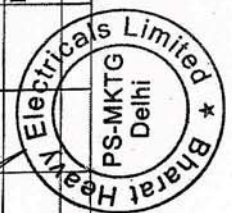


		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL		REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017		
Sl. No.	ITEM	QP/INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLI ER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS

26.	PVC conduit/hume pipe/lighting wire/GI pipes/HDPPE pipe/Structural Steel	III						BIS licensee / ISI marked with valid CML number	A	
27.	GI steel rigid conduit/ epoxy conduit	III						BIS licensee with valid CML number	A	



		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL		REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017		
		ITEM	Sl. No.	QP / INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC

NB:

Under Sub Supplier approval status as per NTPC column:

A: mean that vendor for this item is acceptable to NTPC.

Under QP / INSPN CATEGORY column:

CAT-I : For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection & witness by NTPC

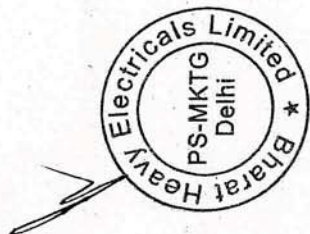
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on basis of verification of documents as per approved QP

CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.

@ : Vendors acceptance is subject to sub-QR clearance.

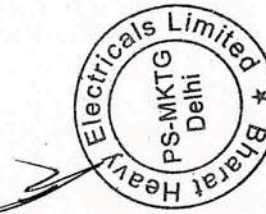
Note-1- Approval conditions attached to above identified vendors, as applicable shall be adhered to.

Note-2 - List of NTPC acceptable galvanizers



				PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017			
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS					
1.	M/s M J Engg, Delhi														
2.	M/s Jamna Metal, Delhi														
3.	M/s A. V. Engg, Kolkata														
4.	M/s Inar Profiles, Vishakapatnam														
5.	M/s Anand Udyog, Mumbai														
6.	M/s Techno Engg, Chandigarh														
7.	M/S Steelite Engg, Mumbai														
8.	M/s National Galvanizer, Kolkata														
9.	M/s Unistar Galvanizer, Kolkata														
10.	M/s B.P. Project, Kolkata														
11.	M/s Bajaj Pune														
12.	M/s Electrocare Industries, Mumbai														
13.	M/s B.G. Shirke, Pune														
14.	M/s Gurpreet Galvanizer, Hyderabad														
15.	M/s Sigma, Mumbai														
16.	M/s Radhakrishnan Shetty, Chennai														
17.	Karamlara Mumbai														
18.	Poona Galvanizers Pune														
19.	Neha Galvanizer- Kolkata														
20.	Unitech galvanizers- Hoogly														
21.	Gurpreet galvanizers- Hyderabad														
22.	DMP Projects- Kolkata														

Note-3 : VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: SELF CERTIFICATION/VALID CERTIFICATION FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC'S INFORMATION



for
(JATIN GAHLAWAT)
BHEL



[illegible]

ANNEXURE -V

[illegible]

PATRATU VIDYUT UTPADAN NIGAM LIMITED

3X800MW PVUNL PATRATU TPP PHASE-1

TECHNICAL SPECIFICATION

FOR

FUEL OIL HANDLING SYSTEM

SECTION – IC

**SPECIFIC TECHNICAL SPECIFICATION
C & I PORTION**



**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**

	PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	
	C & I TECHNICAL SPECIFICATION FOR DCS BASED FUEL OIL UNLOADING & STORAGE SYSTEM	

C&I TECHNICAL SPECIFICATION FOR DCS BASED FUEL OIL UNLOADING & STORAGE SYSTEM

	PATRATU STP STATION EXPANSION PHASE-I (3X 800MW)		DESG	JKG	<i>Sanjiv Kaur</i> 11/05/2018
	JOB NO: 434		CHKD	MK	<i>S</i> 11/05/2018
	REV. NO. 00	DATE: 11.05.2018	APPD	BS	<i>BS</i> 11/05/18

INDEX

S. No.	DESCRIPTION
1	TITLE SHEET
2	INDEX SHEET
3	SPECIFIC TECHNICAL REQUIREMENTS (C&I)
4	SPECIFICATION FOR MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
5	LIST OF DOCUMENTS/DELIVERABLES
6	DATA SHEETS FOR MOTORISED VALVE ACTUATOR
7	SIGNAL EXCHANGE BETWEEN DRIVES & DCS (DCP)
8	INSTRUEMNT STUB DETAILS
9	QUALITY ASSURANCE FOR INSTRUMENTS
11	SUB VENDOR LIST
12	INSTRUMENT INSTALLATION DRAWING
13	CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY
14	MANDATORY SPARES
15	KKS TAGGING PHILOSOPHY

SPECIFIC TECHNICAL REQUIREMENTS (C&I)

SPECIFIC TECHNICAL REQUIREMENTS (C&I) WITH SCOPE OF SUPPLY:

- 1) Fuel Oil Unloading & Storage System shall be operated from DCS (BHEL Scope) through operator work stations located in the respective control room.
- 2) The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire Fuel Oil Unloading & Storage System. The requirements given are to be read in conjunction with detailed Technical specification enclosed in the specification. Further in case of any discrepancy in the requirement within the same or different section, as noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre- bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per interpretation of BHEL/customer shall prevail without any commercial implication.
- 3) The make/model of various instruments/items/systems shall be as per approved vendor list. No commercial and delivery implication in this regard shall be acceptable. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.
- 4) Number of pairs to be selected for Screen /Control cable
 - a. F-Type: 2P/4P/8P/12P (Size: 0.5mm²) for Analog signals.
 - b. G-Type: 2P/4P/8P/12P (Size: 0.5mm²) for Binary signals.
 - c. Core Cable: 3CX2.5mm², 5CX2.5mm², 12CX1.5mm²
(also shown in Drive control philosophy sheets).
- 5) For cable supply scope refer electrical scope between BHEL and vendor defined in Electrical Specification.
- 6) The quantity of instruments for the system in tender P &ID wherever provided of the respective system is minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.
- 7) Bidder to terminate all instrumentation and control elements in junction boxes. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable.
- 8) Bidder to provide documents input/output list, drives list, junction box schedule and termination details, recommended control logics / write-up etc., as per List of deliverables sheet.

- 9) All the Transmitters PT, DPIT etc. supplied by Bidder (for steam and condensate medium except fuel oil medium) shall be enclosure mounted. The transmitter enclosure shall be in Bidder's scope of supply (Please refer the detailed specification sheet under clause 5.00.00, Local Instrument Enclosure And Racks). All transmitters shall be HART compatible.
- 10) Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification. However, if any test not specified in the quality plan but specified in specification Tests for I&C equipment included elsewhere in specification will have to perform by Bidder without any cost implication.
- 11) Instrument installation and accessories required for the same shall be in Bidder's scope and shall be submitted after award of contract. However any instrument installation not covered in the same shall be subject to customer and BHEL approval during detailed engineering. The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks and all the other accessories required for mounting/ erection of these local instruments shall be provided by bidder, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments; sensors etc. for external connection including spare contacts shall be wired out to suitably located junction boxes by bidder.
- 12) Typical Hook-up diagram is included for reference.
- 13) 415 V/230 V AC Power supply shall be provided by BHEL at a single point, further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board, changeover circuit in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.
- 14) Contractor shall furnish documents Instrument Schedule, I/O list, Drive list, Cable Schedule, Cable interconnection, JB grouping, Annunciation list , List of Instruments/devices for HART in BHEL approved format. Also reusable database format like MS Excel, MS Access etc. of these documents shall also be provided by Contractor in BHEL approved format. Soft copy of the formats shall be provided to the successful bidder.
- 15) Electrical Actuators with integral starter shall be provided for all on/off and inching type valves along with necessary interface units for linking to corresponding Control System as applicable,
- 16) Field instruments enclosure shall be IP65 or better.
- 17) For level transmitters, all weather canopy\ rack enclosures shall be provided for protection from direct sunlight and direct rain for open locations. For

applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location.

- 18) Interface of MCC/SWGR, field instruments etc. with DDCMIS based control system shall be as per Drive Control Philosophy enclosed in specification.
- 19) Redundancy of sensors shall be provided by bidder
 - (i) Triple redundancy for all analog and binary inputs required for protection of the system/drives.
 - (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidder.
- 20) The PDBs (in bidders scope) provided for distribution of UPS loads shall be as per following guidelines. Each PDB shall be provided with input feeder monitoring through potential free contact wired to DCS. The output feeders from the PDB shall be provided with separate fuse & MCB's. 10% spare feeders (min. 1 no.) with MCB & fuses for each rating shall be provided in Bidder's each PDB.
- 21) The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifold and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments; sensors, switches etc for external connection including spare contacts shall be wired out to suitably located junction boxes.
- 22) Bidder shall provide Ultrasonic/Radar type level transmitters depending upon the functional suitability for different sumps which is also subject acceptance by NTPC.
- 23) All transmitters & electronics items will be explosion proof / intrinsically safe as per hazardous area classification.
- 24) All the instruments PG/DPG/DPIT/PT/LT etc. as applicable shall have chemical/diaphragm seal.
- 25) The bidders shall specifically mention any deviation they would like to take on the C&I specification. In absence of only deviation, a No deviation certificate is to be furnished.
- 26) Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification. However, if any test not specified in the quality plan but specified in specification Tests for I&C

equipment included elsewhere in specification will have to perform by Bidder without any cost implication.

- 27) All Temperature sensors shall be Duplex type and temperature transmitter shall be provided for all temperature measurement applications.
- 28) Bidder to furnish electrical load data during detailed engineering.
- 29) Interface of MCC/SWGR, field instruments, Actuators etc. with DDCMIS based control system shall be as per Drive Control Philosophy enclosed in specification.
- 30) Local control panel if any required for operation shall be in bidder scope.
- 31) Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Intimation to attained FAT shall be informed in 2 days advance. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.
- 32) Contractor's C&I representative shall be present at BHEL-PEM for 3 man-days, for preparation of Control scheme of FOHS. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.
- 33) Bidder's presence is required for 15 Man days (in three visit) at site during commissioning of DDCMIS for assistance related to process correctness. Three visit with total 15 Man days (Excluding travel time) in which one visit shall be of 5 Man days each. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.
- 34) Contractor shall furnish Instrument Schedule, I/O list, Drive list, Cable Schedule, Cable interconnection, JB grouping, Annunciation list, SOE list, List of Instruments/devices for HART in BHEL approved format. Also reusable database format like MS Excel, MS Access etc. of these documents shall also be provided by Contractor in BHEL approved format. Soft copy of the formats shall be provided to the successful bidder.
- 35) At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc.
- 36) Measuring instruments (primary & secondary), analysers (if applicable) offered for this package shall have at least one year's satisfactory operation in one power station having unit rating of 200 MW or above. Provenness certificate shall be provided as per the attached format.

GENERAL REQUIREMENT

1.0 Bidder shall provide complete and independent control & instrumentation system with all accessories, auxiliaries and associated equipments for the safe, efficient and reliable operation of auxiliary systems.

2.0 Measuring instruments/equipment and subsystems offered by the bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further all the instruments shall be of proven reliability, accuracy, and acceptable international standards and shall be subject to employer's approval. All instrumentation equipment and accessories under this specification shall be furnished as per technical specification, ranges, makes/ numbers as approved by the employer' during detail engineering.

FORMAT FOR PROVENNESS CERTIFICATE

Award/Contract Agreement/
Order enclosed

Sl.No.	Item Description	Plant No.1
5.00.00	INSTRUMENTS (PRIMARY & SECONDARY)	
(i)	Type of Instrument	
(ii)	Make / Model	
(iii)	Name of Power Station (Location & Address)	
(iv)	Unit Size (MW)	
(v)	Commissioning date	
	Whether above instruments have atleast one (1) year satisfactory operation in one (1) power station having unit rating of 200 MW or above.	Yes/No
(vi)	Client's certificate attached	Yes/No

Signature of authorized signatory.....

SPECIFICATION FOR MEASURING
INSTRUMENTS
(PRIMARY & SECONDARY)

CLAUSE NO.	TECHNICAL REQUIREMENTS 
1.00.00	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)
1.01.00	Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.
1.02.00	Every panel-mounted instrument requiring power supply shall be provided with easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.
1.03.00	All transmitters, sensors, switches and gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Contractor shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Employer during detailed engineering.
1.04.00	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	<table><tr><td> TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2 </td><td> SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) </td><td> PAGE 1 OF 46 </td></tr></table>	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 1 OF 46
TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 1 OF 46		

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
2.00.00	SPECIFICATION FOR ELECTRONIC TRANSMITTERS		
2.01.00	SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS		
	Sl.No.	Features	Essential/Minimum Requirements
	1.	Type of Transmitter	Microprocessor based 2 wire type (loop powered), Hart protocol compatible.
	2.	Accuracy	± 0.1% of calibrated span (minimum)
	3.	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol)
	4.	Turn down ratio (minimum)	10:1 for vacuum/very low pressure applications (i.e. pressure <= 200 mmWC) 5:1 for very high pressure application (i.e. pressure >= 200 Kg/cm2) 30:1 for other applications
	5.	Stability	± 0.1% of calibrated span for six months for Ranges up to and including 70 Kg/cm² ± 0.25% of calibrated span for six months for Ranges more than 70 Kg/cm²
	6.	Zero and span drift	+/- 0.015% per deg.C at max span +/-0.11% per deg.C at min. Span
	7.	Load impedance	500 ohm (minimum)
	8.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistant coating
	9.	Over Pressure	150% of max. Operating pressure
	10.	Connection (Electrical)	Plug and socket type
	11.	Process connection	1/2 inch NPT (F)
	12.	Span and Zero	Continuous, tamper proof, Remote as well as manual adjustability from instrument with zero suppression and elevation facility.
	13.	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition. -2 valve manifold for absolute & Gauge pressure transmitters, 3-valve and 5 valve manifold for DP/Level/Flow applications. The valve manifold shall be non integral type (except Fuel Oil area).
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
			PAGE 2 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC	
2.02.00	-For hazardous area, explosions proof enclosure as described in NEC article 500 Mounting: 2 inch pipe mounting. 14. Diagnostics & displaySelf-Indicating feature and digital display on transmitter 15. Power supply24V DC ± 10%. 16. Adjustment/calibration/maintenanceFrom hand held HART calibrator/ centralized PC based system (as applicable). Notes - For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for pressure measurement. - LVDT type is not acceptable. - Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.			
	GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER			
	Type	Microprocessor based 2 wire type (loop powered), HART protocol compatible Guided wave radar transmitter.		
	Principle	TDR (Time domain reflectometry)		
	Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.		
	Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.		
	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.		
	Power supply	24 VDC +/- 10%.		
	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.		
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)

CLAUSE NO.	TECHNICAL REQUIREMENTS											
2.03.00	Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).										
	Zero & span adjustment	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.										
	Display	Integral digital display.										
	Load Impedance	500 ohms (minimum).										
	Electromagnetic compatibility	Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2										
	Mounting	(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.										
	Note: Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.											
	Ultrasonic Type level Transmitter											
	<table><tr><th>S.No.</th><th>Features</th><th>Essential/Minimum requirement</th></tr><tr><td>1.</td><td>Type of Transmitter</td><td>Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.</td></tr><tr><td>2.</td><td>Output signal</td><td>4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).</td></tr></table>			S.No.	Features	Essential/Minimum requirement	1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.	2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).
	S.No.	Features	Essential/Minimum requirement									
1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type (loop powered), HART protocol compatible Ultrasonic transmitter.										
2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).										
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 4 OF 46									

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	
	4.	Power supply	24 V DC +/- 10%.	
	5.	Temperature compensation	To be provided within transducer.	
	6.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	
	7.	Adjustment/calibration/ maintenance	Using hand held HART calibrator/ centralized PC based system (as applicable).	
	8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.	
	9.	Sensor Material	Corrosion resistant material to suit individual application requirement.	
	10.	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry.	
	11.	Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.	
	12.	Display	Integral digital display	
	13.	Diagnostics	Loss of echo alarm etc.	
	14.	Load Impedance	500 ohms (minimum).	
15.	Electrical Connection	Plug and socket		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 5 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	16. Accessories	• All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations. • All mounting accessories required for erection and commissioning shall be provided. • For hazardous area, explosion proof enclosure as described in NEC article 500	
	Note: 1) Contractor can also provide Radar type transmitter as per above specification in place of ultrasonic transmitter subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under “ultrasonic transmitters” category for fly ash silo level. 2) Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer’s approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC. 3) For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location.		

