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Introduction

Thank you for purchasing the HIOKI Model FT6380, FT6381 CLAMP ON EARTH TESTER. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Registered Trademarks

- Bluetooth® is a registered trademark of Bluetooth SIG, Inc. (USA).
- Android™ Google Play™ is a registered trademark of Bluetooth® Google, Inc.
- Adobe and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and /or other countries.
Verifying Package Contents

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Package Contents

Confirm that these contents are provided.

- FT6380 or FT6381 Clamp On Earth Tester (1)
- Resistance Check Loop (1)
- Instruction Manual (1)
- Carrying Case (1)
- LR6 alkaline batteries (2)
- Strap (1)

Use the original packing materials when transporting the instrument, if possible. For other transportation notes, refer to the "Transporting (p.66)".
Safety Information

**WARNING**

This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. However, using the instrument in a way not described in this manual may negate the provided safety features. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

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

**Safety Symbols**

- The symbol indicates particularly important information that the user should read before using the instrument.

- The symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the symbol) before using the relevant function.

- Indicates a double-insulated device.

- Indicates AC (Alternating Current).

- Indicates that the instrument may be connected to or disconnected from a live circuit.

- Indicates the power on/off button.
4 Safety Information

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

**DANGER**
Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.

**WARNING**
Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.

**CAUTION**
Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.

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

### Symbols for Various Standards

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="WEEE" /></td>
<td>WEEE marking: This symbol indicates that the electrical and electronic appliance is put on the EU market after August 13, 2005, and producers of the Member States are required to display it on the appliance under Article 11.2 of Directive 2002/96/EC (WEEE).</td>
</tr>
<tr>
<td><img src="image" alt="CE" /></td>
<td>This symbol indicates that the product conforms to safety regulations set out by the EC Directive.</td>
</tr>
<tr>
<td><img src="image" alt="Bluetooth" /></td>
<td>Indicates that the product incorporates Bluetooth® wireless technology. Bluetooth® is a registered trademark of Bluetooth SIG, Inc., and is used under license by HIOKI E.E. CORPORATION.</td>
</tr>
<tr>
<td><img src="image" alt="Radio" /></td>
<td>Indicates that the product conforms to the domestic Japanese technical standards set forth by the Radio Act (type certification).</td>
</tr>
<tr>
<td><img src="image" alt="FCC" /></td>
<td>Indicates the ID number of the wireless module certified by the U.S. Federal Communications Commission (FCC).</td>
</tr>
</tbody>
</table>
Safety Information

IC Indicates the number of the wireless module certified by Industry Canada.

Other Symbols

- Indicates a prohibited action.
- (p. #) Indicates the location of reference information.
- [ ] Information displayed on the screen is enclosed in brackets.
- Fn (bold characters) Bold text indicates alphanumeric characters shown on operation keys.

The screen of this instrument displays characters in the following manner.

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| a | b | c | d | e | f | g | h | i | j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | y | z |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |

Screen displays that differ from the above notation:

**Over-range display**
Resistance measurement: When the reading exceeds 1,600 Ω
Current measurement: When the reading exceeds 60.0 A.

**Open display**
This screen is displayed when the clamp sensor is not completely closed during use of the resistance measurement function.
This instrument complies with CAT IV safety requirements. To ensure safe operation of measurement instruments IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.

### Measurement categories

| CAT II | Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)  
CAT II covers directly measuring electrical outlet receptacles. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT III</td>
<td>Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.</td>
</tr>
<tr>
<td>CAT IV</td>
<td>The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).</td>
</tr>
</tbody>
</table>

Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.

Use of a measurement instrument that is not CAT-rated in CAT II to CAT IV measurement applications could result in a severe accident, and must be carefully avoided.
Operating Precautions

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

**Preliminary Checks**

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

**Instrument Installation**

Operating temperature: -10 to 50°C (14 to 122°F)

(Ensure to use batteries that are suited for use under the environmental conditions in which you are using the instrument.)

Operating humidity: 80%RH or less (non-condensating).

---

Avoid the following locations that could cause an accident or damage to the instrument.

- Exposed to direct sunlight
- Exposed to high temperature
- Exposed to water, oil, other chemicals, or solvents
- Exposed to high humidity or condensation
- Exposed to high levels of particulate dust
- Subject to vibration
- In the presence of corrosive or explosive gases
- Exposed to strong electromagnetic fields
- Near electromagnetic radiators
- Near electromagnetic radiators (e.g., high-frequency induction heating systems and IH cooking utensils)
Handling the Instrument

⚠️ DANGER

- To avoid short circuits and potentially life-threatening hazards, never attach the clamp to a circuit that operates at more than 600 V, or over bare conductors.
- The maximum rated voltage between input terminals and ground is 600 VAC. Measuring a voltage in excess of this rating relative to ground could damage the instrument and result in bodily injury.
- To avoid electric shock, do not remove the instrument’s case. The internal components of the instrument carry high voltages and may become very hot during operation.
- When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines, and do not use over bare conductors.

⚠️ WARNING

To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.
• Do not input a current in excess of the maximum allowable current. Doing so may damage the instrument or cause burns. The maximum allowable current is 100 AAC continuous or 200 A AC within two minutes at 50/60 Hz. For more information about the frequency derating characteristics during continuous input, see the following diagram:

![Frequency vs. Current Diagram]

• To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
• Be careful to avoid dropping the instrument or otherwise subjecting them to mechanical shock, which could damage the mating surfaces of the core and adversely affect measurement.
• Although this instrument is dust resistant, it is not completely dust- or waterproof. To prevent possible damage, avoid using in dusty or wet environments.
• Do not slant the device or place it on top of an uneven surface. Dropping or knocking down the device can cause injury or damage to the device.
*IP40
This indicates the degree of protection provided by the enclosure of the device against use in hazardous locations, entry of solid foreign objects, and the ingress of water.

4: Protected against access to hazardous parts with wire measuring 1.0 mm in diameter. The equipment inside the enclosure is protected against entry by solid foreign objects larger than 1.0 mm in diameter.

0: The equipment inside the enclosure is not protected against the harmful effects of water.
The FT6380 and FT6381 Clamp On Earth Tester make grounding resistance measurements simply by being clamped to multiple-grounded ground wires. No auxiliary grounding rod is needed, and there is no need to disconnect the ground wire from the grounding rod.

The instruments also provide AC current measurement functionality and can measure currents ranging from leakage current on the order of several mA to load currents of up to 60 A.

The FT6381 can only be used in Japan, the U.S., Canada, and the EU. Because it incorporates Bluetooth® wireless technology, the instrument emits radio radiation. Use of devices that emit radio radiation requires approval in the country of use, and use of the instrument in a country or region other than those listed above may be subject to penalty as a violation of law.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the
FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person’s body (excluding extremities: hands, wrists, feet and ankles).

