LH240
LH1040
LH2040
LH2015

AC/DC Clamp On Multimeters
Pinces Multimétriques AC/DC
AC/DC Zangen-Multimeter
Multimetri tenaglia c.a./c.c.
Multímetros de inserción de C.A./C.C.

Operating Instructions
Mode d'emploi
Bedienungsanleitung
Istruzioni per il funzionamento
Instrucciones de Funcionamiento

LEM

International Electrical Symbols	
⚠	Caution! Refer to this manual before using the meter
⧈	Meter is protected by Reinforced or Double Insulation

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CE

Issue 4 05/06/97

1. INTRODUCTION

The advanced design of the LH series instruments ensures reliable and accurate measurements under a wide range of operating conditions. Measurement features include:

- Non-intrusive AC/DC current
- True RMS for complex and distorted waveforms
- AC/DC current component analysis
- Autoranging and Autozeroing
- AC/DC Volts *
- Ohms, Continuity and Diode Test *
- Max RMS (surge) and Data Hold
- Analogue outputs for recoder, logger or oscilloscope *

*** LH40 series only (LH240, LH1040, LH2040)**

The LH series of instruments conform to the latest international directives and standards concerning safety and electromagnetic compatibility.

- European Low Voltage Directives 73/23/EEC and 93/68/EEC
- European EMC Directives 89/336/EEC and 93/68/EEC
- Submitted for approval to UL 3111-1

Safety Standards

IEC 1010-1: 1992-09 Safety requirements for electrical equipment for measurement, control and laboratory use.

Part 2-032: 1994-12 Particular requirements for hand held current clamps for electrical measurement and test.

Part 2-031: 1993-02 Particular requirements for hand held probe assemblies for electrical measurement and test.

600V Cat III Pollution degree 2

EMC Standards

RF Susceptibility

EN 50082-1: 1992 3V/m Residential, Commercial and Light Industry

RF Emissions

EN 50081-1: 1992 Residential, Commercial and Light Industry

FCC Part 15 Class B

1.1 Instrument Features

The main operating features of the instrument are as follows. See Fig. 1.

(1) Clamp-on jaws for current measurement

(2) Jaw opening lever

(3) Rotary switch for function selection

(4) Push button switch for MAX/))) selection.

MAX holds the maximum RMS value when in the current or volts mode.

))) selects continuity buzzer when in Ohms mode *

(5) Push button switch for display HOLD

(6) Sliding safety shutter allowing access to either the test lead input terminals or the analogue output port *

(7) V out - Analogue output port *

(8) and (9) - Test lead input terminals *

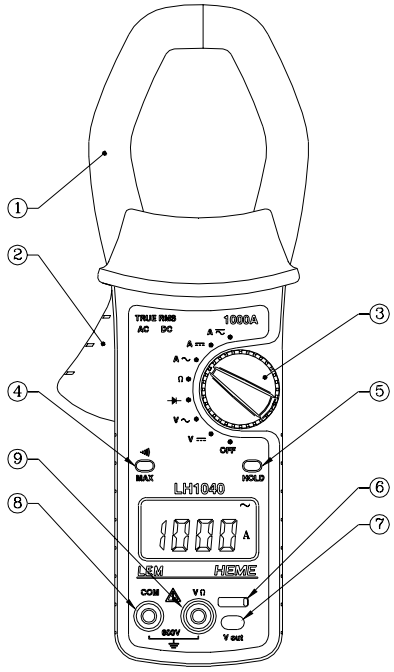

Fig. 1
Instrument Features

2. SPECIFICATION

2.1 Electrical data

(All accuracies stated at 23°C ± 1°C)

2.1.1 Current measurement

(DC, DCRMS*, ACRMS)

LH240

Measuring range		0 - 200A DC or AC pk
Autorange facility		40A / 200A
Resolution		10mA in 40A range 100mA in 200A range
Accuracy	I > 5A.....	± 1.3% rdg ± 3 digits
	I < 5A	± 0.2A

LH1040

Measuring range		0 - 1000A DC or AC pk
Autorange facility		400A / 1000A
Resolution		100mA in 400A range 1A in 1000A range
Accuracy	I > 15A.....	± 1.3% rdg ± 3 digits
	I < 15A	± 0.5A

