See AP 113B-0112-1. not held 'C'

Chapter 13

GENERATOR, B.T.H. TYPE LA2413, FORM B/10

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Generator, Type LA2413	*Ref. No. 5UA/6382*
Output voltage	*24V. a.c.*
Excitation voltage	*24V, d.c.*
Output current	*208 amp.*
Output KVA	8·5
Power factor	*Unity*
Phases	3
Speed range	3,500 *to* 10,000 *r.p.m.*
Output KVA (reduced speed 3,000 r.p.m.)	4·75
Frequency	400 *c/s at* 8,000 *r.p.m.*
Rotation	*Clockwise looking at drive end*
Cooling air required	170 *cu. ft. per min. at a pressure of* $11\frac{1}{2}$ *in. water gauge referred to ground level*
Brushes	*KCEG* 11 *high altitude grade*
Brush spring pressure	12 *oz. approx.*
Minimum brush length	$\frac{9}{16}$ *in.*
Overall length	$12\frac{5}{8}$ *in.*
Overall width	$6\frac{3}{4}$ *in.*
Overall height	$9\frac{1}{8}$ *in.*
Weight	41 *lb.*

RESTRICTED

Introduction

1. The Type LA2413 Form B10 (*fig.* 1) a.c. generator, which is engine driven and blast cooled is rated at 8·5 KVA, unity P.F., three phase, 24V, a.c. (nominal), 208 amp. and is designed to deliver this output over a speed range of 3,500 to 10,000 r.p.m. At a reduced speed of 3,000 r.p.m. the rated output is 4·75 KVA.

2. The generator is a six pole machine and thus the output is at a frequency of 400 c/s when running at 8,000 r.p.m. Excitation is from a source of 24V, d.c.

3. Blast cooling air is led in through an inlet (which may be fitted in any one of three positions around the frame) and expelled through an outlet trunking at the drive end (on the right-hand side of the machine looking at the drive end). The inlet air passes directly on to the slip rings and from there flows through ducts behind the stator core, or through the hollow main shaft.

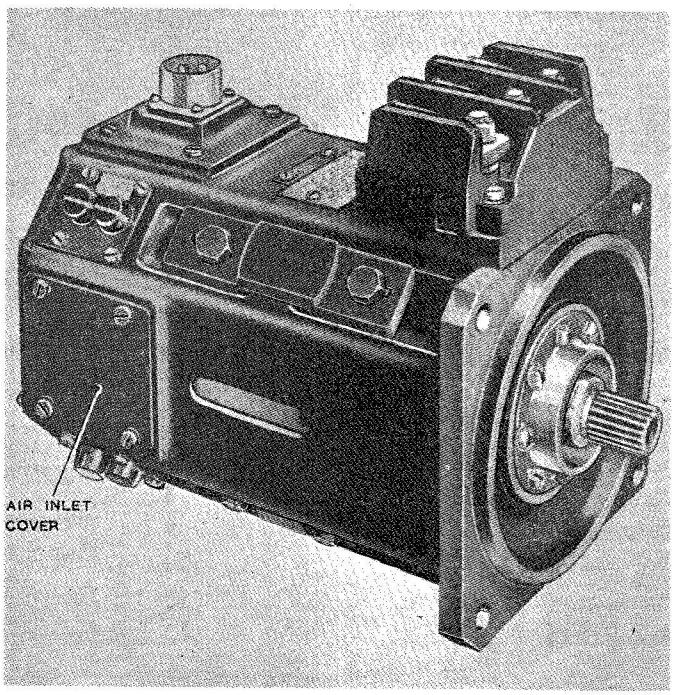

Fig. 1. General view, generator Type LA2413, Form B/10

4. The machine should run efficiently up to altitudes of 50,000 ft.

DESCRIPTION

Frame

5. The machine frame is a light alloy casting, designed for spigot mounting and having a square flange with four clearance holes for the fixing studs. The drive endshield is an integral part of the frame casting, but the slip ring endshield is a separate light alloy casting with a spigot for fitting into the main frame, and a steel liner for the bearing.

Stator

6. The stator consists of a laminated core, wound with a double-layer lap winding in semi-closed slots. The winding is delta connected and brought out to three main terminal studs mounted on top of the machine on a special moulded block.

7. The core is held in the frame by four sets of screws (two screws in each set) and special anti-vibration dowel plates (*fig.* 2).

Rotor

8. The rotating field system consists of six salient poles built up of steel laminations. An exciting winding is wound on and the leads are taken along the main shaft to the two slip rings. In addition a squirrel-cage, pole-face winding is fitted to absorb the harmonics produced by the associated rectifier. This winding consists of three copper bars per pole running through the laminations, and short circuited at each end by binding bands.

