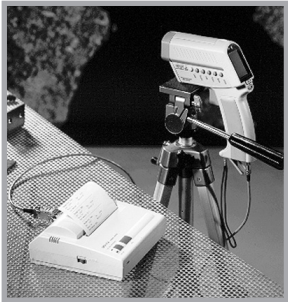
To take a temperature measurement, hold the unit as shown. Aim at the target. Pull the trigger (F). The temperature of the object being measured is shown on the display (B). The temperature will be displayed for seven seconds after the trigger is released.

The unit automatically switches “off” after 7 seconds if a function key is not pressed. The last settings are stored. The display returns to the last mode selected. To recall the last reading, press ENTER without pulling the trigger.

MEASUREMENT

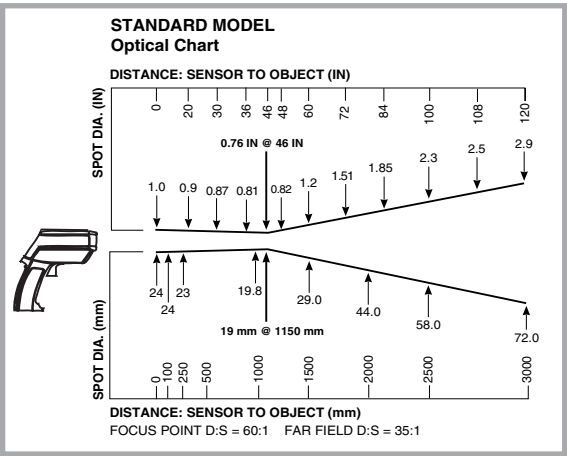
CONTINUOUS

Open the battery compartment and switch LOCK "on" to lock the unit on. You may mount the unit on a tripod, using the tripod mount. Pull the trigger for continuous temperature measurement. (The laser will not be locked on.) To unlock, switch LOCK off.



MEASUREMENT

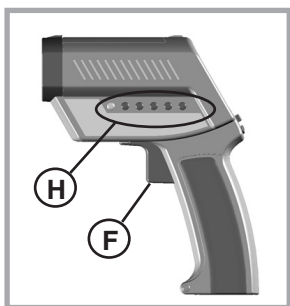
SPOT SIZE



The measured spot size depends on the distance between the object you are measuring and the infrared thermometer. The relationship between distance and spot size is 60:1 at the focus point. The D:S in the far field (>33ft/10m) is 35:1.

SELECTING

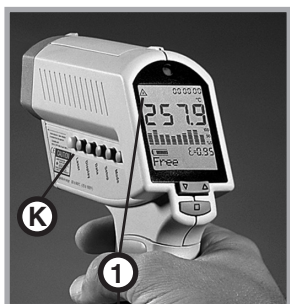
A FUNCTION



To select a function, first turn the unit on by pulling the trigger (F). Then push the button of the desired function (H). To change functions, press ENTER or the function button again, and then the new function button.

LASER

ON/OFF



The laser sight simplifies sighting of the measurement object. It shows the spot size that includes the measured target.

To turn the laser on or off press the LASER button (K) when the trigger is pulled. A laser symbol (1) appears when the laser is on. The laser automatically turns off if you release the trigger.



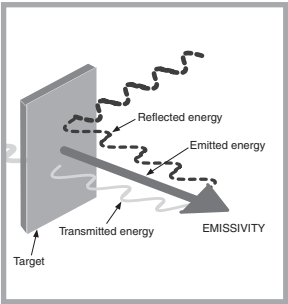
laser ON
symbol

EMISSIONITY

EMISSIONITY EXPLAINED

The amount of infrared energy radiated by an object depends on its emissivity and its temperature.

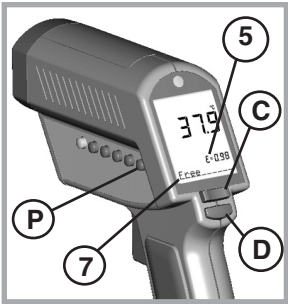
The emissivity depends on the material and its surface characteristics. For more accurate readings, adjust the emissivity value for the type of material being measured.



