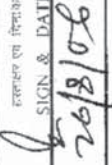


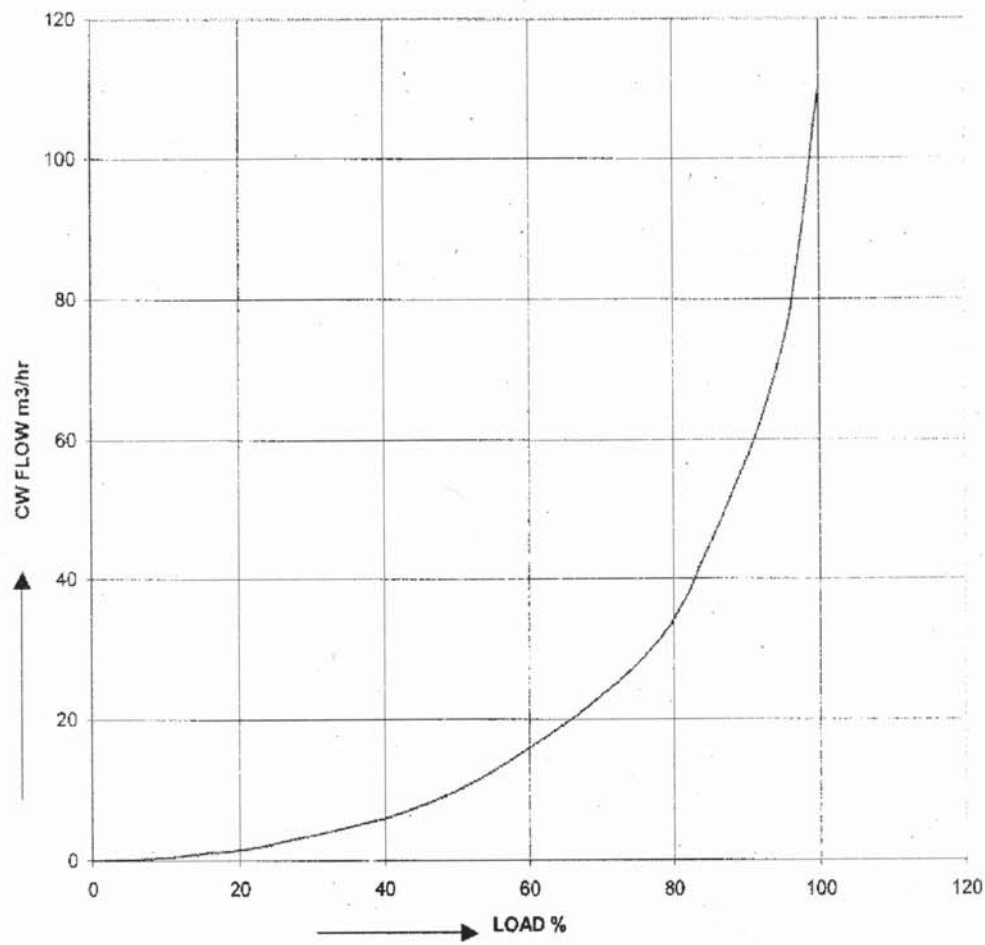
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक		TG60427																																										
		PRODUCT STANDARD		पृष्ठ का Page 1 of 8																																										
सुपरसेड्स INVENTORY NO	TEMPERATURE CONTROL VALVE WITH MOTORISED ACTUATOR.																																													
समर्पित मूली संख्या को संश्लेषित	1.0 SCOPE :- This specification covers the requirements of TEMPERATURE CONTROL VALVES along with MOTORISED ACTUATORS for automatic primary water & H2 cooler temperature control. (with smart actuator/position transmitter)																																													
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.	2.0 APPLICATION:- These valves along with temperature controllers are required to maintain constant temperature under various load conditions of Turbo-generators.																																													
	3.0 COMPLIANCE WITH STANDARD :- There is no national / international standard available on the subject. However this standard is based on BHEL's experience.																																													
	4.0 DESIGNATION :- A cold gas temperature control valve with actuator of size NB 200 shall be designated as below:																																													
	4.1 On drawing and Indents :-																																													
	(a) Material specification column : TG 60427 (b) Description column : TEMPERATURE CONTROL VALVE WITH INTEGRAL ACTUATOR, SIZE NB200 (c) Material Code No. : W90418113017																																													
