

DOBLE OFF-LINE TESTING & ASSESSMENT

M4100 4TH GEN

High Voltage Apparatus Tester

THE INDUSTRY STANDARD
FOR COMMISSIONING,
DIAGNOSTIC & SCHEDULED
MAINTENANCE TESTING

The M4100 is the industry standard for power apparatus and insulation testing. Its unique combination of test capabilities and artificial intelligence analysis software makes it the power industry's most trusted Power Factor/Tan-Delta instrument. These instruments are used around the globe thanks to their comprehensive testing options, safety features and measurement accuracy.

FEATURES

- Power Factor/Tan-Delta testing to confirm insulation integrity and quality
- Capacitance testing to measure physical changes that may have occurred to the apparatus
- HV turns ratio testing to detect shorted turns or winding damage
- Leakage reactance/short circuit impedance testing to evaluate winding deformation
- Single phase excitation current testing to evaluate transformer magnetizing circuit
- Capacitor bank testing to detect deteriorating or failed capacitors within a bank
- Generates its own precise sine wave test signal
- Self-calibrating in the field
- Easy and accurate testing with Doble Test Assistant software (DTA)



BENEFITS

- Safety is our priority with dual safety switches, power strobes and ground earth relay interlocks
- Eliminates the effect of varying electrostatic interference with patented Line Frequency Modulation, which makes measurements at a frequency above and below the system frequency
- Reliability & Accuracy—generates its own clean test signal using an internal waveform generator for reliable results and stable readings
- Software firmware system senses abnormal current, temperature and voltage operation even before a user would notice
- Instantly analyze your test results, providing clear recommendations and explanations with FRANK™, the First Response Analytics Knowledgebase

M4100 4TH GEN TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS	
Operating Temperature	-20° to 50°C / -4° to 122°F
Dry Heat	IEC 60068-2-2
Cold	IEC 60068-2-1
Shock & Vibration	IEC 60068-2-27, IEC 60068-2-7 & ASTM D999.75
Drop Test	EC 60068-2-6
Weight	95 lb / 43 kg
Dimensions	10.3 H x 20 W x 25.3 D (in) 26 H x 50.8 W x 64.1 D (cm)
Software	DTA6 Basic
Power Input	95-264 VAC, Auto Sensing 47 to 63 Hz Accommodates Inverter and Portable Generators 16 A max at 110 V 10 A max at 220 V Accommodates GFIC/RCBO Class A & B
Field Verification & Calibration	Integrated Self-Calibration & Verification Module 3 Resistive Standards Amplifier Test Range: 7-All Nominal Test Ranges Coverage: Watts, Amps, PF/Tan-Delta, Internal Source Loss, HV Cable, LV Cable(s)
Safety Features	Open Ground Detection Circuit Abnormal Current Sensing System with continuous temperature compensation Safety Switches: 2-Deadman Safety Strobe
Source Output	3 kVA 25 V to 12 kV Output Current: Continuous @ 100 mA at 10 kV 30 minutes @ 200 mA at 10 kV 4 minutes @ 300 mA at 10 kV
Power Factor/Tan-Delta Measurement	Range: 0 to ±100.00% Resolution: 0.01% (0.0001) Typical Accuracy: ± 0.005%
Capacitance Measurement	Range: 0 to 100 µF Resolution: 0.01 pF
Inductance Measurement	Range: 6 H to 10 MH Resolution: 0.01 H
Watts Measurement	Range: 0 to 2 kW, actual power Resolution: 0.5 mW

