TECHNICAL SPECIFICATION

FOR

ULTRASONIC FLOW METERS

2 X 660 MW UDANGUDI STPP

VOLUME - IIB

SECTIONS-A, C & D

SPECIFICATION No: PE-TS-435-145-I916

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT DIVISION

NOIDA, INDIA

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	Technical specification for **ULTRASONIC FLOW METERS** **2 X 660 MW UDANGUDI STPP**	SPEC NO.: **PE-TS-435-145-I916** DOCUMENT NO. VOLUME II B SECTION REV. NO. 00

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SECTION – A

SCOPE OF ENQUIRY

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SCOPE OF ENQUIRY

1. SCOPE

1.1 This specification covers the Design, Manufacture, Inspection and testing at manufacturer's works, proper packing for transportation and delivery to site of the **Ultrasonic flow meters along with accessories** as mentioned in different sections of this specification for **2 X 660 MW UDANGUDI STPP** project.

1.2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.

1.3 Scope of supply shall be Ultrasonic flow meter along with accessories as indicated in specification.

1.4 Following signed & stamped documents with company seal to be submitted by bidder.

a) Complete offer including calculation sheets, catalogues etc.
b) Quality Plan
c) Datasheet A & B, duly filled

2 GENERAL TECHNICAL INSTRUCTIONS

2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

2.3 BHEL' s / Customer' s representatives shall be given access to the shop in which the equipment are being manufactured or tested and all test records shall be made available to them.

2.4 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / Customer.

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SECTION – C

- **SPECIFIC TECHNICAL REQUIREMENT**
- **CUSTOMER'S SPECIFICATION**
- **DATA SHEETS – A & B**
- **QUALITY PLAN**
- **BOQ-MAIN SUPPLY**

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SECTION – C

SPECIFIC TECHNICAL REQUIREMENT

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SPECIFIC TECHNICAL REQUIREMENTS

The requirements in this section are specific for this project and shall over-ride the specification under Section-D in case of any contradiction. BIDDER to comply the stringent requirement as per BHEL decision without any commercial implication.

1.0 Bidder to note that duly filled up Data Sheet-B and Quality plan enclosed in Section-C of Volume IIB, to be signed and stamped and submitted with the bid.

2.0 Inspection shall be carried out in line with pre-approved drawings/data sheet/QP.

3.0 Supplier supervision is required for 1 day for each Ultrasonic Flow Meter during it's E&C. Total 9 number of UFMs are required at site. Hence bidder may have to visit the site 2 times for 4 full days and 5 days, for E&C of UFM. All the expenses such as boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

4.0 DOCUMENTATION:

(A) Along with the bids

a) Duly filled, signed and stamped datasheet- A & B attached in Section-C of this Specification
b) Signed and stamped QP in BHEL's format attached in Section-C of this Specification
c) Documents pertaining to PQR

(B) After the award of contract: 10 sets of the following documents to be enclosed along with the contract documents for approval:

a) Technical data sheet for each UFM & accessories in the pro forma enclosed under Data Sheet-B
b) Quality plan duly signed and stamped.
c) Assembly drawing of each type of flow UFM complete with all accessories indicating detailed dimensions, B.O.M. and weights.
d) GA Drawing/ Installation drawings for the flow elements.

For Information

a) Storage and Commissioning Instruction
b) All relevant catalogues for the models of the UFM as well as accessories finalized.
c) O&M manuals

(C) Final documentation: The documentation as listed below shall be submitted as a part of final documentation.

1. Approved final drawings/data sheets – 10 sets with 2 CD-ROMS
2. All Test certificates – 10 sets.
3. Operation & Maintenance Manuals for Ultrasonic flow meter – 10 sets
4. Assembly drawings and QP for approval – 10 sets.
5. "As built" drawings – 10 sets.

5.0 In case during erection/commissioning of the Ultrasonic flow meter, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the vendor free of cost.

6.0 Design & Engineering details of all spares (make, model, rating, drawing, data sheet etc.) shall be submitted to the Owner prior to dispatch from manufacturers' works.

SPARES: The following spares are required to be offered

(A) Recommended Spares:

The bidder shall furnish a List of Recommended spares giving unit prices and total prices for 3 years of normal operation of the Ultrasonic flow meters / accessories to enable BHEL/BHEL's Customer to place a separate order later, if required. The price of recommended spares will not be used for the evaluation of bids.

(B) Start-up & Commissioning Spares:

Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Ultrasonic flow meter. All spares used until the plant is handed over to the Owner shall come under this category.

All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements.

The Start-up and commissioning spares indicated by the bidder shall be a part of the main Ultrasonic flow meter supply. However, bidder to indicate prices separately.