स्वत्वधिकार एवं गोपनीय This document is the property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company.	4.2 On enquiries and purchase orders :- In addition to above details, a copy of this standard shall be enclosed.																																													
	5.0 TECHNICAL REQUIREMENTS :-																																													
दिनांक एवं हस्ताक्षर SIGN & DATE	5.1 Control valve :																																													
	5.1.1 Technical data :																																													
सुपरसेड्स INVENTORY NO	(i) Size : As per table (ii) Type : GLOBE (iii) Nominal flow at rated load : As per table (iv) Quality of cooling water : Raw water (v) Max. cooling water pressure : 5 Kg/cm ² (vi) Nominal design pressure : 10 Kg/cm ²																																													
	<table border="1"> <tr> <td>TSX</td> <td>DL OBEROI</td> <td>24/8/06</td> <td>अनुवादक</td> <td>TRANSLATED BY</td> <td></td> </tr> <tr> <td>QAX</td> <td>N K MOHAWAN</td> <td>24/8/06</td> <td>निर्माणकर्ता</td> <td>WORKED BY</td> <td>SATISH KUMAR</td> </tr> <tr> <td>CIE</td> <td>S.K.SHARMA</td> <td>24/8/06</td> <td>जांचकर्ता</td> <td>CHECKED BY</td> <td>SATISH KUMAR</td> </tr> <tr> <td>सहमत विभाग</td> <td>नाम</td> <td>दिनांक एवं हस्ताक्षर</td> <td>पर्यवेक्षणकर्ता</td> <td>SUPERVISED BY</td> <td>M.R.BHARDWAJ</td> </tr> <tr> <td>AGREED DEPTT</td> <td>NAME</td> <td>DATE & SIGNATURE</td> <td>स्वीकृति</td> <td>APPROVED : AGM / CIE</td> <td>24.7.06</td> </tr> <tr> <td colspan="3">03</td> <td>निर्माण</td> <td>जारी</td> <td>DATE : 05.06.90</td> </tr> <tr> <td colspan="3">27.01.07</td> <td>PREPARED : CIE</td> <td>ISSUED : TSX</td> <td></td> </tr> </table>					TSX	DL OBEROI	24/8/06	अनुवादक	TRANSLATED BY		QAX	N K MOHAWAN	24/8/06	निर्माणकर्ता	WORKED BY	SATISH KUMAR	CIE	S.K.SHARMA	24/8/06	जांचकर्ता	CHECKED BY	SATISH KUMAR	सहमत विभाग	नाम	दिनांक एवं हस्ताक्षर	पर्यवेक्षणकर्ता	SUPERVISED BY	M.R.BHARDWAJ	AGREED DEPTT	NAME	DATE & SIGNATURE	स्वीकृति	APPROVED : AGM / CIE	24.7.06	03			निर्माण	जारी	DATE : 05.06.90	27.01.07			PREPARED : CIE	ISSUED : TSX
