

Chapter 1**ROTARY TRANSFORMERS, ROTAX, S3200 SERIES****LIST OF CONTENTS**

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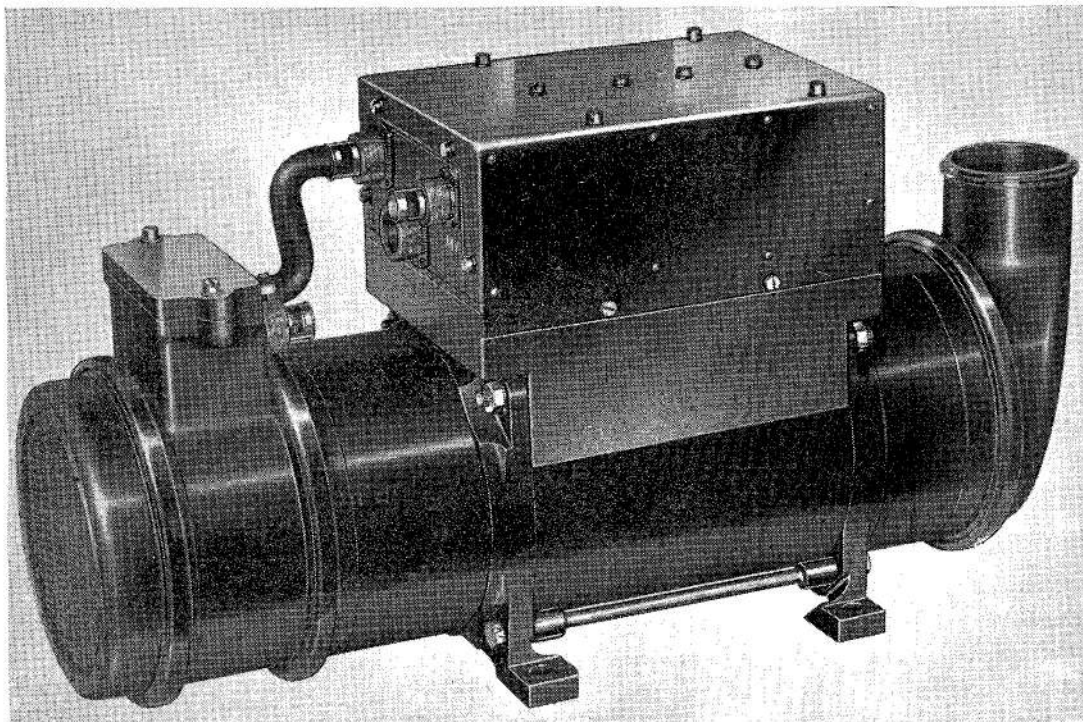


Fig. 1. General view of typical rotary transformer

◀ Introduction

1. Rotary transformers in the Rotax S3200 series are intended for use in aircraft having a main power supply at 112V d.c., in order to provide a supply at 28V d.c. They are used in conjunction with a voltage regulator, Type 66 (Rotax F4101). Details of particular types will be found in Appendices to this chapter. ▶

Note . . .

It is convenient, mechanically, to describe the machine relative to the flow of air through it, viz., inlet and outlet, whilst electrically, l.v. (low voltage) and m.v. (medium voltage) are more appropriate. Air inlet (l.v.) and air outlet (m.v.) are double references to the same location in each instance.

DESCRIPTION

◀ 2. A typical unit in the S3200 series is shown in fig. 1. ▶ The machine is continuously rated, giving an output of 3 kilowatts at 28 volts (l.v.) with a regulation of $\pm 2\frac{1}{2}$ per cent; the input required is 112-volt (m.v.). It will operate satisfactorily up to an altitude of 50 000 ft. with an efficiency of not less than 64 per cent.

3. The rotary transformer comprises two cast end frames separated by an iron yoke,

which, when bolted together, form the shell of the machine.

