



**Government of India
Ministry of Railways**

**QMS-07:2000
(Revision 0)**

**Schedule of Infrastructure, manufacturing & testing facilities
and quality control requirements**

for

Slack Adjuster
(Specn. No. 07-ABR-92)

**Inspection & Liaison Directorate
Research Designs & Standards Organisation
Manak Nagar Lucknow – 226011**

February'2009

(Price Rs. 1200/-)

1.0 SCOPE

- 1.1 This schedule covers the norms for manufacturing of Slack Adjuster IRSA-600 & IRSA-600J for freight stock & IRSA-450 of coaching stock, designed for automatic controlling of brake block clearance and brake cylinder piston travel.

2.0 REQUIREMENTS

The vendors seeking approval shall have the required facilities as mentioned below:

General & Manufacturing Facilities

- 2.1 Manufacturer shall have adequate covered accommodation for the storage of raw material, bought-out components and finished items awaiting despatch which is free from dust/dirt/moisture.
- 2.2 Manufacturers shall have full fledged Machine shop to machine all the important components mentioned in Annexure-B.
- 2.3 Manufacturers shall have dust free assembly, inspection and testing shop.
- 2.4 Following machinery & plant with adequate capacity should be available.
- 2.4.1 Minimum two numbers Multistart Thread milling/Thread rolling machine for thread cutting on adjuster spindle.
- 2.4.2 Minimum two numbers special purpose Tapping Machines for thread cutting on adjuster nut and leader nut.
- 2.4.3 Following dedicated general purpose machines shall be available:
Centre Lathe, Turret, Capstan, Grinding, Drilling Power Saw, Shearing, Copy turning (preferably) are required for shearing, partings, turning, milling, Shapping, grinding, drilling, boring etc., to adjuster nut leader nut, traction sleeve, clutch ring, Adjuster tub socket, Leader nut casing, Spindle sleeve, Ear Bushing, Safety collar, Leader nut flange, Clutch sleeve, Adjuster tube, Actuating sleeve, Barrel, Adjuster Ear, Barrel Head etc.
- 2.4.4 Minimum two numbers Welding Machine for protection tube & dust bushing.
- 2.4.5 One pneumatic press of 10 kg capacity for pneumatic fixture required to assemble traction unit in barrel.
- 2.5 Facilities for surface treatment
- 2.5.1 Manufacturers shall have adequate facilities for hot phosphating as per IS:3618 for adjuster nut, leader nut, clutch sleeve, leader nut casting, etc. Phosphating arrangement should have facilities for cleaning, degreasing, derusting, phosphating and passivation with arrangement for temperature and weight of phosphating items.

- 2.5.2 A suitable salt-spray test arrangement should be available to ensure the effectiveness of phosphating.
- 2.5.3 Manufacturer shall have facilities for zinc plating or galvanising as per IS:1573 for safety collar, lock screw, spring adjuster tube, adjuster spindle, sleeve, tab washer and barrel head, coating thickness of 8-15 microns should be achieved.
- 2.5.4 At least one posimeter for measuring thickness should be available.
- 2.6 Other accessories
- 2.6.1 At least one air compressor of capacity 100 CFM which can provide test pressure of 10 kg/cm² shall be available.
- 2.6.2 Tool room facility – the manufacturer should ensure following tool room facilities
- (a) Universal milling machine
 - (b) External cylinder grinding for different type of gauges
 - (c) Twist drill grinding machine with web thinner
 - (d) Slip gauge box (inspection grade)
 - (e) Mechanical comparators for checking gauges, segmented plug gauge and cylinder gauges.
 - (f) Flowing carriage micrometer for checking screw plug gauges.
 - (g) Sine bar and sine centre
 - (h) Universal tool and cutter grinder
 - (i) Lapping machine
 - (j) Common measuring instruments.
- 2.6.3 Ensure that adequate material handling equipment i.e. trolley, forklifter, conveyor, etc. are available.
- 2.6.4 Calibration facilities for gauges and fixture i.e. surface table, master gauge, Vernier, micrometer etc. should be available. The policy and frequency for calibration should also be specified.