LH2040/LH2015

Measuring range		0 - 2000A DC or AC pk
Autorange facility		400A / 2000A
Resolution		100mA in 400A range 1A in 2000A range
Accuracy	I > 25A.....	± 1.3% rdg ± 3 digits
	I < 25A	± 1.0A
Frequency range		DC and 15Hz to 1kHz in DCRMS 15Hz to 1kHz in ACRMS

Frequency characteristics above 1kHz

Signal Amplitude	3dB @ 5kHz
	6dB @ 10kHz
Crest factor	6 maximum
Maximum overload	10,000A or ACRMS x frequency < 400,000

Amps ACRMS or DCRMS* offer AC or DC coupling of the amps measurement respectively.

2.1.2 Max RMS Current

This function is actuated by pressing MAX/))) when in DC, DCRMS*, ACRMS Amps. No polarity indication is given for DC readings. Typical acquisition time is 100ms

Accuracy	± 2% rdg ± 4 digits
Frequency Range	DC and15 Hz to 1kHz in DCRMS *
	15 Hz to 1kHz in ACRMS
Crest Factor.....	6 maximum

2.1.3 Voltage measurement*

(DC,ACRMS)

Measuring range.....	0-600V
Autorange Facility.....	400V / 600V
Resolution	100mV in 400V range
	1V in 600V range
Accuracy AC/DC	± 1% rdg ± 3 digits
AC < 20V	± 1V
Frequency Range	DC in DC
	15 Hz to 1kHz in ACRMS
Maximum Overload	1000V
Crest Factor	6 maximum

2.1.4 Max RMS Voltage *

This function is activated by pressing MAX/))) when in DC or ACRMS. No polarity indication is given in DC. Typical acquisition time is 100mS

Accuracy	± 2% rdg ± 4 digits
Frequency Range	15 Hz to 1kHz in ACRMS
Crest Factor.....	6 maximum

2.1.5 Diode Test *

Measurement of the voltage drop across a forward biased diode.

Measuring range	0-2V
Resolution	1mV
Accuracy	± 1% rdg ± 2 digits
Input protection.....	600V
	(DC or sinewave RMS)

2.1.6 Resistance Measurement *

Measuring range	0-4 kΩ

Autorange Facility.....	400Ω/4kΩ
Resolution	100mΩ in 400Ω range 1Ω in 4kΩ range
Accuracy	± 1% rdg ± 3 digits
Input protection.....	600V (DC or sinewave RMS)

2.1.7 Continuity *

This function is actuated by pressing the MAX/))) button when in Ω measurement. The buzzer will sound for values of resistance below ≈ 50Ω.

2.1.8 Analogue Output (Current Measurement) *

An analogue output of the measured current is provided for use with oscilloscopes and recording equipment. This can be accessed when the voltage input terminals are blocked off by the sliding safety cover. The output, either instantaneous or rms, is switch selectable by a slider switch located in the battery compartment.

SAFETY WARNING
Before removing the battery cover, make sure that all external voltages are disconnected from the instrument. For certainty remove all leads.

Output voltage in all ranges:

LH240.....	5mV/A
LH1040.....	1mV/A
LH2040.....	0.5mV/A
Accuracy	± 1.3% rdg ± 1mV (RMS) ± 1.3% rdg ± 7mV (Instantaneous)
Frequency Range ..	DC -1kHz Instantaneous DC and 15Hz to 1kHz true RMS

Frequency characteristics above 1kHz.

Signal / Amplitude .	3dB @ 5kHz 6dB @ 10kHz

The analogue output adapter plugs into the front of the instrument and the output is obtained from a standard BNC plug.

2.2 General Data

2.2.1 Display

Display 4000 count 12mm high characters.

	Low battery indicator
Pk	Max RMS Amps or Volts
~	AC
⎓	DC, DCRMS *
	Diode *
kΩ	Ohms *
)))	Continuity *
H	Hold

2.2.2 Power Supply

Battery Type 9V Alkaline PP3 ,NEDA1604 or IEC 6LR61

Battery life typically 40 hours continuous operation.

