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# User's manual

## Flir CM83

600 A power clamp







# User's manual

## Flir CM83





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# 1 Disclaimers

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## 1.1 Copyright

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## 1.2 Quality assurance

The Quality Management System under which these products are developed and manufactured has been certified in accordance with the ISO 9001 standard.

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## 1.3 Documentation updates

Our manuals are updated several times per year, and we also issue product-critical notifications of changes on a regular basis.

To access the latest manuals and notifications, go to the Download tab at:

<http://support.flir.com>

It only takes a few minutes to register online. In the download area you will also find the latest releases of manuals for our other products, as well as manuals for our historical and obsolete products.

## 1.4 Disposal of electronic waste



As with most electronic products, this equipment must be disposed of in an environmentally friendly way, and in accordance with existing regulations for electronic waste.

Please contact your Flir Systems representative for more details.

## 2 Safety information

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### Note

Before operating the device, you must read, understand, and follow all instructions, dangers, warnings, cautions, and notes.

### Note

Flir Systems reserves the right to discontinue models, parts or accessories, and other items, or to change specifications at any time without prior notice.

### Note

Remove the batteries if the device is not used for an extended period of time.



### WARNING

Do not operate the device if you do not have the correct knowledge. Formal qualifications and/or national legislation for the electrical inspections can apply. Incorrect operation of the device can cause damage, shock, injury or death to persons.



### WARNING

Do not start the measuring procedure before you have set the function switch to the correct position. This can cause damage to the instrument and can cause injury to persons.



### WARNING

Do not change to current or resistance when you measure the voltage. This can cause damage to the instrument and can cause injury to persons.



## 2 Safety information



### WARNING

Do not measure the current on a circuit when the voltage increases to more than 600 V. This can cause damage to the instrument and can cause injury to persons.



### WARNING

You must disconnect the test leads from the circuit that you did a test on before you change the range. If you do not do this, damage to the instrument and injury to persons can occur.



### WARNING

Do not look directly into the laser beam. The laser beam can cause eye irritation.



### WARNING

Do not use the laser pointer near explosive gases or in other possible explosive areas. Injury to persons can occur.



### WARNING

Do not replace the batteries or the fuses before you remove the test leads. This can cause damage to the instrument and can cause injury to persons.



### WARNING

Do not use the device if the test leads and/or the device show signs of damage. Injury to persons can occur.

## 2 Safety information

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### **WARNING**

Be careful when you do the measurements if the voltages are more than 25 VAC rms or 35 VDC. There is a risk of shock from these voltages. Injury to persons can occur.



### **WARNING**

Do not do diode, resistance or continuity tests before you have removed the power from the capacitors and from a device during a test. Injury to persons can occur.



### **WARNING**

Do not use the device as a tool to identify live terminals. You must use the correct tools. Injury to persons can occur if you do not use the correct tools.



### **WARNING**

Make sure that children cannot touch the device. The device contains dangerous objects and small parts that children can swallow. If a child swallows an object or a part, speak with a physician immediately. Injury to persons can occur.



### **WARNING**

Do not let children play with the batteries and/or the packing material. These can be dangerous for children if they use them as toys.



### **WARNING**

Do not touch expired or damaged batteries without gloves. Injury to persons can occur.

## 2 Safety information



### **WARNING**

Do not cause a short-circuit of the batteries. This can cause damage to the instrument and can cause injury to persons.



### **WARNING**

Do not put the batteries into a fire. Injury to persons can occur.



### **CAUTION**

Do not use the device for a procedure that it is not made for. This can cause damage to the protection.



This symbol, adjacent to another symbol or terminal, indicates that the user must refer to the manual for further information.



This symbol, adjacent to a terminal, indicates that, under normal use, hazardous voltages may be present.



Double insulation.

## 3 Introduction

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Thank you for choosing a Flir CM83 clamp meter.

This device is shipped fully tested and calibrated and, with proper use, will provide years of reliable service.

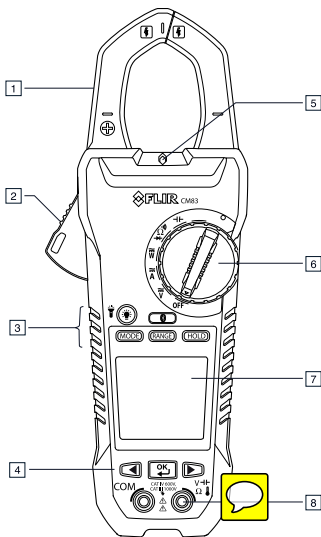
### 3.1 Key features

- 10 000-count digital display.
- Active backlit, large-scale display.
- Analog bar graph.
- True RMS reading in AC and AC+DC mode.
- Torch lightening when clamping.
- Auto AC/DC 1000 A capability and selection.
- Auto AC/DC 1000 V capability and selection.
- Auto resistance/continuity/diode selection.
- Power and power factor measurement.
- Total harmonic distortion and 1 to 25 harmonics.
- Phase rotation Indication.
- 100 k $\Omega$  resistance capability.
- VoltSense (none-contact voltage).
- Frequency counter.
- Capacitance capability.
- Temperature function.
- Smart data hold.
- Peak hold.
- In-rush current.
- DCA auto-zeroing key.
- Minimum/maximum hold.
- Low-pass filter.
- Auto power off.
- Up to 42 mm diameter (1000 MCM) conductor.
- Bus bar size 62 mm x 12 mm (2.4" x 0.5").
- 1.2 m (4') drop-proof.
- Convenient battery cover.
- CAT. IV 600 V /CAT. III 1000 V standard.

