TECHNICAL SPECIFICATION

FOR

ROTAMETER

1 X 660 MW BHUSAWAL TPP

SPECIFICATION No: PE-TS-415-145-I105

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT DIVISION

NOIDA, INDIA

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SPEC NO.: **PE-TS-415-145-I105**	
		DOCUMENT NO.	
		VOLUME II B	
		SECTION A	
		ISSUE NO. 2	
		REV. NO. 00	DATE 18.05.2020

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SCOPE OF ENQUIRY

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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 **Rotameter along with Accessories, Start-up/Commissioning Spares & Mandatory spares** as mentioned in different sections of this specification for **1 X 660 MW BHUSAWAL TPP** 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.

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 is 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.

3 GENERAL NOTES

1. ROTAMETER SHALL UNDERGO TESTS AS PER ATTACHED QUALITY PLAN NO. PE-QP-415-145-I105E

2.ALL INSTRUMENTS USED IN CALIBRATION PROCEDURE SHOULD BE TESTED AND STAMPED BY GOVT ACRREDITED LAB/AGENCY AND CERTIFICATES OF THE SAME TO BE SUMITTED AS A PART OF FINAL VENDOR DOCUMENTS

3. TAG NO & SERVICE TO BE ENGRAVED ON SS MATERIAL NAME PLATE AS INDICATED IN THE DATASHEET

4. DIRECTION OF FLOW TO BE MARKED ON ROTAMETER

5. INSTALLATION DIAGRAM TO BE SUBMITTED AS A PART OF VENDOR DOCUMENTS

6. DIRECTION OF FLOW TO BE MARKED ON FLANGE ASSEMBLY AND ORIFICE PLATE

FORM NO. PEM-6666-0

	SPECIFICATION FOR ROTAMETER (VARIABLE AREA TYPE)	SPECIFICATION NO.: PE-TS-999-145-I 010	
		VOLUME II B	
		SECTION D	
		REV. NO. 03	DATE : 14.03.2019
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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 ROTAMETER (Variable Area Type) 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 Design and Materials used for the components shall also comply with the relevant National and International standards.

2.3 As a minimum requirement, the following standards shall be complied with:

Orifice Flanges : ASME B16.36 – 1996 / ANSI 16.5
Orifice Design : BS 1042 or ASME PTC 19.5 – 1972 (as specified in the Data Sheet)

3.0 TECHNICAL REQUIREMENTS

3.1 General

The Rotameter shall be suitable for ambient temperature of 0-55 Deg. C and Relative humidity 0-95%. Rotameter shall be equipped with all the accessories required for mounting like Rack, bracket and necessary hardware.

3.2 Type of Rotameter

AS INDICATED IN DATASHEET

3.3 Process & Technical Requirements:

Rotameter should be designed taking care of process and technical requirements as detailed in the data sheet enclosed.

3.4 The main parts of the Rotameter shall be a Metering tube, Float, Two magnets and an Indicator with a pointer, which moves on a graduated scale of the Indicator. For By-pass type Rotameter Main Orifice, Range Orifice, Isolating Valves and By-pass tubing are the additional parts.

3.5 (a) In case of Bypass type Rotameter, Direction of flow should be clearly marked on the Flow Orifice as well as on Flange Assembly for proper installation of the equipment.

(b) In case of Online type Rotameters, the meter shall be mounted vertically for both horizontal as well as vertical flow direction of the process fluid. The mounting arrangement to followed is mentioned against Clause no. 9.0 of Section-D of this specification. Necessary piping, fittings, any other hardware required for this arrangement shall be in bidder's scope of supply.

3.6 The Bidder to specify the Straight Length requirement at the inlet and outlet of the In-Line type Rotameter and also at the inlet and outlet of the Orifice Assembly for Bypass type Rotameter. Bidder to also specify any other requirements as per his recommendations.

3.7 The scale of the indicator shall be suitably graduated in M^3/HR to indicate the discharge flow. The calibration shall be 10% more than the Max. flow as specified in the Data sheet. The pointer should be capable of indicating flow up to the flow range as specified in the Data Sheet.

