

FT3700-20 FT3701-20

INFRARED THERMOMETER

Instruction Manual

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gional contact information, please go to our website at
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adclaration of Conformity for instruments that comply to CE
requirements may be downloaded from the HIOKI website.

nty

malfunctions occurring under conditions of normal use in con-
with the Instruction Manual and Product Precautionary Mark-
I be repaired free of charge. This warranty is valid for a period
'1) year from the date of purchase. Please contact the distribu-
1 which you purchased the product for further information on
y provisions.

luction

you for purchasing the HIOKI "Model FT3700-20,
1-20 INFRARED THERMOMETER." To obtain maximum
nance from the instrument, please read this manual first,
ep it handy for future reference.

review

odel FT3700-20, FT3701-20 is a non-contact thermome-
g infrared rays.
measure the surface temperature of an object by measur-
energy level of the infrared rays emitted from the object
touching it.

l crystal display with backlight
ont Laser marker beams
nal emissivity setting function
ay and sound alarm functions

pection and Maintenance

Inspection

y receive the instrument, inspect it carefully to ensure
y damage occurred during shipping. In particular, check
cessories, the liquid crystal display, the control keys, and
s, if damage is evident, or if it fails to operate according to
ifications, contact your dealer or HIOKI representative.

enance and Service

an the instrument, wipe it gently with a soft cloth moistened with
or mild detergent. Never use solvents such as benzene, alcohol,
ne, ether, ketones, thinners or gasoline, as they can deform and
for the case.

Instrument seems to be malfunctioning, confirm that the batteries
at discharged before contacting your dealer or HIOKI representative.
the instrument so that it will not sustain damage during shipping,
include a description of existing damage. We do not take any
nsibility for damage incurred during shipping.

1

Safety

WARNING

Mishandling this instrument during use could result in
injury or death, as well as damage to the instrument. Be
certain that you understand the instructions and precau-
tions in the manual before use. We disclaim any respon-
sibility for accidents or injuries not resulting directly
from instrument defects.

This manual contains information and warnings essential for safe opera-
tion of the instrument and for maintaining it in safe operating condition.
Before using it, be sure to carefully read the following safety precautions.

Safety Symbol



In the manual, the symbol indicates particularly important infor-
mation that the user should read before using the instrument.



Indicates warnings relating to the laser.

Symbols for Various Standards



WEEE marking:
This symbol indicates that the electrical and electronic appli-
ance is put on the EU market after August 13, 2005, and pro-
ducers of the Member States are required to display it on the
appliance under Article 11.2 of Directive 2002/96/EC (WEEE).



This symbol indicates that the product conforms to safety reg-
ulations set out by the EC Directive.



The following symbols in this manual indicate the relative importance
of cautions and warnings.



Indicates that incorrect operation presents an extreme haz-
ard and that could result in serious injury or death to the user.



Indicates that incorrect operation presents a significant haz-
ard and that could result in serious injury or death to the user.



Indicates that incorrect operation presents a possibility of
injury to the user or damage to the device.



Indicates advisory items related to performance or correct
operation of the instrument.

Usage Notes

Follow these precautions to ensure safe operation and to obtain the full
benefits of the various functions.

Preliminary Checks

Before using the instrument the first time, verify that it operates normal-
ly to ensure that the no damage occurred during storage or shipping.
If you find any damage, contact your dealer or HIOKI representative.

DANGER

**Do not allow the laser light beam to impinge upon any
gas which can explode.**

CAUTION

- Use of controls or adjustments or performance of proce-
dures other than those specified herein may result in hazard-
ous radiation exposure.

- The Model FT3700-20, FT3701-20 uses as a light source a
semiconductor laser which emits visible light, and which con-
forms to IEC standard class 2 (IEC 60825-1). (Wavelength
640 nm to 660 nm, maximum power output 1 mW)
Since there is considerable danger of this laser light causing
light into your eyes, be very careful not to direct this laser
light into your eyes or those of another person.

- Do not look directly into the laser light from the optical system.
- When measuring the temperature of an object which has a
mirror finish, be careful not to allow the laser light beam to be
reflected off the surface into your eyes or those of another
person.

- This instrument should be installed and operated indoors on-
ly, between 0 and 50°C and 80% RH or less.

