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TACHOMETER INDICATORS TYPE KTD 1100 AND KTD 1300 SERIES

GENERAL AND TECHNICAL INFORMATION

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TACHOMETER INDICATORS
TYPE KTD 1100 SERIES AND KTD 1300 SERIES

LIST OF CHAPTERS

Chapter

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- 1-1 Tachometer indicators, Type KTD 1100 series.
- 1-2 Tachometer indicators, Type KTD 1300 series.
- 2 Standard serviceability tests.

Chapter 1

GENERAL DESCRIPTION

INTRODUCTION

1. The tachometer indicators in the Type KTD 1100 and KTD 1300 series are fitted in aircraft to indicate engine speed in revolutions per minute (rev/min), and operate in conjunction with a tachometer generator, driven by the engine.
2. The Type KTD 1100 series and Type KTD 1300 series indicators are, basically, similar in construction and are identical in operation. The difference between the two series being in the gear ratio of the respective gearboxes.

DESCRIPTION

GENERAL

3. Each indicator consists, essentially, of a three-phase, self-starting synchronous motor, which operates a co-axial magnetic drag element to move two pointers over a dial calibrated in R.P.M.

DIAL AND POINTER

4. The dial has an outer scale graduated at intervals of 1 000 rev/min and a subsidiary scale, located at the top centre of the dial, graduated at intervals of 100 rev/min. The secondary pointer makes one revolution of the subsidiary scale for every 1 000 rev/min indication on the outer scale. The dial markings and pointers can be luminized, fluorized or plain white, to suit the particular installation requirements. Details of the dial finish of any indicator are given in the chapter referring to that indicator.



Fig.1 Tachometer indicator - general view

CASE

5. The indicator mechanism is housed in a sealed case which is filled with an inert gas to ensure trouble free operation. Electrical connection to the generator is by a sealed 3-pin plug at the rear of the case. An external screw thread at the front of the case facilitates installation.

MOTOR (fig.2)

6. The stator windings of the motor are connected to the 3-pin plug. The rotor assembly consists of a permanent magnet, free to rotate on the rotor shaft and mounted between the two halves of a hysteresis rotor, each half being secured to the rotor shaft. A peg protrudes from the side of the magnet and engages a similar peg protruding from one of the hysteresis rotors.