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COMPLIANCE CERTIFICATE

We shall comply with the following:

1. All the requirements as stated in Technical Specification / Specific Technical requirement / Data sheets / Drawings, BHEL quality plan etc. as enclosed in the tender, shall be fully complied **without any deviation**.

2. BHEL Quality Plan (enclosed with the specification) duly signed and stamped is submitted herewith **without any deviation.**

3. Sizing, Data Sheet-C in line with Data sheet-A of specification, dimensional drawings / UFM erection details, etc shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of LOI.

4. Selection of UFM sensors, mounting accessories, Electronics etc. are our (bidder's) responsibility. Any change in selection of type of sensor, electronics etc., if desired by BHEL / Customer during approval of the documents after award of contract, without major changes in process parameters as per tender Specification, shall be carried out without any commercial implication and time delay.

5. BHEL / Customer reserves the right to accept/rejects any variation to the specification.

(To be Signed & Stamped by the Bidder)

Signature with date	
Name	
Company seal	

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SECTION – C

CUSTOMER'S SPECIFICATION

5. Ultra sonic type Flow Meter

Ultra sonic type flow elements shall be provided for measurement of CW flow.

i) Ultrasonic Flow meter shall be dual path transit time clamp-on type.

ii) The flow meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. They shall comply with relevant international standards and shall be subject to approval.

iii) All accessories required for mounting/erection of these instruments shall be furnished, erected and installed as necessary for completeness of the system though not specifically asked for. Also the equipment shall include necessary cables, flexible conduits, junction boxes required for the purpose.

iv) Flow meters shall be provided with suitable environment protection devices/structures such that they shall be suitable for continuous operation in the operating environment of a coal fired utility station without any loss of function or departure from the specification requirements.

Type	Transit time Clamp On Ultrasonic meter
Mounting Style	Dual path with two sets of transducers on the same pipe
Flow measurement	Instantaneous Flow rate as well as totalized flow
Power supply	230 V AC
Outputs :	
Analog Current	Isolated 4-20mA linear outputs for each path
Binary	Contact relay outputs, 2 NO + 2 NC for alarm
Communication ports	RS 232 C digital Hand held terminal port
Display/Indication	Flow meter with LCD screen backlight based local display and keypad. If required, transmitter shall be suitably located away from the sensor for better access and visibility.
Recording / Totalizing /Logging Facilities	Yes. Should be able to compute cumulative flow over intervals selectable by owner i.e., daily, weekly, monthly etc. The data shall be stored in the memory of flow computer for access in future
Software features	Compensation for any cross path errors Programming, configuration, shall be possible from front panel.
Diagnostics	False signal tolerance , power supply failure etc
Protection class	IP-65 or better, Weather protection against direct sunlight, rain etc for Flow meter and suitable for Cooling water for Transducer
Accuracy	+/- 1%
Electrical connection	Plug and socket
Accessories	All mounting hardware required like clamping fixtures, mechanism to remove the transducers online, interconnecting cables etc All weather canopy for protection from direct sunlight and direct rain. Material of all fittings shall be SS316.

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SECTION – C

DATA SHEETS - A&B

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916
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GENERAL TECHNICAL REQUIREMENTS FOR ULTRASONIC FLOW METERS:

1. EACH ULTRASONIC FLOW METER SHALL BE OF TRANSIT TIME CLAMP ON TYPE WITH DUAL PATH AND WITH TWO SET OF TRANSDUCER.
2. ALL TYPE OF ACCESSORIES I.E. CABLE GLAND, TRANSDUCER CABLE, ALL MOUNTING HARDWARE LIKE CLAMPING FIXTURES, INTERCONNECTING CABLES AND SS NAMEPLATE SHALL BE PROVIDED WHICH ARE REQUIRED FOR THE COMPLETENESS OF THE SYSTEM.
3. MATERIAL OF ALL FITTINGS SHALL BE SS-316.
4. CABLE GLAND, AS APPLICABLE SHALL BE OF SS-316 AND DOUBLE COMPRESSION TYPE.
5. EACH ASSEMBLY SHALL BE IDENTIFIED WITH THE FOLLOWING INFORMATION: TAG NO., SERVICE, LINE SIZE & THICKNESS AND DIRECTION OF FLOW.
6. ULTRASONIC FLOW METER ASSEMBLIES SHALL UNDERGO TESTS AS PER BHEL STANDARD QUALITY PLAN, PROJECT DOC NO. PE-QP-435-145-I011.
7. UFM TRANSMITTER SHALL BE CONNECTED TO DDCMIS THROUGH 2 WIRE CABLE.
8. IN UNDERGROUND PIPE, UFM SHALL BE INSTALLED IN PIT. BIDDER TO SUBMIT THE OPTIMISED PIT SIZE REQUIREMENT FOR UFM INSTALLED IN PIT.
9. IF REQUIRED, TRANSMITTER SHALL BE SUITABLY LOCATED AWAY FROM THE SENSOR FOR BETTER ACCESS AND VISIBILITY. HENCE MINIMUM DISTANCE OF 30 METER TO BE CONSIDERED BETWEEN SENSOR AND TRANSMITTER.
10. THE DATA SHEET SHALL BE USED BY VENDOR AS INPUTS FOR DESIGNING ULTRASONIC FLOW METER ASSEMBLIES.
11. ULTRASONIC FLOW METER ASSEMBLIES SHALL UNDERGO TESTS AS PER QUALITY PLAN, WHICH WILL BE APPROVED BY END USER DURING CONTRACT EXECUTING STAGE.

