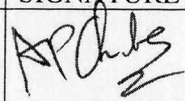
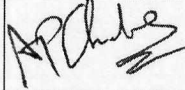
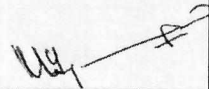


TITLE: TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS FOR ECI

ITEM : ACTUATOR FOR FANS BLADE PITCH CONTROL (CONTINUOUS MODULATING DUTY)

	NAME	DESIGNATION	SIGNATURE	DATE
PREPARED	A.P.CHANDRASEKAR	Dy. Manager		11-01-2020
CHECKED	A.P.CHANDRASEKAR	Dy. Manager		11-01-2020
APPROVED	M.JEYAMURUGANAND	AGM		11-01-2020

ISSUED BY
EDC-ECI

RECORDS OF REVISION:

REVISION NUMBER 02	Specification Generalised	11-01-2020
REVISION NUMBER 01	Cl. 2.3, 10.1 revised	09-08-2018
REVISION NUMBER 00	INITIAL RELEASE	02-05-2018

Sl. No.	Details	Requirements
1.0	General	
1.1	Site Conditions	Ambient Temperature : -20° C to 60° C. Refer to point no. 2.4 for actuator design temperature. Relative Humidity : 95% Atmosphere : Tropical, dusty, salty, corrosive and highly polluted.
2.0	Actuator	
2.1	Actuator type	Continuous Modulating duty, electrical actuator, operated by 4-20 mA demand signal from the control system. Shall be electrical motor driven, consisting of suitable gear train mechanism with other accessories such as power supply, starter circuit, position controller, position feedback transmitter etc. Shall be Foot mounted, Lever operated type.
2.2	Application	Used in the critical application of FD/ID/PA/Booster fan blade pitch variation for controlling the draft requirement in powerplant. Hence, failure of any one or more electrical actuator will result in reduction in power generation to half or total loss of power generation. For Blade pitch control, this electrical actuator provides the pilot action to the hydraulic control unit of the fans based on the demand signal, resulting in the change of blade angle.
2.3	Standards	Shall conform to EN-15714-2 CLASS D standard or equivalent for all requirements.
2.4	Construction	Shall be suitable for operation in hot, humid and tropical atmosphere, highly polluted at places with coal dust and/or fly ash. Actuator enclosure shall be totally enclosed, dust tight, weather-

		proof construction meeting the requirements of IP-68. Shall be suitable for working in a temperature range, (-)20 °C to (+)60 °C.
		Shall be designed for mounting in any orientation without any lubricant leakage or operational difficulties.
2.5	Manual operation	Provision for manual operation such as Hand wheel/Knob/Lever shall be provided for operating the actuator during emergency conditions, during loss of power supply.
3.0	Power Supply	
3.1	Power Supply	1 no. of power supply feeder of 415 V AC(+/-10%), 3 phase, 3 wire, 50Hz(+/-5%) (SFU type feeder) will be provided to each actuator present in the field. (Vendor to take care of separate hardware units in each actuator, to derive any other voltages that are required for the operation of the actuator). For power cables, the grade of TBs in actuator shall be 600V minimum.
3.2	Power supply variation	Voltage variation $\pm 10\%$, Frequency variation $\pm 5\%$, Combined voltage and frequency variation 10 %. Actuator should perform without any problem, even under the above situations.
4.0	Design requirements	
4.1	Torque requirement	Shall develop the torque at the output shaft, as specified in the purchase enquiry.
4.2	Operating time of the actuator	Operating time (full close-full open) shall be 30-35 sec at rated voltage and frequency meeting the load lever torque, rotation & radius requirements furnished after ordering. Tentative load lever details: radius-150 mm & rotation 90 deg.