2.2.3 Environmental

FOR INDOOR USE ONLY

Reference conditions. All accuracies stated at 23°C ± 1°C

Temperature coeff. of current ±0.1% of rdg per °C

Operating Temperature 0°C to 50°C (32°F to 122°F)

Maximum Relative Humidity 80% for temperatures up to 31°C (87°F) decreasing linearly to 50% Relative Humidity at 40°C (104°F)

Storage Temperature -20°C to +60°C (-4°F to 140°F)

Maximum operating altitude 2000m.

2.2.4 Mechanical

Dimensions ..... Length 251mm / 9.88”

	Width	98mm / 3.86”
	Depth	52mm / 2.05”
Weight.....	500g / 1.1 lbs.	
Case Material	Bayblend T85MN	
Jaw Opening	55mm / 2.2”	
Accessories.....	Voltage probes *	
	Analogue Output lead *	
	Carrying case	
	Operators manual	
Cleaning	The unit can be cleaned with an isopropanol impregnated cloth. Do not use abrasives or other solvents.	

3. OPERATING INSTRUCTIONS

International Symbols	
⚠	Important Information (See Manual)
~	AC
⎓	DC
Ω	Ohms
→|–	Diode
⧈	Double Insulation

The instrument function is selected by a rotary switch with the following positions :-

The instrument function is selected by a rotary switch with the following positions :-

OFF	Instrument off
V ⎓	Volts DC *
V~	Volts ACRMS *
→|–	Diode measurement *
Ω	Ohms measurement *
A~	Amps ACRMS (AC Component)
A ⎓	Amps DC (DC Component)
A⎓~	Amps DCRMS (AC+DC) *

3.1 Measurement of AC or DC current

- **Remove any Voltage test leads from the instrument.**
- Move the rotary switch to Amps AC, DC or DCRMS*.
- Wait until the autozero operation has completed and the display reads 00.00 (LH240), 000.0 (LH1040, LH2040, LH2015) to within ±3 digits.
- Press the trigger to open the jaws and clamp them around the current carrying conductor as shown in Fig. 2
- Read the display
- Use the HOLD button to freeze the display.
- Use the))))/MAX button to measure the max RMS current.
- Note that the Amps autozero is initiated by the movement of the rotary switch from the Ω position to the Amps measurement positions. If, after a high current measurement, the display does not return to zero, then a re-autozero can be initiated by the movement of the rotary switch into and out of the Ω selection position for the LH40 series and from OFF to Amps DC for the LH2015.

3.2 Resistance Measurement *

- Insert the test leads into the sockets on the front of the instrument, the red lead to the VΩ terminal and the black lead to the COM terminal.
- Move the rotary switch to the Ω position.
- Apply the test leads across the component whose resistance is to be measured. Read the displayed value.
- Use the HOLD button to freeze the display. Use the))))/MAX button to select the continuity facility. The buzzer will sound for resistance measurements below ≈ 50Ω.

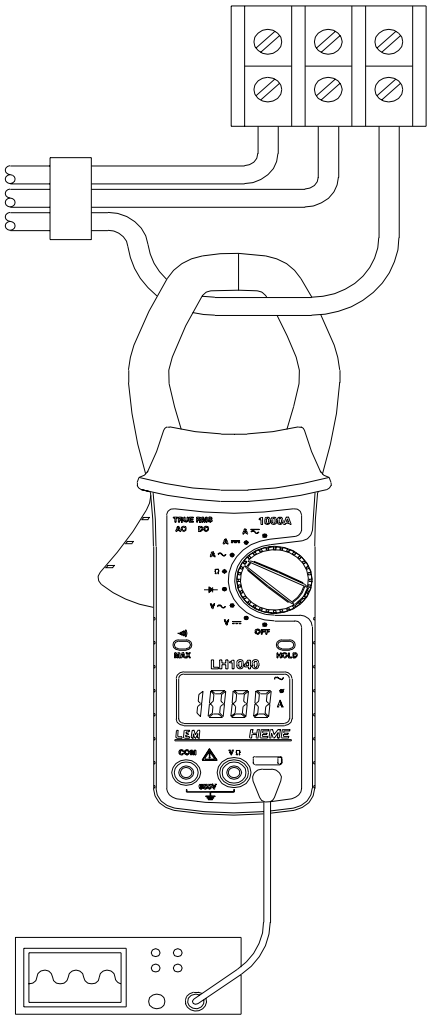

Fig. 2
Current Measurement

3.3 Measurement of AC or DC Voltage *

SAFETY WARNING
To avoid possible electric shock and damage to the instrument, do not attempt to measure any voltage that might exceed the maximum range of the instrument - 600Vrms and 1kHz.