# 4 Description

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## 4.1 Meter parts

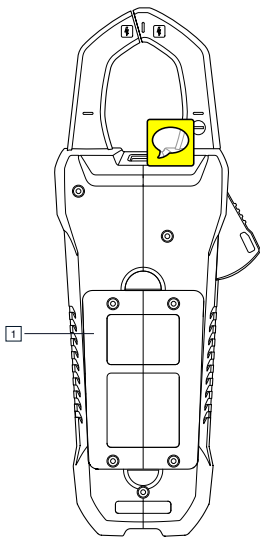


**Figure 4.1** Front view

1. Clamp jaw.
2. Jaw opening trigger.
3. Function buttons, see section 4.3 *Function buttons*, page 9.
4. Navigation buttons.
5. **Work light.**
6. Function switch, see section 4.2 *Function switch*, page 8.
7. LCD display.
8. Probe/**thermocouple** terminals.

## 4 Description





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**Figure 4.2** Rear view


1. Battery compartment.

### 4.2 Function switch







$\text{- }$ 	The meter can measure capacitance through the probe inputs.
$\text{+}\Omega$ 	The meter can measure resistance, continuity, or diode polarity through the probe inputs. The type of measurement is selected by the <b>MODE</b> button.
$\text{W}$ 	The meter can measure power through the probe inputs and the clamp jaws.
$\text{A}$ 	The meter can measure current through the clamp jaws.

## 4 Description

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	The meter can measure voltage through the probe inputs.
OFF	The meter is in full power-saving mode.

### 4.3 Function buttons

	<ul style="list-style-type: none"><li>Use the button to select Auto select or Manual select mode, see section 5.2 <i>Auto/Manual select mode</i>, page 12.</li><li>In Manual select mode, press the button to select the operating mode.</li></ul>
	<ul style="list-style-type: none"><li>Use the button to select Auto range or Manual range mode, see section 5.3 <i>Auto/Manual range mode</i>, page 13.</li><li>In Manual range mode, press the button to change the range (scale).</li></ul>
	Press the button to toggle between Normal and Hold mode. In Hold mode, the display freezes the last reading and continues to display this value. 
	<ul style="list-style-type: none"><li>Press the button to enable/disable the display backlight.</li><li>Press and hold the button for 2 seconds to enable/disable the work light.</li></ul>
	Press the button to enable/disable MeterLink (Bluetooth) communication, see section 5.11 <i>Streaming measurement data using Bluetooth</i> , page 24.

## 4 Description

### 4.4 Display icons and indicators

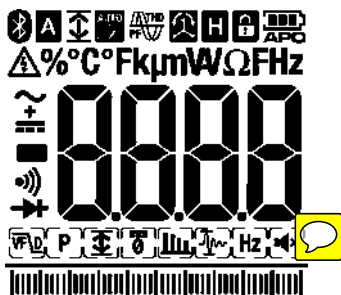





























Figure 4.3 Display

	Indicates that MeterLink (Bluetooth) communication is active, see section 5.2 <i>Auto/Manual select mode</i> , page 12.
	Indicates that the meter is in Auto select mode.
	Indicates that the meter is displaying maximum reading values.
	Indicates that the meter is displaying minimum reading values.
	Indicates that the meter is displaying the average reading.
	Indicates that the meter is displaying peak maximum values.
	Indicates that the meter is displaying peak minimum values.
	Indicates that the meter is in Auto range mode.
	Indicates that the meter is in Power factor mode.
	Indicates that the meter displays the total harmonic distortion.
	Indicates that the meter is in Phase rotation mode.





## 4 Description

	Indicates that the meter is in Hold mode.
	Indicates the battery voltage status.
<b>APO</b>	Indicates that the auto power off function is enabled.
	Indicates that the measured voltage is greater than 30 V DC or AC RMS.
	Indicates that the meter is measuring AC current or voltage.
	Indicates that the meter is measuring DC current or voltage.
	Indicates that the meter is measuring AC+DC current or voltage.
	Indicates that the continuity function is active.
	Indicates that the diode test function is active.
	LPF mode icon.
	Peak mode icon.
	Min/Max/Avg mode icon.
	DC Zero mode icon.
	Harmonic Distortion icon.
	In-rush current mode icon.
	Frequency mode icon.
	Silent mode icon.

### 4.4.1 Out-of-range warning

If the input is out-of-range, *OL* is displayed.

## 5 Operation

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### Note

Before operating the device, you must read, understand, and follow all instructions, dangers, warnings, cautions, and notes.


### Note

When the meter is not in use, the function switch should be set to the **OFF** position.

### Note

When connecting the probe leads to the device under test, connect the negative lead before connecting the positive lead. When removing the probe leads, remove the positive lead before removing the negative lead.

