



HYDRO PROJECTS ENGINEERING DIVISION

SPECIFICATION NO.

REV 00

**TITLE : SPECIFICATION OF HEAD RACE &
TAIL RACE WATER LEVEL MEASURING
EQUIPMENT (SUBMERSIBLE TYPE)**

241505785-A

Page 1 of 9

1. PROJECT: VISHNUGAD PIPALKOTI HEP (444 MW)**2. APPLICATION:**

Submersible (Hydrostatic) type level transducer cum transmitter shall be used for measurement of Head Race and Tail Race site water levels of hydro power house.

3. SCOPE OF SUPPLY:

Sl. No.	Item Description	Quantity	Remarks
1.	Head Race water level measuring equipment-Hydrostatic type	1 Set	Refer clause no. 3.1
2.	Tail Race water level measuring equipment-Hydrostatic type	1 Set	Refer clause no. 3.2
3.	Head Race water level measuring piping and fittings	1 Set	Refer clause no. 3.3
4.	Tail Race water level measuring piping and fittings	1 Set	Refer clause no. 3.4

3.1. Head Race water level measuring equipment:
[One Set consists of the following items]

Sl. No.	Item description	Quantity	Remarks
(i)	Head Race Level Sensor with cable mounting screw (Cable holder) and terminal box (cable connecting box)	1 No.	- For measurement of head race water level - Recorder is common for recording of water levels of Head race & Tail race sites - Refer Drawing no. 02311619704 Rev. 02
(ii)	Digital indicator cum power supply	2 Nos.	
(iii)	Power line surge protector	1 No.	
(iv)	Signal line surge protector	1 No.	
(v)	Wall mounted box	1 No.	
(vi)	Two channel chartless recorder	1 No.	

Note: Level sensor and Digital indicator cum power supply unit should be of same make.

REV.NO.		DISTRIBUTION.	QTY.	APPROVED:			
PREPARED					(MS)		
CHECKED		HPE	01	PREPARED	CHECKED	ISSUED	DATE
APPROVED		MHX	04				
DATE				(DB)	(VKN)	(VKN)	20-05-2020

**TITLE : SPECIFICATION OF HEAD RACE &
TAIL RACE WATER LEVEL MEASURING
EQUIPMENT (SUBMERSIBLE TYPE)****241505785-A****Page 2 of 9****3.2. Tail Race water level measuring equipment:
[One Set consists of the following items]**

Sl. No.	Item description	Quantity	Remarks
(i)	Tail Race Level Sensor with cable mounting screw (Cable holder) and terminal box (cable connecting box)	1 No.	- For measurement of tail race water level - Refer Drawing no. 02311619705 Rev. 02.
(ii)	Digital indicator cum power supply	2 Nos.	
(iii)	Power line surge protector	1 No.	
(iv)	Signal line surge protector	1 No.	
(v)	Wall mounted box	1 No.	

Note: Level sensor and Digital indicator cum power supply unit should be of same make.**3.3. Head Race Water Level Measuring Piping and Fittings – Refer clause no. 1.1 of Specification No. 241505785-B.****3.4. Tail Race Water Level Measuring Piping and Fittings – Refer clause no. 1.2 of Specification No. 241505785-B.****4. DESCRIPTION:****4.1 LEVEL SENSOR WITH CABLE MOUNTING SCREW (CABLE HOLDER) AND TERMINAL BOX (CABLE CONNECTING BOX) : (HYDROSTATIC TYPE):**

These transducers shall be capable of measuring static or dynamically changing pressure in any non corrosive fluid medium (in this case water). The most important characteristic required for level transducer cum transmitter include reliability, performance, accuracy, compactness and ruggedness. This transducer converts water pressure into proportional electrical signals. Transmitters of outstanding linearity and excellent stress and strains characteristics shall be employed in the construction of these transducers. The ceramic element should be perfectly sealed. Zero & span adjustment shall be available on level transmitter if required. This transmitter should be submersible type and protected against lightning voltage.

