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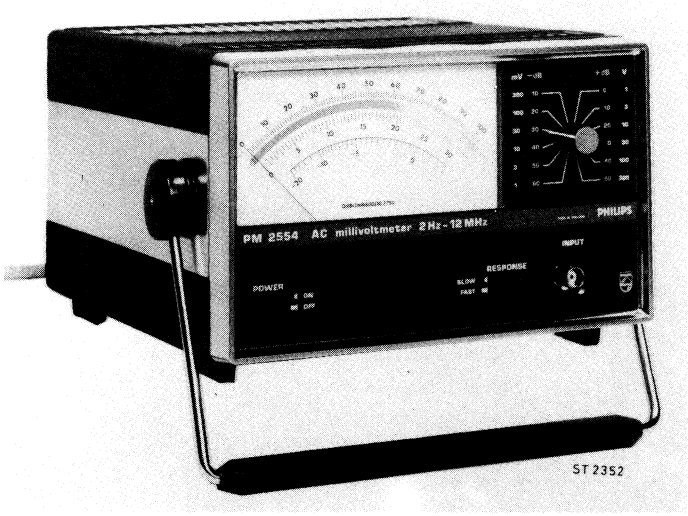

Instruction Manual

AC-millivoltmeter

PM2554

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CONTENTS

GENERAL / ALLGEMEINES / GENERALITES

DIRECTIONS FOR USE / GEBRAUCHSANWEISUNG / MODE D'EMPLOI

SERVICE DATA

NOTE:

The design of this instrument is subject to continuous development and improvement. Consequently, this instrument may incorporate minor changes in detail from the information contained in this manual.

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LIST OF FIGURES

1. INTRODUCTION

GENERAL

The Philips AC millivoltmeter PM 2554 is a sensitive and accurate measuring instrument suitable for floating measurements from 50 μV up to 300 V in the frequency range from 2 Hz up to 12 MHz.
The instrument can be powered by mains.
By the very great bandwidth and sensitivity the instrument has a width range of applications, e.g. measurements on LF and HF amplifiers, carrier-wave telephony, electro-acoustical as well as for measurements on transducers and measuring-transformers, etc.

The d.c. or a.c. output choosen by an internal jumper, makes it possible to employ the instrument as an a.c./d.c. converter or as an a.c. amplifier.
The instrument has a great indicating speed, a high temperature stability and is quickly ready for use.
The 12 measuring ranges of 1 mV up to 300 V f.s.d. overlap so that a high reading accuracy is obtained.
The moving-coil instrument is provided with a mirror scale with the ranges 0-30 and 0-100 as well as dB scale from −20 dB...+ 2 dB (total span −80 dB... + 52 dB).

By means of the measuring-probe PM 9336 the input impedance can be changed from 1 MΩ // 30 pF except capacity measuring cable (100 pF) into 10 MΩ // 11 pF to permit measurements on very high ohmic circuits.

2. TECHNICAL DATA

Properties expressed in numerical values with tolerances are guaranteed by the factory.
Numerical values without tolerances serve only for information and represent the properties of an average instrument.

2.1. Electrical

Measuring range	50 μV...300 V divided into 12 ranges from 1 mV...300 V (f.s.d.)
dB Measuring range	−80 dB...+ 52 dB (12 ranges) 0 dB = 1 mW into 600 Ω, 0.775 V
Frequency range	2 Hz...12 MHz
Input impedance	direct 1 MΩ // 33 pF with PM 9336: 10 MΩ // 11 pF
Accuracy	Frequency 10 Hz – 400 kHz ± 1% of reading, ± 1% f.s.d. 2 Hz – 10 Hz ± 3% of reading, ± 1% f.s.d. 400 kHz – 2 MHz ± 2% of reading, ± 1% f.s.d. 2 MHz – 6 MHz ± 2% of reading, ± 3% f.s.d. 6 MHz – 12 MHz ± 4% of reading, ± 4% f.s.d. *Note: By application of probe PM 9336 the accuracy will decrease 3% of reading.*