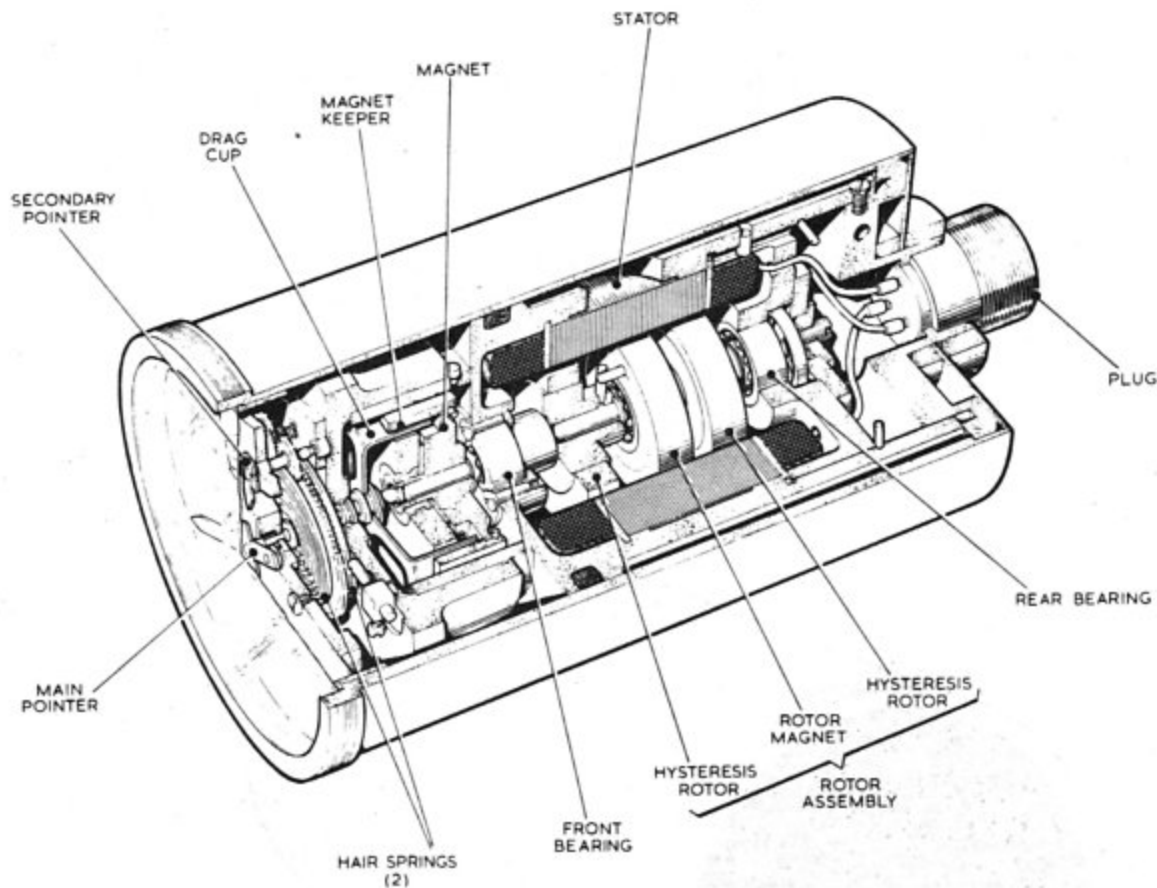


Fig.2 Tachometer indicator - cutaway view

MAGNETIC DRAG ASSEMBLY AND GEARBOX

7. A magnetic drag assembly is mounted on the front end of the rotor shaft. This assembly consists of a 4-pole cruciform shaped magnet attached

to the shaft and surrounded by a magnetic shield, which is positioned so that a narrow air gap separates the shield and the magnet. Located in the air gap is a copper drag cup, mounted on the main handstaff, together with two hairsprings. A top plate mechanism is located between the magnetic drag assembly and the dial, this mechanism carries a gear train which transmits the rotary motion from the rotor shaft to the two pointers.

OPERATION

8. Rotation of the tachometer generator rotor produces a rotating magnetic field in the stator windings of the indicator; the speed of this field being controlled by the output frequency of the generator. The rotating magnetic field in the stator produces a torque in the magnet on the rotor shaft, causing it to revolve in synchronism with the field. The peg on the magnet engages with the peg on the hysteresis rotor, causing the rotor to turn at the same speed as the magnet. At higher speeds the motor runs as a hysteresis motor, the use of the hysteresis rotor ensuring synchronization of the indicator and generator at approximately ten per cent of the maximum speed.

9. When the indicator rotor revolves, the permanent magnet, mounted on the rotor shaft, rotates within the drag cup. The rotating field of the permanent magnet induces eddy currents in the drag cup which, in turn, create their own magnetic fields. Interaction between the magnetic fields produced by the permanent magnet and the eddy currents, results in a magnetic torque within the drag cup, which causes the drag cup to rotate.

10. The rotary movement of the drag cup is transmitted, through the handstaff and gears, to the two pointers. This action is opposed by the hairspring and, when the hairspring torque equals the eddy current torque, the drag cup ceases to rotate, and the indicator reading stabilizes at a value corresponding to the engine speed.

INSTALLATION

11. Two methods of installation may be used to mount the indicator, these are by use of a bezel and clamping ring, or by a securing clamp. In the first method a flanged bezel screws on to the externally threaded front of the case and is retained by the clamping ring. The indicator is then secured to the instrument panel by four screws and insert nuts in the bezel. The second method uses a special clamp which is placed over the front end of the case and tightened around it: a fixing screw passes through the instrument panel into a block on the clamp. Alternatively the clamp may have a square flange and two fixing screws.

SERVICING

12. Examine the exterior of the indicator for damage and corrosion, paying particular attention to the sealing of the 3 pin plug. If the serviceability of the indicator is suspect, carry out the tests detailed in Chapter 2.

