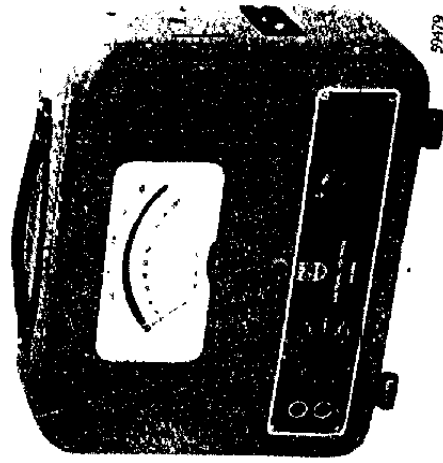


**PHILIPS**



**ELECTRONIC  
VOLTMETER  
TYPE GM 6005**

**DIRECTIONS FOR USE**

## DESCRIPTION

### Applications

The Philips electronic voltmeter GM 6005 has been designed for measuring I.F. and H.F. alternating voltages up to 300 V with frequencies of 20 c/s up to 1 Mc/s. These extensive measuring and frequency ranges make the meter eminently suitable for use in laboratories, electrotechnical workshops and industries, where it will be found a valuable instrument for the measuring of damping, resonance curves of L.F. and H.F. circuits, sound amplifiers, microphony, cables, etc. A great advantage is also that the entire range of carrier-telephony frequencies is covered by the frequency range of the voltmeter.

### Working

The GM 6005 contains a four-stage wide-band resistance amplifier, the first valve of which is a cathode follower, thus giving low input capacitance and little damping, so that there is only a very small load on the object being measured. A part of the last valve functions as a rectifier for the meter system, which has been inserted in the anode circuit of that valve.

Feedback is applied so that variations in the mains voltage or in the valves have practically no effect upon the result of the measurement.

By means of an attenuator switch the meter can be adjusted for ten different measuring ranges mounting up from 10 mV to 300 V (full pointer deflection). A voltage of 500  $\mu$ V can still be read quite well.

The meter is also calibrated in decibels.

The attenuator switch has an eleventh position for checking the calibration of the instrument, in which position a constant alternating voltage is laid onto the input of the amplifier.

The amplifier has been so constructed that in the event of overloading the current flowing through the meter is automatically limited to a safe value.

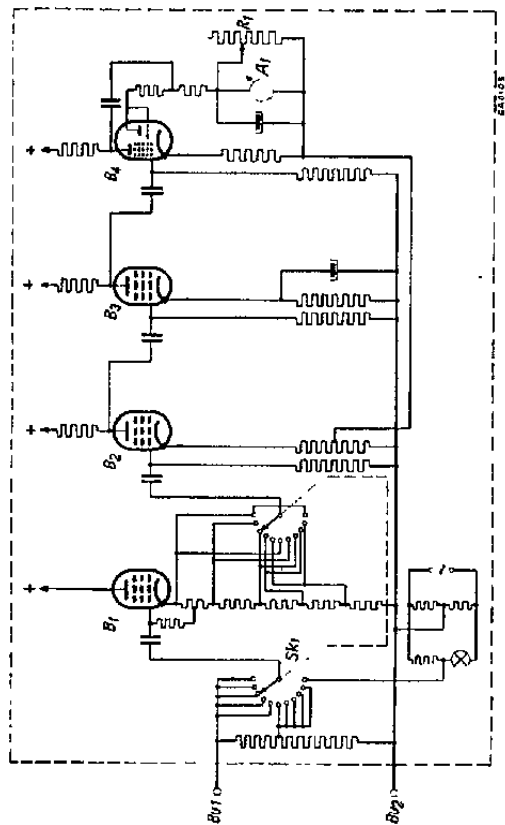


Fig. 1  
Simplified circuit diagram

## ELECTRICAL DATA

### Measuring range

This instrument has a measuring range of 0-300 V alternating voltage and -60 to +52 dB, each subdivided into 10 overlapping ranges.

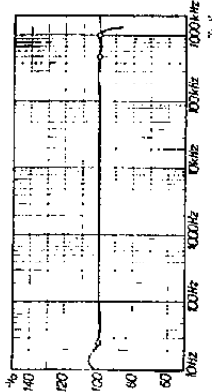
Position of the attenuator	Measuring range	
	V	in dB
10 mV	-50	-60 up to -38 dB
30 mV	-40	-50 up to -28 dB
100 mV	-30	-40 up to -18 dB
300 mV	-20	-30 up to - 8 dB
1 V	-10	-20 up to - 2 dB
3 V	0	-10 up to +12 dB
10 V	+10	0 up to +22 dB
30 V	+20	+10 up to +32 dB
100 V	+30	+20 up to +42 dB
300 V	+40	+30 up to +52 dB

The attenuator works in ten steps of 10 dB and has an additional position for checking the calibration.

The meter has three scales: 0-316, 0-100 and  $-\infty$  to +12 dB. The subdivision of the decibel scale begins at -10 dB. The zero level has been chosen at 0.775 V (1 mW in 600 ohms).

**Frequency range**

The frequency range extends from 20 c/s up to 1 Mc/s (see fig. 2).



**Accuracy**

The error due to deviations in the frequency characteristic (relative accuracy) amounts to:

- between 100 c/s and 500 kc/s less than 1%,
- between 20 c/s and 1 Mc/s less than 2%.

For absolute measurements the total error is:

- between 100 c/s and 500 kc/s less than 4%,
- between 20 c/s and 1 Mc/s less than 5%.

Influence of mains voltage variations is very little, a fluctuation of 5% giving a deviation of the calibrating voltage less than -0.5%, whilst the error in the measurement is then at most 1%. Short impulses (up to 20 $\mu$ s) do not affect the measurement.