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2 SUB-SECTION-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 6 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.00.00	Temperature Elements and accessories		
3.01.00	Thermocouple		
	Sr. No.	Features	Essential/Minimum Requirements
	1	Type of Thermocouple.	: 16 AWG wire of Chromel-Alumel (Type K) or 24 AWG wire Pt-Rhodium Pt (Type R) depending on operating temperature Range (ungrounded separate junction type).
	2	No. of element	: Duplex
	3	Housing/Head	: IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well.
	4	Insulation and Sheathing of Thermocouple	: Swaged type mineral (magnesium oxide) insulation and SS316 sheath.
	5	Calibration and accuracy	: As per IEC-584/ ANSI-MC-96.1 (special limits of errors/ class1) for T/C.
	6	Accessories	: Thermo well and associated fittings
	7	Standard	: IEC-584/ ANSI MC 96.1 for Thermocouple and ASME PTC-19.3 for Thermo-well
3.02.00	Resistance Temperature Detector (RTD)		
	Sr. No.	Features	Essential/Minimum Requirements
	1	Type of RTD.	: Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
	2	No. of element	: Duplex
	3	Housing/Head	: IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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CLAUSE NO.	TECHNICAL REQUIREMENTS		एनटीपीसी NTPC
		provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well 4 Insulation and sheathing of RTD : Mineral (magnesium oxide) insulation and SS316 sheath, 5 Calibration and accuracy : As per As per IEC-751/ DIN-43760 Class-A for RTD 6 Accessories : Thermo well and associated fittings 7 Standard : IEC-751/ DIN-43760 for RTD and ASME PTC-19.3 for Thermo-well. NOTES : 1) The specifications for RTDs of winding/ bearings of motor/pump, can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However the type of RTD shall be Pt100. 2) The specifications of temp elements for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.	
3.03.00	Metal Temperature Thermocouples Measuring Medium Metal Temperature Material of Thermocouple. Chromel Alumel Type K Type of Thermocouple Duplex with ungrounded separate hot junctions Insulation Mineral Insulation (Magnesium Oxide). Thermocouple wire gauge 16 AWG Protective sheath SS 321 Protective sheath dia 8 mm OD Calibration & accuracy As per IEC-584/ ANSI-MC-96.1 (special limits of error) for T/C Mounting accessories 1/2" BSP SS sliding end connector, weld pad, clamps of heat resistant steel SS310. Adjustable gland fitting for connection at the junction box end as per manufacturer's standard. Cold end sealing SS pot seal with colour coded PTFE Insulated flexible tails. Sealing compound- Epoxy resin. Length of PTFE insulated flying leads shall be minimum 750 mm.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 8 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS 
3.04.00	Minimum bending radius 30 mm Length of T/C On as required basis considering location of measurement point and the JB/TTJB location. Notes : 1) The specification for thermocouples of bearings metal temp measurements can be as per their manufacturer standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice. However type of thermocouples shall be K-type. 2) For boiler metal temperature applications, considering the location of installations and response time, manufacturer's standard and proven specification for metal temperature measurement can also be accepted subject to employer's approval. The manufacturer shall submit adequate supporting documents for establishing their standard and proven practice.
	Thermo well (for all process temp. elements) (a) Shall be one piece solid bored type of 316 SS of step-less tapered design. (As per ASME PTC 19.3, 1974) or latest.

3.06.0	TEMPERATURE TRANSMITTER (TT) Following types of 2-wire (loop powered) temperature transmitter (directly powered from 4-20mA input cards of DDCMIS/PLC) shall be provided. The temperature transmitter shall be fully compatible with thermocouples and RTDs being provided by the contractor. Temperature compensation of the thermocouples shall be performed in the temperature transmitter itself. a. Single Input Head mounted Temperature Transmitter These shall be suitable for mounting in the head of temperature element itself. Temperature transmitter and associated temperature element shall be factory fitted. b. Single Input DIN-rail mounted Temperature Transmitter These shall be suitable for mounting on DIN-rails in JB's. The specifications of the JB's shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class. This temperature transmitter shall be the ones which are		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE -I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 9 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS																																							
	especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category. c. Dual-input Temperature Transmitter With integral Indicator: These shall be suitable for mounting on pipes/ support. Both elements of the duplex thermocouple/ RTD shall be wired to a single transmitter. Integral indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum. d. Common requirements for each of the above type of temperature transmitters. <table><tr><td>Output</td><td>:</td><td colspan="2">2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal.</td></tr><tr><td>Input</td><td>:</td><td colspan="2">Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K & R types (input type to be selectable at site through HART terminal).</td></tr><tr><td>Isolation</td><td>:</td><td colspan="2">Min. 500 V AC.</td></tr><tr><td>EMC compatibility</td><td>:</td><td colspan="2">As per EN 61326.</td></tr><tr><td>Operating ambient temperature</td><td>:</td><td colspan="2">0 to 85 deg C (without indicator). 0 to 70 deg C (with indicator).</td></tr><tr><td>Power supply</td><td>:</td><td colspan="2">24V DC +/- 10%.</td></tr><tr><td>Accessories</td><td>:</td><td colspan="2">Mounting arrangements including clamps etc.</td></tr><tr><td>Composite Accuracy (Refer note 2)</td><td>(i)</td><td colspan="2">For head mounted and DIN-rail mounted types: RTD = <0.4% of 0-250 deg C span T/C-K type = <0.4% of 0-600 deg C span T/C-R type = <0.4% of 0-1000 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C</td></tr><tr><td></td><td>(ii)</td><td colspan="2">For dual-input type: RTD = <0.25% of 0-250 deg C span T/C-K type = <0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C</td></tr></table> e. Field bus compatible temperature transmitters Temperature transmitters of this category shall be field mounting type & shall be capable of withstanding operating ambient temperature upto 85 deg C. These modules shall be connected to DDCMIS through field bus such as Profibus, Foundation Field bus etc directly from the transmitter. Maximum Number of inputs per such temperature transmitter shall be eight. These shall be mounted in cabinets/enclosures/JBs in non-AC areas.				Output	:	2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal.		Input	:	Same transmitter shall be capable to handle Pt-100 RTD, Thermocouples –K & R types (input type to be selectable at site through HART terminal).		Isolation	:	Min. 500 V AC.		EMC compatibility	:	As per EN 61326.		Operating ambient temperature	:	0 to 85 deg C (without indicator). 0 to 70 deg C (with indicator).		Power supply	:	24V DC +/- 10%.		Accessories	:	Mounting arrangements including clamps etc.		Composite Accuracy (Refer note 2)	(i)	For head mounted and DIN-rail mounted types: RTD = <0.4% of 0-250 deg C span T/C-K type = <0.4% of 0-600 deg C span T/C-R type = <0.4% of 0-1000 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C			(ii)	For dual-input type: RTD = <0.25% of 0-250 deg C span T/C-K type = <0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C	
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)																																				
				PAGE 10 OF 46																																				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	As an alternate, these signals from temperature transmitters can be connected to DDCMIS through standard remote I/O modules of the DCS, in which case, the temperature transmitter signals will be acquired through 4-20mA input modules in the remote I/O cabinet for connecting to DDCMIS through remote I/O bus. Air conditioned panel shall be provided for remote I/O. Notes (Common for a) to d) above):- 1. In case of failure (open or burn-out) of RTD/thermocouple, temp. Transmitter shall provide low temperature output. 2. Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of Temperature Elements specified. All such accuracy/ temp effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures. All temperature transmitters are to be interchangeable (i.e. can be used for either RTD or thermocouple) and composite accuracy shall be met for each type of input specified in (i) & (ii).			
4.00.00	ELECTRICAL METERING INSTRUMENTS			
	Electrical metering instruments shall be furnished in accordance with the following general specifications. However, the scope shall be governed by the Contract quantity given in appendix-1 to part-A. Application standard for electrical metering instruments shall be as per IS: 1248- 2003 (Revised). The size of each instrument shall be as approved by Employer during detailed engg. All metering instruments shall be flush panel mounting type.			
4.01.00	(a) Frequency meters for Synchronization purposes: Accuracy: $\pm 1.5\%$ of full scale.			
	(b) Synchroscope: Accuracy class: 0.5 or better.			
	(c) Voltmeters: Accuracy: $\pm 2.0\%$ of full scale or better.			
4.02.00	Synchronizing Relays			
	Synchronizing check relay with necessary ancillary equipment shall be provided which shall permit breakers to close after checking the requirements of synchronizing of incoming and running supply. The phase angle setting shall not exceed 10 Degree and this angle shall be adjustable and shall take the account the circuit breaker closing period. This relay shall have a response time of less than 200 milliseconds when the two system conditions are met within preset limits and with the timer disconnected. The relay shall have a frequency difference setting not exceeding 0.45% at rated value and at the minimum time setting. The relay shall have a continuously adjustable time setting range of 0.5-3 secs. Additionally, a guard relay shall be provided to prevent the closing attempt by means of synchronizing check relay when control switch is kept in closed position long before the two systems are in synchronism. The Control Voltage shall be 220V DC and PT input Voltage shall be 110 V AC.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
8.00.00	In case it is the proven standard practice of a Contractor to provide vibration monitoring PC with TFT LCD monitor, instead of dedicated monitors with the signal conditioning equipment in control equipment room, the same shall also be acceptable. However, all relevant functional requirements detailed above shall be met and the system shall be subject to Employer's approval.		
	E-P Converter		
	E-P converters and associated accessories shall be furnished in accordance with the specifications given below :		
	A. Fail Freeze Type E/P convertes		
	1	Air supply Pressure	: 2 kg/sq. cm.
	2	Input signal	: 4-20mA DC
	3	Output signal	: 0.2 to 1.0 kg/sq. cm
	4	Linearity	: 0.5% of span or better.
	5	Span/Zero Adjustment	: To be provided
	6	Hysteresis	: 0.5% of span or better.
	7	Fail Freeze Feature	: Stay put at last position on failure of 4 –20mA signal.
	8	Allowable drift rate	: Maximum 2% set point/ hour.
	9	Ambient Temperature Effect	: less than 0.02% of span per deg C between -
	10	Mounting	: Surface/Pipe/Bracket Mounting.
	11	Protection class	: IP 65.
12	Connection Port Sizes	: ¼ inch NPT (F)	
13	Electrical Cable Entry	: ½ inch NPT	
14	Output Pressure Gauge	: 1/4 inch NPT connection, 2 inch dial.	
15	Accessories	: All accessories like mounting brackets, fittings etc. required for installation is to be supplied.	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW) TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2 SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 23 OF 46			

CLAUSE NO.	TECHNICAL REQUIREMENTS एनटीपीसी NTPC		
11.03.03 12.00.00	8. Should support primary and secondary mean values of user defined time interval. 9. Should have data backup facilities 10. Should have the facilities for calculation of Arithmetic mean values, average ½ hr, 1 hr, 2 hrs, 3 hrs, 4 hrs, 8 hrs, 12 hrs, 24 hrs, weekly monthly and yearly 11. Minimum, Median, percentile, Maximum, standard deviation frequency analysis and cumulative frequency analysis 12. Calculation of pollution load and Wind Roses 13. Reports of daily, weekly, annual and user defined period 14. Reports of Pollution load and Wind Roses, frequency analysis, and calibration 15. Should have the facilities of the following chart types: - Line & column chart - Simple 3 D, line & column chart - Polar diagram and 3 D perspective column chart Data Communication System Each AAQMS station shall be connected to Central data Acquisition station through a two way wireless communication link. This shall allow for wireless transmission of data periodically to individual and central DAS & do the necessary communication between stations. Bidders shall determine the optimal antenna type required to achieve data transfer rate between all wireless access points. Contractor shall use for this purpose, approved and standard equipment like antennas and/or amplification devices etc required to achieve the above and shall provide agreement of technical support and support availability. Contractor shall obtain necessary approval for Licenses authorizing the use of communication equipment specified frequencies. SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER TypeCoriolis Material of Wetted Parts316 SS Material of Housing304L SS Accuracy± 0.2% of Rate Repeatability± 0.1% of Rate Output4-20 mA DC, HART Compatible		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 34 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	Power Supply 230 VAC or 24VDC operated Process Temperature range 0-200 degree Celsius Others Drain / purging arrangement shall be provided as per standard practice. Viscosity range of Fluid 0-500cst for HFO The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer's approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer's approval.		
13.00.00	SPECIFICATION FOR FLOW ELEMENTS		
13.01.00	Orifice Plate Features Essential/Minimum Requirements Type Concentric as per ASME PTC-19.5 (Part-II), ISA RP-3.2, 1960 or BS-1042, ISO 5167 Material 316 SS Thickness 3 mm for main pipe diameter up to 300 mm and 6 mm for main pipe dia above 300 mm. Material of branch pipe Same as main pipe Root valve type Globe Root valve material Same as pipe material Root valve size 1 / 2 inch or 1 inch (as applicable) Impulse pipe of same material up to root valve Required Tappings Flanged weld neck or D & D/2 with 3 pairs of tapping (as applicable). Root valves to be provided in all the tappings. Beta Ratio 0.34 to 0.7 Beta Ratio calculation to be submitted Yes Assembly drg. and flow Vs DP Curves Yes Accessories Root valves, flanges, Vent/drain hole(As required) Contractor shall submit certified flow calculation and differential pressure vs. flow curves for each element for Employer's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for Employer's approval.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-III-C-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 35 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	Enclosure	Weather and dust proof as per IP-55, metallic housing.			
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories	
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-	
	Power Supply (wherever required)	As per Contractor's Standard practice.			
	Notes :- 1) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. 2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications. 3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range. 4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.				
16.00.00	NOT USED				
17.00.00	SOLENOID VALVES Solenoid valves shall fulfil the following requirements: a. Type 2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.) b. Power supply : 24 V DC $\pm$ 10%. c. Plug and socket electrical connection. d. Insulation : Class 'H'				
18.00.00	REVERSE ROTATION INDICATOR (RRI) Reverse rotation indicator comprising of proximity sensors, processing electronics with output of 4-20mA (corresponding to speed) interconnecting cables, speed display in rpm,				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE -I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 39 OF 46

