



IRtec P Mk2

Portable IR Thermometers

Instruction Manual MM850246 ed. 09a



INTRODUCTORY NOTE

NOTE: THIS MANUAL MUST BE REFERRED TO IRTEC P Mk2 SERIES WITH SERIAL NUMBER 135922 OR SUPERIOR AND FIRMWARE REVISION 1.009.

*This publication contains operating instructions, as well as a description of the principles of operation, of **IRtec P Mk2 portable IR thermometers**.*

This information covers all models of the instrument, including the basic equipment and its options and accessories. This manual is a complete "USER GUIDE", providing step-by-step instructions to operate the instrument in each of its designed functions.

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***IRtec P Mk2** gas analyser uses sophisticated analog and digital technologies. Any maintenance operation must be carried out by qualified personnel ONLY. **Eurotron** supplies instructions and operative procedures for any operation on the instrument. We recommend to contact our technicians for any support requirements.*

The instrument is supplied by a Ni-MH rechargeable battery pack or by 100, 115, 230V $\pm 10\%$ 50/60Hz line supply using the special power supply module provided with the unit.

***IRtec P Mk2** is fully tested in conformity with the directive n°89/336/CEE Electromagnetic Compatibility. **Eurotron** shall not be liable in any event, technical and publishing error or omissions, for any incidental and consequential damages, in connection with, or arising out of the use of this book.*



CAUTION - LASER SAFETY

LASER RADIATION - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT CONFORMS TO IEC 823:1993
WAVELENGTH: 630-670NM – OUTPUT: <1mW



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TABLE OF CONTENTS

1	GENERAL DESCRIPTION	6
1.1	Instrument codes	8
1.1.1	IRtec P 500+ / P800+ / P1000+ / P1300+ / P1600+ / P2000+ / P3000+.....	8
1.1.2	IRtec P 510G	9
1.1.3	IRtec P MM.....	9
1.1.4	Optics / models compatibility.....	10
1.2	Specifications.....	10
1.2.1	Target dimensions at different distances	11
2	GENERAL FEATURES	15
2.1	General	15
2.2	Optical System.....	15
2.2.1	Dual optic (for IRtec P 800+ and P 510G only)	15
2.3	Target pinpointing.....	16
2.3.1	TTS laser pinpointing	16
2.4	Taking measurements	16
2.5	Keyboard.....	17
2.6	Display	17
2.7	USB serial interface	17
2.8	Thermocouple Input.....	17
2.9	Logging Mode	18
2.10	Calculated Measurements	18
2.11	Quality System.....	18
2.12	Report of Calibration	18
2.13	Case	18
2.14	Logging Data Manager	18
3	PHYSICAL DESCRIPTION	19
4	FUNCTIONAL DESCRIPTION	20
4.1	Power supply	20
4.2	Keyboard.....	21
4.3	Microcontroller	21
4.4	Firmware	21
4.5	Display	21
4.6	Battery charger	21
4.7	USB digital interface	21
5	UNPACKING	22
6	PRE-OPERATIONAL CHECK	23
7	POWER SUPPLY	24
7.1	Rechargeable Li-Ion battery.....	24
7.1.1	Battery charging.....	25
7.2	Power supply from main line AC	25
8	OPERATIONS & APPLICATIONS	26
8.1	Switching on modes.....	27
8.2	How to Operate the instrument	27
8.3	Hold function	29
8.4	Laser pinpointing.....	29
8.5	Unstable temperature measurement.....	29
8.6	Alarm settings	31
8.7	Thermocouple input	32
8.8	Minimum, maximum, average and difference indication	33
8.9	Emissivity setting	33
8.9.1	Manual setting.....	33
8.9.2	Automatic setting	34
8.9.3	Preloaded emissivity table setting.....	35



9	INSTRUMENT CONFIGURATION	37
9.1	Technical Unit selection	37
9.2	Thermocouple input enabled.....	37
9.3	Temperature Scale selection	38
9.4	Decimal point selection	38
9.5	Date & Real Time clock setting	39
9.6	Display backlit setting	39
9.7	Acquisition settings	40
9.8	Buzzer.....	40
9.9	Ambient Temperature Compensation (TAM)	41
9.10	Firmware revision number.....	42
9.11	Instrument serial number	42
9.12	Battery level of charge	43
10	DATA ACQUISITION OPERATIVE MODE	44
10.1	Storing data	44
10.2	Resetting memory.....	46
10.3	Recalling data	47
11	LOGGING DATA MANAGER	49
11.1	System requirements	49
11.2	Installing the Software.....	49
11.3	Uninstalling the Software	52
11.4	Compatibility	52
12	OPTIONS & ACCESSORIES	53
12.1	External IR printer (optional)	53
12.1.1	Using the printer.....	53
12.1.1.1	Printer description	53
12.1.1.2	Enabling the IR port	54
12.1.1.3	Changing the paper roll.....	55
12.1.1.4	Cleaning the printer.....	56
12.1.2	Printing.....	56
12.1.2.1	Printing a single measure.....	56
12.1.2.2	Printing a single measure and its minimum/maximum values	57
12.1.2.3	Printing one tag measurement	58
12.1.2.4	Printing all TAG measurements	59
12.1.2.5	Printing errors.....	61
12.2	Sighting telescope system	62
12.3	Red Point system.....	63
12.4	Close Focus Lens (for P 1300+, P1600+, P2000+ and P3000+ only).....	64
13	USB INSTALLATION SETUP	65
13.1	Installing the USB driver	65
13.2	Checking the installed COM port	67
14	MAINTENANCE	71
14.1	Faulty operating conditions	71
14.2	Recommendations	71
14.2.1	Auxiliary input.....	71
14.2.2	Laser sight.....	71
14.3	Spare parts	72
14.4	Storage	72
15	CERTIFICATES	73
15.1	Warranty terms	73
15.2	Letter of conformity	73
APPENDIX		74
A1	How to define an object emissivity.....	75
A1.1	Typical Emissivity Values.....	75
A1.2	Metals - Typical Emissivity Values	76
A1.3	Non-metals - Typical Emissivity Values	77



A2	APPLICATION NOTES	78
A2.1	Infrared energy.....	78
A2.2	Applications.....	78
A2.3	Emissivity.....	78
A2.4	Reflected energy compensation.....	78
A3	EMC CONFORMITY	79



1 GENERAL DESCRIPTION

Portable infrared thermometers measure surface temperature without touching the surface. They collect the infrared energy radiated by a target and compute its surface temperature.

IRtec series P (P500+, P510G, P800+, P1000+, P1300+, P1600+, P2000+, P3000+ and P MM) are portable infrared temperature devices designed to ease maintenance operations. They also enable the monitoring of operating temperatures of mechanical and electrical plants or production equipment without removing the equipment from the service. Any temperature variation noticeable in whatever kind of system device should show critical overheating conditions which may cause malfunctioning to the device itself.

They are also useful to measure product temperatures during manufacturing, to spot problems before they reduce quality or cause production downtime.

Their principle of operation is very simple, the instrument determines the temperature of an object by measuring the amount of radiant energy emitted by it.

The detector, installed on each **IRtec P Mk2**, responds by producing a voltage signal which is directly proportional to the amount of energy received, and therefore to the temperature of the target.

By sampling and manipulating the output of the detector, the microcontroller-based electronics can display the temperature and the related computed values such as maximum, minimum, average, and difference temperatures seen during the measurement.

The same information can also be stored and processed via Personal Computer (using electronic spreadsheets e.g. Lotus, Excel, Paradox, etc.). The displayed value can be printed out directly into an external printer supplied on request.

Thanks to its advanced optical system and electronics, **IRtec P Mk2** can be very useful for objects up to 5 mm (additional lens for smaller target are available on request) and can operate in critical ambient conditions.

To take measurements by using **IRtec P Mk2** thermometers just pull the trigger and then point at the target to be measured. The trigger can be locked on if desired. For more distant targets, hold the unit at arm length and use the sighting notch and post to aim. This will give a parallel and offset sighting.

Temperature information as well as auxiliary parameter pieces of information are shown on the high contrast liquid crystal display (LCD).

The case, made in shock-resistant ABS + polycarbonate, is ergonomically designed for an easy practical use.

The instrument is powered by a Li-Ion rechargeable internal battery; an external battery charger module is supplied as a standard accessory.

IRtec P Mk2 portable IR thermometers have been developed using the most advanced microcontroller technique to provide high accuracy on extended ranges and a powerful operating flexibility.

The calibration uses computerised procedures and the relevant calibration data are memory stored to ensure high accuracy.

General features

IRtec P Mk2 non contact infrared thermometers are designed to simplify temperature measurements at distance from a target and to identify hot spots, which normally means anomalous operative conditions avoiding costly downtime or processing problems that lead to rejected products.

There is no need to focus as required by the equipment using a lens sighting systems.

Innovative design

This new line of portable instruments represents the most versatile and powerful infrared temperature system. The most appropriate aiming system at the application can be selected with a twin laser pinpointing or with a combination of twin lasers and telescope or red point for true universal applications.

An on board data logger is available to store up to 500 data points, an analogue output can drive directly a recorder or a controller, The real-time temperature can be displayed together with the Maximum, Minimum, Difference and Average values.





Each model incorporates the following :

- high quality optical system
- high sensitivity infrared radiation detector
- auxiliary input for thermocouple type K and S
- microcontroller circuit
- high contrast LCD display with backlight device
- extended life traditional microswitch keyboard
- Internal not-removable Li-Ion rechargeable battery
- external module for battery charge and/or line operation
- USB serial interface

ATTENTION:

BEFORE USING THE IRTEC P Mk2 FOR THE FIRST TIME, GO OVER THESE OPERATING INSTRUCTIONS CAREFULLY AND KEEP THEM AVAILABLE FOR FUTURE REFERENCE.



1.1 Instrument codes

1.1.1 IRtec P 500+ / P800+ / P1000+ / P1300+ / P1600+ / P2000+ / P3000+

Cat. 119A - B - C - D - E

The basic instrument includes: charger, vinyl carrying case (for 1190/1192/1195/1196 models) or aluminium case (for 1194/1198/1199 models), 2x telescope (standard included with the 1194 model), red point system (standard included with 1199 model), Tc K thermocouple (standard included for the 1194 model), IRLogMan 2007 software, USB cable, wrist strap, traceable Report of Calibration and instruction manual

Table A Model

1190	P500+ Mk2	from -30°C to +1000 °C (-22°F to +1832°F)
1192	P800+ Mk2	from -30°C to +1200 °C (-22°F to +2192°F)
1194	P1000+ Mk2	from -30°C to +1200 °C (-22°F to +2192°F)
1195	P1300+ Mk2	from +200°C to +1300 °C (+392°F to 2370°F)
1196	P1600+ Mk2	from +600°C to +1600 °C (+1100°F to 2900°F)
1198	P2000+ Mk2	from +500°C to +2000 °C (+932°F to +3630°F)
1199	P3000+ Mk2	from +550°C to +3000°C (+1022°F to +5432°F)

Table B Optics (see par. 1.1.2 for the instrument compatibility)

SF	Standard lens with red dual TTS laser
SFG	Standard lens with green dual TTS laser
TF	D:S=60:1 focus with triple laser: dual TTS laser + central laser (for P500+ MK2 only)
LD	Dual red parallel laser for long distance
LDG	Dual green parallel laser for long distance

Table C Battery / Line plug

USA	Li-Ion / 120 Vac USA plug
SCK	Li-Ion / 230 Vac Schuko plug
UK	Li-Ion / 230 Vac UK plug
EUR	Li-Ion / 230 Vac European plug
JAP	Li-Ion / 100 Vac Japan/USA plug

Table D Accessories

NO	None
TELE	Sighting 2x telescope pinpointing system (standard included with 1194)
RED	Red area pinpointing system (standard included with 1199)

Table E Report of calibration

EC	Eurotron Certificate
----	----------------------



1.1.2 IRtec P 510G

Cat. 1193 - B - C - D - E

The basic instrument includes: charger, vinyl carrying case, IRLogMan 2007 software, USB cable, wrist strap, traceable Report of Calibration and instruction manual

Table A	Model
1193	P 510G from 150°C to +1300 °C (300°F to +2370°F)

Table B	Optics (see par. 1.1.4 for the instrument compatibility)
SF	Standard lens with red dual TTS laser

Table C	Battery / Line plug
USA	Li-Ion / 120 Vac USA plug
SCK	Li-Ion / 230 Vac Schuko plug
UK	Li-Ion / 230 Vac UK plug
EUR	Li-Ion / 230 Vac European plug
JAP	Li-Ion / 100 Vac Japan/USA plug

Table D	Accessories
NO	None
TELE	Sighting 2x telescope pinpointing system
RED	Red area pinpointing system

Table E	Report of calibration
EC	Eurotron Certificate

1.1.3 IRtec P MM

Cat. 1197 - B - C - D - E

The basic instrument includes: charger, aluminium case, red point pinpointing system, IRLogMan 2007 software, USB cable, wrist strap, traceable Report of Calibration and instruction manual

Table A	Model
1197	P MM from 1000°C to +2000 °C (1830°F to +3630°F)

Table B	Optics (see par. 1.1.4 for the instrument compatibility)
SF	Standard lens with red dual TTS laser
SFG	Standard lens with green dual TTS laser
LD	Dual red parallel laser for long distance
LDG	Dual green parallel laser for long distance

Table C	Battery / Line plug
USA	Li-Ion / 120 Vac USA plug
SCK	Li-Ion / 230 Vac Schuko plug
UK	Li-Ion / 230 Vac UK plug
EUR	Li-Ion / 230 Vac European plug
JAP	Li-Ion / 100 Vac Japan/USA plug

Table D	Accessories
RED	Red area pinpointing system

Table E	Report of calibration
EC	Eurotron Certificate



1.1.4 Optics / models compatibility

Model/Optic	SF	SFG	TF	LD	LDG
IRtec P 500+ MK2	X		X		
IRtec P 510G	X				
IRtec P 800+ MK2	X				
IRtec P 1000+ MK2	X	X		X	X
IRtec P 1300+ MK2	X	X		X	X
IRtec P 1600+ MK2	X	X			
IRtec P 2000+ MK2	X	X		X	X
IRtec P 3000+ MK2	X	X		X	X
IRtec P MM	X	X		X	X

1.2 Specifications

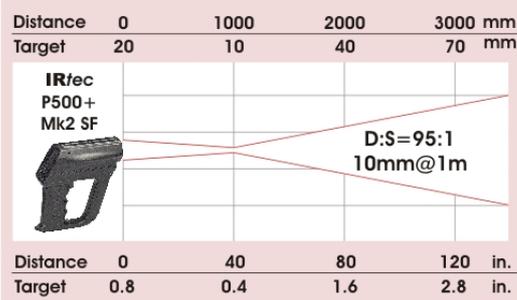
- **Accuracy IR:**
IRtec P500+, P 510G, P800+ & P1000+: $\pm(0.75\%$ of rdg + $0.75^{\circ}\text{C}/1.3^{\circ}\text{F}$)
IRtec P1300+, P1600+, P2000+, P3000+ & P MM: $\pm 0.25\%$ K of rdg
- **Repeatability IR:**
IRtec P500+, P 510G, P800+ & P1000+ : $\pm 0.5\%$ of the reading or $\pm 0.5^{\circ}\text{C}/1^{\circ}\text{F}$)
IRtec P1300+, P1600+, P2000+ , P3000+ & P MM: $\pm 0.1\%$ K of rdg
- **Temperature stability IR:**
 $\pm 0.01\%$ f.s./ $^{\circ}\text{C}$ (for the band exceeding $+18^{\circ}\text{C}$ to $+28^{\circ}\text{C}$)
- **Thermocouple measuring ranges:**
type K : from -100°C to $+1370^{\circ}\text{C}$ - 0.1°C resolution
type S : from 0°C to $+1760^{\circ}\text{C}$ - 0.1°C resolution
- **Thermocouple accuracy:**
type K: $\pm(0.05\%$ of reading + 0.4°C)
type S $\pm(0.05\%$ of reading + 2.5°C)
- **Display:**
High contrast custom LCD with backlight device
- **Resolution:**
 $1^{\circ}\text{C} / ^{\circ}\text{F} / \text{K}$ ($0.1^{\circ}\text{C}/0.1^{\circ}\text{F}$ in AVG mode up to 200°C)
- **Measurement sampling time:** <150 ms
- **Emissivity:** Adjustable from 0.10 to 1.00 - preloaded emissivity table and table management with IRLogMan 2007 Software
- **Laser:** Dual or triple laser for IRtec P500+ TF
- **Digital interface:** USB serial port
- **Calculated functions:** average, max, min, diff.
- **Data memory:** 500 input data structured by tag (max. 20 Tags)
- **Power supply:** internal Li-Ion rechargeable battery, not-removable
- **Battery life:** 60 h (backlight off)
- **Battery low level of charge:** symbol on the LCD display, different levels indication
- **Line operation:**
 $100, 115, 230\text{V} \pm 10\%$ 50/60 Hz using the external charger
- **Charger transformer insulation:** 2500 V
- **Battery recharging time:**
6 h at 90% (instrument switched off)
- **Operating environment temperature range:**
from -10°C to $+60^{\circ}\text{C}$
- **Storage temperature range:**
from -10°C to $+60^{\circ}\text{C}$ without battery
- **Case:** Injection moulded ABS+ polycarbonate
- **Dimensions:** 200 x 180 x 80 mm
- **Weights:** net 0.8 kg gross 1.5 kg



