■ MEGOHMMETER

6527

User Manual

AEMC® INSTRUMENTS

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met its published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer.

Serial #: _____

Catalog #: 2126.53

Model #: 6527

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

AEMC® INSTRUMENTS

Chauvin Arnoux®, Inc.
d.b.a AEMC® Instruments

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CHAPTER 1

INTRODUCTION

WARNING

This device complies with safety standard IEC-61010-1.

(Ed 2–2001) for voltages up to 600V in category IV, at an altitude of less than 2000m, indoors, with a pollution level of not more than 2.

These safety instructions are intended to ensure the safety of persons and proper operation of the device. If the tester is used other than as specified in this data sheet, the protection provided by the device may be impaired.

- Do not use the instrument in an explosive atmosphere or in the presence of flammable gases or fumes.
- Do not use the instrument on networks of which the voltage or category exceeds those mentioned.
- Do not exceed the rated maximum voltages between terminals or with respect to ground/earth.
- Do not use the instrument if it appears to be damaged, incomplete, or not properly closed.
- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any element of which the insulation is deteriorated (even partially) must be set aside for repair or scrapped.
- Use leads and accessories rated for voltages and categories at least equal to those of the instrument.
- Observe the environmental conditions of use.
- Do not modify the instrument and do not replace components with “equivalents”. Repairs and adjustments must be done by approved qualified personnel.
- Replace batteries as soon as the symbol appears on the display. Disconnect all leads before opening battery compartment cover.
- Replace the defective fuse with a fuse having identical characteristics. Disconnect all leads before opening the fuse compartment cover.
- Use personal protective equipment when conditions require.
- When handling probes or contact tips, keep your fingers behind the guards.

1.1 International Electrical Symbols

	Signifies that the instrument is protected by double or reinforced insulation.
	This symbol on the instrument indicates a WARNING that the operator must refer to the user manual for instructions before operating the instrument. In this manual, the symbol preceding instructions indicates that if the instructions are not followed, bodily injury, installation/sample and/or product damage may result.
	Compliance with the Low Voltage & Electromagnetic Compatibility European directives (73/23/CEE & 89/336/CEE)
	AC – Alternating current
	AC or DC – Alternating or direct current
	Risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.
	Important instructions to read and understand completely.
	Helpful information to acknowledge.
	Ground/Earth symbol
	In conformity with WEEE 2002/96/EC

1.2 Definition of Measurement Categories

CAT I: For measurements on circuits not directly connected to the AC supply wall outlet such as specially protected lines (mains) derived circuits.

CAT II: For measurements performed on circuits directly connected to the electrical distribution system (AC supply wall outlet). Examples are measurements on household appliances or portable tools.

CAT III: For measurements performed in the building installation at the distribution level such as on hardwired equipment in fixed installation and circuit breakers.

CAT IV: For measurements performed at the primary electrical supply (< 1000V) such as on primary overcurrent protection devices, ripple control units, or meters.

1.3 Receiving Your Shipment

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

1.4 Ordering Information

Megohmmeter Model 6527..... **Cat. #2126.53**

Includes set of two 5 ft color-coded leads (red/black) with alligator clips, 1 black test probe, soft carrying case and a user manual.

1.4.1 Accessories and Replacement Parts

Lead – Set of 2, Color-coded 5 ft Safety Leads
w/Color-coded Alligator Clips (UL), & Test Probe..... **Cat. #2119.01**

Case - Replacement Carrying Pouch..... **Cat. #2126.75**

Fuse - Set of 5, 0.5A, 1000V, HPC, 6x32mm..... **Cat. #2970.97**

PRODUCT FEATURES

2.1 Description

The Model 6527 is a portable multi-range megohmmeter capable of measuring insulation resistance from 1kΩ to 4000MΩ. It has three user selectable test voltages of 250V, 500V and 1000V.

The Model 6527 also features a continuity test function with audible beeper for resistances under 35Ω, and an overload protection of 600Vrms. In addition it can measure resistance up to 400kΩ.

The TEST button has an associated locking feature for continuous tests up to three minutes, eliminating the need to manually hold down the button.

This lightweight, easy-to-use megohmmeter can be used for most commonly performed insulation tests, such as on cables, switch gears, motors, DC generators, power tools and small appliances.