Bearings

9. The rotor is mounted on a roller bearing at the slip ring end and a ball journal bearing at the drive end. The slip ring end bearing is of the two-dot fit type, lubricated with grease (XG-275). Felt washers on the inner side of the bearing are impregnated with grease during assembly, while the cavity in

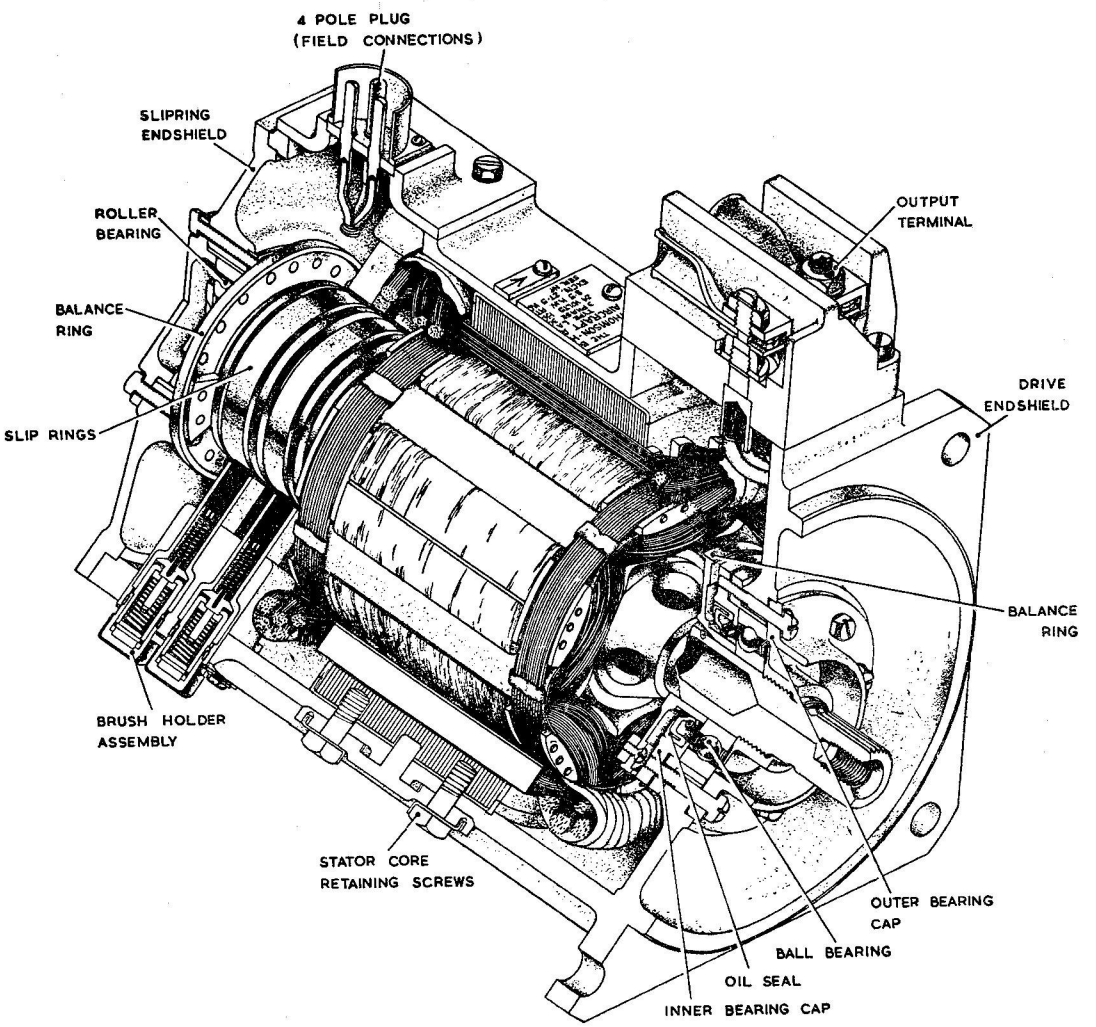

Fig. 2. Sectional view

the bearing cap on the outer side of the bearing is partially filled with grease and forms a reservoir. The drive-end bearing has a machined brass cage and is of the two-dot fit type, but relies for its lubrication on oil splash from the engine. An oil seal is fitted behind the bearing to prevent oil getting into the interior of the generator.

Brushgear

10. There is a total of eight brushes in the machine, carried in four dual moulded brush-holder assemblies (*fig.* 2), spaced at right-angles to each other, and thus allowing four brushes to bear on each slip ring. Pressure is maintained on each brush by phosphor bronze compression springs, held down by bayonet-cap type brush caps. These brush-caps are self locking and allow brushes to be withdrawn for inspection without removing any other part of the machine.

11. The brushes used are KCEG11 high altitude grade, and brush spring pressure should be approximately 12 oz. when the

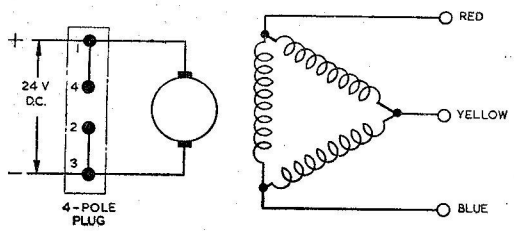

Fig. 3. Circuit diagram

unworn brush projects $\frac{1}{16}$ in. from the end of the brush box.

