Operating Instructions

GOSSEN METRAWATT

METRA**THERM** | **1**

Portable Infrared Thermometer

3-349-386-15
2/4.10

Table of Contents

1   Product Description

The **METRATHERM | 1** is a contactless infrared temperature measuring instrument. It fulfills the requirements of applicable European and national EC directives. This is confirmed by means of the CE mark. A corresponding declaration of conformity can be requested from GMC-I Messtechnik GmbH.

The instrument fulfills the following standards:

EN61326: Electrical equipment for control technology and laboratory use

IEC61000-4-2: Testing of interference immunity to the discharge of static electricity

IEC61000-4-3: Testing of interference immunity to high frequency electromagnetic fields

IEC61000-4-8: Testing of interference immunity to magnetic fields with energy technology frequencies

Product Features

- Infrared temperature measuring range: −50 to 1000° C (−58 to 1832° F)
- Exact positioning with laser sighting (can be activated if desired)
- High D:S ratio of 50:1
- Emissivity adjustable from 0.1 to 1.00 in steps of 0.01
- Additional measuring option with type K thermocouple
- Illuminated LCD panel
- Selectable unit of measure: °C or °F
- Single and continuous measurements
- Storage of current measured temperature, lowest and highest temperature or maximum temperature difference ΔT
- 10 memory locations for individual measurements
- Alarm function: acoustic signal in the event of violation of adjustable limit values
- USB port for data transmission to a PC
- PC software for displaying and recording measured values (data logger function) on included CD ROM

Applications

- Temperature measurement at large distances, and thus at a safe distance from potential danger zones
- Electrical troubleshooting
- Automotive repair and maintenance
- Air conditioning
- Scientific experiments
- Manufacturing processes in the field of semiconductor technology
- Contacts in electrical switch boxes
- Food monitoring and processing

Included

- 1   **METRATHERM** | **1** measuring instrument
- 1   9 V battery
- 1   screw-on carrying strap
- 1   type K thermocouple
- 1   USB adapter cable for data transmission to a PC
- 1   CD ROM with installation software for PC display and recording program (data logger)
- 1   set of operating instructions in English and German

2 Safety Warnings

Read the following safety precautions carefully before placing the measuring instrument into service. Repairs and maintenance work which are not described in these operating instructions should only be executed by qualified personnel.

Laser Warning!

Never aim the laser beam directly at the eye!
Exercise care with reflective surfaces!
Keep the instrument out of the reach of children!

Safety Precautions

- Never immerse the instrument in water.
- This product is not suitable for medical examinations. When measuring body temperature, the measured value serves as a reference value only. The instrument has been designed for industrial, scientific and technical applications.

Symbols on the Device

Warning concerning a point of danger
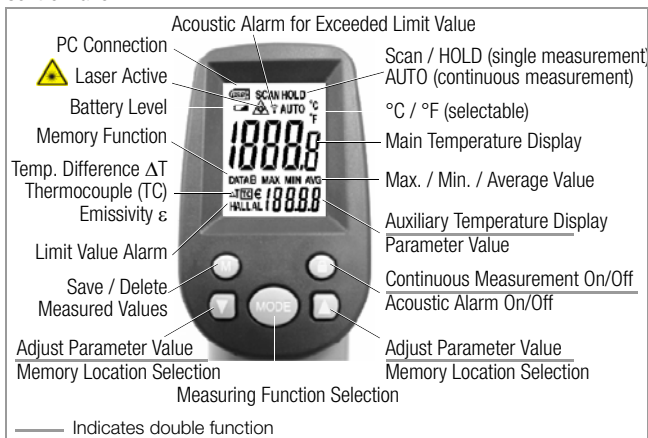(attention: observe documentation!)