2.2 Key Features

- Insulation test voltage selections of 250V, 500V and 1000V
- Measure insulation to 4000MΩ (4GΩ)
- TEST LOCK feature for time sensitive measurements
- Auto discharge after insulation test
- AC/DC voltmeter to 600VAC and 1000VDC
- Resistance measurements up to 400kΩ
- Continuity measurements with 200mA test current
- Test lead resistance compensation for accurate low resistance measurements
- Auto HOLD function to “freeze” readings
- Large and bright dual display with blue backlight
- Auto Power Off
- Ergonomic over-molded case with back-stand
- Complies with International Insulation Testing Standards including EN61557
- CE marked and 600V CAT IV rating

2.3 Control Features

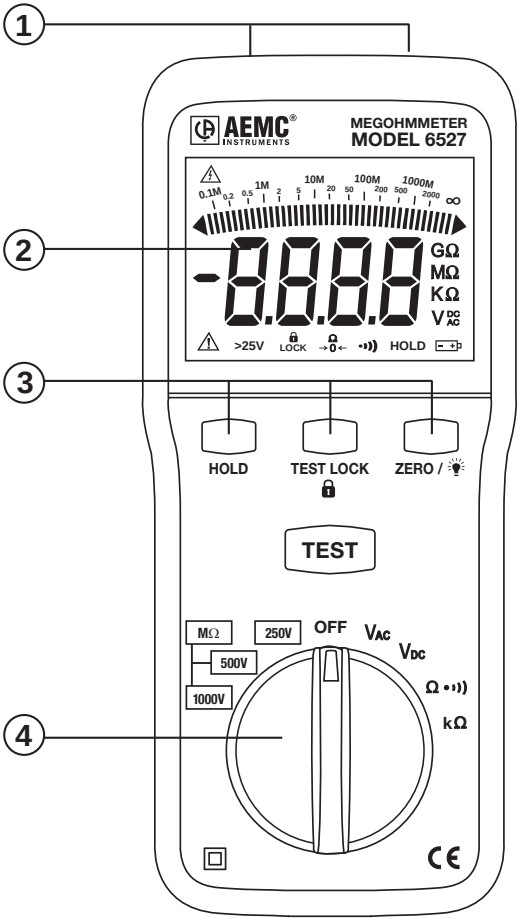

Figure 2-1

1. VΩ Jack / COM input jack
2. LCD Display (see § 2.4)
3. Data Hold, Test Lock and Zero/Backlight buttons (see § 2.5)
4. Rotary Function Switch (see § 2.7)

2.4 Display

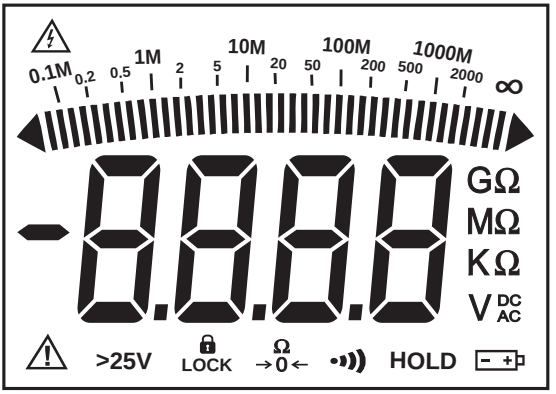

Figure 2-2

Symbol	Description
⚠	Risk of electric shock
⚠ **> 25V**	Not used
LOCK	Test lock function enabled
Ω →0←	Lead compensation for resistance measurements
•))	Continuity measurement with buzzer
HOLD	Locking of the display
− +	Indicates the battery is low and must be replaced (see § 4.1)
G	Giga-
M	Mega-
K	Kilo-
V	Volt
Ω	Ohm
AC	Alternating current
DC	Direct current
OL	Indicates overload on the measured signal

2.5 Button Functions

Button	Range	Function
HOLD	Any Position	• Short Press: Holds the display of the measured value. When activated, The HOLD symbol will appear and the measurement is locked. To deactivate, press the HOLD button again. • Long Press: Deactivates the Auto-off function at start-up **NOTE:** For insulation measurements, the HOLD feature is automatically activated after each measurement.
TEST LOCK 🔒	250V 500V 1000V	The Test Lock 🔒 button allows the user to perform insulation measurements in a permanent mode. • Press the button once to turn the LOCK function ON. • Press once again to turn the LOCK function OFF.
ZERO/ 💡	VAC VDC Ω •ı)) kΩ	• Short Press: compensates the measurement leads (see § 3.6.1)
	Any Position	• Long Press: Activates/deactivates the backlighting
TEST	250V 500V 1000V	• Long Press: Starts the insulation measurement **NOTE:** Press the button down until the insulation measurement is stabilized. After each measurement, the HOLD symbol is displayed.