3. TESTING FACILITIES

- 3.1 Supplier shall have adequate facilities for checking of slack adjuster components according to the dimensional tolerances and surface finish shown on the RDSO drawings and also facilities for testing of complete payin and payout (450mm & 600mm) Slack Adjuster assembly.
- 3.2 Manufacturer should have arrangement of checking piston stroke, 'e' dimension, brake block clearance over wheel thread etc. in mock up i.e. simulating the actual condition of rolling stock of different types.
- 3.3 Performance test rig for testing payin and payout capacity of complete slack adjuster assembly for complete range i.e. 600mm for freight stock slack adjuster

and 450mm for coaching stock slack adjuster (ref. Para 1.4.1 of Annexure-B of Specification WD-07-ABR-92.

- 3.4 Rig for testing loss of force in the slack adjuster should be available to ensure barrel movement of 40mm for freight and 25mm for coaching stock with respect of adjuster tube shall not be more than 310 kgs.
- 3.5 Manufacturer should have load testing machine of 500 kgs capacity for testing take up spring, payout/payin clutch spring and barrel spring.
- 3.6 Suitable testing fixture for conducting tests on circlip as per IS:3073 should be available. The fixture should have facility to check at 30° bend and flatness.
- 3.7 Test arrangement to check spring dowel sleeve by reducing dia about 20% with the help of hard press and hardened block having hole of different dias should be available.
- 3.8 Suitable testing machines for conducting hardness tests (upto 350 BHN).
- 3.9 Manufacturer should have vibration test rig as per para 1.4.3 of Annexure-1 of Specn. 07-ABR-92 (Rev.) to determine that internal parts will not be seriously affected or worn sufficiently which lead unsatisfactory performance of slack adjuster when subject to 5 million cycles of vibration at a frequency rate of 30, 40, 50 & 60 H2 with an amplitude of 3g value (2.5mm). The test rig should have computerised facility to record and document the dates in respect of nos. cycles, amplitude and frequency co-relating each parameters at 5 million cycles.
- 3.10 Tension test rig should be provided to see the yeild point of the weakest member of Slack adjuster when subjected to a tensile load of 10 tons.
- 3.11 Suitable shadowgraph machine with sufficient magnification (30 times minimum) for detailed checking of threaded profile of Adjuster spindle, adjuster nut and leader nut.
- 3.12 Ensure that a Endurance test rig is available with microprocessor data recording system conforming the requirements as stipulated in Amendment No. 2 of 07-ABR-92(Rev.). The rig should have provision to record applied tensile load (3650 kg), piston velocity (60 cm/pin), 2mm indexing increment for each 10 cycles over a range of approximate 550mm for IRSA-600 and 400mm for IRSA-450. Data should be recorded and documented on one lakh cycles.
- 3.13 The following measuring instruments in adequate nos. should be available:
 - (a) Micrometer (0 to 300mm with least connt .01mm)
 - (b) Verniers (with least connt .01mm)
 - (c) Common measuring and weighing instruments upto 500 kg
 - (d) GO-NO-GO gauges, suitable ring, plug and thread gauges for checking the threaded components viz. Adjuster spindle, adjuster nut and leader nut.

- (e) Suitable gauges for checking the dimension of the component mentioned as per Annexure 'A' should be available.

