

DDA-3000 and DDA-6000 Universal Circuit Breaker Test Sets

Megger[®]



- **Model DDA-1 Digital Data Acquisition Instrumentation and Control System**
- **High-current output: 60,000 A for Model DDA-6000; 35,000 A for Model DDA-3000**
- **Digital signal processing (DSP) technology**
- **Variable pulse time and firing angle output current control**
- **Compliant with NEMA AB-4 test guidelines**

DESCRIPTION

Incorporating the latest technological advancements, Models DDA-3000 and DDA-6000 Series are designed specifically to test low-voltage power and molded-case circuit breakers equipped with thermal, magnetic or solidstate trip devices. The units are fully compliant with NEMA AB-4 test guidelines.

Tests are performed by simulating an overload or fault condition. Each test set is an integrated test system that provides a variable, high-current output. The test sets incorporate all control circuitry and instrumentation necessary to test direct-acting circuit breakers accurately, efficiently and safely.

The unique transformer and circuit design results in a very highcapacity test set in a very compact size. Advanced digital control and instrumentation provides exact testing capacity.

APPLICATIONS

Universal in application, the test sets will test virtually all low-voltage, molded-case and metal-clad, direct-acting ac circuit breakers produced by General Electric, Westinghouse, Federal Pacific, Square D, Gould, ABB, ITE, Siemens and other manufacturers.

Model DDA-3000 is rated for testing breakers up to 3000 amperes. Model DDA-6000 is rated for testing breakers up to 6000 amperes. Rugged and reliable, Megger circuit breaker test sets will provide years of trouble-free operation.

The test sets also may be used for other high-current applications, such as verifying the ratio of current transformers and performing heat runs or primary injection testing of high-voltage breakers and their associated protective relays.

All Model DDA-3000 and DDA-6000 test sets have identical features, instrumentation and operational characteristics. The only changes in the specifications among the units are their size, weight and maximum output-current capacity.

FEATURES AND BENEFITS

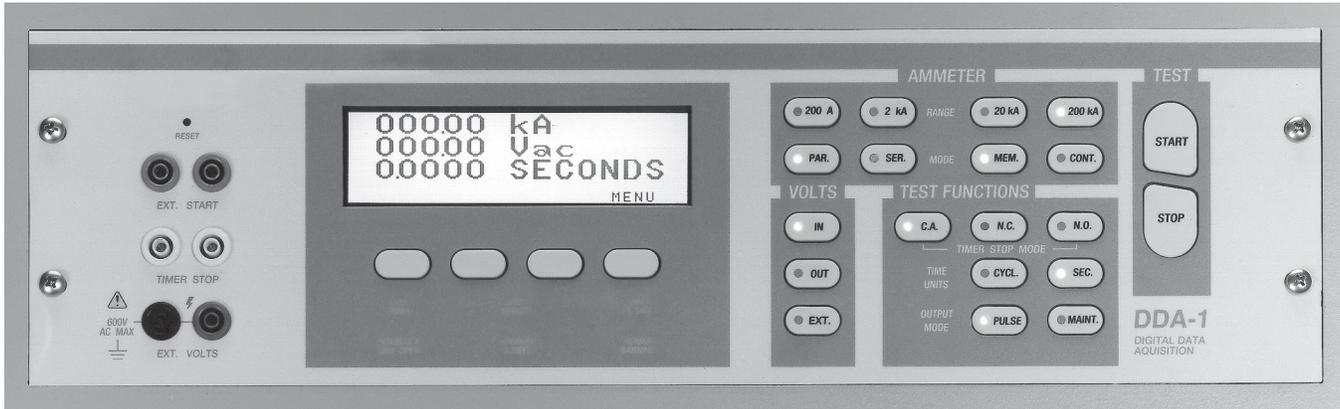
- **Initiating control circuit:** Fully digital initiating control circuit provides both pulsed and maintained control modes of output duration. The pulsed mode automatically pulses the output to any programmed pulse duration. This provides additional testing capabilities for electromechanical and solid-state trip devices. A short pulse duration also limits the preheating of the breaker under test while setting the test current.

In the maintained mode, the output remains energized until manually turned off or, during timing test, until the device under test operates, which both stops the timer and de-energizes the output.

- **Zero dc offset:** Use of digitally controlled SCRs instead of a contactor to initiate the output of the test set eliminates closing-time error and thereby ensures precise initiation at the zero crossover point of the output current waveform every time. Initiation at the zero crossover point ensures symmetrical output current by eliminating dc offset in the current waveform. Therefore accurate, repeatable test results are assured even with currents of very short duration, as when conducting tests of instantaneous or short-time delay trip elements.

The digital control of the SCRs also allows the unit to initiate at any point within 90 degrees of the zero crossover point of the output-current waveform. This will allow the intentional insertion of a dc offset into the waveform for a complete investigation of a breaker's operation.

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The Model DDA-1 control panel digitally samples the output current and mathematically calculates the current supplied to the breaker under test.

■ **Compact enclosure:** Improvements in transformer and circuit design have resulted in a very high-capacity test set in a single, relatively small enclosure. For safety and mobility, the test set is housed in a single, rugged, sheet metal enclosure with a low center of gravity, tow ring, lifting eyes and large, locking swivel casters with brakes.