EMISSIONITY

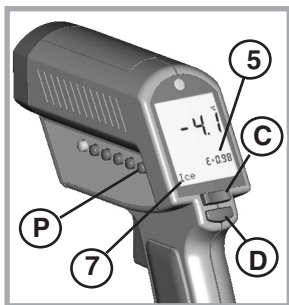
ADJUST EMISSIONITY

To adjust the emissivity value, press EMISS (P). Use the Up and Down keys to select “Free” (“Free” will have a flashing underline) (7). Press EMISS again. “Free” is not underlined, and the emissivity icon (5) flashes. Use the Up and Down keys (C) to adjust. Press ENTER (D) to activate this setting.



EMISSION

TABLE OF VALUES



To choose the emissivity of a material, press EMISS (P). The display shows a material name (7), an emissivity value, and the calculated temperature value (5). To choose another material, use the Up and Down keys (C). Press ENTER (D) to activate this setting.



EMISSION

UNKNOWN VALUE



To adjust the unit's emissivity value for a material with unknown emissivity, plug in the probe.

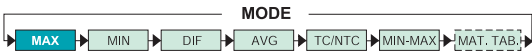
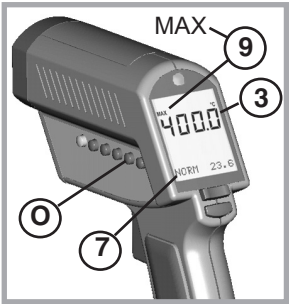
Pull the unit's trigger. Place the measuring tip of the probe on the area to be measured. Wait for the reading to stabilize.

Note the indicated probe temperature reading. Release the trigger. Pull the trigger again. Measure the same area using infrared measurement. Press the emissivity button (P). Use the Up and Down keys (C) to select the material name "Free" which will be shown in the display (7). Press the emissivity button (P) again until the emissivity sign (5) flashes. Use the arrow keys (C) to change the emissivity value until the temperature matches the probe's reading.

MODE

MAXIMUM

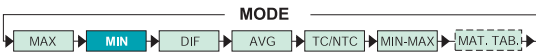
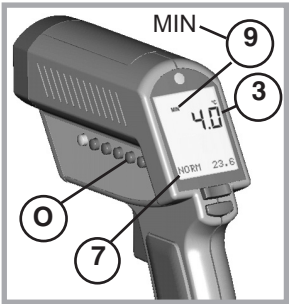
To activate the MAX mode, press MODE (O) until the MAX symbol appears (9). The measured maximum temperature is displayed (3) as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (7).



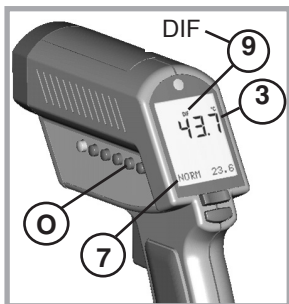
MODE

MINIMUM

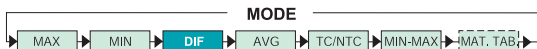
To activate the MIN mode, press MODE (O) until the MIN symbol (9) appears. The measured minimum temperature (3) is displayed as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (7).



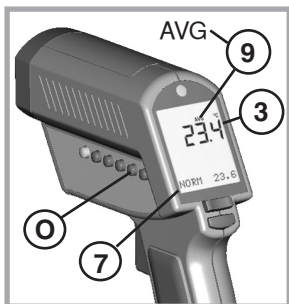
MODE DIFFERENCE



To activate the DIF mode, press MODE (0) until the DIF symbol (9) appears. The difference between the measured max and min temperatures is displayed (3) as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (7).



MODE AVERAGE



To activate the AVG mode, press MODE (0) until the AVG symbol (9) appears. The average value of measured temperatures (3) is displayed as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (7).

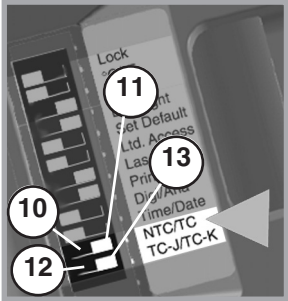


MODE TC/NTC

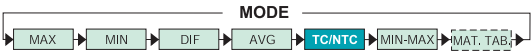
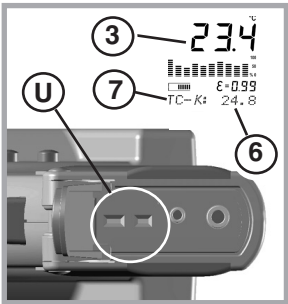
PROBE CONNECTIONS

Open the battery compartment and set the switches according to the desired probe type.