4. A sheet aluminium box, housing terminals and suppression components, is bolted externally to the yoke. Another enclosure, housing resistor connections, is located at the air outlet end of the machine and in both instances these housings are secured to the top of the machine relative to the mounting feet. ◀ The terminal arrangement of a machine having a separate shunt field connection is shown in fig. 2. ▶

5. Each end frame houses a ball bearing which carries the armature shaft. The shaft protrudes beyond each bearing and has bolted to it a cast aluminium fan. The fan at the air inlet end has its securing nut shrouded by an aluminium spinner which serves to streamline the flow of air. Enclosing the fan, and secured to the end frame of the machine, is an air spout. The latter is secured by a manacle ring and can be radially positioned to suit a particular installation.

6. A double flanged frame extends beyond the end casting (air outlet) and has a resistor connection box (*para.* 4) secured to it. A manacle ring embraces both flanges, securing a wire gauze filter to the frame at one end,

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and the frame to the end casting at the other. The frame encloses a resistance element which is suspended from the connection box across the cooling air stream.

7. Two window strap assemblies are provided for inspection of the brush-gear which is secured within each end frame.

Windings

8. The armature consists of two laminated cores (*fig. 3*). One of these (the main core) has a 112-volt primary winding (m.v.) wound on top of a 28-volt secondary winding (l.v.). The two armatures thus formed are connected in series on the principle of an auto-transformer. In order to control the low voltage (l.v.) output the secondary winding is extended beyond the main core to a smaller auxiliary core. Separate field systems are used with the main and auxiliary cores.

9. The auxiliary field consists of three coils, one series and two shunt. The two shunt coils are wound in opposition, one being controlled by the external voltage regulator, the other permanently connected across the 112-volt + ve terminal and the 28-volt + ve

terminal via a preset resistor. One shunt coil being permanently excited and the other being controlled by the regulator, provides the overall control of the shunt excitation. The two coils are wound in opposition to provide maximum control. ◀ In some machines within the series, the shunt field which is in series with the preset resistor is brought out to a separate terminal, adjacent to the MV terminal. ▶

10. The series field is wound so as to assist the main shunt magnetic flux to provide some measure of compounding. This gives a form of control which boosts the low voltage to the required value.

Cooling

11. Cooling is effected at ground level by two internal fans. At altitude, fan and blast cooling operates at 6 in. head of water. The airflow is 3.6 lb. per min. at ground level (fan and 7.5 lb. per min. at altitude (fan plus blast).

12. A variable positioned air intake is provided at the l.v. end to fit a pipe of 2½ in. nominal diameter. The intake casting is made of magnesium alloy.

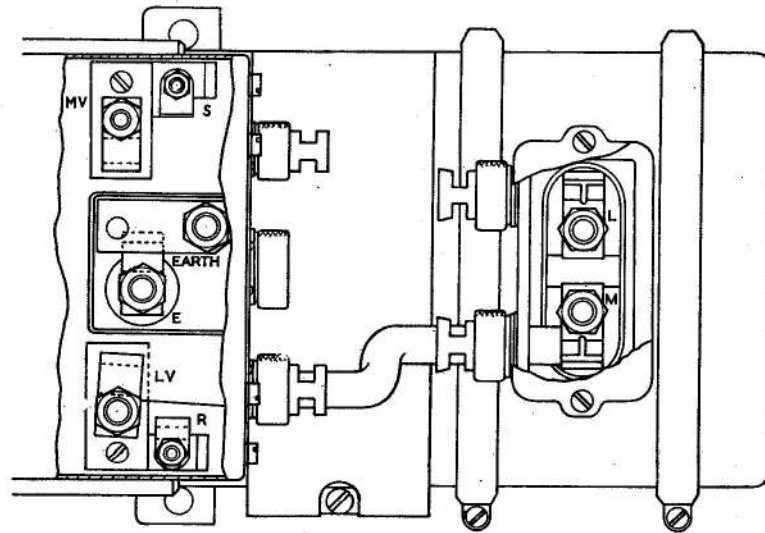


Fig. 2. Terminal arrangement

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13. Cooling air leaves the machine at the m.v. end via a wire gauze protection cover. Minimum air requirements are as follows:—