CLAUSE NO.	TECHNICAL REQUIREMENTS																			
20.02.00	Time constant : 2 mins.																			
	Output from the sensor is to be connected to respective control system. Contractor can also provide combined instrument for measurement of humidity and temperature subject to Employer's approval during detailed engineering. In all such cases, 4-20 ma outputs, each for temperature and humidity measurements are to be provided.																			
	TEMPERATURE/ HUMIDITY INDICATOR																			
	Sensor : RTD for(Pt 100) for temperature																			
	: Capacitance Type for Humidity (specs for humidity and temperature shall be as mentioned above)																			
	Display : Combined enclosure with two three digit seven segments LED display with decimal point after two digits. LED height shall be 4 inches, clearly legible from a distance of at least 10 meters.																			
	Range : 0-60 Deg C for temperature.																			
	: 0-95.0 % for Relative Humidity.																			
	Accuracy : Better than +/-0.5 % for Temperature																			
	: Better than +/-2.5 % for Relative Humidity																			
21.00.00	Mounting : Table Top/ wall mounting.																			
	Power supply : 240 V AC, 50 Hz.																			
	Output : 4-20 mA signal each for temperature.																			
	Qty. : 15 nos. each of temperature & Humidity indicators (combined indicators for Humidity and temperature is also applicable).																			
	One Set of output signal is to be connected to respective control system. Apart from displaying the temperature/humidity values on indicator.																			
	Limit switches																			
	For offsite plant application Limit switches shall be gold plated with high conductivity and non corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.																			
	For main plant application limit switches are to be provided as per contractor standard and proven practice.																			
	SPECIFICATIONS OF EFFLUENT QUALITY MONITORING SYSTEM (EQMS)																			
	COMMON REQUIREMENTS FOR ALL ANALYSERS																			
22.01.00	<table><tr><th>Sno</th><th>Features</th><th>Minimum Requirement</th></tr><tr><td>1.</td><td>Output signals</td><td>Analog 4-20 mA DC galvanically isolated.</td></tr><tr><td>2.</td><td>Zero & span Adjustment</td><td>To be provided with range selection facility</td></tr><tr><td>3.</td><td>Ambient temp</td><td>50 degC</td></tr><tr><td>4.</td><td>Sample Temperature</td><td>40 degC</td></tr><tr><td>5.</td><td>Indication</td><td>Digital Alphanumeric Display of reading in engineering units shall be provided.</td></tr></table>	Sno	Features	Minimum Requirement	1.	Output signals	Analog 4-20 mA DC galvanically isolated.	2.	Zero & span Adjustment	To be provided with range selection facility	3.	Ambient temp	50 degC	4.	Sample Temperature	40 degC	5.	Indication	Digital Alphanumeric Display of reading in engineering units shall be provided.	
	Sno	Features	Minimum Requirement																	
	1.	Output signals	Analog 4-20 mA DC galvanically isolated.																	
	2.	Zero & span Adjustment	To be provided with range selection facility																	
	3.	Ambient temp	50 degC																	
	4.	Sample Temperature	40 degC																	
	5.	Indication	Digital Alphanumeric Display of reading in engineering units shall be provided.																	
<table><tr><td>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE -I (3X 800MW)</td><td>TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2</td><td>SUB-SECTION-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)</td><td>PAGE 42 OF 46</td></tr></table>			EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE -I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 42 OF 46														
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SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.

Sl. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
3	Dial size	150mm	150 mm	Tubular covering entire range
4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	±1% of span	± 1% of span	± 2%
6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.		
9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero/span adjustment	Provided	Provided	--
11	Identification	Engraved with service legend or laminated phenolic name plate		

12	Accessories	Blow out disc, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS

Notes:-

*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.04.00	The Bidder shall be responsible for proper grounding of all equipment under this package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests.			
9.05.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.			
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES			
	(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.	
	(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).	
	(iii)	Type	Screwed at all four corners for door. Door gasket shall be of synthetic rubber.	
	(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.	
	(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.	
	(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.	
	(vii)	Grounding	To be provided.	
	(viii)	Color	RAL 7035	
11.00.00	CONDUITS			
11.01.00	Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanised rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated galvanized steel with , water leak, fire and rust proof protected <i>for the areas of Mills,Drum, Main Steam, RH steam Air Heaters and Furnace, BFPDT's</i> . <i>And for remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided.</i> The temperature rating of flexible conduit shall be suitable for actual application.			
11.02.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.			
11.03.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-07 INSTRUMENTATION CABLES	PAGE 12 OF 13

LIST OF DOCUMENTS/DELIVERABLES

PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			
DOCUMENT NUMBER PE-GL-434-145-I100 SHEET 1 of 1			
Sl.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY
1	PE-V2-434-145-I902	HMI PICTURES/PLANT SCHEMATICS	A
2	PE-V2-434-145-I903	INSTRUMENT SCHEDULE with set points	A
3	PE-V2-434-145-I904	Input/ output (I/O) LIST (ANALOG & BINARY)	A
4	PE-V2-434-145-I905	DRIVE LIST/SOLENOID/ACTUATOR VALVE LIST WITH LOCATION DATA	A
5	PE-V2-434-145-I906	FIELD JB/LIE/LIR TERMINATIONS DETAILS	A
6	PE-V2-434-145-I907	DATASHEETS FOR INSTRUMENTS, JBs, etc.	A
7	PE-V2-434-145-I908	QUALITY PLANS (INSTRUMENTS etc.)	A
8	PE-V2-434-145-I909	CABLE SCHEDULE & INTERCONNECTION	A
9	PE-V2-434-145-I910	Instrument installation drawings and the drawings for open racks & closed racks (as applicable)	A
10	PE-V2-434-145-I911	THERMOWELL SIZING CALCULATION for applicable services as per ASME PTC 19.3 (latest revision)	A
11	PE-V2-434-145-I912	CONTROL SCHEME/LOGIC DIAGRAM (TO BE IMPLEMENTED IN DDCMIS)	A
12	PE-V2-434-145-I913	ANNUNCIATION & SOE LIST	A
13	PE-V2-434-145-I914	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM	A
NOTES: 1. ANY OTHER DOCUMENT DECIDED DURING DETAILED ENGINEERING SHALL BE PROVIDED BY BIDDER WITHOUT ANY COMMERCIAL/TECHNICAL IMPLICATION. 2. CONTRACTOR TO SUBMIT REUSABLE DATABASE FORMATS IN BHEL/CUSTOMER APPROVED FORMATS LIKE MS EXCEL,MS ACCESS OF DOCUMENTS LIKE INSTRUMENT SCHEDULE, I/O LIST, DRIVE LIST,FIELD JB TERMINATIONS, CABLE SCHEDULE & INTERCONNECTION, etc. SOFT COPY OF FORMATS SHALL BE PROVIDED TO SUCCESSFUL BIDDER.			

DATA SHEETS FOR MOTORISED VALVE ACTUATOR



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

REV. NO. 01 DATE: 11.05.2018

SHEET 1 OF 4

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL*	* PROJECT	3 x 800 MW PATRATU TPP	
	OFFER REFERENCE		
	* TAG NO. SERVICE		
	* DUTY	☐ ON / OFF	☐ INCHING
	* LINE SIZE (inlet/outlet): MATERIAL		
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY	
	* OPENING / CLOSING TIME		
	* WORKING PRESSURE		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%	
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY	
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY	
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY	
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55	
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL	
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.	
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.	
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING /REGULATING SERVICE - 150 STARTS/HR MINIMUM.	
HANDWHEEL	* REQUIRED	☒ YES ☐ NO	
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED	
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.		
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY	
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY	
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT- INCLUSIVE OF I.S. TOLERANCE	
	ACTUATOR APPLICABLE WIRING DIAGRAM	☒ ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ☐ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram	
	COLOUR SHADE	☒ BLUE (RAL 5012) ENAMEL ☐	
	PAINT TYPE (## Refer Notes)	☐ ENAMEL ☐ EPOXY ☐	
	SHAFT RPM	BIDDER TO SPECIFY	
	OLR SET VALUE	BIDDER TO SPECIFY	
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY	
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY	
	@ PWR SUPP TO MTR / STARTER	415V +/- 10 %, 3PH,3 W, AC 50 HZ. +/- 5 %	
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☒ 110 V AC/24V DC	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

REV. NO. 01

DATE: 11.05.2018

SHEET 2 OF

4

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

	MOTOR BEARING WITH 2 EARTH TERMINALS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI FRICTION	
	@ ENCLOSURE CLASS OF MOTOR	IP 67 FOR OUTDOOR & IP 55 FOR INDOOR(TOTALLY ENCLOSED SELF VENTILATED)	
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B	
	@ WINDING TEMP PROTECTION	☒ THERMOSTAT (3 Nos., 1 IN EACH PHASE) ☐	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED	
INTEGRAL STARTER	INTEGRAL STARTER	☒ REQUIRED ☐ NOT REQUIRED	
	TYPE OF SWITCHING DEVICE	☒ CONTACTORS ☐ THYRISTORS	
	TYPE	☒ CONVENTIONAL ☐ SMART (NON-INTRUSIVE)	
	IF SMART	(NOT APPLICABLE)	
	a) SERIAL LINK INTERFACE	☐ INTEGRAL ☐ FIELD MOUNTED	
	b) SERIAL LINK PROTOCOL	☐ FOUNDATION FIELD-BUS ☐ PROFI-BUS ☐ DEVICE NET ☐	
	c) SERIAL LINK MEDIA	☐ TWISTED PAIR Cu-CBL ☐ CO-AXIAL Cu-CBL ☐ OFC	
	d) HAND HELD PROGRAMMER	☐ REQUIRED ☐ NOT REQUIRED	
	e) TYPE OF HAND HELD PROGRAMMER	☐ BLUETOOTH ☐ INFRARED ☐	
	f) MASTER STATION	☐ REQUIRED ☐ NOT REQUIRED	
	g) MASTER STN INTRFACE WITH DCS	☐ MODBUS ☐ TCP/IP	
	h) DETAILS OF SPECIAL CABLE	☐ ENCLOSED ☐ NOT REQUIRED	
	STEP DOWN CONT. TRANSFORMER	☒ REQUIRED	
	OPEN / CLOSE PB	☒ REQUIRED ☐ NOT REQUIRED	
	STOP PB	☒ REQUIRED ☐ NOT REQUIRED	
	INDICATING LAMPS	☒ REQUIRED ☐ NOT REQUIRED	
	LOCAL REMOTE S/S	☒ REQUIRED ☐ NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	☒ REQUIRED ☐ NOT REQUIRED	
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)	
	INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	☒ INTERPOSING RELAY ☐ OPTO COUPLER ☐ EITHER
QUANTITY		☒ 2 NOS. ☐ 3 NOS.	
DRIVING VOLTAGE		☒ 20.5 – 24V DC ☐ _____ V DC	
DRIVING CURRENT		☒ 125mA MAX ☐ _____ mA MAX	
LOAD RESISTANCE		☒ > 192 ohms - <25 k ohms ☐ > _____ ohms - < _____ ohms	
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN / CLOSE	☒ 1 No. ☐ 2Nos. / ☒ 1 No. ☐ 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A 240V AC AND 0.5A 220V DC	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	+3% OF SET VALUE	
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN : INT : CLOSE	☐ 1 No. ☒ 2 Nos.	☐ 1 No. ☒ 2Nos.
	CONTACT TYPE	2 NO + 2 NC	

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		
		REV. NO.	01
		SHEET	3 OF 4
Data Sheet A & B			
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)
Refer Notes	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC	
Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of control system subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.			

