

		Specification No. 736270001 Rev 00.	
 BHARAT HEAVY ELECTRICAL LIMITED UNIT'S ADDRESS: BHEL, Jhansi (UP), India			
		Supplier Qtn. No.:	
		Date :	

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF 240 kJ, 2400 kV IMPULSE GENERATOR

NOTE:-

1. Vendor must submit complete information against clause no. 13 (Qualifying Condition). The offer meeting this clause would only be processed.
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-compliance.
3. The offer and all documents enclosed with offer should be in English language only.

NAME & ADDRESS OF THE SUPPLIER :		NAME & ADDRESS OF THE INDIAN AGENT :	
TELEPHONE NOS.:		TELEPHONE NOS.:	
FAX NOS.:		FAX NOS.:	
E-MAIL ADDRESS :		E-MAIL ADDRESS :	

SCOPE: SUPPLY, ERECTION & COMMISSIONING OF 1 No. 240 kJ, 2400 kV IMPULSE GENERATOR COMPLYING WITH SPECIFICATIONS AS BELOW

SNO	DESCRIPTION FOR BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	COMPLIED/ OFFERED	DEVIATIONS	REMARKS
1.0	PURPOSE & WORKPIECE MATERIAL				
1.1	Purpose:				
	Impulse Generator is required for conducting Impulse testing in line with the latest IEC of 1-ph & 3-ph Power Transformers, Reactors, Bushings, CTs, VTs, Dry Type Trfrs, ESP Trfrs & Traction Trfrs.	Vendor to note			
1.2	Jobs to be tested : Power Transformers will include following ratings: i) up to 315 MVA, 3 Phase, 220 kV, ii) 150 MVA, 3 Phase, 400 kV iii) 100 MVA, 1 Phase, up to 400 kV Dry Type Transformer from 3.3 kV to 33 kV class Reactors: 80 MVA, 3 Phase, 400 kV class Bushings, CTs, VTs, etc. upto 400 kV class.	Vendor to note			
	Quantity : 01 No.				
2.0	SPECIFICATION:				
2.1	Impulse Voltage Generator				
2.1.1	Voltage rating : 2400 kV (200 kV/ stage, 12 Stages) or more.	Yes/No			
2.1.2	Energy : 240 kJ (20 kV/Stage) or more.	Yes/No			
2.1.4	Impulse generator should have the flexibility of connecting all stages in parallel to deliver high energy at lower voltage.	Yes/No			
2.1.5	Impulse Generator should have separate spring contacts for front and tail resistors. It should have sufficient (minimum 3) connecting sockets for front resistor and two parallel for the tail resistors in order to allow maximum number of different combinations of front and tail resistors to achieve the desired wave-shape for different loads.	Yes/No			
2.1.6	Impulse generator structure should be designed to withstand earth quakes of magnitude of at least 6.8 on Richter scale.	Yes/No			

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2.1.7	Impulse Generator shall have proper construction of supporting structure for its mechanical stability, low loop inductance and for the enclosure of the main spark gaps.	Yes/No			
2.1.8	Impulse Generator construction shall have integrated safety grounding system which discharges all potential terminals of all stage impulse capacitors of the impulse generator.	Yes/No			
2.1.8.1	The earthing system must function even in case of power outage and should operate fully automatically.	Yes/No			
2.1.9	Impulse Generator shall have modular design for ease of quick installation.	Yes/No			
2.1.9.1	Each module should comprise of minimum 3 stages.	Yes/No			
2.1.10	Impulse generator should be with steps inside it to climb in the generator upto top for changing resistance and connecting generator for different configuration.	Yes/No			
2.1.11	Impulse generator should have provision for achieving the required wave shape on low voltage (low inductance, high capacitance) of power transformer. External/Internal LR circuit provided along with Impulse Generator.	Yes/No			
2.2	SET OF RESISTORS:				
2.2.1	Set of Lightning Impulse resistors required for testing Transformers, Reactors, CTs, Bushings, Dry Type Transformers, ESP Transformers, Traction Transformers as per details given above. Vendor to specify the total number of front and tail resistors included in the scope of supply.	Yes/No			
2.2	Set of Switching Impulse resistors (as per IEC 60076) required for testing Transformers, Reactors, CTs, Bushings, Dry Type Transformers, ESP Transformers, Traction Transformers as per details given above. Vendor to specify the total number of front and tail resistors included in the scope of supply.	Yes/No			
2.3	CHARGING RECTIFIER : 200 KV, 200 mA or higher. Output Voltage should be 0 - 200 kV with respect to ground and not +100 KV and -100 kV in order to achieve lower charging time constant.	Yes/No			
2.4	Control Unit housed in Industrial PC based computerised control system with keyboard and 19" Monitor (portable on wheels) to be supplied complete with: Set of control cables, length 80 m (Control cables to be supplied with the junction box to easy movement of Impulse generator in test bay) Connection box : 90 A or higher.	Yes/No			
2.4.1	Controller Hardware with features:	Yes/No			
2.4.1.1	Analog to digital conversion of the measured impulse signal	Yes/No			
2.4.1.2	Control and regulation of the charging voltage	Yes/No			
2.4.1.3	Time control of triggering, generation of trigger impulses for the measuring system and chopping device.	Yes/No			
2.4.1.4	Synchronization of the triggering with an AC voltage	Yes/No			
2.4.1.5	Digital input and output ports	Yes/No			
2.4.1.6	Generator controls and measuring system shall communicate to allow efficiency correction of charging voltage. This allows to enter test voltage rather than charging voltage.	Yes/No			
2.4.2	Standard Software for operation of Impulse Test System should include the following features:	Yes/No			
2.4.2.1	Configuration of impulse test system for particular test conditions	Yes/No			
2.4.2.2	Configuration of system with regard to the external measuring device.	Yes/No			
2.4.2.3	Besides fully automatic operation software should allow manual / semi-automatic operation of the test system and selection of every individual parameter plus manual release of trigger impulse.	Yes/No			
2.4.2.4	Indication of pre set levels and actually measured voltage.	Yes/No			
2.4.2.5	Impulse counter for a pre-selectable number of pulses with automatic stop.	Yes/No			
2.4.2.6	Detection and display of flashovers, indication of trip levels, system status and failure condition. (All the parameters to be set up the PC and values displayed on the screen)	Yes/No			




