



उत्पाद मानक

PRODUCT STANDARD – HYDROGENERATOR

HG 100 58

REV00

PERIODIC ON LINE PARTIAL DISCHARGE ANALYSER

PAGE

1 OF 8

This product standard is divided in four parts .

- Part-1** Contains the technical specification of **periodic on line partial discharge monitoring system** and technical documentation requirements of the quotation.
- Part-2** Contains technical specification of PD couplers and termination boxes.
- Part-3** Contains technical specification of Portable partial discharge analyzer , PD software and other accessories.
- Part-4** Contains project details and project specific technical and other requirements.

PART-1

1.0 INTRODUCTION

Partial discharges (corona or small sparks) are symptoms of thermally, electrically or mechanically induced deterioration of stator winding insulation of hydrogenerators due to prolonged operation at high temperatures, mechanical & electrical stresses, pollution and high voltage surges during operation.

This specification covers “**periodic on-line partial discharge monitoring equipment**” specifically designed to measure partial discharges in the stator slot between high voltage stator winding bars & the slot wall and within the insulation of bars of hydrogenerator, as & when required. Partial discharge monitoring equipment shall be suitable for acquisition of data i.e. quantity, magnitude, polarity & phase angle of the partial discharges and for their analysis & display.

The analyzer must be portable type modular micro processor based state of the art with digital display monitor /controller /work station, with latest software to interpret the PD results.

The equipment shall be of self diagnostic and resistant to false indications and shall be able to effectively separate the real PD activity from noise. It shall record the data in digital form. The analyzer should automatically suspend measurement when the machine is not in service.

1.1 SPECIFICATION

Partial discharge monitoring equipment required for hydrogenerators (Details of which are furnished in part-4) shall be complete with partial discharge couplers, partial discharge analyzer and other associated accessories complete with insulation & installation kit as per specification given in part-2 and 3 of product standard.

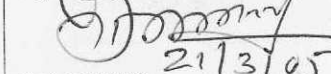
संशोधन :

हाइड्रोजेनरेटर इंजीनियरिंग विभाग
भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल

तैयारकर्ता


A.DIXIT


अनुमोदनकर्ता



J.K.BHATI 21/3/05


जारी करने की
दिनांक


21.03.05

गोपनीय एवं अधिकार सुरक्षित
इस प्रपत्र पर दी गई जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है इसे प्रत्यक्ष या अप्रत्यक्ष रूप से कम्पनी के हितों को नुकसान पहुँचाने के लिए कदापि उपयोग नहीं किया जावे


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| <div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;"> <p>गोपनीय एवं अधिकांश सुरक्षित इस प्रपत्र पर दी गई जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपत्ति है इसे प्रत्यक्ष या अप्रत्यक्ष रूप से कम्पनी के हितों को नुकसान पहुँचाने के लिए कदापि उपयोग नहीं किया जावे</p> </div> <div style="flex-grow: 1;"> <p>1.2 SCOPE OF SUPPLY</p> <p>The supplier shall design, manufacture, inspect, test, supply and install (at site) a proven partial discharge analysis (PDA) system for periodic on-line monitoring of the condition of stator winding insulation without an interruption in the operation of the machine. The PDA system supplied & installed shall not in any way compromise the integrity and safety of the machine. The system shall be complete in all respect covering the following major items. Any other item which is not specifically stated, but essentially required for instillation & trouble free operation of the system shall also deemed to have been included in the supplier’s scope without any additional cost to purchaser.</p> <p>1.2.1 FOR EACH GENERATOR</p> <p>1 Set- partial discharge coupler package with appropriate length of HT & LT cables per coupler, termination box, connectors for termination of cables and insulating materials for insulation of HT joints, etc as per specification in part-2 and quantity in part-4 along with complete test result for each PD coupler issued by an accredited laboratory as per ASTM D-1868.</p> <p>1.2.2 COMMON OF ALL GENERATORS.</p> <p>1 Set- Portable Partial Discharge Analyzer , Computer, PD software etc as per specification in part-3.</p> <p>1.3 INSTALLATION & COMMISSIONING</p> <ul style="list-style-type: none"> - Supervision for Installation & Commissioning, calibration & testing of complete lot of PD equipment covered under scope of supply for each generator/ common for all generators. - Preparation and submission of test report on PD equipment for each generator . - Preparation of “as-built” drawings indicating total installation of PDA system with location of PD couplers, method of fastening PD couplers, and their electrical connections for one machine. - Training at site for customer’s engineers on the fundamentals of the PDA system (installed) and the use of PDA instrumentation package & softwares with suitable recommendations of PDA test procedures, data/result interpretation PDA test file management, etc. for implementation by end user for first set for Unit-I only. <p>Supplier should quote for the above on lump sum basis under installation and commissioning for each generator including all expenses towards lodging, boarding and transport and irrespective of no. of visits to site.</p> </div> </div> | | | | |