4.0 QUALITY CONTROL REQUIREMENTS

- 4.1 The firm must have ISO:9000 or QS certification for the product for which the approval is sought and should be broadly covered in scope of certification for manufacture and supply.
- 4.2 There should be a system to ensure the traceability of the product from raw material stage to finish product stage. The system should also facilitate to identify the raw material composition from the finish product stage also.
- 4.3 Ensure that a system of 'first-in-first-out' is followed for the raw material and intermediate stage product.
- 4.4 Ensure that there is a quality assurance plan for the product including components detailing various aspects.
- 4.5 The QAP should comprise of the following information's :-
 - (i) Organisation chart emphasising quality control set up.
 - (ii) Qualification of key personnel's and the officials deployed in quality control cell.
 - (iii) Process flow chart indicating process of manufacture for an individual product or for a family of products if the process is same.
 - (iv) Stage inspection detailing inspection procedure, inspection parameters, and method of testing/test procedure including sample sizes for destructive & non-destructive testing etc. (as per format).
 - (v) Criteria for selection of sublet vendors.
 - (vi) Details of sublet vendors :
 - The name of components for which it is approved.
 - Sublet vendor approving agency.
 - Inspection criteria at sublet vendor's premises.
 - (vii) Quality assurance system – Inspection & testing plan
 - This shall cover the following – Incoming material, process control, product control and system control and sublet items.
 - (viii) Calibration agency
 - (ix) A write up on the manufacturing process
 - (x) List of special gauges or instruments exclusively used for quality control
 - (xi) Format of internal inspection check sheet.

The QAP shall satisfy the requirements detailed in vendor approval and guideline application form IL-03:2000 and it should be a part of control documents used for ISO:9000 certification.

5.0 TECHNICAL EXPERTISE REQUIREMENT

5.1 Process of operation	Minimum personnel	Numbers
Production	Diploma Engineer with 5 yrs. experience	1
	ITI technician with 3 years experience	1
Inspection	Diploma engineer with 5 yrs. experience.	1

5.2 Quality System

5.2.1 Organisation

QM	Diploma Engineer
Receiving Inspection	Experience Inspector
Stage Inspection	ITI Technician
Final Inspection	ITI Technician

5.2.2 Documentation

Ensure that the following documentation is available.

- (a) Quality plan
- (b) Incoming raw material register with TC reference of suppliers as well as internal test results.
- (c) Stock register
- (d) Stage inspection results in check sheet itemwise
- (e) Record of internal rejection and its analysis vis-à-vis action taken
- (f) Receiving inspection and testing of bought out components
- (g) Inspection report of spring
- (h) Manufacturers inspectors final product inspection and testing register with NCR & its analysis and action taken thereof.
- (i) Final product inspection of external agency (like RDSO), NCR & case analysis as well as action taken.
- (j) Heat treatment register with graph.
- (k) Ensure that proper systems available for dealing with customer complaint.

5.3 Ensure that all the relevant IS specifications, IS Standard are available with the firm.

6.0 TRAINING

6.1 Training need should be identified for all concerned officials and regular training should be organised.

LIST OF GAUGES USED IN SLACK ADJUSTER SPARES

- | | | |
|-----|----------------------|--|
| 1. | Dust Bushing | (i) Plug Gauge (GO & NO-GO)
(ii) Groove Profile Gauge |
| 2. | Spindle Sleeve | (i) Concentricity checking gauge
(ii) Length gauge |
| 3. | Dog Pin | Plug Gauges (GO & NO-GO) |
| 4. | Leader Nut Casing | (a) Plug gauges (GO & NO-GO) 4 different sizes
(b) Taper Plug Gauge
(c) Thread Ring Gauge (GO & NO-GO)
(d) Depth Gauges |
| 5. | Traction Sleeve | (i) Plug Gauge (GO & NO-GO)
(ii) Taper Plug Gauge
(iii) Thread Plug Gauge (GO & NO-GO)
(iv) Depth Gauges 2 different sizes
(v) Gap Gauge |
| 6. | Guide Bushing | (i) Plug Gauge
(ii) Adjustable Snap Gauge
(iii) Gap Gauge |
| 7. | Guide Pin | Snap Gauge |
| 8. | Adjuster Tube Socket | (i) Adjustable Snap Gauges in 2 different size
(ii) Thread plug gauges (GO & NO-GO)
(iii) Plug Gauge (GO & NO-GO) |
| 9. | Spring Dowel Sleeves | Resistance and recovery testing gauge |
| 10. | Clutch Sleeve | (i) Plug gagues (GO & NO-GO) in 3 different size
(ii) Thread Ring gauge (GO & NO-GO)
(iii) Adjustable snap gauge |
| 11. | Clutch Ring | (i) Taper Gauge
(ii) Plug Gauge (GO & NO-GO)
(iii) Dial Gauge |
| 12. | Springs | Snap Gauges (GO & NO-GO) |