2

CAUTION

- Do not store or use the instrument where it could be exposed
to direct sunlight, high temperature or humidity, or conden-
sation. Under such conditions, the instrument may be dam-
aged and insulation may deteriorate so that it no longer
meets specifications.

- This instrument is not designed to be entirely water- or dust-
proof. Do not use it in an especially dusty environment, nor
where it might be splashed with liquid. This may cause damage.
- Do not use the instrument where it may be exposed to corrosive
or combustible gases. The instrument may be damaged.

- Do not use the instrument near a source of strong electro-
magnetic radiation, or near a highly electrically charged ob-
ject. These may cause a malfunction.

- To avoid damage to the instrument, protect it from physical
shock when transporting and handling. Be especially careful
to avoid physical shock from dropping.

- Do not point the lens at the sun or at any other source of
strong light. If you do, the sensor may be damaged.

- Do not contact the lens against the object whose tempera-
ture is to be measured, or get it dirty, allow it to be scratched,
or allow any foreign material to adhere to it. Doing so may
cause errors.

NOTE

The indicator flashes when the remaining battery capacity
is low. In this case, the instrument's reliability is not guaranteed.
Replace the battery immediately.

Replacing Batteries

DANGER

**When replacing the batteries, be careful not to acciden-
tally pull the measuring trigger key. This may cause the
laser marker to enter the eyes and is extremely danger-
ous. After replacing the batteries, be sure to close the
cover before using the instrument.**

WARNING

- Battery may explode if mistreated. Do not short-circuit,
recharge, disassemble or dispose of in fire.
- Handle and dispose of battery in accordance with local
regulations.

CAUTION

- Do not mix old and new batteries, or different types of batter-
ies. Also, be careful to observe battery polarity during instal-
lation. Otherwise, poor performance or damage from battery
leakage could result.

- To avoid corrosion and damage to this instrument from bat-
tery leakage, remove the batteries from the instrument if it is
to be stored for a long time.

- Hold the instrument with both hands as
shown in the diagram.

- Twist the battery cover in the direction as
shown in the diagram to open it.

- Take out the batteries.

- Install new batteries (LR03) in the case,
being careful to observe proper battery
polarity.

- Close the battery cover

Remaining battery life indicator

There is ample battery life remaining.

Replace the batteries soon.

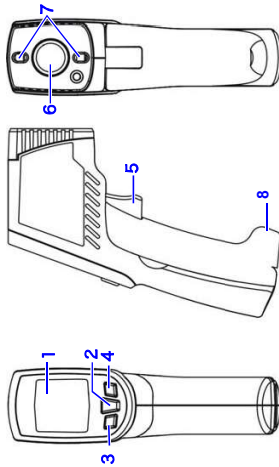
No battery life remaining. The instru-
ment cannot be used in this state.

NOTE

The battery cover has been designed to fit tightly in order pre-
vent accidental opening.

3

Names and Function of Parts



1. LCD Display

Changes the instrument's mode (see "Changing the Mode").

2. MODE Key

Press one time: Changes (decreases) the setting.
Press and hold while pulling the measurement trigger (1 sec.):
Toggles the laser marker on and off.

Change temperature units (except when using the emissivity
setting, HAL mode, or LAL mode).

4. Up/LOCK Key

Press one time: Changes (increases) the setting.

Turns continuous measurement mode on and off
(except when using the emissivity setting, HAL
mode, or LAL mode).

Press and hold while pulling the measurement trigger (1 sec.):
Toggles the backlight on and off.

5. Meas. Key

Pull the trigger to switch on the power to start measuring.

6. Infrared Lens

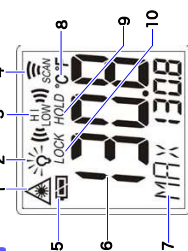
Infrared rays from the object whose temperature is to be measured
are received here.

7. Laser

The laser marker beams are emitted from here.

8. Battery cover

LCD Display



- Indicates the lit setting for laser marker. (When this lamp is off,
the laser marker beam is not emitted)
This lamp will blink when the laser marker beam is being emitted
during lit setting.

- Indicates the backlight setting. (When this lamp is off, the laser
marker beam is not emitted)

- "Hi" indicates that the alarm setting's upper limit temperature
has been exceeded. "LO" indicates that the reading is lower
than the lower limit temperature.

- Indicates that measurement is in progress.

- Indicates the battery consumption level (refer to Replacing
Battery)

- Main display: Indicates the measurement value.

