

# **PHILIPS**

## **DIRECTIONS FOR USE**

### **UNIVERSAL**

### **MEASURING INSTRUMENT**

### **P 817 00/01**

66 580 33-3-120

1/361

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## APPLICATIONS

Between 50 and 70% of all electrical faults occurring in a radio receiver or amplifier are such that they can be easily traced by measurements, for which particularly the PHILIPS Universal Measuring Instrument P 817 00/01 is eminently suitable.

It is the ideal measuring instrument for use in the smaller repair shops or at the customer's home, owing to its small dimensions and to the fact it does not require any mains supply.

The following measurements can be carried out with the meter:

- direct and alternating voltages from 0 to 1200 V;
- direct and alternating currents from 0 to 3 A;
- resistances from 0 to 10 M $\Omega$

## ELECTRICAL DATA

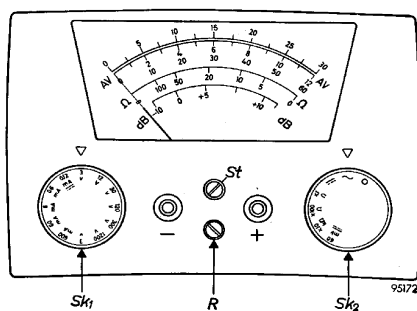


Fig. 1

### PROTECTION

For all commonly used measuring ranges the galvanometer can stand overloading for a short time. This does not hold, however, if the knob Sk2 is set to the very sensitive position "60mV"; in this position the protection is cut out and the meter cannot stand overload any longer. The maximum current is 30  $\mu$ A.

The voltage loss and the current consumption as given in the table at page 4 apply to full deflection; at less deflection these values are proportionally lower. All current and voltage scales are linear. For alternating-current and alternating-voltage measurements the reading remains accurate throughout the frequency range 30 10,000 c/s, with the exception of the measuring range of 1200 V, for which the upper accuracy limit lies at 5,000 c/s.

The A.C. and alternating-voltage ranges have been calibrated for a purely sinusoidal signal. Although the meter can, if necessary, be used standing upright, it measures more accurately lying down (see also page 5, under

"zero setting").

| Measurement        | Measuring range  | Position Of Sk1                                     | Position Of Sk2                | Scale    | Current consumption or voltage loss at full deflection   | Sensitivity  |
|--------------------|--|---|--------------------------------|----------|--|--|
| $V_{\overline{=}}$ | 0 – 60 mV  | Any position  | 60 $\overline{mV}^*$           | AV       |  | 33,300 $\Omega/V$  |
|                    | 0 – 3 V<br>0 – 12 V<br>0 – 30 V<br>0 – 120 V<br>0 – 300 V<br>0 -1200 V               | 3 V<br>12 V<br>30 V<br>120 V<br>300 V<br>1200 V     | $\overline{=}$                 |          | 30 $\mu A$<br><br>25 $\mu A$                             | 40,000 $\Omega/V$  |
| $I_{\overline{=}}$ | 0 – 30 $\mu A$   | Any position  | 60 $\overline{mV}^*$           | AV       | 60 mV  |  |
|                    | 0 – 120 $\mu A$<br>0 – 600 $\mu A$<br>0 – 6 mA<br>0 – 60 mA<br>0 – 600 mA<br>0 – 3 A | 0.12 mA<br>0.6 mA<br>6 mA<br>60 mA<br>600 mA<br>3 A | $\overline{=}$                 |          | 285 mV<br>345 mV<br>360 mV<br>360 mV<br>400 mV<br>580 mV |  |
| $V_{\sim}$         | 0 – 3V<br>0 – 12 V<br>0 – 30 V<br>0 – 120 V<br>0 – 300 V<br>0 – 1200 V               | 3 V<br>12 V<br>30 V<br>120 V<br>300 V<br>1200 V     | $\sim$                         | AV       | 5 Ma   | 1666 $\Omega/V$  |
|                    |  |   |                                |          | 600 $\mu A$  |  |
| $I_{\sim}$         | 0 - 600 $\mu A$<br>0 – 6 mA<br>0 – 60 mA<br>0 – 600 mA<br>0 – 3 A                    | 0.6 mA<br>6 mA<br>60 mA<br>600 mA<br>3 A            | $\sim$                         | AV       |  |  |
| R                  | 0 – 1000 $\Omega$<br>0 – 100 k $\Omega$  | Any position  | X 1 $\Omega$<br>X 100 $\Omega$ | $\Omega$ | 83 mA<br>0.8 mA  | Centre-scale Value<br>18 $\Omega$<br>1800 $\Omega$<br>180,000 $\Omega$ |

|  |                   |  |                 |  |         |  |
|--|-------------------|--|-----------------|--|---------|--|
|  | 0 – 10 M $\Omega$ |  | X 10 k $\Omega$ |  | 0.a3 mA |  |
|--|-------------------|--|-----------------|--|---------|--|