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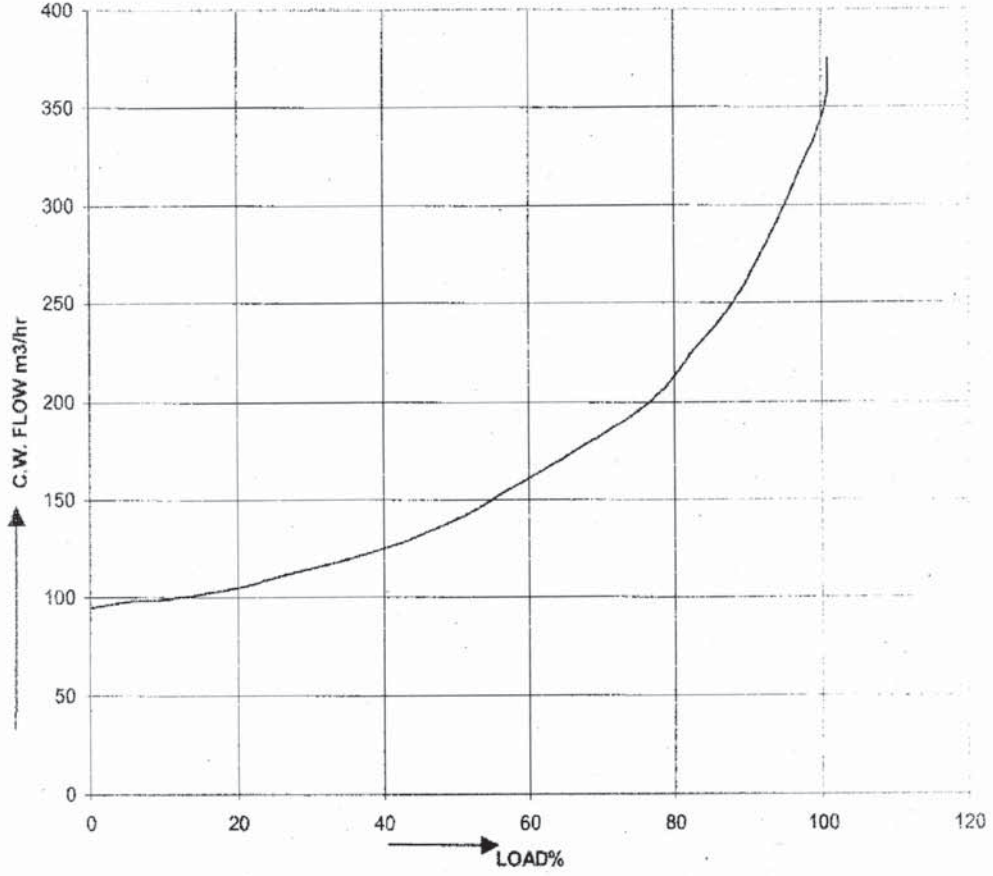
SIGN & DATE SUPERSEDES INVENTORY NO. अतिरिक्त प्रतीक		उत्पाद मानक PRODUCT STANDARD (HEEP - HARDWAR)		TG60427 पृष्ठ का Page 2 of 8	
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited it must not be used directly or indirectly in any way detrimental to the interest of the company.		(vii) Nominal temperature .. . : 50°C (viii) Differential pressure to be throttled by valve : As per table (ix) Differential pressure shut – off : 3.0 Kg / cm² (x) Cooling water quantity at .. . : as per respective characteristic curves Various loads (xi) Weld end details .. . : Butt weld as per ANSI-B 16.25 5.1.2 Material of main parts :- (i) Body .. . : Cast carbon steel to ASTM A 216/Grade WCC (ii) Bonnet .. . : Cast carbon steel to ASTM A 216/Grade WCC (iii) Stem ... : 13% Chromium stainless steel as per ASTM A 182 F6a (iv) Seat .. . : 13% Chromium stainless steel as per AISI 410 (v) Packing .. . : Teflon Materials mentioned above indicate minimum requirements. 5.2 ACTUATOR :- 5.2.1 Technical Data :- (i) Type .. . : Motorised actuator with position indicator (ii) Movement .. . : Linear / Rotary (iii) Power supply .. . : 415V ± 10%, 50Hz, 3-Phase, 3-wire (Any other power supply needed will be generated by the vendor internally) (iv) Positioner input .. . : 4-20 mA (for load burden up to 250 ohms) (v) Position transmitter output .. . : 4-20 mA (for load burden → 250 ohms) (vi) Limit switch .. . : 