

## Appendix 6

### ROTAX, TYPE A 1300 SERIES

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#### ILLUSTRATION

A typical actuator in the A1300 series ... Fig. 1

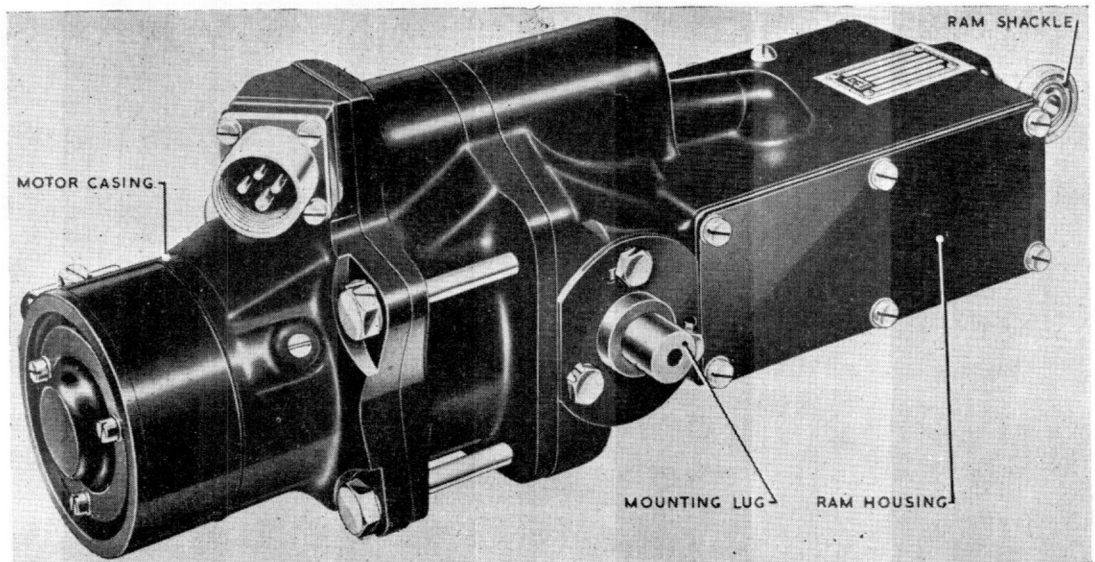


Fig. 1. A typical actuator in the A1300 series

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## Introduction

1. The Rotax A 1300 Series of linear actuators has been developed for general use in aircraft, but particularly to operate elevator trim tab controls. Additional information which applies to specific types will be found in A.P.4343D, Vol. 1, Sect. 14.

## DESCRIPTION

2. A typical machine of the A 1300 Series of linear actuators is illustrated in fig. 1. These machines are of "in-line" design, with the motor and ram on the same axis, and incorporate a screwshaft of truncated Whitworth form. Mounting is made by two mounting lugs provided on the sides of the actuator. The 28-volt motor drives the ram via a 3-stage epicyclic gearbox, and its rating is continuous at an operational cycle of two seconds on and six seconds off. Between the motor and gearbox is a drum-type electro-magnetic brake and a single plate phosphor bronze clutch.

### Motor

3. The motor is a 4-pole, 2-brush machine having a split series field, each half of the field winding energizing two pole pieces. Reversal of rotation is thus affected by switching the field supply to the opposite winding.

4. The armature is supported at the commutator end by a ball bearing and is located at the driving end in a plain bearing within the brake drum, which itself runs in a ball bearing. Relative rotation between the armature and the brake drum occurs only during clutch slip.

5. External electrical connections are made via a 4-pole Breeze plug (Stores Ref. 5X/6006).

### Brake and clutch

6. Between the motor and the gearbox is a drum-type electro-magnetic brake, the coil of which is connected in series with the armature. When energized, the brake shoes are drawn away from contact with the drum against spring pressure. The brake is applied when the coil is de-energized. Locating pins on the brake spider prevent displacement of the four brake shoes.

7. Interposed between the armature and the inside of the brake drum is a single plate phosphor bronze clutch. When the brake is applied, the stored energy in the armature is dissipated via the clutch, and the deceleration of the ram is assisted.