- (10) NTC - thermistor
- (11) TC - thermocouple
- (12) Thermocouple type J
- (13) Thermocouple type K

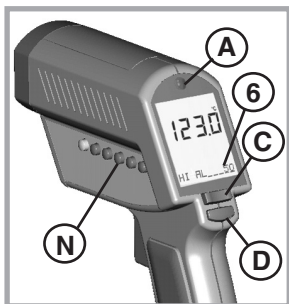


Connect the probe to the input (U). Press MODE, until the desired probe symbol (7) appears. The probe temperature is shown in the lower part of the display (6). The real time infrared temperature is shown in the main display (3).



SETUP

HIGH ALARM



The high alarm (HiAl) generates an audible and visual (flashing LED (A) and laser) alarm if the temperature is above the setpoint.

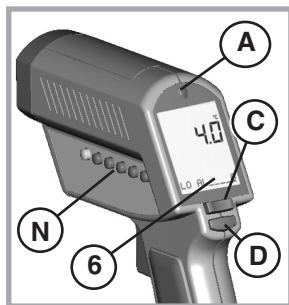
To set the alarm value (6), Press SETUP (N) once, and use the Up and Down keys (C).

Then press ENTER (D) to activate this setpoint.



SETUP

LOW ALARM



The low alarm (LoAl) generates an audible and visual (flashing LED (A) and laser) alarm if the temperature is below the setpoint. To set the alarm value (6), Press SETUP (N) twice and use the Up and Down keys (C).

Then press ENTER (D) to activate this setpoint.

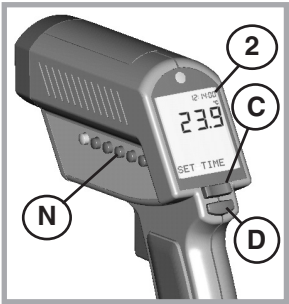


SETUP

TIME

To set the time, press SETUP (N) three times. Change the time (2) using the Up and Down keys (C).

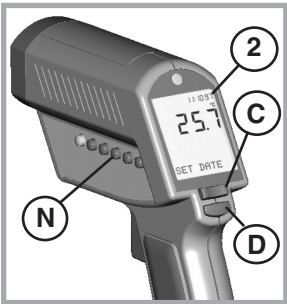
Then press ENTER (D) for each time segment to activate this time setting. The time appears on the display, is stored within the data logger, and is part of the printer output.



SETUP

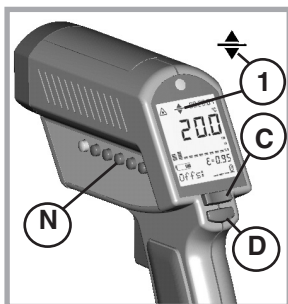
DATE

To set the date, press SETUP (N) four times. Change the date using the Up and Down keys (C). Then press ENTER (D) for each date segment to activate this date setting. The date (2) is stored within the data logger and is part of the printer output.



SETUP

OFFSET



This function is used with a selected emissivity to add or subtract an offset value ($\pm 10^{\circ}\text{C}/\pm 18^{\circ}\text{F}$) to the temperature value. Press the Setup button (N) until "Offset" appears in the display. With the arrow keys (C) adjust the display to the corrected value. Press ENTER (D) to

confirm. If OFFSET is used, a symbol (1) appears in the display. The OFFSET feature allows the temperature values for several units to be matched, correcting for the allowed temperature tolerance difference between units. The OFFSET function can also be used to increase the accuracy for a narrow temperature range.



MODE

MIN-MAX VALUES



To show the minimum and maximum temperature values during a measurement at the bottom of the display, press MODE (O) until the two values appear (6).

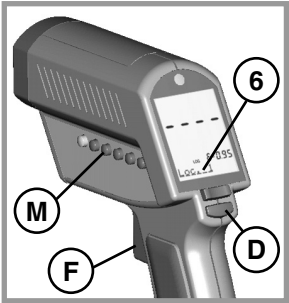


DATA LOGGER

HOW TO STORE DATA

By pressing the ENTER button (D) the LOG function (6) appears on the display. Pull the trigger (F) and hold it. Aim at the target. Be sure that the laser sighting is inside the target. Gently release the trigger to record the temperature. The next location will be shown on the display.

