Chapter 6

VOLTMETERS AND AMMETERS, SANGAMO WESTON TYPE S.78

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Introduction

1. Information contained within this chapter deals with the basic model S.78 meter. Each instrument has a manufacturer's code number which is made up of three parts; a typical code is S.78/4/474 of which S.78 is the model number, /4/ is the ' form ' (i.e. type of case, terminal connections, etc.) and the suffix number represents the application to which the instrument is adapted.

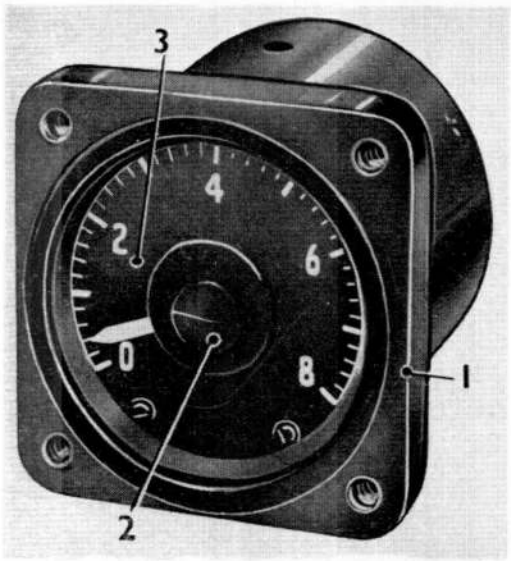


Fig. 1. Typical Type S. 78 instrument

Key to fig. 1

1 CASING
2 ZERO ADJUSTER
3 DIAL PLATE

2. Chapters describing the dial presentation, circuit details and testing of particular instruments of this type may be found in A.P.4343A, Sect. 16.

3. The instrument is essentially a d.c. permanent magnet, moving coil indicator and is used as a sensitive milliameter or voltmeter, with a full scale deflection of 1 mA. Where the current to be metered exceeds this figure, the required resistances are connected in shunt or series and mounted on the base plate.

DESCRIPTION

4. The indicator consists of four main parts; these are as follows:—

(1) Casing.
(2) Base.
(3) Rear cover.
(4) Magnet and movement assembly.