## Gearbox

8. A 3-stage epicyclic gearbox is incorporated, giving a reduction ratio of 91.125 to 1. It comprises first, second and third planetary trains. Integral with the brake drum, which extends beyond the brake housing into the gearbox, is the first sun gear. The other two gear trains are formed as integral parts of two planet carriers; the third stage of the planetary train being secured to the screwshaft. Each planet carrier has mounted on it three planet gears, and the three planetary trains revolve in a fixed annulus.

### Ram and screwshaft

9. The steel ram, housing a bronze nut, is driven by a screwshaft of truncated Whitworth form. Torque reaction is absorbed by three sets of balls located in the ram and sliding in steel guides in the ram housing. The screwshaft, at the gearbox end, is borne by, and revolves in, a double row of steel balls housed between an outer race and the annulus gear.

### Limit switches

10. The 28-volt motor circuit is controlled by four snap-action limit switches. The switches are arranged in two pairs, each pair being connected in series to provide a safety factor, and each pair, so connected, is in series with an energizing field. The switches are operated by pressure being applied by a shouldered section machined on to each side of the ram. When the correct amount of travel has been made by the ram, contact is made with the switches, and the circuit is broken.

### Heater coil

11. Located in the upper part of the ram housing is a heater coil enclosed in a metal container of cylindrical form. The purpose of this heater coil is to assist operation at low temperatures; and its loading is 24 watts.

## OPERATION

12. The direction of travel of the ram depends upon the energizing of one of two field circuits. The amount of travel in each direction is controlled by a pair of limit switches connected in series to provide a safety factor.

13. Consider, then, the ram to be fully retracted; and the extend field is now energized. The ram will travel forward until the shouldered section of the ram (*para.* 10) engages with the forward pair of switches and opens them. This will give the position

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of maximum extension. Upon energizing the retract field the sequence will be reversed. Movement of the ram backwards will continue until the other pair of switches are in contact with the ram. When they become operated this will be the position of maximum retraction.

#### INSTALLATION

14. Information on the installation of the actuators will be found in the relevant Aircraft Handbook.

15. The actuators will operate satisfactorily in any position and may be readily connected to the electrical supply by means of its Breeze plug and mating socket.

#### SERVICING

16. Normal servicing of an actuator will not necessitate any dismantling other than removing the window strap surrounding the brushgear at the end of the motor casing.

##### Brushgear

17. Service the brushgear in the following manner:—

- (1) Remove the window strap and withdraw the brushes from their holders.
- (2) Check the length of the brushes to ascertain if they are long enough to perform satisfactorily until the next servicing period. The minimum length is 0.25 in., and if new brushes require fitting they should be bedded to the contour of the commutator.
- (3) Badly chipped or cracked brushes should be removed and new ones fitted.
- (4) Ensure that the brushes are a free fit in the holders.
- (5) Check the brush spring pressure by attaching a tension gauge, 50 to 250 gm. (Stores Ref. 1H/59), to the tip of the brush spring and raising the latter level

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with the top of the brush box. The spring will be found to be satisfactory if the tension gauge measures 5 to 7 oz. (i.e., 141.7 to 198.5 gr.). It should be noted that a square pull is required.

##### Note . . .

*In all instances where the unit is likely to be operated at high altitudes, reference must be made to A.P.4343, Vol. 1, Sect. 1, Chap. 1.*

#### Lubrication

18. The actuators are lubricated during manufacture and repair and, normally, should not require lubrication during servicing periods.

#### General

19. Check the security of all soldered leads. Ensure that all external nuts, screws and locking devices are secure. Examine the electrical connections for security and damage, and the wiring for frayed or damaged insulation.

20. At the end of the servicing operations, ensure that all components are in their correct positions and replace and secure the brushgear window strap.

#### Testing

21. Test the insulation of all the live parts to the frame, using a 500-volt insulation resistance tester. If a reading of less than 10 megohms is obtained the unit will be unservicable. It should be noted, however, that this value refers to units being tested under normal workshop conditions. Due allowance should be made for the climatic conditions of the locality and those of the aircraft servicing area or dispersal point. In particularly damp or humid climates, the reading will be low enough to give apparently sufficient reason for rejection, and in these instances discretion should be exercised.

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