

TD-106-1 Rev No. 5	Form No.		PRODUCT STANDARD PUMPS HYDERABAD		FP50443 Rev No. 06 Page 1 of 6
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 BARS-ROUGH MACHINED, FOR PUMP SHAFTS</u> 1.0 <u>GENERAL</u> This standard specifies the quality requirements of rough machined forged bars as per the details given in TABLE-1, intended for Pumps Shafts of BFP, BP & CEP. 2.0 <u>CONDITION OF DELIVERY</u> 2.1 Forgings shall be supplied in rough machined condition with surface finish of 6.3 microns or better. 2.2 Forgings shall be hardened and tempered before rough machining. 2.3 Forgings shall be stress relieved after rough machining. 2.4 Nearest equivalent BHEL material specification : AA19321. 3.0 <u>NEAREST EQUIVALENT INTERNATIONAL STANDARDS</u> Nearest equivalent international standard : DIN 17440-1996, Gr-X20Cr13 (1.4021) 4.0 <u>DIMENSIONS, TOLERANCES & HEAT TREATMENT</u> 4.1 <u>DIMENSIONS:</u> The forgings shall be supplied in rough machined condition as per the dimensions given in TABLE-1. The minimum reduction ratio when forgings are made of ingots shall be 4:1 4.2 <u>TOLERANCES:</u> Tolerances on diameter shall be (+) 2 mm and on length (+) 5 mm. Maximum permissible run out shall be 0.5 mm. 4.3 <u>HEAT TREATMENT:</u> Forgings shall be heat treated and tempered to give the mechanical properties specified. Test pieces shall also be heat treated along with the forgings they represent.			
Ref. Doc	Revisions : Refer to record of revisions :		Prepared : TSR	Approved : JGC	Date : 15.05.91



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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.		Stress relieving shall be done to remove machining stresses and this temperature shall be less than the tempering temperature.																	
		5.0 FREEDOM FROM DEFECTS																	
		Forgings 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 forgings. Forgings shall be free from internal and surface defects.																	
		5.1 Inclusion rating per each melt and heat treatment batch as per ASTM: E45, 2 thin series for all types.																	
		6.0 CHEMICAL COMPOSITION																	
		<table border="1"> <tr> <th>Carbon %</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> <tr> <td>0.16 to 0.25</td> <td>1.00</td> <td>1.50</td> <td>0.04</td> <td>0.03</td> <td>12.00 to 14.00</td> <td>1.00</td> </tr> </table>				Carbon %	Silicon % max.	Manganese % max.	Phosphorus % max.	Sulphur % max.	Chromium %	Nickel % max.	0.16 to 0.25	1.00	1.50	0.04	0.03	12.00 to 14.00	1.00
Carbon %	Silicon % max.	Manganese % max.	Phosphorus % max.	Sulphur % max.	Chromium %	Nickel % max.													
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		7.0 MECHANICAL PROPERTIES																	
		<table border="1"> <tr> <th>Tensile strength N/mm²</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> <tr> <td>750 - 950</td> <td>550</td> <td>12</td> <td>15</td> <td>50</td> <td>217 - 241</td> </tr> </table>				Tensile strength N/mm ²	Yield stress N/mm ² min.	Elongation % Min.	Charpy Impact (Iso-V-notch) J, min.	Reduction in area % min.	Hardness HB	750 - 950	550	12	15	50	217 - 241		
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		8.0 NON DESTRUCTIVE TESTS																	
		8.1 100% Ultrasonic examination shall be carried out after heat treatment and rough machining as per AA0850118 and acceptance standard AA0850102 category 2. Frequency shall be 2 MHz minimum and back wall echo, minimum 80%. 8.2 100% magnetic particle examination shall be carried out after heat treatment and rough machining as per AA0850102 category 2.																	
		9.0 INSPECTION:																	
Ref. Doc		Forgings shall be supplied with inspection and certification by BHEL or BHEL nominated Third Party Inspection Agency (TPIA).																	