ORDERING INFORMATION

PART #	PRODUCT
M4K60	M4100 with cables, strobe, T/H Sensor, safety switches(2), DTA6 Basic software, M4151 Field Calibration Module & 65' HV Cable.
M4K100	Includes all of the above with 100' HV Cable instead of 65' HV Cable.
INCLUDED ACCESSORIES	
02D-0024-02	HV Cable 65' with Hook (included with M4K60)
02D-0024-01	HV Cable 100' with Hook (included with M4K100)
02B-0020-03	Lead, Low Voltage Red 65'
02B-0020-02	Lead, Low Voltage Blue 65'
020-0048-01	1 Set Hot Collars (5 at different lengths)
02B-0026-02	5' Copper Bare Copper Jumper
03B-1137-01	C2 Tap Adapters, ASEA GO Types
02B-0089-01	C2 Tap Adapters, Westinghouse type O "hockey stick"
212-0416	C2 Tap Adapters, Westinghouse type O Plus
02B-0012-01	C2 Tap Adapters, Westinghouse type OS, S
03C-1318-02	Temperature/Humidity Sensor
05B-0493-01	Temperature/Humidity Sensor Cable
2FA-0280-01	Hook M2 Cable 3-inch, M Series
09C-0613-01	Safety Strobe Light
05B-0492-01	Safety Strobe Light Cable
OPTIONAL ACCESSORIES	
M4300	M4300 Field Transporter for M4100
903-0031	M4100 Transportation Case
903-0034	M4300 Field Transporter Transportation Case
02C-5200-01	MFL (M-Oil) Liquid Insulation Test Cell and carrying case
010-0105-01	M4110 Leakage Reactance Interface (includes cables)
030-1684-01	M4140 CapBank Kit
03D-2010-01	Doble Universal Controller™, Tablet PC Controller
03B-0706-01	doble TTR Capacitor and Carry Case



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Specifications are subject to change without notice.
Doble is an ISO 9001 & ISO/IEC 17025 & 17034 Certified Company.
Doble is an ESCO Technologies Company.
MKT_SL_M4100_4TH_GEN_1/22

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M4100 4TH GEN

Technical Specifications

POWER SPECIFICATIONS

Output Voltage	0 to 12 kV ac
Output Current	Continuous @ 100 mA at 10 kV 30 minutes @ 200 mA at 10 kV 4 minutes @ 300 mA at 10 kV

Operating time period based on 50°C operating temperature. Longer durations at high currents will be realized at lower operating temperatures.

Output Power	3 kVA
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Sinusoidal output signal internal generated independent of input supply, No loss in performance when used with portable generator.

A.C. Input*	95-264 V AC 47 to 63 Hz 16 A max at 110 V 10 A max at 220 V
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MEASUREMENT, ACCURACY AND RANGE TEST FREQUENCY

TEST FREQUENCY

Range	45 to 70 Hz independent of input signal
Resolution	0.1 Hz
Accuracy	± 1% of reading

* There are power restrictions for input voltages below 190 V AC.



TEST VOLTAGE

Range	25 V to 12 kV
Resolution	1 V
Accuracy	± 1% of reading

TEST CURRENT

Range	0 to 5.0 A
Resolution	0.1 μ A
Accuracy	± 1% of reading, $\pm 1 \mu$ A

CAPACITANCE

Range	0 to 100 μ F
Resolution	0.01 pF
Accuracy	± 0.5% of reading, ± 1 pF

INDUCTANCE

Range	6 H to 10 MH
Resolution	0.01 H
Accuracy	± 0.5% of reading

WATTS

Range	0 to 2 kW, actual
Resolution	0.5 mW
Accuracy	± 2% of reading at 10 kV ± 0.03% of VA, ± 0.5 mW

POWERFACTOR/TAN-DELTA

Range	
% PF	0 to $\pm 100.00\%$
PF	0 to ± 1.0000
% Tan d	0 to $\pm 999.99\%$
Tan d	0 to ± 9.9999
mW/Var	0 to ± 9999.9
Resolution	0.01% / 0.0001
Guaranteed Accuracy	± 1% of Reading, $\pm 0.04\%$ PF/Tan d (Entire Range)
Typical Accuracy	< $\pm 0.005\%$ (Entire Range)



TEMPERATURE MEASUREMENT	
Range	-20°C to +50°C
Resolution	0.1°C
Accuracy	±4°C

Requires optional temperature probe

ENVIRONMENTAL	
TEMPERATURE	
Instrument	-20°C to +50°C
Storage	-40°C to +70°C
Humidity	90% non-condensing

