

Users Manual

Phenix Technologies Inc.



LIQUID DIELECTRIC TEST SET

MODEL NUMBER LD60

VERSION 3.2



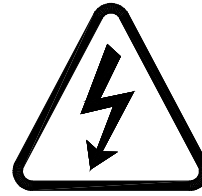
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GENERAL SAFETY PRECAUTIONS



CAUTION



HIGH VOLTAGE

This equipment is capable of providing POTENTIALLY LETHAL VOLTAGES! Improper operation or test practices may result in injury or death to the operator or surrounding personnel.

The operation of High Voltage test equipment should only be performed by personnel familiar with HIGH VOLTAGE testing and safety procedures. The operator of this equipment must be aware of all hazards associated with High Voltage testing. The operator is responsible for himself and others in close proximity of the testing area.

Some General Safety Practices for working with High Voltage Test Equipment have been listed below for your reference.

- Become familiar with your instrument before performing an actual test
- Know your work area, check that all circuits are de-energized and locked out.
- Never work alone; always work with another qualified worker.
- Mark off entire work area with barriers and warning tape.
- Make all personnel aware of your testing activities.
- Be aware of dangerous conditions that may arise from energizing a test specimen.
- Never modify test equipment, modifications to equipment could introduce an unknown hazard or hinder a designed-in safety feature.
- DO NOT operate damaged equipment. Remove power, and do not use the equipment until safe operation can be verified by service-trained personnel.

Phenix Technologies, Inc. assumes no liability for unsafe or improper use of test equipment.

DESCRIPTION

The Liquid Dielectric Test Set, Model LD60, is designed to test and measure the dielectric breakdown of insulating oil used in transformers, capacitors, bushings, etc. in accordance to ASTM D877 and ASTM D1816. The standard test set also satisfies the requirements of IEC, VDE, and BS standards.

The test set is of portable type built into a rugged carrying case. Below and protected by the cover is the control panel with the voltmeter as well as the high voltage test compartment. The test compartment is provided with a see through lid interlocked to the test circuit with a limit switch to ensure full safety for the operation.

As options, the test set can be supplied with two different kinds of test cells, either TC/VDE test cell with VDE electrodes according to ASTM D1816, or TC/DE test cell with 1-inch flat electrodes according to ASTM D877. Other cells are available upon request.

The test set is fully automatic. Just put the prepared test cell in the test compartment, set voltage rate of rise switch to correct position, close test chamber lid and switch to start position. It will automatically raise the voltage to the breakdown level, indicate "failure" and the breakdown level can be read on the voltmeter.

SAFETY FEATURES

- Center tapped high voltage transformer.
- The test cell is isolated from the supply when the protective lid is raised.
- Fast acting relay in series with the high voltage winding and the test cell ensures immediate cutout at flashover above specified current levels.
- Control lamp indicating AC power on.
- Control lamp indicating failure.
- Fast acting fuses are located both in the input to the test set and in the primary of the high voltage transformer.

OTHER FEATURES

- Input switch, fuse, and power indicator lamp.
- Motorized output voltage control from 0 to 60,000 volts with three selectable speeds of 500, 2000 and 3000 volts per second.
- Single range memory voltmeter connected across transformer primary calibrated to output voltage level records breakdown voltage for the test sample.
- The test compartment is provided with a 115 volt outlet for convenient plug-in of motor driven stirrer when testing to ASTM D1816 standards.

SPECIFICATIONS

| | |
|------------------------------|---|
| Input Voltage/Current | Single Phase, 120 Volts at 60 Hz, 5 Amps or 220 Volts at 50 Hz, 2.5 Amps (Check Specification Tag) |
| Output Voltage/Power | 0-60,000 Volts at 500 VA (momentary), Maximum Voltage to Earth is 30,000 Volts |
| Rate of Rise | Selectable—500/2000/3000 Volts/Second |
| Memory Voltmeter | Scale of 0-60,000 Volts, Accuracy 1% of Full Scale |
| Dimensions | 21 1/4" W x 16 3/4" D x 13 3/4" H (540 mm W x 426 mm D x 350 mm H) |
| Weight | 50.5 lbs. (22.9 kg) - 120 V 53.5 lbs. (24.26 kg) - 220 V |

INSTALLATION AND GROUNDING INSTRUCTIONS

1. Place the test set on a table or similar flat surface.
2. Make sure that the test set is level.
3. Open the cover.
4. Check that your input voltage corresponds with the input of the test set.
5. Check that your supply outlet provides a ground.
6. Connect the power cord to the outlet.
7. The test set is now installed and ready for operation.

