Chapter 34

ACTUATORS, PLESSEY, CUB PUMA SERIES

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF APPENDICES

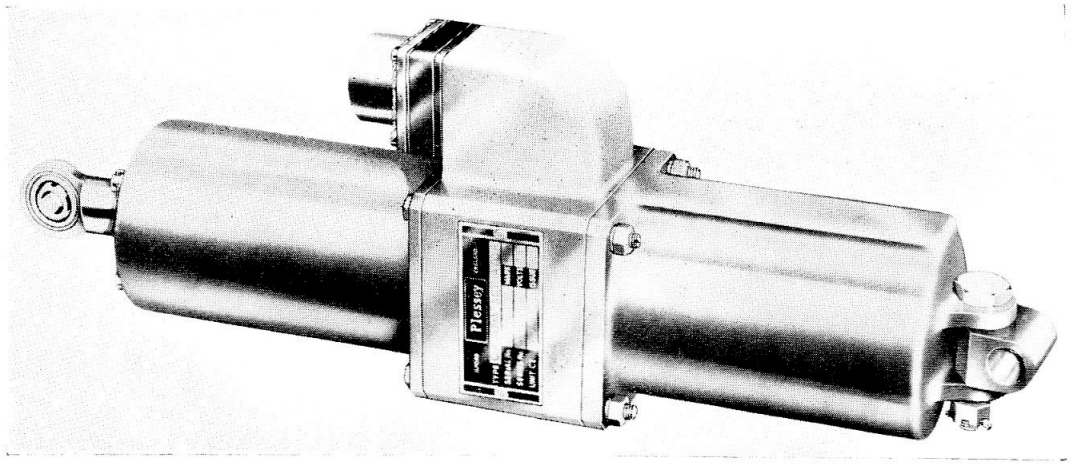


Fig. 1. Typical Cub Puma actuator

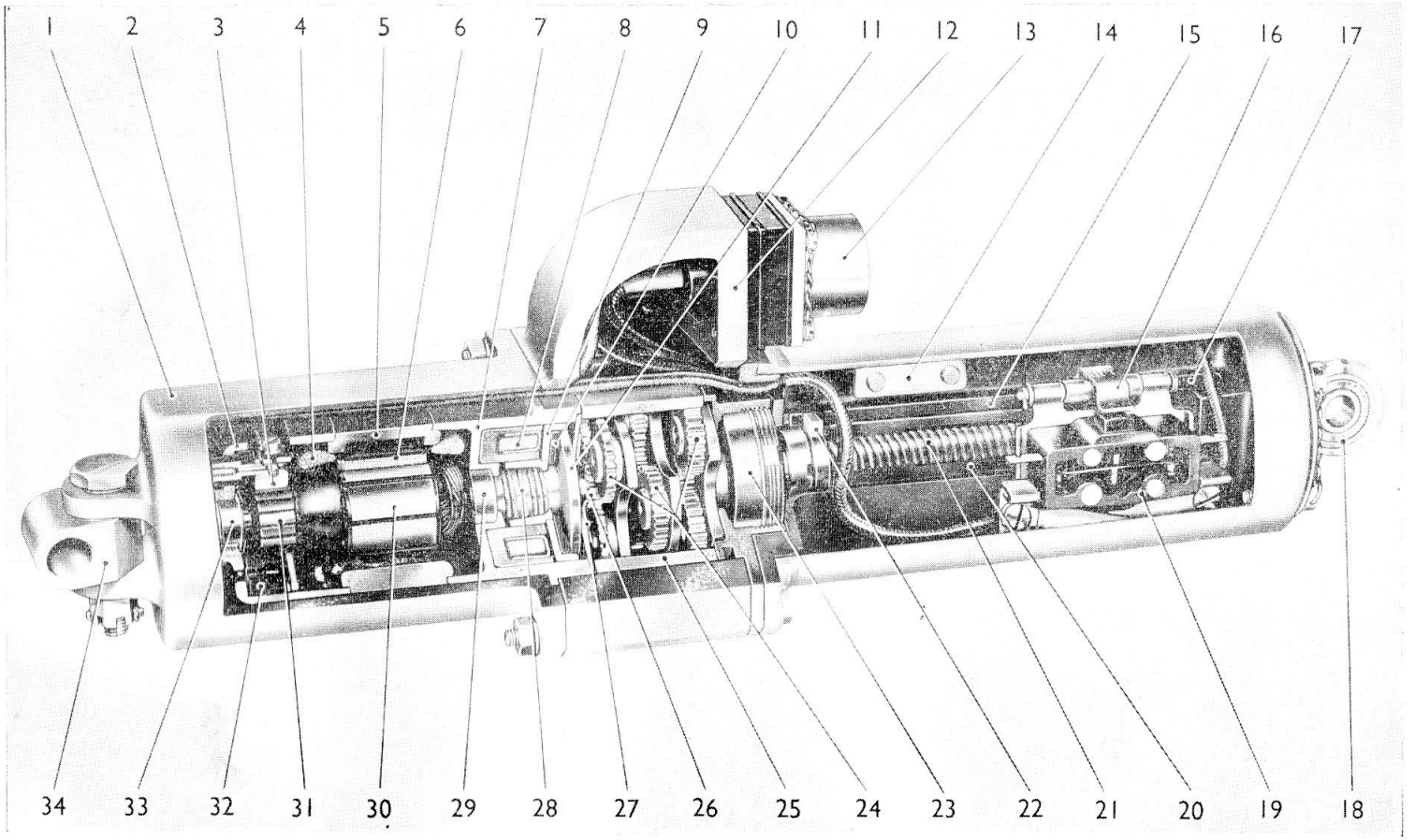


Fig. 2. Sectional view of actuator

KEY TO FIG. 2
SECTIONAL VIEW OF ACTUATOR

1 MOTOR HOUSING
2 COMMUTATOR END PLATE
3 BRUSH ROCKER ASSEMBLY
4 FIELD COIL WINDINGS
5 YOKE
6 POLE-PIECE
7 BRAKE HOUSING
8 BRAKE COIL
9 BRAKE SHOE
10 FRICTION DISC
11 FRICTION PLATE
12 GEARBOX HOUSING
13 PLUG ASSEMBLY
14 GUIDE PLATE ASSEMBLY
15 PLUNGER HOUSING
16 LIMIT SWITCH TRIGGER
17 TORQUE EAR GUIDE SLOT
18 PLUNGER END FITTING
19 LIMIT SWITCH ASSEMBLY ("OUT")
20 PLUNGER
21 LEAD SCREW
22 PLUNGER TORQUE EARS
23 LEAD SCREW BEARING
24 THREE-STAGE EPICYCLIC GEAR TRAIN
25 ANNULUS
26 MOTOR DRIVE PINION
27 GREASE GUARD
28 BRAKE SPRING
29 MOTOR DRIVE BEARING
30 WOUND ARMATURE
31 COMMUTATOR
32 INSULATING SLEEVE
33 COMMUTATOR END BEARING
34 UNIVERSAL END FITTING

Introduction

1. Plessey linear actuators of the Cub Puma series follow the general design described in this Chapter; the machine illustrated, the CZ64250, is typical of the series, and specific details of individual actuators will be found in appendices to this chapter. They vary in such details as the working load, the type of end fittings and the length and time of plunger travel.

2. The actuators of the Cub Puma series are designed to provide remotely controlled linear motion against either compressive or tensile loads. Motive power is provided by a small reversible fractional horse power motor, the drive shaft of which engages a train of gears. Snap action limit switches are fitted; these automatically switch off the motor supply when the actuator reaches the end of its travel.

DESCRIPTION

Motor

3. The motor (fig. 2) is a reversible split-field series type with an integral electro-magnetic brake. The motor is located by a spigot in the gear housing; the motor pinion is part of an assembly and is pin-driven by the armature shaft. The armature is dynamically balanced to eliminate vibration.

Gearbox

4. The gearbox assembly (fig. 2) comprises the main housing (enclosing the toothed annulus) with the three-stage epicyclic gear train. The lead screw is extended into the gearbox, where it is supported in a bearing. One stage of the gearing is supported on a carrier integral with the lead screw extension; the other two gear stage carriers, for support and bearing purposes, are freely located on the lead screw extension, where they are retained by a circlip.

5. Each of the planet gears has two small holes for lubrication of the gear support pins, and from the motor end each gear stage has increased tooth face width. The annulus for the epicyclic gears is keyed and positioned in the gearbox housing.

Plunger

6. The plunger assembly comprises a chrominum finished tube and eye end, screwed and pinned together. At the gearbox end is fitted the detachable torque reaction and switch operating key (plunger ears) with locking washer and ring nut.

Plunger housing

7. The plunger housing, when assembled to the unit, encloses the lead screw and plunger. It is bolted to the gearbox by its end flange plate which registers against the lead screw bearing housing. To minimize wear, the chromium plated plungers run in phosphor bronze bushes.