**Input impedance**

Measuring ranges	Input capacitance	Input impedance
10 mV up to 1 V	< 15 pF	at 20 kc/s > 1.5 megohms at 1 Mc/s > 0.7 megohm
3 V up to 300 V	< 6 pF	at 20 kc/s > 1.9 megohms at 1 Mc/s > 0.7 megohm

**Supply**

The voltmeter can be supplied from a.c. mains of 110, 125, 145, 200, 220 or 245 V, 40-100 c/s. The power consumption is about 27 W.

It can also be supplied from direct current mains with the aid of a vibrator-converter. For supply from a 6-V battery the "Vibraphil" type GM 4226 can be used.

**Valves**

The valve equipment of this apparatus is as follows:

Item	Type	Description
B <sub>1</sub>	EF 40	pentode
B <sub>2</sub>	EF 51	pentode
B <sub>3</sub>	EF 50 N	pentode
B <sub>4</sub>	6CH 21	triode-heptode
B <sub>5</sub>	1Z 2	two-phase rectifying valve

Further the apparatus contains a pilot lamp type 8034 D/00 and a calibrating lamp type 6890 D/00.

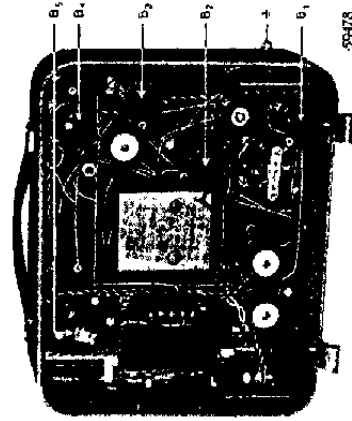


Fig. 3  
Back view of the apparatus

## INSTALLATION

### Adjustment for the local mains voltage

The voltmeter can be adapted to the local mains voltage with the aid of the voltage adapter behind the small plate on the right-hand side panel. After removing this plate pull out the switch, turn it until the right voltage comes uppermost and push it back in again, then putting back the plate.

### Connections

The sunken plug pins on the right-hand side of the instrument have to be connected to the mains with the aid of the cable supplied, while the mains switch  $Sk_3$  on the front is in the position "0". The earth terminal on the left-hand side has to be earthed with the shortest possible lead.

## OPERATION

### Switching on

Before switching on make sure that the needle of the meter points to zero. If necessary it can be adjusted with the aid of the adjusting screw underneath the glass covering the dial. The instrument can then be switched on by turning the switch  $Sk_3$  (on the right) to the position "∞", when the signal lamp  $La_1$  will light up.

### Calibrating

Set the attenuator  $Sk_1$  in the position "Contr.", when the pointer should indicate 100 on the scale 0-100 as soon as the valves have reached their working temperature, which is the case after about 5 minutes. For very accurate measuring it is necessary that the needle should come to rest at the exact point, any necessary adjustments being made with the potentiometer R (see fig. 4), which can be reached through an opening in the right-hand side panel and turned with a screwdriver.

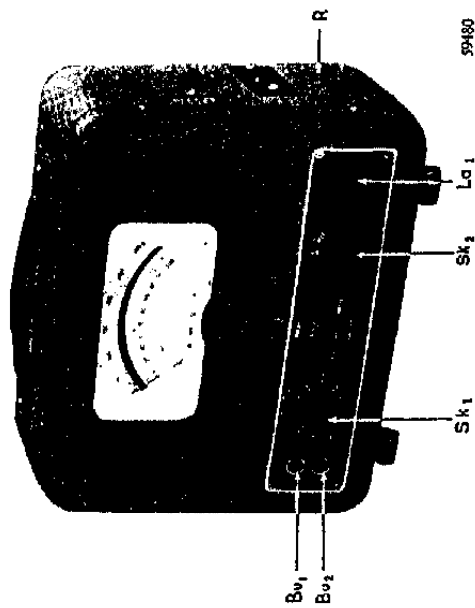


Fig. 4

### Measuring

Measurements can be taken with the instrument either standing upright or lying down. The voltage to be measured is applied to the sockets  $Bu_1$  and  $Bu_2$  (earth) on the left-hand side of the front panel, the attenuator then being turned anti-clockwise until a good readable deflection is obtained.

### Measuring modulated H.F. signals with frequencies up to 30 Mc/s

By employing the probe GM 8016 one can measure modulated H.F. signals with frequencies between 1 and 30 Mc/s. The two plugs of the probe are connected to the sockets  $Bu_1$  and  $Bu_2$  of the GM 6005, the plug at the end of the grey-coloured lead being inserted in  $Bu_2$  (earth). The modulated H.F. signal is applied to the measuring pin and the earth contact at the side of the probe.

The amplitude of the detected signal can then be read from the meter. It has to be borne in mind, however, that when, for instance, voltages are being measured across a tuned circuit with a high impedance the probe detunes that circuit, so that the meter reading is then no longer the absolute value of the voltage. Comparative measurements

can, however, quite well be taken, using equal frequencies and depths of modulation.

When measurements are being taken from a voltage source with a low internal resistance and this is not tuned then there is no detuning and the scale of the voltmeter can be calibrated for H.F. voltages. This calibration only applies for a certain depth of modulation.

### Replacement of valves and lamps

To replace the valves one has to take off the back panel after removing the four screws. When one or more valves have been replaced the meter reading has to be checked with the switch Sk<sub>1</sub> in the position "Contr." and if necessary readjusted. It has to be borne in mind, however, that in the event of the 1F 51 or the 1CH 21 being replaced there may be an additional deviation of 3% and 2% respectively in the frequency characteristic above 500 kc/s. If the lamp 6890 D/100 becomes defective and needs replacing the calibrating voltage is then no longer reliable and the instrument has to be recalibrated.