

DELTA2100

10 kV Power Factor Test Set with Integrated LV 3-phase TTR Test Capability



- Combines all the functions of the Megger DELTA2000 and TTR300 in one easy-to-use system
- Designed to work in high interference switchyards of up to 765 kV
- Built-in capability for storing, printing and downloading test results
- Rugged, portable design for field/shop use with automated control via the PowerDB™ software package
- Optional HV reference capacitors (100 pF, 1000 pF) with 2% dissipation factor, and a 10 nF HV TTR capacitor
- Optional Priority Access package offering exclusive services/support (US market only)

DESCRIPTION

The DELTA2100 is a fully automatic 10 kV insulation power factor test set designed for condition assessment of electrical insulation in high voltage apparatus such as transformers, bushings, circuit breakers, cables, lightning arresters and rotating machinery. In addition, the DELTA2100 (via PowerDB software) is used for measuring the excitation current and low-voltage turns ratios of three-phase transformer windings.

This set has been designed to provide a comprehensive AC insulation diagnostic test. Measurements are performed automatically by the DELTA2100, and results are displayed on a large graphical LCD. Measured quantities include voltage, current, power (loss), power factor and capacitance. The operator has the option of correcting the current and loss readings to their 2.5 kV or 10 kV equivalents. An optional 10 nF TTR capacitor in addition to two HV reference capacitors are also available.

The built-in tracking automatic interference suppression circuit ensures accurate and reliable test results under severe electrostatic and electromagnetic interference conditions. This feature allows the performance of test measurements in energized switchyards of up to 765 kV.

The operator has the option of storing the test results on the provided data key, or download directly to a PC or the included thermal printer. A small printer mounting can be installed inside the unit's lid in lieu of the standard printer

that is included. The data key has storage capacity for 127 sets of test results. Information stored on the data key can be easily retrieved on a PC using the provided software program and interface box.

The Priority Access program provides specific guaranteed support to assure full utilization of the DELTA2100. The purchase of the program entitles the user free services for one year from receipt of the unit.

FEATURES AND BENEFITS

- Fully automatic operation eliminates operator error and reduces testing time.
- Simplified operation procedure eliminates the need for extensive software or hardware setups.
- Performs all standard ungrounded-specimen tests (UST) and grounded-specimen tests (GST), with or without a guard circuit.
- Utilizing the automatic suppression circuitry achieves high accuracy measurement under severe electrostatic and electromagnetic interference conditions.
- Two-piece design reduces size and weight of the system and provides easier transportation.
- Built-in self diagnostic and calibration check.
- The operator has the option of measuring either the power factor or dissipation factor ($\tan \delta$).

- Open-ground detector ensures proper grounding before test.
- Interlock switches provide operator safety.
- High accuracy SF₆ gas-filled capacitor as internal reference.
- Built-in interface to the optional Resonating Inductor (Cat. No. 670600) to extend the capacitance measuring range to 1.1μF at 10 kV.
- Data key stores 127 sets of test results for retrieval and analysis. Stored results can be easily transferred to a PC using the provided interface box.
- Optional printer mounting inside unit's lid instead of standard thermal printer.
- Optional HV TTR capacitor (10 nF) in addition to two HV reference capacitors (100 pF and 1000 pF) with a 2% dissipation factor.
- LV three-phase transformer turns ratio testing and excitation current up to 500 mA (via PowerDB software).
- RS-232 serial interface for remote control and downloading the test results to a PC.
- Includes a battery/line operated printer for a hard copy of the test results which are date and time stamped.
- Optional bar code wand and PC software for recording an alphanumeric test identification in the field.
- Optional Priority Access package with exclusive services (US market only).
- Optional Oil Test Cell for testing insulating fluids up to 10 kV.
- Optional Calibration Standard verifies proper operation and accuracy of the test results.
- Interfaces with a PowerDB software package that performs extensive information processing, data trending and report generation.



The DELTA2100, available in either 120 or 240 V ac/50 or 60 Hz, includes the control unit (top) and auxiliary module (bottom) containing HV amplifier and LV three-phase TTR circuitry.



Close-up of DELTA2100 panel



LV three-phase TTR connections, installed inside DELTA auxiliary cabinet. (Lid not shown for clarity.) TTR testing in accordance with Megger TTR300 product specifications (via PowerDB software). An external laptop is easily placed on top surface of module for added convenience.

SPECIFICATIONS**Input**

120/230 V $\pm 10\%$, 1 ϕ , 50/60 Hz, 1440 VA

Output

0 to 12 kV, continuously adjustable.

For insulation testing: 200 mA continuous and 310 mA maximum for up to 5 minutes.