2.6 Auto-OFF Function

The Model 6527 automatically turns off after 10 minutes of non-use. At 9 minutes, five beeps warn that the unit is about to be turned off. To turn the megohmmeter back on, turn the rotary switch to OFF, then to the desired function.

NOTE: Auto-off can be deactivated by pushing the HOLD button when turning the rotary switch ON.

2.7 Function Switch Positions

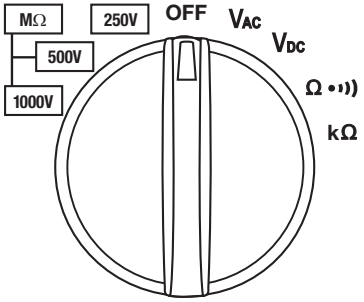

Figure 2-3

Range	Function
1000V	Insulation measurement at 1000V
500V	Insulation measurement at 500V
250V	Insulation measurement at 250V
OFF	Turns the instrument OFF
VAC	AC voltage measurement (V)
VDC	DC voltage measurement (V)
Ω •ı))	Continuity measurement with buzzer
kΩ	Resistance measurement

OPERATION

3.1 Starting the Instrument

Turn the rotary switch to the appropriate function. All segments of the display will light for a few seconds. The screen corresponding to the chosen function will then appear. The megohmmeter is now ready for measurements.

3.2 Stopping the Instrument

To turn the megohmmeter off manually, turn the switch to **OFF**.

If left unused for 10 minutes, the unit will turn off automatically. At 9 minutes, five beeps warn that the megohmmeter is about to be turned off. To turn back on, press any button on the unit.

A long press on the **HOLD** button at startup deactivates the Auto-off function.

3.3 Insulation Resistance Testing (MΩ Range)

3.3.1 Test Voltage

No published standard tells which voltage to choose for any given test. However, published recommendations could be summarized as follows:

Rated Voltage of Motor	Test Voltage
Below 115	250V
115	250V or 500V
230	500V
460	500V or 1000V

Table 3-1

3.3.2 Spot Testing

As a general rule in spot testing, test voltage should be applied until no variation in reading is noted for 15 seconds, or applied for a fixed 60 seconds.

What minimum value should be measured?

The IEEE standard No. 43-1974 states that it is impossible to specify the value of insulation resistance at which a winding will fail electrically, but on motors, minimum readings generally stated are:

Rated Voltage	R Minimum
250 or less	2MΩ
460	2MΩ

Table 4-2

There is no fixed figure for determining what is good and bad in resistance readings, but a good guide would be 1 megohm for every one hundred operating volts applied, as a minimum figure. This applies to motors and transformers. When the insulation resistance gets this low, an electrical breakdown can be expected at any time, and rewinding or replacing should be considered.

It is not unusual for a winding to be 10 to 100 times the recommended minimum value (IEEE Std. #43-1974: *Recommended Practice for Testing Insulation Resistance of Rotating Machinery*), but this varies with temperature and humidity.

3.3.3 Ratio Testing

In timed resistance testing (Dielectric Absorption Ratio), readings are taken at 30 and 60 seconds to obtain the dielectric absorption ratio.

$$\frac{\text{Insulation resistance @ 60s}}{\text{Insulation resistance @ 30s}} = \text{Dielectric Absorption Ratio (DAR)}$$

This test is useful to increase the accuracy of spot testing. In general, a ratio of 1.25:2 or better should be required. A ratio below this indicates that repair is probably needed.

Remember, a DC insulation test may be used for acceptance testing, but is more commonly used to check the gradual deterioration of equipment over its life. Consult your equipment manufacturer for specific test or test voltage if not known.

Insulation resistance decreases with moisture, temperature and age and should be recorded over time at a given temperature and corrected.

