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CHECK SHEET NO. MP/TTH/COUPLER, REV. 01

## **Inspection Plan (Check Sheet)**

**Item:** Coupler Assembly, H-type Tight lock for ALCo / Electric/ HHP Passenger Locomotives.

**Specn.:** MP-0.41.00.05 (Rev. 02), March 2020

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Firm's Name:

Date (period) of Inspection:

Contract Details:

- a. Contract no. and date.
- b. DP
- c. Order placing authority.
- d. Specification no.
- e. Drawing no.

Quantity on order

Earlier Passed Qty.

Quantity offered for inspection on date

Quantity passed:

Quantity rejected:

Balance quantity:

Consignee:

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## 1. Pre inspection checks

S.no.	Parameter to be checked	Observation
a)	Availability of valid internal test reports.	
b)	Calibration status of testing equipments.	
c)	Audit checks of manufacturing procedure/internal quality system.	
d)	Availability of approved QAP/Drgs of the firm.	
e)	Availability of test bars of casting components of CBC for testing of chemical and mechanical properties.	
f)	Test Plan submitted by vendor as per para 6.5.10 of spec.	

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## 2. Summary of results

S.N.	parameters	Specified value	Observation
a)	Visual & operational check	No cracks, Components should be operating freely in assembled condition. Marking as per specification.	
b)	Chemical composition (clause no.4.10 of spec.)	C- 0.32 (Max.) Mn- 1.85 (Max.) P- 0.03 (Max.) S- 0.03 (Max.) Si- 1.50 (Max.)	
c)	Dimensional	As per approved drg/gauges drawings	
d)	Physical properties (clause no. 4.13 of spec.)	Grade E	
	i) Tensile strength(Min.)	8435 Kg/cm <sup>2</sup>	
	ii) Yield Point(Min.)	7030 Kg/cm <sup>2</sup>	
	iii) Elongation in 51 mm (Min.)	14%	
	iv) Reduction in area	30%	
e)	Impact test (clause no. 4.13.3 of spec.)	Cast steel: Grade E Temp:-40°C, Energy(Kg-m): 2.77(Min.)	
f)	Proof static tension test. (clause no. 5.1.4)	Max. permanent set in mm for grade E steel: a) Knuckle at 181.5t: -0.76 b) coupler body at 317.5 t: -0.76 Minimum ultimate load: a) knuckle: 295t b) coupler body: 408t (Note: Test to be done at the time of prototype inspection and thereafter once supply reached 200 numbers.)	
g)	Proof test of clevis (clause no. 5.1.5 of spec.)	The clevis shall be able to withstand a proof load of 750KN without any deformation. (Note: Test to be done at the time of prototype inspection and thereafter once supply reached 200 numbers.)	
h)	Microstructure of Knuckle	Fine Tempered Martensite.	
i)	Hardness (clause no.4.13.4 of spec.)	a) Grade E steel castings(Except lock & Knuckle) : 241-311 BHN b) Grade E, lock & knuckle : 241-291 BHN	
j)	Destructive test (Para 4.15 of spec)	No blow holes, slag inclusion, shrinkage etc.	
k)	Heat treatment	Record to be checked.	
l)	Weight variation(Para 4.18 of spec)	+5% to -3%	

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**DETAILED TEST RESULTS**

**3. Visual & Operational Check**

**3.1 Visual Check (as per clause no. 5.3 & 5.6):** Check the surfaces of all components that there should not be any visual crack and undesirable irregularities. **OK/Not OK**

**3.2 Marking: (as per clause no. 5.5):** sampler size: 5% or min. 10 nos. whichever is more.

Specified Value	Observation
As per clause no. 5.5 of spec	

**3.3 Operational Check:** The coupler assembly shall be checked as per para 5.2 of Spec. **OK/Not OK**

**4. A. Chemical Composition (As per para no. 4.10 & 4.11 of Spec.):** Sample size- test specimen from each heat.

Heat No.										
Body S. No.										
Qty. Cast										
Qty. Offered										
<b>Chemical Composition</b>										
C- 0.32(Max.)										
Mn-1.85(Max.)										
P-0.03(Max.)										
S-0.03(Max.)										
Si-1.50(Max.)										

