(4)

POR W.O. 71862A & 718644

SPECIFICATION FOR ONLINE DISSOLVED GAS AND MOISTURE ANALYSER

INDENT NO. - 14065T040 **WO71511R17100**

→ FOR P.I. NO. - 14067 0076 — Dt. 20/04/17

1. Online Dissolved Gas (Multi-gas) and Moisture Analyzer along with all required accessories shall be provided with each transformer for measurement & analysis of dissolved gases and moisture in the oil. Interpretations shall be as per IEC 60599-1999.

2. **The equipment shall detect, measure and analyze the following gases:**

Gases & Moisture Parameters	Typical Detection Range
H_2	5 – 5,000 ppm
CH_4	5 – 5,000 ppm
C_2H_6	5 – 5,000 ppm
C_2H_4	3 – 5,000 ppm
C_2H_2	1 – 3,000 ppm
CO	10 – 10,000 ppm
CO_2	20 – 30,000 ppm
O_2	500 – 25,000 ppm
H_2O	2 – 100 % RS should have facility for measurement of moisture in oil in ppm

3. The analyzer should measure (not calculate) all above gases and should have 100% sensitivity. The equipment shall be capable of transferring data to sub-station automation system confirming to IEC 61850. Necessary interface arrangement shall be provided by the contractor for integration with automation system. The necessary type test report for such confirmation shall be submitted during detailed engineering.

4. Equipment shall have facility to give SMS alert to at least three users whenever any fault gas violates the predefined limit.

5. Equipment should work on station auxiliary supply. **In case some other supply is required for the equipment then suitable converter shall be included in scope of supply**. All the necessary power and control cables, communication cables, cable accessories as required shall be provided by the supplier.

6. Online DGA shall be installed out-door on transformer in harsh ambient and noisy condition (Electromagnetic induction, Corona, and capacitive coupling). Suitable arrangement shall be provided to take care of vibration for tank mounting. The equipment shall be suitable for proper operation in EHV substation (800kV) environment where switching takes place in the EHV/HV System. The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment. The equipment shall have IP55 Stainless Steel enclosure, suitable for 55 ^{0}C ambient temperature and EMI and EMC compatibility. The Equipment must carry a minimum of two (2) years manufacturer's Warranty.

7. The equipment shall connect to the transformer's main body in two locations. One Connection is for the supply of oil from the transformer. Second connection is for the return of the oil to the transformer. The connecting oil lines must be of Stainless Steel rigid pipes or flexible hoses.

8. The equipment shall be able to measure gas concentration and when downloaded should immediately compare it with user selected alarm & caution level for immediate display. The sampling

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rate shall be selectable as 2 or 4 or 6 or 12 hours etc. The equipment shall have inbuilt memory to store these results for complete one year even if sampling is done at the lowest interval.

9. The Equipment must have an automatic calibration facility at fixed intervals. **For calibration, if anything is required including cylinder, must be provided and mounted with the Equipment.**

10. **The technical feature of the equipment shall be as under:**

Accuracy	± 10%
Repeatability	±3% to 10% depending upon gases
Oil temperature range	- 20^0 C to + 120^0 C
External Temp. Range	- 20^0 C to + 55^0 C (External temp range of 55^0 C is important and should not be compromise due to Indian ambient & operating conditions.)
Humidity range	10 to 95 %
Operating Voltage	230 Vac; 50 Hz (±20% variation)
Communications	USB & IEC 61850 compliant

11. Software for fault indication and fault diagnostics shall include following:

Fault indication:

i) IEEE, IEC or user configurable levels of dissolved gases

ii) Rate of change trending

Fault Diagnosis:

i) Key gases

ii) Ratios (Rogers, IEC. etc.)

iii) Duval's Triangle

12. The equipment shall be supplied with all necessary accessories required for carrying out DGA of oil sample complete in all respect as per the technical specification. The following shall be also form a part of supply.

i) Software

ii) Operation Manual (2 set for every unit),

iii) Software Manual and

iv) CD giving operation procedures of Maintenance Manual & Trouble shooting instructions.

13. Supplier shall submit clause wise compliance to all above clause 1-12 in their offer. Please also read attached annexure-I in conjugation to this specification before submitting offer.