3.3.4 Tips For Successful Insulation Resistance Testing

- Check with the equipment manufacturer for factory insulation resistance readings.
- Do not rely on insulation resistance testing alone as proof of winding conditions.
- Do not expect the same value for all parts of all machines.
- Observe consistent test time duration, recognizing that total current through insulation under test will vary with time.
- Correct all readings properly to a standard reference temperature (see IEEE Std. #43-1974, Temperature Correction Curve).
- Know what you are testing. Isolate the piece of equipment from other circuitry.
- Watch trends rather than relying on single “spot” readings.

3.3.5 Insulation Measurement - Connections

Figure 3-1 shows the connections to measure the insulation of one conductor to the other conductors. The cable should be disconnected at both ends to avoid leakage through switchboards and panels.

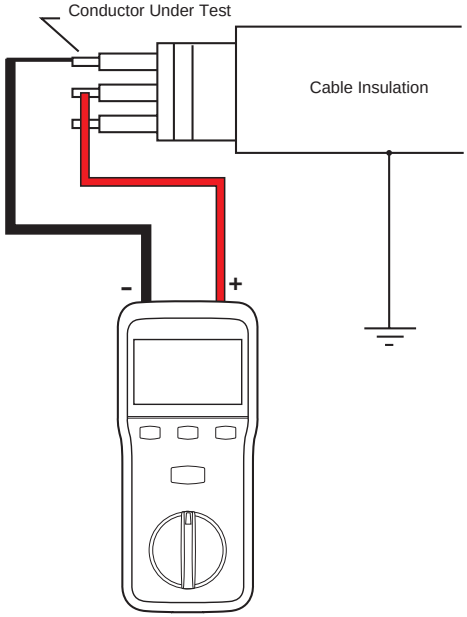

Figure 3-1

Figures 3-2 and 3-3 show the connections for testing insulation from a supply conductor to ground (e.g. a motor frame).

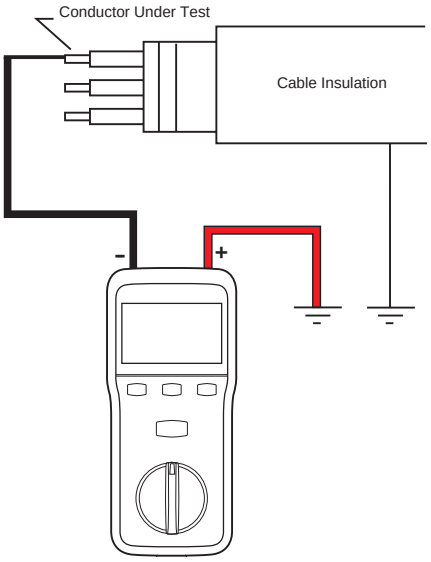

Figure 3-2

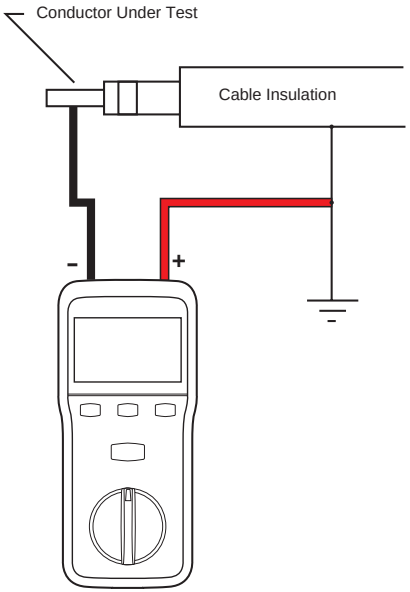

Figure 3-3

Figure 3-4 shows the connections to a transformer (lighting or distribution).

Make sure that the switches and/or circuit breakers on both sides are open.

Check the high voltage winding to ground, low voltage to ground, and the resistance between them with no winding grounded.