**B. Chemical Analysis.**

Record shall be verified as per para 4.11 of specification: **Ok/Not Ok.**

**5. Hardenability (As per clause 4.12 of Spec):**

Record shall be verified at the time of inspection for each heat offered: **Ok/Not Ok.**

**6. Tension test (As per clause no. 4.13.1 & 4.13.2 of Spec):** Sample size- Test specimen from each heat.

Tests	Specified value	Heat No.	Observed Value			
Material	Grade E (Min)					
Tensile Strength	8435 Kg/cm <sup>2</sup> (Min.)					
Yield Stress	7030 Kg/cm <sup>2</sup> (Min.)					
Elongation in 51mm.	14 % (Min.)					
Reduction in area	30%					

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**7. Impact test** (As per clause no. 4.13.3 of Spec): Sample size- Test specimen from each heat

Cast steel	Temp. (°C)	Energy (Kg-m)
Grade E	-40	2.77(Min.)

**8. Hardness** (As per clause no. 4.13.4 of Spec.): Sample size- 5% of lot size or min. 5 nos. whichever is more\*.

Grade	Specified Value	Observed Value									
	BHN No.	1	2	3	4	5	6	7	8	9	10
Grade E steel castings(Except lock & Knuckle)	241-311										
Grade E steel castings for lock & knuckle	241-291										

\*Testing should be done as per ASTM A 370.

**9. Heat treatment** (As per clause no. 4.14 of Spec.):

<b>Record of heat treatment to be verified</b>	<b>OK / NOT OK</b>
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**10. (i) Proof Static test (Permanent set in mm)**(As per clause no 5.1.1 to 5.1.4 of Spec.): Sample size- One per lot (Test to be done at time of prototype inspection and thereafter once in 200 quantities reached.).

Load Item	At 181.5 t		At 317.5t		Min. Ultimate Load	
	Specified	Observed	Specified	Observed	Specified	Observed
*Knuckle	0.76		-		295 t	
Coupler body	-		0.76		408 t	

\*Based on testing with dummy knuckle fixture.

**(ii) Proof test of clevis** (As per clause no. 4.3 & 5.1.5 of Spec.): Sample size- One per lot (Test to be done at time of prototype inspection and thereafter once in 200 quantities reached.)

Specified value	observation
The clevis shall be able to withstand a proof load of 750KN without any deformation	

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**11. Microstructure of knuckle** (As per clause no. 4.17 of spec ): Sample size: One from each heat.

specified	Observed	1	2	3	4	5	6	7	8	9	10
Fine Tempered Martensite	OK/NOT OK										

**12. Destructive Test** (As per clause no. 4.15 of spec): Sample size: one or 2% of the lot whichever is more.

Specified Value	Observation
No Blow holes, slag inclusion and shrinkage etc. after sectioning.	

**13. Radiography Test** (As per clause no. 4.16 of spec): Sample size: one or 5% of the lot whichever is more.

Specified value	Observation
The radiography examination shall be as per ASTM-E 446 Level-II. Location of radiography test should be as per annexure –F, G & H of specification MP-0.41.00.05	

**14. Variation of Weight** (As per clause no. 4.18 of spec): One Assembly per lot offered for inspection .

Specified Value	Observation
Within +5% to -3%	

**Note:** This is only for Regular Inspection.

**15. HEAT NO./S.NO./PAINTING**

S.no.	Parameter	Observations				
		1	2	3	4	5
1.	Coupler S.no.					
2.	Heat no.					
3.	Knuckle S.no.					
4.	Heat no.					
5.	Painting					

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**16. Performance Test:** 2 numbers assembly (min.) or 10% of lot offered for inspection, whichever is more.