Limit switches

8. These are micro snap-action lever-operated type, on which the moulding of

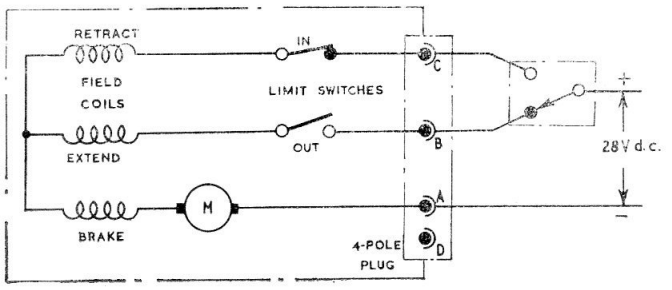


Fig. 3. Circuit diagram

the switch housing completely shrouds the contacts and micro-break mechanism. Two electrical connections are made to each switch; these are screwed to the threaded lugs located on each side of the moulding.

9 One arm of the switch-operating lever depresses the switch button when the other arm is actuated by the plunger ear as the plunger moves through its stroke.

INSTALLATION

10. Before coupling the actuator to the installation, it must be ascertained that all the links and joints, bearing pivots, etc., of the component being actuated are free to move.

11. The installation centres must be checked against the relevant installation drawing for the actuator concerned, and the fixing bolts should be passed through the location holes to make certain that a free fit results.

12. To install the actuator, first couple the rear end fitting to the fixed fork end of the installation. The unit should be rocked slightly to check the fitting of the fixing bolt before and after the attachment of washer and nut, etc. The actuator should then be coupled to the moving link, checking that the front (plunger) end fitting enters the fork end of the linkage freely, i.e., without touching the sides of the form arm.

13. While the fixing bolts should be well lubricated with the approved grease, no lubricant should be applied to the actuator plunger as this is adequately lubricated on assembly.

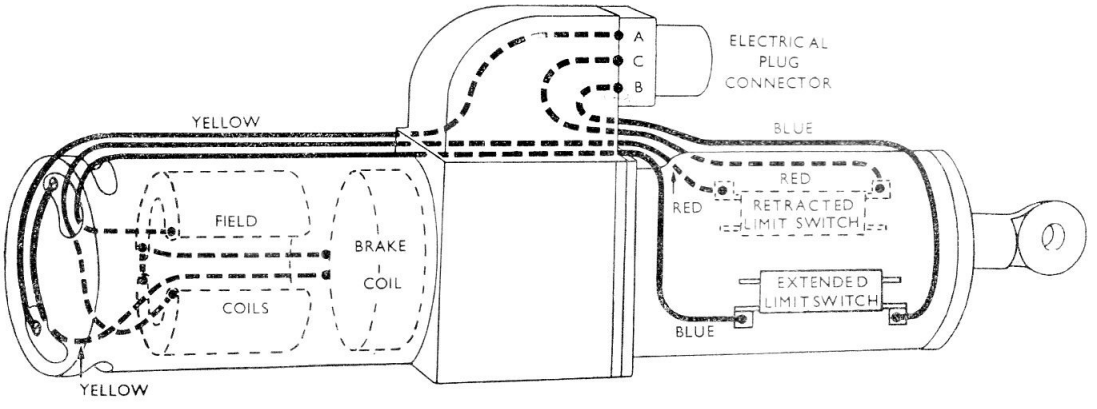


Fig. 4. Schematic wiring diagram

14. After installation, the actuator should be given a test to ensure that it functions correctly.

SERVICING

15. These actuators should be serviced in accordance with the general chapter in A.P.4343, Vol. 1, Sect. 17, Chap. 1, and the instructions contained in the relevant Servicing Schedule.

Lubrication

16. As the actuators are lubricated during manufacture, they require no attention during normal service other than the application of a smear of approved grease to the pivot pins at each end of the actuator.

Testing

◀**17.** If the serviceability of an actuator is suspect apply the standard serviceability test detailed in the appropriate appendix to this chapter. If the actuator fails to meet the requirements of its standard serviceability test it should be disposed of in accordance with the current service instruction.▶

Appendix D

STANDARD SERVICEABILITY TEST FOR ACTUATOR, PLESSEY, TYPE 1CZ80358

Introduction

1. When considered necessary the tests detailed in this appendix may be applied to the above-mentioned actuator immediately prior to installation in an aircraft, or when its serviceability is suspect.

Test equipment

2. The following test equipment is required: —

Linear actuator test rig (Ref. No. 4G/5420)

250V insulation resistance tester, Type C (Ref. No. 5G/152)

A 29V d.c. supply

Tension gauge (Ref. No. 1H/59)

TEST PROCEDURE

Insulation resistance test

3. Using the insulation resistance tester, check the resistance between each lead and the actuator body in turn. The reading in each instance must not be less than 50,000 ohms.

Brushgear

4. The brushgear is accessible when the cast end cover of the motor housing is removed. The length of the brushes should not be less than 0·25 in. and the brush spring pressure should be between 3·5 and 4·5 oz. (100 and 127 gm). Refit the motor housing cover.

Function test

5. The linear actuator test rig is described and illustrated in A.P.4343S, Vol. 1, Book 2, Sect. 8. Set the actuator to be tested on the rig and ensure that it operates within the limits given in Table 1.

6. Perform several inching strokes in each direction to check for satisfactory brake operation.

TABLE 1

Applied voltage	Load	Time for 1·4 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	50 lb. L.A.	4·7	6·7	1·6	1·4 ± 0·01
29	50 lb. L.O.	5·2	7·4	1·75	1·4 ± 0·01

L.A.—Load assisting motion
L.O.—Load opposing motion

Appendix F

STANDARD SERVICEABILITY TEST FOR ACTUATOR, PLESSEY, TYPE 1CZ82400

Introduction

1. When considered necessary the tests detailed in this appendix may be applied to the above-mentioned actuator immediately prior to installation in an aircraft, or when its serviceability is suspect.

Test equipment

2. The following test equipment is required: —

Linear actuator test rig (Ref. No. 4G/5420)

250V insulation resistance tester, Type C (Ref. No. 5G/152)

A 29V d.c. supply.

Tension gauge (Ref. No. 1H/59).

TEST PROCEDURE

Insulation resistance test

3. Using the insulation resistance tester, check the resistance between each lead and the actuator body in turn. The reading in each instance must not be less than 50,000 ohms.

Brushgear

4. The brushgear is accessible when the cast end cover of the motor housing is removed. The length of the brushes should not be less than 0·25 in. and the brush spring pressure should be between 3·5 and 4·5 oz. (100 and 127 gm.). Refit the motor housing cover.

Function test

5. The linear actuator test rig is described and illustrated in A.P.4343S, Vol. 1, Book 2, Sect. 8. Set the actuator to be tested on the rig and ensure that it operates within the limits given in Table 1.

6. Perform several inching strokes in each direction to check for satisfactory brake operation.

TABLE 1

Applied voltage	Load	Time for 1·4 in. stroke (sec.) Min.	Time for 1·4 in. stroke (sec.) Max.	Max. current (amp.)	Length of stroke (in.)
29	50 lb. L.A.	9·0	13·0	1·5	1·4 ± 0·01
29	50 lb. L.O.	9·5	13·5	1·55	1·4 ± 0·01

L.A.—Load assisting motion
L.O.—Load opposing motion

Appendix G

STANDARD SERVICEABILITY TEST FOR ACTUATORS, PLESSEY, TYPE 1CZ135260, /A, /B AND /C

Introduction

1. When considered necessary the tests detailed in this appendix may be applied to the above-mentioned actuator immediately prior to installation in an aircraft, or when its serviceability is suspect.

Test equipment

2. The following test equipment is required: —

Linear actuator test rig (Ref. No. 4G/5420)

250V insulation resistance tester, Type C (Ref. No. 5G/152)

A 29V d.c. supply.

Tension gauge (Ref. No. 1H/59).

TEST PROCEDURE

Insulation resistance test

3. Using the insulation resistance tester, check the resistance between each lead and the actuator body in turn. The reading in each instance must not be less than 50,000 ohms.

Brushgear

4. The brushgear is accessible when the cast end cover of the motor housing is removed. The length of the brushes should not be less than 0·25 in. and the brush spring pressure should be between 3·5 and 4·5 oz. (100 and 127 gm.). Refit the motor housing cover.

Function test

5. The linear actuator test rig is described and illustrated in A.P.4343S, Vol. 1, Book 2, Sect. 8. Set the actuator to be tested on the rig to ensure that it operates within the limits given in the appropriate Table.

