



TECH SPEC NO: QC-IV/TAND/20156587

REV NO.: 00

DATE: 05/04/2016

**TECHNICAL SPECIFICATION OF AUTOMATIC DISSIPATION
FACTOR AND CAPACITANCE MEASUREMENT SYSTEM**

PAGE 1 OF 4

INDENT REF NO: 20156587

SL NO.	PARTICULARS	REQUIREMENT	
1	GENERAL REQUIRMENTS		
1.1	PRE-QUALIFICATION REQUIREMENT	The bidder shall comply with the pre-qualification requirement (PQR) as per Annexure-1. Only PQR qualified bidders will be considered for further processing. Bidder to submit records as per the requirement of PQR (Annexure-1).	
1.2	COMPLIANCE ASPECT	The offer shall contain confirmation for compliance to each and every clause of the specification. The certificate of compliance shall be as per Annexure-2. If there is any deviation, the same shall be clearly stated.	
1.3	LANGUAGE REQUIREMENT	The offer and all documents enclosed with the offer should be in English language only.	
2	PURPOSE	The automatic dissipation factor (tan-delta) and capacitance measurement system is required to measure dissipation factor (tan δ), capacitance (C) of stator winding, stator winding bars and connecting bus bars of turbo-generators rated upto 1000 MW.	
3	TEST OBJECT DETAILS	The test objects which are to be tested are as follows:	
3.1	GENERATOR STATOR BARS AND CONNECTING BUS BARS	The rated voltage of generators varies from 15.75 KV to 27KV and capacitance of single generator bars varies from 4nF to 12nF. The capacitance of individual connecting bus bars varies from 2nF to 6nF. The dissipation factor (tan δ) of a stator bar is normally measured in steps of 20% of rated voltage and upto 140% of rated voltage. So, maximum test voltage will be approximately 50 KV.	
3.2	STATOR WINDING OF TURBO GENERATOR	The rated voltage of generators varies from 15.75 KV to 27.0 KV and per phase capacitance of wound generators varies from 0.2 μ F to 0.6 μ F and maximum capacitance when all phases together is to be tested is approximately 1.8 μ F. The dissipation factor (tan δ) of a stator winding is normally measured in steps of 20% of rated voltage and upto 140% of rated voltage. So, maximum test voltage will be approximately 50 KV.	
4	SCOPE OF SUPPLY		
4.1		The scope of supply includes design, manufacturing, supply, commissioning and proving of automatic tan-delta and capacitance measurement system. The supply shall include basic equipment, standard capacitor and connecting cables with applicable accessories.	
4.2		External shunt of 15 A or more to be provided in case in-built current capacity of the offered system is less than 15 A.	
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APPROVED BY	PRASANTA MAJEE	AGM (QC-E)	<i>Prasanta Majee</i>



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PAGE 2 OF 4

INDENT REF NO: 20156587

4.3		Test voltage source is not in the scope of supply.
5	BASIC REQUIREMENTS	A modern state of the art automatic dissipation factor (tan-delta) and capacitance measurement system along with essential accessories to measure the dissipation factor (tan δ), capacitance (C) of test object as mentioned in clause 3.1 and 3.2 shall have the following major features in it:
5.1		For measurement of tan-delta and capacitance of test objects in ungrounded (floating) as well as grounded test object condition with guard (to nullify the effect on tan-delta due to electrically graded portions while measurements are being conducted) and without guard test facility as per IS 13508:1992/IEC 60894.
5.2		Integrated laptop with operating software for instrument control, data storage, analysis, report generation and printing.
5.3		Advance software functions like graphical results for trend analysis along with other important features like digital display of measured value of capacitance, tan-delta, leakage current, applied voltage.
5.4		Built-in standard interface RS 232/Ethernet/USB.
5.5		Data storage and enabling easy transfer of data to external PC, conveniently print and storage.
5.6		Mains cable and other cable set of length minimum 10 meter suitable for interface of instrument and standard capacitor.
5.7		The measuring unit shall operate on an input supply of $240 \pm 6\%$ Volt at $50 \pm 3\%$ Hz. Note: Use of any type of battery in the test system is not acceptable except in laptop.
5.8		Test voltage source is not in the scope of supply. Test voltage to be applied from external source available with BHEL.
5.9		The measuring equipment and the standard capacitor shall be separate entities.
5.10		Measuring unit consisting of various modules shall be housed in one box.
5.11		3 nos. copies of original software used for measurement shall be provided
6	TECHNICAL SPECIFICATIONS	
6.1	FOR DISSIPATION FACTOR (TAN δ) MEASUREMENT	<ol style="list-style-type: none">1. Measuring range of dissipation factor (tan δ) = 0...1002. Resolution $\leq 1 \times 10^{-5}$3. Accuracy = $\pm 1\%$ reading $\pm 10^{-4}$ or better

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**TECHNICAL SPECIFICATION OF AUTOMATIC DISSIPATION
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PAGE 3 OF 4

