



**ISO-TECH** *IDM 203/205 RMS*

**DIGITAL MULTIMETER**



**INSTRUCTION MANUAL**





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**Digital Multimeter**  
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## 1. Safety notes

These meters have been produced to comply with category II requirements under IEC publication 1010-1, "Safety requirements for electronic measuring equipment" and with UL 1244.


The present operating manual gives directions and warnings which must be observed if the meter is to be used safely and is to be kept in a safe state.

### Terms used in the operating manual

**Important :** This word identifies conditions or operations in which there is a possibility of the multimeter or other equipment being damaged.

**Warning:** This word identifies conditions or operations in which there is a possible risk of injury or death.

### Markings on the unit

 **Attention** — Follow the operating instructions.


 **Danger** — Dangerous voltages may occur at these connections.


### Symbols in operating manual

 This symbol indicates important information.

 Fuse

 Battery

 **WARNING :** To avoid hazards or the risk of electric shock or of the multimeter being damaged, voltages which may exceed 600Vdc or 600Vac to earth must not be connected to any of the input terminals of the multimeter.

 **WARNING :** To avoid the risk of electric shock :  
Carefully observe the safety precautions when dealing with voltages of more than 50V or 25Vrms. Voltages above these levels may expose the operator to electric shock hazard. Make sure that the test leads are in a safe state.

**Important :** To avoid damage to the meter

- Remove the test probes from the item from which measurements are being taken before you change the function to which the meter is set.
- Never apply to the meter voltages which may exceed 600Vd.c. or 600Va.c.rms.
- Never try to measure voltages when the meter is set to measure resistance ( $\Omega$ ).

**Always use the fuses specified.**

To avoid the risk of fire, you must only use fuses of the correct type with the voltage and current ratings given on the bottom of the meter. It is strictly forbidden for "repaired" fuses to be used or for the fuse holders to be shorted out.

**⚠ WARNING :** Read this operating manual thoroughly before you use the meter and follow the instructions given in it when you are using the meter.

Misunderstandings of the warnings given or the operating instructions and errors in following them may cause hazards or serious injury and/or may result in damage to the meter or other equipment.

### **1.1 Mains voltage supply**

This meter is designed to operate on mains voltages which do not exceed 264Vrms between the phase conductors or between these conductors and earth.

### **1.2 Earth conductor**

The earth conductor (the third conductor in the power cable) is essential to allow this meter to be used safely. To avoid the danger of electric shock and before any connections are made to the input or output terminals of the meter, the mains plug should only ever be plugged into a socket properly wired to statutory requirements. Never cut, disconnect or otherwise interrupt the earth conductor. Always use power cables and plugs as specified in this operating manual.

### **1.3 Fuses**

To avoid the risk of fire, you must only use fuses of the correct type with the voltage and current ratings given on the bottom of the meter (see section 3.2 Electrical characteristics).

## **2. Introduction**

These meters are mains or battery-powered measuring and testing instruments for service engineers, laboratory use and amateur electronics engineers. The functions they can perform are as follows:

Measurement of a.c. and d.c. voltages  
Measurement of a.c. and d.c. currents  
Measurement of resistance and capacitance  
Diode and continuity testing  
Frequency and ADP measurement

### **Unpacking and checking**

When you unpack your new multimeter, the items you should have are as follows:

1. Digital multimeter
2. Set of test leads (one black and one red)
3. Operating manual
4. Power cable
5. Carrying strap

### **3. Technical specification**

#### **3.1 General characteristics**

**Display** : 3 3/4 digit 4000 count LCD display with a 42-segment analog bargraph display. Higher resolution of up to 9999 in frequency range.

**Display update rate** : Two per second for digital display, 20 per second for bargraph display. For capacitance and frequency measurements: 1 per second.

**Over range** : Most significant digit flashes.

**Backlighting** : LED

**Safety** : These meters have been produced to comply with category II requirements under IEC publication 1010-1, "Safety requirements for electrical equipment for measuring, monitoring and laboratory use". This standard of safety can only be guaranteed if the maximum and minimum figures specified below are observed.