6. Perform several inching strokes in each direction to check for satisfactory brake operation.

TABLE 1

1CZ135260

Applied voltage	Load	Time for 3 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	22	28	1·8	3 ± 0·03
29	250 lb. L.O.	28	35	2·0	3 ± 0·03

TABLE 2

1CZ135260/A

Applied voltage	Load	Time for 1·8 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	14·4	18·6	1·8	1·8 ± 0·03
29	250 lb. L.O.	16·8	23·4	2·0	1·8 ± 0·03

TABLE 3

1CZ135260/B

Applied voltage	Load	Time for 0·5 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	3·6	4·7	1·8	0·5 ± 0·03
29	250 lb. L.O.	4·6	5·9	2·0	0·5 ± 0·03

TABLE 4

1CZ135260/C

Applied voltage	Load	Time for 0·67 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	4·8	6·3	1·8	0·67 ± 0·03
29	250 lb. L.O.	6·2	7·9	2·0	0·67 ± 0·03

L.A.—Load assisting motion
L.O.—Load opposing motion

Appendix H

STANDARD SERVICEABILITY TEST FOR ACTUATORS, PLESSEY, TYPES 1CZ135261, /A AND /B

Introduction

1. When considered necessary the tests detailed in this appendix may be applied to the above-mentioned actuator immediately prior to installation in an aircraft, or when its serviceability is suspect.

Test equipment

2. The following test equipment is required: —

Linear actuator test rig (Ref. No. 4G/5420)

250V insulation resistance tester, Type C (Ref. No. 5G/152)

A 29V d.c. supply.

Tension gauge (Ref. No. 1H/59).

TEST PROCEDURE

Insulation resistance test

3. Using the insulation resistance tester, check the resistance between each lead and the actuator body in turn. The reading in each instance must not be less than 50,000 ohms.

Brushgear

4. The brushgear is accessible when the cast end cover of the motor housing is removed. The length of the brushes should not be less than 0·25 in. and the brush spring pressure should be between 3·5 and 4·5 oz. (100 and 127 gm.). Refit the motor housing cover.

Function test

5. The linear actuator test rig is described and illustrated in A.P.4343S, Vol. 1, Book 2, Sect. 8. Set the actuator to be tested on the rig and ensure that it operates within the limits given in the appropriate Table.

6. Perform several inching strokes in each direction to check satisfactory brake operation.

TABLE 1

1CZ135261

Applied voltage	Load	Time for 2·5 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	20	26	1·8	2·5 ± 0·03
29	250 lb. L.O.	23	33	2·0	2·5 ± 0·03

TABLE 2

1CZ135261/A

Applied voltage	Load	Time for 0·45 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	3·6	4·7	1·8	0·45 ± 0·03
29	250 lb. L.O.	4·1	6·0	2·0	0·45 ± 0·03

TABLE 3

1CZ135261/B

Applied voltage	Load	Time for 0·73 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	5·8	7·6	1·8	0·73 ± 0·03
29	250 lb. L.O.	6·7	9·7	2·0	0·73 ± 0·03

L.A.—Load assisting motion

L.O.—Load opposing motion

Appendix I

STANDARD SERVICEABILITY TEST FOR ACTUATOR, PLESSEY, TYPE 1CZ136150

Introduction

1. When considered necessary the tests detailed in this appendix may be applied to the above-mentioned actuator immediately prior to installation in an aircraft, or when its serviceability is suspect.

Test equipment

2. The following test equipment is required: —

Linear actuator test rig (Ref. No. 4G/5420)

250V insulation resistance tester, Type C (Ref. No. 5G/152)

A 29V d.c. supply.

Tension gauge (Ref. No. 1H/59).

TEST PROCEDURE

Insulation resistance test

3. Using the insulation resistance tester, check the resistance between each lead and the actuator body in turn. The reading in each instance must not be less than 50,000 ohms.

Brushgear

4. The brushgear is accessible when the cast end cover of the motor housing is removed. The length of the brushes should not be less than 0·25 in. and the brush spring pressure should be between 3·5 and 4·5 oz. (100 and 127 gm.). Refit the motor housing cover.

Function test

5. The linear actuator test rig is described and illustrated in A.P.4343S, Vol. 1, Book 2, Sect. 8. Set the actuator to be tested on the rig and ensure that it operates within the limits given in Table 1.

6. Perform several inching strokes in each direction to check for satisfactory brake operation.

TABLE 1

1CZ136150

Applied voltage	Load	Time for 3 in. stroke (sec.) Min.	Max.	Max. current (amp.)	Length of stroke (in.)
29	250 lb. L.A.	22	28	1·8	3 ± 0·03
29	250 lb. L.O.	28	35	2·0	3 ± 0·03

L.A.—Load assisting motion

L.O.—Load opposing motion

Appendix 1

ACTUATORS, PLESSEY, TYPES CZ63696/A and /B

LEADING PARTICULARS

Actuator, Type CZ63696/A ..... *Ref. No. 5W/1029*
Type CZ63596/B ..... *Ref. No. 5W/1353*

The following particulars are applicable to both variants:

Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	100 *lb.*
maximum	150 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·75 *amp.*
Operating time (normal load)	34 *sec.*
Ambient temperature range	−60 *to* +90 *deg. C.*
Weight	3 *lb.*
Motor, Type C1606B/19	*Ref. No. 5W/3496*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
Brushes, Type, CZ62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*

The following table details the variation in stroke of each model:

Type	Stroke (in.)	Centres (from trunion centre point) Extended (in.)	Retracted (in.)
CZ63696/A	0·45	7·675	7·225
CZ63696/B	0·73	7·815	7·085

1. The actuator, Type CZ63696, is similar to the typical actuator described and illustrated in the main chapter.

2. This model has no rear end eye fitting but is anchored by trunnions. The general construction is otherwise similar to the typical model.

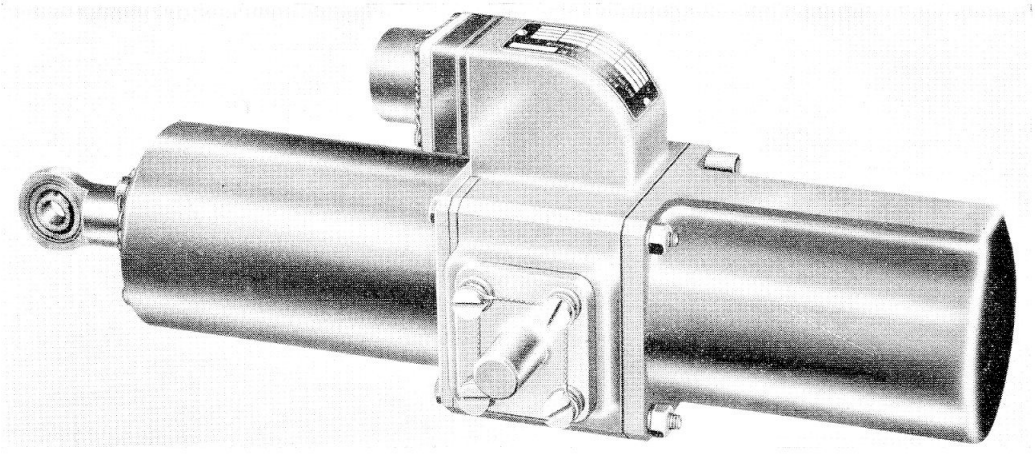


Fig. 1. General view of actuator, Type CZ63696

Appendix 2

ACTUATOR, PLESSEY, TYPE CZ64250

LEADING PARTICULARS

Actuator, Type CZ64250	*Ref. No. 5W/317*
Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	100 *lb.*
maximum	150 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·75 *amp.*
Operating time (normal load)	40 *seconds*
Plunger — stroke	3 *in.*
thread	*Acme, single start*
Centres — retracted	10·250±0·010 *in.*
extended	13·250±0·010 *in.*
Ambient temperature range	−60 *to* +90 *deg. C.*
Weight	3 *lb.*
Motor, Type C1606B/19	*Ref. No. 5W/3496*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
Brushes, Type, CZ62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*

1. The actuator, Type CZ64250, is similar to the typical actuator described and illustrated in the main chapter. The peculiarities of this variant are given in Leading Particulars.

