

## MIT400 CAT IV Industrial Insulation Testers



- **CAT IV 600 V applications**
- **TRMS & DC Voltage measurement**
- **Insulation testing up to 1000 V and 200 GΩ**
- **Continuity testing at 200 mA or 20 mA down to 0.01 Ω**
- **Pass/Fail limit alarms**
- **Combined Analogue and dual digital display**
- **PI/DAR and Timer function**
- **Test result storage (MIT420)**
- **Bluetooth® wireless data transfer (MIT430)**

### DESCRIPTION

The new Megger MIT400 series insulation and continuity testers has been designed for electrical testing by the utilities, industrial, commercial and domestic electricians. The wide range of features also makes the MIT400 series ideal for the maintenance and service/repair engineer.

Safety rated to CAT IV 600 V the MIT400 series of testers are suitable for use in high energy systems, up to the substation transformer, while lower test voltages can be used in data and telecommunication systems.

### The range

The range consists of five instruments:

**MIT400** 250 V, 500 V and 1000 V

**MIT410** 50 V, 100 V, 250 V, 500 V and 1000 V + PI, DAR

**MIT415** 10 V, 25 V, 50 V, 100 V, 250 V and 500 V + PI, DAR

**MIT420** 50 V, 100 V, 250 V, 500 V & 1000 V + PI, DAR and result storage

**MIT430** 50 V, 100 V, 250 V, 500 V & 1000 V + Bluetooth download

**MIT40X** 10 V to 100 V in 1 V steps

### Insulation testing

- **Test voltages** - 10 V to 1000 V insulation test voltages available
- **Test Lock** - Locks insulation test on continuously.
- **Test voltage display** - The actual test voltage is displayed on the smaller digital readout, with the insulation result on the larger digital display.

- **Analogue arc** - The display also features an analogue arc to replicate the response of a moving coil display.
- **PI and DAR** - Polarisation Index (PI) and Dielectric Absorption Ratio (DAR) functions
- **200 GΩ** - Insulation testing from 20 GΩ (MIT400) to 200 GΩ (MIT420 and MIT430).
- **Silicone leads** - High quality flexible silicone test leads are comfortable to use and prevent measurement errors on higher GΩ ranges.
- **Test inhibit** - prevents testing if voltages in excess of 50 V are detected when making insulation tests.
- **Insulation buzzer** - The buzzer can be set to buzz if the insulation resistance is above a preset limit, set via the Setup menu.

### Continuity testing

- **Auto-test** - Auto test on circuit contact enables real two handed operation without the need to press the test button.
- **200 mA or 20 mA** - Either 200 mA or 20 mA continuity test currents are available. 20 mA test current will considerably increase battery life.
- **Lead null** - Lead resistance compensation (NULL) operates up to 9.99 Ω of resistance.
- **Buzzer** - ON-OFF selected by simple push button.
- **Buzzer limit** - Continuity buzzer limit alarm provides adjustment of the maximum resistance the continuity buzzer sounds. This is adjustable from 1 Ω to 20 Ω in 5 steps.
- **kΩ range** extends resistance measurement to 1 MΩ.

## Display

The display offers a combination of analogue arc and a dual digital readout:

### Analogue arc:

- Full display width analogue arc.
- Patented arc display shows essential charge and discharge characteristics not visible on a digital display.
- Single pointer “needle” response is similar to a moving coil meter.
- Logarithmic display for better low insulation value measurements.

### Dual digital display:

- Large main digital readout for good visibility of all main measurement results
- **Second digital display for additional data such as:**
  - Insulation test voltage.
  - Insulation leakage current.
  - Supply frequency (when measuring volts).
  - Test mode eg. PI, DAR or TI (Timed mode).

## MIT40X - Variable insulation voltage tester

The MIT40X provides a unique solution for awkward insulation voltage measurement applications. The MIT40X has a variable insulation test voltage from 10 V to 100 V in 1 V steps, selectable in the “Set-Up” menu. Once selected this can only be changed by re-configuring in the Setup menu.

Typical applications include:

- Commercial avionics
- Military land, marine and air communications
- Manufacturing/production line goods
- Electrostatic measurement
- Component testing
- Battery powered traction and lifting equipment

## Storage & Downloading results

### MIT420

The MIT420 is capable of saving test results for recall to the screen. A simple storage structure allows for a test number and screen results to be recalled individually.

