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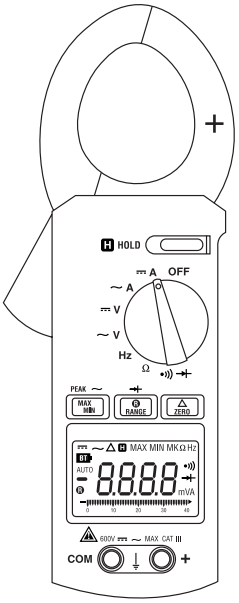
INSTRUCTION MANUAL
MANUAL DE INSTRUCCIONES
MANUEL D'INSTRUCTIONS

GREENLEE®



CMI-100

CLAMP-ON METER

AMPERÍMETRO CON PINZA

COMPTEUR A PINCES

Read and **understand** all of the instructions and safety information in this manual before operating or servicing this tool.

Lea y **entienda** todas las instrucciones y la información sobre seguridad que aparecen en este manual, antes de manejar estas herramientas o darles mantenimiento.

Lire attentivement et **bien comprendre** toutes les instructions et les informations sur la sécurité de ce manuel avant d'utiliser ou de procéder à l'entretien de cet outil.

999 3269.5

IM 1413 8/99

Description

The Greenlee CMI-100 Clamp-on Meter is a hand-held testing device with the following measurement capabilities: AC and DC voltage, AC and DC current, frequency and resistance. The unit is also intended to check diodes and verify continuity.

Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This instruction manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

Purpose

This instruction manual is intended to familiarize all personnel with the safe operation and maintenance procedures for the Greenlee CMI-100 Clamp-on Meter.

Keep this manual available to all personnel.

Replacement manuals are available upon request at no charge.

KEEP THIS MANUAL

Important Safety Information

SAFETY ALERT SYMBOL

This symbol is used to call your attention to hazards or unsafe practices which could result in an injury or property damage. The signal word, defined below, indicates the severity of the hazard. The message after the signal word provides information for preventing or avoiding the hazard.

⚠DANGER

Immediate hazards which, if not avoided, WILL result in severe injury or death.

⚠WARNING

Hazards which, if not avoided, COULD result in severe injury or death.

⚠CAUTION

Hazards or unsafe practices which, if not avoided, MAY result in injury or property damage.

⚠WARNING

Read and **understand** this material before operating or servicing this equipment. Failure to understand how to safely operate this tool can result in an accident causing serious injury or death.

⚠WARNING

Electric shock hazard:

Contact with live circuits can result in severe injury or death.

Important Safety Information

⚠WARNING

Electric shock hazard:

- Do not use the unit if it is wet or damaged.
- Use test leads or accessories that are appropriate for the application. See the category and voltage rating of the test lead or accessory.
- Inspect the test leads or accessory before use. The item(s) must be clean and dry, and the insulation must be in good condition.

Failure to observe these warnings can result in severe injury or death.

⚠WARNING

Electric shock hazard:

- Do not apply more than the rated voltage between any two input terminals, or between any input terminal and earth ground.
- Do not contact the test lead tips or any uninsulated portion of the accessory.

Failure to observe these warnings can result in severe injury or death.

⚠WARNING

- Do not operate with the case open.
- Before opening the case, remove the test leads or jaw from the circuit and shut off the unit.

Failure to observe these warnings can result in severe injury or death.

Important Safety Information

⚠CAUTION

Do not change the measurement function while the test leads are connected to a component or circuit.

Failure to observe this precaution can result in injury and can damage the instrument.

⚠CAUTION

- Do not attempt to repair this unit. It contains no user-serviceable parts.
- Do not expose the unit to extremes in temperature or high humidity. See Specifications.

Failure to observe these precautions can result in injury and can damage the unit.

IMPORTANT

Unless measuring voltage, current or frequency, shut off and lock out power. Make sure that all capacitors are discharged. Voltage must not be present.