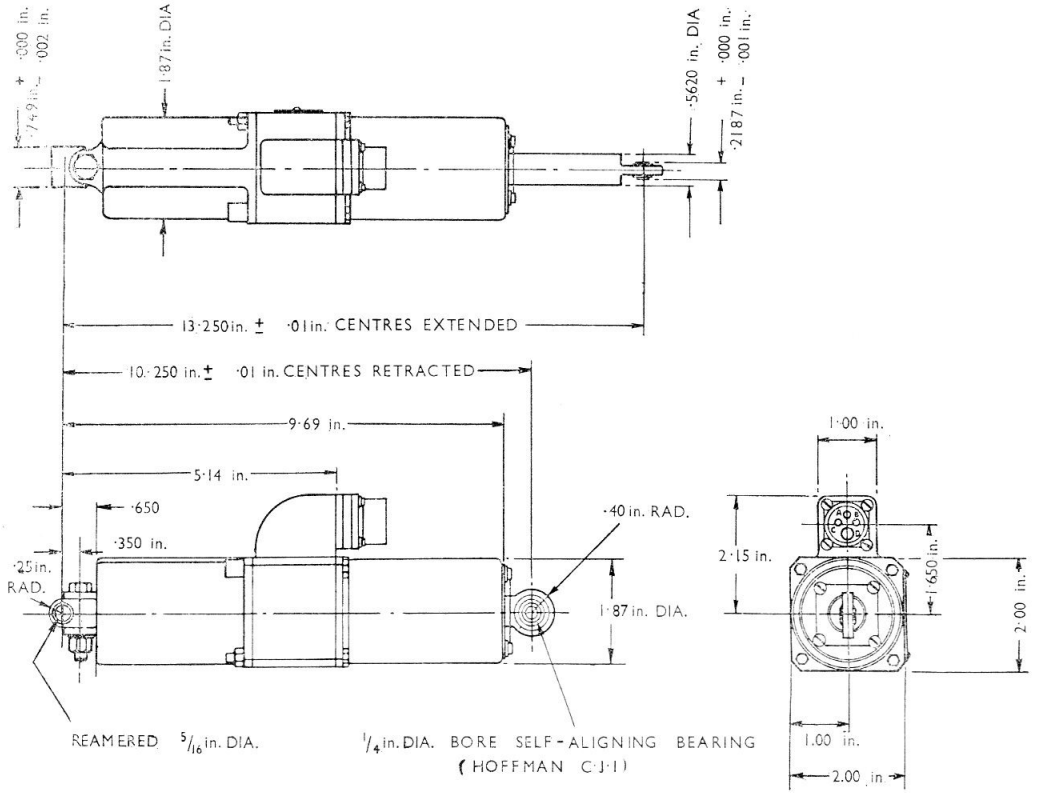


Fig. 1. Stroke setting and installation details

Appendix 3

ACTUATOR, PLESSEY, TYPE CZ77790

LEADING PARTICULARS

Actuator, Type CZ77790	*Ref. No. 5W/990*
Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	100 *lb.*
maximum	250 *lb.*
Maximum static load	1,000 *lb.*
Operational period (normal load and stroke)	12 *seconds*
Rating at normal working load	1·5 *minutes*
Length of stroke	1·00 *in.*
Travel between mechanical stops	1·06 *in.*
Fixing centres retracted	4·565±0·010 *in.*
Fixing centres extended	5·565±0·010 *in.*
Weight	3 *lb.* 6 *oz.*

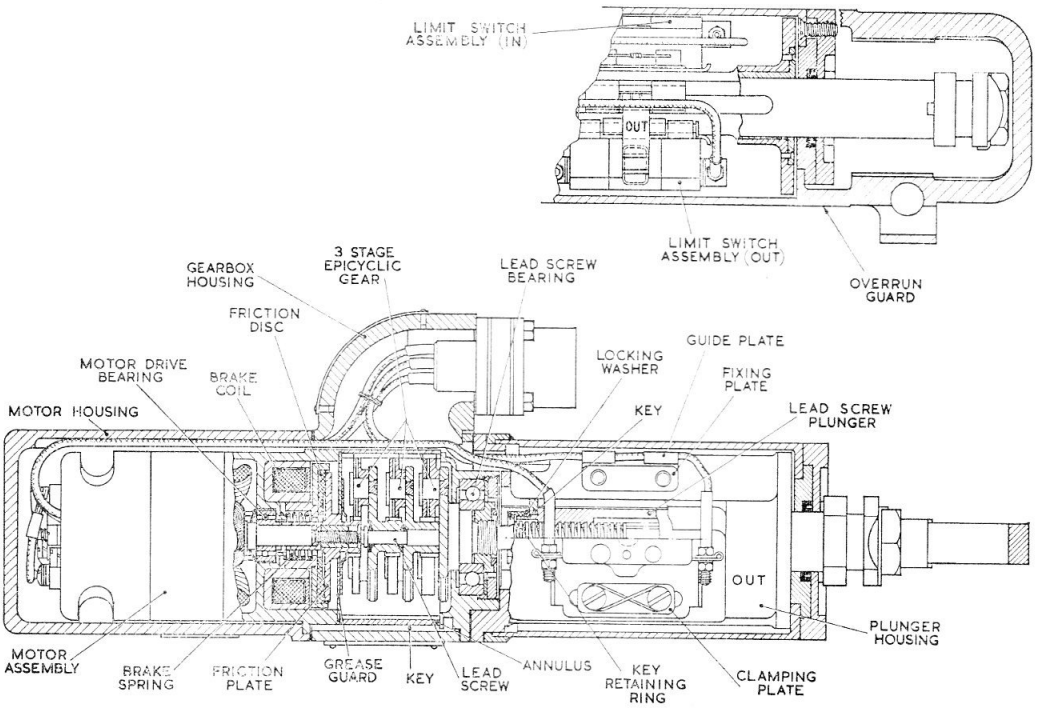


Fig. 1. Sectional view of actuator

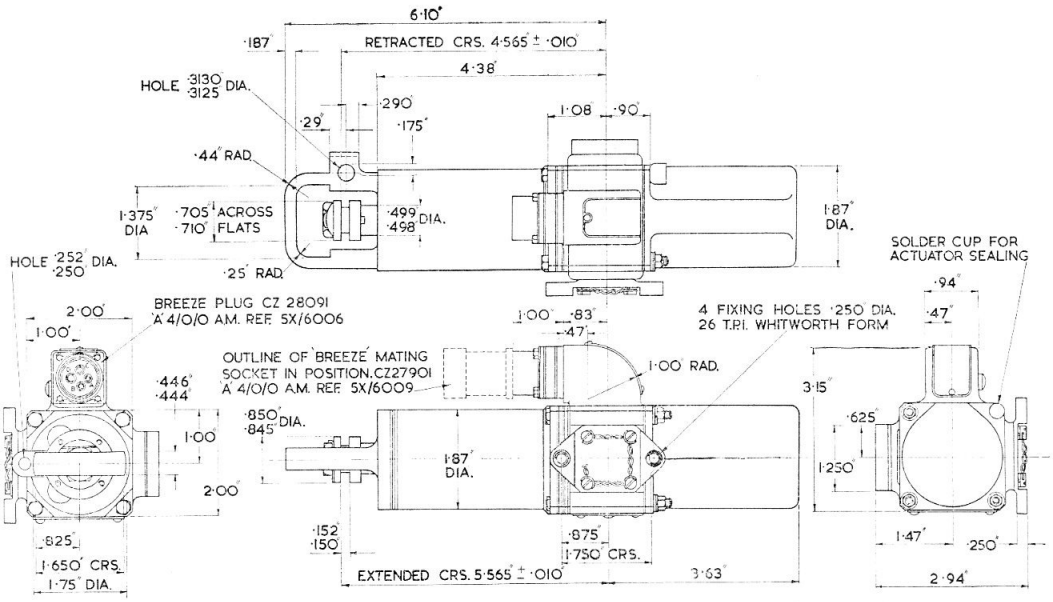


Fig. 2. Stroke setting and installation details

1. The actuator, Type CZ77790, is similar to the typical actuator described and illustrated in the main chapter.

2. The circuit diagram of this model differs from the typical actuator. An additional connection is made to pole D as shown in fig. 3.

3. This actuator has no rear end eye fitting, but is fitted with two side mounting brackets, one disposed vertically, the other horizontally.

4. These side mounting brackets hold the actuator in its installation position in the aircraft, each bracket being secured by two $\frac{1}{4}$ in. B.S.F. screws. The other end of the actuator is coupled by its special end fitting to the valve it will operate.

