

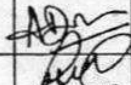
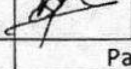
BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL
TRANSFORMER ENGINEERING DEPARTMENT

DOC. REF. TRE/OLDGA/RC/01

ANNEXURE - B

SECTION 1**General technical specification for online dissolved gas monitoring system**

	Technical requirements	Compliance by bidder Yes/ No
1. GENERAL		
	The equipment offered shall be suitable for online dissolved gas monitoring, required for detection of incipient fault in oil filled equipment i.e. transformers/ reactors. Oil filled in the equipment shall be transformer mineral insulating oil conforming to IEC: 60296. The equipment shall continuously monitor PPM value of dissolved gases and dissolved water content of transformer oil.	
2. TECHNICAL FEATURES		
2.1	The Monitor shall be a microprocessor based Intelligent Electronic Device (IED), designed to continuously detect and measure desired gases and Water content, even at very low concentrations, in transformer oil. It should be easy to install and it should be possible to retrofit it on an energized transformer, without shutting down the transformer.	
2.2	The equipment shall be installed out door on Reactor in harsh ambient and noisy condition (Electromagnetic induction, Corona, and capacitive coupling). The equipment shall be suitable for proper operation in EHV substation (800kV) environment where switching takes place in the EHV/HV System.	
2.3	Sufficient length of inlet line tube to monitor and return line tube to transformer (if applicable) shall be furnished.	
2.4	Two nos. of 40 (Round flange, 4 Holes, 14mm dia. and 100mm PCD) or 50 NB Gate Valve (Round flange, 4 Holes, 18mm dia. and 115mm PCD) shall be available as inlet & outlet for fixing of the equipment. Size applicable for shall be informed along with particular order. Necessary matching adopter plates to connect tubes shall be in bidder's scope.	
3. OTHER DETAILS		
3.1	<i>Scheme and electrical connection:</i> Complete schematic showing the connections of power supply to the digital display unit, terminal marking and wiring termination of alarm & trip contacts shall be furnished along with offer. Further, type and size of terminals used in digital display unit shall also be furnished to select suitable cable lugs.	

REV	DATE	ALT CKD	REV-	DATE	ALT CKD	REV-00	NAME	SIGN	DATE
						PREP			04.12.19
						CKD			05.12.19
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3.2	Mounting details – Outline and fixing detail drawings for sensor unit and digital display unit to be furnished along with offer, so as to enable us to provide suitable mounting arrangement. Conduit thread size for cable entry should also be furnished along with offer.	
3.3	The offered equipment shall include all the items i.e. operating and calibration software (if any) etc. to complete the equipment in all respect for the purpose described in this specification.	
3.4	Supplier should furnish 2 sets of literature/ leaflet of offered model and list of total item in their scope of supply along with offer.	
4.	INSTALLATION AND COMMISSIONING	
4.1	Installation & commissioning of the system is also in the scope of supply. The installation and commissioning at site shall be done under the supervision of OEM representative or OEM certified representative and also provide training for operation and maintenance to our ultimate customer at site on intimation of BHEL and obtain certificate from the customer for the same. Supplier should quote the charges for the same, if any, in the offer separately.	
4.2	Vendor shall make all required arrangements for mounting/installation of equipment on tank/ ground from the stored location to the installation site. All associated accessories as supplied by the vendor for commissioning of equipment shall be properly commissioned at site.	
4.3	In case the equipment will be integrated with SAS, whatever input of the instrument required shall be given to SAS/Customer engineer for SAS integration. If any problem arises related to signal transmission, then supplier to give solution or they have to visit site.	
5.	INSPECTION & DESPATCH	
5.1	Three sets of inspection, routine, acceptance and calibration test reports, operation and maintenance manual, descriptive catalogue/ leaflets shall be sent along with dispatch document. One set shall be supplied along with the equipment.	
5.2	The supplier shall furnish a list of all fittings and components in the dispatch details giving description and quantity of each item (Quantity of each item shall be mentioned). All items shall be properly packed in wooden boxes so as to avoid scratches/damage in transit.	
5.3	All the items of each DGA equipment to be kept in set of box only i.e. one box for main equipment, 1 box for commissioning & accessories items. In any condition item required for 2 different sets not to be mixed in 1 box.	

