Wee *MEGGER*® Tester

WM6 catalog No. 21805-3

User Guide

MEGGER®

SAFETY WARNINGS

- ★ ***The circuit must be de-energized and isolated BEFORE connections are made for any test.***
- ★ ***Do not touch the circuit during an insulation test.***
- ★ ***After insulation tests, capacitive circuits MUST be allowed to discharge BEFORE disconnecting the test leads.***
- ★ ***Test leads, including prods and crocodile clips, must be in good order; clean and having no broken or cracked insulation.***
- ★ ***Replacement fuses must be of the correct type and rating.***

Refer also to page 8 for further explanations and other precautions.

The warnings and precautions must be read and understood before the instrument is used. They must be observed during use.

NOTE

This instrument must only be used by suitably trained and competent persons.

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GENERAL DESCRIPTION

The WM6 MEGGER® Insulation and Continuity Tester is a completely self contained instrument designed to give rapid and accurate measurement of insulation resistance and continuity resistance.

The WM6 uses a low voltage hand-cranked a.c. brushless generator as the power supply. This generator is easy to turn and is connected to a rectifier and d.c. to d.c. converter to provide the test voltage.

The WM6 uses a moving coil meter with taut band suspension, white scales on a black scale plate and an orange 'dayglow' pointer. An electronic circuit is employed to produce a four decade calibrated scale for insulation resistance measurement from 0 to 200 MΩ.

Two shrouded sockets are provided in the side of the case for the test leads and a slider switch selects either insulation or continuity tests ('MΩ' or 'Ω'). The case is robust, made of ABS plastic, and the generator handle folds neatly against it when not in use.

APPLICATIONS

The WM6 is intended for the direct measurement of insulation resistance and continuity of domestic and industrial wiring, cables, transformers, motors, generators, electrical machinery and appliances. Because the WM6 is self-powered it is suitable for use during installation and commissioning work as well as for service and maintenance applications.

Note:— The cover of this instrument has been given an antistatic treatment which should be effective for many months. If in the course of time the cover is found to retain electrostatic charges, it should be re-treated with a suitable antistatic solution.

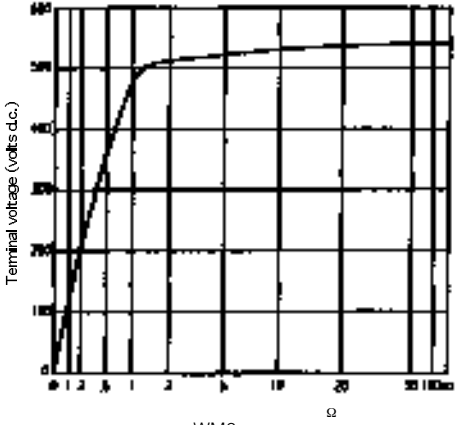
SPECIFICATION

		WM6
Ranges	insulation	0–200 MΩ and ∞
	continuity	0–100 Ω
Terminal Voltage on Open Circuit (d.c.)	insulation range	<600 V
	continuity range	800 mV approx.
Terminal Voltage at 1 MΩ Load (d.c.)	insulation range	500 V + 10% –5%
Terminal Current on Short Circuit	insulation range	1,3 mA approx.
	continuity range	55 mA approx.
Voltage Stability 160 r.p.m. to 240 r.p.m.	insulation range	<±1%
Ripple Content at 160 r.p.m. on Open Circuit	insulation range	500 mV pk-pk approx.
Accuracy		1,5 mm (0,060 in) from any marked position on the scale when measured against standard resistors.
Temperature	operating	–10 °C to +50 °C
	storage	–20 °C to +70 °C
Flash Test		2,3 kV a.c. r.m.s.
Voltage Source (d.c.)		Brushless a.c. hand-cranked generator with rectifier and d.c. to d.c. converter.