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty applications)	☒ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS INDUCTIVE TYPE ,EXTERNAL 24 V DC OPERATED ,SUITABLE FOR STABILISED 4-20 mA SIGNAL	
	SUPPLY	☒ 24V DC ☐	
	OUTPUT	☒ 4-20mA	
	ACCURACY	$\pm 1\%$ FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC, 1 PH., 50 Hz	
	@ POWER SUPPLY (INTEGRAL)	POWER SUPPLY DERIVED FROM MAIN POWER SUPPLY AVAILABLE AT ACTUATOR END.	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	☒ IP 68 @ ☐	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	☒ REQUIRED ☐ NOT REQUIRED ☒ 2 NOS. PRE WIRED ☐	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----	
	@ SPACE HEATER CABLE GLAND	SIZE:-----	
	OTHER CONTROL CABLE GLANDS-1	2 NOS SUITABLE FOR 4P,0.5SQ MM	
	OTHER CONTROL CABLE GLAND	1 No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR			
	REV. NO.	01	DATE:	11.05.2018
SHEET	4 OF	4		
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY	_____ Kg.	
NOTES: SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722 - TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. - CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. - THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. - THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. - THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. \$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE. ## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS. - IT SHALL BE POSSIBLE TO OPERATE THE ACTUATOR LOCALLY. LOCKABLE LOCAL/REMOTE SELECTION SHALL BE PROVIDED ON THE ACTUATOR. - POSITION INDICATOR SHALL BE PROVIDED FOR 0 TO 100 % TRAVEL - WIRING SHALL BE SUITABLE VOLTAGE GRADE COPPER WIRE.				
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
	Madhav gupta	Mayank kesharwani	Bharat Singh	NAME
				SIGNATURE
	01.03.2018 01.	03.2018	01.03.2018	DATE
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES				

ELECTRICAL ACTUATORS WITH INTEGRAL STARTERS

1.00.00	CODES AND STANDARDS:				
1.01.00	All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. In case of conflict between this specification and codes, standards, etc, the former shall prevail.				
2.00.00	ELECTRIC ACTUATORS WITH INTEGRAL STARTERS				
2.01.00	TYPE:				
2.01.01	The actuators shall have integral starters along with over load relays with built in SPP (Single Phasing Preventer). Alternatively Smart non intrusive actuators are also acceptable. A 415, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply.				
2.01.02	In case supplier's standard control voltage for Open/Close contactors is 110V AC, the same is acceptable if suitable Opto Isolation circuit is provided with coupling relays for 24 V DC command inputs.				
2.02.00	INTERFACES:				
2.02.01	Open/Close command termination logic with position & torque Limit Switches, positioner circuit shall be suitably built in the PCB inside the actuator. (a) For Binary Drive (both ON-OFF and INCHING type) :- Open/Close command & status thereof and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided. Interface with the control system shall be through hardware signal only. Inter posing relays provided (with coil burden 2.5 VA) in the actuator shall be energized to initiate opening and closing, by 24V DC signal from the external control system. (b) For Modulating Drive:- the command to actuator shall be in form of 4-20mA signal. The necessary positioning circuit and motor protection shall be provided (c) Open/close command termination logic shall be suitably built inside actuator.				
2.03.00	RATING : (a) Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire 50HZ +/-5%. (b) Sizing:- Open/Close at rated speed against designed differential pressure at 90% of rated voltage. For isolating service:- Three successive open-close operations or 15 mins, whichever is higher. For regulating service 150 starts per hour or required cycles, whichever is higher.				
2.04.00	CONSTRUCTION: (a) Enclosure:				
<table><tr><td>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)</td><td>TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC NO : CS-9585-001-2</td><td>SUB-SECTION B-17 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS</td><td>PAGE 1 OF 5</td></tr></table>		EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC NO : CS-9585-001-2	SUB-SECTION B-17 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS	PAGE 1 OF 5
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC NO : CS-9585-001-2	SUB-SECTION B-17 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS	PAGE 1 OF 5		

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	Limit switch/contacts and disturbance signals shall be available to DCS even when the power supply to the actuators is not available.			
2.07.00	LOCAL OPERATION:			
2.07.01	It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.			
2.08.00	POSITION INDICATOR :			
2.08.01	To be provided for 0 to 100% travel.			
2.09.00	POSITION TRANSMITTER (FOR MODULATING/INCHING TYPE) :			
2.09.01	As required. Suitable for stabilized 4-20 mA signal, 2 wire inductive type, External 24 volts DC operated.			
2.10.00	WIRING :			
2.10.01	Suitable voltage grade copper wire.			
2.11.00	TERMINAL BOX : (i) 9 pin plug and socket (1 no. per actuator to suit 4 pair 0.5 sq.mm. copper overall shielded (16 mm OD), instrumentation cable) suitably mounted in the starter box itself to terminate open/close command and status feedback signals with external control systems. (ii) Additional one number 9 pin plug and socket (to suit 4 pair 0.5 sq.mm copper (16 mm OD) individual and overall shielded instrumentation cable) suitably mounted in the starter box itself for actuators with 4-20 mA position transmitters. (iii) Necessary glands for power cables shall be provided.			
2.12.00	TERMINAL BLOCK :			
2.12.01	650V grade. For power cables.			
2.13.00	SPACE HEATER :			
2.13.01	Space heater of suitable rating. The supply shall be derived from the main power supply available in the actuator.			
2.14.00	TYPICAL WIRING DIAGRAM :			
2.14.01	Refer Tender Drawing No. 0000-999-POI-A-063.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE –I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION-VI, PART-B BID DOC NO : CS-9585-001-2	SUB-SECTION B-17 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS	PAGE 3 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.01.00	General Requirements			
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the “Federal Occupational Safety and Health Standards, USA” or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.			
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves.			
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, refer to the corresponding mechanical sections.			
1.01.04	Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION			
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.			
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.			
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation/flashing service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished.			
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system, HP/LP heater Emergency level control, Emergency Make-up to condenser hotwell, GSC minimum flow, Deaerator Drain to Condenser Hotwell, Condensate spill to condensate reserve tank, condenser normal make-up and valve gland sealing supplying pressure control, CEPS minimum flow control, BFP circulation control valve shall have permissible leakage rate as per leakage Class V. All other control valves shall have leakage rate as per leakage Class-IV as per ANSI / FCI /70.2,2006 or equivalent.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers except for few cases as per contractor's standard and proven practice subject to employer's approval.			
1.02.06	Control valves for steam and water application shall be provided with rangability of 30:1 for all services except for applications wherein control valves are envisaged to be operated in lower range like Reheater spray and superheater spray system wherein control valve with rangability of 50:1 shall be provided			
2.00.00	VALVE CONSTRUCTION			
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.			
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.			
2.03.00	Cast Iron valves are not acceptable.			
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.			
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.			
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing)			
2.07.00	Valve characteristic shall match with the process characteristics.			
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.			
2.09.00	Flanged valves shall be rated at no less then ANSI press class of 300 lbs.			
3.00.00	VALVE MATERIALS			
	Sr. No.	Service	Body material	Trim Material
	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for design fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC6 for design fluid temperature above 275 Deg. C and upto 400 Deg. C Alloy steel ASTM-A217Gr. WC9 for design fluid temperature above 400 Deg. C	316SS stellited with stellited faced guide posts and bushings.
	2.	Severe flashing/cavitati on services	Alloy steel ASTM-A217 Gr. WC9	440 C
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
PAGE 2 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	3.	Low flashing/cavitation on service	Alloy steel ASTM-A217 Gr. WC6 17-4 PH SS	
	4.	DM water service	316 SS 316 SS	
	NOTE: (a) Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.			
	(b) Severe flashing / cavitation services includes as a minimum all control valves whose downstream piping is connected to condenser or flash tank.			
	However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.			
	Contractor shall ensure that all required measures like proper selection of anti-corrosive/erosive material along with durable epoxy coating with polyurethane finish shall be provided for all the C&I equipment/ devices being supplied in this contract, which are mounted in non-AC areas (prone to sea water environment corrosion / erosion) like measuring instruments, control valves & actuators, JBs, LIEs / LIRs, impulse pipes, sample pipes, fittings, conduits, cable trays and accessories, local control panels, erection hardware items etc. Contractor shall furnish their comprehensive proposal regarding the anti-corrosion/ erosion measures for protection against sea water environment which shall be finalized during detailed engineering subject to Employer's approval.			
4.00.00	END PREPARATION			
	Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.			
5.00.00	VALVE ACTUATORS			
	All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously.			
	Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.			
	The travel time of the pneumatic actuators shall not exceed 10 seconds.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
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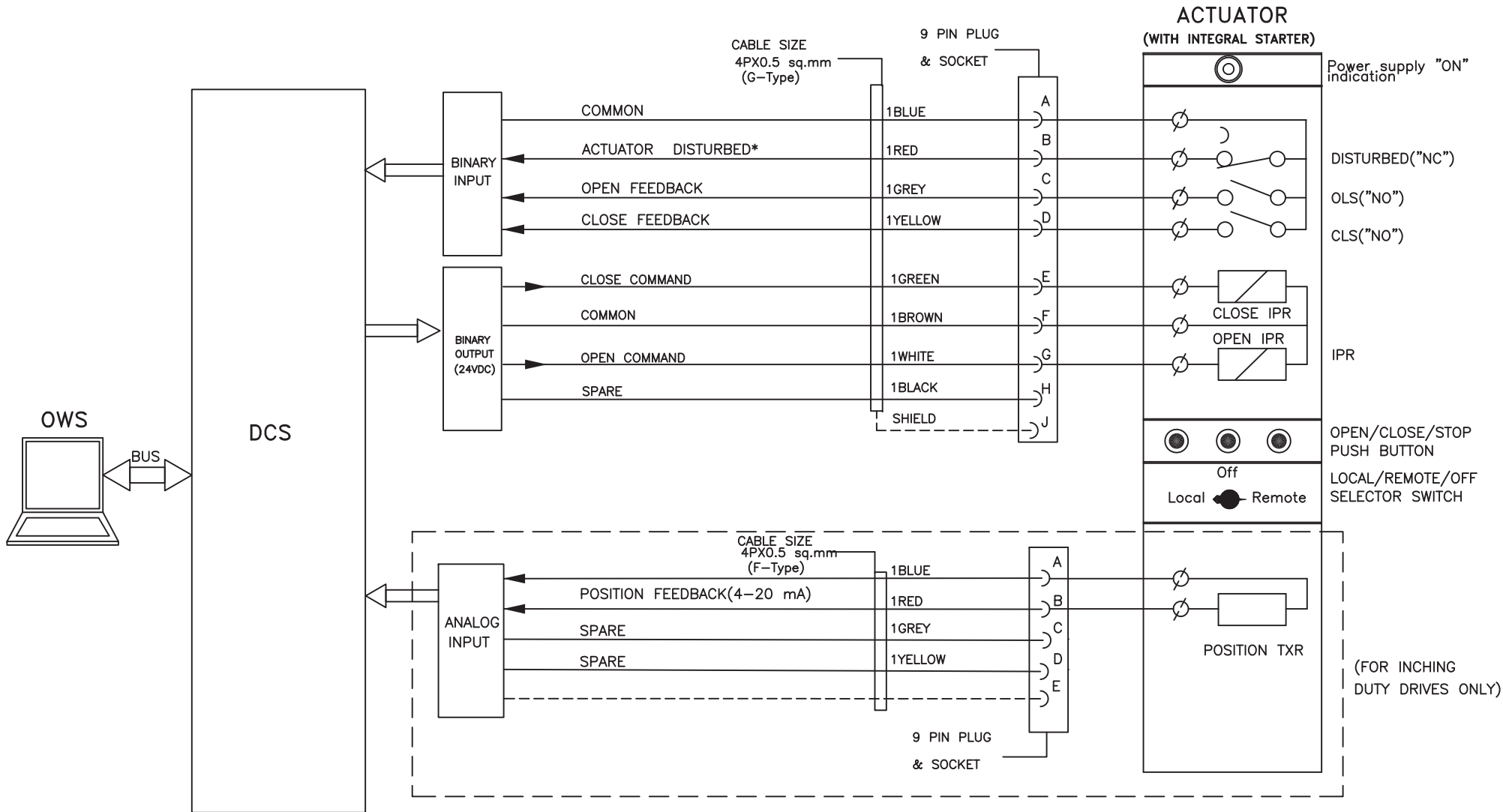
CLAUSE NO.	TECHNICAL REQUIREMENTS				
6.00.00	CONTROL VALVE ACCESSORY DEVICES				
6.01.00	All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.				
7.00.00	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER				
	1	Electrical	a) Input Demand Signal	4-20 mA	
			b) Power Supply	Loop Powered from the output card of Control System.	
			c) HART Protocol	Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal (4-20 mA))	
			d. Valve position sensing	Position sensing, 4-20 mA output signal to be provided for control system.	
	2	Environment	a) Operating temp.	(-)30 To 80 Deg. C	
			b) Humidity	0-95 %	
			c) Protection class	IP-65 Minimum	
	3	Software for Configuration and Diagnostics	Software	Software shall meet the requirements for Configuration, Diagnostics, Calibration and Testing of the actuator.	
			Diagnostic/Test features	Advanced diagnostic features like Stroke counter or Travel counter, Leakage in actuators, Valve Signature analysis, Step Response test, Valve friction /Jamming detection etc to be provided.	
	4	Test reports/ Certificates	Factory Valve Signature Tests Reports (Pr Vs Valve travel and Travel Vs I/P signal) are to be provided.		
			Test certificates as per Manufacture Standard/Relevant Standard are to be submitted.		
	5	Configuration/ Calibration.	Remote & Local Calibration, Auto & Manual Calibration shall be possible.		
	6	Operating Range	Full range/ Split range.		
	7	Modes	Valve Action	Direct / Reverse Valve Action	
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
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CLAUSE NO.	एनडीपीसी NTPC TECHNICAL REQUIREMENTS			
			Flow Characterization	Possible to fit Valve Characteristic Curves- Linear , Equal percentage etc.
	8	Fail Safe/Fail Freeze	Fail Safe/Fail Freeze feature is to be provided. (In case the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit).	
	9	Pneumatic	Air capacity	Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.
			Air pressure	To suit the air supply pressure/quality available.
			Process connection	1/4" NPT
	10	Performance	Characteristic deviation	<=0.5 % of span.
			Ambient temp effect	<=0.01 %/ deg C or better.
	10	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
	11	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
			Hand Held Hart Calibrator	Universal Hart Calibrator to be provided (for quantity, refer Part-A: Contract quantities of the specification).
			Press Gauge Block	For supply & output pressures, Air Filter Regulator and other accessories shall be provided on as required basis for making system complete.
			Electrical Cable Entry	1/2"NPT, side or bottom entry to avoid water
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES PAGE 5 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
			ingress.	
		Valves Mounting Assembly	For Sliding Stem/Rotary/Single acting/Double acting actuators on as required basis	
	* Note: The HART signals shall be picked up from marshalling terminals of DDCMIS (SG/TG DDCMIS as well as BOP DDCMIS), as applicable. The details of the above mentioned HART management system specification are mentioned in HART system (Annexure IIIC-02C to DDCMIS). The positioners shall be monitored from this HART management system .To achieve this, Bidder shall provide the necessary software to achieve the functionalities described above under " Software for Configuration and Diagnostics", and this software shall be loaded in the HART management system.			
8.00.00	TEST AND EXAMINATION All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:			
8.01.00	Non Destructive Test as per ANSI B-16.34.			
8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.			
8.03.00	Valve closure test and seat leakage test in accordance with ANSI-B 16.34/ FCI 70.2 standard and as per the leakage class indicated above			
8.04.00	Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.			
8.05.00	CV Test: Please refer CI No. 1.00.00 & 3.00.00 OF Sub-section- IIIC-10 (Type test requirements), Control Valves. Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-08 CONTROL VALVES, ACTUATORS & ACCESSORIES
				PAGE 6 OF 6