This function is also initiated by pressing the DATA button (M) once.

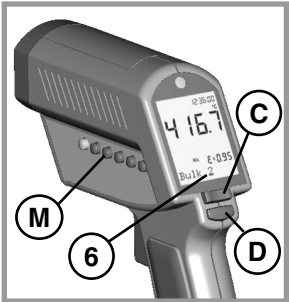


DATA

RECALL

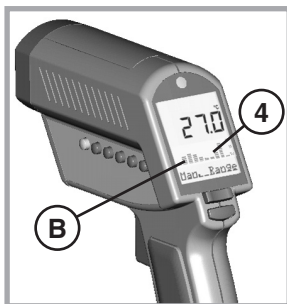
To Recall stored data, press the ENTER button (D), without pulling the trigger. Then press the DATA button (M) until RCL appears on the display. A log location will be shown (6).

To select another log location, use the Up and Down keys (C).

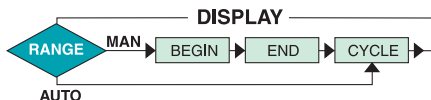


DISPLAY

GRAPHIC DISPLAY

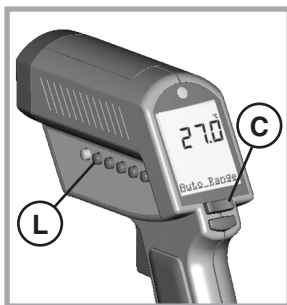


The graphic display (4) shows the temperature as a picture. The last ten measurements are shown (B). It is possible to choose between Auto Range and Manual Range. In manual range the user defines the beginning and ending temperature points of the graph.

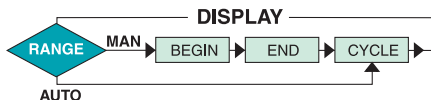


DISPLAY

AUTO OR MAN RANGE



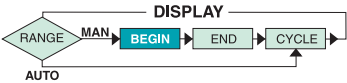
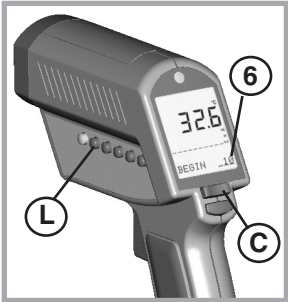
Press DISPLAY (L) once. Use the Up and Down keys (C) to toggle between ranges. Auto Range is automatically defined by the measured maximum and minimum value. Manual Range (Man Range) is user defined (see DISPLAY, BEGIN section).



DISPLAY

BEGIN
(Man. Range)

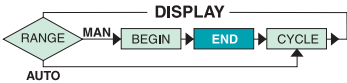
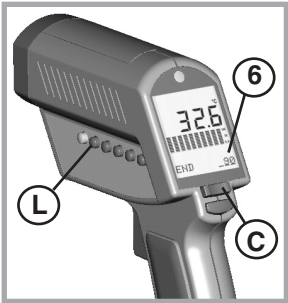
To set the BEGIN value for the graphic display (Man. Range is activated), press DISPLAY (L) until "Begin" is shown at the status bar. Use the Up and Down keys (C) to select the value (6).



DISPLAY

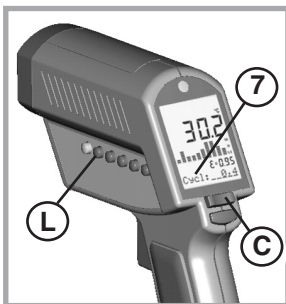
END
(Man. Range)

To set the END value of the graphic display (Man. Range), press DISPLAY (L) until "End" is shown at the status bar. Use the Up and Down keys (C) to select the value (6).