4.3	Angle of travel (actuator arm)	Crank arm rotation of actuator for the input 4-20 mA signal shall be finalized by vendor based on the operating time (30-35sec), torque requirement (10 kg.m) & load lever details (furnished after order)
4.4	Resolution/Precision	0.1% to 0.2% or better of total travel.
5.0	Motor	
5.1	Motor	The type of motor shall be Squirrel Cage Induction type with Variable Frequency drive or Permanent Magnet Synchronous motor or Brushless DC motor, as per the actuator design. Motor shall be suitable for Continuous duty.
5.2	Duty Cycle	The duty cycle of the actuator motor shall be 3600 starts/hour or higher.
5.3	Motor winding Insulation	Shall have class-F insulation with tropicalisation suitable for the site conditions.
6.0	Gear Mechanism	
6.1	Gear mechanism	Shall be provided with required gear train mechanism for the purpose of speed reduction. Shall be made out of suitable metal. The gear mechanism shall be suitable for continuous modulating duty and shall be designed suitably to achieve the actuator performance characteristics as indicated in clause no. 7.2. Self-locking feature has to be provided to prevent the drift due to the load acting on the actuator.
6.2	Lubricant	The gear train mechanism shall be either Oil or Grease lubricated.
7.0	Actuator Controls	
		Shall have the following minimum features : a. Integral Starter module with Electronic reversing circuits. b. Electronic positioner circuit. c. Lockable Local/Remote selector switch.

7.1	Features of the Actuator	d. Push buttons for local operation. e. Adequate protection feature such as single phasing protection, over load protection etc. as applicable, shall be provided. f. Indicating lamps/LED/LCD readout for status/fault, position and indication. g. Potential free, common annunciation contact for various fault conditions. h. Provision to diagnose the type of fault locally in the actuator. i. Shall have SMART, non-intrusive facilities for calibration. j. Vendor to supply necessary tools & kit, parameterization/diagnosis software for actuator calibration, setting, configuration of various parameters and diagnosis at site.
7.2	Actuator performance characteristics	a. Minimum input signal (Deadband) for which the actuator can respond : 0.5 % of full span. b. The actuator shall have STAYPUT characteristics on loss of the demand and feedback signal.
7.3	Position feedback Transmitter: Actuator control:	Non-contact type position sensor, shall be provided with isolated 4-20 mA DC current output to DCS (24V DC). 4-20 mA (24V DC).
7.4	Position sensing limit	Position limit sensing shall be made available and potential-free, contact shall be provided for Open, Close and 2 predefined intermediary positions respectively and all the contacts shall be terminated in the terminal box. Vendor to indicate the contact rating.
8.0	Local position Indicator	Shall be provided.

9.0 Internal Wiring and Termination		
9.1	Internal wiring	Shall be done by using cables of suitable size with proper ferruling. Signal interface details shall be neatly affixed on to the cover/body.
9.2	Termination of Power & Control Cable	1 no. Double compression type, Weather proof, Brass with Nickel plated, cable gland shall be provided for the power cable of OD – 16 mm. Plug & socket/ gland type connectors as per vendor standard shall be provided for the termination of command and feedback signals. The socket/ connectors shall be fixed on the terminal board and wired to the terminal blocks. The Plug shall be suitable for a cable of OD 16 mm (approx.).
9.3	Earth terminal	Shall be provided.
10.0 Output Levers and Linkage rod		
10.1	Linkage assembly with crank arm (actuator side) & load lever arm (fan side)	Vendor to provide linkage assembly of length 350 ± 50 mm (will be confirmed after order), with suitable adjustable crank arm on actuator side and lever arm on fan side. Necessary inputs regarding lever arm on fan side (rotation, radius & size) will be given after ordering during drawing submission stage to design the actuator crank arm rotation and radius. Necessary fasteners to erect the actuator on BHEL supplied frame shall be supplied by Vendor. The orientation and rotation of the actuator crank arm has to be matched with the style drawing enclosed with Purchase Enquiry.
11.0 Finish		
11.1	Painting	All external Parts shall be finished and painted to produce a neat and durable surface using Epoxy based paint, which would prevent Corrosion & Rusting.