### 5.1 Powering the meter

1. Set the function switch to any position to switch on the meter.
2. If the battery indicator  shows that the battery voltage is low or if the meter does not power on, replace the battery. See section 6.2 *Battery replacement*, page 25.


#### 5.1.1 Auto power off

The meter enters sleep mode after 30 minutes of inactivity. The meter beeps three times **15** seconds before powering off. Press any button or turn the function switch to prevent the meter from powering off. The auto power off time-out is then reset.







#### 5.2 Auto/Manual select mode

In Auto select mode, the meter attempts to automatically select the proper operating mode (e.g., AC, DC, **or AC+DC** measurement) based on the input signal. In Manual select mode, the desired operating mode is selected manually.

Auto select mode is the default mode of operation. When a new function is selected with the function switch, the starting mode is Auto select and the  indicator is displayed.





## 5 Operation

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- To enter Manual select mode, press the  button. To manually select the operating mode, press the  button repeatedly.
- To enter Auto select mode, press and hold the  button until the  indicator is displayed.


### 5.3 Auto/Manual range mode

In Auto range mode, the meter automatically selects the most appropriate measurement scale. In Manual range mode, the desired range (scale) is set manually.

- To enter Manual range mode, press the  button. To change the range, press the  button repeatedly until the desired range is displayed.
- To enter Auto range mode, press and hold the  button until the  indicator is displayed.

### 5.4 Silent mode

In Silent mode, the alert beeper is disabled. Silent mode does not affect the continuity beeper.

1. Use the navigation buttons to select the Silent mode icon , see section 5.5.3.1 *Selecting the mode*, page 15.

## 5.5 Voltage and current measurements

### 5.5.1 Basic voltage measurements

1. Set the function switch to the  $\overline{V}$  position.
2. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive V terminal.
3. Connect the probe leads in parallel to the part under test.
4. Read the voltage value on the display.

## 5 Operation


### 5.5.2 Basic current measurements



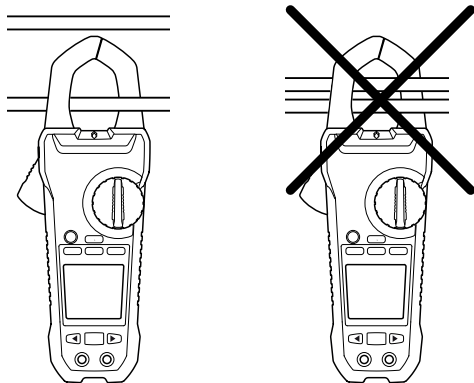
#### WARNING

Do not measure the current on a circuit when the voltage increases to more than 600 V. This can cause damage to the instrument and can cause injury to persons.

#### Note

If the measured voltage is greater than 30 V DC or AC RMS, the  indicator is displayed.

When measuring current using the clamp jaws, only one conductor should be enclosed by the jaws—refer to Figure 5.1.



**Figure 5.1** Correct and incorrect setup

1. Ensure that the probe/thermocouple leads are disconnected from the meter.
2. Set the function switch to the  $\bar{A}$  position.
3. Press the trigger to open the clamp jaws. Fully enclose one conductor—refer to Figure 5.1. For optimum results, center the conductor in the jaws.
4. Read the current value on the display.

## 5 Operation

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### 5.5.3 Extended functionality

In addition to the basic voltage and current measurements, the meter can be set to different modes for extended functionality.




#### 5.5.3.1 Selecting the mode

The mode icons applicable for the selected measurement type are displayed in the lower part of the display. When a mode is enabled, the icon is framed.








**Figure 5.2** Mode icons (AC voltage measurements): Peak mode and Silent mode are enabled

The navigation buttons are used to select a mode icon and to enable/disable a mode:

- Use the  and  navigation buttons to navigate to a mode icon. The currently selected icon will flash.
- Press the  button to enable/disable the selected (flashing) mode.

#### 5.5.3.2 Peak mode

In Peak mode, the meter captures and displays the positive and negative peak values, and updates only when a higher/lower value is registered. Peak mode is available when measuring AC current or voltage in Manual select mode.

1. Use the navigation buttons to select  and enable Peak mode.
2. Press the  button to toggle between the display of Peak Max and Peak Min.
  - In Peak Max mode, the  indicator is displayed.
  - In Peak Min mode, the  indicator is displayed.
3. Press and hold the  button to disable Peak mode.

## 5 Operation

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### 5.5.3.3 In-rush current mode

In In-rush current mode, the meter displays the highest current reading in the first 100 ms after the trigger point. In-rush current mode is available when measuring AC current in Manual select mode.


1. Use the navigation buttons to select  and enable In-rush current mode.

#### Note

If the in-rush current under testing may be more than 100 A AC, manually set the range to 600 A/1000 A before activating the in-rush current, see section 5.3 Auto/Manual range mode, page 13.

### 5.5.3.4 DC Zero mode

The DC zero feature removes offset values and improves the accuracy for DC current measurements. DC Zero mode is available when measuring DC or AC +DC current in Manual select mode.

1. Ensure that there is no conductor in the clamp jaws.
2. Use the navigation buttons to select  and enable DC Zero mode.