NOTE: The output of Head Race water level transducer (4 – 20 mA) will be fed in isolation amplifier for multiplication of this output.

4.2 POWER LINE SURGE PROTECTOR:

The power line surge arrester should protect a measuring instrument line side against line surges and voltage peaks, which occur due to atmospheric electrical charges or switching processes in the power supply. Both wires of the power cabling should be protected through a surge diverter and a surge resistant resistor, which limits the current when the arrester responds.

**4.3 SIGNAL LINE SURGE PROTECTOR:**

The signal line surge arrester should protect a measuring instrument signal side against surges and voltage peaks, which occur in cable due to atmospheric electrical charges or interference. The signal surge arrester shall be used for signal cables having voltages up to 20V, cable to ground, or up to 40 V, cable to cable (non-grounded, and currents up to 30 mA). The signal line surge arrester shall protect 2 or 3 pole signal inputs or outputs of a measuring unit. The over voltage shall be discharged through a surge diverter in the cabling or a surge -resistant current limiting resistor and a Transzorb diode at the instrument.

4.4 DIGITAL INDICATOR CUM POWER SUPPLY UNIT:

The digital indicator cum power supply unit should be flush panel mounting type. Indicating meter display should be of LED / LCD type with indicating digits shall not be less than 5 digits. Digital indicator shall be equipped with built in 24 V DC power supply for powering level transmitter. Input power supply to digital indicator cum power supply unit shall be 230 V AC.

4.5 TWO CHANNEL CHARTLESS RECORDER:

Compact two channel chartless recorder suitable for panel mounting shall be provided. Input to this recorder will be fed from Head race water level & tail race water level transducers.

4.6 WALL MOUNTED BOX:

The metallic box shall be wall-mounted type with provision for mounting the following items (Sl. No. 4.2, 4.3 & 4.4 of specification):

- One No. Digital indicator cum power supply unit with proper cutout size on the front cover
- One No. Power line surge protector on Din-rail inside the box
- One No. Signal line surge protector on Din-rail inside the box
- Terminal blocks [15 Nos.] suitable for wiring of wires up to four sq mm.

Wall mounted box should be supplied with terminal blocks mounted on Din Rail inside the box by the supplier.

Mounting detail drawing shall be submitted along with the offer. Suitable removable cable glands plate shall be provided at the bottom of the box. Necessary anchor fasteners bolts etc. required to mount this box on wall to be supplied by supplier.

5. SPECIFICATION:**5.1. SPECIFICATION OF LEVEL SENSOR WITH CABLE MOUNTING SCREW AND TERMINAL BOX:**

- | | | |
|-------------------|---|--------------------------------|
| a) Type | : | Submersible (Hydrostatic) type |
| b) Supply voltage | : | DC 24 V |

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : SPECIFICATION OF HEAD RACE & TAIL RACE WATER LEVEL MEASURING EQUIPMENT (SUBMERSIBLE TYPE)	241505785-A	Page 4 of 9

- c) Output : DC 4 – 20 mA for measuring range
- d) Temperature range (process) : (-) 5°C to 45 °C
- e) Temperature range (ambient) : 5°C to 45 °C.
- f) Safe overload : Transducer should be safe for 3 times the max. measuring range.
- g) Accuracy, combined non linearity and hysteresis : $\pm 0.25\%$ of span (F.S)
- h) Mounting : Probe will be mounted inside the guide pipe & always submerged in water.
- i) Measuring range details :

Sl. No.	Level Sensor Description	Water Levels	Level Difference	Measuring Range of Sensor	Cable Length of Sensor
A	Level sensor for <u>Head Race</u> water level	Maximum EL - 1269.0 M	16.5 M	20 Meters	40 Meters
		Minimum EL - 1252.5 M			
B	Level sensor for <u>Tail Race</u> water level	Maximum EL - 1040.5 M	12.3 M	15 Meters	35 Meters
		Minimum EL - 1028.2 M			

