


**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**  
**QUALITY CONTROL TRANSPORTATION**  
**QUALITY ASSURANCE PLAN (QAP)**

Ref.: TM12545 Rev. 08 Dt.26.03.2023


**QA Plan for fully finished components (with finish dimensions final machined on CNC machines) with mandatory requirement of checking on 3D CMM, supplied on fully finish basis or labour basis**  
**Note: Components to be finished machined on CNC are Stator frame, Bearing assy. components (including end shields), Suspension tube & its assy. components**

**Part 1: Final inspection of the component before dispatch from vendor works (#)**

Sl. No.	Name of the Process	Parameters of Inspection	Quantum of Check*		Mode of Inspection/ Equipment used	Drawing No./Spec./Std.	Acceptance Norms***	Requirement from supplier
			TP (Supplier)	Inspection agency				
1.	Raw material	Applicable only in case order is executed on fully finish basis						
	a. If the raw material is casting.	Applicable QAP No.: QTM/QAP/VENDOR/13-14/001 (latest revision) [Witness & Verification of RT reports & films for correlation with components, only record verification of material testing/checking parameters and verification of 3 test samples (keel blocks separately cast/integrally cast as per specification to be supplied along with consignment.) as per raw material QAP to be done by TPI. No inspection/record verification for cast/rough machined dimensions as per casting QAP.]						
	b. If the raw material is fabrication/ plate.	Applicable QAP No.: QTM/QAP/FABRICATED ITEMS/VENDOR/18-19/01 (latest revision) [Only record verification of testing/checking parameters and verification of TC of plate used for fabrication of component (to be supplied along with consignment) as per raw material QAP to be done by TPI. No inspection/record verification for fabricated/rough machined dimensions as per fabrication QAP.]						
	c. If the raw material is forging.	Applicable QAP No.: QTM/QAP/VENDOR/13-14/002 (latest revision) [Only record verification of testing/checking parameters and verification of 3 test samples to be supplied along with consignment) as per raw material QAP to be done by TPI. No inspection/record verification for forge/rough machined dimensions as per forging QAP.]						
2.	Dimensions	A) Critical to quality (CTQ) dimensions as marked in drawing. B) Other dimensions (machined/ un-machined).	A) 100%	A) 20% (Min.) \$	3D CMM	As per relevant BHEL Drawing	As per relevant BHEL Drawing	\$-Inspection of 3D CMM checking shall be done by RDSO in case of TM 6FRAG088 bearing components only. And for others inspection shall be done by agency as mentioned in P.O.

  
 Engineer / Engineer  
 Mr. Ravi Kumar C.T.M. Division  
 Quality Control Transportation  
 Bharat Heavy Electricals Limited


Sl. No.	Name of the Process	Parameters of Inspection	Quantum of Check*		Mode of Inspection/ Equipment used	Drawing No./Spec./Std.	Acceptance Norms***	Requirement from supplier
			TP (Supplier)	Inspection agency				
3.	Visual Inspection	Free from visual defect.	100%	100%	Visual	-	Component to be free from any abnormality such as blow hole, pin hole, dent etc.	-
4.	Identification marking	Identification marking at machining stage on the location shown in drawing or location may be taken from BHEL Engg. Dept.	100%	10%	Verification	As per relevant BHEL drawing/ specification TM12548	Identification marking as per BHEL drawing/spec. TM12548	-
5.	Paint (Visual, Dry paint thickness and Adhesion. test)	Epoxy primer paint (specification AA56113) on unmachined surfaces.	100%	100%(Visual) & 10% per lot (DFT and adhesion test)	Visual and Instruments	As per relevant BHEL Drawing/ specification TM94217 (Latest Rev)	As per relevant BHEL Drawing/ specification TM94217 (Latest Rev)	Report to be submitted for- • Visual • DFT • Adhesion

  
 अतिरिक्त सहायक अभियंता / Engineer  
 अतिरिक्त सहायक अभियंता / C.T.M. Division  
 अ. टी. एम. दिवाकर / A.T.M. Divakar

Sl. No.	Name of the Process	Parameters of Inspection	Quantum of Check*		Mode of Inspection/ Equipment used	Drawing No./Spec./Std.	Acceptance Norms***	Requirement from supplier
			TP (Supplier)	Inspection agency				
6.	Packing	Packaging suitability for transit & storage	100%	-	Visual	-	-	Each component shall be suitably packed & wrapped to avoid any damage to components during transit and ingress of water. Note: In case any damage to machined surface found during inspection at BHEL, job will be liable to be rejected.