OPERATING INSTRUCTIONS

Operation with TC/DE Test Cell (ASTM D877 Standard)

1. Adjust the test cell electrode by the use of the measuring rod located on the test cell in the following manner.
 - a. Remove the measuring rod by unscrewing it from its threaded holder.
 - b. Release the setscrew, which holds the adjustable electrode in place on the test cell.
 - c. Place the measuring rod between the electrodes.
 - d. Move the adjustable electrode in until snugly against the measuring rod.
 - e. Moderately tighten setscrew to secure this position.
 - f. Remove the measuring rod and place it in the holder for safekeeping. (Distance between the electrodes should be 0.100 of an inch if measuring rod is not used.)
2. Fill the test cell with test sample of oil according to standards procedure.
3. Place the test cell in the test chamber of the unit and close chamber lid.
4. Turn on AC power switch.
5. Select 3000 volts per second rate of rise.
6. Move the start switch to start position when stand time requirements have been met.
7. High voltage will come on; the unit will automatically raise the voltage to the desired rate per second until failure occurs.
8. If a failure occurs, the voltage will shut off, the failure light will illuminate, and the breakdown voltage will be indicated on the kilovolt meter.
9. To return to zero, switch the stop-reset switch to stop/reset.
10. Continue test as per ASTM D877.
11. Remove the test sample of oil and repeat the above procedure for other samples.

NOTICE: The voltmeter may continue to rise slightly after the failure indicator is tripped. This meter response delay should be ignored. The final voltage reading is the breakdown point.

OPERATING INSTRUCTIONS

Operation with TC/VDE Test Cell (ASTM D1816)

1. Adjust the test cell electrode gap using the double end gauge rod in the following manner.
 - a. Remove the gauge rod and hex key from the storage block on the side of the cell.
 - b. Loosen the setscrew that holds the moveable electrode in place.
 - c. Place the desired end of the gauge, either .080 or .040 diameter, between the electrodes.
 - d. Hold the movable electrode snugly against the gauge rod while moderately tightening the setscrew.
 - e. Remove the gauge rod and replace it and the hex key back into storage.
2. Fill the test cell with test sample of oil according to standards procedure.
3. Place the test cell in the test chamber of the unit.
4. Plug cord of stirrer into chamber receptacle.
5. Close chamber cover.
6. Turn on AC power switch.
7. Set the rate of rise to 500 volts per second.
8. Move the start switch to start position when stand time requirements have been met.
9. High voltage will come on; the unit will automatically raise the voltage at the desired rate per second until failure occurs.
10. If a failure occurs, the voltage will shut off, the failure light will illuminate, and the break-down voltage will be indicated on the kilovolt meter.
11. To return to zero, switch the stop-reset switch down as labeled.
12. Continue test as per ASTM D1816.
13. Remove the test sample of oil and repeat the above procedure for other samples.

OPERATING INSTRUCTIONS

Operation with optional LDCU (Liquid Dielectric Comparison Unit)

1. Make sure power to LD set being checked is turned off.
2. Place the comparison cell in the test chamber of the unit. Plug LDCU ground lead into ground jack. Close transparent cover.
3. Turn on Input Power switch.
4. Set the Rate of Rise to the slowest speed.
5. Move the Start/Stop switch to the Start position.
6. High voltage will come on; the unit will automatically raise the voltage at the selected rate per second.
7. Allow voltage to rise on the LDCU until it reaches 60 KV.
8. Move the Start/Stop switch to the Stop position at this time.
9. Unit under test and comparison cell should be in agreement. If a discrepancy is found, LD unit being checked should be sent for recalibration.
10. Turn Input Power switch off and back on to shut off high voltage and reset unit.
11. Check 15 KV, 30 KV, and 45 KV settings.

Calibration of LDCU

LDCU unit should be sent to OEM factory for recalibration at periodic intervals, not to exceed 12 months.

RECALIBRATION

Recalibration of this test set is normally not necessary.

For any internal changes, modifications, or calibrations found necessary, please return to the factory.

ELECTRICAL SCHEMATICS

| | <u>Drawing Number</u> | <u>Description</u> |
|----|-----------------------|--------------------------------------|
| 1. | 9101060 | LIQUID DIELECTRIC TEST SET PCB1019 E |
| 2. | 31114000 | LD60 VM Circuit |

MAINTENANCE AND TROUBLESHOOTING

Maintenance

No maintenance is required besides the control of fuses and control lamps located on the front panel. Ratings of these are described in the parts list.

