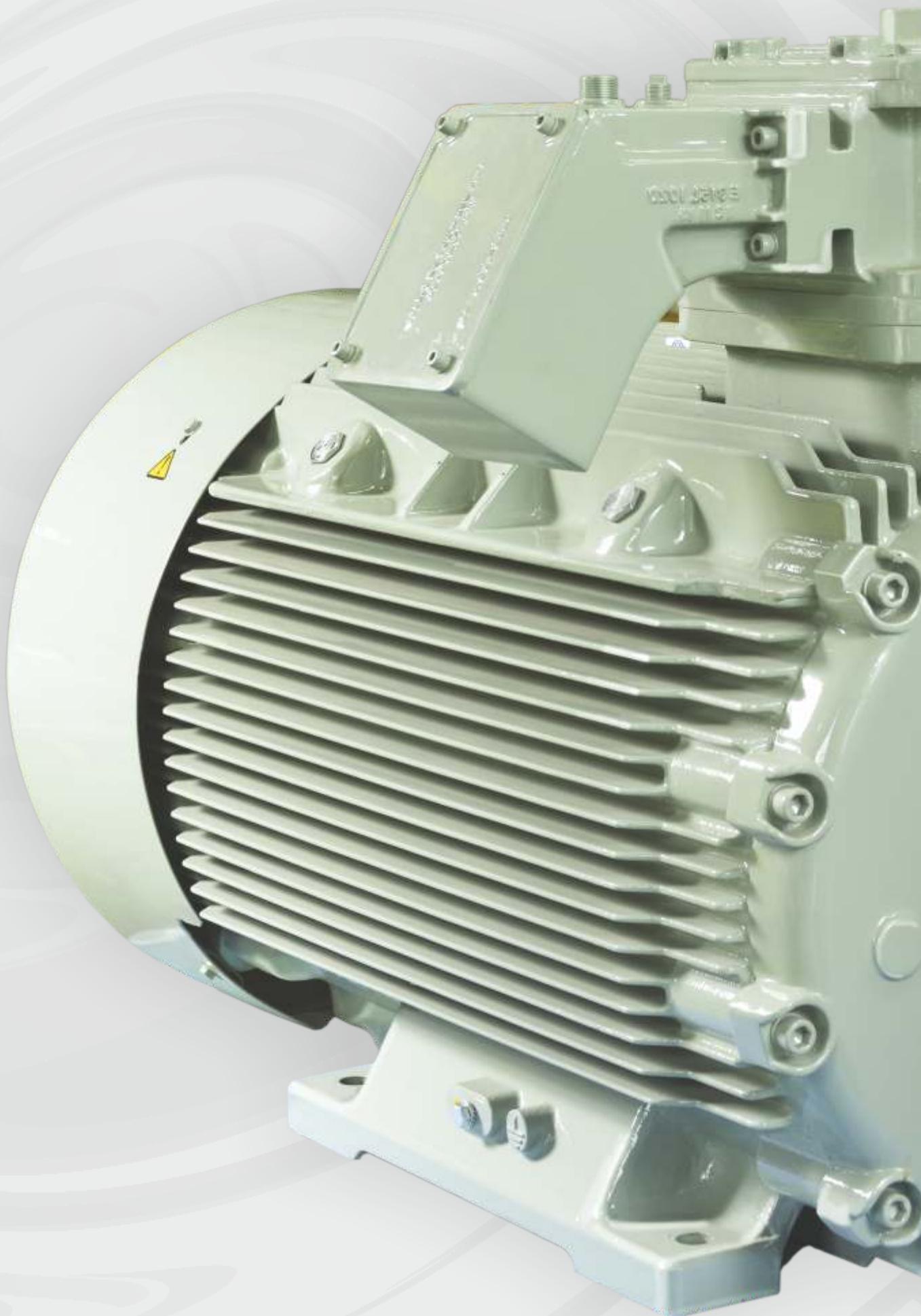




Smart solutions.
Strong relationships.

L V MOTORS CATALOGUE





slipring
motors

special
purpose
motors

spdP
slipring
motors

energy efficient
motors

hazardous area
motors

flameproof
motors

standard
motors

flip brake
motors

increased
safety
motors

brake
motors

dc
motors

alternators

crane
duty
motors



**save
today
for
better
tomorrow**

Out of total electricity generated worldwide, it is estimated that between 30 to 40 % is consumed by industrial electric motors. Given the global concern about diminishing resources, and recent high prices for energy, it is no wonder that there is increasing interest in the energy efficiency of electric motors. Of course the electric motor is only one element in a motor-driven system that offers the potential for savings, but it has been estimated that optimizing motor-driven systems could deliver overall savings of between 30 and 60 per cent.

"Saving 1 kWh of electricity produced from a thermal power station saves average 0.82kg of CO₂ emission to the atmosphere".

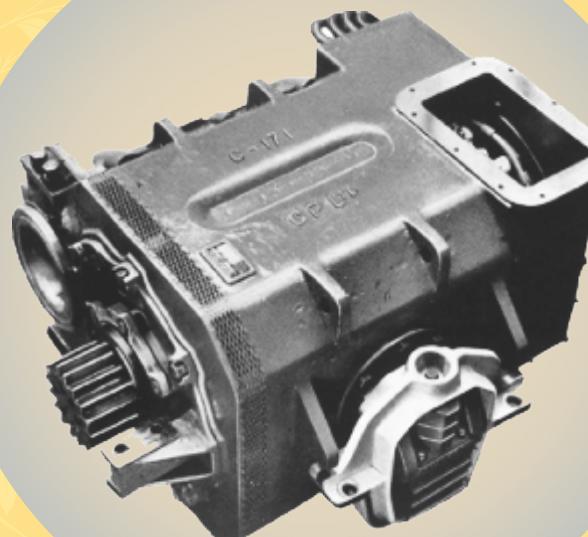


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origin &
company
profile





Powerful Motors

Crompton Parkinson's Motors (like diesel engine driver) were powering not just the modernization of railways in Britain in 1950s and 1960s, but were also a driving change in India. In 1899, the first unit of Electricity in India was generated in Crompton Dynamo at Calcutta (Kolkata).



The **Company**

→ **Origin & Company Profile**

The origins of CG can be traced back to the pioneering work of Colonel REB Crompton, who, in 1878 founded a business at Chelmsford, Essex, England under the name of REB Crompton & Co., to engage in the manufacture and contracting of electrical equipment. In fact in 1899 First Unit of Electricity in India was generated in Crompton Dynamo at Calcutta (Kolkatta).

In 1937, CPL established its wholly owned Indian subsidiary 'Crompton Parkinson Works Ltd.', in Mumbai, along with a sales organization, 'Greaves Cotton & Crompton Parkinson Limited' was later rechristened as Crompton Greaves Limited (CG) in 1966.

Today, as the world's leading engineering corporation, CG provides end-to-end solutions, helping its customers use electrical power effectively and increase industrial productivity with sustainability.

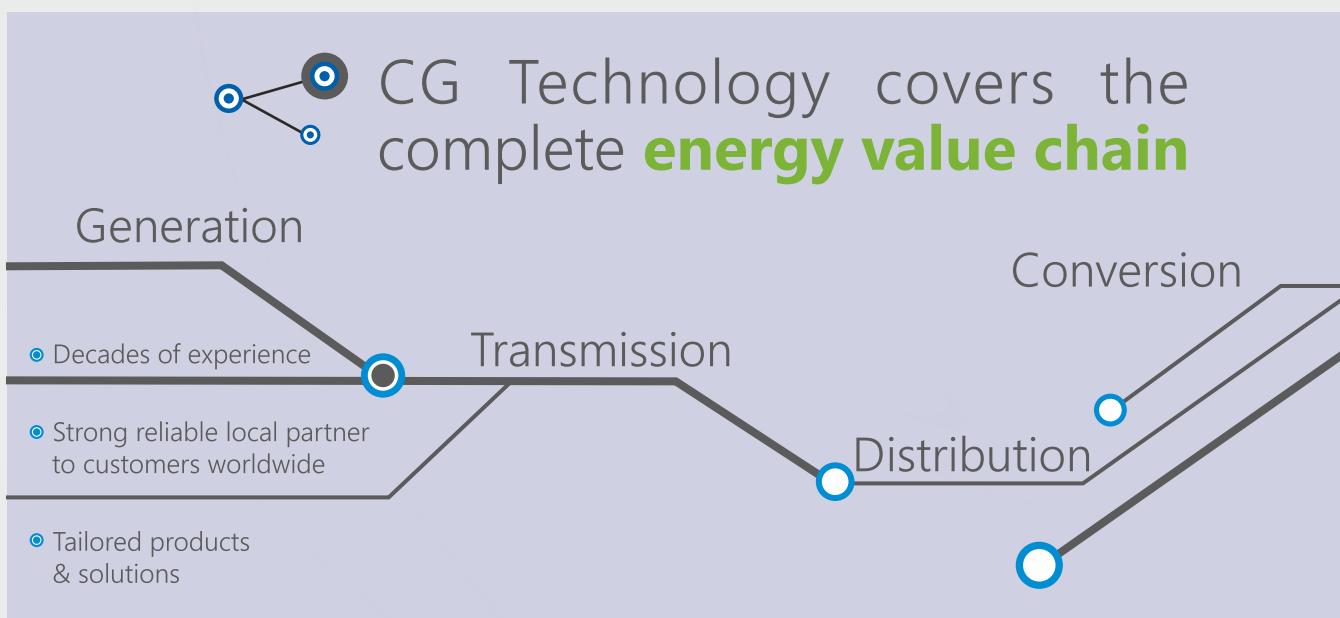




The Company

Business Model

CG is part of the Avantha Group is a global pioneer in the management and application of electrical energy. CG is amongst the world's leading makers of ultra high voltage transformers, switchgears, rotating machines and among the most trusted names in electrical equipment in the burgeoning Indian market. CG's solutions address the growing complexity and scale of modern infrastructure, with smart devices and systems to bridge demand and supply, as well as supporting the renewable energy movement with creative leadership and smart solutions.



CG's value differentials are innovative technologies, cost competitive manufacturing and energy efficient products. We have a strategic focus on customer orientation and we will continue to invest in capabilities and people with priority on leading edge service that drives customer productivity. CG provides electrical products, systems and services for utilities, power generation and industries. From state-of-the-art products to fully integrated technology solutions, CG has the expertise to lower energy consumption, power economic competitiveness and deliver green growth.



Product **Segments**

With a heritage of over one hundred years in the business, CG's mission is to create value by providing integrated solutions and superior knowledge products and services in the domain of Generation , Transmission, Distribution and utilisation of electrical industry . From generation, transmission, distribution and conversion, CG manages and tends electricity to travel great distances, directing it intelligently to the end user and helping it to convert efficiently back into motive power.

	Power Generation	Transmission	Distribution	Power Consumption
Segments of Value Chain				
Clients	Utilities Developers	Transmission System Operators	Distribution System Operators	Industry
Dominant Voltage	HV / MV / LV	HV /UHV /EHV	MV	HV /MV /LV

As the No. 1 most trusted brand in India in Engineering (According to TRA's Brand Trust Report 2015), CG is the partner of choice for almost every industry. Leveraging leading edge technologies and state-of-the-art manufacturing facilities, CG has emerged as a key producer of energy efficient machines. As industries worldwide tackle the increasing demand for electricity and industrial output, CG is well positioned to partner them in their business growth with their three main segments viz. Transformers, Switchgears, Industrial.

India's massive electrical infrastructure for utilities and industry relies on CG industrial products that have been conferred with awards such as the Frost & Sullivan, Indian Company of the Year Award, 2013 for Leadership Excellence in the Electric Motor Industry. We supply a broad and comprehensive range of motors and generators that can drive down energy use, improve process reliability, lower cost and maximize productivity. Our compact and robust products offer a high degree of flexibility to support all applications and integrate into every system throughout the entire life cycle.



Powering the world with **robust and reliable solutions**

Transformers

Advanced Solutions for
Transmission and Distribution of
Electricity



Switchgear

Equipment and Services to
manage and control the flow of
electricity in Transmission and
Distribution Grids



Industrial

Equipment & Services for Energy
conversion for Industrial
Applications





Industrial **Systems**

→ **Comprehensive Industrial Portfolio**

CG's Industrial business offers the widest range of rotating machines ranging up from 120 Watts to 25 Mega Watts . The product offering includes low voltage (LV) motors ranging up to 3 MW ; fractional horse power (Commercial) motors up to 3.7 kW ; Direct current (DC) motors up to 2 MW; AC generators up to 70 MVA; CG's caters to Railways with their wide product basket - traction electronics, railway transportation & signalling equipment and stamping products. CG is the largest manufacturer of Low voltage motors in India, offering an extensive range of motors up to 700 kW in AC and up to 500kW in DC conforming to various standard and customised configurations to match the exacting demands of the industry. Industrial Systems has a very strong market presence and market leadership position in most segments in India. CG has established state-of-the-art manufacturing facilities at key locations in India, Hungary, Germany, Sweden and Netherlands to leverage local value advantages and get closer to the customer. This strategy enables CG to efficiently deliver high quality, competitive motors, drives, alternators and related control equipment cater to over 140 countries worldwide, including USA, UK, EU, Australia and New Zealand.

CG is India's
No.1 supplier of AC Motors

manufactured indigenously with world class accreditation

ISO 9001 Quality • ISO 14001 Environment • OHSAS 18001 Health & Safety



Industrial Systems

FHP(Fractional Horse Power) / Commercial Motors		Wide range of Single and three-phase motors for applications in the Domestic, Commercial, Agricultural, Industrial, Healthcare and Construction segments; and Single Phase UPF Alternators for Commercial applications. Flameproof (Explosion proof - Ex d) motors are specially manufactured for fuel dispensers.
Motors: Low Voltage, AC & DC		Low voltage motors (rotating machines) Includes safe and hazardous area motors, energy efficient motors (as well as motors for special applications like brake motor, re-rolling mill, cement mill, oil-well pump. Suitable for all industries.) Laminated yoke and solid yoke DC Motors are made for steel, sugar and critical applications.
MOTORS: High Voltage AC & DC		Wide range of High & Medium Voltage Motors from 2 to 24 Poles up to 25 MW range in various enclosures like Closed Air Circuit Water Cooled (CACW), Closed Air Circuit Air Cooled (CACA), Totally Enclosed Tube Ventilated Motors (TETV), Screen Protected Drip Proof (SPDP), Totally Enclosed Fan Cooled (TEFC) to meet various industrial requirements of any specific application.
Generators/ Alternators: AC & DC		AC & DC generators (alternators), both brushless and slip ring type. Single phase alternators for uninterrupted power supply. AC Brushless generators incorporate advanced European technology and are designed for optimum performance. Compact Slip Ring Ustad Series alternators are popular in agro industries.
Railways: Alternators & DC Motors		State-of-the-art, self-excited, self-regulated and dependable source of power. DC Motors and Traction motors made in accordance to various standards and customized configurations to match the exacting demands of the industry & Railway. These generators incorporate advanced technology and are designed for optimum performance using high-end software solutions.
Railways: Traction Drives, Control Electrics, Signaling & Coach Applications		Include state-of-the-art Converters / Inverters, Control Electronics (Train Management System) and integrated propulsion solutions. The integrated products/solutions are offered by teaming with the reputed world class European & other foreign technology partners.
SCADA: Industrial & Railway		Supervisory Control and Data Acquisition (SCADA) system collects reliable field data through remote terminal units (RTUs) and Intelligent Electric Devices (IEDs). The user interface or the man machine interface (MMI) provides various options of data presentation according to specific application and user needs.
Drives & Automation		Provide Total Drive Technology Solutions. CG's team of experts offer an ideally packaged solution tailor-made to the application needs of the clients. Adopt the latest designs and manufacturing technology and an equally strong Research and Development back-up helps us to maintain our leadership in technology, quality, delivery as well as cost.
Stampings & Laminations		Offer various grades of high quality steel in fully and semi processed forms through in-house continuous roller hearth annealing furnace. Manufacture notching, blanking, gang slotting and progression & diameters ranging from 50-1250mm in round & 1100mm width segmental. Offer welded, riveted, auto stacked, skewed packs and die cast rotors. Include state-of-the-art Converters / Inverters.
Services for Industrial Systems	All India toll free number: 180-419-0505	Complete site establishment, erection, retrofit and maintenance of industrial electrical systems.



Industrial **Systems**

→ **Low Voltage Rotating machines**

Every Industrial need is serviced by CG's Low Voltage Rotating Machines which are designed to facilitate , control and optimise processes. With its capability to deliver consistently high quality and reliable products suitable for all working conditions, CG is able to cater wide plethora of industries such as Oil & Gas, Mining & Metals, Cement, Marine, Cement, Water, Sugar, Iron & Steel, Power, Paper & Food Processing, Chemicals & Fertilizers, Material Handling, Agriculture . Its strong understanding of customers need and its ability to develop new products indigenously at a faster pace than competition make it the most preferred brand in Industries in India and today CG supplies every third motor required in Indian Industry.

To ensure the highest levels of customer satisfaction, CG constantly provides smart solutions with its latest innovative energy efficient products. CG LVRM boasts of many Indian and International certifications including CSA, UL, CE and BASEEFA ,PESO, DGMS for hazardous enclosures. CG LVRM has well established state of the art manufacturing facilities located in Ahmednagar and Goa in India with a backward integration of its own stamping Facility .







IE 4 Motor



IE 3 Motor



IE 2 Motor



IE 2 Motor



Aluminum Motor



Cast Iron Motor



Cast Iron Motor



Slipring Motor



Higher Output
(450 Frame)



Higher Output
(400 Frame)



Crusher Duty
Motor



Flameproof
Motor



Ex'd Motor



Flameproof Motor



Hazardous Area Motor



Flameproof Brake Motor



Smoke Extraction Motor



Kibosh Series



Soild Yoke DC Motor



Laminated Yoke DC Motor



Laminated Yoke DC Motor



Alternator



Slipring Alternator



Standard Alternator



GO GREEN



AC Motors

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Rotor Shaft Balancing



Standards & Specifications **of Electric Motors**



International Standards

IEC 60034-1	Rotating electrical machines, Part 1: Rating and performance
IEC 60034-2-1	Determination of loss and efficiency
IEC 60034-5	Degrees of protection (IP code)
IEC 60034-6	Methods of cooling (IC code)
IEC 60034-9	Noise limits
IEC 60034-14	Mechanical vibration Measurement, evaluation and limits of vibration severity
IEC 60034-30	Efficiency classes of single speed, three phase, cage induction motor
IEC 60072-1	Dimensions & output rating of Electrical machines (for 56 to 400 frame)
IEC 60072-2	Dimensions & output rating of Electrical machines
IEC 60079-0	Electrical apparatus for explosive gas atmosphere part 0 general requirement
IEC 60079-1	Equipment protection by flameproof enclosures "d"
IEC 60079-7	Equipment protection b increased safety 'e'
IEC 60079-15	Electrical apparatus for explosive gas atmosphere – Construction, test & marking of type of protection "n" electrical apparatus
BS EN 1201-3	Smoke extraction motor



Indian Standards

IS 1231	Dimensions of three phase foot mounted AC induction motors
IS-2223	Dimensions of flange mounted AC induction motors
IS 2253	Designations for types of construction and mounting arrangements of rotating electrical machines
IS 4029	Guide for testing three phase induction motors
IS 4691	Degree of protection provided by enclosures for rotating electrical machinery
IS 4722	Rotating electrical machines
IS 4889	Methods of determination of efficiency of rotating electrical machines
IS 6362	Designation of methods of cooling for rotating electrical machines
IS 7538	Three phase squirrel cage induction motors for centrifugal pumps for agricultural applications
IS 8151	Single speed three phase induction motors for driving lifts
IS 12065	Permissible limits of noise levels for rotating electrical machines
IS 12075	Mechanical vibration of rotating electrical machines, measurement, evaluation and limits of vibration severity
IS 12615	Energy efficient induction motors-three phase induction motors





Irrigation



Product Range

21

Product Range 22



Frames	Nomenclature	Frames	Nomenclature
GD, PA	Squirrel cage motor with aluminum stator	C	Screen Protected Drip Proof (SPDP) squirrel cage motor with cast iron stator
ND, NG, PC	Squirrel cage motor with cast iron stator	CW	Screen Protected Drip Proof (SPDP) slipring motor with cast iron stator

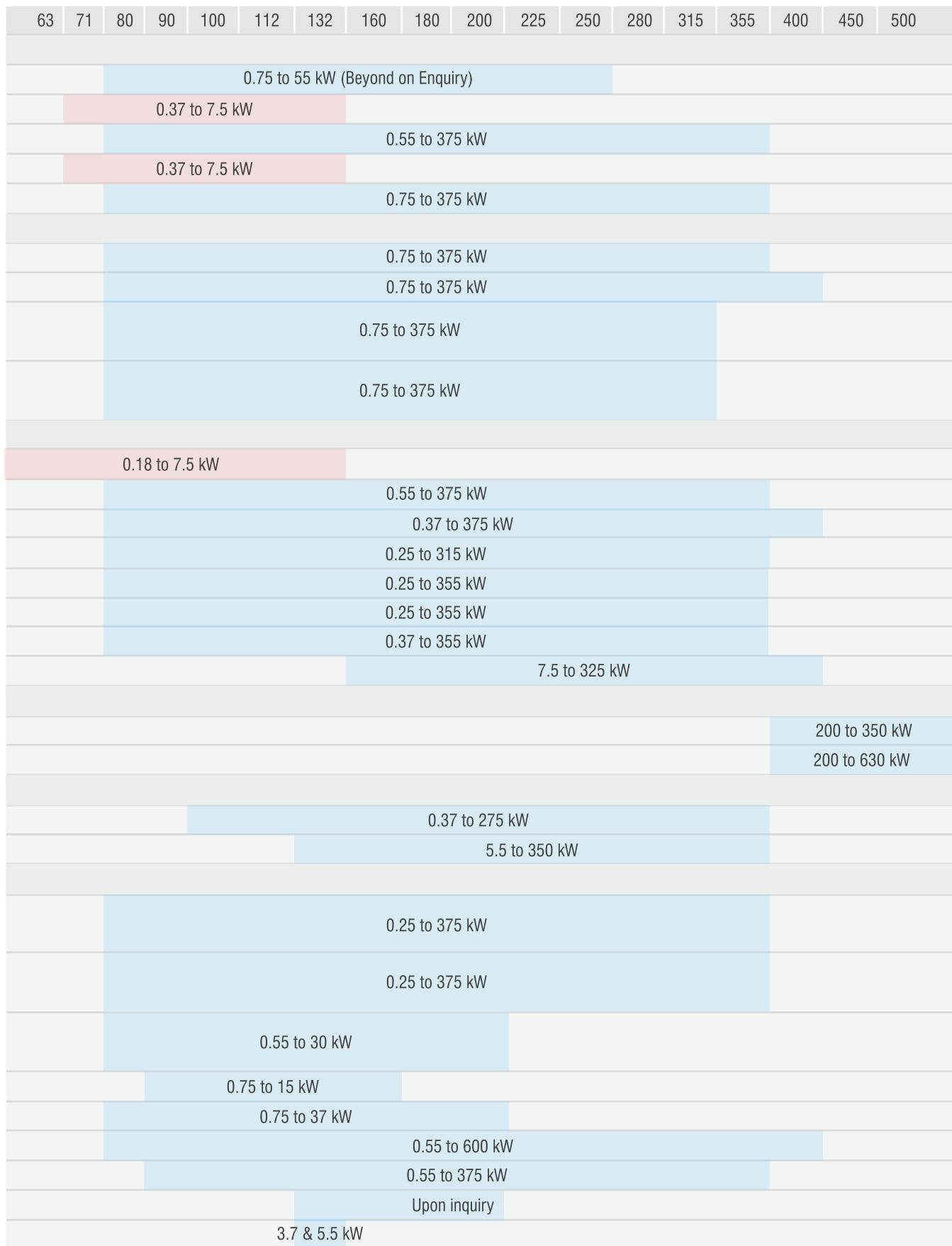
Type of Motor	Enclosure	Frame Prefix	Voltage	Frequency	Pole
Apex Series - Safe Area					
IE4 Motors	Cast Iron / AL	PC / PA	Up to 690V	50 Hz	2, 4, 6
IE3 Motors	Aluminum	GD	Up to 690V	50/60 Hz	2, 4, 6, 8
(NG- 80 to 132) & (ND-160 and UP)	Cast Iron	NG, ND	Up to 690V	50/60 Hz	2, 4, 6, 8
IE2 Motors	Aluminum	GD	Up to 690V	50/60 Hz	2, 4, 6, 8
(ND/NG- 80 to 132) & (ND-160 and UP)	Cast Iron	NG, ND	Up to 690V	50/60 Hz	2, 4, 6, 8
Apex Series - Hazardous Area					
IE3 Flameproof Motors	Cast Iron	E	Up to 690V	50/60 Hz	2, 4, 6, 8
IE2 Flameproof Motors	Cast Iron	E	Up to 690V	50/60 Hz	2, 4, 6, 8
Type 'e' - IE3/ IE2	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	2, 4, 6, 8
Type 'n' - IE3/ IE2	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	2, 4, 6, 8
Standard Motors					
Safe area	Aluminum	GD	Up to 690V	50/60 Hz	2, 4, 6, 8
	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8
IE1 Flameproof Motors	Cast Iron	E	Up to 690V	50/60 Hz	2, 4, 6, 8
Type 'e' - Ex 'e' Motors	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8
Type 'n' - Ex 'n' Motors	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8
BASEEFA / ATEX Motors - Type 'n'	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8
BASEEFA / ATEX Motors - Ex 'd'	Cast Iron	E	Up to 690V	50/60 Hz	2, 4, 6, 8
TEFC SPDP Motors	Cast Iron / M.S.	C	Up to 690V	50/60 Hz	4, 6, 8
Higher Output Motors					
IEC 400 to 500* - SR	Cast Iron	NDW	Up to 690V	50/60 Hz	4, 6, 8, 10
IEC 400 to 500* - SCR	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8, 10
Slipring Motors					
TEFC Slipring Motors	Cast Iron	NDW, DW	Up to 690V	50/60 Hz	4, 6, 8
SPDP Slipring Motors	Cast Iron / M.S.	CW	Up to 690V	50/60 Hz	4, 6, 8, 10
Special Applications Motors					
Crane Duty Motors	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	4, 6, 8, 10
	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	4, 6, 8, 10
Lift Duty Motors	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	4, 6, 8, 10
Kibosh Brake Motors	Cast Iron	NG(80-132), ND(160 & up)	Up to 690V	50/60 Hz	4, 6, 8, 10
Flameproof Motors Brake Motors	Cast Iron	E	Up to 415V	50/60 Hz	2, 4, 6, 8
Smoke Extraction Motors	Cast Iron	ND, NG	Up to 415V	50/60 Hz	2, 4, 6, 8
Crusher Duty Motors	Cast Iron	ND	Up to 690V	50/60 Hz	4, 6, 8
UL certified fire pumps Motors	Cast Iron	ND, NG	Up to 690V	50/60 Hz	2, 4, 6, 8
Roller Table	Cast Iron	R, NR	Up to 415V	50 Hz	4, 6, 8, 10
Thresher Motors	Cast Iron	ND	Up to 690V	50/60 Hz	4