- Sub-display: Indicates the mode and associated value.

- Indicates the temperature units.

- Indicates that the measurement value is being maintained.

- Indicates that continuous measurement mode is active.

4

Measurement

ANGER

ever the indication  is blinking, the laser marker beam emitted. Exercise extreme care not to allow the laser beam to enter your eyes or those of another person. Use of this laser light causing damage to the eyes.

Active measurements are carried out by pulling and holding the trigger key. Measurement will stop when the measuring key is released and the last shown value will be retained. The instrument will automatically switch off approximately 15 seconds after the measuring trigger key is released.

Setting the Power On
The power switch at OFF, pull the measuring trigger key to switch the power to start measuring.

Thermal emissivity setting
Press the **MODE** key to activate emissivity mode ($\uparrow \downarrow$) will be shown on the display).

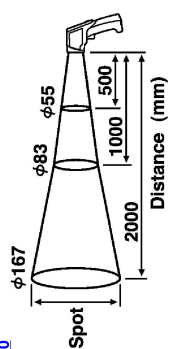
Press the $\blacktriangledown$ keys to set thermal emissivity.

Refer to the section on thermal emissivity for thermal emissivity setting.

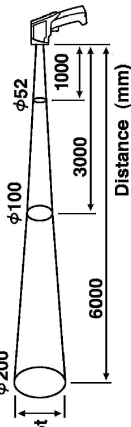
Surrounding
The lens toward the object whose temperature is to be measured.

Measurement field of view

FT3700-20



FT3701-20



The laser marker indicates the diameter of the measurement field of view.

The measurement field of view is defined as the measurement diameter at the optical response is 90°. The object whose temperature is to be measured needs to be larger than the measurement diameter by an adequate margin. (1.5 to 2 times or more)

OFF setting for laser marker

The laser marker is set to OFF in the factory default or immediately after changing the batteries. To turn ON the laser marker, press and hold the key (1 sec) while pulling the measuring trigger key.

OFF the laser marker is the same operation again.

Infrared measurement mode

Pressing the **▲/LOCK** key while the instrument is on activates continuous measurement mode, except when using the emissivity setting, the key, or LAL mode. This mode lets you take measurements continuously without needing to pull the measurement trigger.

The instrument will turn off automatically about 60 minutes after continuous measurement mode is activated.

The laser marker is on, the sighting laser will only activate when the measurement trigger is pulled.

The response may be slow when continuous measurement mode is on.

Changing the Mode

Pressing the **MODE** key while the instrument is on causes it to cycle through the following modes:

E	Emissivity display	↔	LAL	Alarm lower limit setting
↑ ↓	Emissivity setting	↔	HAL	Alarm upper limit setting
MAX	Maximum value display	↔	AVG	Average value display
MIN	Minimum value display	↔	dIF	Difference between maximum and minimum values

MAX/MIN/dIF/AVG measurement

The instrument will display the maximum value, minimum value, difference between the maximum and minimum values, and average value since measurement began.

- Press the **MODE** key to display "MAX", "MIN", "dIF" or "AVG" on the sub-display.
- The MAX/MIN/dIF/AVG value will be refreshed when you pull the measurement trigger or while continuous measurement mode is active.
- When using the continuous measurement mode, the key response may be slow.

Alarm Function

The alarm can be set to go off whenever a value which is higher or lower than a threshold value inputted beforehand is reached. The alarm is in the form of a display and a buzzer.

- Pull the measuring trigger key to switch on the power.
- Press the **MODE** key to display "HAL" in the sub-display. Press the $\blacktriangledown$ key to set the alarm setting's upper limit temperature.
- Press the **MODE** key to display "LAL" in the sub-display. Press the $\blacktriangledown$ key to set the alarm setting's lower limit temperature.

Error Indication

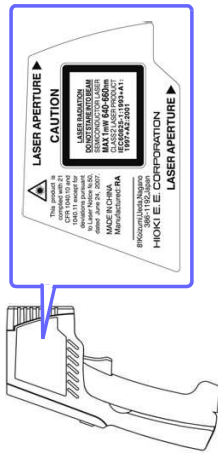
Error indication	Description	Remedy
E-2	The change in the measurement temperature is too great.	Allow the instrument to acclimate to the measurement temperature for about 30 minutes before use.
E-3	The ambient temperature is outside the operating temperature range.	Use the instrument within the operating temperature range (0°C to 50°C).

