

Tender Enquiry No. 9900316474

**Bill of Materials**  
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**Delivery Address:**

Vindhyachal Super Thermal Powe  
P.O. Vindhyanagar  
Vindhyanagar  
Madhya Pradesh  
486885  
India  
Tel : 07805-247685247928 Fax: 07805-247728

( UOM Legends :- NO - Number )

Item	Material Code	Description	UoM*	Total Quantity
00010	M8655512811	MOTOR,SGL SQ CAGE IND,6.6KV,3PH,1500RPM	NO	2.000

Tender Enquiry No. 9900316474

**TECHNICAL DATA SHEET**

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**00010 - M8655512811**

**Specification**

"MOTOR

TYPE :SINGLE SQUIRREL CAGE INDUCTION

VOLTAGE :6.6 KV

PHASE :3 PH

SIZE,FRAME :ILA7566-4

SPEED :1500 RPM

RATING,POWER :420 KW

FOR PA FAN"

# **Compliance Formats to be filled by bidder**

## Compliance sheet for HT Motors

S.No	Critical Parameters	Required Parameter with acceptable range/options	Offered Parameter by bidder
1	Type of Motor	Synchronous Motor	
2	Voltage Level	6.6 kV	
3	Frequency	50 Hz	
4	kW Rating@ 50 degree ambient	420	
5	Direction of Rotation from NDE Side	Bi-directional	
6	No. of Poles	4	
7	Mounting	HORIZONTAL	
8	Frame	KR660M4KBSPL	
9	Method of Starting	DOL	
10	Method of Cooling	IC511	
11	Degree of Protection	IP55	
12	Starting Torque (in % of FLT or Kg.M)	0.59	
13	Full Load Torque (Min.in Kg.M)	277.5	
14	Stator Connection	STAR	
15	Insulation class	F	
16	Temperature rise	70	
17	Terminal Box Type	<ul style="list-style-type: none"> <li>• Stator leads :-PHASE SEPARATED TYPE</li> <li>• Space heater:- CAST</li> <li>• Temperature detectors:- CAST</li> <li>• Instrument switches etc.</li> </ul>	
18	Neutral CT requirement	NO	
19	Main TB Location	Location (from DE) LHS	
20	Cable size & Run	1 X 3C /150 MM2	
21	Type of Coupling	RIGID	
22	Application of Motor/ Drive	PA FAN	
23	Existing Motor Load Curve compatibility	Yes	Yes/No
24	Interchangeability wrt critical dimensions with Existing Motor without Adapter Plate and without modification in foundation	Yes	Yes/No
26	Bearing Type	ANTIFRICTION BALL	
27	Bearing protection (Temp. & Vibration) Scheme	TEMPERATURE	
28	Vibration Pad Size	60 mm cube	
30	Type Test Report Availability	YES	Yes/No

31	<b>Delivery period shall be 12 months from the date of award by NTPC.</b>	Yes	
32	<b>After award of PO, Bidder shall submit documents (e.g. drawings, datasheet, QPs etc.) to NTPC within 30 days of release of PO, for approval</b>	Yes	
33	<b>Datasheet/drawings of existing motors given in the tender are for reference to the bidders. Offered Motor shall meet the existing Motor's characteristics and requirements.</b>	Yes	Yes/No
34	<b>Compliance to HT Motor General Technical Requirements given in tender</b>	Yes	Yes/No
	<b>Note:</b>		
	<p>1. Value/Parameter/range stipulated in the compliance sheet shall prevail in case given differently/with variance else where in the tender documents.</p> <p>2. Datasheet/drawings of existing motors, if attached, are meant for reference of bidders to understand the required Motor's characteristics.</p> <p>3. Published SQP will be applicable for PDI. However, if any bidder is having RQP approved by NTPC, the same shall also be acceptable in lieu of the published SQP. Fine Tuning( if required) in SQP/RQP shall be dealt with successful bidder during detailed design engineering.</p> <p>4. Bidder shall confirm pointwise compliance to all the tender technical specification and matching of details/parameters given in compliance sheet. Any other detail/drawing/data-sheet submitted by bidder shall not be considered for evaluation</p>		

# Conditions

Motor Type	Delivery Period	Mandatory points/conditions to be included in bid documents as part of tech specifications in tenders of Electrical Motors
HT Motor	12 months	<ol style="list-style-type: none"> <li>1. Delivery period shall be 12 months from the date of award by NTPC.</li> <li>2. After award of PO, Bidder shall submit documents (e.g. drawings, datasheet, QPs etc.) to NTPC within 30 days of release of PO, for approval.*</li> <li>3. Bidder shall confirm pointwise compliance to all the tender technical specification and matching of details/parameters given in compliance sheet. Any other detail/drawing/data-sheet submitted by bidder shall not be considered for evaluation.</li> <li>4. Datasheet/drawings/other documents of existing motors given in the tender are meant for reference of bidders to understand the required Motor's characteristics.</li> <li>5. Published SQP will be applicable for PDI. However, if any bidder is having RQP approved by NTPC, the same shall also be acceptable in lieu of the published SQP</li> <li>6. Fine Tuning( if required) in SQP/RQP shall be dealt with successful bidder during detailed design engineering.</li> </ol>

- All equipment to be supplied shall be of type tested design. The Contractor shall submit for NTPC vindhayachal 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**.
- 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 under this contract at **no additional cost to the owner either at third party lab or in presence of client/owner's representative and submit the reports for approval**.
- The type test reports once approved for any projects shall be **treated as reference**. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

General

**Technical Specification**

CLAUSE NO.	TECHNICAL REQUIREMENTS										
<b>MOTORS</b>											
<b>1.00.00</b>	<b>GENERAL REQUIREMENTS</b>										
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.										
1.02.00	All equipment's shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.										
1.03.00	Contactor shall provide fully compatible electrical system, equipment's, accessories and services.										
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.										
1.05.00	<p>The auxiliary AC voltage supply arrangement shall have 11kV, 6.6kV, 3.3 kV and 415V systems and DC voltage shall be 220 V. It shall be designed to limit voltage variations as given below under worst operating condition :</p> <table border="0" data-bbox="397 976 1437 1176"> <tr> <td data-bbox="397 976 844 1018">(a) 11kV, 6.6kV,3.3 kV</td> <td data-bbox="844 976 1437 1018">+/- 6%</td> </tr> <tr> <td data-bbox="397 1039 844 1081">(b) 415/240V</td> <td data-bbox="844 1039 1437 1081">+/- 10%</td> </tr> <tr> <td data-bbox="397 1102 844 1176">(c) 220 V DC</td> <td data-bbox="844 1102 1437 1176">-15% to +10%. However the nominal continuous DC power supply shall be 240V.</td> </tr> </table>			(a) 11kV, 6.6kV,3.3 kV	+/- 6%	(b) 415/240V	+/- 10%	(c) 220 V DC	-15% to +10%. However the nominal continuous DC power supply shall be 240V.		
(a) 11kV, 6.6kV,3.3 kV	+/- 6%										
(b) 415/240V	+/- 10%										
(c) 220 V DC	-15% to +10%. However the nominal continuous DC power supply shall be 240V.										
1.06.00	<p>The voltage level for motors shall be as follows :-</p> <table border="0" data-bbox="397 1270 1437 1501"> <tr> <td data-bbox="397 1270 876 1312">a) Upto 0.2KW</td> <td data-bbox="876 1270 1437 1312">: Single phase 240V AC / 3 phase 415V AC</td> </tr> <tr> <td data-bbox="397 1333 876 1396">b) Above 0.2KW and upto 200KW</td> <td data-bbox="876 1333 1437 1396">: 3 phase 415V AC</td> </tr> <tr> <td data-bbox="397 1428 876 1470">c) Above 200KW and upto 1500 KW:</td> <td data-bbox="876 1428 1437 1470">3.3 kV/6.6 kV</td> </tr> <tr> <td data-bbox="397 1470 876 1501">d) Above 1500 KW</td> <td data-bbox="876 1470 1437 1501">: 11 kV</td> </tr> </table>			a) Upto 0.2KW	: Single phase 240V AC / 3 phase 415V AC	b) Above 0.2KW and upto 200KW	: 3 phase 415V AC	c) Above 200KW and upto 1500 KW:	3.3 kV/6.6 kV	d) Above 1500 KW	: 11 kV
a) Upto 0.2KW	: Single phase 240V AC / 3 phase 415V AC										
b) Above 0.2KW and upto 200KW	: 3 phase 415V AC										
c) Above 200KW and upto 1500 KW:	3.3 kV/6.6 kV										
d) Above 1500 KW	: 11 kV										
1.07.00	A.C. motors shall be fed from bus at above specified voltage level and fault level of 50 kA RMS (Max.) for 1 second. The 415V system shall be solidly grounded and 220 VDC system shall be isolated type.										
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.										
1.09.00	NA										
		<b>TECHNICAL SPECIFICATION OF MOTORS</b>	<b>PAGE 1 OF 7</b>								