Product Range



Frames	Nomenclature	Frames	Nomenclature
DW, NDW	Slipring cast iron motor	EW	Slipring flameproof motor
E	Cast iron flameproof motor		





Sugarmill



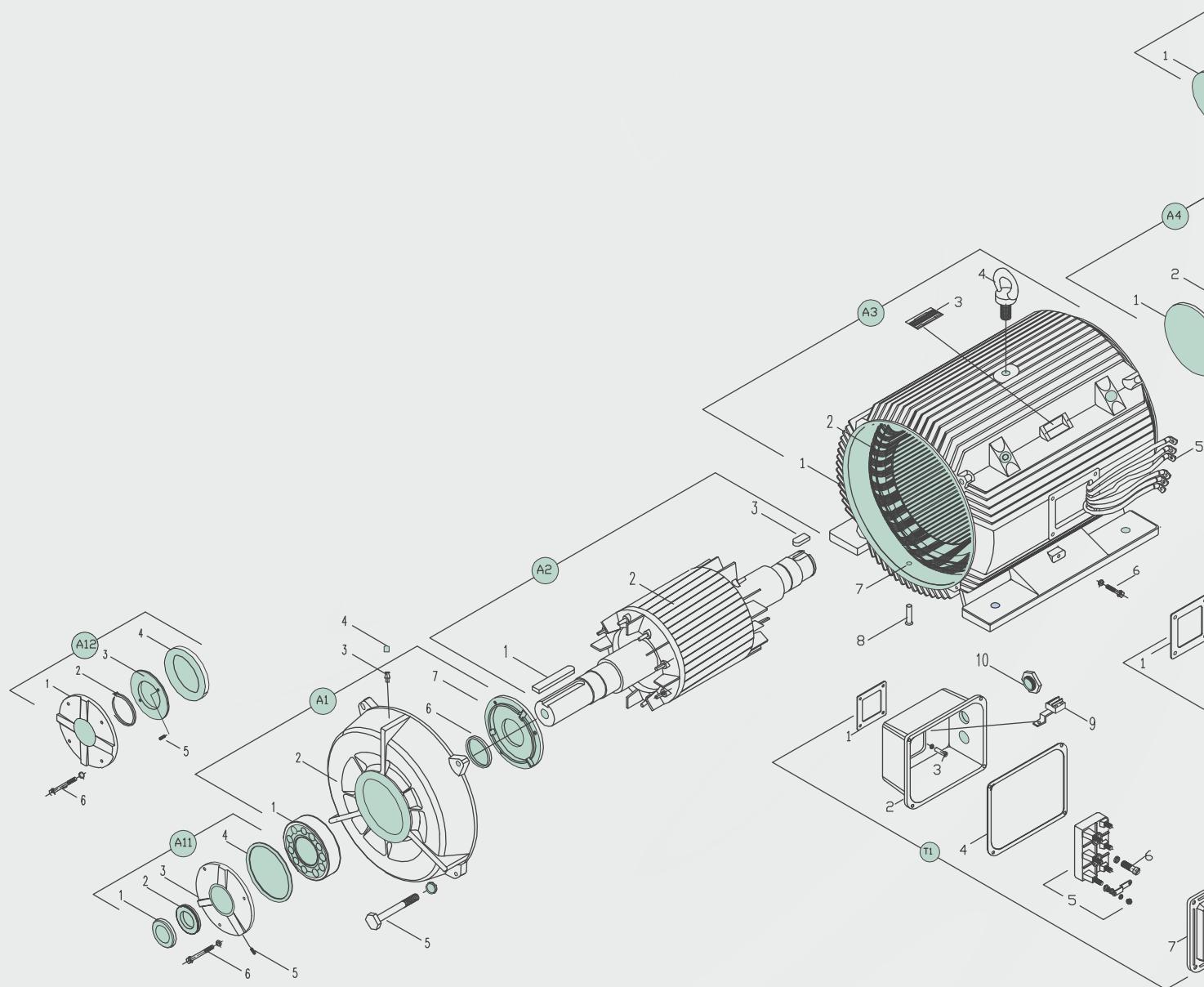
Constructional Details

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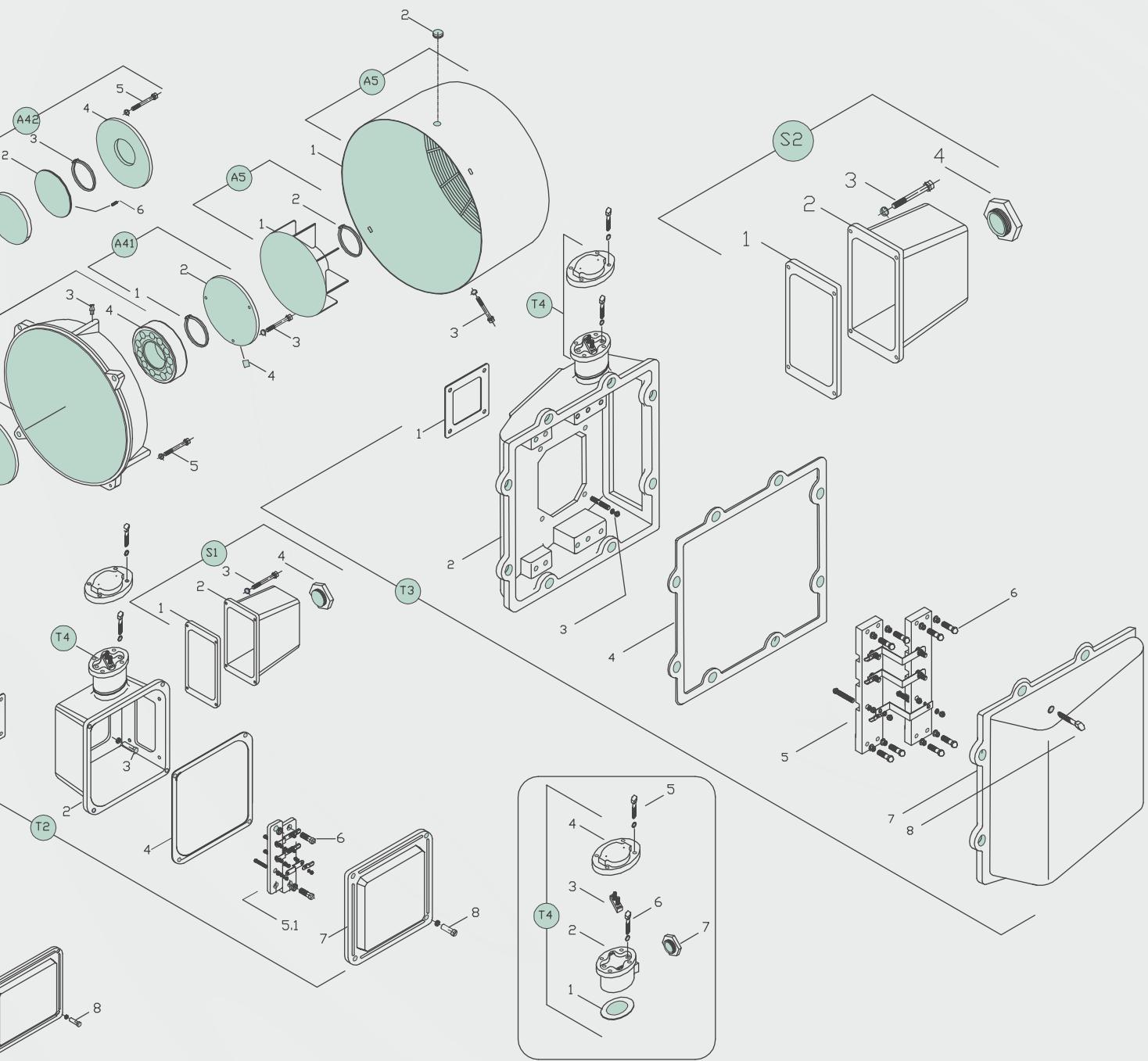
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Exploded View of Induction Motor



DIRVE - END ENDSHIELD ASSLY.	A2 ROTOR ASSLY.	A3 STATOR ASSLY.	NON DRIVE- END ENDSHIELD ASSLY.	A5 FAN ASSLY.
A1				
A 1.1 DRIVE END BEARING A 1.2 DRIVE END END SHIELD A 1.3 GREASE NIPPLE A 1.4 GREASE NIPPLE CAP	A 1.5 E/SHIELD FIXING HARDWARE A 1.6 BRG. SPACER EXCLUDING FRAME ND160 & ND315L A 1.7 INSIDE BRG.COVER	A 2.1 EXTN. KEY A 2.2 BALANCED ROTOR A 2.3 FAN KEY	A 3.1 STATOR CASE A 3.2 WOUND PACK A 3.3 RATING PLATE A 3.4 EYE BOLT A 3.5 M/C SOCKET A 3.6 EARTHING HARDWARE A 3.7 DRAIN HOLE A 3.8 DRAIN PLUG	A 4.1 INSIDE BRG.COVER A 4.2 ODE END SHIELD A 4.3 GREASE NIPPLE
A11 FOR 160 - 225 FRAMES	A12 FOR FRAME 250 & ABOVE	ROTOR MAY BE BUILT UP TYPE FOR 280/315 FRAMES	A41 FOR 160 - 225 FRAMES	A51 EXTERNAL FAN A 5.2 CIRCLIP
A 11.1 VRING CUP A 11.2 V - RING A 11.3 INTERGAL ENDSHIELD A 11.4 PRE LOADING WASHER A 11.5 DRAIN PLUG	A 12.1 DE OUT SIDE BRG.COVER A 12.2 CIRCLIP A 12.3 GREASE FLINGER A 12.4 GREASE BAFFLE A 12.5 GRUB SCREW A 12.6 BRG.CVR FIXING HARDWARE		A42 FOR FRAMES 250 ABOVE	
			A 41.1 CIRCLIP A 41.2 INTERGAL B.COVER ENDSHIELD A 41.3 BRG.CVR FIXING HARDWARE A 41.4 DRAIN PLUG A 41.5 INSIDE BRG. COVER	A 42.1 GREASE BAFFLE A 42.2 GREASE FLINGER A 42.3 CIRCLIP A 42.4 GRUB SCREW A 42.5 OUT SIDE BRG.COVER A 42.6 BRG.CVR FIXING HARDWARE



A6 FAN COVER ASSLY.	T1 TERMINAL BOX ASSLY. FOR 160 - 200 FRAMES.	T2 TERMINAL BOX ASSLY. FOR 225 TO 280 FRAMES.	T3 TERMINAL BOX ASSLY. FOR 315 & 355 FRAMES.	T4 AUX.TERMINAL BOX ASSLY. FOR 225 TO 355 FRAMES.	S1 SEALING BOX ASSLY. FOR 225 TO 280 FRAMES.	S2 SEALING BOX ASSLY. FOR 315 TO 355 FRAMES.
A 6.1 FAN COVER A 6.2 GREASE NIPPLE COVER A 6.3 FAN COVER FIXING HARDWARE T 1.1 GASKET (BOX/S.CASE) T 1.2 TERMINAL BOX T 1.3 T.BOX FIXING HARDWARE T 1.4 GASKET (T.BOX/CVR) T 1.5 TERMINAL BLOCK ASSLY. T 1.6 BLOCK FIXING HARDWARE T 1.7 TERMINAL BOX COVER T 1.8 COVER FIXING HARDWARE T 1.9 AUX.TER BLOCK & CLAMP T 1.10 CONDUIT PLUG	T 1.1 GASKET (BOX/S.CASE) T 1.2 TERMINAL BOX T 1.3 T.BOX FIXING HARDWARE T 1.4 GASKET (T.BOX/CVR) T 1.5 TERMINAL BLOCK ASSLY. FOR 225-280 FRAMES T 1.6 BLOCK FIXING HARDWARE T 1.7 TERMINAL BOX COVER T 1.8 COVER FIXING HARDWARE T 1.9 AUX.TER BLOCK & CLAMP T 1.10 CONDUIT PLUG	T 2.1 GASKET (BOX/S.CASE) T 2.2 TERMINAL BOX T 2.3 T.BOX FIXING HARDWARE T 2.4 GASKET (T.BOX/CVR) T 2.5.1 TERMINAL BLOCK ASSLY. FOR 225-280 FRAMES T 2.6 BLOCK FIXING HARDWARE T 2.7 TERMINAL BOX COVER T 2.8 COVER FIXING HARDWARE	T 3.1 GASKET (BOX/S.CASE) T 3.2 TERMINAL BOX T 3.3 T.BOX FIXING HARDWARE T 3.4 GASKET (T.BOX/CVR) T 3.5 TERMINAL BLOCK ASSLY. T 3.6 BLOCK FIXING HARDWARE T 3.7 TERMINAL BOX COVER T 3.8 COVER FIXING HARDWARE	T 4.1 GASKET T 4.2 TERMINAL BOX T 4.3 TERMINAL BLOCK T 4.4 TERMINAL COVER T 4.5 COVER FIXING HARDWARE T 4.6 BOX FIXING HARDWARE T 4.7 CONDUIT PLUG	S 1.1 GASKET S 1.2 SEALING BOX S 1.3 S/BOX FIXING HARDWARE S 1.4 CONDUIT PLUG	S 1.1 GASKET S 1.2 SEALING BOX S 1.3 S/BOX FIXING HARDWARE S 1.4 CONDUIT PLUG



3.1 General Enclosure

Stator Frame 80 to 500 with prefixes ND/NG/PC/NDW for standard motors and E/EW for hazardous Ex'd motors are made of high quality cast iron of grade FG200/260 with an integral solid feet to avoid vibration or loosening / breaking of feet. All these frames have specially designed integral longitudinal ribs for effective heat transfer and minimal accumulation of dust and water in the body. Frames with Prefix E denote Flame proof Ex d enclosure and are capable of withstanding explosion of gas or vapor within it and preventing ignition of surrounding explosive gas or vapour.



Fig. 1 Aluminum Stator



Fig. 2 Cast Iron Stator



Fig. 3 FLP Stator



Fig. 4 SPDP Stator

The stator frame and end shields are machined to close tolerances for providing perfect alignment and concentricity. Earthing pads are provided on the stator for all frames with earthing screw and washer (1 X M5 screw on either side for 63-80 frame Aluminum body motors. 2 X M6 on either side for 80 to 132 frame, 1 X M8 one either side for 160 to 225 frame, 1 X M12 on either side beyond 250 frame.

Multi-mount motor

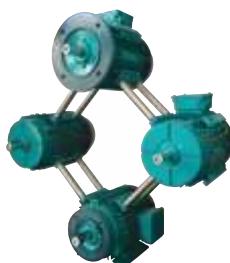


Fig. 5 Multi-Mount Motor

Stators of 63 to 160 frames with prefix GD/SD/PA are made of Aluminum alloy with detachable feet and are suitable for Multi mount. By simply changing the position of feet, user can change the terminal box position at right, left or top. The foot mounted can be converted to flange or face mount by removing the feet and interchanging the standard end shield with flange and face version.

3.2 End Shields



Fig. 6 End shield - Standard, Flange 'D' type, Face 'C' type

End shields are ruggedly designed to take care of high bearing loads and for optimized heat dissipation to maintain low bearing temperature. End shields for flange and face mounting motors are made up of cast iron.

For flame proof Ex 'd' motors, the endshield to stator joint forms flame path (as shown in the fig. 7) and is maintained as per certified drawings.

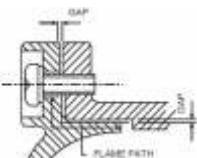


Fig. 7 Flamepath

3.3 Terminal Box

Standard motors up to frames 132 are provided with Aluminium terminal box and frame 160 & above have cast iron terminal box with IP 55 protection. Terminal boxes of all motors are rotatable in steps of 90° except aluminum body motor in 80 frame. This feature has been incorporated in order to facilitate cable entry from any direction.



Fig. 8 TB - RHS, TOP & LHS

As a standard practice, for cast iron body motors, the terminal box is provided on the right hand side when viewed from driving end. Optionally terminal box can be provided on left hand side or on top when specified in the order.

For motors rated upto and including 2.2.kW (3HP) 2pole/4pole are provided with 3 terminals. For 2.2.kW (3HP) 6pole / 8pole and 3 kW and above are provided with 6 terminals as a standard practice. The terminal markings U, V, W or U1, V1, W1, & U2, V2, W2 are provided on the motor lead sockets.



3.3 Terminal Box

Frames 225 & Cable termination box and anti rotating socket arrangement is provided as a standard feature. For slipring motors, separate terminal box for stator & rotor terminations are provided. Stator terminal box is on left hand side while rotor terminal box is on right hand side when viewed from driving end.

Clearance and creepage distances are maintained for ease of termination of supply cables. One earthing terminal is provided inside the terminal box. Optionally motors with flying leads, plug & socket arrangement can also be offered.

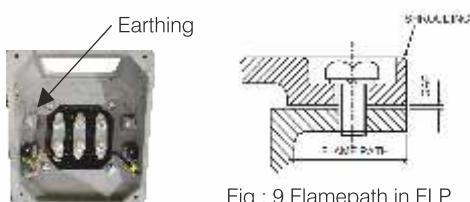


Fig : 9 Flamepath in FLP

Adequate care is taken at the joints to maintain the flame path (gap) specified in the Fig. 9. The terminal box is designed with adequate space for terminating large size of cables. Larger frames are provided with Double Decker terminal studs for easy connection of 2 cables.

Flame proof Motors have a Cast Iron Spigot terminal box capable of withstanding of internal explosion. A Sealing box is provided for Gas Group I.

3.4 Accessories Termination



Fig. 10 Auxiliary terminal box

As a standard practice, terminals of accessories (Heater, Thermistor, etc.) are provided in the main terminal box for small motors. For larger frames, a separate auxiliary terminal box is provided which is mounted on the side of main terminal box as shown in the figure. The auxiliary terminal box is provided with threaded hole of M20 x 1.5P for fitting cable glands.

3.5 Cable Glands

Standard TEFC & Drip Proof (DP) motors are provided with threaded cable entry. These holes are plugged with PVC plugs. On request, double compression type cable glands (made of nickel plated brass) can be fitted. The type of cable & its size in that case is required to be mentioned at the time of ordering.

3.6 Fan and Fan Cover



Fig. 11 Fan cover



Fig. 12 Fan cover with canopy

Aerodynamically designed Fan and fan covers ensure adequate air flow over the motor body and optimum transfer of heat. Specially designed fan cover also ensures reduced air noise level. For hazardous motors metallic fan is provided as standard. Fans are made up of different materials like polypropylene up to frame 225, beyond metallic fan. Any other requirement shall be referred back.

3.7 Cable Termination

Motor power supply leads are connectable to a terminal block made of high strength polyester based resin (generally DMC). Frame size below 280 is supplied with single layer terminal box having (six leads). Frame size 280 and above is provided with double decker terminal box.



Fig. 13 Double decker terminal block



Fig. 14 Terminal board

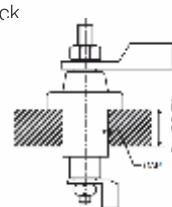


Fig. 15 Flamepath



3.7 Cable Termination

Flameproof motors terminals are provided with anti rotating and anti loosening arrangement. The terminal studs are made of non hygroscopic thermosetting glass filled DMC.

They are specially designed for high tightening torque to avoid breakage of insulation. These studs form flame paths between the main frame and the terminal box of the motor as per certified design. The flame path is a metal to metal joint to avoid any distortion of flameproof gaps in the event of deterioration of the insulation during its operating life.

Frame	Max. Cable Size	No. of Terminals	Stud Size		Metric Entry
			Main	Earthing	
E80	1Rx3Cx6mm ²	3	M6	M5	M20x1.5P
E90L-	1Rx3Cx25mm ²	3 or 6	M6	M5/M6	M25x1.5P
E132M	or 2Rx3Cx16mm ²				
E160M-	1Rx3Cx95mm ²	6	M8	M8	M40x1.5P
E200L	or 2Rx3Cx70mm ²				
E225S-	1Rx3Cx150mm ²	6	M10	M10/M8	M50x1.5P
E315M	or 2Rx3Cx120mm ²				
E315L	2Rx3Cx185mm ²	6	M16	M10	M63x1.5P
E355LX	2Rx3Cx240mm ²	6	M20	M10	M75x1.5P
E400LX	2Rx3Cx400mm ²	6	M20	M10	M75x1.5P

Table 1 : Flamproof Cable size

TEFC Frame	SPDP Frame	Maximum Cable Size		No of Main Terminals	Terminal Stud		Metric Entry	
		DOL	Star delta		Main	Earth	Nos.	Size
GD63-71	-	1RX3CX4mm ²	1RX3CX4mm ²	6	M4	M5	DOL-1, S/D-2	M20X1.5P
ND80-132M	-	1RX3CX10mm ²	2RX3CX10mm ²	#6	M6	M5	DOL-1, S/D-2	M25X1.5P
GD/NG100-132	-	1RX4CX10mm ²	2RX4CX10mm ²	6	M5	M5	DOL-1, S/D-2	M25X1.5P
ND160-180	C160 & C180	1RX4CX50mm ²	2RX3CX35mm ²	6	M6	M6	2	M32X1.5P
ND200	-	1RX4CX70mm ²	2RX3CX50mm ²	6	M8	M8	2	M50X1.5P
ND225-ND250	C200 -C250	1RX3CX150mm ²	2RX3CX120mm ²	6	M10	M10	2	M63X1.5P
ND280	-	1RX3CX185mm ²	2RX3CX185mm ²	6	M12	M10	2	M63X1.5P
ND315S/ M/L	C280- C315S/M/MX	1RX3CX240mm ²	2RX3CX240mm ²	6	M16	M12	2	M75X1.5P
ND355L/LX	-	1RX3CX240mm ²	2RX3CX300mm ²	6	M16	M12	2	M75X1.5P
ND/NG400,	-	3CX400mm ²	2RX3CX400mm ²	6	20 mm	M16	2	M75X1.5P
ND450, Nd500	-	3CX400mm ²	2RX3CX400mm ²	6	20 mm	M16	2	M75X1.5P

Table 2 : Cable size for safe area motor



3.8 Drains

Foot mounted motors of frame size 160 and above have drain holes at their lowest position at both DE and ODE side as a standard feature. These are used for extracting condensed water inside the motor housing. Drain plugs are closed during normal working operation and should be open during periodic maintenance to drain out condensed water if any. Standard motors with V1, V6 mounting & Flameproof motors do not have drain holes. Drain holes are provided as shown in fig. 16.

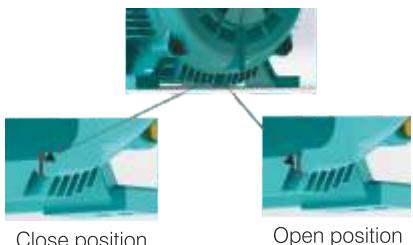


Fig. 16 Details of the drain plug position on drive end shield

3.9 Eye Bolts



Frame Size	Eye bolts with TB position		
	TOP	Side	Flange
100-132	2	1	1
160-200	2	1	2
225-355L	2	1	2
355LX-450	2	2	2

Fig. 17 Auxiliary terminal box

Table 3: No of Eyebolts

To allow easy lifting of motors eye bolts are provided as standard from frame size 100L. Jacking out holes are provided as standard feature in frame 315M and above and as an optional feature for frame 200 and above .



Pressure testing for Flameproof motors





Mechanical Features

33

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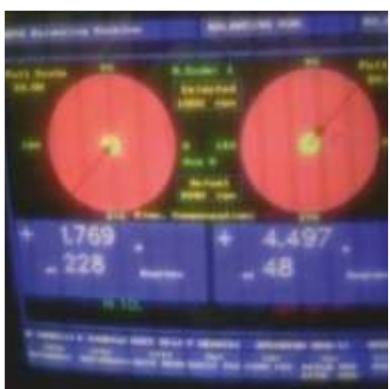


4.1 Vibration

We set our own standards for vibration much lower than IEC 60034 - 14.

Rotors are dynamically balanced to G 2.5 class at rated speed ensuring low vibration level.

Frame Size	IEC 60034-14	CG
6 3 - 1 3 2	1.6	0.4 - 1.2
160 - 280	2.2	1.1 - 1.8
280 & Above	2.8	1.8 - 2.0



Vibration of an electrical motor is closely related to its assembly With the driven equipment. To evaluate the vibration levels of motor alone, it is necessary to measure the same in uncoupled and free shaft condition with a half key fitted in key way on shaft and in freely suspended state with the help of a string as specified in IEC60034-14. The motor is said to have vibration if any part of it experiences displacement / velocity in any direction beyond the limits specified in the table 4.