E-5 to E-9 System error
Remove the battery, wait at least 1 minute, and then replace the battery. If you are unable to resolve the error, the instrument may be broken. Contact your dealer or HIOKI representative.

H1 or La The measurement value is outside the measurement range.
The measurement value cannot be displayed since it is outside the measurement range.

Warning Labels

Location of labels used in the HIOKI FT3700-20, FT3701-20 Infrared Thermometer" is as follows.



Specifications

Basic Specifications

Function	Infrared temperature measurement
Additional Function	MAX, MIN, dIF (MAX-MIN), AVE measurement, Alarm function, Backlight function
Power supply	LR03 alkaline battery x 2
Dimensions	Approx. 48 W x 172 H x 119 D mm (1.89" W x 6.77" H x 4.69" D) (excluding projections)
Mass	Approx. 256 g (9.0 oz.) (including LR03 alkaline battery x 2)
Location for use	Indoors, altitude up to 2000 m (6562 ft.)
Operating temperature and humidity	0 to 50°C (32°F to 122°F), 80%RH or less (non-condensation)
Storage temperature and humidity	-10 to 50°C (14°F to 122°F), 80%RH or less (non-condensation)
Accessories	Instruction manual, LR03 alkaline battery x 2, Carrying case x 1
Effect of radiated radio frequency electromagnetic field	70°C at 3 V/m
Applicable standards	EMC : EN61326 Laser : IEC60825-1:1993+A1:1997+A2:2001 CLASS 2 LASER This product is compliant with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007

Electrical characteristics

Detection element	Thermopile
Temperature units	°C, °F
Measurement temperature range	FT3700-20: -60 to 550°C (-76 to 1022°F) FT3701-20: -60 to 760°C (-76 to 1400°F)
Display resolution	0.1°C, 0.1°F (1°F at 1000°F and over)
Outside display of measurement range	FT3700-20: "Lo" mark lights when -60.0°C (-76.0°F) or less FT3701-20: "Lo" mark lights when -60.0°C (-76.0°F) or less "Hi" mark lights when 760.0°C (1400°F) or higher
Response time	1 second (90%)
Measurement wavelength	8 to 14 μm
Thermal emissivity compensation	0.10 to 1.00 by steps of 0.01
Diameter of field of measurement	FT3700-20: 83 mm at 1000 mm (D:S=12:1) FT3701-20: 100 mm at 3000 mm (D:S=30:1)
Sighting	Two-point laser marker, 1 mW (MAX), Red (640 nm to 660 nm) It is illuminated in conjunction with pulling the measuring trigger key.
Battery low warning voltage	mark lights when 2.70 V (±0.1 V) or higher mark lights when 2.70 V (±0.1 V) or less, measurement value is fixed. mark lights when 2.55 V (±0.1 V) or less, Power turned off at 2.20 V (±0.1 V)
Rated supply voltage	1.5 VDC x 2
Maximum rated powers	150 mVA
Continuous operating time	Approx. 140 hours (alkaline battery)
Auto Power Off	Approx. 15 seconds