SIGNAL EXCHANGE BETWEEN DRIVES & DCS

DCS INTERFACE FOR (BIDIRECTIONAL DRIVE WITH INTEGRAL STARTER) (BID/BIDI)

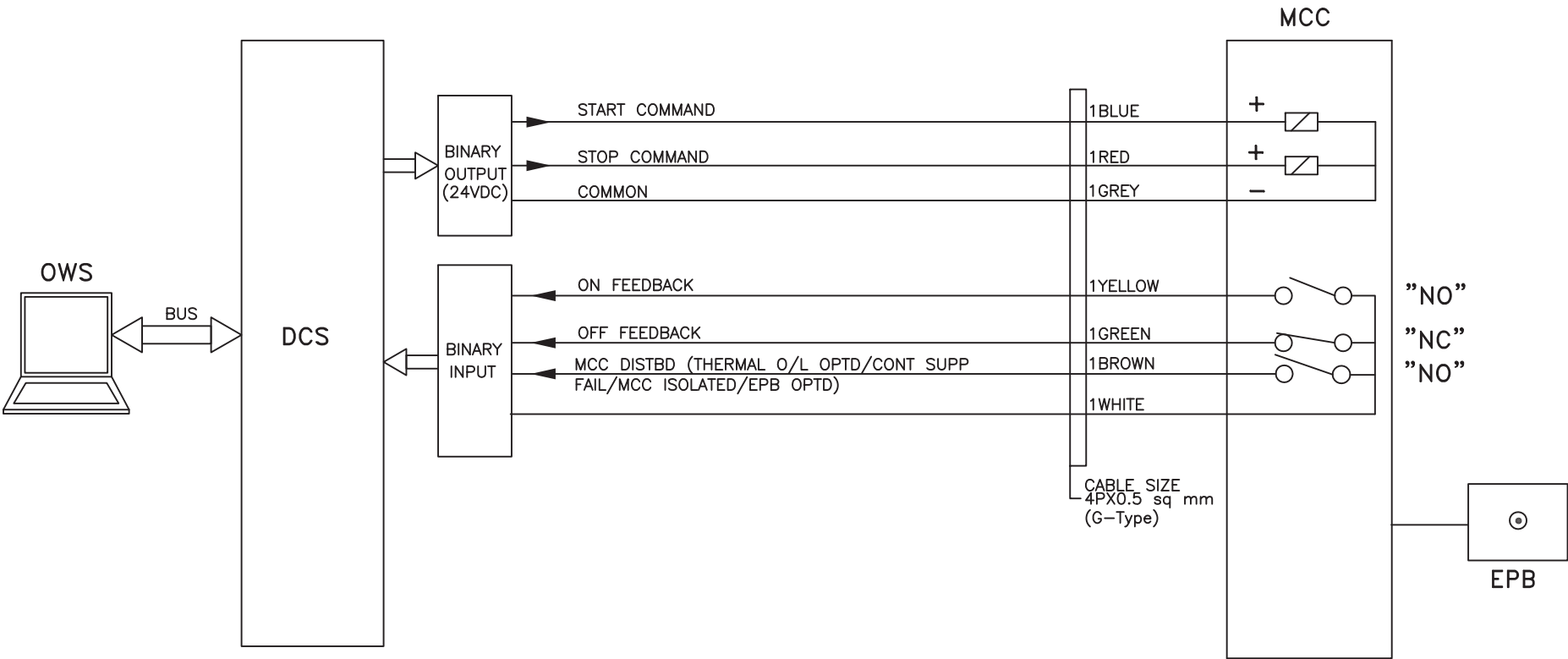


NOTE:

* DISTURBED= Loss of Power supply (1 Phase/3 Phase)/
Loss of control supply/ Motor thermostat trip/
Thermal over load/
Local/Off/Remote Sel. switch in local or off mode/

	PROJECT: PATRATU STPP		DRG.NO.	PE-DM-434-145-I002
	TITLE		DATE	05.04.18
	DDCMIS INTERFACE FOR		REV.NO.	00
	BIDIRECTIONAL DRIVE		SHT	7

DCS INTERFACE FOR UNIDIRECTIONAL LT DRIVE (CONTACTOR CONTROLLED) (LTUD)

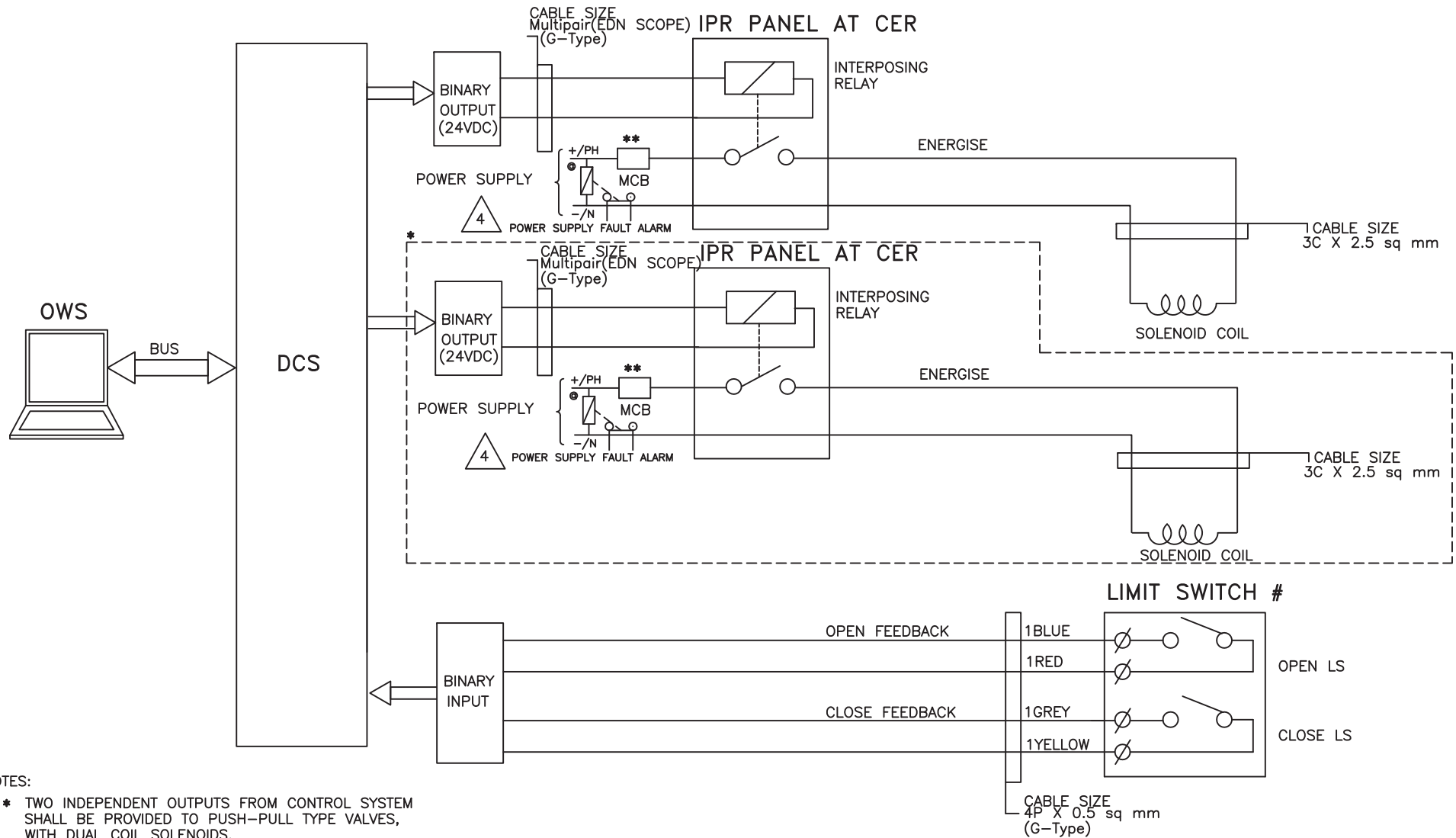


PROJECT: PATRATU STPP

TITLE DDCMIS INTERFACE FOR UNIDIRECTIONAL LT DRIVE

DRG.NO.	PE-DM-434-145-I002
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SHT	08 OF 13

DCS INTERFACE FOR SOLENOID DRIVE (SOLV) (24V DC / 240V AC UPS)



NOTES:

* TWO INDEPENDENT OUTPUTS FROM CONTROL SYSTEM SHALL BE PROVIDED TO PUSH-PULL TYPE VALVES, WITH DUAL COIL SOLENOIDS.

** MCB SHALL BE PROVIDED FOR EACH SOLENOID

FOR ON/OFF TYPE, SOLENOID ACTUATED CONTROL VALVE.

© COMMON FOR ALL SOLENOID VALVES



PROJECT: PATRATU STPP

TITLE

DDCMIS INTERFACE FOR
SOLENOID DRIVE

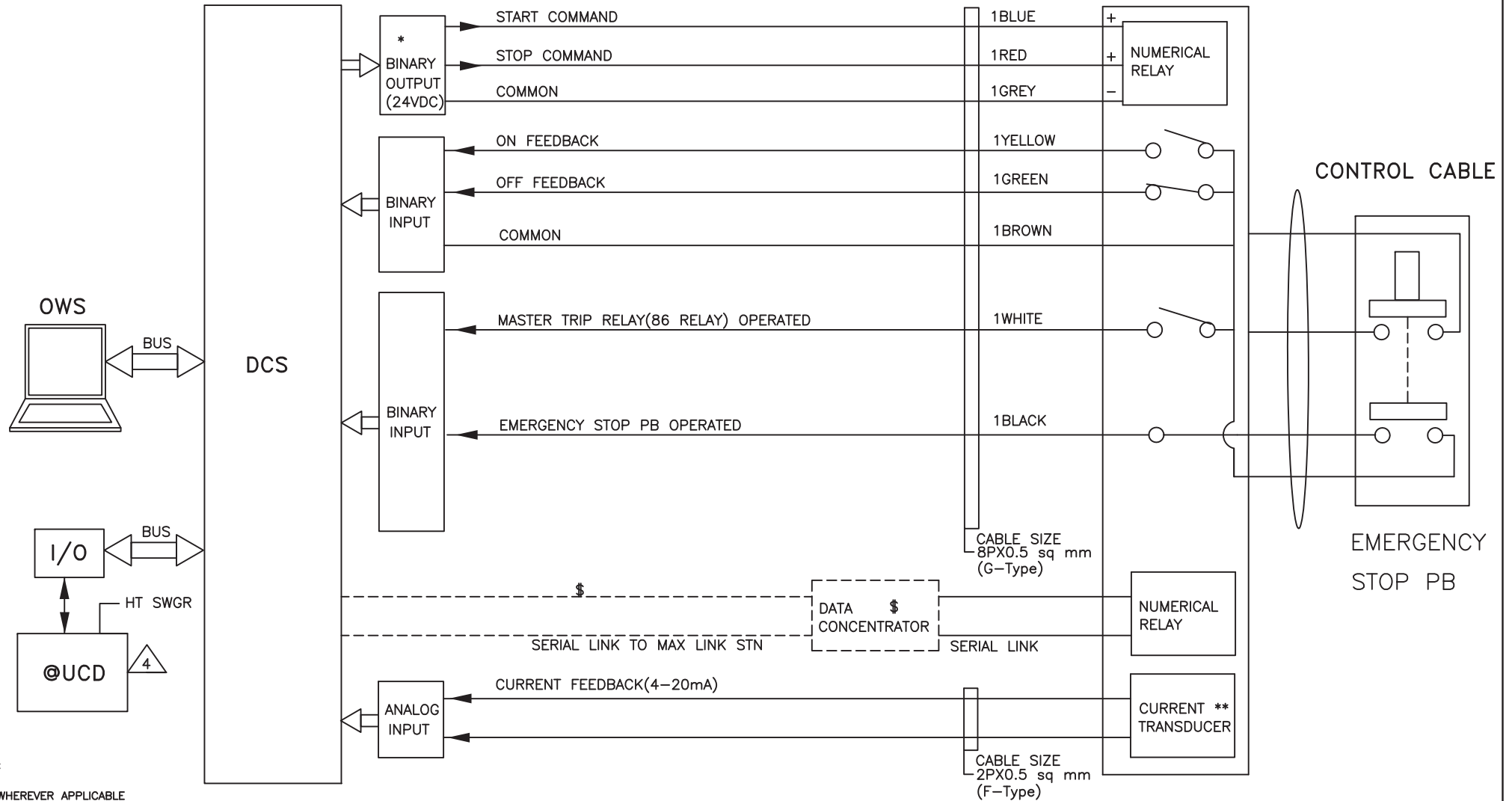
DRG.NO. PE-DM-434-145-I002

DATE 05.04.18

REV.NO. 00

SHT 9

DCS INTERFACE FOR HT/LT UNIDIRECTIONAL DRIVES (BREAKER OPERATED) (HTUD/LTUD)



NOTE:

⊙ WHEREVER APPLICABLE

* REDUNDANCY SHALL BE PROVIDED AS PER CLAUSE NO. 1.02.00 , NOTE NO. 4, CONTRACT QTY. FOR DDCMIS, APPENDIX-I TO PART-A OF TECHNICAL SPECIFICATION

\$ DATA CONCENTRATOR & SERIAL LINK TO MAX STATION SHALL BE COMMON FOR HT/LT DRIVES (BREAKER CONTROLLED)

** SHALL BE APPLICABLE FOR FD, ID, PA, BFP, CEP, ECW, ACW, MILL MOTORS

1. EXACT NO. OF PORTS/LINKS BETWEEN NUMERICAL RELAYS & MAX LINK STATION SHALL BE AS PER THE APPROVED SWGR & DATA CONCENTRATOR DRAWINGS.
2. OVERLOAD ALARM, RELAY FAULT, SWGR AVAILABLE & SWGR DISTURBED SIGNALS ALONG WITH OTHER INFORMATION SHALL FLOW THROUGH SOFT LINK.