Shaft Height, mm	Vector	Vibration Grade	
		A	B
56 ≤ H ≤ 132	Displ. μ	25	11
	Vel. mm/s	1.6	0.7
132 ≤ H ≤ 280	Displ. μ	35	18
	Vel. mm/s	2.2	1.1
H > 280	Displ. μ	45	29
	Vel. mm/s	2.8	1.8

Note: Limits of maximum vibration magnitude in displacement and velocity for shaft height H, Subject to tolerance of +10%.

Grade "A" applies to machines with no special vibration requirements.

Grade "B" applies to machines with special vibration requirements.

Table 4 : Vibration for free suspension mounting

CG motors are dynamically balanced at rated speed with half key and meet the vibration levels of grade A. In case of special applications requiring grade B levels can be supplied against order.

4.2 Cooling System and Noise



Fig. 18 Motor with fan

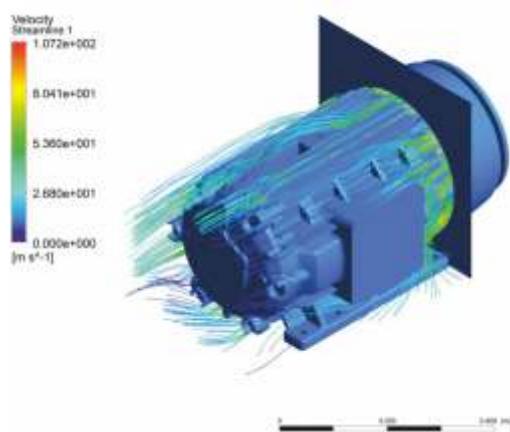


Fig 19 : Velocity stream line analysis



Mechanical Features



Standard motors are totally enclosed fan cooled (IEC411), as per IEC 60034-6 as shown in fig. 18. Non-ventilated versions, air over and forced ventilation are available on request. Cooling system consists of fan, non drive end shield and fan cover. As shown in fig. 19 cooling system is designed to minimize the noise level and improve thermal efficiency. The noise level of standard motors are well within limits of IEC60034-9. Sound pressure level measured in dbA at 1 meter at no load and decoupled condition are given in the table 5.

Shaft Height H mm				
	2 pole	4 pole	6 pole	8 pole
90	78	66	63	63
100	82	70	64	64
112	83	72	70	70
132	85	75	73	71
160	87	77	73	72
180	88	80	77	76
200	90	83	80	79
225	92	84	80	79
250	92	85	82	80
280	94	88	85	82
315	98	94	89	88
355	100	95	94	92
400	100	96	95	94

Table 5 : Sound pressure level in dbA at 1 meter





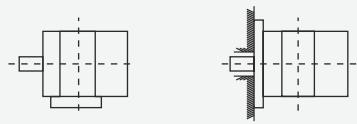
Mechanical Features



Mounting Arrangement

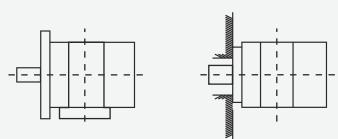
HORIZONTAL

FIGURE



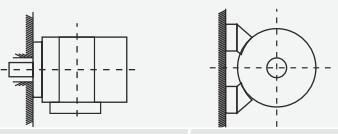
REF	B3	B5
CODE I	IM B3	IM B5
CODE II	IM 1001/2/3/4	IM 3001
FRAME	WITH FEET	WITHOUT FEET
SHAFT	HORIZONTAL	HORIZONTAL
MOUNTING	BASE OR RAILS	FLANGE TYPE D

FIGURE



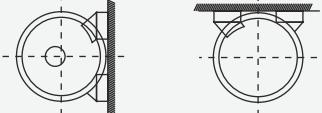
REF	B35	B14
CODE I	IM B35	IM B14
CODE II	IM 2001	IM 3601
FRAME	WITH FEET & FLANGE	WITHOUT FEET
SHAFT	HORIZONTAL	HORIZONTAL
MOUNTING	BASE OR FLANGE TYPE D	FLANGE TYPE C

FIGURE



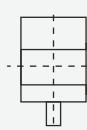
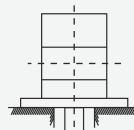
REF	B34	B6
CODE I	IM B34	IM B6
CODE II	IM 2101	IM 1051
FRAME	WITH FEET	WITH FEET
SHAFT	HORIZONTAL	HORIZONTAL
MOUNTING	BASE OR FLANGE TYPE C	WALL

FIGURE

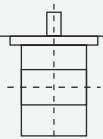
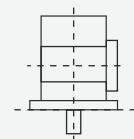


REF	B7	B8
CODE I	IM B7	IM B8
CODE II	IM 1061	IM 1071
FRAME	WITH FEET	WITH FEET
SHAFT	HORIZONTAL	HORIZONTAL
MOUNTING	WALL	CEILING

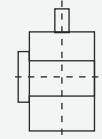
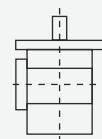
VERTICAL



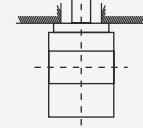
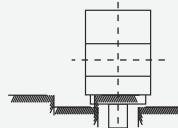
REF	V1	V5
CODE I	IM V1	IM V5
CODE II	IM3011	IM1011
FRAME	WITHOUT FEET	WITH FEET
SHAFT	FACE VERT DOWN	FACE VERT DOWN
MOUNTING	FLANGE TYPE D	BASE OR RAILS



REF	V15	V3
CODE I	IM V15	IM V3
CODE II	IM 2011	IM3031
FRAME	WITH FEET	WITHOUT FEET
SHAFT	FACE VERT DOWN	FACE VERT UP
MOUNTING	WALL OR FLANGE TYPE D	FLANGE TYPE D



REF	V36	V6
CODE I	IM V36	IM V6
CODE II	IM 2031	IM 1031
FRAME	WITH FEET	WITH FEET
SHAFT	FACE VERT UP	FACE VERT UP
MOUNTING	WALL OR FLANGE TYPE D	BASE OR RAILS



REF	V18	V19
CODE I	IM V18	IM V19
CODE II	IM 3611	IM 3631
FRAME	WITHOUT FEET	WITHOUT FEET
SHAFT	FACE VERT DOWN	FACE VERT UP
MOUNTING	FLANGE TYPE C	FLANGE TYPE C

Table 6

**HORIZONTAL**

Ref	Code I	Code II
B9	IM B9	IM 9101
B10	IM B10	IM 4001
B15	IMB15	IM 1201
B20	IMB20	IM 1101
B30	IM B30	IM 9201
V2	IM V2	IM 3231
V4	IM V4	IM 3211
V8	IM V8	IM 9111

Table 7 : Equivalent codes for horizontal mounting

VERTICAL

Ref	Code I	Code II
V9	IM V9	IM 9131
V10	IM V10	IM 4011
V14	IM V14	IM 4031
V16	IM V16	IM 4131
V21	IM V21	IM 3051
V30	IM V30	IM 9211
V31	IM V31	IM 9231

Table 8 : Equivalent codes for vertical mounting

REFERENCE : IS 2253



Multi-mounting



4.4 Degree of Protection

The degree of protection as classified in IEC 60034-5 is given below. It is denoted by two digits. The first digit denotes protection against solid bodies or particles and the second digit denotes protection against liquid. All our standard TEFC motors have degree of protection IP 55, unless otherwise specified.

CG motors are supplied with degrees of protection in conformance with IEC 60034-5.

CG can optionally supply motor with IP 56/65/66 in standard TEFC and flameproof motors.

Second Characteristic Numeral								
First Characteristic Numeral	No Protection	0	Water falling Vertically shall not harm	Water falling up to 15° from vertical shall not harm	Water falling up to 60° from vertical shall not harm	Water splashes shall not harm	Water projected by nozzle shall not harm	Water from heavy seas shall not harm
		1	2	3	4	5	6	
0	No Protection							
1	Special Protection against bodies 50 mm dia.							
2	DP protection against bodies 12 mm dia		IP 21	IP 22	IP 23			
4	TEFC Protection against bodies 1 mm dia					IP 44		
5	TEFC Protection against powder					IP 54	IP 55	IP 56
6	TEFC Protection against powder						IP 65	IP 66



Mechanical Features



4.5 Shaft

CG motors are supplied with shaft made of AISI 1040/45 (EN8) hot rolled steel. Shaft bars are ultrasonically tested for detection of flaws, before taken up for machining. Shaft bars of diameter more than 140mm are generally forged. Shaft made of high tensile steel i.e. AISI 4340 (EN24) or stainless steel are also available on demand to suit the requirement of application.

The values given in the table 9 for radial thrusts taking into consideration the point upon which the load is applied i.e. at the center of shaft extension.



Fig. 21 Radial and axial load on motor shaft

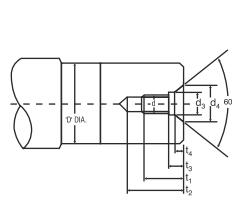


Fig. 22 Threaded Centred Holes for Motor Shaft

SYNC. RPM	3000	1500	1000	750
FRAME SIZE				
63	42	46	-	-
71	46	55	-	-
80	53	66	76	-
90	46	57	66	72
100	66	83	96	106
112	95	120	138	153
132	137	173	198	218
160	255	305	305	305
180	300	380	395	395
200	400	505	580	580
225	450	570	655	655
250	510	1095	1095	1095
280	510	1790	1790	1790
315	560	1905	1905	1905
355	590	2000	2000	2100

Table 10 : Maximum permissible radial pull in kg.
Note : For frame 400 & 450 axial thrust can be provided on request

Diameter Range 'D'	Thread d	d3	d4	t ₁₀ ⁺²	t _{2(min)}	t ₃	t ₄
7 to 10	M3	3.2	5.3	9.0	13.0	2.6	1.8
10 to 13	M4	4.3	6.7	10.0	14.0	3.2	2.1
13 to 16	M5	5.3	8.1	12.5	17.0	4.0	2.4
16 to 21	M6	6.4	9.6	16.0	21.0	5.0	2.8
21 to 24	M8	8.4	12.2	19.0	25.0	6.0	3.3
24 to 30	M10	10.5	14.9	22.0	30.0	7.5	3.8
30 to 38	M12	13.0	18.1	28.0	37.5	9.5	4.4
38 to 50	M16	17.0	23.0	36.0	45.0	12.0	5.2
50 to 85	M20	21.0	28.4	42.0	53.0	15.0	6.4
85 to 130	M24	25.0	34.2	50.0	63.0	18.0	8.0

Table 9: Maximum permissible radial thrust in kg.

SYNC. RPM	3000		FACE WIDTH
	PULLEY DIA	BELOW	
FRAME SIZE			
63	75	75	30
71	75	75	40
80	75	75	50
90	75	75	63
100	75	75	80
112	100	100	100
132	120	120	125
160	120	180	177
180	125	200	203
200	130	220	280
225	170	26	330
250	180	220	380
280	300	220	380
315	500	420	380
355	600	450	400

Table 11 : Minimum diameter & maximum face width of pulley in mm



4.6 Bearings

CG Motors are supplied with deep groove ball bearings sealed for life up to frame 225 frame. For larger frames, greased bearings with on line greasing arrangement is supplied.

The minimum L10 life of bearings for standard motors is 40000 hrs subject to operations within maximum permissible radial/axial load as described in table no 9 & 10 and under standard operating conditions (Environment, temperature, speed and grease life).

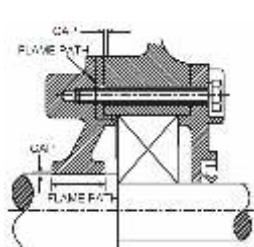


Fig. 22 Cross sectional view of bearing

CG motors are provided with drive end bearing lock from frame 160 and above, to prevent any axial movement at the load side. A pre load washer is provided at non-driving end. Motors in frame 160 and above can be supplied with roller bearings or thrust bearings to take care of higher radial / axial load.

In flameproof (Ex'd) motors, the clearances between the Inside bearing cover and shaft and the joint with end shield forms the flame path as shown in the figure and are maintained as per certified drawings in fig 22.

Points to be noted:

1 - Special applications motor operation under adverse operating conditions, such as higher ambient temperatures and altitudes or abnormal axial / radial loads, may require specific lubrication measures and alternative re-lubrication intervals to those indicated in the tables provided within this technical catalogue.

2 - Roller bearings require a minimum radial load so as to ensure correct operation. They are not recommended for direct coupling arrangements, or for use on high speed (2 pole) motors.

3 -Motors operated with VFD are provided with Insocoat (Insulated) bearings as standard from frame size 315 and above unless otherwise specified.

4 – Bearing life of frequency inverter driven motors may be reduced if a motor is driven at speeds above nominal. Speed itself is one of the factors taken into consideration when determining motor bearing life.

5 - Motors with modified mounting configurations like motors supplied with horizontal mounting but working vertically, lubrication intervals must be reduced by half.

Bearings are greased with Lithium Base grade II upto frame 250, for frame 280 and above lithium complex grade III.

It must be emphasized that excessive lubrication i.e. quantity of grease greater than recommended in the nameplate can result in increase of bearing temperature which can lead to reduced operating hours.

Aluminum Motor - Safe Area

FRAME	POLE	DE BEARING	NDE BEARING
GD63	All	6202 ZZ	6202 ZZ
GD71	All	6003 ZZ	6003 ZZ
GD80	All	6204 ZZ	6003 ZZ
GD90S/L	All	6205 ZZ C3	6203 ZZ
GD100L	All	6206 ZZ C3	6205 ZZ C3
GD112M	All	6206 ZZ C3	6205 ZZ C3
GD132S/M	All	6208 ZZ C3	6305 ZZ C3

Aluminum Motor - Safe Area

FRAME	POLE	DE BEARING	NDE BEARING
PA80	All	6204 ZZ C3	6003 ZZ
PA90S/L	All	6205 ZZ C3	6203 ZZ
PA100L	All	6206 ZZ C3	6206 ZZ C3
PA112M	All	6206 ZZ C3	6206 ZZ C3
PA132S/M	All	6208 ZZ C3	6208 ZZ C3



Mechanical Features



Cast Iron Motor - Safe Area

FRAME	POLE	DE BEARING	NDE BEARING
NG80	All	6204 ZZ	6003 ZZ
NG90S/L	All	6205 ZZ C3	6203 ZZ
NG100L	All	6206 ZZ C3	6205 ZZ C3
NG112M	All	6206 ZZ C3	6205 ZZ C3
NG132S/M	All	6208 ZZ C3	6305 ZZ C3
ND80	All	6204 ZZ	6204 ZZ
ND90S/L	All	6205 ZZ	6205 ZZ
ND100L	All	6206 ZZ	6205 ZZ
ND112M	All	6306 ZZ	6305 ZZ
ND132S/M	All	6308 ZZ	6208 ZZ
ND160M/L	All	6309 ZZ C3	6209 ZZ C3
ND180M/L	All	6310 ZZ C3	6210 ZZ C3
ND200L	All	6312 ZZ C3	6212 ZZ C3
ND225S/M	All	6313 ZZ C3	6213 ZZ C3
ND250M/MX	2	6314 C4	6314 C4
ND250M/MX	4 & UP	6314 C3	6314 C3
ND280S/M	2	6314 C4	6314 C4
ND280S/M	4 & UP	6318 C3	6318 C3
ND315S/M/L/LX	2	6315 C4	6315 C4
ND315S/M/L/LX	4 & UP	6319 C3	6319 C3
ND355L	2	6316 C4	6316 C4
ND355L	4 & UP	6321 C3	6321 C3
ND355LX	2	6316 C4	6316 C4
ND355LX	4 & UP	6322 C3	6322 C3
NG355LX	2	6318 C4	6318 C4
NG355LX	4 & UP	6322 C3	6322 C3
NG400LX	2	6318 C4	6318 C4
NG400LX	4 & UP	6324 C3	6324 C3
ND400LX	2	6318 C4	6318 C4
ND400LX	4 & UP	6322 C3	6322 C3
ND450LX	4 & UP	6326 C3	6326 C3

Roller bearing can be given in 160 & above frames.

For online greasing arrangement NDE bearing size will be same as DE bearing for frame size 160 to 225.

FRAME	POLE	DE BEARING	NDE BEARING
PC80	All	6204 ZZ	6003 ZZ
PC90	All	6205 ZZ	6203 ZZ
PC100	All	6206 ZZ	6205 ZZ
PC112	All	6206 ZZ	6206 ZZ
PC132	All	6208 ZZ	6208 ZZ
PC160	All	6309 ZZ C3	6309 ZZ C3
PC180	All	6310 ZZ C3	6310 ZZ C3
PC200	All	6312 ZZ C3	6312 ZZ C3
PC225	All	6313 ZZ C3	6313 ZZ C3

Slipring Cast Iron Motor - Safe Area

FRAME	POLE	DE BEARING	NDE BEARING
DW132S/M	4 & UP	6208 ZZ	6208 ZZ
NDW160M/L	4 & UP	6309 ZZ C3	6309 ZZ C3
NDW180M/L	4 & UP	6310 ZZ C3	6310 ZZ C3
NDW200L	4 & UP	6312 ZZ C3	6312 ZZ C3
NDW225S/M	4 & UP	6313 ZZ C3	6313 ZZ C3
NDW250S/M/MX	4 & UP	6314 C3	6314 C3
NDW280S/M	4 & UP	6318 C3	6318 C3
NDW315S/M/L/LX	4 & UP	6319 C3	6319 C3
NDW355S/M/L	4 & UP	6321 C3	6321 C3
NDW355LX	4 & UP	6322 C3	6322 C3
NDW400LX	4 & UP	6322-C3	6322-C3
NDW450LX	4 & UP	6326-C3	6326-C3

SPDP Cast Iron Motor - Safe Area

FRAME	POLE	DE BEARING	NDE BEARING
C160M/L	4 & UP	6310 ZZ C3	6310 ZZ C3
C180M/L	4 & UP	6212 ZZ C3	6212 ZZ C3
C200M/L	4 & UP	6313 ZZ C3	6313 ZZ C3
C225M	4 & UP	NU314	6314 C3
C250S/M/MX	4 & UP	NU316	6316 C3
C280S/M	4 & UP	NU318	6318 C3
C315S/M/MX	4 & UP	NU319	6319 C3



Smoke Extraction Motor

FRAME	POLE	DE BEARING	NDE BEARING
NG80	ALL	6204ZZ	6003ZZ
NG90S/L	ALL	6205ZZ	6203ZZ
NG100L	ALL	6206ZZ	6205ZZ
NG112M	ALL	6206ZZ	6205ZZ
NG132S/M	ALL	6208ZZ	6205ZZ
ND80	ALL	6204ZZ	6204ZZ
ND90S/L	ALL	6205ZZ	6205ZZ
ND100L	ALL	6206ZZ	6205ZZ
ND112M	ALL	6306ZZ	6205ZZ
ND132S/M	ALL	6308ZZ	6208ZZ
ND160M/L	ALL	6309	6309
ND180M/L	ALL	6310	6310
ND200L	ALL	6312	6312

Flameproof Slipring Motor

FRAME	POLE	DE BEARING	NDE BEARING
EW250M	4 & UP	6315 C3	6315 C3
EW280M	4 & UP	6318 C3	6318 C3
EW315M	4 & UP	6319 C3	6319 C3
EW315L	4 & UP	6319 C3	6319 C3



Fig. 23 Motor with BTD

Flameproof Area Motor

FRAME	POLE	DE BEARING	NDE BEARING
E80	All	6304 ZZ	6304 ZZ
E90	All	6205 ZZ	6205 ZZ
E100	All	6206 ZZ	6206 ZZ
E112	All	6306 ZZ	6306 ZZ
E132	All	6308 ZZ	6208 ZZ
E160	All	6309 ZZ	6309 ZZ
E180	All	6310 ZZ	6310 ZZ
E200	All	6312 ZZ	6312 ZZ
E225	All	6313 ZZ	6313 ZZ
E250	2	6315 C4	6315 C4
E250	4 & UP	6315 C3	6315 C3
E280	2	6315 C4	6315 C4
E280	4 & UP	6318 C3	6318 C3
E315 M/L	2	6315 C4	6315 C4
E315 M/L	4 & UP	6319 C3	6319 C3
E355LX	2	6318 C4	6318 C4
E355LX	4 & UP	6322 C3	6322 C3
E400LX	2	6318 C4	6318 C4
E400LX	4 & UP	6324 C3	6324 C3

Many applications require continuous temperature monitoring of bearings and CG Motors can be offered with Bearing Temperature Detectors (BTD) on request to monitor bearing operating temperature . The output signal of BTD is a resistance signal which varies linearly with the temperature. Temperature upto 200 degC can be monitored with BTDs. CG provides duplex BTDs as an accessory. The Bearing temperature monitoring is important for critical applications considering that it directly affects the bearing life.

4.6.2 Lubrication Chart

Bearing life time is closely related to its correct use, maintenance and lubrication. The quantities of grease and lubrication intervals are stamped in the motor nameplate. Lubrication intervals are shown in adjoining table.



Mechanical Features



Lubrication Chart

Frame	DE BRG	NDE BRG	Interval For Re-lubrication In Hours For respective Syn. RPM				
			2 Pole	4 Pole	6 Pole	8 Pole	10/12 Pole
ND160M/L	6309	6309	6,000	9,000	14,000	23,000	28,000
ND180M/L	6310	6310	4,800	8,800	13,500	22,000	27,000
ND200L	6312	6312	3,500	8,500	13,200	20,000	25,000
ND225S/M	6313	6313	3,100	8,000	13,000	18,500	24,000
ND250S/M 2 Pole	6314	6314	2,500	-	-	-	-
ND250S/M 4P & UP	6314	6314	-	7,800	12,800	18,000	23,000
ND280S/M 2 Pole	6314	6314	2,500	-	-	-	-
ND280S/M 4P & UP	6318	6318	-	5,800	9,500	14,500	19,000
ND315S/M/L 2 Pole	6315	6315	2,300	-	-	-	-
ND315S/M/L 4P & UP	6319	6319	-	5,000	9,000	14,000	18,000
ND355S/M/L 2 Pole	6315	6315	2,300	-	-	-	-
ND355S/M/L 4P & UP	6321	6321	--	5,000	5,000	9,000	9,000
ND355LX 2P	6316	6316	2,000	--	--	--	--
ND355LX 4P & UP	6322	6322	--	2,600	4,500	5,700	10,000
PC250S/M 2 Pole	6314	6314	2,500	-	-	-	-
PC250S/M 4P & UP	6314	6314	-	7,800	12,800	18,000	23,000
PC280S/M 2 Pole	6314	6314	2,500	-	-	-	-
PC280S/M 4P & UP	6318	6318	-	5,800	9,500	14,500	19,000
PC315S/M/L 2 Pole	6315	6315	2,300	-	-	-	-
PC315S/M/L 4P & UP	6319	6319	-	5,000	9,000	14,000	18,000
PC355S/M/L 2 Pole	6316	6316	2,000	-	-	-	-
PC355S/M/L 4P & UP	6322	6322	-	2,600	4,500	5,700	10,000
C160M/L	6310	6310	4,800	8,800	13,500	22,000	27,000
C180M/L	6312	6312	3,500	8,500	13,200	20,000	25,000
C200M/L	6313	6313	3,100	8,000	13,000	18,500	24,000
C225S/M	6314	6314	2,500	7,800	12,800	18,000	23,000
C250S—2 Pole	6314	6314	2,500	-	-	-	-
C250S—4P & UP	NU316	6316	-	6,500	10,000	15,500	21,000
C280S—2 Pole	6314	6314	2,500	-	-	-	-
C280S/M/MX- 4P & UP	NU318	6318	-	5,800	9,500	14,500	19,000
C315S/M/MX-2 Pole	6315	6315	2,300	-	-	-	-
C315S/M/MX- 4P & UP	NU319	6319	1,000	5,000	9,000	14,000	18,000



Mechanical Features



4.7 Sliping and Brush Gear

Sliping (SR) motors are provided with sliping and brush gear arrangement. All slippings are made of cupro-nickel alloy. The sliping unit is having high insulation resistance ensuring minimum wear and breakdown. The brush holders are assembled as a complete unit which can be easily replaced. The sliping enclosure is dust proof & has a cover with accessibility for inspection. The slip rings are moulded in epoxy-based insulation and have excellent stability at high temperature and have excellent anti tracking property. Fabricated Sliprings as per Steel Plant's specification (IPSS) are also available on request for frames 160 & above.

Three brush holders each having 2 nos of metal graphite carbon brushes are provided on each ring phase. The grade of carbon brush is M15E of Assam carbon or equivalent. Each carbon brush is marked with its grade and the line of wear, which helps in identifying the replacement need.