1.2.1 Target dimensions at different distances

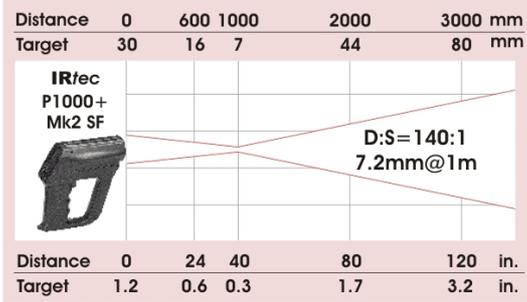


IRtec P500+ SF



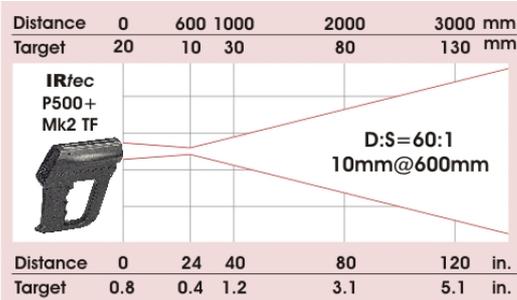
* Nominal target @ 90% of energy

IRtec P1000+ SF



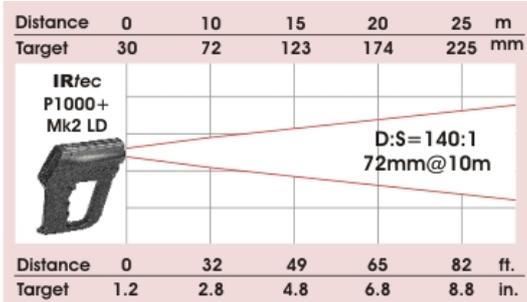
* Nominal target @ 90% of energy

IRtec P500+ TF



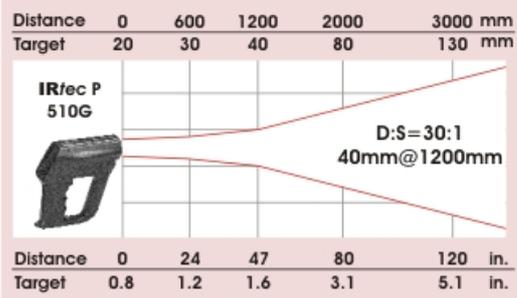
* Nominal target @ 90% of energy

IRtec P1000+ LD



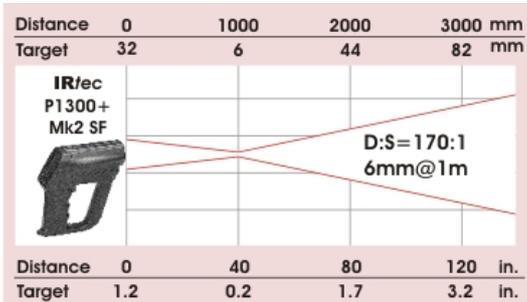
* Nominal target @ 95% of energy

IRtec P 510G



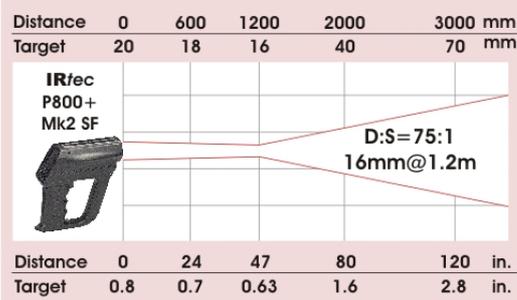
* Nominal target @ 90% of energy

IRtec P1300+ SF



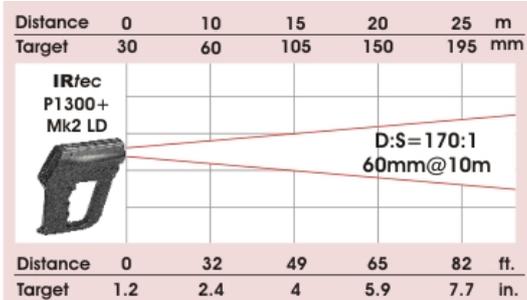
* Nominal target @ 95% of energy

IRtec P800+ SF



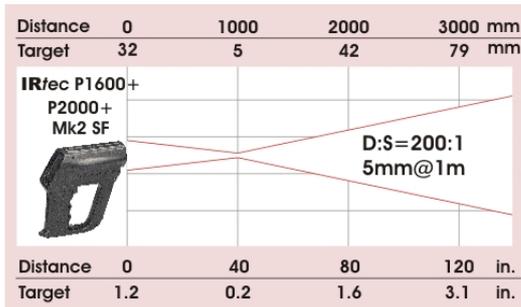
* Nominal target @ 90% of energy

IRtec P1300+ LD



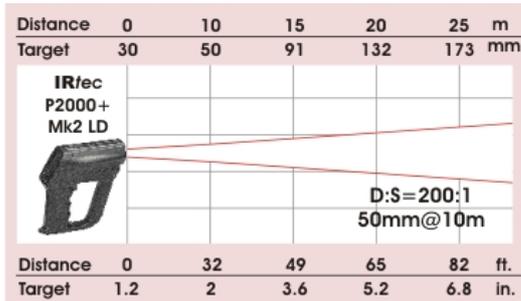
* Nominal target @ 95% of energy

IRtec P1600+ SF & P2000+ SF



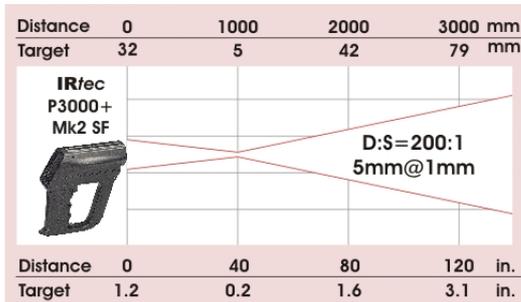
* Nominal target @ 95% of energy

IRtec P2000+ LD



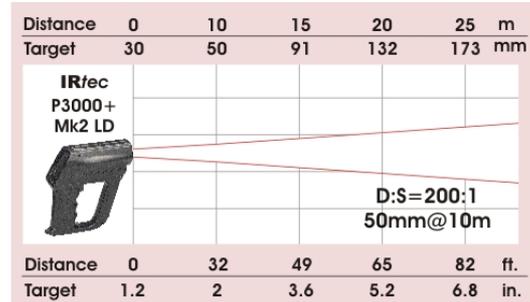
* Nominal target @ 95% of energy

IRtec P3000+ SF



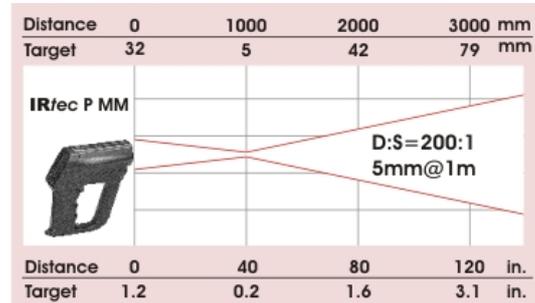
* Nominal target @ 95% of energy

IRtec P3000+ LD



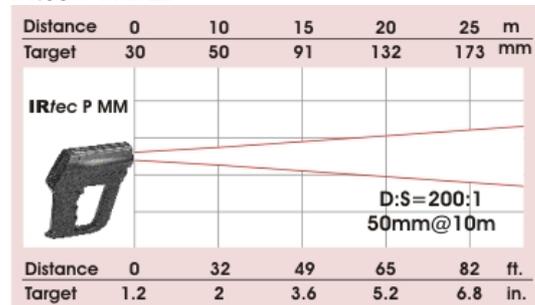
* Nominal target @ 95% of energy

IRtec P MM SF



* Nominal target @ 95% of energy

IRtec P MM LD



* Nominal target @ 95% of energy



Model	Temperature Range	Spectral Response	Target spot size @ Distance	D/S Optical Ration
IRtec P500+	-30 °C to +1000 °C -20°F to +1832°F	8 to 14 μm	SF: 10mm @ 1000m 0.39 @ 40" TF: 10mm @ 600m 0.39 @ 24"	95:1 60:1
IRtec P 510G	150 °C to +1300 °C 300°F to +2370°F	5.1 μm	SF: 10mm @ 1200m 0.39 @ 47"	30:1
IRtec P800+	-30 °C to +1200 °C -20°F to +2192°F	8 to 14 μm	SF: 16mm @ 1200mm 0.6 @ 47" CF: 1mm @ 65mm 0.04 @ 2.6"	75:1
IRtec P1000+	-30 °C to +1200 °C -20°F to +2192°F	8 to 14 μm	SF: 7.2mm @ 1000mm 0.28 @ 39.4" LD: 72mm @ 10m 2.8 @ 394"	140:1
IRtec P1300+	+200 °C to +1300 °C +392°F to 2370°F	1.6 μm	SF: 6mm @ 1000mm 0.24 @ 39.4" LD: 60mm @ 10m 2.4 @ 394"	170:1
IRtec P1600+	+600 °C to +1600 °C +1120°F to 2900°F	0.9 μm	SF: 5mm @ 1000mm 0.20 @ 39.4"	200:1
IRtec P2000+	+500 °C to +2000 °C +962°F to +3630°F	0.9 μm	SF: 5mm @ 1000mm 0.20 @ 39.4" LD: 50mm @ 10m 2 @ 394"	200:1
IRtec P MM	+1000 °C to +2000 °C +1830°F to 3630°F	0.55 μm	SF: 5mm @ 1000mm 0.20 @ 39.4" LD: 50mm @ 10m 2 @ 394"	200:1
IRtec P3000+	+550 °C to +3000 °C +1020°F to +5430°F	0.9 μm	SF: 5mm @ 1000mm 0.20 @ 39.4" LD: 50mm @ 10m 2 @ 394"	200:1

Dual TTS lasers:

General application, ideal for small objects and distances up to 5 meters indicates the diameter of the target spot

Dual parallel lasers:

Long distance application over 5m

Dual TTS + center laser:

General application, Triple laser indicates the diameter and the center of the target spot

Red Point:

High temperature over 1250°C 1x

Sighting Telescope:

High temperature over 1250°C 2x tele.

Software:

Includes memory up to 500 values. You can divide them by Tag (20 different). Each value includes temperature value and date & time (built in real time clock). Tag name with 7 characters on instrument display. Data logging manual or automatic with sampling time from 1 to 999 sec. Windows 95 software to download data to PC and cable. You can view, save, print, export to Excel and graph data.



2 GENERAL FEATURES

2.1 General

Temperature measurements of a liquid or gaseous compound have been successfully made with thermoelectric or expansion thermometers thanks to the good thermal exchange of the sensor with the fluid. With solid bodies a good thermal exchange is difficult to be obtained and an additional measuring error should be considered.

A direct contact measurement is impractical when the object being measured is moving, it cannot be touched with a thermoelectric sensor because of electrical hazard or of other reasons.

A non-contact IR temperature measurement is the only solution to the above application problems.

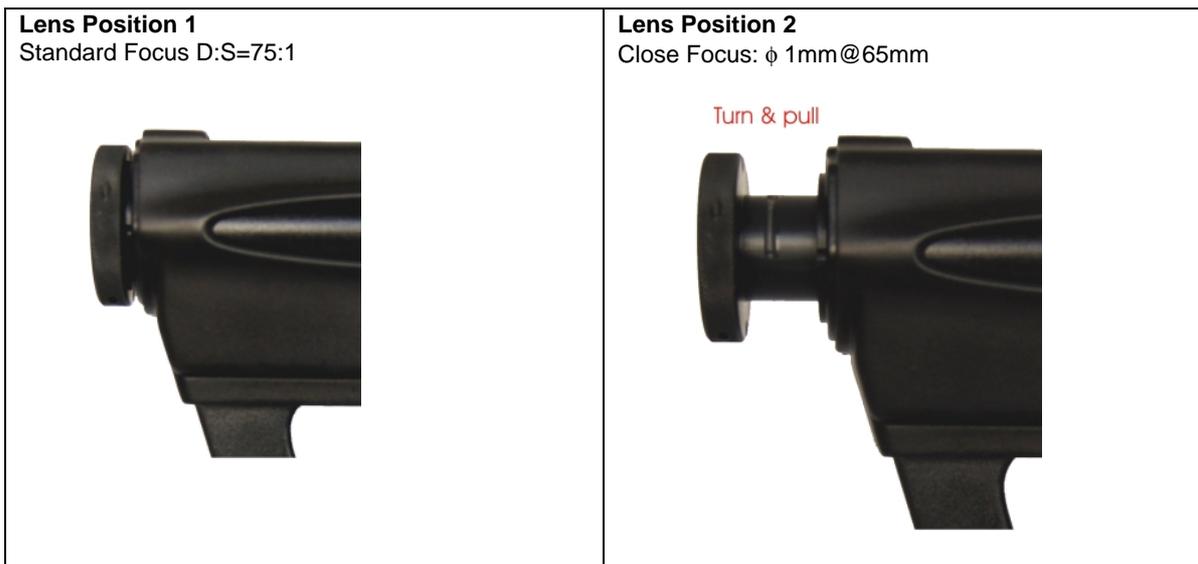
Also other applications benefit because non-contact thermometers do not add or remove heat or disturb the process in any way.

2.2 Optical System

- The optical system is equipped with a main objective to focus the infrared energy into the infrared detector through a single lens, a filter and a field stop which defines the visual cone and therefore the target dimensions.
- As the detector is placed in the focal point of the measurement portion of the optical system no focusing operations are required.
- A secondary, but extremely important objective, is the correct pinpointing of the target as described below.

2.2.1 Dual optic (for IRtec P 800+ and P 510G only)

The IRtec P800+ and the P 510G can be used both as a long focus and a close focus infrared thermometer. Rotating the lens, the instrument change the optic and the dual laser change the inclination to the new focus point.





2.3 Target pinpointing

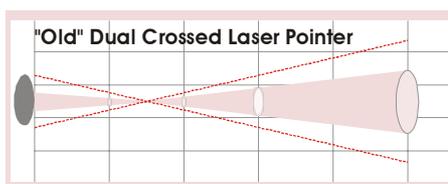
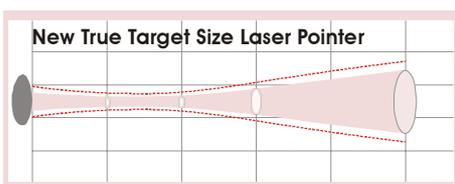
A correct aiming at the target is an important factor of a non-contact thermometer. The immediate evaluation of the smallest measurable target area is also a positive key factor in many applications.

The following types of pinpointing are available :

- A "V" groove on the up side of the instrument can be used spreading the arm.
- Twin laser pointers to define, at distance, the measurable target dimensions. Two versions are available with Dual TTS or dual parallel lasers. The dual parallel lasers are suggested for target distance greater than 5 meters.
- Combination of dual lasers and direct telescope viewing for universal applications mainly required for a high distance targets (more than 10 meters) and high temperature targets (more than 1000 °C) where laser spots are not visible .
- Combination of dual lasers and a red point pinpointing for universal applications mainly required for high temperature target where laser spots are not visible
- The triple laser (for **IRtec P Mk2500+ TF** only) indicates the diameter and the centre of the target spot. The third laser beam goes out directly from the centre of the lens, through it centred little hole.

2.3.1 TTS laser pinpointing

A dual laser pointer define at different distances the true target dimension. This unique and innovative system go over the limits of the old crossed laser pointer based system. TTS (True Target Size) really guarantees the measuring of the true area diameter along all the optical path



With a laser pinpointing the operation of the instrument is extremely simplified. You simply aim at the target and read the temperature.

The installation procedures for telescope and red point pinpointing, please refers to the dedicated chapters.

2.4 Taking measurements

IRtec P Mk2 portable thermometers are accurate, rugged and compact.

Its modern and practical design allows an easy handling and aiming, either at arm length or using a tripod mount, to obtain current temperature value, average, minimum, maximum and difference temperature measurement values.

Its analogue to digital outputs allows a continuous documentation on a continuous trace recorder or on a serial printer.

Using the keyboard it is also possible to enable the instrument to measure one of the computed values in addition to the actual temperature value measurement:



MAX	maximum temperature recorded during current measurement
MIN	minimum temperature recorded during current measurement
DIF	difference between MAX and MIN
AVG	average temperature for entire measurement
Tamb	ambient temperature

2.5 Keyboard

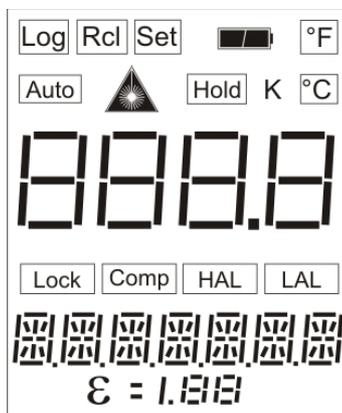
Traditional metal-click switches, with a working life of one million operations, are used to enter the operator's instructions.

The contact closure of the keyboard keys is acknowledged, as a coded signal, directly by the microcontroller.



2.6 Display

The high contrast customised alphanumeric LCD display indicates the measured temperature value. It is also used for operators' messages, instrument configuration set-up, special operative modes, etc. It is equipped with a backlight device to allow easy readings even in poor light conditions.



2.7 USB serial interface

The special Eurotron IRLogMan 2007 software lets the operator to download through the USB serial interface all the recorded data directly on a PC for subsequent analysis.