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
1.1 Product Overview

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. 
L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body (excluding extremities: hands, wrists, feet and ankles).

Cet équipement est conforme aux limites d’ exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d’exposition aux fréquences radioélectriques (RF) CNR-102 de l’IC. 
Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation de l’exposition maximale autorisée. Cependant, cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le dispositif rayonnant et le corps (à l’exception des extrémités : mains, poignets, pieds et chevilles).
1.2 Features

- **Compact, low-profile sensor**
  The compact, low-profile sensor can be used to clamp ground wires with ease. The sensor design dramatically speeds the measurement process by eliminating the need to pull out ground wires for clamping or dig around the ground rod or wire.

- **Broad dynamic range**
  The instrument can easily measure grounding resistance of up to 0.02 to 1,600 Ω with its auto-range function. Current measurement ranges from small leakage current (maximum resolution 10 μA) to a maximum of 60 A.

- **Noise check function (p.30)**
  The instrument automatically detects noise that may affect grounding resistance measurement and displays a noise mark.

- **True RMS display**
  True RMS calculation allows the instrument to accurately measure distortion waveform currents.

- **Data hold function (p.35)**
  A large button that is easy to push lets you hold the measured value. The button notifies the user of the hold status by flashing while the value is being held.

- **Backlight function (p.35)**
  The instrument uses a white LED for excellent visibility so that display values can be read clearly, even in dark locations.

- **Auto-power-save (APS) function (p.55)**
  An auto-power-save function keeps batteries from running down when you forget to turn off the instrument.
1.2 Features

**Alarm function** (p.37)

By setting a threshold, you can have the instrument make a PASS/FAIL judgment and notify you of the result with a buzzer. You can set separate thresholds for resistance and current measurements and select judgment criteria (whether to generate a FAIL result when the reading is greater than or less than the threshold).

**Filter function** (p.36)

Widespread use of switching power supplies and inverters has led to cases where harmonic components are superimposed on leakage current waveforms. The instrument’s filter function allows it to perform two types of measurement: leakage current as related to degradation of insulation, and leakage current including this harmonic component.

**Internal memory** (p.40)

The instrument’s internal memory can record up to 2,000 measured values.

**Automatic measurement report function with Android™ connectivity (FT6381 only)** (p.44)

The FT6381 features Bluetooth® wireless technology and can be connected to a smartphone running the Android operating system to easily create measurement reports in the field. (FT6381 availability is limited to certain countries. For more information, contact your dealer or Hikari representative.)
1.3 Names and Functions of Parts

**POWER key**
- Used to turn the instrument on and off.
- To temporarily cancel the auto-power-save function, press the POWER key while holding down the HOLD key.

**HOLD key**
- Holds the measured value display or cancels hold mode.
- To cancel auto-power-save mode, press the POWER key while holding down the HOLD key.

**Backlight key**
- Turns the backlight on and off.

**A/Ω key**
- Switches between resistance measurement mode and current measurement mode.
1.3 Names and Functions of Parts

- **Battery cover** (p.23)
- **Back Strap hole** (p.22)
- **FT6380**
- **Serial No.**
- **Bottom Strap hole** (p.22)
- **FT6381**
- **Battery cover** (p.23)
### 1.3 Names and Functions of Parts

**Operation key**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fn</strong></td>
<td>Switches to function mode, which is used to configure settings. Pressing this key again will return to resistance measurement mode or current measurement mode.</td>
</tr>
</tbody>
</table>
| **▼** | Enables the alarm function. (p.37)  
• When the alarm function is enabled, the instrument will notify the user with the buzzer if a reading is greater than (or less than) a preset threshold.  
• Alarm function threshold settings can be configured in function mode. (p.39)  
*In function mode, this key serves as the ▼ key, which is used to select setting items and values.* |
| **▲** | Pressing this key while using the current measurement function enables the low-pass filter to reject unneeded harmonic components. (p.36)  
Pressing it while using the resistance measurement function enables the moving average function, allowing more stable measurement. (p.36)  
*In function mode, this key serves as the ▲ key, which is used to select setting items and values.* |
| **MEM** | Saves measurement data to the instrument’s internal memory. (p.40)  
*In function mode, this key serves as the OK key, which is used to accept setting items and values.* |

---

18 1.3 Names and Functions of Parts
1.3 Names and Functions of Parts

### Display Indicators

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HOLD</strong></td>
<td>Lights up when data is being held. (p.35)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up in function mode. (p.52) Flashes in subfunction mode. (p.53)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up when the alarm function is on. (p.37)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up when the filter function is on. (p.36)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up when the Bluetooth™ function is on. Flashes when data is being sent or received. (model FT6381 only) (p.44)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up when the auto-power-save function is on. (p.55)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Indicates the remaining battery power. (p.24)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up in AC current measurement mode. (p.31)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up in resistance measurement mode. (p.28)</td>
</tr>
<tr>
<td><strong>NOISE</strong></td>
<td>Lights up in resistance measurement mode when a current that could affect the measured value is detected. (p.30)</td>
</tr>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>Lights up in resistance measurement mode when the measured ground loop has a high reactance component or capacitance component (±45° or greater). When the <img src="image" alt="Symbol" /> mark lights up due to a low measured resistance value, it is likely that the displayed value indicates a shorted measurement loop rather than normal grounding resistance. When the <img src="image" alt="Symbol" /> mark lights up, the loop may have a break in it. In this case, the mark indicates that the wires have been coupled by capacitance. (p.30)</td>
</tr>
<tr>
<td><strong>MEM</strong></td>
<td>Lights up during internal memory operations. (p.40) The number of measurement data points stored in memory is shown to the right.</td>
</tr>
</tbody>
</table>
1.3 Names and Functions of Parts

| RANGE | Lights up when the range display function is on.  
The measurement range is shown to the right. |
2.1 Measurement process

1. Measurement Preparations
   - Pre-Operation Inspection (p.25)
   - Using the included resistance check loop to inspect the instrument (p.26)

2. Measurement
   - Resistance Measurement (p.28)
   - Current Measurement (p.31)

3. End of measurement
   - Remove the instrument from the measurement target.
   - Turn off the instrument.
2.2 Preparing for Measurement

After purchasing the instrument
Complete the following steps before using the instrument to make measurements.

### Attaching the Strap

**CAUTION**

Attach both ends of the Strap securely to the instrument. If insecurely attached, the instrument may fall and be damaged when carrying.

Thread the strap through the strap hole as shown in the following diagram:
2.2 Preparing for Measurement

Before using the instrument for the first time, install two AA-size alkaline batteries (LR6). Verify that there is sufficient battery power remaining before measurement. If there is insufficient battery power remaining, replace the batteries.