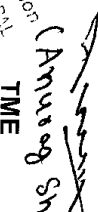

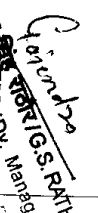

**Notes:**

- 1) All test records, dimensional reports (3D CMM & MANUAL) checked & reviewed by TP, QC (duly signed & sealed) as per above QAP requirement shall be submitted along with consignment.
- 2) Final acceptance will be based on inspection at BHEL, Bhopal.
- 3) (\*) Quantum of inspection shall be in line with QAP unless otherwise mentioned in the drawing.
- 4) (\*\*\*) Job shall be randomly selected from offered lot, the quantum of check (min. 1 no.) from the offered lot to be checked by QC. (e.g.: If lot size is 2 then minimum one no is to be checked).
- 5) (\*\*\*\*) Sample inspection of component does not mean that the supplier will not meet drawing & specification requirements in remaining components. In case any defect / non-conformance is observed at any stage (during processing or before and after fitment in any job), the same is liable to be rejected and same shall be replaced immediately by the supplier at BHEL or BHEL Customer site (wherever deficiency is observed) and necessary penal action will be taken as per BHEL norms.
- 6) Measuring machines, instruments, gauges, fixtures etc. used for dimensional measurement shall have valid calibration (from NABL accredited lab/ Government agency/OEM) at the time of inspection and record of the same shall be reviewed by BHEL/BHEL inspection agency before start of inspection.

  
 Q. T. D.  
 Quality Engineer  
 BHEL, Bhopal

**Part II: Requirement of clearance of 1<sup>st</sup> lot from BHEL:**

- 1) First lot of item shall be supplied after meeting all QAP requirements to BHEL Bhopal and supply of subsequent lots shall be undertaken only after clearance of first lot by BHEL Bhopal.
  - 2) Vendor has to initiate the supplies as per PO delivery only. Delay in supply of first lot of components or rejection of components due to any non-conformity/ quality deficiency shall not be considered as reason for delay in supply of components in subsequent deliveries as per PO delivery requirement.
  - 3) Initial clearance of 1st lot of items does not absolve the supplier from supply of items as per drawing and specification requirement in subsequent lots.
- Meaning of Legends: '#' - Supplier to submit test certificates & reports of above mentioned parameters.**
- Abbreviation: T P – Task Performer (Supplier), QC – Quality Control (QIX / BHEL appointed inspection agency)**

<b>Prepared by:</b>	<b>Approved by:</b>	<b>Issued by:</b>
 <b>Q.T.M. / AMIT SEN</b> अधिकारी / Engineer अखिल / Q.T.M. Division बसू. टी. एस. विभाग / B.H.E.L., BHOPAL श्री. एच. ई. एल. भोपाल / B.H.E.L., BHOPAL	 <b>TME</b> (Anurag Sharma)	 <b>S. RATHORE</b> Sr. Manager राजेश कपूर / RAJESH KUMAR बसू. टी. एस. विभाग / TQM Division श्री. एच. ई. एल. भोपाल / B.H.E.L., BHOPAL
		 <b>G.S. RATHORE</b> Sr. Manager राजेश कपूर / RAJESH KUMAR बसू. टी. एस. विभाग / TQM Division श्री. एच. ई. एल. भोपाल / B.H.E.L., BHOPAL
		 <b>Q.T.M. / AMIT SEN</b> अधिकारी / Engineer अखिल / Q.T.M. Division बसू. टी. एस. विभाग / B.H.E.L., BHOPAL श्री. एच. ई. एल. भोपाल / B.H.E.L., BHOPAL

**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**  
**QUALITY CONTROL TRANSPORTATION**  
**QUALITY ASSURANCE PLAN (QAP)**

QA Plan for forging/ rough machined forge components No : QTM/QAP/VENDOR/13-14/002 REV.06 Dt:24.12.2020


**Part 1: Final inspection of the component before dispatch from vendor works (#)**

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TP/A/QC**				
1	Heat treatment	Soaking temperature/ soaking time	100%	100% TC to be verified	Temperature recorder/ Time Temperature charts	Heat treatment requirement as per BHEL specification mentioned in the drawing	Mechanical properties as specified in the BHEL specification	Heat treatment report and graph to be provided to BHEL
2	Melt analysis	Chemical Composition	One sample/ heat / Lot	100% TC to be verified	Spectrometer / Wet analysis method	As per BHEL drawing/ specification	As per BHEL drawing/specification	1. TC (as per specification format) from NABL approved Lab for shaft forging. 2. TC (as per specification format) for other forging.
3	Mechanical Testing	Mechanical properties mentioned in the BHEL specification/ drawing	One sample/ Heat treatment batch / Lot	100% TC to be verified	Mechanical testing equipment	As per BHEL drawing/ specification	As per BHEL drawing/specification	3. Three test samples per heat / per heat treatment batch duly approved by TPIA to be provided to BHEL.