IMPORTANT

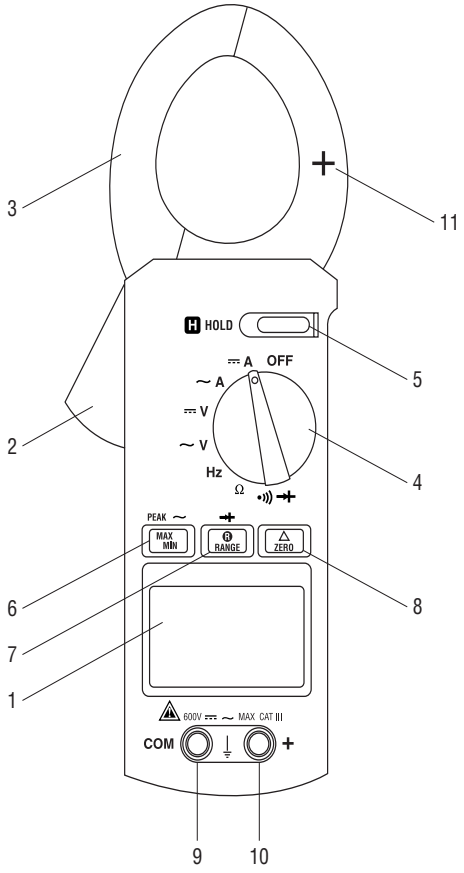
Set the selector and connect the test leads so that they correspond to the intended measurement. Incorrect settings or connections can result in a blown fuse.

IMPORTANT

Using this unit near equipment that generates electromagnetic interference can result in unstable or inaccurate readings.

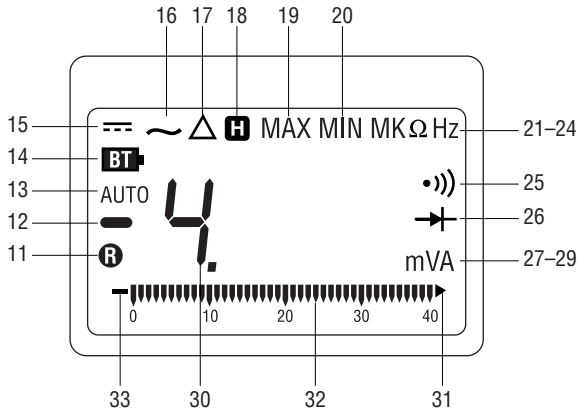
Identification

1. Display
2. Lever
3. Jaw
4. Selector
5. H HOLD Button
6. MAX/MIN Button
7. → R RANGE Button
8. Δ ZERO Button
9. COM Terminal
10. + Terminal
11. Polarity Indicator for DC Current Measurements



Display Icons

11.	Ⓡ	Manual Ranging is enabled.
12.	–	Polarity Indicator for Digital Display
13.	AUTO	Automatic Ranging is enabled.
14.	BT	Low Battery
15.	⎓	DC measurement is selected.
16.	~	AC measurement is selected.
17.	Δ	Relative mode is enabled.
18.	H	Hold function is enabled.
19.	MAX	MAX Hold function is enabled.
20.	MIN	MIN Hold function is enabled.
21.	M	Mega (10^6)
22.	K	Kilo (10^3)
23.	Ω	Ohms
24.	Hz	Hertz
25.	•)))	Continuity
26.	→|	Diode
27.	m	Milli (10^{-3})
28.	V	Volts
29.	A	Amps
30.	4	Overload for Digital Display
31.	▶	Overload for Bar Graph
32.	▮	Bar Graph Element
33.	–	Polarity Indicator for Bar Graph



Symbols on the Unit

⚠	Read the instruction manual.
⧈	Double Insulation
⊟	Battery

AC Measurement

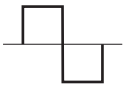
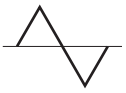
AC measurements are usually displayed as RMS *(root mean squared)* values. Two types of AC measurement method are *average-responding RMS calibrated* and *true RMS-reading*.

The average-responding RMS calibrated method takes the average value of the input signal, multiplies it by 1.11, and displays the result. This method is accurate if the input signal is a pure sine wave.

The true RMS-reading method uses internal circuitry to read the true RMS value. This method is accurate, within the specified crest factor limitations, whether the input signal is a pure sine wave, a square wave, sawtooth wave, half wave or signal with harmonics. The ability to read true RMS provides much more measurement versatility. The Greenlee CMI-100 is a true RMS meter.

The Waveforms and Crest Factors table shows some typical AC signals and their RMS values.

Waveforms and Crest Factors

Waveform				
RMS Value	100	100	100	100
Rectified Value	90	100	87	64
Crest Factor* (ξ)	1.414	1	1.73	2

* The crest factor is the ratio of the peak value to the RMS value; it is represented by the Greek letter ξ.

Using the Features

- **RANGE** Press once to enter the manual ranging mode. The AUTO icon will disappear from the display. Press repeatedly to step through the ranges. Press and hold to return to the automatic ranging mode.

