70-, 120- and 160-kV DC
High Voltage DC Dielectric Test Sets

- **Lightest weight available in air-insulated high-voltage model**
- **Advanced performance with long-term reliability provided by filtered half-wave rectification**
- **Designed for maximum operator safety**

DESCRIPTION

The High Voltage DC Dielectric Test Sets (70, 120 and 160 kV) provide the most dependable, portable dc high-voltage sources for checking the quality of electrical power cables, motors, switchgear, insulators, transformers and capacitors. Each portable set (heaviest is 73 lb, 32.8 kg) is comprised of two separate modules:

Control Module

This module allows the operator to switch-select the appropriate voltage output range, adjust the output level and monitor both the applied voltage and leakage current at a safe distance from the high voltage being delivered to the load under test. No voltage higher than input ac power is present in the control module.

High-Voltage Module

An air-insulated design receives its instructions from the control unit. It generates the dc high voltage that is delivered to the load under test.

Although a different control module is used with each of the three models, they are all the same size and weight. Each high-voltage module is a different size and weight to accommodate the rated output voltage.

APPLICATIONS

The dc dielectric test sets are used to make proof tests and insulation tests on electrical power cables, motors, switchgear, insulators, transformers and capacitors. Both types of tests are performed by applying controlled high voltages to the unit under test at or above insulation system operating level. Measuring the leakage current helps determine the unit under test's ability to withstand overvoltages such as lightning strikes and switching surges.

The three models described cover a range of output voltages that meet the most commonly specified ratings in5-kV to 69-kV class cable. All are suitable for testing power cable, switchgear and rotating machinery in accordance with IEEE, IPCEA, NEMA and ANSI guidelines.

Proof Test

Proof testing is used for acceptance testing of newly installed cable and maintenance testing of aged and/or repaired cable. For the proof test, the unit under test will either withstand the test voltage or it will "break down," providing the user with a go/no-go" answer.

This is essentially the same as the proof test performed by Megger impulse generator systems, within voltage limitations.

Insulation Resistance Tests

To make appropriate tests on healthy insulation, the test instrument must have microampere sensitivity. Insulation resistance can be measured in at least three different ways:

The insulation resistance test is often referred to as a "spot check," and is performed by applying a predetermined voltage to the unit under test, holding it until the apparent leakage current becomes stable and recording the readings with adjustments for temperature. This test is especially applicable to low-capacitance units under test.

Time-varying tests such as the polarization index test (PI test) are independent of temperature effects and save time. To perform this test, a predetermined test voltage is

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applied to the unit under test and readings are taken at 1 minute and 10 minutes. The resulting ratio is analyzed to determine insulation quality. This type of test is especially appropriate for high-capacitance samples.

The step-voltage test is independent of temperature effects and saves time. To perform this test, the output voltage is increased in even steps at regular intervals over a fixed period of time. As long as the resistance of the unit under test increases with time, it has high-quality insulation. This type of test is only useful for high-capacitance samples.

FEATURES AND BENEFITS

Operates Like a Full-Wave Rectified Unit (Filtered Half-Wave Rectification)

- Provides the advanced performance equal to a full-wave rectified unit.
- Allows for a simple circuit scheme for long-term reliability.

Lightweight High-Voltage Module

- Air insulated, it is the lightest weight module available for its voltage and power ratings.
- Convenient portability allows a single operator to transport it into the field.

Complete Internal Guard Circuit/Guard Connection on High-Voltage Output Cable

- Intercepts stray surface leakage currents which could interfere with the measurement.
- Eliminates the need for an extra lead to hook up the guard connection.
- Ensures highly accurate measurements.

Separate high-voltage unit allows the operator to remain at a safe distance while testing is performed. Shown from left to right: 70, 120, and 160 kV units.

Choice of Digital or Analog Metering

- The preferred medium may be selected by the user.

Continuously Variable Test Voltage

- User can set test voltage to intermediate values as required.

Fast Charging of High-Capacitance Samples

- Saves the operator test time.

Negative Polarity to Ground

- Applies a worst-case condition to assure reliability.

Strip Chart Recorder (Optionally Available)

- Provides a permanent record of the leakage current for the unit under test.

Standard Safety Features

- Bipolar ammeter that displays the magnitude of the discharge current from the unit under test
- Input-supply-line circuit breaker
- Output current overload relay
- Zero-start interlock for high-voltage output
- Operational procedure interlock to ensure safe operating sequence
- Pushbutton controls and indicating lights for high-voltage ON/OFF
- Full circuit-breaker protection against internal damage by overloads, surges or test sample breakdown
- Connection for external permissive and safety interlocks

Model Capabilities/Applications

Following are the acceptance and maintenance testing capabilities of each of the Biddle dc dielectric test sets.

70-kV DC Dielectric Test Set

- Acceptance testing on 15 kV class cable
- Maintenance testing on 28 kV class cable

120-kV DC Dielectric Test Set

- Acceptance testing on 35 kV class cable
- Maintenance testing on 46 kV class cable

160-kV DC Dielectric Test Set

- Acceptance testing on 46 kV class cable
- Maintenance testing on 115 kV class cable

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Model	*Test Voltage	Max. Power System Voltage (phase-to-phase)	Output Current (120 Vac Input)	Display	CAT. NO.
70 kV	0 to 70 kVdc	15 kVac	5 mA for 30 min; 3.5 mA continuous	Digital	220070
				Analog	220072
120 kV	0 to 120 kVdc	35 kVac	5 mA for 20 min; 2.5 mA continuous	Digital	220123
				Analog	220124
160 kV	0 to 160 kVdc	69 kVac	5 mA for 20 min; 2 mA continuous	Digital	220163
				Analog	220164
*Negative polarity with respect to ground.					

