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Chapter 2

GENERATOR, TYPE HX2

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LEADING PARTICULARS

Generator, Type HX2

Clockwise rotation	*Ref. No. 5UA/4185*
Counter-clockwise rotation	*Ref. No. 5UA/4184*
Output	...*50A at 29V*
Speed range	3300-5000 *rev/min cont.* 6000 *rev/min (max.) for 5 min.*
Brushes	
Grade	*EGO (low altitude)* *K.C.E.G.11 (high altitude)*
New length	0·747 *in.*
Minimum length	
Spring pressure	12-15 *oz.*

Leading Particulars—(*continued*)

Commutator	
New diameter	1·88 *in.*
Minimum diameter	1·78 *in.*
Lubricant	*Grease XG-271*
Weight	21 *lb.*

Introduction

1. The generator, Type HX2, described in this chapter is a self-excited, four-pole, shunt wound machine. It is driven through gearing from the aircraft engine, and is a development of, and very similar to the now obsolete generator, Type HX.

DESCRIPTION

Terminals

2. The terminal markings (*fig.* 4) are as follows:

Positive ... Yellow spot
Field ... Small terminal—unmarked
Negative ... Blue spot

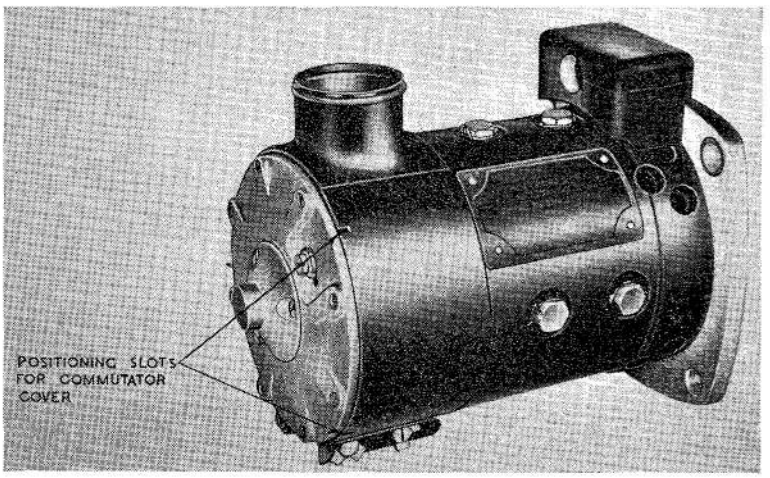


Fig. 1. Generator, Type HX2

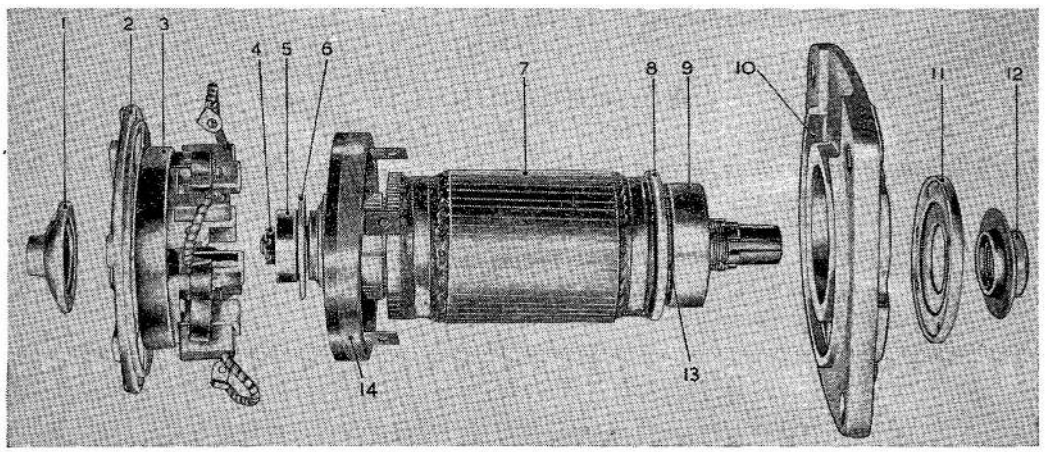
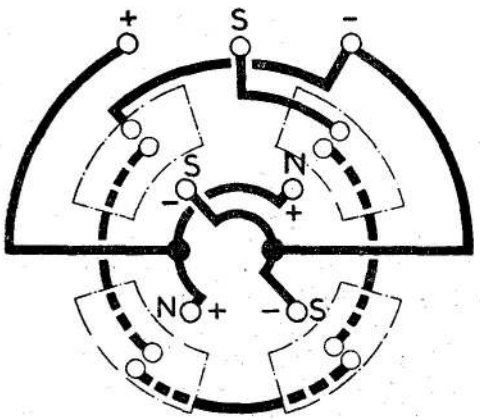


