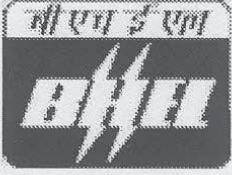
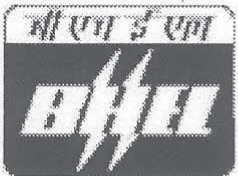


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SUPERSEDES INVENTORY NO.		Page 1 Of 9																																											
सामग्री सूची संख्या को अधिकृत		GEN END WINDING VIBRATION MONITORING EQUIPMENT WITH FIBER OPTICS SENSOR FOR TURBO-GENERATORS 1.0 GENERAL: BHEL'S EXPERIENCE This specification covers the requirement of Fibre Optic Vibration Monitoring System (FOVMS) for Generator end winding overhang zone. The system will comprise of FO Vibration Sensors, integrated Cable, Signal conditioners, field JB's, safety barriers and a Cabinet comprising monitoring module, PSU, fuses etc. The Fiber Optics (FO) sensors shall be mounted at different locations on generator overhang winding on both ends and will be connected by special optical integral cable and terminated on lead-in-plates. There will be two lead in plates (BHEL scope), one at turbine end and one at Exciter end. The work of mounting FO sensors on Generator overhang and making connection up to lead-in-plate is in scope of BHEL Haridwar and shall be carried out at BHEL works. Signal conditioner shall mounted on Lead in plates. Electrical signals will be taken to generator mounted JB by low noise screened cable. The signal from JB will be taken to EW Cabinet having vibration monitoring modules by low noise cables to ensure minimum corruption in signal. The control cabinet shall be of Rittal/ Pyrotech (or other reputed make, subject to BHEL's approval). The degree of protection shall be IP-32 or as specified in enquiry / order. This cabinet will be placed in air conditioned room in the power station Control Room. The equipment will generally be used to monitor 2X (94Hz-106Hz) vibrations in displacement mode. However, there will also be the facility to monitor 1X Hz (47Hz-53Hz) and overall (Sigma) values which shall be software selectable or switch selectable to operator. The corresponding 4-20mA outputs for 2X /1X / sigma values will be made available for external use in the client's DCS. There shall be in-built provision for supply of 24VDC to signal conditioner from vibration monitoring modules.																																											
COPYRIGHT AND CONFIDENTIAL The information on this documents 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		स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।																																											
