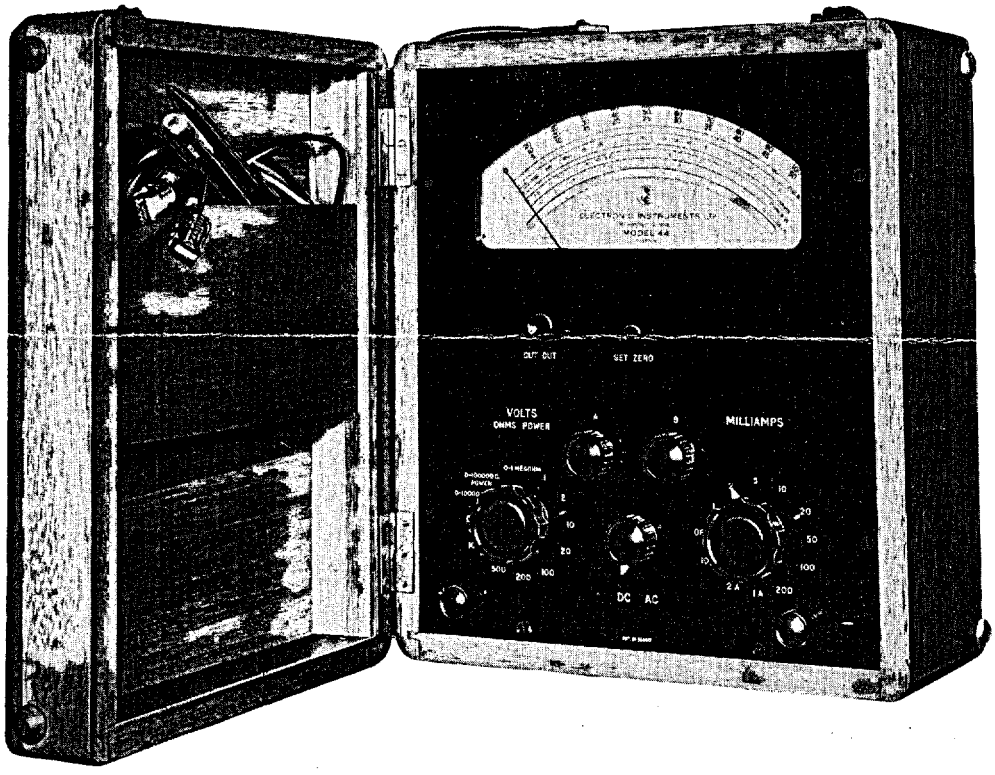


MODEL 44

Substandard Multi-Range Meter

The Model 44 Substandard Multi-range Meter is an instrument of very high precision for measuring Voltage, Current and Resistance in the ranges most commonly used in the Laboratory, Test-room or Factory.

All instruments are individually calibrated to the *substandard* limits specified in B.S. 89:1937 in so far as these apply.

Special treatment is given during manufacture to ensure long-term stability of the electrical and magnetic characteristics of the instrument.

These meters have been in production for many years and their accuracy will be found dependable over a long and useful life.

7

ELECTRONIC INSTRUMENTS LIMITED

SOLE REPRESENTATIVE
W. G. LEATHAM LTD.,
104 Featherston St.,
WELLINGTON.

Model 44 Substandard Multi-Range Meter

The instrument is housed in a polished mahogany case fitted with a detachable lid. The main feature on the front panel is the precision six-inch moving coil meter with its bold clear scale and anti-parallax mirror. There are two selector switches, one for the current ranges and the other for the voltage ranges. The same switches are used for both d.c. and a.c. measurements, and a separate DC/AC control selects the appropriate internal circuits. The switches are electrically interlocked so that only one can be used at a time. The Voltage Selector Switch also controls the three resistance ranges, in conjunction with two further controls which are used for zero setting. The meter assembly is designed for robustness and sensitivity and is assembled with the greatest of care. A magnet of modern alloy material is used with stainless steel pole pieces and the moving coil is mounted in spring-loaded jewels to minimise the effect of mechanical shocks on the pivots.

A unique feature of the Model 44 is the electro-mechanical cutout which automatically disconnects the meter in the event of an overload being inadvertently applied to the input terminals.