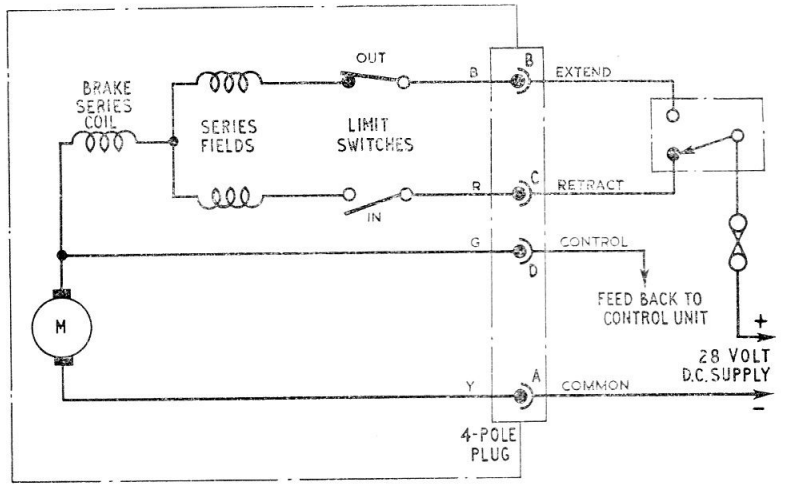


Fig. 3. Circuit diagram

Appendix 4

ACTUATOR, PLESSEY, TYPE 1CZ80358

LEADING PARTICULARS

Actuator, Type 1CZ80358	*Ref. No. 5W/989*
Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	50 *lb.*
maximum	150 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·1 *amp.*
Plunger travel	1·40 *in.*
Fixing centres — retracted	8·98 *in.*
extended	10·38 *in.*
Ambient temperature range	−40 *to* +90 *deg. C.*
Weight	2 *lb.* 11 *oz.*
Motor, Type C1606B/5	*Ref. No. 5W/2727*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
Brushes, Type CZ62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·0125 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*

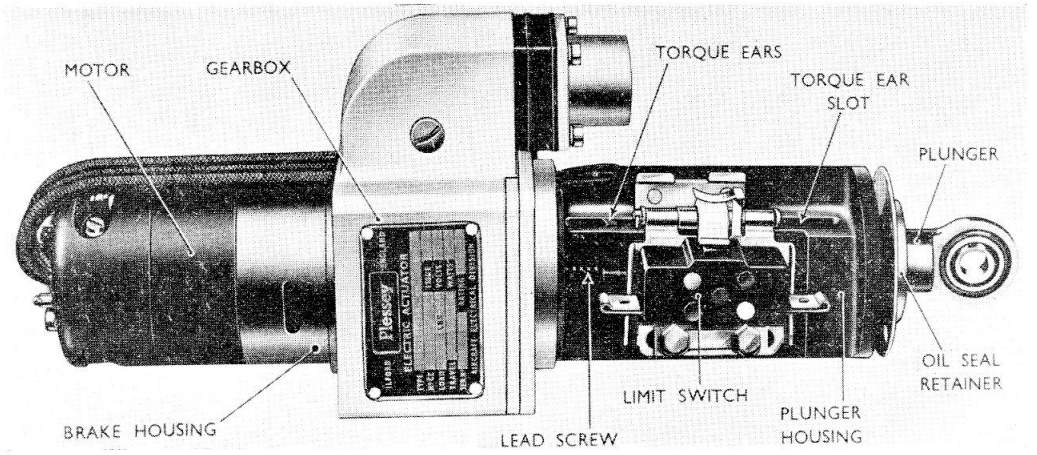


Fig. 1. View of actuator with covers removed

1. The actuator, Type 1CZ80358, is similar to the typical model described and illustrated in the main chapter. The pecularities of this variant are given in Leading Particulars.

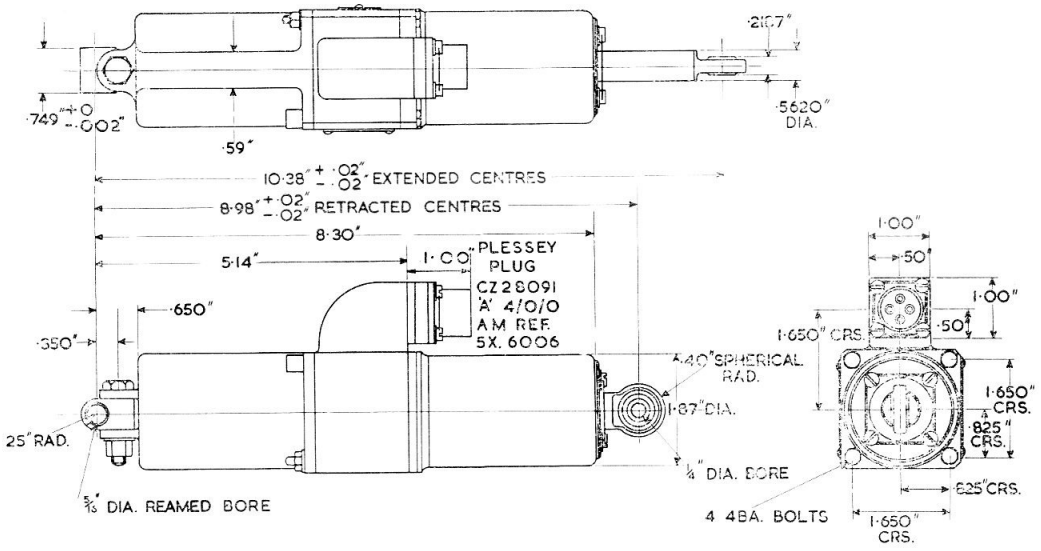


Fig. 2. Installation drawing

Appendix 5

ACTUATOR, PLESSEY, TYPE 1CZ81100/A

LEADING PARTICULARS

Actuator, Type 1CZ81100/A	*Ref. No. 5W/2392*
Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	100 *lb.*
maximum	150 *lb.*
Maximum static load	1,000 *lb.*
Operating time for 3 *in. stroke*	11·5 *seconds min.*
at 29*V d.c. (normal load)*	16·0 *seconds max.*
Plunger — stroke	3 *in.*
thread	*Acme, two start*
Fixing centres — retracted	10·250±0·010 *in.*
extended	13·250±0·010 *in.*
Maximum operating frequency	50 *inching cycles per hour*
Ambient temperature range	−40 *to* +90 *deg. C.*
Weight	3 *lb.*
*Motor, Type C*1606*B*/19	*Ref. No. 5W/3496*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
*Brushes, Type, CZ*62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*

1. The actuator, Type 1CZ81100/A, is similar to the typical actuator described and illustrated in the main chapter.

2. This actuator has a phosphor-bronze plunger tube which runs in a stainless steel bush. The general construction is otherwise similar to the typical model.