Casing

5. The casing houses the glass which is secured by a Bezel ring held in place by

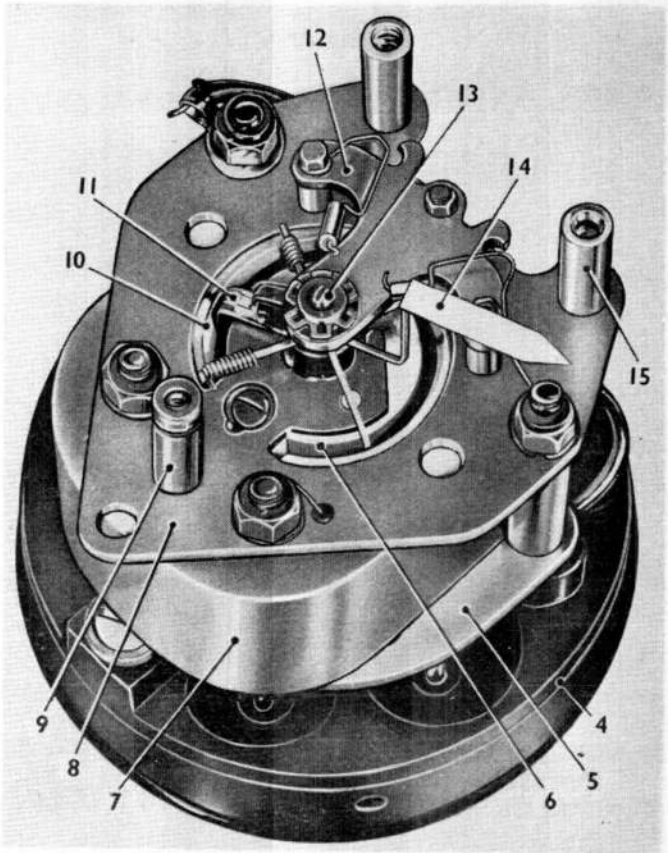


Fig. 2. Magnet and movement assembly

Key to fig. 2 and 3

3	DIAL
4	BASE
5	BACK PLATE
6	CENTRE CORE
7	YOKE
8	FRONT PLATE
9	PILLAR
10	FIELD SPACE
11	MOVING COIL
12	FRONT BEARING BRIDGE
13	JEWEL SCREW
14	POINTER
15	THREADED PILLAR
16	COVER SCREW
17	MAGNET
18	RESISTANCE SPOOLS
19	TERMINAL SCREW
20	REAR COVER SECURING SCREW
21	REAR COVER
22	FRONT PLATE CONNECTION
23	COVER SEAL
24	POINTER STOPS
25	LIGAMENT
26	MAGNET SPACER
27	REAR BEARING BRIDGE CONNECTION
28	INSULATING BUSH
29	REAR BEARING BRIDGE
30	BACK PLATE
31	POLE PIECE
32	COIL PIVOT

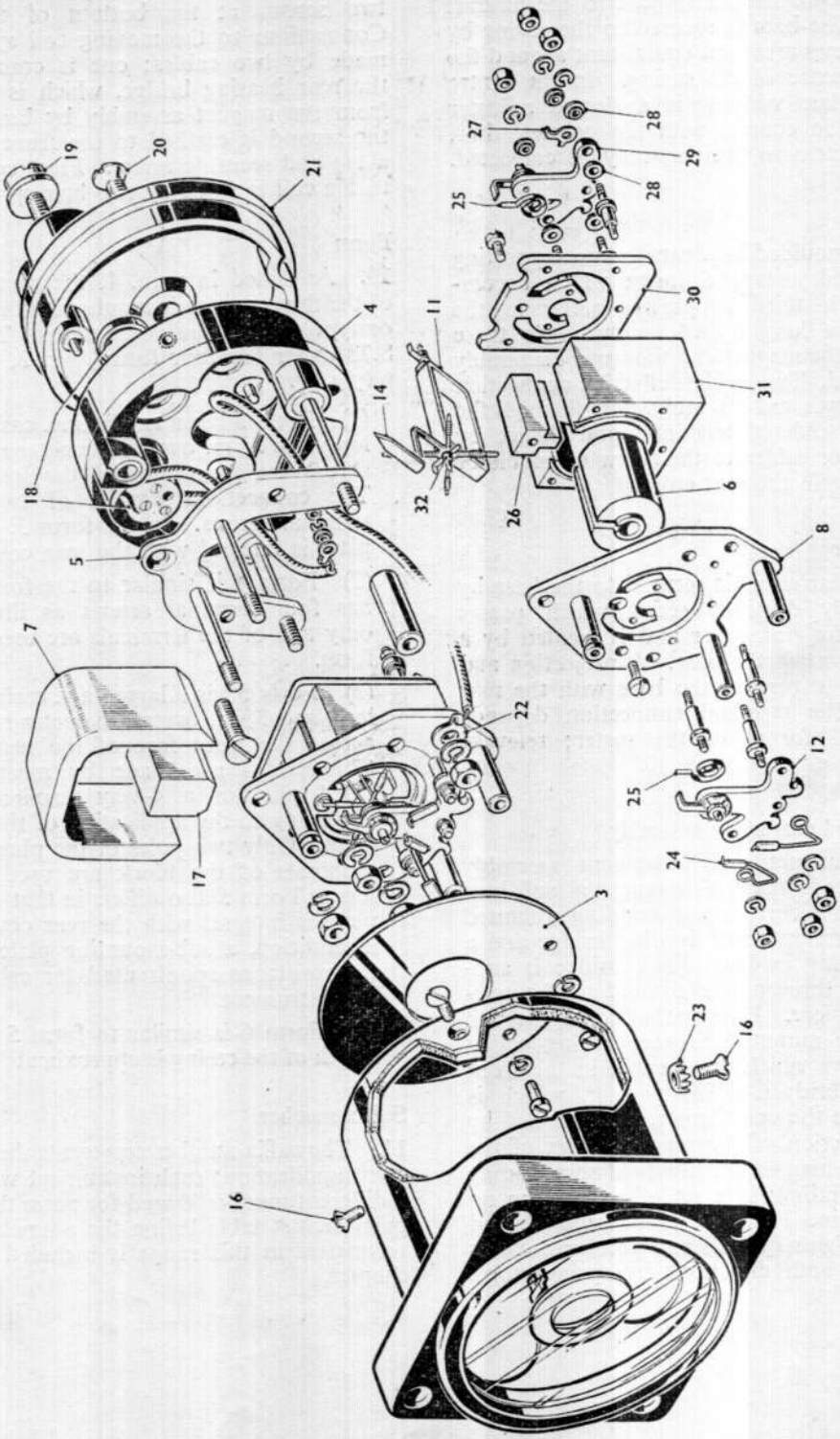


Fig. 3. Exploded view of instrument

Bostic cement. Four tapped inserts, in the casing flange, accommodate four screws which secure the instrument to the aircraft panel. The base is secured to the casing by three screws arranged equidistant around the circumference of the casing. In the centre of the glass window is a slotted adjuster which is in contact with the pointer, thus, the pointer zero position may be corrected.

Base

6. The moulded base carries two supporting pillars and a tapped insert which accommodates a third supporting pillar in the form of a long 6 B.A. screw. To these supports the magnet and movement assembly is attached. Two cables, effecting connection to the movement assembly, pass through the base via soldered terminals and thence by two further cables to the screw terminals or Mk.4 plug in the rear cover.

Rear cover

7. The rear cover is secured to the base by a centrally disposed screw which passes through the rear cover and is located by a tapped insert in the base. A projection and slot serve to register the base with the rear cover. The terminal connection depends upon the 'form' of the meter; relevant details are given in para. 10.

Magnet and movement assembly

8. The magnet and movement assembly (*fig.* 2) comprises a magnet, a soft-iron pole-piece, a core, a coil winding mounted upon a former, a rear bearing bridge and a front bearing bridge. Each bridge is supported by three pillars secured to the soft-iron pole-piece. Pivots attached to the coil former are mounted between spring-loaded jewel screws which are located in the front and rear bridges. The pointer, which is attached to the coil former, is controlled by the inter-action of the magnetic flux of the permanent magnet and the field surrounding the coil winding; it is set off-scale when no current flows. Pointer balance is maintained by two weights (*fig.* 2) and pointer travel is limited in both directions by spring stops.

9. The scale is secured in position by the pillar riveted to the front plate and also by two screws at the bottom of the scale. Connections to the moving coil system are made by two cables; one is connected to the rear bearing bridge, which is insulated from the magnet assembly by bushes, and the second is earthed to the front plate by a tag and securing screw. Final connection to the coil is made by two hair springs.

Form

10. As stated in para. 1, the centre figure of the three part code number is the 'form' or type of case and connections. The Type S.78 meter has four forms, viz. 3, 4, 5 and 6 (*fig.* 4).

(1) Form 3 has a small s.a.e. casing, 2 in. long and $2\frac{3}{8}$ in. overall diameter measured across the front face of the instrument. The connections consist of two 4B.A. terminal screws. In the form 3, the base plate is integral with the rear cover.

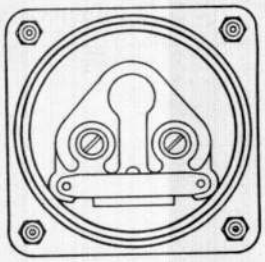
(2) Form 4 is similar to the form 3 but has four terminal screws as illustrated; only two of the terminals are used in this form.

(3) Form 5 has a large s.a.e. casing $3\frac{1}{4}$ in. long and $3\frac{1}{4}$ in. overall diameter measured across the front face of the instrument. Connections are made by means of a Mk.4 plug or a 4-way terminal block according to the application of the instrument. Only two poles of the plug or two terminals of the block are used in this form. Form 5 also differs in that the base plate is integral with the rear cover and, in addition, a sub-mounting plate carries the resistance spools used for calibrating the instrument.