SPECIFICATION

Fuse	1 A 20 x 5 mm ceramic
Dimensions	131 x 98 x 61 mm ($5^1/_8$ x $3^7/_8$ x $2^3/_8$ in)
Weight	650 g (1 lb 7 oz)

Terminal Voltage Characteristics



WM6

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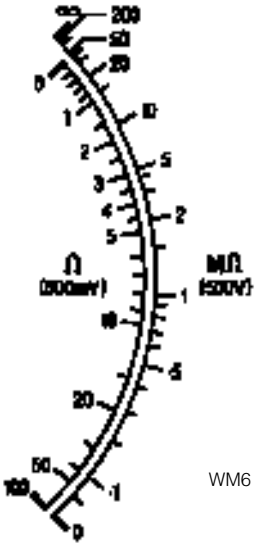
Illustrations of Typical Scales (full size)



WM6

ACCESSORIES

SUPPLIED WITH THE INSTRUMENT

Test lead set including shrouded crocodile clips

User Guide Part No. 6171-685

Test Record Card (5 supplied) Part No. 6172-111

AVAILABLE AS AN OPTIONAL EXTRA

A leather 'test-and-carry' case with a special compartment for test leads Part No. 6420-088

Test Lead set red/black Part No. 6220-437

Test Record Card (Pack of Twenty) Part No. 6111-216

OPERATION

WARNING

1. The circuit under test **must** be de-energized and isolated before insulation or continuity tests are made.
2. When capacitive circuits have been tested allow a suitable time to elapse before disconnecting the test leads, for the circuit to discharge.
3. Instruments used in dusty environments should be stripped and cleaned periodically.
4. Do not leave the instrument exposed to direct heat from the sun for long periods.
5. The instrument circuit contains a static sensitive device. If the instrument casing is opened for any reason (this will automatically invalidate any warranty covering the instrument), care must be exercised in handling the printed circuit board. This should be done in accordance with DEF STAN 59-98 and BS 5783 specifications for handling electrostatic sensitive devices. Printed circuit boards containing such devices are identified either by a yellow warning label or by a yellow legend and a large yellow dot on the p.c.b. (Initially the dot may not be included.)

PRELIMINARY CHECKS

Inspect the test leads to see that they have good unbroken insulation. Connect the red and black leads, terminated with the clips, to the red (+) and black (–) terminal sockets respectively in the side of the instrument case. Leave the leads coiled or twisted together, but ensure that their clips are not touching anything. Set the slider switch to the 'MΩ' position. Turn the generator handle at approximately 160 r.p.m. and observe the meter pointer, it should rest over the '∞' (infinity) position on the scale. If it does not the test leads may be faulty and should be inspected more closely for damage. Replace them if necessary.

Connect the test lead clips together and turn the generator handle again, the meter should read zero. If it indicates infinity or a high resistance value the leads may be open circuit and should be inspected further, replace if necessary. Shorting the leads together and obtaining a zero reading also proves that the instrument is working.

To check that the fuse in the continuity circuit is intact, leave the test leads connected together and set the slider switch to the 'Ω' position. Turn the generator handle again, the reading obtained should be zero (or very nearly so). If the reading is beyond full scale on the 'Ω' range the fuse has ruptured and should be replaced.

FUSE REPLACEMENT

The fuse is held in a screw-type holder. To change a fuse, use a screwdriver to release the centre part of the holder containing the fuse. Replace with a 1 A 20 x 5 mm ceramic fuse part no. 25413-286. An alternative fuse should not be used as the fuse resistance will affect the lower continuity readings.

INSULATION TESTING

After connecting the test leads to the instrument and making the preliminary checks as detailed above, set the slider switch to 'MΩ'. With the circuit to be tested isolated, connect the test leads as follows:—

(a) for insulation tests to earth —
connect the red lead to earth or frame of the equipment, and the black lead to that part of the circuit to be tested.

(b) for insulation tests between wires —
connect a lead to the core of each of the wires.