SPECIFICATIONS

Input Power
Nominal 120 Vac, 50/60 Hz
For 220/240 Vac, 50/60-Hz operation, add **–47** to Cat. No.
Please note that specifications for the –47 models differ as follows:
Output Current: 220/240 Vac
120 kV Models: 5 mA for 5 min; 2 mA continuous
160 kV Models: 5 mA for 5 min; 1.5 mA continuous
When using external 240/120-volt step-down voltage transformers, the ratings may be used as given for 120 volt input.
Weight: Add approx 2 lb (1 kg) for **–47** control unit.

Ammeter
Ranges
0 to 19.9 mA
0 to 199 mA
0 to 1.99 mA
0 to 5 mA
Resolution: 0.1 µA on lowest range
Accuracy: ±2% of reading + 1 digit

Voltmeter
Resolution: To 100 V over entire range
Accuracy: ±(2% of reading + 100 V)

Ripple
Less than 2% on capacitive samples at continuous rated output

Temperature Range
Operating: -20 to +130° F (-30 to +55° C)
Storage: -40 to +150° F (-40 to +65° C)

Relative Humidity Range
Operating: 0 to 90% noncondensing
Storage: 0 to 95% noncondensing

Dimensions
Control Unit (all models)
20 H x 12 W x 12.5 D in. (510 H x 305 W x 318 D mm)

High Voltage Unit
70 kV: 20 H x 12 W x 12 D in. (510 H x 305 W x 305 D mm)
120 kV: 29 H x 12 W x 12 D in. (740 H x 305 W x 305 D mm)
160 kV: 39 H x 12 W x 12 D in.(1000 H x 305 W x 305 D mm)

Weight
Control Unit (all models)
23 lb (10.5 kg)

High-Voltage Unit
70 kV: 44 lb (20 kg)
120 kV: 65 lb (30 kg)
160 kV: 73 lb (33 kg)

Cables (including carrying bag)
70 kV Models: 7 lb (3 kg)
120 and 160 kV Models: 9 lb (4 kg)

OPTIONS AND ACCESSORIES

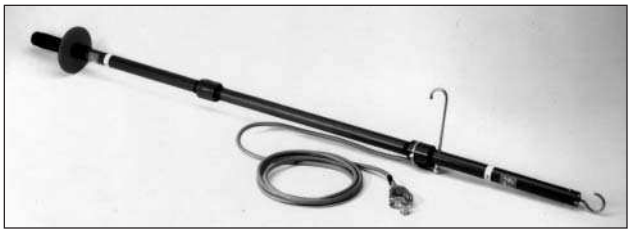
External Voltage Stabilizer
Filters input power to the test set and guards against line voltage fluctuations that may cause inaccurate readings.

Strip Chart Recorder
Document and print test sample leakage current measurements at the test site. This portable analog chart recorder features two ranges (50 and 500 mA), with results printed on pressure-sensitive paper.
Dimensions:
9 H x 7.5 W x 7.4 D in.
(230 H x 190 W x 190 D mm)
Weight: 6 lb (2.7 kg)

High-Voltage Discharge and Grounding Stick
Applying a suitably rated high-voltage resistance discharge stick following a test is recommended. This is not only a good safety practice, but will hasten discharge of highly capacitive samples.

Analog Meter Relay Trip
Overvoltage and overcurrent meter relay trips provide extra protection for sensitive analog meters.

Applications Guide
A practical guide, "*Lowdown on HV DC Testing*," gives the what, when, how and why of high-voltage dc testing and its applications.



High-voltage Discharge and Grounding Stick, ratings 70/120/160 kV

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ORDERING INFORMATION

Item (Qty)	Cat. No.
Dielectric Test Sets	
70 kVdc, digital	220070
70 kVdc, analog	220072
120 kVdc, digital	220123
120 kVdc, analog	220124
160 kVdc, digital	220163
160 kVdc, analog	220164
For 220/240-Vac, 50/60-Hz operation, add –47 to Cat. No.	

Included Accessories

Input supply cord, three-wire, 8 ft (2.4 m)	17032
Ground cables, 15 ft (4.5 m) [2]	4702-5
Interconnection cable, 15 ft (4.5 m)	18320
Detachable HV output cable, for 70 kV test sets, 15 ft (4.5 m)	18328
Detachable HV output cable, for 120 and 160 kV test sets, 15 ft (4.5 m)	29590
Carrying bag for cables	18313
Kilovolt/megohm test record graph paper (100-sheet pad)	220000

Item (Qty)	Cat. No.
Optional Accessories	
External voltage stabilizer	220004
Strip chart recorder	220003
Discharge sticks	
70 kV HV	222070-62
120 kV HV	222120-62
160 kV HV	222160-62
Analog meter overvoltage relay trip	add **–43**
Analog meter overcurrent relay trip	add **–42**
Special cable lengths, HV cable	add **–56**
"Lowdown on HV DC Testing" manual	AVTM22P-1

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ISO STATEMENT
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Registered to ISO 14001 Reg no. EMS 61597

70_120_160_DCTS_DS_en_V02
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