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2.5.0	Impulse Voltage Divider (CR type): Transformation ratio and transfer behaviour should comply with requirements of IEC60060-2 edition 2010-11 (with its latest edition at the time of supply) requirements with respect to measuring accuracy and dynamic behaviour.	Yes/No			
2.5.1	Voltage rating : 2400 KV or higher	Yes/No			
2.5.3	Measuring cable : 40 m. each - 8 nos.	Yes/No			
2.5.4	Secondry LV Units - 2 Nos. for different impulse ratios.	Yes/No			
2.6.0	MULTIPLE CHOPPING GAP.				
2.6.1	Voltage : 1800 kV or higher	Yes/No			
2.6.2	Stages : Minimum 3 Modules	Yes/No			
2.7.0	Overshoot Compensation Device: Internal serial overshoot compensation device with compensating capacitor in parallel to compensating resistor and compensating inductor is connected in series to the impulse capacitances (Divider / Test Object) should be provided to compensate the loop inductance.	Yes/No			
2.7.0.1	The use of overshoot compensating device should will not affect the efficiency of Impulse generator.	Yes/No			
2.7.1	Impulse Generator efficiency under full load conditions with and without overshoot compensation device will be more than 90%.	Yes/No			
2.8.0	High Resolution Impulse Measuring and Analyzing system(HIAS)				
2.8.1	No. of channels : 4 (Each channel should be an independent channel insert)	Yes/No			
2.8.2	Amplitude resolution : 16 - bit	Yes/No			
2.8.3	Sampling rate: 120 MS/sec.---- 117 kS/sec. selectable	Yes/No			
2.8.4	Analog Bandwidth: 100 MHz				
2.8.5	HV input : +/- 2000 Vpp. +/-5 Vpp	Yes/No			
2.8.6	Amplitude uncertainty: $\leq 1\%$	Yes/No			
2.8.7	Time parameter uncertainty: $\leq 2\%$	Yes/No			
2.8.8	Measurement, evaluation and analysis of impulse voltage and impulse current should be performed according to IEC 61083, IEC 60060 edition 2010-11, IEC 60076, IEC 60099 & IEC 60230 (with the latest editions of each IEC at the time of supply).	Yes/No			
2.8.9	Impulse analysing system should be installed in mini rack with desk top version. It should be combined with rack for control unit to get better space utilisation.	Yes/No			
2.9	Standard Analysis Software of Impulse Analysing system with features as below:				
2.9.1	Should be Windows based system of latest WINDOWS version	Yes/No			
2.9.2	Should have flexible configuration of report generation eg.incorpoation of BHEL logos etc.	Yes/No			
2.9.3	Should allow independent adjustment of all parameters like sampling rate, range etc. for every channel.	Yes/No			
2.9.4	Should allow automatic wave form analysis in full accordance with IEC61083-2.	Yes/No			
2.9.5	Should allow software calibration in full accordance with IEC 61083-2.	Yes/No			
2.9.6	Should allow fully automatic hardware calibration with 4 channel Reference Impulse calibrator(RIC).	Yes/No			
2.9.7	Should allow superimposed display of impulse waves with comparison of differences.	Yes/No			
2.9.8	Should allow step response measurement analysis.	Yes/No			
2.9.9	Office software to analyze measurement on PC	Yes/No			
2.9.10	Coherence and transfer function software should also allow calculation of coherence admittance and should give graphical representation and screen display of corresponding curves.	Yes/No			
2.9.13	Impulse analysing software should have full IEC:61083 calibration routine (press start .. get a report) together with Reference Impulse Calibrator without any further manual operations (to allow overnight calibration)	Yes/No			
2.9.14	Impulse analyzing software should be able to calibrate the system using Reference Impulse Calibrator fully automatically, which should be supplied with this system. Reference Impulse Calibrator should be fitted in the same rack in which HIAS (High resolution Impulse Analysing System) and control rack is fitted for proper integration and easy calibration.	Yes/No			