Temp. (deg. C)	Weight of air (lb. per min.)
+50	3
+25	2.4
+5	2.1
—15	1.8
—30	1.7

Electrical connections

14. The terminal and suppression box (*para. 4*) is provided with three cable entry positions at one end. One entry is for the m.v. lead and external shunt field connection (if fitted), one for the negative and one for the l.v. and regulator connections.

15. A link is provided for use when a connection between the negative terminal and the frame of the machine is required.

16. Two cable entry positions are provided at one end of the resistor terminal box (*para. 4*), one for a connection between terminal M (resistor box) and terminal LV (suppression box). The two terminals are connected with approximately 8 in. of Helsyn sleeved cable.

Suppression

17. Six suppression capacitors and two chokes are provided and they are housed in the terminal box (*para. 4*). The m.v. lead (*fig. 3*) has two 0.5 microfarad capacitors and a Y4 choke and the l.v. lead has two 2 microfarad capacitors and a W3 choke. The regulator lead has two 0.75 microfarad capacitors. All pairs of capacitors are connected in parallel to earth.

INSTALLATION

18. Rotary transformers in the S3200 series are suitable for mounting in any position. Four feet are provided, each containing a $\frac{5}{16}$ in. dia. clearance hole. The fixing centres are $5\frac{11}{16}$ in. (axially) and $5\frac{3}{8}$ in.

19. Overall dimensions of the machines are given under Leading Particulars in the

relevant Appendix, but it should be noted that when the air inlet spout is adjusted at 180 degrees to the terminal and suppression box, the extra depth would be $1\frac{1}{8}$ in.

Note . . .

External negative leads, forming part of the aircraft installation, should be screened.

SERVICING

20. These rotary transformers should be serviced in accordance with the general chapter in A.P.4343, Vol. 1, Sect. 8, Chap. 1, and the instructions contained in the relevant Servicing Schedule.

Brushgear

21. Access to the brushgear is gained by removal of the window straps after withdrawal of the securing screws. The minimum brush length beyond which brushes must not be used is quoted in the relevant Appendix; brushes should be renewed at periods prescribed in the appropriate Servicing Schedule, and whenever examination reveals that they will not remain serviceable for the period that must elapse before the next Servicing.

22. Brush spring pressure, measured with a suitable spring balance, such as Ref. No. 1H/97, should be within the limits quoted in the relevant Appendix.

Commutators

23. The commutators should be examined for signs of wear, scoring or burning. If re-surfacing is necessary it should be noted that the minimum commutator diameter is as quoted in the relevant Appendix.

Lubrication

24. The bearings of the machine are grease lubricated during manufacture and repair, and should not normally require lubrication during servicing periods.

Insulation resistance tests

25. With the suppression unit isolated, measure the insulation resistance between all live parts and the frame with a 250-volt insulation resistance tester. The reading should not be less than 50 000 ohms.

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Appendix 1

ROTARY TRANSFORMER, TYPE 1050 (ROTAX S3201)