Frame	Brushsize = t x a	Recommended force / brush
112-132	8 x 12.5 sq. mm	200gms - 250gms
160-200	16 x 24 sq. mm	200gms - 250gms
225-250	16 x 20 sq. mm	650gms - 800gms
280-315	20 x 40 sq. mm	1600gms - 2000gms
355-400		Will be provided on request

Brush sizes for frames

4.8 Name Plate

STD EFF2 GD/NG SERIES

FRAME			SERIAL NO.	
Hz	50	DUTY	DIAG.	
			CLASS F	
V	S.F.-1			
A				
RPM	IP 55		IC 411	
AMB °C	EFF		BRG. DE/NDE	
3 PH TEFC INDUCTION MOTOR MADE IN INDIA				
			REF STD	IEC 60034

STD ND SERIES

3 PH INDUCTION MOTOR				
MACHINE No**		FRAME	REF	
kW(HP)	RPM	EFF	Hz	
VOLT	A	PF	CON DIAG	
AMB	TH CL/ TEMP RISE		DUTY	
BRGS DE/NDE		RELUB HRS	MTG	
GREASE		GREASE QTY g	IP	
IEC 60034-1		Half-key balanced	Wt kg	
TAG NO. ***			WB*	
QA4522R0				

TYPE 'e'

CE 3 PH INDUCTION MOTOR Ex"e"			
MACHINE No	FRAME	REF	
kW (HP)	RPM	EFF	Hz
VOLT	A	PF	CONN DIAG
AMB	TH CL/ TEMP RISE	RELUB HRS	T
BRG DE/NDE		GREASE QTY g	IE Sec la/ln
GREASE		PESO:	MTG IP
CERTIFICATE NO:		WT kg	DUTY
IEC 60034-1	GROUP		Half-key balanced
TAG NO. ***			
DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT			

QA4522R0

TYPE 'n'

CE 3 PH INDUCTION MOTOR Ex"nA"			
MACHINE No	FRAME	REF	
kW (HP)	RPM	EFF (IE2)	Hz
VOLT	A	PF	CONN DIAG
AMB	TH CL/ TEMP RISE	RELUB HRS	T
BRG DE/NDE		GREASE QTY g	IE Sec la/ln
GREASE		PESO:	MTG IP
ATEX CERTIFICATE NO:		WT kg	DUTY
IECEx CERTIFICATE NO:			Half-key balanced
TAG NO. ***			
DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT			

QA4522/12100R0

NEMA EPACT SERIES

3 PHASE INDUCTION MOTOR MADE IN INDIA				
186777		FRAME	DESIGN	
M/C NO/REF.			HP	NOM. FL EFF %
			Hz	INS. CL.
KVA CODE	AMB °C	CONN. DIG		IP SF.
VOLT		FLA	RPM	SYN. RPM
				RELUB HRS:
BRG:DE/NDE				
QA6997/5696R0				

NEMA PREMIUM SERIES

3 PH INDUCTION MOTOR				
M/C No.		FRAME	S/N	
HP	Hz	COS Ø	AMB °C	IC411 IP
VOLT		NOM. FL EFF		
FLA		INSL CL	DUTY	
RPM		SYN.RPM	CONN	
BRG DE/NDE			GREASE	
RELUB HRS		GREASE QTY	WT kg	
SF-1.15 (FOR INVERTER DUTY SF 1.0)			MFG. mm/yy	
NEMA MG-1	KVA CODE	DESIGN		
MADE IN INDIA				
CT : 12-60 Hz			VT : 6-60 Hz	

QA45002R0

IE2/IE3/IE4 NG/GD SERIES

M/C No.		Sr. No.	IC411	IP55	IS/IEC 60034
FRAME		AMB °C	INS CL	DUTY	Wt
kw	IE2			TEMP RISE	
Volt		Cos Ø			
Hz50		BRG. DE/NDE			
Amp					
RPM					



3 PH INDUCTION MOTOR



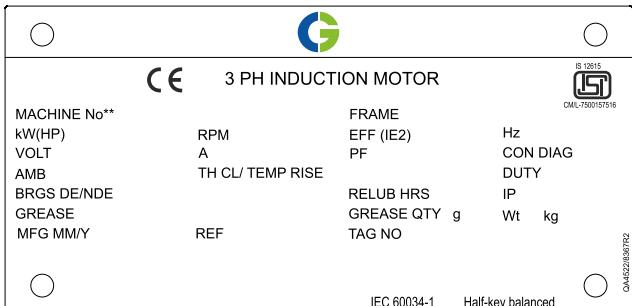
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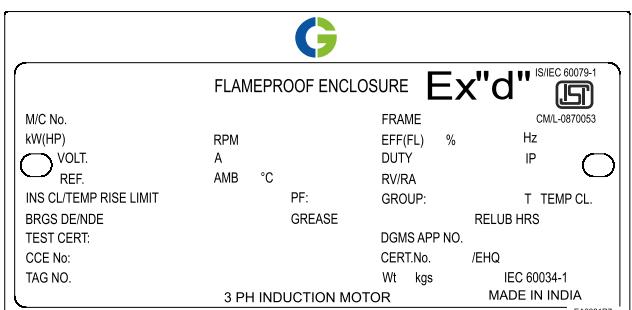
Mechanical Features



IE2/IE3/IE4 ND SERIES



FLAMPROOF



BASEEFA

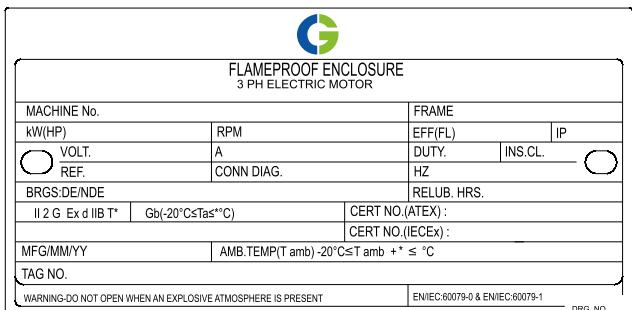


Fig. 24 Name plates of various motors

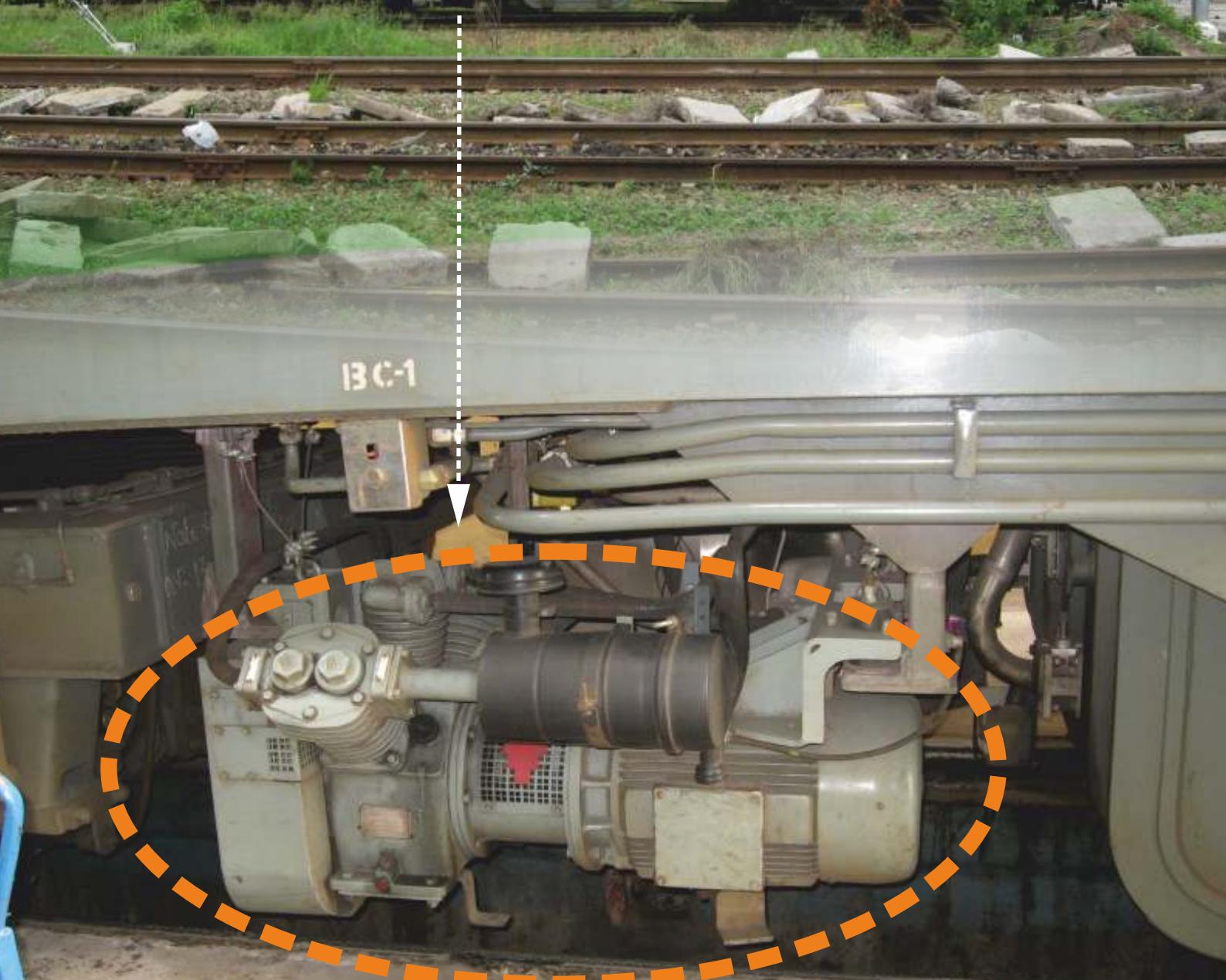
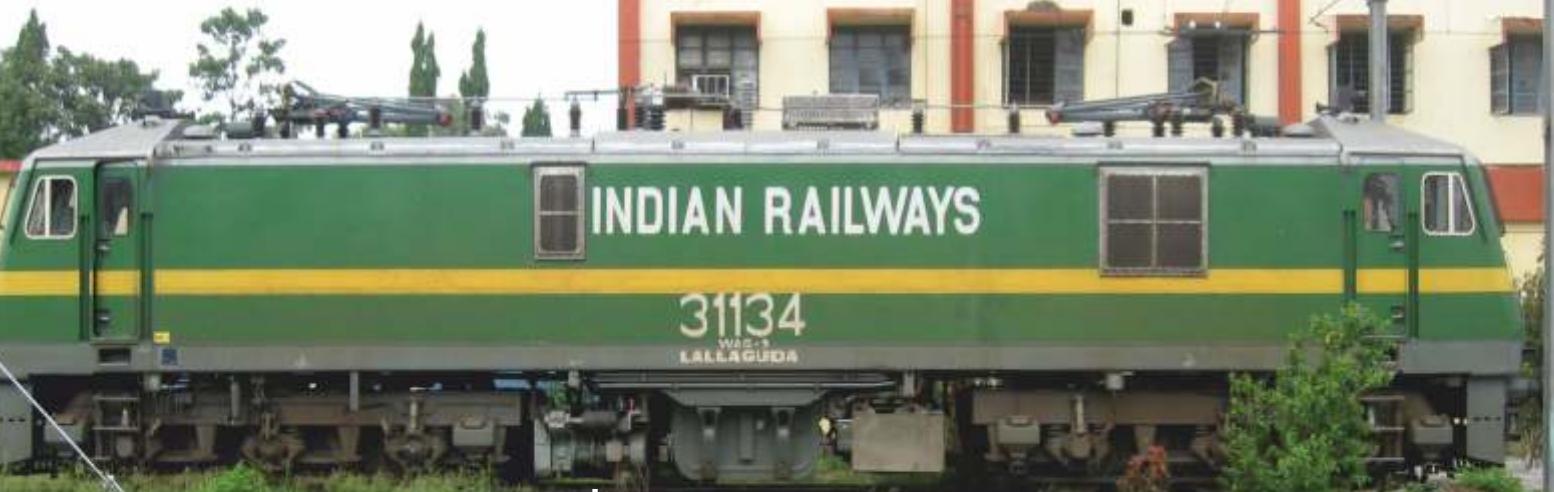


4.9 Finish and Painting

All castings and mild steel components of CG Motors are coated with high build zinc phosphate or red oxide primer and for aluminum components with zinc chromate primer. CG standard motors are painted with synthetic enamel paint. Paint shade of CG standard motors is Light grey. CG APEX series IE2 motors are offered in RAL 7034 & IE3 motors are offered in RAL 5021 (water blue) paint shade as standard. Different Paint shades other than CG standard can also be offered on request.

The standard motor painting scheme meets the "C2" performance criteria indicated in the DIN EN ISO 12944-5 Standard with respect to "Corrosive Category" and may be used for installation in normal environments, slightly severe, sheltered or non-sheltered, industrial use, with low relative humidity, normal temperature variations. CG Flame proof Ex d motors are suitable for moderate corrosive environment.

However these painting plans are not recommended for direct exposure to acid steam, alkalis, solvents and salty environments. CG offers different painting schemes for the motors required to be operated in acidic and alkaline or other corrosive atmosphere like C3-M, C4-M, C5-M, C5-I as described in DIN EN ISO 12944-5.



Railways



Electrical Features

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5.1 Core

Both stator and rotor cores are made of high permeability magnetic steel stacked under pressure and secured by end plates. Rigidity of the core is maintained by cleats and welds.

5.2 Windings & Insulation

Windings of standard motors are made with class 'F' insulation and they are designed for maximum temperature rise limited to class 'B' insulation level on the specified ambient temperature. Winding with class 'H' insulation is provided on request. Stator and rotor (Wound rotors) windings are made with modified polyester enamel covered copper wire. For frame 280 and above they are wound with dual coat copper wire as per IEC: 60037-13.



Fig. 25 Machining Centre



Fig. 26 Vacuum Pressure Impregnation

Motor windings are impregnated with class F varnish or resin with trickle or vacuum pressure impregnation. The winding overhangs of frame 225 and above are coated with Epoxy gel coat for extra protection against humidity and to provide extra mechanical rigidity to the winding to withstand electrical and mechanical stresses.

CG's unique winding and insulation schemes for Inverter grade motors are suitable for high corona inception voltage (CIV). They are minutely designed and carefully manufactured for voltage stress severity as described in standard. High voltage stress windings are made of inverter grade copper wire and enhanced insulation system.

Table 14 showing maximum temperature rise at various ambient and the *Hot spot temperature for the insulation system is given below:

Class of Insulation	Max. permissible temp. limit (C)	Max. Permissible Temperature Rise for windings at Ambient of (°C)				
		40	45	50	55	60
B	130	80	75	70	65	60
F	155	100	95	90	85	80
H	180	125	120	115	110	105

Table 14: Maximum temperature rise at various ambient

5.3 Rotor



Fig. 27 Rotor balancing

The rotor of squirrel cage motors are made of pressure die cast EC grade aluminum (or alloy in case of special designs). Rotors of specific designs are made of electrolytic copper alloy bars & rings joined by high quality silver brazing. The rotor cage designs of larger frames are of Double cage type to achieve higher starting torque at limited starting current. All rotors are dynamically balanced to the rated speed.

5.3.1 Wound Rotor for Slipring Motors

The rotors of SR (slipring) motors are wound with copper wire or strip and impregnated in resin similar to stator windings. In addition, rotor windings are braced with resiglass banding. This gives protection against centrifugal forces experienced by overhang during over speed and reversals (crane motors). Gelcoat is sprayed on the winding overhang for better consolidation and protection from vibration.

5.3.2 Tropicalization

The integrity of the insulation system is the primary consideration when determining the lifetime of an electric motor. High humidity can result in premature deterioration of the insulation system. Therefore for any ambient temperature with relative humidity above 95%, it is recommended to coat motor winding overhangs with epoxy gel coat which provide extra protection against moisture. For chemically corrosive environment, all internal as well as external components of the motor are painted with epoxy paint.



Electrical Features

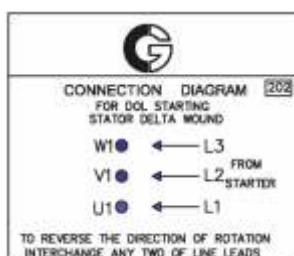
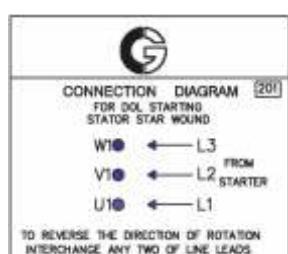
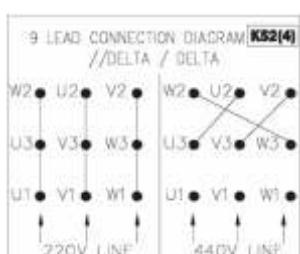
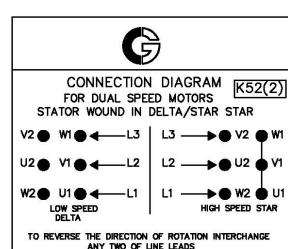
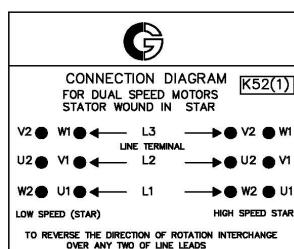
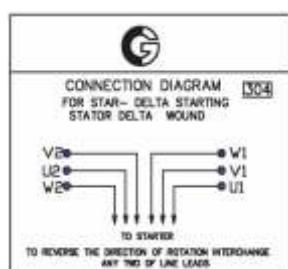
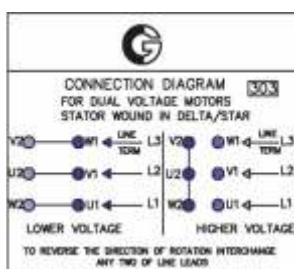
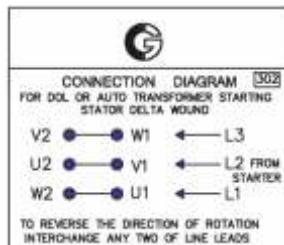
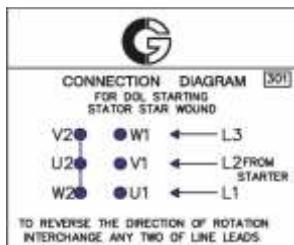


Fig. 28 Connection diagrams

5.4 Direction of Rotation

In general CG Motors are capable of rotating in either direction unless otherwise specified (except in frame C280,315 /2 pole motors). Direction of rotation can be changed by interchanging any of two-phase connection. In general direction of rotation is to be specified at the time of ordering.

5.5 Accessories

5.5.1 Anti-condensation Heaters

These are laid on the winding overhang of the motor. The main function of heaters is to keep the winding warm when the motor is in idle condition or in storage, in order to prevent moisture or dew settling over the windings and thereby reducing the insulation resistance.

The use of space heaters is recommended in two situations:

Motors installed in environments with relative air humidity below 95%, but it may remain idle for periods greater than 24 hours;

Motors installed in environments with relative air humidity greater than 95%, regardless of the operating schedule. Tropicalization to be done under this condition as described above.

Supply to the heaters must be switched off compulsorily before switching on the motor. Standard supply voltage for space heaters is 240V. Heaters of other voltage rating can be supplied against order. CG motors of frame 280 and above are provided with anti condensation heater as standard. The space heater leads are brought in the main terminal box up to frame 180 and in a separate auxiliary terminal box for frames 200 and above. The power rating and number of space heaters fitted depends on the size of the motor as indicated in table below.



FRAME SIZE	NUMBER X RATING
132	1 x 25W
160-225	1 x 60W
250-315	2 x 60W
355	2 x 100W
400	4 x 100W
450	4 x 100W

Table 15 : Space heater details



5.5.2 Thermistor (PTC)

This protects the winding against overheating due to excess load on the motor or any other reason. These are semi conductor devices, which have a property of suddenly changing their resistance at a definite temperature known as 'curie point' which then actuates a relay in the motor control panel to trigger an alarm or cut off the power supply. Thermistors provided on the motors are those having 'Positive Temperature Coefficient' (PTC); where the resistance suddenly increases at a 'Curie Point'. The thermistors generally provided are of 130°C (PTC 130) for Class B temperature rise, 150°C (PTC 150) for class F rise motors. Three thermistors connected in series are placed inside windings of the motor (one per phase). A combination of different ratings of thermistors can be provided in same motor for 'Alarm & Trip' facilities (for frame 160 and above only).

5.6 Locked Rotor Withstand Time (Thermal withstand time)

It is the time taken by the motor windings or rotor to reach the maximum limiting temperature, during locked rotor condition, depending upon class of insulation, from

5.5.3 Resistance Temperature Detector

Many applications require continuous temperature monitoring of motor. The Resistance Temperature Detectors (RTDs), due to their linear Resistance Temperature characteristic, are used for temperature sensing, measurement and control. The output signal of RTD is a resistance signal which varies linearly with the temperature. Temperature up to 200°C can be monitored with RTDs.



Fig. 29 Thermister in winding

either ambient temperature, or rated service temperature.

CALCULATION OF LOCKED ROTOR WITHSTAND TIME FOR STATOR

Limiting Temperature

Class B Insulation	185°C
Class F Insulation	210 °C
Class H Insulation	236°C

Locked rotor withstand time (cold)

$$= (\text{Limiting temp.} - \text{Amb Temp.}) / (0.0065 \times 0.85 \times j^2)$$

Locked rotor withstand time (hot)

$$= (\text{Limiting temp.} - \text{Max. Permissible Temp.}) / (0.0065 \times 0.85 \times j^2)$$

Where j = Starting Current Density

& Max. Permissible Temp.

= 120°C for Class B Insulation

= 140°C for Class F Insulation

= 165°C for Class H Insulation

CALCULATION OF LOCKED ROTOR WITHSTAND TIME FOR ROTOR:

Limiting Temperature

For normal applications: 450°C
For hazardous areas, respective temperature class to be considered.

Locked Rotor Withstand time (cold)

$$= (\text{Limiting Temp.} - \text{Amb. Temp.}) / * \times 0.85$$

$$\text{Where } * = (T_{st}/T_r) \times P^2 / (J^2 \times W)$$

T_{st}/T_r = Starting torque to full load torque ratio

P_2 = Specific heat of rotor conductors in Joules/kg / °C

W_2 = Weight of rotor conductors in kg.

J = Starting current density

Locked Rotor withstand time (hot)

$$= (\text{Limiting temp.} - \text{permissible rotor temp.}) / * \times 0.85$$



5.7 Starting Time

It is the time taken by a motor to come to its rated speed, when connected to load. Starting time depends upon:

i. Total Inertia of the system i.e. GD^2 of load referred to motor shaft speed plus motor GD^2 .

ii. Torque speed curve of the motor.

iii. Torque speed curve of the load

Starting time should be lower than thermal withstand time for safe operation of the motor.

Calculation of starting time. The starting time can be calculated approximately by the following formulae.

$$t_a = \frac{K \times \text{Total } GD^2}{\text{Output} \times (K_1 - K_2)}$$

Where t_a = acceleration time (starting time) in secs.

K = 24.66 for 2 pole (3000 synchronous RPM)

= 6.165 for 4 pole (1500 synchronous RPM)

= 2.74 for 6 pole (1000 synchronous RPM)

= 1.541 for 8 pole (750 synchronous RPM)

Total GD^2 = GD^2 of motor + GD^2 of load in kgm

5.8 Output of Motor

Output = Output of motor in kw

$$K_1 = \frac{\text{Breakaway torque}}{\text{Full load torque}}$$

$$K_2 = \frac{\text{Load torque}}{\text{Full load torque}}$$

= 0.3 for fans, blowers, pumps

= 1.0 for other applications like cranes, hoists, conveyors.

The starting time can be more accurately determined by knowing the load torque speed curve and superimposing it on the motor torque speed curve.

Example

Consider a 2.2 KW 6 pole motor in frame 112 M for driving centrifugal fan.

Motor GD^2 = 0.048 kgm load GD^2 = 4.0 kgm

Breakaway Torque of the motor = 2.0 full load torque

The starting time would then be calculated as follows:

$$t_a = \frac{K \times \text{Total } GD^2}{\text{Output (kW)} \times (K_1 - K_2)}$$

$$= \frac{2.74 \times (0.048 + 4.0)}{2.2 \times (2.0 - 0.3)}$$

$$= 2.895, \text{ say } 2.9 \text{ seconds.}$$



**5.9 Thermal Withstand Time**

Standard TEFC Motors Operating at Rated Voltage and Frequency

POLE	2		4		6		8	
FRAME	Hot	Cold	Hot	Cold	Hot	Cold	Hot	Cold
63	10	20	15	30	-	-	-	-
71	10	20	10	20	10	20	15	30
80	10	20	10	20	10	20	15	30
90	10	20	10	20	10	20	15	30
100	8	16	8	16	10	20	10	20
112	8	16	8	16	10	20	10	20
132	8	16	8	16	10	20	10	20
160	10	22	10	22	10	22	10	22
180	10	22	10	22	10	22	10	22
200	12	27	12	27	12	27	12	27
225	12	27	12	27	12	27	12	27
250	12	27	12	27	12	27	12	27
280	15	33	15	33	15	33	15	33
315	15	33	15	33	15	33	15	33
355	15	33	15	33	15	33	15	33

Cold - Ambient Temp. 50 °C

Hot - Max. permissible Temp. 120 °C

Limiting Temperature - up to 185°C for class "B" Insulation
up to 210°C for class "F" Insulation



Electrical Features



5.10 Derating Factor

The derating factors applicable under different conditions are given below

Operating conditions:

A: 415 V +/- 6%, 50Hz +/-3%

B: 415V +/-10%, 50Hz +/- 5%

Table A: permissible output as % of standard output for different ambient temperatures

Ambient Temp.	40°	45 °	50°	55°	60°	65°
A	100%	100%	100%	93.3%	86.7%	80%
B	100%	100%	100%	92%	85%	78%

Table B: Permissible output as % of standard output at different altitude

Altitude in Mtrs Above MSL	1000	1500	2000	2500	3000	3500	4000
A	100%	98%	93%	87%	82%	78%	73%
B	100%	95%	90%	84%	78%	75%	70%

Table C: Permissible output as % of standard output for different % of unbalance in voltage

% Unbalance	1%	2%	3%	4%	5%
A	100%	100%	95%	82.5%	75%
B	100%	95%	90%	78%	70%

Table D: Permissible output as % of standard output at different voltages

Voltage	100%	90%	85%	80%	70%
40° C Ambient	100%	100%	90%	85%	75%
45° C Ambient	100%	90%	85%	80%	70%

Table E: Permissible output as % of standard output * for different duties

	S2			S3			S4-S9
	60Min	30Min	10Min	60%CDF	40%CDF	25%CDF	
A	110%	120%	130%	110%	110%	130%	Special
B	100%	115%	120%	100%	105%	120%	Design Required

* Standard motors for above permissible output will have starting and breakdown torque proportionately reduced as % of FLT, hence these will be suitable only for application requiring low starting torque and are to be started Direct- On-Line.

NOTE: When motor is subjected to two or more variations in above mentioned conditions, then all the appropriate factors are to be multiplied to arrive at permissible output.



5.11 Testing of Motors

All motors are tested in accordance with IS 325/IEC:60034

Routine tests

The following are the routine tests carried out on each and every motor

- a. Measurement of resistance
- b. Insulation resistance test
- c. Motors are tested at 1/3 times the rated voltage for checking the ability of the motor to run up to the full speed, when switched in either direction
- d. No load test : This test is carried out at rated voltage and the readings for current, RPM & power input are noted
- e. Locked rotor test : This test is carried at a reduced voltage by passing the full load current and the readings for current and lower input are noted
- f. High voltage test.

Note: The meters used for noting the above readings have class 0.5 class accuracy.

Type of Tests

The following tests are carried out on one motor in a batch production or on motors specially required to be type tested as per customer's requirement. In addition to all the tests included in routine test, following tests are carried on the motor.

- a. Locked rotor test at reduced voltage and measurement of current, power input and torque of motors.
- b. Full load reading of voltage, current, power input and slip.
- c. Temperature rise test: The temperature rise of the motor after being run on full load till steady state is reached is determined by
 - i. Thermometer method
 - ii. By resistance method Momentary overload test
- d. Momentary overload test
- e. Insulation resistance test
- f. High voltage test

Other tests

Apart from the above tests mentioned in the Standards, following additional tests can be offered.

- a. Over speed test: Running of motor at 1.2 times the maximum rated speed for 2 Mins at no load.
- b. Vibration test as per IS :12075/ IEC:60034-14
- c. Noise level of the motors measured as per IS:12065/ IEC:60034-9
- d. Test for degree of protection as per IS 4691 (2nd numeral only)



5.12 General Tolerances

General Tolerances on Electrical Performance (As Per IEC:60034-1)

SR. NO.	ITEM	TOLERENCE
1.	EFFICIENCY (EFF) a. By summation of losses Motors Upto 150 kw Motors above 150 kw b. By input output test	- 15% of (1-EFF) - 10% of (1-EFF) - 15% of (1-EFF)
2.	Power factor ($\cos \phi$)	-1/6 of (1- $\cos \phi$) Min 0.02 and max 0.07
3.	Slip at full load and working temp.	* Below 1kW $\pm 30\%$ of guaranteed slip 1kW & above $\pm 20\%$ of guaranteed slip
4.	Breakaway starting current of SCR induction motors with short-circuited rotor and with any specified starting apparatus	+20% of the guaranteed Starting current (no lower limit)
5.	Breakaway torque	- 15% to + 25% of the guaranteed torque (+25% may be exceeded by agreement)
6.	Pull out torque	-10% of the guaranteed torque except that after allowing for this tolerance the torque shall not be less than 1.6 to 1.5 times the rated torque

5.13 Multi-speed motors

Table one indicates ratings of Multi-speed motors for polarity ratio of 2/4p, 4/6p, 4/8p, 6/8p, and 6/12p. These are of tapped or PAM winding construction. For other ratios, please refer to us. Also three speed and four speed motors are offered as per customer's requirement.

The frame/output relationship in tables 12 and 13 are confirmed subject to knowing:

- a. Complete application details.
- b. Duty cycle/loading cycle
- c. Method of braking
- d. Load GD² referred to motor speed.

Motors required for Multi-speed/two speed operations are designed with two types of winding techniques

1. Tapped winding (also called Dahlander winding) where the two speeds are in ratio of 2:1
2. Separate windings one for each speed, when the output speeds are other than 2:1 ratio.

The latter results in considerable reduction in HP output.

NOTE: Motors will be suitable for DOL Starting only.



5.14 Dual Speed Motors

(Frame v/s kW Output) (Single Winding)

Constant Torque Application

FRAME	2/4	4/6	4/8	FRAME	2/4	4/6	4/8
ND80	-	-	-	ND200L	30/6	-	-
ND90L	1.5/1.1	0.75/0.55	0.75/0.37		22/22		
	0.37/0.22			ND225S	-	22/18.5	
ND100L	1.1/0.82	1.6/1					15/15
			0.55/0.55				30/3.7
			0.75/0.37	ND225M	37/30	30/18.5	
			1.70/0.35				22/22
ND112M	2.2/1.6	2.2/1.1		ND250M	45/30	45/11	
		2.2/0.75	2.30/0.50				33/24.6
			3.60/0.75	ND280S	-	60/15	
ND132S	3.7/2.5	3/1.5					45/30
	4.5/3.7	3.7/1.1		ND280M	48/36	45/37	
		3.7/3.7					78/18.5
		5.5/1.5	3.70/0.75	ND315M	90/55	93/45	
ND132M	5.5/4.1	-					70/48
	7.5/5.5			ND315L	75/55	-	
ND160M	7.5/5.5	7.5/3.75					100/18.5
	11/7.5		5.5/2.8	ND315LX	110/75	93/93	
			9.3/1.1	ND355LX	-	125/62.5	
ND160L	11/7.5	15/3.7					
		5.5/3.7	11.00/3.70				
ND180M	11/9.3	8.0/4.0					
			11/7.5				
ND180L	15/11	18.5/11					
			22/5.5				
			22/11				
			18.5/2.2				

Table 12





Frame - Output Relationship for Dual Speed Motors

FRAME	2/4	2/8	4/12	4/16	4/6	4/8	6/8	6/10	6/16
E90L	-	-	-	-	-	0.75/0.37	-	-	-
E100L	2.20/1.50	-	-	-	-	-	-	-	-
E112M	3.70/2.20	-	-	-	-	1.50/0.75	-	-	-
E132M	5.50/3.70	-	-	-	-	3.70/2.20	-	-	-
E160L	11/7.50	-	-	-	7.50/7.50	11/7.50 7.50/5.50	-	-	-
E180L	-	-	-	-	15/7.50	11/7.50 18.50/11	-	-	-
E200L	-	-	-	-	22/15	22/15	-	-	-
E225S	-	-	-	-	-	22/18.50	-	-	-
E225M	-	-	-	-	30/22	15/15	-	9.30/9.30	-
						33/24.60			
						18.50/15			
E250M	-	-	-	-	45/30	37/30 18.50/18.50	-	-	-
E280M	-	-	-	-	45/37	63.50/47	-	-	-
						45.50/37			

Table 13

5.15 Dual Voltage Motors

Motors can be offered for dual voltage operation. Such motors are so designed that they work satisfactorily on both the voltages, but motor may not give optimum performance at both the voltage

Two kinds of dual voltage motors are offered.

1. Motors operating at voltages in a ratio of 1: 1.73 or 3

Entire range of motors can be suitably wound to operate in such voltage combinations. This method is also known as Delta-Star re-connections. Motor is DELTA connected at lower voltage and STAR connected at higher voltage. 6 lead terminal blocks is fitted and suitable connecting links are provided (if required). These motors are suitable for standard supply variations. Example:

A motor designed for 380V operation (STAR connection) can also be run with 220V supply (MESH connection)

$$\begin{array}{r} 380 \\ \hline \text{---} = 1.73 \\ 220 \end{array}$$

Hence merely by changing the position of connecting links, dual voltage operation can be achieved Alternatively this can also be performed with the help of a suitable starter.

2. Motors operating on voltage in a ratio of 1:2

This phenomenon involves Series Parallel connections in the windings. Motors are DELTA wound at both the voltages. Such motors have 9 leads (for DOL starting at both voltages) coming out from stator windings.

Slipring motors and Multi-speed cannot be offered for dual voltage operations.

Flameproof motors are generally not offered with series parallel re-connection because of limitations of terminal studs inside the terminal box. However specific cases may be sent to Division for scrutiny.



5.16 Effect of Variation and Frequency on the Characteristics of Motors

Characteristics	Voltage		Frequency	
	110%	90%	105%	95%
Torque				
Starting & Maximum	Increase 21%	Decrease 19%	Decrease 10%	Increase 11%
Speed				
Synchronous	No Change	No Change	Increase 5%	Decrease 5%
Full Load	Increase 1%	Decrease 1.5%	Increase 5%	Decrease 5%
Current				
No Load	Increase 10-15%	Decrease 10-12%	Decrease 5-6%	Increase 5-6%
Starting	Increase 10-12%	Decrease 10-12%	Decrease 5-6%	Increase 5-6%
Full Load	Decrease 7%	Increase 11%	Slight Decrease	Slight Increase
Temp. Rise	Decrease 3-4%	Increase 6-7%	Slight Decrease	Slight Increase
Overload Capacity	Increase 21%	Decrease 19%	Slight Decrease	Slight Increase
Magnetic Noise	Slight Increase	Slight Decrease	Slight Decrease	Slight Increase
Efficiency				
Full Load	Increase 0.5-1.0%	Decrease 2%	Slight Increase	Slight Decrease
Power Factor	Decrease 3%	Increase 1%	Slight Increase	Slight Decrease

Overload

Standard motors are designed to withstand overload up to 1.6 times their rated torque for 15 Seconds without stalling or abrupt change in speed at rated supply conditions.

Rated Speed / Slip

The rated speed is the speed at which the motor runs with rated load .The slip is the difference between the synchronous speed and the rated speed of the motor expressed as a percentage of the synchronous speed.

Where synchronous speed $N_s = 120 \times f/p$

Where f = frequency of the supply system

And p =No. of poles

Normally, for partial loads, slip varies proportionally with output.

Rated Current

It is the current drawn by the motor when running with rated load and the rated supply conditions. The rated current given in performance data are for 415V supply. For motors designed to suit other voltages, the rated current (approximate) is given by

$$I = (V_r / V) \times I_r$$

Where I_r =rated current at rated voltage V_r .

I =rated current at rated voltage V .

The current drawn by a motor varies with the load ,though no linear relationship exists.

Locked Rotor Current (Starting Current)

This is the current drawn by the motor at the time of starting when started on DOL. It is expressed as percentage of the rated current of the motor.

The starting current varies proportionally with voltage from its rated value within the permissible limits.



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6.1 Duty

The various operating cycles of driven machines can be classified into nine basic duties, ranging from S1 to S9 separately indicated in the following pages. Suitable motors can be offered to match the duty cycles of the driven machines.

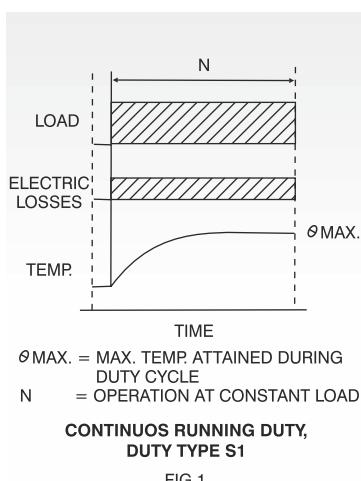
Classes of Duty

The following are the duty types:

- S1 Continuous running duty
- S2 Short time duty
- S3 Intermittent periodic duty
- S4 Intermittent periodic duty with starting
- S5 Intermittent periodic duty with Electric braking
- S6 Continuous operation periodic duty
- S7 Continuous operation periodic duty with Electric braking operation
- S8 Continuous periodic duty with related load/ speed changes
- S9 Duty with Non-periodic load & speed variations

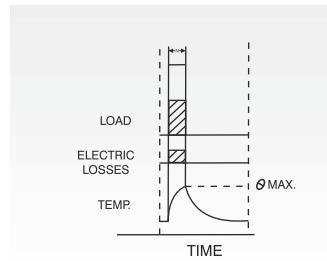
Diagrams of Duty Cycle

S1 - Continuous Running Duty



Operation at constant load of sufficient duration till thermal equilibrium is reached.

S2 - Short Time Duty

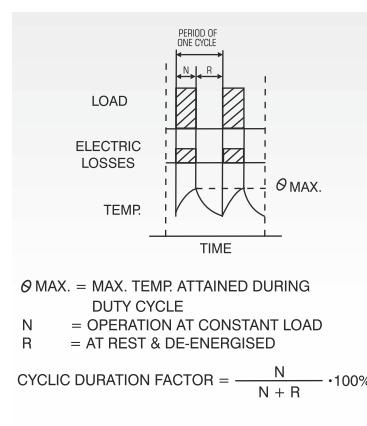


SHORT TIME DUTY, DUTY TYPE S2

FIG 2

Operation at constant load during a given time, less than that required to reach thermal equilibrium, followed by a rest of sufficient duration to re-establish equality of temperature with the cooling medium. The recommended values for the short time duty are 10,30,60 and 90 minutes.

S2 - Intermittent Periodic Duty



INTERMITTENT PERIODIC DUTY,
 DUTY TYPE S3

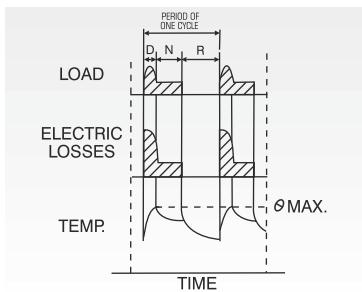
FIG 3

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a rest period, these periods being too short to attain thermal equilibrium during one duty cycle. In this duty type, the starting current does not significantly affect the temperature-rise.

Unless otherwise specified, the duration of the duty cycle is 10 minutes. The recommended values for the load factor are 15,25,40 and 60 percent.



S4 - Intermittent Periodic Duty with Starting



θ_{MAX} = MAX. TEMP ATTAINED DURING DUTY CYCLE
 N = OPERATION AT CONSTANT LOAD
 D = STARTING
 R = AT REST & DE-ENERGISED

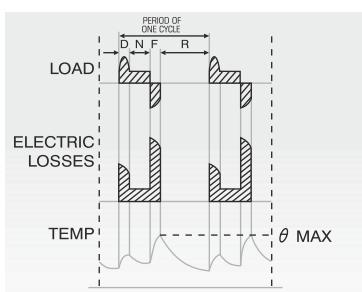
$$\text{CYCLIC DURATION FACTOR} = \frac{D + N}{D + N + R} \cdot 100\%$$

INTERMITTENT PERIODIC DUTY WITH STARTING, DUTY TYPE S4

FIG 4

A sequence of identical duty cycles, each periodically consisting of a period of starting, a period of operation at constant load and a rest period, the operating and rest and de-energized being too short to attain thermal equilibrium during one duty cycle. In this duty the stopping of the motor is obtained either by natural deceleration after disconnection of the electricity supply or by means of braking such a mechanical brake which does not cause additional heating of the windings.

S4 - Intermittent Periodic Duty with Electrical Braking



D = STARTING
 N = OPERATION AT CONSTANT LOAD
 F = ELECTRIC BRAKING
 θ_{MAX} = MAX. TEMP ATTAINED DURING THE DUTY CYCLE
 R = AT REST AND DE-ENERGIZED

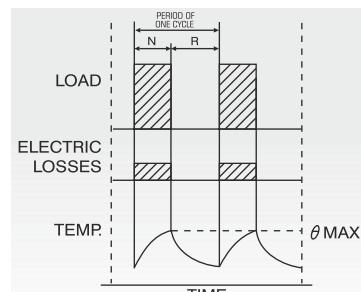
$$\text{CYCLIC DURATION FACTOR} = \frac{D+N+F}{D+N+F+R} \cdot 100\%$$

INTERMITTENT PERIODIC DUTY WITH ELECTRIC BRAKING, DUTY TYPE S5

FIG.5

A sequence of identical duty cycles, each consisting of a period of starting, a period of operation at constant load, a period of braking and a rest period. The operating and de-energized periods being too short to obtain thermal equilibrium during one duty cycle. In this duty braking is rapid and is carried out electrically.

S6 - Continuous Operation with Periodic Duty



N = OPERATION AT CONSTANT LOAD
 V = OPERATION ON NO LOAD
 θ_{MAX} = MAX. TEMP ATTAINED DURING THE DUTY CYCLE

$$\text{CYCLIC DURATION FACTOR} = \frac{N}{N+V} \cdot 100\%$$

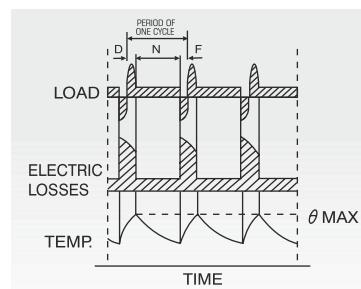
CONTINUOUS - OPERATION PERIODIC DUTY, DUTY TYPE S6

FIG.6

A sequence of identical duty cycles, each consisting of a period of operation at constant load and a period of operation at no-load, machines with excited windings having normal no load rated voltage excitation. The operation and no-load periods are too short to attain thermal equilibrium during one duty cycle.

Unless otherwise specified the duration of the duty cycle is 10 minutes.

S7 - Continuous Operation Periodic Duty with Electrical Braking Operation



D = STARTING
 N = OPERATION AT CONSTANT LOAD
 F = ELECTRIC BRAKING
 θ_{MAX} = MAX. TEMP ATTAINED DURING THE DUTY CYCLE

$$\text{CYCLIC DURATION FACTOR} = 1$$

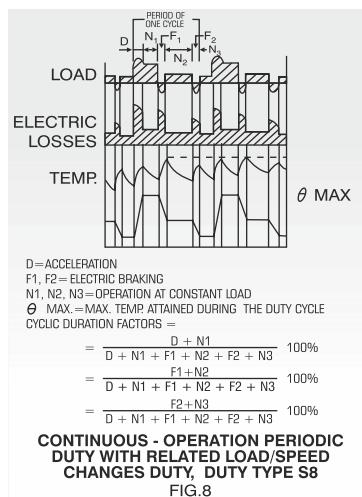
CONTINUOUS - OPERATION PERIODIC DUTY WITH ELECTRIC BRAKING, DUTY TYPE S7

FIG.7

A sequence of identical duty cycles each consisting of a period of starting, a period of operation at constant load and a period of electrical braking. There is no rest and de-energized period.

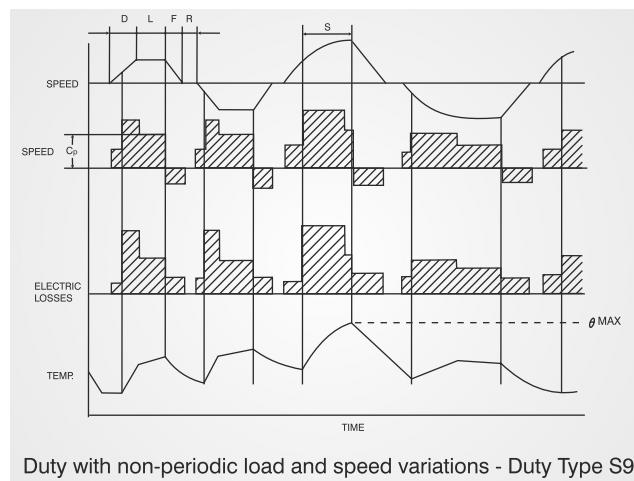


S8 - Continuous Periodic Duty with related load / speed changes



A sequence of identical duty cycles each consists of a period of operation at constant load corresponding to a determined speed of rotation, followed immediately by a period of operation of another load corresponding to a different speed of rotation (carried out, for example by means of change of the number of poles in the case of induction motors), the operating periods being too short to attain equilibrium during one duty cycle. There is no rest and de energized period.

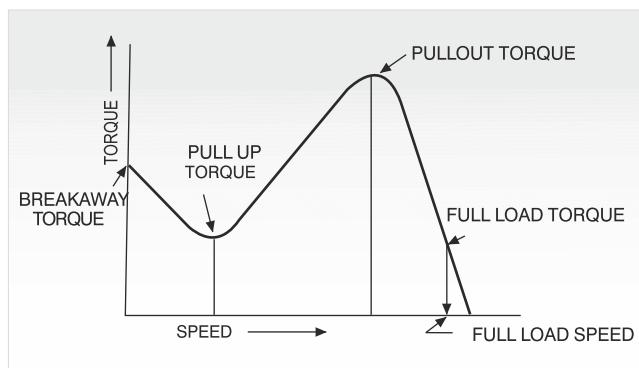
S9 - Duty with non-periodic load and speed variations



Application of the duty type, rated motors

DUTY	APPLICATION
S1	Pumps, blowers, Fans, Compressors
S2	Operation of gates of dams, sirens, Capstan
S3	Valve actuators, Wire drawing machine
S4	Hoists, Cranes, Lifts
S5	Hoists, Cranes, Rolling Mills
S6	Conveyors, Machine Tools
S7	Machine Tools
S8, S9	Special application where the motor is required to run at different speeds and different loads

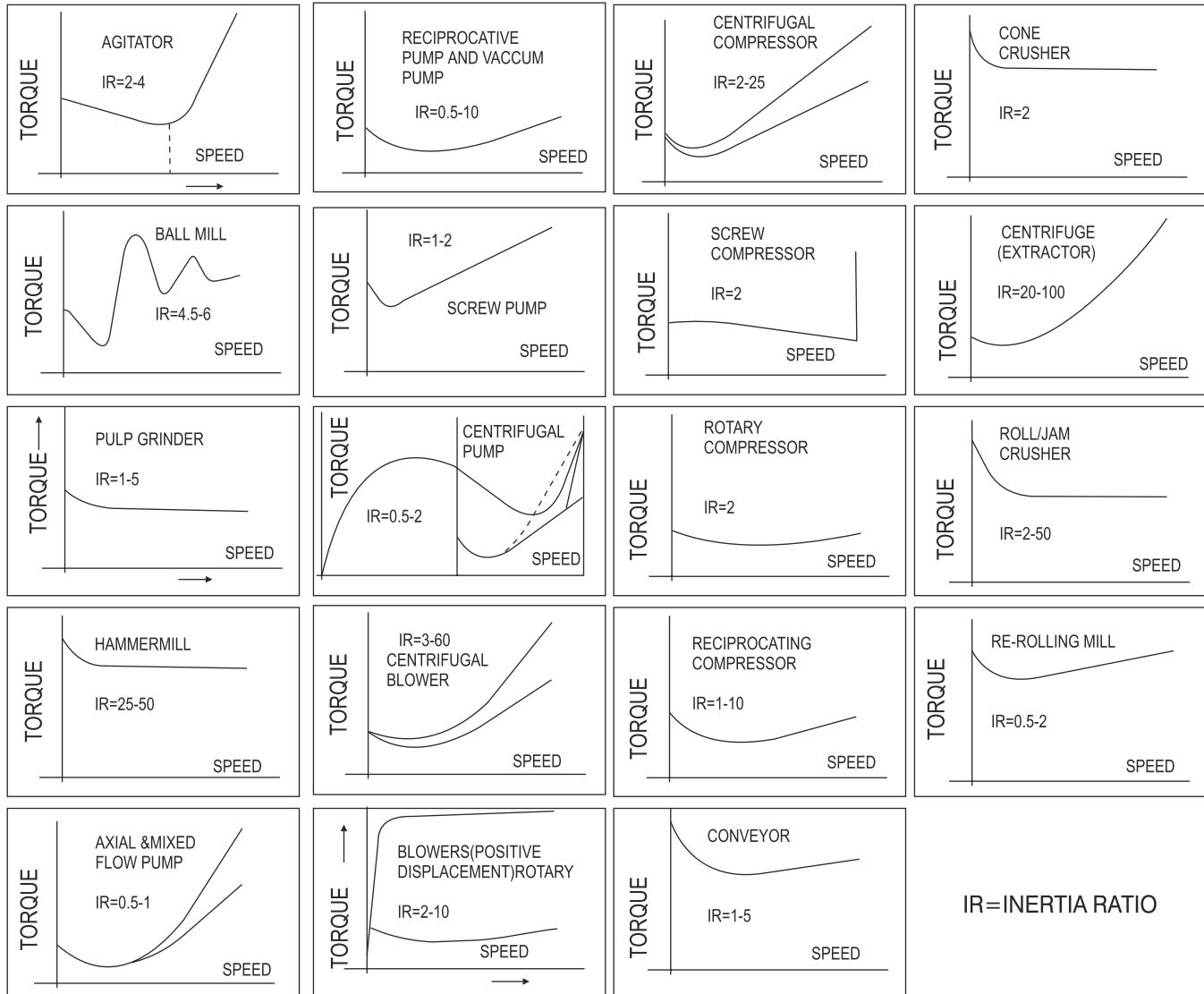
6.2 Speed Torque Characteristics



If the voltage varies from its rated value within the permissible limits, the starting, pull-up and pull-out torques vary as the square of the voltage.



6.2 Speed Torque Characteristics for a few applications



Note: These characteristics are exemplary and the values of Torque, Inertia Ratio etc. are given based on experience of normal applications. These values should be verified in actual before framing any reference.



6.3 Guide for Protection - Fuse Ratings

In addition to the starters (DOL or Star / Delta) being used to protect motors from overload and under voltage, the motors are also to be provided with backup HRC

fuse protections of suitable ratings. The table below gives general guidelines for selection of the fuse ratings.

