

Appendix 7

WESTERN, TYPE ERJ 60 SERIES

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LEADING PARTICULARS

Voltage range	18 to 29 volts d.c.
Normal working full load	60 lb./in.
Maximum working load	85 lb./in.
Full load current	4.2 amp.
Weight	2 lb. 5 oz.
Overall length	6.10 in.

Introduction

1. The ERJ 60 actuator is designed for fuel valve operation, but may have other applications. It can be remotely controlled, and remote indication of operation is provided. A visual indicator showing OPEN-SHUT is incorporated in the coupling housing of the actuator. The differences in various marks in this series are the angular travel of the coupling shaft and the type of electrical plug fitted. Details are given in A.P.4343D, Vol. 1, Section 16.

DESCRIPTION

General

2. The actuator is assembled in three main units, the motor and the brake, the reduction gearbox and the coupling unit. Normally this would not be stripped except at fourth line.

Motor and brake assembly

3. This is housed under the cover secured by a wire-locked circular nut to the gearbox casting, making a sealed joint. When this cover is removed the brake assembly and brush assemblies are accessible.

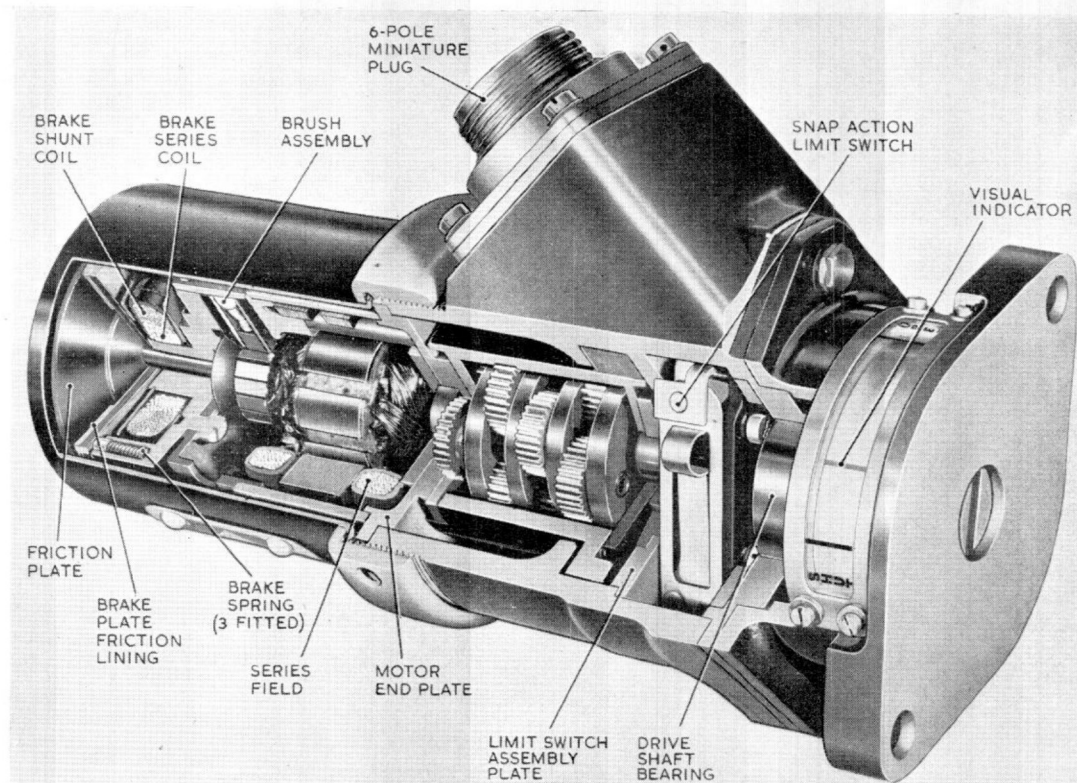


Fig. 1. Sectional view of actuator

Gearbox

4. This unit contains the three-stage epicyclic gear train and the limit switch assembly in a circular casting which has a square boss projection to accommodate the electrical plug. The casting is externally threaded at one end to accept the motor cover nut and flanged at the other end to mate with the coupling unit. Between the casting flange and the coupling unit flange, and secured by four bolts, is the casting which houses the ball bearing supporting the main drive shaft from the epicyclic gear. The epicyclic train of gears is held between end plates, one formed by the motor end plate and the other being the limit switch assembly plate. Shims are fitted as requisite to ensure running clearance and float, and the whole is located by three long screws between the end plates passing through an internal projection of the body casting. The limit switches align with a small lift cam machined integral with the main drive shaft and have snap action. They are adjusted during assembly to operate at the correct travel limits.

Coupling unit

5. The coupling casting has a two-bolt mounting flange. A cut-away portion of the casting is fitted with a perspex window with lines engraved to indicate travel limit and the words OPEN and SHUT. The coupling shaft engages a slot in the main drive shaft and has a 0.125 in. slot to engage the load; it also has attached the indicator marked with a red line, which registers against the lines on the perspex window.