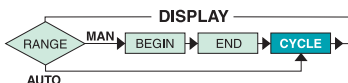


DISPLAY

CYCLE

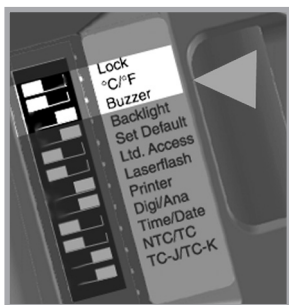


CYCLE allows the adjustment of the display interval. Press DISPLAY (L) until Cycl.: (7) is shown at the status bar. To select the interval time, use the Up and Down keys (C). The default value is pre-set for 0.2 sec.



SETTINGS

(PART 1)



Change the setting in the unit by using the DIP switches located in the battery compartment (see BATTERIES section).

- Lock: Trigger locked (on) or unlocked (off).
- °C/°F: changes between °C and °F and date and time format.
- Buzzer: Audible alarm On or Off.

SETTINGS

(PART 2)

Factory Defaults DIP-Switch Settings																																																					
<table><tr><th>ON</th><th></th></tr><tr><td></td><td>Lock</td></tr><tr><td></td><td>C/ F</td></tr><tr><td></td><td>Buzzer</td></tr><tr><td></td><td>Backlight</td></tr><tr><td></td><td>Set Default</td></tr><tr><td></td><td>Ltd. Access</td></tr><tr><td></td><td>Laserflash</td></tr><tr><td></td><td>Printer</td></tr><tr><td></td><td>Digi/Ana</td></tr><tr><td></td><td>Time/Date</td></tr><tr><td></td><td>NTC/TC</td></tr><tr><td></td><td>TC-J/TC-K</td></tr></table>	ON			Lock		C/ F		Buzzer		Backlight		Set Default		Ltd. Access		Laserflash		Printer		Digi/Ana		Time/Date		NTC/TC		TC-J/TC-K	<table><tr><th>ON</th><th></th></tr><tr><td></td><td>Lock</td></tr><tr><td></td><td>C/ F</td></tr><tr><td></td><td>Buzzer</td></tr><tr><td></td><td>Backlight</td></tr><tr><td></td><td>Set Default</td></tr><tr><td></td><td>Ltd. Access</td></tr><tr><td></td><td>Laserflash</td></tr><tr><td></td><td>Printer</td></tr><tr><td></td><td>Digi/Ana</td></tr><tr><td></td><td>Time/Date</td></tr><tr><td></td><td>NTC/TC</td></tr><tr><td></td><td>TC-J/TC-K</td></tr></table>	ON			Lock		C/ F		Buzzer		Backlight		Set Default		Ltd. Access		Laserflash		Printer		Digi/Ana		Time/Date		NTC/TC		TC-J/TC-K
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Celsius setting shown	Fahrenheit setting shown																																																				

- Backlight: Backlight On or Off.
- Set Default: Activates the factory defaults by overwriting listed settings (see specifications).
- Ltd. Access: No function buttons will work.
- Laserflash: The laser flashes in case of over- or underranging of the alarm values.

SETTINGS

(PART 3)
PRINTER

english

D17.03.98 @14:41:38 T023.9 X025.6
(15) D18.03.98 @14:53:30 T024.5 X-30.0 (16)
D18.03.98 @14:53:31 T024.4 X-30.0
D18.03.98 @14:53:32 T024.3 X-30.0
(14) D18.03.98 @14:53:33 T024.3 X-30.0 (17)
D18.03.98 @14:53:34 T024.4 X-30.0
D18.03.98 @14:53:35 T024.4 X-30.0
D18.03.98 @14:53:36 T024.4 X-30.0
D18.03.98 @14:53:37 T034.0 X-30.0
D18.03.98 @14:53:38 T033.7 X-30.0
D18.03.98 @14:53:39 T024.4 X-30.0
D18.03.98 @14:53:40 T024.3 X-30.0
D18.03.98 @14:53:41 T031.4 X-30.0
D18.03.98 @14:53:42 T024.5 X-30.0
D18.03.98 @14:53:43 T022.2 X-30.0
D18.03.98 @14:53:44 T024.8 X-30.0
D18.03.98 @14:53:45 T024.6 X-30.0

Printer: (ON) The printer's data output (RS232) is working as long as the trigger is pulled. The protocol includes:

- (14) Date
- (15) Time
- (16) Target temperature - infrared
- (17) Target temperature- probe "X"

See software manual for other printout options.

