

DELTA3100

10 kV Power Factor Test Set with “PowerDB ONBOARD” and Integrated LV 3-phase TTR Test Capability



- Combines all the functions of the Megger DELTA3000 and TTR330 instruments in one easy-to-use system
- Integrated PowerDB software package allows for automated control without the use of a laptop
- Rugged, portable unit for field/shop use and designed to work in high interference switchyards of up to 765 kV
- Built-in capability for storing, printing and downloading test results
- Optional Priority Access package offering exclusive 24/7 service and support (US market only)

DESCRIPTION

The DELTA3100 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 to performing insulation power factor tests, the DELTA3100 is also used for measuring the excitation current and low-voltage turns ratios of three-phase transformer windings.

The DELTA3100 allows for direct data feed into PowerDB for automatically generating test reports such as table of contents, data sheets, deficiency and comments reports. All data can be saved in an XML file with all historical data. This allows the user to view the previous year's test sheet or to trend specific test points. If a user also has a full license of PowerDB, test sheets can be modified and downloaded to the instrument to customize the instrument's personality and procedures in order to meet customer needs.

The unit's intuitive and easy-to-use interface allows the user to configure test sheets and pop-up test procedures. A QWERTY keyboard makes it simple for entering all nameplate and location information. USB drive support is also included in the unit with two exposed USB ports.

The test set is designed to provide a comprehensive AC insulation diagnostic test. Measurements are performed automatically by the DELTA3100, and results are displayed on a large 8.4" full VGA bright color display. 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. Information can be downloaded directly to a PC or USB flash device, allowing the user to store up to 100,000 data sets. Printing is done via a second USB port directly to a USB thermal paper printer (included) allowing the user to print full-size test forms in either 8.5" x 11" or A4 size, without the use of an external laptop.



LV three-phase TTR test connections shown, integrated inside DELTA auxiliary cabinet. (Lid not shown for clarity.)

Two optional high-voltage reference capacitors are available to allow the user to perform a quick field check to ensure the DELTA3100 has maintained its calibration. In addition, an optional 10 nF TTR capacitor is available to allow the user to perform high-voltage Transformer Turns Ratio measurements with the DELTA3100.

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 Priority Access program provides specific support to assure full utilization of the Megger DELTA3100. The purchase of the program entitles the user to 24/7 support services at an economical cost, with the first year provided at no charge. (Applies to US market only.)

FEATURES AND BENEFITS

- Fully automatic operation (stand-alone or remote-control) with user interface via on-screen customizable test forms.
- Integrated PowerDB ONBOARD allows for data analysis and trending while in the field without the use of an external computer.
- Large 8.4" full VGA bright color display.
- Built-in USB port and included USB printer allows for 8.5"x 11" or A4 test forms printing without the use of a laptop.



The DELTA3100, 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.

- Built-in capability for storing test results, in an open XML format, to either internal memory or to an external USB storage device.
- Performs all standard ungrounded-specimen tests (UST) and grounded-specimen tests (GST), with or without a guard circuit.
- Built-in self diagnostic and calibration check.
- LV three-phase transformer turns ratio testing and excitation current up to 500 mA.
- 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.
- 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 1.1 μ F at 10 kV.
- Optional HV TTR capacitor (10 nF) in addition to two HV reference capacitors (100 pF and 1000 pF) with a 2% dissipation factor.
- Optional USB bar code scanner to record and 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.



DELTA3100 shown testing a pad mount transformer

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%)

Dissipation Factor

$\pm(2\%$ of reading + 0.05%)

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 90%, 0.01% maximum resolution.