### 5.5.3.5 Frequency mode

In Frequency mode, the meter measures and displays the frequency. Frequency mode is available when measuring AC current or voltage in Manual select mode.

1. Use the navigation buttons to select  and enable Frequency mode.


### 5.5.3.6 Min/Max/Avg mode

In Min/Max/Avg mode, the meter captures and displays the minimum or maximum values and updates only when a higher/lower value is registered. The meter can also calculate the average of the minimum and maximum value. Min/Max/Avg mode is available for all measurement types.

1. Use the navigation buttons to select  and enable Min/Max/Avg mode.
2. Press the  button repeatedly to cycle through the minimum, maximum, and average reading displays. The corresponding icons are displayed: ↓, ↑, or ↻.

## 5 Operation






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1. Press and hold the  button to disable Min/Max/Avg mode.

### 5.5.3.7 Harmonic Distortion mode


In Harmonic Distortion mode, the meter displays the distortion percentage value for the first 25 harmonics as well as the total harmonic distortion. Harmonic Distortion mode is available when measuring AC current or voltage in Manual select mode.

The harmonic distortion is expressed as  $H_n = (\text{RMS of an individual harmonic } n) / (\text{RMS of the fundamentals}) \times 100\%$ .

1. Use the navigation buttons to select  and enable Harmonic Distortion mode.
2. While in Harmonic Distortion mode, use the  and  navigation buttons to navigate through the individual and total harmonic data.
3. When the total harmonic distortion is displayed, the  indicator appears in the upper part of the display.
4. Press and hold the  button to disable Harmonic Distortion mode.


### 5.5.3.8 LPF mode

In LPF mode, high-frequency noise is eliminated from the voltage measurement by a low-pass filter (LPF). LPF mode is intended for measurements on variable-frequency drives (VFDs). LPF mode is available when measuring AC current or voltage in Manual select mode.

1. Use the navigation buttons to select  and enable LPF mode.

## 5.6 Power measurements

### 5.6.1 Single-phase power measurements

1. Set the function switch to the  position.
2. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive W terminal.




## 5 Operation

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3. Press the trigger to open the clamp jaws. Fully enclose one conductor—refer to Figure 5.1. For optimum results, center the conductor in the jaws.

### Note

The + symbol on the jaw should be directed toward the power source.

4. Connect the probe leads in parallel to the part under test.
5. Read the active power value on the display.
  - If the value is displayed without a sign, the power is flowing from the power source to the load.
  - If the value is displayed with a minus sign (-), the power is flowing from the power load to the source.
6. To measure and display the power factor, press the **MODE** button repeatedly until the  indicator is displayed.
7. Read the power factor value on the display.
  - If the value is displayed without a sign, the phase of the current signal is lagging behind the voltage signal (inductive load).
  - If the value is displayed with a minus sign (-), the phase of the current signal is leading the voltage signal (capacitive load).
8. To return to active power measurements, press the **MODE** button repeatedly until neither the  nor the  indicator is displayed.

If an overload occurs, the following is displayed:

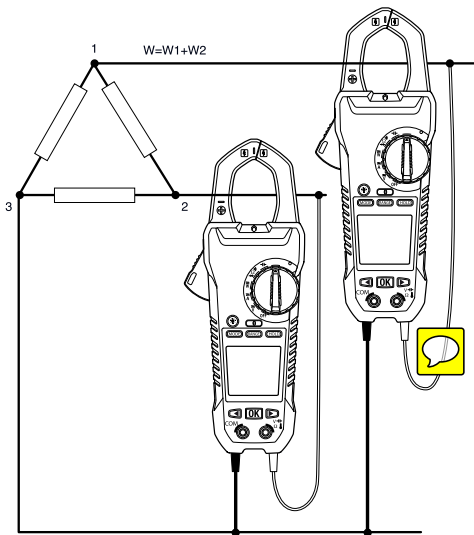
- **OL.V:** Voltage overload.
- **OL.A:** Current overload.
- **OL:** Both voltage and current overload.
- **OL.W:** Active power overload.

### 5.6.2 Three-phase power measurements

#### 5.6.2.1 Three-phase three-wire balanced/unbalanced

The power of a three-phase three-wire wye (star) configuration is measured in two steps, in accordance with Figure 5.3. The total power is the sum of the two measurements:  $W = W_1 + W_2$ .





**Figure 5.3** Three-phase three-wire measurement

1. Set the function switch to the  $\overline{W}$  position.
2. Ensure that the meter is set to active power measurement. If the  $\overline{A}$  or the  $\overline{V}$  indicator is displayed, press the **MODE** button repeatedly until none of these indicators are displayed.
3. Take two measurements of the active power, in accordance with Figure 5.3.

### 5.6.2.2 Three-phase four-wire balanced/unbalanced

The power of a three-phase four-wire configuration is measured in three steps, accordance with Figure 5.4. The total power is the sum of the three measurements:  $W = W_1 + W_2 + W_3$ .