2.8 Thermocouple Input

To extend the operative capability the instrument is equipped with an auxiliary input for thermocouple. This feature, when used with a calibrated thermocouple, can be used to obtain accurate temperature measurements eliminating the problems of emissivity and the interfering light. The thermocouple can be used to obtain an accurate temperature reading of the target material and then these data are used to determine the compensation value for the actual emissivity, including the interfering light, within a range from 0.10 to 1.00.



2.9 Logging Mode

The instrument can be equipped with an internal memory to store up to 500 input data. Two types of data acquisitions can be selected by the user.

Continuous acquisition

The operator can select the interval time between each acquisition and store progressively the input data in the Tag file or can manually, step by step, give the acquisition instruction.

Acquisition by dedicated tag

Standard Agencies and Quality Auditors require the collection, organisation and availability of traceability documents.

A supporting software is available to transfer a selection of plant inspections from a PC to the internal memory of the instrument in order to simplify field check and select the appropriate tag number.

Dedicated input data are memory stored and downloaded into a PC to document the inspection activity.

Data can be saved on disks, viewed and printed in a numeric or graphic mode.

2.10 Calculated Measurements

For the measurement of unstable input signals by a progressive averaging with a programmable average weight. In addition the operator can select average, minimum, maximum, $T_{max} - T_{min}$, differential.

2.11 Quality System

Research, development, production, inspection and certification activities are defined by Eurotron Quality System methods and procedures.

Eurotron Quality System has been inspected and certified in compliance with ISO 9001 by Gastec, a Dutch notified body.

2.12 Report of Calibration

Each **IRtec P Mk2** portable IR thermometer is factory calibrated and certified against **Eurotron** Standards, that are periodically certified by an International recognised Laboratory, and shipped with a Report of Calibration stating the nominal and actual values and the deviation errors.

2.13 Case

The case of the instrument is ergonomically designed for an easy hand held operation and transport.

The body is injection moulded, shock-resistant, flame proof ABS+ polycarbonate.

A vinyl case with shoulder strap and an aluminium case for instrument + printer + accessories are available on request.

2.14 Logging Data Manager

IRLogMan 2007 software allows the IRtec users to set and prepare the infrared thermometers to acquire the data organised by 'Tag'.

This software also allows to download data from Instrument on document (table) with date, time and value.

You can view table, save table, print table, export table in excel-txt-html and obtain graph. You can also manage data coping, moving on other tables.



3 PHYSICAL DESCRIPTION

IRtec P Mk2 portable IR thermometers consist of a rugged, compact and self-extinguishing case ergonomically designed for an easy practical use.

The internal surface of the case is metal coated to improve the compliance with EMC and the thermal equalisation of internal circuits.

The instrument can be supplied either with a vinyl protective case with shoulder strap or with an aluminium case to assure better protection against mechanical knocks or scratches.

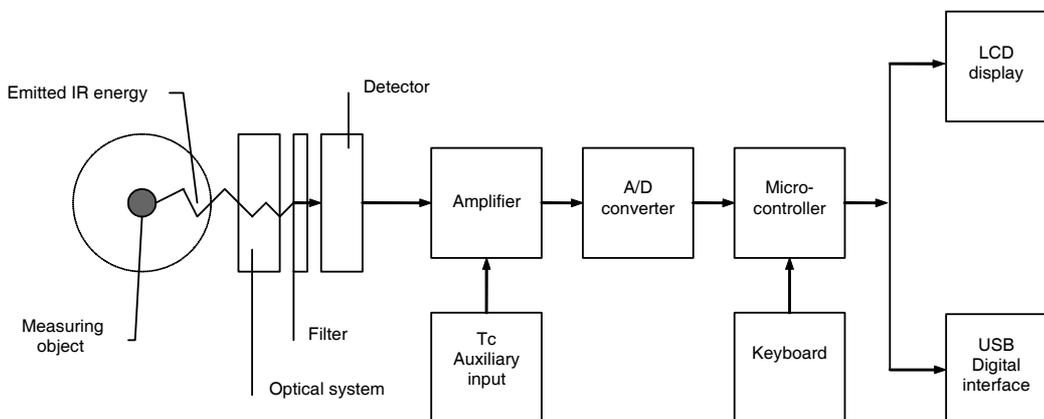
The battery container is located on the lower part of the handle, and is accessible through a cover fastened by a metal screw.





4 FUNCTIONAL DESCRIPTION

IRtec series P infrared portable thermometers block diagram is shown below:



- **Optical system**
- **Filter**
- **Detector**
- **Amplifier**
- **A/D converter**
- **Microcontroller**
- **LCD display**
- **Digital interface**
- **Keyboard**
- **Tc auxiliary input (optional)**

Thanks to an optical system, the radiated infrared energy is focused on an infrared detector sensitive to the required spectral band.

The infrared detector generates a signal proportional to the energy received corresponding to the temperature of the target.

The output signal of the sensor is then conditioned, converted from analog to digital and transmitted to the microcontroller.

The procedures used to process all the operating functions as well as measure and calculation routines are stored into the microcontroller memory.

Any operator's instruction, through the trigger and the keyboard is directly recognised, as a coded signal, by the microcontroller.

The actual temperature value and the active operative mode are indicated on the LCD display.

4.1 Power supply

The instrument is powered by a not-removable internal Li-Ion rechargeable battery that can be recharged through an external charger module supplied as a standard accessory.



4.2 Keyboard

The operative keyboard is designed with a traditional single microswitch per button for long life and high reliability. The contact closure of the keys is acknowledged as a coded signal by the microprocessor that recognises the operator's instructions.

4.3 Microcontroller

The microcontroller handles all the logic functions of the instrument, performs the linearization for non linear transducers, compensates for the reference junction temperature, drives the digital display and acknowledges all the operator's instructions.

The core of the circuit is a single-chip microcomputer that utilises HCMOS technology to provide the low power characteristics and high noise immunity of CMOS plus the high speed operation of HMOS.

The microcomputer provides highly sophisticated, on-chip peripheral functions including: 256 bytes of static RAM, an 8 channel analog to digital (A/D) converter (used to read the R_j value, the setting of the input comparator, the battery package voltage and the value of the auxiliary input), a serial communication interface (SCI) subsystem, and a serial peripheral interface (SPI) subsystem.

The microprocessor works with an 8-bit communication bus to EPROM and EEPROM memories and is interfaced with a decoder, a latch of address and an inverter-driver.

4.4 Firmware

The operating system firmware handles all the logic instructions to the internal peripheral circuits and performs the computation of the linearization equations.

The application system firmware is resident on the non-volatile memory (EEPROM) of the microprocessor chip.

It is used to store the installation parameters (autocalibration data, program data, etc.)

4.5 Display

The digital display, mounted on an auxiliary board, uses high contrast LCD technologies (STN liquid).

IRtec P Mk2 thermometers are standard equipped with an automatic backlight device for easy readings in poor light conditions.

4.6 Battery charger

The auxiliary module, supplied as a standard accessory, allows operations from 100, 115, 230V 50/60 Hz. **IRtec P Mk2**, can operate directly from a line source through the charger.

The plastic case of the battery charger incorporates the line voltage plug and a cable with a connector for interconnections to the instrument.

4.7 USB digital interface

With the built-in USB bi-directional digital interface it is possible to directly connect the instrument with a PC. It is possible to send and download data and manage the pre-loaded emissivity table by using the IRLogMan 2007 software



5 UNPACKING

Remove the instrument from its packing case and remove any shipping ties, clamps, or packing materials. Carefully follow any instruction given on any attached tags.

Inspect the instrument from scratches, dents, damages to case corners etc. which may have occurred during shipment.

If any mechanical damage is noted, report the damage to the shipping carrier and then notify Eurotron directly or its nearest agent, and retain the damaged packaging for inspections.

A label, mounted above the optical body, indicates the serial number of the instrument.

Refer to this number for any inquiry for service, spare parts supply or application and technical support requirements.

Eurotron will keep a data base with all information regarding your instrument.



6 PRE-OPERATIONAL CHECK

IRtec series P portable thermometers are powered either a not-removable internal rechargeable Li-Ion battery.

The external battery charger, supplied as a standard, can be ordered for 120 Vac or 100 - 230 - 240 Vac power source.

Before using the instrument carefully verify the nominal voltage value of the charger with the available mains power line.

The instrument should be used in environments where the temperature does not exceed the specified limits (from -5°C to +50°C) and where the relative humidity is lower than 95%.

In case of "low" battery conditions the display will show the appropriate symbol.

A battery symbol means that the battery package has enough energy for about 30 minutes operation.

In this condition the instrument batteries must be recharged.

WARNING

IRTEC P Mk2, IR PORTABLE THERMOMETERS, USE TO MEASURE TEMPERATURE, THE 0.9 μM (IRTEC P Mk21600+ MK2, P2000+ MK2 AND P3000+ MK2), 1.6 μM (IRTEC P Mk21300+ MK2) AND THE 8 - 14 μM (IRTEC P Mk2500+ MK2, P800+ MK2 AND P1000+ MK2) SPECTRAL BANDS.

IN CASE IR THERMOMETER SHOULD MEASURE DIRECT OR REFLECTED HIGH INTENSITY RADIATIONS IN THE ABOVE SPECTRAL BAND, THEY CAN DAMAGE PERMANENTLY THE IR SENSORS INSIDE THE THERMOMETERS.

THIS KIND OF RADIATION CAN BE PRODUCED BY EITHER THE LASER TYPE Nd :YAG ($\lambda_{EM} = 1.06 \mu\text{M}$) OR BY THE LASER TYPE CO₂ ($\lambda_{EM} = 10.6 \mu\text{M}$).

CAUTION - LASER SAFETY

**LASER RADIATION - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT CONFORMS TO IEC 823:1993
WAVELENGTH: 630-670NM – OUTPUT: <1MW**





7 POWER SUPPLY

The instrument is already calibrated and optimized when shipped. The operator only need to setup the working parameters as described in this manual and provide to the normal battery changing when the battery level is low (see par. 7.1).

7.1 Rechargeable Li-Ion battery

The instrument is shipped with an average level of charge.

After unpacking, a full charge of the batteries is recommended; connect the instrument to the charger module ("OFF" condition) for a period of 10 hours minimum.

The Li-Ion internal battery do not suffer when used in cyclic operations. The cyclic operation is understood as a method of operation by which the battery is continually charged and discharged. Avoid leaving the instrument, with batteries totally or partially discharged, for a long time without recharging them.

ATTENTION

TO CHARGE THE BATTERIES USE THE ORIGINAL SUPPLIED CHARGING MODULE ONLY

The module incorporates protection and current limiting devices not normally found in other commercial chargers.

The external battery charger is configured, before shipment, for a supply voltage of 100, 115 or 230V $\pm 10\%$ @ 50/60Hz, upon order specification. The nominal voltage value is indicated on the front label of the charger.

The internal battery is not removable by the operator. Charge the battery inside the environmental ambient temperature range from 0°C to 40°C.

If the battery is completely discharged, plugging the charging module will not recharge the battery, and the instrument can operate for 30 minutes only, more or less.

The battery charge level is indicated by a special symbol that can shows different charging level, according to the following table:

	Blinking	Voltage lower than 2,50*2V. Very low charge level. The instrument could switch it off. Recharge the battery in short time
	Discharged battery	Voltage lower than 3,65*2V Recharge the battery
	Half charge battery	Voltage not higher than 3,70*V
	Charged battery	Voltage not lower than a 3,70*V
	Charging	
	Charge almost complete	
	Charging complete	Charging module deactivated



7.1.1 Battery charging

If the operator try to charge the battery out of the operative temperature range (from 0°C to +40°C), the battery will be not charged and the instrument continue to operate with battery supply, even if the charging module is connected to the instrument.

In this case one of the two messages below will be displayed



High temperature



Low temperature

If the instrument is switched off, the plugging of the charger will switch on the display and the battery icon will start to blink (see the table on par. 7.1).

You can switch off the instrument by pressing the <Trigger> button; only the blinking battery icon will be displayed, without backlight

7.2 Power supply from main line AC

The battery charger module can be used to power the instrument for continuous operations from main line AC. The internal Li-Ion battery is not removable.



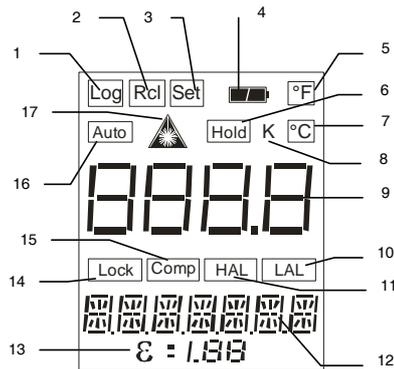


8 OPERATIONS & APPLICATIONS

IRtec series P portable infrared thermometers are factory calibrated before shipment.

During the start-up the operator should only select and load, if required, the pertinent application parameter as described in the following paragraphs. Before entering the procedure to operate the instrument it is useful the understanding of the messages that can be present in the display.

The following figure shows the overall layout of the display and an explanation of each symbol or message :



- 1 - Indicates logging mode operative
- 2 - Enables recall of memory stored data
- 3 - Indicates the setting mode enabled during configuration and logging mode set up
- 4 - Low battery indication
- 5 - Temperature in degree Fahrenheit
- 6 - HOLD function: hold the last measure
- 7 - Temperature in degree Celsius
- 8 - Temperature in degree Kelvin
- 9 - Actual measured temperature value
- 10 - Indicates Low Alarm
- 11 - Indicates High Alarm
- 12 - Auxiliary measurement data or setting (AVG, LAL, HAL, MIN, MAX, DIF) or thermocouple input indication
- 13 - Operative emissivity value
- 14 - Ambient temperature compensation
- 15 - Continuous measurement mode
- 16 - Automatic acquisition in logging mode
- 17 - Laser on

The contact closure of the keys is acknowledged as a coded signal by the microprocessor that recognises the operator's instructions.

<Trigger>	Instrument ON/OFF
<▲> <▼>	Value setting or data selection during Configuration or Set-up procedures
<*>	Laser switch or data acquisition mode set-up
<MEM>	Data acquisition operation and logging manual step
<SEL>	Selects the operative mode
<ENTER>	Memory load key



8.1 Switching on modes

Mode 1 - Hold

Press and keep the trigger pressed. The instrument will switch on. The display will show the current temperature of the measured object. If the laser is activated, it will switch on.

By releasing the trigger the display shows the "HOLD" symbol: this means that the current temperature will be locked, hold; if the laser is on, it will switch off. By pressing and keeping pressed the trigger again the instrument will measure again the temperature and the laser, if it's activated, it will switch on again.

By quickly pressing and releasing the trigger (pressing time lower than 0.45 seconds), the instrument switch off.

NOTE: USING THIS SWITCHING MODE 1 (TRIGGER FUNCTION) THE INSTRUMENT WILL ANYWAY SWITCH OFF AFTER 30 SECONDS FROM THE LAST KEY PRESSING.

Mode 2 - Lock

Press and quickly release twice the trigger. The instrument will be switch on.

The display simultaneously shows the "LOCK" symbol and the current object temperature continuously changing. To hold the measure (to activate the Hold mode), press the "MEM" key: the "HOLD" symbol will appear on the display and the last displayed measure will be hold.

By pressing and keeping pressed the trigger with the HOLD function on, the laser, if it's activated, will be switch on, but the displayed temperature value doesn't change.

To unlock the displayed measure and to return to the normal measurement mode, press again the "MEM" key.

NOTE: BY QUICKLY PRESSING AND RELEASING THE TRIGGER THE INSTRUMENT WILL SWITCH OFF. USING THIS SWITCHING MODE 2 THE AUTOMATIC SWITCHING OFF MODE IS DISABLED.

If the instrument has been switch off using the **Mode 1**, is it possible to pass into the **Mode 2** as follows:

- By switching off and switching on again the instrument as described on the Mode 2
- By quickly pressing twice the trigger (the same described on the Mode 2, but with the instrument already switched in Mode 1.)

It is possible to switch from the Mode 2 to the Mode 1 by switching off and switching on again the instrument.

8.2 How to Operate the instrument

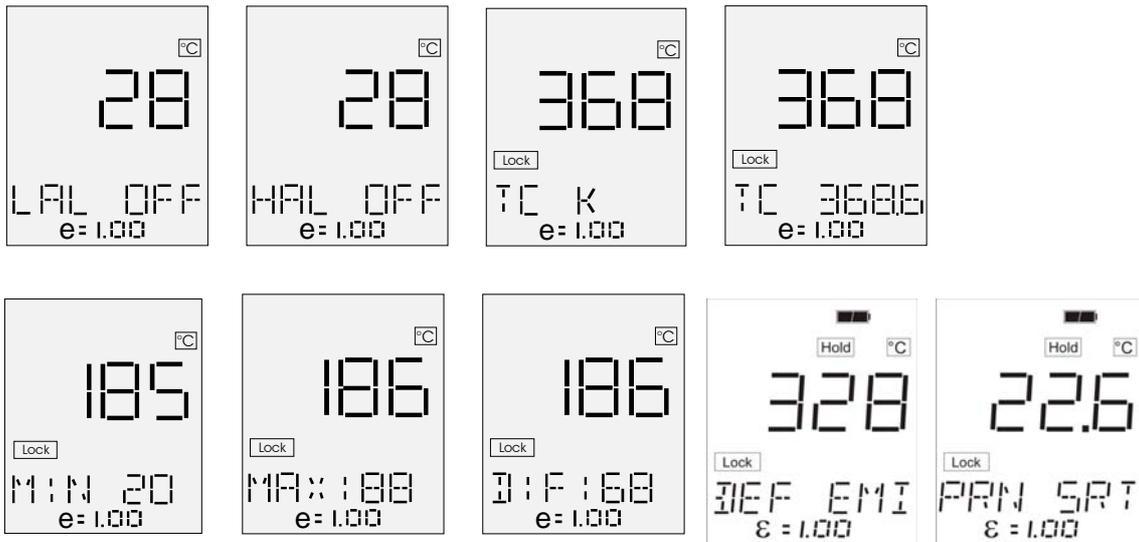
Switch the instrument on using one of the two switching modes described the previous paragraph.

