



**Bharat Heavy
Electricals Ltd**
Boiler Auxiliaries Plant
Ranipet-632 406

EDC / AIR PREHEATERS
TECHNICAL SPECIFICATION
Effective Date: 09.08.2018

Specification No : RAH-532

Rev. No : 01

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01 Item : Triplex High Pressure plunger Pump with Motor and accessories.

02	Application	To supply high pressure water to Multimedia cleaning devices having nozzles of Ø2mm, located in Air pre-heater of power plant.
03	Surroundings	Dusty, humid and corrosive atmosphere of a coal/oil fired Boilers. Ambient Temperature 50°C.
04	Type of Pump	Horizontal Triplex High Pressure Plunger Pump.
05	Rated Flow	11.53 m³/hr at 220 Bar & 8.15 m³/hr at 110 bar.
06	Operating Pressure	100 Bar to 250 Bar
07	Design Pressure	250 Bar
08	Hydro Test pressure	375 Bar
09	Inlet Connection	To suit carbon steel pipe 80.0x4.8. Necessary flange/ mating flange / reducer to be supplied.
10	Outlet Connection	To suit carbon steel pipe 88.9x11.13. Necessary flange/ mating flange/ expander to be supplied.
11	Medium Handled	Water at 3 to 5 Kg/Sq. cm pressure at Ambient temperature.
12	Type of Operation	10 Hrs per day. Once in 15 days.
13	Mounting	Base mounting with foundation bolts at ground level.
14	Materials of Pump: a) Power End Pump body : Cast Iron IS 210 FG 300. b) Crank shaft & Connecting rod: Forged steel. c) Fluid end components including pump head, plunger, stuffing box, manifolds, valves & Pulsation Dampener: Stainless steel. d) Crank shaft bearings: Taper roller bearings of SKF/FAG make only. e) Fasteners: SS304 for fluid end components including pipe flange fasteners. f) Base plate / Frame: IS 2062.	
15	Electric Motor	Refer Page 03 to 05.
16	Scope of supply: a) Pump assembly complete with electric motor, local control panel, starter panel suitable for local & remote operation with digital display, all cables between motor, panels & accessories, coupling, gear reduction unit, discharge pulsation dampener, spring loaded suction and discharge valve, relief valve, safety valve, pressure regulator valve with bypass connected to suction line, Oil lubrication system with oil pump, pressure indicator with needle valve and Pressure transmitter with sensor in suction and discharge, Drain valve in discharge, suction strainer and Base plate/frame with foundation bolts. b) Spares including 1 No each of Suction and delivery valve, complete set of seals and packing/gaskets and Pressure gauge. c) Erection and commissioning assistance at site for a period of 3 working man days (excluding travel duration) and this will also be considered for Bid evaluation.	

01	09.08.18				Clause 05, 16, 17 & Specification for electric motor updated
00	16.11.17	VMR	SCH	RSB	FRESH ISSUE
Rev.No	Date	Prepared	Checked	Approved	Record of Revisions.