To increase maneuverability, all four casters swivel; however, they also can be locked into a fixed position easily. The compact size of test sets permits easy movement through narrow doors. Controls and instrumentation are positioned so that the operator can simultaneously observe the circuit breaker under test.

■ **Construction:** Built for years of trouble-free, reliable operation, the test sets include rugged instrumentation and controls designed to withstand the vibration and shock of frequent transportation. They need never be removed from the enclosure .

■ **Protection:** Fuse, circuit breaker and overload protective devices are incorporated. The output-initiating SCRs are forced-air cooled, and temperature sensors provide protection from overheating. Emergency stop pushbutton is provided to de-energize all input power to the test set.

■ **Ground safety interlock:** An interlock circuit ensures that the test set chassis is connected to system ground before the output of the test set can be energized.

■ **Accessory outlet:** A ground-fault-protected, 120 volt outlet with a capacity of 1.2 kVA is provided for convenient connection of accessory equipment. Other voltages are available internally for customer-installed outlets.

INSTRUMENTATION AND CONTROLS

Model DDA-1: The Digital Data Acquisition instrumentation and control system was designed specifically to provide precise control of the output current and accurate metering of the breaker under test.

Model DDA-1 uses the latest in digital signal processing (DSP) technology. This technology provides complete digital control of the SCRs and digitally samples the output current for high-accuracy measurements.

Digital ammeter: Model DDA-1 samples the output current digitally and mathematically calculates the current that is supplied to the breaker under test. This process increases the accuracy of the ammeter systems and provides extreme flexibility in what current value is displayed. For example, when the test set is delivering a continuous current, the digital ammeter is continuously sampling the output waveform and can display a true rms value of the current.

For measuring short-duration currents, Model DDA-1 can calculate the output current in the following ways via selection from the soft control buttons on the panel:

1. For any output current greater than half a cycle, Model DDA-1 can calculate the true rms value of the output current pulse. For any output less than half a cycle, a true rms measurement is invalid.
2. For any current pulse, Model DDA-1 can measure the peak current and calculate an anticipated rms value of the current from the peak current.

This multiple-current calculation feature is also useful when testing different styles of solid-state trip devices. This feature allows the test set to simulate a similar type of current calculation that is being used by the various solid-state trip devices.

Digital timer: Thanks to digital signal processing technology, Model DDA-1's system knows exactly when current is present and when the breaker under test opens. This provides high-accuracy timing even when testing the instantaneous trip function on fast-acting breakers. In addition, the digital timer can display the breaker trip time in cycles or seconds.

A completely digital, solid-state circuit starts the timer automatically when the output current starts to flow and stops it when the device under test operates. This circuit will accommodate a variety of test conditions including:

1. When testing a circuit breaker or a device which has no auxiliary contact to monitor (e.g., a single-pole circuit breaker), the timer starts when the output current starts to flow and stops when the output current is interrupted.
2. When testing a device and monitoring normally closed contacts, the timer starts when the output current starts to flow and stops when the contacts open.
3. When testing a device and monitoring normally open contacts, the timer starts when the output current starts to flow and stops when the contacts close.

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Digital voltmeter: Model DDA-1 can be used to measure the input voltage to the test set or the output voltage from the test set. It also can be used as a diagnostic tool to evaluate contact condition by measuring the voltage drop across breaker contacts while subject to high current.

Panel indicators: Panel lamps incorporated for operator safety and convenience, indicate:

1. Output of the set ENERGIZED
2. Thermal WARNING or SHUTDOWN
3. GROUND INTERLOCK open
4. OVER RANGE of ammeter

External initiate circuit: Allows initiation of the test set from a remote location when desired.

SPECIFICATIONS

Input

Model No.	Input Voltage (single-phase)	Input Frequency	Input Current
DDA-3000	460 V±5%	60 Hz	200 A
DDA-3001	380 V±5%	50 Hz	200 A
DDA-3002	415 V±5%	50 Hz	200 A
DDA-6000	460 V±5%	60 Hz	350 A
DDA-6001	380 V±5%	50 Hz	350 A
DDA-6002	415 V±5%	50 Hz	350 A
DDA-6004	575 V±5%	60 Hz	350 A

Because Model DDA-3000/6000 is used all over the world to test low-voltage circuit breakers, there are a number of test sets designed to contend with the many different input voltages and frequencies.

When ordering, select the test set which best suits the power system available. The standard input power requirements for the DDA-3000 and DDA-6000 series are as follows:

Output

Output Circuit: The output of the test set is easily adjustable from zero to the maximum current available through the impedance of the device under test. Two output ranges are provided to accommodate a variety of load circuit impedances.

For high impedance devices, the output can be connected in series (with the series bar provided) to double the output voltage at a reduced maximum current.

The maximum current available from the test set is determined primarily by the impedance of the load circuit.

The duration of the available current is determined primarily by thermal conditions within the test set.