SCALE

The scale is 6½ inches long. A knife edge pointer and an anti-parallax mirror are fitted. The ten cardinal figures for each range are printed on the scale, and no division or multiplication is required beyond fixing the decimal position. The same scale is used for voltages and currents whether d.c. or a.c. A second scale is calibrated in ohms for the measurement of resistance, and a third scale in milliwatts and decibels for the output power range.

CALIBRATION

Special attention is paid to the treatment of the meter movement before calibration, to ensure the highest possible stability in service. After assembly and test, all Model 44 movements are treated in an a.c. field of sufficient intensity to force the operating point of the magnet to a lower value than it would normally reach under extreme conditions. The instrument is then kept under observation for a definite period to ensure that no change takes place in the full scale reading.

Each instrument is individually calibrated in a potentiometer circuit and the scale divisions are drawn by hand. The error of the basic 1 mA scale does not exceed 0.1 per cent. of the full scale reading at any point of the scale.

ACCURACY

The accuracy of the Model 44 Meter on all the d.c. ranges conforms to the British Standards Institution limits for Substandard instruments; that is, the maximum error on any voltage range does not exceed 0.3 per cent. of full scale reading, and on any current range, 0.6 per cent. of full scale. The accuracy on a.c. ranges at 50 c/s is nominally claimed as First Grade since there is no B.S. Specification for Substandard rectifier-type meters, but in actual practice the performance of the Model 44 on d.c. is very much better than First Grade. Temperature errors can normally be disregarded, but should the accuracy of the work demand it, the correction figures given in the table overleaf may be applied. It will be noted that no form of automatic temperature correction has been incorporated in the Model 44, since for accurate work it is preferable to apply a known correction than to rely on an approximate mechanical compensating device.

OVERLOAD PROTECTION

The overload cut-out in the Model 44 is a refined and comparatively elaborate instrument of the moving coil type. It resembles the driving unit of a very small permanent magnet loud-speaker. The current flowing through the meter movement flows also through the coil of the cut-out, causing a proportional displacement of the coil in its magnetic field. When this displacement exceeds a predetermined limit, the coil closes an electrical circuit containing a relay which trips a spring-loaded circuit breaker.

It will be seen that the Model 44 cut-out operates as soon as the critical value of overload current is reached. It makes no difference whether the overload is forward or reverse, or whether the overload occurs suddenly or gradually. Due to the internal action of the meter rectifier, the cut-out operates satisfactorily on a.c. but it should be noted that a sudden heavy a.c. overload may cause permanent damage to the rectifier, even though the cut-out has operated and protected the meter movement and internal components. For this reason it is always wise to test the rectifier after an a.c. overload by checking the accuracy of any single reading.

INSTRUCTIONS FOR USE

The left-hand switch on the panel covers the voltage, resistance and power ranges, while the right-hand switch covers the current ranges. When a range has been selected on one switch the other switch must be set to the OFF position or the meter will not read. The circuit is so designed, however, that no damage can be caused to the instrument by not observing this rule. The DC/AC switch must be set to DC when selecting resistance ranges and to AC when selecting power ranges.

A $1\frac{1}{2}$ volt cell and a standard $16\frac{1}{2}$ volt grid bias battery (of which only $13\frac{1}{2}$ volts are in circuit) provide the current for the resistance ranges. These may be reached by removing the sliding panel on the underside of the case.

Two controls for the resistance ranges are provided. Knob A is for compensating changes in battery voltage and Knob B for compensating changes in battery resistance. Both controls have to be carefully adjusted when accurate measurements are required on the lower resistance ranges. The procedure is as follows: first select the 100,000 ohms range, short circuit the terminals and turn Knob A till the pointer indicates 0 ohms. Then select the 10,000 ohms range and turn Knob B till the pointer indicates 0 ohms. Again select the 100,000 ohms range and repeat the operation until the pointer indicates 0 ohms on both ranges without further adjustment of the control. Now changes in battery voltage and battery resistance are compensated and the required resistance range, 10,000 ohms or 100,000 ohms, may be selected.

On the 1 megohm range Knob A may need re-adjustment. Control B on this range is out of circuit.