  Note: The autoranging feature is not available in the MAX/MIN and Δ modes.

- **MAX/MIN (PEAK)** Holds the minimum or maximum value on the display. Since this feature only operates with manual ranging, press the **RANGE** button first to select the appropriate range, as described above. Press once to hold the minimum value; press again to hold the maximum value (or peak value, if measuring an AC signal). Press again to exit this mode.
- Δ **ZERO** Finds the difference between two measurements. While taking a measurement, press Δ to set the display to zero. The Δ icon will appear on the display. Take the second measurement. The value on the display will be the difference between the two measurements. Press and hold to exit this mode.
- **HOLD** Press momentarily to hold the present value on the display. Press again to exit this mode.

Operation

⚠WARNING

Electric shock hazard:

Contact with live circuits can result in severe injury or death.

1. Set the selector according to the Settings Table and connect the test leads to the unit. Start with the highest measurement range.

Settings Table

To measure this value …	set the selector to this symbol …	this icon will appear on the display …	connect the red lead to …	and connect the black lead to …
Continuity**	•))) → |	•))) and Ω	+	COM
Current (AC)	~ **A**	~ and A	N/A	N/A
Current (DC)	⎓ **A** and press △ **ZERO**	⎓ and A	N/A	N/A
Diode	•))) → | and press the **RANGE** button	→ | and V	+	COM
Frequency*	**Hz** and press the **RANGE** button	Hz	+	COM
Resistance	Ω	Ω	+	COM
Voltage (AC)	~ **V**	~ and V	+	COM
Voltage (DC)	⎓ **V**	⎓ and V	+	COM

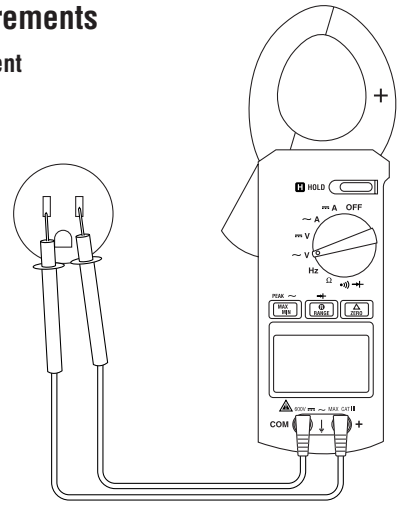
* Frequency can also be measured with the jaw. Current flow must be at least 5 amps for an accurate frequency reading.

** Tone indicates circuit resistance is less than 40 Ω.

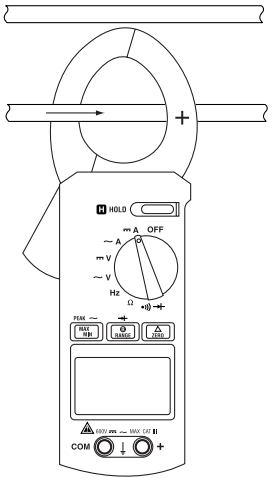
2. See Typical Measurements for illustrations of typical uses.
3. Test the unit on a known functioning circuit or component.
   - If the unit does not function as expected on a known functioning circuit, replace the battery.
   - If the unit still does not function as expected, send the unit to Greenlee for repair.
4. Take the reading from the circuit to be tested.

Typical Measurements

Voltage Measurement



Current Measurement—Clamp Around Wire



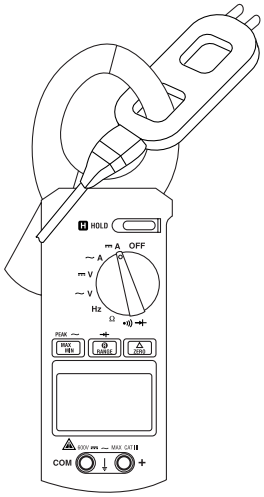
Notes:

- *Clamp the jaw around one conductor only.*
- *Close the jaw completely.*
- *Center the wire in the jaw for highest accuracy.*

Note: For DC measurements, current flowing through the jaw in the direction indicated by the arrow produces a positive reading.

