Chapter 22

GENERATOR, ROTAX, TYPE N 0504

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LEADING PARTICULARS

Generator, Type N0504	**Ref. No. 5UA/7020**
Maximum output at 8,000 *r.p.m.*	7·5 *kVA*, 208*V a.c.*, 400 *c/s*
Power factor	*Unity*
D.C. excitation	24 *volts*
Rotation	*Clockwise from drive end*
Cooling	*Blast air*
Brush grade	*KCEG*.11
New brush length	0·810 *in.*
Minimum brush length	0·437 *in.*
New slip-ring diameter	2·015 *in.*
Minimum slip-ring diameter	1·875 *in.*
Brush spring pressure	7 *to* 10 *oz.* (199 *to* 283 *gm.*)
Concentricity	0·003 *in. T.I.R.*
Overall dimensions—	
Length	11·781 *in.*
Height	8·187 *in.*
Width	8·0 *in.*
Weight	26 *lb.*

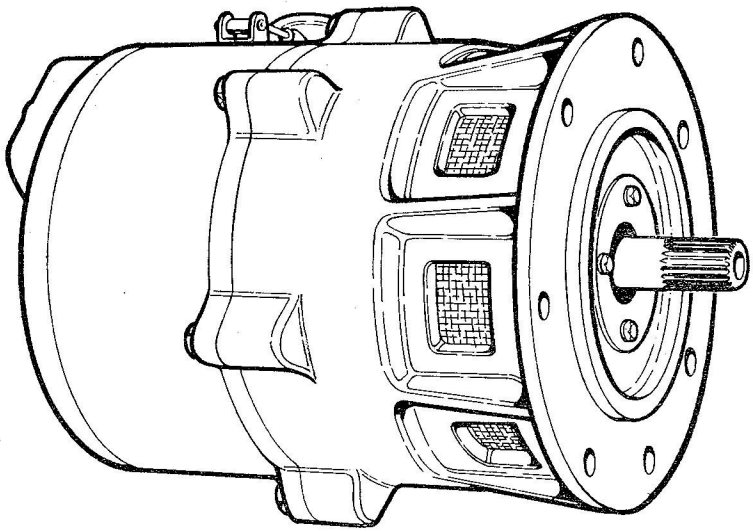

Fig. 1. General view of Type N0504 generator

Introduction

1. The generator, Type N0504, produces an output of 7·5 kVA at 208V a.c. with unity power factor. The output is 3-phase with a frequency of 400 c/s. As the output will alter, depending on the speed and load, the generator can be regarded as variable in voltage and frequency. When the generator is used with a transformer rectifier unit (for example Type U1801) almost any a.c. or d.c. voltage, subject to the limitations of the transformer rectifier unit, can be obtained.

2. The Type N0504 is a 6-pole generator with a speed range of between 5,900 r.p.m. and 10,000 r.p.m. The rotation of the drive shaft can be in either direction but when clockwise, viewed from the driving end, the phase sequence is A-B-C.

DESCRIPTION

3. The generator is illustrated in fig. 1. A sectional view of the machine is shown in fig. 2, and a circuit diagram in fig. 3.

Casing

4. The generator is housed in two cases of aluminium alloy which are held together by six bolts. The drive end casing contains the stator, rotor and drive end of the shaft, and the main casing houses the slip-rings and brushgear. A flange on the drive end casing carries eight equi-spaced mounting holes which are 0·406 in. in diameter. The six terminals for external connections are mounted on a single aluminium block and protected by an aluminium cover. The terminal block is secured to the end plate of the main housing.

5. To cool the generator, blast air is forced through an air spout on the main casing, passes across the brushgear, stator and rotor and flows out through the apertures in the drive end casing. To protect the generator, the apertures and air spout are fitted with wire gauze which is riveted in position.