No solution or chemical stronger than ordinary mild soap and water solution should be applied to the cabinet area of this unit. Care must be used when cleaning the meter faces and console panel. Abrasives may remove printing and descriptive titles and scratch meter faces. When cleaning, always have unit disconnected from power source. Never attempt to clean inside the unit as the cleaning solution may cause damage to the electronic components.

In the event it becomes necessary to replace any parts, a description can be found with the supplied parts list.

Troubleshooting

No "power on".

- Have you plugged in the power cord?
- Is voltage available in the wall outlet?
- Check fuse F1.
- Check the control lamp for "Input power".

The test procedure does not start.

- Is "Input power" turned on?
- Is the compartment lid closed? Check that the micro switch is clicking when closing the lid.
- Have you turned the toggle switch to start position?
- Have you reset the test set before start-up?

The voltmeter does not show any reading.

- Check test procedure start as above.
- Check fuse F2.

PARTS LIST

| ITEM | DESCRIPTION | QTY | PART NO. |
|---------------------------|--|-----|----------|
| | <u>ASSY NO. 8131060, LD60 (120V/240V)</u> | | |
| <u>FRONT PANEL</u> | | | |
| A1 | PC1140 METERING ASSEMBLY | 1 | 31114000 |
| F1, 2 | FUSE HOLDER, 3AGHKP | 2 | 1603920 |
| F1, 2 | FUSE, 3AG-5A | 2 | 1603605 |
| F1 (220v) | 3AG-3A | 1 | 1603603 |
| PL1 | PILOT LAMP, YELLOW LED | 1 | 1420138 |
| PL2 | PILOT LAMP, RED LED | 1 | 1420137 |
| | KNOB, (PLEXIGLASS COVER) | 1 | 1350050 |
| M1 | METER, 3 ½ DIGIT LCD | 1 | 1506400 |
| MOV6 (120V) | MOVISTOR 130V, V130LA10A | 1 | 1606100 |
| SW1 | SWITCH, CH7565K7 TGL2PDT | 1 | 1865005 |
| SW2 | RATE OF RISE SWITCH | 1 | 1863037 |
| SW2 | KNOB PKAP 50B | 1 | 1355310 |
| SW3 | SWITCH, 8832KT TGL SPRING | 1 | 1865025 |
| HINGE | PIANO HINGE | 1 | 40500060 |
| COVER | PLEXIGLASS (SMOKED GRAY) | 1 | 40500070 |
| CAL | HOLE PLUG-1/4" | 1 | 1359925 |
| CORD | LINE CORD 18/3 8' | 1 | 1077183 |
| PANEL | FRONT PANEL | 1 | 42000024 |
| <u>CHASSIS</u> | | | |
| T1 (220 V) | N2X 230/115 STEP DOWN AUTO XFMR-100 VA | 1 | 1894427 |
| CAM | CAM ALUM BORED ½" | 3 | 41000002 |
| MOT1 | MOTOR, 744KC1-22T5 BODINE WITH CAP. | 1 | 1560715 |
| PCB ASSY | PCB1019E - LD60 ASSY | 1 | 31101900 |
| RECPT | RECEPTACLE 15 A, 125 V | 1 | 1159900 |
| SPACER | SPACER 3/4X 4-40 | 2 | 1350123 |
| SW4-7 | SWITCH, U3L-121-DB LIMIT | 4 | 1866015 |
| T3 | TRANSFORMER 221 VARIABLE STACO | 1 | 1890105 |
| | MOTOR SHAFT | 1 | 40500030 |
| | MOTOR - VARIAC BRACKET | 1 | 40500020 |
| | CHASSIS | 1 | 40500040 |
| <u>HV XFMR</u> | | | |
| T2 | TRANSFORMER, EPOXY CAST | 1 | 38322205 |
| C-CORE | C-CORE | 1 | 1900130 |
| BRKT | TRANSFORMER MOUNTING BRACKET | 1 | 46000067 |
| <u>CASE</u> | | | |
| | CASE WITH HANDLES | 1 | 2100508 |
| | CABLE BRACKET | 1 | 40500050 |