हस्ताक्षर एवं दिनांक SIGN & DATE	सामग्री सूची संख्या INVENTORY NO.	<table><tr><td></td><td></td><td></td><td>नाम NAME</td><td>दिनांक एवं हस्ताक्षर SIGNATURE & DATE</td></tr><tr><td>GRI</td><td>P.J.BAGAWADE</td><td></td><td>अनुवादक TRANSLATED BY</td><td></td></tr><tr><td>TSX</td><td>LALIT KUMAR</td><td></td><td>निर्माणकर्ता WORKED BY</td><td>SATISH KUMAR</td></tr><tr><td>QAX</td><td>SK CHAUHAN</td><td></td><td>जांचकर्ता CHECKED BY</td><td>RAJNISH GUPTA</td></tr><tr><td>सहमत विभाग AGREED DEPTT</td><td>नाम NAME</td><td>दिनांक एवं हस्ताक्षर DATE & SIGNATURE</td><td>पर्यवेक्षणकर्ता SUPERVISED BY</td><td>VINOD KUMAR</td></tr><tr><td colspan="3">REV.NO. 00</td><td>स्वीकृति : APPROVED : AGM (CIE)</td><td>GR.No 3.40</td></tr><tr><td colspan="3">Dt 22-03-13</td><td>निर्माण : PREPARED : CIE</td><td>जारी : ISSUED : TSX</td></tr><tr><td colspan="3"></td><td></td><td>दिनांक : DATE : 22-03-13</td></tr></table>							नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE	GRI	P.J.BAGAWADE		अनुवादक TRANSLATED BY		TSX	LALIT KUMAR		निर्माणकर्ता WORKED BY	SATISH KUMAR	QAX	SK CHAUHAN		जांचकर्ता CHECKED BY	RAJNISH GUPTA	सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	VINOD KUMAR	REV.NO. 00			स्वीकृति : APPROVED : AGM (CIE)	GR.No 3.40	Dt 22-03-13			निर्माण : PREPARED : CIE	जारी : ISSUED : TSX					दिनांक : DATE : 22-03-13
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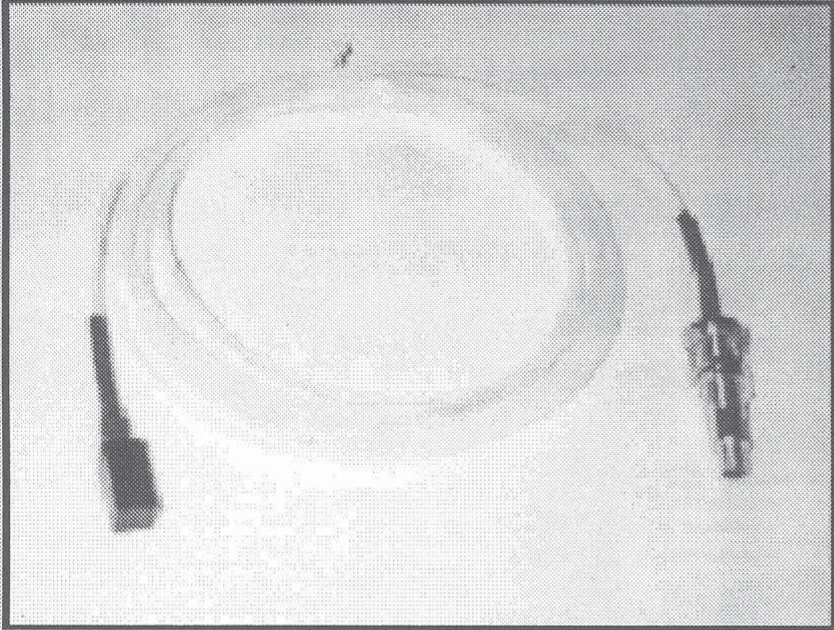
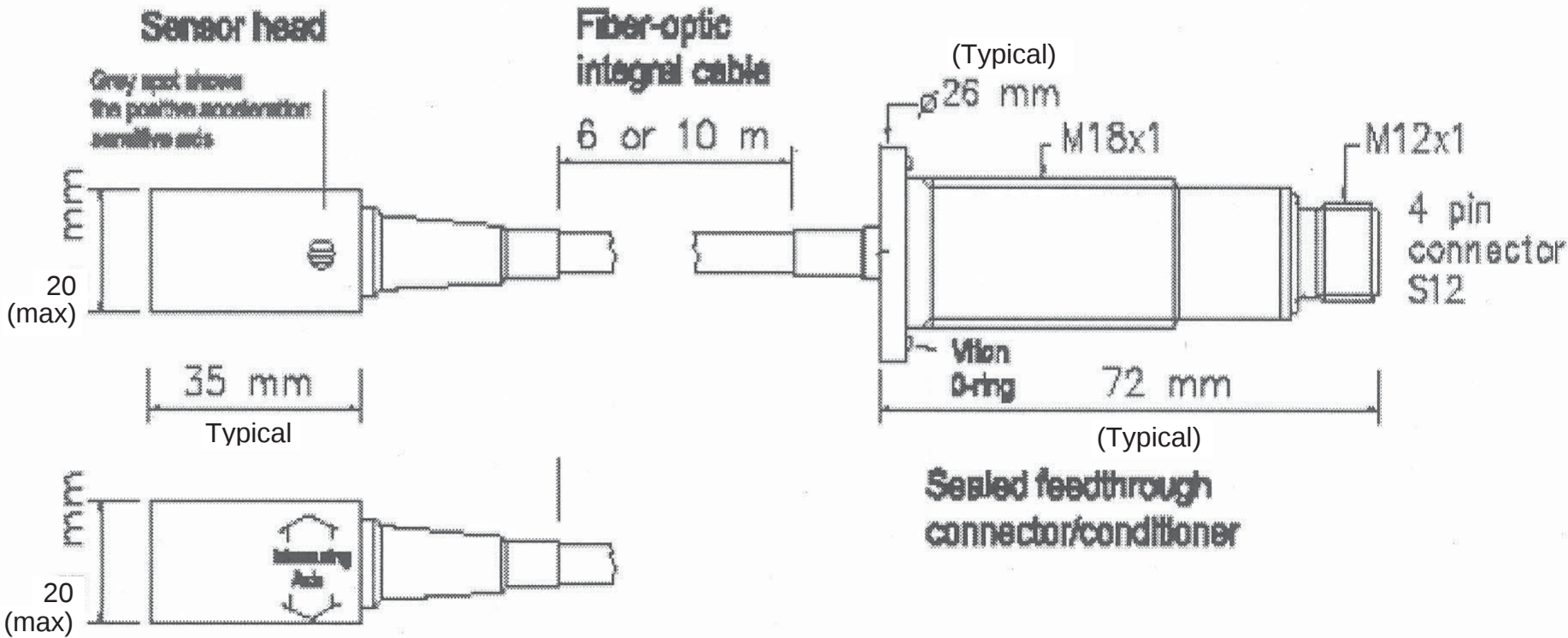
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सामग्री सूची संख्या को अधिकृत करता है INVENTORY NO.		SUPERSEDES INVENTORY NO.		पृष्ठ Page 2		का Of 9	
COPYRIGHT AND CONFIDENTIAL The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company		Scope of Supply:- (A) - To be supplied directly to Site (as mentioned in PO) 1. End Winding Vibration Monitoring (EWVM) Cabinet - 1 No. The cabinet will house Vibration monitoring modules, PSUs, fuses etc. 2. Any other items/ accessories/ spares which is essential for proper operation of the system. Commissioning at site (To be quoted against separate code) (B) - To be supplied to BHEL Haridwar (for mounting on Generator) 1. Fiber Optic Accelerometer - 12 nos (with sealed feed through conditioner & with 6 mtrs Fiber optic integral cable) 2. Fiber Optic Accelerometer - 4 nos (with sealed feed through conditioner & with 10 mtrs Fiber optic integral cable) 3. Field Junction Boxes - 2 nos. 4. Cable length from lead-in-plate to JB - 2 mtrs Also refer figure-02 for typical fig for Fiber Optic Accelerometer and fig-03 for field JB. 2.0 Technical Requirement: The system shall comprise of the followings: 2.1 Sixteen channels vibration monitoring modules (2/4 channels per module) along with associated power supply units and accessories mounted in a free standing cabinet of size 600(W)x800(D)x 2200(H) along with inbuilt Software based band pass filters for individual channels to filter out required 1X and 2x frequencies components Preferably, the vendor shall supply the microprocessor based, fully programmable modules to provide stator end winding vibrations at 100Hz in terms of displacement (0-400 microns Pk-to-Pk). For selected frequency, the 4-20mA hard wired outputs from the vibration monitoring modules will be made available for client's DDCMIS use. The system shall be suitable for redundant 230V AC $\pm$ 10%, 50Hz UPS power supply (unless specified otherwise in the enquiry / order). Paint shade of the cabinet & JB shall be informed after placement of order as per end customer requirement. The paint thickness will be 100 Microns minimum. 