

TD-106-1 Rev No. 5	 HYDERABAD	PRODUCT STANDARD PUMPS HYDERABAD		FP 50639 Rev No. 05 Page 1 of 5		
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.		<u>FORGED RINGS/BUSHES/SLEEVES</u> 1.0 SCOPE This standard specifies the requirements of stainless steel forged rings / bushes used in Cooling Water Pump of Super critical power plants. 2.0 CONDITIONS OF DELIVERY: 2.1 Forging shall be rough machined as per the dimensions indicated against the relevant variant number shown in the accompanying Table-I. 2.2 Forgings shall be hardened and tempered before rough machining 2.3 Forgings shall be stress relieved after rough machining. 3.0 COMPLIANCE WITH NATIONAL STANDARDS: Nearest equivalent international standards for this standard are: JIS G4303 SUS403Q and ASTM A276-S40300 & S41000. 4.0 DIMENSIONS AND TOLERANCES: 4.1 The forging shall be supplied in rough machined condition (Ra 6.3) as per dimensions indicated against relevant Variant Number shown in the accompanying Table - I. When the forging are made out of ingots the minimum reduction ratio shall be 4:1. 4.2 No scratch, bruise shall be found on machined surface 4.3 Tolerances on diameter shall be + 1.0 mm and on length $\pm$ 5 mm. 4.4 Maximum permissible run out shall be 0.3 mm. 5.0 HEAT TREATMENT: Forgings shall be heat treated and tempered to give the mechanical properties specified. Recommended temperatures are given below for guidance. The manufacturer may decide actual temperatures and HT charts shall be furnished. Test pieces shall also be heat treated along with the forgings they represent.				
		Ref. Doc	Revisions : Refer to record of revisions :	Prepared : SATISH	Approved : K.H.R.K	Date : 23.05.12



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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<u>Recommended temperatures:</u> Hardening : 950-1000 °C, Oil quenching Tempering : 700-750 °C, Water quenching Stress relieving: The forgings shall be stress relieved after rough machining. Stress relieving temperature shall be with (-) 20°C of tempering temperature with atmospheric radiation. 6.0 FREEDOM FROM DEFECTS: Forging shall be free from defects such as cracks, flakes, seams, segregation, harmful non-metallic inclusions and other defects which may affect the utility of the forging. Bars shall be free from internal and surface defects. Inclusion rating per each melt and heat treatment batch as per ASTM: E45, 2 series for all types shall be acceptable. 7.0 CHEMICAL COMPOSITION: <table border="1"> <thead> <tr> <th>Carbon % max.</th> <th>Silicon % max.</th> <th>Manganese % max.</th> <th>Phosphorus % max.</th> <th>Sulphur % max.</th> <th>Chromium %</th> <th>Nickel % max.</th> </tr> </thead> <tbody> <tr> <td>0.15</td> <td>0.50</td> <td>1.00</td> <td>0.04</td> <td>0.03</td> <td>11.50 to 13.00</td> <td>0.60</td> </tr> </tbody> </table> 8.0 MECHANICAL PROPERTIES: <table border="1"> <thead> <tr> <th>Tensile strength N/mm² min.</th> <th>Yield stress N/mm² min.</th> <th>Elongation % Min.</th> <th>Charpy Impact (Iso-V-notch) J, min.</th> <th>Reduction in area % min.</th> <th>Hardness** HB</th> </tr> </thead> <tbody> <tr> <td>590</td> <td>390</td> <td>20</td> <td>59</td> <td>50</td> <td>170 - 240</td> </tr> </tbody> </table> ** Note: To ensure better sampling & compliance, hardness shall be checked and recorded on all forgings & test samples 9.0 NON-DESTRUCTIVE TESTS: a) After heat treatment and rough machining, the shaft forging shall be subjected to 100% Ultrasonic examination as per standard AA0850118 and acceptance shall as per AA0850102 and category-2. Frequency shall be minimum 2 MHz and back wall echo minimum 80%.			Carbon % max.	Silicon % max.	Manganese % max.	Phosphorus % max.	Sulphur % max.	Chromium %	Nickel % max.	0.15	0.50	1.00	0.04	0.03	11.50 to 13.00	0.60	Tensile strength N/mm ² min.	Yield stress N/mm ² min.	Elongation % Min.	Charpy Impact (Iso-V-notch) J, min.	Reduction in area % min.	Hardness** HB	590	390	20	59	50	170 - 240
	Carbon % max.	Silicon % max.	Manganese % max.	Phosphorus % max.	Sulphur % max.	Chromium %	Nickel % max.																						
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.			b) Additional acceptance criteria: The reflected wave from the defects is less than 20% of the height of reflected wave from the bottom of a part without defects. The reflected wave from the bottom is more than that 50% of the reflected wave from bottom of a part without defects. The above shall be accepted. c) 100% magnetic particle examination shall be carried out after heat treatment and rough machining as per AA0850102 category 2 10.0 INSPECTION: Forgings shall be supplied with inspection and certification by BHEL or BHEL nominated Third Party Inspection Agency. For shaft couplings variant no.01 & 06, separate SQP shall be followed as per annexure-1 11.0 TEST CERTIFICATES: The supplier shall furnish 5 copies of test certificates (in English) duly certified by the inspection agency containing the following information. a) Dimension report b) Chemical analysis c) Mechanical properties d) Heat treatment chart e) NDT results (Ultrasonic and Magnetic Particle) f) BHEL order No, supplier's name, Var. No., description of item. 12.0 MARKINGS: The following details shall be engraved on each forging for easy identification. Drawing No: Eg. FP50618, VAR. No.xx Melt No:/Heat No: 13.0 PRESERVATION AND PACKING: The forging shall be properly protected from damaged and corrosion during transport. Machined surfaces shall be protected with non-greasy anti-corrosive coating. Painting is not permitted. 14.0 REJECTION AND REPLACEMENT:	
Ref. Doc			If it is found that forging is not as per the specification requirement at any time during further operation at BHEL works, the forging is liable for rejection and the vendor shall replace the rejected forging at free of cost	