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DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	10PAB10CF011	……
	SERVICE :	CW PUMP UNIT-1 DISCH HDR FLOW	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH	……
		■ 2 SETs OF SENSORS	……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	
	ACCURACY	± 1%	
	REPEATABILITY	±0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 81,350 m3/Hr	……
		MAXIMUM : 1,10,000 m3/Hr	……
	UPSTREAM WORKING PRESS (Kg/cm2g)	2.6 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	5.7 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	33 Deg C	……
	MAXIMUM TEMP (Deg C)	60 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

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PIPE LINE DATA	PIPE SIZE (OD x THK) mm	3800 NB	……
	PIPE MATERIAL	CARBON STEEL	……
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…… ……
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility.

Hence minimum distance of 30 meter to be considered between sensor and transmitter.

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DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	.....
	TAG NO.	20PAB10CF011	.....
	SERVICE :	CW PUMP UNIT-2 DISCH HDR FLOW	.....
	MAKE : MODEL	Bidder to indicate	.....
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	.....
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	.....
	OUTPUT	Isolated 4-20 mA DC linear output	.....
	ACCURACY	± 1%	.....
	REPEATABILITY	± 0.2% of calibration span	.....
	RANGEABILITY	400:1	.....
	RESPONSE TIME	≤ 20 msec	.....
	LOAD RESISTANCE	MIN. 500 OHM	.....
	HART COMPATIBILITY	■ YES	.....
	CONTACT RELAY OUTPUT	2 NO + 2 NC	.....
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	.....
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	.....
	TOTALIZING FACILITIES	■ YES	.....
	VELOCITY MEASUREMENT	■ YES	.....
	FLOW MEASUREMENT	■ YES	.....
	PROTECTION CLASS	IP-65 or better	.....
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	.....
	MOUNTING	SS Chain or Strap or Welded	.....
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	.....
	COMMUNICATION PORTS	RS 232 C	.....
	SOFTWARE	■ YES	.....
	DIAGNOSTIC FEATURE	■ YES	.....
	RECORDING /LOGGING	■ YES	.....
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 81,350 m3/Hr	.....
		MAXIMUM : 1,10,000 m3/Hr	.....
	UPSTREAM WORKING PRESS (Kg/cm2g)	2.6 Kg/cm2	.....
	DESIGN PRESS (Kg/cm2g)	5.7 Kg/cm2(g)	.....
	NORMAL TEMP (Deg C)	33 Deg C	.....
	MAXIMUM TEMP (Deg C)	60 Deg C	.....
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	.....

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
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PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	3800 NB CARBON STEEL UPSTREAM : 10D DOWNSTREAM : 5D	…… …… …… ……
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility. Hence minimum distance of 30 meter to be considered between sensor and transmitter.

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DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	10PCB10CF011	……
	SERVICE:	ACW PUMP UNIT-1 DISCH HDR FLOW	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	……
	ACCURACY	± 1%	……
	REPEATABILITY	± 0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 3,750 m3/Hr	……
		MAXIMUM : 5,400 m3/Hr	……
	UPSTREAM WORKING PRESS (Kg/cm2g)	4 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	8 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	36 Deg C	……
	MAXIMUM TEMP (Deg C)	60 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

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PIPE LINE DATA	PIPE SIZE (OD x THK) mm	800 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility. Hence minimum distance of 30 meter to be considered between sensor and transmitter.