12. Adjacent brush boxes on each collector ring are connected in pairs by paralleling links, and leads from each pair of brushes are connected to pins in the four pole connection plug on the frame casting. The pins of the plug are connected in two pairs, so that all the brushes on each collector ring are connected together in parallel.

Terminals

13. The output terminals are arranged in a moulded block on the frame casting and are designed to take three, spade-type cable lugs.

14. The field leads are terminated in a standard 4-pole 19 amp. plug, in which pin 1 is joined to pin 4, and pin 2 to pin 3 by links (*fig.* 3).

INSTALLATION

15. Four $\frac{15}{32}$ in. diameter holes are drilled in the square end flange to take the bolts or studs securing the generator to the engine.

16. The spade-type cable lugs (*para.* 13) have a $\frac{7}{32}$ in. slot cut through the end of the spade to the terminal stud hole. After the cable has been sweated into the lug, the terminal nut must be slackened off to its full extent, and the lug inserted between the two terminal plates. The slotted lug passing through the groove on the terminal stud. The lug must then be lowered on the stud and the $\frac{5}{16}$ in. nut tightened.

17. Care should be taken to see that the brush holders are reasonably accessible.

SERVICING

General

18. See that all fixing devices nuts, screws, etc. are tight. Terminal connections must also be tight and free from any signs of corrosion, and it should be ascertained that no cable insulation has become worn or chafed through vibration, etc.

Brushes

19. The brushes should be taken out and inspected to see that they have not worn below their minimum length of $\frac{9}{16}$ in.

20. To remove a brush from its box proceed as follows:—Press the brush cap inwards, turn in an anti-clockwise direction and then withdraw. The extension piece of the brush pigtail can then be gripped and the brush withdrawn from its box. Check the spring loaded washer fitted into the brush cap to see that there is sufficient spring pressure to ensure positive contact with the pigtails disc, and that it moves freely.

21. Before replacing the brush cap, check that the synthetic rubber rings are in good condition. Fit new rings if any signs of wear or damage are evident. To secure the brush caps, press inwards, turn in a clockwise direction and locate correctly. As an indication of the correct position the brush caps have a white line marked on their top face, and these lines must coincide with the longitudinal axis of the machine.

22. Make sure that the brushes move freely in the boxes. If they stick at all clean them with lead-free gasoline.

23. If new brushes have to be fitted they must be bedded in. To do this first of all remove one of the air inlet covers, so giving access to the slip rings. Reference may be made to A.P.4343, Vol. 1, Sect. 2, Chap 1 for the procedure for bedding brushes, but for this machine, for the commutator read slip rings and for armature read rotor. All brushes must bed down over at least 75 per cent. of their area, and after bedding all dust, etc., must be blown away using dry air.

Slip rings

24. The slip rings should be inspected and wiped free from oil or grease using a soft dry cloth. No other cleaning must be undertaken.

25. If the slip rings are badly worn or pitted the machine will have to be sent to the appropriate repair depot for dismantling and skimming.

Slip ring end bearing

26. Take out the eight 2 B.A. hexagon-headed screws in the slip ring end bearing cover, and so remove the cover.

Note . . .
Take special care not to turn the rotor during this operation. Four of the screws, screw direct into the inner bearing cap and if this moves at all, difficulty may be experienced in inserting the screws again.

27. Remove the old grease and then pack 75 per cent. of the available space in the bearing cap recess and 25 per cent. of the available space in the bearing with grease (XG-275).

28. Replace the bearing cap and re-assemble loosely the four longest 2 B.A. hexagon headed screws. These are fitted with locking tab washers and secure the inner bearing cap assembly. If the rotor has been turned during the greasing operation it will be necessary to ensure that the holes in the inner bearing cap and endshield coincide before attempting to refit these screws. Replace the other four screws and their locking tab washers, tighten all eight fixing screws and lock them.

29. The drive end bearing is lubricated by oil splash from the engine and so should not require attention at normal servicing periods. If either of the rotor bearings have to be renewed then it will necessitate dismantling the machine.

TESTING

30. The rotor resistance winding as measured between slip rings on a new machine should be 0·480 ohm ± 10 per cent. at 20 deg. C. and similarly the stator winding should have a resistance of 0·0125 ohm ± 10 per cent.

Note . . .
These readings are taken on a new machine under ideal conditions and are given as a guide. Under adverse conditions lower readings are acceptible, provided that the machine gives its full output when subjected to the following tests.

Running tests

31. Run the generator on open circuit at 8,000 r.p.m. for 15 min. The open circuit voltage between phases must be balanced and not less than 75V, for a field current of 20 amp, at 24V, d.c. nominal.

32. Run the generator on short circuit at 8,000 r.p.m. and increase the field current to approximately 25 amp. at 24V, d.c. nominal. The short circuit output current under these conditions must be within the limits of 210 amp. ± 10 per cent.

Insulation resistance

33. The insulation resistance between stator and rotor windings and the frame should be 2 megohms measured with a 250V insulation tester. The note given after para. 28 applies to these readings as well.

Note . . .
During these running tests the drive end bearing must be lubricated with a constant oil feed or hand lubricated every five minutes. Blast cooling air must also be supplied to the machine.