Fig. 2. Armature and bearings

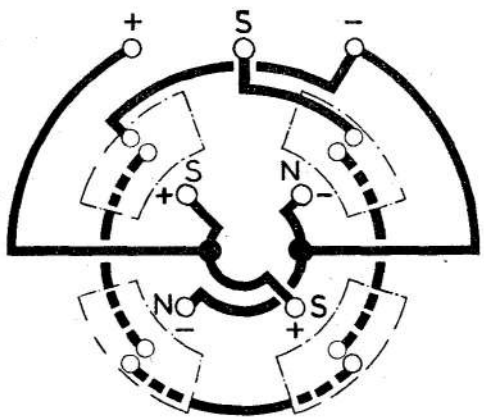
One end of the field winding is connected internally to the negative terminal, and the other to the field terminal.

Bearings

3. There are two grease-lubricated ball bearings, one housed in the driving end frame, and the other in an annular recess in the commutator end frame in which it is free to slide. The driving end bearing is secured by a combined oil thrower and lock-nut, and the commutator end bearing by a castellated nut and a split pin.



CLOCKWISE ROTATION



ANTI-CLOCKWISE ROTATION

Fig. 3. Internal connections

Brushes and brush gear

4. Four brushes are set diametrically about the commutator, opposite brushes being interconnected by two interconnecting strips (*fig.* 2). Both strips form complete rings and have an insulating strip between them. The connections are made to the tabs with connecting screws. One pair of brushes, (*fig.* 3) are connected by flexible leads to the positive terminal, and the other pair are similarly connected to the negative terminal.

5. Two hexagon-headed screws passing through slots in the commutator end frame secure the brush rocker to the frame. These screws are slackened if for any reason the brush position is to be adjusted. Corresponding white lines, painted on the brush rocker and on the commutator end frame, indicate the correct brush position.

KEY TO FIG. 2

1 COMMUTATOR END OUTER BEARING CAP
2 COMMUTATOR END FRAME
3 BRUSH ROCKER ASSEMBLY
4 COMMUTATOR END BEARING NUT
5 COMMUTATOR END BEARING
6 COMMUTATOR END INNER BEARING CAP
7 ARMATURE
8 DRIVING END INNER BEARING CAP
9 DRIVING END BEARING
10 DRIVING END FRAME
11 DRIVING END OUTER BEARING CAP
12 OIL THROWER AND DRIVING END BEARING NUT
13 OIL RETAINER
14 BRUSH INTER-CONNECTING STRIPS

Cooling

6. Air from the slipstream is blown into the machine through an airpipe union at the commutator end. It passes through the yoke and escapes through four groups of holes drilled in the yoke at the driving end. One air pipe union, which may be located in any one of four positions, is employed. The position chosen is, however, decided during the construction of the aircraft and must not be altered without authority.

7. Access to the brush gear is obtained by removing a cover band which fits over apertures in the yoke, and is located by a dowel pin.

