

QUALITY ASSURANCE PLAN

QAP No: QA 548 0121 1018 forging

Issue No : 01

Date : 15-03-13

Revision No:

Date:

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Component

STUB AXLE

1 Drawing No. - V 548 0121 1018 Sheet 1 of 2

2 Method of Manufacture - forging

3 RECEIVING INSPECTION -

3.1 Raw Material - Steel Forging to BS: 970 – 1991, Part 3,
817M40 or (En24) /IS:4367-1991, 40Ni6Cr4Mo3.

3.2 Tests / Checks and Acceptance Criteria for Raw Material:

SI. No.	Test / Check	Parameter	Acceptance Value
1	Chemical Analysis	Chemical composition	As per BS:970 – 199
2	Mechanical Tensile Test (vide Col No 7 Below)	UTS	900 – 1050 MPa
		0.2% Yield stress	700 MPa (min.)
		% Elongation (4D)	10% (min.)
3	Impact Test	Izod	55 J ,Min

4 IN-PROCESS INSPECTION

4.1 Parameters for In-process Check and Acceptance Criteria:

SI. No.	In-Process Parameter	Acceptance Value
1	Forging to be processed through closed die route	Ensure
2	Forging temperature	1100°C – 900°C
3	Shot blasting	Ensure
4	Normalising of Forging	Record the heat treatment cycle

6 .FORGING REQUIREMENT: Firstoff, to be critically inspected and passed for dimension & metallurgical soundness before bulk production

6 FINAL INSPECTION

6.1 Visual Inspection: 100%

Features for Visual Inspection and Acceptance Criteria:

SI. No.	Details of Features	Acceptance Value
1	Cracks, laps, scales, etc.	Not allowed
2	Fillet and corner radii R5	To be Present

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6.2 Dimensional Inspection -10%AS PER DRG ALL THE DIMENSIONS

6.3 Tests on Finished Items

6.3.1 Details of Tests / Checks on Finished Items and Acceptance Criteria:

Sl. No.	Test/Check	Sample Size	Acceptance Value
1	NDT :		
	a) Ultrasonic test as per IS-3664	100%	1.2mm FBH
	b) FPI or DPI	100%	Free from any surface cracks, defects, voids & flakes.
2	Hardness in Normalised condition	100%	Record
3	Grain flow on cut-up forging	1 per batch	Shall uniform and smooth, as per the drawing, without any re-entrant grain flow and folds. The structure shall be free from any segregation and abnormality.
4	Mechanical properties in hardened and tempered condition on the cut-up test forging :-		
	(a) Tensile test	1 per batch	Refer Clause-3.2 of this document for minimum acceptable values.
	(b) Impact test	1 per batch [Batch Size : 25 Nos. max.]	
5	Microstructure as per ASTM-E-112/BS-4490.	1 per batch	Shall have uniform austenitic grain size ASTM-5 or finer. The structure shall be free from any segregation and abnormality.

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7 Details of test and other information

- The Grain flow to be checked by cutting the forging in to two halves in longitudinal direction. One half to be duly etched to reveal the grain flow pattern. The specimen thus prepared to be suitably dyed and paper impression/photography to be taken for record purpose.
- For the mechanical properties evaluation, one forging per batch [Cut-up test forging], in normalised condition, shall be further heat treated [hardening and tempering] before extraction of the test specimens.
- Remnants of cut-up test forging, after completion of all the testing, shall be provided to the Purchaser alongwith the supplies.
- The forging to be supplied in Normalised Condition.
- The Forging to be cleaned by Shot blasting and painted with ready mixed air drying red oxide zinc chrome priming to IS : 2074 – 1992.

8 List of documents for inspection clearance

- Raw material test certificate from its source - From NABL accredited lab only
- Dimensional, NDT and Mechanical test reports for the forging
 - Mechanical test reports From NABL accredited lab only
- Metallurgical [macro and microstructure] reports together with glossy prints of photographs. - From NABL accredited lab only

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