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5.4	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:- <ul style="list-style-type: none">• Software• Operation Manual (2 set for every unit),• Software Manual• Compact disc giving operation procedures of Maintenance Manual & Trouble shooting instructions	
6.	WARRANTY	
6.1	The equipment must carry manufacturer's warranty for 24 Months from date of commissioning or 30 months from date of delivery to BHEL whichever is earlier. The date of commissioning shall be reckoned from submission of certificate received from customer to BHEL.	

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**TRANSFORMER ENGINEERING DEPARTMENT****DOC. REF. TRE/OLDGA/RC/01****SECTION 2****Specific Technical Requirement of Online DGA - ITEM 1**

	Technical requirements			Compliance by bidder Yes/ No
1.	Measurement range	H2 CH4 C2H6 C2H4 C2H2 CO CO2 O2 N2 H2O	5 to 5000 ppm 5 to 5000 ppm 5 to 5000 ppm 3 to 5000 ppm 1 to 3000 ppm 10 to 10000 ppm 20 to 30000 ppm 500 to 25000 ppm 10000 to 100000 2 to 100% RS (Given in ppm)	
2.	Operating principal	Photo acoustic spectroscopy (PAS) or Gas chromatography (GC) with thermal conductivity detector (TCD)/ Flame ionization detector (FID) method/ Non-dispersive infrared NIR (Near Infra-red) spectroscopy The analyzer should measure (not calculate) all above gases.		
3.	Complying standards	IEC 61326-1 for EMI/EMC Standards IEC 60255-21-1/ IS 9000 for Basic Environmental Testing Procedures covering Shock, bump and vibration tests. IEC 60364-4-41 for Protection against electric shock IEC 61010 for Safety requirements for electrical equipment for measurement & control use. IEC 60529, IP 55 for Weather Proof Standards.		
4.	Sensitivity Accuracy Repeatability	100% for each gas For N2 & O2 : $\pm 15\%$, For all other gases : $\pm 5\%$ $\pm 3\%$ to 10% depending upon gases		
5.	Operating condition	Power supply Voltage # Power supply Frequency Ambient Temperature Range Operating Oil Temperature Range Operating Humidity Pressure Withstand (Oil side) Exterior enclosure Environment protection EMI & EMC Compatibility # In case other supply is required for the equipment then suitable converter shall be included in scope of supply.	230V $\pm 20\%$, 1-phase AC 45 to 55 Hz -20 to + 55°C -20 to + 120°C 10 to 95% RH Full Vacuum to 10 psi Stainless steel IP 55 Yes	

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6.	Display / Memory	The suitable indications for power On, Alarm, Caution, normal operation etc. shall be provided on the front panel of the equipment.	
		The equipment shall display all the individual gas and moisture concentration on its display unit and shall have facility to download all the stored data from the unit for further analysis.	
7.	Sampling & Memory	The sampling 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 3 year even if sampling is done at the lowest interval.	
8.	Communications	USB & IEC 61850 compliant	
		Modem/ Ethernet or RS 232 & RS 485 and analogue 4-20mA Isolated output	
		Equipment shall have facility to give SMS alert to at least three users whenever any fault gas violates the predefined limit.	
		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 supplier for integration with automation system. The necessary type test report for such confirmation shall be submitted.	
		Bidder to include armoured multimode fiber optic cable 25m with suitable ST connector at both end alongwith suitable converter/ adopter (if required) to communicate between DGA equipment and substation PC / Laptop in their scope of supply. Necessary FO port / suitable adopter at equipment end shall also be part of main DGA equipment. LIU & splicing of FO cable shall be in bidder's scope as per requirement.	
9.	Calibration (If applicable)	The carrier and calibration gas shall have minimum capacity to work for at least three years without replacement. All the consumable (if any) up-to warrantee period shall be included in the scope of supply. The equipment must have an automatic Calibration facility at fixed intervals. For calibration if anything required including cylinder must be mounted with the equipment.	
10.	Mounting	Equipment shall be mounted separately on ground. Suitable arrangement shall be provided to support and protect the inlet and outlet piping arrangement. Inlet and outlet piping shall be of stainless steel.	