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	SPECIFICATION FOR ROTAMETER (VARIABLE AREA TYPE)	SPECIFICATION NO.: PE-TS-999-145-I 010	
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3.8 Process Connection

i) In-Line type : Flanged with weld neck counter flange to match process pipe connection. Flange design shall be as per bidder's standard practice.

ii) By-pass type: Weld neck flange as per ASME B 16.36 – 1996.

3.9 Contacts

Wherever asked, Rotameter should be provided with alarm contacts with configuration and rating as called for in the Data Sheets.

In case relay is required to be used for contact multiplication / rating up-gradation, the relay should be suitably wired and terminated on to a terminal block and mounted on a DIN rail in field mountable weatherproof enclosure having minimum Four (4) openings with cable glands. Bidder to include 10 meters control cable for interconnection between relay and Rotameter.

3.10 Painting

The Rotameter and its Indicator should be free from burr, scales, and should have a smooth surface. Rotameter and its indicator should have a coat of primer and Two (2) coats of finish paint. The colour and shade of the paint should be as specified in the data sheet. Whenever no specific mention is made in the data sheet, bidder to use their standard colour and shade.

4.0 TESTING AND INSPECTION

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

4.2 The Quality Plan is included in volume-IIB. The Quality checks indicated in Quality Plan are the minimum requirements. As a token of acceptance bidder to sign and stamp and furnish a copy of the same with the technical bid.

4.3 The following test shall be conducted as a minimum requirement.

i) Calibration Test

ii) Contact Rating, Repeatability, HV & IR tests. (Applicable for Alarm contacts).

4.4 Inspection will be conducted by BHEL and/or their authorised 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 covered under 4.3 (b), "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 authorised representatives or in independent Test House /Laboratory approved by BHEL.

4.5 The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the agreed QP, taking care of customer requirements mentioned in Sec-C and submit QP for final approval by BHEL / Customer.

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5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables:

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

5.2 Mandatory Spares

The bidder shall offer along with main offer, the Mandatory Spares as specified in Volume IIB Section C of the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3 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.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid:

6.1.1 Data sheet-B, completely filled-up along with all enclosures.

6.1.2 Quality Plan.

6.1.3 Catalogs with detailed technical information.

6.1.4 Bar-chart to indicate the time schedule for procurement, manufacture, testing and dispatch.

6.1.5 Installation Diagrams.

6.2 The successful bidder shall furnish the following documents in required number of copies during the contract stage:

6.2.1 For approval

i) Dimensional/Installation drawings and edge preparation details for flanges
ii) Wiring diagram of alarm contacts.
iii) Data sheet-C, completely filled-up along with all the enclosures
iv) Quality Plan of vendor/sub-vendor.
v) Test Certificates.

6.2.2 Final/As-built Drawings

Final/As-built drawings, Data sheets, Test certificates, in required number of copies shall be submitted. One soft copy of the final documents, As-built drawings, Data sheets and catalogues.

6.3 Operation & Maintenance Manuals

6.3.1 O&M Manuals in required number of copies and one(1) soft copy shall be submitted. O&M Manuals shall also contain storage & commissioning instructions.

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7.0 MARKING AND PACKING

7.1 Marking

Tag no. and technical details should be properly engraved and filled with epoxy paint for better readability.

7.2 Packing

All equipment / materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in transit and storage in open.