### TRANSPORT

The right-hand knob (Sk<sub>2</sub>) is provided with a green dot.

Whenever the instrument is transported, set this knob to the position marked with the green dot. In this position the galvanometer is short-circuited.

The same precaution should be taken when the meter is to be sent to the repair shop.

### ACCESSORIES (available on order)

1 pair of universal plugs, type P 995 00;

1 pair of measuring flexes, type P 997 04, complete with probe pins;

1 leather bag with carrying straps, type P 997 05;

1 transistor tester, type P 997 09;

1 step down transformer (300/3 Amps, 2 ½ VA, class 1, type P 997 10.

### MAINTENANCE

The inside of the window in the front panel of the universal meter is coated with a colourless liquid having antistatic properties, to prevent static charges, which may affect the position of the pointer and attract dust. This side of the window must not be rubbed with a cloth or anything similar, since otherwise the inside will become dull and the antistatic effect will be lost.

### OPERATION

The position of knobs and sockets is shown in Fig. 1.

#### ZERO SETTING

Before starting measurements, it is recommended to check and, if necessary, to correct the zero settings as follows:

- for the current/voltage scale (A V), mechanically with the set screw "St";
- for the resistance scale ( $\Omega$ ), with knob "R", with sockets + and - short-circuited (see also point E at page 7).

#### Remark concerning the zero adjustment

Turning over a meter that has been checked for use in the flat position to the upright position (or the reverse) may result in a difference of one scale division in the deflection of the pointer at any point on the 0 - 12 V scale; it is therefore necessary always to check the zero adjustment

again and, if necessary, to correct it.

## MEASURING

### A. Direct voltage (A V scale)

1. Set knob  $Sk_2$  to position " $\overline{\text{---}}$ ".
2. Set knob  $Sk_1$  to position "1200 V" (highest voltage range, to prevent overloading) and connect the measuring leads to the sockets + and -.
3. Now connect the measuring leads to the voltage source to be measured and set knob  $Sk_1$  to that measuring position that is most suitable to provide an accurate reading of the voltage in question.  
If the direct voltage in question has a maximum value of .60 mV, knob  $Sk_2$  may be put in position "60 mV  $\overline{\text{---}}$ ". ( $Sk_1$  may have any position; the meter protection is cut off!)

### B. Direct current (A V scale)

1. Set knob  $Sk_2$  to position " $\overline{\text{---}}$ ".
2. Set knob  $Sk_1$  to position "3 A" (highest current range to prevent damage to the meter due to the selection of too low a range) and connect the measuring leads to the sockets + and -.
3. Subsequently connect the measuring leads to the current circuit to be measured and then set knob  $Sk_1$  in that measuring position that is most suitable to provide an accurate reading of the current in question.  
If the direct current has a value of maximum 30  $\mu\text{A}$ , knob  $Sk_2$  may be put in position "60 mV  $\overline{\text{---}}$ ". (The position of  $Sk_1$  is unimportant; the meter protection is cut off!)

### C Alternating voltage (A V scale)

1. Set knob  $Sk_2$  to position " $\sim$ ".
2. Set knob  $Sk_1$  to position "1200 V" (highest voltage range to prevent overloading) and connect the measuring leads to the sockets + and -.
3. Subsequently connect the measuring leads to the voltage source to be measured and then set knob  $Sk_1$  to that measuring position that is most suitable to provide an accurate reading of the voltage in question.

#### **D. Alternating current (A V scale)**

1. Set knob  $Sk_2$  to position "~".
2. Set knob  $Sk_1$  to position "3 A" (highest current range, to prevent damage to the meter) and connect the measuring leads to the sockets + and -.
3. Now connect the measuring leads to the current circuit to be measured and then set knob  $Sk_1$  that measuring position that is most suitable to provide an accurate reading of the current in question.