The first display indication will show the type of instrument and the temperature technical unit enabled followed, after few seconds, by one of the main operative display pages.





The displayed page will be the same as when the instrument was switched -Off-



- Press the <SEL> key until the required page is displayed.
- Press the <▲> and <▼> keys to adjust the emissivity value as required by the application.

At first usage or after a supply absence (external charging module not connected and discharged battery), the typing of both date and time will be required and the following pages will be displayed:



Date and time set use a proper menu page (see par. 9.5)

NOTE: TO USE THE INSTRUMENT AND ALL ITS FEATURES (PRINTING, MEMORIZING, ETC...) IT IS MANDATORY TO SET BOTH THE CURRENT DATE AND TIME

If the laser is activated (see par. 8.4), it will switch on by pressing the trigger, allowing a simplest target pointing.

Quickly press and release the trigger to switch off the instrument.



8.3 Hold function

Two hold modes are possible, accordingly with the performed switching on mode (see par. 8.1):

- On **Mode 1** the HOLD function is on when the trigger is not pressed. The HOLD symbol will appear on the display.
- On **Mode 2** the HOLD function can be enabled/disabled by pressing the <MEM> key on the keyboard. To return into the measuring mode again press the <MEM> key again. The HOLD symbol will appear on the display when the function is operating only.

8.4 Laser pinpointing

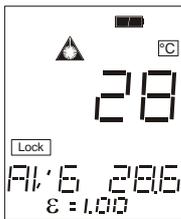
CAUTION: BEFORE USING THE LASER SIGHT READ THE RECOMMENDATIONS ON PARAGRAPH 15.2.2.

In measuring mode, press the <*> key to enable (disable) the laser spot. After one second the message "LAS EN" ("LAS DIS") will be displayed.

When enabled, the laser can be turned on by pressing the <Trigger> button for more than 1 second; the icon



will appear on the lower display.



The laser will go out automatically releasing the <Trigger> button: new temperatures will be measured if the HOLD function is disabled (see par. 8.3)

NOTE: TO PREVENT ANY COLLATERAL RADIATION IN EXCESS OF THE LIMITS DURING THE OPERATION OR MAINTENANCE, THE LASER BEAM WILL AUTOMATICALLY SWITCHED OFF WHEN TRIGGER IS RELEASED (ALSO IN LOCK OPERATION MODE).

CAUTION - LASER SAFETY

**LASER RADIATION - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT CONFORMS TO IEC 823:1993
WAVELENGTH: 630-670nm – OUTPUT: <1mW**



8.5 Unstable temperature measurement

When measuring a very unstable temperature process, it is necessary to have a slow and stable reading.

IRtec P Mk2 is equipped with an advanced average mode that works with the following parameters :

- Working band
- Weight

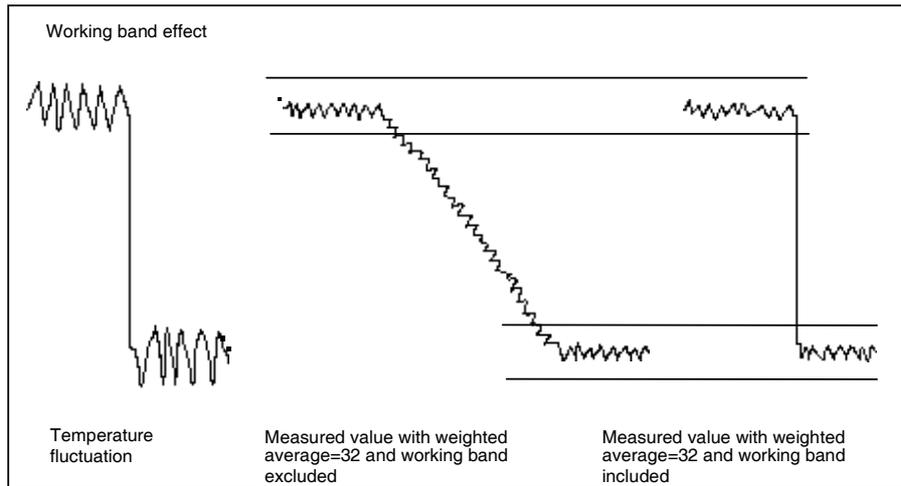
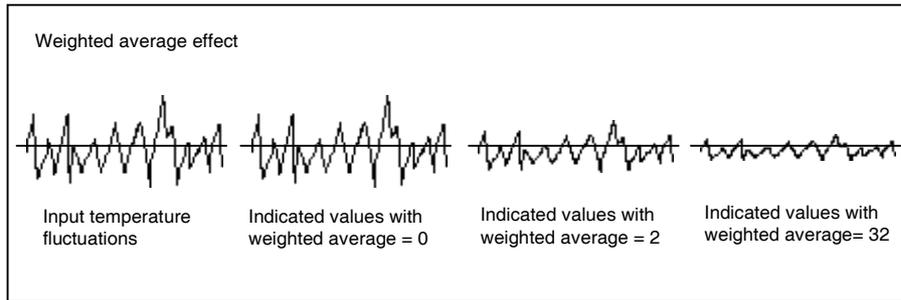
The working band is used to define the maximum difference between the actual and previous measurement values where average mode has to be operative.



It means that if you are measuring ambient temperature (e.g. 23°C) and you point the instrument to the process (e.g. 600°C) you don't need a slow increasing due to average (The difference is $600 - 23 = 577$ °C). If working band is set at 100°C instrument don't apply any average and it will pass directly to temperature of the process (600°C) otherwise with standard average you will see the temperature slowly growing from ambient to the target point.

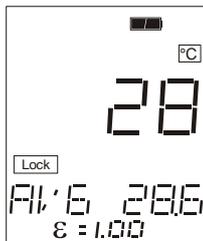
When instrument is measuring the process the difference due to unstable temperature is inside working band so it will works in average mode.

More unstable is the process higher has to be the weight of the average. Higher is the weight ,slower will be the reading.



To enable/disable the average mode follows the procedure below:

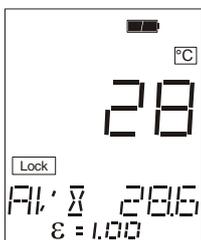
- In measuring mode, press the **<Sel>** key until the following page will appear:



The display indicates the actual temperature value together with the technical unit symbol, the programmed emissivity value and the averaged temperature value.



- At this stage, by keeping pressed the <Trigger> button, press <ENTER> key to enable the average mode. On the display will appear the following page:



The average mode is now enabled. It will remain enabled after the instrument switching off. To disable, repeat the above procedure. The "X" symbol will disappear. Average mode will remain enabled also in data acquisition mode and in peak mode operations.

The standard programmed values on IRtec P Mk2 are: **working band**=100°C and **average weight**=32 that are parameters valid in most of your process applications.

To change the parameters setting, use the optional **Average** software for personal computer and TTL/RS232 cable.

8.6 Alarm settings

Low and High Alarm levels can be programmed and used in "hot spots" for fast scanning or long term surveillance.

To select these operative modes press, in sequence, the <SEL> key to obtain the following display pages :



At the first usage of this function, or if no alarm has been set before, the display will show the indication of disabled alarm (OFF)

To change the Low and/or High Alarm settings follow the procedure indicated below :

- Press the <ENTER> key to enter the setting procedure. One digit of the setting line will blink. The blinking digit allows a new adjustment.
- Press the <SEL> key to select a different digit or the polarity (+/-)
- Press the <▲> or the <▼> key to modify the value of the blinking digit
- Repeat the last two steps to set the new alarm threshold
- Press together the <▲> and <▼> key to set the default alarm value

NOTE: THE DEFAULT CAN BE SET IN EDITING MODE ONLY (WHEN ONE DIGIT IS BLINKING)

- Press the <ENTER> key to return to the normal operative mode with the new Low Alarm setting

If required the Low Alarm can be excluded setting the low alarm level above the full scale temperature value where the message -Off- will appear.

- Press the <SEL> key to display the High alarm settings



- Repeat the previous procedure used for the low alarm settings.

If required the High Alarm can be excluded setting the high alarm level above the full scale temperature value where the message -Off- will appear.

- Repeat the setting procedure used for the low alarm setting

An alarm status, as shown in the above figure, will be announced to the operator by the **-HAL-** or **-LAL-** message on the display and, simultaneously, by an acoustic signal.

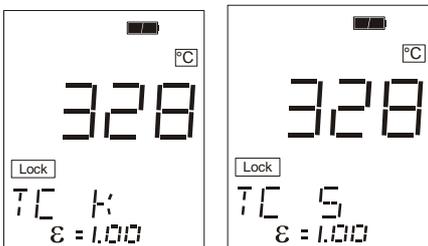
- The acoustic signal can be acknowledged with the **<MEM>** key.



8.7 Thermocouple input

The function need to be enabled from the instrument SETUP in order to operate (see par. 9.2)

- Press **<▲>** and **<▼>** keys to select the required type of thermocouple (type "S" or type "K"). This auxiliary input can be used for contact temperature measurements or for automatic emissivity adjustments.



- When selected the required type of thermocouple press the **<SEL>** key to obtain the following page showing simultaneously both the actual IR temperature and the temperature measured with the thermocouple.



If the measuring thermocouple is not connected or is broken, the display will indicate "Tc OTC".



If the auxiliary input is disable, the display will indicate "Tc OFF".



8.8 Minimum, maximum, average and difference indication

- Press the <SEL> key to obtain one of the following indications showing, in the auxiliary display, respectively the Minimum or Maximum value recorded in the interval time from the instrument switch -On- and the calculated Difference value between the identified Maximum and Minimum values.



When positioned on the max or min function, use <ENTER> key to reset the stored value.

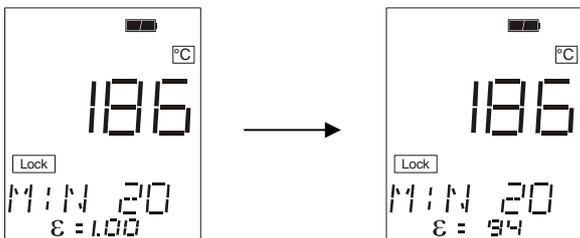
8.9 Emissivity setting

8.9.1 Manual setting

This function is used to make a manual setting of emissivity.



- Press the \blacktriangle and \blacktriangledown keys to change the emissivity value.



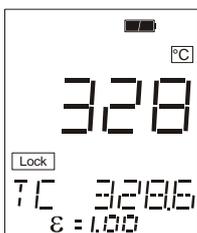
NOTE: THE MANUAL SETTING WORKS ONLY WHEN NO MENU IS ACTIVE

By pressing simultaneously the \blacktriangle and \blacktriangledown keys the emissivity default value, 1.00, will be set.

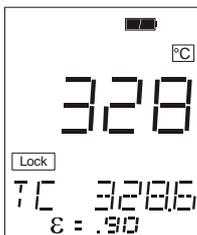
8.9.2 Automatic setting

This function is used to make an automatic setting of emissivity using an external thermocouple connected to the auxiliary Tc input.

- If it is necessary, enable the thermocouple input (see par. 9.2) and select the thermocouple type (see par. 8.6)
- Quickly press and release the **<Trigger>** button twice to switch on the instrument
- Press the **<SEL>** key until the thermocouple value is visualised



- Press **<ENTER>** key to run the internal automatic emissivity setting procedure. The instrument will calculate the proper emissivity by using simultaneously the temperatures read from the IR sensor and from the external thermocouple.



- An error message will appear if the **IRtec P Mk2** measure a temperature highest of the thermocouple. If the error happen, verify the contact between the thermocouple and the object.



If the automatic procedure will be not correctly performed, an error message will be displayed.

The two possible causes are:

- The target temperature is very close to the ambient temperature: the automatic emissivity calculation is not reliable for temperature differences lower than 2 degrees:



(Low Delta T)

- The dynamic of the emissivity value doesn't include the optimum value you'd want to calculate. This error could be happens if the contact between the thermocouple and the target is not good. The following message will be displayed:



(Out of range)

NOTE: WHEN THIS MESSAGE WILL APPEAR, A SOUNDING BEEP WILL BE ALSO GENERATED

8.9.3 Preloaded emissivity table setting

This function is used to set up to 50 preset emissivity values, in order to use them for your measurements.

The emissivity settings can be manage with the IRLogMan 20072006 software, while you can use the set values by selecting them on the instrument.

- Press the <SEL> key to display the following page:



- Press the <▲> or <▼> key to select one of the preset emissivity values



The preloaded emissivity table is as follows:

NON-METALS	
<i>Material</i>	<i>Emissivity</i>
Asphalt	0.95
Ceramic	0.95
Clay	0.95
Concrete	0.95
Cloth	0.95
Glass	0.85
Gravel	0.95
Gypsum	0.88
Ice	0.98
Limestone	0.98
Paint	0.93
Paper	0.95
Plastic	0.95
Rubber	0.95
Sand	0.9
Snow	0.9
Soil	0.93
Water	0.93
Wood	0.93



METALS	
Material	Emissivity
Steel Polished	0.1
Steel Oxidized	0.9
Stainless	0.5
Titanium Polished	0.12
Titanium Oxidized	0.6
Zinc Oxidized	0.1
Aluminium Oxidized	0.3
Alloy Oxidized	0.3
Brass Oxidized	0.5
Brass Burnished	0.3
Carbon	0.9
Graphite	0.8
Chromium	0.11
Copper	0.95
Oxidized	0.6
Roughened	0.08
Iron Oxidized	0.8
Rusted	0.6
Iron Molten	0.3
Nickel Oxidized	0.4

9 INSTRUMENT CONFIGURATION

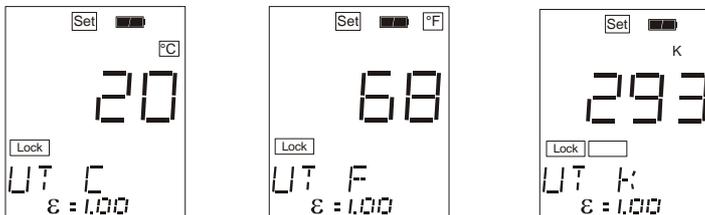
The operative configuration of the instrument can be modified using the below indicated procedure.

- Switch the instrument **-Off-**
- Keep the **<ENTER>** key pressed and press the **<Trigger>** push button until the instrument displays the indication relevant with the technical unit selection.

The "SET" icon will appear on the display: it indicates that now the instrument works in parameter setting mode.

9.1 Technical Unit selection

- Press the "SEL" key until the following menu is displayed:



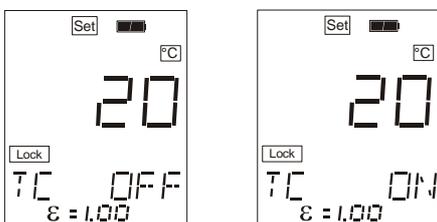
The display will indicate one of the following technical units (Celsius, Fahrenheit and Kelvin):

- Press the **<▲>** or **<▼>** key if you require to select a new technical unit
- Press the **<SEL>** key to select the new configuration step or press the **<Trigger>** to switch the instrument **-Off-**. The new selection will be automatically memory stored.

9.2 Thermocouple input enabled



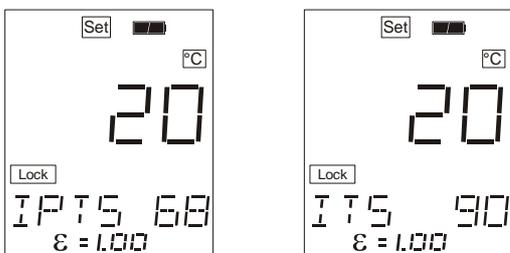
- Press the <SEL> key until the following indication is displayed:



- Press the <▲> or <▼> key to enable (or to disable) the thermocouple auxiliary input operation.
- Press the <SEL> key to select the new configuration step or press the <Trigger> to switch the instrument - Off-. The new selection will be automatically memory stored.

9.3 Temperature Scale selection

Press the <SEL> key until one of the following indication is displayed :



If enabled, the decimal point will be displayed if the digit is lower than 1000 (°C/°F/°K). A double threshold mechanism re-enable the decimal point when the temperature value decrease under 985 (°C/°F/°K). The same mechanism works even for the temperature measured by an external thermocouple. In this case the threshold is fixed to 995 (°C/°F/°K).

- Press the <▲> or <▼> key to select the required International Temperature Scale.
- Press the <SEL> key to select the new configuration step or press the <Trigger> key to switch the instrument -Off-. The new selection will be automatically memory stored.

9.4 Decimal point selection

NOTE: THIS FUNCTION WORKS ONLY ON ALL THE THERMOPILE IRTEC P Mk2500/800/1000 MODELS.