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11.	Other technical features	The monitor shall be equipped with an inbuilt oil circulation system to ensure that the oil being sampled is the true representative sample of the oil from the transformer tank/ in continuous touch with the sensor of the equipment for online continuous monitoring of the oil from the transformer tank.	
		The monitor must have facility for collecting an oil sample for external oil tests, such as an external quick connect port plus sampling accessories.	
12.	Software	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	

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SECTION 3

Specific Technical Requirement of Online DGA - ITEM 2

Technical requirements					Compliance by bidder Yes/ No
		Gas	Range	Accuracy (Whichever is greater)	
1.	Measurement range	H2 CO C2H4 C2H2	5 to 2000 ppm 5 to 5000 ppm 1 to 2000 ppm 1 to 2000 ppm	±10% or ±5 ppm ±10% or ±10 ppm ±10% or ±3 ppm ±10% or ±1 ppm	
2.	Sensitivity	100% for H2 and C2H2 Minimum detection sensitivity to C2H2 – 2ppm			
3.	Operating condition	Power supply Voltage Power supply Frequency Operating Ambient Temperature Operating Oil Temperature Range Operating Humidity Pressure Withstand (Oil side) Environment protection			230V ±20%, 1-phase AC 45 to 55 Hz 50°C 0 to +100°C 10 to 85% RH 40 psi IP 55
4.	Display	The system shall have microprocessor, watchdog and clock system complete with LCD display unit and keypad. The function is to show gas levels and daily / hourly trend.			
5.	Sampling & Memory	Data including gas concentration , date and time of measurement shall be stored in memory at a specified frequency. The last gas concentration stored in device database shall be displayed on a high quality LCD display. The device shall be driven by a minimum 8-bit microprocessor and operating parameters and data retrieval shall be managed using a PC based control software to be provided with the unit.			
6.	Communications	Modbus TCP/IP Protocol, RS 232 / RS 485 and analogue 4-20mA Isolated output The output for DAS/ recorder shall be 4-20 mA isolated. Potential free alarm contacts for high gas concentration (user programmable) of each gas shall be wired upto transformer M. Box/CMB/CMS. These will be used by owner for facia alarm in control room and DDCMIS/ SCADA. Also real time data for concentration of each gas shall be provided at owner's control room (DDCMIS/SCADA) through CMS with required format & communication. All software/ hardware/ cables & its conduit covering/ laptop computer for monitoring from control room (within a distance of 500 m) shall be in the scope of the			
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		bidder.	
7.	Calibration (If applicable)	A suitable calibrating arrangement for each online DGA shall also be provided.	
8.	Mounting	Sufficient length of stainless steel tubes (min . 30 meters), connectors etc. shall be in scope of supply of supplier.	
9.	Other technical features	The attachment shall be provided with oil sampling port to facilitate oil collection for manual off-line DGA.	

SECTION 4

Specific Technical Requirement of Laptop

	Technical requirements		Compliance by bidder Yes/ No
1.	Screen size	14 inch (min.)	
2.	Processor	Intel Core i5 or higher, 64 bit or higher	
3.	Operating System	Window 8.1 professional (single language) or higher	
4.	RAM	4 GB or higher	
5.	HDD	500 GB or higher	
6.	Accessories	Carry bag & charger to be supplied along with Laptop	

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