2 SPDT at each end position (vii) Torque switch .. . : 2 SPDT for end positions (viii) Hand wheel .. . : Side (ix) Operating time of actuator (Response time) : See table (x) Dead band .. . : 0.1 – 3% of input signal (adjustable) (xi) Span adjustment .. . : 0 – 100 % of signal (xii) Protection operation of valve .. . : Stay put / Fully opened (configurable at site) (xiii) Motor Type / Duty ... : TEFC / Continuous (xiv) Standards to which motor conforms .. . : IS 325 or equivalent BS/DIN/VDE/IEC stand (xv) Permissible voltage and frequency variation : ± 10 % of voltage, ± 5 % of frequency ± 10 % of combined voltage & frequency (xvi) Protection class .. . : IP 54 or better (xvii) Ambient temperature ... : 55 °C (Maximum) (xviii) Relative humidity ... : 0 – 100 % (xix) Insulation class ... : F			
स्वतंत्रता एवं गोपनीय इस दस्तावेज़ में दी गई जानकारी केवल ही है और इसे किसी भी प्रकार से बिना लिखित अनुमति के न कहीं जाना चाहिए।		REV.NO. 03	निर्माणकर्ता WORKED BY SATISH KUMAR	जांचकर्ता CHECKED BY M.R.BHARDWAJ	24/07/08 29/08/08

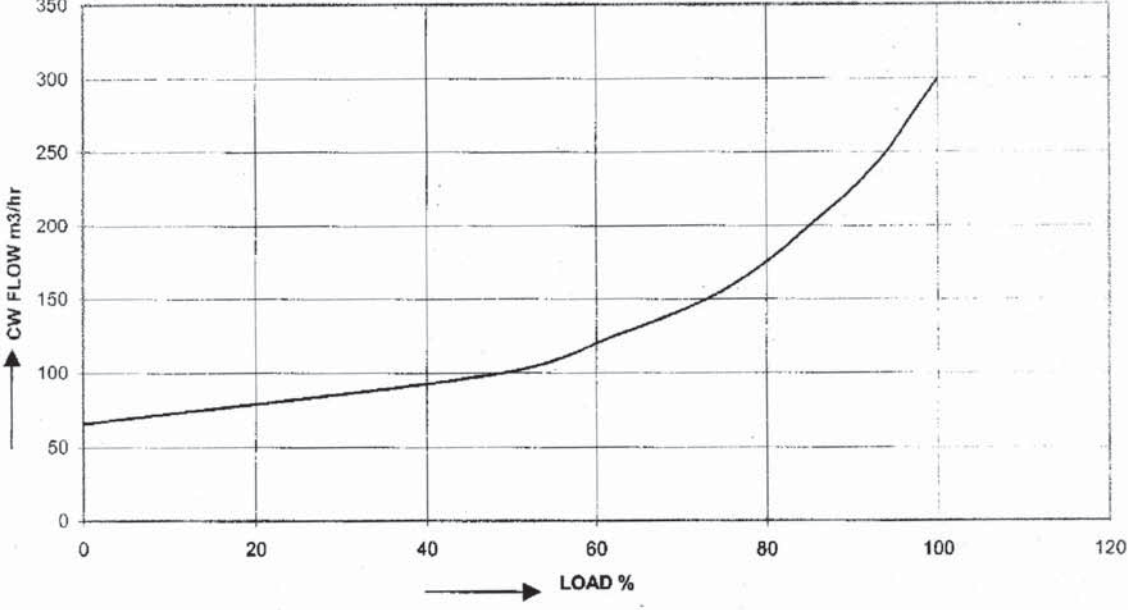
दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक (डीप - हार्डवेयर)		TG60427	
		PRODUCT STANDARD (HEEP - HARDWAR)		पृष्ठ का Page 3 of 8	
सुपरसेड्स INVENTORY NO	(xx) Voltage class : 660 V / 1100 V (xxi) Test voltage : 2 Kv (RMS) for 1 min. (xxii) Auxilary contacts rating : 5 AMP. At 220V(AC) / Silver Plated contacts (xxiii) Position Transmitter Characteristics : To be Suitable for 24 VDC, $\pm 20\%$, 0.5 % resolution & $\pm 1\%$ accuracy 5.2.2 Smart actuator / position transmitter with complete technical characteristics will be offered as optional in lieu of conventional actuator. BHEL reserves the right to order any type.				
