

Chapter 39

ACTUATOR, ROTAX, TYPE A0607/2

LIST OF CONTENTS

	Para.		Para.
Introduction	1	Limit switches	8
Description	2	Operation	10
Motor	3	Installation	11
Brake and clutch	4	Servicing	13
Gearbox	6	Insulation resistance test	16
Ram and screwshaft	7		

LIST OF ILLUSTRATIONS

	Fig.		Fig.
Type A 0607/2 actuator	1	Diagram of internal connections	2

LEADING PARTICULARS

Actuator, Type A0607/2	Stores Ref. 5W/1110
Voltage	22—29 V d.c.
Normal load	250 lb.
Maximum load	1,000 lb.
Maximum static load	6,000 lb.
Current for normal load at 28 V d.c.	1.20 ampere
Length of stroke	3 in. \pm .010 in.
Time of stroke	25—70 seconds
Rating	Continuous
Operational ceiling	50,000 ft.
Operational temperature range	—70 deg. C. to + 90 deg. C
Length (extended)	19.287 in.
Length (retracted)	16.287 in.
Width	3.437 in.
Height	4.218 in.
Weight	10.4 oz.

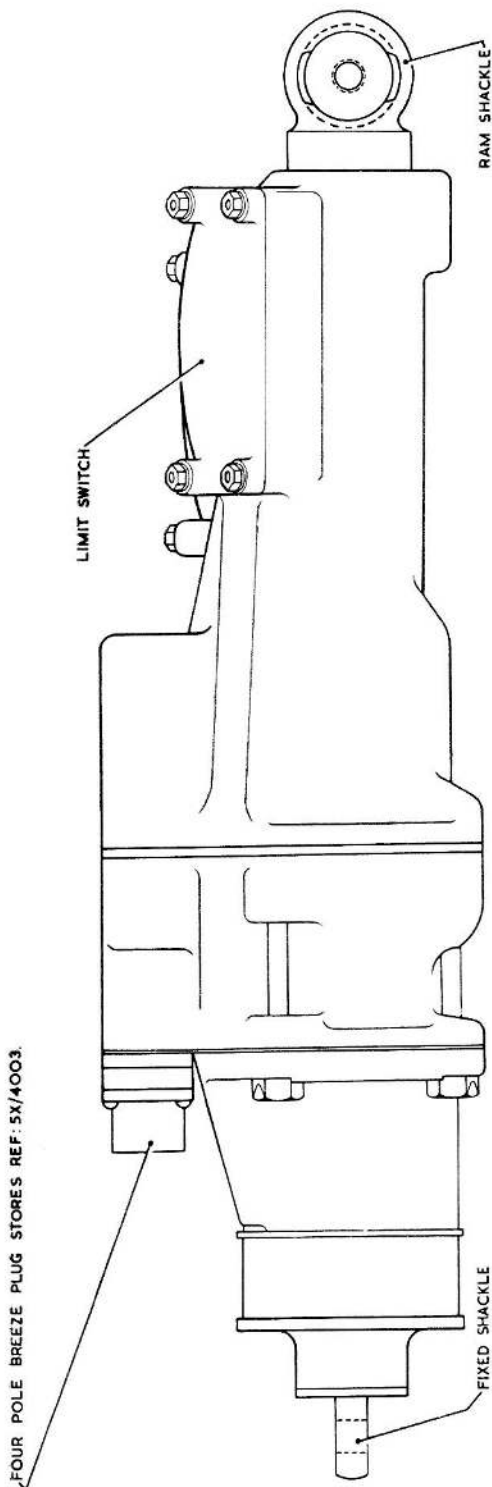


Fig. 1. Type A 0607/2 actuator

Introduction

1. Type A 0607/2 linear actuator is intended for use in aircraft having a 24 V. or 28 V. d.c. supply. It is suitable for the automatic control of flying surfaces and also satisfies other requirements. The ram may be operated through a complete cycle or may be "inched". Limit switches are provided to break the motor circuit and thereby stop the ram as the end of permitted travel is reached. An electro-magnetic brake and a single-plate clutch are fitted in order to minimize the overrun of the ram. The actuator will operate satisfactorily at altitudes up to 50,000 ft. and at temperatures ranging from -70 deg. C to $+90$ deg. C. A heater is incorporated to maintain the ram and gearbox at a working temperature in conditions of extreme cold.

DESCRIPTION

2. The actuator is of "in-line" construction, the motor, gearbox, ram and fixing shackles all lying on a common axis. The single four pole plug for electrical connection, and the heater coil are off set from the main axis. The actuator is enclosed by three housings; the motor housing, an intermediate housing containing the brake and clutch, (to which the plug is fixed) and the ram housing, containing the ram, screwshaft, gearbox, limit switches and heater coil.

Motor

3. The motor is a split field, series wound machine, one field winding being used for anti-clockwise rotation to extend the ram and the other for clockwise rotation to retract the ram. The armature is carried by a ball bearing at the commutator end and, at the drive end, by an Oilite bearing in the brake drum. The brushgear is enclosed by a removable cover band so that access can readily be gained to inspect the brushes.

Brake and clutch

4. The brake coil (fig. 2) is wound on a soft iron core, or "spider", having four "webs". Each web has a cork surfaced, spring loaded brake shoe which presses outwards on the inner surface of a surrounding brake drum when the coil is de-energized. The brake drum is carried by a ball bearing in the intermediate housing but is normally prevented from rotating by the brake shoes.