#### **Ambient conditions**

**Maximum altitude** : 2000m

**Installation category** : 600V Category III , 300V Category II

**Pollution degree** : 2

**Operating temperature** : 0 to +50°C

**Storage temperature** : -30 to +70°C

**Temperature coefficient** : 0.15 x specified accuracy/°C, <18°C or >28°C

**Relative humidity** : 0 to 70% (0 to +50°C)

**Maximum voltage to earth** : 600V d.c./a.c. peak voltage at any connection

**Supply required** : 90 to 264V, 50/60Hz a.c. voltage, six 1.5 V AA or LR6 or AM3 batteries  
(not supplied) able to supply a power of at least 10 VA

**Battery life (alkaline)** : typically 1200 hours without backlighting  
typically 80 hours with backlighting on continuously

**Dimensions (B x H x D) mm** : 218 x 73 x 195(without carrying strap)

**Weight (without power cable)** : 1.3kg

**Accessories supplied** : Test leads, carrying strap, power cable and instruction manual

### 3.2 Electrical characteristics

Accuracy is given as  $\pm$  (measurement error + display error) and applies at  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and less than 70% RH.

Measurement error (%) is given as a percentage of the current measurement.

Display error (D) is given in units equal to the smallest increment able to be shown on the display.

#### Voltage

d.c. voltage	203	205
400mV	$\pm (0.75\% + 2D)$	$\pm (0.3\% + 2D)$
4V, 40V, 400V, 600V	$\pm (0.5\% + 2D)$	$\pm (0.1\% + 2D)$

a.c. voltage	203	205
4V, 40V, 400V, 600V		
50 to 60Hz	$\pm (1\% + 5D)$	$\pm (0.5\% + 5D)$
40Hz to 1KHz	$\pm (1.5\% + 5D)$	$\pm (1\% + 5D)$

**Resolution** : 0.1mV on 400mV range

**Input impedance** :  $10\text{M } \Omega$ ,  $<100\text{pF}$

**Overload protection** : 1100V or  $V_{\sim}(\text{peak})$

**Conversion of a.c. voltages** : 203 : Mean measured - R.m.s. value displayed

205 : Measurements are a.c. voltage coupled and represent a true r.m.s. value. Calibration is to the r.m.s. value of a sinusoidal a.c. voltage.

The accuracy specified is for full-scale deflection for sinusoidal voltages and half-scale deflection for non-sinusoidal voltages, of frequencies less than 500Hz and crest factors of up to 2.



## Current

d.c. current	203	205
4mA to 400mA	$\pm (0.75\% + 2D)$	$\pm (0.4\% + 2D)$
10A	$\pm (1.5\% + 4D)$	$\pm (0.8\% + 4D)$

a.c. current	203	205
40Hz to 1KHz		
4mA to 400mA	$\pm (1.5\% + 5D)$	$\pm (1\% + 5D)$
10A	$\pm (2.5\% + 5D)$	$\pm (1\% + 5D)$

**Ranges :** 4mA, 40mA, 400mA, 10A (20A for 30 seconds)

**Resolution :** 1 $\mu$ A on 4mA range

**Voltage drop :** mA input: 800mV (max.),

**10A input :** 1V (max.)

### Input protection

**mA input :** 1A, 600V, 10kA breaking capacity fuse (Bussmann BBS-1 or equivalent)

**A input :** 15A, 600V, 100kA breaking capacity fuse (Bussmann KTK15 or equivalent)

### A.c. current conversion :

**203 :** Mean measured - R.m.s. value displayed

**205 :** A.c. coupling. True r.m.s. measurements. Calibration to r.m.s. value with sinusoidal a.c. current.

The accuracy specified is for full-scale deflection for sinusoidal currents and half-scale deflection for non-sinusoidal currents, of frequencies less than 500Hz and form factors of up to 2.