**Installing (or Replacing) the Battery**

Before using the instrument for the first time, install two AA-size alkaline batteries (LR6). Verify that there is sufficient battery power remaining before measurement. If there is insufficient battery power remaining, replace the batteries.

**WARNING**

- To avoid electric shock when replacing the batteries, first disconnect the clamp from the object to be measured.
- After replacing the batteries, replace the cover and screws before using the instrument.
- Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.
- Handle and dispose of batteries in accordance with local regulations.

**CAUTION**

- Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.
- To avoid corrosion from battery leakage, remove the batteries from the instrument if it is to be stored for a long time.

**NOTE**

- The indicator lights when battery voltage becomes low. Replace the batteries as soon as possible.
- Before replacing the batteries, make sure that the Slide Switch is OFF.
- After use, always turn OFF the power.
- If the battery is completely exhausted, the display will show [BattLo], and the instrument will automatically turn off.
2.2 Preparing for Measurement

Required Items:
• Phillips screwdriver
• LR6 alkaline battery (2)

Normal procedure

1. Verify that the instrument is off.
2. Remove the fastening screws of the battery cover, using a Phillips screwdriver.
3. Remove the battery cover.
4. Insert two new batteries (LR06 alkaline batteries), taking care to orient them properly.
5. Replace the battery cover and tighten the fastening screws.

Battery Status Indicator
This indicator is displayed at the top right corner.

<table>
<thead>
<tr>
<th>Icons</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>🍃</td>
<td>When new alkaline batteries have been installed</td>
</tr>
<tr>
<td>🍃</td>
<td>When 2/3 of the battery power remains</td>
</tr>
<tr>
<td>🍃</td>
<td>When 1/3 of the battery power remains</td>
</tr>
<tr>
<td>🍃</td>
<td>No battery power remains. Replace with new batteries.</td>
</tr>
</tbody>
</table>
2.3 Pre-Operation Inspection

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

1. Inspecting the instrument

- Is the instrument damaged?  
- Is the clamp sensor cracked or otherwise damaged?  

Yes  

Do not use the instrument if it is damaged as doing so may result in electric shock. Have the instrument repaired.

2. Inspecting the instrument after turning it on

- The instrument may be malfunctioning. Have the instrument repaired.

Does the screen turn on when the instrument is turned on?

Yes  

Using the included resistance check loop to inspect the instrument (p.26)

End of inspection

No  

The batteries may be dead. Replace the batteries and try again.

The screen is on.

An error is displayed.

- The screen is not on.  
- The screen shows an error.

The batteries may be dead. Replace the batteries and try again.

The screen is on.
2.3 Pre-Operation Inspection

Before turning on the instrument, be sure to read Operating Precautions (p.8).

Using the included resistance check loop to inspect the instrument

Inspecting the instrument with the resistance check loop

Verify that there is no foreign matter lodged between the tips of the clamp sensor and that the sensor can be closed and opened smoothly. If so, clamp the included resistance check loop and verify that the instrument is operating properly. Verify that a value within the allowable range is displayed for each loop.

<table>
<thead>
<tr>
<th>Test resistance</th>
<th>Allowable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ω</td>
<td>0.95 to 1.05 Ω</td>
</tr>
<tr>
<td>25 Ω</td>
<td>24.3 to 25.7 Ω</td>
</tr>
</tbody>
</table>

**NOTE**
- If the instrument displays a value outside the allowable range, it needs to be repaired. Contact your dealer or Hioki representative.
- The resistance check loop cannot be used to calibrate the instrument. To have the instrument calibrated, contact your dealer.
2.4 Measurement Procedure

**DANGER**

- To avoid electric shock, do not touch the portion beyond the protective barrier during use.
- When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines, and do not use over bare conductors.
- The maximum allowable current is 100 A AC continuous or 200 A AC for 2 minutes (50/60 Hz). Currents in excess of these values must be avoided as they may damage the instrument or cause bodily injury.

**NOTE**

- The tips of the clamp sensor are precisely manufactured in order to provide a high level of precision. Exercise caution when handling the clamp so as to avoid subjecting it to excessive vibration, mechanical shock, or force.
- If foreign matter gets stuck between the tips of the clamp sensor, do not forcibly open or close the sensor, but rather use a soft brush or similar implement to carefully remove the foreign matter. Accurate measurements cannot be made while foreign matter is stuck between the tips of the clamp sensor or while the shape of the clamp sensor is deformed. If the tips of the clamp sensor become deformed, have the instrument inspected and calibrated by your dealer.
2.4 Measurement Procedure

Resistance Measurement

Measuring Principle

As illustrated below, the instrument is designed to measure grounding resistance at multiple grounding locations. (*For applications involving the measurement of grounding resistance at a single grounding site, use Hioki’s 3151 EARTH HiTESTER.)

If the grounding resistance of the measurement target is represented by $R_x$ and the grounding resistance values of other grounded locations are represented by $R_1, R_2, \ldots, R_n$, the resistance value measured by the product is as follows:

$$R_m = R_x + \sum_{i=1}^{n} \frac{1}{R_i}$$

If $n$ is sufficiently large and each $R_i$ value is sufficiently small, and the second term can be ignored, allowing the value of $R_x$ to be measured.
2.4 Measurement Procedure

Example with actual measured values

The following provides an example with actual measured values. The more grounding electrodes there are in the multiple-grounded installation, the higher the accuracy of the obtained values. Alternately, if even one grounding electrode has a small value (for example, 1 Ω), accurate values can be approached even if there are few grounding electrodes. Since most multiple-grounded systems have a large number of grounding electrodes, the error can be limited.

**Measuring method**

1. **Select resistance measurement mode.**
   - Select resistance measurement mode with the A/Ω key.

2. **Clamp the grounding wire you wish to measure.**
   - The resistance value will be displayed.
2.4 Measurement Procedure

**NOTE**

- Verify that the **NOISE** mark is not lit up.
  When the current flowing through the grounding wire is high (approximately 2.5 A or greater with a commercial frequency of 50/60 Hz), the current will affect measured values, making it impossible to measure the resistance. Check the current flowing through the grounding wire.

- **Open display**
  The screen will show [OPEN] if the clamp is not completely closed. Close the clamp completely and repeat the measurement.
  *If an extremely large current is flowing through the grounding wire, the screen may display [OPEN] even if the clamp is completely closed. This does not signal a malfunction. Check the current flowing through the grounding wire by using the instrument’s current measurement mode.

- **Inductor and capacitor marks**
  If the [ ] marks next to the resistance mark light up during measurement, the grounding resistance includes an in-series L or C component. If the [ ] mark is shown with an extremely small measured value such as 0.1 Ω, the instrument may be unable to measure the grounding resistance because the grounding wire itself has formed a loop. If the [ ] mark lights up, there may be a break in the loop. (In this case, the wires are being coupled by capacitance.) In either of these cases, it is recommended to verify that there is neither a short nor a wiring break in the location being measured.