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2.10	The impulse generator system should be fitted on Aero caster for movement of system. The aero caster system should contain following:	Yes/No			
2.10.1	Load Module system: Load carrying pallets and rubber pads suitable for carrying system load	Vendor to specify and confirm			
2.10.2	Control console (for controlling of air pressure)	Vendor to specify and confirm			
2.10.3	Hose reel with suitable pipes for connecting pallets to control console and compressed air pressure points	Vendor to specify and confirm			
2.10.4	Vendor to specify the mode for movement (drive or manually). The system should supplied with suitable drive(if applicable)	Vendor to specify and confirm			
2.10.5	Air supply system :- BHEL will provide compressed air supply at maximum 6 bar.	Vendor to note and confirm			
2.11	Set of cage shunts for current measurement (4 nos. of shunt)	Vendor to specify and confirm			
2.12	SAFETY ARRANGEMENTS: Following safety features in addition to other standard safety features should be provided on the system: 1. Impulse generator should be equipped with the automatically controlled safety system (employing tapes with feedback provision on control unit indicating its status) which switches off the generator, shorts and grounds all capacitors automatically upon power failure or opening of safety fence or any other reason. 2. System should have adequate and reliable safety interlocks / devices to avoid damage to the system, workpiece and the operator due to the malfunctioning or mistakes.	Yes/No Yes/No			
	3. All electronics parts are housed in EMI/EMC compatible shielded enclosures.	Yes/No			
2.13	ENVIRONMENTAL PERFORMANCE OF THE SYSTEM: The Instrument shall conform to following factors related to environment : (a) If any safety / environmental protection enclosure is required it should be built in the system by the vendor.	Yes/No			
3.0	ACCESSORIES:				
3.1	Vendor to furnish list and details of accessories if any	Vendor to specify			
4.0	SPARES:				
4.1	All necessary spares for two years trouble-free operation.	Vendor to Specify			
5.0	DOCUMENTATION : 4 copies of each of the following shall be supplied along with the system				
5.1	Instruction manual	Yes/No			
5.2	Maintenance manual along with circuit diagrams and schematics	Yes/No			
5.3	Test & Guarantee Certificate.	Yes/No			
5.4	Calibration certificate	Yes/No			
6.0	SYSTEM INSPECTION:				
6.1	Inspection at suppliers works before dispatch	Yes/No			
6.2	All routine and type tests to be performed at supplier's works on all components of the system before dispatch in presence of BHEL representatives. List of tests to be furnished alongwith the offer.	Vendor to specify & confirm			
6.3	Demonstration of all features of the Impulse Generator system.	Yes/No			
6.4	Calibration tests on Impulse measuring system and RIC (reference impulse calibrator) as per IEC 60060 and IEC 61083	Yes/No			
7.0	TRAINING:				
7.1	BHEL testing engineer and maintenance person should be trained at supplier's Works for mutually agreed period in the area of (a) Use of all system Features, programming for Measuring Systems & supplied accessories etc. (b) Electrical, Electronic & maintenance for system & other supplied equipments	Yes/No			
7.2	Air-fare, boarding & lodging for the trainees shall be borne by BHEL.	Yes/No			
7.3	Competent, English speaking experts shall be arranged by the vendor during training for satisfactory & effective training of BHEL personnel.	Yes/No			
7.4	Vendor to quote for training on man / day basis	Yes/No			