BACK-UP FUSE SELECTION CHART

		D.O.L STARTING OF MOTORS																				
MOTOR OUTPUT	kW	0.37	0.55	0.75	1.1	1.5	2.2	3.7	5.5	7.5	9.3	11	15	18.5	22	26	30	37	45	55	75	90
	HP	0.5	0.75	1.0	1.5	2.0	3.0	5.0	7.5	10	12.5	15	20	25	30	35	40	50	60	75	100	125
FULL LOAD CURRENT	A	1.0	1.3	1.9	2.6	3.7	4.8	7.8	11.2	15	18	21	27	33	39	47	53	65	78	96	131	156
OVERLOAD RELAY RANGE	A	0.5-1	1-2	1-2	1.5-3	2-4	3-6	6-12	6-12	10-16	18-24	18-24	16-32	24-45	24-45	32-63	32-63	50-90	50-90	70-110	90-135	140-170
RECOMMENDED BACKUP PROTECTION FUSE RATING	A	4	6	6	6	10	16	16	25	25	32/35	32/35	50	63	63	80	100	100	160	160	200	250
STAR DELTA STARTING OF MOTORS																						
MOTOR OUTPUT	kW	2.2	3.7	5.5	7.5	9.3	11	15	18.5	22	26	30	37	45	55	75	90	110	132			
	HP	3.0	5.0	7.5	10	12.5	15	20	25	30	35	40	50	60	75	100	125	150	180			
FULL LOAD LINE CURRENT*	A	4.8	7.8	11.2	15	18	21	27	33	39	47	53	65	78	96	137	156	185	220			
FULL LOAD PHASE CURRENT*	A	2.8	4.5	6.5	9	11	12.7	16.8	20.2	23.2	26.9	30.6	37.5	46.4	54.5	74	88	107	127			
OVERLOAD RELAY RANGE	A	3-6	6-12	6-12	10-16	18-24	18-24	16-32	24-45	24-45	32-63	32-63	50-90	50-90	70-110	90-135	140-170					
RECOMMENDED BACKUP PROTECTION FUSE RATING	A	10	16	16	25	25	25	50	50	63	63	63	80	100	125	160	200	200	250			

* Average value for 6 & 8 pole motors





Technical Details



6.4 Ordering Information

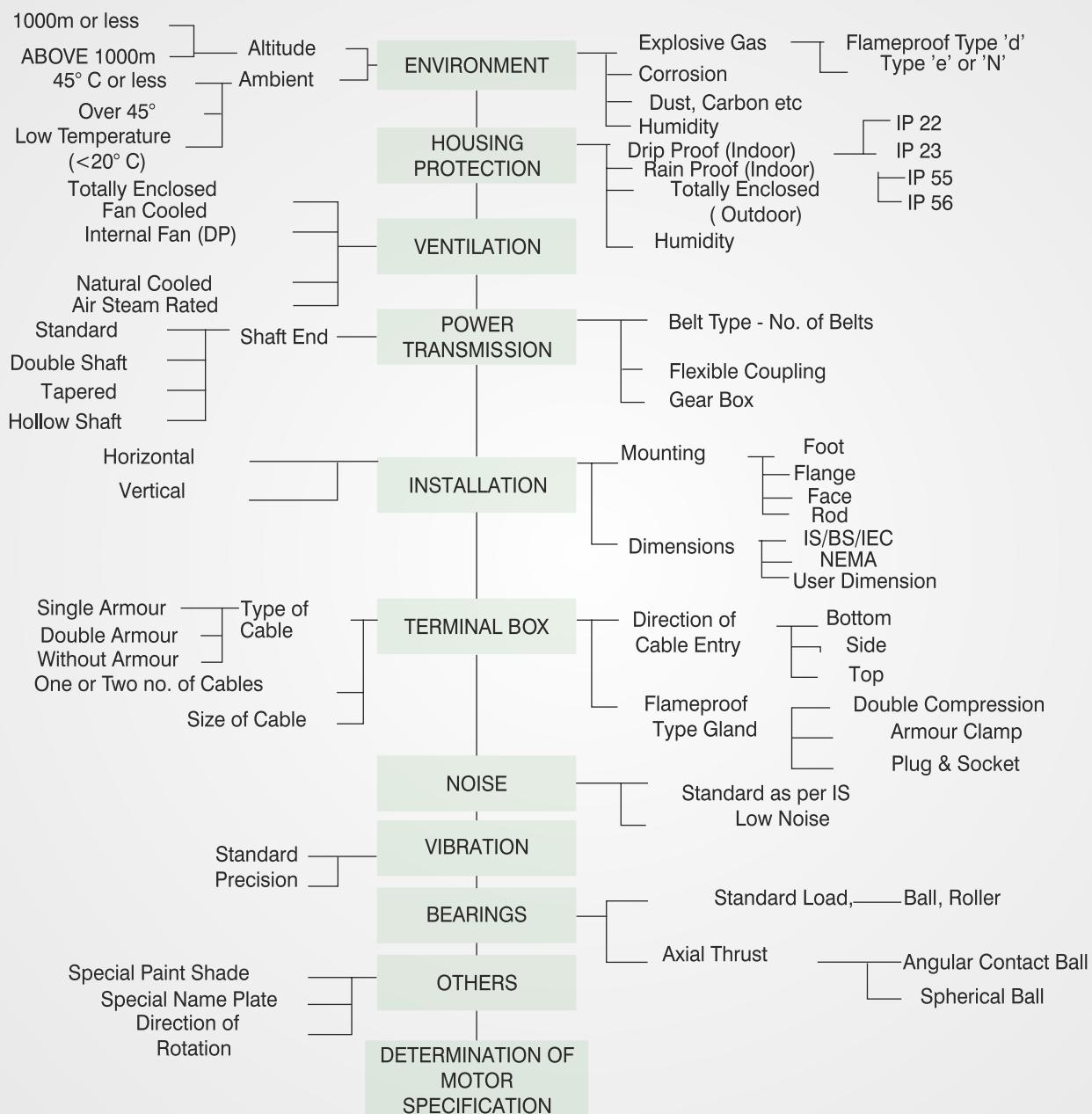
At the time of sending an enquiry or placing an order, kindly furnish following data (as much as possible)

CUSTOMER							
1 Frame size							
2 Application							
3 Zone/Div (in case hazardous area)							
4 Enclosure Group (for type Ex 'd')							
5 Temp Class (for type Ex 'e'/Ex'n'/Ex 'd')							
6 Any specific statutory / Regulatory requirements							
7 Reference to Indian / International std.	IS:12615	IS:12065	IS:12075	IEC 60034	IEC 60079	IF OTHER SPECIFY	
8 Any cust /consultant specs.							
9 Type of Enclosure	TEFC	SPDP TYPE e	TYPE d TYPE n	IF OTHER SPECIFY			
10 Type of Rotor	SCR	SR: WIRE or BAR	IF OTHER SPECIFY				
11 Type of Duty	S1 S6	S2 S7	S3 S	S4 S9	S5	IF OTHER SPECIFY	
12 % CDF							
13 No.of Starts/hr.	6, 10, 90, 150, 300, 600, 900						
14 Type of Braking /No.of. reversal							
15 Load GD ²							
16 Degree of Protection	IP55 IP22	IP56 IP23	IP66	IF OTHER SPECIFY			
17 Method of Cooling	FAN AIR STREAM	NATURAL	BLOWER	IF OTHER SPECIFY			
18 Mounting							
19 Frequency in Hz & Variation	0± 5%		IF OTHER SPECIFY				
20 Output in kW							
21 Rated voltage & variation	415± 10%		IF OTHER SPECIFY				
22 Class of insulation			F	H			
23 Approx Speed, in rpm or polarity							
24 Dir of rot viewed from de	BI DIR.	ACW	CW				
25 Design amb temp.							
26 % Rel humidity							
27 Max. Permissible temp.rise	BY RES		IF OTHER SPECIFY				
28 Altitude at site in meter	<1000M		IF OTHER SPECIFY				
29 Performance Requirement		FL	3 / 4 FL	1 / 2 FL			
a. Efficiency							
b. Power Factor							
c. Load Current							
d. Starting Current							
e. Starting Torque							
f. RV/RA							
g. Pull out torque							
h. Noise Level (other than IS:12065)							
i. Vib. Level (other than IS:12705)							
j. Any other							
30 System of earthing, if adopted							
31 Particulars of tests to be carried out (other than type & routine as per IS:325)							
32 Method of Starting	DOL IF OTHER SPECIFY	Y/D	SOFT START				
33 Drive(if applicable)	VVF(* FREQ RANGE)		IF OTHER SPECIFY				
34 Dimensions	ST	IF OTHER SPECIFY					
35 GA drg.no (if non std)							
36 Method of drive		BELT DIRECT OTHER	BELT PULL / PULLEY DIA TYPE OF COUPLING				
37 Cable size/type							
38 Cable Gland (if reqd)	DCG	CONICAL	P&S				
39 Accessories	THERMISTOR SPACE HEATER RTD	BTD IF OTHER SPECIFY	IF OTHER SPECIFY				
40 Non std treatment	ACP	IF OTHER SPECIFY					
41 Any other specific requirement							
* Torque over entire frequency Range							



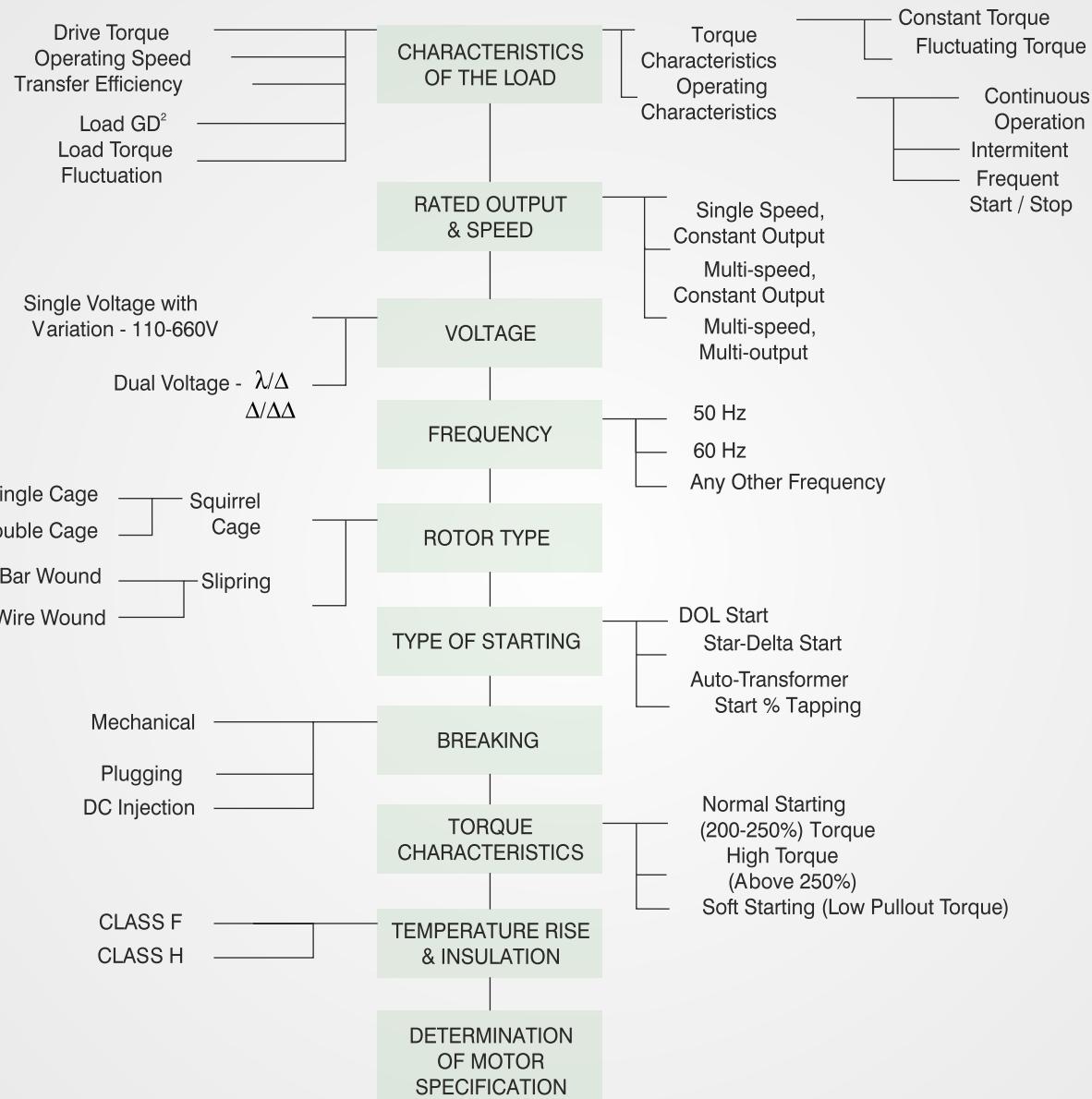
6.5 Guide and Checkpoints for Selection of Motors (Mechanical & Electrical Aspects)

Mechanical Aspects





Electrical Aspects





6.6 Variable Frequency Drive

Load Types

The correct dimensioning of the variable speed drive system depends on the knowledge of the behavior of the load, that is, how the load is related with speed and consequently how much torque is demanded on the motor shaft. In most processes the load may be described by one of the following terms:

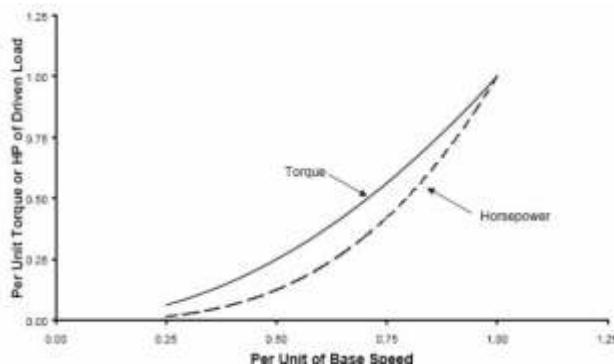
- Variable torque
- Constant torque and
- Constant horsepower

(a) Variable torque loads

In this application torque varies in square proportion of the speed. Horse power varies in cube proportion of the speed. Ex.

- Centrifugal pumps
- Centrifugal fans
- Centrifugal blowers
- Centrifugal compressors

Typical curve of variable torque load



(b) Constant torque loads

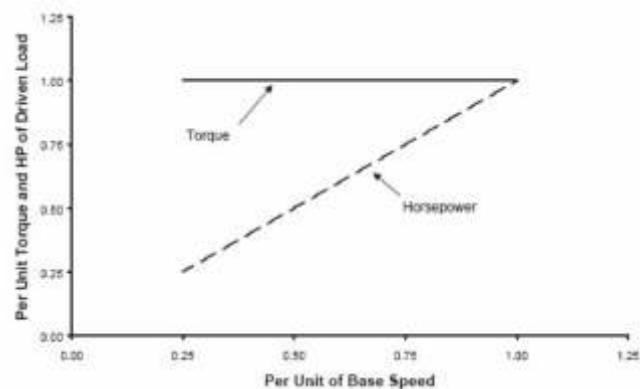
Machines that are high impact loads (intermittent torque loading not as function of speed, requiring that the motor and control combination produce sufficient accelerating torque to return the load to the required speed prior to the beginning of the next work stroke) or duty cycle loads (discrete loads - at changing or constant speeds - applied for defined periods of time repeated periodically) typically fall into the constant torque classification.

- Load torque remains constant throughout the speed range
- Horsepower changes linearly with operation speed
- Rated load torque and horsepower at base speed

Ex:

- Screw compressors
- Reciprocating compressors
- Positive displacement pumps
- Extruders, Crushers, Ball mills
- Conveyors
- Augers
- Process lines (strip, web, sheet)

Typical curve of variable torque load

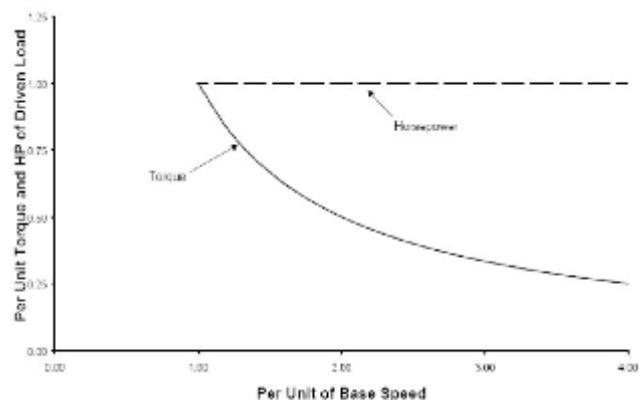


(c) Constant horsepower loads

- Load torque drops as speed increases
- Horsepower results constant throughout the speed range
- Rated load torque and horsepower at base speed

Typical examples

- Machine tools (where heavier cuts are taken at lower speeds and lighter cuts at higher speeds)
- Center driven winders





Technical Details



Selection of motors

From the above study we can conclude that CG standard motors are suitable for

Motor rated voltage	Peak Voltage on the motor Terminal (Phase to Phase)	dV/dt on motor Terminal phase to phase	Rise time	Time between pulses	Maximum Cable length
$V_n \leq 415 \text{ DELTA}$	$\leq 1.28 \text{ kV}$	$5.2\text{kV}/\mu\text{sec}$	$\geq 0.1 \mu\text{sec}$	$\geq 0.6 \mu\text{sec}$	7 mtr

If the one of the above condition are not met then suitable filters are required at the drive output.
For 690V delta CG can offer with reinforced insulation. Please contact division for such requirement.





Influence of inverter on temperature rise of motor

Induction motors may heat up more when fed by frequency inverter than when fed by sinusoidal supply. This higher temperature rise results from the motor losses growth owing to the high frequency components of the PWM signal and the often reduced heat transfer resulting from speed variation.

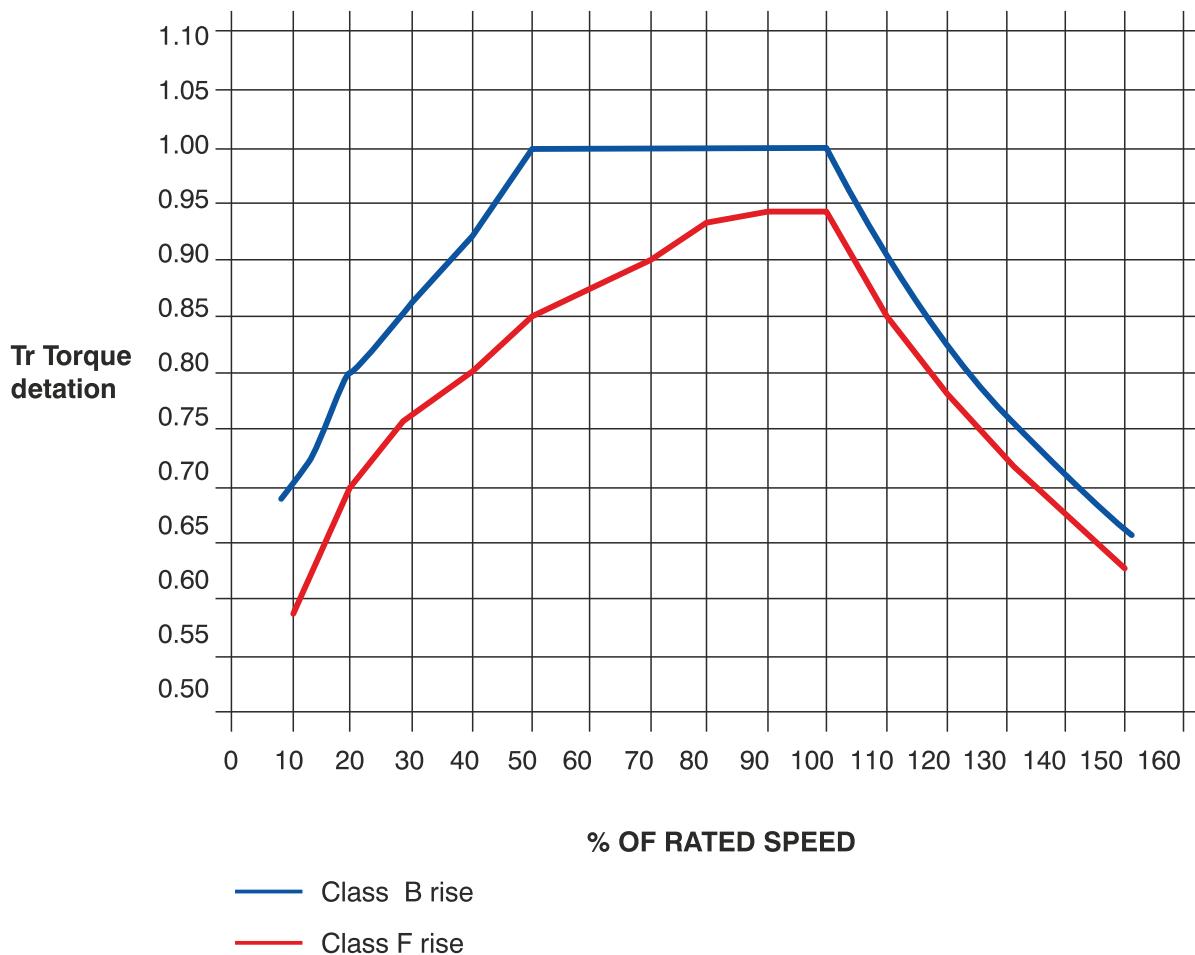
The voltage harmonic distortion contributes to increase the motor losses, once that creates minor hysteretic loops in the lamination steel, increasing the effective saturation of the magnetic core and giving rise to high frequency harmonic currents, which bring about additional Joule losses. Nevertheless, these high frequency components do not contribute to the production of torque at steady operation of the motor,

since they do not increase the air gap fundamental flux, which rotates at synchronous speed. The operation at low speeds causes the ventilation over the (self-ventilated) motor frame to decrease, consequently lowering the motor cooling and raising in this way the thermal stabilization temperature.

Therefore, when operating with frequency inverters, both the effects mentioned above must be considered. There are basically the following solutions to avoid excessive overheating of the inverter fed motor:

- Torque derating (over sizing of the self ventilated motor frame)
- Utilization of independent cooling system (separate ventilation)

Torque deration factor for IC411 motors





Technical Details



Frame size & type of cooling is selected based on the following:

1. Application engineering for expected temperature rise due to various factors
2. Committed temperature rise

Other factors required to consider are as per below:

1. Use of insulated bearing at NDE is recommended in frame size 315 & up.

Insulated bearing is suggested in lower frames also if any of the following conditions are prevailing:

- a. Peak to peak voltage is more than 1.6 kV
- b. Rise time less than 0.1 micro sec.

2. Special attention should be given to earthing of VFD driven motors. Ineffective earthing leads to higher bearing currents & frequent failure of bearing in spite of using insulated bearing. Correct type of insulated bearing should be selected based on site data.
3. Use of winding temperature detectors & bearing temperature detectors is recommended in large motors.
4. For stringent EMI/EMC norms, use of shielded power cables is recommended.
5. The motor suitability for switching frequency ,rise time, peak to peak voltage should be given to drive manufacturer to ensure drive parameters within motor limitations, Or suitable input & output filters should be provided with drive.





6.6 Torque Ratio

Torque ratio	2 : 1	5 : 1	10 : 1
Speed variation	50% to 100%	20% to 100%	10% to 100%

- V. T - Variable torque
- T - Torque
- C.T - Constant torque
- N - RPM (Speed)

Frame	STD	2 Pole							
		Class F rise				Class B rise			
	O/P	Load Types				Load Types			
		KW	V.T	CT		V.T		CT	
		TaN2	2:1	5:1	10:1	TaN2	2:1	5:1	100
71	0.37	0.37	0.37	0.296	0.259	0.35	0.31	0.26	0.22
71	0.55	0.55	0.55	0.44	0.385	0.52	0.47	0.39	0.33
80	0.75	0.75	0.75	0.60	0.525	0.71	0.64	0.53	0.45
80	1.10	1.10	1.10	0.88	0.77	1.05	0.94	0.77	0.66
90S	1.50	1.50	1.50	1.20	1.05	1.43	1.28	1.10	0.90
90L	2.20	2.20	2.20	1.76	1.54	2.09	1.87	1.50	1.30
100	3.70	3.70	3.70	2.96	2.59	3.52	3.10	2.60	2.20
132S	5.50	5.50	5.50	4.40	3.85	5.23	4.70	3.90	3.30
132S	7.50	7.50	7.50	6.00	5.25	7.13	6.40	5.30	4.50
160M	9.30	9.30	9.30	7.44	6.51	8.84	7.90	6.50	5.60
160M	11.00	11.00	11.00	8.80	7.70	10.50	9.40	7.70	6.60
160M	15.00	15.00	15.00	12.0	10.50	14.30	12.80	10.50	9.00
160L	18.50	18.50	15.00	14.8	12.95	17.60	15.70	13.00	11.00
180M	22.00	22.00	22.00	17.6	15.40	20.90	18.70	15.40	13.00
200	30.00	30.00	30.00	24.00	21.00	28.50	25.50	21.00	18.00
200	37.00	37.00	37.00	29.60	25.90	35.20	31.50	25.90	22.00
225M	45.00	45.00	45.00	36.00	31.50	42.80	38.30	31.50	27.00
250M	55	55.00	55.00	44.00	38.50	52.30	46.80	38.50	33.00
280S	75	75.00	75.00	60.00	52.50	71.30	63.80	52.50	45.00
280M	90	90.00	90.00	72.00	63.00	85.50	76.50	63.00	54.00





Technical Details



Torque ratio	2 : 1	5 : 1	10 : 1
Speed variation	50% to 100%	20% to 100%	10% to 100%

- V. T - Variable torque
- T - Torque
- C.T - Constant torque
- N - RPM (Speed)

Frame	STD	4 Pole								
		Class F rise				Class B rise				
	O/P	Load Types				Load Types				
		KW	V.T	CT		V.T		CT		
			TaN2	2:1	5:1	10:1	TaN2	2:1	5:1	100
71	0.37	0.37	0.37	0.296	0.259	0.35	0.31	0.26	0.22	
71	0.55	0.55	0.55	0.44	0.385	0.52	0.47	0.39	0.33	
80	0.75	0.75	0.75	0.60	0.525	0.71	0.64	0.53	0.45	
90S	1.10	1.10	1.10	0.88	0.77	1.05	0.94	0.77	0.66	
90L	1.50	1.50	1.50	1.20	1.05	1.43	1.28	1.10	0.90	
100L	2.20	2.20	2.20	1.76	1.54	2.09	1.87	1.50	1.30	
112M	3.70	3.70	3.70	2.96	2.59	3.52	3.10	2.60	2.20	
132S	5.50	5.50	5.50	4.40	3.85	5.23	4.70	3.90	3.30	
132M	7.50	7.50	7.50	6.00	5.25	7.13	6.40	5.30	4.50	
160M	9.30	9.30	9.30	7.44	6.51	8.84	7.90	6.50	5.60	
160M	11.00	11.00	11.00	8.80	7.70	10.50	9.40	7.70	6.60	
160L	15.00	15.00	15.00	12.00	10.50	14.30	12.8	10.5	9.00	
180M	18.50	18.50	15.00	14.80	12.95	17.60	15.7	13.0	11.00	
180L	22.00	22.00	22.00	17.60	15.40	20.90	18.7	15.4	13.00	
200	30.00	30.00	30.00	24.00	21.00	28.50	25.5	21.0	18.00	
225S	37.00	37.00	37.00	29.60	25.90	35.20	31.5	25.9	22.00	
225M	45.00	45.00	45.00	36.00	31.50	42.80	38.3	31.5	27.00	
250M	55.00	55.00	55.00	44.00	38.50	52.30	46.8	38.5	33.00	
280S	75.00	75.00	75.00	60.00	52.50	71.30	63.8	52.5	45.00	
280M	90.00	90.00	90.00	72.00	63.00	85.50	76.5	63.0	54.00	





6.6 Torque Ratio

**Examples:**

What is the torque that 37kW, 4 pole motor can give at 10% of the rated rpm for Class F rise and Class B rise.