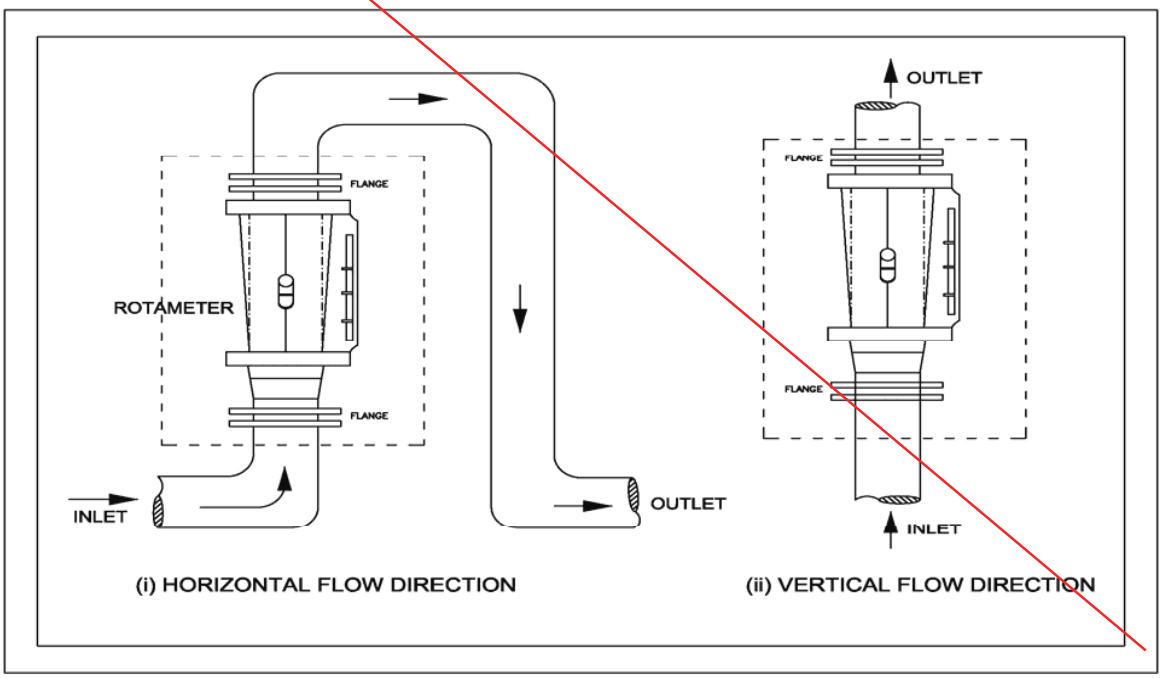
Sea worthy /Air worthy packaging shall be applicable as per project requirement.

8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with the following data sheet forms:

- Data sheet A for Rotameter : Data sheet no. PE-TS-XXX-145-I105D

9.0 MOUNTING ARRANGEMENT FOR ONLINE TYPE FLOW METER



SR. NO.	ITEM	DESCRIPTION
1.29.18	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.29.19	Accessories	Mounting accessories, 3/4"ETcable gland.
1.30	ROTAMETER	
1.30.1	Type	On-line up to 2". By-pass above 2".
1.30.2	Metering tube	Borosilicate glass.
1.30.3	Float	AISI 316-SS unless the process fluid demands some other material.
1.30.4	Body MOC	AISI 316-SS.
1.30.5	Scale	Graduated- Engraved black on white background.
1.30.6	Process connection	Flanged.
1.30.7	Accuracy	± 2% of full scale detection or better for on-line type and ±4% of full-scale detection or better for by-pass type.
1.30.8	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.30.9	Accessories	Slip-on orifice plate of 316-SS and taps of Stainless Steel as per application requirements. Applicable SS Isolation valves and SS Range Orifice - for bypass type rotameters.
1.31	TURBIDITY ANALYSER	
1.31.1	Type	Microprocessor based continuous

BOQ-MAIN SUPPLY

1 x 660 MW BHUSAWAL TPP			
ROTAMETER -MAIN SUPPLY			
Sr No.	**Service Description**	**Pipe size**	**Quantity/ Unit**
1	CT M/U PUMP DISCHARGE HDR	500 NB	1
2	POTABLE WATER PUMPS (COLONY) DISCHARGE HDR	80 NB	1
3	POTABLE WATER PUMPS (PLANT) DISCHARGE HDR	80 NB	1
4	APH/ESP WASH PUMPS DISCHARGE HDR	250 NB	1
5	SERVICE WATER PUMPS DISCHARGE HDR	150 NB	1
6	FGD PUMPS DISCHARGE HDR	200 NB	1
7	SCR PUMPS DISCHARGE HDR	150 NB	1

MANDATORY SPARES REQUIREMENT

Sr. No.	Description	Quantity
1	10 % of each type of total nos. used in the system or minimum 2 nos. of each type, model & range whichever is more	1 set (10 % of each type of total nos. used in the system or minimum 2 nos. of each type, model & range whichever is more)

NOTE

1. Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%)of the total population of the plant. In case the quantity so calculated happens to be a fraction, the same shall be rounded off to next higher whole number.
2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