Dissipation Factor

0 to 200%, 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)
	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

Printer Interface

USB

Computer Interface

Ethernet

User Interface

8.4 in., full-color VGA, test forms on-screen view, full QWERTY keypad and navigational pushbuttons

Data Storage

Internal: up to 100,000 data sets

External: USB flash device, up to 100,000 data sets

Communication/Control Software

PowerDB and PowerDB ONBOARD

Test Frequency

Same as line frequency

Interference Suppression

Available Suppression Methods

1. Operator selectable automatic forward/reverse measurement averaging.
2. 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 leads)

Control unit: 74 lb (33kg)

Auxiliary module: 78 lb (35 kg)

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 DELTA3100 unit



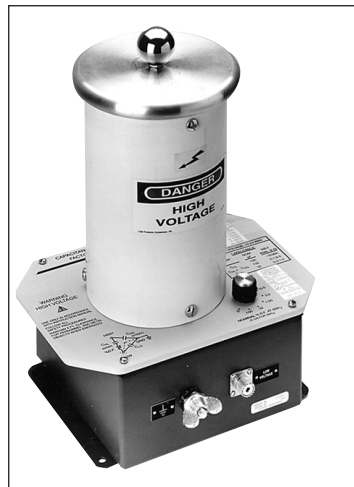
The optional Resonating Inductor expands the capacitance range of the DELTA3100



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 shoring leads, 6-ft non-insulating shoring leads



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



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 DELTA3100 come complete, at no extra charge, with PowerDB (a new powerful PC Windows® based software program). PowerDB allows the operator to completely program a test routine, in advance, for a transformer, save it under the transformer ID number, and then recall it in the future as required.

Testing on the DELTA3100 can be performed in a remote control manner, via PowerDB. Once testing is complete, results are easily downloaded to the external PC in an “open” XML data format. The unit’s internal memory also maintains historical data-files so that, through interface to PowerDB, current and past results can be archived, compared, analyzed, displayed in trend charts, and compiled into Test Reports.

Control of the DELTA3100 in this remote-control manner offers the following benefits:

- Easy to use interface between operator and instrument.
- Suspect data points are flagged visually using a RED highlight.
- Easily recall transformer setups from a custom settings menu.
- Quickly download results to the PC for completing a transformer test report.

With PowerDB’s extensive database capabilities, multiple data files (from multiple instruments) can automatically be fed to PowerDB in order to generate comprehensive asset analysis in the form of Reports containing table of contents, test data sheets, commentary, and deficiency summaries.

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.

For testing companies using PowerDB, 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.

The package also provides a number of other optional add-ons that are described in the PowerDB data sheet available on the Megger website www.megger.com.

PowerDB™ ONBOARD Acceptance & Maintenance Test Data Management Software

The “PowerDB ONBOARD” logo means PowerDB software is running on a computer embedded within the DELTA3100. This powerful feature provides the DELTA3100 with a common “User Interface” to minimize operator training and provides a seamless interface to the full PowerDB (PC version) application.

Easy-to-read on-screen test forms provide the user interface for instrument set-up and test operation. Results are displayed against pass/fail nameplate limits and can be stored (either internally or to a USB storage device) in an open XML data format.

The ONBOARD software also maintains a historical data file so that, while in the field, current and past results can be analyzed, compared, and displayed in trend charts without the need of an external computer. An 8.5” x 11” or A4 test form can also be printed in the field via an optional USB printer, and without the use of an external computer.

Megger. INSULATION TESTS TWO-WINDING TRANSFORMERS

CUSTOMER: ABC Service Center PAGE: 1 of 7
 ADDRESS: Bryan Middle School, 320 East Grand River Avenue, Dallas TX 77845
 USER: JCS # 21037
 DATE: 4/20/2004 TEMPERATURE: °F HUMIDITY: %
 SUBSTATION: MAIN BUILDING POSITION: TR #32

TRANSFORMER: MFR: SERIAL NO: WEATHER: TOP OIL TEMP: °F
 MFR YEAR: TEST TYPE/CLASS: TOA: EOL: DILUTION OF OIL: DATA LAST TEST: LAST SHEET NO: 2
 OIL: ASHAPREL: AIR: GAS: GLUCONE: SEATED: OIL BLANKETED: CONSERVATOR: ☐
 COPIES TO: MFR: TYPE/CLASS: DWG NO: CAT NO: KV: YEAR:

HIGH SIDE: KV: WYE: DELTA: ☐ ☐
 LOW SIDE: KV: WYE: DELTA: ☐ ☐
 NEUTRAL: ☐

TEST NO	INSULATION TESTED	TEST RANGE	TEST RESULTS	TEST COMMENTS	TEST DATE	TEST BY	TEST NO	INSULATION TESTED	TEST RANGE	TEST RESULTS	TEST COMMENTS	TEST DATE	TEST BY
1	C ₁₀₁ + C ₁₀₂	100	100				2	C ₁₀₁	100	100			
3	C ₁₀₁	100	100				4	C ₁₀₁	100	100			
5	C ₁₀₁ + C ₁₀₂	100	100				6	C ₁₀₁	100	100			
7	C ₁₀₁	100	100				8	C ₁₀₁	100	100			
9	C ₁₀₁	100	100				10	C ₁₀₁	100	100			

Data entry and automated control of Megger DELTA3100

ORDERING INFORMATION

Item [Qty]	Cat. No.	Item [Qty]	Cat. No.
DELTA3100, 10 kV Power Factor Test Set with "PowerDB ONBOARD" and integrated LV 3-phase TTR test capability		Optional Accessories	
120 Vac, 60 Hz	DELTA3100	PowerDB software, 1st machine license, USB dongle	DB1001S
120 Vac, 50 Hz	DELTA3100-44	HV 1-phase TTR capacitor (10 nF, 10 kV)	36610
240 Vac, 60 Hz	DELTA3100-45	HV reference capacitor (100 pF, 10 kV)	36610-1
240 Vac, 50 Hz	DELTA3100-47	HV reference capacitor (1000 pF, 10 kV)	36610-2
Included Accessories		Carry case for capacitors	36610-CC
USB portable thermal printer (120 V)	36493-1	Capacitor kit (HV TTR cap, 2 ref caps, carry case)	36610-KIT
Line cord-Euro for thermal printer (240 V)	17032-18	Resonating inductor	670600
*PowerDB software, full version, 1st machine license, soft key	DB1001	Power factor calibration standard	670500-1
HV lead set: 70 ft (21.4 m), double shielded, interchangeable hook or clip termination	30012-5	Oil test cell	670511
HV return leads: 70 ft (21.4 m), shielded		Hot collar belts [3]	670505
Color-coded Red	25572-1	Bushing tap connectors [2]	670506
Color-coded Blue	25572-2	LV 3-phase TTR calibration device	550555
LV 3-phase TTR shielded test lead set, X and H winding: 50 ft (15 m)	37094	Transit case for PF calibration standard (heavy-duty, foam-padded)	670635
120 volt power cord: [2] 8 ft (2.5 m)	17032-4	Bar code scanner	36528
240 volt power cord: [2] 8 ft (2.5 m)	17032-2	High voltage lead, 25 ft (7.6 m)	30012-8
Ground lead, [2] 15 ft (4.6 m)	4702-7	Thermal paper (8.5" x 11") for printer	36809-1
Hand-held TEST switch assy for remote LV TTR operation	30915-220	Thermal paper (A4) for printer	36809-2
LV TTR Bushing clips [6]	MC7144	Replacement/spare battery pack for printer	37077
LV TTR spare fuse kits, 120 V	35026-3	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
LV TTR spare fuse kits, 240 V	35026-4	Priority Access package (US market only)	D3K-P-ACCESS
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		
HV interconnect cables for connecting the control unit and auxiliary module, [2] 5 ft (1.5 m)	27978, 27979		
RS232 cable for connecting control unit to auxiliary module (for LV testing)	CA-RS232		
Null modem adapter	35918		
Foam transit case: two, foam padded, heavy-duty cases for control unit and auxiliary module	35582		
Instruction and application manual	AVTMDelta3100		
*PowerDB software, C/N DB1001, included for a limited time only.			

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