S.No.	Parameters to be checked	Results to be obtained	observation
a)	The coupler shall be couplable with all the AAR E-type couplers of diesel & Electric locomotive & H-type couplers of coaches being used in IR. As per para 4.1 of specification.	Should be coupled	
b)	Coupler head shall be to AAR 'H' type tight lock with the provision for fitment of transition screw coupling and contour shall be to APTA-SS-M-002-98 (Standard S166 & S-168). As per para 4.2 of specification.	As per APTA gauges	
c)	Two coupler heads complete are mounted on the test bench and 50 times coupling & uncoupling to be done as per para 6.5.5 of specification.	Examine visually for proper coupling, ensure tel-tale slot or V slot clear or not. The functioning of anti-creep mechanism will be checked before the tests and after 50 operations of coupling & uncoupling.	
d)	Repeated coupling and uncoupling operation must be performed on the newly developed coupler head and the coupler head of approved make. As per para 6.5.6 of specification.	Repeated coupling & uncoupling operation 10 times & each times couplers should be coupled.	
e)	The design of coupler head shall be enable coupling of two couplers with a maximum vertical displacement of their center lines of 90 mm, without manual assistance. The horizontal gathering range of the coupler heads shall be 110 mm on either side of the longitudinal center lines when coupled with H-type coupler as per para 4.8 of specification.	Should be Coupled.	
f)	The contour slack when two couplers are coupled together should be as per para 4.2 of specification.	The gap should not be more than 3.5mm	

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g)	Manual Uncoupling:- manual uncoupling by turning the rotary lock lift assembly.	Lock is lifted, couplers are uncoupled.	
h)	Operate the uncoupling lever and drive the coupler apart.	Knuckle is open.	
i)	The TENDERER shall specify the wear limits for the components of the coupler head and demonstrate the functioning of the coupler head with fully worn components. As per para no. 6.5.8 of specification.	As per APTA maintenance gauge.	
j)	Clevis Functionality	Check opening/closing of Clevis	

**17. Gauge Check:** As per APTA document no. APTA RP-M-003-98 & APTA RP-M-002-98 & Firm's gauge (Sample size-5% or min 10 nos. whichever is more.) Accuracy of gauges should be checked by Inspection Authority as per para no. 7.1 of Specification.

S.NO.	APTA maintenance gauge no.	Description.	Observation.		
1.	31000	Contour maintenance			
2.	32600	Aligning wing limit			
3.	34101-4	Guard arm			
4.	44250-5	Vertical height condemn limit alignment pocket and guard arm			
5.	34100-1	Contour slack			
6.	34100-2A	Knuckle nose wear and strength			
<b>Any other gauges offered by firm.</b>					
7.					
8.					
9.					

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## 18. LIST OF SUPPLIES

S.No.	Description	Drawing no.	Material as per spec/drg	Supplier's name & address. Verify WTC/DM in case of outsourced/DM item respectively.
1.	Coupler body			
2.	Supporting device			
3.	Knuckle			
4.	Clevis			
5.	Lock			
6.	Knuckle Thrower			
7.	Rotary lock lifter			
8.	Transition screw coupling			
9.	Clevis pin			
10.	Anti-Climbing beam			
11.	Uncoupling device			
12.	Knuckle pivot pin			
13.	Any other			