SETTINGS

(PART 4)

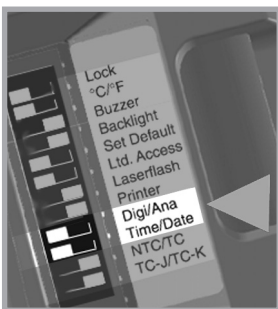
Digi/Ana:

Digital or Analog output.

Digital (RS232) output must be used with the printer or a PC. Analog output (mV/°) is usually used for data logging.

Time/Date:

Time or date shown on the display.



SETTINGS

(PART 5)

CONTACT PROBES

NTC/TC:

Thermistor (NTC) or thermocouple (TC).

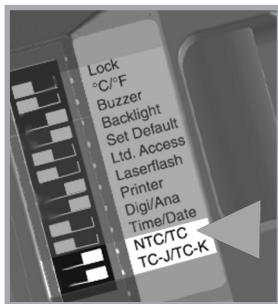
TC-J/TC-K:

Type of thermocouples. The temperature range for the probes:

K: -30°C to 400°C
(-25°F to 750°F)

J: -30°C to 650°C
(-25°F to 1200°F)

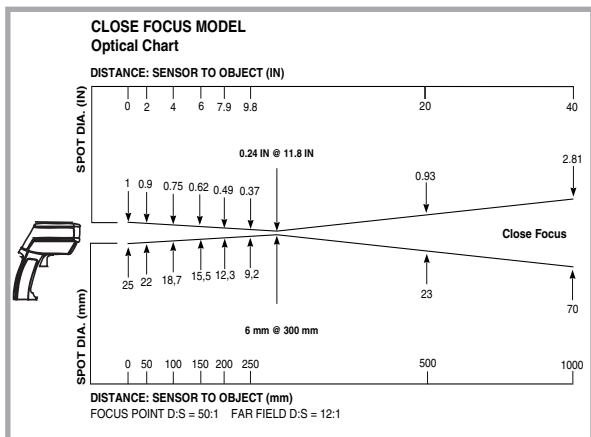
NTC: -30°C to 120°C
(-25°F to 250°F)



Note:

The temperature ranges given are for the unit's optional type K thermocouple.

Close-Focus Model



The measured spot size depends on the distance between the object you are measuring and the infrared thermometer. The relationship between distance and spot size is 50:1 at the focus point. The D:S in the far field is 12:1.

The best distance between sensor and object is from 10 cm (4") up to 50 cm (20").

Sub-Zero Model

Temperature Range: -50 to 500°C (-58 to 932°F)

Following is the accuracy table for the sub-zero model when the ambient temperature is 25°C (77°F) ±5°C (9°F):

Target Temperature

-5 to 500°C (23 to 932°F)

Accuracy

±1% of reading or
±1°C (2°F),
whichever is greater

-30 to -5°C (-22 to 23°F)

±1.5°C (3°F)

-50 to -30°C (-58 to -22°F)

±2°C (4°F)

APPENDIX B
TROUBLESHOOTING

TROUBLESHOOTING

Code	Problem	Action
-O- -U-	Target temperature is over <i>or</i> under range	Select target within unit's specs
EEPROM-Err	EEPROM error	Contact Factory
CalAreaErr ProbCalEr	calibration errors	Contact Factory
Battery icon flashes or LowBatt	Battery is low	Replace Batteries
Blank display	Battery is dead	Replace Batteries
Laser won't work	Low or dead battery	Replace Batteries
	Ambient above 45°C (113°F)	Operate unit in 45°C (113°F) ambient or below
Display "ON"	Display locked "ON"	Disconnect the unit from the PC or power supply

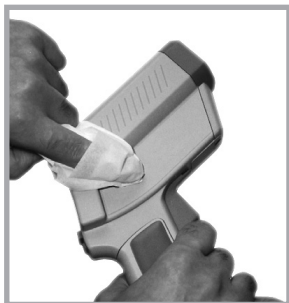
APPENDIX C

MAINTENANCE



Lens Cleaning: Blow off loose particles using clean compressed air. Brush remaining debris away with a camel's hair brush. Wipe the surface with a moist cotton swab. The swab may be moistened with water or a water based glass cleaner.

NOTE: DO NOT use solvents to clean the plastic lens.