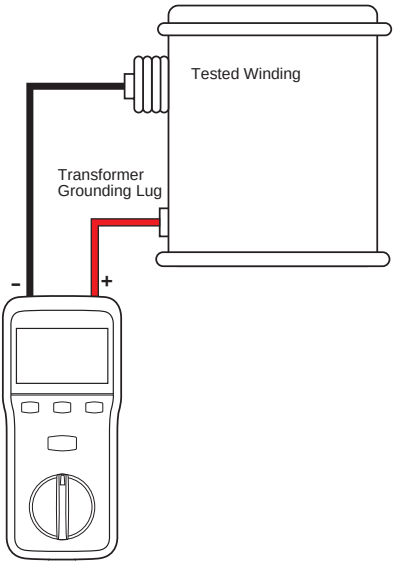

Figure 3-4

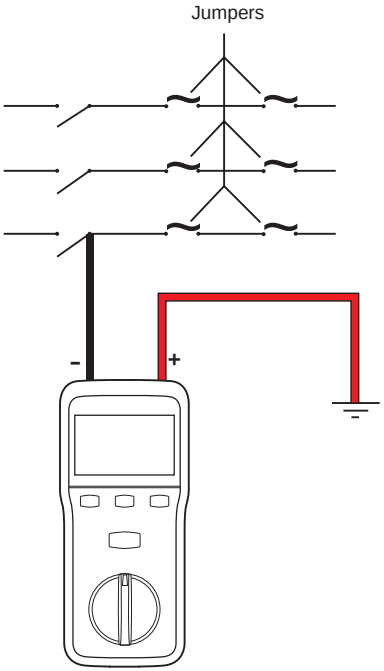

Figure 3-5

Figure 3-5 shows the connections for measuring the insulation of a three-phase line to ground by connecting the jumpers between phases.

This gives a reading of all conductors at once. If a load such as a motor, heater, etc., is attached to the other end of the line, it will read the load resistance to ground at the same time.

By removing the jumpers, readings can be made between the individual conductors and ground.

3.3.6 Insulation Resistance Measurements on Motors

Figure 3-6 shows reading the resistance to ground of a three-phase motor winding. Since the three-phase motors are internally connected, it is only necessary to connect one lead to the motor lead and the other lead to the motor frame as shown.

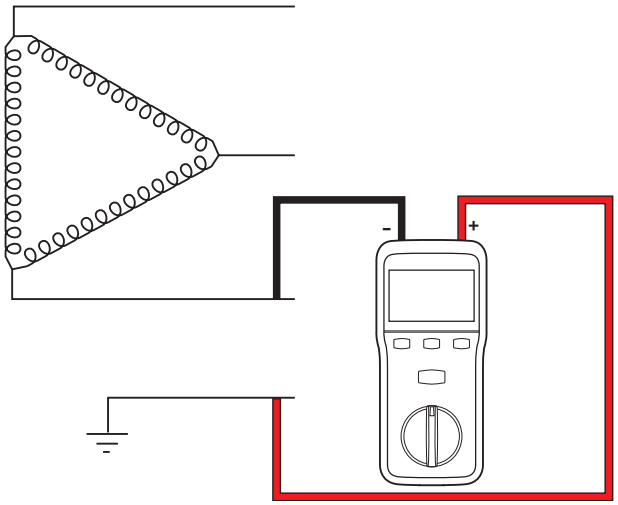

Figure 3-6

Figure 3-7 shows the windings of a three-phase motor separated.

Sometimes this can be done at the lead terminals, while other times the end bells must be removed to get at the lead wires of the coils.

By connecting the megohmmeter as shown, the phase insulation resistance value can now be determined.

Read between phases “A” and “B”, then “B” and “C”, then “C” and “A”.

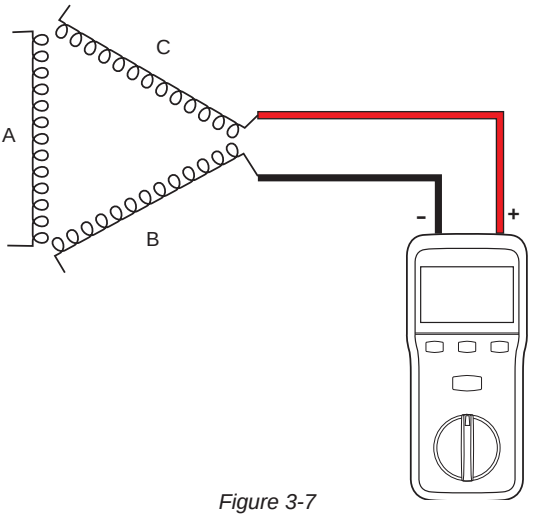

Figure 3-7

Figure 3-8 shows connections for testing insulation from a supply conductor in a switchbox to ground (motor frame). An identical test may be carried out from the motor starter.