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ANNEXURE-I (2)

Technical Specification of Portable Dissolved Gas Analysis of Transformer Oil

<table>
<tr><th>S.No.</th><th>Particulars</th><th>Specification</th></tr>
<tr><td>01</td><td>Functional Requirement</td><td>The Portable Gas Chromatograph equipment to extract, detect, analyse and display the dissolved gases in transformer oil as specified in IEEE C 57-104-1991 and IEC 60559-1999.</td></tr>
<tr><td>02</td><td>Extraction of Gases</td><td>Gases shall be extracted from insulating oil either of the mercury free extraction method
- Shake test method as described in IEC-60567-2005-Annexure C
- Head space method
- Partial Degassing toepler pump method</td></tr>
<tr><td>03</td><td>Detection of Gases</td><td>The gases extracted as above shall be detected using either portable GC with TCD/FID/any other detector or using spectroscopic method. All the fault gases i.e. H2, CH4, C2H2, C2H4, C2H6, CO&CO2 concentrations shall be individually measured and displayed. It is preferable that instrument also displays N2 and O2 content individually. The minimum detection limits of the instrument shall be strictly met the requirement of IEC-60567-2005-Page No.81-clause 9.2, table-5.</td></tr>
<tr><td>04</td><td>Performance Parameters</td><td>
<table>
<tr><th>Gases</th><th>Minimum Detection Limits in ppm</th><th>Working Range in ppm</th><th>Accuracy</th></tr>
<tr><td>Hydrogen-H2</td><td>5</td><td>0-5000</td><td rowspan="4">+/- 2 ppm or +/- 5% whichever is greater</td></tr>
<tr><td>Hydrocarbons-CH4, C2H2, C2H4, C2H6</td><td>1</td><td>0-10000</td></tr>
<tr><td>Carbon Monoxide-CO</td><td>25</td><td>0-10000</td></tr>
<tr><td>Carbon dioxide-CO2</td><td>25</td><td>0-50000</td></tr>
</table>
</td></tr>
<tr><td>05</td><td>Power Supply</td><td>It shall be operated with AC single phase, 50 Hz +/-5%, 230 V +/-10% supply. All power cable and necessary adaptors shall be provided by supplier.</td></tr>
<tr><td>05</td><td>Calibration</td><td>a). Instrument shall have facility to perform calibration check using GAS-IN-OIL standards as well as calibration gas mixtures. This GAS-IN-OIL standard shall be prepared in syringes in accordance with IEC-60567-2005-Page No.35-clause 6.2.
b). The calibration shall be demonstrated by supplier at the time of installation/commissioning at our lab and POWERGRID will provide only the insulating oil for testing.
c). All necessary requirement like Glass syringes, 3 way cock and any other consumable required for calibration check shall include in the scope of supply.</td></tr>
<tr><td>07</td><td>Instrument control and Data handling, Internal</td><td>a). In case laptop is essential for operating the instrument, it shall be of latest specification along with licensed preloaded OS and software as well as software for interpreting DGA results accordance with IEEE C 57-104-1991 and IEC 60559-1999 along with laptop with carrying case included</td></tr>
</table>

	Memory	b). In case instrument is having in built control for all the functions. Data acquisitions and data storage, it shall have a facility for communication with computer for downloading the data from instrument via USB port. Licensed copy of the software required to download data to computer shall be provided. c). Internal Memory can capable of store 15000 records, if inbuilt functions
08	General Conditions	All required items/instruments /spares /consumable /connecting cables/communicationcables/instruments/manuals/Certificates/training materials/original software/original licensed data//station operating software/education CD/DVDs that are essential to understand the basics and advanced gas chromatography and in parts/items that are essential to complete the supply, installation and commissioning the system required in the international standards ASTM-D-3612/2002 Method C / IEC-60567-05 shall be supplied to our laboratory in healthy condition and no extra cost.
09	Operating Temperature, Relative humidity & Dimensions	01. Temperature 0-40 Deg. Centigrade 02. 85% non-condensing 03. Portable
10	Receipt, Storage	It shall be the responsibility of the supplier to ensure proper receipt and storage before commissioning the kit.
11	Warranty	The entire test set up shall be covered on warranty for a period of one year from the last date of complete commissioning and taking over the test set up. If the kit needs to be shifted to suppliers' works for repairs, supplier will have to bear the cost of, spares, software, and transportation etc. of kit for repair at test lab/works.
13	Application Note	An application note/principle document from original manufacturer compliance with standard test method shall be submitted along with the kit.
14	Service Support	The supplier shall furnish the detailed organization structure of the service team, who has acquired qualification and regular training records from manufacturer. Mode of attending service calls shall be given in details.
15	Training	The supplier shall arrange complete training by an application scientist who acquired technical & academic capacity of the principle company in the premises of our Laboratory for a period of two working days. The required reading materials/CDs shall be arranged by the supplier.
16	Spares and consumables	All the necessary spares and consumables including carrier gas bottles if required, calibration gas mixture, septa, syringes, 3 way valves etc. to run the equipment for AMC period with sample load of around 500 samples per year shall be offered items and quantity wise.