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| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">गोपनीय एवं अधिकार सुरक्षित इस प्रपत्र पर दी गई जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपत्ति है इसे प्रत्यक्ष या अप्रत्यक्ष रूप से कम्पनी के हितों को नुकसान पहुँचाने के लिए कदापि उपयोग नहीं किया जावे</p> | | <p>1.4 DOCUMENTS TO BE SUBMITTED ALONG WITH QUOTATION</p> <p>Following documents shall be submitted along with the offer in triplicate.</p> <p>1.4.1 Clause-by-clause confirmation regarding compliance of this specification and deviation if any, shall be stated clearly w.r.t. specification.</p> <p>1.4.2 Latest detailed technical literature/specification for all the components of Partial Discharge Monitoring Equipment.</p> <p>1.4.3 Single line block diagram for the total installation of PDA system.</p> <p>1.4.4 Schematic diagram for location of couplers on four parallel paths of each phase and for all the three phases.</p> <p>NOTE : The offer is liable to be rejected for non-compliance of above condition.</p> <p>1.5 TESTING AND PRODUCT QUALITY ASSURANCE PLAN. (NOT COMPANY'S QUALITY MANUAL)</p> <p>Supplier's product's quality assurance plan and final test report format shall be furnished along with the offer for approval by BHEL.</p> <p>The equipment shall be extensively tested for functional operation, calibration of couplers and reliability as per approved QA Plan and test report shall be furnished to BHEL for approval before inspection/dispatch.</p> <p>1.6 PACKING AND FORWARDING</p> <p>The complete equipment shall be suitably packed for sea worthy packing and safe transport. Packing of the equipment shall also be suitable for dead storage equipment for five years.</p> <p>1.7 QUOTATION</p> <ul style="list-style-type: none"> - Quote main item with number of couplers as per part-4 of product standard. - Quote separately for recommended spare parts for 5 years trouble free operation with item wise price break up (OPTIONAL). - Quote separately for installation and commissioning at site as per clause 1.3 <p>1.8 APPROVAL OF DRAWINGS/DOCUMENTS</p> <p>Supplier to get prior written approval of drawings, QA Plan from BHEL before proceeding with manufacturing. Instruments supplied without written approval of drawings, documents and QA plan shall be rejected.</p> | | |

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| <p style="text-align: center;">PART-3 (SPECIFICATION OF PARTIAL DISCHARGE ANALYSER, PD SOFTWARE AND OTHER ACCESSORIES)</p> | | | | |
| <p>3.1 PARTIAL DISCHARGE ANALYZER</p> | | | | |
| <p>Portable Partial Discharge Analyzer shall be PC compatible with built in tester and shall have provision for connecting to all the PD couplers(as specified in part-4) or more of one generator at a time for measurement of PD activity along with necessary cables for connection from Analyzer to termination box, shall be suitable for measurement of the following :</p> | | | | |
| <ul style="list-style-type: none"> - No of pulses per second. - Magnitude, Polarity of PD pulses. - Phase angle of PD pulses. | | | | |
| <p>Analyser must be able to distinguish pulses as PD pulses, noise pulses and other non-PD pulses through digital noise separation with resolution of 6 ns. > It should also provide alarm for out of scale readings.</p> | | | | |
| <p>Analyser must be capable of distinguishing between the slot discharges, internal discharges, surface discharges, noise and spurious signals, external discharges, end winding discharges etc.</p> | | | | |
| <p>The analyzer shall comply to following requirements :</p> | | | | |
| <ul style="list-style-type: none"> - No. of PD input – As per part-4 of product standard. - Dynamic range of more than ± 20 mV - Minimum windows width of 20 mV - 24 phase windows or more - 15° resolution or better. - Data acquisition should be selectable between 0 to 100 sec for each pair of couplers. - Band width should be 0.1 MHz or more. - Noise separation through “Digital Comparison of Pulse Arrival Time with resolution of 6 ns to distinguish as PD pulses, Noise pulses and other non PD pulses. - Amplifier for extra partial discharge measurements - 4000 mV or more attenuator with high PD activities. - Communication protocol suitable for connection to computer. - Each channel individually programmable. - One Noise Channel - Low level noise levels shall also be programmable for each channel. - Three Analogue input for current, temperature & humidity - 2 nos. Electrical Alarm Contacts for high/low PD - Frequency of collecting monitored test data shall be programmable and shall be capable of being collected at preset fixed time or fixed time base. | | | | |
| <p>Analyzer shall have OPTIONAL feature to make use of winding RTDs (provided between the bars in the slots for measurement of winding temperature) as sensors for detection & measurement of PD activities.</p> | | | | |
| <p>3.2 PARTIAL DISCHARGE ANALYSIS SOFTWARE</p> | | | | |
| <p>Latest version of PD SOFTWARE and PREDICTIVE MAINTENANCE SOFTWARE shall be Microsoft window XP-pro based for complete data acquisition, controlling & analyzing of partial discharge activities. All Software packages shall be provided with software support for minimum period of TWO years after commissioning of the equipment.</p> | | | | |