Solution

Rated kW : 37 Rated rpm : 1470

$$\text{Torque: } 974 \times 37 / 1470 = 24.51 \text{ kgm}$$

10% speed corresponds to CT RATIO 10: 1

In table refer 10: 1 column of 37kW is 25.9kw for Class F rise and 22kW for Class B rise.

Hence 37kW motor @10% of the rated rpm can deliver

$$\text{Torque} = 974 \times 25.9 / 1470 = 17.16 \text{ kgm for Class F rise}$$

$$\text{Torque} = 974 \times 22 / 1470 = 14.57 \text{ kgm for Class B rise}$$

Or from graph - (On page 72)

For 10% of the rated rpm torque deration is 0.70 For Class F rise

$$\text{Torque: } (974 \times 37 / 1470) * 0.70 = 17.16 \text{ kgm}$$

For 10% of the rated rpm torque deration is 0.60 for Class B rise

$$\text{Torque} = (974 \times 37 / 1470) * 0.60 = 14.70 \text{ kgm}$$

Motor required for constant torque application of 37kW, 4 Pole for 10% TO 100% speed. (CT ratio 10: 1).

Solution

From table at column 10: 1

38kW corresponding standard o/p is 55kW 250 frame for Class F rise.

There is no 37kW in the 10:1 column. But immediate next rating is 45kW.

This corresponds to ND280S 75kW.

Or from the graph

Torque deration will be 0.60.

Hence Equivalent rating will be $37 / 0.60 = 61 \text{ kW}$.

Nearest next standard o/p is 75kW. Hence frame will be 280S for Class B rise.



Conveyor



Nuclear



Accessories Matrix

79

7.1	Accessories for safe area motor	80
7.2	Accessories for hazardous area motor	86



7.1 Accessories for safe area motor

Sr. No.	Description	Remark
1.0	Electrical Features	
1.1	Voltage	
	Base voltage	415V/50Hz & 460V/60Hz
	Other than base voltage	220V, 230V, 380V, 400V, 415V, 440V, 460V, 480V, 500V, 525V, 550V, 690V (Star), 575V
	Dual voltage	(1/2 or 1Ö3 Ratio)
	Triple voltage	220V / 380V / 440V
1.2	Frequency	
	Base Frequency	50/60 Hz
1.3	Variable Voltage / Variable Frequency Operated Motors : OR/AND	
	Vacuum Pressure Impregnation	VFD Suitable impregnation
	Treatment (VPI)	VPI & VFD Suitable impregnation
1.4	9 Leads / 12 Leads	
1.5	Non Standard RV/RA for Slipring Motors	Please take prior confirmation
2.0	Mechanical Features	
2.1	Mounting	B3, B35, V1 V18, V19, B14, B34, V15 B5 B6, B7, B8, V3, V5, V6, V36
2.2	Forced Cooling Arrangement	TEFC Only
2.3	CI / MS Fan	CI for frame 160 & up
2.4	Special fixing dimensions other than IS 1231/2223/IEC:60072	For TEFC SCR/SR motor with fabricated body
2.5	Fabricated stator body but fixing dimensions as per IS	
2.6	Double terminal box for slipring motor	
2.7	Flying leads	Up to 1 meter & 6 leads, W/O T. box
2.8	Special Shaft Extention	
	Standard double shaft extension	DE & NDE identical
	Taper Single shaft Extension (1:10)	Diameter & length less than standard
	Taper Double Shaft Extension (1:10)	DE & NDE identical
	Taper other than above	Refer to nearest sales office
	Material Shaft - EN24	
	Stainless Steel Material Shaft	
2.9	Special Bearings	
	Online greasable bearings	Above frame 250 as a standard feature
	Angular contact/ axial thrust bearings	Furnish axial trust in kg and direction of it
2.10	Insulated Bearings	
2.11	Roller bearing on DE side	
2.12	Degree of protection	IP 66, IP65 As per IEC 60034-5 for TEFC & SCR motors



Accessories Matrix





Accessories Matrix



Sr.No.	Description	Remark
2.0	Mechanical Features (cont'd)	
2.13	Fault level certificate	50kA for 0.25 sec With HRC fuse
	NG Frames only	
2.14	Encoder mounting arrangement	TEFC SCR motors
2.15	Brake kit price for Kibosh series motors / (EMCO / MOD-E-TECH)	
	Brake size	Brake torque
	8/K2	8/10
	10/K4	16/20
	12/K5	32/40
	14/K6	60/60
	16/K7	100/85
	20	150 (Frame 160M only)
	20	260 (Frame 160L only)
	25	400
	31	600/800
2.16	Terminal Box Position	
	GD frames	TOP RHS/LHS
	NG frames	TOP RHS/LHS 45° Slant LHS / RHS 6
	ND Frames	TOP RHS/LHS 45° Slant LHS / RHS
2.17	Anticorrosive Paint (ACP)	ACP 631/632 Additional thickness up to 130 microns (except AI series) Any other RAL shades C4-M/C5-M painting For any other painting shade, material or procedure
2.18	Noise Level	<= 85dB (a) @ 1 m at no load (4 pole and up) <= 90 dB(A) @ 1 m at no load (2 pole only)
2.19	Vibration Level	
	Vibration Grade	Vibration level in mm/sec (H - shaft height in mm)
	A	1.6 ($63 \leq H \leq 132$) 2.2 ($132 \leq H \leq 280$) 2.8 ($280 < H$)
	B	Refer to Sales Office
2.20	Jacking out holes	
2.21	Stainless steel hardware	Not available for Aluminium motors
2.22	Totally enclosed motor without fan	Deration Factor = 0.5



Accessories Matrix





Sr.No.	Description	Remark
2.0	Mechanical Features (cont'd)	
2.23	Air stream rated motor	
2.24	Canopy (M.S.)	Motors with TB on RHS/LHS only for safe area
	FRP canopy	TB on RHS/LHS only
2.25	Ratchet arrangements	
3.0	Special Motors	
3.1	Insulation Class	H Class
3.2	Multi-speed motors	Only for safe area (Refer to division) Single Tapped winding with 2/4,4/6,4/8,6/8 pole Motors Dual Speed Motors with Separate Winding or Polarity above 8 pole Multi-speed motors with > 2 speeds (Need prior confirmation from division)
3.3	Motors with 10,12,16 pole	Please refer to sales office
3.4	Crane duty motors	Other than S1
3.5	EPOXY GELCOAT	
3.6	Clean flow construction	TEFC SCR Textile Motors (90S to 132M only)
4.0	Accessories	
4.1	Space heaters	ND 132 TEFC - Terminated in main Separate Aux box
4.2	Thermistors 3 Nos	without relay PTC-110 OR PTC-130 OR PTC-150
	6 Nos	3 Nos PTC 130 & 3 Nos PTC 150
4.3	Resistance Temperature Detector Simplex RTD	2 Nos per phase
	Duplex RTD	1 Nos per phase
	Duplex RTD	2 Nos per phase
4.4	Bearing Temperature Detector	Duplex bearing
4.5	Double compression glands	Main motor Space heater gland & thermistor gland
4.6	Finishing and packing	Motor to be delivered in unpacked condition Motor to be delivered with only primer coat Seaworthy/export packing case for home market (Without fumigating condition)
4.7	Additional nameplate	1 No
4.8	Direction arrow plate	

Standard Specifications:

1. Voltage variation - $415V \pm 10\%$
2. Frequency variation - $50 \text{ Hz} \pm 5\%$
3. Combined variation - 10% (Absolute Sum)
4. Altitude - Maximum of 1000 Mtr.
5. Rating - Continuos / S1
6. Direction of Rotation - Bi directional
7. Class of insulation - F



Accessories Matrix





7.2 Accessories for hazardous area motor

Sr.No.	Description	Remark
1.0	Electrical Features	
1.1	Voltage	
	Base voltage	415V/50Hz & 460V/60Hz
	Other than base voltage	380V, 400V, 415V, 440V, 460V, 480V, 500V, 525V, 550V 230V
	Dual voltage	(1 $\sqrt{3}$ Ratio)
	Triple voltage	
1.2	Frequency	
	Base Frequency	50/60 Hz
1.3	Variable Voltage / Variable Frequency	Type test with drive to be conducted at our works & insp by certifying authority
	Operated Motors :	
	Vacuum Pressure Impregnation	VFD Suitable impregnation
	Treatment (VPI)	VPI & VFD Suitable impregnation
1.4	9 Leads / 12 Leads	
1.5	Non Standard RV/RA for Slipring Motors	Please take prior confirmation
2.0	Mechanical Features	
2.1	Mounting	B3 B35, V15 V18, V19, B14, B34 V1, B5
2.2	Forced Cooling Arrangement	Inter-locking of faux motor & main motor power supply, a must
2.3	CI / MS Fan	CI for frame 160 & up
2.4	Special fixing dimensions other than IS 1231/2223/IEC:60072	For TEFC SCR/SR motor with fabricated body
2.5	Fabricated stator body but fixing dimensions as per IS	
2.6	Double terminal box for slipring motor	
2.7	Flying leads	Up to 1 meter & 6 leads, W/O T. box
2.8	Special Shaft Extension	
	Standard double shaft extension	DE & NDE identical
	Taper Single Shaft Extension (1:10)	Diameter & length less than standard
	Taper Double Shaft Extension (1:10)	DE & NDE identical
	Taper other than above	Refer to nearest sales office
	Material Shaft - EN24	
	Stainless Steel Material Shaft	
2.9	Online greasable bearings	Above frame 250 as a standard feature
	Angular contact/ axial thrust bearings	Furnish axial trust in kg and direction of it
2.10	Insulated Bearings	
2.11	Roller bearing on DE side	
2.12	Degree of protection	IP 66, IP65 As per IEC 60034-5 for TEFC & SCR motors



Accessories Matrix





Sr.No.	Description	Remark
2.0	Mechanical Features (cont'd)	
2.13	Fault level certificate	50kA for 0.25 sec With HRC fuse
2.14	Encoder mounting arrangement	TEFC SCR motors
2.15	Brake	
2.16	Terminal Box Position	
	IIA IIB	TOP RHS/LHS
	IIC	TOP RHS/LHS
2.17	Anticorrosive Paint (ACP)	ACP 631/632 Additional thickness up to 130 microns Any other RAL shades C4-M/C5-M painting For any other painting shade, material or procedure
2.18	Noise Level	<= 85dB (a) @ 1 m at no load (4 pole and up) <= 90 dB(A) @ 1 m at no load (2 pole only)
2.19	Vibration Level	
	Vibration Grade	Vibration level in mm/sec (H - shaft height in mm)
	A	1.6 (80 to 132) 2.2 (132 ≤ H ≤ 280) 2.8 (280 < H)
	B	Refer to Sales Office
2.20	Jacking out holes	
2.21	Stainless steel hardware	Not available for Aluminium motors
2.22	Totally enclosed motor without fan	Deration Factor = 0.5
3.0	Special Motors	
3.1	Insulation Class	H Class
3.2	Multi-speed motors	Only for safe area (Refer to division) Single Tapped winding with 2/4, 4/6, 4/8, 6/8 pole Motors Dual Speed Motors with Separate Winding or Polarity above 8 pole Multi-speed motors with > 2 speeds (Need prior confirmation from division)
3.3	Motors with 10,12,16 pole	Please refer to sales office
3.4	Crane duty motors	Other than S1
3.5	EPOXY GELCOAT	



Accessories Matrix





Accessories Matrix



Sr. No.	Description	Remark
4.0	Accessories	
4.1	Space heaters	
	Separate Aux box	
4.2	Thermistors	
	3 Nos	without relay
		PTC-110 OR PTC-130 OR PTC-150
4.3	Resistance Temperature Detector	
	Simplex RTD	
4.4	Bearing Temperature Detector	2 Nos per phase
4.5	Double compression glands	Duplex bearing
		Main motor
4.6	Finishing and packing	Space heater gland & thermistor gland
		Motor to be delivered in unpacked condition
		Motor to be delivered with only primer coat
		Seaworthy/export packing case for home market
		(Without fumigating condition)
4.7	Additional nameplate	1 No

Standard Specifications:

- 1. Voltage variation - $415V \pm 10\%$
- 2. Frequency variation - $50 \text{ Hz} \pm 5\%$
- 3. Combined variation - 10% (Absolute Sum)
- 4. Altitude - Maximum of 1000 Mtr.
- 5. Rating - Continuos / S1
- 6. Direction of Rotation - Bi directional
- 7. Class of insulation - F



Accessories Matrix



* Either space heater or thermistor



Crusher



Product Portfolio and Performance Data

93

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8.2	Wound rotor motor	108
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8.4	Crane duty	132
8.5	Brake motor	161
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8.6	Crusher duty motor	166
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8.8	NEMA premium motor	171
8.9	Higher output motors	172



8.1 Apex Series Safe Area Motor



Apex Series Motor - IE2/IE3 (safe area)

Range	
Output	0.37 kW to 375 kW
Frames	80 TO 132 (GD Frames) 80 TO 355 (ND Frame)
Poles	2,4,6
Efficiency	IE2, IE3

Apex Series Motor - IE4 (safe area)

Range	
Output	0.55 kW to 45 kW
Frames	80 To 225
Poles	2,4,6
Efficiency	IE4

Specification

	Standard Product	Option
Frame sizes	80 - 355	-
Enclosure	IP55	IP56, IP65, IP66
Mounting option	Foot(B3)	Flange(B5), Face(B14)
Terminal box position	Top	LHS,RHS
Voltage	Upto 3kW 415V λ	other on request
	Above 3kW 415V Δ	
Frequency	50 Hz	60 Hz
Cooling	IC411	IC410
Lubrication	Frame 80 - 225 double-shielded bearings Frame 250 to 355 online greasing	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	IE2 - Yellow grey (RAL 7034) IE3 - Water blue (RAL 5021) IE4 - Pearl Gold (RAL 1036)	On request On request On request
Fan cover	Mild Steel	-
Thermal protection(PTC150)	-	80-355
Anti condensation heaters	-	132-355
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 20°C to + 50°C	- 40°C, up to 60°C

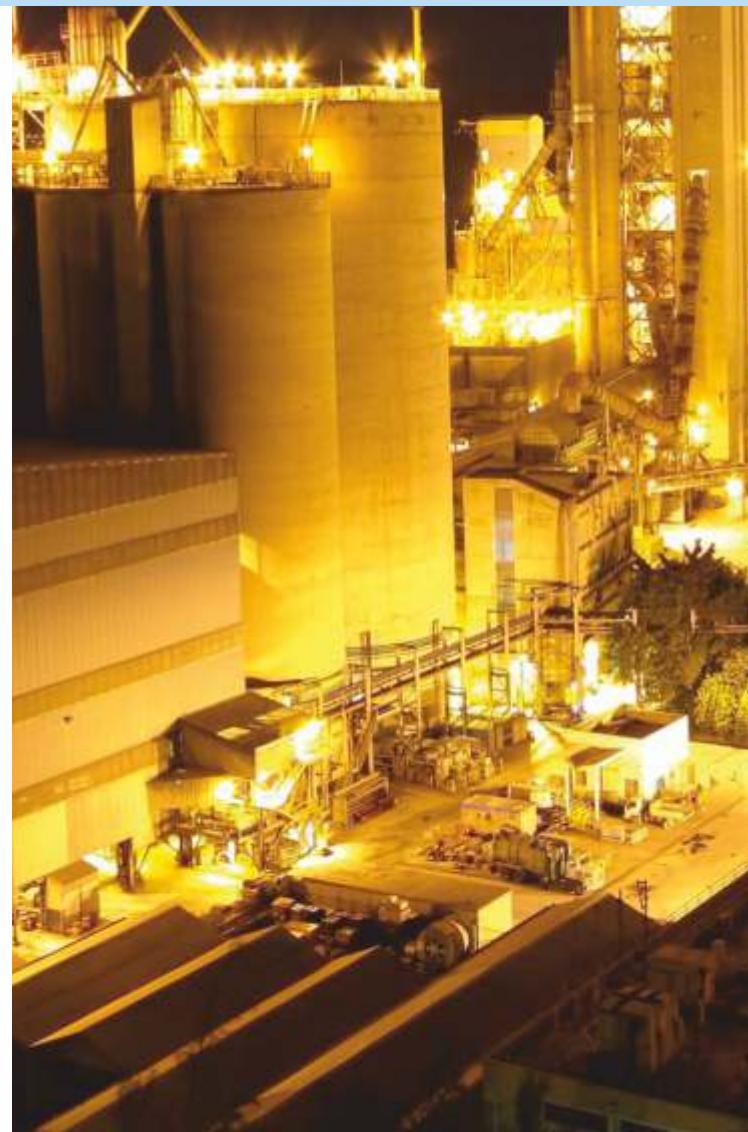
The above specification and options give a brief summary of features available for the Apex series cast iron range. For a full listing of optional features, please contact CG sales.



Over **4,50,00,000** units

energy is saved every year by CG motors in cement, steel, paper, power, oil, gas and other industries ...

"Saving 1unit / hr of electricity produced from a coal power station saves 3.50 tons of Coal per year".





TESTING FACILITY

Our 7 test labs with 0.2 class instrumentation and torque transducers are approved by CSA for accuracy and testing procedure under CPC programme.

We are the only company in India to have the accreditation of **ISO/IEC 17025:2005**.





IE4 Motors: Energy Efficient Motors

Introduction

Out of our commitment towards high energy efficiency and top notch performance, CG presents the next and latest generation of a green solution... **Apex series IE4 motor – Super premium efficiency motor.**

It complies with new efficiency requirements of IEC60034-1:2014-03 with highest efficiency and lowest payback period. Our super premium efficiency motor delivers highest efficiency ever which ensures even lower payback period over the life cycle of motor. By maximizing the output especially in continuous duty applications, due to energy efficiency, our Apex series IE4 motor offers a way to curb energy consumption without limiting your growth and hence reduces CO₂ emissions.

→ Why should you consider buying Apex series IE4 motors ?

- **Highest efficiency:** Super premium efficiency of Apex series motor leads to more energy savings and reduces carbon emission
- **Tested in India's only CSA approved lab:** To keep regular check on instrumentation accuracy and testing procedure to ensure guaranteed efficiency our 7 test labs with 0.2 class instrumentation and torque transducers are approved by CSA under CPC program
- **Early payback:** By maximizing energy savings you get quicker return on investments
- **Same output / Frame ratio:** Lower efficiency motors can be replaced easily with Apex series IE4 motors as frame size is same
- **More reliable:** Less bearing temperature ensures the extended life of motor. Hence Apex series motors are definitely a long term secured solution for the future
- **Low operating cost**

→ Applications of Conventional Motor

- | | | | | |
|-------------------|------------------------|-------------|----------|---------|
| • Conveyors belts | • Textile machines | • Pumps | • Fans | • Mills |
| • Presses | • Centrifugal machines | • Elevators | • Others | |

→ Next generation Line Start Permanent Magnet (LSPM) IE4 motor

- LSPM is a hybrid motor with squirrel cage rotor fitted with low energy ferrite magnets making it suitable for line starting as well as super premium efficiency.
- LSPM operates like an induction motor while starting due to the presence of squirrel cage. After reaching near synchronous speed, the LSPM pull in to synchronism and continues to operate at synchronous speed with zero rotor losses and super premium efficiency.

→ Applications of LSPM Motor

- | | | | | |
|--------------------------|---------|---------------|----------|-------------------|
| • Fans | • Pumps | • Compressors | • Mixers | • Spinning frames |
| • Textile machines, etc. | | | | |

→ Features of LSPM Motor

- | | |
|---------------------------------|------------------------------------------|
| • Super premium efficiency | • Innovative rotor design (patent filed) |
| • Zero slip operation | • Line starting |
| • Compatible with standard VFDs | • APEX mechanical platform |

→ Benefits of LSPM Motor

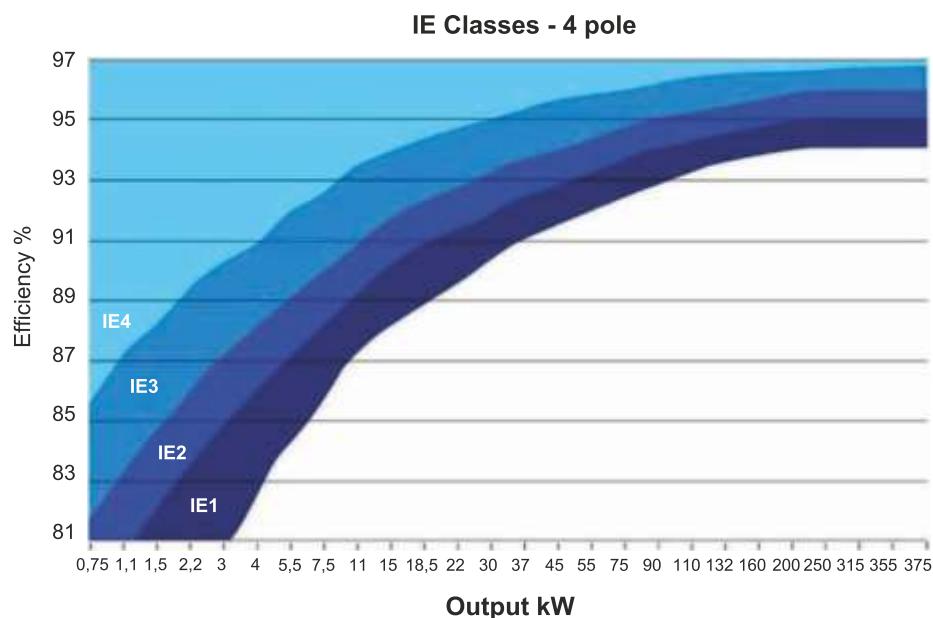
- Same output / frame ratio so it is interchangeable with conventional motor
- Low bearing temperature ensures extended life and less maintenance
- Higher productivity because of increased product output due to synchronous operation
- Easy speed synchronization with multiple motors fed by the same inverter
- Faster return on the investment



IE4 Motors: Energy Efficient Motors Efficiencies

OUTPUT	2 - POLE	4 - POLE	6 - POLE
kW	IE4	IE4	IE4
0.55	81.5	83.9	80.9
0.75	83.5	85.7	82.7
1.10	85.2	87.2	84.5
1.50	86.5	88.2	85.9
2.20	88.0	89.5	87.4
3.00	89.1	90.4	88.6
4.00	90.0	91.1	89.5
5.50	90.9	91.9*	90.5
7.50	91.7	92.6*	91.3
11.0	92.6	93.3*	92.3
15.0	93.3	93.9*	92.9
18.5	93.7	94.2*	93.4
22.0	94.0	94.5*	93.7
30.0	94.5	94.9	94.2
37.0	94.8	95.2	-
45.0	95.0	95.4	-

* - This ratings are available in LSPM construction and for other ratings please contact CG sales.



