



LIQUID DIELECTRIC TEST SET MANUAL
MODEL NUMBER LD75/LD100
VERSION 4.1

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DANGER / WARNINGS
WARNING !!



DANGER

Grounding of this unit is necessary for the safe operation of this equipment. Disconnect inputs before ungrounding this equipment.

DANGER / WARNINGS

GENERAL SAFETY PRECAUTIONS



This equipment can produce 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.

SECTION 1: DESCRIPTION

The Liquid Dielectric Test Sets, Models LD75, and LD100, are 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 metal case provided with a latching cover. 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 of tinted plastic 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 three different kinds of test cells, either TC/VDE test cell with VDE electrodes according to ASTM D1816, TC/DE test cell with 1 inch electrodes according to ASTM D877, or IEC test cell according to Publication 156.

The test set is automatic. Just place the prepared test cell in the test compartment, close compartment cover 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

- 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.
- 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 pilot light.
- Motorized output voltage control from 0 to 75,000 Volts (LD75), and 0 to 100,000 Volts (LD100) with selectable speeds of 2000 volts per second (fixed) and variable.
- Single range memory voltmeter connected across transformer primary 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.

SECTION 2: SPECIFICATIONS

Input Voltage/Current	Single Phase, 120 Volts at 50/60 Hz, 5 Amps or 220 Volts at 50/60 Hz, 2.5 Amps
Output Voltage/Power	<u>Model LD75</u> 0-75,000 Volts at 500 VA, Maximum Voltage to Earth is 37,500 Volts <u>Model LD100</u> 0-100,000 Volts at 500 VA, Maximum Voltage to Earth is 50,000 Volts
Rate of Rise	Selectable—2000 Volts/Second, Variable
Memory Voltmeter	<u>Model LD75:</u> Scale of 0-75,000 Volts <u>Model LD100:</u> Scale of 0-100,000 Volts Accuracy 1% of Full Scale
Dimensions	<u>Model LD75</u> 30" W x 18" D x 13" H (762 mm W x 457 mm D x 330 mm H) <u>Model LD100</u> 36" W x 20" D x 16" H (914 mm W x 508 mm D x 406 mm H)
Weight	<u>Model LD75</u> 120 lbs. (54 kg) <u>Model LD100</u> 135 lbs. (61 kg)

SECTION 3: INSTALLATION AND GROUNDING INSTRUCTIONS

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

SECTION 4: OPERATING INSTRUCTIONS

Operation with TC/DE Test Cell

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 from its holder.
 - b. Release the set-screw which locks the adjustable electrode 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. Tighten set-screw to secure this position.
 - f. Remove the measuring rod and place it in the holder for safe keeping. (Distance between the electrodes should be 1/10th of an inch or 2.5mm if measuring rod is not used.)
2. Fill the test cell with test sample of oil.
3. Place the test cell in the test chamber of the unit. Close transparent cover.
4. Turn on AC power switch.
5. Set the rate of rise to 3000 volts per second.
6. Move the start switch to start position.
7. High voltage will come on; the unit will automatically raise the voltage at the selected 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 reset as labeled.
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 will continue to rise after the failure indicator is tripped. This apparent overshoot should be ignored. The final voltage reading is the breakdown point.

OPERATING INSTRUCTIONS

Operation with TC/VDE Test Cell

1. Adjust the test cell electrode gap by using the double end gage in the following manner.
 - a. Remove the gage rod and hex wrench from the storage block on the side of the cell.
 - b. Loosen the set-screw which holds the moveable electrode in place.
 - c. Place the desired end of the gage, either .080 or .040 diameter, between the electrodes.
 - d. Hold the movable electrode snugly against the gage rod while lightly tightening the set- screw.
 - e. Remove the gage rod and replace it and the hex wrench back into storage.
2. Fill the test cell with test sample of oil.
3. Place the test cell in the test chamber of the unit. Plug line cord of stirrer into receptacle inside the chamber. Close transparent cover.
4. Turn on AC power switch.
5. Set the rate of rise to 500 volts per second.
6. Move the start switch to start position.
7. High voltage will come on; the unit will automatically raise the voltage at the selected 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 reset as labeled.
10. Continue test as per ASTM D1816.
11. Remove the test sample of oil and repeat the above procedure for other samples.

OPERATING INSTRUCTIONS

Operation with IEC Test Cell

1. 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 from its holder.
 - b. Release the set screw which holds the adjustable electrode 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. Tighten set screw to secure this position.
 - f. Remove the measuring rod and place it in the holder for safe keeping. (Distance between the electrodes should be 2.5 mm if measuring rod is not used.)
2. Fill the test cell with test sample of oil.
3. Place the test cell in the test chamber of the unit. Close transparent cover.
4. Turn on AC power switch.
5. Set the rate of rise to 2000 volts per second.
6. Move the start switch to start position.
7. High voltage will come on; the unit will automatically raise the voltage at the selected 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 reset as labeled.
10. Continue test as per IEC Publication 156.
11. Remove the test sample of oil and repeat the above procedure for other samples.

NOTICE: The voltmeter will continue to rise after the failure indicator is tripped. This apparent overshoot should be ignored. The final voltage reading is the breakdown point.

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 test 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.

SECTION 5: CALIBRATION

Caution: Calibration should only be done by persons familiar with High Voltage testing and safety procedures.

All calibrations have been done at the factory. Periodic verification of the output voltmeter should be done approximately every twelve months.

NOTE: Refer to Electrical Diagram Section for schematics pertaining to the model number of your test set.

SECTION 6: ELECTRICAL SCHEMATICS

	<u>Drawing Number</u>	<u>Description</u>
1.	9101075 (LD-75)	PCB1019 (LD-75)
	9101100 (LD100)	PCB1019 (LD-100)
2.	31114000	PCB1140 VM

SECTION 7: MAINTENANCE AND TROUBLESHOOTING

Maintenance

No maintenance is required besides the fuses 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 the unit disconnected from the 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 complete 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 "AC power on".