DIMENSIONS	
Instrument	10-1/4 in. H x 20 in. W x 25-1/4 in. D 26 cm H x 50.8 cm W x 64.1 cm D
High Voltage Cable	60 ft./18 m (other lengths available as options)
Weight	95 lbs/45.5 kg

MAXIMUM INTERFERENCE CONDITIONS AT LINE	
FREQUENCY	
Electrostatic	15 mA rms of interference current into any lead or cable with no loss of measurement accuracy. Applicable to a maximum ratio of interference current to specimen current of 20:1.
Electromagnetic	500 µT, at 50 Hz in any direction

STANDARDS	
EMC Emissions	
FCC 47 CFR Part 15 Class A Emissions requirements (USA)	
EN 55011:1998/A1:1999/A2:2002 Group 1 Class A ISM Emissions requirements (EUROPE)	
AS/NZS CISPR 11:2004 Class A ISM Emissions requirements (Australia)	
EMC Immunity	
EN 61326:1997/A1:1998/A2:2001/A3:2003	
IEC 61000-4-2/3/4/5/6/11	
IEC 801-2(1984) Electrostatic Discharge	
ANSI/IEEE C37.90.1 Surge Withstand Capability	
SAFETY	
EN 61010-1 :2001 (2nd Edition)	
ENVIRONMENTAL	
IEC 60068-2-2 Dry Heat	
IEC 60068-2-1 Cold	
IEC 60068-2-30 Damp Heat	
MECHANICAL**	
IEC 60068-2-27 Shock	
IEC 60068-2-6 Vibration	
IEC 60068-2-6 Drop test	
ASTM D999.75 Transport Shock Test	

** Note: M4100 meets mechanical standards outside of shipping case or container.



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 MKT_SL_M4100TS_08/17

M4100

ACCESSORIES

Maximize Capabilities of Your High Voltage Apparatus Tester



M4110 Leakage Reactance Interface

The M4110 Leakage Reactance Interface (Figure 1-7) provides a power source and signal conditioning that allows the M4100 to measure transformer leakage reactance, also known as short-circuit impedance. The Leakage Reactance test cannot be run without this interface. Current and voltage cables are provided for connection to the transformer. The safety switch and safety strobe are required for this interface.



M4140 Capacitor Bank Test Kit

The M4140 Capacitor Bank Test Kit (Figure 1-8) tests individual capacitors without disconnecting them from the capacitor bank. To use the M4140, the M4110 Leakage Reactance Interface is required.

Laptop Computer

A PC (typically a laptop or tablet) running Microsoft® Windows 10 (or later) is required to operate the M4100 instrument using the latest version of Doble Test Assistant (DTA) Software. The PC must have one available USB or Serial port for communication with the M4100. Contact Doble for available options.



M4300 Transport

In one configuration, the M4300 Transport moves and stores the M4100 system.



Type C Resonating Inductor

The Type C Resonating Inductor is an adjustable reactor that extends the charging current range of the M4100 to test larger apparatus.



M4151 Field Calibration Reference

The M4151 Field Calibration Reference module enables the M4100 to perform System Status, Calibration Verification, and Field Recalibration tests in the field. When included, the M4151 is integrated into to the body of the M4100. The M4150 Field Calibration Reference, with two sets of terminals instead of three, is no longer available.



Doble Test Assistant (DTA) Software

Doble Test Assistant (DTA) software provides standardized apparatus test procedures and templates, data management, and optional expert system software for apparatus condition assessment. For more information, see the Doble Test Assistant Field System User Guide and the Doble Test Assistant Web-Enabled Office System.



dobleTTR Capacitor

The TTR (Transformer-Turns-Ratio) Testing Capacitor is a small, portable capacitor that can be energized at up to 10 kV for performing turns-ratio tests with the M4100 at high voltages.

Transport Cases

Doble offers special high-impact padded cases for transporting the M4100 and associated components.



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