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17	General	a) Supplier shall meet the scope of supply (clause 16) in totality. Deviation in scope, if any to be brought to the notice by supplier and to be resolved. b) Motor capacity shall be 15% more than pump input power required. c) Pump input power requirement shall be calculated based on maximum capacity of the designed pump, design pressure of 250 Bar and actual efficiency of the pump. d) Pump maximum capacity shall be calculated based on Plunger diameter, Stroke length, RPM, No. of plungers (three) and volumetric efficiency of the pump. e) Oil lubrication system with pump shall ensure the proper lubrication of all the bearings. f) Pump dry run prevention to be incorporated in the control system. Pump inlet and outlet pressure shall be digitally displayed at the control panel. g) Drive from motor to pump through gear box/coupling only. Belt/Chain drive not acceptable. h) Pump design shall facilitate maintenance without disconnecting pipelines. i) The supplier shall submit / furnish the following along with the offer. - General arrangement drawing of pump with motor assembly with base frame indicating overall dimensions, list of items with material specification, material standard and weight. - Calculation for Pump input power requirement & Pump maximum flow capacity. - Number of strokes per minute. - Motor rating, rated speed, motor efficiency, pump power, pump efficiency & overall efficiency of complete assy. - Data sheets for Pump & Motor attached in excel format to be filled by supplier. - Motor & Pump characteristics curves. - List of recommended spares for 3-years operation. - Quality plan. - Catalogue. - Scope of supply and deviations if any. j) Noise level shall be less than 85 dBA. k) Non-Asbestos gaskets/packing shall be used. l) Vendor shall submit the detailed dimensional drawings with data sheets, GA and wiring diagram of control panel for our approval after order. m) 3 Copies of O&M manual shall be supplied after order. n) BHEL will provide only 3 Phase 415V 50Hz supply to the starter panel, all other related supply for satisfactory operation shall be derived by vendor.	
18	Painting	Surface preparation as per SSPC-SP3 before painting. Two coats of red-oxide zinc phosphate primer as per IS:12774 to dry film thickness 60 microns and three coats of Synthetic enamel as per IS:2932 of Grey Shade No:692 of IS:5 to dry film thickness 60 microns. Total 120 microns minimum.	
19	Packing	Wooden packaging. Joints shall be dust & water proof. Openings with plastic / metal closures. Exposed machined surfaces to be coated with suitable rust preventive coating. Outside the case to be marked with From, To, Material code, quantity, weight etc.	
20	Inspection	a) Necessary approved Data sheet, Test Certificate and Guarantee Certificate shall be submitted. b) Hydrostatic test on fluid end at 1.5 times the design pressure as per IS-11745 to be done at works. c) Performance test as per IS-11745-1986 including vibration and bearing temperature measurement. d) Inspection will be done at Vendor's works by Customer/BHEL Inspector.	

Specification for Electric Motor

CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 1)
1.00	<u>SITE CONDITIONS</u>		
1.10	Altitude above mean sea level	216 m	
1.20	Ambient temperature condition	6 to 50°C.	
1.30	Relative humidity	100%	
1.40	Atmosphere	Tropical, Dusty, salty, corrosive & highly polluted in a coal based Thermal power plant.	
2.00	<u>GENERAL</u>		
2.01	Reference standards	IS 325, IS 1231, IS 4722, IS 6362, IS 2253, IS 12065, IS 12075, IS 4691 & <u>IS 12615- Energy efficient, IE3</u>	
2.02	Design ambient	50 Deg C	
2.03	Application/ Type(Normal/ Energy efficient)	Energy efficient - IE3.	
2.04	Duty cycle	Continuous S1	
2.05	Rated voltage, frequency & Phases	415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; 10% absolute sum - 3 phase	
2.06	Approved Make	CGL, Ahmednagar / SIEMENS, Mumbai / ABB, Bangalore / BBL, Mumbai / Jyoti, Vadodara / LHP-Solapur / Marathon, Kolkata	
2.07	Minimum starting voltage	80% of the rated voltage.	
2.08	Minimum voltage under which motor will run satisfactorily	The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals	
2.09	Capacity to restart (at voltage specified in point No. 2.05)	i. TWO successive starts from cold condition. ii. Two HOT successive restarts from Hot condition iii. Three equally spread start per hour.	
2.10	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage	
2.11	Type of balancing for rotor	Dynamic balancing	
2.12	Direction of rotation	Suitable for both direction	
2.13	Direction of cooling air	Non-drive end to driving end	
2.14	Class of insulation	Class F with temperature rise limited to Class B.	
2.15	Winding treatment	The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid & tropical climate. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin pour method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15	
2.16	Allowed winding temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method	
2.17	Starting current	Less than or equal to 600% full load current subject to tolerance as per IS.(Normal motor) Less than or equal to 700% full load current subject to tolerance as per IS.(Energy efficient)	