## Resistance

Range	203	205
400 $\Omega$	$\pm (0.75\% + 4D)$	$\pm (0.4\% + 4D)$
4k $\Omega$ , 40k $\Omega$ , 400k $\Omega$	$\pm (0.75\% + 2D)$	$\pm (0.4\% + 2D)$
4M $\Omega$	$\pm (1\% + 3D)$	$\pm (0.6\% + 3D)$
40M $\Omega$	$\pm (2.5\% + 5D)$	$\pm (1.5\% + 5D)$

**Resolution** : on 400  $\Omega$  range: 0.1  $\Omega$

**Off-load voltage** : 0.4V

**Input protection** : 600V or r.m.s. a.c. voltage

**Note** : If stability problems occur in the higher ranges, powering the meter from batteries rather than the mains may improve matters.

## Continuity testing

**Indication threshold** : approx. 50  $\Omega$

**Continuity indication** : 2kHz tone

**Input protection** : 600Vd.c. or r.m.s. a.c. voltage

## Diode testing

**Test current** : 0.6mA

**Off-load voltage** : approx. 3Vd.c.

**Input protection** : 600Vd.c. or r.m.s. a.c. voltage

### Capacitance

Ranges : 4nF, 40nF, 400nF, 4μF, 40μF

Resolution : 1pF on 4nF range

Accuracy : see table

Input protection : 600Vd.c. or r.m.s. a.c. voltage

Range	Accuracy (in relative mode)
-------	-----------------------------

4nF	$\pm (1\% + 40D)$
-----	-------------------

40nF	$\pm (1\% + 4D)$
------	------------------

400nF	$\pm (1\% + 4D)$
-------	------------------

4μF	$\pm (1\% + 4D)$
-----	------------------

40μF	$\pm (1\% + 4D) (\leq 20\mu F)$
------	---------------------------------

	$\pm (5\% + 8D) (\geq 20\mu F)$
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### Frequency

Ranges : 100Hz, 1kHz, 10kHz, 100kHz, 1MHz

Resolution : 0.01Hz on 100Hz range

Accuracy :  $\pm (0.1\% + 4D)$

Sensitivity : 1Hz to 20kHz: 40mVrms;

20kHz to 1MHz: 400mVrms

Input protection : 600Vd.c. or r.m.s. a.c. voltage

### ADAPT measurement

Indication : 10 units of the lowest digit per mV=

Accuracy : IDM 205:  $\pm (0.3\% + 4D)$

IDM 203:  $\pm (0.75\% + 4D)$

Input protection : 600Vd.c. or r.m.s. a.c. voltage

## 4. Using the meter

### Connecting to mains

**Important :** To avoid the risk of electric shock, it is essential for the earth conductor in the power cable to be linked through to the earth conductor of the mains supply. There are no parts serviceable by the user inside the meter.

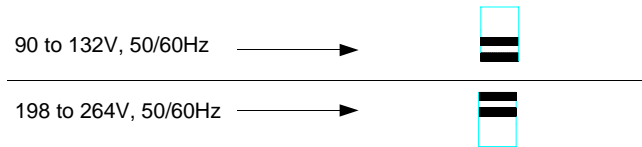
Repairs may only be made by persons qualified to do so.

**WARNING :** Unplug the mains supply before changing fuses. To avoid the risk of fire, fuses may only be replaced with fuses of the same type and ratings. Fuse: 80mA/250V, quick-acting (F), 5 x 20mm.

To avoid damage to the meter, the voltage selector on the back must be set to the correct mains voltage (see below).


**For mains voltages given below:      switch setting as shown:**

Setting of mains voltage switch




### 4.1 Controls and connections

Fig.1 shows the controls and input terminals on the front of the unit.