Rotor

6. The rotor windings are fitted to a core, which forms a part of the steel drive-shaft, and the two leads connected to the slip-rings. The drive shaft is carried in two ball bearings, one mounted at the drive end and the other at the slip-ring end. The drive end of the shaft is 0·75 inches in diameter and splined for a length of 0·875 inches, to receive the coupling from the engine. The drive shaft carries the two cast bronze slip-rings which have a diameter, when new, of 2·015 inches. To prevent oil from the engine entering the generator, an 0·25 inch thick seal is fitted over the end of the shaft and housed within a carrier plate. Where the oil seal contacts the drive shaft, lubrication is required and this should be provided by a spray or splash feed from the engine.

Stator

7. The 6-pole stator has a 3-phase, star-connected winding. The star point of the winding is connected directly to the neutral

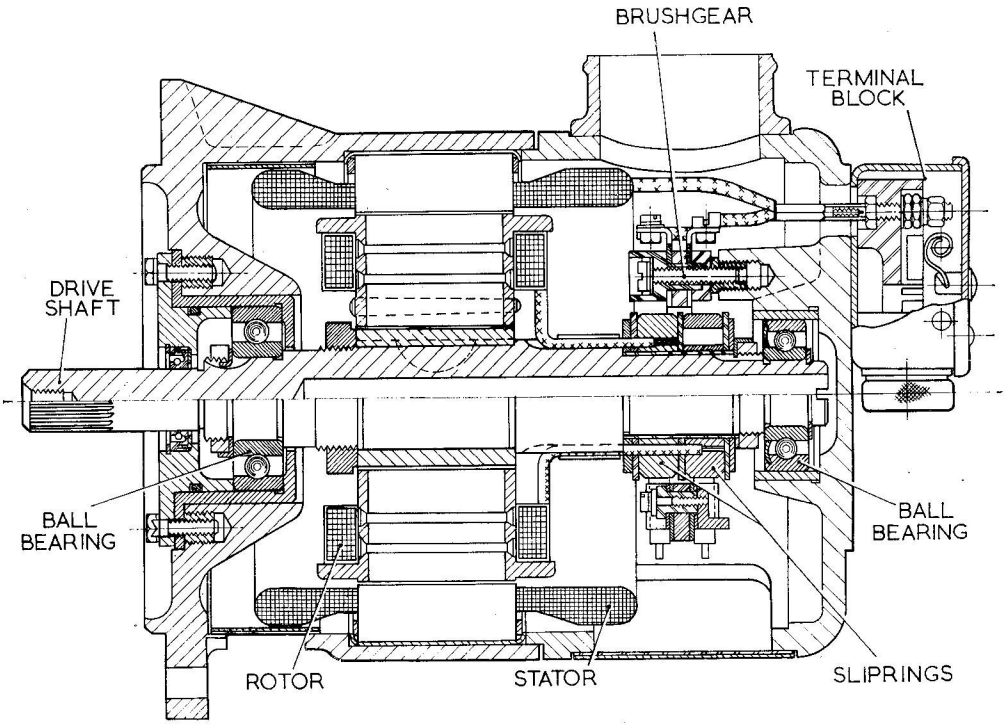

Fig. 2. Sectional view of generator

terminal N on the terminal block. The 3-phase a.c. output from the stator is connected to terminals R, W, B, which correspond respectively to the phase sequence A-B-C.

Brushgear

8. The six brushes are divided into two sets of three, the brushes in each set being equi-spaced around one slip-ring. The d.c. current passes from the positive terminal through an 0·5 μF. capacitor and one set of brushes and slip-ring to excite the rotor winding. The current then passes from the rotor through a second slip-ring and set of brushes and another 0·5 μF. capacitor to the negative d.c. terminal. Each brush is mounted in a stainless steel case.

INSTALLATION

9. The cover which is fitted over the drive end to protect it during transit should be removed before attempting to install the generator. Lightly grease the drive end of the shaft, which is splined with 20 coarse serrations for a length of 0·875 inches, and connect it to the drive coupling from the engine. The drive shaft is 0·75 inches in diameter with a 45 degree chamfer for 0·06 inches. The generator should be secured by eight bolts passed through the 0·4062 inch diameter holes which are equi-spaced on a 7·0 inches P.C. diameter on the mounting flange.