PRODUCT STANDARD

PUMPS

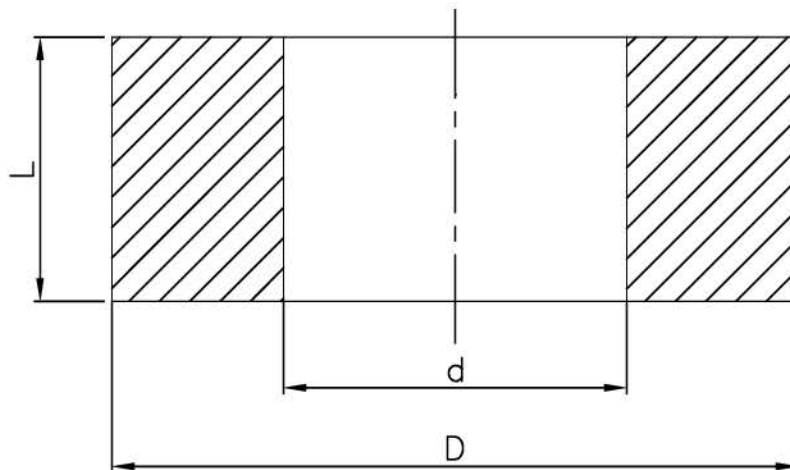
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FORGED RINGS/BUSHES/SLEEVES



VARIANT TABLE:

VAR. NO.	D ±1.0	d ±1.0	L ±1.0	WT. kg.	MATL CODE	REMARKS
01	330	235	950	314.2	FP9550639010	78MN, SHAFT COUPLING
02	260	120	230	75.4	FP9550639029	78MN, COUPLING COLLAR
03	425	245	95	51.9	FP9550639037	78MN, THRUST BEARING NUT
04	290	250	360	48.0	FP9550639045	78MN, PACKING SLEEVE
05	290	250	45	5.9	FP9550639053	78MN, SLEEVE RETAINER
06	290	200	900	245	FP9550639061	SHAFT COUPLING
07	230	100	210	56	FP9550639070	COUPLING COLLAR
08	280	240	440	57	FP9550639088	PACKING SLEEVE
09	280	240	40	5.5	FP9550639096	SLEEVE NUT
10	425	220	95	77.5	FP9750639103	THRUST BRG. NUT
11	270	220	440	67.7	FP9750639111	CW10M, PACKING SLEEVE
12	270	220	40	6.15	FP9750639120	CW10M, SLEEVE NUT
13	310	230	40	10.8	FP9750639138	CW10M, ROLLER HSG NUT
14	425	210	95	81.4	FP9750639146	CW10M, THRUST BRG. NUT
15	270	220	610	94	FP9750639154	CW10M, LINE SHAFT SLEEVE
16	330	200	900	390	FP9750639162	CW10M, SHAFT COUPLING