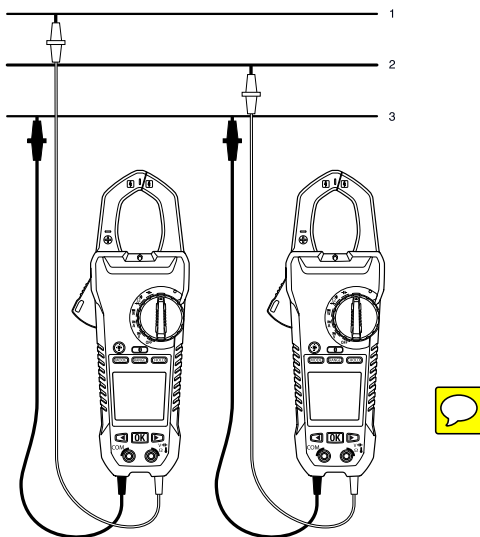
## 5 Operation

### 5.6.3 Phase rotation


With the meter set to Phase rotation mode, it is possible to determine the phase rotation for a three-wire system.

#### Note

The system frequency must be stable.



**Figure 5.5** Phase rotation

1. Set the function switch to the  $\overline{W}$  position.
2. Enter Phase rotation mode by pressing the **MODE** button repeatedly until the  indicator is displayed.
3. Connect the red test lead to the presumed phase line 1 and the black test lead to the presumed phase line 3.

## 5 Operation

4. One of the following results is displayed:

- *OLU* flashes if the voltage is >1000 V.
- *LoU* flashes if the voltage is <30 V.
- *outF* flashes if the frequency is >65 Hz or <45 Hz.
- If normal, *L1* flashes for about 3 seconds. Then *L2* is displayed.

5. Move the red test lead to the presumed phase line 2.

6. One of the following results is displayed:

- *123* indicates clockwise or forward rotation, which means that the presumed phase line 1 is ahead of the presumed phase line 2.
- *321* indicates counterclockwise or reversed rotation, which means that the presumed phase line 2 is ahead of the presumed phase line 1.
- --- means that the meter is unable to determine the results.

### 5.7 Resistance measurements



#### WARNING

Do not do diode, resistance or continuity tests before you have removed the power from the capacitors and from a device during a test. Injury to persons can occur.

1. Set the function switch to the  $\Omega$  position.
2. Ensure that the meter is set to resistance measurement. If the or the indicator is displayed, press the **MODE** button repeatedly until none of these indicators are displayed.
3. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive  $\Omega$  terminal.
4. Touch the tips of the probe across the circuit or component under test.
5. Read the resistance value on the display.


### 5.8 Capacitance measurements



#### WARNING

Do not do diode, resistance or continuity tests before you have removed the power from the capacitors and from a device during a test. Injury to persons can occur.

## 5 Operation

1. Set the function switch to the  position.
2. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive  $\Omega$  terminal.
3. Touch the tips of the probe across the part under test.
4. Read the capacitance value on the display.

### Note

For very large capacitance values, it may take several minutes for the measurement to settle and the final reading to stabilize.






### 5.9 Continuity test



#### WARNING

Do not do diode, resistance or continuity tests before you have removed the power from the capacitors and from a device during a test. Injury to persons can occur.


1. Set the function switch to the  position.
2. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive  $\Omega$  terminal.
3. Use the  button to select continuity measurement. The  indicator will be displayed.
4. Touch the tips of the probe across the circuit or component under test.
5. If the resistance is less than 30  $\Omega$ , the meter will beep.

### 5.10 Diode test



#### WARNING

Do not do diode, resistance or continuity tests before you have removed the power from the capacitors and from a device during a test. Injury to persons can occur.

1. Set the function switch to the  position.
2. Insert the black probe lead into the negative COM terminal and the red probe lead into the positive  $\Omega$  terminal.

## 5 Operation

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3. Use the **MODE** button to select the diode test function. The **→+** indicator will be displayed.
4. Touch the tips of the probe across the diode or semiconductor junction under test. Make a note of the value on the display.
5. Reverse the polarity of the probe, by interchanging the probe test locations.
6. Touch the tips of the probe across the diode or semiconductor junction under test. Make a note of the new value on the display.
7. The diode or semiconductor junction can be evaluated as follows:
  - If one of the readings displays a value (typically 0.400 V or 0.900 V) and the other reading displays *OL*, the component is good.
  - If both readings display *OL*, the component is open.
  - If both readings are very small or 0, the component is shorted.


### 5.11 Streaming measurement data using Bluetooth

#### 5.11.1 General

Some IR cameras from Flir Systems support Bluetooth communication, and to those cameras you can stream measurement data from the meter. The data is then merged into the result table in the IR image.

Streaming measurement data is a convenient way to add important information to an IR image. For example, when identifying an overheated cable connection, you may want to know the current in that cable.

#### 5.11.2 Procedure

1. Pair the IR camera with the instrument. Refer to the camera manual for information on how to pair Bluetooth devices.
2. Turn on the camera.
3. Turn on the meter.
4. Press the  on the meter to enable Bluetooth.
5. Choose the variable that you want to use (voltage, current, resistance, etc.). Results from the meter will now automatically be displayed in the result table in the top left corner of the IR camera screen.