समीचीन रूप में प्रमाणित प्रमाणित किया है	6.0 TESTING AND INSPECTION :- 6.1 The manufacturer shall conduct all tests required to ensure conformity of supplies to the requirements of this specification, applicable codes and standards. 6.2 The bidder shall furnish quality plan on BHEL format for approval. The inspection shall be carried out at supplier's works before dispatch, as per BHEL approved Quality Plan. 6.3 Minimum tests / checks of control valve to be included in the quality Plan :- 6.3.1 Material tests of important parts for chemical and mechanical properties. 6.3.2 Hydraulic test at 15 kg / cm ² for 10 minutes. 6.3.3 Seat leakage test at 10 Kg / cm ² as per ANSI - B16.104 6.3.4 Back seat test at 10 Kg / cm ² . 6.4 Minimum tests / checks of Actuators to be included in Quality Plan :- 6.4.1 Routine tests 6.4.1.1 IR test 6.4.1.2 HV test at 2 KV RMS for 1 minute 6.4.1.3 Motor locked rotor test. 6.4.1.4 Load current shall be measured at maximum rated torque of the actuator. 6.4.1.5 Check for wiring for continuity and correctness. 6.4.1.6 Check for correct operation of switches. 6.4.2 Type tests : 6.4.2.1 IR test 6.4.2.2 HV test at 2 KV RMS for 1 minute 6.4.2.3 Torque characteristics 6.4.2.4 Functional test 6.4.2.5 Response time test 6.4.2.6 Repeatability test				
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स्वीकृति एवं गोपनीय इस प्रमाण में कि यह प्रमाणित करने की समझौते है इसका प्रमाण है। अतः इसका स्वीकार करने के लिए कि कंपनी को दिए गए हस्ताक्षरक को ही माना जाएगा।					
दिनांक एवं हस्ताक्षर SIGN & DATE	24/07/14				
समीचीन रूप में प्रमाणित INVENTORY NO	REV.NO. 03	निर्माणकर्ता WORKED BY	SATISH KUMAR		24/07/14
P-5007		जांचकर्ता CHECKED BY	M.R.BHARDWAJ		24/07/14

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक (हीप - हार्डवेयर) PRODUCT STANDARD (HEEP - HARDWAR)		TG60427 पृष्ठ का Page 4 of 8	
सामग्री सूची संख्या INVENTORY NO.	6.4.2.7 Supply variation : At a torque setting of maximum stated torque rating and supply voltage reduced to 80 %, the actuator shall be started when at nominal speed, the voltage shall be reduced to 75 % for 2 minutes and it shall be seen that no injurious heating of motor takes places. 6.4.2.8 Over heating test : Over heating test shall be performed with the actuator running and the output shaft locked. 6.4.2.9 Weather protection test 6.4.2.10 Endurance test.				
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited it must not be used directly or indirectly in any way detrimental to the interest of the company.	7.0 DOCUMENTS TO BE FURNISHED ALONGWITH OFFER IN TRIPLICATE : 7.1 Technical data sheet (for 5.1 & 5.2 are meant for approval) of control valve , actuator and positioner. 7.2 Electrical parameter of actuator motor including motor rating. 7.3 General arrangement drawing of control valve with actuator and positioner. 7.4 Dimensional detailed drawings alongwith material details of control valve , actuator and positioner. 7.5 Detailed technical catalogues of valve , actuator and positioner. 7.6 Quality Plan on BHEL format. 7.7 Valve travel Vs Flow characteristics of the control valve (for reference). 8.0 DOCUMENT TO BE FURNISHED AFTER PLACEMENT OF ORDER :- 8.1 10 copies of operation and Maintenance manual of the valve , actuator and positioner per set. 8.2 10 copies of GA drawing of the control valve assembly per set. 8.3 5 copies each of test and Guarantee certificates. 9.0 IDENTIFICATION :- Each control valve assembly shall have a stainless steel tag having engraved on it : Make , Type , Size , BHEL code No. , Application , Sl . No. , year of manufacture etc. 10.0 PACKING AND CONSERVATION :- The control valve assembly shall be suitably conserved for long storage at site. These shall be adequately packed with enough cushioning material to avoid transit damages.				