10. The a.c. output connections should be made to the 9-24 amp., 2 B.A. studs on the terminal block. The studs are marked R,

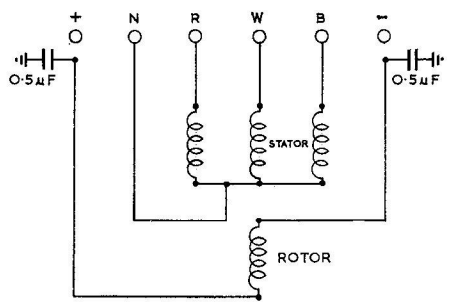

Fig. 3. Circuit diagram

W, B, and N, and connections to them should be made in the phase sequence A-B-C and neutral. The d.c. excitation supply should be connected to the 5-12 amp., 2 B.A. studs, marked + and —, which are mounted on the erminal block.

SERVICING

11. Examine the brushes and use clean, dry pressurized air to remove any carbon deposit. Inspect the brush boxes and remove any accumulation of carbon dust with a cloth moistened with lead-free gasoline. Ensure that the brushes are a correct sliding fit in their boxes and that their length is sufficient to ensure satisfactory operation until the next overhaul. The minimum permissible brush length is 0·437 in.

12. Using a suitable spring balance check the tension of the brush springs at a level with the top of the brush box. The spring pressure in each case should be 7 to 10 oz. (199 to 283 gm.).

13. The slip-rings should be examined for signs of undue sparking and measured to ensure their diameters are sufficient to give satisfactory operation until the next overhaul. The minimum permissible diameter of each slip-ring is 1·875 in.

14. The insulation of all connecting leads should be examined for signs of deterioration and the connections checked for security. Ensure that the oil seal is giving adequate protection against the ingress of oil and that the wire gauze covering the cooling apertures is preventing the entrance of undue dust and dirt.

Testing

15. If the serviceability of the machine is suspect, it may be tested in accordance with the test procedure laid down in Appendix A.

Appendix A

STANDARD SERVICEABILITY TEST FOR GENERATOR, ROTAX, TYPE N 0504

Introduction

1. The following tests 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—one in the Mk. 5 series.

(2) Balance, spring, 0-4 lb. (Ref. No. 1H/97).
or Gauge, tension, 100-500 gm. (Ref. No. 1H/86).

(3) Insulation resistance tester, Type C (Ref. No. 5G/152).

The generator should be driven in a clockwise direction, when viewed from the driving end. Blast air should be supplied to the air inlet spout at a pressure equivalent to a head of 6 in. water gauge. A 24V d.c. supply should be connected to terminals + and — through a suitable variable resistor.

Note . . .

The 24-volt supply should not be broken when the current exceeds 5 amp.

Testing

3. Before mounting the generator on the test set, check for freedom of rotating parts by turning the rotor by hand without using a coupling. There should be no excessive end play in the bearings; a slight radial play which can just be felt by hand is permissible.

Brushgear

4. Check the brush length and brush spring pressure. The brush length should be not less than 0·437 in. and the spring pressure should lie between 7 and 10 oz. (199 and 283 gm.).

Phase sequence

5. When mounted and connected as in para. 2, the a.c. output phase sequence should be A-B-C (R-W-B relative to the terminal markings).

Open-circuit test

6. With the generator driven at 8,000 r.p.m. and the output open-circuited, adjust the 24V excitation until the line voltages give an average reading of 208 volts. The excitation current should not exceed 3·3 amp. After this adjustment, ensure that the voltages between terminal N and the terminals R, W and B are equal.

Short-circuit test

7. Using short lengths of heavy-duty cable, connect each phase of the a.c. output to the primary winding of a current transformer; short-circuit the other ends of the three primary windings to form a star point. Drive the generator at a speed of 8,000 r.p.m. and adjust the excitation supply until the average line current is 20·3 amp. The excitation supply should be between 6·9 and 7·5 amp.

Insulation resistance test

8. With the two capacitors disconnected from the brushgear and with the machine still warm, the insulation resistance, measured between the following points with a 250-volt insulation resistance tester, should be not less than 0·05 megohm.

(1) Stator winding and the frame.

(2) Rotor winding and the frame.

(3) Brushgear and the frame.