#### **E. Resistance ( $\Omega$ scale)**

1. Select the appropriate resistance range with knob  $Sk_2$  ( $\times 1 \Omega$ ,  $\times 100 \Omega$  or  $\times 10 \text{ k}\Omega$ ); knob  $Sk_1$  may be in any position.
2. Connect the measuring leads to the sockets + and - and short-circuit the free ends of these leads.
3. Check the zero setting of the indicator (to the right on the scale) and, if necessary, correct with knob R. if it is found impossible to adjust the indicator to  $0 \Omega$ , this means that the batteries are runned down and have to be replaced (see under REPLACEMENT OF BATTERIES).
4. Now connect the ends of the measuring leads to the resistor to be measured.
5. After switching over to another resistance range the measuring leads must always be short-circuited and the indicator set to exactly  $0 \Omega$ .

Note: When measuring a resistor within an apparatus, make sure that the resistor is disconnected from impedances or voltages.

**dB SCALE** The dB scale is based on the use of the measuring. range 0 - 3 V. The zero level is fixed at 0.775 V, which corresponds to 1 mW across  $600 \Omega$ . In the case of a greater measuring range, the dB value can be determined if the value read from the dB scale is increased by 12 dB for the range 0 - 12 V, 20 dB for 0 - 30 V, 32 db for 0 - 120 V, 40 db for 0-300 V and 52 db for 0 - 1200 V.

## REPLACEMENT OF BATTERIES

Place the meter upright on a table, loosen the two screws in the cover plate (at the rear) three-quarter turn and remove the cover plate (by Aiding it upwards a little and then pulling it forward).

The batteries can now be removed from the meter casing (if necessary, the smallest with the aid of a thin screwdriver) and replaced by fresh ones?

Make sure that the + terminals of the batteries make contact with the contact springs marked + in the meter casing.

Finally refit the cover plate.

**Remark: When replacing batteries, never use the so-called leak-proof type, as the steel jackets of this batteries influence the deflection of the needle of the measuring instrument.**

## SOME EXAMPLES OF MEASUREMENTS

### A'. Direct-voltage measurements

For measuring direct voltages in a receiver or amplifier, the negative side of the meter must be connected to the negative pole of the voltage. The measuring probe at the positive side of the meter is brought into contact with the points to be measured, e.g. with the electrodes of the valves (anode and screen-grid voltages) or with the electrolytic capacitors in the smoothing circuit.

### B'. D.C. Measurements

The anode current of an output valve can be measured very conveniently by placing the two probes on the primary terminals of the output transformer. As the internal resistance of the meter is low compared with the ohmic resistance of the primary of the output transformer, the anode current will flow through the meter and not through the transformer.

For checking the operation of an oscillator valve, the current through the grid-leak resistor is measured. To "do this, disconnect the junction at the "earthed" side of this resistor and connect the probe of the meter to the resistor and the + probe to the cathode of the oscillator valve.

If the grid current of an oscillator valve is e.g. 200  $\mu\text{A}$ , a clear reading can be obtained in the 0.6 mA range.



### **C'. Alternating-voltage mea**

The alternating-voltage ranges are mainly used for measuring the L.F. output voltage of some apparatus, or for examining the voltages of the mains transformer, etc.