The measured temperature can be displayed with or without a decimal digit. Use the following procedure to enable or to disable the display mode.

- Switch off the instrument
- Keep pressed both the two keys <*> and <SEL> and press the <Trigger> button.

If the last time the temperature display was without decimals now it will be with one decimal, vice versa if the last time was with one decimal, now it will be without decimals.

If enabled, the decimal point is displayed if the digit is higher than 1000 (°C/°F/°K). The built-in double threshold mechanism is useful to avoid fluctuations of the fifth decimal:

IR measurement: Upper threshold: 1000
Lesser threshold: 985

TC measurement: Upper threshold: 1000



Lesser threshold: 995

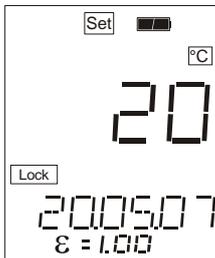
9.5 Date & Real Time clock setting

When the instrument is switched on after a complete battery discharge, the date & time clock setting is automatically displayed.

Confirm both date and time in order to use the instrument properly.

The two following pages allow respectively date and real time updating .

- Press the <SEL> key to display the date page



- Press the <ENTER> key to enable the adjustment
- Press the <SEL> key to select the parameter to be modified (day, month, year)
- Press the <▲> or <▼> key to modify the selected parameter (blinking)
- Press the <ENTER> key to acknowledge the new setting
- Press the <SEL> key to enter the real time clock page

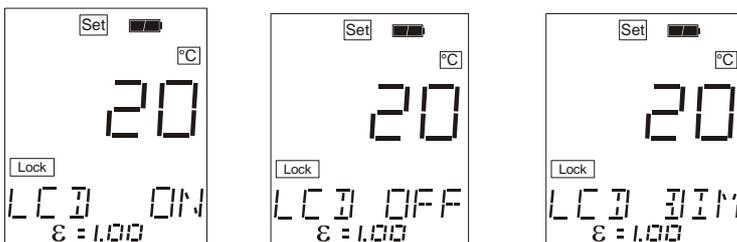


- Press the <ENTER> key to enable the adjustment
- Press the <SEL> key to select the parameter to be modified (hour, minute, second)
- Press the <▲> or <▼> key to modify the selected parameter
- Press the <ENTER> key to acknowledge the new setting
- Press the <SEL> key to select the new configuration step or press the <Trigger> to switch the instrument - Off-. The new selections will be automatically memory stored.

NOTE: THE DATA AND TIME SETTING WILL AUTOMATICALLY START IF THE INSTRUMENT WAS WITHOUT ANY POWER SUPPLY, DISCONNECTED FROM THE AC LINE AND WITH COMPLETE DISCHARGED BATTERY

9.6 Display backlit setting

- Press the <SEL> key up do display the LCD page:



Select one of the three possible options for the LCD mode:

ON: backlit always on

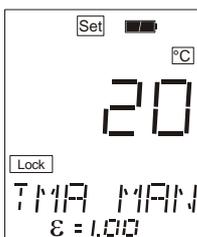
OFF: backlit always off

DIM: the backlit intensity change depending on the external luminosity

NOTE: A WEAK BACKLIT IS HOWEVER PRESENT IF LCD MODE IS DISABLED AND SET ON "OFF" OR "DIM"

9.7 Acquisition settings

- Press the <SEL> key until the following indication is displayed :



- Press <ENTER> for setting the acquisition mode;
- Press the <▲> or <▼> key to select the required setting: MAN, MIN, MAX or interval time for automatic acquisition ;

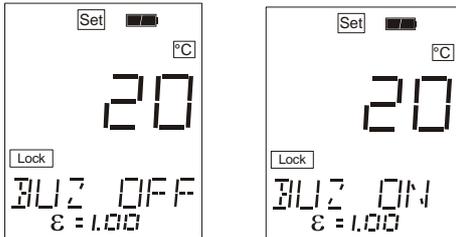
NOTE: MANUAL MODE DISPLAYS THE REAL TIME TEMPERATURE VALUES AND PERMITS TO STORE THE VALUE PRESSING THE <MEM> KEY. MAX (MIN) ACQUISITION MODE DISPLAYS ONLY THE MAXIMUM (MINIMUM) VALUE AND PERMITS TO STORE THE VALUE PRESSING THE <MEM> KEY. (SEE CAP.10).

- To change the interval time for automatic acquisition, press <SEL> to select the digit to change and the <▲> or <▼> key to change its value.
- Press <ENTER> to store the new acquisition mode.

See Cap. 10 for appropriate data acquisition operation.

9.8 Buzzer

This page allows the set-up of the acoustic signal.



When the “Buzzer” is switched -Off- the alarm conditions will be announced only with the relevant -HAL- or -LAL- message on the display.

NOTE: AN ERROR ON THE EMISSIVITY CALCULATION WILL BEEP EVEN IF THE BUZZER IS NOT ENABLED

9.9 Ambient Temperature Compensation (TAM)

This function is used to compensate the measure from the ambient temperature.

Low emissivity targets will reflect energy from their surrounding environments, which is going to add to their own emitted energy. If the temperature of the surrounding environment is the same value as the internal temperature of the unit, there is no need to consider this value as it is automatically and continually measured. However, in some industrial situations the surrounding environment (machines, furnaces, or other heat sources) has a much higher value than the one of the internal of the unit temperature. The table below "*Effect of TAM on Accuracy*" underlines these effects on measurement accuracy, with and without the use of the Ambient Temperature Compensation mode.

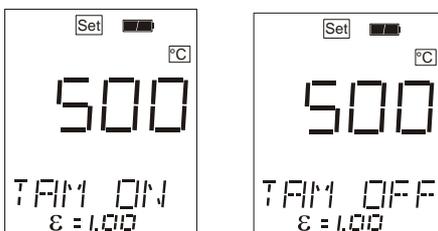
The Ambient Temperature Compensation mode should be used whenever the stated following points are true :

1. The target has a low emissivity.
2. Temperatures of objects facing targets are much hotter than the temperature of the unit.
3. An increased measurement accuracy is required

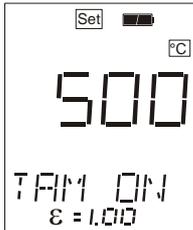
Actual Target Temp.		Emissivity	Ambient Temp.		Indicated Temp. w/o TAM		Indicated Temp. w/ TAM	
°C	°F		°C	°F	°C	°F	°C	°F
100	200	0.8	25	80	100	200	100	200
100	200	0.8	40	100	102	203	100	200
100	200	0.8	150	300	120	250	100	200
100	200	0.6	150	300	160	321	100	200

Note : The internal temperature of IR thermometer is assumed to be 25 °C (80 °F)

- Press the <SEL> key until one of the following indications is displayed :



- Press the <▲> or <▼> key to enable (or to disable) the thermocouple auxiliary input operation.



- With the compensation function activated, press <ENTER> to begin the measurements in order to calculate the ambient temperature average value. Point **IRtec P Mk2** towards objects and surfaces surrounding the target, making a scan over those items and acquiring corresponding temperature values. A counter (from 1 to 255) indicates the number of measurements considered (**IRtec P Mk2** displays the current value read during this procedure). These acquisitions have to be done with emissivity $\epsilon=1$, hence when acquisition starts the emissivity value has set automatically to one.

During the data acquisition the ambient temperature compensation (TAM) function is disabled; the "COMP" icon disappear from the display and the instrument acquires real temperature measurements and that are not coming from any correction algorithm.

At the end of the process the TAM feature will automatically re-enabled.

- Press <ENTER> to stop acquisition and to confirm the read ambient temperature (at this moment **IRtec P Mk2** will display the last acquired temperature value).
- Press the <SEL> key to select the new configuration step or press <Trigger> to switch the instrument off. The new selections will be automatically memory stored.

To execute the temperature measurements with TAM, switch **IRtec P Mk2** on and set the emissivity to the correct target value.

9.10 Firmware revision number

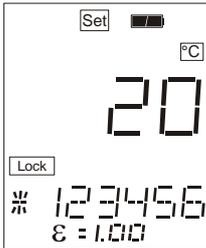
- Press the <SEL> key until the following page is displayed :



The above page indicates the version of the firmware installed in your instrument. This information is very important in all enquiries for technical assistance support.

9.11 Instrument serial number

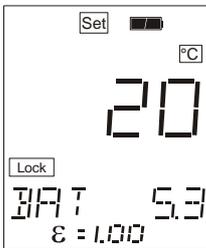
- Press the <SEL> key until the following page is displayed :



The above page indicates the serial number of the instrument. Such number is very important for any request of technical assistance support.

9.12 Battery level of charge

- Press the <SEL> key until the following page is displayed :



The above pages indicate the status of power supply and the level of charge of the battery. When a voltage lower than 4.6 is present a low battery symbol is also displayed.

If the instrument is connected to the main line for battery charge or long term continuous operation a symbol "AC" will be displayed instead of the battery voltage value.





10 DATA ACQUISITION OPERATIVE MODE

The instrument is equipped with an internal memory to store up to 500 input data records. Two types of data acquisitions can be selected by the user.

Continuous acquisition

The operator can manually, step by step, store his data through the keyboard or can select the interval time between each acquisition and store progressively the input data in the "Tag 0" file.

Acquisition by dedicated Tags

Standard Agencies and Quality Auditors require the collection, organisation and availability of traceability documents. A supporting software is available to transfer a selection of plant inspections from a PC to the internal memory of the instrument in order to simplify field check and select the appropriate Tag number.

Dedicated input data are memory stored and downloaded into a PC to document the inspection activity.

Data can be saved on disks, viewed and printed in a numeric or graphic mode. A full description of this acquisition mode is available with the dedicated software.

To operate in continuous acquisition mode, refer to the following procedure.

10.1 Storing data

- Start this procedure with the instrument switched -Off-
- Keep the <MEM> key pressed and, simultaneously, press the <Trigger> until the following indication is displayed :



- Press the <▲> or <▼> key to select the required Tag identification code (Tag 0 or one out of the 20 available Tags from "A" to "S").

NOTE: PARAMETERS (EMISSIVITY, LOW AND HIGH ALARM SETTINGS) CAN BE SET THROUGH KEYBOARD ONLY IN TAG 0. OTHER TAGS ARE RESERVED TO OPERATION THROUGH THE DEDICATED PC SOFTWARE



- Press the <SEL> key to display the number of memory locations still available (500 indicates a full empty memory).



Data can be recorded in the selected Tag in manual or automatic mode. Manual acquisition mode can be selected between normal (MAN), MAX or MIN. About acquisition mode and setting of time acquisition, refer to par. 9.7.

- Press the **<MEM>** key to start the acquisition.
If automatic acquisition mode is set, **IRtec P Mk2** acquires automatically with the programmed time interval.
If **MAN**ual mode is set, the real time temperature measurement is displayed; press the **<MEM>** key to store the displayed value.
If **MAX** or **MIN** mode is set, the maximum (minimum) temperature measurement is displayed; press the **<MEM>** key to trigger acquisition and the **<ENTER>** key to reset the value for the next acquisition.
- Press the **<SEL>** key to obtain the page that allows the clearing of the memory stored data :



- Press the **<ENTER>** key to clear the memory content and to obtain the following message that require confirmation :



- Press the **<ENTER>** key to confirm the deletion of the complete TAG (all the measurements of the current TAG)
- Press the **<MEM>** key to confirm the deletion of the last acquired measurement

NOTE: WHEN THE MESSAGE "SURE" IS DISPLAYED, 2 DIFFERENT DELETIONS ARE POSSIBLE

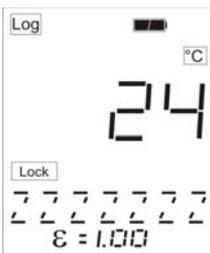
At the end of the deletion the following message will be displayed:



followed by the confirmation message:



- Press the <SEL> key to obtain the following page indicating the identification code (or name) assigned to the active Tag (zzzzzz = Furn686 = Trap888). The identification code is selectable only through software.



- Press the <SEL> key to review the pages relevant with **-HAL-** and **-LAL-** alarm settings. To change the alarm level in the data acquisition mode see the paragraph 10.2.



10.2 Resetting memory

Use the following procedure to completely delete the instrument memory; the internal memory will be initialized after this action:

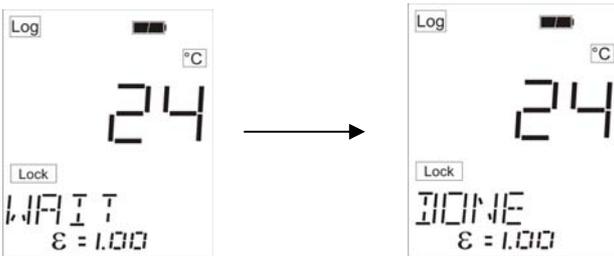
- Press the <SEL> key to display the tag RESET page:



- Press the <ENTER> key: a confirmation message will be displayed:



- Press the <ENTER> key to confirm the deletion or press the <SEL> key again to exit: after the confirmation the waiting message will be displayed followed by the confirmation message



10.3 Recalling data

- Start this procedure with the instrument switched -Off-
- Keeping pressed the <SEL> key, press the <Trigger> key to obtain the following indication :



- Press the <▲> or <▼> key to select the required Tag identification code (Tag 0 or one out of the 20 available Tags from "A" to "S").



- Press the <SEL> key to display the value of the first memory location in the selected Tag.



- Press the <▲> or <▼> key to display the subsequent memory locations.



11 LOGGING DATA MANAGER

IRLogMan 2007 software package has been developed to be used for configuring the IRtec P Mk2 and IRtec MicroRay portable infrared thermometers.

The Software allows viewing, graphing, exporting and reporting the measure.

11.1 System requirements

The following hardware and software are required to use **IRLogMan 2007**:

Operative system Windows™ 98/2000/XP; Processor, such as an Intel Pentium II or Advanced Micro Devices (AMD) processor; RAM 256Mbyte; 150 Mbyte free hard-disk space, CD-ROM drive, and dual RS232 serial port.

11.2 Installing the Software

NOTE: TO CORRECTLY USE THE THERMOMETER WITH THE COMPUTER YOU ALSO NEED TO INSTALL THE USB DRIVER. REFERE TO THE CHAPTER 13.

ATTENTION:
BEFORE STARTING INSTALLATION, CLOSE ALL THE ACTIVE PROGRAMS AND WINDOWS.

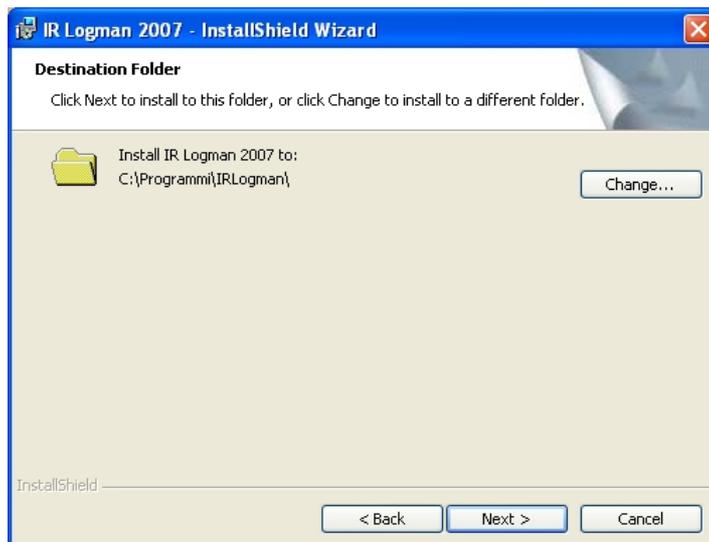
- Insert the IRLogMan 2007 CD-ROM in your drive;
- The InstallShield Wizard window will appear:



- Click "Next" to start the installation procedure; the License Agreement windows will appear:



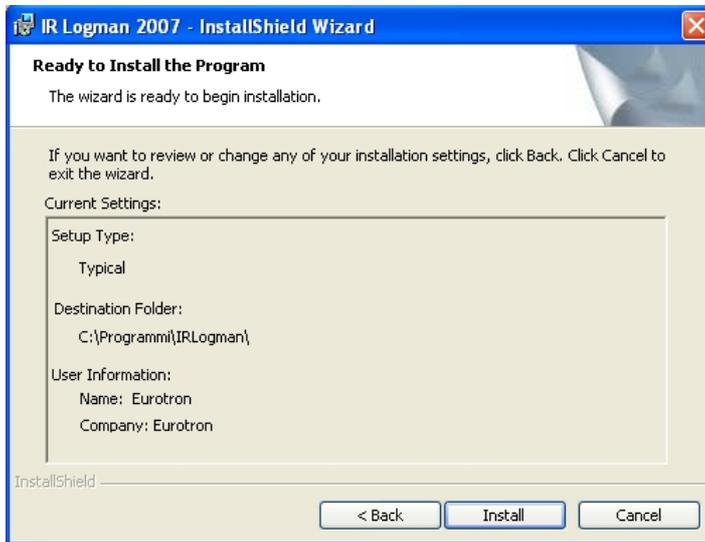
- Read and accept the terms in the license agreement, then click "Next". Simply click "Next" again to confirm the destination folder where the software are going to be installed, or change it clicking on "Change" and selecting, or creating, your own folder.