Pre-deflection	< 3 scale divisions (terminating resistance ⩽ 500 Ω) Influence on accuracy: 10% pointer deflection ⩽ 0.45% 30% pointer deflection ⩽ 0.15%
Temperature range	0...+ 45°C
Temperature coëfficient	⩽ 1°/oo/°C
Effect of mains voltage variations	Additional error of 1°/oo
Rectifying circuit for the meter section	Average value rectifier
Meter scale	Mirror scale with knife-edge pointer Calibrated in rms values of sinusoidal input voltages Linear division from 0...103 and 0...325 dB scale from −20 dB...+ 2 dB
Overload protection	In the ranges 1 mV to 300 mV: 300 V for frequencies between 2 Hz and 10 kHz 10 V for frequencies above 10 kHz Other ranges: 300 V for frequencies between 2 Hz and 12 MHz
Max. permissible voltage (all ranges)	Between Hi and Lo 400 Vd.c. Between Lo and housing 500 Vd.c. or 500 V_{pp}
Common mode rejection ratio (between Lo and housing)	In the 1 mV range: Frequency 10 Hz ... 1 kHz > 140 dB 1 kHz... 10 kHz > 130 dB 10 kHz...100 kHz > 120 dB *Note: These values decrease with 10 dB/range in the higher ranges.*
Impedance between Lo and housing	1 GΩ
Output	D.c. or a.c. output (choosen by internal jumper)
D.C. output	Output resistance 1 kΩ Output voltage 1 V short-circuit proof
A.C. output	Output impedance 600 Ω in serial with 47 μF Output voltage 50 mV short-circuit proof
Accuracy d.c. output	Frequency 10 Hz – 400 kHz ± 1% of reading, ± 1% f.s.d. 2 Hz – 10 Hz ± 3% of reading, ± 1% f.s.d. 400 kHz – 2 MHz ± 2% of reading, ± 1% f.s.d. 2 MHz – 6 MHz ± 2% of reading, ± 3% f.s.d. 6 MHz – 12 MHz ± 4% of reading, ± 4% f.s.d.
Supply	Mains voltage: 90 V...132 V or 180 V...265 V, 50/60 Hz.

Long-term stability	At min. 90 operating days $1^{o}/oo$ of f.s.d. on the average.

2.2. Mechanical

Dimensions	Height 145 mm Width 236 mm Depth 298 mm
Weight	Approx. 3.5 kg.

3. ACCESSORIES

3.1. Supplied as part of the equipment.

- Measuring cable for voltages above 3 mV and frequencies below 100 kHz
- Manual.

3.2. Optionally available.

- Measuring probe (10:1) PM 9336 (fig. 1 page 22)
- Measuring cable BNC–BNC PM 9074
  Length 1 m Impedance 50 Ω
- Measuring cable BNC–BNC PM 9075
  Length 1 m Impedance 75 Ω
- Measuring cable BNC–BNC PM 9076
  Length 1 m Impedance 135 Ω

4. PRINCIPLE OF OPERATION

Blockdiagram fig. 2 (page 22)

The test voltage connected to the "INPUT" socket is supplied to the input attenuator. This is a capacitively compensated and fully screened voltage divider with a proportion of 1:1 or 1000:1. The output of the attenuator is connected to the input of the impedance transformer consisting of a feedback two-stage amplifier.

The main attenuator following it is an ohmic voltage divider operating in steps of 10 dB and ensuring a constant and low impedance for the pre-amplifier

The latter consists of two amplifier stages with a high input impedance and a low output impedance.
The amplifier stage supplies the voltage for the a.c. output and the rectifier circuit, the rectifiers of which are included in the feedback network of an amplifier. The rectified current, which is proportional with the input voltage, flows through a test resistor.

The voltage drop across this resistor is measured differentially by means of a d.c. amplifier supplying the current for the test instrument. This amplifier also supplies the voltage for the d.c. output.

A reference voltage supplied by a calibrating-voltage generator.
With the aid of this voltage the unit can be calibrated in the 100 mV range. Furthermore this voltage renders it possible to adjust the attenuator probe; this should be done in the 10 mV range. The unit can be fed from the mains.
The equipment power supply voltage is stabilized to ensure that variations in mains supply voltage do not influence the display.

5. INSTALLATIONS

Before any other connection is made, the protective earth terminal shall be connected to a protective conductor (see section: EARTHING).