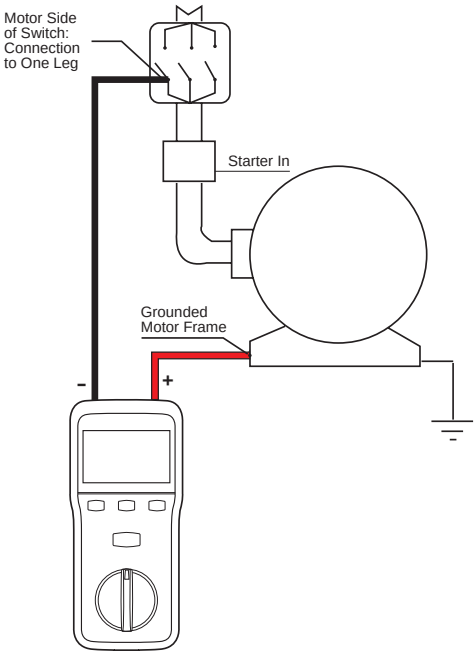

Figure 3-8

3.4 Measuring MΩ Insulation Resistance

- Turn the function switch to desired test voltage range (250V, 500V or 1000V).
- Connect the black test lead to the (**COM**) terminal and the red one to the (**V**Ω) terminal.
- Connect the test lead to sample under test.

⚠ **Warning:** Do not activate the test before the leads are properly connected to the sample under test.

Do not remove the test leads from the sample under test before the discharge process is completed.

- Press the **TEST** button and hold it down until the measurement is stabilized. The display is automatically locked (automatic **HOLD**). The ⚠ symbol lights during the measurement indicating active voltage output.
- The measured resistance value is displayed on the screen. The **HOLD** symbol is lit.

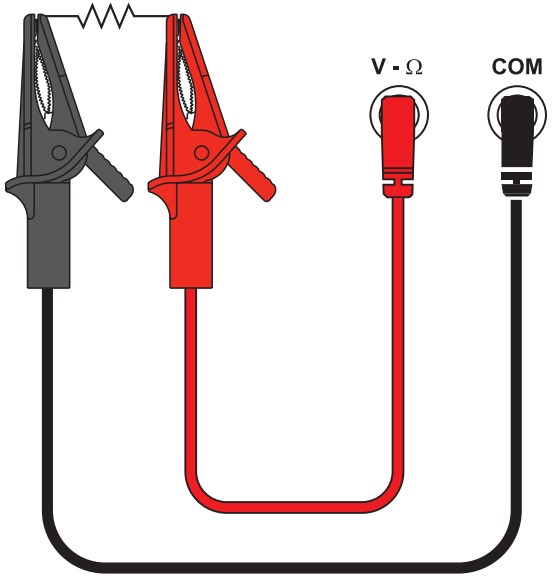

Figure 3-9

3.5 Voltage Measurements

- Turn the function switch to the **VAC** or **VDC** range, accordingly.
- Connect the black test lead to the (**COM**) terminal and the red one to the (**VΩ**) terminal.
- Connect to the sample under test.

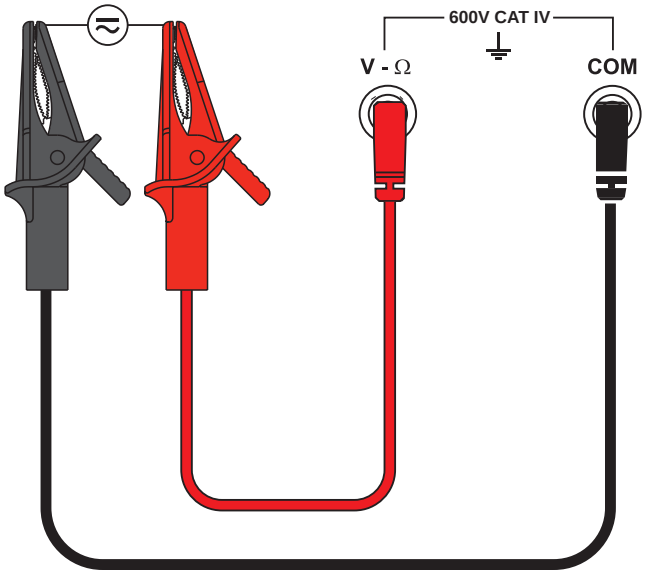

Figure 3-10

3.6 Continuity Measurements

Warning: Tests are to be carried out on non-energized circuits only!

The Model 6527 generates a 200mA$_{DC}$ current between the VΩ and COM terminals. It then measures the voltage across the two terminals and from it deduces the value of R = V/I.

