



QM-C-7.1/FORGING/0003A
Inspection Plan(Check Sheet)

Item: Screw Couplings & Its components for Locomotive
Specn. : MP.0.41.00.01, Rev.-01
Drg. No. & Alt.: SKDL-2494, Alt-

- 1) Firm's Name :
- 2) Date (Period) of Inspection :
- 3) Contract Details :-
 - a) Contract No. & Date :
 - b) Order Placing Authority :
 - c) Specification No. :
 - d) Drawing No. :
- 4) Quantity on Order date :
- 5) Quantity offered for Inspection :
- 6) Delivery Period :
- 7) Consignee/ Consignees :

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SUMMARY OF RESULTS

S.NO.	Parameters	Specified Value	Observations
8.1	Raw Material	35Mn6Mo3	
	Test Certificate Details		
8.2	Visual Check	10 % or minimum 5 Nos.	
8.3	Dimensional Check of componentss	By Go / No Go Gauges/ Measuring instrument.	
8.4	Heat treatment cycle verify time / temperature graph.		
8.5	Mechanical Properties:	UTS : 900-1050 Mpa Yield Stress : 700 Mpa (Min.) Elongation : 15 % (Min.) IZOD Impact : 55 Joules (Min.)	
8.6	Chemical Composition	C: 0.3 to 0.4 % Mn: 1.3 to 1.8 % Si: 0.10 to 0.35 % S: 0.025 % (Max.) P: 0.025 % (Max.) Mo: 0.20 to 0.35 % (Max.)	
8.7	Inclusion Rating	Not worse than 2.0 of A, B, C, D in thin Series & 1.0 of A, B, C, D in thick Series.	
8.8	Impact test at 1500 Kgm (Destroy whole coupling by gas cutting after impact test)	Total extension after 3rd blow shall not exceed 50 mm on whole coupling or 3 mm on the screw.	
8.9	Destruction Test at 130 MT direct pull load. (Destroy whole coupling by gas cutting after test).	No breakage	
8.10	Proof load test at 75 MT direct Pull. All components are to be examined for deformation separately.	No any Sign. of deformation or permanent set after release of pull.	
8.11	Afresh or repaired on.	Afresh/Repaired	
8.12	Dimensional Check of Assembly	By Go / No Go Gauges/ Measuring instrument.	
8.13	Marking, painting & Packing	As per drawing, One coat of boiled linseed oil to IS:77. If not mentioned otherwise in P.O. Packed in rigid case/double gunny bags.	

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9.0 Check/Verify the tests carried out for screw coupling assembly and components –

9.1 (A) Raw Material - Check original test certificate produced by the manufacturer duly signed by their Quality Control Manager to ensure that the material of Short Shackle, Long Shackle, Trunnion Nut, Trunnion Screw, Screw & Operating Handle (to Drg. No. SKDL-2494) are conforming to 35Mn6Mo3 to IS: 5517-93.

	Parameters	Observation on the basis of Suppliers Record
I.	Manufacture of steel is done in electric arc furnace followed by Secondary refining (Vacuum – degassing is preferable)	
II.	Hydrogen content in the liquid steel is maximum - 2 ppm.	
III.	The Sulphur & phosphorus content during ladle analysis is shall be 0.025 % Max. each.	
IV.	Minimum reduction ratio of 8:1 from the minimum cross- section area of ingot or concast billets to the maximum cross section area of the product is ensured.	

(B) Tests certificate (TC) no. & date produced by the Supplier –

- Name of the raw material supplier.
- Raw material supplier should be approved by RDSO.
- Quantity of material indicated on TC.
- Quantity of material used from this TC till this lot offered for inspection.
- Quantity of material used from this.
- Quantity of material balance against this TC for future lots.

10. Visual Check

Specified Sample Size – 10% subject to minimum 5 Nos.

Actual Sample Size –

Check the screw coupling and/or spares as follows shall be free from harmful defects.

i) Short Shackle, Long Shackle, Trunnion Nut, Trunnion Screw, Screw & Operating Handle

OBSERVATIONS

S.No.	1	2	3	4	5	6	7	8	9	10
Surface Defects										
Formation of Rivet										



11. Dimensional Check of components:

(I) Short Shackle (Drg. SKDL-2494 Item No. 1)

Sample Size – 10% or 5 Nos. min.