### MIT430

The MIT430 supports both test result storage and downloading.

Test results can be stored in the instrument and subsequently downloaded to a computer with the Megger download manager software.

Data transfer is by Bluetooth, with the MIT430 Bluetooth transmitter being enabled when the Download mode is selected on the instrument.

NOTE: The receiving PC needs to have Bluetooth capability or a USB port fitted a Bluetooth receiver. Class II (10m) is acceptable.

## Safety

Designed to be exceptionally safe to use, fast detecting circuitry prevents damage to the instruments if accidentally

connected to live circuits or across phases. Specifically, all instruments:

- Meet the international requirements of IEC1010-2 and EN61557.
- Live circuit detection inhibits insulation testing on circuits above 50 V.
- Live circuit detection and test inhibit on continuity measurements.
- Default display of live circuit voltage on all ranges.
- Detection and inhibit functions even if the protection fuse has failed.
- Suitable for use on CAT IV applications and supply voltages to 600 V.

## 600 V CAT IV

All MIT400 instruments are designed to meet the safety requirements for use on CAT IV 600 V installations.

## APPLICATIONS

### Electrical installations testing:

The MIT400 includes all the features required for electricians and engineers working in a range of industries. Available features are selected to make testing easy and fast in a range of situations. Typical industries include:

- Electrical supply companies
- Large and small scale electrical installation
- Periodic inspection and testing
- Cable testing

### Service, repair and maintenance:

The MIT410 and MIT420 add additional features required for engineers working on more demanding applications. Functions such as PI and DAR, capacitance measurement and higher insulation range increase the suitability for applications such as:

- Manufacturing/production testing
- Panel building
- Railway and other transportation
- Motor testing
- Cable inspection/quality control
- Street lighting maintenance
- Avionics ground testing and maintenance
- Military applications

The MIT415 also includes 25 and 50 V ranges for testing communication circuits for signalling controls :

- Elevator service engineers
- Street lights (Pedestrian controls)
- Machines and safety interlock/commissioning service
- HVAC controls
- Robotic Power and Control

### Electrostatic discharge testing:

The 10 V and 100 V insulation test voltage ranges are ideal for ESD testing, including servicing of equipment and routine maintenance of ESD conductive flooring, bench mats and grounding systems etc. Typical industries include:

- Electronic manufacturing
- Electronic servicing and repair
- Calibration houses

	Industrial					Special Apps
	400	410	415	420	430	40X
<b>Insulation Voltage range</b>						
Resolution	0.01 MΩ					
10-100 V variable (2 GΩ - 20 GΩ)						■
10 V			1 GΩ			
25 V			2 GΩ			
50 V		5 GΩ	5 GΩ	10 GΩ	10 GΩ	
100 V		10 GΩ	10 GΩ	20 GΩ	20 GΩ	
250 V	5 GΩ	20 GΩ	20 GΩ	20 GΩ	50 GΩ	
500 V	10 GΩ	50 GΩ	50 GΩ	100 GΩ	100 GΩ	
1000 V	20 GΩ	100 GΩ		200 GΩ	200 GΩ	
Leakage current display		■	■	■	■	■
INS test voltage display	■	■	■	■	■	■
<b>Continuity measurement</b>						
0.01 to 99.9 Ω	■	■	■	■	■	■
Variable current limit. 200 mA/20 mA	■	■	■	■	■	■
Fast buzzer- selectable threshold	■	■	■	■	■	■
kΩ range to 999 k Ω	■	■	■	■	■	
<b>Other functions and features</b>						
Live circuit warning at	50 V					
Default voltmeter	■	■	■	■	■	■
TRMS measurement to 600 V	■	■	■	■	■	■
Frequency measurement 15 Hz to 450 Hz		■	■	■	■	■
Capacitance (0.1 nf to 10 μF)				■	■	
Backlight	■	■	■	■	■	■
Battery condition display	■	■	■	■	■	■
Insulation timed - PI – DAR Tests		■	■	■	■	
Test button plus lock button	■	■	■	■	■	■
Limit alarm pass band on INS				■	■	■
Auto power down	■	■	■	■	■	■
<b>Other functions and features</b>						
Result storage				■	■	
Bluetooth downloading					■	
<b>Included accessories</b>						
Red/black silicone lead set with clips	■	■	■	■	■	■
Protective rubber boot	■	■	■	■	■	■
Remote switch probe		■	■	■	■	
Calibration certificate with product	■	■	■	■	■	■
Batteries	■	■	■	■	■	■
1 year warranty (upgradable to 3 years free within 3 months of purchase)	■	■	■	■	■	■

### SPECIFICATION

All quoted accuracies are at +20°C.