- j) Sensor Material : Stainless steel
- k) Housing Material : Stainless steel
- l) Cable (screened) with cable holder : Cable length as given above
- m) Protection : IP68 (Permanently Hermetically sealed)
- n) Terminal box : For terminating sensor cable (IP 66 /67 protection)
- o) Cable mounting screw : 1½" BSP (M)

**TITLE : SPECIFICATION OF HEAD RACE &
TAIL RACE WATER LEVEL MEASURING
EQUIPMENT (SUBMERSIBLE TYPE)****241505785-A****Page 5 of 9****5.2) SPECIFICATION OF POWER LINE SURGE PROTECTOR:**

- a) Power supply : 240 V AC $\pm$ 15%
- b) Current consumption of unit for Protection : 0.2 A
- c) Surge voltage : 1000 V
- d) Nominal surge current : 20 KA
- e) Temperature Limit : (-) 5 °C to 45 °C

5.3) SPECIFICATION OF SIGNAL LINE SURGE PROTECTOR:

- a) Max signal voltage : 20 V (to ground)
- b) Surge voltage : 600 V
- c) Nominal surge current : 20 KA
- d) Temperature limit : (-) 5 °C to 45 °C

5.4) SPECIFICATION OF DIGITAL INDICATOR CUM POWER SUPPLY UNIT:

- a) Size : 48 mm (H) x 96 mm (W) x 150 mm (D)
- b) Mounting & cut out size : Panel mounting type suitable for cut out
45 mm (H) x 92 mm (W)
- c) Display : Not less than 5 digit 7 segment LED / LCD
- d) Input signals : 4 - 20 mA
- e) Scale reading : For HR water level = 1252.5 to 1272.5 Meters
: For TR water level = 1028.2 to 1043.2 Meters
- f) Auxiliary Power System : 230 V AC
- g) Separate Galvanically isolated output signal of 4-20 mA from digital indicator for MMI.
- h) Relay output: Two Nos. binary output with potential free change over contact. Contact rating should be 250V AC, 5A / 30 V DC, 5A.
- i) Transmitter supply : Galvanically isolated 24 V dc loop
- j) Accuracy : $\pm$ 0.2%
- k) Protection : IP65

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : SPECIFICATION OF HEAD RACE & TAIL RACE WATER LEVEL MEASURING EQUIPMENT (SUBMERSIBLE TYPE)	241505785-A	Page 6 of 9

5.5) SPECIFICATION OF TWO CHANNEL CHARTLESS RECORDER:

- | | | | |
|----|-------------------------------|---|---|
| a) | No. of input measuring points | : | Two |
| b) | Input measurement range | : | 4 - 20 mA |
| c) | Configuration Range Setup | : | Programming of input, types & ranges by keys. |
| d) | Display | : | 5.5" TFT color LCD |
| e) | Scale Setup | : | Programming of maximum values, minimum values and engineering units by keys. |
| f) | Accuracy | : | Class 0.5 to DIN 43782 Part 2
Base accuracy: $\pm 0.25\%$
Long term drift: 0.2%
Power up drift : 0.2% (up to 4 h)
Temp. drift : 0.25% FSD |
| g) | Dead band | : | $\leq 0.25\%$ |
| h) | Scale | : | For Head Race = 1252.5 to 1272.5 Meters
For Tail Race = 1028.2 to 1043.2 Meters |
| i) | Power supply | : | 230 V AC $\pm 10\%$, 50 Hz. |
| j) | Internal memory | : | Not less than 128 MB |
| k) | External memory | : | CF memory not less than 512 MB |
| l) | Mounting | : | Front Panel mounting, Size 144 mm x 144 mm |
| m) | Cut-out size | : | 136.5 mm x 136.5 mm |

6. DOCUMENTS TO BE FURNISHED:

ALONG WITH OFFER:

- Catalogues giving all the technical particulars with model code of all the items offered.
- Details of all equipment's including their type and make, specifications and guaranteed technical particulars.
- Check List along with guaranteed technical particulars**
- List of deviations, if any. Otherwise, it shall be understood that the vendor is meeting all the requirements specified by us.

