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	Operating Flow	15.5 m^3/hr at 220 Bar & 11 m^3/hr at 110 bar.
06	Operating Pressure	110 Bar to 220 Bar
07	Design Pressure	250 Bar
08	Hydro Test pressure	375 Bar
09	Inlet Connection	To suit carbon steel pipe 88.9x5.49. 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	160 KW. Details as per Page 05 to 09.
16	Scope of supply: a) Skid Mounted Pump assembly complete with electric motor, local control panel cum starter panel suitable for local & remote operation with digital display, all cables between motor and panels (5 meters minimum), coupling with guard, gear reduction unit, discharge pulsation dampener, Isolation valves in suction and discharge, safety valve, pressure regulator valve with bypass connected to suction line, Oil lubrication system with Oil pump, pressure indicator in discharge with two needle valves in series, Pressure transmitter with sensor in suction and discharge, suction strainer with drain valve, Enclosure for motor, Noise control accessory if required and Base plate/frame. b) Foundation bolts with Nuts & washers. c) Special Tools set d) Erection and commissioning assistance at site for a period of 3 working man days (excluding travel duration). e) Spares as per Enquiry.	

Rev.No	Date	Prepared	Checked	Approved	Record of Revisions.
02	06-07-19				Motor data sheet included.
01	18-03-19	G.A	K.P	K.P	Updated Scope, motor KW etc.
00	31.07.17	G.A	RSB	RSB	FRESH ISSUE

17	General a) Supplier shall confirm the scope of supply (clause 16) in totality. Offers with deviations may be rejected or accepted with loading (value as decided by the buyer) at the discretion of buyer. b) Oil lubrication system with pump shall ensure the proper lubrication of all the bearings & plungers. c) Motor capacity shall be 15% more than pump input power required. Rated Pump power shall be calculated using displaced volume, hydraulic & mechanical efficiency and design pressure of 250 bar. Rated Pump power shall not exceed 139 KW. d) Drive from motor to pump through gear box/coupling only. Belt/Chain drive not acceptable. e) Pump design shall facilitate maintenance without disconnecting pipelines. Drain line of Safety valve and suction strainer with drain valve to be connected to single drain line. f) Pump shall be built-in with dry-run protection and auto-trip (if exceeds pre-set pressure of 250 bar) features. Safety valve set pressure shall be 242 bar. g) Pump inlet and outlet pressure shall be digitally displayed at the control panel. h) The supplier shall submit / furnish the following along with the offer. I. General arrangement drawing of pump with motor assembly with base frame indicating overall dimensions, list of items with material specification, material standard and weight. II. Pump power calculation at maximum operating flow and design pressure, indicating volumetric efficiency & mechanical efficiency of pump. III. Data sheets for Pump enclosed in Page no.3 & 4 to be filled by supplier. IV. List of recommended spares for 3-years operation. V. Quality plan. VI. Catalogue. i) Noise level shall be less than 85 dB. Necessary accessories to be considered in the scope of supply. j) Non-Asbestos gaskets/packing shall be used. k) Vendor shall submit the detailed dimensional drawing with data sheets, Pump characteristic curves, GA and wiring diagram of control panel for our approval after order. l) 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. m) 3 Copies of O&M manual shall be supplied after order.	
18	Painting for HP Pump	Surface preparation and Painting shall be as per Painting schedule for HP pump / Cleaning device / Multimedia device / PGMA 52338.
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 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.

21. Pump datasheet to be submitted by vendor along with technical offer.

Sl No	Particulars	To be filled by the Vendor
1	Manufacturer	
2	Type	
3	Model Number	
4	Pump design Standard	
5	Plunger diameter in mm	
6	Stroke length in mm	
7	Pump speed Strokes per Minute SPM	
8	Volumetric Efficiency at Rated capacity	
9	Rated Capacity at 220 Bar, m^3/Hr	
10	Capacity at 110 Bar m^3/Hr	
11	Rated Pressure Bar	
12	Maximum pressure Bar	
13	Design pressure Bar	
14	Performance test pressure at works Bar	
15	Hydrostatic test pressure at works Bar	
16	Suction pressure considered Bar	
17	Pump Efficiency at Rated capacity at Design pressure	
18	Motor Efficiency at Rated pump capacity at Design pressure	
19	Overall efficiency of Pump with Motor	
20	Power required at rated pump capacity and Design pressure KW	
21	Margin considered over required power %	
22	Rated power of the drive motor KW	
23	Size of suction connection	
24	Size of discharge connection	
	Materials of Construction	Mention Material Standard with grade
25	Pump Body	
26	Pump head	
27	Plunger	
28	Plunger surface treatment	

Sl No	Particulars	To be filled by the Vendor
29	Cross head & Liner	
30	Connecting rod	
31	Connecting rod bearings	
32	Crank shaft	
33	Crank shaft bearing Number & Make	
34	Stuffing box	
35	Stufing box packing	
36	Suction manifold	
37	Discharge manifold	
38	Pulsation dampener	
39	Suction strainer	
40	Bolts, nuts & fasteners	
41	Base plate/frame	
42	Valves and valve seat	
43	Any other item	
	Lubrication, Gear box, coupling etc	
44	Type of lubrication	
45	Lubrication oil pump capacity	
46	Oil specification / Quantity	
47	Gear box type & Model number	
48	Number of stages, Reduction ratio	
49	Coupling type, make & quantity	
50	Coupling guard furnished	
51	Valves & Gauges	
52	Suction strainer Mesh size, make	
53	Total weight of Pump & Motor assy	
54	Base plate/frame size & thickness	
55	Foundation bolt size and quantity	
56	Noise level in dBA	