LEADING PARTICULARS

Rotary transformer, Type 1050	...	...	...	...	...	...	Ref. No. 5UB/5504
<i>Input—</i>							
Voltage	...	...	...	...	...	...	112V $\begin{matrix} +4V \\ -12V \end{matrix}$ d.c.
Current (nominal)	...	...	...	...	...	...	38.5 amp.
<i>Output—</i>							
Voltage	...	...	...	...	...	...	28V $\pm 0.7V$ d.c.
Power	...	...	...	...	...	...	3 kW
Rating (at 50 000 ft.)	...	...	...	...	...	...	Continuous
<i>Cooling—</i>							
Ground level	...	...	...	...	...	...	Fan
Altitude	...	...	...	...	...	...	Fan and blast
<i>Brush grade—</i>							
28V	...	...	...	...	...	...	KCEG.11
112V	...	...	...	...	...	...	KCEG.11
<i>Brush spring pressure—</i>							
28V	...	...	...	...	...	...	22–24 oz.
112V	...	...	...	...	...	...	15–17 oz.
<i>Brush length when new (measured on long side)—</i>							
28V	...	...	...	...	...	...	0.812 in.
112V	...	...	...	...	...	...	0.687 in.
<i>Minimum brush length (measured on long side)—</i>							
28V	...	...	...	...	...	...	0.640 in.
112V	...	...	...	...	...	...	0.467 in.
<i>Commutator diameter when new—</i>							
28V	...	...	...	...	...	...	2.250 in.
112V	...	...	...	...	...	...	2.875 in.
<i>Commutator diameter (minimum permissible)—</i>							
28V	...	...	...	...	...	...	2.156 in.
112V	...	...	...	...	...	...	2.718 in.
Mica undercut	...	...	...	...	...	...	0.027 in. wide \times 0.027 in. deep
Maximum eccentricity of commutator	...	...	...	...	...	...	0.0005 in.
Bar to bar variation	...	...	...	...	...	...	0.0001 in.
<i>Overall dimensions—</i>							
Casing diameter	...	...	...	...	...	...	5.25 in.
Length	18.725 in.
Width	6.281 in.
Height (including terminal box)	9.5 in.
Weight	49 lb.

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1. The rotary transformer, Type 1050 (Rotax S3201), is similar to that described and illustrated in the main

chapter. The internal connections are shown in fig. 1; there is no separate shunt field connection.

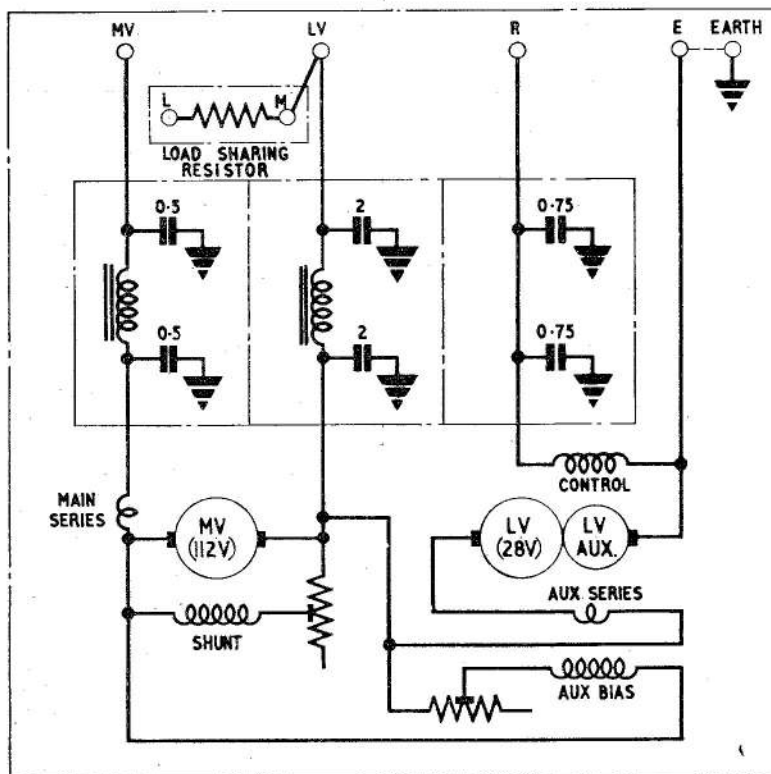


Fig. 1. Diagram of internal connections

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Appendix 2

ROTARY TRANSFORMER, TYPE 1050A (ROTAX S3202/1)