	DATA SHEET FOR ROTAMETER 1x660 MW BHUSAWAL TPS UNIT-6	SPECIFICATION NO.: **PE-TS-415-145-I105E**	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 04.09.2020
		SHEET	

Tag No. GHD10CF011/GHD10BP011 PID No. PE-DG-415-172-N001

DATA SHEET – 1

GENERAL	TAG NO. : QUANTITY SERVICE	GHD10CF011/GHD10BP011 : ONE CT M/U PUMP DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	508 X 6 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 1537 MAXIMUM : 1999 OPERATING: 1.1 MAXIMUM : 10 OPERATING: ATMOSPHERIC MAXIMUM : 60 461 - 1999 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
OTHERS	COLOR PRESSURE DROP STRAIGHT LEGTH REQUIREMENT INLET & OUTLET OF ROTAMETER INLET & OUTLET OF ORIFICE ASSEMBLY END to END DIMENSION of ORIFICE ASSEMBLY WEIGHT OF COMPLETE ASSEMBLY	VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY

	DATA SHEET FOR ROTAMETER 1x660 MW BHUSAWAL TPS UNIT-6	SPECIFICATION NO.: **PE-TS-415-145-I105E**	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 04.09.2020
		SHEET	

Tag No. GHD20CF011/GHD20BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 2

GENERAL	TAG NO. : QUANTITY SERVICE	GHD20CF011/GHD20BP001 : ONE POTABLE WATER PUMPS (COLONY) DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	89.5 X 4.8 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 20 MAXIMUM : 26 OPERATING : 5.1 MAXIMUM : 10 OPERATING : ATMOSPHERIC MAXIMUM : 60 6 - 26 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
OTHERS	COLOR PRESSURE DROP STRAIGHT LEGTH REQUIREMENT INLET & OUTLET OF ROTAMETER INLET & OUTLET OF ORIFICE ASSEMBLY END to END DIMENSION of ORIFICE ASSEMBLY WEIGHT OF COMPLETE ASSEMBLY	VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY

	DATA SHEET FOR ROTAMETER 1x660 MW BHUSAWAL TPS UNIT-6	SPECIFICATION NO.: **PE-TS-415-145-I105E**	
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Tag No. GHD30CF011/ GHD30BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 3

GENERAL	TAG NO. : QUANTITY SERVICE	GHD30CF011/ GHD30BP001 : ONE POTABLE WATER PUMPS (PLANT) DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	89.5 X 4.8 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 15 MAXIMUM : 20 OPERATING : 5.5 MAXIMUM : 10 OPERATING : ATMOSPHERIC MAXIMUM : 60 4 - 20 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
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Tag No. GHD50CF011/GHD50BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 4

GENERAL	TAG NO. : QUANTITY SERVICE	GHD50CF011/GHD50BP001 : ONE APH/ESP WASH PUMPS DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	273 X 6 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 380 MAXIMUM : 494 OPERATING : 8.3 MAXIMUM : 13 OPERATING : ATMOSPHERIC MAXIMUM : 60 114 - 494 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
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Tag No. GHD60CF011/GHD60BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 5

GENERAL	TAG NO. : QUANTITY SERVICE	GHD60CF011/GHD60BP001 : ONE SERVICE WATER PUMPS DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	166.5 X 5.4 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 124 MAXIMUM : 162 OPERATING : 6.2 MAXIMUM : 10 OPERATING : ATMOSPHERIC MAXIMUM : 60 37 - 162 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
OTHERS	COLOR PRESSURE DROP STRAIGHT LEGTH REQUIREMENT INLET & OUTLET OF ROTAMETER INLET & OUTLET OF ORIFICE ASSEMBLY END to END DIMENSION of ORIFICE ASSEMBLY WEIGHT OF COMPLETE ASSEMBLY	VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY

	DATA SHEET FOR ROTAMETER 1x660 MW BHUSAWAL TPS UNIT-6	SPECIFICATION NO.: **PE-TS-415-145-I105E**	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 04.09.2020
		SHEET	