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		Rev. No.	Date	Revision Details	Revised By	Approved By
		01	08/01/2014	Var. no. 06, 07, 08 & 09 added	SATISH	KHRK
		02	21/02/2014	Var. no. 10 added	SATISH	KHRK
		03	17/06/2015	Var. no. 11 to 14 added.	SATISH	KHRK
		04	30.05.2018	Specification generally revised and SQP for shaft couplings is included as annexure-1	SATISH	KHRK
		05	15.02.2019	Var. no. 15 added.	SATISH	KHRK
		Ref. Doc.				

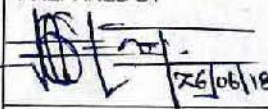
Annexure-1

BHEL		BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD		STANDARD QUALITY PLAN FOR VENDOR ITEMS				QP. NO: HYQA/PMP/SQP/077 REV. NO.: 00 DATE: 26-06-2018 VALID UPTO: 25-06-2020				
		ITEM: CWP SHAFT COUPLING BHEL SPEC: FP 50639 R04 (SUS403Q)				PAGE 1 OF 4						
Sl No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	* D	Agency P W V	Remarks	
1.0	RAW MATERIAL											
1.1	Raw Material (Ingot)	Chemical, Ingot size, Inclusion rating	Major	Spectro. Measrt Microscopic.	Each Melt. 100% Each Melt	FP 50639/ SUS403Q	FP 50639/ SUS403Q	Mil TC	√	2	1	Control on gas content to be maintained by measuring H2 content between 2-3ppm in the molten metal.
2.0	IN- PROCESS INSPECTION											
2.1	Forging Process	Heating of Ingot in the furnace. Forging at Forging press	Major	Review Time & Temperature Forging Temperature	100%	Approved Manufacturing Process Plan	Approved Manufacturing Process Plan	Internal Record	√	2	1	Raw material to Forging Reduction Ratio shall be 4:1
2.2	Forging (after Reduction Process)	Forging Dimensions	Major	Measrt	100%	FP 50639 Clause 7.2.1	FP 50639 Clause 7.2.1	Log sheet	√	2	1	Actual Reduction Ratio to be reported in TC.
		Surface Examination	Major	Visual	100%	FP 50639 Clause 7.3	FP 50639 Clause 7.3	Log sheet	√	2	1	Calculation sheet for Reduction Ratio to be submitted.
2.3	Heat Treatment (Hardening & Tempering)	Time & Temperature	Major	Review	100%	FP 50639 Clause 7.2.3	FP 50639 Clause 7.2.3	HT Chart	√	2	1	

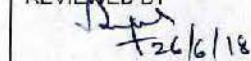
LEGEND:

P: - PERFORM, W: - WITNESS, V: - VERIFICATION,
INDICATING 1: - BHEL / BHEL NOMINATED INSPECTION AGENCY, 2: - VENDOR / SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P, W & V.
* D: RECORDS IDENTIFIED WITH TICK (✓) SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.