- Move the rotary switch to the V DC or V AC position.
- Insert the test leads into the sockets on the front of the instrument. Connect the RED lead to the VΩ terminal and the black lead to the COM terminal.
- Apply the test leads to the circuit under test and read the displayed voltage. See Fig. 3
- Use the HOLD button to freeze the display.
- Use the))))/MAX button to measure the max RMS voltage

3.4 DiodeTest *

- Insert the test leads into the sockets on the front of the instrument, the red lead to the VΩ terminal and the black lead to the COM terminal.
- Move the rotary switch to the position.
- Apply the test leads across the diode to be tested. Read the displayed value.
- Use the HOLD button to freeze the display.

3.5 Analogue Output *

SAFETY WARNING
Before removing the battery cover, make sure that all external voltages are disconected from the instrument. For certainty remove all leads.

Measured current values can be output to an oscilloscope, chart recorder or other recording instruments via the analogue output lead.

The analogue output lead is rated at 300V RMS maximum working voltage IEC1010 CAT III.

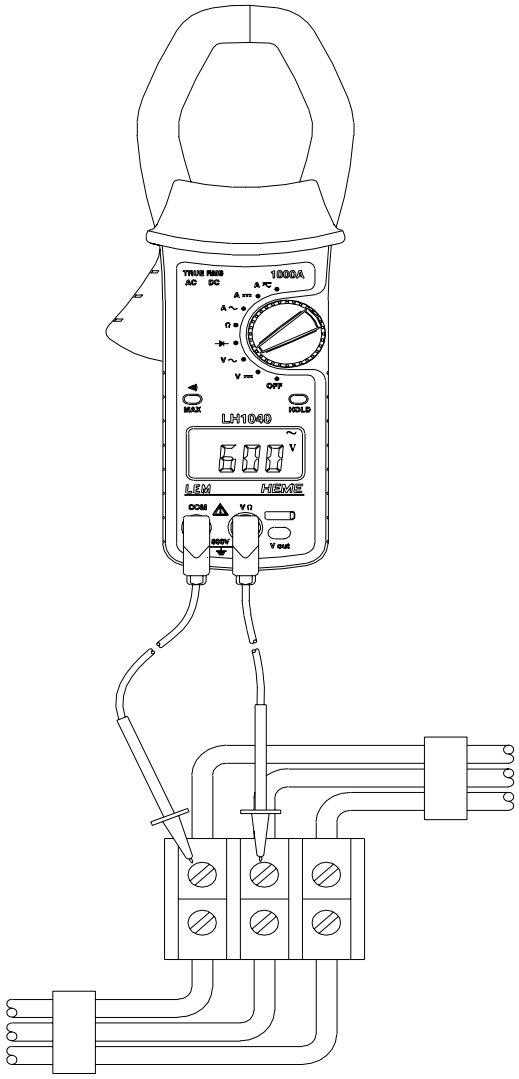

Fig. 3
Voltage Measurement

If the analogue output lead is connected to a hand held oscilloscope, then the maximum working voltage that may be connected to any of the other oscilloscope inputs must be less than 300V RMS to Earth.

- Located in the battery compartment is a slide switch, which selects either the instantaneous or RMS analogue output. See “Battery Replacement”, section 5, for details of gaining access to the battery compartment. With the battery removed from the compartment, the required output can be selected by moving the switch to either the INST or RMS position. The instantaneous output is intended for waveform analysis, while the RMS signal is a DC output suitable for chart recorders.
- Replace the battery and cover.
- Slide the safety shutter at the bottom right hand side of the instrument to the left, blocking off access to the voltage input terminals and exposing the analogue socket.
- Insert the analogue output lead plug into the socket on the lower right hand side of the instrument.
- Insert the BNC plug, at the opposite end of the Instantaneous/RMS lead, into an oscilloscope or chart recorder.
- Select Amps ACRMS or DCRMS

4. SAFETY

The instrument has been designed to comply with IEC1010-2-032 Installation Category (Overvoltage Category) III 600V Pollution degree 2 and UL 3111-1. The product range conforms with the EEC Low Voltage Directive 73/23/EEC and 93/68/EEC. IEC 1010 is a safety standard which has the following features:

- Installation categories I to IV relate the maximum working voltage to overvoltage transients that can be expected in the measuring environment. For the LH range of instruments, 600V CATIII, the maximum expected transients must not exceed 6kV peak.
- In a pollution degree 2 environment the internal design of the instrument can cope with transient conductivities due to condensation.