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| <div style="display: flex;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small; padding-right: 10px;"> <p>गोपनीय एवं अधिकार सुरक्षित इस प्रपत्र पर दी गई जानकारी भारत हेवी इलेक्ट्रिकल्स लिमिटेड की संपत्ति है इसे प्रत्यक्ष या अप्रत्यक्ष रूप से कम्पनी के हितों को नुकसान पहुँचाने के लिए कदापि उपयोग नहीं किया जावे</p> </div> <div style="flex-grow: 1;"> <p>3.2.1 GRAPHICAL DISPLAY</p> <p>The software should be able to display the details as specified below:</p> <ul style="list-style-type: none"> - Two-axis plot indicating number of PD pulses per second Vs Magnitude of PD pulses with Polarity. - Should be able to superimpose two two –axis graphs for comparison - Three-axis plot indicating Number of PD pulses for second, Magnitude of PD pulses with Polarity Vs Phase angle of PD pulses. - Should be able to superimpose two three –axis graphs(mentioned above) for comparison - Pulse magnitude, pulse repetition rate PD intensity phase resolved data in graphed form. <p>3.2.2 TUBULAR DISPLAY</p> <p>The software should be able to display in a tabular form various pulses measured during the tests, the pulses should be clearly categorized as follows:</p> <ul style="list-style-type: none"> - PD Pulses - Noise Pulses - Other Non –PD Pulses <p>3.3 POWER SUPPLY</p> <p>Partial Discharge Analyzer covered in this specification shall be suitable for 240 ± 20% Volt, 50 ± 5% Hz., Single Phase AC supply and provided with necessary protection for input voltage surges.</p> <p>3.4 PORTABLE COMPUTER AND COLOUR PRINTER.</p> <p>Latest version of 1 no portable computer (laptop) and 1 no heavy duty colour printer shall be compatible for use with PDA for data acquisition, storage, analysis and display of partial discharge activities.</p> <p>3.5 WORKING ENVIRONMENT</p> <p>Partial Discharge Analyzer covered in this specification shall be capable of operating trouble free at an ambient temperature range of 0° to 50 ° (Max.), 90% relative humidity, noise level of 90 dB and vibration level of approx. 100 microns (at 100 Hz.) Temperature in the vicinity of PD couplers will be approx. 130 °C(max. absolute).</p> </div> </div> | | | | |



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PART -4 (PROJECT SPECIFIC DETAILS AND REQUIREMENTS)

4.1 PROJECT DETAILS.

4.1.1 Project Name : _____.

4.1.2 Customer : _____.

4.1.3 Site Address : _____.

4.2 GENERATOR DATA:

4.2.1 Rating : _____


4.2.2 No. of parallel path per phase : _____

4.2.3 Insulation Class : _____ kV

4.2.4 Power Frequency Test Voltage : _____ kV ACRMS for 60 Seconds.

4.2.8 No. of terminals : _____ nos. per phase, Total _____ nos line terminals
and _____ nos. neutral terminals. brought outside
stator frame

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