Tag No. GHD70CF011/GHD70BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 6

GENERAL	TAG NO. : QUANTITY SERVICE	GHD70CF011/GHD70BP001 : ONE FGD PUMPS DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	219.1 X 6 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 180 MAXIMUM : 234 OPERATING : 5.2 MAXIMUM : 10 OPERATING : ATMOSPHERIC MAXIMUM : 60 54 - 234 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
OTHERS	COLOR PRESSURE DROP STRAIGHT LEGTH REQUIREMENT INLET & OUTLET OF ROTAMETER INLET & OUTLET OF ORIFICE ASSEMBLY END to END DIMENSION of ORIFICE ASSEMBLY WEIGHT OF COMPLETE ASSEMBLY	VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY

	DATA SHEET FOR ROTAMETER 1x660 MW BHUSAWAL TPS UNIT-6	SPECIFICATION NO.: **PE-TS-415-145-I105E**	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE : 04.09.2020
		SHEET	

Tag No. GHD80CF011/GHD80BP001 PID No. PE-DG-415-172-N001

DATA SHEET – 7

GENERAL	TAG NO. : QUANTITY SERVICE	GHD80CF011/GHD80BP001 : ONE SCR PUMPS DISCHARGE HDR
PROCESS DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL PROCESS FLUID DIRECTION OF FLOW FLOW (M^3/Hr) PRESSURE (Kg/cm^2) TEMPERATURE (degC) FLOW RANGE (M^3/Hr) TEST PRESSURE ALLOWABLE PERMANENT PRESSURE LOSS ACROSS MAIN ORIFICE (Kg/cm^2)	166.5 X 5.4 CARBON STEEL (IS 2062) AS PER 3589 CLARIFIED WATER HORIZONTAL NORMAL : 54 MAXIMUM : 71 OPERATING : 6.5 MAXIMUM : 10 OPERATING : ATMOSPHERIC MAXIMUM : 60 16 - 71 1.5 TIMES OF MAXIMUM PRESSURE MAXIMUM 2 MWC
TECHNICAL	ROTAMETER TYPE BODY END CONNECTIONS ACCURACY RANGEABILITY ENCLOSURE CLASS MATERIAL: a) METERING TUBE b) VETTED PARTS c) SCALE, GRADUATED ENGRAVED d) NAME PLATE e) ENGRAVING FILL COLOR f) ROTAMETER FLANGE WITH MATING FLANGE g) GASKET h) BODY MOC(WINDOW FRAME & SIDE PLATE)	BYPASS GLASS TUBE FLANGED WITH COUNTER FLANGES, GASKETS & FASTENERS +/- 4 % OF FULL SCALE 5 TO 1 IP-55 BOROSILICATE GLASS SS-316 SS-316, BLACK ON WHITE BACKGROUND SS-316 BLACK CS NEOPRENE SS 316
ADDITIONAL INFORMATION	MAIN LINE ORIFICE ASSEMBLY MAIN LINE ORIFICE FLANGE ASSEMBLY STANDARD FOR FLANGES ANSI RATING OF FLANGES ORIFICE DESIGN STANDARD BETA RATIO ORIFICE TAPPINGS RANGE ORIFICE MAIN ORIFICE FLANGE MATERIAL BYPASS TUBING MATERIAL ORIFICE MATERIAL ISOLATION VALVE SIZE : MATERIAL	FLANGED BUTT WELD (WELD NECK) WITHOUT CARRIER RING ANSI 16.36 #150 BS-1042 0.4 TO 0.7 ON FLANGES REQUIRED CS SS-316 SS-316 15 NB : #800,SS316
OTHERS	COLOR PRESSURE DROP STRAIGHT LEGTH REQUIREMENT INLET & OUTLET OF ROTAMETER INLET & OUTLET OF ORIFICE ASSEMBLY END to END DIMENSION of ORIFICE ASSEMBLY WEIGHT OF COMPLETE ASSEMBLY	VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY VENDOR TO SPECIFY

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO: PE-TS-999-145-I 010	DATE: 14.03.2019
		CUSTOMER :		QP NO. PE-QP-999-145-I010 Rev No. 00 DATE: 10.09.2020	
		PROJECT:		PO NO.:	DATE:
		ITEM: ROTAMATER	SYSTEM: C&I	SECTION:	SHEET 1 OF 4