Users of this equipment and or their employees are reminded that Health and Safety Legislation require them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads constructed in accordance with the HSE guidance note GS38 ‘Electrical Test Equipment for use by Electricians’ is advised.

Safe operation of the instrument is the responsibility of the operator who must be suitably qualified and/or authorised.

Maximum Safe Voltage

Current :- 600V MAXIMUM AC RMS or DC between uninsulated conductor and ground and maximum frequency of 1kHz. This limitation applies to bare conductors only.
Voltage:- 600V MAXIMUM AC RMS or DC between live conductor and ground. 600V MAXIMUM AC RMS or DC between VΩ and COM terminals and a maximum frequency of 1kHz *.

Important Information

- The instrument is intended for indoor use only.
- Do not attempt to take any measurement of current or voltage higher than the maximum range of the instrument.
- The unit is not hermetically sealed and should NOT be brought into contact with surface water.
- Frequently inspect the test leads and the instrument for damage. If the instrument is physically damaged or does not function properly, it should not be used.

USE ONLY SUITABLY RATED VOLTAGE TEST LEADS TO IEC 1010-2-031. (600V CAT III Pollution Degree 2).

5. BATTERY REPLACEMENT

Replacement with other than the specified battery will invalidate the warranty.
Fit only Battery Type 9V Alkaline MN1604, IEC 6LR61 or equivalent.
- + will appear on the top row of the LCD display to indicate that the minimum operating battery voltage has been reached.

SAFETY WARNING
Before removing the battery cover, make sure that all external voltages are disconected from the instrument. For certainty remove all leads.

To change the battery, see Fig. 4
- Switch off the instrument
- Undo the retaining screw on the battery cover and lift the cover clear of the unit.
- Replace the used battery. Ensure the battery cover is replaced and the locking screw tightened, before further use.

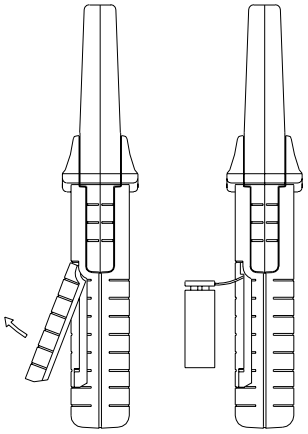

Fig. 4
Battery Replacement

6. WARRANTY

Your LEM HEME clamp on multimeter is guaranteed for one year from the date of purchase against defective material or workmanship. If the meter fails during the warranty period, we shall at our discretion, repair or replace it with a new or reconditioned unit provided we are satisfied that the failure is due to defective material or workmanship. To make a claim under warranty, the meter should be returned to us, postage prepaid, with a description of the defect. The use of a battery, other than that specified invalidates this warranty.

Goods alleged by the buyer to be defective shall not form the subject of any claim for injury, loss, damage, or any expense howsoever incurred whether arising directly or indirectly from such alleged defects other than death or personal injury resulting from the seller‘s negligence.

No condition is made or to be implied nor is any warranty given or to be implied as to the life or wear of goods supplied or that they will be suitable for any particular purpose or for use under specific conditions, notwithstanding that such purpose or conditions may be made known to the seller.

7. OTHER PRODUCTS

The LEM group offers a wide range of non-invasive transducers, probes and instrumentation for the measurement and analysis of current, voltage and power.

Since the introduction of the world's first digital AC/DC clamp-on ammeter in 1982, LEM HEME has continued to provide innovative test and measurement solutions encompassing current measurement from 5mA to 2000A.

LEM HEME policy is one of continuous product improvement and the company reserves the right to revise the above specifications without notice.

*** LH40 series only (LH240, LH1040, LH2040)**