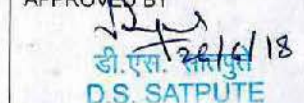
PREPARED BY



REVIEWED BY



APPROVED BY


 डी.एस. साठुटे
 D.S. SATPUTE

ISSUED BY QUALITY ASSURANCE DEPARTMENT

Format no. : HYQA/QP/VSQP Rev.02

 Addl. General Manager / Quality Assurance
 डी.एस.ई.ए. हैदराबाद BHEL, HYD-02


BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD		STANDARD QUALITY PLAN FOR VENDOR ITEMS						QP. NO: HYQA/PMP/SQP/077 REV. NO.: 00 DATE: 26-06-2018 VALID UPTO: 25-06-2020					
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SI No	Component & Operations	Characteristics	Class	Type Of Check	Quantum Of Check	Ref Document	Acceptance Norms	Format Of Record	*	Agency			Remarks
									D	P	W	V	
2.4	Stress Relieving	Time & Temperature	Major	Review	100%	FP 50639 Clause 7.2.3	FP 50639 Clause 7.2.3	SR Chart	√	2		1	
2.5	Test piece Identification	Stamping on Test Piece by TPIA	Major	Visual	Per Melt Per HT Batch	FP 50639	FP 50639	Log sheet	√	2	1		
2.6	Rough Machining	Dimensional Inspection	Major	Measrt	100%	FP 50639	FP 50639	Log sheet		2			
3.0	FINAL INSPECTION & TESTING												
3.1	Test Piece (Identified by TPIA)	Chemical	Major	Spectro	Test Piece as per QP SI No. 2.5	FP 50639 Clause 7.4	FP 50639 Clause 7.4	Test Report	√	2		1	
		Mechanical Properties including Hardness	Critical	Mechanical		FP 50639 Clause 7.5	FP 50639 Clause 7.5	Test Report	√	2	1		
		Inclusion rating	Critical	Microscopic		FP 50639 Clause 7.3.1	FP 50639 Clause 7.3.1	Test Report	√	2	1		

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PREPARED BY

[Signature]
26/6/18

REVIEWED BY

[Signature]
26/6/18

APPROVED BY

[Signature]
26/6/18
D.S. SATPUTE

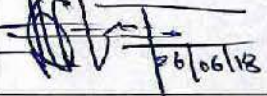
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Format no. : HYQA/QP/VSQP Rev.02

आचार्य महा प्रबंधक / गुणता आश्वासन
Add. General Manager / Quality Assurance
जी.एच.ई.एस. हदराबाद BHEL, HYD-32



		BHARAT HEAVY ELECTRICALS LIMITED R.C.PURAM, HYDERABAD		STANDARD QUALITY PLAN FOR VENDOR ITEMS				QP. NO: HYQA/PMP/SQP/077 REV. NO.: 00 DATE: 26-06-2018 VALID UPTO: 25-06-2020					
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										P	W	V	
3.2	Rough M/c Forgings	Hardness	Critical	Mechanical	100%	FP 50639 Clause 7.5	FP 50639 Clause 7.5	Test Report	√	2	1		Hardness on actual forging shall be with in 30BHN from the test sample.
3.3	Rough M/c Forgings	Internal soundness through UT	Major	UT	100%	FP 50639 Clause 7.6.1	FP 50639 Clause 7.6.1	UT Report	√	2	1		
		Sub Surface Quality through MPI	Major	MPI	100%	AA0850102	AA0850102 Cat-II	MPI Report	√	2	1		
		Visual, Dimensions & Surface Roughness	Major	Visual, Measrt	100%	FP 50639	FP 50639	Inspection Report	√	2	1		
3.4	Identification Marks	Visual check.	Major	Visual	100%	FP 50639	FP 50639	Record		2	1		Marking by hard stamp method
3.5	Documentation & Certification	Verification	Major	Verify.	100%	--	--	Complete Document		2		1	

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	ISSUED BY QUALITY ASSURANCE DEPARTMENT		

Format no. : HYQA/QP/VSQP Rev.02

अधीन महा प्रबंधक / गुणता आश्वासन
 Addl. General Manager / Quality Assurance
 बी एच ई एल हैदराबाद BHEL, HYD-32



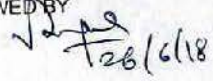
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									D	P	W	V	

NOTES:

- 1) This QP should be read along with BHEL Spec, BHEL drawings and PO.
- 2) Latest revisions of specification / drawings as per P.O. are applicable.
- 3) Any other tests/ checks indicated in specification, P.O., or drawing & any additional checks envisaged by BHEL/TPI to ensure workmanship, finish, aesthetics, etc. shall also be conducted and witnessed/verified by BHEL /TPI / customer as required.
- 4) Specification/Drawing shall prevail over Quality Plan in case of any contradiction
- 5) This QP shall not be applicable to the orders for which QP approval & Inspection by customer/consultant is required.
- 6) This SQP is not applicable for vendors supplying this item for the first time to BHEL
- 7) Pre-despatch inspection photographs of item shall be included in quality documentation
- 8) Material shall be applied with suitable rust preventive coating

HISTORY OF REVISIONS:

Sl. No	Revision details	Date of Revision	Prepared By	Reviewed By	Approved By

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	ISSUED BY QUALITY ASSURANCE DEPARTMENT		

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