स्वत्वाधिकार एवं गोपनीय इस दस्तावेज में दी गई युक्तियां भारत हेवी इलेक्ट्रिकल लिमिटेड की संपत्ति हैं। इसका प्रयोग अन्य किसी भी उद्देश्य के लिए नहीं किया जा सकता है।					
दिनांक एवं हस्ताक्षर SIGN & DATE 					
सामग्री सूची संख्या INVENTORY NO. P-5807	REV.NO. 03		निर्माणकर्ता WORKED BY SATISH KUMAR		24/07/06
			जांचकर्ता CHECKED BY M.R.BHARDWAJ		24/07/06

निर्माक एवं दिनांक SIGN & DATE		उत्पाद मानक (हीप - हार्डवेयर)		TG60427					
		PRODUCT STANDARD (HEEP - HARDWAR)		पृष्ठ का Page 5 of 8					
सुपरसेडिंग INVENTORY NO.	11.0 <u>GUARANTEE :-</u> Equipment shall be guaranteed for a minimum period of 18 months from the date of supply or 12 months from the date of commissioning whichever is earlier.								
12.0 <u>LIST OF THE CROSS REFERED STANDARDS</u> 1.0 Butt Weld as per ANSI - B 16.25 2.0 Cast Carbon steel to ASTM A 216 / Grade WCC 3.0 13 % Chromium stainless steel as per ASTM A 182 4.0 13 % Chromium stainless steel as per AISI 410 5.0 Seat leakage test as per ANSI - B 16 - 104 6.0 IS : 325 OR Equivalent BS/DIN/VDE/IEC standards									
SI No.	Var. no.	material code	Applicable	Size (nb)	Nominal flow at rated load (m3/hr)	Applicable Figure.	Operati on time of actuator (sec)	remarks	ΔP* Kg/cm2
1.	00	-	PW controller	200	110	Fig. 1	50	For THW	0.20
2.	01	-	H2 controller	250	350	Fig.2	48	For THW	0.40
3.	02	W90418113017	H2 controller	250	300	Fig. 3	48	For THRI	0.25
ΔP*-DIFFERENTIAL PRESSURE TO BE THROTTLED BY VALVE (MAX).									
स्वत्वाधिकार एवं गोपनीय This information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.	COPYRIGHT AND CONFIDENTIAL								
निर्माक एवं दिनांक SIGN & DATE	24/07/06								
संपत्ति सूची संख्या INVENTORY NO.	REV.NO.				निर्माणकर्ता WORKED BY	SATISH KUMAR		24/07/06	
P-5807	03				जांचकर्ता CHECKED BY	M.R.BHARDWAJ		24/07/06	

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक (हीप - हार्डवेयर) PRODUCT STANDARD (HEEP - HARDWAR)		TG604-27 पृष्ठ का Page 6 of 8															
सामग्री सूची संख्या को अपडेट किया करता है	SUPERSEDES INVENTORY NO.	For THW 210 MW																	
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of Bhaat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.		FIG 1 LOAD VS C.W. FLOW TO P.W. COOLERS  <table border="1"> <caption>Data points estimated from FIG 1 graph</caption> <thead> <tr> <th>LOAD %</th> <th>CW FLOW m3/hr</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td></tr> <tr><td>20</td><td>2</td></tr> <tr><td>40</td><td>8</td></tr> <tr><td>60</td><td>18</td></tr> <tr><td>80</td><td>35</td></tr> <tr><td>100</td><td>110</td></tr> </tbody> </table>				LOAD %	CW FLOW m3/hr	0	0	20	2	40	8	60	18	80	35	100	110
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100	110																		
