MTR105
Rotating Machine Tester

Megger
Baker Instruments



- **Full colour graphic display**
- **3 Phase insulation resistance**
- **Temperature correction for insulation resistance**
- **Guard terminal**
- **DLRO four wire Kelvin**
- **Continuity and diode test**
- **Motor direction of rotation**
- **Capacitance and inductance**
- **CAT III 600 V up to 3000 m**
- **Environmental protection to IP54**

DESCRIPTION

The MTR105 is a dedicated Static Motor Tester with Megger's tried and trusted suite of insulation resistance tests (IR), plus all the great traditional features and reliability of Megger's testers.

The MTR105 takes the test abilities of Megger's proven IR test instruments adding DLRO four wire Kelvin low resistance test, inductance and capacitance tests to provide a versatile motor tester, all packaged in a robust hand held instrument, which up to now has simply not been available.

Additionally the MTR105 incorporates temperature measurement and compensation (for IR tests), motor direction of rotation plus supply phase rotation tests.

These new test abilities make the MTR105 a real world, versatile, hand held motor test instrument.

The MTR105 comes in an over-moulded case, providing increased protection and robustness, achieving an IP54 weatherproof rating.

FEATURES

- Guard terminal, to eliminate any surface leakage current.
- Detachable test leads with interchangeable clips and probes for different applications.
- Stores test results for up to 256 motors, which can be downloaded to a USB mass storage device.
- Rotary dial control, full graphic display, simple and easy to use.
- Environmental protection to IP54, providing protection against moisture and dust ingress, including the battery and fuse compartment.
- Tough housing: A 'rubber over moulding' combines a tough shock absorbing outer protection with excellent grip, on a strong modified ABS housing, providing a robust case.
- Rechargeable batteries with mains charger kit option.

APPLICATIONS

- Production tests for new manufactured motors and generators.
- Test repaired and refurbished motors and generators.
- Monitoring and maintenance of in service motors (off line) in the field.

TYPICAL INDUSTRIES INCLUDE

- Utilities: Electrical power generation, water, oil / gas.
- Industrial: Production line / factory maintenance teams, HVAC field engineers.
- OEM: Motors / generators.
- Service: Motor repair workshops.
- Transport: Rail, electric vehicles, marine, etc.

SAFETY

The MTR105 is designed to be exceptionally safe to use. The fast detecting circuitry reduces the likelihood of damage to the instrument if accidentally connected to live circuits or across phases.

- Meets the international requirements of IEC61010 and IEC61557.
- Live circuit detection and test inhibit on all measurements with user notification (except for direction of rotation measurements).
- User selectable insulation test terminal lockout voltage 25 V, 30 V, 50 V, 75 V (default is 50 V).
- Detection and inhibit functions when the protection fuse has failed.
- Suitable for use on CAT III applications and supply voltages to 600 V.

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INSULATION RESISTANCE TESTS

- Resistance range 100 Ω up to 200 GΩ.
- Supports PI, DAR, Timed and Temperature Compensation.
- Stabilised insulation test voltage accurate to -0% +2% ±2 V, which provides a more accurate test voltage without the risk of over-voltage damage to circuits or components. The output voltage is maintained between 0 and 2% throughout the test range.
- Where a nonstandard test voltage is required, a variable range allows the exact test voltage to be selected from 10 V up to 999 V and is subject to the same stabilised output control.
- Dedicated buzzer button either ON, VISUAL or OFF.
- Adjustable buzzer for minimum resistance limit (0.5 MΩ up to 1000 MΩ).
- Buzzer sounds on test pass.

VOLTMETER

- Measures ac 10 mV up to 1000 V; dc 0 to 1000 V; TRMS (15 Hz up to 400 Hz).
- Three phase supply and direction of rotation.

CONTINUITY (RESISTANCE) TESTS

- Single automatic resistance range from 0.01 Ω to 1.0 MΩ.
- Automatic test current selection uses the preferred test current for the load resistance under test (200 mA up to 4 Ω).
- Bi-directional tests option automatically reverses the current without reconnecting leads.
- Lead resistance compensation (NULL) operates up to 10 Ω of resistance.
- Dedicated buzzer switch either ON, VISUAL or OFF.
- Adjustable buzzer for maximum resistance limit (1 Ω to 200 Ω in 12 steps).
- Buzzer sounds on test pass.