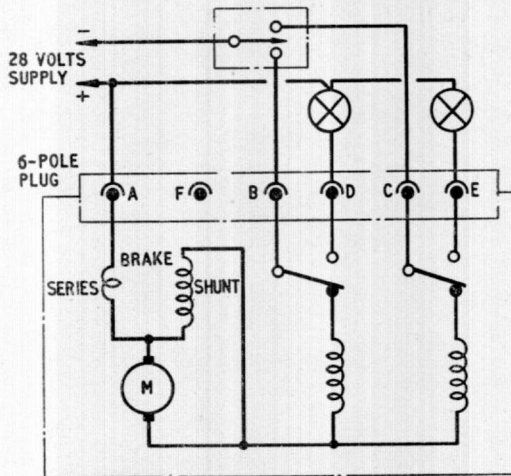
Motor

6. This is a two-pole alternative series field motor. Both poles have a winding, but only one is energized dependent upon the direction of rotation selected. The armature is supported in ball bearings and has a spur wheel drive to the epicyclic gear. At the commutator end the shaft extends through the brake solenoid core and brake plate assembly and carries the rotating friction plate. The brush and brush spring assembly is held in the brush box by a flat insulating plate secured by one screw. Brush pressure is not adjustable.

RESTRICTED

Brake

7. The brake consists of a plate loaded by three helical springs on one side and having a friction lining on the other. This lining bears against the friction plate on the armature shaft when at rest, and is held clear when the brake solenoid is energized. The brake solenoid has two windings, one connected in series with the armature and one connected in shunt across the armature. The series coil releases the brake on starting, but while the series coil current rapidly decreases as the motor speeds up the shunt coil current increases and assists in holding off the brake.



6-POLE PLUG	
PIN A	COMMON
• B	CLOCKWISE
• C	COUNTER-CLOCKWISE
• D	LAMP OPEN
• E	LAMP SHUT
• F	SPARE

Fig. 2. Wiring diagram

Electrical connections

8. A diagram of connections is shown at fig. 2. A standard 6-pole Breeze connection plug is fitted.

SERVICING

9. Little servicing is normally possible with these actuators apart from inspection for security of connections and for mechanical damage. The limit switches which determine the angular travel are set by the manufacturer to fine limits requiring a special rig.

Electrical tests

10. Electrical insulation check can be carried out by testing between each pin of the plug and the actuator body, using a 250V insulation tester. A continuity check between pins A and B and between pins A and C should not exceed 4.5 ohms.

Brushes

11. The motor brushes can be examined when the motor cover and brush box cover are removed. New brushes are 0.25 in. long, and the brush and spring assembly (Pt. No. 275095) should be renewed when brush length has worn to 0.15 in.

12. If brush assemblies are renewed, little bedding is necessary since spare brushes are pre-shaped. If the motor is run without load the supply voltage should be reduced to 18 volts to prevent motor overspeeding.

13. With both brushes removed, a continuity check to include the brake shunt coil can be made by testing between pins A and B or C and should not exceed 160 ohms. When replacing the motor cover use a suitable sealing compound and wire-lock the cover nut to one of the plug securing studs.

Electrical Connections

3. A diagram of connections is shown at Fig. 2. A standard 8-pole three connection plug is fitted.

Adjustment

3.1. The receiving is normally possible with these detectors apart from inspection for security of connections and for mechanical damage. The limit switches which determine the angular travel are set by the manufacturer to give limits requiring a special rig.

Electrical Tests

3.2. Electrical resistance check can be carried out by testing between each pin of the plug and the motor body using a 250V insulation tester. A resistance check between pins A and B and between pins A and C should not exceed 4.5 ohms.

Operation

3.3. The motor brushes can be examined when the motor cover and brush box covers are removed. New brushes are 0.025 in long. The brush holder and spring assembly (Fig. 10) should be renewed when brush length is less than 0.01 in.

3.4. The motor assemblies are removed from the motor. It is necessary since motor brushes are examined. If the motor is run without load, the supply voltage should be reduced to 12 volts to prevent motor overcurrent.

3.5. With both brush holders removed, a cover is fitted to the motor. The brush spring coil is fitted to the brush holder. The brush spring is fitted by testing between pins A and C and should not exceed 1.5 ohms. The motor cover is then fitted and the motor is run at 12 volts to check the accuracy of the spring assembly.

Brake

1. The brake consists of a plate loaded by three helical springs on one side and having a friction lining on the other. This lining bears against the friction plate on the armature shaft when at rest and is held clear when the brake solenoid is energized. The brake solenoid has two windings, one connected in series with the armature and one connected in shunt across the armature. The series coil releases the brake on starting but while the series coil current rapidly decreases as the motor speeds up the shunt coil current increases and assists in holding off the brake.



Fig. 2. Wiring Diagram