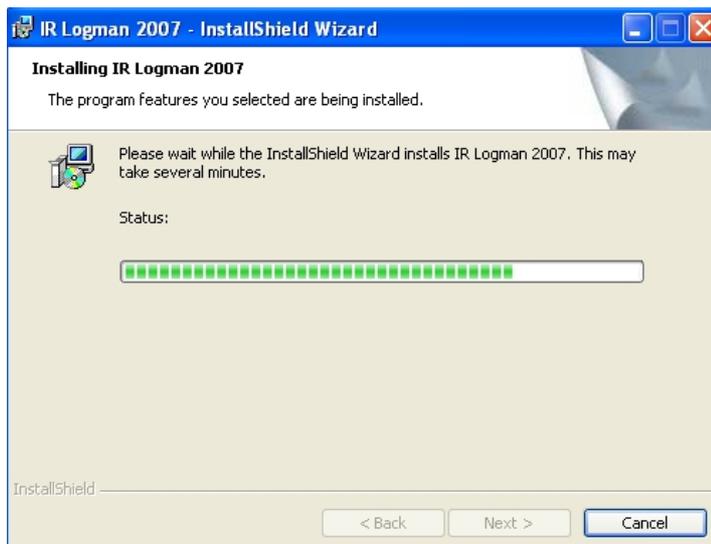
- Click "Next"



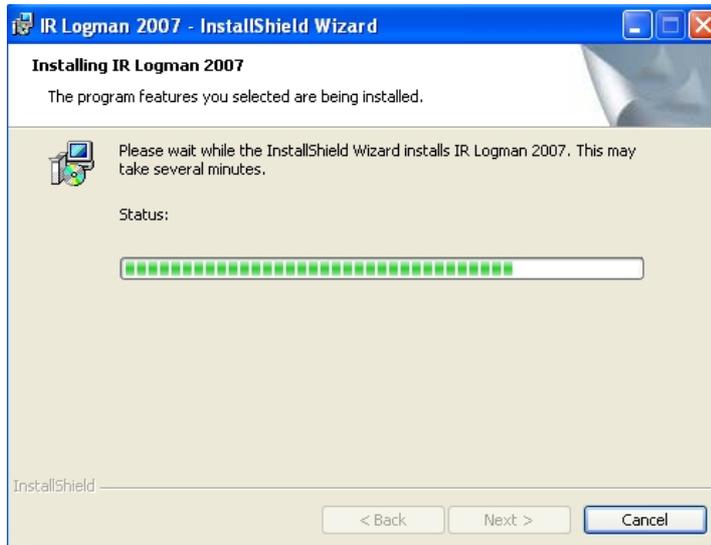
- The InstallShield Wizard is now ready to install the software. Click "Install".



- The InstallShield Wizard is now ready to install the program. Click "Install".



- A successful installation message will appear at the end. Click "Finish" to end the installation, and flag "Launch the program" if you want to run the program immediately. An "IRLogMan 2007" folder will be added on the programs menu of your system.



If the **IRLogMan 2007** setup program does not start automatically, follow these steps:

- Click the Start button
- Select RUN
- Type in D:SETUP.EXE (if "D" is the drive letter for your CD player), or use the "Browse" button to search the file SETUP.EXE on the CD-ROM
- Click OK.
- Follow the instructions on the screen to install the software.

The software is installed. You can run the **IRLogMan 2007** from the program menu.

11.3 Uninstalling the Software

To remove **IRLogMan 2007** program :

- Click the Start button
- Go to Programs
- Go to IRLogMan 2007
- Click "Uninstall"
- Click "OK"

The software is removed, including all related entries in your system registry. You can also manually delete the Folder where the program has been installed (C:\Programs\IRLogMan 2007), if the system doesn't remove it automatically.

11.4 Compatibility

IRLogMan 2007 can work automatically with all Eurotron portable IR thermometer.

The following list show the compatible instruments for this software revision.

IRtec P500+	IRtec P MM
IRtec P 510G	IRtec P 3000+
IRtec P800+	IRtec MicroRay Xtreme
IRtec P1000+	IRtec MicroRay FOOD+ / ++
IRtec P1300+	IRtec MicroRay AUTO+
IRtec P1600+	IRtec MicroRay HVAC++
IRtec P2000+	Rayomatic14 RS485

For detailed information about the IRLogMan 2007 Software and its function, please refer to the supplied IRLogMan 2007 user manual.



12 OPTIONS & ACCESSORIES

12.1 External IR printer (optional)

The instrument can be supplied, on request, with an external wireless printer that works with the InfraRed data transmission technology EE490012. The printer is supplied with a rubber holster and a paper roll to document measured or simulated values, memory stored data and to generate calibration report of instruments under test.

The printer is powered by 5 rechargeable AA type batteries and incorporates its own microprocessor for digital signal handling and character generation.

The connection between printer and instrument is wireless, through the built-in IR interface.

The IR port is located on the front of the printer, at the bottom.

12.1.1 Using the printer

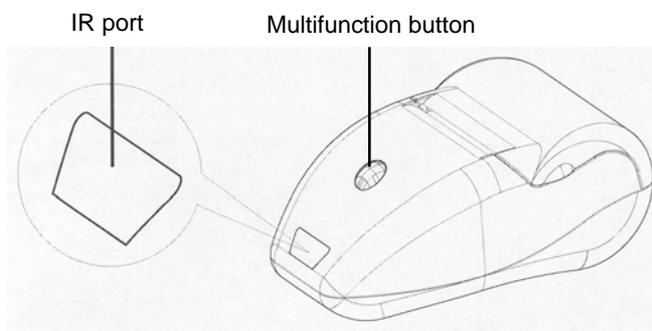


The printer doesn't need to be switched on or off. Simply point the IR leds of your **IRtec P Mk2** thermometers close to the IR receiver on the front of the printer.

For detailed information about the printing possibility refer to the par. 12.1.2.

12.1.1.1 Printer description

The printer body is ABS made and it's has a cover. The paper roll is located below it. On the center of the front there is a multifunction button and the IR port windows also has a red led.



The multifunction button has different functions depending of the duration of the pressing of it. If the printer is switched off (red led off) press the button to switch the printer on (the red led will light and will blink).



Quickly press 2 times the multifunction button to switch the printer off; the red led will quickly blink and after 3 seconds the printer will switch off. During this period the pressing of the multifunction button will break the switching off.

When the printer is switched on, press the multifunction button to feed the paper, if needed.

The red led displays the working status of the printer, accordingly to the following table:

LED Status	Description
Always OFF	Printer switched OFF
Always ON	Printer switched ON No problem during the battery charging
Slow blinking (1 blink every 3 seconds)	Printer switched ON No problem during the battery charging
Quick blinking (1 blink every 1 second)	Out of paper
Quick blinking (2 blinks per second)	Printer error. Head Over temperature. Battery voltage error.
Very quick blinking (7 blinks per second)	The printer is switching OFF

12.1.1.2 Enabling the IR port

To properly use the printer with the **IRtec P Mk2** thermometer the IR port has to be enabled first.

- With the printer switched off, keep pressed the front button for more than 3 seconds.

The printer will print a list showing all the set parameter:

```
SETUP DEFAULT 24 Col.:
HEAD TEMP.[°C] = 27.5
BATT.TEMP.[°C] = 27.5
HEAD VOLT [ V ] = 6.0

Interface : Infrared
IR Protocol: Enabled
Baud Rate : 9600 bps
Data Length: 8 Bits/chr
Parity : None
Handshaking: XON/XOFF
Autofeed : CR Enabled
Battery : 1700 mAh
Standby : 5 MIN
Print Mode : Normal
Alignment : Disabled
Print Dens.: 0

[PUSH] : ENTER SET-UP
[FAST PUSH] : EXIT
```

The parameters can be set in sequence, one after the other, by alternating the possible choices for that parameter. The following procedure will set the "Interface" parameter and can be used to set all the other parameters in the same way.

- Keep pressed the front button for more that 1 second.

The printer will print some rows as showed below:



```
[PUSH]: SKIP TO NEXT PAR
[FAST PUSH] MODIF. VALUE
```

Interface : Infrared	1
Interface : RS232	2
Interface : Infrared	1

- Quickly press 1 time the front button.

Each time you quickly press the front button, the printer will print a row with the modified parameter. You can operate in the same way for all the other parameters. In this case, to set the "Interface" parameter it is possible to alternate the two options "Infrared" and "RS232 (sequence 1 - 2 - 1...).

When the desired option has been set, keep pressed the front button for more than 1 second to go to the setting of the subsequent parameter.

Repeat this procedure for all the parameters. If you don't need the modify the setting of the subsequent parameter simply keep pressed the front button for more than 1 second in order to go the following one. After the last parameter, the printer will print the new parameter list and will go back into the "ON-LINE" mode.

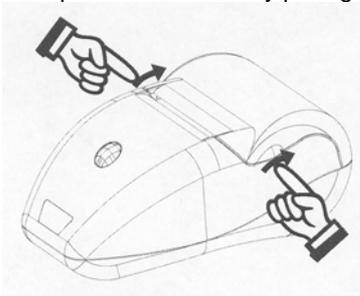
```
SETUP DEFAULT 24 Col.:
HEAD TEMP.[°C] = 27.5
BATT.TEMP.[°C] = 27.5
HEAD VOLT [ V ] = 5.9

Interface : Infrared
IR Protocol: Enabled
Baud Rate : 9600 bps
Data Length: 8 Bits/chr
Parity : None
Handshaking: XON/XOFF
Autofeed : CR Enabled
Battery : 1700 mAh
Standby : 5 MIN
Print Mode : Normal
Alignment : Disabled
Print Dens.: 0

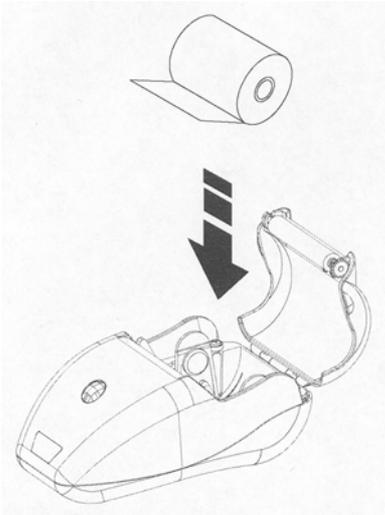
**** PRINTER RESET ****
```

12.1.1.3 Changing the paper roll

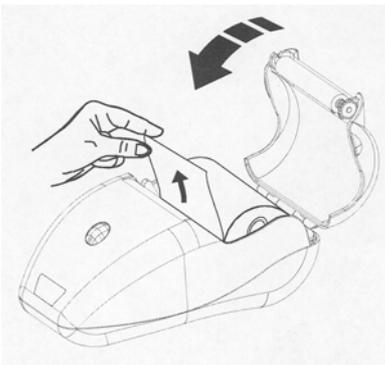
- Open the roll cover by pulling it up.



- Remove the old roll by pulling it up
- Replace the old paper roll with a new one making sure that the paper rotation direction is as shown on the figure



- Pull up the paper first.



- Close the roll cover.

The printer is ready to print.

12.1.1.4 Cleaning the printer

Clean the printer with a soft cloth only

<p>WARNING: DO NOT USE ALCOHOL, SOLVENTS OR BRUSHES WITH HARD HAIRS. DO NOT LET WATER AND OTHER LIQUIDS ENTER INTO THE PRINTER</p>

12.1.2 Printing

12.1.2.1 Printing a single measure

- Press the <MEM> key to HOLD the current measurement. The "HOLD" icon will be displayed:

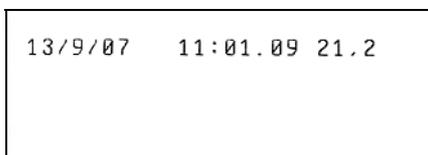


- Press the <SEL> key to display the "PRN SRT" option (Print Short):



- Press now the <ENT> key to print

The current hold measure will be printed:



12.1.2.2 Printing a single measure and its minimum/maximum values

This feature prints the single measure and its two minimum and maximum values that are automatically stored during the time period that the operator keep pressed the <Trigger> button.

- Press the <MEM> key to HOLD the current measurement. The "HOLD" icon will be displayed:

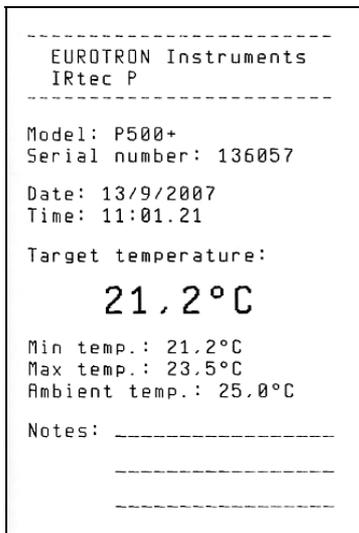


- Press the <SEL> key to display the "PRN LNG" option (Print Long):



- Press now the <ENT> key to print

The current hold measure and its minimum/maximum values will be printed:



12.1.2.3 Printing one tag measurement

This feature prints only one measure of the desired stored TAG. This value need to be recalled from the memory before print it.

- Switch off the instrument, if it's switched on
- Keep pressed the <SEL> key and switch on the instrument by pressing the <Trigger> key
- Press the <SEL> key to display the following page



- Select the desired TAG (the TAGs are stored with a letter from 0 to S) by using the <▲> or <▼> keys.
- Press the <SEL> key to select one of the nine measures available for that tag: the following page will be displayed:

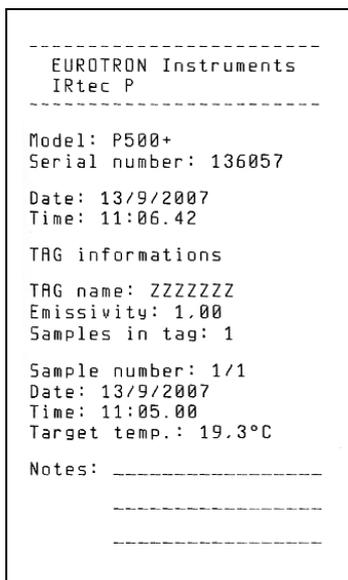


- Press the <SEL> key to display the following page:



- Press <ENTER> to start the printing

The selected measure of that TAG will be printed:



12.1.2.4 Printing all TAG measurements

This feature prints all the 9 measurements of the desired stored TAG. The TAG need to be recalled from the memory before print it.

- Switch off the instrument, if it's switched on
- Keep pressed the <SEL> key and switch on the instrument by pressing the <Trigger> key
- Press the <SEL> key to display the following page



- Press the <SEL> key to display the following page:



- Use the <▲> or <▼> key to select the print of all TAGs:



- Press <ENTER> to start the printing

All the 9 measurements of that TAG will be printed:



```
-----  
EUROTRON Instruments  
IRtec P  
-----  
Model: P500+  
Serial number: 136057  
  
Date: 13/9/2007  
Time: 11:26.07  
  
TAG informations  
  
TAG name: ZZZZZZ  
Emissivity: 1.00  
Samples in tag: 12  
  
Temperature unit: °C  
  
13/9/07 11:25.00 11.0  
13/9/07 11:25.22 18.3  
13/9/07 11:25.24 11.3  
13/9/07 11:25.26 11.0  
13/9/07 11:25.28 18.1  
13/9/07 11:25.30 18.7  
13/9/07 11:25.32 19.4  
13/9/07 11:25.34 10.8  
13/9/07 11:25.36 18.2  
13/9/07 11:25.38 18.9  
13/9/07 11:25.40 20.5  
13/9/07 11:25.42 19.8  
  
Notes: -----  
-----  
-----
```

12.1.2.5 Printing errors

If an error occurs the instrument will try again the data transmission to the printer up to 10 times. Each re-transmission start with a sounding BEEP and the following page will be displayed:



The transmission can be cancelled by pressing the <MEM> key or the <SEL> key (the previous HOLD measurement will be cancelled) and the confirmation message will be displayed:





It is also possible let the instruments continue it 10 transmissions; at the end, if the communication has not be successful, the error message will be displayed:



This message means that the printing has not been successfully completed and it will be displayed in case of:

- Report not printed
- Printing not complete

12.2 Sighting telescope system

The system (**EE300053**) is composed by:

Item	Q.ty	Part n.°	Description
1	2	EE010015	fastening screws for guide
2	1	EE280169	guide
3	2	EE280179	mounting rings
4	1	EE280181	telescope
5	1	EE280198	filter ring
6	1	EE360053	filter HT
7	1	EE370133	O-ring

Telescope installation:

- 1 Remove with a cut screwdriver the nut protection caps placed on the upper part of the instrument.
- 2 Place the guide on the upper part of the pyrometer, taking care of orientating it so that it leans entirely on the back of the instrument.
- 3 Fasten the screws in order to make the guide integral with the pyrometer.
- 4 Place the mounting rings on the guide, in order to cling them to the side edges. Let each ring slide along the guide until each catch is housed in the respective slot. Fasten firmly each fastening screw with a coin or a screwdriver.
- 5 Separate the upper and the lower half of each mounting ring by removing the two screws, using the enclosed hexagonal wrench.
- 6 Put the telescope in the supporting framework formed by the lower halves of the mounting rings and place the extremity with the widest diameter turned towards the target.
- 7 Rotate the telescope into the mounting rings, in order to bring the elevation adjustment (UP) high. Fasten the screws, avoiding to make an excessive clamping.