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.10.00	Degree of Protection: Degree of protection for various enclosures as per IEC60034-05 shall be as follows i) Indoor motors - IP 55 ii) Outdoor motors - IP 55 (Additional Canopy to be provided) iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55			
2.00.00	<b>CODES AND STANDARDS</b> 1) Three phase induction motors : IS15999/IEC:60034 2) Single phase AC motors : IS 996/ IEC:60034 3) Crane duty motors : IS:3177, IS/IEC:60034 4) DC motors/generators : IS:4722, IS/IEC:60034 5) Energy Efficient motors : IS 12615, IEC:60034-30			
3.00.00	<b>TYPE</b>			
3.01.00	<b>AC Motors:</b> a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30. HT motors shall have minimum design efficiency of 95 %. However, tolerance on this efficiency value shall be applicable as per IEC 60034. c) Motor operating through variable frequency drives shall be suitable for inverter duty with VPI insulation. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable. d) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.			
3.02.00	DC Motors Shunt wound.			
4.00.00	<b>RATING</b> (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations. (c) DC motors: The starting current for the DC motors shall be restricted to 3 times of the full load current.			
	<b>TECHNICAL SPECIFICATION OF MOTORS</b>			<b>PAGE 2 OF 7</b>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
<p><b>5.00.00</b></p>	<p><b>TEMPERATURE RISE</b></p> <p><b>Air cooled motors</b></p> <p>70 deg. C by resistance method for both thermal class 130(B) &amp; 155(F) insulation.</p> <p><b>Water cooled</b></p> <p>80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) &amp; 155(F) insulation.</p> <p><b>OPERATIONAL REQUIREMENTS</b></p> <p><b>Starting Time</b></p> <p>6.01.00 For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.</p> <p>6.01.01</p> <p>6.01.02 For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.</p> <p>6.01.03 For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.</p> <p>6.01.04 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.</p> <p>6.02.00 <b>Torque Requirements</b></p> <p>6.02.01 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.</p> <p>6.02.02 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.</p> <p>6.03.00 <b>Starting voltage requirement</b></p> <p>(a) Up to 85% of rated voltage for ratings below 110 KW</p> <p>(b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW</p> <p>(c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW</p> <p>(d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW</p>		
	<p>TECHNICAL SPECIFICATION OF MOTORS</p>		<p>PAGE 3 OF 7</p>

CLAUSE NO.	<p style="text-align: center;"><b>TECHNICAL REQUIREMENTS</b></p> 	
<p>7.00.00</p> <p>7.01.00</p> <p>7.02.00</p> <p>7.03.00</p> <p>7.04.00</p> <p>7.05.00</p> <p>7.06.00</p>	<p>(e) Up to 75 % of rated voltage for ratings above 4000KW</p> <p>Except AOP &amp; JOP motors running on D.G emergency supply, starting voltage shall be 80%.</p> <p><b>DESIGN AND CONSTRUCTIONAL FEATURES</b></p> <p>Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters &amp; RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.</p> <p>All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACAC) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below</p> <p>(a) Fuel oil area : Group – IIB</p> <p>(b) Hydrogen generation :Group - IIC or (Group-I, Div-II as per plant area NEC) or ( Class-1, Group-B, Div-II as per NEMA /IEC60034)</p> <p>Winding and Insulation</p> <p>(a) Type :Electrolytic grade Copper conductor, Non-hygroscopic, oil resistant, flame resistant Insulation.</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However , conveyor motors shall be suitable for 3 consecutive hot starts</p> <p>(c) 11kV,6.6kV &amp;3.3 kVAC motors: Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse &amp; interturn insulation surge withstand level shall be as per IEC-60034 part-15.</p> <p>(d) 240VAC, 415V AC &amp; 220V DC motors : Thermal Class ( F ) or better</p> <p>Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.</p> <p>Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.</p> <p>Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations</p>	
	<p><b>TECHNICAL SPECIFICATION OF MOTORS</b></p>	<p><b>PAGE 4 OF 7</b></p>

CLAUSE NO.	<b>TECHNICAL REQUIREMENTS</b> 														
	<p>produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.</p>														
7.07.00	<p>In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.</p>														
7.08.00	<p>Motor body shall have two earthing points on opposite sides.</p>														
7.09.00	<p>11 KV/6.6kV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.</p>														
7.10.00	<p>3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.</p>														
7.11.00	<p>Not used</p>														
7.12.00	<p>All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.</p>														
7.13.00	<p>The motors shall be suitable for bus transfer schemes provided on the 11kV, 6.6kV,3.3 kV /415V systems without any injurious effect on its life.</p>														
7.14.00	<p>For motors rated 2000 KW &amp; above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.</p>														
7.15.00	<p>The size and number of cables (for HT motors) to be intimated to the successful Contactor during detailed engineering and the Contactor shall provide terminal box suitable for the same.</p>														
8.00.00	<p>The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.</p> <table border="0" data-bbox="423 1640 1024 1871"> <tr> <td>(a) Below 110KW</td> <td>:</td> <td>10.0</td> </tr> <tr> <td>(b) From 110 KW &amp; upto 200 KW</td> <td>:</td> <td>9.0</td> </tr> <tr> <td>(c) Above 200 KW &amp; upto 1000KW</td> <td>:</td> <td>10.0</td> </tr> <tr> <td>(d) From 1001KW &amp; upto 4000KW</td> <td>:</td> <td>9.0</td> </tr> </table>			(a) Below 110KW	:	10.0	(b) From 110 KW & upto 200 KW	:	9.0	(c) Above 200 KW & upto 1000KW	:	10.0	(d) From 1001KW & upto 4000KW	:	9.0
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	<p align="center"><b>TECHNICAL SPECIFICATION OF MOTORS</b></p>		<p align="center"><b>PAGE 5 OF 7</b></p>												

CLAUSE NO.	TECHNICAL REQUIREMENTS			
<p data-bbox="245 260 342 289"><b>9.00.00</b></p> <p data-bbox="245 325 342 354">9.01.00</p> <p data-bbox="245 390 355 420">10.01.01</p> <p data-bbox="245 678 342 707">9.01.02</p> <p data-bbox="224 934 321 963">9.01.03</p>	<p data-bbox="423 197 1060 226">(e) Above 4000KW : 6 to 6.5</p> <p data-bbox="423 260 578 289"><b>TYPE TEST</b></p> <p data-bbox="423 325 594 354"><b>HT MOTORS</b></p> <p data-bbox="423 390 1396 630">HT Motors supplied shall be of type tested design. During detailed engineering, the Contactor shall submit for Employer'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 test 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.</p> <p data-bbox="423 667 1396 873">However if the Contactor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.</p> <p data-bbox="388 934 946 963"><b>LIST OF TYPE TESTS TO BE CONDUCTED</b></p> <p data-bbox="388 999 1393 1060"><b>The following type tests shall be conducted on each type and rating of HT motor</b></p> <p data-bbox="388 1102 1396 1163">(a) No load saturation and loss curves upto approximately 115% of rated voltage</p> <p data-bbox="388 1203 891 1232">(b) Measurement of noise at no load.</p> <p data-bbox="388 1270 1235 1299">(c) Momentary excess torque test (subject to test bed constraint).</p> <p data-bbox="388 1337 1008 1367">(d) Full load test(subject to test bed constraint)</p> <p data-bbox="388 1404 1396 1633">(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp.,coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.</p>			
	<p data-bbox="745 1927 938 2007" style="text-align: center;"><b>TECHNICAL SPECIFICATION OF MOTORS</b></p>		<p data-bbox="1312 1934 1382 1982" style="text-align: center;"><b>PAGE 6 OF 7</b></p>	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
9.01.04	<p><b>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</b></p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> <li>(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.</li> <li>(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.</li> <li>(c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15</li> <li>(d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15</li> </ul>			
9.01.05	<p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p>			
9.01.06	<p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.</p>			
		<p>TECHNICAL SPECIFICATION OF MOTORS</p>	<p>PAGE 7 OF 7</p>	

# Quality Plans

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 1/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	Digitally signed by JAI PRAKASH MAURYA Date: 2022.08.17 17:08:26 +05'30' (Jai Prakash Maurya)	Digitally signed by SUNIL MALANI Date: 2022.08.22 10:42:55 +05'30' (Sunil Malani)

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
			M	N				M	N	D		
<b>A) Raw Material / Bought Out Items Checks</b>												
1	C.I Frame & End Bracket/ Shield / Base Frame (As Applicable)	a) Appearance, Dimensions, Tensile strength & hardness, Heat treatment (if applicable). b) DP test after machining (lifting lug, spigot, feet support, bearing seat).	100%		Tender/PO Tech. specifications /NTPC approved Drg. /DS/ IS 210	TC		P			Weld repair on cast frame is not allowed.	
2	Fab. Frame & End Bracket / Shield / Base Frame (As Applicable)	a) Appearance, Dimensions, Tensile strength, Bend test, % Elongation, chemical composition, Heat treatment. b) DP test on welds (lifting lug, spigot, feet support, bearing seat). c) UT for plate thickness $\geq 25$ mm.	100%	-	ASTM E 165 Tender/PO Tech. specifications /NTPC approved Drg/ IS 2062	TC		P	V			
3	Electricals steel stampings (raw material & after punching) for stator & Rotor	a) Dimensions, Core loss, Grade, Stacking factor, IR, Anisotropy, Bend test, Coating thickness, Core loss after ageing, AC magnetization, Burr height. (after punching). b) Dimensions, Chem. composition, Mech.properties, Yield strength, UTS, %Elongation, Hardness & Impact test, Heat treatment. c) Grain size. d) Ultrasonic test.	100%	1 Sample /lot	ASTM E 165 ASTM A 435 Tender/PO Tech. specifications /NTPC approved Drg /IS 648 / 649/MFRR Std.	TC MFRR TC		V	V	V	Note 3	
4	Forged shaft	a) Dimensions, Chem. composition, Mech.properties, Yield strength, UTS, %Elongation, Hardness & Impact test, Heat treatment. b) Grain size. c) Ultrasonic test.	100%	1 sample / Heat	ASTM E 112 ASTMA 388 Tender/PO Tech. specifications /NTPC approved Drg/ IS:1570 part-II/MFRR std.	TC/IR		P/V	V			
5	Shaft rib	a) Chemical comp., Mechanical prop. (T.S.& % Elongation). b) UT on plates thickness $\geq 25$	100%	1 sample / Heat	ASTM A 435 Tender/PO Tech. specifications /NTPC approved Drg/IS 2062	TC		V	V	V		

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 2/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	(Jai Prakash Maurya) (Sunil Malani)	

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
			M	N				M	N	D	
6	Main insulation, Overhang insulation & semi-conductor tape	mm. a) Dimensions, Chemical composition & BDV test, Shelf life.	1 sample	/lot	Tender/PO Tech. specifications /NTPC approved Drg/MFRR std.		TC/IR	P		V	
7	Resin	Applied viscosity, Gel time, Shelf life.	1 sample	/lot	Tender/PO Tech. specifications /NTPC approved Drg/MFRR std.		TC/IR	P/V		V	
8	Rotor conductor	Dimensions, Conductivity, Mech. properties, Chem. composition including oxygen content.	1 sample	/lot	Tender/PO Tech. specifications /NTPC approved Drg/ IS:1897 / MFRR std.		TC/IR	P/V		V	Note 5
9	Stator winding conductor										
10	a) Copper	Dimensions, resistivity, tensile, hardness, chemical composition.	1 sample	/lot	Tender/PO Tech. specifications /NTPC approved Drg/ MFRR std/IS 613/IS 440		TC/IR	V		V	
	b) Insulated conductor	Dimensions, BDV, flexibility.	1 sample	/lot	IEC 60317/MFRR std.		TC/IR	V		V	
11	a) SC ring (Forged) & Copper flats for fabricated SC ring	Dimension, Conductivity, Chem. composition including oxygen content, Tensile strength & % elongation.	1 Sample	/lot	Tender/PO Tech. specifications /NTPC approved Drg/MFRR std./ IS 613/ IS 6912		TC/IR	P/V		V	Note 5
	b) SC ring (Forged)	UT test.	100%		ASTM A 388	Note 1	TC/IR	Y P		V	
12	Bearing anti friction.	Type & model.	100%		Tender/PO Tech. specifications /NTPC approved Drg.		TC/IR	V		V	
13	Space Heater	HV (2KV for 1 min), resistance/KW, insulation resistance.	100%				TC/IR	P		V	
14	R.T. D	Insulation resistance & resistance.	100%		Tender/PO Tech. specifications /NTPC approved Drg/ IS 2848		TC/IR	V		V	
15	B.T.D (PT 100 type)	a) IR & H.V test (1.1KV for 1 min)	100%		MFRR drawing.		TC /IR	P/V			
16	B.T.D (DIAL type)	Visual & calibration.	100%				TC/IR	P/V			
16	Fan (M.S.)	Dimension, Chemicals & mechanical.	1 Sample	/lot	MFRR drawing.		TC/IR	P/V			

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 3/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	(Jai Prakash Maurya) (Sunil Malani)	

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY		REMARKS
			M	N				M	N	
17	Neoprene gasket	a) Hardness, tensile & % elongation before & after ageing. b) Neoprene content.	1 Sample /lot		IS 11149	TC		V	V	
18	Cooler (CACA/TETV)	Dimension, weld checks, pressure test (for CACA) & tube expansion	1 Sample /lot		IS 3400 part -22	TC		V		
19	Paint	Shelf life & shade.	100%		MFRR standard	TC		V	V	Notes 3
20	Brazing alloy	Chemical analysis.	Random Sample		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std.	TC		V	V	
<b>B) Process/Assembly check</b>										
1	Stator frame, end shield, ribbed shaft (as applicable)	Dimensional check, DP checks on rib welds of shaft, Stress relieving for ribbed shaft, MPI check after stress relieving on rib welds of shaft	100%		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std.	TC/IR		P		Notes 3
2	Stator & rotor core building	Core length & packet height, Core rigidity, slot alignment, cleanliness, stator & rotor dimensions, hot spot (stator core).	100%		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std.	TC/IR		P	V	
3	SC ring (fabricated)	a) DP on SC ring joint b) RT on SC ring joint	100%		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std	IR		P	V	
4	Stator coil & winding							Y	P	
	a) Stator coil	Surge test (inter turn test) & HV DC test	100%		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std/ IEC -892	IR		P	V	
	b) Wound stator	Insulation resistance test, HV DC test, current balance test /impedance test, resistance.	100			IR		P	V	
		Temperature, pressure, time	100%							
5	VPI	IR, HV test & resistance meas. after VPI, tan delta test, cable crimping.	100%		Tender/PO Tech. specifications /NTPC approved Drg./MFRR std /IS:13508	IR		Y	P	V
		Check for weld quality, number &	100%			IR		Y	P	V
6	Capsule insertion (for									

4) a) b) HV AC test is performed as recommended by IEC 60034-1, Clause 9.2, however only testing equipment for HV AC test is available at plant

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 4/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	(Jai Prakash Maurya) (Sunil Malani)	

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
			M	N				D	M	N	
7	vertical motors) Rotor cage assembly	places of locking pieces UT on brazed joints	100%		/NTPC approved Drg./MFRR std.		IR	Y	P	V	DPT for UT-inaccessible areas
8	Rotor assembly a) NDT on shaft after machining b) Rotor balancing with fan at rated speed c) Bearing assembly check	DP test on bearing seating dia. Residual unbalance Check bearing interference with shaft & housing, IR measurement for Insulated bearing	100%		ASTM E165 ISO 1940 Tender/PO Tech. specifications /NTPC approved Drg./MFRR std	ASME SEC VIII DIV-I, App-8 ISO 1940 GR, 2.5	IR IR IR		P P P	V V V	
9	Assembly check	Fitting of sub assembly components, check for any foreign material/ loose item, fitting of accessories e.g. RTD/ BTDT, heaters, dimensional check, terminal marking. a) Location of terminal box, making on rating plates b) Shaft run out	100%		-	Tender/PO Tech. specifications /NTPC approved Drg./MFRR std	IR		P		
10	Complete motor		100%		-	Tender/PO Tech. specifications /NTPC approved Drg./MFRR std	IR		P		
<b>C) Finished product /Final inspection.</b>											
<i>Type Test: Type test clearance from NTPC site shall be reviewed during final inspection as envisaged by tender/PO specification</i>											
1	Routine test	i) Name plate marking, location of main terminal box, accessories & completeness of motor, dimensional check, degree of protection by feeler gauge. ii) Winding resistance at ambient temp., IR test for winding, space	100%			Tender/PO Tech. specifications /NTPC approved Drg./MFRR std	IR	Y	P	W	

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 5/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	(Jai Prakash Maurya) (Sunil Malani)	

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
			M	N				M	N	D		
		heater & RTD/BTD before & after HV.										
		iii) No load test & reading of voltage, current & input power, Speed & bearing temp. at steady state condition.	100%		Tender/PO Tech. specifications /NTPC approved Drg. / IEC:60034.		IR		Y	P	W	
		iv) Locked rotor test at reduced voltage & reading of volt, current & wattage.	100%		Tender/PO Tech. specifications /NTPC approved Drg. / IEC:60034.		IR		Y	P	W	
		v) Reduced voltage running up test (for squirrel cage motors only)	100		Tender/PO Tech. specifications /NTPC approved Drg. / IEC:60034.		IR		Y	P	W	
		vi) High voltage test for winding & space heater.	100		Tender/PO Tech. specifications /NTPC approved Drg. / IEC:60034/IS:4029		IR		Y	P	W	
		vii) Tan delta test (if not done at stator capsule stage)	100%		MFRR std. (For Reference only).		IR		Y	P	W	
		viii) Shaft voltage	100%		MFRR. standard		IR		Y	P	W	
		ix) Phase Sequence & direction of rotation, Over speed test (at 120% for 2 min), polarization index, vibration measurement at rated speed & voltage.	100%		Tender/PO Tech. specifications /NTPC approved Drg.		IR		Y	P	W	

## STANDARD QUALITY PLAN

	<b>Item: -HT Induction Motor upto 11KV, 3MW (RESIN POOR INSULATION)</b>		SQP NO: CPG-QA-SQP-E008	P 6/6	Prepared	Approved
	Rev.	00	Date	01.08.2022	(Jai Prakash Maurya) (Sunil Malani)	

SL. NO.	COMPONENT/ OPERATION	CHARAC-TERISTICS	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD		AGENCY		REMARKS
			M	N			D	M	N		
2	Painting	Shade, thickness & adhesion.	100%		Tender/PO Tech. specifications		Y	P	W		
3	Packing	Proper packing w.r.t. locking arrangement to arrest movement during transit, Use of anti-rust coating on shaft, desiccants etc.	100%		/NTPC approved Drg./MFRR standard.		IR	P			

**Notes:**

- 1 When Back wall echo (BWE) is set to 100% of full screen height (FSH), a defect echo > 20% of FSH is not acceptable. Also loss of BWE > 20% is not acceptable. Frequency of probe used shall be 2MHZ minimum.
- 2 Make of bought out items (fabrication, Casting, shaft, SC ring, stator copper, rotor copper, bearing, cooler, RTD/BTD, main insulation, Resin, magnetic steel, stamping processor) shall be from motor manufacture approved sources with vender rating in top 25%. List of major raw material / Bols and their sources shall be furnished by the supplier.
- 3 Use of Qualified welders & approved WPS as per ASME Sec IX shall be ensured.
- 4 Use of qualified brazers & approved brazing process specification shall be ensured.
- 5 Oxygen content shall be checked once in a year for each supplier.
- 6 Y mark in Column 'D' means such document shall be furnished by the manufacturer / supplier.
- 7 Calibrated equipments required for performing the tests in presence of NTPC or authorized representative, shall be arranged by the supplier without any extra cost.
- 8 Reference and Acceptance norms shall be derived from following in the same sequence a) NTPC Approved drawing / data sheet, b) NTPC tech specs c) Purchase Order, d) Relevant national standard, e) Relevant International standard, f) Manufacturer's standard. g) Good Engineering practices.

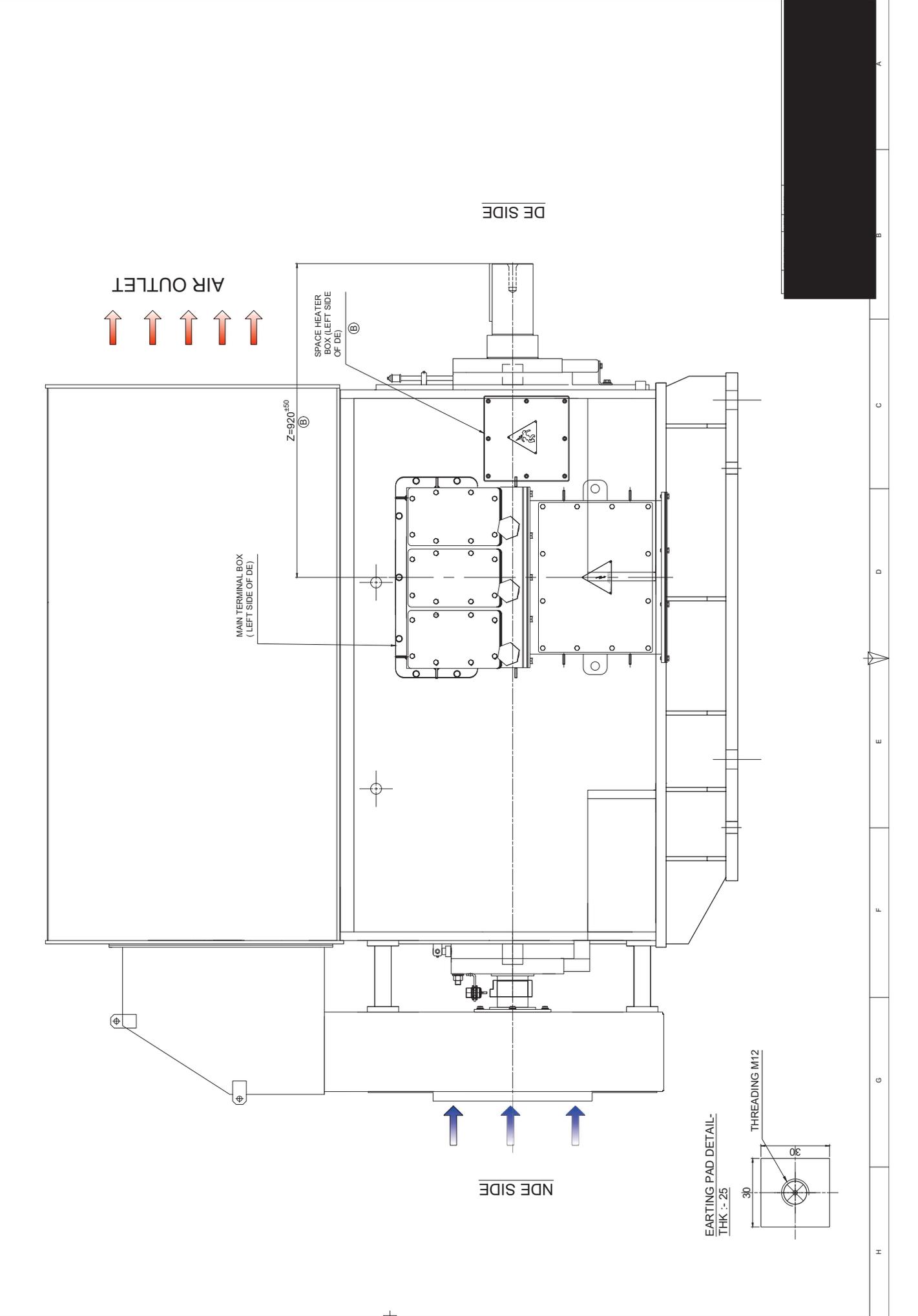
**Abbreviations: -**

M	Manufacturer	P	Perform	IR	Inspection Record / Report
N	NTPC Ltd or authorized representative	W	Witness	TC	Test Certificate
CoC	Certificate of Conformance	V	Verification of records	MTC	Manufacturer's Test Certificate
MFRR	Manufacturer	Drg.	Drawing	DS	Datasheet

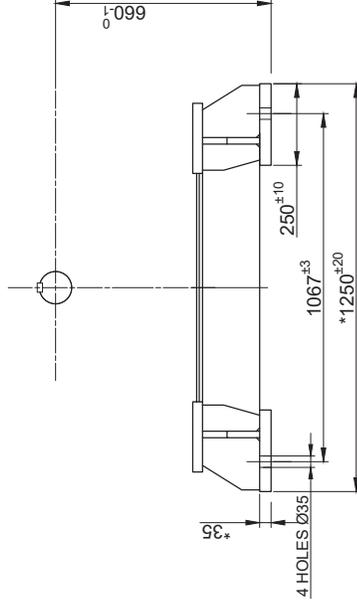
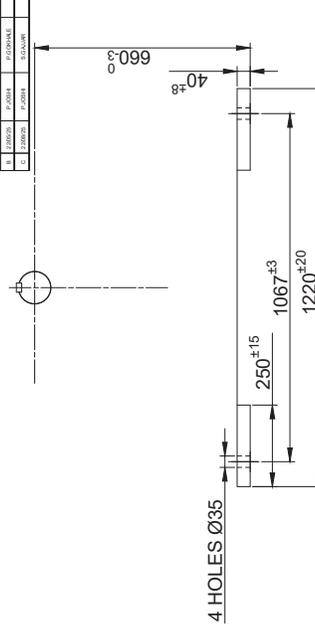
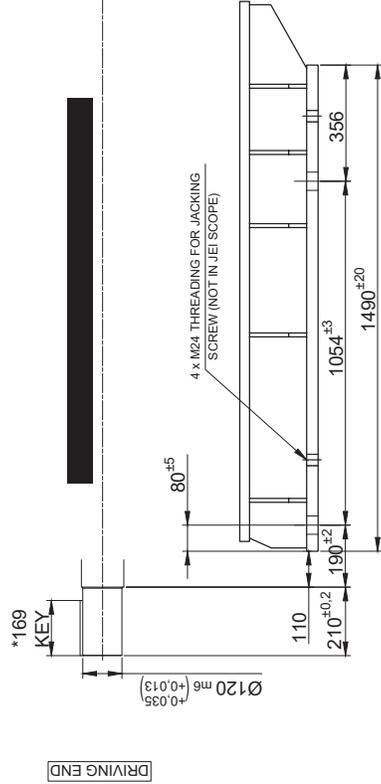
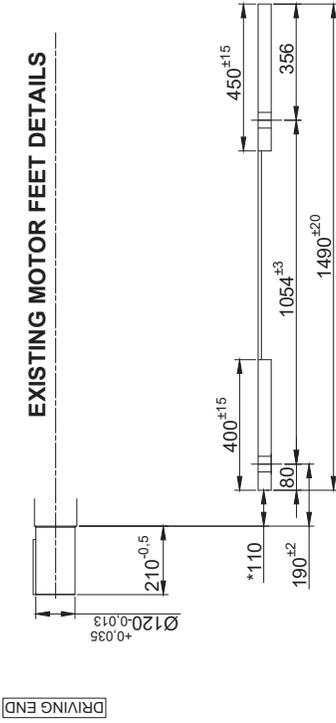
# **Existing Motor Details for reference**



NO.		DATE	QUANTITY	DESCRIPTION	REVISION
1	1	10/10/2023	1	DESIGN	1
2	1	10/10/2023	1	DESIGN	2
3	1	10/10/2023	1	DESIGN	3
4	1	10/10/2023	1	DESIGN	4



### EXISTING MOTOR FEET DETAILS



### MECHANICAL DIMENSION:-

	Existing Motor : 960 SH	Offered Motor : 450*210 BASE FRAME = 660 SH
A Dimension	1067±3 mm	1067±3 mm
B Dimension	1054±3 mm	1054±3 mm
C Dimension	190±2 mm	190±2 mm
Motor feet length approx.	1490±20 mm	1490±20 mm
Motor feet width approx.	1220±20 mm	*1250±20 mm
Overall length Approx.	2100±100 mm	*2466±100 mm
Overall width approx.	2680±50 mm	2632 ±100 mm
Overall height approx.	NOT GIVEN	*2030 ±100 mm
Shaft end diameter	Ø120 mm	Ø120mm6 mm
Motor foot width	210 mm	210±0.2 mm
Foundation hole	4 Hole x Ø35mm	250±10 mm
Motor weight	4.5 T APPROX	5.05 T APPROX
CABLE TERMINATION DIMENSIONS OF MAIN TERMINAL BOX	1180 ±50 mm	X=1180±25 mm
	(NOT GIVEN)	*Y=805±25 mm
	1065±50 mm	Z=920±50 mm
Motor feet thickness	40 mm	*35 mm

- NOTE FOR CUSTOMER :-**
- IN CASE OF MOTOR FEET OVERHANGING BEYOND EXISTING FOUNDATION, FOLLOWING CARE TO BE TAKEN BY CUSTOMER.
  - EXTEND FOUNDATION TO PROVIDE SUPPORT FOR MOTOR FEET.
  - SHIMS REQUIRED FOR HEIGHT ADJUSTMENT IS IN CUSTOMER SCOPE.
  - REPOSITION OF THE CABLE TO TERMINAL BOX IS IN CUSTOMER SCOPE.
  - MOTOR FEET SHOULD BE 100% SUPPORTED FROM ALL SIDE.
  - \* MARKED DIMENSIONS TO BE REVIEW BY CUSTOMER.
  - DIMENSIONS REPRESENTED AS "NOT GIVEN" SHOULD BE PROVIDED BY CUSTOMER.

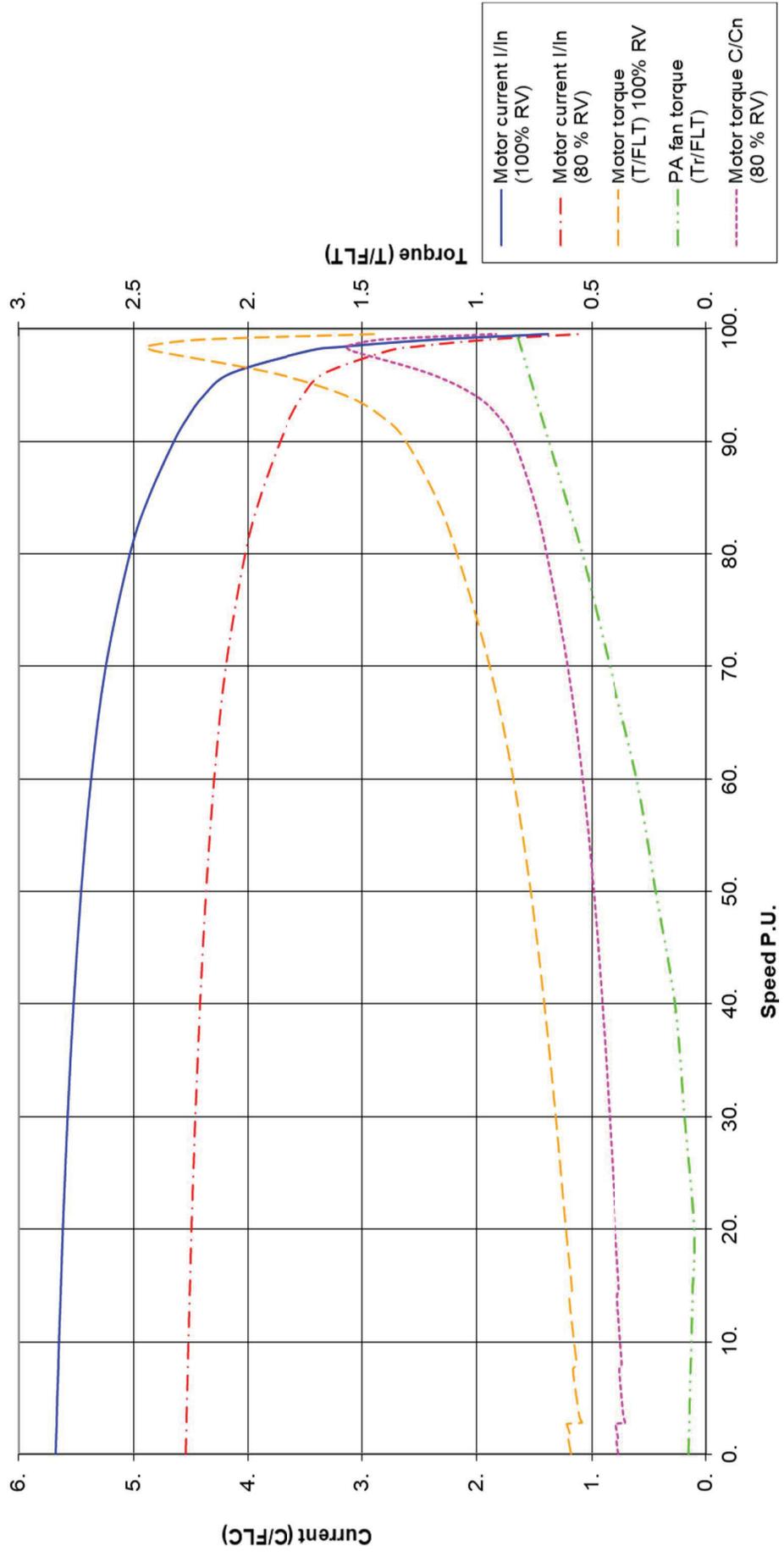
## Electrical Curves

**RATED DATA**

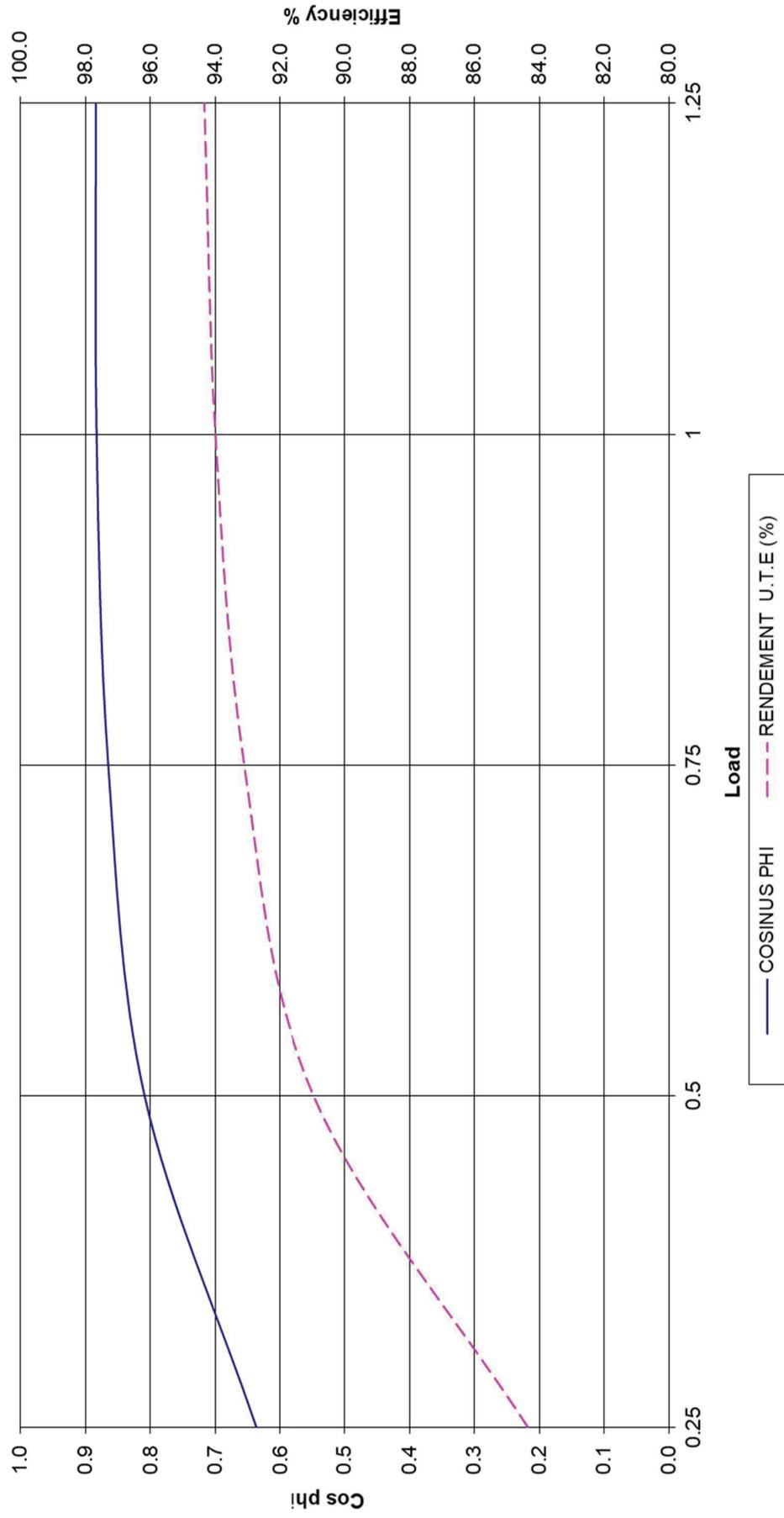
**Power:** 420 kW  
**Voltage:** 6.6 KV  
**Sync. Speed:** 1500 rpm

A	12/12/22	O. BODAS	B. PATEL	O. BODAS	First issue
Rev	Date	Written by	Checked by	Issued by	MODIFICATIONS

Torque and Current Vs Speed Curves



### Efficiency and Power Factor VS Load

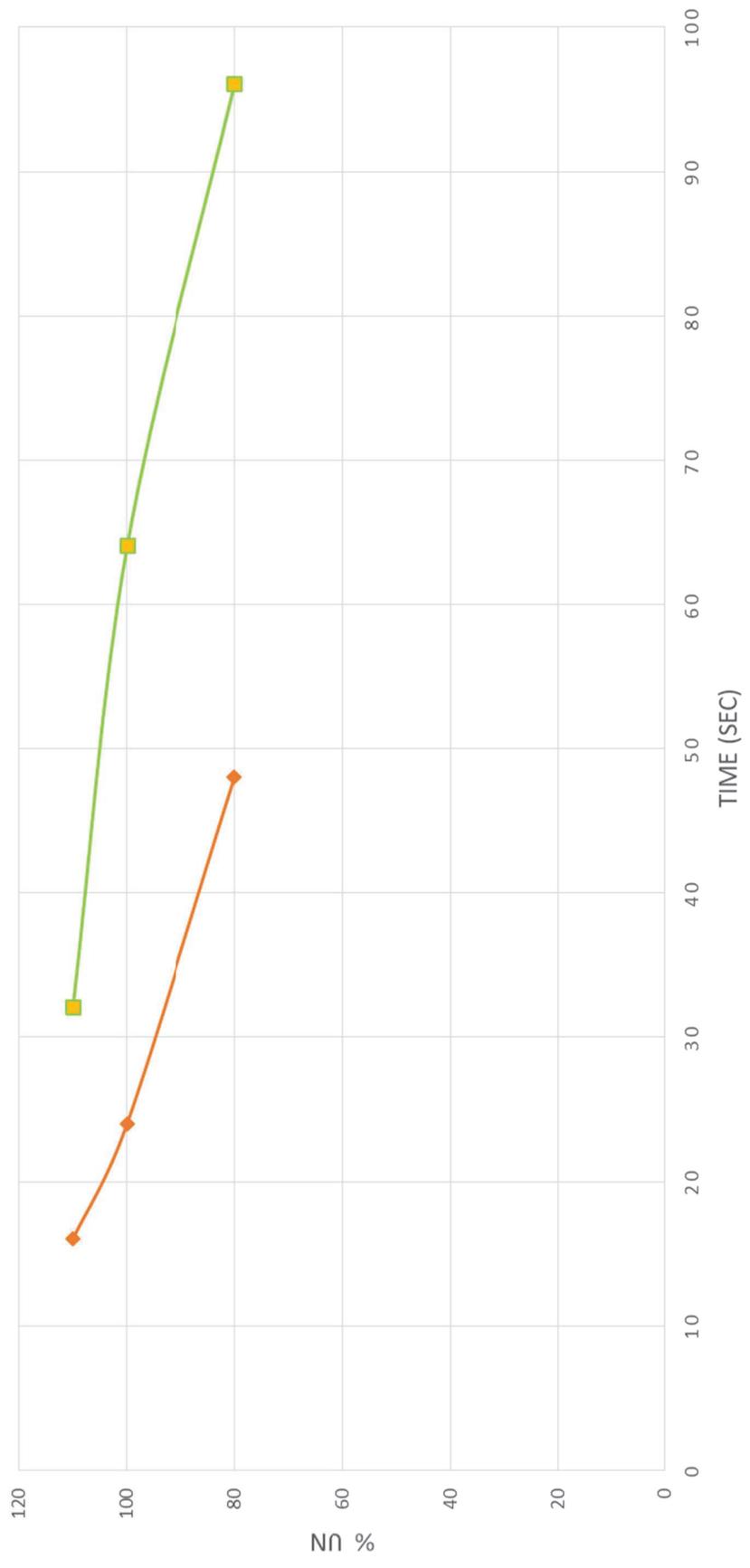


Power Factor VS Speed



Thermal withstand curve

Hot Cold



## MOTOR TECHNICAL DATA-PA FAN() 420 KW

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### 1. GENERAL

i) Equipment driven by motor PA FAN  
ii) Motor type SCIM  
iii) Country of origin INDIA  
iv) Quantity 02 NO.

### 2. DESIGN AND PERFORMANCE DATA

i) Frame size 1LA7 566-4  
ii) Type of duty CONTINUOUS  
iii) Type of enclosure and method TETV / IC 511 IP: 55 AS PER CL.  
of cooling / Degree of protection 10 OF IEC : 34 - 5  
iv) Applicable standard to which motor IS : 325  
Generally conforms  
v) Type of mounting HORIZONTAL  
vi) Direction of rotation viewed from BIDIRECTIONAL ROTATION  
Driving end  
vii) Standard continuous rating 450  
At 40deg. C ambient temperature (KW)  
viii) De-rated rating for specified normal 420  
Condition i.e. ambient temperature of 50 deg. C (KW)  
ix) Rated voltage (volts)/ Rated 6600/50  
frequency (Hz)  
x) permissible variation of

- Voltage (%)  $\pm 6.0$
- Frequency (%) + 3 to - 5
- combined voltage and frequency 10 % (abs)

xi) Minimum permissible starting voltage (%) 80  
xii) rated speed at rated voltage and frequency (RPM) 1475  
xiii) At rated voltage and frequency

- full load current (Amp) 46
- no load current (Amp) 12.5

xiv) Power Factor At

- 100 % load 0.85
- 75 % load 0.84
- 50 % load 0.80
- No load 0.014
- Starting 0.246

xv) Efficiency (%) at rated voltage and frequency at

- 100 % load 94.0
- 75 % load 93.8
- 50 % load 93.3

xvi) Starting current (%) at

- 100% voltage 600
- Minimum starting voltage (80%) 480

xvii) Starting time with minimum permissible voltage (80%)

- Without driven equipment coupled. 1.2 (max)
- With driven equipment coupled 58.5 (max)

xviii) Safe stall with 110% rated voltage

- From hot condition 43.0 Secs (min)
- From cold condition 56.0 Secs (min)

xix) Torques at (in % kg-m)

- Starting ( at minimum permissible voltage 80%) 68/189
- Pull up at 100% voltage 95/264
- Pull out at 100 % voltage 230/638

- Rated load (Kgm) at 100% voltage 277.5 Kg-m
- Driven Inertia (WR2\*) 695 kgm<sup>2</sup>
- Minimum accelerating torque 50/138
- xx) Stator winding resistance per phase (ohms) ref. to 20 deg. C. 0.822
- xxi) Flywheel moment of motor (Kg-m) (GD2) 72.0
- xxii) No. of permissible starts form hot condition 2
- xxiii) Locked rotor KVA input (at rated voltage) 3155
- xxiv) Locked rotor KVA /KW 7.5
- xxv) Vibration at no load
  - Velocity (mm/s) 1.8 rms
  - Displacement (microns) 32 (p-p)
- xxvi) Noise level at no load (at 1 m) 85 DB (A) (IS:12065)
- 3. CONSTRUCTIONAL FEATURES
  - i) Stator winding insulation
    - Class & type F/EPOXY MICA RESIN RICH SYSTEM
    - Tropacalised (Yes/No) YES
    - Temperature rise over cold air temp. of 50°C (°C) 70
    - Method of temperature measurement BY RESITANCE
    - Stator winding connection STAR
    - Number of terminals brought out 6
  - ii) Type of terminal box for
    - Stator leads PHASE SEPARATED TYPE
    - Space heater CAST
    - Temperature detectors CAST
    - Instrument switches etc. -
  - iii) For main terminal box
    - Location (from DE) LHS
    - Entry of cables BOTTOM OF TB
    - Recommend cable size UP TO 1 X 3C /240 MM2, AL, XLPE
    - (Run/Cores/X-Section (mm2) /material) ARMOURED
    - Fault level (MVA) & duration (Sec) 500 & 0.25
  - iv) FOR BEARING
    - Type ANTIFRICTION BALL
    - Manufacturer NTPC APPVD. SUPPLIER
    - Recommended lubricant GREASE, IOC SERVOGEM-3 OR EQV
    - Guaranteed life in hrs. 50000 HRS.
    - Lubricant type PRESSURE RELIF
    - Whether dial type YES
    - thermometer provided
  - vii) Weight of
    -
- Total weight (Kg) approx 4550
- viii) Max. Permissible temp. of rotor (°C) 350
- ix) Temp. rise of rotor during I start 80 °C
- x) Temp. rise of rotor during II start 160°C
- xi) Surge withstands voltage (stator winding.) As per IEC : 34 - 15
  - 0.3/3 Microsecond surge (kVp) 19
  - 1.2/50 microsecond surge (kVp) 36

#### 4.00 LIST OF ACCESSORIES

- 4.01 RTDs for winding (Type / Nos./ Leads/ PT100 SIMPLEX / 6 / 3
  - Location/make/Res. at 0 Deg. C) BETWEEN COIL SIDES IN SLOTS  
REPUTED NTPC APPROVED/100ohm
- 4.02 RTDs for bearing (Type/Nos/Leads) PT100 DUPLEX / 2 / 3
  - location / make / Res. at 0 deg. C) IN BEARING HOUSING  
REPUTED NTPC APPROVED/100ohm
- 4.03.0 Space heaters YES

Additional requirement: Vendor has to submit the type test report of similar motor for approval from NTPC Vindhyachal as per attached type test guidelines.



Nos.	4
Power (watts)	630
Supply voltage	1 PH, 240 V (AC)
4.04.0 Stator terminal box	
Type	PHASE SEPARATED TYPE
Neutral TB	PHASE SEPARATED TYPE
4.05.0 Dial type thermomet	MERCURY IN STEEL / NTPC / APPROVED
(type/make/accuracy)	
Connection type & size	± 1 % FULL SCALE / BSP Q/2"
4.06.0 For bearing nos.	2
4.07.1 Contact rating	5 A AT 240V AC, 0.5 A at 220 V DC
4.07.2 Range	0-120V °C
4.07.3 Supply voltage	0-240 V AC
4.07.4 TBs for RTDs, BTDS & space heater	YES
4.07.5 Foundation & Anchoring bolts	YES
4.07.6 No. of contacts / contact rating	1NO+1NC 5Amps at 240V AC
4.07.7 Set speed	300 RPM
4.07.8 Power supply	240 V 1 Ph. AC
4.08.0 Grounding Pads	
4.08.1 No. & Size on motor body	02 & 6 X 25 X 55 mm
4.08.2 No's on Terminal Box	02
• Vibration Pads	
4.08.3 No's & size	60 mm cube
• Location	on End Shield
4.08.4 Paint Shade	631 of IS 5

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