- 1. Digital display** — The 3 1/2 digit 3999 count digital LCD display includes a 42-element analog bargraph display and has automatic annunciators for polarity, decimal point, range overrun, store data, AC/DC,  $\Omega/\varnothing$ , Auto, ,  $\pm$  REL. MAX. MIN. and unit symbols.
- 2. Rotary function and range switch** — This switch is used to select functions and measuring ranges.
- 3. COM Input Terminal** — Input for the common potential.
- 4. V- $\Omega$ -Hz- $\pm$  Input Terminal** — Input for voltage and resistance measurement, diode testing, and capacitance, frequency and ADP measurement.
- 5. mA Input Terminal** — Input for milliamperere current measurement.

**6. A Input Terminal** — Input for ampere measurement. The meter can measure currents of up to 20A but the time is then limited to a maximum of 30 seconds.

**7. Function button (blue)** — This button is used to switch between a.c. and d.c., between resistance measurement and continuity testing, and between frequency and ADP measurement.


**8. MIN/MAX button** — Pressing the MIN/MAX button selects the MIN/MAX store mode. The minimum and maximum values are then reset to the level currently measured. The display annunciators  and "MAX" or "MIN" are activated. In the MIN/MAX mode the minimum or maximum values are stored. A signal tone sounds if a new minimum or maximum value overruns the display capacity of 4000 units.

By pressing the "Hold" button in the MIN/MAX mode you can stop the maximum/minimum values from being recorded and then, by pressing it again, you can allow the recording to continue. If you stop the recording, the current measurement shown is held and the bargraph display frozen.

In the MIN/MAX mode, the minimum or maximum value is shown on the digital display while the bargraph display continues to show the normal measurements.


**9. Relative button (REL)** — Pressing the "REL" button causes REL to appear on the display and activates the relative mode. When you do this, the value shown on the display is stored as a reference value and the display is reset to zero. To exit the relative mode, hold the "REL" button pressed for two seconds.

In the relative mode, the value displayed is the difference between the reference value held in store and the value currently measured, e.g. if the reference value is 0.04  $\Omega$  and the value currently measured is 15.05  $\Omega$ , what is shown on the display is 15.01  $\Omega$ .

**10. HOLD button** — Except in the MIN/MAX mode, this button is used to switch the data hold mode on and off. When the hold mode is on,  appears on the display and the measurement shown is held until the hold button is pressed again. An audio signal is given when the hold mode is switched to.

If the MIN/MAX button is pressed while the hold mode is on, the meter exits the hold mode and goes over to the MIN/MAX mode.

If the hold button is pressed while the MIN/MAX mode is on, storage of the minimum or maximum values is stopped, and it resumes again if the hold button is pressed for a second time.

- 11. Delay hold button** — This button also switches the hold function on, but with a 10 second delay in this case.
- 12. Manual range button** — The manual range button is used to enable the manual range setting facility and to change ranges.  
If the button is pressed once, the **Auto** annunciator on the display goes out. By pressing the button repeatedly, the meter can then be set to the desired range. To revert to autoranging, hold the button pressed for two seconds.
- 13. Backlighting** — The yellow button switches the backlighting on or off as desired.
- 14. Store button** — In the store mode, "MEM" appears on the display and the last measurement made is stored. The value stored is not deleted when the meter switches itself off automatically, but it is when the rotary switch is turned to "Off".  
(This function is only available on the model 205 meter.)
- 15. Recall button** — This button can be used to recall a stored measurement to the display. That this has been done is indicated by  appearing on the display and "MEM" flashing. The automatic power off is disabled. To cancel the display of the stored value and exit Recall, press the Hold button. (This function is only available on the model 205 meter.)  
Fig.2 shows the controls and connections on the back of the unit.
- 16. Mains on/off switch** — In the "I" position the mains supply is on and in the "O" position it is off.
- 17. Mains socket** — Connector into which the power cable is plugged.
- 18. Mains fuse** — This fuse provides protection against faults in the unit and overloads. (80mA/250V, quick-acting, 5 x 20mm.)
- 19. Mains voltage selector switch** — This switch is used to switch the power supply unit in the meter to the appropriate mains voltage.

**Important :** Before you use the meter, make sure that the mains voltage selector switch is set to the correct voltage supplied from the mains supply.