Laser warning

Indicates EC conformity

The device may not be disposed of with the trash.
Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

3 Instrument Overview

Housing

Laser Aperture
Laser Beam

IR Measuring Window

Terminals
Type K Thermocouple

Measuring
Trigger

Thread for Attaching Carrying
Strap or Tripod (not included)

Control Panel / Display

USB Port

Battery Compartment
and Lid

Control Panel

Acoustic Alarm for Exceeded Limit Value

PC Connection

Laser Active

Battery Level

Memory Function

Temp. Difference ΔT
Thermocouple (TC)
Emissivity ε

Limit Value Alarm

Save / Delete
Measured Values

Adjust Parameter Value
Memory Location Selection

Scan / HOLD (single measurement)
AUTO (continuous measurement)

°C / °F (selectable)

Main Temperature Display

Max. / Min. / Average Value

Auxiliary Temperature Display
Parameter Value

Continuous Measurement On/Off
Acoustic Alarm On/Off

Adjust Parameter Value
Memory Location Selection

Measuring Function Selection

—— Indicates double function
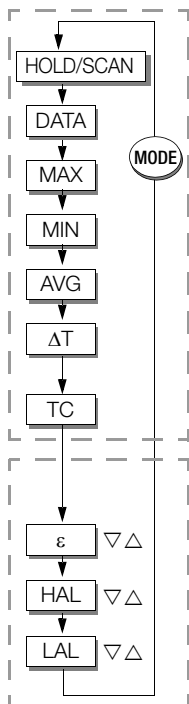
Operating Mode Selection and Parameter Settings

Operating Mode – Selecting Functions

HOLD/SCAN
Acquire and display temp. during measurement (see chapter 4.1.1 for continuous measurement)

DATA
Access stored **data** with the help of the ∇ and $\triangle$ scroll keys (see chapter 4.1.3)

MAX
MAXimum temperature during a measuring sequence (see chapter 4.1.2)

MIN
MINimum temperature during a measuring sequence (see chapter 4.1.2)

AVG
Average temperature during a measuring sequence (see chapter 4.1.2)

ΔT
Largest temperature difference during a measuring sequence (see chapter 4.1.2)

TC
Measurement with thermocouple (see chapter 4.2)

(MODE)

Configuration Mode – Setting Parameters

ε $\nabla\triangle$
Adjustable emissivity for increased accuracy with various materials (see chapter 5.2)

HAL $\nabla\triangle$
Warning signal adjustment for maximum temperature (see chapter 5.3)

LAL $\nabla\triangle$
Warning signal adjustment for minimum temperature (see chapter 5.3)

4 Temperature Measurement

Two types of temperature measurement are possible:
- Measurement with infrared sensor (see chapter 4.1)
- Measurement with thermocouple (see chapter 4.2)

4.1 Measurement with Infrared Sensor

4.1.1 Standard Measurements

Preparing for Measurement

Laser Warning!

When the instrument is switched on by means of the trigger, the laser beam is immediately activated and the laser symbol appears at the display.
Observe the safety precautions!

⇨ Select a unit of measure: °C or °F (see chapter 7.1).
⇨ Set emissivity in accordance with the table in the appendix depending upon the type of object to be measured (see chapter 8.1).
⇨ The field of view must be taken into consideration, i.e. distance from the measuring point to the spot (see chapter 5.1).
⇨ Aim the instrument at the object to be measured, holding it such that you can easily read the LCD panel and pull the trigger with your forefinger.

Make sure that the target is larger than the instrument's measuring spot. In the case of objects with large surfaces, make sure that you are located within the permissible measuring range.

The laser dot can be used to take aim at the measuring point, and has no measuring function of its own. The laser can be deactivated if desired. Refer to chapter 7.1 regarding switch positions.

Single Measurements – HOLD Function

The instrument is switched and measurement is started when the trigger is activated, which is acknowledged by means if a brief acoustic signal. As soon as the trigger is released, the last measured temperature is frozen at the main and auxiliary temperature displays (as long as no special function has been selected), and **HOLD** appears at the display simultaneously. After approximately 30 seconds, the measuring instrument is switched off and the display goes blank.

Continuous Measurements – SCAN Function

Pull and hold the trigger, and then scan each measuring point, one after the other, in order to perform manual continuous measurements. **SCAN** blinks at the display.