PARTS LIST

| ITEM | DESCRIPTION | QTY | PART NO. |
|----------|---|-----|----------|
| | <u>ASSY NO. 3111941, LD60, PCB 1019 REV. E</u> | | |
| C2 | CAPACITOR 1 uF 250 V | 1 | 1094130 |
| C1 | CAPACITOR .01 uF 1kV | 1 | 1092050 |
| PC BOARD | PCB1019 REV E | 1 | 1110195 |
| X5 | 3 PIN PHOENIX CONN. & PLUG | 1 | 1152603 |
| X2, X6 | 4 PIN PHOENIX CONN. & PLUG | 2 | 1152604 |
| X1 | 5 PIN PHOENIX CONN. & PLUG | 1 | 1152605 |
| X4 | 8 PIN PHOENIX CONN. & PLUG | 1 | 1152608 |
| X3 | 16 PIN PHOENIX CONN. & PLUG | 1 | 1152616 |
| K1 | KU SERIES RELAY SOCKET | 1 | 1157600 |
| SPACERS | STANDOFF 8-32 X 1 1/2" | 4 | 1350116 |
| SG1,2 | SPARK GAP 90 V | 2 | 1605110 |
| MOV1-3 | MOVISTOR 130 V, V130LA10A | 3 | 1606100 |
| MOV4,5 | V56Z MOVISTOR | 2 | 1606130 |
| K1 | RELAY KUP14A153P, 120V, 3 POLE | 1 | 1700610 |
| K3 | AROMAT D52E-S-DC48V, 2 POLE | 1 | 1700820 |
| K4 | RELAY 1310P-4C-120A, 4 POLE | 1 | 1701305 |
| K2 | RELAY 5A, 120V, 2 POLE | 1 | 1701316 |
| R1, 2 | RHEOSTAT 1.5 K OHM 25 W | 2 | 1761010 |
| D1-9 | DIODE 1N4007 | 9 | 1780025 |
| | <u>ASSY NO. 31114000, LD60, PCB 1140</u> | | |
| | .01 UF 1 KV 18F2727 | 1 | 1092050 |
| | 4 UF 350 V | 1 | 1094655 |
| | 10 UF 20 V 47F386 TAN | 1 | 1095800 |
| | 100 UF 35 V 14F3253 | 1 | 1098050 |
| | PCB 1140 LD60 METER BD REV A | 1 | 1111401 |
| | 1-640454-0 HDR 10 CKT .1 | 1 | 1152211 |
| | 1-640440-0 CONN 10 CKT .1 | 2 | 1152210 |
| | 4 POS MINI PCTERMINAL BLOCK 44F2705 | 1 | 1155040 |
| | 8254 SPCR 1X6-32, M/F | 4 | 1350110 |
| | 3 1/2 DIGIT LCD METER DISPLAY | 1 | 1506400 |
| | .175 AMP 3AG FUSE | 2 | 1603595 |
| | 1A1119-10 FUSE CLIP | 4 | 1603925 |
| | MOVISTOR V130LA10A | 2 | 1606100 |
| | NE-2 NEON | 1 | 1609990 |
| | .5 W 1 K 10% | 1 | 1711960 |
| | .5 W 5 K 1% | 1 | 1722100 |
| | .5 W 1 MEG 1% | 1 | 1725950 |
| | 10 K TYPE 43P 12F4409 | 1 | 1761096 |
| | 1N4007 (1000 VR, 1.0 A) | 4 | 1780025 |
| | UA7805C, VR +5 V REG | 1 | 1794000 |
| | XFMR DPC 120-8 | 1 | 1894314 |
| | XFMR PC16-55 | 1 | 1894317 |
| | 1N4734A 56V ZENER | 1 | 1780034 |
| | 1N6267A 5V TRANSORB | 1 | 1780060 |

PARTS ORDERING INFORMATION

Replacement parts are available from Phenix Technologies, Inc.

Changes to Phenix Technologies' products are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest technical improvements developed in our Engineering Department. It is, therefore, important when ordering parts to include the serial number of the unit as well as the part number of the replacement part. When your purchase order is received at our office, a representative of Phenix Technologies will contact you to confirm the current price of the part being ordered. If a part you order has been replaced with a new or improved part, an Applications Engineer will contact you concerning any change in part number.

Your order for replacement parts should be sent to:

Replacement Parts Department
Phenix Technologies, Inc.
75 Speicher Drive
Accident, Maryland 21520

RETURNED MATERIAL

If for any reason it should become necessary to return this equipment to the factory, the Service Department of Phenix Technologies, Inc. must be given the following information:

Name Plate Information

Model Number

Serial Number

Reason for Return

Cause of Defect

If Phenix Technologies, Inc. deems return of the part appropriate, it will then issue an "Authorization for Return".

If return is not deemed advisable, other inspection arrangements will be made.

NOTE: Material received at this plant without the proper authorization shall be held as "Customer's Property" with no service until such time as the proper steps have been taken.

Your cooperation is requested in order to ensure prompt service.