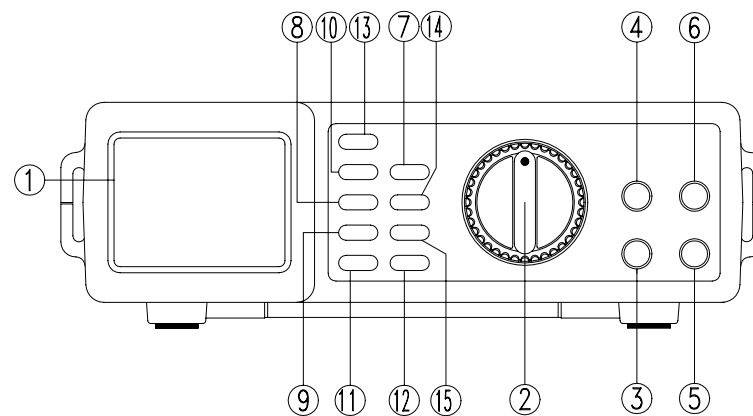


Figure 1

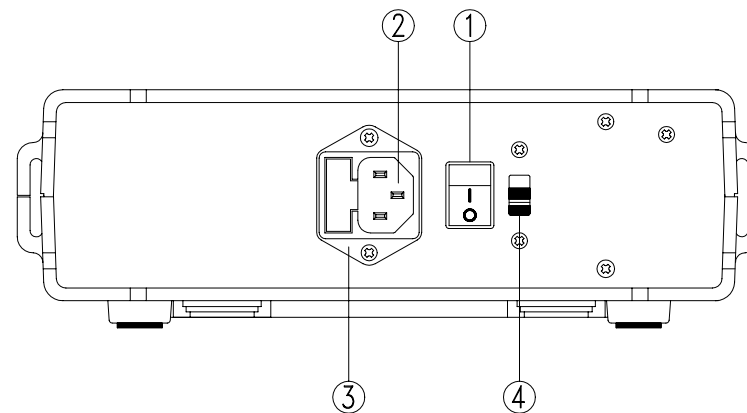


Figure 2

## 5. Making measurements

Preparatory steps and directions to be followed

1. After you switch the meter on, wait for 30 seconds before you make the first measurement.
2. You must set the desired function with the rotary switch before you bring the probes into contact with the item to be measured. Remove the probes from the item to be measured before you change the setting of the rotary switch.
3. If the meter is used in the vicinity of equipment which generates electromagnetic interference, the display may become unstable or incorrect measurements may be shown.
4. Keep the meter dry.

### **TEST EQUIPMENT RISK ASSESSMENT (UK RECOMMENDATION)**

*Users of this equipment and/or their employers are reminded that Health and Safety Legislation require them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as from inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads constructed in accordance with the HSE guidance note GS38 'Electrical Test Equipment for use by Electricians' should be used.*

## 6. Measurement procedure

The meter was produced and tested to comply with the requirements of IEC publication 1010, "Safety requirements for electrical measuring equipment" and with UL 1244 and was in a reliable state when supplied.

This operating manual gives directions and warnings which it is essential for the user to follow if he is to work safely and the safety of the meter is to be ensured.

### **Measuring voltages**

**⚠WARNING** : Never apply voltages of more than 600Vd.c. or 600Va.c. to the inputs of the meter. Never apply voltages of more than 600Vd.c. or a.c. rms to earth to the input terminals of the meter; if these voltages are exceeded, there is a risk of electric shocks or damage to the meter.

When making measurements on circuits carrying high voltages, take particular care not to touch live parts.



1. Plug the black lead into the "COM" input terminal of the meter and the red lead into the "V- $\Omega$ -Hz" input terminal.
2. Turn the function switch to the "Vd.c." or "Va.c." position.
3. Apply the probes to the source or load whose voltage is to be measured. The polarity of the red probe will be shown along with the measurement. If the measurement is higher than the range of the meter or the range which has been set manually, an audio signal is triggered and the most significant digit of the digital display flashes, while the three lower digits go to 0.