The test procedure does not start.

- Is "AC power" turned on?
- Is the compartment lid closed? Check that the microswitch 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.

SECTION 8: PARTS LIST

ITEM	DESCRIPTION	QTY	PHENIX PART #
FRONT PANEL			
POWER CORD	MODULAR POWER CORD	1	1077167
INPUT POWER	INPUT POWER RECEPTACLE	1	1153328
F1, 2	FUSE HOLDER, 3AGHKP	2	1603920
F1, 2 (120V)	FUSE, 3AG-5A	2	1603605
F1 (220V)	FUSE, 3AG-3A	1	1603603
PL1	PILOT LIGHT-YELLOW	1	1420138
PL2	PILOT LIGHT-RED	1	1420137
KNOB	KNOB, (TEST CHAMBER COVER)	1	1350050
M1	METER, 3 ½ DIGIT LCD	1	1506400
SW1, SW2	SWITCH, CH7565K7 TGL2PDT	2	1865005
SW3	SWITCH, 8832KT TGL SPRING	1	1865025
HINGE	PIANO HINGE	2.5 FT.	2371900
COVER	POLYCARBONATE (SMOKED GRAY)	2.5 SQ. FT.	2455070
CAL	HOLE PLUG-1/4"	1	1359925
R2	1.5 K - 25 W RHEOSTAT	1	1761010
R2	KNOB	1	1355101
R2	CAP	1	1355102
R2	BLACK STATOR	1	1355905
R2	DIAL	1	1355910
PCB1140 ASSY	VOLTMETER BD PCB1140 ASSEMBLY	1	31114000
CHASSIS			
T1 (220 V)	N6U 230/115 STEP DOWN AUTO XFMR	1	1894428
CAM	CAM ALUM BORED ½"	3	4802510
MOT1	MOTOR, 744KC1-22T5 BODINE WITH CAP.	1	1560715
PCB ASSY	PCB1019E	1	31101901
RECPT	RECEPTACLE 15 A, 125 V	1	1159900
SPACER	SPACER 1X, #440 ALUM	2	1350125
SW4,5,6,7	SWITCH, U3L-121-DB LIMIT	4	1866015
T3	TRANSFORMER 221 VARIABLE STACO	1	1890105
	MOTOR SHAFT	1	40500030
	MOTORIZED VARIAC BRACKET	1	40500020
	CHAMBER SWITCH BRACKET	1	40500092
	CHASSIS LD-75	1	40500093
	PCB 1019 BRACKET	1	40500080
	CONTROL PANEL	1	42000025
	HANDLE-HV UNIT CHASSIS	2	2100606
	HANDLE-CASE	2	2100610
	GLIDE	4	2109523
	TWIST LATCH	2	2371043
	PIANO HINGE	2.5FT	2371900
TANK			
	HIGH VOLTAGE ELECTRODE	2	40500101
T2, 3	TRANSFORMER GO1125-LD75	2	38341125
T2, 3	TRANSFORMER GO1221-LD90	2	38341221
T2, 3	TRANSFORMER GO1491-LD100	2	38342290

PARTS LIST

ITEM	DESCRIPTION	QTY	PHENIX PART #
ASSY NO. 3111941, PCB 1019 REV. E			
C2	CAPACITOR .01 UF 1kV	1	1092050
C1	CAPACITOR 1 UF 250 V	1	1094130
PCB1019E	PRINTED CKT. BD. 1019 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
MOV 4,5	V56ZA2 MOVISTOR	2	1606130
MOV1,2,3	MOVISTOR 130 V, V130LA10A	3	1606100
SG1, SG2	90 V SPARK GAP	2	1605110
K4	RELAY 1310P-4C-120A, 4 POLE	1	1701305
K2	RELAY 1330-2C-120A, 2 POLE	1	1701315
K1	RELAY KUP14A153P, 120V, 3 POLE	1	1700610
K3	AROMAT DS2E-S-DC48V, 2 POLE	1	1700820
R1	RHEOSTAT 1.5 K OHM 25 W	1	1761010
D1-9	DIODE IN4007	9	1780025
ASSY NO. 31114000, PCB 1140			
	CAPACITOR .01 UF 1 KV	1	1092050
	CAPACITOR .1 UF 20V	1	1093020
	CAPACITOR 4 UF 350 V	1	1094655
	CAPACITOR 10 UF 20 V	1	1095800
	CAPACITOR 100 UF 35 V	1	1098050
	CIRCUIT BOARD PCB 1140	1	1111401
	DIODE IN4007	4	1780025
	FUSE .175 A 3AG	2	1603595
	FUSE CLIP	4	1603925
	MOVISTOR V130LA10A	2	1606100
	NE-2 NEON	1	1609990
	POTENTIOMETER 10 K, TYPE 64W	1	1761096
	RESISTOR .5 W 1 K 10%	1	1711960
	RESISTOR .5 W 5 K 1%	1	1722100
	RESISTOR .5 W 10 K 1%	1	1722190
	RESISTOR .5 W 1 MEG 1%	1	1725950
	XFMR DPC 120-8	1	1894314
	XFMR PC16-55	1	1894317
	VOLTAGE REGULATOR UA7805C	1	1794000
	10 PIN HEADER-MALE	1	1152211
	10 PIN PLUG-FEMALE	1	1152210
	4 POS PC CONN	1	1155040
	1" X 6-32 SPACERS	4	1350110
	TRANSORB-IN6267A	1	1780060
	ZENER DIODE-IN4731	1	1780030

SECTION 9: 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

SECTION 10: 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.