

DDA-1600

Circuit Breaker Test Set



- **Model DDA-1 Digital Data Acquisition Instrumentation and Control System**
- **Variable pulse time and firing-angle output current control**
- **Tests wide range of breakers**
- **Modular, portable design**
- **Compliant with NEMA AB-4 test guidelines**

DESCRIPTION

The Model DDA-1600 Circuit Breaker Test Set incorporates proven transformer design with the latest development in high-current instrumentation and control. This new design means the DDA-1600 is fully compliant with NEMA AB-4 test guidelines.

This combination provides the user with a portable, economical, high-current source for primary injection testing.

Model DDA-1600 provides all the controls, instrumentation and output capabilities to test low-voltage circuit breakers in a three-module configuration.

Module 1 – Controller and instrumentation module contains all the control circuitry and instrumentation needed for manually testing low-voltage circuit breakers.

Module 2 – Power module contains the coarse and fine-current controls, along with the SCR initiate package.

Module 3 – Output module contains the high-current output transformer and the current sensors.

Model DDA-1600 comes complete with all interconnect cables. Each module is housed in its own rugged, compact enclosure. The test set is easily transported and may be connected to the test device by cables or stab assemblies.

APPLICATIONS

Ideally suited for industrial, utility and testing service company use, Model DDA-1600 is designed to maintain and test low-voltage power circuit breakers rated to 1600-ampere frame size.

In addition, it can be used for verifying the ratio of current transformers and testing thermal or magnetic motor overload relays.

In the series configuration, the higher voltage output of Model DDA-1600 permits ready use in substations for primary injection testing of high-voltage circuit breakers and protective relays.

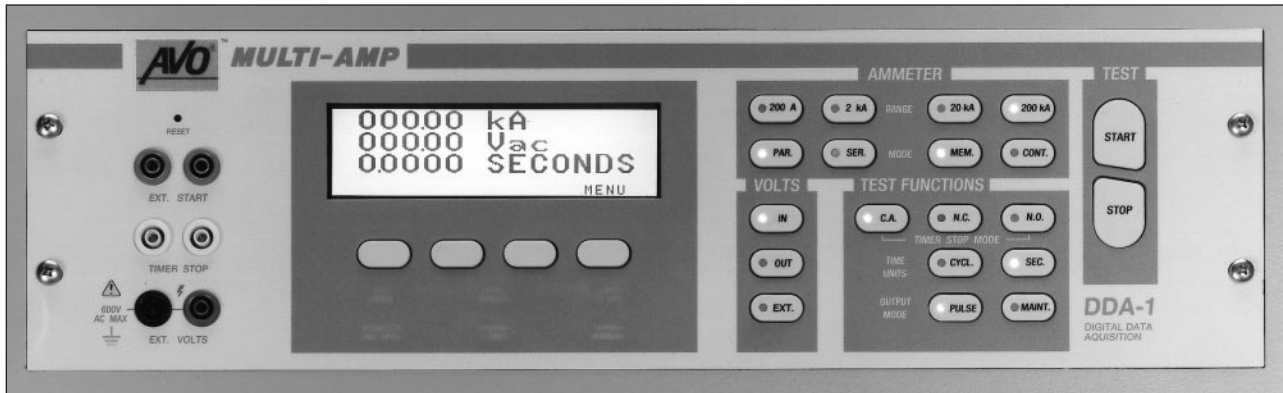
FEATURES AND BENEFITS

Model DDA-1600

- **Portable:** Housed in a lightweight, rugged, three-piece chassis that can be carried. This reduces the need for heavy equipment to transport the test set.
- **Versatile:** Designed to test a wide range of air frame and molded-case circuit breakers. Model DDA-1600 will test airframe circuit breakers rated up to 1600 amperes and molded-case circuit breakers rated up to 1200 amperes.
- **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 the device under test operates, which both stops the timer and de-energizes the output.



Model DDA-1600 uses the Model DDA-1 Digital Data Acquisition Instrumentation and Control System. This system offers the latest in digital signal processing technology to control the test set and measure reactions of the breaker under test.

- **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 ensures precise initiation at of the output current waveform every time.

Accurate, repeatable test results are ensured 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 elimination of a the dc offset caused by a change in impedance of the varying loads.

Controller and Instrumentation

Module

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 therefore 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 one cycle, Model DDA-1 can calculate the true rms value of the output current pulse. For any output less than one 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: Because of the Model DDA-1 digital signal processing technology, the system knows exactly when current is present and when the breaker under test opens.

This provides a high-accuracy timing even when testing the instantaneous trip function on fast-acting breakers. The digital timer can display the breaker trip time in cycles or seconds.