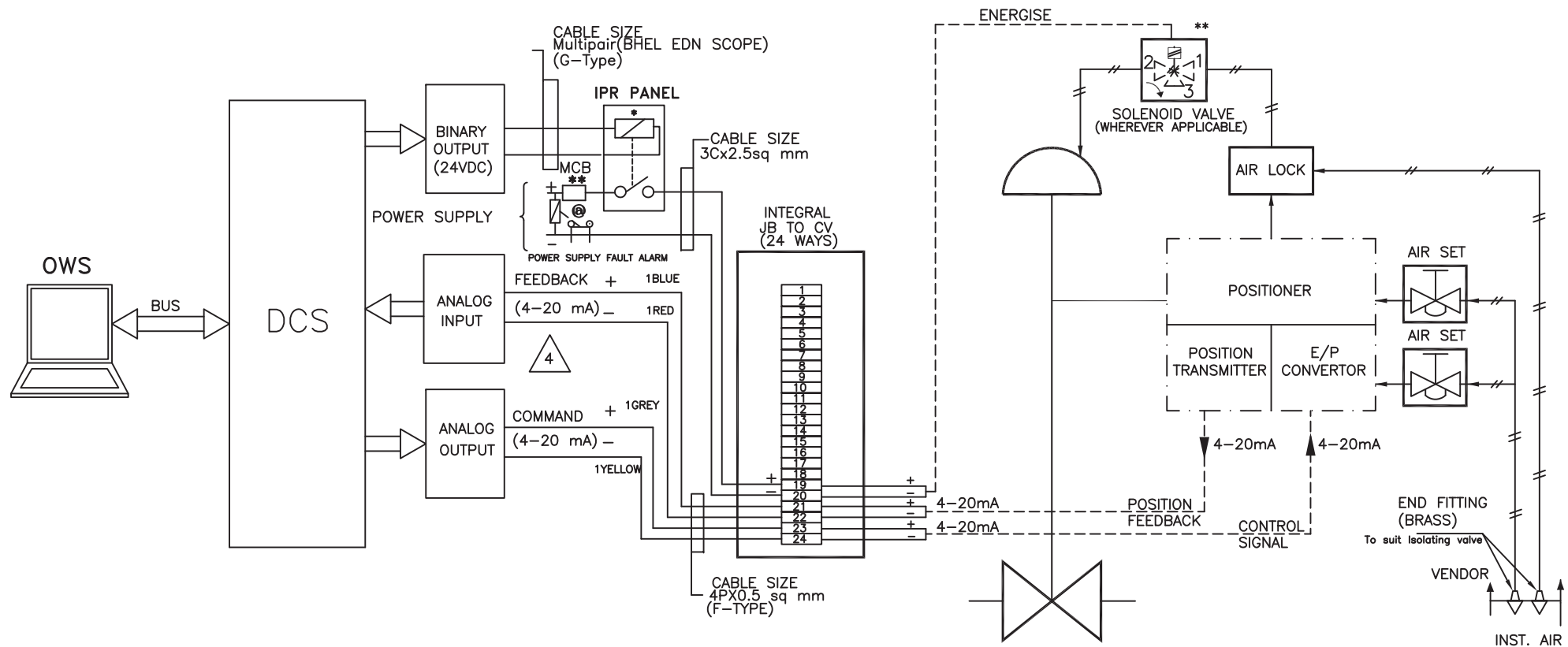
PROJECT: PATRATU STPP

TITLE

DDCMIS INTERFACE FOR
UNIDIRECTIONAL HT DRIVE

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REV.NO.	00
SHT	10

DCS INTERFACE FOR ANALOG DRIVE (MOD-P)



NOTES:

- * APPLICABLE TO VALVES WHERE PROTECTION OPEN/CLOSE ACTION FOR CONTROL DEMAND OVERRIDING IS REQUIRED.
- ** MCB SHALL BE PROVIDED FOR EACH SOLENOID
- ⊗ COMMON FOR ALL SOLENOIDS



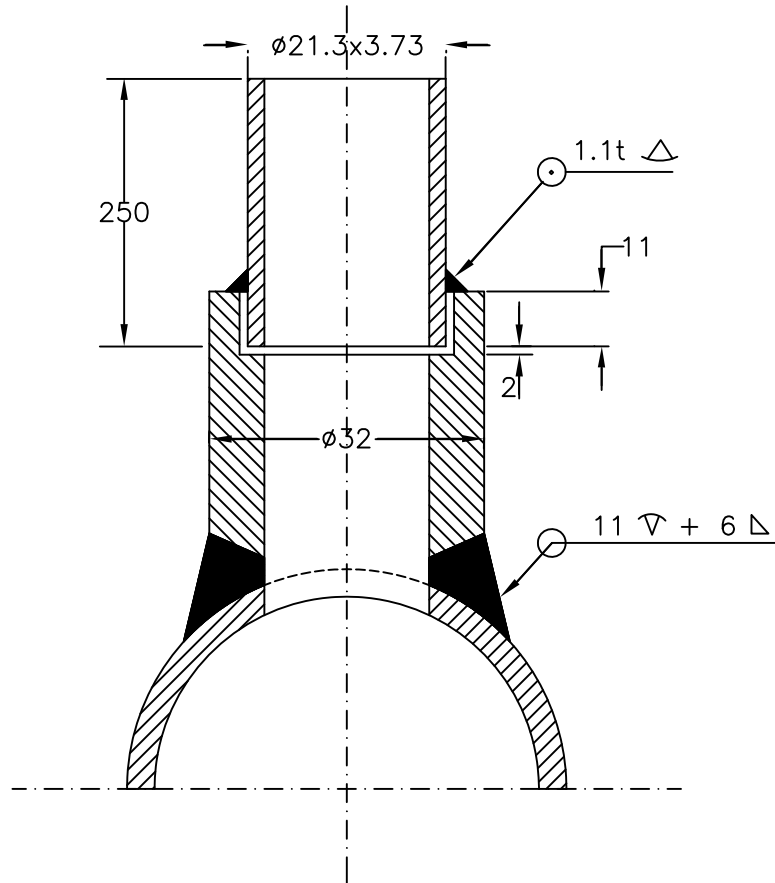
PROJECT: PATRATU STPP

TITLE

TYPICAL HOOK-UP DIAGRAM
ANALOG DRIVE

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SHT	11

INSTRUMENT STUB DETAILS



NOTE :

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFORM TO ANSI B16.11.
2. THE LENGTH OF NIPPLE SHALL BE 250 MM.
3. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED
4. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY (1/64" RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES
5. STUB LENGTH SHALL BE 64mm UPTO 250Nb PIPE, 45mm ABOVE 200Nb PIPE SIZE.

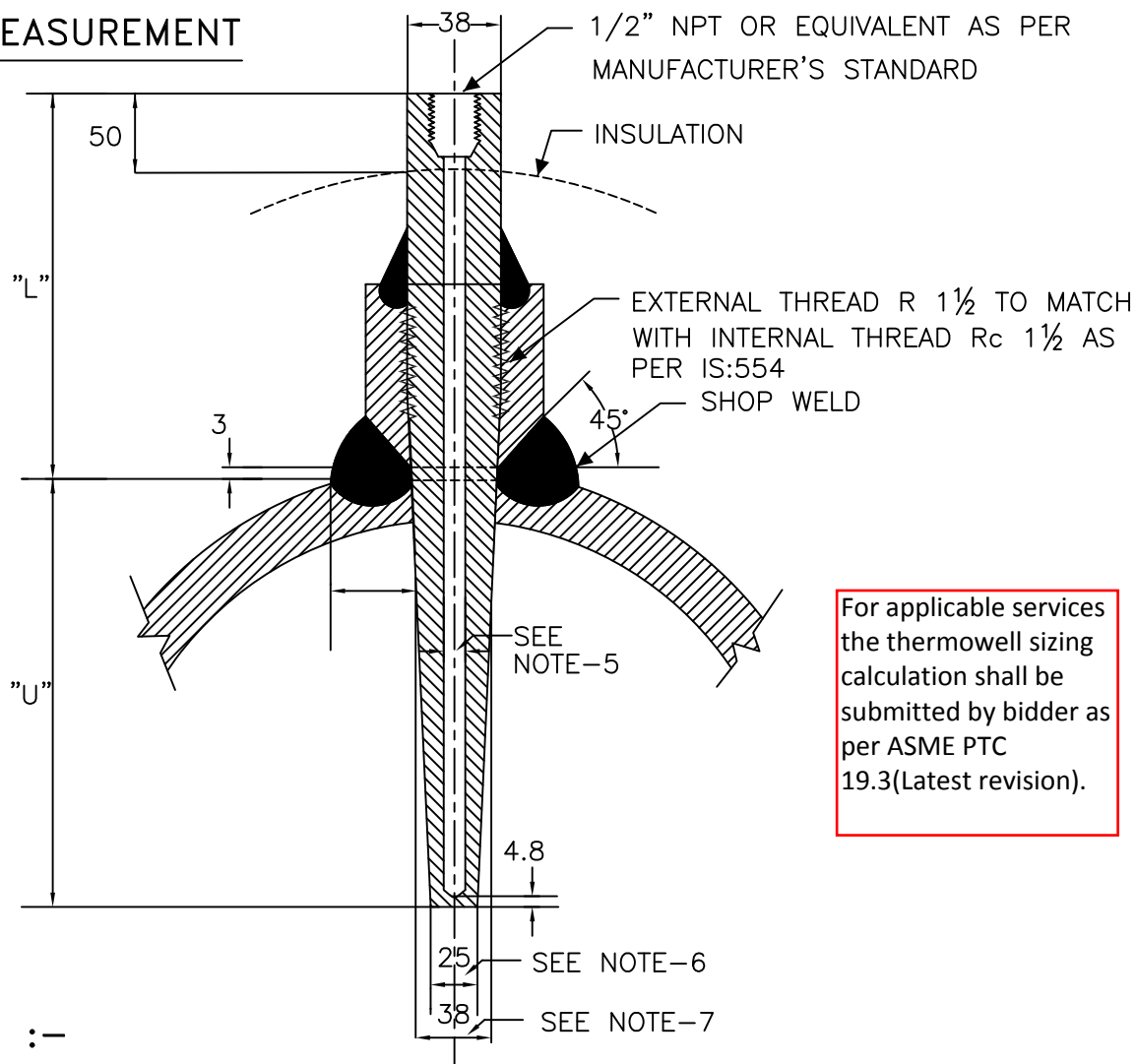


TITLE :
**INSTRUMENT STUB DETAILS
 FOR PRESSURE MEASUREMENT**

DRG. NO.
PE-DG-434-145-I101
 REV. 00
 SH. 04 OF 08 SHS.

(SYSTEM PRESS UPTO 40Kg/Cm², TEMP < 400 Deg C)

TEMP. MEASUREMENT



NOTES :-

1. THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE PROCESS PRESS EQUAL/ ABOVE 40 KG/CM2(g) AND FOR PROCESS TEMP.>400 DEG C EVEN IF THE PROCESS PRESSURE IS LESS THAN 40 KG/CM2(g).
2. THE MATERIAL OF THE BOSS SHALL BE SIMILAR TO PIPING MATERIAL.
3. MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
4. THERMOWELL SHALL BE DRILLED BAR STOCK TYPE.
5. INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME PTC-19.3.
6. THE BOTTOM DIAMETER OF THE THERMOWELL TYPICALLY SHOWN HERE SHALL BE SUBJECT TO VARIATION BASED ON THE INTERNAL BORE OF THERMOWELL AND THICKNESS OF THERMOWELL MATERIAL TO WITHSTAND THE PROCESS PRESS AND TEMP AS PER ASME PTC-19.3.
7. THERMOWELL SHALL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER Rc 1 1/2.
8. THE 'U' & 'L' DIMENSIONS SHALL BE SELECTED BASED ON PARTICULAR APPLICATION.
9. ORIENTATION OF STUB ON VERTICAL/ HORIZONTAL PIPES SHALL BE 90° TO THE CENTRE LINE OF THE PIPES, FOR PIPE SIZE LARGER THAN 4". HEIGHT OF STUB SHALL BE 64mm FOR PIPE OD < 200Nb AND 45mm FOR PIPE OD ≤ 200Nb.
10. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.



TITLE :

INSTRUMENT STUB DETAILS (TEMP)
(APPLICABLE FOR PIPE SIZE ABOVE 4")

DRG. NO.

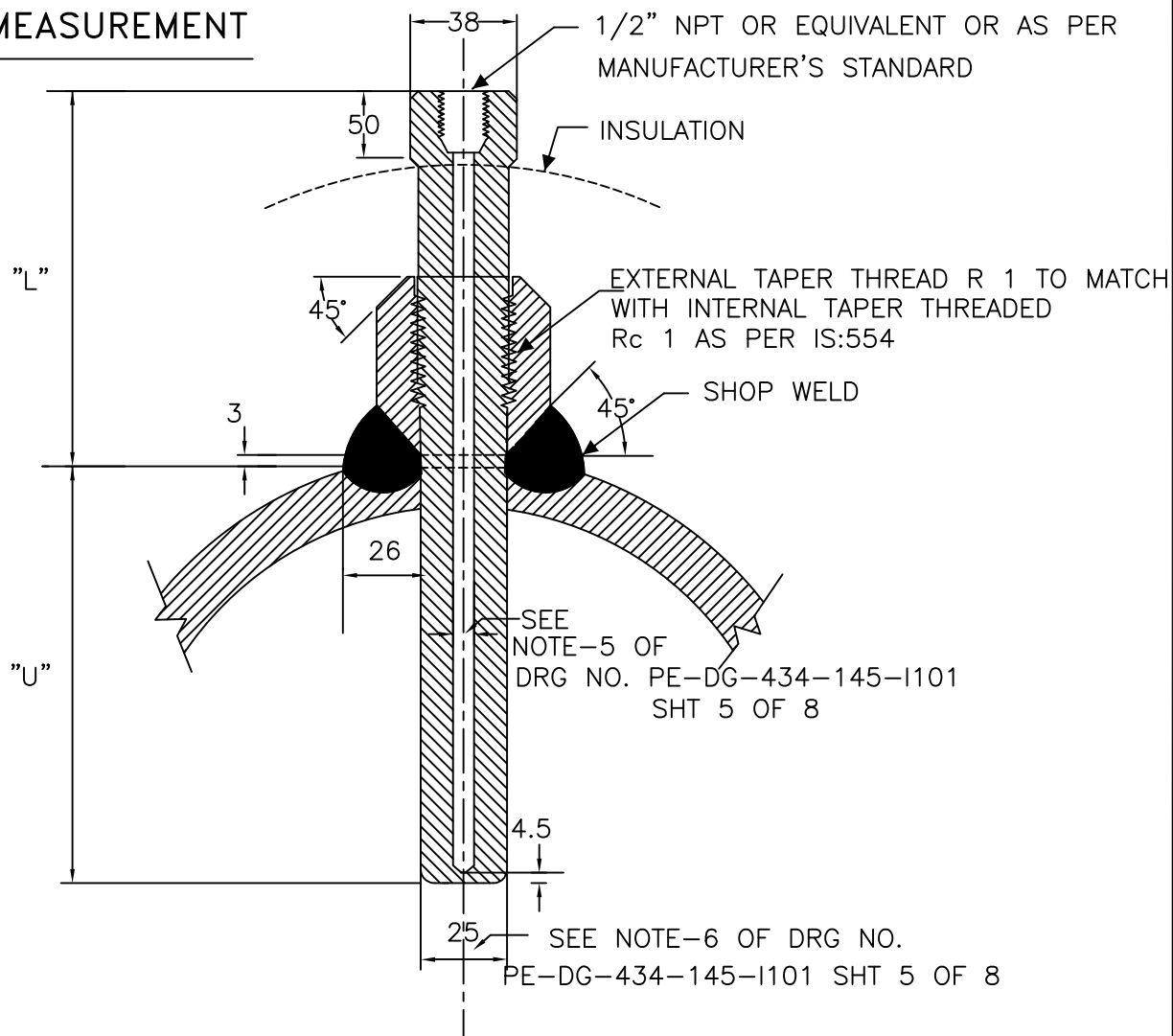
PE-DG-434-145-I101

REV. 00

[PROCESS PRESS EQUAL/> 40 Kg/Cm2 (g)
PROCESS PRESS < 40 Kg/Cm2 (g), TEMP.EQUAL/>400 DEG C]

SH. 05 OF 08 SHS.