### **D'. A.C. Measurements**

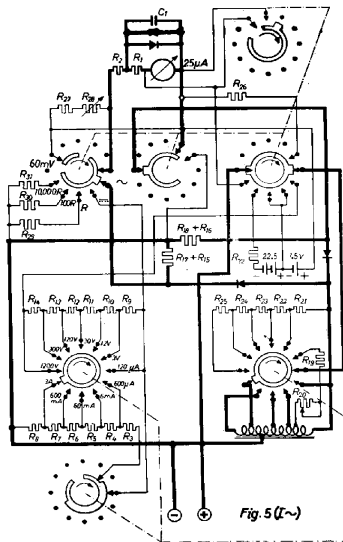
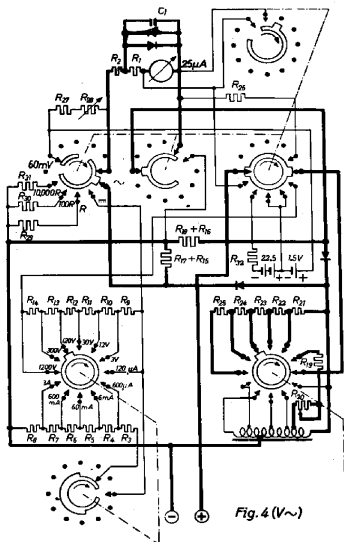
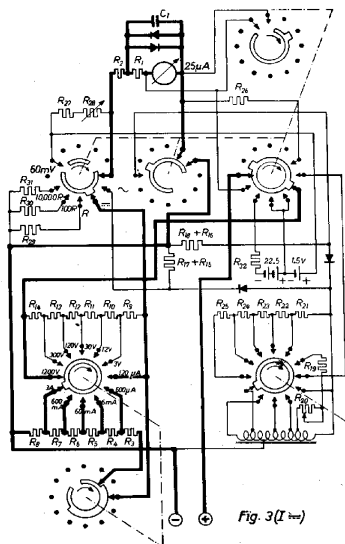
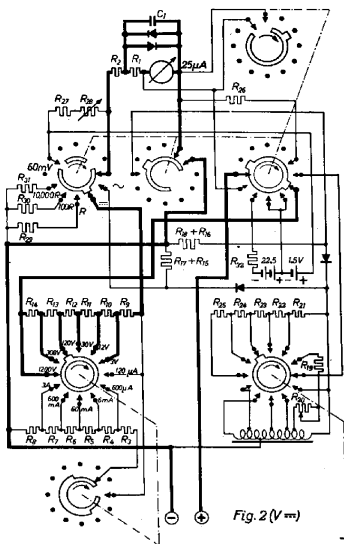
It is sometimes desired to measure the current consumption of some apparatus. To do this, incorporate the meter in one of the leads of the mains-voltage circuit. The power consumption in watts is then found by multiplying the measured current by the voltage, provided that the apparatus presents an ohmic resistance.

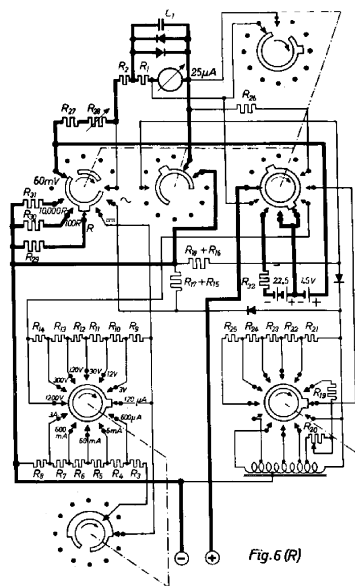
Where transformers are concerned, there is always a self-inductance, so that the number of VA has to be multiplied by the power factor ( $\cos\phi$ ), which as a rule amounts to 0.80 - 0.85 for radio receivers.

## **METER CIRCUITS FOR THE VARIOUS MEASURING RANGES**

In the diagrams on pages 10 and 11 the circuit diagram of the meter is always completely shown; the fat-printed lines represent the circuit operative for the measuring range in question.







## RECOMMENDED BATTERIES

| 22,5 V*) TYPE | MAKE       | MADE IN | 1.5 V**) TYPE    |
|---------------|------------|---------|------------------|
| KB 22.5       | Kapsch     | Austria | E.J. Super 1.5   |
| B 122         | Berec      | England | U 2              |
| L 5521        | Vidor      | "       | V 0002           |
| DH 522        | Drijdex    | "       |                  |
| S 122         | Siemens    | "       |                  |
| 222 G         | Leclanché  | France  |                  |
|               | EMCE       | Germany | Nr 160           |
|               | Baumgarten | "       | Nr 560           |
| 16122         | Daimon     | "       | 16289            |
| 10122         | Hellesens  | Denmark | VII—33/Unite     |
|               | "          | "       | VII—34/All steel |
|               | Tropex     | "       | 2733/Oncel       |
|               | "          | "       | 2734/All steel   |
|               | Fede       | Spain   | No. III          |
| 516           | Ray-O-Vac  | U.S.A.  | 2 LP             |
| U 15 E        | Burgess    | " "     | 2 — 2R           |
|               | RCA        | " "     | VS 036           |
| 412 E         | Eveready   | " "     | 950              |
| 612           | General    | " "     | 920              |
| 0915          | Olin       | " "     | 1550             |

\*) max. dimensions: 27 x 16 x 51 mm.

\*\*) max. dimensions: 33 Ø x 63 mm.