DLRO FOUR WIRE KELVIN LOW RESISTANCE

- Automatic resistance range from 1 mΩ up to 10 Ω.
- Selectable auto or manual test.
- Bi-direction or single direction.
- Bi-directional tests option automatically reverses the current without reconnecting leads.
- 200 mA test current.

MOTOR DIRECTION OF TEST

Tests the direction of rotation of the motor under test and displays the phase sequence on screen.

The connected motor is rotated in one direction and the display shows sequence of the phases of rotation. The motor is next rotated in the opposite direction, the phases are checked again and shown on the display.

INDUCTANCE, CAPACITANCE AND RESISTANCE METER (LCR)

Auto inductive, capacitive and resistive test. Frequency selectable to 120 Hz or 1000 Hz. In AUTO mode, the MTR105 automatically determines if the main element of the load is inductive, capacitive or resistive and displays the result on screen.

Selectable inductance and capacitance test.

TEMPERATURE

Temperature measurement of unit under test, via the supplied thermocouple, allows temperature compensation to be applied in insulation resistance tests.

DISPLAY

Full colour graphic display makes the MTR105 simple to understand and easy to use.

GUARD TERMINAL

The Guard Terminal (G) is a third terminal on the connection panel. Connection of the guard terminal, on certain applications, provides a return path for parallel leakage currents, which could otherwise create significant errors in the insulation measurement. This is especially so for surface contamination of equipment or cables.

STORAGE AND DOWNLOAD OF RESULTS

Test results can be downloaded to a USB mass storage device , which can be accessed by connecting to a PC or a Laptop running PowerDB.

INSTRUMENT SOFTWARE UPDATES

Occasional information bulletins and software updates may be issued on the Megger web site.

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SPECIFICATIONS

All quoted accuracies are at 20 °C (68 °F).

Insulation resistance

Volts	Accuracy
50 V	10 GΩ ±2% ±2 digits ±4.0% per GΩ
100 V	20 GΩ ±2% ±2 digits ±2.0% per GΩ
250 V	50 GΩ ±2% ±2 digits ±0.8% per GΩ
500 V	100 GΩ ±2% ±2 digits ±0.4% per GΩ
1000 V	200 GΩ ±2% ±2 digits ±0.2% per GΩ

Polarisation index (PI): 10 min / 1 minute ratio

Dielectric absorption ratio (DAR): User configurable 15 s or 30 s t1 start time with t2 fixed at 60 s

Guard terminal performance <5% error at 500 kΩ parallel circuit resistance with 100 MΩ load

Resolution 0.1 kΩ

Short circuit/charge current 2 mA +0% -50% (IEC61557-2)

Terminal voltage accuracy -0% +2% ±2 V

Test current 1 mA at min. pass value of insulation to a max. of 2 mA

Operation range 0.10 MΩ to 1.0 GΩ (IEC61557-2)

Leakage current display 0.1 uA resolution 10% (±3 digits)

Voltage display ±3% ±2 digits ±0.5% of rated voltage

Note: Above specifications only apply when high quality silicone leads are being used - as supplied with the instrument.

Continuity

Measurement 0.01 Ω to 1 MΩ (0 to 1000 kΩ analogue scale)

Accuracy ±3% ±2 digits (0 to 99.9 Ω) ±5% ±2 digits (100 Ω - 500 kΩ)

Test current 200 mA (–0 mA +20 mA) (0.01 Ω - 4 Ω)

Polarity Single or Dual (factory default) polarity

Lead resistance Null up to 10 Ω

Selectable current limit 20 mA and 200 mA

Capacitance

Range 0.1 nF - 1 mF

Accuracy ±5.0% ±2 digits (1 nF - 10 µF)

Voltmeter

Range dc: 0 - 1000 V
ac: 10 mV - 1000 V
TRMS sinusoidal (15 Hz - 400 Hz)

Accuracy dc: ± 2% ±2 digits (0 - 1000 V)
ac: ± 2% ±2 digits
(10 mV - 1000 V TRMS)

Frequency range 15 - 400 Hz (50 mV - 1000 V)

Frequency resolution 0.1 Hz

Frequency accuracy ±0.5% ±1 digit

Diode Test Diode test accuracy: ±2% ±2 digits
0.01 V to 3.00 V

Display range: 0.00 V to 3.00 V

Temperature measurement and compensation

Thermocouple Type T (Type K and Type J)

Thermocouple range -20 °C to 200 °C (4 °F - 392 °F)

Instrument range -20 °C to 1000 °C (4 °F - 1832 °F)

Instrument resolution 0.1 °C (0.18 °F)

Instrument accuracy ±1.0 °C ±20 digits (1.8 °F). (Basic accuracy stated assumes forward and reverse measurements.)