- Turn the function switch to Ω •)).
- Connect the black test lead to the (**COM**) terminal and the red one to the (**V-**Ω) terminal.
- Connect to the sample under test.
- The megohmmeter will continue generating a test current (200mA) until it is switched out of the continuity function. Turn the megohmmeter OFF when finished and before touching the lead ends.
- When there are inductive or capacitive elements in the tested sample, it may be useful to invert the polarity by switching the leads around on the sample. Take both measurements and use their average as a measurement result.

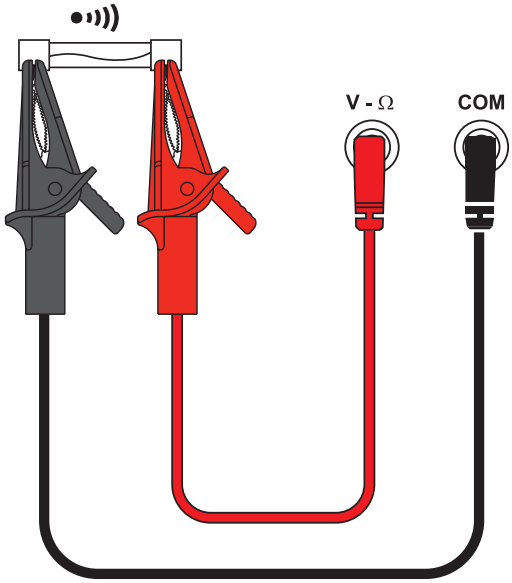

Figure 3-11

3.6.1 Lead Resistance Compensation

To set the compensation of the resistance of the measurement leads, proceed as follows:

- Short-circuit the black and red leads connected to the meter.
- Short-press the **ZERO/** button. The reading is set to zero, and the $\rightarrow\overset{\Omega}{0}\leftarrow$ symbol appears.

NOTE: Valid in **VAC**, **VDC**, Ω and **k**Ω positions only

3.7 Resistance Measurements

The Model 6527 generates a DC voltage between the **V-**Ω and **COM** terminals. It then measures the current across these two terminals and from it calculates the value of R=V/I.

- Turn the range switch to **k**Ω. The test voltage is generated without pressing the test button.
- Connect the black test lead to the (**COM**) terminal and the red one to the (**V-**Ω) terminal.
- Connect the test probe tips to the sample under test.

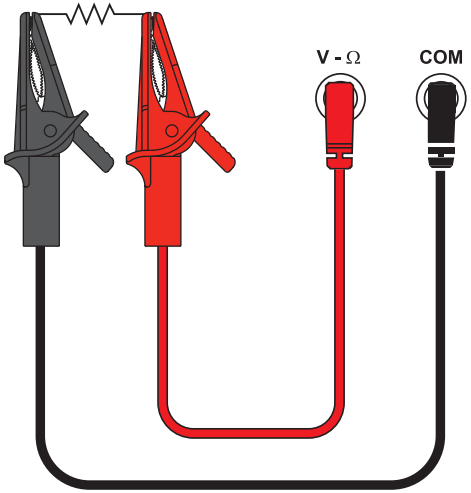

Figure 3-12

MAINTENANCE

WARNING:

- For maintenance use only specified replacement parts.
- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the case. Turn the instrument OFF and disconnect the unit from all the circuits before opening the case.

4.1 Battery Replacement

WARNING: Make sure that no terminals are connected and that the switch is in the OFF position before opening the back of the instrument.

The symbol indicates that the batteries are low and must be replaced. When this symbol appears on the display unit, the instrument continues to operate for a few minutes, and then turns itself off.

To replace the batteries, proceed as follows:

- Set the switch to **OFF**.
- Disconnect the measurement leads from the input terminals.
- Using a screwdriver, unscrew the three screws of the battery compartment cover located on the back of the housing.
- Place the new batteries in the compartment making sure that the polarities are correct.
- Screw the cover back onto the housing.

4.2 Fuse Replacement

WARNING: Make sure that no terminals are connected and that the switch is in the OFF position before opening the back of the instrument.

To replace the fuse, proceed as follows:

- Set the switch to **OFF**.
- Disconnect the measurement leads from the input terminals.
- Using a screwdriver, unscrew the three screws of the battery compartment cover located on the back of the housing.
- Remove the blown fuse using a screwdriver.
- Insert a new fuse (HRC FF 0.5A–600V–6.3x32), then screw the cover back onto the housing.