लवकुश मोर्य / L. K. MAURYA  
अभियंता / Engineer  
क्यू.टी.एम. प्रभाग / Q.T.M. Division  
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

310640/2024/HEP-TXM20500

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TPIA/QC**				
4	Hardness checking on forging	Hardness limit mentioned in the BHEL specification/ drawing	20% of components/ Heat treatment batch / Lot	10% of components / Heat treatment batch / Lot	Portable hardness tester	As per BHEL drawing/ specification	As per BHEL drawing/specification	Hardness test report to be provided to BHEL
5	Reduction Ratio	Reduction ratio from Ingot to bloom & bloom to blank	100%	100% TC to be verified	Dimensional measuring instruments		Stage wise reduction ratio calculation & its measurement on actual job	Dimensional measurement report for reduction ratio
6	Identification marking	Identification marking by punching/ engraving on forging on the location shown in drawing or location may be taken from BHEL Engg. Dept.	100%	100%	Visual	As per BHEL drawing/ specification TM12548	Identification marking as per BHEL drawing/specification TM12548	
7	Dimensional Inspection	Forge Dimension	All drawing dimension of 100% component	All drawing dimension of 10% component	Instrument	As per BHEL drawing	1) a) In case order is as per forging drawing: As per BHEL drawing. b) In case order is as per rough m/cd drawing: As per BHEL drawing along with concentricity less than 1mm. c) In case order is from finish machined drawing: 4 (+/-0.5) mm machining allowances on each tool point along with concentricity less than 1mm.	Dimensional witness report to be provided to BHEL


  
 लवकुश मौर्य / L.K. MAURYA  
 अभियंता / Engineer  
 क्यू.टी.एम. प्रभाग / Q.T.M. Division  
 बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

310640/2024/HEP-TXM20500

Sl. No.	Name of the process	Parameters for inspection	Quantum of Check*		Mode of inspection/ equipment used	Drawing No./Spec./ Std.	Acceptance norms***	Requirement from supplier (See note 1)
			TP/Supplier	TP/IA/QC**				
7	Dimensional Inspection	Rough machined dimensions	All drawing dimension of 100% component	All drawing dimension of 20% component	Instrument	As per BHEL drawing	2) Centre line on each job should be marked to ensure the forge, rough m/cd dimensions as per the forging, rough m/cd drawing requirement or machining allowance on each tool point of finish machined drawing.	Dimensional witness report to be provided to BHEL
8	Non Destructive Tests (NDT)	NDT tests (DP/MPI/UT) as mentioned in the BHEL drawing/ specification	100% or Sampling percentage as mentioned in the BHEL drawing/ specification	20%	NDT equipment	As per BHEL drawing/ specification	As per BHEL drawing/ specification	NDT report to be provided to BHEL along with consignment
9	Visual Inspection	Component to be free from any abnormality such as blow hole, pin hole, dent etc.	100%	100%	Visual	As per BHEL drawing/ specification	Free from visual defect	-

**Notes:**

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 लवकुश मोदी / L.K. MAURYA  
 Engineer  
 म्यू.टी.एम. प्रभाग / Q.T.M. Division  
 बी.एच.ई.एल., भोपाल / BHEL, BHOPAL



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**Meaning of Legends: ‘#’ - Supplier to submit test certificates & reports of above mentioned parameters.**

**Abbreviation: TPIA -BHEL appointed third Party Inspecting Agency, T P – Task Performer (vendor), QC-QIX.**

Prepared by:	Approved by:	Issued by:
<div>लवकुश मौर्य / L. K. MAURYA अभियंता / Engineer उपू.टी.एम. प्रभाग / Q.T.M. Division बी.एच.ई.एल., भोपाल / BHEL, BHOPAL</div> <div>24/12/20 ANISH VERMA TPIA / QA Division BHEL, Bhopal</div>	<div>राजेश कुमार / RAJESH KUMAR उप प्रबंधक / Sr. Manager उपू.टी.एम. प्रभाग / TQM Division बी.एच.ई.एल., भोपाल / BHEL, Bhopal</div> <div>एम. एल. प्रताप लाल KATY उप प्रबंधक / Sr. Manager उपू.टी.एम. प्रभाग / Q.T.M. Div. बी.एच.ई.एल., भोपाल / BHEL, Bhopal</div>	<div>पंकज कुमार / Pankaj Kumar Paigvar उप प्रबंधक / Dy. Manager उपू.टी.एम. प्रभाग / QTM Division बी.एच.ई.एल., भोपाल / BHEL, Bhopal</div>