DLRO four wire Kelvin low resistance

Test current 200 mA dc

Range 1 mΩ to 10 Ω

Resolution 0.01 mΩ

Accuracy ± 0.25% rdg. ± 10 digits, accuracy stated includes forward and reverse measurements.

Inductance

Instrument accuracy

Range	Accuracy	Test Frequency
1 H	±(0.7 % +(Lx/10000) % +5 digits)	1 kHz
200 mH	±(1.0 % +(Lx/10000) % +5 digits)	120 Hz
	±(0.7 % +(Lx/10000) % +5 digits)	1 kHz
20 mH	±(2.0 % +(Lx/10000) % +5 digits)	120 Hz
	±(1.2 % +(Lx/10000) % +5 digits)	1 kHz
2 mH	±(2.0 % +(Lx/10000) % +5 digits)	1 kHz only

Results storage

Storage capacity 256 motor results (date / time stamped)

Data download USB Type A (USB Mass Storage Device)

Power

Battery 6 x IEC LR6 1.5 V Alkaline (AA), IEC FR6 1.5 V Lithium ($LiFeS_2$), IEC HR6 1.2 V NiMH (rechargeable option).

Battery life 10 motors per (complete suite of tests at 100 V into 100 MΩ) IEC61557-2 - test cycle, 1200 insulation tests with duty cycle of 5 s testing on 25 s standby @ 500 V into 0.5 MΩ.

IEC61557-4 test cycle, 1200 continuity tests with duty cycle of 5 s testing on 25 s standby on 1 Ω resistance.

Battery charging Mains battery charger kit.

Safety protection IEC61010-1 CAT III 600 V

EMC Industrial IEC61326

Temperature coefficient <0.1% per °C up to 1 GΩ

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Environment

Operating temperature range	-10 °C to 50 °C (14 °F to 122 °F)
Storage temperature range	-25 °C to 50 °C (-13 °F to 122 °F)
Humidity	90% RH at 40 °C (104 °F) max.
Calibration temperature	20 °C (68 °F)
Maximum altitude	3000 m (9843 ft.)
IP rating	IP54

Physical

Display	Full LCD colour screen with user configurable backlight
Languages	English, French, German and Spanish.
Dimensions	228 x 105 x 75 mm (8.98 x 4.1 x 2.95 in)
Weight	0.93 kg (2.02 lbs)
Fuse	x2 500 mA (FF) 1000 V 32 x 6 mm ceramic fuse, high break capacity HBC, 30 kA minimum. Glass fuses must not be installed.

ORDERING INFORMATION

Description	Part number
MTR105 Rotating Machine Tester	1010-361
Included accessories:	
Hook strap assembly	
Soft pouch	
Temperature probe, T type CAT III 600 V	
IR lead set (comprising of):	
3 x Grabber Clips (Red, Black and Blue) CAT III 1000 V, CAT IV 600 V	
3 x 4 mm Test leads, 2 m, 1 end Right Angle 1 end straight (red, black and blue) CAT III 1000 V, CAT IV 600 V	
3 x Test probes (red, black and blue), long reach (100 mm), CAT III 1000 V, CAT IV 600 V	
Kelvin clip lead set CAT III 600 V (comprising of):	
2 x Kelvin Clip leads, 2 meters, 4 mm Right Angled Connectors (4), Single (2-core) cable.	
MTR105 calibration certificate	1012-173
USB memory stick	
6 x AA alkaline batteries (fitted)	

Description	Part number
Optional accessories:	
Mains charger kit	1007-464
Hook strap assembly	1012-068
Soft pouch	1012-063
Kelvin probe lead set CAT III 600 V	1011-929
Kelvin probe pins (pack of 4)	1012-064
Kelvin clip lead set CAT III 600 V	1011-928
Grabber clip lead set CAT III 1000 V, CAT IV 600 V	1012-069
Test probe set, long reach CAT IV 600 V	1012-066
Test probe set, long reach, CAT II 1000 V	1012-065
Temperature probe, T type CAT III 600 V	1012-067
MTR105 UKAS calibration certificate	1012-172
SP5 remote probe accessory	1007-157
6 x AA rechargeable NiMH batteries	XXXX-XXX

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