4.3 Cleaning

WARNING: Make sure that no terminals are connected and the range switch is in the OFF position.

- Clean the body of the instrument with a cloth lightly moistened with soapy water.
- Wipe clean with a damp cloth.
- Dry with a dry cloth or forced air.
- Do not use alcohol, solvents or hydrocarbons.

SPECIFICATIONS

5.1 Reference Conditions

Influence Quantity	Reference Values
Temperature	23°C ± 2°K
Relative Humidity	45 to 75%

5.2 Specifications

ELECTRICAL				
INSULATION RESISTANCE (250V)				
Range	4MΩ	40MΩ	400MΩ	4GΩ
Resolution	0.001MΩ	0.01MΩ	0.1MΩ	1MΩ
Accuracy	2% ± 10cts	2% ± 10cts	3% ± 5cts	4% ± 5cts
Test Current	1mA test current into a 250kΩ load			
INSULATION RESISTANCE (500V)				
Range	4MΩ	40MΩ	400MΩ	4GΩ
Resolution	0.001MΩ	0.01MΩ	0.1MΩ	1MΩ
Accuracy	2% ± 10cts	2% ± 10cts	2% ± 5cts	4% ± 5cts
Test Current	1mA test current into a 500kΩ load			
INSULATION RESISTANCE (1000V)				
Range	4MΩ	40MΩ	400MΩ	4GΩ
Resolution	0.001MΩ	0.01MΩ	0.1MΩ	1MΩ
Accuracy	3% ± 10cts	2% ± 10cts	3% ± 5cts	4% ± 5cts
Test Current	1mA test current into a 1MΩ load			
AC VOLTAGE TRMS				
Range	600V		1000V(1)	
Resolution	1V			
Accuracy	1.2% ± 10cts			
Input Impedance	10MΩ (40/400Hz)			
DC VOLTAGE				
Range	600V		1000V(1)	
Resolution	1V			
Accuracy	0.8% ± 3cts			
Input Impedance	10MΩ			

RESISTANCE (Ω)		
Range	400kΩ	
Resolution	0.1kΩ	
Accuracy	1.2% ± 3cts	
Overload (OL) Protection	Fusible HPC; FF 0.5 A - 600V; 6.3 x 32	
Short-circuit Current	< 1.5mA	
CONTINUITY (•))		
Range	40Ω	400Ω
Resolution	0.01Ω	0.1Ω
Accuracy[2]	1.2% ± 3cts	
Continuity Threshold	Audible signal triggered <35Ω ±3Ω	
Measurement Current	>200mA (0.2Ω/2Ω)	
Overload (OL) Protection	Fusible HPC; FF 0.5 A - 600V; 6.3 x 32	
Short-circuit Current	< 250mA	
POWER SUPPLY		
Supply	6 x 1.5V AA batteries	
Auto-Off	10 minutes of non-use	
Battery Life	>50h in MΩ >200h in VAC/DC >15h in Continuity Test	
MECHANICAL		
Dimensions	7.9 x 3.6 x 2.0" (200 x 92 x 50mm)	
Weight	24 oz (700g)	
Measurement Acquisition	400ms	
Bargraph	35 segments, refresh rate 30ms	
Drop Test	Free fall: 1m (tested in accordance with standard IEC-68-2-32)	
ENVIRONMENTAL		
Operating Temperature	32° to 90°F (0° to 50°C); <90% RH	
Storage Temperature	-36° to 126°F (-20° to 70°C); <50% RH	
SAFETY & ELECTRO-MAGNETIC COMPATIBILITY		
Safety Rating	EN-61010-1, 600V CAT IV, Pollution Degree 2	
Electro-Magnetic Compatibility	Compliant with standard EN-61326:2006 Residential environment	
Electric safety in LV distribution networks	In the insulation and Ohm/Continuity functions, the entire measurement range complies with uncertainties requirements of standards IEC-61557-1/-2/-4:2007 and IEC-61557-10:2000	
Protection Degree	IP51 (EN-60529)	
Double Insulated	Yes	
CE Approved	Yes	

(1) Limited to 600Vrms for EN-61010-1 CAT IV

(2) After compensation of lead resistance

Specifications are subject to change without notice.

AEMC® INSTRUMENTS

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99-MAN 100363 v8

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments