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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

assessed or has actually been assessed on the date of supply provided the transaction of sale is legally liable to sales tax and within the delivery period. Any change on the taxes & duty structure beyond the delivery period will not be considered by HEC.

3. The rates quoted must be firm and the offers made must remain open for acceptance for **four months** from the **due date of opening of the tender**.
4. Quotations erased or over written are likely to be rejected unless all corrections are authenticated with the tenderers signature.
5. Delivery date offered must be specified and guaranteed. Preferred delivery within 03 Months .
6. Payment:-**100% of the total value along with taxes & duties shall be released through RTGS/ cheque within 30 days of the receipt of material complete in all respect along with guarantee certificate, test certificate, inspection certificate/CRV (to be issued by HEC), excise duty gate pass (If applicable), original invoice & 10% Performance bank guarantee to be valid till full guarantee period from any nationalized bank in HEC's format only and all relevant documents as per enquiry specification.**
7. Full particulars specifications, literature and / or drawing wherever applicable should be submitted along with the quotation. The brand and 'Make' name must be indicated.
8. The Corporations does not pledge itself to accept the lowest or any tender and reserves to itself the right of accepting the whole or any part of tender or portion of the quantity offered and you shall supply the same at the rate quoted.
9. Supplies will be subject to inspection by our Inspection wing/or Inspection agencies prescribed by us.
10. Order placed as a result of this tender will be subject to the Corporation's General Terms and Conditions of contract, which can be down loaded from our web site [www.hecltd.com](http://www.hecltd.com).
11. Corporation reserves the right to call for and examine at any time the books of accounts and other documents and papers of the firm for the purpose of ascertaining whether any excess payments has been made or the firm likely to be received/ received undue benefit out of execution of the particular contract.
12. **Earnest Money-** Earnest money to the extent of 2% of the total value to be deposited along with the offer by demand draft in favour of Heavy Engineering Corporation Ltd. payable at Ranchi,. EMD will be converted into security deposit in case of successful bidder.**Only Demand Draft no. with date to be mentioned in techno-commercial bid but amount no to be mentioned.**
13. **Delivery-** The time for and date of delivery of the Stores stipulated in the acceptance of tender shall be deemed to be the essence of the contract and delivery must be completed not later than the dates specified therein. Otherwise:
  - (a) **LD Clause:** - The purchaser to recover from the contractor a sum of 0.5 % per week ( completed week) of the price any stores (up to maximum 10%) as liquidated damages, which the contractor has failed to deliver as aforesaid or
  - (b) The purchaser may procure the undelivered stores/ similar items from elsewhere, without notice to the contractor at the risk of the contractor without canceling the contract in respect of the consignment not yet due for delivery or,
  - (c) To cancel the contract or a portion thereof.
14. **Security Deposit:-successful tenderers will have to submit security deposit in form of demand draft/bank guarantee for the value of 5% of the basic order value within 21 days from the date of purchase order .Failing this contract will be cancelled at the risk & expense of supplier.**
15. **Performance Bank Guarantee: Please confirm that in the event of ordering you will furnish PBG of 10% of the basic order value in HEC's Format from any nationalized bank which will be valid for the full guarantee period.**
16. Guarantee-The stores supplied shall be guaranteed for a period of 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier against defective materials or bad workmanship.
17. There is no obligation on our part to accept delayed / late tenders received after the due date of opening and there are liable to be summarily rejected.
18. The rates quoted shall also be inclusive of embossing on the material. The Ownership namely "HMBP" at a predominant place of the material to a size/thickness depending upon the volumes of the material.



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19. **Income tax clearance certificate:** - All tenderers shall submit along with their tender an income tax clearance certificate duly countersigned by income tax officer of the circle concerned under the seal of the office. Copy of permanent account number (PAN) of income tax to be enclosed with the bid.

