	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : ONLINE MOISTURE DETECTOR FOR TURBINE GUIDE BEARING SUMP	241504876	Page 1 of 5

PROJECT : PUNATSANGCHHU-II HEP (6 x 170 MW – V. FRANCIS)

1. SCOPE OF SUPPLY:

SL. NO.	DESCRIPTION	QTY	REMARKS
1.	Online Moisture Detector equipment for Turbine Guide Bearing oil sump	6 Sets	Refer Sketch No. HPE-GC-404 Rev. 00 for mounting details
2.	Commissioning of all six (6) sets Online Moisture Detector equipment for Turbine Guide Bearing oil sump at Punatsangchhu-II HEP in Bhutan.	1 lot	-

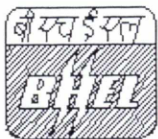
One set of Online Moisture Detector equipment consists of 1 no. each of the following items: -

- (1) Moisture Sensor with inbuilt cable
- (2) Moisture Indicator cum control unit
- (3) Wall mounted box
- (4) Ball valve with ball of SS material (Suitable for mounting moisture sensor through this valve)
- (5) Mounting Accessories assembly (Adapters, Teflon washers etc.) as per Sketch No. **HPE-GC-404 Rev. 00.**
- (6) Interface cable for configuration / calibration setting of the sensor (If required)

2. APPLICATION:

- 2.1 The online moisture detector equipment with its sensor probe immersed in bearing oil sump for measuring the moisture content in oil & directly connected to the moisture indicator cum control unit for display of moisture content. The moisture indicator cum control unit shall be mounted inside the wall-mounted box. The indicator cum control unit shall provide the current signal retransmission for displaying the moisture content in SCADA / DCS in control room. The signal from the sensor probe shall energize the relays in the indicator cum control unit for alarms if moisture exceeds the preset value. The indicator cum control unit shall provide the relays output for high and very high alarm.
- 2.2 The sensor of the moisture detector equipment shall be suitable for use with mineral lubricating bearing oil to ISO grade VG 46 in the temperature range of 5° C to 70° C.

REV.NO.		DISTRIBUTION	QTY.	APPROVED:			
PREPARED				(MS)			
CHECKED		HPE	01	PREPARED	CHECKED	ISSUED	DATE
APPROVED		MHX	01	(VKN)	(AP)	(AP)	01.08.2020
DATE							

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : ONLINE MOISTURE DETECTOR FOR TURBINE GUIDE BEARING SUMP	241504876	Page 2 of 5

3. SPECIFICATION:

3.1 MOISTURE SENSOR:

- 3.1.1 Moisture Sensors should have protection with fine SS mesh filter. The housing material of the moisture sensor should be of stainless steel.
- 3.1.2 Sensor bulb having separate sensor for temperature and moisture shall be pressure tight to 10 Kg/Cm². Sensor mounting process connection should be (1/2" BSP (M) to be provided for fixing it with the bearing sump through ball valve installation arrangement.
- 3.1.3 Moisture sensors: Highly stable capacitive sensor, which provides the change in capacitance, based on the change in moisture content in the oil to the moisture indicator cum control unit. All the electronics for moisture calculation / calibration should be part of remote moisture indicator cum control unit.
- 3.1.4 The moisture sensor probe cable should be with integral type and shall have minimum cable length of **10 meter (Single cable)**.
- 3.1.5 Temperature sensor: PT 100 / Pt 1000 Class A;
Temperature range: 0° C to 100° C.
- 3.1.6 Turbine guide bearing sump shall have ½ " BSP (F) process connection for mounting of moisture sensor through ball valve.
- 3.1.7 Installation of the sensor shall have a ball valve to provide mounting and removal of sensor probe without interrupting the process.
- 3.1.8 The ball valve (with SS ball) of suitable size with process connection (1/2" BSP) to suit the moisture sensor probe and existing process connection on TGB sump shall be provided by the vendor. Mounting Accessories (i.e. Adapter (of SS material) for connecting ball valve with the connection of TGB sump and Teflon washer etc.) to be provided by the vendor for fixing it to the turbine oil-bearing housing as per attached sketch (Refer sketch no. HPE-GC-404 Rev. 00).
- 3.1.9 Sensor probe length shall be suitable for mounting on the oil sump tank through ball valve. **(For sump tank thickness & limiting dimension, refer enclosed sketch no. HPE-GC-404 Rev. 00)**
- 3.1.10 Suitable sealing arrangement should be provided to avoid oil leakages from the sump connection.

3.2 MOISTURE INDICATOR CUM CONTROL UNIT:

- 3.2.1. The Moisture indicator cum control unit shall be suitably wall mounted type and shall be mounted inside the "Wall mounted box". The sensor probe shall be connected to the Moisture indicator cum control unit through integral type cable.
- 3.2.2. Moisture Indicator cum control unit shall have feather touch keys for selecting MIN / MAX & other parameters.
- 3.2.3. The Moisture indicator cum control unit shall be provided with a Digital Display for display of measured PPM (0-1000 PPM) / Saturation indication (in terms of water activity 0.0 to 1.0 aw / 0.0 to 100.0 % aw) and oil temperature (in the range of 0° C to 100° C).

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : ONLINE MOISTURE DETECTOR FOR TURBINE GUIDE BEARING SUMP	241504876	Page 3 of 5

3.2.4. Input Supply:

240 VAC, 50Hz

However, Sensor supply shall be derived from the Moisture indicator cum control unit. The suitable power supply converter shall have to be used if Moisture indicator cum control unit requirement is other than 240 VAC. MCB of suitable capacity shall be provided in the power supply circuit of 240 VAC.