Actual Sample Size -

Parameters to be checked :-

Drawing Dimensions (in mm.) with tolerance as per IS: 3469 & IS: 2102	Observed dimensions									
	1	2	3	4	5	6	7	8	9	10
O/D 54 (+0.9/-0.5)										
Length 198 (+1.9/-0.9)										
Centre Distance 129 (+1.0/-0.0)										
Hole dia 48 ± 0.8										
Centre Distance 41 ± 0.8										
Thickness 38 (+0.9/-0.5)										
Thickness 28 (+0.8/-0.4)										
Gap 86 (+0.5/-0.9)										
Thickness 162 (+1.2/-0.6)										
O/D 90 (+1.5/-0.7)										
Hardness (Between 269 to 331 BHN)										

(II) Long Shackle (Drg No. SKDL-2494 Item No. 2)

Sample Size – 10 % or 5 Nos. min.

Actual Sample Size –

Parameters to be checked :-

Drawing Dimensions (in mm.) with tolerance as per IS: 3469 & IS: 2102	Observed dimensions									
	1	2	3	4	5	6	7	8	9	10
Centre Distance 186 (+0/-1.0)										
Centre Distance 40 (+0.9/-0.5)										
Outer Dia 40 (+0.9/-0.5)										
Total Length 270 (+2.1/-1.5)										
Hole Dia 47 (± 0.2)										
Thickness 38 (+0.9/-0.5)										
Gap 110 (+0.5/-1.1)										
O/D 82 (+0.9/-0.5)										
O/D 43 (+1.5/-0.5)										
Hardness (Between 269 to 331 BHN)										



(III) Trunnion Screw (Drg No. SKDL-2494 Item No. 3)

Sample Size – 10 % or 5 Nos. min.

Actual Sample Size –

Parameters to be checked :-

Drawing Dimensions (in mm.) with tolerance as per IS: 3469 & IS: 2102	Observed dimensions									
	1	2	3	4	5	6	7	8	9	10
Length 211 (+1.2/-0.6)										
Length 165 (± 1.2)										
Step Length 8 (± 0.5)										
O/D 30 (± 0.5)										
O/D 35 (± 0.8)										
Thread length 135 (± 1.2)										
Knuckle thread 60 Ø x 6.35 pitch										
Gap 84 (± 0.8)										
Thickness 46 (± 0.3)										
Length 180 (±1.2)										
Length 40 (± 0.3)										
Hardness (Between 269 to 331 BHN)										

(IV) Screw (Drg. No. SKDL-2494 Item No. 4)

Sample Size – 10 % or 5 Nos. min.

Actual Sample Size –

Parameters to be checked :-

Drawing Dimensions (in mm.) with tolerance as per IS: 3469 & IS: 2102	Observed dimensions									
	1	2	3	4	5	6	7	8	9	10
Length 162 (± 1.2)										
Length 125 (± 0.5)										
Thickness 25 (± 0.2)										
Length 45 (± 0.8)										
Slot length 26 (± 0.5)										
Slot width 16 (± 0.5)										
Length 18 (± 0.5)										
Width 03 (± 0.3)										
Dimension 12 (± 0.2)										
OD 88 (+0.9/-0.5)										
Thread 88 Ø RH x 6.35 pitch										
Hardness (Between 269 to 331 BHN)										

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(V) Trunnion Nut (Drg. No. SKDL-2494 Item No. 5)

Sample Size – 10 % or 5 Nos. min.

Actual Sample Size –

Parameters to be checked :-

Drawing Dimensions (in mm.) with tolerance as per IS: 3469 & IS: 2102	Observed dimensions									
	1	2	3	4	5	6	7	8	9	10
Length 130 (+1.1/-0.5)										
Dia 90.5 (± 0.3)										
OD 78 (+0.9/-0.5)										
Centre distance 36 (± 0.8)										
Length 108 (± 0.3)										
End dia 28 (± 0.5)										
Thread 88.635 Ø x 6.35 pitch										
Length 204 (± 1.2)										
Hardness (Between 269 to 331 BHN)										

12. Heat treatment Cycle:

(I) Shackle Short + Trunnion Screw

This is to be checked for the lot from the time temperature graph available with manufacturer.

S.No.	Parameters	Specified Value	Value as recorder in the Certificate of the firm
1	Temperature of furnace at the time of placing assembly.	Less than 500 deg. C	
2	Time of heat up to gain 860 deg. C Temp.	2 hours (Minimum)	
3	Soaking time at 860 deg. C	1 To 1.5 hours	
4	Tempering Temp.	550 to 650 deg. C	
5	Tempering time at specified Temp. (550-650 deg. C)	1 To 2 hours	

(II) Shackle Long + Trunnion Nut

This is to be checked for the lot from the time temperature graph available with manufacturer.

