

# OPERATING INSTRUCTIONS

## ANALOG MULTIMETER

### MI7054



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# 1. SAFETY FEATURES AND PRECAUTIONS

You have selected an instrument which provides you with a high level of safety. The multimeter is manufactured and tested in accordance with safety regulations IEC 61010–1 / DIN EN 61010–1 / VDE 0411–1. When used for its intended purpose, safety of the operator, as well as that of the instrument, is assured. Their safety is however not guaranteed, if the instrument is used improperly or handled carelessly. In order to maintain flawless technical safety conditions, and to assure safe use, it is imperative that you read the operating instructions thoroughly and carefully before placing your instrument into service, and that you follow all instructions contained therein. The instrument is equipped with a circuit breaker for your safety and to protect the multimeter. It interrupts the current circuit if overload occurs during measurement.

## Observe the following safety precautions:

- The instrument may only be operated by persons who are capable of recognizing contact hazards and taking the appropriate safety precautions. Contact hazards exist anywhere, where voltages of greater than 30 V RMS may occur.
- Avoid working alone when taking measurements which involve contact hazards. Be certain that a second person is present.
- The maximum allowable voltage between the voltage terminals and ground is 600 V~ category II, or 300 V~ category III.
- Nominal voltage at the electrical system may not exceed the following values:
  - Between phase and neutral conductor 600 V
  - In 4-wire 3-phase systems 400 V between phase conductors
  - In 3-wire 3-phase systems 400 V between phase conductors
- The current measuring ranges are equipped with automatic switches. The **maximum allowable voltage for the current measuring circuit** (= rated voltage of the fuse) is **240 V~ / 50V~** in the “mA” and “A” ranges. Make sure that heavy current measuring circuits are pre-fused with a 20 A fuse.
- Be prepared for the occurrence of unexpected voltages at devices under test (e.g. defective devices). For example, capacitors can be dangerously charged.
- Make certain that the measurement cables are in flawless condition, e.g. no damage to insulation, no interruptions in cables or plugs etc.
- No measurements may be made with this instrument in electrical circuits with corona discharge (high-voltage).
- Special care is required when measurements are made in HF electrical circuits. Dangerous pulsating voltages may be present.
- Measurements under moist ambient conditions are not permitted.
- Be absolutely certain that the measuring ranges are not overloaded beyond their allowable capacities. Limit values can be found in the *Measuring Ranges* table in chapter 24, “Characteristic Values”.

## Meanings of symbols on the instrument



Warning concerning a point of danger (Attention: observe documentation!)



Ground



Continuous, doubled or reinforced insulation

CAT II / III

Overvoltage category II or III device



Indicates EC conformity

## 2. DESCRIPTION

The MI7054 multimeter has been designed for measurements in industry, for training and in the commercial trades. Its greatest advantage is protection: The current measuring ranges are protected against overload with an electromagnetic protective relay (AUTO-FUSE), resistance ranges are protected with a PTC thermistor, and the voltage measuring ranges are protected through the use of adequately dimensioned electrical components.

## 3. CHARACTERISTIC VALUES

- Scale Length: approx. 87 mm
- Pointer Stop: 0 ... 100 °∠
- Accuracy Class: 2.5
- Dimensions: 104 x 143 x 40 mm
- Weight: approx. 300 g

**Safety Regulations** in accordance with IEC 61010-1

Operating Voltage	Overvoltage Category	Fouling Factor	Measuring Function
600 V	II	2	V
300 V	III	2	V
240 V~ / 50 V=	II	2	A

### Electromagnetic Compatibility (EMC)

Interference immunity and interference emission per EN 61326-1

### Protection

Housing: IP 40                      EN 60529

## 4. MEASURING RANGES AND CHARACTERISTIC VALUES

### 4.1 Voltage

DC		AC	
Measuring Range	Internal Resistance	Measuring Range	Internal Resistance
30 V	30 kΩ	30 V	32 kΩ
300 V	300 kΩ	300 V	380 kΩ
600 V	600 kΩ	600 V	780 kΩ

### 4.2 Current

\*) Current > 10 A max. 5 min.

DC		AC	
Current	Voltage Drop	Current	Voltage Drop
0.3 A	140 mV	0.3 A	140 mV
3 A	320 mV	3 A	320 mV
15 A*)	915 mV	15 A	915 mV

### 4.3 Resistance

Measuring Range	Scale Range and Value at Scale Center	Measuring Current $I_{max}^{2)}$ , prox.	Battery Voltage
$\Omega \times 1$	1 $\Omega$ ... 30 $\Omega$ ... 3 k $\Omega$	50 mA	1.5 V (IEC R6)
$\Omega \times 10$	10 $\Omega$ ... 300 $\Omega$ ... 30 k $\Omega$	6 mA	
$\Omega \times 100$	100 $\Omega$ ... 3 k $\Omega$ ... 300 k $\Omega$	0.6 mA	

<sup>2)</sup> With 1.5 V battery voltage

## 5. ACCURACY AND INFLUENCING QUANTITIES

### 5.1 Accuracy under Reference Conditions

**Current, voltage and resistance accuracy under reference conditions:**

Class 2.5 for DC

Class 2.5 for AC

Class 2.5 for  $\Omega$  (with reference to a scale length of 87 mm)