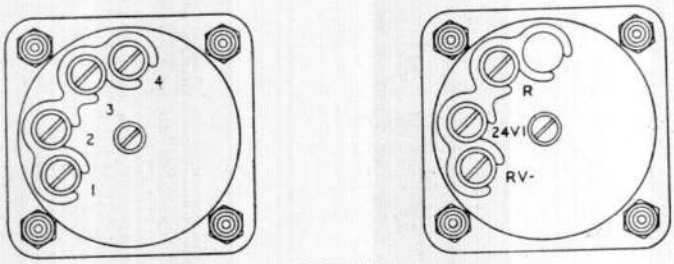
(4) Form 6 is similar to form 5 but the length of the casing is approximately $4\frac{5}{8}$ in.

Suffix number

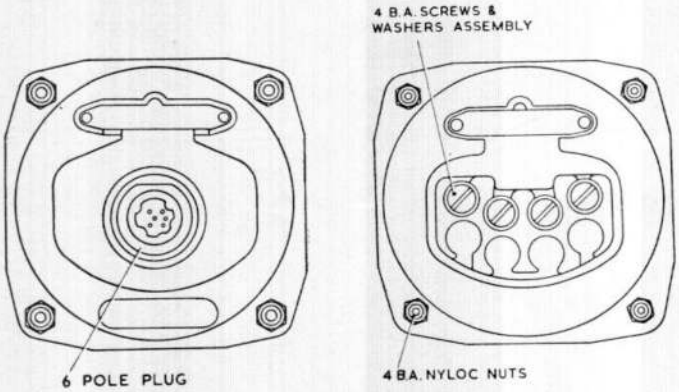
11. The suffix number represents the instrument application; each instrument will have a different number if used for more than one purpose. A table listing the ammeters and voltmeters in this range is included in this chapter.



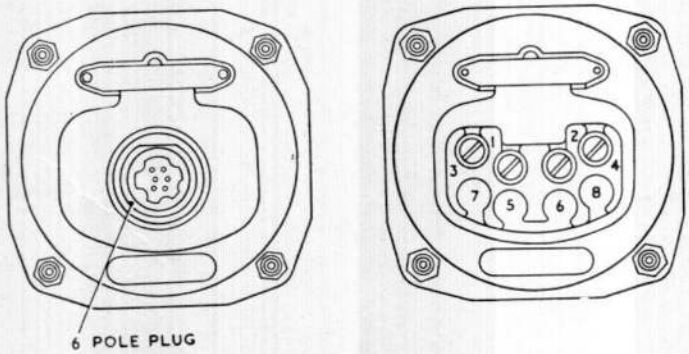
FORM 3



FORM 4



FORM 5



FORM 6

Fig. 4. Meter 'forms'

Table 1

List of Type S.78 voltmeters and ammeters

Manufacturer's Code Number	Type of Instrument	Range of Scale	Ref. No.
S 78/5/275	d.c. ammeter	0–300A	5Q/25488
S 78/5/294	d.c. ammeter	0–300A	5Q/25487
S 78/3/353	d.c. voltmeter	0–40V	5Q/25426
S 78/3/472	d.c. ammeter	120–0–120A	
S 78/4/474	a.c. ammeter	0–120A	
S 78/3/650	d.c. ammeter	50–0–120A	
S 78/3/651	d.c. ammeter	50–0–120A	
S 78/4/652	a.c. voltmeter	0–250V	
S 78/4/653	d.c. voltmeter	0–150V	
S 78/3/654	d.c. voltmeter	0–35V	
S 78/3/467	d.c. ammeter	50–0–120V	
S 78/4/474	a.c. ammeter	0–120A	
S 78/4/834	a.c. voltmeter	0–250V	
S 78/4/835	d.c. voltmeter	0–150V	
S 78/3/836	d.c. voltmeter	0–35V	
S 78/4/837	a.c. voltmeter	0–140V	

(81190) Gp. 375/1. D2644/Wt.34220/364378/L.P.S. Ltd. 3250/5/59