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5. The drive end of the armature shaft extends through a bore in the centre of the brake spider and is carried by an Oilite bearing in the brake drum, concentric with the ball bearing. Torque is transmitted from armature to brake drum via a single clutch plate which makes a friction drive with the inner end of the brake drum, being loaded by a helical spring on the shaft. The clutch plate has a sleeve which fits on the armature shaft and engages the shaft driving pin. The clutch is provided to absorb the inertia of the armature when the motor is switched off and the brake applied so that the overrun of the ram is minimized.

Gearbox

6. The brake drum is integral with the sun gear of the first stage of a four stage epicyclic gearbox. The gearbox has a reduction ratio of 410 to 1. A heater coil is provided, off set from the main body and in line with the plug, to heat the gearbox when required. The heater is necessary to ensure satisfactory operation of the gearbox at very low temperatures.

Ram and screwshaft

7. The fourth stage planet carrier is integral with a screwshaft which revolves within the ram housing. The ram is hollow and encloses the screwshaft when in the retracted position. The circular motion of the screwshaft is converted into linear motion of the ram via a recirculating ball thread. The torque reaction of the ram is absorbed by balls running in grooves in the ram housing. The ram carries a fixing shackle having a self-aligning joint.

Limit switches

8. Each of the two limit switches is housed in the ram housing and is accessible on removing a cover. Each switch consists of a hollow moulding within which is set a fixed contact, and a moving contact riveted to an "S" shaped contact spring which normally sets with the contacts open. When a small plunger in the base of the moulding is moved upwards, it presses on the spring which then snaps into a reverse "S", thereby closing the contacts. The spring reverts to its normal set when the plunger is released.

9. Each plunger rides on the periphery of

the ram and is then in the "operated" position; i.e., with the contacts made. When the ram reaches either end of its travel, however, a cavity in the ram permits the plunger of the appropriate limit switch to return to its "normal" position, so that the contacts open and break the motor circuit.

Operation

10. On connecting the appropriate pole of the four-pole plug to positive (pole B to extend; pole C to retract) and pole A to negative, a circuit is completed through the limit switch contacts, motor field, armature and brake coil. The brake shoes are pulled in to release the brake drum and the motor begins to rotate. The rotary motion of motor is transmitted, via the epicyclic gearbox to the screwshaft where the rotary motion is transformed into the linear motion of the ram by the recirculating ball thread. The ram extends or retracts until either the supply is switched off or the ram reaches the end of its travel, whereupon the motor circuit is broken by the limit switch. In either instance, the brake coil is immediately de-energized, and the brake shoes arrest the brake drum under the action of their springs. The actuator, therefore, comes quickly to rest, the momentum of the armature being dissipated through the single plate clutch so that the ram overrun is reduced to a minimum. The gearbox may be heated, if necessary, by connecting pole D of the plug to positive and pole A to negative.

INSTALLATION

11. Two shackles, one moving with the ram; the other fixed to the end of the motor housing, are provided for installation. The moving shackle has a $\frac{5}{16}$ in. hole through the centre of a self-aligning joint, whilst the fixed shackle has a $\frac{3}{8}$ in. hole through its centre. The shackles are set mutually at right angles.

12. Electrical connection is made via a single 4-pole Breeze plug (Stores Ref. 5X/4003).

SERVICING

13. The procedure detailed in this and the following paragraphs is sufficient to ensure the satisfactory operation of the actuator. First examine the actuator for signs of

damage or distortion. In particular, check the security of the electrical connection and the condition of the shackles.

14. Remove the coverband and blow out any carbon dust that may have collected in the brushgear, with clean, dry compressed air from a pipe line or bellows. Operate the actuator, both in extension and retraction, and ensure that any sparking at the commutator is very slight. Switch the supply on and off several times and ensure, by listening, that the brake is functioning

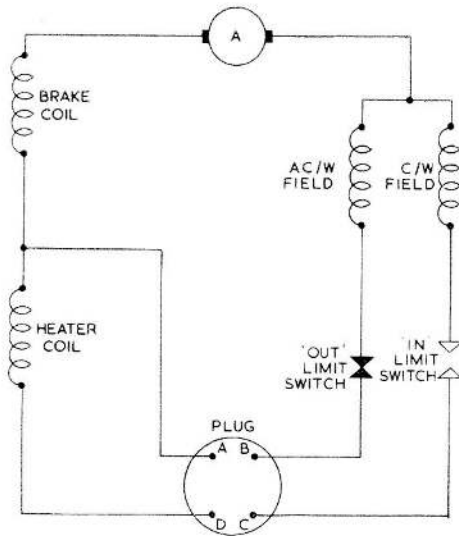


Fig. 2. Diagram of internal connections

correctly and permitting no appreciable overrun.

15. Inspect the two brushes in their boxes to ensure that they are free. If any brushes are binding, both the brushes and the interiors of the boxes should be wiped clean of accumulated carbon with a soft cloth moistened with lead-free white spirit. Ensure that the brushes have not worn to the minimum length of .281 in. and check that the brush spring pressures are between 5 oz. and 7 oz. (142-198 gr.). This reading should be taken with a tension gauge (Stores Ref. 1H/86), from the point where the spring bears on the brush.

Insulation resistance test

16. Measure the insulation resistance between live parts and frame, using a 250-v. insulation resistance tester. A reading of not less than 50,000 ohm. should be obtained.

Note . . .

The value of insulation resistance given in para. 16 applies to units being tested under normal workshop conditions. Due allowance should be made for the climatic conditions of the locality and for those of the aircraft servicing area or dispersal point where the tests are being applied. In particularly damp climates, the readings may be low enough to give apparently sufficient reason for rejection and, in these instances, discretion should be exercised.

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