Continuous Measurements with Tripod – AUTO SCAN Function

Press the 🔒 key once in order to perform automatic continuous measurements without having to pull the trigger. **SCAN** blinks and **AUTO** appears at the display. Automatic shutdown is deactivated. Although the laser symbol is displayed, the laser is switched off immediately, because the measuring equipment is set up only once with the help of a tripod for continuous measurements. Background illumination is deactivated after 30 seconds in order to reduce power consumption. Measurement is performed until the 🔒 key is pressed once again.

4.1.2 Special Functions

Ascertaining Maximum Temperature – MAX Function

This measuring function makes it possible to acquire and store the highest measured (absolute) temperature value after scanning several measuring points (SCAN function).
- ➪ Repeatedly press the **MODE** key until **MAX** appears at the display.
- ➪ Pull and hold the trigger until all measuring points have been scanned.

The maximum temperature value is frozen at the auxiliary display after the trigger is released.

Ascertaining Minimum Temperature – MIN Function

This measuring function makes it possible to acquire and store the lowest measured (absolute) temperature value after scanning several measuring points (SCAN function).
- ➪ Repeatedly press the **MODE** key until **MIN** appears at the display.
- ➪ Pull and hold the trigger until all measuring points have been scanned.

The minimum temperature value is frozen at the auxiliary display after the trigger is released.

Ascertaining Average Temperature – AVG Function

This measuring function makes it possible to acquire and store the average temperature value after scanning at least eight measuring points (SCAN function) during a single measuring sequence.

⇨ Repeatedly press the **MODE** key until **AVG** appears at the display.
⇨ Pull and hold the trigger until all measuring points have been scanned.

The average temperature value is frozen at the auxiliary display after the trigger is released.

Ascertaining Temperature Difference – ΔT Function

This measuring function makes it possible to acquire and store the largest measured temperature difference (difference between lowest and highest measured temperature value) after scanning several measuring points (SCAN function).

⇨ Repeatedly press the **MODE** key until ΔT appears at the display.
⇨ Pull and hold the trigger until all measuring points have been scanned.

The temperature difference is frozen at the auxiliary display after the trigger is released.

4.1.3 Memory Functions

Saving Measurement Data – DATA Function (blinking)

Up to 10 measured values can be saved to 10 memory locations: DATA1 ... 9, A, where A is used as a hexadecimal character for the 10th memory location.

The current measured value, the maximum value (MAX), the minimum value (MIN), the average value (AVG), maximum temperature difference ΔT or temperature measured by means of a thermocouple (TC) can be stored to any given memory location.

Proceed as follows in order to save values to memory:

⇨ Repeatedly press the **MODE** key until **DATA** blinks at the display.
⇨ Select **DATA1** by pressing the ▽ or the △ key.
⇨ Repeatedly press the **MODE** key until the desired measuring function appears at the display.
⇨ Start measurement by pulling the trigger.
⇨ Save the measured value to memory during measurement by pressing the **M** key. A brief acoustic signal acknowledges that the value has been saved. The memory location number is increased by one.

Querying Stored Measurement Data – DATA Function (static)

➪ Repeatedly press the **MODE** key until **DATA** no longer blinks at the display.

➪ Press the ▽ or the △ key in order to read out data from memory locations DATA1 ... 9, A. The stored value appears at the auxiliary temperature display.

Deleting Measurement Data – DATA Function (static)

Proceed as follows in order to clear all memory locations (DATA1 ... 9, A):

➪ Repeatedly press the **MODE** key until **DATA** no longer blinks at the display.

➪ Repeatedly press the ▽ or the △ key until **DATA0** is displayed, and -*CL*- appears at the auxiliary display.

➪ Press the M key. Deletion of data from all memory locations is acknowledged by a brief sequence of two acoustic signals.

Double check: "----" appears in the auxiliary temperature display for each memory location when queried with the ▽ or the △ key.

➪ Press the **MODE** key in order to exit the "Clear" mode, and **DATA** once again blinks at the display.

4.2 Thermocouple Measurements – TC Function

Laser Warning!

Switch the laser off for safety reasons before plugging in the thermocouple. Refer to regarding switch positions. chapter 7.1

The laser is not required when performing measurements with thermocouples.