Chapter 1-1

TACHOMETER INDICATOR

TYPE KTD 1100 SERIES

(incorporating modifications up to B. 647)

LEADING PARTICULARS

Case dia.	...	...	...	...	...	...	2 in.
Weight	...	...	...	...	...	...	1.25 lbs.
Range	...	...	...	...	...	...	0 to 2 000 rev/min.
Ref.No.(KTD 1101K)	...	...	...	...	...	...	6A/6504
(KTD 1101W)	...	...	...	...	...	...	6A/8577

DESCRIPTION

1. The tachometer indicator, Type KTD 1101K and KTD 1101W are basically similar in construction and operation; the difference being that the type KTD 1101K is provided with fluorized dial markings and pointers, whereas the type KTD 1101W is provided with white painted dial markings and pointers. These indicators are similar to the general description given in Chapter 1. The electrical connection to the generator is by a 3-pin plug at the rear of the case. The plug connections are as follows:-

Pin A - phase 2
 Pin B - phase 1
 Pin C - phase 3



Fig.3 Dial presentation of indicator, type KTD 1301W

SERVICING

2. Serviceability tests are quoted in Chapter 2 and a list of test points and tolerances is given in Table 1.

TABLE 1
Test points and tolerance

Test bench speed (rev/min)	Indicator speed (rev/min)	Tolerance (rev/min)
500	2 000	± 100
1 000	4 000	± 100
2 000	8 000	± 100
3 000	12 000	± 100
4 000	16 000	± 100
5 000	20 000	± 100

MODIFICATIONS

3. Modifications applicable to the Type KTD 1100 series indicators are listed in Table 2.

TABLE 2
List of modifications

Manufacturer's Mod. No.	Mod. No.	Brief description
01 (AMI B187)		To improve running conditions in the gearbox
02 (AMI B297)		Introduction of improved pins on hysteresis rotors and bearings lubricated with grease to DTD. 825.
03 (AMI B647)		Introduction of collet on drumstaff
04 (AMI B755)		Increase in top mechanisation operating torque.

Chapter 1-2

TACHOMETER INDICATORTYPE KTD 1300 SERIES

(Incorporating modifications up to B.298)

LEADING PARTICULARS

Case dia.	...	...	...	...	...	2 in.
Weight	...	...	...	...	...	1 lb.
Range	...	...	...	...	...	0 to 10 000 (rev/min)
Ref. No. (KTD 1301K)	...	...	...	...	...	6A/6670
Ref. No. (KTD 1301W)	...	...	...	...	...	6A/7787

DESCRIPTION

1. The tachometer indicators type KTD 1301K and KTD 1301W are basically similar in construction and operation; the difference being that the Type KTD 1301K is provided with fluorized dial markings and pointers, whereas the Type KTD 1301W is provided with white painted dial markings and pointers. These indicators are similar to the general description given in Chapter 1. The electrical connection to the generator is by a 3-pin plug at the rear of the case. The plug connections are as follows:-

Pin A - phase 2
Pin B - phase 1
Pin C - phase 3



Fig.4 Dial presentation of indicator, type KTD 1301W

SERVICING

2. Serviceability tests are quoted in Chapter 2 and a list of test points and tolerances is given in Table 1.

TABLE 1
Test points and tolerances

Test bench speed (rev/min)	Indicator speed (rev/min)	Tolerance (rev/min)
500	1 000	± 50
1 000	2 000	± 50
2 000	4 000	± 50
3 000	6 000	± 50
4 000	8 000	± 50
5 000	10 000	± 50

MODIFICATIONS

3. Modifications applicable to the Type KTD1300 indications are listed in Table 2.

TABLE 2

Manufacturer's Mod.No.	Mod.No.	Brief description
01	B.180	To improve running conditions in the gearbox
02	B.298	Introduction of improved pins on hysteresis rotor and bearings lubricated with grease to DTD 825

Chapter 1-2

TACHOMETER INDICATORTYPE KTD 1300 SERIES

(Incorporating modifications up to B.298)

LEADING PARTICULARS

Case dia.	...	...	...	...	...	2 in.
Weight	...	...	...	...	...	1 lb.
Range	...	...	...	...	...	0 to 10 000 (rev/min)
Ref. No. (KTD 1301K)	...	...	...	...	...	6A/6670
Ref. No. (KTD 1301W)	...	...	...	...	...	6A/7787