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DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……..
	TAG NO.	20PCB10CF011	……..
	SERVICE:	ACW PUMP UNIT-2 DISCH HDR FLOW	……..
	MAKE : MODEL	Bidder to indicate	……..
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	……..
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……..
	OUTPUT	Isolated 4-20 mA DC linear output	……..
	ACCURACY	± 1%	……..
	REPEATABILITY	± 0.2% of calibration span	……..
	RANGEABILITY	400:1	……..
	RESPONSE TIME	≤ 20 msec	……..
	LOAD RESISTANCE	MIN. 500 OHM	……..
	HART COMPATIBILITY	■ YES	……..
	CONTACT RELAY OUTPUT	2 NO + 2 NC	
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……..
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……..
	TOTALIZING FACILITIES	■ YES	……..
	VELOCITY MEASUREMENT	■ YES	……..
	FLOW MEASUREMENT	■ YES	……..
	PROTECTION CLASS	IP-65 or better	……..
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……..
	MOUNTING	SS Chain or Strap or Welded	……..
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……..
	COMMUNICATION PORTS	RS 232 C	……..
	SOFTWARE	■ YES	……..
	DIAGNOSTIC FEATURE	■ YES	……..
	RECORDING /LOGGING	■ YES	
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 3,750 m3/Hr	……
		MAXIMUM : 5,400 m3/Hr	……
	UPSTREAM WORKING PRESS (Kg/cm2g)	4.0 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	8.0 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	36 Deg C	……
	MAXIMUM TEMP (Deg C)	60 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

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PIPE LINE DATA	PIPE SIZE (OD x THK) mm	800 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	……. …….
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……...

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility.

Hence minimum distance of 30 meter to be considered between sensor and transmitter.

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DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	90GAC10CF011	……
	SERVICE :	DESALINATION SUPPLY PMP DISCH HDR FLOW	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	…… ……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	……
	ACCURACY	± 1%	……
	REPEATABILITY	± 0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 3,632 m3/Hr MAXIMUM : 5,200 m3/Hr	…… ……
	UPSTREAM WORKING PRESS (Kg/cm2g)	3.0 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	6.0 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	30 Deg C	……
	MAXIMUM TEMP (Deg C)	60.0 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 10 OF 18	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	800 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility.

Hence minimum distance of 30 meter to be considered between sensor and transmitter.

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 11 OF 18	

DATA SHEET – A&B

	DATA SHEET – A (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	90GAC20CF011	……
	SERVICE :	CW FLOW TO CW FOREBAY	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	……
	ACCURACY	± 1%	……
	REPEATABILITY	± 0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 11,750 m3/Hr MAXIMUM : 16,900 m3/Hr	……
	UPSTREAM WORKING PRESS (Kg/cm2g)	1.5 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	3.0 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	30 Deg C	……
	MAXIMUM TEMP (Deg C)	60.0 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 12 OF 18	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	1400 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility. Hence minimum distance of 30 meter to be considered between sensor and transmitter.

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	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 13 OF 18	

DATA SHEET – A&B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……..
	TAG NO.	90GAC30CF011	……..
	SERVICE :	SEA WTR OUTFALL DISCH PUMP HDR FLOW	……..
	MAKE : MODEL	Bidder to indicate	……..
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	……..
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……..
	OUTPUT	Isolated 4-20 mA DC linear output	……..
	ACCURACY	$\pm$ 1%	……..
	REPEATABILITY	$\pm$ 0.2% of calibration span	……..
	RANGEABILITY	400:1	……..
	RESPONSE TIME	$\leq$ 20 msec	……..
	LOAD RESISTANCE	MIN. 500 OHM	……..
	HART COMPATIBILITY	■ YES	……..
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……..
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……..
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……..
	TOTALIZING FACILITIES	■ YES	……..
	VELOCITY MEASUREMENT	■ YES	……..
	FLOW MEASUREMENT	■ YES	……..
	PROTECTION CLASS	IP-65 or better	……..
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……..
	MOUNTING	SS Chain or Strap or Welded	……..
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……..
	COMMUNICATION PORTS	RS 232 C	……..
	SOFTWARE	■ YES	……..
	DIAGNOSTIC FEATURE	■ YES	……..
	RECORDING /LOGGING	■ YES	……..
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 22,500 m3/Hr MAXIMUM : 30,000 m3/Hr	……..
	UPSTREAM WORKING PRESS (Kg/cm2g)	1.5 Kg/cm2	……..
	DESIGN PRESS (Kg/cm2g)	6.0 Kg/cm2(g)	……..
	NORMAL TEMP (Deg C)	30 Deg C	……..
	MAXIMUM TEMP (Deg C)	60 Deg C	……..
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……..

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 14 OF 18	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	2000 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility. Hence minimum distance of 30 meter to be considered between sensor and transmitter.

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 15 OF 18	

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	10PAB30CF011	……
	SERVICE:	CW HDR FLOW AT UNIT-1 COND O/L	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	…… ……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	……
	ACCURACY	± 1%	……
	REPEATABILITY	± 0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 84,796 m3/Hr MAXIMUM : 1,27,000 m3/Hr	…… ……
	UPSTREAM WORKING PRESS (Kg/cm2g)	1.8 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	5.7 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	41 Deg C	……
	MAXIMUM TEMP (Deg C)	60 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 16 OF 18	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	3800 NB CARBON STEEL UPSTREAM : 10D DOWNSTREAM : 5D	…….. …….. …….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility.