➪ Insert the connector pins of the yellow thermocouple plug into the sockets provided to this end underneath the IR sensor.

➪ Activate the display with the trigger.

➪ Repeatedly press the **MODE** key until **TC** appears at the display.

➪ Contact the measuring point with the thermocouple's cable.

Values measured by the thermocouple appear continuously at the auxiliary display. After approximately 30 seconds, the measuring instrument is switched off and the display goes blank.

5   Infrared Thermometer Mode of Operation and Parameters Configuration

5.1   Field of Vision Ratio

The field of vision is the instrument's viewing angle. It is determined by the utilized optics. The FOV (**f**ield **o**f **v**ision, also D:S) is the relationship between the distance of the measuring instrument from the object to be measured and the diameter of the spot. The smaller the object to be measured, the closer you should be to it.

Ideally, the diameter of the spot is smaller than the diameter of the object to be measured. If this is the case, ambient radiation can be ignored.

Spot Diameter	Distance
19 mm	0.5 m
20 mm	1 m
64 mm	2 m

5.2   Emissivity – Parameter ε

Emissivity is a measure of an object's ability to emit or absorb energy. Perfect emitters have an emissivity value of 1, which means that they reemit 100% of the energy to which they are exposed. An object with an emissivity value of 0.8 absorbs 80% of the energy to which it is exposed, and reemits 20%. Emissivity is defined as the relationship of the amount of infrared energy which is emitted by an object at a specified temperature to the amount of infrared energy which is emitted by a perfect emitter at the same temperature. Emission values lie within a range of 0.0 and 1.0 (see chapter 8.1).

⇨   Repeatedly press the **MODE** key until ε appears at the display in order to set the emissivity parameter.

⇨   Select the desired value with the ∇ and △ keys.

5.3 Temperature Limit Values

Alarm for Exceeded Limit Value – HAL Parameter

A maximum temperature can be specified here (HAL = **h**ighest **al**arm).
An acoustic signal sounds periodically as long as this value is
exceeded.
- ➪ Repeatedly press the **MODE** key until **HAL** appears at the display.
- ➪ Select the desired value with the ∇ and $\triangle$ keys.
- ➪ Repeatedly press the 🔒 key in order to switch the buzzer on or off.

Alarm for Limit Value Fallen Short of – LAL Parameter

A minimum temperature can be specified here (LAL = **l**owest **al**arm).
An acoustic signal sounds periodically as long as this value is fallen
short of.
- ➪ Repeatedly press the **MODE** key until **LAL** appears at the display.
- ➪ Select the desired value with the ∇ and $\triangle$ keys.
- ➪ Repeatedly press the 🔒 key in order to switch the buzzer on or off.

6   Technical Data

Quantity	Characteristic Value
Infrared thermometer sensor	
Temperature range	−50 to 1000° C (−58 to 1832° F)
Accuracy	±3.0° C (±5° F) from -50 to -20° C (-58 to -4° F), ±2.0° C (±3° F) from -20 to 100° C (-4 to 212° F), ±2% from 100 to 1000° C (212 to 1832° F)
Wavelength	8 to 14 μm
Repetition accuracy	±1° C or ±2° F
Resolution, main and auxiliary displays	0.1° C
Response time	500 ms
Emissivity	Adjustable from 0.1 to 1.0
Relationship of the distance between the measuring instrument and the object to be measured, and diameter of the spot (distance relationship D:S)	50:1
Type K thermocouple sensor	
Temperature range / accuracy	-200 to +200° C / ±(0.2% rdg. + 1.5° C) +200 to +1370° C / ±(0.5% rdg. + 1° C)
Temperature range / resolution	-200 to -100° C / 1° C -99.9 to +1370° C / 0.1° C
Supply power / battery service life	9 V block battery (6LR61) / 10 hours
Operating temperature	0 to 50° C (32 to 122° F), 10 to 90% atmospheric humidity
Electromagnetic compatibility (EMC)	DIN EN 61326:2002
Selectable unit of measure: °C or °F	✔
Automatic shutdown	Approx. 30 seconds after last key activation
Background illumination	✔
Switchable laser beam	✔
Min. max. and average values	✔
10 memory locations	✔
Acoustic warning signal	✔
Automatic measurement	✔
Double display	✔
USB data port	✔
Dimensions	200 × 127 × 47 mm
Weight	Approx. 350 grams with battery

7 Maintenance

7.1 Unit of Measure and Laser On/Off Switches

Temperature can be displayed in either °C or °F. Switch positions for switching back and forth between °C and °F, as well as for switching the laser on and off, are depicted in the following figure.