Turn the generator handle at between 160 r.p.m. and 240 r.p.m. The meter pointer will indicate the value of insulation resistance on the 'MΩ' scale. (If a capacitive circuit is tested the pointer will initially deflect towards zero and then gradually rise to its final steady value as the capacitance is charged up to the output voltage of the tester.)

If several successive readings of '∞' are obtained, connect the two further ends of the test leads together and turn the generator handle. A zero reading should result which double checks that the leads are not disconnected or broken and therefore the insulation resistance readings are correct.

Capacitive circuits automatically discharge through the tester when the generator handle stops rotating. The meter pointer will deflect beyond the '∞' position on the scale and then return to its normal rest position at '∞' when the circuit has discharged. Wait a few moments for this to happen before disconnecting the test leads. The discharge time (to 0 V) is approx. 8 seconds per microfarad.

CONTINUITY TESTING

With the test leads connected to the instrument, and having checked them and the fuse as described above, set the slider switch to the 'Ω' position. With the circuit under test isolated, connect the test leads across the appropriate points and turn the generator handle at between 160 r.p.m. and 240 r.p.m. The resistance will be indicated on the 'Ω' scale. This resistance includes that of the test leads which should be measured separately, (by performing a test with the clips joined together), and the result deducted from the total.

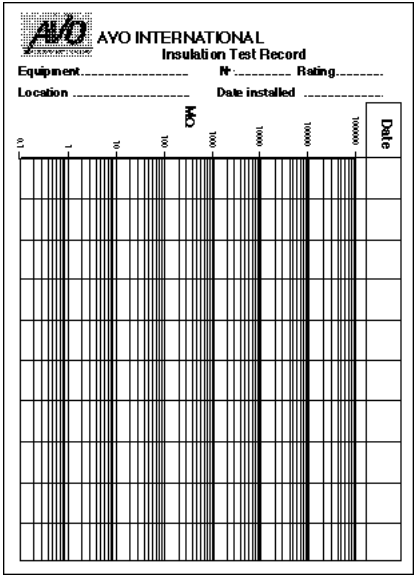
Preventive Maintenance

The proverb 'A stitch in time saves nine' inspired the title of an **AVO International** booklet on insulation testing, as it neatly sums up the benefits of preventative maintenance. The savings come in financial terms from costly repairs, lost production, lost profits and in human terms, from lives saved in the event of dangerous electrical faults.

Regular insulation testing of electrical equipment can help to detect deteriorating insulation. The effects which cause insulation to deteriorate include mechanical damage, vibration, excessive heat or cold, dirt, oil, moisture and localized voltage stresses - all of which can arise on most industrial or utility equipment.

Insulation tests are sometimes used in isolation as absolute measures of the quality of the insulation. This is most appropriate when equipment is being installed and checked for compliance with a specified 'Pass' level. For operational equipment the key factors are trends in the insulation readings.

It is therefore important that records of insulation readings are kept, relating to each piece of equipment or 'Asset' in your testing regime. **AVO International** supplies test record cards to assist with such record keeping. There are also a number of influences on the insulation readings - temperature, humidity and surface leakage for example and a range of test techniques have been developed to help with the interpretation of your insulation tests.



Test Record Example

Insulation Testing Concepts

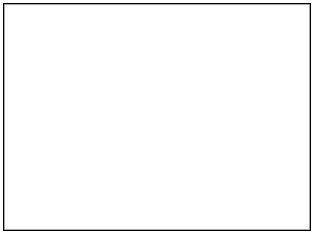
Insulation resistance can be considered by applying Ohm's Law. The measured resistance is determined from the applied voltage divided by the resultant current, $R = \frac{V}{I}$

There are two further important factors to be considered. These are:

(i) the nature of the current through and/or over the insulation, and :

(ii) the length of time for which the test voltage is applied. These two factors are linked.