Typical Measurements (cont'd)

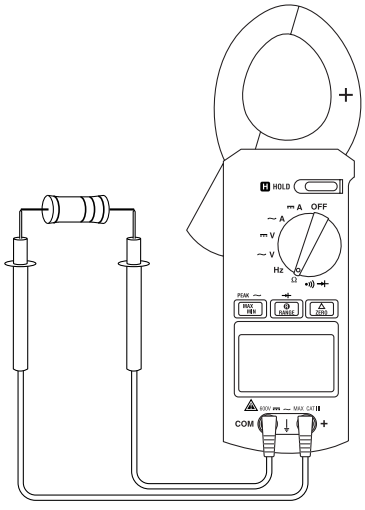
Current Measurement—Clamp Around Line Splitter



Notes:

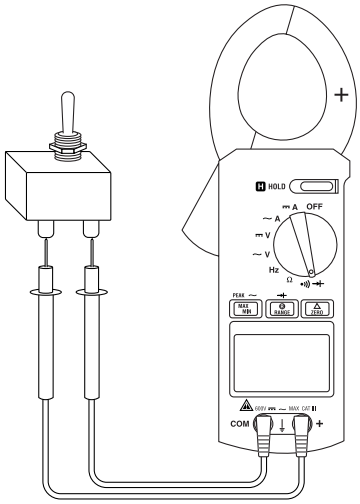
- *The Greenlee 93-30 Line Splitter is divided. One section renders amps; the other renders amps multiplied by 10.*
- *Close the jaw completely.*
- *Center the line splitter in the jaw for highest accuracy.*

Resistance Measurement

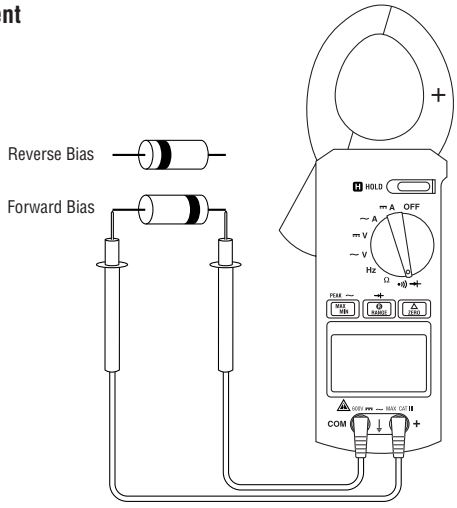


Typical Measurements (cont'd)

Continuity Check



Diode Measurement



Accuracy

See the Specifications section for operating conditions.

Accuracy is specified as follows: ± (a percentage of the reading + a fixed amount) at 18 °C to 28 °C (64 °F to 82 °F), 0% to 80% relative humidity.

Accuracy Table

Value	Range	Accuracy	Frequency Range	Input Impedance
Current (DC)	399.9 A	± (2% + 0.5 A)*		
	1000 A	± (2% + 5 A)*		
Current (AC)	399.9 A	± (2% + 1 A)*	40 to 450 Hz	
	1000 A	± (2% + 10 A)*		
Voltage (DC)	399.9 mV	± (0.75% + 0.2 mV)**		≥ 1000 MΩ
	3.999 V	± (0.75% + 0.002 V)**		≈ 11 MΩ
	39.99 V	± (0.75% + 0.02 V)**		≈ 10 MΩ
	399.9 V	± (0.75% + 0.2 V)**		
	600 V	± (0.75% + 2 V)**		
Voltage (AC)	399.9 mV	* * * *	40 to 450 Hz	
	3.999 V	± (1.2% + 0.005 V)*		≈ 11 MΩ
	39.99 V	± (1.2% + 0.05 V)*		≈ 10 MΩ
	399.9 V	± (1.2% + 0.5 V)*		
	600 V	± (1.5% + 5 V)*		
Frequency When Measuring Voltage	99.99 Hz	± (0.1% +0.02 Hz)†		
	999.9 Hz	± (0.1% + 0.2 Hz)†		
	9.999 kHz	± (0.1% + 0.002 kHz)†		
	99.99 kHz	± (0.1% + 0.02 kHz)†		
	800 kHz	± (0.1% + 0.2 kHz)††		
Frequency When Measuring Current	99.99 Hz	± (0.5% + 0.05 Hz)†††		
	999.9 Hz	± (0.5% + 0.5 Hz)†††		
Resistance (Open Circuit Voltage ≤ 0.5 VDC)	399.9 Ω	± (1% + 0.5 Ω)*		
	3.999 kΩ	± (1% + 0.003 kΩ)*		
	39.99 kΩ	± (1% + 0.03 kΩ)*		
	399.9 kΩ	± (1% + 0.3 kΩ)*		
	3.999 MΩ	± (1% + 0.003 MΩ)*		
	39.99 MΩ	± (1.5% + 0.03 MΩ)***		

* Allow 5 seconds for reading to stabilize.
** Allow 3 seconds for reading to stabilize.
*** Allow 15 seconds for reading to stabilize.
**** Accuracy not specified.