A completely digital, solid-state circuit automatically starts the timer 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 (each as 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.

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

Other input voltages are available with an optional input autotransformer, Model AT-5: 208/240/575 V, 1.
(Refer to the Optional Accessories section.)

Model No.	Input Voltage (single phase)	Input Frequency	Input Current
DDA-1600	460 V \pm 5%	60 Hz	150 A
DDA-1600/50	380 V \pm 5%	50 Hz	150 A

Output

The output of the test set is easily adjustable from zero to the maximum current available through the impedance of the device under test. For low-current, high impedance devices, the output can be connected in series with the optional series bar to double the output voltage.

Model No.	Maximum Continuous Current	Output Current	
		Maximum Current Through Air-Frame Circuit Breaker	Maximum Current Through Molded-Case Circuit Breaker
DDA-1600	1,600 A	19,200 A	14,400 A
DDA-1600/50	1,580 A	16,000 A	12,000 A

Model DDA-1600 will deliver the rated continuous current for a 24 hour period.

The maximum current available from the test set is determined primarily by the test-circuit impedance. The duration of the available current is determined by the thermal conditions within the test set.

The maximum current through an air frame circuit breaker is the maximum current the test set can deliver through a breaker connected with stabs.

The maximum current through a molded-case circuit breaker is the maximum current the test set can deliver through a breaker connected with 5 ft (1.5m) cables provided.

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: \pm 1% of reading

Peak Pulse: \pm 2% of reading

RMS Pulse: \pm 1.5% of reading

Model No.	Module	Weight		Dimensions	
		lb	kg	H x W x D (in.)	H x W x D (cm)
DDA-1600	Control and Instrumentation	19	8.6	9.9 x 14.1 x 11.3	27 x 54 x 24.8
	Power	100	45.4	14 x 29 x 12.5	35.6 x 73.6 x 31.8
	Output	210	95.4	7.5 x 33 x 18	19 x 83.8 x 45.7

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: \pm 1% of reading

Digital Voltmeter

Operating Mode

Input voltage

Output voltage

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

Ranges

Up to 600 V

Accuracy

\pm 1% of reading

OPTIONAL ACCESSORIES

Model AT-5 Input

Autotransformer

If nameplate input voltage is not available, or if Model DDA-1600 is to be used at various locations with different input voltages, specify Model AT-5 Input Autotransformer.

The multitapped autotransformer with power ON/OFF switch and appropriate sockets and plugs is housed in a rugged, sheet-metal enclosure with casters and handles.

Model DDA-1600 is designed to be placed on top of Model AT-5, providing a compact, transportable system. Model AT-5 tap selections are: 208, 240 and 575 volts, 60Hertz, single-phase. For other input voltage and frequency, contact Technical Sales.

Model AT-5 may reduce the maximum output of the test set. For example, a 208-volt input, stepped up to 460 volts, may not be sufficient to provide maximum output.

Transport Cart

The transport cart is a mobile base that supports Model DDA-1600. This allows the test set to be rolled from one test site to another.

Stab Adapter

To obtain the maximum output current of the unit, the appropriate stab adapter connects the output bus of Model DDA-1600 in a parallel configuration while providing an output base for stab set Models CBS-1, CBS-2 or CBS-3. The Model DDA-1600 test set uses Stab Adapter Model CBS-7.

Refer to the catalog entry for Circuit Breaker Stab Sets to determine the proper stab set selection.

ORDERING INFORMATION

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
Model DDA-1600	DDA-1600	Instruction manual [1]	50550
Model DDA-1600/50	DDA-1600/50		
Included Accessories		Optional Accessories	
Input leads, 15 ft (4.5 m), 4AWG, [2]	17165	Model AT-5 Autotransformer	AT-5
Ground lead, 8 in. (45.7 cm) [1]	15067	Stab adapter	CBS-7
Timer leads, 12 ft (3.7 m) [2]	2997	Optional stab sets	CBS-1, CBS-2
Output leads, quadruple 4/0, 5 ft. (1.5 m) [1 set]	15397	Transport cart	11685
Signal cable interconnect [1]	17413	Series bar	CBS-8
Control cable interconnect [1]	17435	Model CBS-3 stabs	Contact Technical Sales
Power interconnect [1]	14783		
Fuses			
1.5 A, 250 V MDL [5]	11898		
3 A, 250 V MDA [5]	951		
0.5 A, 250 V MDL [5]	982		
2 A, 250 V MDA [5]	983		
1.6 A, 500 V FLQ [5]	15533		