- Do not measure the same location with two or more Clamp On Earth Testers at the same time. The instruments will interfere with each other, preventing accurate measurement.
2.4 Measurement Procedure

Current Measurement

1. Select current measurement mode with the A/D key.

2. Position the conductor in the center of the clamp sensor.

3. The current RMS value will be shown on the display.
2.4 Measurement Procedure

- The frequency of special waveforms such as at the secondary side of an inverter may not be indicated correctly.
- Depending on the magnitude and frequency of the input current, resonances may be heard from the clamp jaw. This does not affect the measurement.
- Do not input a current in excess of the maximum allowable current for the current range being used.

**NOTE**
2.4 Measurement Procedure

Measuring zero-phase current

When measuring zero-phase current, clamp all of the circuits at once.

Single-phase, 2-lead circuits

three-phase 3-lead circuits
2.4 Measurement Procedure

**NOTE**

Do not input current that exceeds the maximum continuous input of the electric current range.

- Measurement may not be accurate in the cases below.
  1. When there is large current (of about 100 A) flowing through a nearby electric line.
  2. Note that a value of several tens of amperes may be displayed when opening or closing the clamp sensor, or when changing the electric current range. This is not an error. It may take some time for the display to return to zero. However, starting measurement before the display returns to zero will not affect measurement.

- Enable the "Filter function (Rejecting noise) (p.36)" when conducting measurement in the cases below.
  1. When meaningless data is displayed due to noise.
  2. When using the instrument to measure special waveforms, such as those on the secondary side of an inverter.

The instrument may not be able to perform measurement in the cases below.

- When using input current that is 1/10 or less of the full electric current range
- When measuring high frequencies with the filter function enabled.
2.5 Convenient function

**Data hold function (Holding the measured value)**

This function holds the measured value and continues to display that value.

Press the **HOLD** key. The instrument will beep twice and the [HOLD] mark will be displayed, and the measured value will be held. The **HOLD** key will flash. To cancel hold mode, press the **HOLD** key again. The instrument will beep once and the [HOLD] mark will disappear, and the **HOLD** key will stop flashing.

**Backlight function**
(Making measurements in a dark location)

This function makes the display easier to see in dark locations.

Press the **BACKLIGHT** key ( ). The backlight will turn on. The backlight will turn off automatically when there has been no operation for about 2 minutes.

To turn off the backlight, press the **BACKLIGHT** key ( ) again. The backlight will turn off.
2.5 Convenient function

Filter function (Rejecting noise)
This function allows you to reject unneeded frequency components such as high-frequency noise.
Press the FILTER key. The [FILTER] mark will be displayed. To cancel the filter, press the FILTER key again. The [FILTER] mark will disappear.

During resistance measurement
Using the filter function when there is a significant amount of variation in measured values during resistance measurement will cause the measured values to stabilize.
*Note that noise rejection cannot be used when the [NOISE] mark is lit up.

During current measurement
Using the filter function enables a low-pass filter, causing the harmonic component to be eliminated from measured values. Widespread use of switching power supplies and inverters has led to cases where harmonic components are superimposed on current waveforms; the filter function is effective in such cases. Canceling the filter function disables the low-pass filter, allowing measurement of current including harmonic components.
You can sound an alarm (A high tone signifies a high alarm, while a low tone signifies a low alarm.) using previously set thresholds by pressing the [••] key. Thresholds and other settings must be configured in advance. To cancel the alarm function, press the [••] key again.

1. Configuring the alarm settings

Press the Fn key to switch to function mode. Using the ▼ and ▲ keys, select the resistance or current Alarm Settings screen and press the OK key.

*For more information about function mode, see (p.52).
2.5 Convenient function

2. Set the alarm type (Hi/Lo).

Using the ▼ and ▲ keys, select the alarm type (Hi/Lo), and press the OK key. The next threshold setting will start flashing.

*The Hi/Lo setting is saved once the following setting has been configured. If you press the Fn key after configuring the Hi/Lo setting but before saving the threshold and thereby cancel the configuration process, any changes to the Hi/Lo setting will not be saved.
3. Set the threshold.

After configuring the Hi/Lo setting, set the threshold. Using the ▼ and ▲ keys, set the threshold and press the OK key. You can move more quickly through threshold values by pressing and holding the ▼ and ▲ keys.

Once the settings are complete, the screen will switch to the Alarm Settings screen. To return to resistance measurement or current measurement mode, press the Fn key again or the A/Ω key.
2.5 Convenient function

**Memory function (Saving measurement data)**

Press the MEM key in either resistance measurement mode or current measurement mode. The instrument will beep three times and the displayed measured value will be stored along with the memory number (1 to 2,000) in the instrument’s internal memory.

When the number of values saved in the instrument’s memory reaches 2,000, the display will show “FULL,” and you will not be able to save additional values. Delete unneeded values to free up space.

* Measured values, filter use, and the [ ] and [ ] marks are saved in memory.
2.5 Convenient function 41

Loading a value from the instrument’s internal memory

1. Press the **Fn** key to enter function mode.
   Using the ▼ and ▲ keys, select the Read Memory screen and press the **OK** key.
   *For more information about function mode, see (p.52).

2. Using the ▼ and ▲ keys, increment or decrement the memory number to recall the measured value for the memory number you wish to load.
   You can move more quickly through memory numbers by pressing and holding the ▼ and ▲ keys.

   To exit the Read Memory screen, press the **Fn** key or the **OK** key.
   *To return to resistance measurement or current measurement mode, press the **Fn** key again or the **AΩ** key.
2.5 Convenient function

Clearing stored data
You can clear the last stored data point (1 value) or all stored data points.

1. Press the Fn key to enter function mode.
   Using the ▼ and ▲ keys, select the Clear Memory screen and press the OK key. The screen will show [CLR].
   *For more information about function mode, see (p.52).

2. Using the ▼ and ▲ keys, select either the last stored data point or all data points and press the OK key.
   To clear the last stored data point (1 value)
   (The screenshot to the left indicates that 34 values have been saved in the instrument’s memory.)
   To clear all data points
   (The screen will show [ALL].)
2.5 Convenient function

The [OK?] mark will flash on the LCD once you select the data to clear so that you can confirm your intentions. Press the OK key again to clear the data.

- To cancel, press the Fn key.
- To return to resistance measurement or current measurement mode, press the Fn key again or the A/Ω key.
By enabling the FT6381's Bluetooth function, you can transfer measurement data to an Android handset to create measurement reports. For more information, refer to the help function of the FT6381 Communication Software, an app for Android handsets.