It should be noted that the overload cut-out is powered by the $1\frac{1}{2}$ volt cell, which supplies the test voltage for the two lower resistance ranges, 0 to 10,000 ohms and 0 to 100,000 ohms. Provided that the output from this cell is sufficient to allow correct zero adjustment on these two resistance ranges, it is adequate for the relay, the current consumption of which is negligible. When zero adjustment becomes impossible, *the $1\frac{1}{2}$ volts cell should at once be replaced.*

SPECIFICATION

RANGES

DC VOLTAGE	DC CURRENT	AC VOLTAGE	AC CURRENT	RESISTANCE
0.2 V*	1 mA	1 V	1 mA	0 —10,000 ohms — With
1 V	2 mA	2 V	2 mA	0 —100,000 ohms — self-
2 V	5 mA	10 V	5 mA	0 —1 megohm — contained
10 V	10 mA	20 V	10 mA	batteries
20 V	20 mA	100 V	20 mA	
100 V	50 mA	200 V	50 mA	
200 V	100 mA	500 V	100 mA	
500 V	200 mA	1000 V	200 mA	
1000 V	1 A		1 A	
	2 A		2 A	
	10 A		10 A	

*On 1 mA DC only

POWER

(Internal load resistance 4000 ohms)

0 —4 watts
−10 to + 19 db (reference level 50 mW)

DC CHARACTERISTICS

SENSITIVITY	On all ranges except 0—1000 V	1000 ohms per volt
	On 0—1000 V range	500 „ „ „
CURRENT CONSUMPTION ON VOLTAGE RANGES	On all ranges except 0—1000 V	1 mA at full scale
	On 0—1000 V range	2 „ „ „ „
VOLTAGE DROP ON CURRENT RANGES	On all ranges	200 mV
TEMPERATURE CORRECTIONS	On 0—1 mA range	negligible.
	On 0—2 „ „	add 0.02% per 1°C. rise
	All other current ranges	add 0.04% per 1°C. „
	Voltage ranges	negligible

AC CHARACTERISTICS

IMPEDANCES AT 50 c/s
Current Ranges

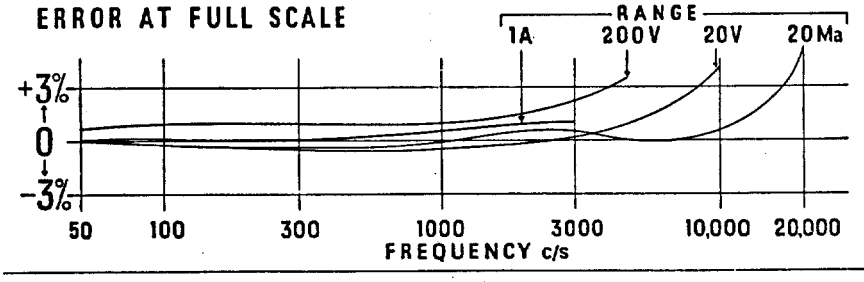
Range	Impedance
1 mA	1370 ohms (approx.)
2	508
5	167
10	65
20	26
50	6.8
100	1.1
200	0.38
1 A	0.11
2 A	0.05
10 A	0.04

CURRENT CONSUMPTION AT 50 c/s—*Voltage Ranges*

Range	Consumption (approx.)
0—1, 0—2 V	100 mA f/s
0—10, 0—20 V	10 „ „
0—100 V	5 „ „
0—200, 0—500, 0—1000 V	2 „ „

TEMPERATURE CORRECTIONS — Current and voltage ranges ... ... negligible

AC Frequency Characteristics



HOUSING

Polished mahogany case with detachable lid.
Compartment in lid for accessories.

ACCESSORIES	Set of leads with detachable insulated probes and clips.
SIZE OVERALL	11¾" × 10¾" × 6" (29 cm × 26 cm × 15 cm)
WEIGHT	14 lbs. (6½ kg.)
EXPORT SPECIFICATION	Size packed 18" × 18" × 12" (45 cm × 45 cm × 30 cm) Gross weight 36 lbs. (16 kg.)

18

ELECTRONIC INSTRUMENTS LIMITED · RICHMOND · SURREY

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