13.	Adjuster Spindle	<ul style="list-style-type: none"> (i) Thread ring gauge (ii) Adjustable snap gauge (iii) Thread Calliper gauges (GO & NO-GO)
14.	Safety Coller	<ul style="list-style-type: none"> (i) Thread Plug gauge (GO & NO-GO) (ii) Snap Gauge
15.	Control Rod Head	<ul style="list-style-type: none"> (i) Thread Plug gauge (GO & NO-GO) (ii) Plug gauge (iii) Centre distance checking gauge
16.	Adjuster Ear	<ul style="list-style-type: none"> (i) Plug Gauge (GO & NO-GO) (ii) Thread ring gauge (GO & NO-GO) (iii) Centre distance checking gauge
17.	Ear Bushing	Plug Gauge (GO & NO-GO)
18.	Leader Nut Flange	<ul style="list-style-type: none"> (i) Plug gauge (ii) Concentricity checking gauge (iii) Gap gauge
19.	Lock Screw	Thread Ring Gauge (GO & NO-GO)
20.	Leader Nut	<ul style="list-style-type: none"> (i) Adjustable Snap gauges in 2 different sizes (ii) Plug gauges (GO & NO-GO) in 2 different sizes (iii) Groove distance gauge (iv) Thread plug gauge
21.	Adjuster Nut	<ul style="list-style-type: none"> (i) Adjustable snap gauges in 2 different sizes. (ii) Plug gauge (GO & NO-GO) (iii) Gap gauge (iv) Thread plug gauge
22.	Actuating Sleeve	<ul style="list-style-type: none"> (i) Plug gauges (GO & NO-GO) in 2 different sizes (ii) Depth Gauge (GO & NO-GO) in 2 different sizes (iii) Taper plug gauges in 2 different sizes (iv) Adjustable snap gauges (GO & NO-GO) (v) Gap Gauge (GO & NO-GO)
23.	Adjuster Tube	<ul style="list-style-type: none"> (i) Groove distance gauge (GO & NO-GO) (ii) Thread Ring Gauges (GO & NO-GO)

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|-----|-------------|---|
| | | (iii) Thread Plug Gauge (GO & NO-GO) |
| 24. | Barrel Head | (i) Plug gauge (GO & NO-GO)
(ii) Groove Profile Gauge |
| 25. | Control Rod | (i) Concentricity checking gauge
(ii) Thread ring gauge (GO & NO-GO)
(iii) Receiving gauge |
| 26. | Lock Nut | Thread Plug gauge (GO & NO-GO) |
| 27. | Barrel | (i) Plug gauge (GO & NO-GO)
(ii) Concentricity checking gauge
(iii) Thread plug gauge(GO & NO-GO) |
| 28. | Circlips | (i) Bend and fracture test arrangement
(ii) Deformation test arrangement
(iii) Spiral flatness test arrangement |