INDENT REF NO: 20156587

6.2	FOR CAPACITANCE MEASUREMENT	<ol style="list-style-type: none">1. Capacitance measuring range = 0.1nF.....5μF2. Resolution \leq 0.01 pf3. Accuracy = \pm 0.25% reading \pm 0.1pF or better
6.3	STANDARD CAPACITOR	<ol style="list-style-type: none">1. The standard capacitor should be portable.2. SF₆ gas filled standard capacitor.3. Rated voltage: Minimum 50KV4. Capacitance and PD of standard capacitor should be such that the overall system meets the requirements as per CL 6.1 and 6.2.
7	WORKING ENVIRONMENT CONDITIONS	The automatic dissipation factor (tan-delta) and capacitance measurement system shall operate under the following environment conditions: <ol style="list-style-type: none">1. Operating temperature: 0-45°C2. Humidity: upto 90% RH
8	SOURCE OF POWER SUPPLY AND INTER CONNECTING CABLES	All interconnecting control and power cables shall be supplied by the supplier along with the measuring system. Supplier has to ensure operation of the measurement system under above power supply condition.
9	MANDATORY SPARES	The following items are required to be supplied along with the main equipment: <ol style="list-style-type: none">a) Fuses: 2 nos. of each typeb) All inter connecting cables as supplied with equipment: 01 no. of each type Price of each spare item to be quoted separately.
10	O&M MANUAL	Operation and maintenance manuals in English shall be supplied with the main test system. The following details shall be included in the manual:
10.1		Block schematic illustrating the principle of operation of the system.
10.2		Detailed assembly drawings with clear marking of each assembly/sub-assembly.
10.3		Installation and commissioning manuals for various components separately and combined.
10.4		General maintenance manual of the equipment.
10.5		Programming manual of controls.
10.6		Specifications for all type of connecting cables, standard capacitors for measurement test set up.

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PAGE 4 OF 4

INDENT REF NO: 20156587

10.7		2 nos. original copies of O&M manual (no photocopies) to be supplied along with 3 CD ROMs.
11	TEST AND CALIBRATION CERTIFICATES	1. Calibration certificate for overall measurement system accuracy and measurement accuracy of all the instruments traceable to National/International standards shall be supplied along with the measurement system. 2. Test certificates for the overall measurement system shall be supplied.
12	PACKING	The automatic dissipation factor (tan-delta) and capacitance measurement system/accessories shall be packed in a suitable water proof/vibration proof packing boxes capable of bearing transit hazards. The measurement system shall have proper casing/ covers for its instruments and assemblies for safe handling, storage and transportation.
13	COMMISSIONING AND PROVING	The automatic dissipation factor (tan-delta) and capacitance measurement system shall be commissioned by the supplier at BHEL Haridwar works. Any special instrument/equipment required for commissioning shall be brought by the supplier. The equipment shall be proved at BHEL Haridwar works. It shall be considered commissioned only after successful proving. The job/test object along with HV source required at the time of commissioning shall be provided by BHEL for proving.
14	WARRANTY	The equipment/test system shall have a warranty for a period of at least 12 months after successful completion of installation and commissioning at BHEL Haridwar works.
15	TRAINING	Training of BHEL personnel at BHEL Haridwar works shall be imparted by the supplier regarding its operation, calibration, maintenance and testing. Supplier shall demonstrate its operation under different test modes (floating/grounded) of objects with different test objects having different capacitance value.
16	PRE DISPATCH INSPECTION (PDI)	BHEL reserves the right to conduct PDI at vendor's works prior to dispatch. Accordingly vendor shall raise inspection call for PDI. During PDI the vendor should demonstrate all technical requirements of the specification. Travel, boarding and lodging expenditure of BHEL personnel deputed for PDI will be borne by BHEL.

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Pre-Qualification Requirement (PQR)

(Refer Tech Spec NO: QC-IV/TAND/20156587)

1. The offered instrument should be supplied by the Bidder within last ten years prior to tender opening date. The offered equipment shall be working satisfactorily at customer's premises. Following documents need to be submitted against satisfactory performance:
 - a) Un-priced copy of purchase order.
 - b) Name of the customer/company where the offered equipment is installed.
 - c) Year of commissioning.
 - d) Name and designation of the contact person of the customer.
 - e) Phone and email address of the contact person of the customer.
 - f) Evidence of satisfactory performance of the equipment from customer (issued within 2 year of tender opening date).

2. Technical details of the offered instrument in the form of catalogue/brochure etc. to be submitted by the Bidder.

3. a) The Bidder should be original equipment manufacturer (OEM) or authorized dealer/distributor of OEM. In case the Bidder is dealer/distributor, they should furnish the details of OEM and valid authorization certificate from OEM.

 b) In case the Bidder offers a system as an authorized representative of OEM, the complete system should be sourced from OEM only. (Bidder to confirm in its letter head)

4. a) The Bidder, if OEM, should have service center or authorized service agent in India. Declaration, as applicable, should be made available by the Bidder mentioning Indian address and contact details.

 b) In case, the Bidder is authorized representative of OEM, then the Bidder is required to furnish details of service center in India with proper authorization from OEM.

NOTE:-

1. BHEL reserves the right:
 - To verify the information provided by the Bidder.
 - To seek additional information to verify the details provided.
2. The offered bid shall be rejected for any false or incorrect information.

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07/04/16

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