For excitation current and LV three-phase TTR testing: 500 mA continuous.

The power supply capacity can be expanded to 4 Amps using the optional Resonating Inductor, catalog number 670600.

Power Factor Accuracy**Voltage**

(RMS) $\pm(1\%$ of reading + 1 digit)

Current

(RMS) $\pm(1\%$ of reading + 1 digit)

Capacitance

$\pm(0.5\%$ of reading + 2 pF) in UST mode

$\pm(0.5\%$ of reading + 6 pF) in GST mode

Power Factor

$\pm 2\%$ of reading + 0.05% (up to 90%)

Dissipation Factor

$\pm 2\%$ of reading + 0.05% (up to 200%)

Watt Loss

$\pm(2\%$ of reading + 1mW)

Power Factor Measuring Ranges**Voltage**

250 V to 12 kV, 10 V resolution. Minimum recommended voltage is 500 V.

Current

0 to 5 Amps, 1 μ A maximum resolution. The measurement can be corrected to either 2.5 kV or 10 kV equivalents.

Capacitance

1 pF to 1.1 μ F, 0.01 pF maximum resolution on low ranges.

Power Factor

0 to 100%, 0.01% maximum resolution.

Dissipation Factor

0 to 1000%, 0.01% maximum resolution.

Watt Loss

0 to 2 kW, actual power, 0 to 100 kW when corrected to 10 kV equivalent. 0.1 mW maximum resolution. The measurement can be corrected to either 2.5 kV or 10 kV equivalents.

Power Factor Measurement

The following seven test modes are available, using the blue and red measuring leads, and can be selected by the operator:

- UST: Ground Red, Measure Blue
- UST: Ground Blue, Measure Red
- UST: No Ground, Measure to both Red and Blue
- GST: No Guard
- GST: Guard Blue, Ground Red
- GST: Guard Red, Ground Blue
- GST: Guard Red, and Blue, No Grounding
- UST: Ungrounded Specimen Testing
- GST: Grounded Specimen Testing

LV Three-Phase Turns Ratio Range and Accuracy

8 V ac:	$\pm 0.1\%$ (0.8 to 2000)
	$\pm 0.25\%$ (2001 to 4000)
	$\pm 0.35\%$ (4001 to 8000)
40 V ac:	$\pm 0.1\%$ (0.8 to 2000)
	$\pm 0.15\%$ (2001 to 4000)
	$\pm 0.3\%$ (4001 to 10,000)
80 V ac:	$\pm 0.1\%$ (0.8 to 2000)
	$\pm 0.15\%$ (2001 to 4000)
	$\pm 0.25\%$ (4001 to 10,000)
Resolution:	$\pm 0.30\%$ (10,001 to 45,000)

Resolution: 5 digit for all ratios

LV Excitation Current Range and Accuracy

0 to 500 mA, 3 digit resolution, $\pm(2\%$ of reading + 1 digit)

LV Phase Deviation Range and Accuracy

± 90 degrees, 1 decimal point for the minutes display, 2 decimal points for the degree display, or for the centi-radian display

Accuracy: ± 3 minutes

Test Frequency

Same as line frequency

Interference Suppression

Available Suppression Methods

- Operator selectable automatic forward/reverse measurement averaging.
- Operator selectable automatic tracking interference cancellation.

Safety Qualifications

The test set meets the requirements of both the IEC-1010 and the CE mark specifications. The test set also meets the shock and vibration requirements of the ASTM D999.75 standard.

Environment**Temperature**

Operating: 32 to 122° F (0 to 50° C),

Storage: -58 to +140° F (-50 to +60° C)

Relative Humidity

Operating: 0 to 90% non-condensing

Storage: 0 to 95% non-condensing

Dimensions**Control Unit**

16 H x 22 W x 16 D in. (406 H x 559 W x 406 D mm)

Auxiliary Module

16 H x 22 W x 16 D in. (406 H x 559 W x 406 D mm)

Weight (excluding cables)

Control unit: 74 lb (33kg)

Auxiliary module: 78 lb (35 kg)



Data Keys with PC interface box and standard thermal printer

OPTIONAL ACCESSORIES



Optional capacitor kit includes carry case, HV single-phase TTR capacitor (left), and 2 reference capacitors (center). Also shown are 2 connectors (right) that will work with the capacitors and are supplied with the DELTA2100 unit



The optional Resonating Inductor expands the capacitance range of the DELTA2100



The optional accessory kit, C/N 670501 includes mini bushing tap connectors, hot collar straps, temperature/humidity meter, .75" bushing tap connector, 1" bushing tap connector, "J" probe bushing tap connector, 3-ft non-insulating shorting leads, 6-ft non-insulating shorting leads