Pull the battery compartment lid (at the bottom of the instrument) out towards the side with the operating controls, all the way in to the end position, and then fold it down as shown in steps 1 and 2 in the figure. In order to close the battery compartment lid, fold it back up again such that the four guide pins fit into the openings provided for this purpose. Push the lid all the way back into its end position.

°C / °F
Laser On/Off
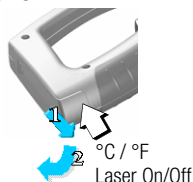
7.2 Battery Replacement

The battery is located in the same compartment as the unit of measure and laser on/off switches (to open see chapter 7.1).

Make sure that no battery leakage has occurred before initial start-up, and after long periods of storage. Continue to inspect the batteries for leakage at short, regular intervals.

If battery leakage has occurred, carefully and completely clean the electrolyte from the instrument with a damp cloth, and replace the battery before using the instrument.

When the "⬛" symbol appears at the display, or if background illumination is only activated briefly after pulling the trigger, the battery should be replaced as soon as possible. You can continue working with the instrument, but reduced measuring accuracy may result. Please dispose of depleted batteries in accordance with environmental protection regulations!

☞ **Note!**
Measuring parameters remain in memory during battery replacement.

7.3 Cleaning the Lens

Use clean compressed air to blow out loose particles. Any remaining contamination or residual dust should be carefully removed with a camel's hair brush. The surface of the lens should be wiped off with a damp cotton swap which can be moistened with distilled water.

☞ **Note!**
Do not use solvents to clean the lens!

7.4 Cleaning the Housing

Moisten a sponge or a soft cloth with a bit of soapy water. Avoid the use of cleansers, abrasives or solvents.

8 Appendix

8.1 Emissivity Table

Material	Temperature in °C / °F	Emissivity
Gold (pure, highly polished)	227 / 440	0.02
Aluminum foil	27 / 81	0.04
Aluminum disc	27 / 81	0.18
Household aluminum (flat)	23 / 73	0.01
Aluminum (polished plate, 98.3%)	227 / 400	0.04
	577 / 1070	0.06
Aluminum (rough plate)	26 / 78	0.06
Aluminum (oxidized at 599° C)	199 / 390	0.11
	599 / 1110	0.19
Aluminum surfaced roofing	38 / 100	0.22
Zinc galvanized sheet iron (bright)	25 / 77	0.04
Nickel wire	187 / 368	0.1
Lead (pure, 99.95 unoxidized)	127 / 260	0.06
Copper	199 / 390	0.18
	599 / 1110	0.19
Steel	199 / 390	0.52
	599 / 1110	0.57
Zinc galvanized sheet iron (bright)	28 / 82	0.23
Brass (highly polished)	247 / 476	0.03
Brass (cold rolled, polished)	21 / 70	0.04

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Material	Temperature in °C / °F	Emissivity
Galvanized iron (bright)	—	0.13
Iron plate	20 / 68	0.69
Rolled sheet steel	21 / 71	0.66
Oxidized iron	100 / 212	0.74
Wrought iron	21 / 70	0.94
Molten iron	1299 to 1399 / 3270 to 2550	0.29
Copper (polished)	21 to 117 / 70 to 242	0.02
Copper (scraped shiny, not mirrored)	22 / 72	0.07
Copper (heavily oxidized surface)	25 / 77	0.78
Enamel (white, fused onto iron)	19 / 66	0.9
Formica®	27 / 81	0.94
Frozen soil	—	0.93
Brick (red, rough)	21 / 70	0.93
Brick (silica, unglazed, rough)	1000 / 1832	0.8
Carbon (T-carbon, 0.9% ash)	127 / 260	0.81
Concrete	—	0.94
Glass (smooth surface)	22 / 72	0.94
Granite (polished)	21 / 70	0.85
Ice	0 / 32	0.97
Marble (light gray, polished)	22 / 72	0.93
Asbestos board	23 / 74	0.96
Asbestos paper	38 / 100	0.93
	371 / 700	0.95
Asphalt (paving)	4 / 39	0.97