Hence minimum distance of 30 meter to be considered between sensor and transmitter.

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
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		REV. NO. 00	DATE : 05.08.2022
		SHEET 17 OF 18	

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**UDANGUDI STPP – STAGE-1 (2 X 660 MW)**	……
	TAG NO.	20PAB30CF011	……
	SERVICE :	CW HDR FLOW AT UNIT-2 COND O/L	……
	MAKE : MODEL	Bidder to indicate	……
TECHNICAL	TYPE	■ TRANSIT TIME CLAMP-ON ■ DUAL PATH ■ 2 SETs OF SENSORS	…… ……
	FLOW MEASUREMENT	■Instantaneous Flow Rate ■ Totalized Flow	……
	OUTPUT	Isolated 4-20 mA DC linear output	……
	ACCURACY	± 1%	……
	REPEATABILITY	± 0.2% of calibration span	……
	RANGEABILITY	400:1	……
	RESPONSE TIME	≤ 20 msec	……
	LOAD RESISTANCE	MIN. 500 OHM	……
	HART COMPATIBILITY	■ YES	……
	CONTACT RELAY OUTPUT	2 NO + 2 NC	……
	DISPLAY/INDICATION	Flow meter with LCD screen backlight based local display and keypad.	…… ……
	OPERATING VOLTAGE	■ 230V AC ☐ 24 VDC	……
	TOTALIZING FACILITIES	■ YES	……
	VELOCITY MEASUREMENT	■ YES	……
	FLOW MEASUREMENT	■ YES	……
	PROTECTION CLASS	IP-65 or better	……
	ENCLOSURE MATERIAL	■ SS ☐ DIE CAST ALUMINIUM	……
	MOUNTING	SS Chain or Strap or Welded	……
	ELECTRICAL CONNECTION	■ PLUG-IN SOCKET ☐ CABLE GLAND	……
	COMMUNICATION PORTS	RS 232 C	……
	SOFTWARE	■ YES	……
	DIAGNOSTIC FEATURE	■ YES	……
	RECORDING /LOGGING	■ YES	……
PROCESS DATA	RATE OF FLOW (T/HR)	NORMAL : 84,796 m3/Hr MAXIMUM : 1,27,000 m3/Hr	…… ……
	UPSTREAM WORKING PRESS (Kg/cm2g)	1.8 Kg/cm2	……
	DESIGN PRESS (Kg/cm2g)	5.7 Kg/cm2(g)	……
	NORMAL TEMP (Deg C)	41 Deg C	……
	MAXIMUM TEMP (Deg C)	60 Deg C	……
	PIPE LOCATION	■ UNDERGROUND ☐ OVERGROUND	……

	DATA SHEET FOR UTRASONIC FLOW METER 2 X 660 MW UDANGUDI STPP	SPEC NO.: PE-TS-435-145-I916	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE : 05.08.2022
		SHEET 18 OF 18	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	3800 NB	……..
	PIPE MATERIAL	CARBON STEEL	……..
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 10D DOWNSTREAM : 5D	…….. ……..
SUPERVISION	SUPERVISION OF ERECTION AND COMMISSIONING	■ YES	……..

NOTES: -

1) All accessories required for the completeness of the system (like plug and socket connectors, Transducer cable, all mounting hardware, SS nameplate etc.) shall be provided. Material of all fittings shall be SS316.
2) If required, Transmitter shall be suitably located away from the sensor for better access and visibility.

Hence minimum distance of 30 meter to be considered between sensor and transmitter.

BHEL	Technical specification for **ULTRASONIC FLOW METERS** **2 X 660 MW UDANGUDI STPP**	SPEC NO.: **PE-TS-435-145-I916**
		DOCUMENT NO.
		VOLUME II B
		SECTION C
		REV. NO. 00

SECTION – C

QUALITY PLAN

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	QUALITY PLAN : STANDARD QUALITY PLAN		SPEC. NO	DATE:
		CUSTOMER :		QP NO.: PE-QP-999-145-I 011, Rev.00	DATE: 18.01.2021
		PROJECT:		PO NO.:	DATE:
		ITEM: ULTRASONIC FLOW METER	SYSTEM: C&I	SECTION:	SHEET 1 OF 2