In addition to installing the application, the following two sets of connection settings must be configured in order to use the Bluetooth function:

- Pairing the Android™ handset and FT6381
- Registering the FT6381 connection with the FT6381 Communication Software

Use the following procedure to configure the connection settings:

**Measurement process**

1. Enable the FT6381’s Bluetooth® function. (p.45)
2. Pair the instrument with the Android™ handset. (p.46)
3. Install the FT6381 Communication Software on the Android™ handset. (p.47)
4. Register the instrument you wish to connect with the FT6381 Communication Software. (p.48)
2.5 Convenient function

Enabling the Bluetooth® function on the FT6381

1. Press the Fn key to enter function mode. For more information about function mode, see (p.52).

2. Using the ▼ and ▲ keys, select the Bluetooth® Setting screen and press the OK key.

Using the ▼ and ▲ keys, select “on” on the Bluetooth® Setting screen and press the OK key to enable the Bluetooth® function.

NOTE: Use of Bluetooth® functionality shortens the battery life compared to normal use. It is recommended to turn off Bluetooth® functionality when not in use.
2.5 Convenient function

**Pairing the instrument with an Android™ handset (first use only)**

1. Select [Wireless and Networks] from the Android™ handset’s Settings button.

2. After enabling the Bluetooth® function, select [Scan for devices] from [Bluetooth settings] (exact words varies with the specific Android™ handset being used; variants include “Search for devices” and “Detect nearby terminals”).

3. When the handset discovers [FT6381#XXXXXXXXX] (where “XXXXXXXXX” is the serial number found on the back of the instrument), pair the instrument.
   Note that previously paired devices may appear in a separate column labeled with language such as “Paired devices” rather than in the search results.

4. Enter [0000] as the PIN number.

Pairing is only necessary the first time you use the instrument with the handset. When using multiple FT6381 instruments, you will need to pair each instrument.
The screen contents vary with the specific Android™ handset being used. For more information about Bluetooth® device pairing methods and related procedures, see your Android™ handset’s instruction manual.

**Installing the FT6381 Communication Software on the Android™ handset**

Search for “FT638” on the Google Play™ store and download and install the FT6381 Communication Software. A Google account is required in order to download applications from the Google Play™ store. For more information about how to register for a Google account, contact the store from which you purchased the Android™ handset.
2.5 Convenient function

**NOTE**
The application is free, but the user is responsible for any Internet connection costs incurred in the course of downloading or using the application. Since such costs may be incurred during use of the application, it is recommended to use a fixed-price plan. Hioki is not liable for any Internet connection costs.

**Registering the instrument you wish to connect with the FT6381 Communication Software**

1. Turn on the FT6381.
   Launch the FT6381 Communication Software on the Android™ handset. If you wish to use the map function, enable the GPS function.

2. From the list of Bluetooth® devices, select [FT6381#XX XXXXXXXX] and press the [Settings] button. The FT6381 will be registered.

Once the instrument has been paired, it will connect automatically, and FT6381 measured values will be sent to the Android™ handset in real time. The instrument will not be able to connect to the handset if it has not been paired. Refer to "Pairing the instrument with an Android™ handset (first use only) (p.46)" to pair the instrument.
The screen contents vary with the specific Android™ handset being used. For more information about Bluetooth® device pairing methods and related procedures, see your Android™ handset's instruction manual.

Communications between the FT6381 and Android™ handset are limited to a range of about 10 m, but obstacles (walls, metal shielding, etc.) can shorten this distance or prevent communications from being established.

The FT6381's wireless function uses Bluetooth® wireless technology that utilizes the 2.4 GHz band. It may not be possible to establish communications if there is a wireless LAN (IEEE 802.11.b/g/n) or other network/device using the same frequency band nearby.

The application supports Android OS 2.1 or later, but proper operation is not guaranteed on all Android™ handsets. For more information about the devices on which proper operation has been confirmed, see Hioki's website.

Adobe's Adobe Reader, which is available free of charge on the Google Play™ store, is required in order to view PDF reports. Install the application before attempting to view reports.

The confidentiality of information contained in Bluetooth® communications sent from the FT6381 is not guaranteed. Hioki is not liable for any unauthorized disclosure or other issue with measured values caused by Bluetooth® communications.

The FT6381 can only be used in Japan, the U.S., Canada, and the EU. Because it incorporates Bluetooth® wireless technology, the instrument emits radio radiation. Use of devices that emit radio radiation requires approval in the country of use, and use of the instrument in a country or region other than those listed above may be subject to penalty as a violation of law.
2.5 Convenient function

Using the FT6381 Communication Software (second and subsequent use)

After turning on the FT6381, launch the FT6381 Communication Software on the Android™ handset. If you wish to use the map function, enable the GPS function. Once the instrument has been paired, it will connect automatically, and FT6381 measured values will be sent to the Android™ handset in real time. The instrument will not be able to connect to the handset if it has not been paired. Refer to "Pairing the instrument with an Android™ handset (first use only) (p.46)" to pair the instrument.

Switching the FT6381 to connect with the Android™ handset

If you have multiple FT6381 instruments and wish to change the unit to connect to the handset, press the Settings button after pressing the menu button on the Android™ handset and reconfigure the Bluetooth® device settings.

If you are unable to establish a Bluetooth® connection

Check the following if you are unable to establish a Bluetooth® connection between the FT6381 and the Android™ handset:

• Is the Bluetooth® function enabled on both the Android™ handset and the FT6381?
• Has the FT6381 in question been paired on the Android™ handset’s Bluetooth® settings screen? If the instrument has not been paired, refer to "Pairing the instrument with an Android™ handset (first use only) (p.46)" to pair it.
2.5 Convenient function

The application provides the following functionality:

- Sending measurement data (from the LCD display) to the Android™ handset in real time
- Saving and viewing measurement data (including time stamp, GPS position data for the measurement location, and map data)
- Creating reports from measurement data
  - Single reports created from measurement data from one location
  - Summary reports that present a summary of multiple sets of measurement data (with the ability to add comments and change header and footer information)
- Outputting measurement data as a CSV file
- Sending measurement data as an e-mail
- Downloading the contents of the FT6381’s internal memory

For more information about the FT6381 Communication Software application, refer to the application help.
2.5 Convenient function

Function mode

In function mode, the following settings and operations are available:

- Resistance alarm settings
- Loading values from memory
- Bluetooth® setting
- Current alarm settings
- Clearing data from the instrument’s memory

Press the \textbf{Fn} key to enter function mode.

1. Press the \textbf{Fn} key.
2. Using the \textbf{▼} and \textbf{▲} keys, select the desired setting.
3. Accept the setting with the \textbf{OK} key.

While in function mode, the \textbf{Fn} mark will light up.