Telescope alignment:

- 1 Make the pyrometer integral with a support.
- 2 Remove the elevation and the windage adjustment caps.
- 3 Switch on the two pinpointing lasers and aim them to a target placed at a distance equal to the working distance.
- 4 The aiming must be carried out by keeping the eyepiece at a distance of about 80 cm from the eye.
- 5 Operating on the two adjustments (elevation and windage), place the centre of the reticule in connection with the centre of the axis joining the two spot lasers. The minimum suggested working distance is 5 meters, shorter working distance can cause alignment problems.
- 6 In this way the telescope is aligned to operate at the working distance; a variation in the working distance requires a new alignment of the telescope.



Filter installation

- 1 Filter use is suggested in viewing targets with temperature higher than 1000°C
- 2 Install the filter ring on the front side of the telescope lightly pushing the component

CAUTION

NEVER LOOK AT THE SUN THROUGH THE TELESCOPE. THE CONCENTRATION OF STRONG SOLAR RAYS CAN CAUSE SERIOUS EYE DAMAGE.

NEVER LOOK AT TARGET WITH TEMPERATURE HIGHER THAN 1000°C WITHOUT THE TELESCOPE PROTECTION FILTER. CONCENTRATION OF STRONG VISIBLE - IR RADIATION CAN CAUSE EYE DAMAGE

12.3 Red Point system

The system (**EE300054**) is composed by:

Item	Q.ty	Part n.°	Description
1	2	EE010015	fastening screws for the guide
2	1	EE280169	guide
3	1	EE280180	N°1 red point sight device
		"	N°2 mounting rings
		"	N°1 polarizer filter
		"	N°1 lens Hood extension
4	1	EE360055	Filter for T > 1300°C
5	1	EE360057	Filter for T from 1000 to 1300°C
6	1	EE370127	O-ring

Sighting device installation:

- 1 Remove with a cut screwdriver the nut protection caps placed on the upper part of the instrument.
- 2 Place the guide on the upper part of the pyrometer, taking care of orientating it so that it leans entirely on the back of the instrument.
- 3 Fasten the screws in order to make the guide integral with the pyrometer.
- 4 Place the mounting rings on the guide, in order to cling them to the side edges. Let each ring slide along the guide until each catch is housed in the respective slot. Fasten firmly each fastening screw with a coin or a screwdriver.
- 5 Separate the upper and the lower half of each mounting ring by removing the two screws, using the enclosed hexagonal wrench.
- 6 Put the sighting device in the supporting framework formed by the lower halves of the mounting rings, so that the rheostat hand grip is situated on the left side of the pyrometer, with respect to the aiming direction.
- 7 Rotate the sighting device into the mounting rings, in order to bring the elevation adjustment (UP) high. Fasten the screws, avoiding to make an excessive clamping.

Sighting device installation:

- 1 Make the pyrometer integral with a support.
- 2 Activate the illuminated red point by turning the rheostat hand grip clockwise to increase the brightness or in a counter-clockwise direction to reduce it. The position "1" indicates the minimum brightness and the position "7", the maximum one.
- 3 The aiming must be carried out by keeping the eyepiece at a distance of at least 7 cm from the eye.
- 4 Remove the elevation and the windage adjustment caps.
- 5 Switch on the two pinpointing lasers and aim them to a target placed at a distance equal to the working distance. The minimum suggested working distance is 5 meters, shorter working distances can cause alignment problems
- 6 Operating on the two adjustments (elevation and windage), place the illuminated red dot in connection with the centre of the axis joining the two spot lasers.
- 7 In this way the sighting device is aligned to operate at the working distance ; a variation in the working distance requires a new alignment of the sighting device.



Filter installation

- 1 Select the filter depending on the working temperature
- 2 Insert the selected filter in the internal side of the polarised filter mount
- 3 Place the O-ring over the filter to lock it
- 4 Screw up the polarised filter with the inserted optical filter placed on the front side of the sighting device

CAUTION

IF YOUR IRTEC P Mk2 IS EQUIPPED WITH TELESCOPE OR "RED POINT" PINPOINTING SYSTEM, NEVER AIM IRTEC P Mk2 DIRECTLY AT THE SUN, AS EYE DAMAGE COULD RESULT.

12.4 Close Focus Lens (for P 1300+, P1600+, P2000+ and P3000+ only)

The close focus lens is available on request for the IRtec P 1300+, IRtec P 1600+, IRtec P2000+ and IRtec P3000+ thermometers. With this lens the standard optic will be modified into:

1mm@200mm - D:S=200:1



The Close Focus Lens (cat. EE300301) is optional; simply screw the lens of the front part of the thermometers and you will be ready to use it.



13 USB INSTALLATION SETUP

Depending on the configuration of the computer, the instrument could be automatically identified or not. If the instrument is not properly identified you'll need to manually install its driver, that you can find on the instrument's software CD.

You need to follow the driver installation below only at first connection of the instrument. Then, every time you connect the instrument to your USB port, it will be automatically identified and it will be ready to operate.

- If you have previously installed a similar instrument on your pc and the drivers that are about to install are different from those already installed, uninstall the already installed drivers FIRST. Please refer to the Driver's Uninstall procedure of your Operating System.

13.1 Installing the USB driver

- Close all the active windows and/or applications.
- If you computer runs in Windows™XP or Windows™ XP SP1, temporally disconnect the PC from the web. To do this, temporally remove the network cable from your pc, if connected, or by disabling your network card going to the "Control Panel \ Network and Dial-Up Connections", right-clicking on the appropriate connection and selecting "Disable" from the menu. The connection can be re-enabled after the correct driver installation. This it's not necessary if your computer runs Window™ XP SP2 if configured to ask before connecting to Windows Update. Windows™ XP SP2 can have this parameter already set, and to verify this open the Control Panel, select "System", select the Hardware tab and click "Windows Update". Please verify that this option is DISABLED.
- Connect the USB cable to the USB port of your computer. This will automatically launch the Windows "Found New Hardware Wizard", if the instrument is not automatically identified and installed on your system.
- The following page will be displayed:



- select "No, not this time" to avoid the driver search in internet, then click "Next" to proceed with the installation



- Select the second option: “Install from a list or a specific location (Advanced)”, then click “Next”
- Select the option referring to the following page, flagging “Search for the best driver in these locations”. Press “Browse” to select the file path.



- Select the folder where the driver is present on the CD:
- D:\EE26032-SW-DRIVER USB-Serial FTDI, then select the folder referred to your operative system and click “OK”. The driver will be automatically installed on your system.

NOTE: IF WINDOWS XP IS CONFIGURED TO WARN WHEN UNSIGNED (NON-WHQL CERTIFIED) DRIVERS ARE ABOUT TO BE INSTALLED, YOUR COMPUTER WILL BE DISPLAY THE “HARDWARE INSTALLATION” WARNING PAGE. CLICK ON “CONTINUE ANYWAY” TO CONTINUE WITH THE INSTALLATION. IF WINDOWS XP IS CONFIGURED TO IGNORE FILE SIGNATURE WARNINGS, NO MESSAGE WILL APPEAR.

At the end Windows will show a message indicating that the installation was successful. Click “Finish” to complete the installation.



WARNING

THE INSTRUMENT WILL BE CONFIGURED ON YOUR SYSTEM AS A COMMUNICATION "COM" USB SERIAL PORT, NOT AS A CLASSIC USB PORT.

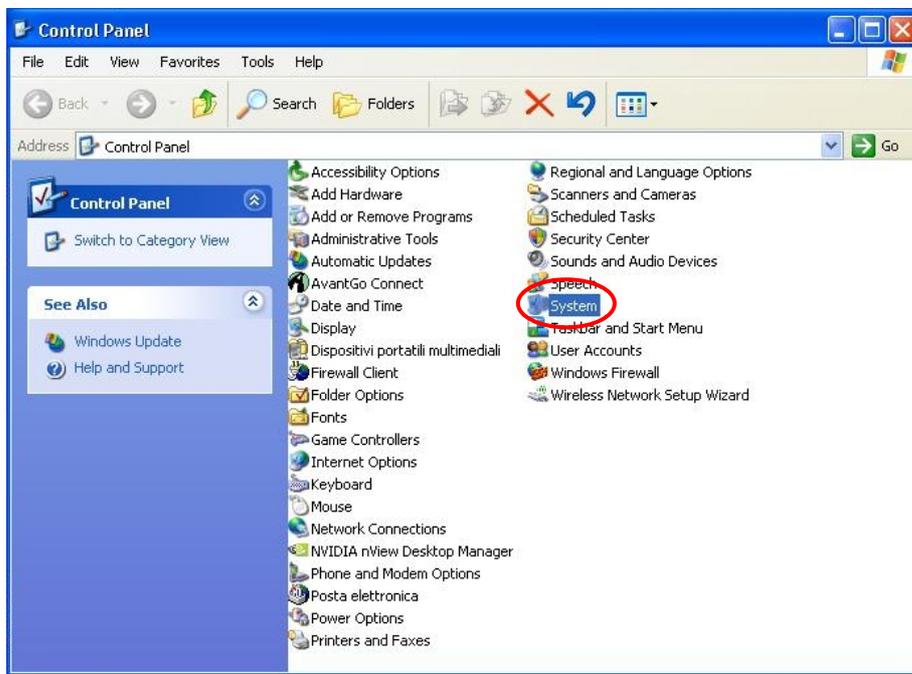
INTO THE DEVICE MANAGER OF YOUR PC THE PORT WILL APPEAR IN THE "COM AND LPT PORT" CATEGORY.

ALSO REMEMBER TO SET BOTH THE CORRECT COM PORT NUMBER AND THE PORT SPEED IN BAUD ON THE SOFTWARE SETTINGS THAT YOU ARE RUNNING, OTHERWISE YOU WILL HAVE ANY COMMUNICATION BETWEEN THE INSTRUMENT AND THE COMPUTER.

13.2 Checking the installed COM port

Use the following procedure to check what COM port has been installed on your system

- Open the Control Panel (Start - Control Panel)



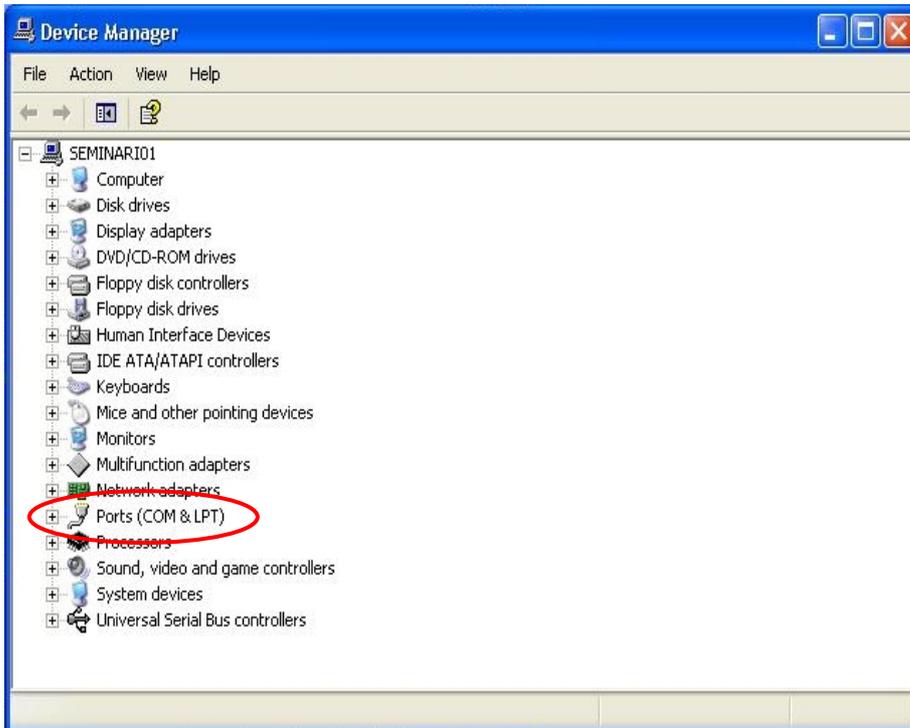
- Double click "System" to open it.



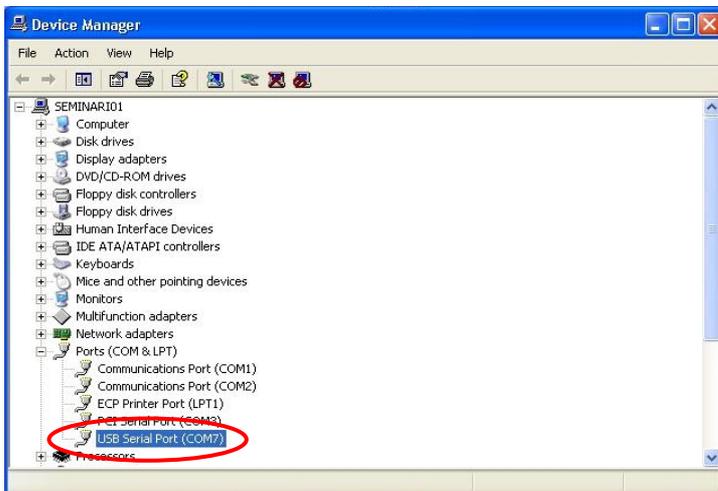
- Select "Hardware"



- Select "Device Manager"



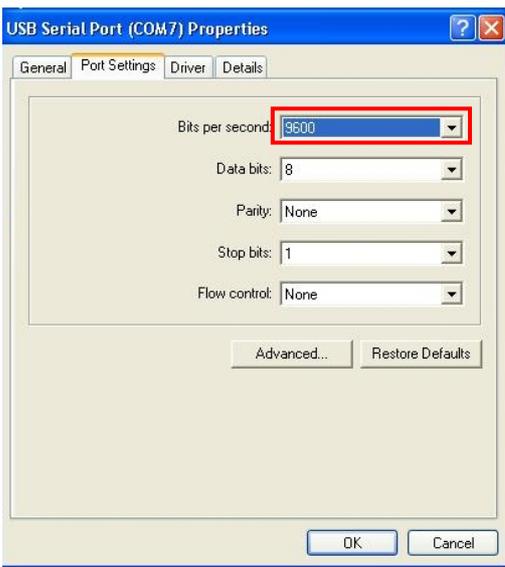
- Click on the "+" symbol of the "COM & LPT ports" category



- The installed COM port will be displayed (for example COM7)
- Select the port
- Right click on it and select "Properties" to open the port properties



- Select "Port Settings" to open the port communication properties



- The communication speed of the selected COM port (in Bits per second) will be displayed on the first field

WARNING
REMEMBER TO SET BOTH THE CORRECT COM PORT NUMBER AND THE PORT SPEED IN BAUD ON THE SOFTWARE SETTINGS THAT YOU ARE RUNNING, OTHERWISE YOU WILL HAVE ANY COMMUNICATION BETWEEN THE INSTRUMENT AND THE COMPUTER.



14 MAINTENANCE

Each **IRtec P Mk2** portable infrared thermometer has been factory tested and calibrated before shipment. The calibration should be verified and re-adjusted if the instrument shows an error exceeding the declared specifications or when a critical active or passive component is replaced (either at the component level or at the board level).

Eurotron will supply, on request, a technical reference manual, with all the instructions and recommendations for service and calibration. **Eurotron** engineers will give prompt support for any request of assistance.

14.1 Faulty operating conditions

During the start-up and measuring modes, faulty conditions of the instrument will be announced with coded messages.

If the faulty condition is critical for the application, it is recommended to re-start the pertinent set-up procedure. All errors which cannot be recovered without the user's knowledge, result in some system action to inform the operator via message and where possible to restore the system.

Restarting the instrument from -Power ON- may clear the error, but generally such messages are caused by hardware or software faults, which require the user's action.

Display	Error Type	Solution
Err 1	Internal EEPROM memory error	Contact technical support
Err 2	IR sensor reading error	Verify ambient temperature (from -5 to +55°C)
Err 3	Calibration data error	Recalibrate unit
OTC	No sensor connected at Tc input	Connect sensor
RJer	Cold-junction sensor reading error	Verify ambient temperature (from -5 to +55°C)

14.2 Recommendations

14.2.1 Auxiliary input

Thermocouple sensors are normally linked to electrical potentials equal or near to the ground potential. However, in some applications, there may be present a common mode voltage to ground. Check for voltage between input terminals and the ground, as this voltage can be transmitted to other devices connected to the IRtec P Mk2 series temperature indicator.

14.2.2 Laser sight

- Use of controls or adjustments or performance of procedures other than those specified here may result in hazardous radiation exposure.
- Do not look at the laser beam coming out of the lens or view directly with optical instruments – eye damage can result.
- Use extreme caution when operating the laser sight module.
- Never point the module at a person.
- Keep out of reach of all children.





14.3 Spare parts

EE880026	Aluminium carrying case
EE880028	Soft vinyl carrying case with shoulder strap
EE420394	Line AC cable for charger module - 230 Vac with Schuko plug
EE420396	Line AC cable for charger module - 115 Vac with USA plug
EE420395	Line AC cable for charger module - 230 Vac with UK plug
EE420394	Line AC cable for charger module - 230 Vac with European plug
EE420396	Line AC cable for charger module - 100 Vac with Japan/USA plug
EE880029	Wrist strap
EE300055	Telescope pinpointing system
EE300056	Red Point pinpointing system
EE490012	External IR printer (supplied with rubber holster and 1 paper roll)
EE340009	Paper rolls kit (10 rolls)
EE300301	Close Focus Lens Kit
EE700476	USB cable for PC

14.4 Storage

If the instrument has been left unused for a long time, it is recommended to remove the batteries.

Store the instrument in the original package, at a temperature from -30°C to +60°C, with R.H. less than 90%.