List of Items to be manufactured inhouse by manufacturers

S.No	Description	Drg.No.
1.	Dog pin	WD-82064-S-05-RC (Item -3)
2.	Leader nut casing	WD-82064-S-07-RC (Item -1)
3.	Clutch sleeve	WD-82064-S-03-RC (Item -4)
4.	Leader nut	WD-82064-S-02-RC (Item -1)
5.	Adjusting nut	WD-82064-S-02-RC (Item -2)
6.	Actuating sleeve	WD-82064-S-06-RC (Item -1)
7.	Barrel head	WD-82064-S-03-RC (Item -2)
8.	Control rod head IRSA 600/600J	WD-82064-S-05-RC (Item -2) / WD-90002-S-02-RC (Item-3)
9.	Adjuster ear IRSA 600/600J	WD-82064-S-10-RC (Item -1) / WD-90002-S-02-RC (Item-1)
10.	Control rod IRSA 600/600J/450	WD-82064-S-10-RC (Item -2) / WD-90002-S-02-RC (Item -2) / Sk.85069
11.	Dust bushing	WD-82064-S-09-RC (Item -2)
12.	Spindle sleeve IRSA 600/600J/450	WD-82064-S-09-RC (Item -6) / Sk.-85067
13.	Spring sleeve	WD-82064-S-09-RC (Item -3)
14.	Transaction sleeve	WD-82064-S-03-RC (Item -3)
15.	Guide bushing	WD-82064-S-05-RC (Item -4)
16.	Guide pin	WD-82064-S-03-RC (Item -1)
17.	Wire ring	WD-82064-S-07-RC (Item -3)
18.	Friction washer	WD-82064-S-07-RC (Item -2)
19.	Adjuster tube socket	WD-82064-S-06-RC (Item -2)
20.	Clutch ring	WD-82064-S-06-RC (Item -3)
21.	Barrel IRSA 600/450	WD-82064-S-02-RC (Item -3) / Sk.-85063

22.	Adjuster spindle IRSA 600/450	WD-82064-S-02-RC (Item -4) / Sk.-85064
23.	Safety collar	WD-82064-S-10-RC (Item -5)
24.	Lock washer	WD-82064-S-08-RC (Item -1)
25.	Ear bushing IRSA 600/600J /450	WD-82064-S-10-RC (Item -6) / WD-90002 -S-02 RC (Item 4) / Sk.-85068
26.	Leader nut flange	WD-82064-S-05-RC (Item -1)
27.	Adjuster tube IRSA 600/450	WD-82064-S-05-RC (Item -5) / Sk.85066

List of Items which can be subletted

S.No	Description	Drg.No.
1.	Sealing ring	WD-82064-S-08-RC (Item -5)
2.	Rubber gasket	WD-82064-S-09-RC (Item -1)
3.	Seal ring	WD-82064-S-08-RC (Item -6)
4.	Circlip 45x 1.75 N	WD-82064-S-08-RC (Item -8)
6.	Circlip 85x4H	WD-82064-S-09-RC (Item -4)
7.	Pay out spring	WD-82064-S-04-RC (Item -2)
8.	Spring dowel sleeve 6x 10	WD-82064-S-10-RC (Item -4)
9.	Barrel spring IRSA 600/450	WD-82064-S-04-RC (Item -4) / Sk.- 85065
10.	Spring dowel sleeve 5x24	WD-82064-S-10-RC (Item -3)
11.	Circlip 40x 2.5 H	WD-82064-S-08-RC (Item -3)
12.	Take up spring	WD-82064-S-04-RC (Item -1)
13.	Clutch spring	WD-82064-S-04-RC (Item -3)
14.	Circlip 45x 2.5 H	WD-82064-S-08RC (Item -9)
15.	Multi tooth lock washer B 31/ B28 IRSA 600/600J	WD-82064-S-08-RC (Item -7) / WD- 90002-S-02 -RC (Item 6)
16.	Bearing 45 TA II (complete)	IS-2513 & 5932
17.	Bearing 45 TA II	IS-2513 & 5932
18.	Lock screw	WD-82064-S-09-RC (Item -5)
19.	Tab washer	WD-82064-S-08-RC (Item -4)
20.	Lock nut	WD-82064-S-08-RC (Item -2)
21.	Name plate	WD-82064-S-07-RC (Item -4)
22.	Rivet	WD-82064-S-07-RC (Item -5)
23.	Nut IRSA 600J	WD-90002-S-02-RC (Item 5)
24.	Punched Washer M-20 IRSA 600J	IS:2016