## 6 Maintenance

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### 6.1 Cleaning and storage

Clean the meter with a damp cloth and mild detergent; do not use abrasives or solvents.

If the meter is not to be used for an extended period, remove the batteries and store them separately.

### 6.2 Battery replacement

1. To avoid electrical shock, disconnect the meter if connected to a circuit, remove the probe/thermocouple leads from the terminals, and set the function switch to the **OFF** position before attempting to replace the batteries.
2. Unscrew and remove the battery compartment cover.
3. Replace the six standard AAA batteries, observing correct polarity.
4. Secure the battery compartment cover.

#### 6.2.1 Disposal of electronic waste



As with most electronic products, this equipment must be disposed of in an environmentally friendly way, and in accordance with existing regulations for electronic waste.

Please contact your Flir Systems representative for more details.

## 7 Technical specifications

### 7.1 Model specifications

<b>AC A</b>	
Ranges	100.00 A, 600.0 A
Resolution	0.01 A
Basic accuracy	$\pm(1.5\% + 5 \text{ digits})$ at 50–500 Hz
Conversion type: average sensing RMS indicating	<ul style="list-style-type: none"><li>• AC+DC</li><li>• True RMS</li></ul>
<b>DC A</b>	
Ranges	100.00 A, 600.0 A
Resolution	0.01 A
Basic accuracy	$\pm(1.5\% + 5 \text{ digits})$
<b>AC+DC A</b>	
Ranges	100.00 A, 600.0 A
Resolution	0.01 A
Basic accuracy	Same as AC A + (1.5% + 5 digits)
<b>AC V</b>	
Ranges	100.00–1000 V
Resolution	0.01 V
Basic accuracy	$\pm(1.0\% + 5 \text{ digits})$ at 50–500 Hz
Input impedance	3.5 M $\Omega$
Overload protection	1000 V RMS
Conversion type: average sensing RMS indicating	AC+DC true RMS
<b>DC V</b>	



## 7 Technical specifications

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Ranges	100.00–1000 V
Resolution	0.01 V
Basic accuracy	$\pm(0.7\% + 2 \text{ digits})$
Input impedance	3.5 M $\Omega$
Overload protection	1000 V RMS
<b>AC+DC V</b>	
Ranges	100.00–1000 V
Resolution	0.01 V
Basic accuracy	$\pm(1.0\% + 5 \text{ digits})$
Input impedance	3.5 M $\Omega$
Overload protection	1000 V RMS
<b>Watts</b>	
Ranges	10–600 kW
Resolution	1 W
Basic accuracy	$\pm(2.5\% + 5 \text{ digits})$
<b>Power factor</b>	
Ranges	-1.00 to 1.00
Resolution	0.01
Basic accuracy	$\pm 3^\circ$
<b>Total harmonic distortion</b>	
Ranges	0.1%~100.0%
Resolution	0.1%
Basic accuracy	$\pm(3.0\% + 10 \text{ digits})$
<b>Harmonics</b>	
Ranges	0.1–100.0%

## 7 Technical specifications

Resolution	0.1%
Basic accuracy	<ul style="list-style-type: none"><li>• <math>\pm(5.0\% + 10 \text{ digits})</math> for order 1–12</li><li>• <math>\pm(10.0\% + 10 \text{ digits})</math> for order 13–25</li></ul>
<b>Ohms</b>	
Ranges	1.0000 k $\Omega$ , 10.00 k $\Omega$ , 100.00 k $\Omega$
Resolution	0.01 $\Omega$
Accuracy	$\pm(1.0\% + 3 \text{ digits})$
Overload protection	1000 V RMS
<b>Continuity beeper</b>	
<30 $\Omega$ , 2 kHz tone buzzer	
<b>Diode test</b>	
Open circuit voltage	$\pm 1.8 \text{ V max}$
<b>Capacitance</b>	
Ranges	400.0 $\mu\text{F}$ , 4.000 mF
Resolution	0.1 $\mu\text{F}$
Basic accuracy	$\pm(1.9\% + 8 \text{ digits})$
Overload protection	1000 V RMS
<b>Frequency counter</b>	
Ranges	20.0 Hz to 10 kHz
Resolution	0.1 Hz
Basic accuracy	$\pm(0.5\% + 3 \text{ digits})$
Overload Protection	AC/DC 600 A, AC/DC 1000 A

## 7 Technical specifications

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### 7.2 System specifications

Dimensions	49 mm × 100 mm × 262 mm (1.9" × 3.9" × 10.3")
Weight	0.59 kg (1.29 lb.), including batteries
Battery life	200 hours
Battery type	6 × AAA (LR03)
Agency approvals	FCC Class B, CE, UL/CSA, GSA, S-JQA

### 7.3 Environmental specifications

Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 60°C (-4 to 140°F)
Operating humidity	Maximum 90% up to 35°C (95°F), decreasing linearly to 60% at 45°C (113°F)
Storage humidity	90% maximum
Operational altitude	2000.0 m (6562')
Electromagnetic compatibility	EMC EN6 1326-1
Vibration	Random vibration per MIL-PRF-28800f Class 2 (5–55 Hz, 3g maximum).
Shock	5 m (16.4') drop per IEC/EN 61010-1, 2nd edition



# 8 Flir Global Limited Lifetime Warranty

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A qualifying FLIR Test and Measurement product (the "Product") purchased either directly from FLIR Commercial Systems Inc and affiliates (FLIR) or from an authorized FLIR distributor or reseller that Purchaser registers on-line with FLIR is eligible for coverage under FLIR's Limited Lifetime Warranty, subject to the terms and conditions in this document. This warranty only applies to purchases of Qualifying Products (see below) purchased and manufactured after April 1, 2013.