†Minimum input 100 mV.
††Minimum input 1 V.
†††Minimum input 5 A.

Accuracy (cont'd)

Additional Tolerance Due to Crest Factor

Crest Factor	Error (% of reading)
1 - 3	0.5%
3 - 5	3%
5 - 7	6%

Peak Hold Accuracy Table

Value	Range	Accuracy	Frequency Range	Input Impedance
AC Voltage (Manual Range)	3.999 V	± (2.5% + 0.01 V)	50 to 60 Hz	≈ 11 MΩ
	39.99 V	± (2.5% + 0.1 V)	50 to 60 Hz	≈ 10 MΩ
	399.9 V	± (2.5% + 1 V)		
	600 V	± (2.5% + 10 V)		
AC Current (Manual Range)	399.9 A	± (2.5% + 1 A)	50 to 60 Hz	
	1000 A	± (2.5% + 10 A)		

Diode Test

Test Current (Typical): 0.8 mA

Open Circuit Voltage: 3 V maximum

Accuracy: ± (1% + .002 V)

Continuity

Threshold: Tone indicates circuit resistance is ≤ 40 Ω.

Open Circuit Voltage: ≤ 0.5 V

Specifications

Display: 3-3/4–digit LCD (3999 maximum reading) and 40-segment bar graph

Polarity: Automatic

Sampling Rate:
Numeric Display: 2 per second
Bar Graph Display: 20 per second

Auto Power Off: 30 minutes after last function change. Disable this feature by pressing any button while turning the unit on.

Over Range Indication: “4” will flash in the left-most position, accompanied by a continuous beeping (except for ranges of 1000 A AC/DC and 600 V AC/DC).

Jaw Opening: 46 mm (1.811")

Overvoltage Category: Category III, 600 Volts

Operating Conditions: 0 °C to 40 °C (32 °F to 104 °F), 0% to 80% relative humidity (non-condensing)
Elevation: 2000 m (6500') maximum
Indoor use

Storage Conditions: –10 °C to 60 °C (14 °F to 140 °F), 0% to 70% relative humidity (non-condensing). Remove battery.

Pollution Degree: 2

Battery: 9-Volt battery (NEDA 1604, JIS 006P or IEC 6LF22)

Battery Replacement

⚠WARNING

Before opening the case, remove the test leads or jaw from the circuit and shut off the unit. Failure to observe this warning can result in severe injury or death.

1. Disconnect the unit from the circuit. Turn the unit OFF.
2. Remove the screws from the back cover.
3. Remove the back cover.
4. Replace the battery (observe polarity).
5. Replace the cover and screws.

GREENLEE®

Greenlee Textron / Subsidiary of Textron Inc. 4455 Boeing Dr., Rockford, IL 61109-2988 815/397-7070

Descripción

El Amperímetro con pinza modelo CMI-100 de Greenlee es un instrumento de verificación capaz de efectuar los siguientes tipos de mediciones: tensión alterna y continua, corriente alterna y continua, frecuencia y resistencia. Esta unidad es de bolsillo y cabe perfectamente en la palma de la mano. También está diseñada para verificar diodos y continuidad.

Acerca de la seguridad

Es fundamental observar métodos seguros al utilizar y dar mantenimiento a las herramientas y equipo Greenlee. Este manual de instrucciones y todas las marcas que ostenta la herramienta le ofrecen la información necesaria para evitar riesgos y hábitos poco seguros relacionados con su uso. Siga toda la información sobre seguridad que se proporciona.

Propósito de este manual

Este manual de instrucciones tiene como propósito familiarizar a todo el personal con los procedimientos de operación y mantenimiento seguros para el Amperímetro con pinza, modelo CMI-100 de Greenlee.

Mantenga siempre este manual al alcance de todo el personal.

Puede obtener copias adicionales de este manual de manera gratuita, previa solicitud.

CONSERVE ESTE MANUAL

Importante Información sobre Seguridad

SÍMBOLO DE ALERTA SOBRE SEGURIDAD

Este símbolo se utiliza para indicar un riesgo o práctica poco segura que podría ocasionar lesiones o daños materiales. Cada uno de los siguientes términos denota la gravedad del riesgo. El mensaje que sigue a dichos términos le indica cómo puede evitar o prevenir ese riesgo.