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8.0	INSTALLATION & COMMISSIONING				
8.1	Supplier to take full responsibility for carrying out the start up and commissioning	Yes/No			
8.2	Successful proving of supplied components by the supplier shall be considered as part of commissioning. Following tests deemed necessary for system acceptance shall form part of the commissioning activity. i) Operational Tests ii) Calibration Tests	Yes/No			
8.3	Demonstration of all features of the Impulse Generator system & all accessories to the satisfaction of BHEL for their efficient and effective use.	Yes/No			
8.4	Demonstration by actual use of all supplied components and accessories to their full capacity.	Yes/No			
8.5	Commissioning spares, required for commissioning of the system within stipulated time, shall be brought by the supplier on returnable basis.	Yes/No			
8.6	Schedule of Commissioning shall be submitted with the offer.	Yes/No			
8.7	Charges, duration, terms & conditions for E&C should be furnished in detail separately by vendor along with offer.	Yes/No			
9.0	AMBIENT CONDITIONS & THERMAL STABILITY :				
9.1	Total System and all supplied items should work trouble free and efficiently under following operating conditions and should give specified accuracies. Power Supply: Voltage: 415 V $\pm 10\%$, 3-phase supply Frequency: 50 Hz ± 1.5 Hz Operating Humidity : 10% to 90% Operating Temperature : 0°C to 45°C for HV components mounting outside control room. (Vendor to confirm that system is suitable for above and details of provisions on the system for the same are to be furnished by Vendor. The ambient conditions mentioned above for control system will be made available with suitable air-conditioning at works.)	Yes/No			
9.2	Thermal Stability of the complete system keeping in view specified Ambient Conditions and accuracy requirements of BHEL components and trouble free operation of the system should be ensured by vendor. (Vendor to confirm that system is suitable for above and details of provisions on the system for the same should be furnished by Vendor)	Yes/No			
10.0	PACKING:				
10.1	Air worthy/Sea worthy & rigid packing for all items of complete system, all Accessories and other supplied items to avoid any damage/loss in transit. When system is despatched in containers, all small loose items shall be suitably packed in boxes	Yes/No			
11.0	GARANTEE :				
11.1	24 months from the date of commissioning of the system.	Yes/No			
12.0	GENERAL : The vendor should submit the following information:				
12.1	Equipment Model	Yes/No			
12.2	Total connected load (KVA):	Yes/No			
12.3	Total weight of the system	Yes/No			
12.4	Vendor to submit, along with offer, the reference list of customers where similar systems have been supplied mentioning the customer, Machine Model, major specifications of the supplied system, Year of Supply etc	Yes/No			
12.5	Detailed catalogues , sketch/ photographs of the m/c and accessories/ attachments should be submitted with the offer.	Yes/No			
13.0	QUALIFYING CONDITIONS :				
13.1	Only OEM or their authorised vendors will be considered whose OEM have at least 15 years of experience in manufacturing of such type of system (complete impulse generator and its control should be OEM make) and OEM have supplied and commissioned (either directly or through their authorised vendor) at least one set of Impulse generator test system having rating of 2400 kV or higher in the past 10 years (from the tender opening date). Such equipment should be working satisfactorily i) For more than ten years after commissioning and ii) On the date of issue of Performance Certificate as mentioned in the clause 13.1.7 below	Yes/No			
13.1.1	Name of the customer / company where similar system is installed. (Unpriced Copy of Purchase order should be furnished).	Vendor to furnish			
13.1.2	Complete postal address of the customer.	Vendor to furnish			




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13.1.3	Year of commissioning	Vendor to furnish			
13.1.4	Application for which the system is supplied with details of accuracies achieved on the job.	Vendor to furnish			
13.1.5	Name and designation of the contact person of the customer.	Vendor to furnish			
13.1.6	Phone, FAX no. and email address of the contact person of the customer.	Vendor to furnish			
13.1.7	Performance certificate (in English language only) regarding satisfactory performance of the equipment mentioned in clause 13.1 from any one customer mentioned in clause 13.1.1 (issued within 1 year of tender opening). Performance certificate should be supplied from customers other than from country of origin of equipment.	Vendor to furnish			
13.1.8	OEM must have atleast two or more similar systems having rating atleast 2400 kV or more installed and working satisfactorily in India since more that last 10 years. The details and contact numbers of the places and contact persons details where such systems are installed and working should be provided.	Vendor to furnish			
13.1.9	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/incorrect, the offer shall be rejected.	Vendor to furnish			
13.1.10	Autorisation Letter from Original Equipment Manufacturer(in case of not directly quoted by OEM) for quoting of their system and provide support for commissioning and after sales services.	Vendor to furnish			

Lawer

Rajeev Agarwal
 (राजीव अग्रवाल)
 अपर महाप्रबन्धक
 गुणता एवं परीक्षण
 बी०एच०ई०एल०, झाँसी
 (RAJEEV AGARWAL)
 Addl. General Manager
 (Quality & Testing)
 B.H.E.L., JHANSI