#### Reference Conditions

Ambient Temperature  $23^{\circ}\text{C} \pm 3^{\circ}$

Position of Use horizontal

Frequency 45 ... 65 Hz

Waveshape for AC: sine (max. deviation: 1%)

### 5.2 Frequency Influence

- $\pm 2.5\%$  of scale length in all measuring ranges, and in a frequency range of 30 Hz ... 1 kHz

### 5.3 Temperature Influence

$\pm 2.5\%$  of scale length with a change in ambient temperature of 10 K within a temperature range of 0...40 °C

## 6. OVERLOAD PROTECTION

- The voltage ranges are protected against overload to 600 V<sub>AC</sub> and 600 V<sub>DC</sub> with PTC thermistors, and by means of adequately dimensioned electrical components.
- The current ranges are protected against overload to 240 V<sub>AC</sub> or 50 V<sub>DC</sub> with an electromagnetic interrupter (AUTO-FUSE). Current and resistance ranges are additionally protected against voltages of up to 500 V<sub>AC</sub> and 500 V<sub>DC</sub> with a slow-blow fuse (16 A / 500 V), in order to prevent danger resulting from inadvertent measurement beyond the specified category. However, internal components may be destroyed in such cases!
- The resistance ranges are protected against overload to 250 V<sub>AC</sub> with PTC thermistors and by means of adequately dimensioned electrical components. The time limit for measurements at this level of overloading is approximately 30 seconds.

## 7. BATTERY FOR RESISTANCE MEASUREMENTS

1 ea. 1.5 V IEC LR6 or LR6. We recommend the use of leak-proof batteries.

## 8. OPERATING INSTRUCTIONS

### Initial Start-Up

The instructions included below must be followed in order to assure error-free, safe use of the instrument:

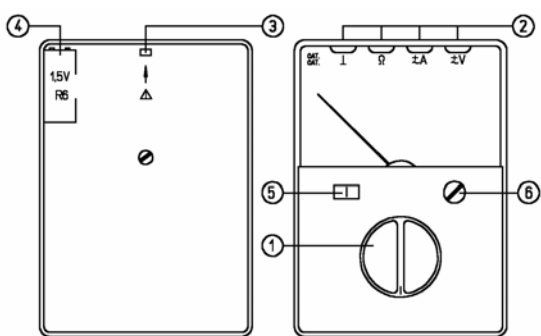
The instrument must be in the horizontal position during the performance of measurements.

The battery must be inserted into the instrument for resistance measurements. First remove the battery compartment cover from the instrument, and then insert the battery (IEC LR6). The battery supplies auxiliary voltage for resistance measurements. Make sure that the battery contacts are clean and mechanically secure. The battery level can be checked by setting the measuring range switch to the “ $\Omega \times 1$ ” position and then shorting the  $\perp$  and  $\Omega$  measurement cables. Set the needle to full-scale deflection with the potentiometer knob (0 on the  $\Omega$  scale). If the needle can no longer be set to full-scale deflection, or if indication is erratic, the battery must be replaced.



**The measurement cables must be disconnected from the measuring circuit at all poles before opening the instrument!**

Make sure that the needle is adjusted to zero with the instrument switched off, and correct if required (with the adjusting screw at the back). Discharge any static electrical charging with a damp cloth after cleaning the glass face plate.



① Measuring range selector switch

② Measurement input jacks

③ Snap catch

④ Battery

⑤ Reset switch for breaker (AUTO-FUSE)

⑥ Rotary knob for pointer adjustment to 0  $\Omega$  (full scale deflection)

1. Set the measuring range selector switch to the desired position. Always start with the largest measuring range for current and voltage measurements, and then switch to the appropriate, smaller measuring range. Do not interrupt the measuring circuit during switching. Observe maximum measuring limits and correct polarity at the measurement connections. After the measurement has been completed, return the measuring range selector switch to the largest voltage measuring range.
2. Full scale deflection to “0  $\Omega$ ” for resistance measurements, short jacks  $\perp$  and  $\Omega$  with a measurement cable.
3. Observe detailed instructions in the following chapter for initial start-up.

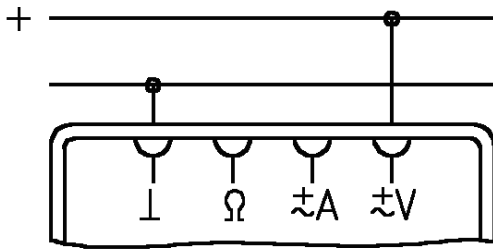
## 9. MEASUREMENTS



**Make sure that the circuit breaker is active and that the internal voltage measuring circuit functions correctly before performing voltage measurements at dangerous contact voltages in accordance with chapter 9.1. The is best assured by performing a resistance measurement in accordance with chapter 9.5 (zero point test)!**

## 9.1 Direct and Alternating Voltage Measurements

### Direct Voltage Measurements to 600 V



Measuring range selector switch:  
600V...30V= or V~

Measured value: can be read from the V (A)  
scale

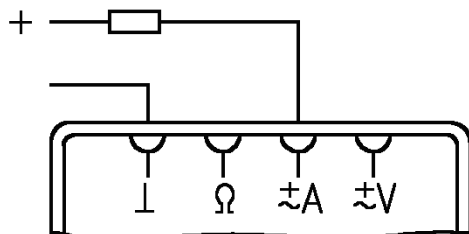
## 9.2 Direct and Alternating Current Measurements



In the event of incorrect connection (inadvertent application of voltage to max. 50 V DC or 240 V AC), the protective relay is switched off. The “AUTO-FUSE” breaker jumps to the green field. After the error has been eliminated, the slide must be set to the white field in order to perform further measurements.