SNo.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record	*	Agency			Remarks
1	2	3	4	5	6		7	8	9		**			10
					M	C/N				D	M	C	N	
1.00	RAW MATERIAL													
1.1	Electronic Housing	Chemical Property	MAJOR	Visual	100%	-	Approved Drg / data Sheet	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	V	P	V	–	
1.2	Cable gland	Chemical Property	MAJOR	Visual	100%	-	Approved Drg / data Sheet	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	V	P	V	–	
1.3	Mounting Material					-	Mfr. Standard	Technical catalogue/ Mfr. Standard		V	P	V	–	
2.00	IN PROCESS INSPECTION													
2.1	Standard Certificates	Certificate of Compliance, Warranty Certificate,	MAJOR	Visual	100%	As applicable	Technical documents/ Approved documents	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	V	P,V	V	-	
2.2	Visual Check	Mechanical	MAJOR	Visual	100%	-	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	-	P	V	-	
2.3	Calibration	Electrical	CRITICAL	Measurement	1 / type per size	1 / type per size	Tech Spec.	Tech Spec.	Test Certificate / Inspection Report	V	P	V		Refer Note-3
3.00	FINAL INSPECTION													
3.1	Complete Assembly	Overall dimension and end connection	MAJOR	Measurement	100%	-	Approved Drg / data Sheet	Technical catalogue/ Approved documents	Inspection Report	V	P,W	V		
		Marking–Tag No., direction of flow	MINOR	Visual	100%	-	Approved Drg / data Sheet	Technical catalogue/ Approved documents	Inspection Report	V	P,W	V		

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by	18/1/21	Neha Jain	Checked by:		Kunal Gandhi			Reviewed by:			
Reviewed by	18/1/21. 18.01.2021	Sachin Srivastava / S.S.Bansala	Reviewed by:		Ritesh Kumar Jaiswal			Approved by:			

18/1/2021

MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	QUALITY PLAN : STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-145-I 011, Rev.00	DATE: 18.01.2021
	PROJECT:		PO NO.:	DATE:
	ITEM: ULTRASONIC FLOW METER	SYSTEM: C&I	SECTION:	SHEET 2 OF 2

3.2	Functional Test													
3.21	Functional test & power ON	Electrical	MAJOR	Visual	100%	-	Functional test report for meter & transducer	Approved documents	Technical catalogue/Approved documents	-	P	V	-	
3.22	HART Communication	Electrical	MAJOR	—	100%	-	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	Technical catalogue/ Approved documents	-	-	V	-	
4.00	PACKING & DISPATCH	Soundness of Packing against transit damage	MAJOR	Visual	100%	-	Mfr. Standard	Technical catalogue/ Mfr. Standard		--	P	W	—	Refer Note-4

NOTES:

1. BHEL reserves the right to conduct repeat tests, if required.
2. Protection Class shall be IP-65 or better or as per approved datasheet.
3. CALIBRATION Test to be carried out at NABL approved laboratory.
4. Following to be noted for packing:
   (a) Shall be packed suitably in order to avoid damage during transit and also during storage at site.
   (b) Photographs of Ultrasonic Flow Meter duly placed inside the wooden box just before final packing.
   (c) Photographs of the packing (with LR No.) as per approved packing procedure (if applicable) just before dispatch.
   (d) Clearance for dispatch will be given only after receipt of the photos
   (e) Sea worthy packing shall be provided, if called for in the Data sheets. Acceptance Norms shall be in line with the Technical Specification.
5. Project specific QP will be prepared based on customer requirement.
6. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier TPIA.
7. The latest revisions/year of issue of all the standard indicated in the QP shall be referred.
8. Quantum of check by BHEL/BHEL nominated inspection agency shall be indicated during project specific enquiry.

LEGEND:

* RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION, D: DOCUMENTATION.

** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD INSPECTION AGENCY, N: CUSTOMER, P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE.

BHEL							BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No.				
	Sign & Date	Name		Sign & Date	Name	Seal				Sign & Date	Name	Seal
Prepared by	18/11/21	Neha Jain	Checked by:	18/11/20	Kunal Gandhi			Reviewed by:				
Reviewed by:	18/11/21	Sachin Srivastava / S.S.Bansala	Reviewed by:	18/1/2021	Ritesh Kumar Jaiswal			Approved by:				

18.01.2021

SECTION – C

BOQ

BOQ FOR UFM FOR 2x660 MW UDANGUDI STPP

A) MAIN SUPPLY

Ultrasonic Flow Meter Assembly - Transit Clamp on / Dual Path / 2 Set of Sensor with Instantaneous Flow Rate & Totalized Flow (complete with connectors, transducer cable, all mounting hardware, SS name plate, SS chain etc.)