11.2	Asbestos free	The materials used in the actuator and its accessories, shall be free from asbestos.
12.0	Inspection & Testing	
12.1	Quality Plan	Vendor to submit the Vendor Quality Plan for review and approval by BHEL and Customer.
12.2	Inspection Testing	& As per the technical specification, approved Data sheet and approved Quality Plan.
13.0	Documents to be submitted (ALL DRAWINGS WILL BE SUBJECT TO APPROVAL BY M/s NTPC AFTER P.O.)	
13.1	Documents to be submitted along with offer	a. Vendor has to submit “Sub-delivery Enquiry deviation form”, indicating No-Deviation, in case of no deviation, with respect to the requirements indicated in the purchase enquiry. The references of the technical specification and the quality plan have to be indicated in the format. Deviations shall only be indicated in the above form. Deviations indicated elsewhere in the offer will not be considered. b. Technical data sheet, as per BHEL’s format. c. Actuator catalogues, model decoding sheet, wiring drawing, GA drawings and Sizing Calculations. d. Vendor Quality Plan incorporating (Inspection at Raw material stage/In-process stage/Finished product stage, Routine tests and type tests.)
13.2	Documents to be submitted for approval after placement of	a. Technical data sheet and link assist datasheet as per BHEL’s format. b. GA Drawings with dimensional details. c. Wiring drawings. d. Vendor Quality Plan.

	Purchase order (ALL DRAWINGS WILL BE APPROVED BY M/s NTPC)	
13.3	O & M manuals	O & M manuals including all details required for operation, erection and commissioning–Soft copies in CDs shall be submitted to BHEL. 2 Sets of hard copies shall be sent to site along with actuator packing.
14.0	Packing	The packing shall be sea-worthy and shall meet Transport, environment, Storage and handling hazards, meeting the requirements as per relevant international standards.
15.0	Pre - Qualification requirement	Vendor should have supplied and commissioned similar products of suitable ratings to thermal power plant applications or industrial applications and the same shall be working satisfactorily for a period of minimum 2 years as on the date of techno-commercial bid opening. The bidder can offer and supply such equipment with collaboration or valid license agreement for design, engineering, manufacture and supply of such equipment in India provided the collaborator meets the above criteria.
16.0	Commissioning	Commissioning of the actuator shall be in vendor's scope. Vendor to take-care of the commissioning spares and special tools required for successful commissioning of the product. A commissioning protocol shall be signed by the customer, site & vendor on successful commissioning of the system and shall be submitted to BHEL-Ranipet.
17.0	Spares	Supplier to indicate a list of recommended spares for 5 years of trouble free operation.

18.0	Service support	After commissioning, vendor to provide necessary service support to installations at various power plant sites like trouble shooting/rectification works, re-calibration of actuator etc. and shall support supply of spares for a minimum period of 5 years,
19.0	Specific Requirements	Control unit: Blade Pitch (Booster Fan blade pitch control) Actuating Torque (kg-m): 10 Load lever Radius (mm): Approx. 150 Load lever angle of travel (deg.): Approx 90 deg Actuator style: Style -01 (Refer attached drawing) Operating time: 30-35 sec.

This technical specification covers only the basic requirements. However, vendor shall take care of all the requirements of the actuator to meet with the performance requirements and to ensure the completeness of the system.

Vendor to indicate whether the following accessories/features are applicable or not. If it is not applicable, vendor to furnish reasons and elaborate how the requirement is taken care of.

1.	Thermostat	Thermostats shall be provided in the motor winding for monitoring the temperature rise and the same shall be interlocked with the control circuit.
2.	Space heater	Actuator shall be provided with Space heater for the purpose of anti-condensation inside the actuator housing. The space heater shall be suitably rated and the power supply shall be derived internally from the main power supply.
3.	Torque switch	Torque switch shall be provided for Open and Close positions. The control circuit shall bypass the torque switches at both end positions.