2.18	Starting time & locked rotor withstand time	The locked rotor withstand time (LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 3 sec more than the starting time at 80% of rated voltage for motors with acceleration time upto 20 sec at RV and 5 sec where the accelerating time is more than 20 sec at RV.	
2.19	Vibration	The peak amplitude of vibration shall be as per IS 12075	
2.20	Noise level	Within the limits specified by IS 12065. (<80 db at full load condition) @ 1 metre distance.	
2.21	Type of enclosure	TEFC, IP 55 as per IS 4691.	
2.22	Type of mounting	Horizontal foot mounted.	
2.23	Bearings	Ball or roller type / bearings effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum. Sealed bearings are also acceptable.	
2.24	Noise level	Sealed bearings are also acceptable.	
2.25	Lubricant Type	Grease	
2.26	Bearing life	Bearings shall have a minimum life of 40000 Working hours.	
2.27	Shaft extension	Motors shall be provided with key slotted bare shaft extension with key at the driving end.	
2.28	Terminal box Type	Weather proof IP 55 as per IS 4691, Capable of being turned through 360° in steps of 90°. However, in the case of rectangular type, Terminal Box shall be rotatable in steps of 180 Deg. Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation. The distance between gland plate and the centre of terminal studs shall not be less than 331 mm for rating 90-125KW & 203 mm for 125KW to 200KW.	
2.29	Cable gland and lugs	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size shall be supplied along with the motor. i) Size of power cables will be intimated after PO. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided	
2.30	Type of terminals	Stud / screw type with plain washers, spring washers / check nuts & lugs.	
2.31	Fault level	40 KA for 0.25 Sec (Suitable HRC fuse backup will be provided by BHEL in MCC/switchgear)	
2.32	Painting	Epoxy based paint (Colour shade 631/ Shade 632/ Shade 275/ RAL 5012 as per IS:5. This will be confirmed after PO.	
2.33	Space heaters		
	Motors above 30 kW	Separate space heater suitable for 240V, I Phase, AC ,50 Hz shall be provided	
	Terminals for space heater	Separately terminated with clear identification in main terminal box.	

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2.34	Thermistors/RTD for winding	Two numbers of Thermistors / RTD for each phase as below are to be provided A). Motors above 37 Kw shall have thermistors Or RTD. B). Motor rated 160kW and above shall have RTDs	
2.35	Bearing RTD	For motors 132 Kw and above bearing temperature detectors (RTD) shall also be offered.	
2.36	Terminals for RTD/ Thermistor	Thermistors/ RTDs shall be terminated in a auxiliary terminal box. Details shall be furnished in TB diagram.	
2.37	Earthing	Two no of earthing provisions on terminal box and on motor body. The cable terminal box shall have a separate grounding pad.	
2.38	Name plate	In addition to the minimum information required by IS 325, the following information shall be shown on motor rating plate : a) Temperature rise in Deg.C under rated condition and method of measurement. b) Degree of protection. c) Bearing identification no. and recommended lubricant. Bearing DE/ NDE details. d) Location of insulated bearings. e) Year of manufacture	
2.39	Lifting Device	Eye bolt or lugs to facilitate safe lifting.	
3.00	<u>INSPECTION & TESTING</u>	As per applicable quality plan	
4.00	<u>DOCUMENTS</u>		
	a) Along with offer:	One set of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details.	
	b) After placement of Purchase order (within 15 days)	Three sets of the following for approval: 1. Technical Data sheet as per the enclosed format. 2. Motor general arrangement drawing giving foundation details, shaft details and weight 3. Motor terminal box arrangement drawing. 4. Motor characteristic curves. The following shall be submitted : 1. Guarantee certificate. 2. O & M manuals. 3. Acceleration time and LRWT calculation shall be submitted for review.	

NOTE:

1. In 'Vendor compliance' column Vendor to indicate 'YES', 'NO' or 'NOT APPLICABLE'.
Clarification , if any, in this column will not be considered.