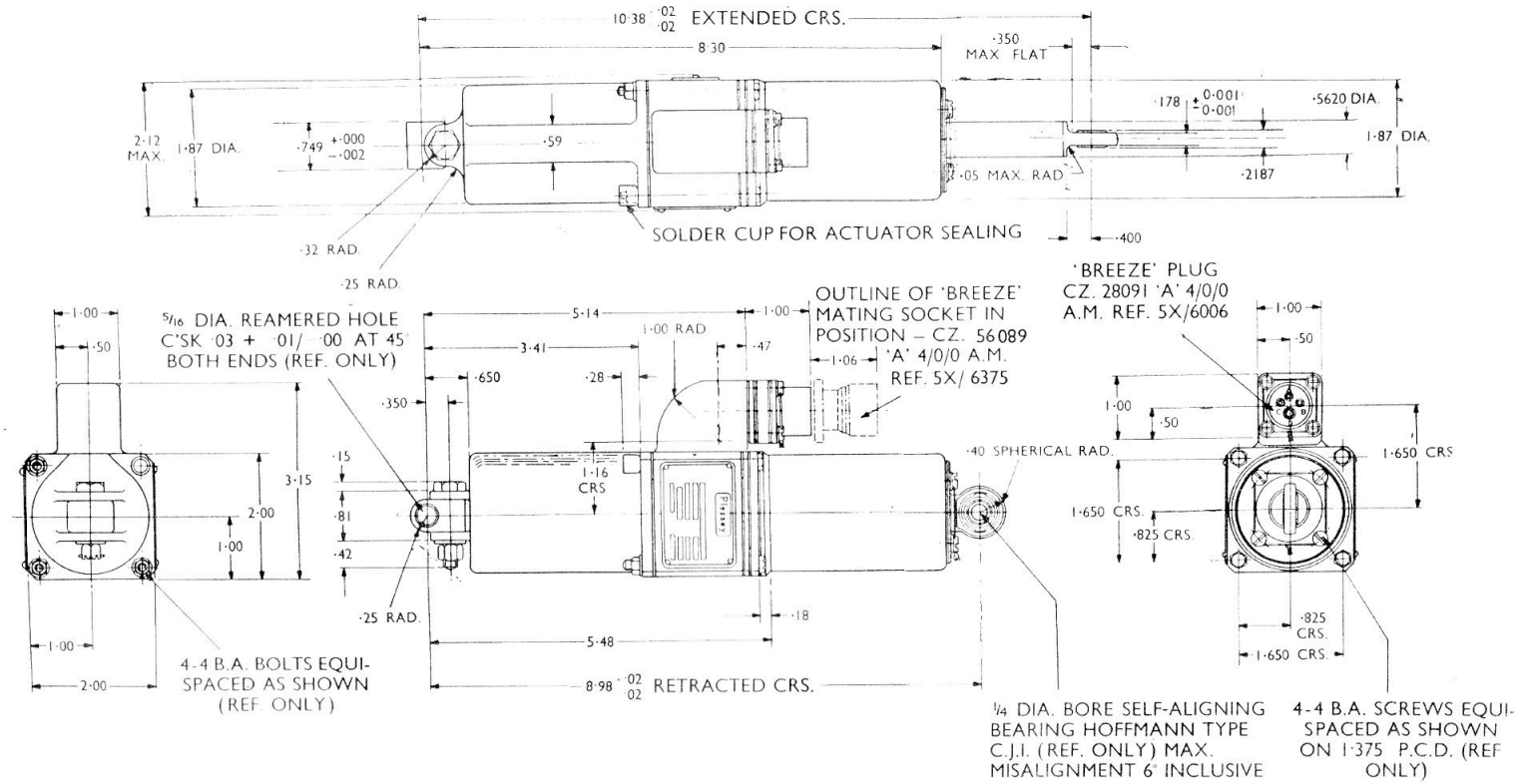
Appendix 6

ACTUATOR, PLESSEY, TYPE 1CZ82400

LEADING PARTICULARS

Actuator, Type 1CZ82400	*Ref. No. 5W/1392*
Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	50 *lb.*
maximum	150 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·5 *amp.*
Operating time for 1·4 *in. stroke*	9 *seconds minimum*
at 29*V d.c. (normal load)*	13·5 *seconds maximum*
Plunger stroke	1·4 *in.*
Fixing centres — retracted	8·98±0·020 *in.*
extended	10·38±0·020 *in.*
Ambient temperature range	−40 *to* +90 *deg. C.*
Weight	2 *lb.* 11 *oz.*
*Motor, Type C*1606*B*/5	*Ref. No. 5W/2727*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
*Brushes, Type CZ*62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·0125 *in.*
Brake disc and friction lining	
thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*

1. The actuator, Type 1CZ82400, is similar to the typical actuator described and illustrated in the main chapter. The peculiarities of this variant are given in Leading Particulars.



ALL DIMENSIONS IN INCHES

Fig. 1. Stroke setting and installation details

Appendix 7

ACTUATORS, PLESSEY, TYPES 1CZ135260, /A, /B and /C

LEADING PARTICULARS

Actuator, Type 1CZ135620	*Ref. No. 5W/2571*
Type 1CZ135620/A	*Ref. No. 5W/2572*
Type 1CZ135260/B	*Ref. No. 5W/2573*
Type 1CZ135260/C	*Ref. No. 5W/2574*

The following particulars are applicable to all variants : —

Operating voltage range	18 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	250 *lb.*
maximum	375 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·95 *amp.*
Maximum operating frequency	50 *inching cycles per hour*
Plunger thread	*Acme, single start*
Ambient temperature range	−60 *to* +90 *deg. C.*
Weight	3 *lb.*
Motor, Type 1606*B*/19	*Ref. No.* 5*W*/3496
Weight	12·5 *oz.*
Rating	1·5 *minutes*
*Brushes, Type CZ*62177/1	*Ref. No.* 5*W*/1041
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*
Reduction gear ratio	178 : 1

The following table details the variation in stroke of the four actuators

Type	Stroke (in.)	Centres (in.) Extended	Retracted
1CZ135260	3	13·250	10·250
1CZ135260/A	1·8	13·250	11·450
1CZ135260/B	0·5	12·0	11·5
1CZ135260/C	0·67	12·080	11·410

1. The actuators, Type 1CZ135260, /A, /B and /C, are similar to the typical actuator described and illustrated in the main chapter. Types 1CZ135260/A, 1CZ135260/B and 1CZ135260/C are variants of the basic type 1CZ135260. The differences between these variants are given under Leading Particulars.

2. These actuators are each fitted with a phosphor-bronze plunger which runs in a stainless steel bush. The general construction is otherwise similar to the typical model.

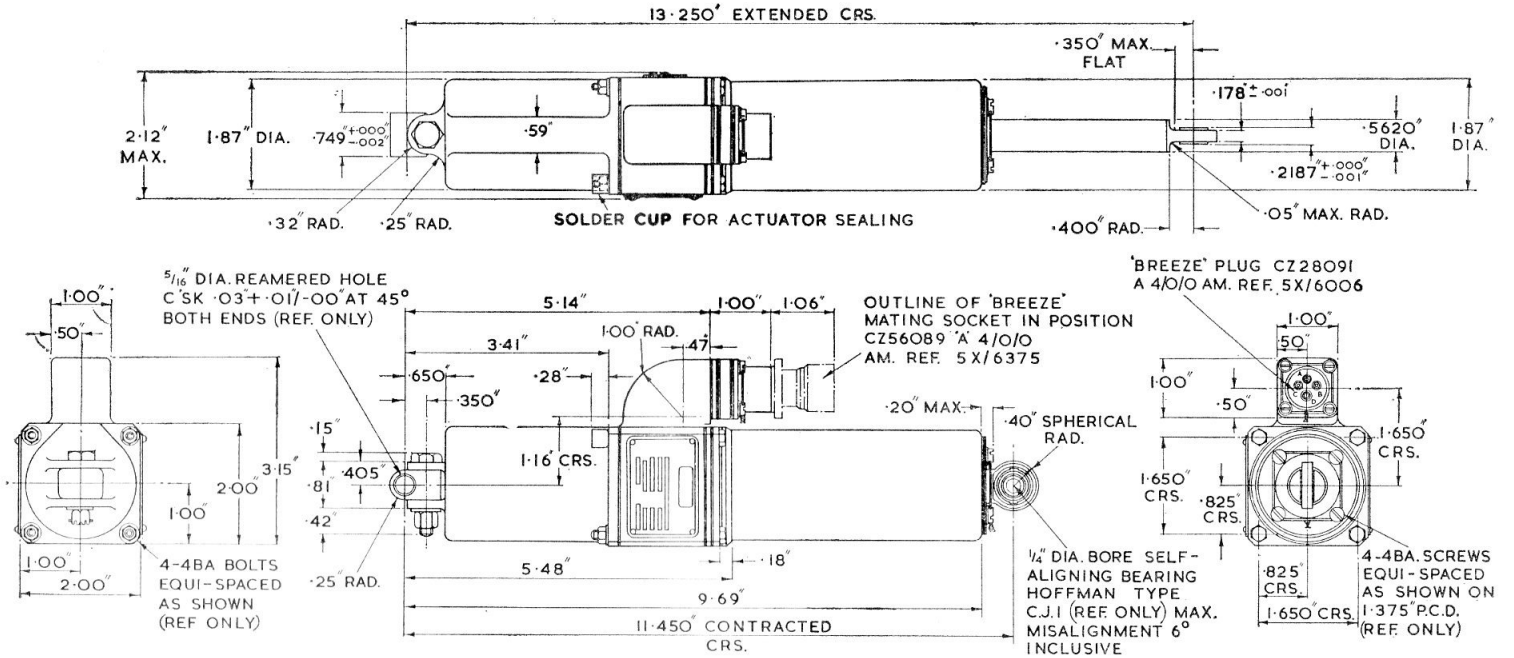


Fig. 1. Stroke setting and installation details for 1CZ135260/A

Appendix 8

ACTUATORS, PLESSEY, TYPES 1CZ135261, /A and /B

LEADING PARTICULARS

Actuator, Type 1CZ135261	*Ref. No.*
Type 1CZ135261/A	*Ref. No. 5W/2575*
Type 1CZ135261/B	*Ref. No. 5W/2576*

The following particulars are applicable to all three types:

Operating voltage range	22 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	250 *lb.*
maximum	375 *lb.*
Maximum static load	1,000 *lb.*
Plunger thread	*Acme, single-start, R.H.,* 16*T.P.I.*
Current consumption (normal load)	1·95 *amp.*
Maximum operating frequency	50 *inching cycles per hour*
Ambient temperature range	−50 *to* +90 *deg. C.*
Weight	3 *lb.*
Motor, Type 1606*B*/19	*Ref. No. 5W/3496*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
*Brushes, Type CZ*62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*
Reduction gear ratio	178 : 1

The following table details the variation in stroke of the three actuators.

Type	Stroke (in.)	Centres (in.) Extended	Retracted
1CZ135261	2·5	8·700	6·200
1CZ135261/A	0·45	7·675	7·225
1CZ135261/B	0·73	7·815	7·085

Extended and retracted centres refer to the distances between the centres of the actuator trunnions and front end fittings, at the extreme limits of plunger travel.

1. Plessey linear actuator, Type 1CZ135261, is a Cub Puma model in the series described in the main chapter. Types 1CZ135261/A and 1CZ135261/B are variants of the basic Type 1CZ135261. The three types are similar in construction and operation; the only difference between them is in the length of their working strokes, details of which are given in the Leading Particulars. Fig. 1 shows a cutaway view of the basic type. Actuator 1CZ135261/A is easily identified by the engraving VAL STI 5 on the motor housing, no lettering being engraved on the housings of the other two types.

