

**ANDREW YULE & COMPANY LIMITED  
(A Government of India Enterprise)  
Engineering Division, Kalyani Works  
Plot -16 A & B, Block-D,  
Kalyani, Nadia, PIN-741235, WB**

**TENDER DOCUMENTS FOR SUPPLY OF 132 KW/4 Pole AC MOTOR**

**ANDREW YULE & CO. LTD.** invites e-Tender under single stage two part system (Part I: Techno-Commercial Bid and Part II: Price Bid) from bona fide and reputed Company/OEM for above mentioned Job. The Item details are available in **Annexure- i** of this tender document.

Tender document may be downloaded from MSTC website:

[www.mstcecommerce.com/eprochome/aycl](http://www.mstcecommerce.com/eprochome/aycl). Corrigenda or clarifications, if any, shall be hosted on the above mentioned websites only. AYCL reserves the right to accept or reject any tender.

Brief Description:-

**SUPPLY OF 132 KW MOTOR**

**Qty:- 1 no**

Price quoted should be FOR Kalyani Works.

### Schedule of Tender

1.	<b>TENDER NO.</b>	AYCL/ENGG/MSD/SSG/Motor/17090/21 Dated: 30/10/2017
2	<b>Event No</b>	AYCL/ENGG DIVN/29/17-18/ET/172
3.	<b>MODE OF TENDER</b>	e-Procurement System Online submission of <b>Part I - Techno-Commercial Bid</b> and <b>Part II - Price Bid</b> through <a href="http://www.mstcecommerce.com/eprochome/aycl">www.mstcecommerce.com/eprochome/aycl</a> The intending bidders are required to submit their offer electronically through this e-tendering portal. <b>No physical tender is acceptable by AYCL/MSTC</b>
4.	<b>Date of publication of e-Tender through publication MSTC/AYCL websites and Central Public Procurement Portal</b>	<b>01.11.17</b>
5.	<b>Date of availability of NIT to the Vendors for downloading</b>	<b>01.11.17</b>
6.	<b>Earnest Money Deposit</b>	<ul style="list-style-type: none"> <li>• <b>“Earnest Money Deposit”</b>- as per EMD clause given in the Tender documents.</li> <li>• <b>Value @ Rs 20,000</b></li> </ul>
7	<b>Tender Fee</b>	<ul style="list-style-type: none"> <li>• <b>Tender Fee – Rs. 1,000/- (One Thousand only))</b> to be paid by D.D. favoring <b>Andrew Yule &amp;Co Ltd</b>, payable at Kolkata.</li> </ul>
8	<b>Date of Starting of e-Tender for submission of Online Techno-Commercial Bid and Price Bid at <a href="http://www.mstcecommerce.com/eprochome/aycl">www.mstcecommerce.com/eprochome/aycl</a></b>	<b>01.11.2017 – 4:30 PM</b>
9	<b>Date of closing of Online e-tender for submission of Techno-Commercial Bid &amp; Price Bid at <a href="http://www.mstcecommerce.com/eprochome/aycl">www.mstcecommerce.com/eprochome/aycl</a></b>	<b>14.11.17 – 02:00 PM</b>
10.	<b>Date &amp; time of opening of Part-I (Techno-Commercial Bid)</b>	<b>14.11.2017 – 03:00 PM</b>
11	<b>Date &amp; time of opening of Part-II (Price Bid )</b>	<b>TO BE INTIMATED LATER ON</b>

## Important Instructions for E-procurement

This is an e-procurement event of ANDREW YULE & COMPANY LTD Ltd.

You are requested to read the Terms & Conditions (Annexure- III, and IV) of this tender before submitting your online tender. Tenderers who do not comply with the Conditions with documentary proof (wherever required) will not qualify in the Tender for opening of Price Bid.

### 1. Process of E-tender:

A) **Registration:** The process involves vendor's registration with MSTC e-procurement portal which is free of cost. Only after registration, the vendor(s) can submit his/their bids electronically. Electronic Bidding for submission of Techno-Commercial Bid as well as Price Bid over the internet will be done. The Vendor should possess Class III signing type Digital Signature Certificate. Vendors are to make their own arrangement for bidding from a PC connected with Internet. MSTC is not responsible for making such arrangement. (Bids will not be recorded without Digital Signature).

**SPECIAL NOTE:** THE PRICE BID AND THE COMMERCIAL BID HAS TO BE SUBMITTED ONLINE AT [www.mstcecommerce.com/eprochome/aycl](http://www.mstcecommerce.com/eprochome/aycl)

1) Vendors are required to register themselves online with [www.mstcecommerce.com](http://www.mstcecommerce.com) → e-Procurement → PSU / Govt. depts. → Register as Vendor under AYCL- Filling up details and creating own user id and password → Submit.

2) Vendors will receive a system generated mail confirming their registration in their email which has been provided during filling the registration form.

In case of any clarification, please contact MSTC/AYCL (before the scheduled time of the e-Tender).

### Contact person (ANDREW YULE & COMPANY LTD):

1. Mr. Sourav Sen Gupta  
Sr Manager (Projects.)  
[pradip.majumder@andrewyule.com](mailto:pradip.majumder@andrewyule.com)

Cell : +91 98308-53319

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2. Mr. Gourab Banerjee  
Asst. Manager – Materials  
[gourab.banerjee@andrewyule.com](mailto:gourab.banerjee@andrewyule.com)  
Cell- 9674037162

Phone : +91(33) 2582 5734; Fax: +91(33) 2582 8279

**Contact person (E-Commerce, MSTC Ltd):**

- |   |  |
|---|--|
| <b>1. Mr. Arindam Bhattacharjee</b><br>Deputy. Manager (E-commerce)<br>Mobile No: 09330102643<br>Email: arindam@mstcindia.co.in<br>Landline: (033) 22901004 | <b>2) Mr. Sabyasachi Mukherjee</b><br>Assistant Manager (E-commerce)<br>Mobile- 07278030407<br>Email: smukherjee@mstcindia.co.in |
| <b>3. Ms Sumona Maity</b><br>Management Trainee (E-Commerce)<br>Mobile-09831155225<br>Email: smaity@mstcindia.co.in   |  |

**System Requirement:**

- i) Windows XP-SP3 or above / Windows 7 Operating System
  - ii) IE-7 or above Internet browser.
  - iii) Signing & Encryption type digital signature
  - iv) JRE 7 updates 79 software to be downloaded and installed in the system. Security level should be medium
  - v) To enable ALL active X controls and disable 'use pop up blocker' under Tools → Internet Options → custom level (Please run IE settings from the page [www.mstcecommerce.com](http://www.mstcecommerce.com) once)
- 2. Part-I: Submission of EMD, Tender Fee & Filled up General Information Form (Annexure – II) - in sealed envelope to DGM (Materials), KW, AYCL:**
- Bidder may request for exemption from submitting EMD (Refer details given in Sl No 1 of Annexure-IV, General terms & condition).  
Tender Fee – Rs. 5,000/- (Five Thousand only- Non refundable) to be paid by D.D. favouring Andrew Yule &Co Ltd, payable at Kolkata.
- Earnest Money as per amount mentioned in Annexure-VII to be paid by DD favouring Andrew Yule & Co. Ltd. Payable at Kolkata
- General information, under Annexure-II complete in all respect along with desired document.
- In case of failure to submit the EMD within the stipulated time, the Tender may be rejected.

**Part-II: Online Bid Submission: After proper submission of EMD and Tender Fee at Andrew Yule & Co, the prospective bidder to submit online Techno commercial and price bid through MSTC portal.**

**Following documents are to be uploaded at the E-Tender Portal as a credential of the prospective bidder:**

3. Present Customer List.
4. Copies of purchase Orders & Performance Certificate from at least one reputed Organizations for having supplied same materials and provided same service during the year 2014-2015/2015-2016. Offers received without copies of performance certificate will/may be rejected.
5. Balance sheets and P&L Account. (2014-2015, 2015-2016 & 2016-17).

**Bidding in e-Tender:**

- a. No interest will be paid on EMD. EMD of the unsuccessful bidder(s) will be refunded by ANDREW YULE & COMPANY LTD. EMD to be paid along with the Document within the last date as mentioned in SOT.
- b. The process involves Electronic Bidding for submission of Techno Commercial Bid as well as Price Bid.
- c. The bidder(s) who have submitted the EMD & Tender Fee to Andrew Yule can submit their Techno Commercial Bids and Price Bid through internet in MSTC website [www.mstcecommerce.com](http://www.mstcecommerce.com) → e-procurement → PSU / Govt depts. → Login under AYCL → My Menu → Auction Floor Manager → live event → Selection of the live event.
- d. The bidder should allow to run an application namely enApple by accepting the risk and clicking on run. This exercise has to be done twice immediately after opening of Bid floor. Then they have to fill up Common terms /Commercial specification and save the same. After that clicking on the Techno-Commercial bid, if this application is not run then the bidder will not be able to save / submit his Techno-Commercial bid.
- e. After filling the Techno-Commercial Bid, bidder should click 'save' for recording their Techno-Commercial bid. Once the same is done, the Price Bid link becomes active and the same has to be filled up and then bidder should click on "**Save**" to record their Price Bid. Then once both the Techno-Commercial bid & Price Bid has been saved, the bidder can click on the "**Submit**" button to register their bid.
- f. Vendors are instructed to use link in **My Menu** to **Upload Documents** in document library. Multiple documents can be uploaded. Maximum size of single document for upload is 5 MB.

- g. Once documents are uploaded in the library, vendors can attach documents through *Attach Document* link against the particular tender. For further assistance please follow instructions of vendor guide.
- h. In all cases, bidder should use their own ID and Password along with Digital Signature at the time of submission of their bid.
- i. During the entire e-tender process, the bidders will remain completely anonymous to one another and also to everybody else.
- j. The e-tender floor shall remain open from the pre-announced date & time and for as much duration as mentioned above.
- k. Techno-Commercial bid will be opened electronically on specified date and time as given in the NIT. Bidder(s) can download Technical Comparative statement.
- i. Price bid will be opened electronically on specified date and time given in the NIT. Bidder(s) can download Price Comparative statement.
- m. All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.
- n. All electronic bids submitted during the e-tender process shall be legally binding on the bidder. Any bid will be considered as the valid bid offered by that bidder and acceptance of the same by the Buyer will form a binding contract between Buyer and the Bidder for execution of supply. Such successful tenderer shall be called hereafter **SUPPLIER**.
- o. It is mandatory that all the bids are submitted with Digital Signature Certificate otherwise the same will not be accepted by the system.
- p. Buyer reserves the right to cancel or reject or accept or withdraw or extend the tender in full or part as the case may be without assigning any reason thereof.
- q. No deviation of the terms and conditions of the tender document is acceptable. Submission of bid in the e-tender floor by any bidder confirms his acceptance of terms & conditions for the tender.
- r. Unit of Measure (UOM) is indicated in the e-tender Floor. Rate to be quoted should be in Indian Rupee as per UOM indicated in the e-tender floor/tender document.

E-tender cannot be accessed after the due date and time mentioned in NIT.

All notices / corrigendum and correspondence to the bidder(s) shall be sent by email only during the process till finalization of tender by ANDREW YULE & COMPANY LTD/MSTC LTD. Hence the bidders are required to ensure that their corporate email I.D. provided is valid and updated at the

stage of registration of vendor with MSTC. Bidders are also requested to ensure validity of their DSC (Digital Signature Certificate).

Any order resulting from this open e-tender shall be governed by the terms and conditions mentioned therein.

No deviation to the technical and commercial terms & conditions are allowed.

ANDREW YULE & COMPANY LTD has the right to cancel this e-Tender without assigning any reason thereof.

The online tender should be submitted strictly as per the terms and conditions and procedures laid down in the website [www.mstcecommerce.com/eprochome/aycl](http://www.mstcecommerce.com/eprochome/aycl) of MSTC Ltd.

The bidders must upload all the documents required as per terms of NIT. Any other document uploaded which is not required as per the terms of the NIT shall not be considered.

The bid will be evaluated based on the filled-in technical & commercial formats.

Bidders are requested to read the vendor guide and see the video in the page [www.mstcecommerce.com/eprochome/mstc](http://www.mstcecommerce.com/eprochome/mstc) of MSTC Ltd. to familiarize them with the system before bidding.

**ANDREW YULE & COMPANY LIMITED**  
**Kalyani Works, Engineering Division**

**General Information**

**Tender ref.: AYCL/ENGG/MSD/SSG/Motor/17090/21 Dated: 30/10/2017**  
**Ref (This document should be dully filled up and attached along with EMD)**

The applicants are required to furnish full information to the queries included in this form. In giving the particulars, the supporting documents/certificates as called for per queries at places, must be tagged with the application for evidencing the information furnished in the application.

1. Name of the firm in full :

2. Address, Telephone No.,

Fax No. & E-mail :

a) Address :

b) Telephone No. :

c) Fax No. :

d) E-mail ID :

e)Name of contact person :

3. Status of the company (Limited / Pvt. Ltd /  
Proprietary /partnership/ Reg. /Non-Reg.  
and date of inception:

4. Trade License No.

**(Please attach a photo  
Copy of the license) :**

5. Service Tax Registration No.

(Please enclose photocopy of Reg.)

6. Banker's name

(a) Name of the Bank :

(b) Name& address of the Branch :

(c) Account No. :

**Note: A copy of Banker's Certificate to be attached.**

7. GST No.



8. I. T. Permanent Account No. & assessed up to (latest clearance Certificate to be attached):

9. Turnover in last three financial years (Audited Balance Sheet and P & L Account to be submitted):

10. Name of present customers (Photocopy of few contracts may be enclosed):

11. Details of EMD (DD Details) submitted:

12. Details of Tender Fee (DD Details) submitted:

I/we hereby certify that the particulars furnished by me/us above are true to the best of my / our knowledge and belief and mis-representations of facts will render me/us liable to my/our action as may be deemed fit by Andrew Yule & Co. Ltd. (Engineering Division) & have the sole discretion to reject or accept my/our candidature.

(Signature of the Applicant)  
Office Stamp/Seal.

Place :

Date ;

List of Enclosures:

**TECHNO-COMMERCIAL TERMS**  
**(To be filled online in MSTC portal).**

<b>SL NO</b>	<b>TERMS &amp; CONDITIONS</b>
1	Delivery period/Lead time: Within 30.12.17.
2	GST no: Pls. mention with registration No., if any
3	Negotiated L1 price may be offered to other bidders whose price bid was opened. Andrew Yule reserves the right to order the entire Tender quantity on the L1 bidder.
4	Risk purchase clause: The company reserve the right to impose risk purchase clause as " For delay in execution / supply we shall have every right to do the same through some other agency/s which shall deemed fit and the additional cost of the same (Incidental/Consequential) shall be to your account which with respect to our intimation or observation whatsoever. Please confirm acceptance.
5	Liquidated damage - If the delivery is delayed beyond the date of scheduled date of execution in the order, penalty will be levied @ 1/2% per week subject to a maximum of 5% . Please confirm acceptance.
6	Legal condition(Arbitration): Any contract entered against this tender will be as per the following legal condition- It is recorded that this purchase order / contract / agreement is executed and concluded by and between the parties hereto at premises Engineering Division, Kalyani Works Plot -16 A & B, Block-D, Kalyani, Nadia, PIN-741235, West Bengal. In the event of any dispute arises out of this agreement between the parties only the appropriate Civil Court in the City of Kolkata shall have the exclusive jurisdiction to entertain, try and determine the said proceedings in exclusion of all other courts. Please confirm acceptance”-.
7	Validity of offer: Your price should be valid for acceptance till completion of complete supply/service, No price escalation will be entertained during that period
8	Price Basis , P&F :The price quoted should be FOR Kalyani Works. and will remain valid , firm & fixed till completion of supply, installation and commissioning of the items. no price variation will be allowed at any circumstances.
9	PAYMENT TERMS: - within 90 days of receipt of the items at site ( duly received.)
10	Guarantee /Warrantee Clause: The workmanship/smooth operation of the plant with respect to supply is to be guaranteed for a period of 18 months from the date of supply.
11	Inspection: Inspection will be done by us/client at your works. Final inspection may be done, if required by us/client at site after receipt of the materials/installation of the item by you. Vendor to submit QAP for approval.
12	Codes and Standards: All equipment and materials to be furnished under this specification shall be designed, manufactured and tested in accordance with the latest revisions of the relevant Indian Standard(IS) as applicable. The work shall be done in compliance with the IS Specification.

13	<p><b>Force Majeure Clause:</b></p> <p>1. Force Majeure</p> <p>1.1 Neither vendor nor AYCL shall be liable to the other for any delay or non-performance of its obligations under this <b>Contract</b> arising from any cause beyond its reasonable control including in relation to either Party any act of God, governmental act, act of any regulatory authority, supervening illegality, war, fire, flood, explosion, power blackout, break-down of machinery, loss of utility, civil commotion, industrial dispute, manpower unrest acts or omissions of telecommunications or data communications operators or carriers , in relation to vendor (to the extent not directly attributable to vendor's negligence), (a "<b>Force Majeure Event</b>").The affected Party shall promptly notify the other Party in writing, of the cause and the Force Majeure Event and its likely duration within no later than two (2) days after the affected Party knew of the occurrence of the Force Majeure Event. Performance by the affected Party of its obligations <b>under this Contract</b> shall be suspended for the duration of the Force Majeure Event. If performance is not resumed within 15 (fifteen) days after theForce Majeure Event, either Party may terminate this <b>Contract</b> by giving to the other Party seven (7) days' notice in advance.</p> <p>1.2 On the occurrence of any Force Majeure Event, the affected Party shall use all reasonable efforts (including emergency fixes and workarounds) to perform its obligations <b>under this Contract</b> during the period of suspension. Further the affected Party shall perform such part of its obligations pursuant to this Contract as are not affected by the Force Majeure Event.</p> <p>1.3 The affected Party shall use its reasonable efforts to mitigate the effect of any event of Force Majeure as soon as practicable.</p>
14	<b>Others if any.</b>

## GENERAL TERMS AND CONDITIONS

1. **EMD:** to be paid , by way of Demand Draft drawn in favor of M/S ANDREW YULE & CO.LTD Payable at Kolkata to be submitted.

For bidders already enlisted with AYCL- Kalyani Works, having outstanding amount more than the EMD amount or who have already submitted the EMD against our earlier tenders or those who have security deposit with Andrew Yule may apply for adjustment of the same.

Bidders who are MSME units may apply for exemption from furnishing EMD by making a specific request in writing and enclosing the necessary document in support of the same.

Bidders whose turnover is more than Rs: 50 crores may apply for exemption from furnishing EMD by making a specific request in writing and enclosing the necessary document in support of the same

If reason for non-submission of EMD or adjustment against the outstanding balance for EMD is not mentioned in Techno-commercial bid of tender, the tender will be rejected.

New vendors are required to submit all credentials for enlistment /competency

2. Bidder should submit copies of purchase orders & Performance Certificate from at least two reputed Organizations for providing/supply of similar items during the year last three years.. Offers received without copies of performance certificate may be rejected.

3. Bidders should enclose copy of last 3 years Balance sheets and P&L Account. (2014-2015, 2015-2016, 2016-2017).

4. Bidders should enclose a DD for Rs: 5,000 /= in favor of ANDREW YULE & CO.LTD, Payable at Kolkata towards cost of tender document.

5. THE RIGHTS OF THE COMPANY

The company reserves the right to reject any tenderer based on their past performance

6. **The breakup of your quoted rate with respect to supply and supervision service to be submitted along with Price bid.**

**CHAPTER 17 : AC & DC MOTORS****1.00 MOTORS****1.1 SCOPE**

This specification is intended to cover design, manufacture, assembly and testing of AC Squirrel Cage Induction Motors for use in Thermal Power Plants and is supplement to the driven equipment specifications under which these motors are being procured for the project.

**SITE CONDITIONS**

Site conditions are covered in 'Project Data', contained in specification of the driven equipment.

**1.2 Gases, Fumes & Dust Particles**

1.2.01 General - Sulphur dioxide and/or trioxide fumes mildly present. Climate is tropical, conducive to fungus growth.

**1.2.02 Dust Particles**

1 Outdoor locations - Heavily dusty with abrasive dust and coal particles of size five (5) to hundred (100) microns present in atmosphere in large quantity.

2 Indoor Locations.

2.1 Lignite conveyors - As for outdoor as per clause 1.02.02.1 above.

2.2 Other locations - Lightly dusty with abrasive dust and coal particles of size five (5) to twenty (20) microns present in atmosphere.

**1.2.03 Special Fumes**

1 Water treatment plant and acid cleaning room - Acid and alkali fumes present.

2 Fuel oil pumping areas & Hydrogen generation plant - Explosive fumes (flameproof motors required).

1.2.04 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.

**1.3 LOCATION OF MOTOR - As required**

1.4 **SPECIFICATIONS & STANDARDS**.....Motors shall comply with the latest revisions of all relevant standards of BIS (IS-325, IS-900, IS-996, IS-1231, IS-1885, IS-2148, IS-2223, IS-2253, IS-2254, IS-2848, IS-3202, IS-4029, IS-4691, IS-4722, IS-4728, IS-4889, IS-6362, IS-7816, IS-8223, IS-8789 , IS: 12615, IS:3177 and IEC : 60034 3Φ Induction motor) except as modified herein or in driven equipment specification.



"1 x 660 MW - Harduaganj Thermal Power Station, Extension - II"

Bidding Doc. No. : D-1-4029-4100-00-T-RSB



Motors conforming to BS or IEC Publications, which ensure equivalent quality shall also be acceptable. In case of any difference between IS Specification/International Standards (IEC; NEMA etc.), this motor specification prevails.

## 1.5 TYPE

### 1.5.1 AC Motors:

- a) Squirrel cage induction motor suitable for direct-on-line starting.
- b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg. C ambient temperature), shall be **Efficiency class-IE2**, conforming to IS 12615, or IEC:60034-30.
- c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.

1.5.2 DC Motors Shunt wound.

## 1.6 VOLTAGE (NOMINAL)

### 1.6.1 LV Motors

For motors upto and including 200 KW - Four hundred fifteen (415) V.

### 1.6.2 MV MOTORS

For motors above 200k W upto and including 1500kW. Three point three (3.3)kV.

**For CHP conveyors motor above 160 kW, 3.3 kV, AC supply is to be used. However all the motors on stacker reclaimer shall be on 415 V AC only.**

### 1.6.3 HV Motors

For motors above 1500kW - eleven(11) KV

1.6.4 All motors are to be designed for system grounding described in "System Particulars" under site information of the Driven Equipment Specification.

1.7 **FREQUENCY (NOMINAL)** - fifty (50) Hertz

1.8 NUMBER OF PHASES - Three (3)

1.9 SPEED - As required by the driven equipment

1.10 TYPE OF STARTING :

Direct on-line (VFD/Soft-starter/star/delta starting in special cases)

1.11 DUTY

1.11.1 Continuous motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment,



"1 x 660 MW - Harduaganj Thermal Power Station, Extension - II"

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whichever is higher, considering highest system frequency and voltage variation. Crane motors shall be rated for S4 duty, 40% cyclic duration factor. If however, a higher margin is stipulated in the accompanying driven equipment specification, the higher stipulated margin shall prevail.

- 1.11.2 All HT motors shall be vibration pads for mounting vibration detectors.
- 1.11.3 All motors shall be designed to withstand hundred twenty (120) percent of rated speed without any mechanical damage for two (2) minutes.
- 1.11.4 Motors shall be designed to keep torsional and rotational natural frequencies of vibration of the motor and driven equipment atleast twenty five (25) percent above or below, preferably above the motor operating speed (to avoid resonance in vibration over the operating speed) range.
- 1.11.5 All LV motors rated 0.37kW and higher with S1 duty shall be compulsorily be of energy efficiency level IE 2 as per IS 12615:2011.

Motors rated above 37kW shall have efficiency higher than 0.92 and high power factor of atleast 0.88.

#### 1.12 **SUPPLY VARIATIONS**

Motors shall be capable of running continuously at full load under following variations in power supply:

- 1.12.1 All equipments shall be suitable for rated frequency of 50 Hz with a variation of (+) 3% and (-)5%, voltage variation of ( $\pm$ ) 6% for 11 kV & 3.3 kV and ( $\pm$ )10% for 415V and 10% (absolute sum) combined variation of voltage and frequency unless specifically brought out in the specification.

#### 1.13 **ABNORMAL CONDITIONS CAPABILITY**

Motor shall have following capabilities as specified design ambient temperature:

- 1.13.1 The motors shall also be capable of running up again after voltage collapse to about 40% for approximate duration of 0.5 sec. Subsequent rise in voltage to 70% and further to 80% and 100%, the total duration not exceeding 20 sec.

##### 1.13.2 Low Voltage Running :

Motor shall be capable of running satisfactorily at seventy five (75) percent nominal voltage for five (5) minutes.

##### 1.13.3 Momentary Low Voltage Withstanding :

Motor, when running at full load, shall not stall when voltage drops down to seventy (70) percent nominal voltage for one (1) minute.

#### 1.14 **STARTING CAPABILITY**

##### 1.14.1 Low Voltage Starting :

Motor shall be capable of starting and accelerating to full speed at full load (including loaded equipment e.g. mills and conveyors etc) at eighty (80)



percent nominal voltage at motor terminals. Mill motors may be permitted to start with terminal voltage not below 90%.

1.14.2 Cold Motor Starting ..... Under specified voltage variations two (2) starts in quick succession and third start five (5) minutes thereafter, all with full load (including loaded equipment eg mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.3 Hot Motor Starting ..... Under specified voltage variations, one (1) immediate and two (2) fifteen (15) minutes interval starts all with full load (including loaded equipment e.g. mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.4 Motor shall also be suitable for three (3) equally spread starts per hour when the motor is under normal service condition.

1.14.5 Break-away Starting Current ..... Breakaway starting current as percent of full load current for various motor ratings shall not exceed the values given below:

1.14.5.1 Motors upto 1500 KW ..... 600% subject to IS Tolerance of plus 20%.

1.14.5.2 Motors above 1500 KW ..... 450%. Not subject to any positive tolerance

1.14.5.3 **Starting voltage requirement**

a) All Motors (except Mill Motors)

- 80% of rated voltage for Motors upto 4000 kW
- 75% of rated voltage for Motors above 4000 kW

b) For Mill Motors:

- 85% of rated voltage for Motors above 1000 kW
- 90% of rated voltage for Motors below 1000 kW

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

1.14.5.4 **Starting Time**

1.14.5.4.1 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.

1.14.5.4.2 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.

1.14.5.4.3 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.



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**1.14.5.5 Torque Requirements:-**

- 1.14.5.5.1 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% of motor full load torque.
- 1.14.5.5.2 Full out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty Motors.

**1.15 SAFE STALL TIME**

- 1.15.1 To avoid problem in selecting standard protective relays without using speed switches, safe stall time under hot conditions (corresponding to 110% nominal voltage at motor terminals) shall be more than the accelerating time (corresponding to 80% nominal voltage at motor terminals) by the following minimum values :
- 1.15.1.01 Two (2) seconds, where accelerating time (at 80% nominal voltage) does not exceed 20 seconds.
- 1.15.1.02 Three (3) seconds, where accelerating time (at 80% nominal voltage) exceeds 20 seconds.
- 1.15.1.03 At no stage, speed switch shall be provided to achieve the above requirements mentioned under Clause No. 1.14.5.4

**1.16 CLASS OF INSULATION**

- 1.16.1 LV Motors ..... Class F.
- 1.16.2 MV & HV Motors ..... Class F
- 1.16.03 However temperature rise shall be restricted to limits corresponding to Class 'B' insulation for both HT & LT motors. The temperature under abnormal running conditions shall be limited to 5°C above class 'B' limits.
- 1.16.04 The value of the polarization index for motors above 200kW should not be less than 2 when determined according to IS: 7816.
- 1.17 **TEMPERATURE RISE UNDER NORMAL CONDITIONS**..... Temperature rise over specified design ambient temperature when motor is running with full load at nominal supply voltage & frequency shall not exceed the values given below:

S.No.	Specified Design Ambient Temperature	Thermometer Method	Resistance Method
1.17.01	50°C	60°C	70°C
1.17.02	45°C	65°C	75°C
1.17.03	40°C	70°C	80°C

**1.18 BUS TRANSFER WITHSTAND CAPABILITY**

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Motors will be connected to an automatic bus transfer system and hence may be subjected to one hundred and fifty (150) percent of the nominal voltage during changeover of buses due to the vector difference between the residual voltage and incoming supply voltage and the duration of this condition may be one second. Motors shall be capable of withstanding the voltage and torque stresses developed under such conditions without damage. The manufacturer/vendor shall indicate the special precautions taken to meet the above requirements and confirm.

- 1.18.01 That about 5000 bus transfers, in lifetime of motor, shall not puncture its insulation.
- 1.18.02 That motor shall be capable of withstanding heavy inrush transient current caused by such bus transfers without damage.
- 1.18.03 That the motor windings shall be adequately braced to satisfactorily withstand mechanical stresses under these conditions.
- 1.18.04 The motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torques under these conditions.

#### 1.19 TYPE OF ENCLOSURE

- 1.19.01 Outdoor Motors ..... IP 55 (Additional canopy to be provided by EPC contractor.
- 1.19.02 Indoor Motors ..... IP 55
- 1.19.03 IP-55 degree of protection shall be achieved without application of any compound, putty etc.

#### 1.20 METHOD OF COOLING

- 1.20.1 Method of cooling shall be IC 411 (TEFC), IC 511 (TETV) or IC 611 (CACA). However, motors rated 3000kW or above can be closed air circuit water cooled (CACW).
- 1.20.2 Large capacity motors not available with above types of cooling may be accepted with IC 81 W for IC 91 W (CACW) cooling subject to the approval of the Owner.

- 1.21 TYPE OF MOUNTING ..... As required for the driven equipment.

#### 1.21 MAXIMUM MECHANICAL VIBRATIONS

- 1.21.01 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 produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
- 1.21.02 Noise level

The noise level of motors shall not exceed 85 db (A) at 1m from operating motor measured in accordance with IS: 10265.



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- 1.21.03 Motor body shall have two earthing points on opposite sides.
- 1.21.04 11 KV motors shall be offered with Separate Insulated Connector (Elastimould or Equivalent make) as per IEEE 386. The offered Elastimould terminations shall be provided with protective cover and trifurcating sleeves. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
- 1.21.05 3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided 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.
- 1.21.06 The spacing between gland plate & centre of terminal stud shall be as per Table-I.

**TABLE - I****DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS**

<b>Motor MCR in KW</b>	<b>Minimum distance between centre of stud and gland plate in mm</b>
------------------------	--

**UP to 3 KW****As per manufacturer's practice.**

Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

- 1.21.07 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.



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1.21.08 For motors rated 1000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.

1.21.09 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.

(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
(e)	Above 4000KW	:	6 to 6.5

## 1.22 WINDING & INSULATION

- (a) Type : Non-hygroscopic, oil resistant, flame resistant
- (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature.
- (c) 11kV & 3.3 kV : Thermal class 155 (F) insulation.  
AC motors  
The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15
- (d) 240VAC, 415V : Thermal Class( B ) or better  
AC & 220V  
DC motors

## 1.23 DIRECTION OF ROTATION

1.23.1 As needed by driven equipment.

1.23.2 The 3 phase motor shall, however, be suitable for operation in both directions of rotation. A plate showing direction of rotation as determined by the phase sequence on the terminals marking shall be screwed at non-driving end of the body of the motor.

1.23.3 If, in the case of HT motors, fan is suitable for only one direction of rotation, the fan shall be so designed that with the slight modification work, it can be made suitable for other direction of rotation also. No extra material shall be required for doing above modification work.

## 1.24 BEARINGS

1.24.1 General ..... Greased ball, roller and/or sleeve bearing shall be rated for minimum standard life of 20,000 hours taking bearing and driven equipment loads into account. Loss of grease shall be scarce and it shall not creep along shaft into motor housing.

Bearing shall be effectively sealed against dust ingress and shall be pressure grease gun lubricated.

If the bearings are oil lubricated, a drain plug shall be provided for draining residual oil and oil level gauge shall be provided to show precisely oil level required under standstill and running conditions.



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Unless otherwise approved, bearing lubricating system shall be such that no external forced oil or water is necessary to maintain required oil supply to keep bearing temperature within design limits.

For MV & HV motors, the bearings shall be insulated wherever necessary to prevent damage to motor bearings from shaft current.

When pressure oiling is required for horizontal motors, bearings shall be sleeve type arranged for pressure oiling supplied from lubrication system of driven machine, with ring oiling for starting and emergency duty. Ring oiling system shall be adequate for starting and continuous operation of motor for at least half an hour, without pressure oiling system in operation. Oil sight flow gauges shall be provided to indicate oil flow through each bearing.

Lubricants shall be selected for prolonged storage and normal use of motors in tropical climate and shall contain corrosion and oxidation inhibitors. Greases shall have suitable bleeding characteristics to minimize setting. The selected lubricants shall be indigenously available.

Sleeve bearings for use with motors having flexible coupling with limited end play, shall have adequate axial end play to prevent transmission of thrust from driven equipment to motor bearings.

Bearings shall be of reputed make subject to the approval of the Owner/Consulting Engineer.

- 1.24.2 Large motors ..... Large motors shall preferably have spherically seated babitted, ring forced, feed lubricated, water-cooled bearings. If anti-friction bearings are provided, these shall be roller bearings rated for a minimum standard life of 30000 hours taking all bearing and driven equipment loads into account.
- 1.25 **SHAFT EXTENSION** ..... Key slotted bare shaft extension of required length with key on driving end.
- 1.26 **DRAIN HOLES** ..... Two (2) drain holes with plugs, one (1) on either end of motor at the bottom most point.
- 1.27 **LIFTING DEVICES** ..... Motors shall be provided with eyebolts, lugs or other means to facilitate safe lifting.
- 1.28 **DOWEL PINS**..... It shall be possible to drill holes vertically inclined through motor feet or mounting flange for installing dowel pins after assembling motor and driven equipment, before despatch (for completed driving + driven equipment assembly) or at site after erection (for separate supplies of above equipment).
- 1.29 **CENTERING SPIGOT**..... Flange mounted motor shall have centering spigot to match driven equipment socket.
- 1.30 **EASE OF MAINTENANCE**..... Motor shall be so constructed that it can be de-assembled and reassembled with ease.
- 1.31 **NAMEPLATES**..... Motor shall have nameplate(s) showing diagram of connections, all particulars as per IS: 325 and following additional information:



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In addition, an arrow block shall be screwed on to the body of motor on the non-driving end to indicate direction of rotation of motor.

1.31.1 Temperature rise under normal/abnormal conditions.

1.31.2 Type of bearing and recommended lubricants.

1.32 **FINISH**..... Motor shall have glossy, light grey finish No. 631 as per IS: 5 for withstanding site conditions as per Clause 1.00 above.

All sharp edges and scales shall be removed from the surface, which shall then be thoroughly degreased, de-rusted and given two (2) coats of primer and two (2) coats of finish paint. It is preferred that a phosphate coat is given to motor prior to application of primer coat. Motors for water treatment plant shall have Zinc Chromate base with acid resistant Epilex 4 paint.

1.33 **TERMINAL BOXES**

1.33.1 General .....Motors shall be provided with separate terminal boxes for main, space heaters, embedded temperature detectors, bearing temperature indicators and moisture detectors terminals. When it is not possible to provide LT motors with separate terminal box for space heater terminals, space heater terminals shall be adequately segregated from the main terminals in the single box. Terminal boxes shall be weatherproof and water-tight conforming to minimum IP-55 degree of protection with removable front cover for making connections. IP-55 degree of protection shall be achieved without application of compound. Space between and around terminals shall be adequate for easily connecting aluminium conductor cables. Terminal box arrangement shall be to the approval of the Owner /Consulting Engineer. All terminal boxes shall be suitable for proper termination of the type and tentative size of cables specified in Clause 1.34 below, however, exact size of cables shall be furnished by Owner during engineering stage.

The terminal boxes shall be complete with cable glands and termination accessories as required. Suitable non-magnetic material construction shall be adopted for terminal boxes where single core cables are to be terminated. All HT motors shall be provided with phase segregated terminal box.

Terminal bushings and clamps shall be non-absorbent, non- inflammable, insulated material for connecting with cable.

1.33.2 **Main Terminal Box**

1.33.2.1 LV Motors ..... Main terminal box shall be capable of being turned through 360 degrees in steps of 90 degrees.

1.33.2.2 MV & HV Motors ..... Motor shall be provided with two (2) terminal boxes for stator terminals. One (1) terminal box shall be for phase terminals while other one for forming star connection. These should be interchangeable to facilitate cable routing.

Neutral terminal box for HT motors rated 2000 KW and above shall be suitable for mounting of three (3) Nos. wound/bar primary/ring type cast resin insulated current transformers for differential protection. These transformers shall be supplied and mounted in the motor terminal box. In addition to above, 3 Nos. of



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identical current transformers shall be supplied loose for mounting in the switchgear. Stator phase terminal box may either be phase segregated or standard terminal box suitable for both top and bottom entry of cables (i.e. they should be capable of being turned through 180 Degrees). The terminal box shall be designed for termination of XLPE cables using heat shrinkable or push on type terminating Kit. Terminal leading shall be stud type or leading wire type.

- 1.33.2.3 Cable End Boxes.....Terminal Boxes shall be provided with cable end boxes having cable lugs and cable glands for cables of sizes as specified in Clause 1.34 below.

Cable box shall be suitable for glanding the cables; and shall have adequate space between cable glands terminating studs to allow suitable bends of cable inside the cable box for all 3 phases of relevant cable sizes specified.

- 1.33.2.4 The terminal boxes shall be capable of withstanding at the terminals the system fault level (as indicated below) without rupture for a duration of atleast 0.25 seconds.

Min. fault level for MV Motors - 40 KA

Min. fault level for LV & HV Motors - 50 KA

- 1.33.2.5 **PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:**

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

- 1.33.2.6 Terminal Accessories.....Each terminal end shall be furnished with bimetallic washers, spring washers, nuts and crimp type aluminium (preferably tinned) lugs suitable for cables of sizes as specified in Clause 1.34 below.

## 1.34 TYPE AND SIZE OF CABLES

### 1.34.1 Space Heaters

- 1.34.1.1 For LV Motors: Two point five (2.5) mm<sup>2</sup>, two (2) core copper conductor PVC insulated, armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable to IS: 1554 (Part-I).

- 1.34.1.2 For MV & HV Motors: Six (6) mm<sup>2</sup> two core aluminium conductor PVC insulated armoured and FRLS PVC sheathed heavy duty 650/1100V grade cable to IS: 1554 (Part-I).

- 1.34.2 For Embedded Temperature Detectors two sets of six (6) Twisted triad 0.5 mm<sup>2</sup> ATC copper conductor armoured, shielded cable, 650/1100 V Grade IS: 1554 (Part-I). For bearing temperature, RTDS, two (2) sets of four (4) twisted triad



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0.5 mm<sup>2</sup>, ATC copper conductor armoured shielded 650/1100 V Grade, IS: 1554 (Part-I).

1.34.3 Bearing Temperature Indicators - For each indicator, 0.5 mm<sup>2</sup> six (6) tarnished triad ATC copper conductor, PVC insulated, shielded armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable as per IS: 1554 Part-I. Two (2) cables one (1) for each bearing temperature indicator.

1.34.4 For Moisture Detectors.....As for space heaters as per Clause 33.01.01 above.

1.34.5 **For Main Terminals**

#### LT Motors

1. Three (3) core cables .....Stranded aluminium conductor, XLPE insulated, colour coded, laid up, PVC sheathed, GI wire / strip armoured, FRLS PVC jacketed overall, 650 / 1100V grade, heavy-duty cables as per IS: 1554 (Part-I).

2. Single core cables .....Stranded aluminium conductor, XLPE insulated, hard drawn aluminium wire/ strip armoured FRLS PVC jacketed overall, 650 / 1100V grade, heavy duty cable as per IS: 1554 (Part-I).

#### HT Motors

1. Three (3) core cables ..... stranded aluminium conductor, XLPE insulated, screened colour coded, laid up, PVC sheathed, GI wire/strip armoured FRLS PVC jacketed overall, 6.6 KV / 11 KV grade, heavy duty cables as per requirement for unearthed system as per IS: 7098 (Part-II).

The size and no. of cable to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box, cable gland and lugs suitable for the same.

Cable size may be increased in some cases because of large number of cables in under-ground ducts or because of voltage drop consideration. The supplier shall supply with terminal box and cable accessories suitable for higher size of cable at no extra cost.

1.35 **EARTHING**

1.35.01 General..... Two (2) grounding terminals one (1) on either side at the bottom suitable for connecting mild steel/GI flat/GI wire grounding conductor, size of grounding conductor shall be decided during detailed engineering.

1.35.02 LV Motors.....At each earthing point, two (2) drilled and tapped holes with hexagonal head bolts, plain washers, spring washers and tinned lugs (for motors upto 5.5 KW) for size of conductor specified shall be provided.

1.35.03 MV & HV Motors.....Non-corrodible metallic grounding pad shall be welded or brazed at each earthing point. The size of grounding pad shall be 75x65x25 mm. Grounding pad shall have 40 mm apart two (2) drilled and tapped holes with hexagonal head bolts, plain washers and spring washers for size of conductor specified. In addition, one suitable earthing terminal shall be



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provided inside the stator phase terminal box for earthing metallic shield of XLPE cables.

- 1.36 **EMBEDDED TEMPERATURE DETECTORS**.....HT motor shall be provided with six (6) Nos. duplex resistance temperature detectors (RTDs) embedded in stator winding at locations where high temperatures are expected. In addition one (1) duplex type RTD shall be provided in each bearing. The RTDs shall be 3 wire duplex platinum resistance type having a value of 100 ohms at 0 Deg.C
- 1.37 **BEARINGS TEMPERATURE INDICATORS**..... HT motors shall be provided with dial type two (2) bearing temperature indicators and will have two (2) sets of contacts, each set having 2 NO + 2 NC contacts rated for 5A at 240V AC and 0.5A at 220V DC. One set will be set to operate at lower value to give alarm and other set at a higher value to trip the motor.
- 1.38 **SPACE HEATERS**.....Valve / Damper actuator motors; and Motors above 30 KW shall be provided with one (1) or two (2) space heaters suitable for 240V, 50 Hertz single phase AC supply and of adequate capacity to maintain motor internal temperature above dew point to prevent moisture condensation or deterioration of insulation during shut down. Heaters shall be mounted inside the motor in accessible locations so that their removal and replacement is simple. Motors upto 30 kW shall have stator windings suitable for connections to 24V, 50 Hz AC supply for space heating.
- Motors upto 30 kW shall have stator windings suitable for connection to 24V, 50 Hz ac supply for space heating
- The terminals of space heaters shall be brought out to a separate totally enclosed dust proof and weatherproof terminal box.
- 1.39 **HOT AIR TEMPERATURE DETECTOR**
- If the motor is of CACA or CACW enclosure, a thermometer with alarm contracts in hot air circuit shall be provided.
- 1.40 **WATER FLOW INDICATOR**
- If the motor is of CACW enclosure a provision shall be made for visual indication of water flow and flow switch shall also be provided with alarm contacts. Thermometers shall be provided in water inlet and outlet circuits.
- 1.41 **MOISTURE DETECTORS**.....Motors with type of cooling 1C 81W or 1C 91 W shall be provided with moisture detectors for raising alarm in the event of water tube failure.
- 1.42 **BED PLATE**.....Whenever motor is supplied with driven equipment the Supplier shall ensure that bed plate suits both motor and driven equipment and is adequately braced to keep vibration and misalignment within allowable limits to the approval of driven equipment and motor manufacturers.
- 1.43 **OTHER ACCESSORIES**..... Motor shall be supplied with all accessories and parts other than those, specified above which are necessary and/or useful for efficient operation.

1.44 **TYPE TEST**1.44.01 **HT MOTORS**

- a) The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract.
- b) The type tests shall be carried out in presence of the Purchaser's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Purchaser's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.
- c) In case the contractor has conducted such specified type test(s) within last five years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Purchaser's for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Purchaser's reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.
- d) Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last five 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. However if the contractor is not able to submit report of the type test(s) conducted within last five 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 contractor shall conduct all such tests under this contract at no additional cost to the Purchaser's either at third party lab or in presence of client representative and submit the reports for approval.
- e) **LIST OF TYPE TESTS TO BE CONDUCTED**

**The following type tests shall be conducted on each type and rating of HT motor**

- i) No load saturation and loss curves upto approximately 115% of rated voltage
- ii) Measurement of noise at no load.
- iii) Momentary excess torque test (subject to test bed constraint).



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- iv) Full load test(subject to test bed constraint)
- v) 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.

f) **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of HT motor

- i) Degree of protection test for the enclosure followed by IR, HV and no load run test.
- ii) Terminal box-fault level withstand test for each type of terminal box of HT motors only.
- iii) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15
- iv) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

1.44.02

**LT Motors**

- a) LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Purchaser's approval the reports of all the type tests as listed in this specification and carried out within last five 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.
- b) However if the contractor is not able to submit report of the type test(s) conducted within last five 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 Purchaser's shall conduct all such tests under this contract at no additional cost to the Purchaser either at third party lab or in presence of client representative and submit the reports for approval.

1.44.03

**LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

**The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only**

- i) Measurement of resistance of windings of stator and wound rotor.
- ii) No load test at rated voltage to determine input current power and speed.
- iii) Open circuit voltage ratio of wound rotor motors ( in case of Slip ring motors)
- iv) Full load test to determine efficiency power factor and slip .
- v) Temperature rise test.



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- vi) Momentary excess torque test.
  - vii) High voltage test.
  - viii) Test for vibration severity of motor.
  - ix) Test for noise levels of motor(Shall be limited as per clause no 1.21.01 of this section)
  - x) Test for degree of protection and
  - xi) Over speed test.
  - xii) Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1
- 1.44.04 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.
- 1.45 **INFORMATION WITH PROPOSAL**
- 1.45.1 AC Motor Data Sheet.
- 1.45.2 Dimension Drawing/Foundation load details of motor and driven equipment.
- 1.45.03 Manufacturer's catalogue showing constructional details.
- 1.46.00 **INFORMATION ON AWARD OF CONTRACT**.....Within six (6) weeks from the date of award of the Contract, following shall be furnished:
- 1.46.01 Motor Data Sheet.
- 1.46.02 Certified binding dimension drawing of motor complete with all accessories and fittings specifically showing terminal boxes, terminal spacing and sizes, earthing connections and sizes thereof, mounting details, lifting lugs, final foundation loads and dimensions with tolerances of centering spigot (where needed), shaft extension and key.
- 1.46.03 Following characteristics curves:
- 1.46.03.01 Torque-speed curves for motor at eighty (80), hundred (100) and hundred ten (110) percent rated voltage as well as torque-speed curve for driven equipment.
- 1.46.03.02 Current-speed curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage
- 1.46.03.03 Current-time curves at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.
- 1.46.03.04 Thermal withstand curves for hot and cold at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.
- 1.46.03.05 Efficiency, power factor, current and speed versus power output curves.
- 1.46.03.06 Speed-time curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage.
- 1.46.03.07 Negative phase sequence current withstand characteristics.

**1.47 COMMISSIONING CHECK LIST (HT MOTORS)****A PRELIMINARY CHECKS**

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box
6. Checking stator (motor air gap) Check – Grease lubrication (for ball or roller bearing) is adequate if the motor was in storage for very long period replace the grease, by fresh grease after flushing the bearing clean. Excess grease in the bearing (housing ... is overheat of bearings) Check the free rotation of the rotor in decoupled condition. Check the air gap between stator and rotor at four positions 90° apart at driving and non-driving end. Compare the recorded values with factory results. For slip ring motors : with starting resistances.
  - a) Check the variation of resistance
  - b) Check brush lifting and slip ring short.

**B COMMISSIONING CHECKS**

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Measure resistance of motor winding (in case of large motors)
4. Control and interlocks should be checked
5. Motor protection relay to be calibrated
6. Phase sequence and direction of rotation
7. Other than DOL scheme to be checked example trafo starts
9. Measure starting current starting timer and no load current
10. On load operations starting and running currents (observed vibrations, temperatures of bearings and body)
11. On load operation, starting and running currents (observed vibrations, temperatures of bearings and body)
12. In case of forced water cooling of start or check winding temperatures as ready by built in RTDs.
13. Water level (start up cooling) low to be checked for limit switch operation.

**1.48 COMMISSIONING CHECK LIST (LT MOTORS)****A PRELIMINARY CHECKS**

Check the following:



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1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box

**B COMMISSIONING CHECKS**

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Over load and short circuit relay tests and settings
4. Control and interlocks should be checked
5. Phase sequence and direction of rotation
6. Operation of timer in case of star delta starting
7. Measure starting current starting timer and no load current
8. On load operations starting and running currents

**1.49 DC MOTOR SPECIFICATION**

DC Motor will be of continuous duty type totally enclosed fan cooled (TEFC) having IP-54 degree of protection suitable for 220 V DC supply. DC motor will be shunt wound type having high torque characteristic suitable for Bi-directional rotation at rated speed and output. The general constructional features and details of DC motor will be in line with details/ particulars stipulated in the specification for AC squirrel cage induction motors.

Contractor will furnish the data in respect of DC motors.

## DATASHEET

	<b>Auxiliary power supply</b>	
<b>1.1</b>	<b>HV supply</b>	
	11kV, 3 $\Phi$ , 3W, 50 Hz non effectively earthed	Motors rated above 1500 kW
	Fault level	50 kA for 1 second
<b>1.2</b>	<b>MV supply</b>	
	3.3kV, 3 $\Phi$ , 3W, 50 Hz non effectively earthed	Motors above 200kW upto and including 1500kW
	Fault level	40 kA for 1 second
<b>1.3</b>	<b>LV supply</b>	
	415V, 3 $\Phi$ , 3W, 50 Hz effectively earthed	Motors below and including 200kW
	Fault level	50kA for 1 second
	110V, 1 $\Phi$ , 2W, 50 Hz effectively earthed	Lighting, space heating, AC control and protective devices
<b>1.4</b>	<b>DC supply</b>	
	220V, 2W, unearthed	DC alarm, control and protective devices.
	Fault level	25 kA for 1 second
<b>2</b>	Range of variation	As indicated in the specification
<b>2.1</b>	AC supply	
	voltage	-----
	Frequency	-----
	Combined voltage & frequency	-----
<b>2.2</b>	DC supply	198 to 240 V
Note: During starting of largest motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance.		