22. Specification for Electric Motor

Cl No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 1)
1.00	**SITE CONDITIONS**		
1.10	Altitude above mean sea level	149 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	**GENERAL**		
2.01	Reference standards	IS 325, IS 1231, IS 4722, IS 6362, IS 2253,IS 12065, IS 12075 , IS 4691 & IS 12615- Energy efficient, IE3	
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 ±10%; 50 Hz ± 5%; 10% absolute sum - 3 phase	
2.06	Approved Make	KEC, Bangalore / CGL, Ahmednagar / SIEMENS, Mumbai / ABB, Bangalore / BBL, Mumbai / Marathon, Kolkata / Jyoti, Vadodara / LHP, Solapur.	
2.07	Minimum starting voltage	80% of the rated voltage	
2.08	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes	
2.09	Capacity to restart (at voltage specified in point No. 2.05)	i. TWO successive starts from cold condition. ii. Two HOT restarts starts 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.	
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.	
2.25	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°.	
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.	
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	
2.38	Name plate	**As per IS 325 and Addl data on name plate::** a. Bearing DE/ NDE details. b. Year of manufacture	
2.39	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
3.00	**INSPECTION & TESTING**	**As per applicable quality plan**	
4.00	**DOCUMENTS**		
	a) Along with offer:	Motor general arrangement drawing giving mounting details & shaft details.	
	b) After placement of Purchase order (**within 15 days**)	**Three sets of the following for approval:** 1. Motor data sheet as per the enclosed format (page no 8 & 9 of this document) 2. Motor general arrangement drawing giving Mounting 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.

23. Motor Datasheet to be submitted by Vendor after placement of purchase order.

CL. NO	CHARACTERISTICS	**Vendor data (To be filled by vendor)**
1.0	Application	
1.1	Fan / Load Curve referred	
2.0	Manufacturer	
3.0	Type & frame size	Normal / Energy efficient **Frame size**:
3.1	Degree of Protection	IP55
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage , frequency & phases	• **415 V** AC ±10%; 50 Hz ± 5%; (Check voltage as per engy), 10% absolute sum - 3 phase
6.0	Full load current	Amps
7.0	Energy efficient	**As per IS 12615**
8.0	Efficiency & power factor at Full load	Eff-- PF---
9.0	Efficiency & power factor at 75 % load	Eff-- PF---
10.0	Efficiency & power factor at 50 % load	Eff-- PF---
11.0	Duty Cycle	S1 - Continuous
12.0	Rated torque	
13.0	Starting current	600% of full load current
14.0	No load current (with mechanism coupled)	**@ RV and Frequency**
15.0	Starting torque in % of full load torque	
16.0	Pull up torque in % of full load torque	
17.0	Pull out torque in % of full load torque	
18.0	No load starting time (without mechanism coupled)	
19.0	Locked rotor withstand time at rated voltage	a. Hot b. Cold
20.0	Locked rotor withstand time at minimum starting voltage	a. Hot b. Cold
21.0	Locked rotor withstand time at 110% rated voltage	a. Hot b. Cold
22.0	Starting time at **minimum** starting voltage with mechanism coupled	
23.0	Starting time at **rated** voltage with mechanism coupled	
24.0	Maximum permissible starting time	
25.0	Stator thermal time constant	Minutes
26.0	Type & No of terminals brought out	

Cl no	CHARACTERISTICS	Vendor Data (**To be filled by vendor**)
27.0	Stator winding connection	Delta / star
28.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method.
29.0	Minimum permissible starting voltage	Volts
30.0	Resistance per phase @20 Deg C (Indicative)	Ohms
31.0	No of successive starts in Hot condition	ONE / TWO
32.0	Quantity and power consumption of space heater	Qty== Watts==
33.0	Direction of rotation	Bi-Directional.
34.0	Bearing make & type	Make:: Drive End; Non Drive End;
35.0	Lubricant quantity , grade & recommended interval of lubrication	
36.0	Type of mounting & shaft orientation	Foot mounting; Horizontal.
	Terminal Box	
37.0	Location & angle of rotation	
38.0	Gland size for stator winding	
39.0	Gland size for space heater	Suitable for 2CX2.5 sq.mm(armoured), if applicable.
40.0	Cable entry	
41.0	GD² of motor (kg-m²)	
42.0	Total weight of motor (kg).	
43.0	Weight of stator (kg)	
44.0	Weight of rotor (kg)	
45.0	Anticipated bearing life in Hours	
46.0	Method of connection to driven equipment	
47.0	Limiting rotor temperature for determining safe stall time	☐
48.0	RTD for winding/ Bearing	Applicable YES NO
49.0	Grade of balance of motor	
50.0	Standard continuous rating at 40 Deg C ambient.	
51.0	Derated rating of motor at 50 Deg C.	
52.0	a. Locked Rotor KVA b. Ratio of Locked rotor KVA / Rated KW	
53.0	a. Motor Dynamic Load b. Motor Static load	Upward/ Downward— Upward / Downward—
54.0	**PAINT SHADE**	