#### **Measuring currents**

1. Plug the black lead into the "COM" input terminal of the meter. To measure currents up to a maximum of 400 mA plug the red lead into the "mA" input terminal and to measure currents up to a maximum of 10A plug it into the "A" input terminal. (The meter can also measure and display currents of up to 20A but currents of this level must not be applied to it for more than 30 seconds.)
2. Turn the rotary function switch to which ever range you require from "4mA" to "400mA" and set DC or AC with the function button.

**Note :** If you do not know which range you require, start with the highest range and if need be repeat the measurement in whichever lower range you then find to be required.

3. Connect the meter in series with the load from which a measurement is to be taken.

#### **Measuring resistance**

1. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz" input terminal.

**(Note:** The polarity of the red lead is positive.)

2. Turn the function switch to " $\Omega$ ->" and use the function button to bring " $\Omega$ " up onto the display.

**WARNING :** To avoid the possibility of injury and to protect the meter from damage, make sure that the item from which measurements are to be taken is not live.

3. Apply the probes to the item whose resistance is to be measured. To obtain the greatest possible accuracy with low resistances, set the meter to the 400  $\Omega$  range, and before making a measurement short the probes together and press the "REL" button. This will automatically correct for the resistance of the leads when subsequent measurements are made.

#### Continuity testing with the internal sounder

1. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz- $\rightarrow$ " input terminal.
2. Turn the function switch to " $\Omega \rightarrow$ " and use the function button to set the meter to continuity testing.
3. Apply the probes to the circuit to be tested. The internal sounder will operate if the resistance is less than about 50  $\Omega$ .

#### Diode testing

1. Turn the function switch to " $\rightarrow$ ".
2. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz- $\rightarrow$ " input terminal.  
(Note: The red lead is positive.)
3. Apply the probes to the diode to be tested. With a non-faulty silicon diode, the voltage shown in the forward direction will be between 0.500 and 0.900V. With a faulty diode, "000" (short-circuit) or a reading of approx. 3.2V (open circuit) will be shown.
4. When tested in the opposite direction (blocking direction), a reading of approx. 3.2V will appear for a non-faulty diode and "000" (short circuit) or a different reading of less than 3.2V for a faulty one.

#### Measuring capacitance

1. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz- $\rightarrow$ " input terminal.
2. Turn the function switch to " $\rightarrow$ ".
3. When measuring the capacitance of polarised capacitors be sure to apply the probes with the correct polarity.
4. Apply the probes to the capacitor whose capacitance you wish to measure.

- Important :**
1. The capacitor must be fully discharged before any measurements are made.
  2. To obtain a more accurate measurement you are advised to use the relative mode (press REL button) to correct for any stray capacitances.

### Measuring frequency

1. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz- $\rightarrow$ " input terminal.
2. Turn the function switch to "Hz ADP" and use the function button to select frequency measurement (Hz).
3. Apply the probes to the signal source.

**Note :** The two least significant digits on the display may not be stable at frequencies of less than 1kHz or more than 20kHz.

### ADT measurement (ADAPT)

1. Plug the black lead into the "COM" input terminal and the red lead into the "V- $\Omega$ -Hz- $\rightarrow$ " input terminal.
2. Turn the function switch to "Hz ADP" and use the function button to select ADP measurement (ADP).
3. Apply the probes to the signal source.

**⚠ WARNING :** To avoid the risk of electric shock, the test leads and the power cable must be unplugged from the meter before the covers giving access to the fuses or batteries are removed.

To avoid the risk of fire, you should only use fuses of the types specified below with the ratings specified below.

⇒ F1: 1A/600V, 10.3 x 35mm, quick-acting (F), 1R, 10kA min.

⇒ F2: 15A/600V, 10.3 x 38mm, quick-acting (F), 1R, 10kA min.