2. All three actuators follow the general working principle outlined in the main chapter where a fractional horsepower reversible motor extends and retracts a plunger through a gearbox and leadscrew. Rotary movement of the leadscrew is converted into linear motion of the plunger by the torque-reaction ears of a special key fitted to the plunger; the ears locate in slots machined in the plunger housing and restrain the plunger from rotating with the leadscrew. The limits of the plunger travel are controlled by switches mounted at the sides of the plunger housing. These switches are normally "ON" and interrupt power supply to the motor when actuated by the torque-reaction ears of the plunger key. The mounted positions of the switches determine the length of the plunger stroke.

3. The actuators are mounted on trunnions and linked to associated equipment by front end fittings. The trunnions are secured by their integral flanges to the sides of the actuator gearboxes; the front end fittings are screwed and pinned to their respective plungers. The types of trunnions and end fittings used are the same for all three models.

4. Whilst the components of the three actuators are of the same design as those described in the main chapter, the material of the plunger tube differs in these actuators, in that it is phosphor-bronze.

5. A circuit diagram is shown in fig. 3 of the main chapter; it is applicable to all three actuators. Two single-pole, change-over type micro-switches and a four-pole plug are used, although only two terminals, at each switch, and three plug pins are connected into the circuit.

6. An installation diagram, applicable to all three actuators is shown in fig. 2. For details of an actuator installation in a particular aircraft, reference should be made to the appropriate aircraft Air Publication.

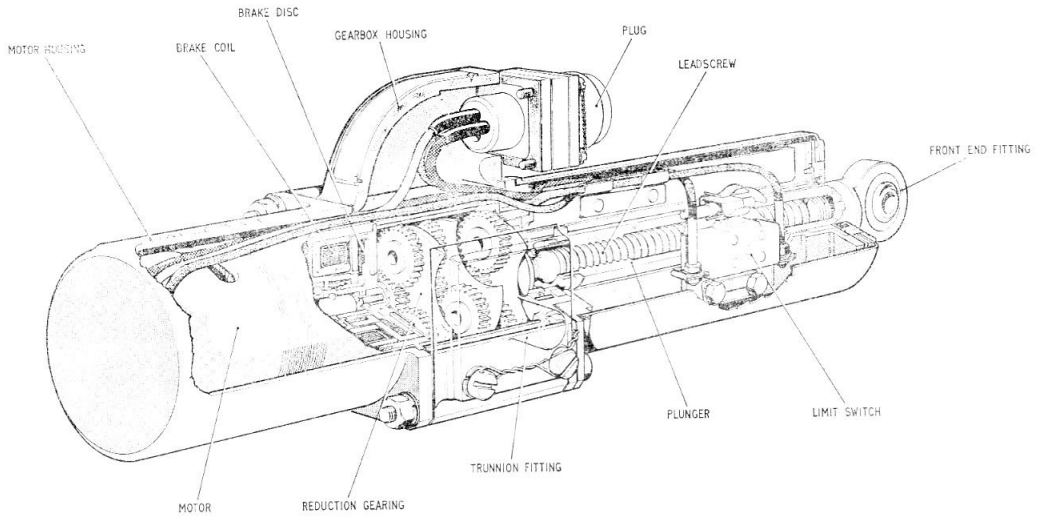
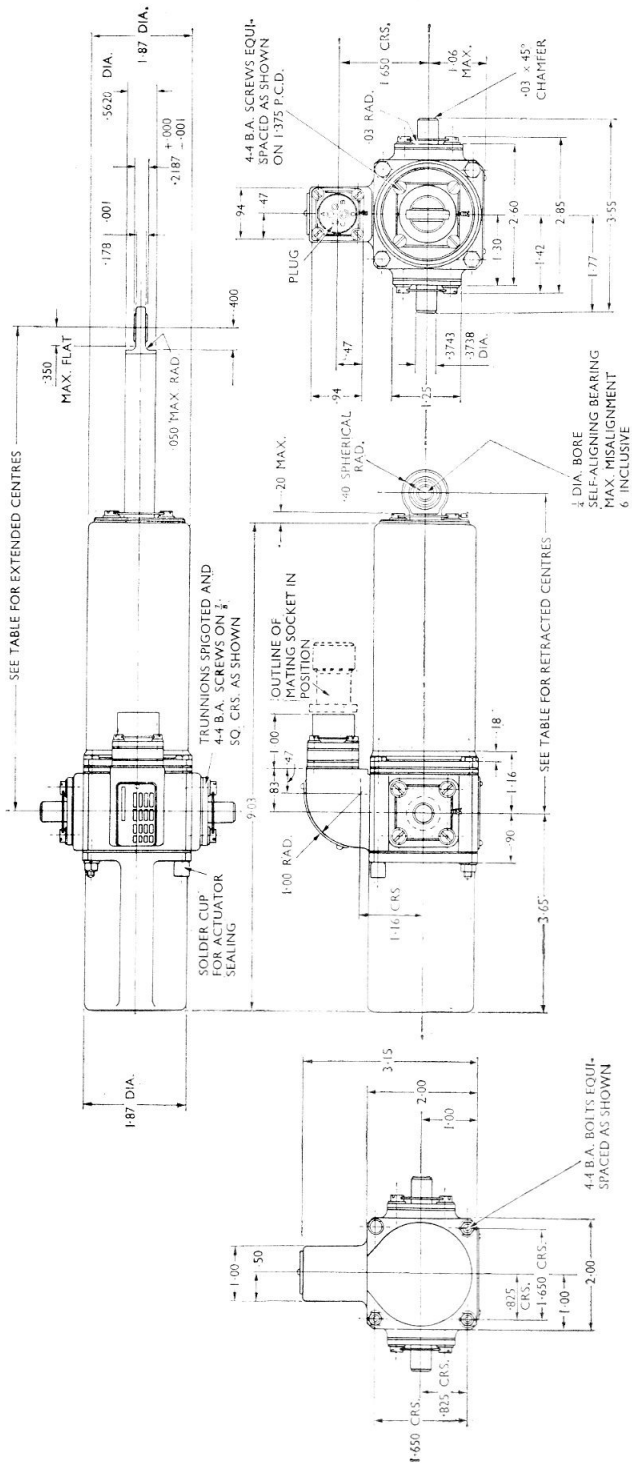


Fig. 1. Cutaway view of actuator, Type ICZ 135261



ALL DIMENSIONS IN INCHES

Fig. 2. Installation diagram

7. When fitting a new or overhauled unit, first check that the actuator is of the correct type for the installation; no adjustment of the plunger travel is possible in service since a special test rig is used to obtain the required accuracy. Ensure the actuator has not been damaged in transit and that all external screws, nuts and bolts are fully tightened and locked. After the actuator has been installed, check the security of the installation and operate the actuator to ensure that it functions correctly.

8. The servicing instructions given in the main chapter are applicable to these actuators. The only additional information required is that regarding lubrication of the plunger which must be lightly greased at scheduled servicing periods.

Appendix 9

ACTUATOR, PLESSEY, TYPE 1CZ136150

LEADING PARTICULARS

Actuator, Type 1CZ136150	*Ref. No. 5W/3848*
Operating voltage range	22 *to* 29*V d.c.*
Normal voltage	28*V d.c.*
Working load — normal	250 *lb.*
maximum	375 *lb.*
Maximum static load	1,000 *lb.*
Current consumption (normal load)	1·95 *amp.*
Maximum operating frequency	50 *inching cycles per hour*
Plunger — stroke	3 *in.*
thread	*Acme, single start, R.H., 18T.P.I.*
Centres — retracted	10·25 *in.*
extended	13·25 *in.*
End fitting — rear	*Z59598*
Ambient temperature range	−50 *to* +90 *deg. C.*
Weight	3 *lb.*
Motor, Type C1606B/19	*Ref. No. 5W/3496*
Weight	12·5 *oz.*
Rating	1·5 *minutes*
Brushes, Type CZ62177/1	*Ref. No. 5W/1041*
Length — new	0·355 *to* 0·385 *in.*
worn	0·25 *in.*
Commutator diameter — new	0·490 *to* 0·495 *in.*
worn	0·450 *in.*
after skimming	0·470 *in.*
Armature shaft journal diameter —	
commutator end	0·1249 *to* 0·1253 *in.*
drive end	0·1874 *to* 0·1878 *in.*
Brake air gap	0·008 *to* 0·011 *in.*
Brake disc and friction lining	
Thickness — new	0·120 *to* 0·125 *in.*
worn	0·115 *in.*
Reduction gear ratio	178 : 1

1. Plessey linear actuator, Type 1CZ136150, is a variant in the Cub Puma series described in the main chapter. A cutaway view of the actuator is shown in fig. 1. The following text describes the salient features of the actuator and establishes any departures, from the general design, not covered by the Leading Particulars.

