

PRODUCT STANDARD  
ELECTRICAL, CONTROLS & INSTRUMENTATION  
BAP / BHEL / RANIPET – 632 406

TECI: LT MOTOR: REV 05  
PAGE 1 OF 10  
EFFECTIVE DATE : 28.07.2021

|   |   |             |   |            |
|---|---|-------------|---|------------|
| DOCUMENT TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS |   |             |   |            |
| ITEM : LT MOTOR   |   |             |   |            |
| PROJECT : BHEL STANDARD                                       |   |             |   |            |
|   | NAME  | DESIGNATION | SIGNATURE   | DATE       |
| PREPARED BY   | ALAN S G  | ENGINEER    |  | 28/7/2021  |
| REVIEWED BY   | CHANDRASEKAR A P                                  | DM          |   | 28-07-2021 |
| APPROVED BY   | JEYAMURUGANAND M                                  | AGM         |   | 28/07/2021 |
| ISSUED BY EDC – ECI   |   |             |   |            |
| RECORD OF REVISIONS:  |   |             |   |            |
| REVISION NUMBER 00  | INITIAL RELEASE - Dt. 19.03.2013                  |             |   |            |
| REVISION NUMBER 01  |   |             |   |            |
| REVISION NUMBER 02  | Cl. No: 5- Packing and Drawing included           |             |   |            |
| REVISION NUMBER 03  | Cl. No: 2.20, 2.21, 2.38, 2.39, 2.43 added        |             |   |            |
| REVISION NUMBER 04  | Cl.No: 2.3, 4(b) - ECI:DATASHEET:LTMOTOR:00 added |             |   |            |
| REVISION NUMBER 05  | Cl.No: 2.36, 2.40, 4(b), 5(a) Updated             |             |   |            |

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|       | <u>SPECIFICATION</u>  | <u>VENDOR<br/>COMPLIANCE/<br/>REMARKS</u>  |
|-------|---|--|
| 1     | <u>SITE CONDITIONS</u>                                      |  |
| 1.1   | Altitude above mean sea level                               | >1000 m.   |
| 1.2   | Ambient temperature condition                               | 6 to 50°C.   |
| 1.3   | Relative humidity   | 100%   |
| 1.4   | Atmosphere  | Tropical, Dusty, salty, corrosive & highly polluted as in a coal based Thermal power plant.  |
| 2     | <u>GENERAL</u>  |  |
| 2.1   | Reference standards   | IS 15999, IS 12615, IS/IEC-60034, IS 1231, IS 6362, IS 2253, IS 12065, IS 12075  |
| 2.2   | Design ambient  | 50 Deg.C   |
| 2.3   | Application/ Type( Normal/ Energy efficient)                | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS  |
| 2.4   | Duty cycle  | Continuous S1  |
| 2.5   | Rated voltage, frequency & Phases                           | 415 V AC $\pm 10\%$ ; 50 Hz (+5% to -5%);<br>3 phase   |
| 2.6   | Combined variation of Voltage and frequency                 | 10% absolute sum   |
| 2.7   | Motors efficiency class                                     | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS  |
| 2.8   | Minimum starting voltage                                    | 80% of the rated voltage   |
| 2.9   | Minimum voltage under which motor will run satisfactorily   | 75% of the rated voltage for 5 minutes   |
| 2.10. | Capacity to restart (at specified voltage)                  | i. Two successive starts from cold condition<br>ii. Two HOT restarts starts from Hot condition<br>iii. Three equally spread start per hour |
| 2.11  | High speed bus transfer withstand capability                | Suitable to withstand 150 % of rated voltage   |
| 2.12  | Type of balancing for rotor                                 | Dynamic balancing  |
| 2.13  | Direction of rotation                                       | Suitable for both direction  |
| 2.14  | Direction of cooling air                                    | Non-drive end to driving end   |
| 2.15  | Class of insulation   | Class F with temperature rise limited to Class B.  |
| 2.16  | Winding treatment   | The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid & tropical climate.    |
| 2.17  | Allowed winding temperature rise at continuous full load    | 60°C by thermometer method &<br>70°C by resistance method  |
| 2.18  | Accelerating Torque at minimum permissible Starting voltage | 10% of full Load Torque  |

|       |  |   |  |
|-------|--|---|--|
| 2.19  | <b>Pullout Torque at rated voltage</b>                 | 205% of full load torque  |  |
| 2.20. | <b>Ratio of Locked rotor KVA to KW for</b>             | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.21  | <b>Starting current</b>                                | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.22  | <b>Starting time &amp; locked rotor withstand time</b> | The locked rotor withstand time ( LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 2.5 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. |  |
| 2.23  | <b>Momentary overload withstand capability</b>         | 60% of full load torque for 15 second without any damage.   |  |
| 2.24  | <b>Over speed withstand</b>                            | 120% of rated speed for 2 minutes without any mechanical damage.  |  |
| 2.25  | <b>Hot thermal withstand curve</b>                     | margin of at least 10% over the full load current   |  |
| 2.26  | <b>Cooling</b>   | Totally enclosed fan cooled- IC 411(TEFC)   |  |
| 2.27  | <b>Vibration</b>                                       | The peak amplitude of vibration shall be as per IS 12075  |  |
| 2.28  | <b>Noise level</b>                                     | Within the limits specified by IS 12065 / <85 dB at 1 meter distance from motor.  |  |
| 2.29  | <b>Type of enclosure</b>                               | TEFC, IP 55 as per IS/IEC 60034-5   |  |
| 2.30. | <b>Type of mounting</b>                                | Horizontal foot mounted.  |  |
| 2.31  | <b>Bearings</b>  | 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.<br>Sealed bearings are also acceptable   |  |
| 2.32  | <b>Lubricant Type</b>                                  | Grease  |  |
| 2.33  | <b>Bearing life</b>                                    | minimum life of 40000 Working hours   |  |
| 2.34  | <b>Shaft extension</b>                                 | Key slotted bare shaft extension with key at the driving end.   |  |
| 2.35  | <b>Terminal box Type</b>                               | Weather proof IP 55 as per IS/IEC 60034-5;<br>Capable of being turned through 360° in steps of 90°.   |  |
| 2.36  | <b>Cable gland and lugs</b>                            | Double compression type nickel plated brass cable glands and annealed tinned copper crimping lugs to suit the cable size<br>i) Size of power cables will be intimated after PO.<br>ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided                          |  |

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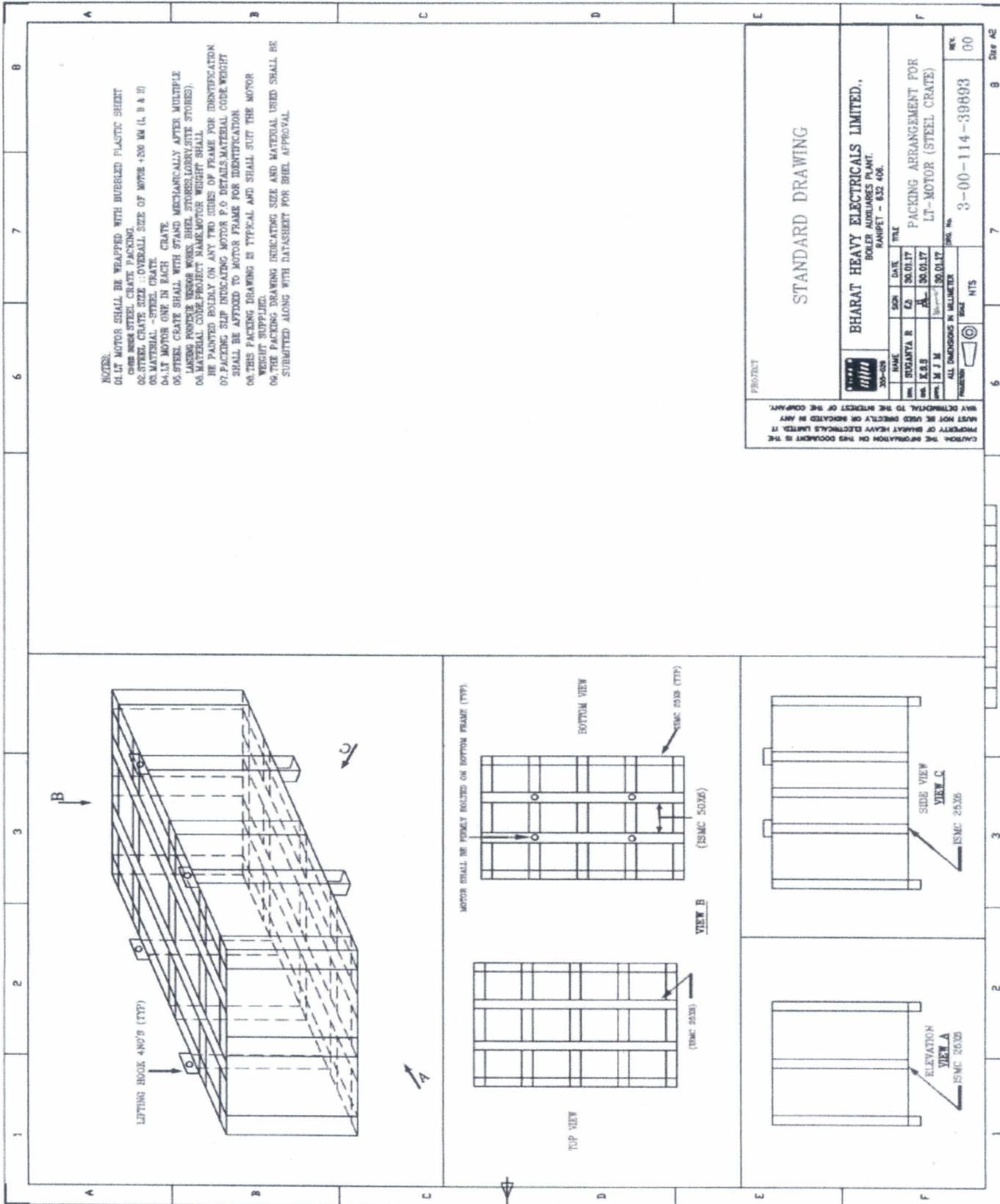
|        |  |   |  |
|--------|--|---|--|
| 2.37   | Type of terminals  | Stud / screw type with plain washers, spring washers / checknuts & lugs   |  |
| 2.38   | Min.Spacing between Gland plate and Center stud(in mm)             | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.39   | Phase to Phase/Phase to Earth air clearance(in mm) in Terminal Box | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.40.  | Fault level  | 40KA for 0.25Sec  |  |
| 2.41   | Painting   | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.42   | Space heaters:   |   |  |
| 2.42.a | i) Motors above 30 kW  | Separate space heater suitable for 240V, Single Phase, AC,50 Hz   |  |
| 2.42.b | ii) Motors below 30 kW   | Winding shall be suitable for heating at 24 V, Single phase, AC,50 Hz   |  |
| 2.43   | Terminals for space heater   | As per the document LT MOTOR:PROJECT SPECIFIC DETAILS   |  |
| 2.44   | RTD for winding  | Two numbers of Thermistors / RTD for each phase as below are to be provided<br>A. Motors above 37 Kw shall have thermistors Or RTD if specifically called for in enquiry.<br>B. Motor rated 160kW and above shall have RTDs |  |
| 2.45   | Bearing RTD  | For motors 132 Kw and above   |  |
| 2.46   | Terminals for RTD/ Thermistor                                      | Thermistors/ RTDs shall be terminated in an auxiliary terminal box. Details shall be furnished in TB diagram.   |  |
| 2.47   | Earthing   | Two no of earthing provisions on terminal box and on motor body(on opposite sides)  |  |
| 2.48   | Name plate   | As per IS/IEC 60034-8 and Additional data on name plate :<br>a. Bearing DE/ NDE details.<br>b. Year of manufacture  |  |
| 2.49   | Lifting Device   | Eye bolt or lugs to facilitate safe lifting   |  |
| 3      | <b>INSPECTION &amp; TESTING</b>                                    | As per applicable quality plan  |  |

4 DOCUMENTS

|  |   |  |
|--|---|--|
| 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) | <p>Three sets of the following for approval:</p> <ol style="list-style-type: none"> <li>1. Technical Data sheet as per the enclosed format ECI:DATASHEET:LTMOTOR:00</li> <li>2. Motor general arrangement drawing giving foundation details, shaft details and weight</li> <li>3. Motor Terminal box arrangement drawing</li> <li>4. Motor characteristic curves :<br/>Torque vs Speed with load curve superimposed<br/>Speed vs Current<br/>Time vs Current<br/>Thermal with stand curve<br/>Load vs Efficiency<br/>Load vs Slip<br/>Load vs Power factor<br/>Speed vs Time<br/>Load vs Current</li> <li>5. Suggested steel crate packing drawing (Drawing No:- 3-00-114-39893) or vendor standard packing drawing subject to approval.</li> </ol> <p>The following shall be submitted:</p> <ol style="list-style-type: none"> <li>1. Guarantee certificate.</li> <li>2. O &amp; M manuals.</li> <li>3. Acceleration time and LRWT calculation shall be submitted for review.</li> </ol> |  |
| 5 <u>PACKING</u>                                       | <ol style="list-style-type: none"> <li>a) As per suggested Drawing No:- 3-00-114-39893</li> <li>b) The packing shall meet the Transport, Environment &amp; Storage hazards.</li> <li>c) As per Packing Procedure QA:CI: STD:PR:03 or as per Manufacturer's Standard Practice subject to approval.</li> </ol>  |  |

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ECI: DATASHEET: LTMOTOR: 00

TECHNICAL DATA SHEET OF LT MOTOR

P.O No:

DATA SHEET - Customer No: Project:

| 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 $\pm$ 10% AC; 50 Hz $\pm$ 5%;<br>( Check voltaqe as per Enquiry) 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                         | As per IS standards  |
| 14.0  | No load current (with mechanism coupled) | (at Rated.V 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 |  |

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|      |  |  |
|------|--|--|
| 18.0 | No load starting time<br>( without mechanism coupled)            |  |
| 19.0 | Locked rotor withstand time at rated voltage                     | a.Hot<br>b.Cold  |
| 20.0 | Locked rotor withstand time at minimum starting voltage          | a.Hot<br>b.Cold  |
| 21.0 | Locked rotor withstand time at 110% rated voltage                | a.Hot<br>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                               |  |
| 27.0 | Stator winding connection  | Delta / Star   |
| 28.0 | Class of insulation & temperature rise                           | Class F; 60 <sup>0</sup> C by thermometer method / 70 <sup>0</sup> C by resistance method. |
| 29.0 | Minimum permissible starting voltage                             | Volts  |
| 30.0 | Resistance per phase at 20Deg C ( Indicative )                   | Ohms   |
| 31.0 | No of successive starts in Hot condition                         |  |
| 32.0 | Quantity and power consumption of space heater                   | Quantity:          Watts:  |
| 33.0 | Direction of rotation  | Bi-Directional.  |
| 34.0 | Bearing make & type  | Make:<br>Drive End:<br>Non Drive End:  |
| 35.0 | Lubricant quantity grade & recommended interval of lubrication   |  |

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|      |  |  |
|------|--|--|
| 36.0 | Type of mounting & shaft orientation                       | Foot mounting; Horizontal.   |
|      | <u>Terminal Box</u>  |  |
| 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 | GD <sup>2</sup> of motor (kg-m <sup>2</sup> )              |  |
| 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 <input type="checkbox"/> NO <input type="checkbox"/> |
| 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                                      | Upward/ Downward—  |
|      | b. Motor Static load                                       | Upward / Downward—   |
| 54.0 | PAINT SHADE  |  |

Vendor's signature and seal

Rev No :

Date :

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The following curves are to be enclosed during datasheet approval.

1. GA drawing , Terminal box arrangement
2. Torque Vs Speed with load curve superimposed.
3. Speed Vs Current
4. Time Vs Current
5. Thermal with stand curve
6. Load Vs Efficiency
7. Load Vs Slip
8. Load Vs Power factor
9. Speed Vs Time
10. Load Vs Current.

The following information shall be specifically provided for motors suitable for VFD drive ( if called for in eqny during datasheet approval in addition to datasheet.

1. Stator Resistance
2. Stator leakage reactance
3. Magnetising reactance
4. Rotor resistance referred to stator
5. Rotor reactance referred to stator

Vendor's signature and seal.

Date

**LT MOTOR: PROJECT SPECIFIC DETAILS – NTPC North Karanpura**

INDENT NO: R\*\*\*\*\*

Customer No: G601, G602 &amp; G603

|   |   |
|---|---|
| <b>ENERGY EFFICIENT</b>   | IE3   |
| <b>SUPPLY</b>   | Supply: 415V + 10% & -10%, 3 Phase, 50 Hz +5% & -5%. System fault level of 40kA rms for 0.25sec |
| <b>STARTING CURRENT</b>   | As per IS 12615   |
| <b>RATIO OF LOCKED ROTOR KVA TO KW</b>                                    |   |
| i) 50KW to 110KW  | 11  |
| ii) 110KW to 200KW  | 9   |
| <b>MIN. SPACING BETWEEN GLAND PLATE AND CENTER STUD(IN MM)</b>            |   |
| upto 3KW  | As per manufacturer's practice  |
| above 3KW and upto 7KW  | 85  |
| above 7KW and upto 13KW   | 115   |
| above 13KW and upto 24KW  | 167   |
| above 24KW and upto 37KW  | 196   |
| above 37KW and upto 55KW  | 249   |
| above 55kw and upto 90KW  | 277   |
| above 90KW and upto 125KW   | 331   |
| above 125KW and upto 200KW  | 203   |
| <b>PHASE TO PHASE/PHASE TO EARTH AIR CLEARANCE(IN MM) IN TERMINAL BOX</b> |   |
| upto 110  | 10  |
| above 110kw and upto 150KW  | 12.5  |
| above 150KW   | 19  |
| <b>ADDITIONAL DATA TO BE INCLUDED IN DATASHEET</b>                        |   |
| GRADE OF BALANCING OF MOTOR   |   |
| STANDARD CONTINUOUS RATING AT 40DEG.C AMBIENT                             |   |
| DERATED RATING OF MOTOR AT 50DEG.C(DESIGN POINT)                          |   |
| NO LOAD CURRENT OF MOTOR AT RATED VOLTAGE AND FREQUENCY                   |   |
| STARTING TORQUE VALUE IN KGM  |   |
| LOCKED ROTOR KVA @ RATED KW   |   |
| POWER FACTOR AND EFFICIENCY AT 75% LOAD                                   |   |
| POWER FACTOR AND EFFICIENCY AT 50% LOAD                                   |   |
| <b>SPACE HEATER TERMINAL</b>  | Separate terminal box shall be provided   |
| <b>PAINTING</b>   | RAL 5012  |