- Press the \textbf{Fn} key or the \textbf{A/Ω} key to exit function mode.
- *FT6381 only

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
</table>
| Resistance Alarm Settings | Press the \textbf{Fn} key.
| Current Alarm Settings    | Using the \textbf{▼} and \textbf{▲} keys, select the desired setting.
| Clearing Data from Memory | Accept the setting with the \textbf{OK} key.
| Bluetooth® Setting        | While in function mode, the \textbf{Fn} mark will light up.
| Loading Values from Memory| Press the \textbf{Fn} key or the \textbf{A/Ω} key to exit function mode.

*FT6381 only
2.6 Advanced Settings and Functions

Advanced settings can be configured in sub-function mode. In sub-function mode, the following settings and operations are available:

- Measurement range display setting (p.54)
- Auto-power-saving (APS) setting (p.55)
- System reset (to revert to factory settings) (p.56)

To enter sub-function mode, turn on the instrument by pressing the **POWER** key while holding down the **Fn** key.

To exit sub-function mode, press the **POWER** key to turn off the instrument and then turn it back on.
Enabling/disabling the measurement range display function

1. Enter sub-function mode.
   Press the POWER key while holding down the Fn key.

2. Using the ▼ and ▲ keys, select the Range Display Setting screen and press the OK key.

3. Using the ▼ and ▲ keys, switch the range display function on or off and press the OK key.

   ![Image of range display settings]

   **NOTE**
   The measurement range is displayed using values only.
   (Example: 1,600 Ω range → 1,600)
   The units for the measurement range are the same as for the displayed measured value.
2.6 Advanced Settings and Functions

The auto-power-saving (APS) function prevents unintentional battery consumption when you forget to turn off the instrument. The APS function activates automatically when the instrument is turned on. The instrument will automatically turn off once about 5 minutes pass without any operation (an alarm will sound for about 10 seconds first). Pressing any key while the alarm sounds will reset the time before the instrument turns off to about 5 minutes.

1. Enter sub-function mode.
   Press the **POWER** key while holding down the **Fn** key.

2. Using the ▼ and ▲ keys, select the APS Setting screen and press the **OK** key.

3. Using the ▼ and ▲ keys, switch the APS function on or off and press the **OK** key.
   When the APS function is disabled in sub-function mode, APS will remain disabled when the instrument’s power is cycled.
2.6 Advanced Settings and Functions

To disable APS temporarily

Turn on the instrument by pressing the POWER key while holding down the HOLD key to disable APS until the next time the instrument’s power is cycled. The next time the power is cycled, APS will be enabled (as long as the APS setting is enabled in sub-function mode).

Reverting the instrument to factory settings (system reset)

This section describes how to initialize the instrument’s settings. All measurement data (up to 2,000 values) will be deleted.

1. Enter sub-function mode.
   Press the POWER key while holding down the Fn key.
2. Using the ▼ and ▲ keys, select the System Reset screen and press the OK key. The [OK?] mark will flash.
3. Press the OK key again. The instrument will revert to the factory settings.

NOTE
• If the System Reset screen is displayed by mistake, cycle the instrument’s power without pressing the OK key. Instrument operation will be restored without a system reset having been performed.
• For more information about how to clear previously saved measurement data, see “Clearing stored data (p.42)”.
### 3.1 Measurement Specifications

#### Common measurement specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guaranteed accuracy period</td>
<td>1 year (Opening and Closing of the Sensor: Maximum 10000 times)</td>
</tr>
<tr>
<td>Accuracy guarantee for temperature and humidity</td>
<td>23°C±5°C (73°F±9°F) 80%RH or less (non-condensation)</td>
</tr>
<tr>
<td>Temperature characteristics</td>
<td>-10 to 50°C Measurement accuracy x 0.1°C (except 23°C±5°C)</td>
</tr>
<tr>
<td>Maximum rated voltage to earth</td>
<td>600 VAC measurement category IV (anticipated transient overvoltage 8000 V)</td>
</tr>
</tbody>
</table>

#### Resistance measurement specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guaranteed accuracy conditions</td>
<td>No reactance component, no noise current</td>
</tr>
<tr>
<td>Effective measuring range</td>
<td>0.02 Ω to 1600 Ω</td>
</tr>
<tr>
<td>Zero suppression</td>
<td>Less than 0.02 Ω</td>
</tr>
<tr>
<td>Overrange</td>
<td>Greater than 1600 Ω</td>
</tr>
<tr>
<td>Measurement Method</td>
<td>Analog synchronous detection method (effective resistance measurement)</td>
</tr>
<tr>
<td>Injected signal frequency</td>
<td>Approx. 2.4 kHz</td>
</tr>
<tr>
<td>Injected voltage level</td>
<td>Approx. 9.0 mV (with load open)</td>
</tr>
</tbody>
</table>
3.1 Measurement Specifications

<table>
<thead>
<tr>
<th>Range (Accuracy Range)</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20 Ω (0.02 Ω to 0.20 Ω)</td>
<td>0.01 Ω</td>
<td>±1.5%rdg. ±0.02 Ω</td>
</tr>
<tr>
<td>2.00 Ω (0.18 Ω to 2.00 Ω)</td>
<td>0.01 Ω</td>
<td>±1.5%rdg. ±0.02 Ω</td>
</tr>
<tr>
<td>20.00 Ω (1.80 Ω to 20.00 Ω)</td>
<td>0.01 Ω</td>
<td>±1.5%rdg. ±0.05 Ω</td>
</tr>
<tr>
<td>50.0 Ω (18.0 Ω to 50.0 Ω)</td>
<td>0.1 Ω</td>
<td>±1.5%rdg. ±0.1 Ω</td>
</tr>
<tr>
<td>100.0 Ω (50.0 Ω to 100.0 Ω)</td>
<td>0.1 Ω</td>
<td>±1.5%rdg. ±0.5 Ω</td>
</tr>
<tr>
<td>200.0 Ω (100.0 Ω to 200.0 Ω)</td>
<td>0.2 Ω</td>
<td>±3.0%rdg. ±1.0 Ω</td>
</tr>
<tr>
<td>400.0 Ω (180.0 Ω to 400.0 Ω)</td>
<td>1 Ω</td>
<td>±5%rdg. ±5 Ω</td>
</tr>
<tr>
<td>600.0 Ω (400.0 Ω to 600.0 Ω)</td>
<td>2 Ω</td>
<td>±10%rdg. ±10 Ω</td>
</tr>
<tr>
<td>1200.0 Ω (600.0 Ω to 1200 Ω)</td>
<td>10 Ω</td>
<td>±20%rdg.</td>
</tr>
<tr>
<td>1600.0 Ω (1200.0 Ω to 1600 Ω)</td>
<td>20 Ω</td>
<td>±35%rdg.</td>
</tr>
</tbody>
</table>