⚠PELIGRO

Peligros inmediatos que, de no evitarse, OCASIONARÁN graves lesiones o incluso la muerte.

⚠ADVERTENCIA

Peligros que, de no evitarse, PODRÍAN OCASIONAR graves lesiones o incluso la muerte.

⚠PRECAUCIÓN

Peligro o prácticas peligrosas que, de no evitarse, PUEDEN OCASIONAR lesiones o daños materiales.

⚠ADVERTENCIA

Lea y **entienda** este documento antes de manejar esta herramienta o darle mantenimiento. Utilizarla sin comprender cómo manejarla de manera segura podría ocasionar un accidente, y como resultado de éste, graves lesiones o incluso la muerte.

⚠ADVERTENCIA

Peligro de electrocución:

El contacto con circuitos activados puede ocasionar graves lesiones o incluso la muerte.

Importante Información sobre Seguridad

⚠ADVERTENCIA

Peligro de electrocución:

- No utilice este amperímetro si se encuentra mojado o dañado.
- Utilice cables de prueba y accesorios que sean apropiados para la aplicación que se va a realizar. Consulte la información sobre categoría y voltaje nominal del cable de prueba o el accesorio.
- Revise minuciosamente los cables de prueba o el accesorio, antes de utilizarlos. Deberán estar limpios y secos, y su forro aislante deberá hallarse en buenas condiciones.

De no observarse estas advertencias pueden sufrirse graves lesiones o incluso la muerte.

⚠ADVERTENCIA

Peligro de electrocución

- No aplique más del voltaje nominal entre dos terminales de entrada cualesquiera, o entre una terminal de entrada cualquiera y una conexión a tierra.
- No toque las puntas de los cables de prueba ni ninguna parte del accesorio que carezca de forro aislante.

De no observarse estas advertencias pueden sufrirse graves lesiones o incluso la muerte.

⚠ADVERTENCIA

- No haga funcionar este amperímetro con la caja abierta.
- Antes de abrir la caja, retire del circuito los cables de prueba o la pinza, y apague la unidad.

De no observarse estas advertencias pueden sufrirse graves lesiones o incluso la muerte.

Importante Información sobre Seguridad

⚠ PRECAUCIÓN

No cambie la función de medición mientras los cables de prueba estén conectados a un componente o circuito.

De no observarse estas precauciones podrían sufrirse lesiones o daños a la unidad.

⚠ PRECAUCIÓN

- No intente reparar esta unidad, ya que contiene piezas que deben recibir mantenimiento por parte de un profesional.
- No exponga la unidad a ambientes de temperatura extrema ni a altos niveles de humedad. Véase la sección “Especificaciones” en este manual.

De no observarse estas precauciones podrían sufrirse lesiones o daños a la unidad.

IMPORTANTE

A menos que vaya a medir voltaje, corriente o frecuencia, apague y bloquee la energía. Asegúrese de que todos los condensadores estén totalmente sin carga. No debe haber voltaje alguno.

IMPORTANTE

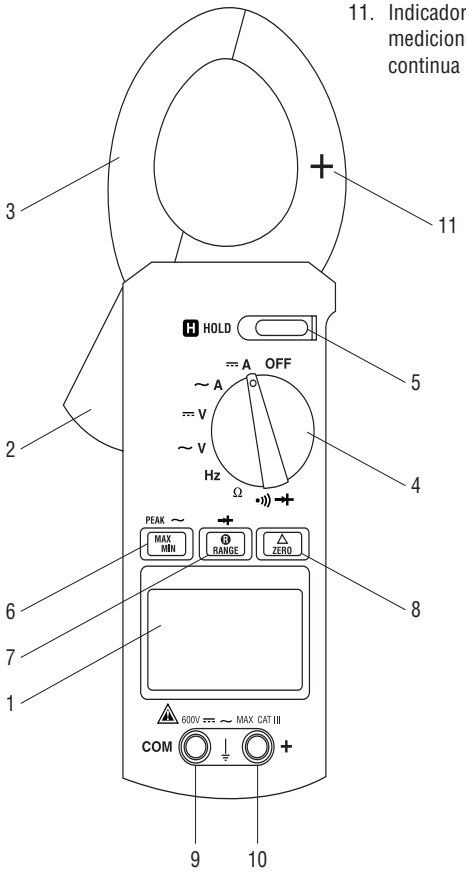
Coloque el interruptor de selección y conecte los cables de prueba de modo que correspondan al tipo de medición que se desea efectuar. Si se colocan o se conectan incorrectamente puede quemarse un fusible.

