

# MTR105

## Rotating Machine Tester



- Full color 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.

### INSULATION RESISTANCE TESTS

- Resistance range 100  $\Omega$  up to 200 G $\Omega$ .
- Supports PI, DAR, Timed and Temperature Compensation.
- Stabilized insulation test voltage accurate to -0% +2%  $\pm 2$  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 Stabilized output control.
- Dedicated buzzer button either ON, VISUAL or OFF.
- Adjustable buzzer for minimum resistance limit (0.5 M $\Omega$  up to 1000 M $\Omega$ ).
- 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  $\Omega$  to 1.0 M $\Omega$ .
- Automatic test current selection uses the preferred test current for the load resistance under test (200 mA up to 4  $\Omega$ ).
- Bi-directional tests option automatically reverses the current without reconnecting leads.
- Lead resistance compensation (NULL) operates up to 10  $\Omega$  of resistance.
- Dedicated buzzer switch either ON, VISUAL or OFF.
- Adjustable buzzer for maximum resistance limit (1  $\Omega$  to 200  $\Omega$  in 12 steps).
- Buzzer sounds on test pass.

### DLRO FOUR WIRE KELVIN LOW RESISTANCE

- Automatic resistance range from 1 m $\Omega$  up to 10  $\Omega$ .
- 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 color 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.

## 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

**Polarization 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<sub>2</sub>), 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 sec testing on 25 sec 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

**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 color 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	Description	Part number
MTR105 Rotating Machine Tester	1010-361	<b>Optional accessories:</b>	
<b>Included accessories:</b>		Mains charger kit	1007-464
Hook strap assembly		Hook strap assembly	1012-068
Soft pouch		Soft pouch	1012-063
Temperature probe, T type CAT III 600 V		Kelvin probe lead set CAT III 600 V	1011-929
IR lead set (comprising of):		Kelvin probe pins (pack of 4)	1012-064
3 x Grabber Clips (Red, Black & Blue) CAT III 1000 V, CAT IV 600 V		Kelvin clip lead set CAT III 600 V	1011-928
3 x 4 mm Test leads, 2 m, 1 end Right Angle 1 end straight (red, black & blue) CAT III 1000 V, CAT IV 600 V		Grabber clip lead set CAT III 100 V, CAT IV 600 V	1012-069
3 x Test probes (red, black & blue), long reach (100 mm), CAT III 1000 V, CAT IV 600 V		Test probe set, long reach CAT IV 600 V	1012-066
Kelvin clip lead set CAT III 600 V (comprising of):		Test probe set, long reach, CAT II 1000 V	1012-065
2 x Kelvin Clip leads, 2 metres, 4 mm Right Angled Connectors (4), Single (2-core) cable.		Temperature probe, T type CAT III 600 V	1012-067
MTR105 calibration certificate		MTR105 calibration certificate	1012-173
USB memory stick		MTR105 UKAS calibration certificate	1012-172
		SP5 remote probe accessory	1007-157

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**MTR105\_DS\_US\_V04**

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ISO 9001  
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# TC3231

## Thermal Camera



- **2.2 inch (55.88 mm) 320\*240 TFT LCD display**
- **32 x 31 pixel resolution IR temperature measurement**
- **Measurement range -20 ° to 300 °C / -4 °F to 572 °F**
- **Adjustable emissivity**
- **Micro SD memory for storing up to 6000 images**
- **High & Low Alarm (enable & disable)**
- **Selectable colour palette**
- **Image blending with selectable distance of 0.5 m, 1 m, 2 m or 3 m**

### DESCRIPTION

The Megger TC3231 offers a professional infrared 32 x 31 pixels image thermometer with a 2.2 inch (55.88 mm) colour TFT LCD display. Quick, accurate readings are possible; covering a wide range of surface temperature measurements.

The product combines the convenience of an infrared thermometer with the visual advantage of a thermal imager providing a troubleshooting camera with infrared heat map.

The TC3231 features a range of selectable thermal image colour palette display options along with high / low user preset temperature alarms. For convenience, background temperature is also user selectable.

An easy to use image blending function is also featured; the camera takes an aligned visible, non-infrared, image, together with a full infrared image. The 2 pictures are then blended and can be adjusted between 0 to 100%. This makes identifying problems and pinpointing their location far easier.

As well as centre spot temperature measurement, the camera also offers simultaneous hot and cold spot tracking, with resultant values and location updated continuously on the display.

Up to 6000 images can be saved on the included micro SD memory card which can be downloaded to a PC via the USB interface in BMP file format. An SD card adapter is also provided for file transfer directly to a computer if required.

### FEATURES

- Image capture frequency 9 Hz
- Thermal sensitivity (NETD)  $\leq 150$  mK
- Hot spot and cold spot tracking
- Visual camera & images capture (BMP) (6000 images)
- Date/time setup controls
- Li-Ion rechargeable battery
- USB interface for charging and downloading images from SD memory
- Auto power off (10 minutes of inactivity)
- Standard camera mount



**SPECIFICATIONS**

**Temperature:**

Measurement Range	-20 to 300 °C (-4° to 572 °F)
Measurement Accuracy	+/-2% +/-2 °C as tested (at 25 °C)
On-Screen Emissivity Correction	Yes
On-Screen Reflected Background Temperature Compensation	Yes

**Image Performance:**

Image Capture Frequency	9 Hz
Detector Type	Un-cooled pyroelectric ceramic
Thermal Sensitivity (NETD)	≤ 150 mK
Infrared Spectral Band	6.5 µm to 14 µm
Visual Camera	48608 pixels
Field of View	38° x 38°
Focus Mechanism	Fixed Focus

**Image Presentation:**

Palettes	Hot Metal, Ironbow, Rainbow, Rainbow High Contrast, Grayscale (white hot), Grayscale (black hot)
Level and Span	Auto

**Image capture and data storage:**

Image Capture	Image available for review before a save.
Storage Medium	Micro SD memory card, stores up to 6,000 images, 4 GB supplied. bmp
File Format	
Memory Review	Scroll through all saved images and view on-screen images / delete unwanted images.
Operating Temperature	0 °C to +50 °C
Storage Temperature	-20 °C to +60 °C
Relative Humidity	10 % to 90 % non-condensing
Display	2.2 inch (55.88 mm) diagonal 320 x 240 TFT LCD
Overload Display	----
Dimensions	208 mm (H) x 62 mm (W) x 150 mm (D)
Weight	406 g (including battery)
Battery (fitted)	18500 3.7 V 1400 mAh Li-Ion
Auto Power Off	10 minutes

**ORDERING INFORMATION**

Description	Part number	Description	Part number
TC3231 Thermal Camera	1012-514	<b>Included accessories</b>	
		USB mains charger	
		Charger adapters (UK, Schuko, US, AUS),	
		USB lead	
		Micro SD card	
		SD card adapter	

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