INSTALLATION

8. The mounting of the generator depends primarily upon the type of engine to which it is fitted, and in some instances upon the particular type of aircraft. A number of

different arrangements are possible with each generator, and reference should be made to the relevant S.I.S.

9. Before fitting, inspect the name plate fitted to the yoke of the machine and see that the direction of rotation and type of generator are correct for the engine and aircraft concerned. The direction of rotation is taken when looking at the driving end of the machine.

10. The splined end of the shaft protruding from the driving end of the machine must be protected by a ferrule when the generator is not in use. In some installations a coupling member, intended to engage with a corresponding member on the engine, is fitted to the generator shaft. When this arrangement is employed, care should be taken to ensure that the coupling member is a close sliding fit on the shaft, and that it is properly secured by an axial or clamping bolt which should be suitably locked after tightening. In other installations the generator shaft engages directly with a splined driving member on the engine, but whichever method is used the shaft should, before installation, be lightly coated with clean engine oil.

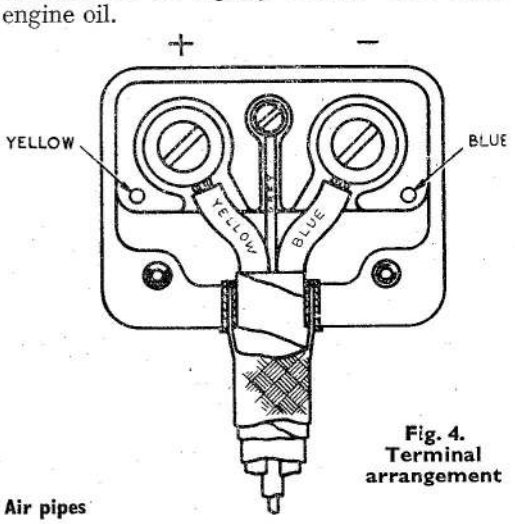


Fig. 4. Terminal arrangement

Air pipes

11. Pipes for the cooling air are usually made of thin aluminium; they must be handled with care and should not be bent or restricted except as designed, particularly at the inlet or outlet apertures.

Corrosion

12. After installation, anti-corrosive treatment should be applied to certain components. Information on this subject will be found in A.P.4343, Vol. 1, Sect. 2, Chap. 1.

OPERATION

13. As the generator is coupled to the engine through gearing, the ratio may be so arranged that, over the speed range of the engine concerned, the speed range of the generator drive is within the correct limits.

Voltage regulation

14. An external voltage regulator is used to maintain the output voltage at a pre-determined figure irrespective of fluctuations of speed or load. However, as the regulator and cut-out unit, Type A, used with this generator, has a falling voltage/load characteristic, generator voltage will decrease with increasing load, and battery current is limited to approximately 12 amp. The battery, connected in parallel with the generator, supplies all the general service loads when the generator is not running.

Generators in parallel

15. When two or more generators are connected in parallel, the load will not be equally shared between them unless the regulator is connected correctly, and reference should be made to A.P.4343B, Vol. 1, Sect. 1, Chap. 18 of this publication.

SERVICING

16. The following instructions should be read in conjunction with the chapter on the servicing of d.c. generators to be found in A.P.4343, Vol. 1, Sect. 2, Chap. 1. The machines should be inspected as laid down in the relevant Servicing Schedule. Commutator covers should be removed and the brushes, commutator, internal connections, etc., should be examined. The external connections must also be inspected and all nuts, union caps, and fixing screws checked, and if necessary, tightened. When an inspection is being made on an aircraft dispersed in the open, care must be taken to prevent the ingress of moisture into the generator or terminal box.

Bearings and lubrication

17. The generator must be removed from the aircraft and dismantled for lubrication. The bearings are grease-lubricated and the general instructions, given in A.P.4343, Vol. 1, should be adhered to.

Dismantling

18. Remove the commutator cover band and lift the brushes, then extract the three screws and take off the commutator bearing cap. Take out the screws holding the driving end frame to the yoke. Unscrew and remove the three countersunk screws holding the inner bearing plate at the commutator end.