DESCRIPTION

1. The tachometer indicators type KTD 1301K and KTD 1301W are basically similar in construction and operation; the difference being that the Type KTD 1301K is provided with fluorized dial markings and pointers, whereas the Type KTD 1301W is provided with white painted dial markings and pointers. These indicators are similar to the general description given in Chapter 1. The electrical connection to the generator is by a 3-pin plug at the rear of the case. The plug connections are as follows:-

Pin A - phase 2

Pin B - phase 1

Pin C - phase 3



Fig.4 Dial presentation of indicator, type KTD 1301W

SERVICING

2. Serviceability tests are quoted in Chapter 2 and a list of test points and tolerances is given in Table 1.

TABLE 1
Test points and tolerances

Test bench speed (rev/min)	Indicator speed (rev/min)	Tolerance (rev/min)
500	1 000	± 50
1 000	2 000	± 50
2 000	4 000	± 50
3 000	6 000	± 50
4 000	8 000	± 50
5 000	10 000	± 50

MODIFICATIONS

3. Modifications applicable to the Type KTD1300 indications are listed in Table 2.

TABLE 2

Manufacturer's Mod.No.	Mod.No.	Brief description
01	B.180	To improve running conditions in the gearbox
02	B.298	Introduction of improved pins on hysteresis rotor and bearings lubricated with grease to DTD 825.

Chapter 2

STANDARD SERVICEABILITY TESTS

for

TACHOMETER INDICATORSTYPE KTD 1100 and KTD 1300 SERIES

INTRODUCTION

1. The tests detailed in this chapter are to be applied to the tachometer indicators, Type KTD 1100 and KTD 1300 immediately prior to installation in aircraft, or if serviceability is suspect. The tests are also to be applied at re-inspection periods at Equipment Depots. Any tolerances specified are not to be exceeded.

TEST EQUIPMENT

2. The following test equipment is required:-

- (1) Tester, insulation resistance, Type C (Ref.No. 5G/152).
- (2) A serviceable, Mk.II percentage generator.
- (3) Dual tachometer tester Ref.No. 6C/3000, 6C/2391 or 6C/2392).
or tachometer tester, bench type (Ref.No.6C/1879 or 6C/1880).
or tachometer calibrator, Mk.2 (Ref.No. 6C/869).

TEST PROCEDURE

METHOD OF TEST

3. During the ranging tests, the indicator is to be mounted in the normal position, that is, with the dial upright and in the vertical plane. Light tapping of the indicator is permissible during the tests.

INSULATION RESISTANCE TEST - ROOM TEMPERATURE

4. Using the Type C tester, measure the insulation resistance between each pin of the plug and the body, in turn. The resistance in each instance must not be less than 20 megohms at 250V.

INSULATION RESISTANCE - HOT

5. Using the Type C tester, measure the insulation resistance between each pin of the plug and the body in turn. The resistance in each instance must not be less than 5 megohms at 250V.

RANGING TESTS

6. Connect the generator to the tester or calibrator, then connect the indicator to the generator. If the generator is driven clockwise, pins A, B and C of the generator must be connected to pins A, B and C of the indicator. If the generator is driven counter-clockwise, pins A, B and C of the generator must be connected with pins A, C and B respectively of the indicator. Switch on the test equipment and exercise the generator and indicator by running for 10 minutes at approximately 15000 rev/min for the Type KTD 1101W, and at 7500 rev/min for the type KTD 1301K and W. At the end of the period, reduce the speed to zero.

7. Slowly increase the generator speed from zero and check the speed at which the generator and indicator synchronize. This must occur at or below the following speeds:-

Type KTD 1100 series - 2000 rev/min.

Type KTD 1300 series - 1000 rev/min.

8. Check the accuracy of the indicator at the test points quoted in Table 1 (Chap. 1-1 or Chap. 1-2). The error at any point must not exceed the given tolerance. Any lag as shown by the difference between readings taken at increasing and decreasing speeds, must not exceed 100 rev/min for the KTD 1100 series and 50 rev/min for the KTD 1300 series.