The power supply converter and MCB shall be installed inside the Wall mounted box.

3.2.5. Output / Signal:

Two sets of output signal shall be available for retransmission to SCADA / CCS / DCS from Moisture indicator cum control unit.

- 4 - 20mA output for PPM / Water activity indication.
- 4 - 20mA output for Temperature Indication.

3.2.6. Alarm Contacts:

Two Nos. SPDT Potential free contacts, continuously adjustable throughout the range i.e. 0 to 100 PPM / 0-1aw / 0-100 %aw. Contacts shall have capacity of 240 VAC / 0.5 A.

{If direct SPDT potential free contacts of above ratings are not available, then, separate auxiliary relays shall be used to provide SPDT contacts of above rating. The auxiliary relays can be installed in inside the Wall mounted box.}

Alarm configuration settings:

- Relay -1: Moisture saturation water activity 0.8 aw / 80 % aw
- Relay -2: Moisture saturation water activity 0.9 aw / 90 % aw

3.2.7. If interface cable is required for configuration / calibration of moisture sensor through moisture indicator cum control unit, then the Interface cable for configuration / calibration of the sensor should be supplied with each moisture sensor.

Note : The Moisture Sensor and Moisture indicator cum control unit should be of same make.

3.3 WALL MOUNTED BOX:

3.3.1. Items of moisture detector i.e. "Moisture indicator cum control unit", "Power supply converter", "Auxiliary relays", MCB and Terminal blocks shall be mounted inside the Wall mounted box.

3.3.2. Wall mounted box should be of, wall mounted type, weatherproof with protection class of IP 65 / 66. Mounting hardware should be provided alongwith box. The wall mounted box should be made up of sheet steel / Aluminum Casting housing. The box should be powder coated with epoxy paint (External: Light gray, Internal: Pearl white).

3.3.3 All input / output / power supply terminals of the Moisture indicator cum control unit should be terminated to terminal blocks (din rail mounting type). The terminal blocks should be of screw type, suitable for **four sqmm** wires. Suitable removable gland plates / glands should be provided in the bottom of controller box.

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : ONLINE MOISTURE DETECTOR FOR TURBINE GUIDE BEARING SUMP	241504876	Page 4 of 5

3.3 ACCURACY & REPEATABILITY:

Accuracy & repeatability shall be better than $\pm 2\%$.

3.4 ELECTROMAGNETIC CAPABILITY:

Instrument shall comply with the requirements as per EN61326-1.

3.5. CONFIGURATION:

Moisture indicator cum control unit & sensor shall be supplied in fully configured & calibrated. Identification no. shall be marked on both sensor and indicator unit. If required, each unit shall be supplied with interface cable for connection the indicating unit with the PC for configuration setting.

3.6. SOFTWARE:

Software CD shall be supplied along with the instrument for easy configuration & calibration.

4. Commissioning of all six sets of Online Moisture Detectors at Punatsangchhu-II HEP Site, in Bhutan.

- 4.1. Vendor shall offer lump-sum price of Commissioning of all six sets of online moisture detector on a lot basis. Offer of commissioning on per day charge basis / number of visits basis / to-and-fro fare basis etc. shall not be accepted. The commissioning charges shall include travelling charges, travel at site, boarding and lodging and any other miscellaneous charges applicable. The instruments shall be commissioned in Punatsangchu-II HEP, Bhutan.

5. DOCUMENTATION:

ALONGWITH THE OFFER:

The supplier shall submit the documents / drawings at the time of offer, which shall include the following.

- Details of all equipment including their type and make, specifications and guaranteed technical particulars.
- Interface wiring diagram.

AFTER PLACEMENT OF ORDER:

The supplier shall submit within four weeks from the date of award of contract, which shall include but not limited to the following:

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : ONLINE MOISTURE DETECTOR FOR TURBINE GUIDE BEARING SUMP	241504876	Page 5 of 5

FOR OUR APPROVAL:

- QAP & General Arrangement drawing with dimensions in line with our sketch no. **HPE-GC-404**.
- Wiring schematic of the controller box.
- Manufacturing to start only after approval of above documents.

In case of any BHEL comments on the documents, Supplier shall have to resubmit the revised documents within One week from the date of BHEL comments.

Supplier shall start manufacturing of the items only after approval of above documents.

FOR OUR REFERENCE:

- Control Schematic diagrams.
- O & M Manual containing the following.
 - Operating principle
 - Mounting details
 - Calibration & adjustment procedure
 - Trouble shooting
- All Test Certificates shall be part of O & M Manual

6. GUARANTEE:

Instruments should bear supplier's guarantee / warrantee for trouble free operation and good workmanship for a period of 18 months from the date of supply. Supplier should undertake to replace free of cost any material / components found defective in operation during guarantee period.

7. TESTING & INSPECTION:

All necessary test / Test Certificates shall be carried out to prove that the equipment supplied meets the requirement of this specification and relevant IS. These tests shall be witnessed by BHEL at Vendor's works. During inspection setting / calibration procedure shall be explained by the vendor

- Visual inspection.
- Operational Test.
- Continuity Test.
- Calibration Test

8. PACKING:

- Each Moisture detector sensor and Controller box shall be packed individually with covered by polyethylene sheet with silica gel packet and placed in an individual carton or case with adequate cushioning material and water proof cover to minimize the movement of the internals and ensure that the instrument is capable of withstanding the transit conditions without damages.
- Mounting Accessories (Ball valve, Adapters etc) assembly should be packed in the separated wooden / cartoon box.