स्वाध्यायिकार एवं गोपनीय इस दस्तावेज़ में कोई भी सूचना भारत देश की स्वतंत्रता, संप्रभुता, एकीकरण, सुरक्षा, अखंडता एवं विकास के लिए आवश्यक है जो कि कंपनी के हित में हस्तक्षेप करने में किया जाए।																			
दिनांक एवं हस्ताक्षर SIGN & DATE	26/8/08																		
INVENTORY NO. P-5807	REV.NO. 03		निर्माणकर्ता WORKED BY	SATISH KUMAR	24/07/08														
			जांचकर्ता CHECKED BY	M.R.BHARDWAJ	24/07/08														

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक (हीप - हार्डवयर) PRODUCT STANDARD (HEEP - HARDWAR)		TG604-27 पृष्ठ का Page 7 of 8															
सामग्री सूची संख्या एवं INVENTORY NO	SUPERSEDES INVENTORY NO	For THW 210 MW																	
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.		FIG. 2 LOAD VS C.W. FLOW TO H2 COOLER																	
स्वत्वाधिकार एवं गोपनीय इस दस्तावेज़ में दी गई सूचना भारत भारती इलेक्ट्रिकल्स लि. की संपत्ति है और गोपनीय है। इस दस्तावेज़ को किसी भी प्रकार प्रयोग, जो कि उसकी को हित में हानिकारक हो न किया जाए।		 <table border="1"> <caption>Approximate data points from FIG. 2</caption> <thead> <tr> <th>LOAD%</th> <th>C.W. FLOW m3/hr</th> </tr> </thead> <tbody> <tr><td>0</td><td>95</td></tr> <tr><td>20</td><td>105</td></tr> <tr><td>40</td><td>125</td></tr> <tr><td>60</td><td>160</td></tr> <tr><td>80</td><td>215</td></tr> <tr><td>100</td><td>360</td></tr> </tbody> </table>				LOAD%	C.W. FLOW m3/hr	0	95	20	105	40	125	60	160	80	215	100	360
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सामग्री सूची संख्या INVENTORY NO	P-5807	REV.NO. 03	निर्माणकर्ता WORKED BY	SATISH KUMAR	24/07/04														
			जांचकर्ता CHECKED BY	M.R.BHARDWAJ	24/07/04														

दिनांक एवं स्थिति SIGN & DATE		उत्पाद मानक (हीप - हार्डवार) PRODUCT STANDARD (HEEP - HARDWAR)		TG60427 पृष्ठ का Page 8 of 8															
सामग्री शरी संख्या को SUPERSEDES INVENTORY NO	For THRI 210 MW FIG 3 COOLING WATER FLOW VS LOAD  <table border="1" style="margin-top: 10px;"> <caption>Data points estimated from FIG 3</caption> <thead> <tr> <th>LOAD %</th> <th>CW FLOW m³/hr</th> </tr> </thead> <tbody> <tr><td>0</td><td>65</td></tr> <tr><td>20</td><td>75</td></tr> <tr><td>40</td><td>90</td></tr> <tr><td>60</td><td>120</td></tr> <tr><td>80</td><td>170</td></tr> <tr><td>100</td><td>300</td></tr> </tbody> </table>					LOAD %	CW FLOW m³/hr	0	65	20	75	40	90	60	120	80	170	100	300
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स्वत्वाधिकार एवं गोपनीय इस दस्तावेज़ में दी गई सूचना भारत भारती इलेक्ट्रिकल्स लि. सम्पत्ति है इसका प्रयोग अथवा प्रसारण के बिना भारत भारती इलेक्ट्रिकल्स लि. की लिखित अनुमति के बिना नहीं किया जाये।																			
दिनांक एवं स्थिति SIGN & DATE	26/8/06																		
सामग्री शरी संख्या INVENTORY NO	REV.NO. 03		निर्माणकर्ता WORKED BY	SATISH KUMAR	 24/07/06														
P-5307			जांचकर्ता CHECKED BY	M.R.BHARDWAJ	 24/7/06														