To obtain the measurement accuracy at a range boundary, apply the accuracy of the higher-accuracy range.
### 3.1 Measurement Specifications

<table>
<thead>
<tr>
<th>Current measurement specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Guaranteed accuracy conditions</strong></td>
<td>Sine wave input</td>
</tr>
<tr>
<td><strong>Measurement method</strong></td>
<td>Digital sampling method (true RMS measurement)</td>
</tr>
<tr>
<td><strong>Crest factor</strong></td>
<td>5.0 or less (for the 60 A range, 1.7 or less)</td>
</tr>
<tr>
<td><strong>Conductor position effects</strong></td>
<td>Within ±0.5% rdg. (using the center of the sensor as the reference, in all positions)</td>
</tr>
<tr>
<td><strong>Magnetic field interference</strong></td>
<td>10 mA or less in an external magnetic field of 400 A/m at 50/60 Hz AC</td>
</tr>
<tr>
<td><strong>Maximum allowable input</strong></td>
<td>100 A AC continuous, 200 A AC for 2 minutes (50/60 Hz)</td>
</tr>
</tbody>
</table>

For frequency derating characteristics during continuous input, see the following diagram:

![Frequency vs. Gain Chart](image)

- **Effective measuring range**: 0.05 mA to 60.0 A
- **Zero-suppression**: Less than 0.05 mA
- **Overrange**: Greater than 60.0 A
### 3.1 Measurement Specifications

<table>
<thead>
<tr>
<th>Range (Accuracy Range)</th>
<th>Resolution</th>
<th>Guaranteed accuracy frequency range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.00 mA (1.00 mA to 20.00 mA)</td>
<td>0.01 mA</td>
<td>45 ≤ f ≤ 66 Hz</td>
<td>±2.0%rdg. ±0.05 mA</td>
</tr>
<tr>
<td></td>
<td>30 ≤ f &lt; 45 Hz</td>
<td></td>
<td>±2.5%rdg. ±0.05 mA</td>
</tr>
<tr>
<td></td>
<td>66 ≤ f ≤ 400 Hz</td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>

| 200.0 mA (18.0 mA to 200.0 mA) | 0.1 mA | 45 ≤ f ≤ 66 Hz | ±2.0%rdg. ±0.5 mA |
| 30 ≤ f < 45 Hz |  |  | ±2.5%rdg. ±0.5 mA |
| 66 ≤ f ≤ 400 Hz |  |  | -- |

| 2.000 A (0.180 A to 2.000 A) | 0.001 A | 45 ≤ f ≤ 66 Hz | ±2.0%rdg. ±0.005 A |
| 30 ≤ f < 45 Hz |  |  | ±2.5%rdg. ±0.005 A |
| 66 ≤ f ≤ 400 Hz |  |  | -- |

| 20.00 A (1.80 A to 20.00 A) | 0.01 A | 45 ≤ f ≤ 66 Hz | ±2.0%rdg. ±0.05 A |
| 30 ≤ f < 45 Hz |  |  | ±2.5%rdg. ±0.05 A |
| 66 ≤ f ≤ 400 Hz |  |  | -- |

| 60.0 A (18.0 A to 60.0 A) | 0.1 A | 45 ≤ f ≤ 66 Hz | ±2.0%rdg. ±0.5 A |
| 30 ≤ f < 45 Hz |  |  | ±2.5%rdg. ±0.5 A |
| 66 ≤ f ≤ 400 Hz |  |  | -- |
### 3.2 General Specifications

<table>
<thead>
<tr>
<th>Location for use</th>
<th>Pollution Degree 2, altitude up to 2000 m (6562-ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature and humidity</td>
<td>20 to 60°C (4.0°F to 140°F), 80%RH or less (non-condensation, except for the battery)</td>
</tr>
<tr>
<td>Operating temperature and humidity</td>
<td>Temperature: -10 to 50°C (14°F to 122°F)</td>
</tr>
<tr>
<td></td>
<td>Humidity: 80%RH or less (non-condensation)</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>Between the Case and the Clamp core 7400 Vrms 1 minute</td>
</tr>
<tr>
<td>Applicable standards</td>
<td>Safety: EN61010</td>
</tr>
<tr>
<td></td>
<td>EMC: EN61326</td>
</tr>
<tr>
<td></td>
<td>Page 64</td>
</tr>
<tr>
<td></td>
<td>Effects of radiated, radiofrequency, electromagnetic field: At 3 V/m, 5X accuracy specifications or less (resistance measurement)</td>
</tr>
<tr>
<td></td>
<td>Wireless: Japan (type certification) 001-X00013</td>
</tr>
<tr>
<td></td>
<td>Canada (IC): RSS-210 (IC: 5123A-BGTTWT12A)</td>
</tr>
<tr>
<td></td>
<td>EU: EN 300 328</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-1</td>
</tr>
<tr>
<td></td>
<td>EN 301 489-17</td>
</tr>
<tr>
<td>Dust and water protection</td>
<td>IP40 (EN60529) <em>With clamp sensor closed.</em></td>
</tr>
<tr>
<td>Power supply</td>
<td>LR06 alkaline battery × 2 (3 VDC)</td>
</tr>
<tr>
<td>Maximum rated power</td>
<td>450 mVA</td>
</tr>
<tr>
<td>Continuous operating time</td>
<td>Approx. 35 hours (25 Ω measurement, backlight off, Bluetooth® OFF (Model FT6381), 23°C reference)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Approx. 73 W×218 H×43 D mm (2.87&quot;W×8.58&quot;H×1.69&quot;D) (excluding projections)</td>
</tr>
<tr>
<td>Maximum measurable conductor diameter</td>
<td>φ32 mm</td>
</tr>
<tr>
<td>Mass</td>
<td>Approx. 620g (21.9 oz) Except for the battery</td>
</tr>
<tr>
<td>Accessories</td>
<td>Carrying case (1), Resistance check loop (1), Strap (1), LR06 alkaline battery × 2, Instruction manual (1)</td>
</tr>
<tr>
<td>Display specifications</td>
<td>LCD display: Max. 2,000 count</td>
</tr>
<tr>
<td></td>
<td>Display refresh: Approx. 2 times/sec.</td>
</tr>
</tbody>
</table>
### 3.2 General Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range switching</td>
<td>Auto-range</td>
</tr>
<tr>
<td>Overrange display</td>
<td>[O.L] display mark lights up.</td>
</tr>
<tr>
<td>Data hold display</td>
<td>[HOLD] mark lights up.</td>
</tr>
<tr>
<td>Function mode display</td>
<td>[F] mark lights up. Flashes in subfunction mode.</td>
</tr>
<tr>
<td>Filter display</td>
<td>[FILTER] mark lights up.</td>
</tr>
<tr>
<td>Auto-power-save display</td>
<td>[APS] mark lights up.</td>
</tr>
<tr>
<td>Remaining battery display</td>
<td>Display of remaining battery power in 4 stages</td>
</tr>
<tr>
<td>Memory number display</td>
<td>[MEMORY] mark lights up.</td>
</tr>
<tr>
<td>Range display</td>
<td>[RANGE] mark lights up.</td>
</tr>
<tr>
<td>Alarm display</td>
<td>[ALARM] mark lights up.</td>
</tr>
<tr>
<td>Confirmation of memory erasure and reset operation</td>
<td>[OK] mark lights up.</td>
</tr>
<tr>
<td>Noise mark display</td>
<td>[NOISE] mark lights up.</td>
</tr>
<tr>
<td>(When there is a superimposed noise current during resistance measurement, accuracy cannot be guaranteed.)</td>
<td></td>
</tr>
<tr>
<td>mA/A unit display</td>
<td>mA mark or A mark lights up.</td>
</tr>
<tr>
<td>Ω unit display</td>
<td>[Ω] mark lights up.</td>
</tr>
<tr>
<td>AC current mark display</td>
<td>[AC] mark lights up (during AC current measurement).</td>
</tr>
<tr>
<td>Resistance mark display</td>
<td>[Ω] mark lights up (during resistance measurement).</td>
</tr>
<tr>
<td>Inductance mark display</td>
<td>[H] mark lights up (when the phase angle θ &gt; approx. 45° during resistance measurement).</td>
</tr>
<tr>
<td>Capacitance mark display</td>
<td>[C] mark lights up (when the phase angle θ &lt; approx. -45° during resistance measurement).</td>
</tr>
<tr>
<td>Bluetooth® display</td>
<td>Bluetooth® function off: [ ] mark turns off (Model FT6381). Bluetooth® function on/communications inactive: [ ] mark lights up (Model FT6381). Bluetooth® function on/communications active: [ ] mark flashes (Model FT6381).</td>
</tr>
</tbody>
</table>
### 3.2 General Specifications