S.No.	Parameters	Specified Value	Value as recorder in the Certificate of the firm
1	Temperature of furnace at the time of placing assembly.	Less than 500 deg. C	
2	Time of heat up to gain 860 deg. C Temp.	2 hours (Minimum)	
3	Soaking time at 860 deg. C	1 To 1.5 hours	
4	Tempering Temp	550 to 650 deg. C	
5	Tempering time at specified Temp. (550-650 deg. C)	1 To 2 hours	

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(III) Screw :

This is to be checked for the lot from the time temperature graph available with manufacturer.

S.No.	Parameters	Specified Value	Value as recorder in the Certificate of the firm
1	Temperature of furnace at the time of placing assembly.	Less than 500 deg. C	
2	Time of heat up to gain 860 deg. C Temp.	2 hours (Minimum)	
3	Soaking time at 860 deg.	1 To 2 hours	
4	Tempering Temp	550 to 650 deg. C	
5	Tempering time at specified Temp. (550-650 deg. C)	1 To 2 hours	

(IV) Operating Handle :

This is to be checked for the lot from the time temperature graph available with manufacturer.

S.No.	Parameters	Specified Value	Value as recorder in the Certificate of the firm
1	Temperature of furnace at the time of placing assembly.	Less than 500 deg. C	
2	Time of heat up to gain 860 deg. C Temp.	2 hours (Minimum)	
3	Soaking time at 860 deg. C	1 To 1.5 hours	
4	Tempering Temp	550 to 650 deg. C	
5	Tempering time at specified Temp. (550-650 deg. C)	1 To 2 hours	

13. Mechanical Properties:

Sample Size – One per Batch

S.NO.	Mechanical Properties	UTS (900-1050 Mpa)	YS (700 Mpa) Min.	Elongation (15 %) Min.	Izod Impact (55 Joules) Min
1.	Short Shackle				
2.	Long Shackle				
3.	Trunnion Nut				
4.	Trunnion Screw				
5.	Screw				
6.	Operating Handle				

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14. Chemical Composition:

- Batch Size - Minimum 100 for screw coupling assembly or Min 300 for spares.
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 Sample Size - One per batch for screw coupling assembly.
 - One separate part per batch for spares.

Elements Specified in Item	Carbon 0.3 to 0.4 (%)	Manganese 1.3 to 1.8 (%)	Silicon 0.10 to 0.35 (%)	Molybdenum 0.20 to 0.35 (%)	Sulphur 0.025 max (%)	Phosphorus 0.025 Max (%)
Short Shackle						
Long Shackle						
Trunnion Screw						
Screw						
Trunnion Nut						
Operating Handle						

15. Metallographic examination inclusion rating (to be checked as per IS:4163) -

- Sample Size - One per batch for screw coupling assembly.
 - One separate part per batch for spares.

Specified in Item	A Not more than		B Not more than		C Not more than		D Not more than	
	Thick 1.0	Thin 2.0	Thick 1.0	Thin 2.0	Thick 1.0	Thin 2.0	Thick 1.0	Thin 2.0
Short Shackle								
Long Shackle								
Trunnion Screw								
Screw								
Trunnion Nut								
Operating Handle								

16. Dimensional check (in assembly condition)

Dimension Checked – 5% or 5 Nos. minimum

S. No.	1	2	3	4	5	6	7	8	9	10
Opened condition (617 ± 3.0 mm)										
Closed condition (425 ± 3.0 mm)										

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17. PROOF LOAD TEST: -

Specified value – The coupling shall be subjected to a direct pull of 75 T. It should not show any signs of permanent set under the pull, after release of pull. The inspector shall verify the records of proof load testing carried out by the manufacturer on 100% screw couplings. After proof load testing one screw coupling should be completely dismantled and checked for permanent set.

	1	2	3	4	5	6	7	8	9	10
Deflection										
Permanent Set										

18. Impact test

Sample Size - One Coupling Per Batch

Specified Value	The extension after third blow shall not exceed 50 min on the whole coupling or 3mm on the screw, when subjected to the impact of 1500 Kgm. Also the part should not brake, after impact test the coupling which impact test is carried out should be destroyed by gas cutting.
Observation	

19. Destruction Test

Sample Size - One per Batch.

Specified Value	Should not brake with a load of 130T for Drg. No. SKDL-2494 of direct pull test. After destruction test the coupling of which destruction test is carried out should be destroyed by gas cutting.
Observation	

- 20.** (i) Whether the batch is offered afresh or after repair as per clause 7.0 of Spec. MP-0.41.00.01
- (ii) If yes, whether RDSO approved was obtained?
Indicate RDSO authority reference permitting repair.

21. Painting and Packing

S.N.	Specified	OBSERVATION (OK / Not OK)
1	Painting with one coat of boiled linseed oil to IS:77	
2	Packing should be proper & in rigid cases.	
3	Weight of each shall not exceed 750 Kgs.	

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