Sl. No.	KKS	Description	Total Qty for Station	Unit of measurement
1	10PAB10CF011	CW PUMP UNIT-1 DISCH HDR FLOW	1	Nos.
2	20PAB10CF011	CW PUMP UNIT-2 DISCH HDR FLOW	1	Nos.
3	10PCB10CF011	ACW PUMP UNIT-1 DISCH HDR FLOW	1	Nos.
4	20PCB10CF011	ACW PUMP UNIT-2 DISCH HDR FLOW	1	Nos.
5	10PAB30CF011	CW HDR FLOW AT UNIT-1 COND O/L	1	Nos.
6	20PAB30CF011	CW HDR FLOW AT UNIT-2 COND O/L	1	Nos.
7	90GAC10CF011	DESALINATION SUPPLY PMP DISCH HDR FLOW	1	Nos.
8	90GAC20CF011	CW FLOW TO CW FOREBAY	1	Nos.
9	90GAC30CF011	SEA WTR OUTFALL DISCH PUMP HDR FLOW	1	Nos.
		Total Quantity	9	Nos.

B) SERVICES

1	Charges of Supervision of Erection & Commissioning at site (Including lodging & boarding, Local Conveyence at site) per Manday (Excluding Travel Time)	9	Mandays
2	Lump sum price for travel (Per Visit) including ticket ,Visa/ Insurance (as applicable), intermediary stay Including travel time.	2	Nos.

BHEL	Technical specification for **ULTRASONIC FLOW METERS** **2 X 660 MW UDANGUDI STPP**	SPEC NO.: **PE-TS-435-145-I916**
		DOCUMENT NO.
		VOLUME II B
		SECTION D
		REV. NO. 00

SECTION – D

EQUIPMENT SPECIFICATION

FORM NO. PEM-6666-0

	Technical specification for **ULTRASONIC FLOW METERS** **2 X 660 MW UDANGUDI STPP**	SPEC NO.: **PE-TS-435-145-I916** VOLUME II B SECTION D REV. NO. 00 SHEET 1 OF 3

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Ultrasonic Flow Meter for use in Utility/Captive Power Station/Combined Cycle Station.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 The Ultrasonic Flow Meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. The Design and Materials used for the components shall also comply with the relevant National and International standards.

3.0 TECHNICAL REQUIREMENT

The Ultrasonic Flow Meters and the accessories shall be suitable for continuous operation under an ambient temperature of 0-60°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C though not specifically asked for.

All accessories required for mounting/erection of these instruments shall be furnished as necessary for completeness of the system though not specifically asked for. Also the equipment shall include necessary cables, flexible conduits, junction boxes required for the purpose.

Flow meters shall be provided with suitable environment protection devices/structures such that they shall be suitable for continuous operation in the operating environment of a coal fired utility station without any loss of function or departure from the specifications requirements.

3.1 Flow measurement

The Ultrasonic Flow Transmitter shall be based on transit-time flow measurement technique uses a pair of transducers with each transducer sending and receiving coded ultrasonic signals through the fluid. When the fluid is flowing, signal transit-time in the downstream direction is shorter than in the upstream direction; the difference between these transit times is proportional to the flow velocity. The Ultrasonic Flow Transmitter measures this time difference and uses programmed pipe parameters to determine flow rate and direction. Clamp-on transducers are clamped onto the outside of the pipe and never come into contact with the process fluid. HART Compatibility for the transmitter shall be provided.

3.2 Accessories:

All mounting hardware like clamping fixtures, mechanism to remove the sensors on line, interconnecting cables etc is required to be supplied. Weather canopy for protection from direct sunlight and direct rain shall also be offered as an option. Material of all fittings shall be SS-316.

4.0 GUARANTEE AND PERFORMANCE

The guarantee of flow measuring assembly shall be 18 months from the date of dispatch or 12 months from commissioning whichever is earlier.

FORM NO. PEM-6666-0

	Technical specification for **ULTRASONIC FLOW METERS** **2 X 660 MW UDANGUDI STPP**	SPEC NO.: **PE-TS-435-145-I916** VOLUME II B SECTION D REV. NO. 00 SHEET 2 OF 3

5.0 TEST & INSPECTION

5.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.

5.2 The Quality Plan shall be discussed and finalized with the technically accepted bidders before opening the price bid. The stages where the purchaser would like to be associated for witnessing or verification would be indicated by the purchaser in the Quality Plan before approval. The quality plan forming part of this specification shall be the minimum requirements for the vendor's quality plan to be submitted with the offer. The vendor shall give at least 15 days written notice to purchaser for witnessing the tests/inspection at various stages. The expenses for all such tests/inspection shall be to manufacturer's account except for the expenses of purchaser's representatives witnessing the tests. The purchaser shall attend such tests/inspection within 15 days failing which the manufacturer may proceed with the tests which shall be deemed to have been made in purchaser's presence and shall furnish relevant test certificates to the purchaser.