8.2 PC Display and Recording Program (data logger)

The included PC software makes the following functions possible:

- Display currently measured infrared temperature values with date and time.
- Adjust the sampling interval for recording measured values.
- Record measured values to a text file which can be exported to Microsoft® Excel™ for analysis.

8.2.1 PC System Requirements

The following prerequisites apply to the PC to which the software will be installed:

- Windows PC with at least Pentium II processor, 350 MHz or faster
- Windows 2000 SP4 or Windows XP
- 128 MB RAM
- 5 MB available hard disk space (without data)
- SVGA monitor with at least 800 x 600 pixels
- Windows supported printer
- Microsoft compatible mouse
- CD ROM drive
- USB port

8.2.2 Installation

⚠️ **Attention!**
    Install the PC software from the included CD ROM to your PC before connecting the USB cable to the PC.

- ➪ Exit all applications before installation.
- ➪ Insert the CD ROM into the CD drive.
- ➪ The CD ROM is started automatically after just a few minutes. Otherwise, execute the **autorun.exe** file from the CD ROM.

- ⇨ Click the **Setup** button.
- ⇨ The remaining installation steps are self-explanatory.
- ⇨ Follow the instructions which appear at the screen.

8.2.3 Starting the Application Software

- ⇨ Connect the measuring instrument to your PC:
  – Insert the small connector plug with the suppressor choke into the appropriate socket on the instrument such that the embossed arrow can be seen when viewing the control panel.
  – Insert the USB plug into the corresponding socket at the PC.
- ⇨ Start the program:
  Click *Start > Programs > Infrared thermometer > **Infrared thermometer**, or double click the appropriate desktop icon.

The measuring sequence is started several seconds after pulling the trigger once. The measuring instrument is automatically set to the SCAN function for continuous measurement.
– The USB symbol appears.
– SCAN and DATA blink at the display.

☞ **Note!**
The 🔒 key for continuous measurement is disabled while the measuring instrument is communicating with the PC.

8.2.4 Recording Measurement Data – Data Logger Function

➪ Set the sampling rate (record interval) using the entry fields for hours, minutes and seconds.

➪ Start data logging by clicking the **Record** button.

You are prompted to enter a filename and a directory path for the text file to which data will be written.

➪ Click the **Stop** button in order to end recording.

After recording has been completed, you can open the file (name.txt) with a text editor. Recorded data can be processed by copying them to the clipboard and entering them to a Microsoft® Excel™ spreadsheet.

Example

High Performance Infrared Thermometer

Item	Date	Time	Temperature	Unit of Measure
1	2006.09.26	14:43:09	22.9	Centigrade
2	2006.09.26	14:43:10	23.1	Centigrade
3	2006.09.26	14:43:11	23.1	Centigrade
4	2006.09.26	14:43:12	23.1	Centigrade
5	2006.09.26	14:43:13	23.2	Centigrade
6	2006.09.26	14:43:14	39.0	Centigrade
7	2006.09.26	14:43:15	39.5	Centigrade
8	2006.09.26	14:43:16	38.4	Centigrade
9	2006.09.26	14:43:17	38.6	Centigrade
10	2006.09.26	14:43:18	37.4	Centigrade

Click the **Exit** button to close the program.

9 Product Support

If required please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone: +49 911 8602-112
Fax: +49 911 8602-709
e-mail support@gossenmetrawatt.com

10 Repair and Replacement Parts Service Calibration Center and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
Service Center
Thomas-Mann-Str. 20
90471 Nuremberg, Germany
Phone: +49 911-8602-0
Fax: +49 911-8602-253
e-mail service@gossenmetrawatt.com

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