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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.		10.0 <u>TEST CERTIFICATES :</u> 5 copies of following test certificates (in English) shall be furnished, duly certified by Inspection Agency. a) Dimension report b) Run out report c) Chemical analysis d) Mechanical properties e) Heat treatment chart f) NDT results (Ultrasonic and Magnetic Particle) 11.0 <u>MARKING :</u> The following details shall be engraved on each forging for easy identification. BHEL order No., Supplier name Specn No: Eg. FP50443, VAR.No.xx, Dimension : ODxL Melt No:/Heat No: 12.0 <u>PRESERVATION & PACKING</u> The forgings shall be properly protected from damage and corrosion during transport. Machined surfaces shall be protected with anti-greasy, anticorrosive coating. Painting is not permitted. 13.0 <u>REJECTION AND REPLACEMENT :</u> The final decision regarding acceptance or rejection rests with BHEL, if the forging is not found as per specification or drawing at any time during further operation on the forging. The supplier shall replace the rejected forging at his own cost.	
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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.	TABLE - 1					
	VAR NO.	DIA x LENGTH (mm x mm)	WT. kg.	TYPE OF PUMP	F-M/C DRG. (FOR INFN)	MATL CODE
	01	135 x 2480	279	200KHI FK8D30	11801210002 01804114134 01804113772 01804114441	FP9750443012
	02	135 x 2900	326	150KHI FK8C36	11811210005 11801210016 11804016184 01804113755	FP9750443020
	03	128 x 2280	230	FK6D30	01804113585	FP9750443039
	04	150 x 2800	270	FK4E36	01804113201	FP9750443047
	05	148 x 2040	261	FK2C45	01804113453	FP9750443055
	06	110 x 1850	138	FA1E64 FA1B75	01891213189 01891213278 01891213414 01891213433	FP9750443063
	07	120 x 2430	216	FRH27 FTAZ30	01804113784 01804113730	FP9750443071
	08	DELETED	--	DELETED	DELETED	DELETED
	09	95 x 1700	95	FA1B56	11891213006	FP9750443098
	10	115 x 3700	302	EN8J40-3Shaft Top Shaft	11812713893	FP9750443101
	11	100 x 2710	167	EN8J40-3Shaft Bottom Shaft	11812713894	FP9750443110
	12	100 x 3270	202	EN8J40-3Shaft Intermediate Shaft	11812713895 11812714631	FP9750443128
	13	100 x 2910	180	EN7J40-2Shaft C'pur EN5J40-250-2Shaft Bottom Shaft	11812713617	FP9750443136
	14	115 x 3600	294	EN7J40-2Shaft C'pur EN5J40-250-2Shaft Top Shaft	11812713616	FP9750443144
	15	80 x 2380	94	EN8H32 Upper shaft	11811216915 11812713189 11812713661	FP9750443152
	16	70 x 2275	69	EN8H32 Lower shaft	11811216914 11812713188 11812713662	FP9750443160
	17	90 x 4550	228	EN5J40-210, 1shaft Wanakbori, Gandhinagar Kolaghat, Panipat-6 Birsingpur, Mejia 1-4 Khaperkheda 1-4	01811213019	FP9750443179
18	90 x 4800	240	EN5J40-210, 1shaft Farakka, Raichur 1-3	01811213059	FP9750443187	

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		Rev. No.	Date	Revision Details	Revised By	Approved By	
		01	04/09/95	GENERALLY REVISED IN LINE WITH EMI-011	TSR	JGC	
		02	18/05/02	Var. Nos.10, 11 & 12 ADDED.	MSR	BRK	
		03	15/10/03	Mech properties TS, YS & Elongation in line with specn AA19321. Heat treatment and nearest equivalent specns revised.	MSR	BRK	
		04	18/02/13	Charpy Impact value changed to 15 in line with AA19321, Rev 07.	ASJK	BRK	
		05	22.10.15	Extra length of 250mm for test piece deleted. Table-1 dimensions and weights revised. Standard generally revised. Cl.no. 2.0 & 4.0 revised.	MSR	KHRK	
		06	10/06/19	Var.Nos.13 to 24 added. Cl.no.5.0&7.0 revised. Specn generally revised.	MSR	KHRK	
		Ref. Doc.					