#### Insulation

##### Nominal test voltages

MIT400	250 V, 500 V, 1000 V
MIT410, 420, 430	50 V, 100 V, 250 V, 500 V, 1000 V
MIT415	10 V, 25 V, 50 V, 100 V, 250 V, 500 V
MIT40X	10 V to 100 V variable (1 V increments)

##### Insulation resistance range (at maximum test voltage)

MIT400	20 GΩ
MIT410	100 GΩ
MIT415	50 GΩ
MIT420, 430	200 GΩ
MIT40X	20 GΩ

##### Range Full Scale Accuracy

All ranges  $\pm 2\%$   $\pm 2$  digits up to 100 MΩ.

Then:

1000 volts	$\pm 3\%$ $\pm 2$ digits $\pm 0.2\%$ per GΩ
500 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 0.4\%$ per GΩ
250 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 0.8\%$ per GΩ
100 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 2.0\%$ per GΩ
50 volts.	$\pm 3\%$ $\pm 2$ digits $\pm 4.0\%$ per GΩ
10 volts	$\pm 3\%$ $\pm 2$ digits $\pm 2.0\%$ per 100 MΩ

**Analogue range:** 1 GΩ full scale

**Short Circuit Current:** 2 mA +0% -50%

**Terminal voltage:** -0% +20%  $\pm 1$  V  
MIT40X  $\pm 1$  V

##### Test Current on load:

1 mA at min. pass value of insulation specified in BS7671, HD384 and IEC364, 2 mA max.

**EN61557 Operating range:** 0,10 MΩ to 1,00 GΩ

**Leakage current range** 10 μA 2000 μA

**Leakage current:** 10%  $\pm 3$  digits

**Voltage display:** 3%  $\pm 3$  digits  $\pm 0.5\%$  of rated voltage

**Polarisation Index (PI):** 10 min / 1minute ratio

**Dielectric Absorption Ratio (DAR):** 60 sec / 30 sec ratio

#### Notes:

- (1) All ranges measure from 0,00 MΩ upwards.
- (2) Above specifications only apply when high quality silicone leads are being used.

#### Continuity

**Measurement:** 0,01 Ω to 99,9 Ω (0 to 100 Ω on analogue scale)

**Accuracy:**  $\pm 2\%$   $\pm 2$  digits (0 to 100 Ω)

**Open circuit voltage:** 5 V  $\pm 1$  V

**Test current:** 205 mA ( $\pm 5$  mA)  
(0.01 Ω to 9.99 Ω)  
20 mA ( $\pm 1$  mA)  
(10.0 Ω to 99.9 Ω)

**Zero offset at probe tips:** 0,10 Ω typical

**Lead resistance zeroing:** Up to 9.99 Ω

**Buzzer:** Variable limit 1 Ω, 2 Ω, 5 Ω, 10 Ω, 20 Ω

#### Resistance

**Measurement:** 0.01 kΩ to 1000 kΩ (0 to 1 MΩ on analogue scale)

**Accuracy:**  $\pm 3\%$   $\pm 2$  digits up to 50 kΩ then  $\pm 5\%$   $\pm 2$  digits

**Open circuit voltage:** 5 V  $\pm 1$  V

**Short circuit current:** 1.5 mA  $\pm 0.2$  mA

#### Voltage range

0 to 600 V d.c.  $\pm 2\%$   $\pm 2$  digits

10 mV to 600 V TRMS sinusoidal (40 to 400 Hz)  $\pm 2\%$   $\pm 2$  digits

0 to 1000 V on Analogue scale

Unspecified input level 0 - 10 mV (40 to 400 Hz)