5.1. Mains supply and fuse

Before inserting the mains plug into a mains socket, make sure that the instrument is set to local mains voltage. The instrument is wired for operation from a 180 V...265 V, 50/60 Hz mains voltage.

5.1.1. Adapting of the mains voltage

Adaption of the instrument for other mains voltages is possible by altering the wiring of the mains transformer (see fig. 3 page 26)

To adapt the mains voltage proceed as follows:

- Remove the top cover by removing the two screws A (see fig. 5 page 26)
- Change the wiring of the transformer according to figure 3 page 26

The PM 2554 is suitable for mains voltages of 90 V...132 V and 180 V...265 V, 50/60 Hz.

5.2. Fuse

Make sure that only fuses with the required current rating and of the specified types are used. The use of repaired fuses and the short-circuiting of fuse holders is prohibited.
The rating of the mains fuse of the instrument should be: 50 mA d.a. for 180 V...265 V
100 mA d.a. for 90 V...132 V

5.3. Earthing

The instrument should be connected to a protective earth in accordance with the local safety regulation. This can be effected via the 3-core mains lead. The mains plug should only be inserted in a socket outlet provided with a protective contact, the protective action of which is not cancelled by the use of an extension card or device without protective conductor.

5.4. Rackmounting

The PM 2554 can be mounted in a 19" rack by using a mounting-set as shown in fig. 22 page 27. This set is not delivered by Philips.

6. OPERATION

6.1. Mechanical zerosetting

- Place the meter in a horzontal position and check the zero-setting of the meter.
- If necessary correct the setting by means of plastic screw "A", fig. 4 (page 26)

6.2. Switching on

The instrument is ready for use after connection to the mains and earthing.
It is switched on by means of switch POWER ON (S 2).
A warming-up time of approximately 30 min. should be observed to obtain full accuracy.

6.3. Calibration

6.3.1. Instrument

- Select measuring range 100 mV
- Put the signal lead (Hi) to the connector X4 at the rear
- Adjust the meter to 100 scale divisions with potentiometer "CAL" (R 80).

6.3.2. Measuring probe PM 9336

- Before adjusting, the instrument should be calibrated as described above
- Select measuring range 10 mV
- Put the signal lead (Hi) to the connector X4 at the rear
- Adjust the probe by means of adjusting screw "A", fig. 1 (page 22).

6.4. Measuring

- Select the correct measuring range with range selector S 101
- Connect the test voltage to coaxial socket "INPUT" (X1) with the delivered measuring cable.

Notes:

- *By means of the 10:1 measuring probe PM 9336 the input impedance can be increased from 1 MΩ//30 pF (except capacity of the cable: 100 pF) to 10 MΩ//11 pF.*
  This permits of carrying out measurements on very high-ohmic circuits.
- *Do not use the delivered measuring cable for measuring voltages below 3 mV, and/or with a frequency above 100 kHz.*
- *In case of measurements of voltages in the lowest range, (1 mV) or with high frequencies (above 1 MHz) it may occur that h.f. interference signals respectively the standing wave ratio will influence the results.*
  Therefore it is advised to shield the measurements circuit.
- *For measurements at low frequencies, switch SLOW-FAST (S 102) should be set in position SLOW to obtain a proper reading.*
  As a result the indicating speed of the meter will be reduced and the pointer deflection will become more stable.

6.5. Output (X2 and X3)

The instrument is provided with a floating output.
The Lo is directly connected to the shield of the "INPUT" connector X1.
By means of an internal jumper or a d.c. output or an a.c. output is selected.
(see fig. 16 page 42).

6.5.1. D.C. output

The output voltage is proportional to the input voltage and is 1 V at full scale deflection, irrespective of the selected measuring range.
The output resistance is approx. 1 kΩ.

6.5.2. A.C. output

The output voltage is proportional to the input voltage and is 50 mV at full scale deflection, irrespective of the selected measuring range.
The output impedance is approx. 600 Ω in serial with 47 μ F.

6.6. Errors due to disortion.

Although the meter indicates the mean value of the full-wave rectified voltage, the scale of the instrument is calibrated in rms values of sinewave voltages. As a result measuring errors will arise when measuring non-sinusoidal voltage.

The values of these depend on the coëfficient of non-lineair distortion.