Accuracy Specifications

Accuracy (infrared)	-60.0 to -35.1°C (-76.0 to -31.1°F) Accuracy not specified -35.0 to -0.1°C (-31.0 to 31.9°F) ±10%rdg, ±2°C (100 to 320°F) ±2%rdg, ±2°C (320 to 500°F) ±1%rdg, ±1°C (500 to 1000°F) ±0.5%rdg, ±1°C (1000 to 1400°F) ±0.5%rdg, ±1°C (1400 to 2000°F) ±0.5%rdg, ±1°C (2000 to 2500°F) ±0.5%rdg, ±1°C (2500 to 3000°F) ±0.5%rdg, ±1°C (3000 to 3500°F) ±0.5%rdg, ±1°C (3500 to 4000°F) ±0.5%rdg, ±1°C (4000 to 4500°F) ±0.5%rdg, ±1°C (4500 to 5000°F) ±0.5%rdg, ±1°C (5000 to 5500°F) ±0.5%rdg, ±1°C (5500 to 6000°F) ±0.5%rdg, ±1°C (6000 to 6500°F) ±0.5%rdg, ±1°C (6500 to 7000°F) ±0.5%rdg, ±1°C (7000 to 7500°F) ±0.5%rdg, ±1°C (7500 to 8000°F) ±0.5%rdg, ±1°C (8000 to 8500°F) ±0.5%rdg, ±1°C (8500 to 9000°F) ±0.5%rdg, ±1°C (9000 to 9500°F) ±0.5%rdg, ±1°C (9500 to 10000°F) ±0.5%rdg, ±1°C (10000 to 10500°F) ±0.5%rdg, ±1°C (10500 to 11000°F) ±0.5%rdg, ±1°C (11000 to 11500°F) ±0.5%rdg, ±1°C (11500 to 12000°F) ±0.5%rdg, ±1°C (12000 to 12500°F) ±0.5%rdg, ±1°C (12500 to 13000°F) ±0.5%rdg, ±1°C 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28000°F) ±0.5%rdg, ±1°C (28000 to 28500°F) ±0.5%rdg, ±1°C (28500 to 29000°F) ±0.5%rdg, ±1°C (29000 to 29500°F) ±0.5%rdg, ±1°C (29500 to 30000°F) ±0.5%rdg, ±1°C (30000 to 30500°F) ±0.5%rdg, ±1°C (30500 to 31000°F) ±0.5%rdg, ±1°C (31000 to 31500°F) ±0.5%rdg, ±1°C (31500 to 32000°F) ±0.5%rdg, ±1°C (32000 to 32500°F) ±0.5%rdg, ±1°C (32500 to 33000°F) ±0.5%rdg, ±1°C (33000 to 33500°F) ±0.5%rdg, ±1°C (33500 to 34000°F) ±0.5%rdg, ±1°C (34000 to 34500°F) ±0.5%rdg, ±1°C (34500 to 35000°F) ±0.5%rdg, ±1°C (35000 to 35500°F) ±0.5%rdg, ±1°C (35500 to 36000°F) ±0.5%rdg, ±1°C (36000 to 36500°F) ±0.5%rdg, ±1°C (36500 to 37000°F) ±0.5%rdg, ±1°C (37000 to 37500°F) ±0.5%rdg, ±1°C (37500 to 38000°F) ±0.5%rdg, ±1°C (38000 to 38500°F) ±0.5%rdg, ±1°C (38500 to 39000°F) ±0.5%rdg, ±1°C (39000 to 39500°F) ±0.5%rdg, ±1°C (39500 to 40000°F) ±0.5%rdg, ±1°C (40000 to 40500°F) ±0.5%rdg, ±1°C (40500 to 41000°F) ±0.5%rdg, ±1°C (41000 to 41500°F) ±0.5%rdg, ±1°C (41500 to 42000°F) ±0.5%rdg, ±1°C (42000 to 42500°F) ±0.5%rdg, ±1°C (42500 to 43000°F) ±0.5%rdg, ±1°C (43000 to 43500°F) ±0.5%rdg, ±1°C (43500 to 44000°F) ±0.5%rdg, ±1°C (44000 to 44500°F) ±0.5%rdg, ±1°C (44500 to 45000°F) ±0.5%rdg, ±1°C (45000 to 45500°F) ±0.5%rdg, ±1°C (45500 to 46000°F) ±0.5%rdg, ±1°C (46000 to 46500°F) ±0.5%rdg, ±1°C (46500 to 47000°F) ±0.5%rdg, ±1°C (47000 to 47500°F) ±0.5%rdg, ±1°C (47500 to 48000°F) ±0.5%rdg, ±1°C (48000 to 