If the instrument has been unused for a month check the battery voltage, and charge the Ni-MH batteries for at least 12 hours.



15 CERTIFICATES

15.1 Warranty terms

Eurotron Instruments warrants its products against defects in materials and workmanship for the period declared from the date of the original retail purchase.

This warranty applies to the original purchaser only.

If the unit should malfunction, it must be returned during the warranty period, transportation prepaid, to **Eurotron** for evaluation. Upon examination, if the unit is found to be defective it will be repaired or replaced at no charge.

Direct all warranty and repair requests/inquiries to the **Eurotron** Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO EUROTRON, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM EUROTRON'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).**

Please include a copy of the original invoice or a small service charge may be applied.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

Eurotron's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of **Eurotron's** control.

15.2 Letter of conformity

This is to certify that the instrument has been manufactured and inspected to document procedures and where applicable, calibrated against standards which are traceable to National and International Standards.

The Instrument has been found to conform in all respects to specifications, drawings, workmanship standards and work order requirements.



APPENDIX



A1 How to define an object emissivity

Emissivity is the measure of an object ability to absorb, transmit, and emit infrared energy. It can have a value from 0 (shiny mirror) to 1.0 (blackbody). If a value of emissivity higher than the actual one is set, the output will read low, provided that the target temperature is above the ambient one. For example, if 0.95 is set in and the actual emissivity is 0.9, the reading will be lower than the true temperature when the target temperature is above the ambient one.

The emissivity can be determined by one of the following methods, in order of preference:

1. Determine the actual temperature of the material using a sensor such as a RTD, thermocouple or another suitable method. Next, measure the object temperature and adjust the emissivity setting until the correct value is reached. This is the correct emissivity for the measured material.
2. For relatively low temperature objects (up to 260°C or 500°F, place a piece of tape, such as a masking, on the object. Make sure the tape is large enough to cover the field of view. Next, measure the tape temperature using an emissivity setting of 0.95. Finally, measure an adjacent area on the object and adjust the emissivity setting until the same temperature is reached. This is the correct emissivity for the measured material.
3. If a portion of the surface of the object can be coated, use a flat black paint, which will have an emissivity of about 0.98. Next, measure the painted area using an emissivity setting of 0.98. Finally, measure an adjacent area on the object and adjust the emissivity setting until the same temperature is reached. This is the correct emissivity for the measured material.

A1.1 Typical Emissivity Values

The following table provides a brief reference guide to determine emissivity and can be used when one of the above methods is not practical. Emissivity values shown in the table below are only approximate, since several parameters may effect the emissivity of an object. These include the following ones:

1. Temperature
2. Angle of measurement
3. Geometry (plane, concave, convex, etc.)
4. Thickness
5. Surface quality (polished, rough, oxidised, sandblasted)
6. Spectral region of measurement
7. Transmissivity (i.e., thin film plastics)



A1.2 Metals - Typical Emissivity Values

	1.0 μm	1.6 μm	5.1 μm	8-14 μm
Aluminum				
Non-Oxidized	0.1-0.2	0.02-0.2	0.02-0.2	0.02-0.1
Oxidized	0.4	0.4	0.2-0.4	0.2-0.4
Alloy A 3003				
Oxidized	—	0.4	0.4	0.3
Roughened	0.2-0.8	0.2-0.6	0.1-0.4	0.1-0.3
Polished	0.1-0.2	0.02-0.1	0.02-0.1	0.02-0.1
Brass				
Polished	0.8-0.95	0.01-0.05	0.01-0.05	0.01-0.05
Burnished	—	—	0.3	0.3
Oxidized	0.6	0.6	0.5	0.5
Carbon				
Non-oxidized	0.8-0.95	0.8-0.9	0.8-0.9	0.8-0.9
Graphite	0.8-0.9	0.8-0.9	0.7-0.9	0.7-0.8
Chromium	0.4	0.4	0.03-0.3	0.02-0.2
Copper				
Polished	0.05	0.03	0.03	0-0.3
Roughened	0.05-0.2	0.05-0.2	0.05-0.15	0.05-0.1
Oxidized	0.2-0.8	0.2-0.9	0.5-0.8	0.4-0.8
Gold	0.3	0.01-0.1	0.01-0.1	0.01-0.1
Haynes Alloy	0.5-0.9	0.6-0.9	0.3-0.8	0.3-0.8
Inconel				
Oxidized	0.4-0.9	0.6-0.9	0.6-0.9	0.7-0.95
Sandblasted	0.3-0.4	0.3-0.6	0.3-0.6	0.3-0.6
Electropolished	0.2-0.5	0.25	0.15	0.15
Iron				
Oxidized	0.4-0.8	0.5-0.9	0.6-0.9	0.5-0.9
Non-oxidized	0.35	0.1-0.3	0.05-0.25	0.05-0.2
Rusted	—	0.6-0.9	0.5-0.8	0.5-0.7
Molten	0.35	0.4-0.6	—	—
Iron Cast				
Oxidized	0.7-0.9	0.7-0.9	0.65-0.95	0.6-0.95
Non-oxidized	0.35	0.3	0.25	0.2
Molten	0.35	0.3-0.4	0.2-0.3	0.2-0.3
Iron Wrought				
Dull	0.9	0.9	0.9	0.9
Lead				
Polished	0.35	0.05-0.2	0.05-0.2	0.05-0.1
Rough	0.65	0.6	0.4	0-4
Oxidized	—	0.3-0.7	0.2-0.6	0.2-0.6
Magnesium	0.3-0.8	0.05-0.3	0.03-0.15	0.02-0.1
Mercury	—	0.05-0.15	0.05-0.15	0.05-0.15
Molybdenum				
Oxidized	0.5-0.9	0.4-0.9	0.3-0.7	0.2-0.6
Non-oxidized	0.25-0.35	0.1-0.3	0.1-0.15	0.1
Monel (Ni-Cu)	0.3	0.2-0.6	0.1-0.5	0.1-0.14
Nickel				
Oxidized	0.8-0.9	0.4-0.7	0.3-0.6	0.2-0.5
Electrolytic	0.2-0.4	0.1-0.3	0.1-0.15	0.05-0.15



	1.0 μm	1.6 μm	5.1 μm	8-14 μm
Platinum				
Black	—	0.95	0.9	0.9
Silver	0.04	0.02	0.02	0.02
Steel				
Cold-Rolled	0.8-0.9	0.8-0.9	0.8-0.9	0.7-0.9
Ground Sheet	—	—	0.5-0.7	0.4-0.6
Polished Sheet	0.35	0.25	0.15	0.1
Molten	0.35	0.25-0.4	0.1-0.2	—
Oxidized	0.8-0.9	0.8-0.9	0.7-0.9	0.7-0.9
Stainless	0.35	0.2-0.9	0.15-0.8	0.1-0.8
Tin (Non-oxidized)	0.25	0.1-0.3	0.05	0.05
Titanium				
Polished	0.5-0.75	0.3-0.5	0.1-0.3	0.05-0.2
Oxidized	—	0.6-0.8	0.5-0.7	0.5-0.6
Tungsten				
Polished	0.35-0.4	0.1-0.3	0.05-0.25	0.03-0.1
Zinc				
Oxidized	0.6	0.15	0.1	0.1
Polished	0.5	0.05	0.03	0.02

A1.3 Non-metals - Typical Emissivity Values

	1.0 μm	5.1 μm	7.9 μm	8-14 μm
Asbestos	0.9	0.9	0.95	0.95
Asphalt	—	0.95	0.95	0.95
Basalt	—	0.7	0.7	0.7
Carborundum	—	0.9	0.9	0.9
Ceramic	0.4	0.8-0.95	0.95	0.95
Clay	—	0.8-0.95	0.95	0.95
Concrete	0.65	0.9	0.95	0.95
Cloth	—	0.95	0.95	0.95
Glass				
Plate	—	0.98	0.85	0.85
“Gob”	—	0.9	—	—
Gravel	—	0.95	0.95	0.95
Gypsum	—	0.4-0.97	0.8-0.95	0.8-0.95
Ice	—	—	0.98	0.98
Limestone	—	0.4-0.98	0.98	0.98
Paint	—	—	0.9-0.95	0.9-0.95
Paper (any color)	—	0.95	0.95	0.95
Plastic (opaque, over 20 mils)	—	0.95	0.95	0.95
Rubber	—	0.9	0.9	0.95
Sand	—	0.9	0.9	0.9
Snow	—	0.9	0.9	0.9
Soil	—	—	0.9-0.98	0.9-0.98
Water	—	—	0.93	0.93
Wood, Natural	—	0.9-0.95	0.9-0.95	0.9-0.95

- To optimize surface temperature measurements consider the following guidelines:
1. Determine the object emissivity using the suitable instrument for measurement.
 2. Avoid reflections by shielding the object from surrounding high temperature sources.
 3. For higher temperature objects use shorter wavelength instruments, whenever any overlap occurs.
 4. For semi-transparent materials such as plastic films and glasses, assure that the background is uniform and lower in temperature than the object.
 5. Mount the sensor perpendicularly to the surface whenever the emissivity is less than 0.9. In any case, do not exceed angles more than 30 degrees from incidence.



A2 APPLICATION NOTES

A2.1 Infrared energy

Each body, at temperatures above the absolute zero (-273°C or 0K), emits energy in the form of electromagnetic radiation. As the temperature of the body rises, the intensity of this infrared energy increases. The temperature of the body can therefore be determined by measuring the intensity of this infrared energy. An equipment used to measure the temperature with this method is called "infrared thermometer" or a "non-contact thermometer" since the thermometer is not required to be in contact with the body in order to measure its temperature.

A2.2 Applications

The temperature measurement of liquids or gases is well accomplished using a thermoelectric sensor thanks to the good thermal exchange between the sensor and the fluid. When solid objects are to be measured it is difficult to obtain a good thermal exchange and the possibility of making an additional error should be kept into consideration. Temperature measurements with direct contact are often impossible to be carried out when the target is moving or is connected to dangerous electrical sources or when, for any other reason, it is impossible or difficult to touch it.

A2.3 Emissivity

The infrared energy emitted by a body differs according to the composition of the body and to the physical condition of the surface.

Non-contact thermometers are calibrated using a blackbody source (made with material that absorbs energy at all wavelengths) as a reference standard.

However, to obtain the reading of the true temperature, it is necessary to compensate the thermometer for the actual emissivity of the object to be measured.

$$\text{Emissivity} = \frac{\text{Surface Radiation}}{\text{Blackbody Radiation}}$$

All IRtec P Mk2 infrared thermometers are equipped with an emissivity adjustment from 0.10 to 1.00.

The emissivity values relevant to different materials and surface conditions are detailed into the Application Bulletin cod. AB 02-002 (en) "How to determine an object emissivity" in Appendix A2 of the manual. The values from the above tables are reference values only: emissivity can in fact be slightly higher with a higher oxidation of the material .

A2.4 Reflected energy compensation

The radiation perceived from the thermometer is the one emitted by the target plus the radiation reflected by the surface of the object itself. To obtain more accurate readings, particularly for measurements of low emissivity temperature objects, the energy reflected from the target should be considered; that energy changes according to the temperature of the surrounding environment.

A typical example of that principle of operation comes from reheating furnaces, where the temperature of the vault is considerably higher than the target temperature.

IRtec P Mk2 thermometers provide an auxiliary function "TAM" to compensate for the ambient temperature.

When the average value of the ambient temperature is set, the microprocessor processes a correction algorithm and then displays the real temperature value of the target

As an example, the error occurring when no auxiliary function "TAM", to compensate for the ambient temperature, is enabled can reach 20°C when measuring a target at 100°C with the ambient temperature of 150°C.



A3 EMC CONFORMITY

The instrument case, made in shock-resistant injection moulded ABS + polycarbonate has an internal metal coating to fulfil the prevision of the directive 89/336/CEE Electromagnetic Compatibility.
Follow the page with the EMC declaration of conformity



Declaration of Conformity

We : Eurotron Instruments S.p.A.

(Supplier's name)

V.le F.lli Casiraghi, 409/413 20099 Sesto S. Giovanni (MI) - Italy

(Address)

declare under our sole responsibility that the product :

Portable IR thermometers IRtec P500+, P510G, P800+, P1000+, P1300+, P1600+, P2000+, P3000+ Mk2

(Name and type)

Cat. 1190, 1192, 1193, 1194, 1195, 1196, 1197, 1198 & 1199

(Model)

to which this declaration relates is in conformity with the following normative documents :

EN 50082-2 (3/95)

IEC 1000-4-2 / IEC 1000-4-4 / IEC 1000-4-11

ENV 50140 - ENV 50141 - ENV 50204

EN 55011

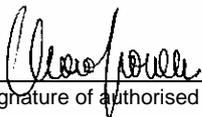
(Title, number and date of issue of normative documents)

following the prevision of directive :

89/336/CEE Electromagnetic Compatibility (EMC)

Sesto S. Giovanni, June 08th, 2007

(Place and date of issue)


(Signature of authorised person)





Declaration of Conformity

We : Eurotron Instruments S.p.A.

(Supplier's name)

V.le F.lli Casiraghi, 409/413 20099 Sesto S. Giovanni (MI) - Italy

(Address)

declare under our sole responsibility that the product :

External IR Printer for portable IR thermometers IRtec P Mk2 Series

(Name and type)

Cat. EE490012

(Model)

to which this declaration relates is in conformity with the following normative documents :

EN 50082-2 (3/95)
IEC 1000-4-2 / IEC 1000-4-4 / IEC 1000-4-11
ENV 50140 - ENV 50141 - ENV 50204

EN 55011

(Title, number and date of issue of normative documents)

following the prevision of directive :

89/336/CEE Electromagnetic Compatibility (EMC)

Sesto S. Giovanni, June 08th, 2007

(Place and date of issue)

(Signature of authorised person)





INDEX

- A**
- Acquisition by dedicated Tags; 43
 - Acquisition settings; 39
 - Alarm settings; 30
 - Ambient Temperature Compensation; 39
 - APPLICATION NOTES; 77
 - Applications; 77
 - Auxiliary input; 70
- B**
- Battery charger; 20
 - Battery charging; 24
 - Battery level of charge; 41
 - Buzzer; 39
- C**
- Calculated Measurements; 17
 - Case; 17
 - CERTIFICATES; 72
 - Changing the paper roll; 54
 - Checking the installed COM port; 66
 - Close Focus lens; 63
 - Compatibility; 51
 - CONFIGURATION; 36
 - Continuous acquisition; 43
- D**
- DATA ACQUISITION OPERATIVE MODE; 43
 - Date & Real Time clock setting; 37
 - Decimal point selection; 37
 - Digital interface; 20
 - Display; 16; 20
 - Display backlit setting; 38
 - Dual optic; 14
- E**
- Emissivity; 77
 - Emissivity automatic setting; 33
 - Emissivity manual setting; 32
 - Emissivity preloaded table; 34
 - Emissivity setting; 32
 - Enabling the IR port; 53
 - External IR printer; 52
- F**
- Faulty operating conditions; 70
 - Firmware; 20
 - Firmware revision number; 41
 - FUNCTIONAL DESCRIPTION; 19
- G**
- General; 14
 - GENERAL DESCRIPTION; 6
 - General features; 6
 - GENERAL FEATURES; 14
- H**
- Hold; 28
 - How to determine an object emissivity; 74
 - How to Operate the instrument; 26
- I**
- Infrared energy; 77
 - Innovative design; 6
 - Installing the USB driver; 64
 - Instrument codes; 8
 - Instrument serial number; 41
 - INTRODUCTORY NOTE; 2
- K**
- Keyboard; 16; 20
- L**
- Laser pinpointing; 28
 - LASER SAFETY**; 2; 22; 28
 - Laser sight; 70
 - Letter of conformity; 72
 - Logging Data Manager; 17
 - Logging DATA Manager; 48
 - Logging Mode; 17
- M**
- MAINTENANCE; 70
 - Microcontroller; 20
 - Minimum, maximum and difference auxiliary indication; 32
- O**
- OPERATIONS & APPLICATIONS; 25
 - Optical System; 14
 - Options & Accessories; 52
- P**
- PHYSICAL DESCRIPTION; 18
 - Power supply; 19
 - POWER SUPPLY; 23
 - Power supply from main line; 24
 - PRE-OPERATIONAL CHECK; 22



Printer description; 52
Printing; 55
Printing a single measure; 55
Printing a single measure and its
 minimum/maximum values; 56
Printing all TAG measurements; 58
Printing errors; 60
Printing one tag measurement; 57

Q

Quality System; 17
Quick Start; 26

R

Recalling data; 46
Rechargeable Li-Ion battery; 23
Recommendations; 70
Red Point pinpointing system; 62
Reflected energy compensation; 77
Report of Calibration; 17
Resetting memory; 45

S

Sighting telescope system; 61
Spare parts; 71
Specifications; 10
Storage; 71

Storing data; 43
System requirements; 48

T

TABLE OF CONTENTS; 3
Taking measurements; 15
TAM; 39
Target dimensions; 11
Target pinpointing; 15
Technical Unit selection; 36
Temperature Scale selection; 36
Thermocouple input; 31
Thermocouple Input; 16
Thermocouple input enabled; 36
TTS laser pinpointing; 15

U

Uninstalling the Software; 51
UNPACKING; 21
Unstable temperature measurement; 28
USB serial interface; 16
Using the printer; 52

W

Warranty terms; 72
Weight; 28
Working band; 28