Model No.	Output Current		
	Maximum Continuous Current	Maximum Current Through a Circuit Breaker	Maximum Current Through a Short Circuit
DDA-3000	4500 A	35,000 A	60,000 A
DDA-3001	4446 A	28,000 A	48,000 A
DDA-3002	4446 A	28,000 A	48,000 A
DDA-6000	6250 A	60,000 A	100,000 A
DDA-6001	6175 A	50,000 A	80,000 A
DDA-6002	6175 A	50,000 A	80,000 A
DDA-6004	6175 A	60,000 A	100,000 A

Output Connections: To provide maximum utilization of the output available from the test set, each set is equipped with a Megger stab adapter board and stab sets Model CBS-1 and Model CBS-2 for use with drawout style, metal-clad breakers. The stabs eliminate the significant losses that occur if leads are used to connect the breaker under test to the test set. Cables must be used when testing molded-case breakers or other devices which will not connect directly to the stabs.

Duty Cycle: The test set will supply the rated continuous current indicated for 30 minutes, followed by 30 minutes off.

Maximum Output Current: Model DDA-3000/6000 Series will produce the following outputs at rated input voltage:

INSTRUMENTATION

Digital Ammeter

Operating Mode

Memory

Continuous

Digital Display: 5-digit display with 0.281 in. (7 mm) numerals

Ranges: 200/2000/20,000/200,000 A

Overall Ammeter System Accuracy

Continuous ±1% of reading

Peak Pulse ±2% of reading

RMS Pulse ±1.5% of reading

Digital Timer

Digital Display: 5-digit display with 0.281 in. (7 mm) numerals

Ranges

0.0001 to 99999 seconds

0.0001 to 99999 cycles

Accuracy: ±1% of reading

Digital Voltmeter

Operating Mode

Input voltage

Output voltage

External voltage

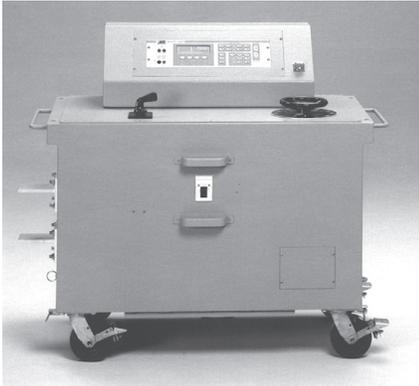
Digital Display: 5-digit display with 0.281 in. (7 mm) numerals

Ranges: 0 to 600 V

Accuracy: ±1% of reading

Model No.	Weight		Dimensions	
	lb	kg	H x W x D (in.)	H x W x D (cm)
DDA-3000 Series	1000	454	46 x 46 x 28 in.	117 x 117 x 71 cm
DDA-6000 Series	1200	545	46 x 55 x 28 in.	117 x 140 x 71 cm

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The DDA Series offers high capacity in a single, relatively compact enclosure that can be easily maneuvered

OPTIONAL ACCESSORIES

Protective Cover

A tough cover made of heavyweight, reinforced, vinylcoated nylon is available for protecting the test set from oil, dust or other particulate matter during storage.

It conforms to Mil-C-43006D and passes Mil-C-20696B test for oil and hydrocarbon resistance. It will withstand continuous exposure to temperatures ranging from -40 to +180° F (-40 to +82° C), and the fire-retardant material is treated with fungal and ultraviolet ray inhibitors.

Input Autotransformer

If the nominal input voltage for the test set is not available, or if use at different locations requires the use of a variety of input voltages, an autotransformer may be used.

The multitapped autotransformer is equipped with a power on/off switch, appropriate sockets, plugs, interconnect and tap selector cables. It is housed in a rugged sheet-metal enclosure with casters and handles.

All voltages are single-phase with a tolerance of $\pm 5\%$. Input taps of 240 volts and below are not recommended for obtaining maximum output of the test set. For other combinations of input and output voltages, contact Megger.

Model No.	Input Tap Voltages	Output Volts	Frequency (Hz)	Weight (lb/kg)	Dimensions H x W x D (in./cm)
AT-1	208, 230, 575	460	60	602/282	24 x 23 x 23 61 x 58 x 58
AT-4	220, 240, 415	380	50	640/290	24 x 23 x 23 61 x 58 x 58

ORDERING INFORMATION

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
Model DDA-3000	DDA-3000	Optional Accessories	
Model DDA-3001	DDA-3001	Input autotransformer	AT-1, AT-4
Model DDA-3002	DDA-3002	Leads included with input autotransformer	
Model DDA-6000	DDA-6000	Interconnect leads, 10-ft (3-m), 4/0 cable [2]	17164
Model DDA-6001	DDA-6001	Jumper lead [1]	17527
Model DDA-6002	DDA-6002	Protective cover	PC-1
Model DDA-6004	DDA-6004	Model CBS-3 stabs	Contact Technical Sales
Included Accessories			
Standard stab sets	CBS-1 and CBS-2		
Leads			
Timer leads, 12 ft (3.7 m) [2]	2997		
Input leads, 15-ft (4.5-m), 4/0 cable [2]	17163		
Fuses			
Fuse 500 V, 6 A [2]	9377		
Fuse 250 V, 1.5 A [5]	950		
Stab series bar [1]	5532		
Instruction manual [1]	17176		

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