48500°F) ±0.5%rdg, ±1°C (48500 to 49000°F) ±0.5%rdg, ±1°C (49000 to 49500°F) ±0.5%rdg, ±1°C (49500 to 50000°F) ±0.5%rdg, ±1°C (50000 to 50500°F) ±0.5%rdg, ±1°C (50500 to 51000°F) ±0.5%rdg, ±1°C (51000 to 51500°F) ±0.5%rdg, ±1°C (51500 to 52000°F) ±0.5%rdg, ±1°C (52000 to 52500°F) ±0.5%rdg, ±1°C (52500 to 53000°F) ±0.5%rdg, ±1°C (53000 to 53500°F) ±0.5%rdg, ±1°C (53500 to 54000°F) ±0.5%rdg, ±1°C (54000 to 54500°F) ±0.5%rdg, ±1°C (54500 to 55000°F) ±0.5%rdg, ±1°C (55000 to 55500°F) ±0.5%rdg, ±1°C (55500 to 56000°F) ±0.5%rdg, ±1°C (56000 to 56500°F) ±0.5%rdg, ±1°C (56500 to 57000°F) ±0.5%rdg, ±1°C (57000 to 57500°F) ±0.5%rdg, ±1°C (57500 to 58000°F) ±0.5%rdg, ±1°C (58000 to 58500°F) ±0.5%rdg, ±1°C (58500 to 59000°F) ±0.5%rdg, ±1°C (59000 to 59500°F) ±0.5%rdg, ±1°C (59500 to 60000°F) ±0.5%rdg, ±1°C (60000 to 60500°F) ±0.5%rdg, ±1°C (60500 to 61000°F) ±0.5%rdg, ±1°C (61000 to 61500°F) ±0.5%rdg, ±1°C (61500 to 62000°F) ±0.5%rdg, ±1°C (62000 to 62500°F) ±0.5%rdg, ±1°C (62500 to 63000°F) ±0.5%rdg, ±1°C (63000 to 63500°F) ±0.5%rdg, ±1°C (63500 to 64000°F) ±0.5%rdg, ±1°C (64000 to 64500°F) ±0.5%rdg, ±1°C (64500 to 65000°F) ±0.5%rdg, ±1°C (65000 to 65500°F) ±0.5%rdg, ±1°C (65500 to 66000°F) ±0.5%rdg, ±1°C (66000 to 66500°F) ±0.5%rdg, ±1°C (66500 to 67000°F) ±0.5%rdg, ±1°C (67000 to 67500°F) ±0.5%rdg, ±1°C (67500 to 68000°F) ±0.5%rdg, ±1°C (68000 to 68500°F) ±0.5%rdg, ±1°C (68500 to 69000°F) ±0.5%rdg, ±1°C (69000 to 69500°F) ±0.5%rdg, ±1°C (69500 to 70000°F) ±0.5%rdg, ±1°C (70000 to 70500°F) ±0.5%rdg, ±1°C (70500 to 71000°F) ±0.5%rdg, ±1°C (71000 to 71500°F) ±0.5%rdg, ±1°C (71500 to 72000°F) ±0.5%rdg, ±1°C (72000 to 72500°F) ±0.5%rdg, ±1°C (72500 to 73000°F) ±0.5%rdg, ±1°C (73000 to 73500°F) ±0.5%rdg, ±1°C (73500 to 74000°F) ±0.5%rdg, ±1°C (74000 to 74500°F) ±0.5%rdg, ±1°C (74500 to 75000°F) ±0.5%rdg, ±1°C (75000 to 75500°F) ±0.5%rdg, ±1°C (75500 to 76000°F) ±0.5%rdg, ±1°C (76000 to 76500°F) ±0.5%rdg, ±1°C (76500 to 77000°F) ±0.5%rdg, ±1°C (77000 to 77500°F) ±0.5%rdg, ±1°C (77500 to 78000°F) ±0.5%rdg, ±1°C (78000 to 78500°F) ±0.5%rdg, ±1°C (78500 to 79000°F) ±0.5%rdg, ±1°C (79000 to 79500°F) ±0.5%rdg, ±1°C (79500 to 80000°F) ±0.5%rdg, ±1°C (80000 to 80500°F) ±0.5%rdg, ±1°C (80500 to 81000°F) ±0.5%rdg, ±1°C (81000 to 81500°F) ±0.5%rdg, ±1°C (81500 to 82000°F) ±0.5%rdg, ±1°C (82000 to 82500°F) ±0.5%rdg, ±1°C (82500 to 83000°F) ±0.5%rdg, ±1°C (83000 to 83500°F) ±0.5%rdg, ±1°C (83500 to 84000°F) ±0.5%rdg, ±1°C (84000 to 84500°F) ±0.5%rdg, ±1°C (84500 to 