TEMP. MEASUREMENT



NOTES :-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE PROCESS PRESS/ TEMP. BELOW 40 KG/CM²(g)/400°C.
2. SEE NOTES-2 TO 9 IN SHT. 5 OF 8 OF THIS DRG.
3. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.

For applicable services the thermowell sizing calculation shall be submitted by bidder as per ASME PTC 19.3(Latest revision).

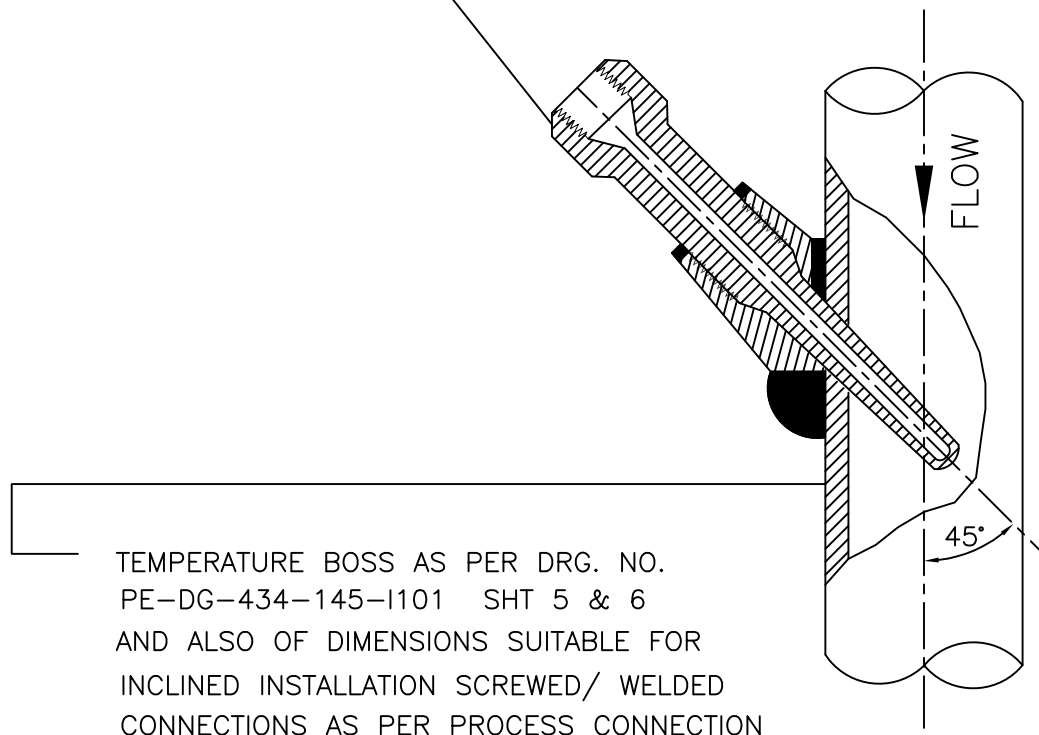


TITLE :
INST. STUB DETAILS (TEMP)
(APPLICABLE FOR PIPE SIZE ABOVE 4")

DRG. NO.
PE-DG-434-145-I101
REV. 00
SH. 06 OF 08 SHS.

[PROCESS PRESS < 40 Kg/Cm² (g), TEMP < 400 °C]

THERMOWELL SUITABLE FOR THE BOSS
AS PER DRG. NO.
PE-DG-434-145-I101 SHT 5 & 6



NOTES :-

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION MAY BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (ATLEAST 3-4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDE OF INSTALLED THERMOWELL).



TITLE :

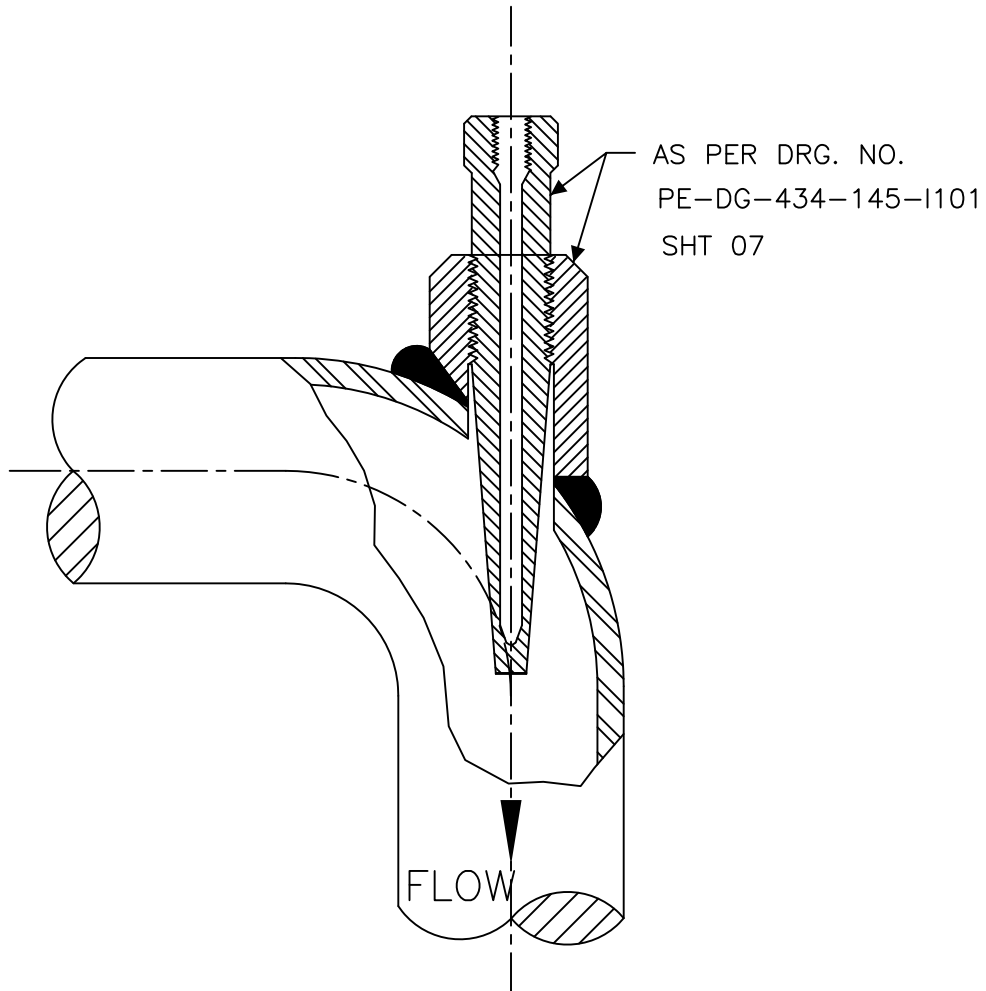
THERMOWELL INSTALLATION

DRG. NO.

PE-DG-434-145-I101

REV. 00

SH. 07 OF 08 SHS.



NOTES :-

1. FLOW INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE. THIS DETAIL IS APPLICABLE FOR THERMOWELL INSTALLATION IN BEND PIPES.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE TO BE USED FOR LIQUID SERVICE. FOR STEAM SERVICES EXPANDER SECTION TO BE USED IN VERTICAL PLANE.



TITLE :

**THERMOWELL INSTALLATION
(IN BEND PIPES)**

DRG. NO.

PE-DG-434-145-I101

REV. 00

SH. 08 OF 08 SHS.

QUALITY ASSURANCE FOR INSTRUMENTS

CLAUSE NO.	TECHNICAL REQUIREMENTS 	
1.00.00	TYPE TEST REQUIREMENTS	
1.01.00	General Requirements	
1.01.01	The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the bidder proposes a different standard/code from that indicated at table 3.00.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard. (a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests. (b) For the rest, submission of type test results and certificate shall be acceptable provided. i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. ii. There has been no change in the components from the offered equipment & tested equipment. iii. The test has been carried out as per the latest standards alongwith amendments as on the date of Bid opening. (c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.	
1.01.02	As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.	
1.01.03	The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.	
1.01.04	For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.	
1.01.05	The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Employer. If a test is waived off, then the cost shall not be payable.	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIIC-10 TYPE TEST REQUIREMENTS PAGE 1 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC
3.00.00	TYPE TEST REQUIREMENT FOR C&I SYSTEMS						
	Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate	
	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	
	1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes	
	2	Transducers	As per standard (col 4)	IEC-60688,IS12784	No	Yes	
	3	Thermocouple	Degree of protection test	IS-13947	No	No	
	4	RTD	As per standard (col 4)	IEC-60751	No	No	
	5	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes	
	6	E/P converter	As per standard (col 4)	Mfr. standard	No	No	
	7	Dust emission monitor	Degree of protection test	IS-13947	No	Yes	
	8	Instrumentation Cables Twisted & Shielded*					
		-Conductor	Resistance test	VDE-0815	No	Yes	
			Diameter test	IS-10810	No	Yes	
			Tin Coating test (Persulphate test)	IS-8130	No	Yes	
		-Insulation	Loss of mass	VDE 0472	No	Yes	
		Ageing in air ovens**	VDE 0472	No	Yes		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 3 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS				
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
	-Inner sheath***	Loss of mass	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Cold bend/ cold impact test	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
	-Outer sheath	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes
		Colour fastness to water	IS-5831	No	Yes
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	
				PAGE 4 OF 9	

CLAUSE NO.	TECHNICAL REQUIREMENTS					एनटीपीसी NTPC
		Cold bend/ cold impact test	VDE-0472	No	Yes	
		Oxygen index test	ASTMD-2863	No	Yes	
		Smoke Density Test	ASTMD-2843	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-fillers	Oxygen index test	ASTMD-2863	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-AL-MYLAR shield	Continuity test		No	Yes	
		Shield thickness		No	Yes	
		Overlap test		No	Yes	
	-Over all cable	Flammability Test	IEEE 383	No	Yes	
		Swedish Chimney Test	SEN 4241475	No	Yes	
		Noise interference	IEEE Trans-actions	No	Yes	
		Dimensional checks	IS 10810	No	Yes	
		Cross talk	VDE-0472	No	Yes	
		Mutual capacitance	VDE-0472	No	Yes	
		HV test	VDE-0815	No	Yes	
		Drain wire continuity		No	Yes	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 5 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																									
	* 1.0 All cables to be supplied shall be of type tested quality. The Contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last Ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. 2.0 In case the Contractor is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Contractor shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval. **These tests shall be carried out as per VDE0207 Part 6 & ASTM-D-2116 for TEFLON insulated & outer sheathed cables ***Applicable for armoured cables only 9 DC Power Supply System (Applicable for each model and rating) 1)The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable <table><tr><td>Surge Withstand Capability(SWC)</td><td>ANSI 37.90.1, No IEEE-472,EN 61000-4-12</td><td>Yes</td></tr><tr><td>Dry Heat Test</td><td>IEC-68-2-2 or No equivalent</td><td>Yes</td></tr><tr><td>Damp Heat test</td><td>IEC-68-2-3 or No equivalent</td><td>Yes</td></tr><tr><td>Vibration test</td><td>IEC68-2-6 or No equivalent</td><td>Yes</td></tr><tr><td>Electrostatic discharge test</td><td>EN 61000-4-2 No orr equivalent</td><td>Yes</td></tr><tr><td>Radio frequency immunity test</td><td>EN-61000-4-3 No orr equivalent</td><td>Yes</td></tr><tr><td>Electromagnetic field immunity</td><td>EN 61000-4-3 No orr equivalent</td><td>Yes</td></tr><tr><td>Degree of Protection</td><td>IS-13947 or No equivalent</td><td>Yes</td></tr></table>	Surge Withstand Capability(SWC)	ANSI 37.90.1, No IEEE-472,EN 61000-4-12	Yes	Dry Heat Test	IEC-68-2-2 or No equivalent	Yes	Damp Heat test	IEC-68-2-3 or No equivalent	Yes	Vibration test	IEC68-2-6 or No equivalent	Yes	Electrostatic discharge test	EN 61000-4-2 No orr equivalent	Yes	Radio frequency immunity test	EN-61000-4-3 No orr equivalent	Yes	Electromagnetic field immunity	EN 61000-4-3 No orr equivalent	Yes	Degree of Protection	IS-13947 or No equivalent	Yes		
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS	PAGE 6 OF 9																								