Vendor to note that if above documents are not furnished along with the offer; the offer shall be liable for outright rejection.



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TAIL RACE WATER LEVEL MEASURING
EQUIPMENT (SUBMERSIBLE TYPE)**

241505785-A

Page 7 of 9

AFTER PLACEMENT OF ORDER:

- (a) Q.A. Plan for our approval before start of manufacturing.
- (b) Control Schematic diagrams for our reference.
- (c) Supplier has to submit the O&M manual of Level sensor and digital indicator cum power supply unit for our reference.

AT THE TIME OF SUPPLY:

- (a) 2 copies of test certificates / Calibration certificate and guarantee certificates should be submitted to indenter. One copy of the above documents shall be put inside the case/ package.
- (b) Shipping / packing lists of the level measuring equipment should be submitted to indenter and also put inside the case / package.

7. TEST CERTIFICATES:

- (a) Calibration certificates issued by an ISO 17025 accredited & certified Lab or Calibration Certificates issued from the manufacturer for each instrument i.e. Level transmitter, digital indicator unit and Chartless recorder are required.

8. GUARANTEE:

The item must be guaranteed for trouble free operation, good workmanship for a period of 18 months from the date of dispatch.

9. TESTING:

All necessary test shall be carried out and following test certificates are to be submitted to prove that the equipment supplied meets the requirement of this specification.

- a) Visual inspection.
- b) Operational Test.
- c) Linearity Test.
- d) Continuity Test.

10. INSPECTION:

The inspection agency shall certify that the testing has been witnessed as per APPROVED Q.A. Plan supplied by the vendor. Acceptance or waiver of inspection does not absolve the supplier of his responsibility to rectify the instrument in case it does not perform satisfactorily at hydro site where it is actually used.

	HYDRO PROJECTS ENGINEERING DIVISION	SPECIFICATION NO.	REV 00
	TITLE : SPECIFICATION OF HEAD RACE & TAIL RACE WATER LEVEL MEASURING EQUIPMENT (SUBMERSIBLE TYPE)	241505785-A	Page 8 of 9

11. PACKAGING:

Each electronic instruments i.e. "Level transmitter", Chartless recorder and "Digital indicator cum power supply unit" etc. shall be packed separately in a thermocol box with silica gel packet and placed in a carton or case with adequate cushioning material and water proof cover to avoid the movement of the internals and ensure that the instrument is capable of withstanding the transit conditions without damages. Cartoon or case to be marked with name of the equipment placed inside. Packing list to be placed inside the box.

Supplier to strictly follow this packing instruction, failing to this may lead to rejection / deduction in the billed amount.

12. IDENTIFICATION:

Each equipment shall be identified with the following information.

1. Manufacturer's name or identification.
2. Manufacturer's model no. or serial no.
3. Project Name
4. Material code.
5. Part of Assembly name i.e. Level measuring system

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TAIL RACE WATER LEVEL MEASURING
EQUIPMENT (SUBMERSIBLE TYPE)

241505785-A

Page 9 of 9

CHECK LIST

(TO BE FILLED BY THE SUPPLIER OTHERWISE THE
OFFER SHALL BE LIABLE FOR OUTRIGHT REJECTION)

1. Scope of supply shall be as per point no. 3 of our Spec. Yes/No
2. Technical Specification shall be as per point no. 4 & 5 of our spec. Yes/No
3. Documents shall be submitted per point no. 6 & 7 of our spec. Yes/No
4. Testing & Inspection shall be as per point no. 9 & 10 of our spec. Yes/No
5. Guarantee shall be as per point no. 8 of our spec. Yes/No
6. Packaging & identification shall be as per point no. 11 & 12 of our spec Yes/No
7. Deviations (if any) Yes/No

(i) _____

(ii) _____