Cleaning the Housing: To clean the exterior housing, use soap and water or a mild commercial cleaner. Wipe with a damp sponge or soft rag.

APPENDIX D

LASER WARNING LABEL



IEC 825
(1994)

LASER LIGHT
DO NOT STARE INTO BEAM
CLASS 2 LASER
< 1 mW / 635 nm

LASERLICHT
NICHT IN DEN STRAHL
BLICKEN
LASER KLASSE 2
< 1 mW / 635 nm

RAYONNEMENT LASER
NE PAS EXPOSER L'OEIL
AU RAYON LASER
LASER DE CLASSE 2
< 1 mW / 635 nm

RAYO LASER
NO FIJAR LA VISTA
EN EL RAYO
LASER CLASE 2
< 1 mW / 635 nm



JISC6802-1989 クラス2レーザー製品
最大出力1mW 630-670nm

レーザー光をのぞきこまないこと
レーザー光を人に向けないこと
子供に使わせないこと

Avoid exposure - laser radiation
is emitted from this aperture.
Complies with
FDA 21 CFR 1040.10 and 1040.11.

CAUTION

LASER RADIATION - DO NOT
STARE INTO BEAM

 OUTPUT <1mW
WAVELENGTH 635 nm
CLASS II LASER PRODUCT

EVITE EXPOSIÇÃO - RADIAÇÃO LASER
EMITIDA ATRAVÉS DESTA ABERTURA
DE ACORDO COM
FDA 21 CFR SUBCAPÍTULO J

CAUTELA

RADIAÇÃO LASER - EVITE EXPOSIÇÃO
DIRETA AOS OLHOS

 SAÍDA < 1mW
COMPRIMENTO DE ONDA 630-670 nm
CLASSE II PRODUTO LASER

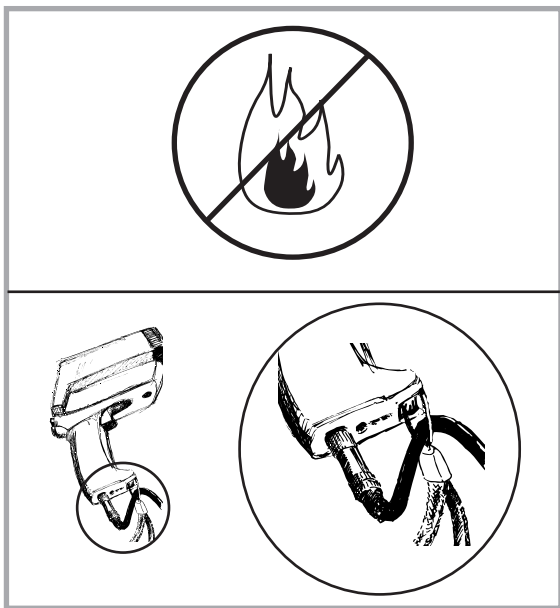
CAUTION! Do not stare into beam!
Avoid indirect exposure via
reflective materials!

SERIAL NUMBER LABEL

Manufacturer,
Address

Made in Germany: Month, Year
Model: XXXXXXXX
Serial: 000000-0000-0000
Power Requirements 3 V

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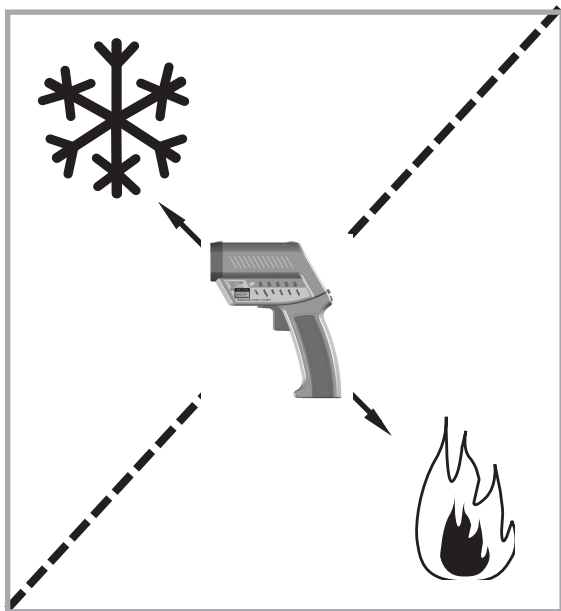


Avoid static electricity, arc welders, and induction heaters. Keep away from very strong EMF (electromagnetic fields). Don't leave the unit on or near objects of high temperature.