PLEASE READ THIS DOCUMENT CAREFULLY; IT CONTAINS IMPORTANT INFORMATION ABOUT THE PRODUCTS THAT QUALIFY FOR COVERAGE UNDER THE LIMITED LIFETIME WARRANTY, PURCHASER'S OBLIGATIONS, HOW TO ACTIVATE THE WARRANTY, WARRANTY COVERAGE, AND OTHER IMPORTANT TERMS, CONDITIONS, EXCLUSIONS AND DISCLAIMERS.

**1. PRODUCT REGISTRATION.** To qualify for FLIR's Limited Lifetime Warranty, Purchaser must fully register the Product directly with FLIR on-line at <http://www.flir.com> within Sixty (60) DAYS of the date the Product was purchased by the first retail customer (the "Purchase Date"). Qualifying PRODUCTS THAT ARE NOT REGISTERED ON-LINE WITHIN SIXTY (60) DAYS OF THE PURCHASE DATE WILL HAVE A LIMITED ONE YEAR WARRANTY FROM DATE OF PURCHASE.

**2. QUALIFYING PRODUCTS.** Upon registration, Test and Measurement products that qualify for coverage under FLIR's Limited Lifetime Warranty are:

- Flir CM78
- Flir CM83
- Flir DM93
- Flir MR77
- Flir VP50
- Flir VP52
- Flir VS70

**3. WARRANTY PERIODS.** For purposes of the The Limited Lifetime Warranty, Lifetime is defined as seven years (7) after the product is no longer manufactured, or ten years (10) from date of purchase whichever is greater. This Warranty is only applicable to the original owner of the Products.

Any Product that is repaired or replaced under warranty is covered under this 2-5-10 Limited Warranty for one hundred eighty days (180) days from the date of return shipment by FLIR or for the remaining duration of the applicable Warranty Period, whichever is longer.

**4. LIMITED WARRANTY.** In accordance with the terms and conditions of this Limited Lifetime Warranty, and except as excluded or disclaimed in this document, FLIR warrants, from the Purchase Date, that all fully registered Products will conform to FLIR's published Product specifications and be free from defects in materials and workmanship during the applicable Warranty Period.  
**PURCHASER'S SOLE AND EXCLUSIVE REMEDY**

UNDER THIS WARRANTY, AT FLIR'S SOLE DISCRETION, IS THE REPAIR OR REPLACEMENT OF DEFECTIVE PRODUCTS IN A MANNER, AND BY A SERVICE CENTER, AUTHORIZED BY FLIR. IF THIS REMEDY IS ADJUDICATED TO BE INSUFFICIENT, FLIR SHALL RE-FUND PURCHASER'S PAID PURCHASE PRICE AND HAVE NO OTHER OBLIGATION OR LIABILITY TO BUYER WHATSOEVER.

**5. WARRANTY EXCLUSIONS AND DISCLAIMERS.** FLIR MAKES NO OTHER WARRANTY OF ANY KIND WITH RESPECT TO THE PRODUCTS. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (EVEN IF PURCHASER HAS NOTIFIED FLIR OF ITS INTENDED USE FOR THE PRODUCTS), AND NON-INFRINGEMENT ARE EXPRESSLY EXCLUDED FROM THIS AGREEMENT.

THIS WARRANTY EXPRESSLY EXCLUDES ROUTINE PRODUCT MAINTENANCE, AND SOFTWARE UPDATES. FLIR FURTHER EXPRESSLY DISCLAIMS ANY WARRANTY COVERAGE FOR MANUALS, FUSES, DISPOSABLE BATTERIES, WHERE THE ALLEGED NON-CONFORMITY IS DUE TO NORMAL WEAR AND TEAR OR OTHER ALTERATION, MODIFICATION, REPAIR, ATTEMPTED REPAIR, IMPROPER USE, IMPROPER MAINTENANCE, NEGLIGENCE, ABUSE, IMPROPER STORAGE, FAILURE TO FOLLOW ANY PRODUCT INSTRUCTIONS, DAMAGE (WHETHER CAUSED BY ACCIDENT OR OTHERWISE), OR ANY OTHER IMPROPER CARE OR HANDLING OF THE PRODUCTS CAUSED BY ANYONE OTHER THAN FLIR OR FLIR'S EXPRESSLY AUTHORIZED DESIGNEE.

THIS DOCUMENT CONTAINS THE ENTIRE WARRANTY AGREEMENT BETWEEN PURCHASER AND FLIR AND SUPERSEDES ALL PRIOR WARRANTY NEGOTIATIONS, AGREEMENTS, PROMISES AND UNDERSTANDINGS BETWEEN PURCHASER AND FLIR. THIS WARRANTY MAY NOT BE ALTERED WITHOUT THE EXPRESS WRITTEN CONSENT OF FLIR.