85000°F) ±0.5%rdg, ±1°C (85000 to 85500°F) ±0.5%rdg, ±1°C (85500 to 86000°F) ±0.5%rdg, ±1°C (86000 to 86500°F) ±0.5%rdg, ±1°C (86500 to 87000°F) ±0.5%rdg, ±1°C (87000 to 87500°F) ±0.5%rdg, ±1°C (87500 to 88000°F) ±0.5%rdg, ±1°C (88000 to 88500°F) ±0.5%rdg, ±1°C (88500 to 89000°F) ±0.5%rdg, ±1°C (89000 to 89500°F) ±0.5%rdg, ±1°C (89500 to 90000°F) ±0.5%rdg, ±1°C (90000 to 90500°F) ±0.5%rdg, ±1°C (90500 to 91000°F) ±0.5%rdg, ±1°C (91000 to 91500°F) ±0.5%rdg, ±1°C (91500 to 92000°F) ±0.5%rdg, ±1°C (92000 to 92500°F) ±0.5%rdg, ±1°C (92500 to 93000°F) ±0.5%rdg, ±1°C (93000 to 93500°F) ±0.5%rdg, ±1°C (93500 to 94000°F) ±0.5%rdg, ±1°C (94000 to 94500°F) ±0.5%rdg, ±1°C (94500 to 95000°F) ±0.5%rdg, ±1°C (95000 to 95500°F) ±0.5%rdg, ±1°C (95500 to 96000°F) ±0.5%rdg, ±1°C (96000 to 96500°F) ±0.5%rdg, ±1°C (96500 to 97000°F) ±0.5%rdg, ±1°C (97000 to 97500°F) ±0.5%rdg, ±1°C (97500 to 98000°F) ±0.5%rdg, ±1°C (98000 to 98500°F) ±0.5%rdg, ±1°C (98500 to 99000°F) ±0.5%rdg, ±1°C (99000 to 99500°F) ±0.5%rdg, ±1°C (99500 to 100000°F) ±0.5%rdg, ±1°C (100000 to 100500°F) ±0.5%rdg, ±1°C (100500 to 101000°F) ±0.5%rdg, ±1°C (101000 to 101500°F) ±0.5%rdg, ±1°C (101500 to 102000°F) ±0.5%rdg, ±1°C (102000 to 102500°F) ±0.5%rdg, ±1°C (102500 to 103000°F) ±0.5%rdg, ±1°C (103000 to 103500°F) ±0.5%rdg, ±1°C (103500 to 104000°F) ±0.5%rdg, ±1°C (104000 to 104500°F) ±0.5%rdg, ±1°C (104500 to 105000°F) ±0.5%rdg, ±1°C (105000 to 105500°F) ±0.5%rdg, ±1°C (105500 to 106000°F) ±0.5%rdg, ±1°C (106000 to 106500°F) ±0.5%rdg, ±1°C (106500 to 107000°F) ±0.5%rdg, ±1°C (107000 to 107500°F) ±0.5%rdg, ±1°C (107500 to 108000°F) ±0.5%rdg, ±1°C (108000 to 108500°F) ±0.5%rdg, ±1°C (108500 to 109000°F) ±0.5%rdg, ±1°C (109000 to 109500°F) ±0.5%rdg, ±1°C (109500 to 110000°F) ±0.5%rdg, ±1°C (110000 to 110500°F) ±0.5%rdg, ±1°C (110500 to 111000°F) ±0.5%rdg, ±1°C (111000 to 111500°F) ±0.5%rdg, ±1°C (111500 to 112000°F) ±0.5%rdg, ±1°C (112000 to 112500°F) ±0.5%rdg, ±1°C (112500 to 113000°F) ±0.5%rdg, ±1°C (113000 to 113500°F) ±0.5%rdg, ±1°C (113500 to 114000°F) ±0.5%rdg, ±1°C (114000 to 114500°F) ±0.5%rdg, ±1°C (114500 to 115000°F) ±0.5%rdg, ±1°C (115000 to 115500°F) ±0.5%rdg, ±1°C (115500 to 116000°F) ±0.5%rdg, ±1°C (116000 to 116500°F) ±0.5%rdg, ±1°C (116500 to 117000°F) ±0.5%rdg, ±1°C (117000 to 117500°F) ±0.5%rdg, ±1°C (117500 to 118000°F) ±0.5%rdg, ±1°C (118000 to 118500°F) ±0.5%rdg, ±1°C (118500 to 119000°F) ±0.5%rdg, ±1°C (119000 to 119500°F) ±0.5%rdg, ±1°C (119500 to 120000°F) ±0.5%rdg, ±1°C (120000 to 120500°F) ±0.5%rdg, ±1°C (120500 to 121000°F) ±0.5%rdg, ±1°C (121000 to 121500°F) ±0.5%rdg, ±1°C (121500 to 122000°F) ±0.5%rdg, ±1°C (122000 to 122500°F) ±0.5%rdg, ±1°C (122500 to 123000°F) ±0.5%rdg, ±1°C (123000 to 123500°F) ±0.5%rdg, ±1°C (123500 to 124000°F) ±0.5%rdg, ±1°C (124000 to 124500°F) ±0.5%rdg, ±1°C (124500 to 125000°F) ±0.5%rdg, ±1°C (125000 to 125500°F) ±0.5%rdg, ±1°C (125500 to 126000°F) ±0.5%rdg, ±1°C (126000 to 126500°F) ±0.5%rdg, ±1°C (126500 to 127000°F) ±0.5%rdg, ±1°C (127000 to 127500°F) ±0.5%rdg, ±1°C (127500 to 128000°F) ±0.5%rdg, ±1°C (128000 to 128500°F) ±0.5%rdg, ±1°C (128500 to 129000°F) ±0.5%rdg, ±1°C (129000 to 129500°F) ±0.5%rdg, ±1°C (129500 to 130000°F) ±0.5%rdg, ±1°C (130000 to 130500°F) ±0.5%rdg, ±1°C (130500 to 131000°F) ±0.5%rdg, ±1°C (131000 to 131500°F) ±0.5%rdg, ±1°C (131500 to 132000°F) ±0.5%rdg, ±1°C (132000 to 132500°F) ±0.5%rdg, ±1°C (132500 to 133000°F) ±0.5%rdg, ±1°C (133000 to 133500°F) ±0.5%rdg, ±1°C (133500 to 134000°F) ±0.5%rdg, ±1°C (134000 to 134500°F) ±0.5%rdg, ±1°C (134500 to 135000°F) ±0.5%rdg, ±1°C (135000 to 135500°F) ±0.5%rdg, ±1°C (135500 to 136000°F) ±0.5%rdg, ±1°C (136000 to 136500°F) ±0.5%rdg, ±1°C (136500 to 137000°F) ±0.5%rdg, ±1°C (137000 to 137500°F) ±0.5%rdg, ±1°C (137500 to 138000°F) ±0.5%rdg, ±1°C (138000 to 138500°F) ±0.5%rdg, ±1°C (138500 to 139000°F) ±0.5%rdg, ±1°C (139000 to 139500°F) ±0.5%rdg, ±1°C (139500 to 140000°F) ±0.5%rdg, ±1°C (140000 to 140500°F) ±0.5%rdg, ±1°C (140500 to 141000°F) ±0.5%rdg, ±1°C (141000 to 141500°F) ±0.5%rdg, ±1°C (141500 to 142000°F) ±0.5%rdg, ±1°C (142000 to 142500°F) ±0.5%rdg, ±1°C (142500 to 143000°F) ±0.5%rdg, ±1°C (143000 to 143500°F) ±0.5%rdg, ±1°C (143500 to 144000°F) ±0.5%rdg, ±1°C (144000 to 144500°F) ±0.5%rdg, ±1°C (144500 to 145000°F) ±0.5%rdg, ±1°C (145000 to 145500°F) ±0.5%rdg, ±1°C (145500 to 146000°F) ±0.5%rdg, ±1°C (146000 to 146500°F) ±0.5%rdg, ±1°C (146500 to 147000°F) ±0.5%rdg, ±1°C (147000 to 147500°F) ±0.5%rdg, ±1°C (147500 to 148000°F) ±0.5%rdg, ±1°C (148000 to 148500°F) ±0.5%rdg, ±1°C (148500 to 149000°F) ±0.5%rdg, ±1°C (149000 to 149500°F) ±0.5%rdg, ±1°C (149500 to 150000°F) ±0.5%rdg, ±1°C (150000 to 150500°F) ±0.5%rdg, ±1°C (150500 to 151000°F) ±0.5%rdg, ±1°C (151000 to 151500°F) ±0.5%rdg, ±1°C (151500 to 152000°F) ±0.5%rdg, ±1°C (152000 to 152500°F) ±0.5%rdg, ±1°C (152500 to 153000°F) ±0.5%rdg, ±1°C (153000 to 153500°F) ±0.5%rdg, ±1°C (15
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