LEADING PARTICULARS

Rotary transformer, Type 1050A	...	...	...	Ref. No. 5UB/6552
Input—				
Voltage	...	...	...	112V \pm 4V - 12V d.c.
Current (nominal)	...	...	...	38.5 amp.
Output—				
Voltage	...	...	...	28V \pm 0.7V d.c.
Power	...	...	...	3 kW
Rating (at 50 000 ft.)	...	...	...	Continuous
Cooling—				
Ground level	...	...	...	... Fan
Altitude	...	...	...	... Fan and blast
Brush grade—				
28V	...	...	...	KCEG.11
112V	...	...	...	KCEG.11
Brush spring pressure—				
28V	...	...	...	22-24 oz.
112V	...	...	...	15-17 oz.
Brush length when new (measured on long side)—				
28V	...	...	...	0.812 in.
112V	...	...	...	0.687 in.
Minimum brush length (measured on long side)—				
28V	...	...	...	0.640 in.
112V	...	...	...	0.467 in.
Commutator diameter when new—				
28V	...	...	...	2.250 in.
112V	...	...	...	2.875 in.
Commutator diameter (minimum permissible)—				
28V	...	...	...	2.156 in.
112V	...	...	...	2.718 in.
Mica undercut	...	...	...	0.027 in. wide \times 0.027 in. deep
Maximum eccentricity of commutator	...	...	...	0.0005 in.
Bar to bar variation	...	...	...	0.0001 in.
Overall dimensions—				
Casing diameter	...	...	...	5.25 in.
Length...	18.725 in.
Width	6.281 in.
Height (including terminal box)	9.5 in.
Weight	49 lb.

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1. The rotary transformer, Type 1050A (*Rotax S3202/1*), is similar to that described and illustrated in the main chapter. It differs

from the Type 1050 (*Rotax S3201*) in having a separate shunt field connection, as shown in the circuit diagram in fig. 1.

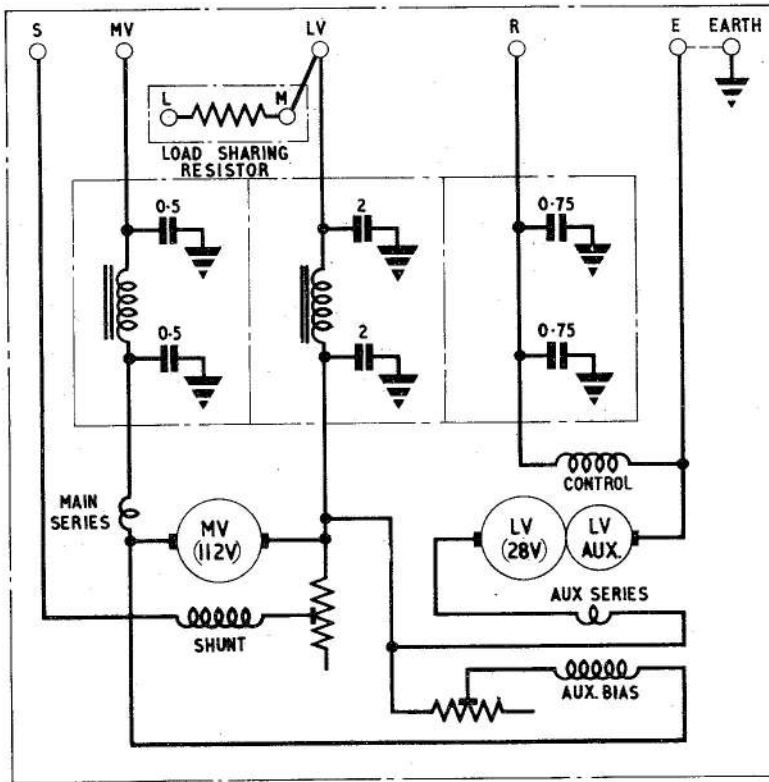


Fig. 1. Diagram of internal connections

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Instrument panel from a MiG-21 Provoost (XP558)