2. The actuator operating principle follows that outlined in the main chapter where a fractional-horsepower reversible motor extends and retracts a plunger through a gearbox and leadscrew. Rotary movement of the leadscrew is converted into linear motion of the plunger by the torque-reaction ears of a special key fitted to the plunger; the ears locate in slots machined in the plunger housing and restrain the plunger from rotating with the leadscrew. The limits of plunger travel are controlled by switches mounted at the sides of the plunger housing. These switches are normally "ON" and interrupt power supply to the motor when actuated by the torque-reaction ears of the plunger key.

3. End fittings are provided for mounting the actuator and for linking it to associated equipment. The rear end fitting is bolted to a bracket integral with the motor cover; the front end fitting is screwed and pinned to the plunger.

4. Whilst the actuator components are of the same design as those described in the main chapter, the plunger tube in this variant is made of phosphor-bronze.

5. Fig. 3 shows the schematic diagram for the wiring of this actuator; it includes the addition to the circuitry typified in the main chapter. Two single pole, change-over type micro-switches and a four-pole plug (Ref. No. 5X/6006), are used. The circuit is designed to provide normal remote control of the actuator and, in addition, to enable an external warning light to be connected into the circuit. The connections are so made that the light should automatically operate when the plunger has reached the pre-set limit of travel in the "extend" position.

6. The general information given in the main chapter regarding installation of the actuator is applicable to this variant. However, although the recommendation regarding lubrication of the plunger is still applicable, it is necessary to maintain a thin film of grease on the plunger at all times. This instruction has arisen as, subsequent to the issue of the original advice, it has been noted that lubricant applied during assembly has been inadvertently or erroneously wiped off the plunger prior to installation of the actuator. Reference must be made to the appropriate Air Publication for details of installation in a particular aircraft.

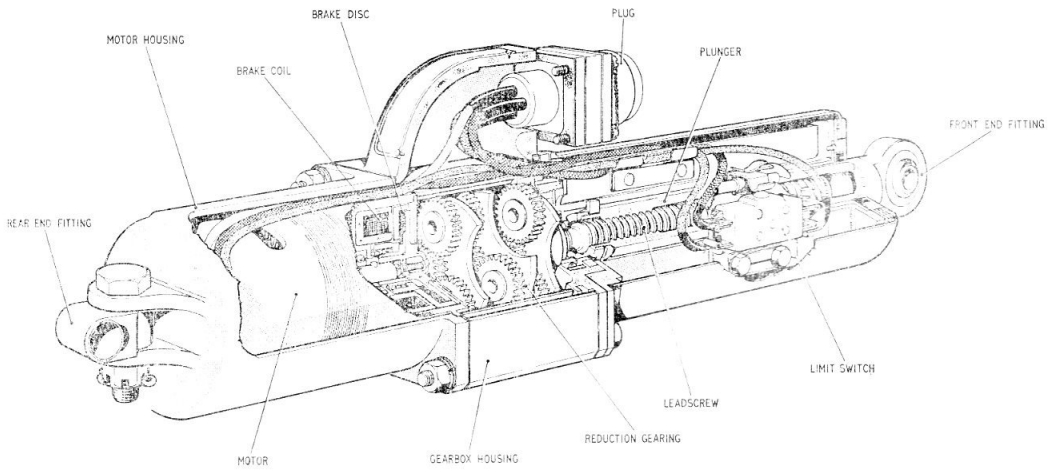
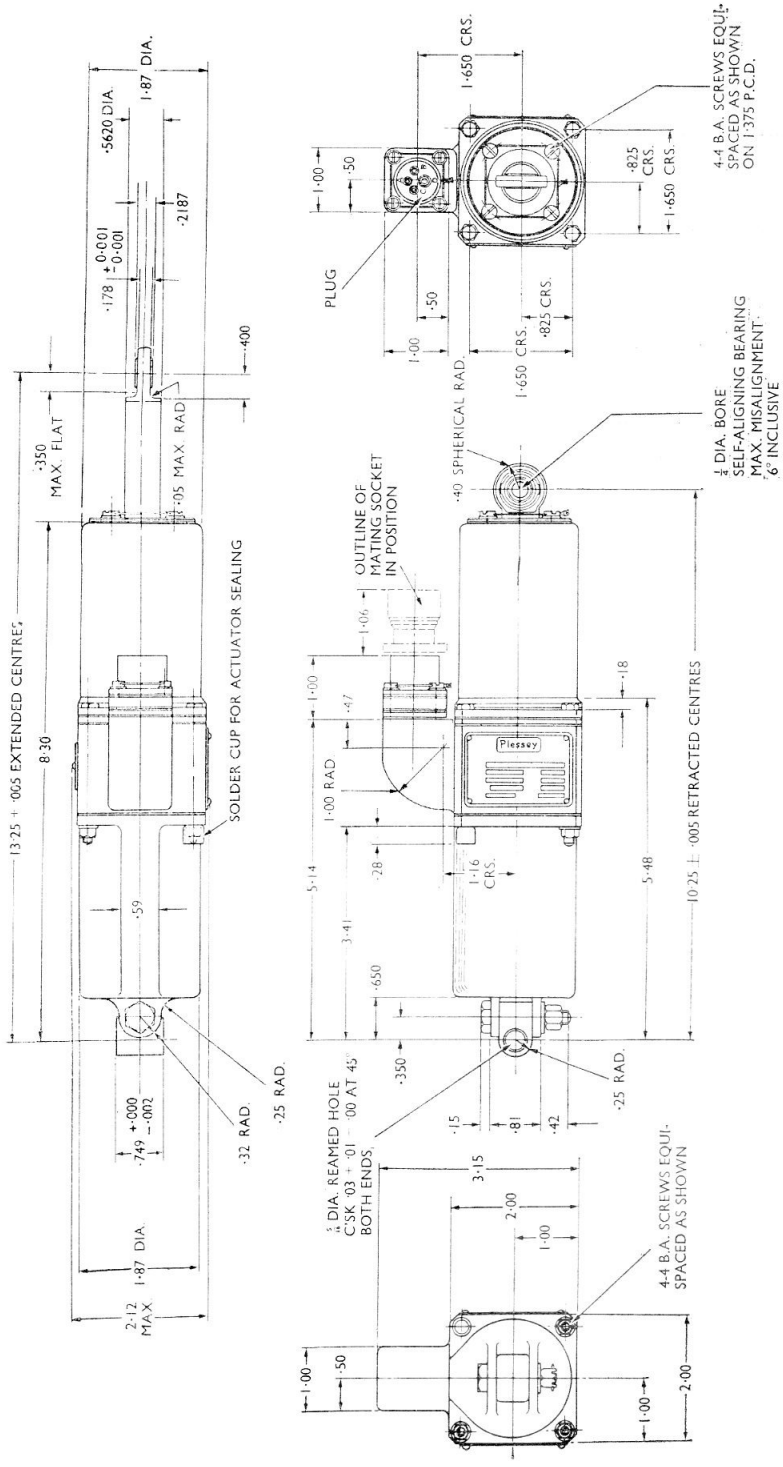


Fig. 1. Cutaway view of actuator



ALL DIMENSIONS IN INCHES

Fig. 2. Installation diagram

7. The servicing instructions detailed in the main chapter are applicable to this actuator. The only additional information required is that regarding lubrication of the plunger which must be lightly greased at scheduled servicing periods.

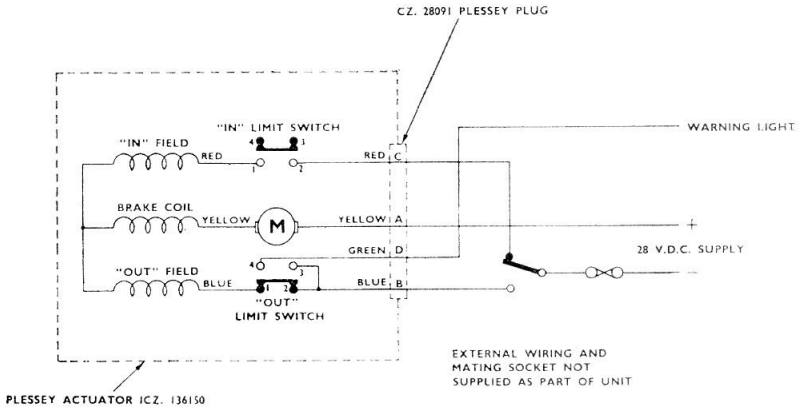


Fig. 3. Circuit diagram

Printed for H.M. Stationery Office by Ezra Sidebotham Ltd., Wigan.
245077/Wt.21389/D.2425 1,875 11/62 Gp.375/7.