The optional Oil Test Cell, C/N 670511, is used for testing insulating fluids up to 10 kV

OPTIONAL ACCESSORIES (Continued)



Optional bar code wand for recording an alphanumeric test identification



The optional Calibration Standard traceable to the NIST for quick operating or calibration checks of test set bridges calibrated in watts loss or in dissipation factor

PowerDB™ Acceptance & Maintenance Test Data Management Software

The DELTA2100 is controlled and automated by the PowerDB management system, a powerful software package providing data management for acceptance and maintenance testing jobs. Customer/contract information is quickly sorted and searched. Opening a specific record shows detailed information such as type of service, order date, sales contact, and invoice information. Job information can be transferred between field-use databases and a master database. Job/Device Productivity Reports aid in bidding future jobs as well as personnel evaluation.

Electrical utilities who have invested in sophisticated Computerized Maintenance Management Systems (CMMS) can easily link with the PowerDB software because it works with a number of systems.

The package also provides test documentation and trending, report generation and a number of other optional add-ons that are described in the Megger PowerDB data sheet available on our website **www.megger.com**.

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Data entry and automated control of Megger DELTA2100

ORDERING INFORMATION

Item [Qty]	Cat. No.
DELTA2100, 10 kV Automated Insulation Test Set with integrated LV 3-phase TTR test capability	
120 Vac, 60 Hz	DELTA2100
120 Vac, 50 Hz	DELTA2100-44
240 Vac, 60 Hz	DELTA2100-45
240 Vac, 50 Hz	DELTA2100-47
Included Accessories	
HV lead set: 70 ft (21.4 m), double shielded, interchangeable hook or clip termination	30012-5
HV return leads: 70 ft (21.4 m), shielded	
Color-coded Red	25572-1
Color-coded Blue	25572-2
LV 3-phase TTR shielded test lead set, X and H winding: 50 ft (15 m)	37094
Ground lead: [2] 15 ft (4.6 m)	4702-7
Hand-held TEST switch assy for remote LV TTR operation	30915-220
120 volt Power cord: [2] 8 ft (2.5 m)	17032-4
240 volt Power cord: [2] 8 ft (2.5 m)	17032-2
LV TTR bushing clips [6]	MC7144
LV TTR spare fuse kits, 120 V	35026-3
LV TTR spare fuse kits, 240 V	35026-4
Canvas carrying bag for LV TTR test leads	30915-211
Safety hand switch, Interlock #1: 70 ft (21.4 m)	34460-021
Safety hand switch, Interlock #2: 8 ft (2.5 m)	34460-020
Interconnect cables: For connecting the control unit and auxiliary module, [2] 5 ft (1.5 m)	27978, 27979
RS232 cable for connecting auxiliary module to a PC	CA-RS232
RS-232 cable for connecting control unit to a PC	34675-1
Foam transit case: two, foam padded, heavy-duty cases for control unit and auxiliary module	35582
Programmed battery/line power serial thermal printer	33842
AC 120 V adapter	33841-2
AC 230 V adapter	33841-3
Data keys [2]	30603
Data key interface box, 120 volt	30606
Data key interface box, 240 volt	30606-1
Data key download software	35227
PowerDB LITE software	
Instruction and application manual	AVTMDDELTA2100

Item [Qty]	Cat. No.
Optional Accessories	
PowerDB software, 1st machine license, soft key	DB1001
PowerDB software, 1st machine license, USB dongle	DB1001S
Printer mounted in lid (in lieu of std. printer)	Add -39
HV 1-phase TTR capacitor (10 nF, 10 kV)	36610
HV reference capacitor (100 pF, 10 kV)	36610-1
HV reference capacitor (1000 pF, 10 kV)	36610-2
Carry case for capacitors	36610-CC
Capacitor kit (HV TTR cap, 2 ref caps, carry case)	36610-KIT
Resonating inductor	670600
PF calibration standard	670500-1
Oil test cell	670511
Hot collar belts [3]	670505
Bushing tap connectors [2]	670506
Transit cases for PF calibration standard (heavy-duty, foam-padded)	670635
Bar code wand and software	34705
High voltage lead, 25 ft (7.6 m)	30012-8
HV PF accessory kit: mini bushing tap connectors [2], hot collar straps [3], temperature/humidity meter [1], .75" bushing tap connector [1], 1" bushing tap connector [1], "J" probe bushing tap connector [1], 3-ft non-insulating shorting lead [3], 6-ft non-insulating shorting lead [3]	670501
Priority Access package (US market only)	D2K-P-ACCESS