⇒ : 6 x 1.5V: IEC LR6, AM3, AA

## **7. Changing the batteries**

This meter is powered by a 9V d.c. supply from a transformer-equipped power supply unit or from six 1.5V batteries (AA).

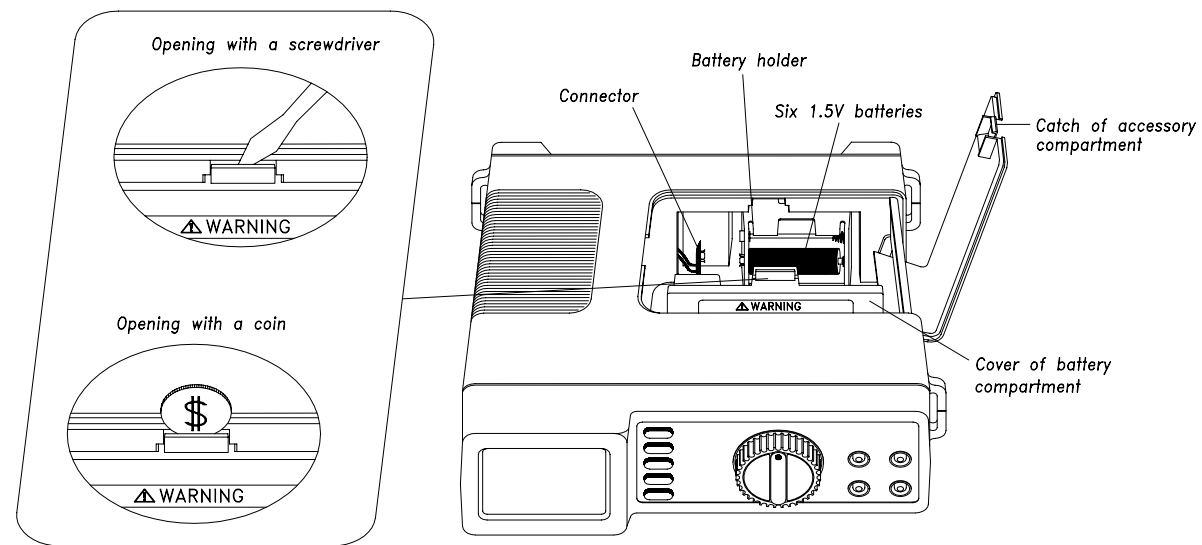
To change the batteries, see Fig. 3a and follow the instructions given below.

1. Remove the probes from the item from which measurements are being taken, switch the supply off from the switch at the back of the meter and unplug the test leads and mains lead from the jacks.
2. Open the accessory compartment by releasing the catch and hinging back the cover and take out all the accessories.
3. Using a screwdriver or some other suitable means, release the cover of the battery compartment and lift it out.
4. Disconnect the connector from the battery holder and take the batteries out of the holder.
5. Fit the new batteries into the holder and reconnect the connector to the battery holder connections.
6. Fit the battery compartment cover back into the meter.