2.2 Junction Boxes along with termination accessories. Details as per figure-3.					
		स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।					
हस्ताक्षर एवं दिनांक SIGN & DATE							
सामग्री सूची संख्या INVENTORY NO.	REV.NO. 00		निर्माणकर्ता WORKED BY		SATISH KUMAR.		
			जांचकर्ता CHECKED BY		RAJNISH GUPTA		

दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक (हीप - हरिद्वार)		TG60720	
		PRODUCT STANDARD (HEEP - HARDWAR)		पृष्ठ का Page 3 Of 9	
सामग्री सूची संख्या को अधिकृतित करता है	SUPERSEDES INVENTORY NO.	2.3 The fiber optics sensor will be mounted inside the Generator by BHEL at its Haridwar unit. The fiber optics sensor should meet following requirements: a) Operation parameters:- 2.3.1 Frequency range: 30Hz - 350Hz. 2.3.2 Amplitude Range : $\geq 0-1000 \mu\text{m}$ (Peak-Peak) / 360ms^{-2} (RMS) @ 100 Hz 2.3.3 Sensitivity : 100 mV/g Acceleration Or 10 mV/ μm Displacement +/- 10%. 2.3.4 Insulation Voltage (between sensor head and ground) : 2KV 2.3.4.1 Normal operation : ≥ 27 KV at 50 Hz 2.3.4.2 During application of 1 minute proof voltage : ≥ 56 KV at 50 Hz 2.3.5 Operating Pressure/ Environment : ≥ 5 bar (Hydrogen) 2.3.6 Current : 35 mA each sensor. 2.3.7 Power supply : 24VDC. 2.3.8 Maximum Shock Acceleration : $\geq 5000 \text{ms}^{-2}$ (pk) for about 1ms 2.3.9 Resonance Frequency : ≥ 500 Hz 2.3.10 Transverse Sensitivity : Typically < 5% with respect to sensitive axis 2.3.11 Residual Noise : Typically < 10 mV overall noise in the frequency range 2.3.12 Ignition protection :- ATEX EX // 3G mb // C T4 b) Environment :- i) Temperature : 0 to 90° C ii) Relative humidity : $\geq 90\%$ RH iii) Magnetic Field : ≥ 1 tesla at 50 Hz iv) Electrical field : ≥ 1 KV / mm at 50 Hz c) Physical parameter i) Sensor body: PPO Noryl and Ceramic or any other appropriate high insulation material ii) Weight : < 40 gram (light and compact design will be preferred) iii) Optical Integral Cable Length : 6 / 10 meters as per cl no 1.B.1 /1.B.2 iv) Fibre-Optic Cable Sheath : Integral PTFE tubing of dia. ≥ 5 mm or suitable material appropriate with sufficient strength and minimum bending radius of about 80 mm 3.0 Low Noise screened cables, along with termination accessories for connections between signal conditioner and Generator mounted JB. 4.0 Mandatory spares comprising 10% of the installed modules / amplifiers rounded off to next higher number. These should be quoted separately.			