CLAUSE NO.	TECHNICAL REQUIREMENTS						एनटीपीसी NTPC
	13	Voltage Stabilisers	Over Load Test	Approved procedure	No	Yes	
			Temp rise test without redundant fans	Approved procedure	No	Yes	
	14	Public Address System					
		- Amplifiers	As standard (col 4)	per IS Part-II 9302,	No	Yes	
		Microphones	As per standard (col 4)	IS Part-III 9302,	No	Yes	
				IS 15482:2004/ IEC 61842(2002)			
		Loudspeaker	As per standard (col 4)	IS Part-IV 9302,	No	Yes	
	15	LIE / LIR	Degree of protection test	IS-13947	No	Yes	
	16	Flue gas analyzers	Degree of protection test	IS-13947	No	Yes	
	17	Master Clock	Functional test	As per approved procedure	No	Yes	
18	CJC Box	Degree of protection test	IS-13947	No	Yes		
19	Junction Box	Degree of protection Test	IS-13947	No	Yes		
20	OPC Access Data Server	Data Server, OPC Compliance Testing &		No	Yes (Self certification is also		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)			TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 8 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS 																																															
	Historical Data Access Server acceptable) <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center; vertical-align: top;">21</td><td style="width: 35%; vertical-align: top;">Conductivity Type Level Switch</td><td style="width: 15%; vertical-align: top;">Degree of protection test</td><td style="width: 5%; text-align: center; vertical-align: top;">of</td><td style="width: 15%; vertical-align: top;">IS-2147</td><td style="width: 10%; text-align: center; vertical-align: top;">No</td><td style="width: 10%; text-align: center; vertical-align: top;">No</td></tr> <tr> <td style="text-align: center; vertical-align: top;">22</td><td style="vertical-align: top;">Local Gauges</td><td style="vertical-align: top;">Degree of protection test</td><td style="text-align: center; vertical-align: top;">of</td><td style="vertical-align: top;">IS-2147</td><td style="text-align: center; vertical-align: top;">No</td><td style="text-align: center; vertical-align: top;">No</td></tr> <tr> <td style="text-align: center; vertical-align: top;">23</td><td style="vertical-align: top;">Process actuated Switches</td><td style="vertical-align: top;">Degree of protection test</td><td style="text-align: center; vertical-align: top;">of</td><td style="vertical-align: top;">IS-2147</td><td style="text-align: center; vertical-align: top;">No</td><td style="text-align: center; vertical-align: top;">No</td></tr> <tr> <td style="text-align: center; vertical-align: top;">24</td><td style="vertical-align: top;">Control Valves</td><td style="vertical-align: top;">CV test</td><td></td><td style="vertical-align: top;">ISA 75.02& 75.11</td><td style="text-align: center; vertical-align: top;">No</td><td style="text-align: center; vertical-align: top;">Yes</td></tr> <tr> <td style="text-align: center; vertical-align: top;">25</td><td style="vertical-align: top;">PLCs</td><td style="vertical-align: top;">As per standard (Col 4)</td><td style="text-align: center; vertical-align: top;">per</td><td style="vertical-align: top;">IEC 1131</td><td style="text-align: center; vertical-align: top;">No</td><td style="text-align: center; vertical-align: top;">No</td></tr> <tr> <td style="text-align: center; vertical-align: top;">26</td><td style="vertical-align: top;">Flow Nozzle Orifice plates</td><td style="vertical-align: top;">Calibration</td><td></td><td style="vertical-align: top;">ASME PTC BS 1042</td><td style="text-align: center; vertical-align: top;">No</td><td style="text-align: center; vertical-align: top;">Yes</td></tr> </table> ## The contractor shall submit for Employers approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence / owners representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier. Note: Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.						21	Conductivity Type Level Switch	Degree of protection test	of	IS-2147	No	No	22	Local Gauges	Degree of protection test	of	IS-2147	No	No	23	Process actuated Switches	Degree of protection test	of	IS-2147	No	No	24	Control Valves	CV test		ISA 75.02& 75.11	No	Yes	25	PLCs	As per standard (Col 4)	per	IEC 1131	No	No	26	Flow Nozzle Orifice plates	Calibration		ASME PTC BS 1042	No	Yes
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EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2		SUB-SECTION-IIIC-10 TYPE TEST REQUIREMENTS		PAGE 9 OF 9																																										

CLAUSE NO.	QUALITY ASSURANCE										एनटीपीसी NTPC																																																																																																																																																																																																										
<table><tr><th colspan="12">MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)</th></tr><tr><th rowspan="2">ITEMS</th><th rowspan="2">TESTS</th><th rowspan="2">Dimensions (R)</th><th rowspan="2">Make, Model, Type, Rating (R)</th><th rowspan="2">Process / Electrical connection (R)</th><th rowspan="2">Calibration (R)</th><th rowspan="2">Test as per standard(R)</th><th rowspan="2">Insulation Resistance (R)</th><th rowspan="2">IBR Certification (if applicable)(R)</th><th rowspan="2">Hydro Test(R)</th><th rowspan="2">Material Test certificate ®</th></tr><tr></tr><tr><td>1. PR Gauge (IS-3624)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>2. Temp. Gauge (BS-5235)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td></tr><tr><td>3. Pr./D.P.Switch(BS-6134)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>4. Electronic Transmitter(IEC-770)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>5. Temp. Switch</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>6. Recorder(IS-9319/ANSI C-39.4)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>7. Vertical indicators</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td></tr><tr><td>8. Digital Indicators</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td></tr><tr><td>9. Integrators</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10. Electrical Metering Instrument (IS-1248)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>11. Transducer (IEC-688)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>12. Thermocouples (ANSI-MC-96.1)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>13. RTD(IEC-751)</td><td></td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td><td></td><td></td><td></td></tr><tr><td>14. Thermowell</td><td></td><td>Y</td><td></td><td>Y</td><td></td><td></td><td></td><td>Y</td><td>Y</td><td>Y</td></tr><tr><td colspan="12">R-Routine Test A- Acceptance Test Y – Test applicable</td></tr><tr><td colspan="12">:</td></tr></table>													MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)												ITEMS	TESTS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Test as per standard(R)	Insulation Resistance (R)	IBR Certification (if applicable)(R)	Hydro Test(R)	Material Test certificate ®	1. PR Gauge (IS-3624)		Y	Y	Y	Y	Y					2. Temp. Gauge (BS-5235)		Y	Y	Y	Y	Y					3. Pr./D.P.Switch(BS-6134)		Y	Y	Y	Y	Y	Y				4. Electronic Transmitter(IEC-770)		Y	Y	Y	Y	Y	Y				5. Temp. Switch		Y	Y	Y	Y	Y	Y				6. Recorder(IS-9319/ANSI C-39.4)		Y	Y	Y	Y	Y	Y				7. Vertical indicators		Y	Y	Y	Y		Y				8. Digital Indicators		Y	Y	Y	Y		Y				9. Integrators		Y	Y	Y	Y						10. Electrical Metering Instrument (IS-1248)		Y	Y	Y	Y	Y	Y				11. Transducer (IEC-688)		Y	Y	Y	Y	Y	Y				12. Thermocouples (ANSI-MC-96.1)		Y	Y	Y	Y	Y	Y				13. RTD(IEC-751)		Y	Y	Y	Y	Y	Y				14. Thermowell		Y		Y				Y	Y	Y	R-Routine Test A- Acceptance Test Y – Test applicable												:											
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CLAUSE NO.		QUALITY ASSURANCE												
ITEMS	TESTS	Dimensions (R)	Make, Model, Type, Rating (R)	Process / Electrical connection (R)	Calibration (R)	Requirement as per standard (R)	WPS approval (A)	Non-destructive testing (R)	Calculation for accuracy (R)	Insulation Resistance (R)	IBR Certification as applicable (R)	Hydro test (R)	Material test certificate (A)	
15. Cold junction compensation box		Y	Y	Y	Y					Y				
16. Orifice plate(BS-1042)		Y	Y	Y	Y *	Y	Y **	Y **			Y	Y **	Y	
17. Flow nozzle(BS-1042)		Y	Y	Y	Y *	Y	Y	Y			Y	Y	Y	
18. Impact head type element		Y	Y	Y					Y				Y	
19. Level transmitter/float type switch		Y	Y	Y	Y					Y	Y	Y	Y	
20. Flue Gas analyser		Y	Y	Y	Y									
21. Dust emission monitors		Y	Y	Y	Y									
*Calibration to be carried out on one flow element of each type and size if calibration carried out as type test same shall not be repeated.														
** If applicable														
R-Routine Test A- Acceptance Test Y – Test applicable														
Note: 1) Detailed procedure of Environmental Stress screening test shall be as per Quality Assurance. Programme in General Technical Conditions 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the Practices and Procedure adopted alongwith relevant supporting documents.														
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2					SUB-SECTION-E-61A MEASURING INSTRUMENTS (PRIMARY & SECONDARY)					Page 2 of 2		

CLAUSE NO.		QUALITY ASSURANCE												एनटीपीसी NTPC
ELECTRICAL ACTUATOR WITH INTEGRAL STARTER														
ITEM/ COPONENT/ SUB SYSTEM ASSEMBLY/ TESTING	Test/Attributes Characteristics													
		RPM ®	No Load Current ®	IR & HV Test®	Mounting Dimension®	All routine Test as per Standard & Specification®	Correct Phase Sequence®	Operation & Setting of limit Switch/Torque Switch®	Stall Torque/Current (A)	Hand Wheel operation/ Auto de clutch function (A)	Function of Aux. like Potentiometer, space heater, position indicator ®	EPT output ®	Grease leakage ®	Local/ Remote (Open-Stop-Close) Operation® Safety check (Single phasing, Phase correction, Tripping etc.) (A)
	ELECTRICAL ACTUATOR WITH INTEGRAL STARTER(IS_9334)													
	Motor	Y	Y	Y	Y	Y								
	Final Testing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Note: 1) Detailed procedure of Environmental Stress Screening test shall be as per Quality Assurance Programme in General Technical Conditions. Requirement of test and procedure finalized during QP finalization 2) This is an indicative list of tests/checks. The manufacturer is to furnish a detailed quality plan indicating the practices and procedure adopted along with relevant supporting documents.														
® - Routine Test (A) - Acceptance Test Y - Test applicable														

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2	SUB-SECTION-E-68 ELECTRICAL ACTUATOR WITH INTEGRAL STARTER	Page 1 of 1
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 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION C				
								ISSUE NO. 2		REV. NO. 00		DATE: 25.05.2016
								SHEET 1		OF		6
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.0	INCOMING MATERIAL											
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3	---	2,1	TC for body/bonnet from foundry only
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet /	Approved drg. / data sheet /	Test Certificate	3/2	2	1	1.IBR Certification (if applicable) to be verified by BHEL. 2.Applicable for body /bonnet only
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1	Applicable for body and bonnet for rating ANSI 900 and above.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining.
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2	

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

RT- Radiographic Test
 UT – Ultrasonic Test

PT – Dye penetrant Test
 MT- Magnetic Test

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-999-145-I 006				
								VOLUME IIB				
								SECTION C				
								ISSUE NO. 2 REV. NO. 00 DATE: 25.05.2016				
								SHEET 2 OF 6				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.3	Spring	2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2,1	
		1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Mfr. standard	Record	3	---	2	
		1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
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RT- Radiographic Test
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks	
									P	W	V		
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2		
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2		
2.0	IN PROCESS INSPECTION												
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.	
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1		
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1		
3.0	TESTS ON COMPLETED VALVE												
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4	
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ASME B16.34	No Leakage	Test Certificate	2	1	1	Refer Note-4	
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1	1	Refer Note-4	
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4	
		2. Opening/Closing time	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4	
		3. Linearity/cam characteristic	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4	
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		4. Repeatability	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4		
		5. Hysteresis	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4		
		6. Sensitivity	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4		
		7. Accuracy (Overall)	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4		
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	Mfr. Procedure	Approved drg. / data sheet	Test Certificate	2	--	1	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.		
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Mfr. Procedure	Approved drg./ data sheet	Test Report	2	1	1	On assembled valve Refer Note-4		
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	Approved drg./ data sheet	Records	2	1	1	Refer Note-4		
		11. Pre defined valve position in case of air failure	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	1	1			
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional, paint thickness	100%	Mfr. Procedure	Approved drg./ data sheet	Test Certificate	2	1	1			
		13. Surface Quality	MA	Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1			
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									P	W	V	
5.0	AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	Certificate of Conformance (C.O.C)
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	---	(C.O.C)
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	---	(C.O.C)
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)
5.6	Smart Positioner	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	---	(C.O.C)

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	(As Applicable)	2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	---	(C.O.C)	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	---	(C.O.C)	
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	---	(C.O.C)	
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-2	
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3	

NOTES:

1. In case valid CV test certificate for a similar control valve (same size, same CV, same trim characteristics) is not submitted to BHEL by the vendor, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, if called for in the Data sheets.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests (Leak/Operation), C.O.C's (Certificates of Conformance) shall be submitted to BHEL for verification and acceptance.

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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	MAINTENANCE AND CALIBRATION EQUIPMENT			
1.01.01	Maintenance and Calibration equipments of proven type, shall be provided as a minimum by the Contractor. The Contractor shall be responsible for supplying all accessories and any necessary additional tools as required for proper maintenance and calibration of the installed C&I devices/systems.			
1.01.02	Electrical power supply requirement of the instruments offered under this Sub-section shall be 230 V AC, 50 Hertz nominal, single phase.			
1.01.03	All the electronic M&C items shall be microprocessor based and shall have the data logging facility for keeping calibration/maintenance records with proper communication facility for downloading these data on the Lab PC.			
1.01.04	The calibration standards of all M&C equipments furnished under this sub-section shall be traceable to National Bureau of Standards, USA or NPL, India or to the applicable standards existing in the country where the equipment is manufactured.			
1.01.05	Bidder to note that these maintenance & calibration equipment shall be for Employer's use for normal operation & maintenance of the plant & shall not be used by the bidder for calibration etc during commissioning. During commissioning, for calibration and other activities, Bidder shall bring his own equipment.			
1.01.06	The accuracy of the M&C equipments shall be better than the instrument being calibrated. The range of all the M&C equipments shall cover the entire range of the instruments being provided under this contract. Dustproof carrying case and rechargeable battery along with external charger shall be provided with all equipments.			
1.01.07	Contractor shall ensure with appropriate documentation that direct service/support from the M&C item supplier/manufacture shall be available to the employer for all M&C items for a minimum period of 5 years after the expiry of defect liability period.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800MW)		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS:9585-001-2	SUB-SECTION - IIIC-16 MAINTENANCE & CALIBRATION EQUIP.	PAGE 1 OF 1

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