IMPORTANTE

Al utilizar la unidad cerca de equipo que genere interferencia electromagnética quizá se obtenga una lectura inexacta e inestable.

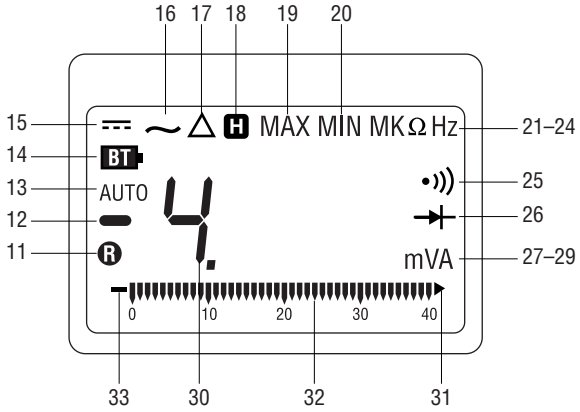
Identificación

1. Pantalla
2. Palanca
3. Pinza
4. Interruptor de selección
5. H Botón “Hold” (Retención de datos en pantalla)
6. Botón “MAX/MIN” (Valor máximo/mínimo)
7. →|– R Botón “RANGE” (Escala)
8. Botón “Δ ZERO”
9. Terminal COM
10. + Terminal
11. Indicador de polaridad para mediciones de corriente continua



Iconos de la pantalla

11.	R	Se activa la selección manual de escala.
12.	–	Indicador de polaridad para la pantalla digital
13.	AUTO	Se activa la selección automática de escala.
14.	BT	Pila baja
15.	⎓	Se selecciona medición de CC.
16.	~	Se selecciona medición de CA.
17.	Δ	Se activa el modo relativo.
18.	H	Se activa la función “Hold”.
19.	MAX	Se activa la función “Hold MAX” (Retención en pantalla del valor máximo).
20.	MIN	Se activa la función “Hold MIN” (Retención en pantalla del valor mínimo).
21.	M	Mega (10^6)
22.	K	Kilo (10^3)
23.	Ω	Ohmios
24.	Hz	Hertzios
25.	•)))	Continuidad
26.	⊣◁⊢	Diodo
27.	m	Mili (10^{-3})
28.	V	Voltios
29.	A	Amperios
30.	4	Sobrecarga (pantalla digital)
31.	▶	Sobrecarga (gráfico de barras)
32.	▮	Elemento de gráfico de barras
33.	–	Indicador de polaridad para el gráfico de barras



Símbolos en la unidad

⚠	Lea el manual de instrucciones.
⧈	Doble forro aislante
⊟+	Pila

Medición de corriente alterna

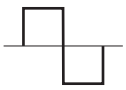
Las mediciones de corriente alterna generalmente se muestran como valores eficaces *(RMS o root mean squared)*. Existen dos métodos de medición de corriente alterna: *calibrados para responder al valor eficaz medio* y *a una lectura de valores eficaces reales*.

El método calibrado para responder al valor eficaz medio toma el valor medio de la señal de entrada, la multiplica por 1,11 y muestra el resultado. El resultado es exacto si la señal de entrada es una onda sinusoidal pura.

El método de lectura de valores eficaces reales utiliza un circuito interno para leer el valor eficaz real. Este método es exacto, dentro de las limitaciones de factor de cresta especificadas, independientemente del tipo de señal de entrada, ya sea una onda sinusoidal pura, rectangular, en diente de sierra o señal con armónicas. La capacidad para leer valores eficaces reales brinda una mayor versatilidad de medición. El amperímetro modelo CMI-100 de Greenlee es un medidor de valores eficaces reales.

La tabla de Formas de onda y Factores de cresta muestra algunas de las señales de CA y valores eficaces reales más comunes.

Formas de onda y Factores de cresta

Forma de onda				
Valor eficaz real	100	100	100	100
Valor rectificado	90	100	87	64
Factor de cresta* (ξ)	1,414	1	1,73	2

* El factor de cresta es el cociente de un valor máximo en relación con el valor eficaz; está representado por la letra griega ξ.