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सामग्री सूची संख्या INVENTORY NO. P-6436	REV.NO. 00	निर्माणकर्ता WORKED BY SATISH KUMAR.	जांचकर्ता CHECKED BY RAJNISH GUPTA	22/03/13	22/03/13

दिनांक एवं हस्ताक्षर SIGN & DATE				उत्पाद मानक (हीप - हरिद्वार) PRODUCT STANDARD (HEEP - HARDWAR)		TG60720 पृष्ठ 4 का Page 4 Of 9	
सामग्री सूची संख्या को अधिकृत करता है		SUPERSEDES INVENTORY NO.		5.0 Any other accessory / item which may be considered essential by the vendor for proper commissioning /measurement /monitoring of the vibration signals.			
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				7.0 ROUTINE TESTING: The equipment shall be subjected to following tests at supplier's works. 7.1 Dimensional details/ visual checking as per the approved GA drawing to ascertain that model no. offered is as per purchase order and mounting/ cutout dimensions are as per catalogues furnished with the offer. 7.2 IR value of terminal blocks to be measured with 500V megger. The value shall be in M. ohms. 7.3 Checking of scope / technical particulars covered under clauses 1.0 & 2.0. 7.4 HV test at 2kV (rms) for one sec. between live and earth parts as per relevant IS (excluding electronics components/ modules). The equipment will pass the test without failure. 7.5 Burn in test of electronics component should be for 48 hrs at elevated temp (≥ 55 °C). The test report of in-house tests carried out for this can be considered. 7.6 Functional checking of the equipment as per approved schematics before dispatch. Vendor to mention "List of all tests" which should be carried out on the components/ module/ overall system at his works to ensure system performance at site.			
हस्ताक्षर एवं दिनांक SIGN & DATE		17/04/13		8.0 TYPE TESTING : The type test certificates of similar equipment for the following climatic tests (which shall not be older than 5 years) as per IEC60068/ IS9000 (relevant parts) will be furnished along with the offer. If these are not available, the party will carry out these type tests from reputed test house and furnish the test certificates to BHEL for acceptance 5.1 Dry heat test 5.2 Temperature cycle test 5.3 Damp heat test 5.4 Surge withstand test as per ANSI 37.90a or other relevant standards.			
सामग्री सूची संख्या INVENTORY NO.		REV.NO. 00		निर्माणकर्ता WORKED BY		SATISH KUMAR.	
P-6436				जांचकर्ता CHECKED BY		RAJNISH GUPTA	
						22/03/13	

दिनांक एवं हस्ताक्षर SIGN & DATE				उत्पाद मानक (हीप - हरिद्वार) PRODUCT STANDARD (HEEP - HARDWAR)		TG60720	
SUPERSEDES INVENTORY NO.		सामग्री सूची संख्या को अधिकृत करता है		पृष्ठ Page 5		का Of 9	
COPYRIGHT AND CONFIDENTIAL The information on this documents 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		9.0 ACCEPTANCE NORMS :- 9.1 Carrying out of routine tests as per clause 7.0 9.2 Compliance to clause 8.0 Calibration data/ curves (between acceleration to mV output upto 15g of acceleration) / data sheet for amplifiers, display modules and 4-20 mA output value shall also be submitted for approval. Before dispatch test results as per above and in compliance of above shall be send to BHEL for approval. Dispatch of the equipment shall be subject to approval of these test results.					
		10.0 TEST AND GUARANTEE CERTIFICATES: Three copies of test certificates for routine & type tests and guarantee certificates in English shall be furnished 11.0 RECOMMENDED SPARES: The list of recommended spares required for 5 years operation with prices of individual items will be furnished for BHEL's reference. BHEL reserves the right to order these components at prevailing rates within 6 months of the placement of the main order. 12.0 PACKING: The items shall be packed in 2 Packages (1) For Site supply (2) For BHEL Haridwar Supply. The equipment shall be packed in such a way that no damage occurs to any of its components during transit & storage. 13.0 MARKINGS: Each package shall be marked with the following: 1. BHEL order number 2. Designation of component/assembly 3. Suppliers name & reference 4. Net weight / gross weight 5. Project Name					
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		17/4/12		निर्माणकर्ता WORKED BY		SATISH KUMAR.	