WARNING: DO NOT touch live voltage with contact probe. Use the wrist strap for cable support.

APPENDIX E

CAUTIONS (cont.)



Thermal Shock

Avoid abrupt changes in temperature. If this occurs, allow 40 minutes for thermal stabilization before use to prevent the possibility of inaccurate temperature readings. Use only the power supply from the manufacturer.

APPENDIX F

EMISSIONS

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

* oxidized

** opaque, over 20 mils

*** natural

SPECIFICATIONS

Temperature Range	- 30 to 900°C (- 25 to 1600°F)
Display Resolution	0.1°C (0.2°F)
Accuracy (Infrared)	± 0.75% of reading or ± 0.75K (± 1,5°F), whichever is greater at 25°C (77°F) ambient temperature, ± 2K (± 4°F) for targets below -5°C (23°F)
Ambient derating	< 0.05K/K or < 0.05%/K, whichever is greater at + 25°C (77°F) ± 25K (± 45°F)
Optical Resolution (Standard Focus)	60:1 (19mm spot size at 1.15 M.) (0.75in. spot size at 3.8 feet)
Optical Resolution (Close Focus)	50:1(6mm spot size at 0.3 M.) (0.24in. spot size at 0.98 feet)
Accuracy (Thermocouple K & J)	± 2K or ± 0.75%, whichever is greater
Accuracy (Thermistor)	
-30 to 0°C (-22 to 32°F)	± 0.6K
0 to 70°C (32 to 158°F)	± 0.4K
70 to 100°C (158 to 212°F)	± 1K
100 to 120°C (212 to 248°F)	± 1.5K
Repeatability (Infrared)	± 0.5% of reading or ± 0.5°C (1°F), whichever is greater, ± 1°C (± 2°F) for targets below -5°C (23°F)
Response Time (95%)	250 mSec
Hot Spot Detection (30%)	85 mSec
Spectral Range	8 to 14 μm
Ambient Operating Range	0 to 50°C (32 to 122°F)
Storage Temperature (without batteries)	-20 to 50°C (-4 to 122°F)
Analog output	1 mV/°C(°F)
Digital Output	RS232

SPECIFICATIONS (Cont.)

Power	2 x 1.5 V Alkaline Type AA
Battery Life	13 hrs. (50% laser and 50% backlight on)
Power supply (External)	7.5 V $\geq$ 200 mA (Using the power supply the display automatically switches on)
Dimensions	200 x 170 x 50 mm (7.9 x 6.7 x 2 inches)
Tripod Mount	1/4"-20 UNC

FACTORY DEFAULTS

	Default	Range
Emissivity/Gain	0.95	0.10 to 1.50 in steps of 0.01
Emissivity Table	Free	30 materials
Mode	normal	
Hi Alarm	50°C (100°F)	-30 to 900°C (-25 to 1600°F)
Lo Alarm	0°C (32°F)	-30 to 900°C (-25 to 1600°F)
Offset Adjust	0°C (0°F)	-10 to 10°C (-18 to 18°F)
Graphic Display	Auto Range	Auto Range / Man Range
Cycle Time	0.2 sec	0.1 sec to 300 sec
Printer Mode	Data Recording	3 modes, selectable via software
Printer output	ASCII 8 bits 1 Stop bit No Parity Baud Rate 9600	
Data logger	100 points pre-set with emissivity 0.95 Lo-AI: 0°C Hi-AI: 50°C adjustable only via Software Accessory	

CE CONFORMITY



This instrument conforms to the following standards:

EMC: - EN 61326-1

Safety: - EN 61010-1:1993 / A2:1995
- EN 60825-1:1994

This product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.

This instrument conforms to the Standards of the European Community.

NIST/DKD CERTIFICATION

The temperature sources used to calibrate this instrument are traceable to the U.S. National Institute of Standards and Technology (NIST) and the Deutscher Kalibrierdienst (DKD). NIST and DKD certificates are available as an option from the manufacturer.