The allowable measuring duration for current measurements of greater than 10 A is limited to max. 5 minutes due to heating-up at the measurement jacks. The cut-off relay tends to hum at these higher current values!

The MI7054 must be **connected to the consumer in series**. For reasons of safety, voltage to earth may not exceed 240 V~ or 50 V= for installation category II.



Measuring range selector switch: 15 A ... 0.3 A= or A~

Measured value: read from the corresponding V or A scale

Measured values >10 A max. 5 minutes!

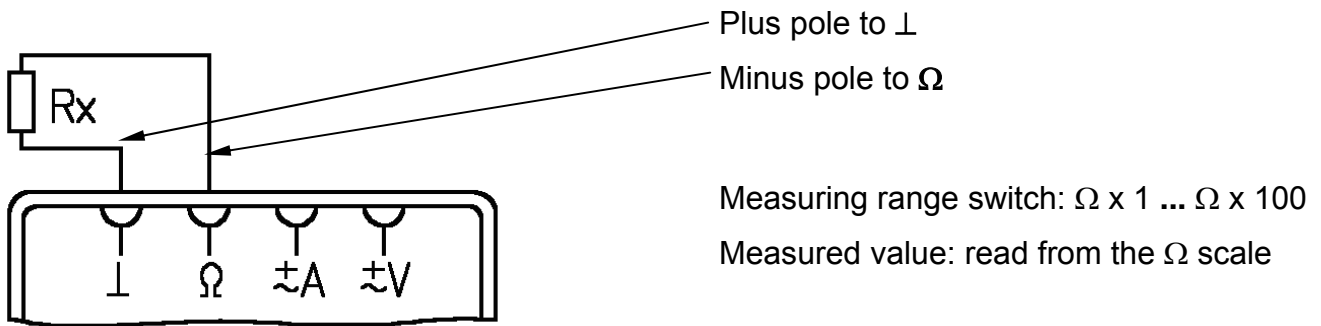
## 9.3 Resistance Measurement



Only voltage-free objects may be measured (resistors, capacitors). Interference voltages distort measurement results.

In the event of incorrect connection (e.g. to 230 V AC), the pointer moves towards “∞” after a few seconds. Overload duration is max. 30 s.

Resistance measurement is performed with direct voltage from the installed 1.5 V battery. Full scale deflection to “0 Ω” should be checked as required during long duration resistance measurements. Deflection should also be checked and corrected if necessary after switching to other resistance measuring ranges.



After eliminating an overload, the MI7054 requires approximately 4 minutes before it is once again able to perform measurements with the specified levels of accuracy.

**The battery is discharged rapidly in the Ω x 1 measuring range. Limit measurements in this range to the shortest possible duration.** Connect measurement cables to jacks ⊥ and Ω, and set the display to "0 Ω" with the rotary knob (Ω).

## 10. MAINTENANCE

No special care or maintenance is required. The battery level should be checked from time to time. Discharged or electrolyzed batteries must be removed from the battery compartment. The battery contacts should be kept clean, and reliable contact pressure must be assured. If the MI7054 remains unused for a lengthy period of time, remove the battery from the battery compartment as a precaution.

### 10.1 Replacing the Battery

**CAUTION: The measurement cables must be disconnected from the measuring circuit at all poles before opening the instrument!**

Press in the tab at the housing rear panel with a suitable tool and remove the housing bottom. Insert the battery into the connectors located in the battery compartment.

Set the housing bottom back into place and press both housing parts together until they snap into place.




### 10.2 Cleaning

A soft cloth which has been slightly dampened with alcohol and a brush are required for cleaning. Electrical charges at the glass face plate may influence measurements. These can be eliminated with a damp cloth. Stubborn contamination can be removed with a cloth which has been dampened with alcohol. No other solvents may be used.

## 11. FUSING

**Fuse specification: 6.3 \*32 mm, T 16A/500V**

This fuse serves as an emergency fuse in the event of operator error. If the fuse blows, damage to the circuit may not be ruled out. Inspection is required at our service department in such cases. Any necessary repairs are not covered by the guarantee!

 <b>Iskra</b> Iskra MIS, d.d.	Ljubljanska c. 24a SI-4000 Kranj Slovenia tel.: +386 4 237 21 40 fax: +386 4 237 21 29 e-mail: info@iskra-mis.si www.iskra-mis.si	 	
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