**(P.K.SINGH)**  
**SDGM/PUR/EL**



ISO 9001 Company

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**Detailed Technical Specification: DAP 179/12M**

**SPECIFICATION OF H. T. MOTOR FOR TERTIARY CONE CRUSHER**

**1.0 OPERATING CONDITION :-**

Ambient	:	50° C
Relative Humidity	:	100% (Max. temp. & max. Humidity not Occurring simultaneously).
Climate	:	Hot, humid & tropical
Environment	:	Dust laden
Vibration	:	Severe shocks & vibration
Site elevation	:	Less than 1000M.

**2.0 POWER SUPPLY:-**

Main supply	:	3.3KV±5%, 50Hz ±5%, 3Ø
Control supply	:	230V±5%, 50Hz ±5%, 1Ø
Space heater supply	:	240V±5%, 50Hz ±5%, 1Ø
Fault level	:	26.2KA for 1 sec.
System Neutral	:	Earthed system

**3.0 STANDARDS:-**

The equipments shall be designed, assembled & tested in accordance with latest IS & IPSS.

- IS: 325-1996 – Rotating Electrical machine
- IS: 4722: 1992- Rotating Electrical machine
- IS: 1231: 1974 – Dimensions of three phase foot mounted motor.
- IS: 4691-1985 – Degree of protection provided by enclosures.



ISO 9001 Company

# Heavy Engineering Corporation Limited

(A Govt. of India Enterprise)

Heavy Machine Building Plant  
(Purchase Department/ MM Division)

IS: 6362-1971 – Designation of methods of cooling for rotating electrical machine

IS: 4029-1967 – Guide for testing three phase induction motors

IS: 2253-1974 – Designation for types of construction and mounting arrangement of rotating electrical machine

4.0 **GUARANTEE:** 12 months from the date of commissioning.

5.0 **TECHNICAL SPECIFICATIONS :-**

Sl. No.	Description	Specifications	Vendor to confirm
5.1	Quantity of motor	1 No.	
5.2	Driven equipment	Tertiary cone crusher	
5.3	Type of operation	Continuous	
5.4	Type	H.T. AC slip ring, reversible duty,	
5.5	Duty	S1, continuous duty for heavy duty crusher.	
5.6	Enclosure	TEFC	
5.7	KW rating at 50°C	250KW at 50°C	
5.8	RPM	500 RPM (synch.)	
5.9	Rated voltage	3.3V ±5%	
5.10	Frequency	50Hz ±5%	
5.11	Combined variation	±10% maximum	
5.12	Degree of Protection	IP-55, IS: 4691.	
5.13	Pull out torque	Min. 250% of Full Load Torque	
5.14	Insulation, Stator / rotor	Class F/F	
5.15	Temp. rise over an ambient 50°C	As per class B - limit by resistance method (i.e. 70°C over an ambient an of 50°C).	
5.16	Cooling	IC-0141, IS: 6362	
5.17	Winding material	Copper	
5.18	Winding insulation type	Non-hygroscopic, oil resistant and resistant to flame propagation	
5.19	Whether windings have adequate tropical	Yes	



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

	protection against fungus, corrosion etc. provided.		
5.20	Winding connections	Stator - Star, Rotor - Star, Y - Y	
5.21	Earthing material	2 Nos. on body & 1 No. in terminal box.	
5.22	Shaft extension	Single cylindrical	
5.23	Mounting	Horizontal foot mounted, (B3)	
5.24	Bearing type	Self lubricated anti friction roller bearing	
5.25	Bearing Details :	i) Type of D.E./N.D.E. ii) Size of D.E. /N.D.E. iii) Make	
5.26	Space heater	To be provided, suitable for 240V, 1 Phase , 50 Hz	
5.27	Load GD <sup>2</sup> referred to motor shaft	850Kg. - M <sup>2</sup>	
5.28	Noise level	The noise level shall be as per IS: 12065-1987.	
5.29	Vibration intensity	The vibration intensity shall be as per IS: 12075-1987.	
5.30	Method of starting	Step resistance in rotor circuit through timers with 5% of Rn of continuous duty as permanent step.	
5.31	Sliprings	Motor shall have fabricated sliprings with continuously rated.	
5.32	Fault withstand current and time for terminal box	26.2 KA (rms) for 0.25 secs	
5.33	Surge withstand capability	As per IS: 14222 - IS:1995.	
5.34	Frame size	Frame size shall be conform to IEC standards.	
5.35	RTD for winding and Bearing temperature measurement	2 Nos. – RTD per phase to be embedded and equally spaced around stator winding 1 No. - RTD in each bearing.	
5.36	Degree of protection for terminal box	IP-55	
5.37	Separate terminal boxes	Stator, Rotor, WTDs & BTDs, Space heater, Neutral point.	



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
(A Govt. of India Enterprise)  
**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

5.38	Starting current in percentage of rated current in DOL start ( Ist. / rated)	Limited to 600% of Irated.	
5.39	Balancing	Motor shall be dynamically balanced with full key on the shaft end and fan.	
5.40	Cable entry	Nos. and sizes of cable entry shall be intimated later to the successful tenderer..	
5.41	Minimum no. of starts / hr. at normal system voltage & frequency	<ul style="list-style-type: none"><li>- 3 nos. of successive starts from cold condition or</li><li>- 2 nos. consecutive starts from hot condition.</li></ul>	
5.42	Starting power factor	To be filled by the tenderer.	
5.43	Thermal time constant	To be furnished by the tenderer.	
5.44	Thermal with stand time hot / cold at 100% VR	30 / 40 Seconds.	
5.45	Overload capacity	150% of full load current for 2 minutes without damage or permanent deformation.	
5.46	Minimum permissible voltage at terminal for starting full load.	80 % of rated voltage	
5.47	Permissible running time with full load at minimum ( 75% ) allowable voltage.	5 minutes	
5.48	Whether suitable for 150% of rated voltage during Bus transfer.	Yes	
5.49	Transient recovery after temporary system disturbance for 0.2 Sec and sudden restoration to 70% of rated Voltage	The motor shall be capable to accelerate with load to rated operating point from such condition.	
5.50	Note	All parts and clearances adopted shall conform to the latest revision of IS / IPSS.	
5.51	Body design	Prevent breakage or other failure due to vibrations. Motors shall be of weather proof construction, Designed	



ISO 9001 Company

# Heavy Engineering Corporation Limited

(A Govt. of India Enterprise)

Heavy Machine Building Plant  
(Purchase Department/ MM Division)

		to operate in the humid air stream, Drain plug to be provided.	
5.52	Direction of rotation	Bi-directional	
5.53	Initial static torque of motor just at moment of starting	0.8 times the rated torque of motor.	
5.54	Average static torque during starting	0.5 times the rated torque of motor	
5.55	Is motor is started with no load in the crushing chamber	Yes	
5.56	Average starting torque of motor during starting	1.6 times the rated torque.	
5.57	Paint shade	Light Grey, Shade No. - 631 as per IS:5 – 1994.	
5.58	The motor shall be provided with adequate & suitable lifting devices and with the foundation bolts.	Yes.	

## 6.0 **SPARES** :-

### 6.1 **COMMISSIONING SPARES** :-

List of Minimum Commissioning Spares :-

SL. NO.	DESCRIPTION	QUANTITY
	MOTORS:-	
1.	Carbon Brushes	12 Nos.
2.	Brush holder assembly	2 Sets





ISO 9001 Company

**Heavy Engineering Corporation Limited**  
(A Govt. of India Enterprise)  
**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

6.2 **2 YEARS OPERATIONAL AND MAINTENANCE SPARES**

**(With Item wise prices )**

( Not in tenderer's Scope )

SL. NO.	DESCRIPTION	QUANTITY
	MOTORS:	
1.	Carbon Brushes	24 Nos.
2.	Brush holder assembly	2 Sets
3.	Slip ring assembly	1 Set
4.	Cooling fan	1 No.
5.	Bearing for D.E. & N.D.E. side	1 No. each

7.0 **INFORMATION ALONG WITH THE OFFER :-**

7.1 The following information shall be furnished by the tenderer along with the offer, failing which the offer may be ignored:

- a) Pointwise confirmation of the enquiry specifications, listing out deviations, if any.
- b) Filled - up data sheets as per enclosed at Annexure- I.
- c) Confirmation of General specifications mentioned at Annexure - II.
- d) Confirmation of Load characteristic curve at no load starting of crusher at Annexure - III.
- e) Confirmation of technical requirement for cone crusher at Annexure - IV.
- f) Reference lists of H.T. motors for heavy duty crusher applications in SAIL.
- g) Dimensional drgs. / Manufacturer's catalogues showing constructional details.



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

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- h) List of commissioning spares.
- i) List of 2 Years operational and maintenance spares.
- j) Any other special information.

**8.0 DRGS. AND DOCUMENTS :-**

- 8.1 Within 2 weeks of order placement, 12 copies of the following drawings and documents are to be furnished for approval by M/s CET / SAIL.
- a) Motor GA drg.,
  - b) Terminal boxes drgs.
  - c) Motor Data sheet.
  - d) Characteristic curves.
- 8.2 After approval of the drgs. / documents from M/s CET/SAIL, The firm will submit another 12 sets as distribution copies.
- 8.3 All the submission of drawing/documents by the vendor for approval from M/s CET / SAIL, MEGHAHATUBURU shall be routed through M/s HEC, But the approval of drawings & documents from M/s CET / SAIL, MEGHAHATUBURU shall be the responsibility of the tenderer. Any minor change required during drawing approval stage shall have to be incorporated by the firm without any price implication.

**9.0 INSPECTION AND TESTS :-**

- 9.1 Inspection shall be carried out by our authorized representative as per the inspection procedure and “mutually agreed approved QAP” between HEC/SAIL/CET and successful tenderer. However, the following minm. tests will be carried out.:
- 9.1.1 Type test certificate of all type tests as per IS:325 of similar H.T. crusher motor.
  - 9.1.2 Routine tests shall be carried out by manufacturer in presence of representatives of M/s HEC/SAIL/CET at manufacturer’s works as per IS: 325 and approved QAP, documents and data sheets by M/s SAIL/CET.

It may pl. be noted that Inspection shall be regarded as a check up and shall be in no way binding on the purchaser.



ISO 9001 Company

# Heavy Engineering Corporation Limited

(A Govt. of India Enterprise)

Heavy Machine Building Plant  
(Purchase Department/ MM Division)

## ANNEXURE - I

- |   |   |            |              |
|---|---|------------|--------------|
| 1. Name of Mechanism  | : |            |              |
| 2. No. of Motors per machine  | : |            |              |
| 3. Make of Motor  | : |            |              |
| 4. Year of Manufacture & Sl. No.  | : |            |              |
| 5. Type of Motor  | : |            |              |
| 6. Specified ambient  | : |            |              |
| 7. Relative humidity  | : |            |              |
| 8. Altitude above sea level   | : |            |              |
| 9. No. of phases  | : |            |              |
| 10. Rated voltage with variation  | : |            |              |
| 11. Rated frequency with variation  | : |            |              |
| 12. Combined voltage and frequency variation  | : |            |              |
| 13. KW rating   | : |            |              |
| a) at specified duty and 50 <sup>0</sup> C ambient  | : |            |              |
| b) at specified duty and 40 <sup>0</sup> C ambient  | : |            |              |
| 14. Rated speed (RPM)   | : |            |              |
| 15. Full load current (Amp.)  | : | STATOR     | ROTOR        |
| a) at rated KW  | : |            |              |
| 16. No load current   | : |            |              |
| 17. Efficiency and power factor at rated voltage & Frequency                                  | : |            |              |
| Percentage Full load  | : | Efficiency | Power factor |
| 100   | : |            |              |
| 75  | : |            |              |
| 50  | : |            |              |
| 25  | : |            |              |
| 18. Rotor open circuit voltage  | : |            |              |
| 19. Rotor current   | : |            |              |
| 20. Rotor resistance per phase  | : |            |              |
| 21. Pull - out torque in KG-M   | : |            |              |
| 22. Rated torque in KG - M  | : |            |              |
| 23. Starting torque in KG – M   | : |            |              |
| 24. Overload capacity   | : |            |              |
| 25. Over speed  | : |            |              |
| 26. Class of insulation   | : |            |              |
| a) Stator   | : |            |              |
| b) Rotor  | : |            |              |
| 27. Maximum permissible temp. rise by resistance method over an ambient of 50 <sup>0</sup> C. | : |            |              |



ISO 9001 Company

# Heavy Engineering Corporation Limited

(A Govt. of India Enterprise)

**Heavy Machine Building Plant  
(Purchase Department/ MM Division)**

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28. Locked rotor withstand time at :  
100% VR and 80% VR.
- a) Cold :  
b) Hot :
29. Thermal withstand characteristics :  
a) Cold :  
b) Hot :
30. Stator winding connection :
31. Are all the stator lead brought out to :  
terminal box.
32. Frame size :  
33. Shaft extension :  
34. Rotor GD" :  
35. Permissible load GD" :  
36. Type of Mounting :  
37. Enclosure :  
38. Degree of protection :  
39. Method of cooling :  
40. Details of bearing :  
Type Make No.
- a) DE :  
b) NDE :
41. Type of lubrication for :  
bearing
42. No. of terminal box :  
43. Position of Terminal Box :  
44. Terminal box details :  
45. Fault level withstand :  
46. Capacity of terminal box :  
47. Stud size for cable termination :  
48. Details of slipping gears and brushes :  
No. of brushes per ring :  
a) Total no. of brushes :  
b) Make :  
c) Grade :  
d) Size :
49. Direction of rotation :  
50. Ratio of slip at pull out / rated torque :  
51. Ratio of current at pull out / rated current :  
52. Weight of the Motor :  
53. Paint shade :  
54. Earthing :



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
(A Govt. of India Enterprise)  
**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

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- 55. GA drg. of motor :
- 56. Speed torque characteristics :
- 57. Pullout torque / rated torque :

[ANNEXURE – II](#)



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

SPECIFICATION FOR INDUCTION MOTORS

**CONTINUOUS RATING AND DUTY TYPE**  
**VOLTAGE 3.3 KV**

**1.0 SCOPE:**

**1.1 This specification covers the requirements for three phase foot/ flange mounted continuous rating and duty type induction motors.**

1.2 The motors will comply with the latest version of IS 325 & IEC 34-1 except where modified or extended by this specification and with the relevant parts of standards mentioned in Para 2.0.

1.3 Any material and component not specially stated in this specification but necessary for trouble free operation of the motor and its accessories specified here in shall be deemed to be included.

2.0 OTHER RELEVANT STANDARDS:

2.1 The other relevant standards applicable are as under:

IS: 900	Code of practice for installation and maintenance of induction motors.
IS: 8223	Dimension and output rating for foot mounted electrical machines with frame number 355 to 1080.
IS: 1231	Dimension of three-phase foot mounted induction motors.
IS: 2223	Dimension of flange mounted induction motors.
IS: 210	Frames for rotating electrical machines.
IS: 1271	Classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability in service.
IS: 2253	Designation for type of construction and mounting arrangement for electrical machines.
IS: 3043	Code of practice for earthing.
IS: 4029	Guide for testing three-phase induction motors.
IS: 1885	Electro technical vocabulary – part XXXV rotating machines.
IS: 4691	Degree of protection provided by enclosures for electrical machinery.
IS: 4722	Rotating electrical machinery.
IS: 6362	Designation of methods of cooling of rotating electrical machinery.
IS: 7816	Guide for testing insulation resistance of rotating machinery.
IS: 12065	Permissible limits of noise level for rotating electrical machines.
IS: 12075	Mechanical vibrations of rotating electrical machines.
IS: 2147	Degree of protection provided by industrial enclosures.
IS: 4729	Measurement and evaluation of vibration of rotating electrical machines.
IS: 4889	Method of determination of efficiency of rotating electrical machines.
IS: 8789	Values of performance characteristic for three-phase induction motors.
IS: 12824	Type of duty and classes of rating for rotating electrical machines.
IS: 1076	Preferred numbers.
IS: 12802	Temperature rise measurement of rotating electrical machines.
IS: 3003	Carbon brushes for electrical machines.
IS: 5	Colours for ready mixed paints and enamels.



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
(A Govt. of India Enterprise)  
**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

Equipment complying with other internationally accepted standards would also be considered if they insure performance and constructional feature or superior standards listed above. In such a case the bidder will clearly indicate the standards adopted, furnish the copy in English of the latest revisions along with the copies of all amendments and revisions in force as on opening of the bid and clearly bring out salient features for comparison.

**3.0 SITE CONDITION:**

**3.1 Ambient Conditions:-**

Ambient air temperature	:	(-)5° C to (+)50° C.
Altitude	:	Maximum up to 1000M above MSL.
Relative humidity	:	Approximately 100%
Pollution degree	:	Degree 4 as per IS: 13947 (part 1) (i.e. the pollution generates persistent conductivity caused by conductive dust).
Location	:	Heavily polluted with coal dust.

**4.0 RULES:**

4.1 The design and operational feature of the equipment offered will comply with the requirements of the latest version of the Indian Electricity Rules and the National Electricity code.

**5.0 DESIGN:**

**5.1 Electrical:**

- a) The motor will be continuous duty (S1) and rating type in accordance with relevant code. The locked rotor torque and break away torque as percentages of full load torque and the locked rotor current as percentage of full load current at rated voltage and the full load slip and power factor will conform to the values indicated in the technical specifications.
- b) **The measurement of temperature will be in accordance with relevant code.**
- c) The motor will be designed to deliver rated out put with the terminal voltage differing from its rated value by not more than  $\pm 10\%$ , frequency differing from its rated value by not more than  $\pm 6\%$  and any combination of these limited to 10%.
- d) The motor will be suitable for three cold or two hot starts in succession under the normal loading condition.
- e) The accelerating torque at any speed with the lowest starting voltage will be at least 10% of rated full load torque.

**5.2 Mechanical:**

- a) The motor vibration will conform to the requirements in accordance with relevant code.
- b) The noise level will conform to the requirements in accordance with relevant code.

**6.0 CONSTRUCTIONAL DETAILS:-**

**6.1 General:**



ISO 9001 Company

**Heavy Engineering Corporation Limited**  
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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

---

- a) The motor and its components such as stator, rotor, end shield, terminal boxes and the bearings will be designed to be readily interchangeable as integral units for the same design and rating.
- b) All non-metallic components used will be resistant to flame propagation.
- c) All heavy parts of the motors will be provided with necessary lifting arrangements.

**6.2 Stator frames and shields:-**

- a) The stator frames and end shields will be rugged and made of cast iron conforming to relevant code or fabricated steel. Cast Aluminum body is not acceptable. The stator frame will have deep ribbed construction machined to ensure concentricity and correct alignment for reliability and ease of maintenance.
- b) The frame holding the stator core and windings must be strong and rigid to withstand short circuit force and unbalanced magnetic pull and minimize vibrations. The cover holding the frame will be bolted to it and strong enough to hold the bearings in position.

**6.3 Enclosures:-**

The enclosure will be complete with suitable means for breathing and drainage. The drain hole diameter will not exceed 6 mm.

**6.4 Stator:-**

- a) The stator core will be built up of low loss high permeability steel laminations assembled under pressure and rigidly secured by end plates and key rings.
- b) The winding will be two-layer type consisting of synthetic enameled copper conductors.
- c) All winding insulations will be non-hygroscopic and resistant to flame propagation. All insulations will be impregnated and suitably processed to effectively seal them to prevent deterioration from adverse environmental conditions at site.
- d) Stator windings will be tight fit in their slots.
- e) All windings over hangs and leads will be adequately supported, braced and blocked.

**6.5 Rotor; -**

- a) The rotor core will be of similar construction to that of the stator.
- b) The complete rotor will be dynamically balanced with the fan on the shaft for motors ensuring vibration free and smooth running.
- c) Rotor windings will be tight fit in their slots.
- d) Rotor windings over hangs and leads will be adequately supported, braced and blocked.
- e) Brush gears, commutators and slip rings for slip ring motors will be suitable for operation without injurious sparking and for runs for at least three months without the need or replacements of brushes. Brushes will be of electrographic or metal graphite type. Sliprings will be industrial type. Adequate precaution will be taken to protect the windings, sliprings and brush gears against deposits of entrained carbon dust. Brush holders will be of brass / bronze materials and located securely to accurately position the brushes on sliprings.





ISO 9001 Company

**Heavy Engineering Corporation Limited**  
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**Heavy Machine Building Plant**  
**(Purchase Department/ MM Division)**

---

Means for adjusting brush pressure to prevent passage of current through pressure devices will be provided.

6.6 **Shaft:-**

- a) The shaft will be manufactured from high-grade steel, preferably C-40. The sustained deflection of the shaft will well below 10% of the air gap.

6.7 **Bearings:-**

- a) The bearings will be roller / pedestal type.
- b) The bearings will be designed to prevent ingress of dust and water and will be sealed against leakage of lubricant along the shaft. The bearing will be self-lubricated.
- c) The bearings will be in accordance with the relevant codes.
- d) The housing for the bearings will be correctly packed with Lithium based grease at the time of assembly. Construction will be such that the bearings can be dismantled without risk of damage.

6.8 **Terminal Box:-**

- a) Terminal boxes integral with the stator frame will be provided with terminals for stator leads. Additional terminal boxes will be provided for slip rings motors.
- b) The terminal boxes and termination arrangement will be designed for easy connection and replacement of cables. Leads from terminals to the windings shall be adequately sized and braced to withstand the heating and forces produced by the maximum fault current.
- c) Terminals will be suitable for receiving Aluminium conductor PVC / XLPE insulated cables.
- d) Clearance between the lugs/bars/live parts of different phases and between lugs/bars/ live parts and earth will be as indicated in the technical specifications. The terminal boxes will be capable of withstanding a system fault level as indicated in technical specifications.

6.9 **Earthing Terminals:-**

Two independent earthing terminals will be provided in accordance with I.E. rules on diagonally opposite corners of the motor for bolted connection.

6.10 **Rating Plate:-**

The rating plate will indicate the parameters as indicated in the para 8.0.

6.11 **Paint & Finish:-**

All fasteners used in the construction of the equipment will be either of corrosion resistant material or heavy cadmium plated. Current carrying fasteners will be of stainless steel.



ISO 9001 Company

# Heavy Engineering Corporation Limited

(A Govt. of India Enterprise)

**Heavy Machine Building Plant  
(Purchase Department/ MM Division)**

## **7.0 Performance:-**

The value of minimum full load speed, maximum full load current, minimum pull out torque and minimum locked rotor torque as percentage of full load torque at rated voltage and frequency for duty type S1 will be in accordance with relevant code.

## **8.0 Rating Plate:-**

8.1 A rating plate stating the following information will be supplied with each motor :

- a) Reference standard
- b) Name of manufacturer
- c) Manufacturer's number and frame reference.
- d) Type of duty.
- e) Class of insulation.
- f) Frequency in Hz.
- g) Number of phases.
- h) Rated output in KW.
- i) Rated voltage and winding connections.
- j) Current approximate in amperes at rated output.
- k) Speeds in revolutions per minute, at rated output.
- l) Rotor (secondary) voltage and winding connections.
- m) Rotor (secondary) current in amperes at rated output.
- n) Ambient temperature.
- o) Enclosure type.

## **9.0 Tests :-**

The bidder will submit certificates for the type tests and routine tests carried out at manufacturer's works as per IS: 325.

### **9.1 Type Tests :-**

These will be carried out on a motor identical in essential details with the one for which this specification is drawn. The following will constitute the type tests as per Annexure –C of IS: 325.

- a) Measurement of stator resistance and rotor resistance in case of slip ring motors.
- b) No load running of motor and reading of current in the three-phases and voltages.
- c) Open circuit voltage ratio in case of slip ring motors.
- d) Reduced voltages running of test at no load to check the ability of the motor to run up to full speed on no load in each direction of rotation with 60% of the rated line voltage applied to the stator terminals in case of squirrel cage motors.
- e) Locked rotor readings of voltage, current and power input at a suitable reduced voltages.
- f) Full load reading of voltage, current, power input and slip.
- g) Temperature rise test.
- h) Momentary over load test.
- i) Insulation resistance test.
- j) High voltage test.



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- k) Over speed test.
- L) Degree of protection.
- m) Test of noise level of motor.
- n) Test of vibration severity of motor.
- o) Test on insulation System.

9.2 **Routine Test :-**

These will be carried out on a motor for which this specification is drawn. The following shall constitute the routine tests.

- a) Insulation resistance test.
- b) High voltage test
- c) No load running of motor and reading of current in the three-phases and voltages.
- d) Locked rotor readings of voltage, current and power input at a suitable reduced voltages.
- e) Reduced voltage running up test at no load to check the ability of the motor to run up to full speed on no load in each direction of rotation with 60% of the rated line voltage applied to the stator terminals (for squirrel cage motor only) and
- f) Open circuit voltage ratio of stator and rotor winding ( for slip ring motors only ).
- g) Measurement of resistance of windings of stator and wound rotor.

**Annexure - IV**

Page 19 of 21



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1. Average starting torque of the motor may be considered approximately 160% of rated torque with step rotor resistance starting.  
1<sup>st</sup> step shall be 50% of Rn.  
2<sup>nd</sup> step shall be 40% of Rn,  
3<sup>rd</sup> step shall be 30% of Rn,  
4<sup>th</sup> step shall be 20% of Rn,  
5<sup>th</sup> step shall be 5% of Rn of continuous duty as permanent step in the rotor circuit.
2. Total starting time may be considered to be maxm. - 5 seconds.
3. Speed vs torque characteristics at no load during starting of secondary cone crusher shall be as per enclosed annexure – III. This diagram is for starting condition when crushing chamber is empty.



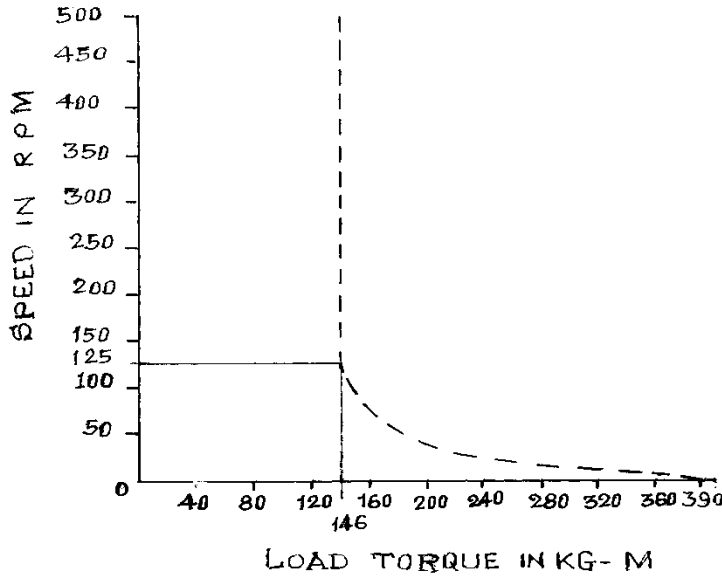
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**1200583**

ANNEXURE - III

Form 140



Speed Torque Characteristics (Cone Crusher 2200)		<b>1200583</b>	
		Material : _____	
Bureau Chief	J. Jha	Scale :	Weight (in kg)
Group Leader	DN Rathak	<b>HMB</b> H. E. C. LTD., RANCHI	
Designer			
Drawn by			
Drsg. No.	Norm. Cont.		