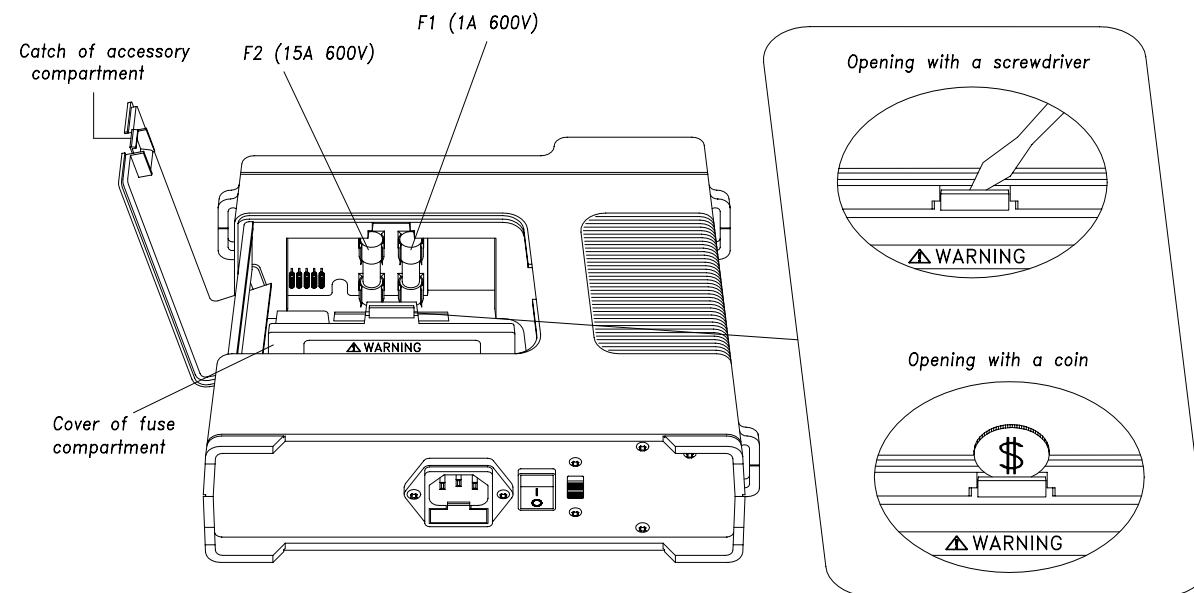
## **8. Changing the fuses**

To check and change the fuses, see Fig. 3b and follow the instructions given below.

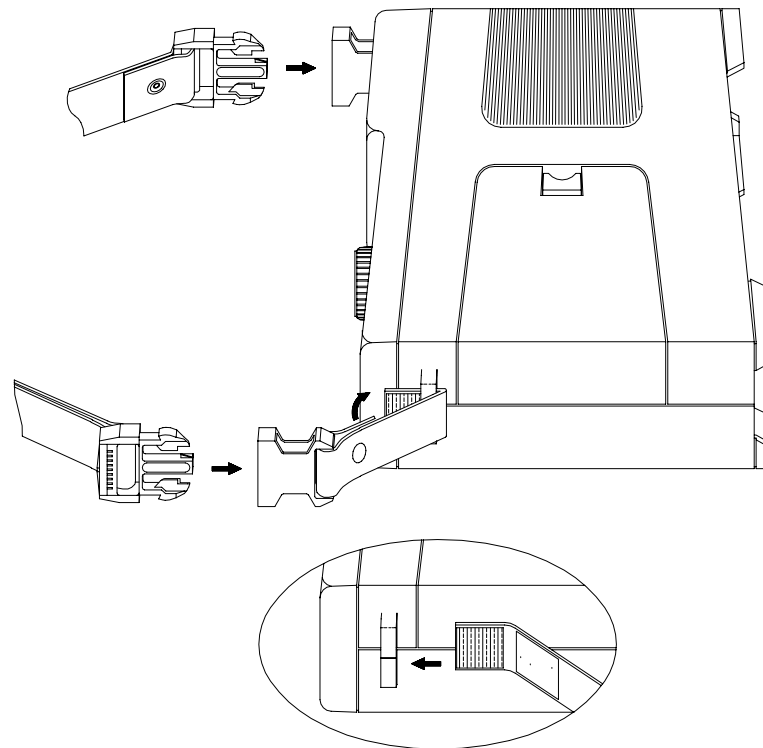
1. Carry out steps 1 to 3 of the instructions for changing the batteries.
2. Using a screwdriver or some other suitable means, release the battery compartment cover and lift it out.
3. Remove the faulty fuse by carefully levering one end up out of the fuse holder and then pulling the fuse out of the fuse holder by this end.
4. Fit a new fuse of the same size and ratings into the fuse holder. Make sure that the fuse is centered longitudinally in the fuse holder.
6. Fit the battery compartment cover back into the meter.



**Figure 3a Changing batteries**



**Figure 3b Changing fuses**



**Figure 4 Attaching the carrying strap**

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