#### For non-sinusoidal waveforms additional specification apply:

$\pm 3\%$   $\pm 2$  digits 101 mV to 600 V TRMS and  $\pm 8\%$   $\pm 2$  digits 10 mV to 100 mV TRMS

**Default Voltmeter:** Operates at >25 V a.c. or d.c. on any range except OFF

**Frequency:** 15 - 450 Hz  $\pm 0.5\%$   $\pm 1$  digit

#### Capacitance measurement

MIT420, MIT430

**Measurement range:** 100 pF to 10 μF

**Accuracy:**  $\pm 5.0\%$   $\pm 2$  digits

#### Distance by capacitance:

MIT420, MIT430

Arithmetic conversion from capacitance measurement on

Default capacitance measurement: 50 nF/km

**Capacitance range:** 40 nF/km to 60 nF/km

#### Result storage

**Capacity:** >1000 test results

**Download:** Bluetooth wireless

**Bluetooth Class:** Class II

**Range:** up to 10 m

#### Power Supply:

5 x 1,5 V cells type IEC LR6 (AA, MN1500, HP7, AM3 R6HP) Alkaline NiMH rechargeable cells may be used.

**Battery life:** 2200 insulation tests with duty cycle of 5 sec ON /55 sec OFF @ 1000 V into 1 MΩ

#### Dimensions

**Instrument:** 220 x 92 x 50 mm (8.66 in. x 3.63 in. x 1.97 in.)

**Instrument + case:** 456 x 178 x 89 mm (18 in. x 7 in. x 3.5 in.)

#### Weight

**Instrument only:** 590 gms, 775 gms with boot (20.73 oz. 27.22 oz.)

**Instrument plus case:** 1.75kg (3.86 lb)

## Fuse

Use only a 500 mA (FF) 1000 V 32 x 6 mm ceramic fuse of high breaking capacity HBC 50 kA minimum. Glass fuses **MUST NOT** be fitted.

## Safety Protection

The instruments meet IEC 61010-1 to 600 V phase to earth, Category IV. Refer to safety warnings supplied.

## E.M.C.

In accordance with IEC 61326-1

## Temperature effects

**Temperature coefficient:** <0,1% per °C up to 1 GΩ

## Environmental

<b>Operating range:</b>	-20 to +55 °C
<b>Operating humidity:</b>	95% RH at 0 °C to +35 °C, 70% RH @ +35 °C to +55 °C
<b>Storage temperature range:</b>	-30 °C to +80 °C
<b>Calibration Temperature:</b>	+20 °C
<b>Maximum altitude:</b>	2000 m

## Dust and water protection:

IP54 Protected against dust and splashing water

## Service error

Insulation range	±15% ±2 digits
Continuity range	±26% ±2 digits
Resistance range	±12% ±2 digits
Voltage range	±10% ±2 digits
Capacitance range	±18% ±2 digits
Distance range	±18% ±2 digits
Frequency range	±5% ±2 digits

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## ORDERING INFORMATION

Item (Qty)	Order No.	Item (Qty)	Order No.
MIT400: basic CATIV 600 V with 250 V/500 V/1000 V insulation	MIT400-EN	<b>Included accessories</b>	
MIT410: as MIT400 + 50 V, 100 V, PI and DAR	MIT410-EN NSN:6625-99-354-2757	Hard case	5410-420
MIT415: 10 V, 25 V, 50 V, 100 V, 250 V, 500 V, PI and DAR	1000-351	2 wire lead set to CAT IV 600 V, consisting of: Red and black leads, probes and clips with 1 x red long probe	
MIT420: as MIT410 + result storage and recall + 200 GΩ	MIT420-EN NSN 6625-99-169-4728	Calibration certificate	
MIT420-MIN: (NATO version - no batteries)	1000-309 NSN 6625-99-169-5675	SP5 Switched probe (not MIT400 or MIT40X)	1002-774
MIT430: as MIT420 with Bluetooth download	MIT430-EN	Owners information user guide CD	
MIT40X: Special applications - selectable IT voltage 10-100 V	MIT40X-EN	<b>Optional accessories</b>	
		Replacement 2 wire test lead set	1002-001
		2 wire 500 mA fused test lead set	1002-015
		Rubber boot with stand	6231-802
		Pouch - test and carry case	2001-322

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