<table>
<thead>
<tr>
<th>Function specifications (underline: default value)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data hold function</strong></td>
</tr>
<tr>
<td><strong>Backlight function</strong> Automatically turns off approx. 2 min. after last key operation.</td>
</tr>
<tr>
<td><strong>Filter function</strong> Moving average time: Max. 9 sec.</td>
</tr>
<tr>
<td><strong>Resistance measurement filter function</strong></td>
</tr>
<tr>
<td><strong>Current measurement filter function</strong> Cutoff frequency: 180 Hz ±30 Hz (-3 dB)</td>
</tr>
<tr>
<td><strong>Alarm function</strong></td>
</tr>
<tr>
<td><strong>Resistance alarm function</strong> Resistance measurement mode alarm: Beeps when measured value is less than or greater than threshold.</td>
</tr>
<tr>
<td><strong>Current alarm function</strong> Current measurement mode alarm: Beeps when measured value is less than or greater than threshold.</td>
</tr>
<tr>
<td><strong>Alarm Hi/Lo</strong> Separate Hi/Lo settings for resistance measurement and current measurement.</td>
</tr>
<tr>
<td><strong>Alarm threshold setting range</strong> Resistance measurement: 0.02 Ω to 1,600 Ω.</td>
</tr>
<tr>
<td><strong>Memory function</strong></td>
</tr>
<tr>
<td><strong>Memory capacity</strong> 2,000 values</td>
</tr>
<tr>
<td><strong>Auto-power-save function</strong> Instrument automatically turns off approx. 5 min. after last key operation.</td>
</tr>
<tr>
<td><strong>Function mode</strong></td>
</tr>
<tr>
<td><strong>Moving between items</strong> After selecting setting item with ▼ and ▲ keys, accept with OK key.</td>
</tr>
<tr>
<td><strong>Resistance alarm function</strong> AL Ω: Resistance Hi/Lo, threshold settings.</td>
</tr>
<tr>
<td><strong>Current alarm function</strong> AL A: Current Hi/Lo, threshold settings.</td>
</tr>
<tr>
<td><strong>Loading memory values</strong> MEM READ: Load memory values.</td>
</tr>
<tr>
<td><strong>Clearing memory values</strong> MEM CLR: Clear last saved memory value or all values.</td>
</tr>
<tr>
<td><strong>Bluetooth® operating setting</strong> BT: ON/OFF (FT6381)</td>
</tr>
</tbody>
</table>
### 3.2 General Specifications

<table>
<thead>
<tr>
<th>Sub-function mode</th>
<th>Range display RNG: ON/OFF function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-power-save function</td>
<td>APS: ON/OFF</td>
</tr>
<tr>
<td>System reset SYS RST</td>
<td></td>
</tr>
<tr>
<td>Bluetooth® function</td>
<td>Displays measured values on the screen of an Android™ handset via Bluetooth®.</td>
</tr>
</tbody>
</table>
4.1 Cleaning

**CAUTION**

If foreign matter gets stuck between the tips of the clamp sensor, do not forcibly open or close the sensor, but rather use a soft brush or similar implement to carefully remove the foreign matter. Accurate measurements cannot be made while foreign matter is stuck between the tips of the clamp sensor or while the shape of the clamp sensor is deformed. If the tips of the clamp sensor become deformed, have the instrument inspected and calibrated by your dealer.

**NOTE**

- Wipe the LCD gently with a soft, dry cloth.
- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
4.2 Troubleshooting

**Inspection and Repair**

*NOTE* If damage is suspected, check the “Before returning for repair” section before contacting your dealer or Hioki representative.

**Transporting**

- When sending the instrument for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- Use the original packing materials when transporting the instrument, if possible.

**Before returning for repair**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No screen is displayed even when the instrument is turned on.</td>
<td>• Are the batteries correctly inserted? • Is the useful battery life at an end?</td>
<td>Insert the new batteries (p.23)</td>
</tr>
<tr>
<td>The screen turns off after a little while.</td>
<td>• Is the useful battery life at an end? • Has the APS function been triggered?</td>
<td>(p.55)</td>
</tr>
</tbody>
</table>
4.3 Error Display

If an error is shown on the LCD, the instrument needs to be repaired. Contact your dealer or Hioki representative.

<table>
<thead>
<tr>
<th>Error Display</th>
<th>Meaning</th>
<th>Remedial Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>E001</td>
<td>Main CPU program error</td>
<td>Please contact your dealer or Hioki representative.</td>
</tr>
<tr>
<td>E002</td>
<td>Sub CPU program error</td>
<td></td>
</tr>
<tr>
<td>E003</td>
<td>EEPROM R/W error</td>
<td></td>
</tr>
<tr>
<td>E004</td>
<td>Adjustment data error</td>
<td></td>
</tr>
</tbody>
</table>