19. To dismantle the driving-end bearing, unscrew the oil thrower disc nut and remove the three countersunk screws in the driving-end frame which holds the bearing retaining plate. After this has been done the armature may be tapped gently and removed from the endframe.

Assembling

20. To assemble the generator reverse the procedure described in para. 18 and 19. When fitting the armature, it will be helpful to screw a length of 6 B.A. rod into one of the threaded holes in the inner bearing plate at the commutator end to act as a locating pin. This can subsequently be withdrawn from the outside. After assembly check that all screws and nuts are securely locked.

Brushes

21. Brushes should be renewed at the periods described in the relevant Servicing Schedule and whenever examination reveals that they will not remain serviceable for the period that will elapse before the next servicing period or examination.

Bedding

22. When new brushes are fitted they should be bedded on the commutator over their full thickness and over 80 per cent of the axial width. Brushes should be bedded in accordance with the procedure detailed in A.P.4343, Vol. 1, Sect. 1, Chap. 2. The bedding operation should be performed after the machine is assembled. During the preliminary bedding operations, excessive brush box clearance should be corrected by the use of suitable tape shims affixed to the trailing faces of the brushes.

23. The final bedding run may be effected by running the machine as a generator or as a motor, both methods being equally effective. When the machine is run as a generator, the drive speed should be adjusted to near the normal maximum; the load applied should be light initially and should be increased progressively as the brushes become bedded. When the machine is run as a motor, suitable resistors should be incorporated in the armature and field circuits to limit the current on starting and to adjust the speed to a value approaching the normal maximum.

24. Blast cooling should be applied only if the duration of the final bedding run is such that the temperature of the machine is likely to reach 100°C.

Position adjustment

25. To adjust the position of the brushes, slacken the two hexagon-headed screws which pass through the slots in the commutator end-frame, rotate the brush rocker and tighten the screws. When checking the brush position (A.P.4343, Vol. 1, Sect. 2, Chap. 1, para. 25), the negative terminal of the battery (sub-para. (3)) should be connected to the negative (blue spot) terminal of the generator. The positive terminal of the battery should be connected through a tapping key to the field terminal.

Testing

26. Details of tests which may be applied to verify the serviceability of this machine will be found in Appendix A to this chapter.

Appendix A

STANDARD SERVICEABILITY TEST FOR GENERATOR, TYPE HX2

Introduction

1. The tests detailed in this Appendix may be applied to the machine before it is put into service, or at any time when its serviceability is suspect.

TEST EQUIPMENT

2. The following test equipment is required.

(1) Tester, generator, Mk. 5 series.

(2) Balances spring 0-4 lb., Ref. No. 1H/97.

(3) Tester, insulation, 250V, Ref. No. 5G/152 (R.A.F.) or Tester, insulation, 250V, Ref. No. 0557/A.P.5047 (R.N.).

(4) Test meter, Type D1, Ref. No. 5QP/10610 or suitable equivalent.

TEST PROCEDURE

General

3. Rotate the armature by hand and check that the armature revolves freely without any fouling of the fixed parts or excessive end play in bearings. A slight radial play which can just be felt by hand is permissible.

Brush gear

4. Check the brush spring tension; this should be between 12 and 15 oz.

Polarity

5. Run the generator in the correct direction of rotation, with a suitable moving coil voltmeter connected across the output terminals. The meter readings should confirm the terminal markings.

Performance

6. With the generator connected to the test bench, run up on no-load to approximately 3300 rev/min. There should be no hesitation in build-up and the correct voltage should be attained.

7. Run at the same speed on half load for ten minutes. During this run, there should be no more than pin-point sparking at the brushes. At the end of the test the brushes should still slide freely in their boxes.

Insulation resistance

8. Whilst the generator is still hot from the preceding test, the resistance of all live parts together to the frame, measured with a 250V insulation resistance tester, should be not less than 50000 ohms.