सामग्री सूची संख्या INVENTORY		REV.NO. 00		जांचकर्ता CHECKED BY		RAJNISH GUPTA	

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सामग्री सूची संख्या को अधिकारित करता है		SUPERSEDES INVENTORY NO.		पृष्ठ 6 Page 6		का 9 Of 9	
COPYRIGHT AND CONFIDENTIAL The information on this documents 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.		14.0 INSTALLATION & COMMISSIONING: The supplier shall arrange for satisfactory commissioning of supplied equipment at site. The offer for the same will be included in main offer separately. The erection of cabinet and laying of the cables will be done by BHEL at site. However, all terminations, installation of modules, balance activities and commissioning of the system shall be done by the vendor. The vendor shall also provide training to customer site engineers during visit for better understanding and operation of the system at site.					
		15.0 DOCUMENTS FOR APPROVAL:- The vendor will furnish GA /Schematic drawings of the offered system including data sheets for the offered amplifiers/ vibration modules/ power supply modules etc. for BHEL's approval before dispatch the items.					
		16.0 O&M MANUALS:- The O&M manuals comprising of BOM with make, installation & commissioning instructions, operation & maintenance procedure, service procedure, technical/ circuit details and data sheets of the used instruments will be furnished in hard copy and soft copy. Numbers of O&M manual and CD will be as per inquiry or Purchase Order.					
		17.0 INSPECTION:- BHEL reserves the right to depute their / customer's representative during final testing at supplier works. The supplier will arrange this inspection without any additional cost.					
स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		18.0 QUALITY PLAN AND INSPECTION: The complete QA plan giving details of items of test to be carried out during the various stage of manufacturing will be furnished for approval along with offer in BHEL format. BHEL reserves it's right to depute their / customer representative during testing at supplier works. The supplier will arrange this inspection without any additional charges.					
		19.0 GUARANTEE:- The 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. The 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.					
सामग्री सूची संख्या INVENTORY P-6436		REV.NO. 00		निर्माणकर्ता WORKED BY SATISH KUMAR.		22/03/13	
				जांचकर्ता CHECKED BY RAJNISH GUPTA		22/03/13	

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सामग्री सूची संख्या को अधिकृत करता है		PRODUCT STANDARD (HEEP - HARDWAR)		पृष्ठ 8 का Page 8 Of 9	
सामग्री सूची संख्या INVENTORY NO.		Fig -2 :- Typical Fiber Optic sensor with sealed feed through conditioner & Fiber optic integral cable			
सामग्री सूची संख्या को अधिकृत करता है		Fiber optic sensor:			
सामग्री सूची संख्या को अधिकृत करता है					
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P-6436				SATISH KUMAR.	
12/4/13				जांचकर्ता CHECKED BY	
				RAJNISH GUPTA	
				22/03/13	

सामग्री सूची संख्या INVENTORY P-6436	17/4/13	स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।	COPYRIGHT AND CONFIDENTIAL The information on this documents 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	सामग्री सूची संख्या को अधिकर्मित करता है	SUPERSEDES INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE	REV.NO. 00	Fig -3 : Field Junction box. A) MATERIAL ALUMINIUM B) ASSEMBLY PLAN 1) 8x CABLE GLAND M20x1.5(METAL)-BOTTOM 2) 2x CABLE GLAND M25x1.5(METAL) LEFT 3) 8x TERMINAL BLOCKS PER 5 TERMINALS MAX 2.5 mm2 4) (BLOCK LABEL A-H AND TERMINAL LABEL 1-5) 5) 4xBLIND PLUG M 25x1.5 6) 2xGROUNDING SCREW C) AMBIENT TEMPERATURE RANGE:- -5 C to +80 C D) PROTECTION CLASS IP65 E) IGNITION PROTECTION CLASS:- Class-II, Devision-2, for Gas & Dust, EEx eII T6.	उत्पाद मानक (हीप - हरिद्वार) PRODUCT STANDARD (HEEP - HARDWAR) मी एच ई एल BHEL	TG60720 पृष्ठ 9 का Of 9	निर्माणकर्ता WORKED BY SATISH KUMAR. जांचकर्ता CHECKED BY RAJNISH GUPTA	22/03/13 22/03/13	22/03/13 22/03/13
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