

Page 1 of 4	Issued on 29.06.2007	RDSO/2007/EL/SMI/0245 (REV 0) dt. 29.06.2007
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No. EL/2.2.2

Dtd.29.06.2007

**CHIEF ELECTRICAL ENGINEER,**

Northern Railway, Baroda House, New Delhi-110 001  
Eastern Railway, Fairlie Place, Calcutta-700 001  
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Central Railway, Mumbai CST-400 001  
Western Railway, Churchgate, Mumbai-400 020  
Southern Railway, Park Town, Chennai-600 003  
South Central Railway, Rail Nilayam, Secunderabad-71  
East Central Railway, Hazipur (Bihar)  
East Coast Railway, BDA Colony, Rly Complex, Chandrasekharapur, Bhubaneswar  
South East Central Railway, Bilaspur-495 004  
West Central Railway, Jabalpur-482 001  
North Central Railway, Hasting Road, Allahabad-211 001  
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***SPECIAL MAINTENANCE INSTRUCTION No. RDSO/2007/EL/SMI/0245 (REV 0)  
dt. 29.06.2007***

- 1.0 TITLE:  
Ultrasonic test procedure to detect cracks at the key groove portion of DJ flange shaft.
- 2.0 BRIEF HISTORY:
  - 2.1 Railways have reported cases of on line failures of locomotives due to breakage of flange & shaft assembly of DJ manufactured and supplied by M/s BT,Vadodara.
  - 2.2 Breakage cases of flange & shaft assembly of DJ have been examined in association with the OEM i.e. M/s BT, who advised to restore normal working pressure from 9.5 kg/cm<sup>2</sup> to 7.5 kg/cm<sup>2</sup>, replace the flange & shaft assembly within 6-8 years time. However from the failure data received from railways, it is seen that there is no definite trend of failure of DJ flange shaft before & after removal of D24 B valve.
  - 2.3 Flange with shaft in DJ is factory press fitted and hence condition monitoring of same at key groove portion in service is difficult. BRC, electric loco shed of Western Railway has suggested ultrasonic test procedure to detect cracks at the key groove portion of flange & shaft assembly of DJ as the same is inaccessible for either visual checks or tests and detected number of cases.

Page 2 of 4	Issued on 29.06.2007	RDSO/2007/EL/SMI/0245 (REV 0) dt. 29.06.2007
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### 3.0 OBJECT:

Detection of cracks through ultrasonic testing to avoid breakage of flange & shaft assembly and on line failures.

### 4.0 MODIFIED INSTRUCTION:

Equipment & accessories along with its procurement source, approximate cost, testing techniques and detection criteria to detect cracks at the key groove portion of DJ flange shaft with ultrasonic testing procedure is enclosed as **Annexure-A**.

### 5.0 APPLICATION TO CLASS OF LOCOMOTIVES:

All class of locomotives fitted with Air Blast Circuit Breaker (DJ).

### 6.0 AGENCY OF IMPLEMENTATION:

All electric loco sheds & POH shops holding locomotives fitted with air blast circuit breaker.

### 7.0 PERIODICITY OF IMPLEMENTATION:

Every AOH, IOH & POH

### 8.0 REFERENCE

Western Railway's letter No. EL 91/7/11 dt 11.11.2005 & MOM of 31<sup>st</sup> MSG meeting held on 25<sup>th</sup> & 26<sup>th</sup> Sept-2006 at Secunderabad.

### 9.0 DISTRIBUTION:

As per mailing list

**(Hari Narayan)**  
For Director General/Electrical

## Annexure- A

### 1.0 Equipment & Accessories:

- 1.1 **Equipment:** CRO, UFD Model Galileo 100 (R)
- 1.2 **Accessories:** High angle probe 70°, 4 MHZ, dia. 10mm with dia. of curvature 24mm to suite the contour of the shaft .
- 1.3 Couplant: Soft grease

### 2 Source of equipments

M/s. Modsonic Instruments Manufacturing Co. Pvt. Ltd.  
 Plot No. 33, phase 111, GIDC Ind. Estate,  
 Naroda, Amdavad – 382330 (Gujarat State) India.  
 Telephone: (079) 22811217 22813131 and 22841294  
 FAX: 079-2282012  
 E mail: [modsonic@vsnl.com](mailto:modsonic@vsnl.com)  
 Web site: [www.Modsonic.com](http://www.Modsonic.com)

Cost: Rs. 2 Lacs (approx).

**NOTE:** Electric loco sheds/POH shops having CRO need not to procure again and procure only probe.

- 3 **Testing Techniques:** Since the shaft is having so manly holes on the body, full skip distance probing is not possible; so only half skip distance probing is employed.

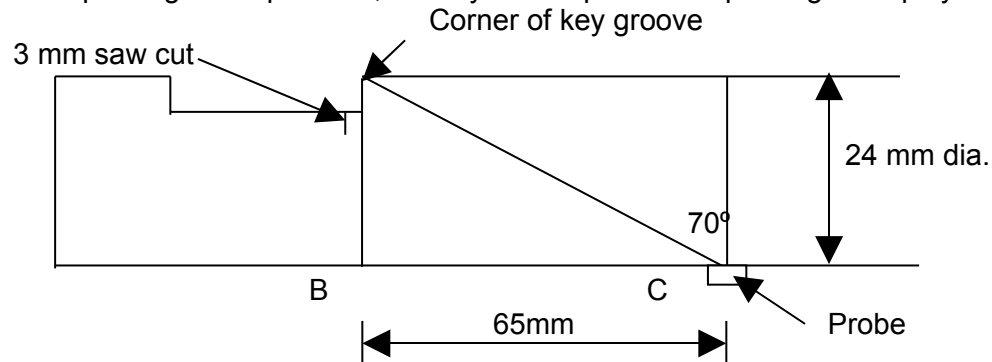


FIG. 1

a) Half skip distance (BC) - = dia. of shaft x tan 70°  
 = 24 x 2.74  
 = 65 mm

b) Beam path (AC)  
 = dia of shaft x sec 70°  
 = 24x2.92  
 = 70 mm

Half skip distance- S/2 = dia of shaft x tan 70°  
 = 24x2.74  
 = 65mm

Beam path for half skip distance probing (AC) = dia of shaft x sec 70°  
 = 24x2.92  
 = 70mm

Page 4 of 4	Issued on 29.06.2007	RDSO/2007/EL/SMI/0245 (REV 0) dt. 29.06.2007
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A high angle probe shall be place on the body of the shaft with probe index marking at 65mm (half skip distance) away from the key group corner as shown in fig.1. The probe shall be moved backward and forward longitudinally from the mean position and also circumferentially on the body of the shaft to obtain maximum amplitude of echo from the corner of key groove at about 7.0 div. (1msd=10mm) on the CRT.

Now adjust the gain setting to obtain 40% height of the reference signal at 7.0 div. Remove the probe from the shaft and place the probe on another shaft, which is having a saw cut at about 3mm deep adjacent to corner of the key groove portion. This will give a double echo at 7.0 & 7.2 div. Due to the reflection from corner and a saw cut. The oscillogram patterns as obtained from the shaft free from flaws and the same with a simulated flaw are shown in FIG.2

#### **4.0 Detection Criteria:**

- 4.1 The shaft without defect will show one peak as shown in FIG. 2(a).
- 4.2 The shaft with defect will show two peaks as shown in FIG. 2(b) and should be withdrawn from service.

Oscillogram Pattern without flaw

FIG. 2(a)

Oscillogram Pattern without flaw

FIG. 2(b)