SR. No.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record		Agency			Remarks
					6					*	**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	10
1.0	**Material / Components**													
1.1	Orifice Plate, Flanges, By-pass piping	A. Physical, Chemical properties	MA	Physical, Chemical Test	One sample from each lot	---	Approved drg./ data sheet	Approved drg./ data sheet	Test Certificate	√	P,V	V	---	
		B. Workmanship,	MA	Visual,	100%	---	Manufacturer standard	Manufacturer standard	Inspection Report / Log Book	√	P,V	---	---	
		C. Finish and dimensions	MA	Measurement	100%	---	Approved drg./ data sheet	Approved drg./ data sheet	Inspection Report	√	P,V	---	---	
1.2a	Metal Tube	Strength	MA	UTS/YS/ES	One sample from each lot	---	Approved drg./ data sheet	Approved drg./ data sheet	Test Certificate	√	P,V	V	---	
1.2b	Glass Tube	Transparency, Toughness	MA	Toughness & Thermal shock, Visual, Measurement	One sample from each lot	---	Approved drg./ data sheet	Approved drg./ data sheet	Test Certificate	√	P,V	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	10/09/20	Madhav Gupta	Checked by	10/9/20	Kunal Gandhi		Reviewed by		
Reviewed by	10/09/20	Vipul Kumar Verma/ Suresh Chand Sharma	Reviewed by	10/9/2020	Ritesh Kumar Jaiswal		Approved by		

10.09.2020

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN	SPEC. NO: PE-TS-999-145-I 010	DATE: 14.03.2019
		CUSTOMER :	QP NO. PE-QP-999-145-I010 Rev No. 00 DATE: 10.09.2020	
		PROJECT:	PO NO.:	DATE:
		ITEM: ROTAMATER / SYSTEM: C&I	SECTION:	SHEET 2 OF 4

SR. No.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record	*	Agency			Remarks
					6						**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	10
2.0	Assembly	1. Marking – Tag No., Model, Range	MA	Visual	100%	100 %	Approved drg./ data sheet	Approved drg./ data sheet	Inspection Report	√	P	W	---	⊙⊙ End connection to be checked with "GO" & "NO-GO" gauge.
		2. Workmanship	MA	Visual	100%	100 %	Manufacturer standard	Manufacturer standard	- do -	√	P	W	---	
		3. Scale graduation	MA	Visual	100%	100 %	Approved drg./ data sheet	Approved drg./ data sheet	- do -	√	P	W	---	
		4. Dimensions & End connections	MA	Measurement	100%	100 %	Approved drg./ data sheet	Approved drg./ data sheet	- do -	√	P	W	---	
3.0	Routine Test	1. Calibration	CR	Measurement	100%	10%	Approved drg./ data sheet	Approved drg./ data sheet	- do -	√	P	W,V	---	Refer note 4
		2. Hydro Test	CR	Measurement	100%	10%	Approved drg./ data sheet	No Leakage	- do -	√	P	W,V	---	Refer note 4
4.0	Painting	Shade & finish	MA	Visual	100%	100%	Vendor Std./BHEL spec	Vendor Std./ Approved data sheet	- do -	√	P	W	---	
5.0	Packing	Soundness of packing	MA	Visual	100%	100%	Vendor Std./BHEL spec	Vendor Std./BHEL spec	- do -	√	P	W	---	Refer note 11

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 12/09/20	Madhav Gupta	Checked by 10/9/20	Kunal Gandhi		Reviewed by		
Reviewed by 10/09/20	Vipul Kumar Verma/ Suresh Chand Sharma	Reviewed by 10/9/2020	Ritesh Kumar Jaiswal		Approved by		

10.09.2020

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN			SPEC. NO: PE-TS-999-145-I 010	DATE: 14.03.2019
		CUSTOMER :			QP NO. PE-QP-999-145-I010 Rev No. 00 DATE: 10.09.2020	
		PROJECT:			PO NO.:	DATE:
		ITEM: ROTAMATER	SYSTEM: C&I		SECTION:	SHEET 3 OF 4

SR. No.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record	Agency			Remarks
					6				*	**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	10

NOTES:

1. All test reports & dimension reports shall be verified by BHEL wherever verification is by BHEL at the time of Final Inspection
2. Positive material identification testing (one per type) as applicable shall be performed by vendor and shall be witnessed by BHEL at time of final inspection
3. Minimum 2 coats of primer paint to be applied before dispatch
4. CALIBRATION Test as applicable to be carried out at IIT DELHI / FCRI or NABL approved laboratory. 10% qty. or minimum of 2 no's / type & size shall be checked by C/N.
5. BHEL reserves the right to conduct repeat tests, if required
6. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by suppliers TPI
7. Project specific QP will be prepared based on customer requirement
8. The latest revisions / year of issue of all the standard indicated in the QP shall be referred.
9. Quantum of check by BHEL /BHEL nominated inspection agency shall be indicated during project specific enquiry.
10. Contact Rating, Repeatability ±1%, HV & IR tests (applicable for Alarm contacts) to be carried out as per relevant standard.
11. Following to be noted for packing
    a) Material shall be packed suitably in order to avoid damage during transit and also during storage at site.
    b) Photograph shall be provided duly packed inside the wooden box just before final packing
    c) Photographs of the packing (with LR No.) shall be provided 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 Sheet. Acceptance norms shall be in line with technical / packing specification.

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	12/09/20	Madhav Gupta	Checked by	10/9/20	Kunal Gandhi		Reviewed by			
Reviewed by	10/09/2020	Vipul Kumar Verma/ Suresh Chand Sharma	Reviewed by	10/9/2020	Ritesh Kumar Jaiswal		Approved by			

	MANUFACTURER / BIDDER / SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO: PE-TS-999-145-I 010	DATE: 14.03.2019
		CUSTOMER :		QP NO. PE-QP-999-145-I010 Rev No. 00 DATE: 10.09.2020	
		PROJECT:		PO NO.:	DATE:
		ITEM: ROTAMATER	SYSTEM: C&I	SECTION:	SHEET 4 OF 4

SR. No.	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference document	Acceptance norms	Format of record		Agency			Remarks
					6					*	**			
1	2	3	4	5	M	C/N	7	8	9	D	M	C	N	10

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.

CR - Critical characteristic
MA - Major characteristics
MI - Minor characteristics

UTS -Ultra Tensile Strength
YS -Yielding Strength
ES -Elongation Strength

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	10/09/20	Madhav Gupta	Checked by	10/9/20	Kunal Gandhi		Reviewed by			
Reviewed by	10/09/20	Vipul Kumar Verma/ Suresh Chand Sharma	Reviewed by	10/9/2020	Ritesh Kumar Jaiswal		Approved by			
	10.09.2020									

SR. NO.	NAME OF EQUIPMENT / ITEM		APPROVED VENDORS
		(c)	LEVELSTATE, UK
		(d)	SOLARTON, UK (PRESENTLY CALLED AS MOBREY)
		(e)	CHEMTROL
		(f)	LEVEL STATE (HITECH SYSTEMS)
		(g)	MOBREY
1.10	FLOW SWITCHES	(a)	SWITZER, CHENNAI
		(b)	KRONHE MARSHALL
		(c)	GENERAL INSTRUMENTS MUMBAI
		(d)	CHEMTROL
1.11	BYPASS ROTAMETER	(a)	IEPL, HYDERABAD
		(b)	PLACKA INSTRUMENTS INDIA PVT. LTD., CHENNAI
		(c)	TRAC, HYDERABAD
		(d)	EUREKA, PUNE
1.12	ROTAMETER	(a)	INSTRUMENTATION ENGINEERS PVT. LTD.
		(b)	SIGMA INSTRUMENTS CO.
		(c)	EUREKA INDUSTRIAL EQPT. PVT. LTD.
		(d)	TELACE EQUIPMENT PVT. LTD.
1.13	FLOW INTEGRATOR (ELECTRONIC TYPE)	(a)	ABB, GERMANY / FARIDABAD
		(b)	MASIBUS, GANDHINAGAR
		(c)	YOKOGAWA, JAPAN/ YOKOGAWA INDIA
		(d)	LEKKTROTEK, PUNE
		(e)	EMERSON