5.3 Inspection will be conducted by BHEL and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorized representatives or in independent Test House/Laboratory approved by BHEL.

6.0 SPARES AND CONSUMABLES

6.1 Commissioning Spares and consumables

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

6.2 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.3 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

7.0 DRAWINGS & DOCUMENTS

7.1 The offer shall include the following in 4 copies each along with 2 CDs after award of contract for owner approval:

i. Technical data sheet for each UFM & accessories in the pro forma enclosed under Data Sheet-B.
ii. Assembly drawing of each type of flow UFM complete with all accessories indicating detailed dimensions, B.O.M. and weights.
iii. Installation drawings for the flow elements.
iv. Quality Plan duly signed and stamped.

v. Calculation Sheet.

7.2 For Information

i. Storage and Commissioning Instruction
ii. All relevant catalogues for the models of the UFM as well as accessories finalized.
iii. O&M manuals

7.3 Final documentation for a project specific contract:
Final documentation shall contain 10 sets with 2 CDROMS of each of the following:

i. Verified test certificates.
ii. Approved Quality Plan
iii. Calibrations Reports
iv. Quality Inspection Report
v. Operation & Maintenance Manuals for Flow Element Assemblies and all the accessories (Containing storage & commissioning instructions).

8.0 PACKING & MARKING

8.1 Each item shall be properly packed with adequate protection against friction, stresses, vibration & shock during transportation. Each packing box shall have marking as per Purchase Order.

8.2 Each assembly shall be identified with the following information.

- Tag No.
- Service.
- Line size & thickness.
- Direction of flow.

9.0 APPLICABLE DATA SHEETS

This document shall be read in conjunction with Data Sheet - A & B.

1109755/2022/PS-PEM-C_I

BHEL	**PRE-QUALIFICATION REQUIREMENTS**	PE-PQ-435-145-I007
		REVISION NO. 00 DATE 07.10.2022
		SHEET NO. 1 OF 1

PACKAGE: **ULTRASONIC FLOWMETER** PROJECT: 2x660 MW UDANGUDI STPP

1.0	
a.	Bidder should be Original equipment manufacturer (OEM) for ULTRASONIC FLOW METER.
b.	In case bidder is not OEM, evaluation shall be done as following: 1. If bidder happens to be Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR. 2. If bidder happens to be Authorized channel partner or having a valid collaboration agreement / licensing agreement with some other company or being a Joint Venture Company, then the credentials of collaborator / licensing company / Principal company /JV partner can also be considered for meeting PQR as per scope of the work. The scope matrix shall include their respective roles including design vetting, manufacturing of critical component and warranty/guarantee. If supplier(s) qualifies on the basis of credentials of his principal/JV partner/Collaborator etc., then the principal/JV partner/Collaborator shall be responsible for overall design vetting and warranty/guarantee of the package.
2.0	The Product being offered by the Bidder should be in use successfully in power plant or any other industrial application for at least **1 (One)** year. Bidder to submit either of following supporting documents for the product: a. Copy of minimum **1 (One)** Performance Certificate from end user / customer certifying that product has been running satisfactorily for **1 (One)** year from date of commissioning to the date of application. The certificate should clearly indicate date of commissioning, date of issue of certificate and name/designation of the certificate issuer. Copy of purchase order & technical parameter to be attached along with the performance certificate. OR b. Copy of repeat orders from minimum 1 **(One)** purchaser. Order received by Bidder from same purchaser with a gap of minimum **2 (Two)** years shall be considered as repeat order. Copy of technical parameters for each order to be attached.
3.0	Bidder to furnish experience list of last 5 years indicating customer name, purchase order reference, item supplied & year of supply to establish the continuity of business.
4.0	Bidder to submit all documents in English. If documents submitted by Bidder are in language other than English, a self-attested English Translated document should also be submitted.

Prepared by:	Checked by:	Approved by:
A RANJAN Digitally signed by A RANJAN DN: cn=A RANJAN, o=BHEL, ou=PEM, email=ATULRANJAN@BHEL.IN, c=IN Date: 2022.10.07 14:04:34 +05'30'	Digitally signed by PRAG JAIN DN: cn=PRAG JAIN, o=BHEL, ou=PS-PEM, email=pragjain@bhel.in, c=IN Date: 2022.10.07 14:08:21 +05'30'	Suresh Sharma Digitally signed by Suresh Sharma DN: cn=Suresh Sharma, o=BHEL, ou=PS-PEM, email=sureshsharma@bhel.in, c=IN Date: 2022.10.07 14:22:11 +05'30'
ATUL RANJAN DY MGR-C&I	PRAG JAIN MGR-C&I	S.C.SHARMA DGM-C&I