**6. WARRANTY RETURN, REPAIR AND REPLACEMENT.** To be eligible for warranty repair or replacement, Purchaser must notify FLIR within thirty (30) days of discovering of any apparent defect in materials or workmanship. Before Purchaser may return a Product for warranty service or repair, Purchaser must first obtain a returned material authorization (RMA) number from FLIR. To obtain the RMA number Owner must provide an original proof of purchase. For additional information, to notify FLIR of an apparent defect in materials or workmanship, or to request an RMA number, visit <http://www.flir.com>. Purchaser is solely responsible for complying with all RMA instructions provided by FLIR including but not limited to adequately packaging the Product for shipment to FLIR and for all packaging and shipping costs. FLIR will pay for returning

## 8 Flir Global Limited Lifetime Warranty

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to Purchaser any Product that FLIR repairs or replaces under warranty.

FLIR reserves the right to determine, in its sole discretion, whether a returned Product is covered under Warranty. If FLIR determines that any returned Product is not covered under Warranty or is otherwise excluded from Warranty coverage, FLIR may charge Purchaser a reasonable handling fee and return the Product to Purchaser, at Purchaser's expense, or offer Purchaser the option of handling the Product as a non-warranty return.

**7. NON-WARRANTY RETURN.** Purchase may request that FLIR evaluate and service or repair a Product not covered under warranty, which FLIR may agree to do in its sole discretion. Before Purchaser returns a Product for non-warranty evaluation and repair, Purchaser must contact FLIR by visiting <http://www.flir.com> to request an evaluation and obtain an RMA. Purchaser is solely

responsible for complying with all RMA instructions provided by FLIR including but not limited to adequately packaging the Product for shipment to FLIR and for all packaging and shipping costs. Upon receipt of an authorized non-warranty return, FLIR will evaluate the Product and contact Purchaser regarding the feasibility of and the costs and fees associated with Purchaser's request. Purchaser shall be responsible for the reasonable cost of FLIR's evaluation, for the cost of any repairs or services authorized by Purchaser, and for the cost of repackaging and returning the Product to Purchaser.

Any non-warranty repair of a Product is warranted for one hundred eighty days (180) days from the date of return shipment by FLIR to be free from defects in materials and workmanship only, subject to all of the limitations, exclusions and disclaimers in this document.

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**A note on the technical production of this publication**

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## FLIR CM83 - USER MANUAL ERRATA

### Correction No. 1

Refer to section 7.1 on page 29. The Storage Temperature should be 14 to 122°F (-10 to 50°C)

### Correction No. 2

Refer to section 7.2 on page 31. The corrected accuracies for Current are shown below:

Function	Range	Accuracy
DCA	99.99A	$\pm (2\% + 0.5A)$
	599.9A	$\pm (2\% + 5dgt) *$
ACA	0.10A ~ 99.99A	50 ~ 60Hz $\pm (2\% + 5dgt) *$
	599.9A	>60 ~ 400Hz $\pm (2.5\% + 5dgt) *$
LPF ACA	0.10A ~ 99.99A	50 ~ 60Hz $\pm (2\% + 5dgt) *$
	599.9A	

\* For measured values <1000dgt, add 5 digits to the accuracy spec.

### Correction No. 3

See section 7.3 on page 32. The correct Peak Hold accuracy for ACA is shown below:

ACA	140.0A	$\pm (3.5\% + 15dgt)$
	850A	

### Correction No. 4

See section 7.7 on page 33. Corrected Inrush Current accuracies are shown below:

Function	Range	Accuracy
ACA	99.99A	$\pm (3\% + 0.3A)$
	599.9A	$\pm (3\% + 5dgt)*$

\* For measured values <1000dgt, add 5 digits to the accuracy spec.

### Correction No. 5

See section 7.8 on page 33. The corrected Active Power accuracies are shown below:

Function	Range	Accuracy
DCW	9.999 kW	$\pm (3\%+0.05kW)$
	99.99 kW	$\pm (3\%+0.5kW)$
	599.9KW	$\pm (3\%+10dgt)$
ACW	9.999 kW	$\pm (3\%+10dgt)$
	99.99 kW	
	599.9KW	

### Addition

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.

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## **IC DISCLAIMER**

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.

**Note:** The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

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**Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence (s). Son fonctionnement est soumis aux deux conditions suivantes:**

- (1) cet appareil ne peut pas provoquer d'interférences, et**
- (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.**

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## **INDUSTRY CANADA CONFORMITY**

This device has been tested and found to comply with the limits specified in RSS-210. 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.

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

## **DECLARATION DE CONFORMITE D'INDUSTRIE CANADA**

Ce périphérique a été testé et reconnu conforme aux limites spécifiées dans RSS-210. Son utilisation est soumise aux deux conditions suivantes : (1) il ne doit pas provoquer d'interférences gênantes et (2) il doit tolérer les interférences reçues, notamment celles susceptibles d'en perturber le fonctionnement.

Cet appareil numérique de classe [B] est conforme à la norme canadienne ICES-003.