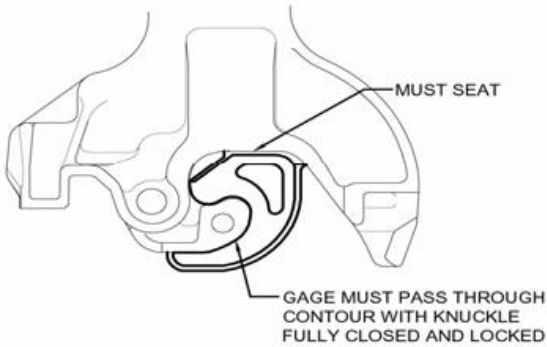
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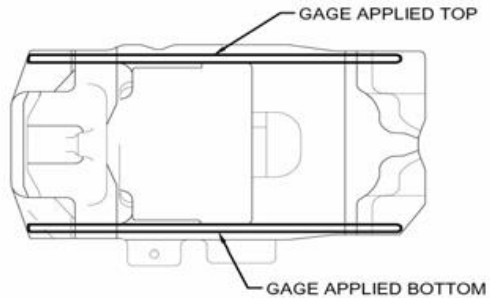
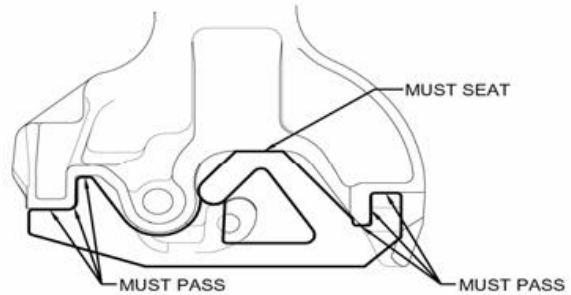
**How to apply APTA maintenance gauges given as under:**

APTA TIGHTLOCK COUPLER MAINTENANCE GAGES



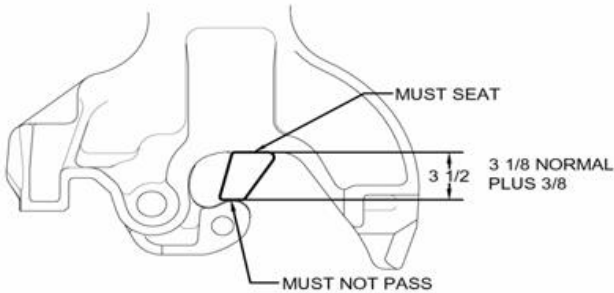
CONTOUR MAINTENANCE GAGE  
NO. 31000

FIG 6



ALIGNING WING LIMIT GAGE  
NO. 32600

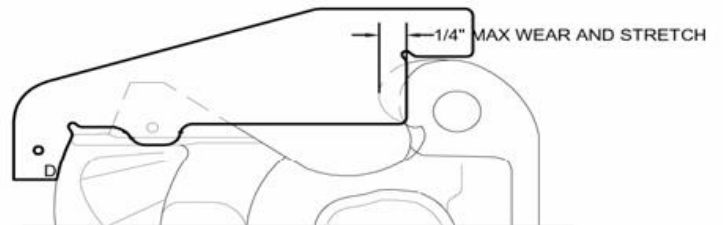
FIG 7



CONTOUR CONDEMNING LIMIT GAGE  
NO. 34100-1

FIG 8

POINT "D" MUST NOT TOUCH OR CLEAR MORE THAN 1/4" WITH A, B, & C SEATED



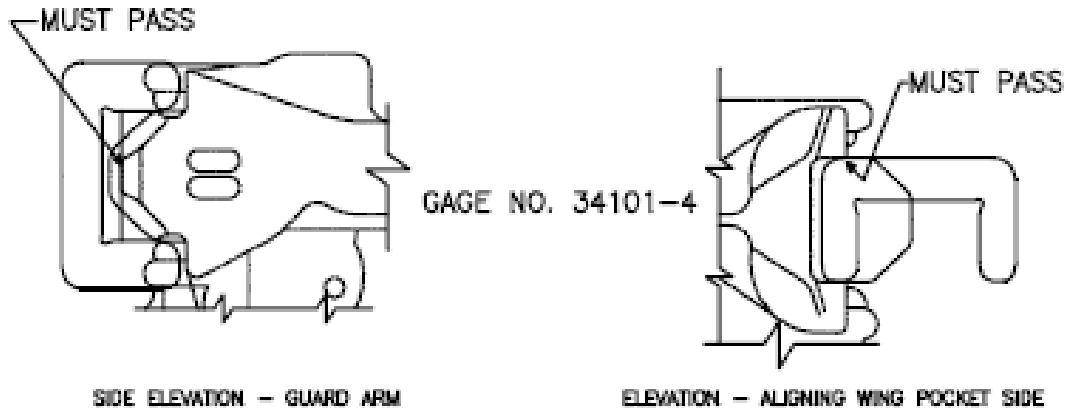
KNUCKLE NOSE WEAR AND STRETCH LIMIT GAGE  
NO. 34100-2A