The total current that flows is made up of three separate currents:-



1. Capacitance charging current. This current is initially high and drops as the insulation becomes charged up to the applied voltage.
2. Absorption current. This current is also initially high but drops at a much slower rate than the charging current.
3. Conduction or Leakage current. This is a small steady current that can be sub-divided into two:-
   (a) A current flowing along conduction paths through the insulation material.
   (b) A current flowing along conduction paths over the surface of the insulation material.

As the total current depends upon the time for which the voltage is applied, Ohm's Law theoretically applies at infinite time.

The charging current falls relatively rapidly as the equipment under test becomes charged up. The actual length of time depends upon the size and capacitance of the item under test.

Larger items with more capacitance will take longer e.g. long supply cables. The absorption current decreases relatively slowly compared with the charging current. In essence it depends upon the nature of the insulation material. The conduction or Leakage current builds up quickly to a steady value and then remains constant for a particular applied voltage under stable conditions. It is this current that is affected by moisture, dirt etc. and the degree to which it flows bears a direct relation to the quality of the insulation, and consequently to the value of the insulation resistance measured. An increase in the leakage current is a pointer to possible future problems.

SAFETY WARNINGS

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Ripple Content at 160 r.p.m. on Open Circuit	insulation range	500 mV pk-pk approx.
Accuracy		1,5 mm (0,060 in) from any marked position on the scale when measured against standard resistors.
Temperature	operating	–10 °C to +50 °C
	storage	–20 °C to +70 °C
Flash Test		2,3 kV a.c. r.m.s.
Voltage Source (d.c.)		Brushless a.c. hand-cranked generator with rectifier and d.c. to d.c. converter.

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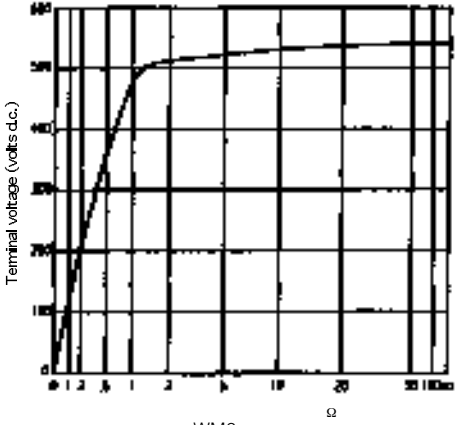

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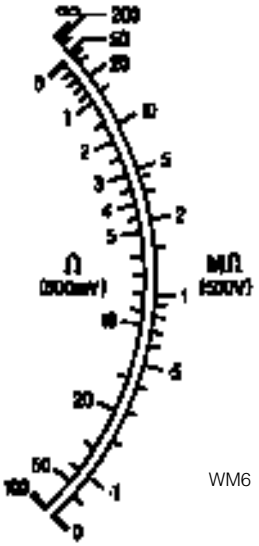

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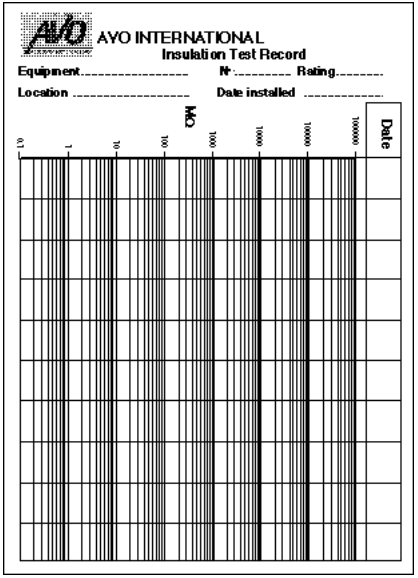

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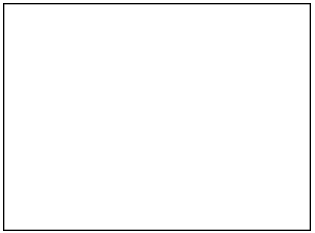

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