FIG 9

NOTE: FORMER DESIGN GAGE NO. 34100-2  
 MAY BE USED WITH CARE

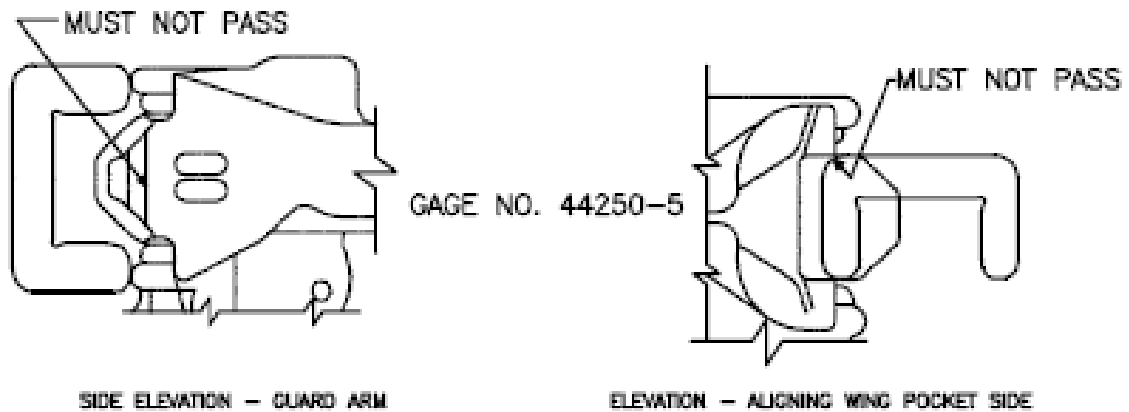
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VERTICAL HEIGHT ALIGNING WING POCKET AND GUARD ARM GAGE

FIG. 10



VERTICAL HEIGHT CONDEMNING LIMIT  
ALIGNING WING POCKET AND GUARD ARM GAGE

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19. Dimensional/Gauge checks of H type tight lock coupler assembly & its components.

<b>A. Item name: Tight lock coupler (for Alco/Electric)(Firm's drawing no. : ----- )</b>						
S.No	Description	Dimension as per Drg. (in mm)	Means of measurement	Gauge no.	Observations	
1.	Coupler length		Gauge			
2.	Clevis location from coupling line.		Gauge			
3.	Take off point location from coupling line		Gauge			
4.	Radius shank end	As per para 4.4 of Spec.	Gauge			
5.	Shank end width		Gauge			
6.	Shank end thickness					
7.	Diameter of shank hole		Gauge			
8.	Location of shank hole from shank end.		Gauge			
9.	Wear plate		Gauge/Vernier			
<b>B. Item name: Anti-climbing beam (Firm's drawing no. : ----- )</b>						
1.						
2.						
3.						
4.						
5.						
6.						
<b>C. Item name: Spring loaded supporting device (Firm's drawing no. : ----- )</b>						
1.						
2.						
3.						
4.						
5.						
6.						
<b>D. Item name: Manual uncoupling arrangement (Firm's drawing no. : ----- )</b>						
1.		As per para no. 4.6 of Spec.				
2.						
3.						
4.						

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