**IE4 Motors: Energy Efficient Motors****Efficiency Comparison**

Efficiency values defined in IEC 60034-30:2008 / IS12615-2011

Output kW	IE 1 Standard			IE 2			IE 3 Premium			IE 4 Premium		
	Efficiency			High Efficiency			Efficiency			Efficiency		
	2 Pole	4 Pole	6 Pole	2 Pole	4 Pole	6 Pole	2 Pole	4 Pole	6 Pole	2 Pole	4 Pole	6 Pole
0.75	72.1	72.1	70.0	77.4	79.6	75.9	80.7	82.5	78.9	83.5	85.7	82.7
1.10	75.0	75.0	72.9	79.6	81.4	78.1	82.7	84.1	81.0	85.2	87.2	84.5
1.50	77.2	77.2	75.2	81.3	82.8	79.8	84.2	85.3	82.5	86.5	88.2	85.9
2.20	79.7	79.7	77.7	83.2	84.3	81.8	85.9	86.7	84.3	88.0	89.5	87.4
3.00	81.5	81.5	79.7	84.6	85.5	83.3	87.1	87.7	85.6	89.1	90.4	88.6
4.00	83.1	83.1	81.4	85.8	86.6	84.6	88.1	88.6	86.8	90.0	91.1	89.5
5.50	84.7	84.7	83.1	87.0	87.7	86.0	89.2	89.6	88.0	90.9	91.9	90.5
7.50	86.0	86.0	84.7	88.1	88.7	87.2	90.1	90.4	89.1	91.7	92.6	91.3
11.0	87.6	87.6	86.4	89.4	89.8	88.7	91.2	91.4	90.3	92.6	93.3	92.3
15.0	88.7	88.7	87.7	90.3	90.6	89.7	91.9	92.1	91.2	93.3	93.9	92.9
18.5	89.3	89.3	88.6	90.9	91.2	90.4	92.4	92.6	91.7	93.7	94.2	93.4
22.0	89.9	89.9	89.2	91.3	91.6	90.9	92.7	93.0	92.2	94.0	94.5	93.7
30.0	90.7	90.7	90.2	92.0	92.3	91.7	93.3	93.6	92.9	94.5	94.9	94.2
37.0	91.2	91.2	90.8	92.5	92.7	92.2	93.7	93.9	93.3	94.8	95.2	94.5
45.0	91.7	91.7	91.4	92.9	93.1	92.7	94.0	94.2	93.7	95.0	95.4	94.8
55.0	92.1	92.1	91.9	93.2	93.5	93.1	94.3	94.6	94.1	95.3	95.7	95.1
75.0	92.7	92.7	92.6	93.8	94.0	93.7	94.7	95.0	94.6	95.6	96.0	95.4
90.0	93.0	93.0	92.9	94.1	94.2	94.0	95.0	95.2	94.9	95.8	96.1	95.6
110	93.3	93.3	93.3	94.3	94.5	94.3	95.2	95.4	95.1	96.0	96.3	95.8
132	93.5	93.5	93.5	94.6	94.7	94.6	95.4	95.6	95.4	96.2	96.4	96.0
160	93.7	93.8	93.8	94.8	94.9	94.8	95.6	95.8	95.6	96.3	96.6	96.2
200	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8	96.5	96.7	96.3
250	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8	96.5	96.7	96.5
315	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8	96.5	96.7	96.6
355	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8	96.5	96.7	96.6
375	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8	96.5	96.7	96.6

Note:

1. It must be noted that efficiency values are only comparable if they are measured using the same method
2. Any efficiency value between IE1 and IE2 values is to be considered as IE1 class for motors
3. Any efficiency value between IE2 and IE3 values is to be considered as IE2 class for motors
4. The full load efficiency of any individual motor when tested at rated voltage and frequency, shall not be less than the rated efficiency minus the tolerances in accordance with IEC 60034-1
5. Energy efficient cage induction motors are typically built with more active material i.e. longer core length and/or greater core diameter in order to achieve the higher efficiency. For this reason, the starting performance of energy efficient motors differs somewhat from motors with lower efficiency. On average, the locked rotor current increases by 10-15% for motors from one energy efficiency class compared to motors of the next higher class with same output power. Individually, this difference depends on the construction principle of the motor and should be checked with the manufacturer when replacing motors in an existing installation. It must be ensured that the control protective device is properly sized and set up.
6. As per IEC60034-30 : 2008 motors are specially designed for -
 - special requirement of the driven machine (eg. heavy starting duty, special torque stiffness and/or breakdown torque characteristics, large number of start/stop cycles, very low rotor inertia)
 - special characteristics of grind supply (eg. limited starting current, high tolerances of voltage and/or frequency)
 - special ambient conditions (eg. very low ambient temperature, smoke extraction motors, high altitudes of installation) may not be able to achieve higher efficiency classifications



Performance Data for Apex Series Aluminum Motors
Complying to IE2 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²				
				IN					SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT			
	kW	HP		380 V	400 V	415 V											KGM ²					
2 POLE - 3000 SYNCHRONOUS rpm																						
0.75KEG2	0.75	1.00	GD80M	1.69	1.61	1.55	2830	0.3	77.40	76.50	74.00	0.87	0.81	0.70	500	175	225	0.004				
1.10KEG2	1.10	1.50	GD80M	2.58	2.45	2.32	2850	0.4	79.60	79.60	78.00	0.83	0.75	0.62	550	200	250	0.007				
1.50KEG2	1.50	2.00	GD90S	3.22	3.06	2.95	2840	0.5	81.30	81.30	80.00	0.87	0.80	0.70	600	200	250	0.007				
2.20KEG2	2.20	3.00	GD90L	5.02	4.77	4.33	2850	0.8	83.20	83.20	82.00	0.85	0.80	0.70	650	250	300	0.008				
3.00KEG2	3.00	4.00	GD100L	6.26	5.95	5.70	2880	1.0	84.60	84.00	82.00	0.86	0.80	0.72	700	250	300	0.031				
3.70KEG2	3.70	5.00	GD100L	7.56	7.18	6.80	2850	1.3	85.50	85.50	84.00	0.88	0.86	0.80	650	250	300	0.022				
4.00KEG2	4.00	5.50	GD112M	7.96	7.56	7.30	2850	1.4	85.80	85.00	83.00	0.89	0.85	0.78	650	250	300	0.033				
5.50KEG2	5.50	7.50	GD132S	10.79	10.25	10.00	2885	1.9	87.00	86.50	85.00	0.88	0.84	0.74	650	250	300	0.076				
7.50KEG2	7.50	10.00	GD132S	14.53	13.81	13.30	2885	2.5	88.10	87.50	86.00	0.89	0.85	0.78	650	250	300	0.090				
4 POLE - 1500 SYNCHRONOUS rpm																						
0.75KEG4	0.75	1.00	GD80M	1.85	1.76	1.70	1390	0.5	79.60	79.50	77.00	0.77	0.70	0.56	500	225	275	0.012				
1.10KEG4	1.10	1.50	GD90S	2.63	2.50	2.41	1400	0.8	81.40	81.00	79.00	0.78	0.75	0.65	600	225	275	0.017				
1.50KEG4	1.50	2.00	GD90L	3.93	3.74	3.60	1435	1.0	82.80	82.50	80.00	0.70	0.60	0.50	600	275	325	0.023				
2.20KEG4	2.20	3.00	GD100L	5.02	4.77	4.60	1425	1.5	84.30	83.50	81.00	0.79	0.71	0.57	600	200	275	0.059				
3.00KEG4	3.00	4.00	GD100L	7.40	7.03	6.80	1430	2.0	85.50	85.00	83.00	0.72	0.63	0.50	650	225	275	0.065				
3.70KEG4	3.70	5.00	GD112M	7.94	7.55	7.30	1430	2.5	86.30	86.00	84.00	0.82	0.76	0.64	600	225	275	0.052				
4.00KEG4	4.00	5.50	GD112M	8.35	7.94	7.70	1430	2.7	86.60	86.00	84.00	0.84	0.80	0.70	600	200	275	0.074				
5.50KEG4	5.50	7.50	GD132S	12.22	11.61	11.2	1445	3.7	87.70	87.70	85.50	0.78	0.70	0.55	600	175	225	0.138				
7.50KEG4	7.50	10.00	GD132M	16.06	15.26	14.7	1450	5.0	88.70	88.70	86.00	0.80	0.73	0.60	600	210	260	0.191				
6 POLE - 1000 SYNCHRONOUS rpm																						
0.75KEG6	0.75	1.00	GD90S	2.21	2.10	1.99	920	0.79	75.90	75.00	72.00	0.69	0.59	0.46	450	200	250	0.017				
1.10KEG6	1.10	1.50	GD90L	3.10	2.95	3.16	926	1.16	78.10	75.00	72.00	0.62	0.52	0.40	450	225	275	0.023				
1.50KEG6	1.50	2.00	GD100L	4.39	4.17	3.96	930	1.57	79.80	79.80	77.00	0.66	0.59	0.48	500	200	250	0.074				
2.20KEG6	2.20	3.00	GD112M	6.19	5.88	5.35	945	2.27	81.80	81.00	80.00	0.70	0.60	0.50	500	180	230	0.069				
3.00KEG6	3.00	4.00	GD132S	7.93	7.53	7.30	955	3.06	83.30	83.00	81.50	0.69	0.62	0.50	600	225	275	0.182				
3.70KEG6	3.70	5.00	GD132S	9.26	8.80	8.50	960	3.75	84.30	84.30	81.50	0.72	0.65	0.55	650	250	275	0.185				
4.00KEG6	4.00	5.50	GD132M	10.41	9.89	9.50	955	4.08	84.60	84.20	82.00	0.69	0.60	0.50	600	200	250	0.208				

Note:

1. Output and frames are as per IS 1231
2. Performance is subject to IEC/IS tolerances
3. Full load current indicated is given for respective voltage designs



Performance Data for Apex Series Cast Iron Motors
Complying to IE2 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			Gd ²	
	IN			SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT					
	kW	HP												KGM ²					
2 POLE - 3000 SYNCHRONOUS rpm																			
0.75KE2	0.75	1.00	NG80	1.69	1.61	1.55	2830	0.3	77.40	76.50	74.00	0.87	0.81	0.70	500	175	225	0.004	
1.10KE2	1.10	1.50	NG80	2.58	2.45	2.32	2850	0.4	79.60	79.60	78.00	0.83	0.75	0.62	550	200	250	0.007	
1.50KE2	1.50	2.00	NG90S	3.22	3.06	2.95	2840	0.5	81.30	81.30	80.00	0.87	0.80	0.70	600	200	250	0.007	
2.20KE2	2.20	3.00	NG90L	5.02	4.77	4.33	2850	0.8	83.20	83.20	82.00	0.85	0.80	0.70	650	250	300	0.008	
3.00KE2	3.0	4.00	NG100L	6.26	5.95	5.70	2880	1.0	84.60	84.00	82.00	0.86	0.80	0.72	700	250	300	0.031	
3.70KE2	3.70	5.00	NG100L	7.56	7.18	6.80	2875	1.3	85.50	85.50	84.00	0.88	0.83	0.75	650	300	350	0.022	
4.00KE2	4.0	5.50	NG112M	7.96	7.56	7.30	2850	1.4	85.80	85.00	83.00	0.89	0.85	0.78	650	250	300	0.033	
5.50KE2	5.50	7.50	NG132S	10.79	10.25	10.0	2885	1.9	87.00	86.50	85.00	0.88	0.84	0.74	650	250	300	0.076	
7.50KE2	7.50	10.0	NG132S	14.53	13.81	13.3	2885	2.5	88.10	87.50	86.00	0.89	0.85	0.78	650	250	300	0.090	
9.30KE2	9.30	12.5	ND160M	18.0	17.0	17.0	2910	3.1	88.86	88.86	87.46	0.88	0.85	0.78	700	175	225	0.130	
11KE2	11.0	15.0	ND160M	21.0	20.0	19.0	2925	4.0	89.40	89.40	87.00	0.88	0.84	0.76	700	225	275	0.130	
15KE2	15.0	20.0	ND160M	29.0	27.0	26.0	2925	5.0	90.30	90.30	89.00	0.88	0.85	0.78	700	200	250	0.170	
18.5KE2	18.50	25.0	ND160L	36.0	34.0	32.0	2920	6.0	90.90	90.90	90.90	0.88	0.85	0.80	700	200	300	0.210	
22KE2	22.0	30.0	ND180M	44.0	41.0	40.0	2930	7.0	91.30	91.30	90.00	0.84	0.82	0.77	600	200	250	0.440	
30KE2	30.0	40.0	ND200L	57.0	54.0	52.0	2950	10.0	92.00	92.00	91.00	0.87	0.86	0.84	600	200	250	0.800	
37KE2	37.0	50.0	ND200L	.069	66.0	63.0	2945	12.0	92.50	92.50	92.00	0.88	0.86	0.81	650	200	250	0.890	
45KE2	45.0	60.0	ND225M	8.04	79.0	77.0	2965	15.0	92.90	92.90	91.50	0.88	0.85	0.81	700	250	300	1.870	
55KE2	55.0	75.0	ND250MX	95.0	91.0	87.0	2955	18.0	93.20	93.20	92.00	0.94	0.92	0.88	700	200	250	2.790	
75KE2	75.0	100	ND280S	135	128	124	2970	25.0	93.80	93.80	92.00	0.90	0.88	0.85	700	200	250	7.140	
90KE2	90.0	120	ND280M	158	150	145	2975	29.0	94.10	94.10	93.00	0.92	0.88	0.82	700	200	250	8.180	
110KE2	110	150	ND315S	191	181	176	2965	36.0	94.30	94.00	93.00	0.92	0.90	0.88	700	225	250	6.630	
132KE2	132	180	ND315M	228	217	211	2968	43.0	94.60	94.60	94.00	0.92	0.90	0.88	700	225	275	7.970	
160KE2	160	215	ND315LX	276	262	258	2980	52.0	94.80	94.60	94.00	0.91	0.89	0.84	650	210	250	13.90	
180KE2	180	240	ND315LX	310	295	290	2975	59.0	94.90	94.90	94.20	0.91	0.89	0.84	700	220	260	13.90	
200KE2	200	268	ND315LX	344	327	322	2975	65.0	95.00	95.00	94.50	0.91	0.89	0.85	650	220	260	16.40	
225KE2	225	300	ND355LX	387	368	370	2975	74.0	95.00	94.50	94.00	0.89	0.86	0.81	700	200	250	18.40	
250KE2	250	335	ND355LX	430	408	411	2980	82.0	95.00	94.50	94.00	0.89	0.86	0.81	700	175	225	27.70	

Note:

- Output and frames are as per IS 1231
- Performance is subject to IEC/IS tolerances
- Full load current indicated is given for respective voltage designs



Performance Data for Apex Series Cast Iron Motors
Complying to IE2 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²			
	kW	HP		IN		SPEED RPM	IN kg-m		FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT				
				380 V	400 V																
4 POLE - 1500 SYNCHRONOUS rpm																					
0.75KE4	0.75	1.00	NG80	1.85	1.76	1.70	1390	0.50	79.8	79.5	77.0	0.77	0.70	0.56	500	225	275	0.012			
1.10KE4	1.10	1.50	NG90S	2.63	2.5	2.41	1400	0.80	81.4	81.0	79.0	0.78	0.75	0.65	600	225	275	0.017			
1.50KE4	1.50	2.00	NG90L	3.93	3.74	3.60	1435	1.00	82.8	82.5	80.0	0.70	0.60	0.50	600	275	325	0.023			
2.20KE4	2.00	3.00	NG100L	5.02	4.77	5.04	1450	1.50	84.3	84.3	83.0	0.72	0.64	0.51	650	200	250	0.059			
3.00KE4	3.00	4.00	NG100L	7.40	7.03	6.10	1430	2.00	85.5	85.0	83.0	0.80	0.76	0.64	600	200	250	0.065			
3.70KE4	3.70	5.00	NG112M	7.94	7.55	7.30	1430	2.50	86.3	86.0	84.0	0.82	0.76	0.64	600	225	275	0.052			
4.00KE4	4.00	5.50	NG112M	8.35	7.94	7.70	1430	2.70	86.6	86.0	84.0	0.84	0.80	0.70	600	200	275	0.074			
5.50KE4	5.50	7.50	NG132S	12.22	11.61	11.2	1445	3.70	87.7	87.7	85.5	0.78	0.70	0.55	600	175	225	0.138			
7.50KE4	7.50	10.0	NG132M	16.06	15.26	14.7	1450	5.00	88.7	88.7	86.0	0.80	0.73	0.60	600	210	260	0.191			
9.3KE4	9.30	12.5	ND160M	19.00	18.0	17.0	1460	6.20	89.3	89.3	88.0	0.84	0.81	0.70	600	200	250	0.310			
11KE4	11.0	15.0	ND160M	24.0	23.0	22.0	1460	7.0	89.8	89.8	88.5	0.78	0.73	0.63	550	200	250	0.360			
15KE4	15.0	20.0	ND160L	29.0	28.0	29.0	1465	10.0	90.6	90.6	89.5	0.80	0.76	0.67	650	180	250	0.470			
18.5KE4	18.5	25.0	ND180M	37.0	35.0	34.0	1475	12.0	91.2	91.2	90.5	0.83	0.79	0.69	600	200	275	0.810			
22KE4	22.0	30.0	ND180L	42.0	40.0	39.0	1460	15.0	91.6	91.6	91.0	0.86	0.83	0.76	550	175	225	0.950			
30KE4	30.0	40.0	ND200L	59.0	56.0	51.0	1460	20.0	92.3	92.3	92.0	0.83	0.81	0.74	600	200	250	1.620			
37KE4	37.0	50.0	ND225S	77.0	73.0	70.0	1470	25.0	92.7	92.7	92.0	0.79	0.75	0.69	650	200	250	2.640			
45KE4	45.0	60.0	ND225M	88.0	84.0	81.0	1475	30.0	93.1	93.1	92.0	0.83	0.80	0.72	600	250	300	3.130			
55KE4	55.0	75.0	ND250MX	106	101	97.0	1480	36.0	93.5	93.5	93.0	0.84	0.79	0.72	700	225	275	3.450			
75KE4	75.0	100	ND280S	138	131	126	1480	49.0	94.0	94.0	92.5	0.88	0.86	0.81	700	200	250	7.210			
90KE4	90.0	120	ND280M	165	157	149	1480	59.0	94.2	94.2	94.0	0.89	0.86	0.80	700	250	300	8.260			
110KE4	110	150	ND315S	197	187	180	1485	72.0	94.5	94.5	94.0	0.90	0.88	0.84	600	200	250	11.62			
132KE4	132	180	ND315M	235	224	215	1485	87.0	94.7	94.7	94.0	0.90	0.88	0.84	700	225	275	13.98			
160KE4	160	215	ND315LX	285	270	261	1488	105	94.9	94.9	94.1	0.91	0.89	0.85	650	200	250	24.97			
180KE4	180	241	ND315LX	320	304	290	1488	118	95.0	95.0	94.2	0.91	0.88	0.85	700	225	275	24.97			
200KE4	200	270	ND315LX	355	337	318	1489	131	95.1	95.1	94.7	0.92	0.90	0.86	700	200	250	25.00			
225KE4	225	300	ND355LX	399	379	366	1490	147	95.1	95.1	94.0	0.90	0.88	0.84	600	150	225	28.00			
250KE4	250	335	ND355LX	444	422	406	1490	163	95.1	95.1	94.0	0.90	0.86	0.81	700	180	225	29.60			

Note:

1. Output and frames are as per IS 1231
2. Performance is subject to IEC/IS tolerances
3. Full load current indicated is given for respective voltage designs



Performance Data for Apex Series Cast Iron Motors
Complying to IE2 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²				
	kW	HP		IN	380 V	400 V	415 V		SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT			
				380 V																		
6 POLE - 1000 SYNCHRONOUS rpm																						
0.75KE6	0.75	1.00	NG90S	2.21	2.10	1.99	920	0.79	75.9	75.0	72.0	0.69	0.59	0.46	450	200	250	0.017				
1.10KE6	1.10	1.50	NG90L	3.10	2.95	3.16	926	1.16	78.1	75.0	72.0	0.62	0.52	0.40	450	225	275	0.023				
1.50KE6	1.50	2.00	NG100L	4.39	4.17	4.02	940	1.55	79.8	79.5	77.0	0.65	0.59	0.48	500	200	250	0.074				
2.20KE6	2.00	3.00	NG112M	6.19	5.88	5.35	945	2.27	81.8	81.0	80.0	0.70	0.60	0.50	500	180	230	0.069				
3.00KE6	3.00	4.00	NG132S	7.93	7.53	7.30	955	3.06	83.3	83.0	81.5	0.69	0.62	0.50	600	225	275	0.182				
3.70KE6	3.70	5.00	NG132S	9.26	8.80	8.50	960	3.75	84.3	84.3	81.5	0.72	0.65	0.55	650	250	275	0.185				
4.00KE6	4.00	5.50	NG132M	10.41	9.89	9.50	955	4.08	84.6	84.2	82.0	0.69	0.60	0.50	600	200	250	0.208				
5.50KE6	5.50	7.50	NG132M	12.0	11.0	12.0	975	5.50	86.0	86.0	85.5	0.80	0.76	0.68	500	175	250	0.400				
7.50KE6	7.50	10.0	ND160M	16.0	15.0	15.0	975	7.50	87.2	87.0	85.0	0.82	0.76	0.64	600	200	250	0.460				
9.3KE6	9.30	12.5	ND160M	20.0	19.0	18.0	970	9.30	88.0	88.0	85.5	0.80	0.75	0.65	500	175	225	0.590				
11KE6	11.0	15.0	ND160L	24.0	23.0	22.0	975	11.0	88.7	88.5	86.0	0.78	0.70	0.56	600	200	250	0.640				
15KE6	15.0	20.0	ND180L	31.0	30.0	30.0	980	15.0	89.7	89.7	88.0	0.78	0.71	0.58	600	225	250	1.160				
18.5KE6	18.5	25.0	ND200L	37.0	35.0	34.0	975	18.0	90.4	90.4	90.1	0.83	0.78	0.67	600	225	275	1.690				
22KE6	22.0	30.0	ND200L	44.0	42.0	41.0	975	22.0	90.9	90.9	90.0	0.83	0.78	0.68	600	200	250	2.040				
30KE6	30.0	40.0	ND225M	58.0	56.0	54.0	980	30.0	91.7	91.7	91.0	0.85	0.81	0.73	600	200	250	3.610				
37KE6	37.0	50.0	ND250M	73.0	69.0	66.0	980	37.0	92.2	92.2	91.5	0.84	0.80	0.72	600	200	250	4.820				
45KE6	45.0	60.0	ND280S	87.0	82.0	79.0	985	44.0	92.7	92.7	92.6	0.85	0.81	0.76	600	200	250	8.010				
55KE6	55.0	75.0	ND280M	109	104	97.0	985	54.0	93.1	93.1	92.8	0.85	0.81	0.73	650	200	250	9.890				
75KE6	75.0	100	ND315S	147	139	131	987	74.0	93.7	93.7	93.5	0.85	0.82	0.76	600	175	250	14.12				
90KE6	90.0	120	ND315M	173	165	159	987	89.0	94.0	94.0	93.5	0.84	0.80	0.70	600	200	250	17.00				
110KE6	110	150	ND315M	209	198	196	988	108	94.3	94.3	94.3	0.83	0.80	0.73	600	200	250	18.98				
132KE6	132	180	ND315L	247	234	223	989	130	94.6	94.6	94.0	0.87	0.85	0.78	600	175	250	29.85				
160KE6	160	215	ND315LX	298	283	273	990	157	94.8	94.8	92.0	0.86	0.82	0.74	600	200	250	29.85				
180KE6	180	241	ND355L	339	322	303	989	177	94.9	94.9	94.5	0.87	0.85	0.78	600	175	250	29.90				

Note:

- Output and frames are as per IS 1231
- Performance is subject to IEC/IS tolerances
- Full load current indicated is given for respective voltage designs



Performance Data for Apex Series Cast Iron Motors
Complying to IE3 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²
	kW	HP		IN	380 V	400 V	415 V	SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT
2 POLE : 3000 RPM																		
0.75KP2	0.75	1.00	80	1.63	1.55	1.49	2820	0.26	80.7	79.8	77.3	0.87	0.83	0.77	175	600	225	0.004
1.10KP2	1.10	1.50	80	2.49	2.37	2.28	2870	0.37	82.7	81.6	80.1	0.86	0.84	0.72	250	650	300	0.005
1.50KP2	1.50	2.00	90S	3.15	2.99	2.88	2860	0.51	84.2	84.2	83.5	0.86	0.80	0.70	250	650	300	0.006
2.20KP2	2.20	3.00	90L	4.52	4.30	4.14	2850	0.75	85.9	85.9	85.5	0.86	0.82	0.70	275	700	300	0.008
3.00KP2	3.00	4.00	100L	5.89	5.59	5.39	2890	1.01	87.1	87.1	86.5	0.89	0.85	0.76	300	700	350	0.027
3.70KP2	3.70	5.00	100L	7.32	6.95	6.70	2875	1.25	87.8	87.8	86.1	0.88	0.83	0.75	300	650	350	0.032
4.00KP2	4.00	5.50	112M	7.70	7.30	7.00	2870	1.36	88.1	88.1	88.1	0.90	0.88	0.82	275	750	350	0.041
5.50KP2	5.50	7.50	132S	10.7	10.2	9.80	2900	1.85	89.2	89.2	88.2	0.88	0.84	0.74	275	700	300	0.093
7.50KP2	7.50	10.0	132S	14.4	13.7	13.2	2890	2.53	90.1	90.1	89.5	0.88	0.86	0.80	200	600	250	0.11
11KP2	11.0	15.0	160M	21.0	20.0	19.0	2925	3.66	91.2	91.2	90.0	0.89	0.85	0.82	225	700	275	0.19
15KP2	15.0	20.0	160M	28.0	27.0	26.0	2920	5.00	91.9	91.9	91.5	0.89	0.86	0.79	250	700	300	0.23
18.5KP2	18.5	25.0	160L	34.0	32.0	31.0	2920	6.17	92.4	92.4	92.0	0.89	0.86	0.82	225	700	275	0.28
22KP2	22.0	30.0	180M	43.0	40.0	39.0	2940	7.28	92.7	92.7	91.5	0.88	0.82	0.74	175	650	225	0.44
30KP2	30.0	40.0	200L	56.0	53.0	51.0	2955	9.89	93.3	93.3	92.5	0.89	0.85	0.80	200	700	200	1.04
37KP2	37.0	50.0	200L	67.0	63.0	61.0	2950	12.20	93.7	93.5	92.5	0.90	0.85	0.80	225	700	275	1.14
45KP2	45.0	60.0	225M	79.0	75.0	72.0	2965	14.83	94.0	94.0	92.6	0.90	0.86	0.82	200	700	250	1.74
55KP2	55.0	75.0	250MX	94.0	89.0	86.0	2965	18.07	94.3	94.3	93.0	0.92	0.88	0.80	200	700	250	2.53
75KP2	75.0	100	280S	133	127	122	2970	24.60	94.7	94.5	93.2	0.92	0.88	0.82	200	700	250	5.67
90KP2	90.0	120	280M	156	148	143	2975	29.47	95.0	95.0	94.0	0.92	0.88	0.82	200	700	250	6.21
110KP2	110#	150	315S	195	185	179	2980	35.93	95.2	95.2	93.8	0.90	0.85	0.81	200	700	250	9.76
132KP2	132#	180	315M	224	213	205	2980	43.22	95.4	95.4	94.8	0.90	0.88	0.84	200	700	250	10.70
160KP2	160#	215	315LX	296	281	271	2980	52.27	95.6	95.6	95.0	0.86	0.82	0.76	200	700	250	12.33
180KP2	180#	240	315LX	314	298	288	2980	58.80	95.7	95.5	95.0	0.91	0.88	0.84	180	700	225	13.08
200KP2	200#	270	315LX	349	331	319	2980	65.34	95.8	95.8	95.0	0.91	0.88	0.84	200	700	250	13.79
225KP2	225*	300	355LX	396	377	363	2980	73.50	95.8	94.8	93.3	0.90	0.86	0.80	175	750	225	17.79
250KP2	250*	335	355LX	441	419	403	2980	81.67	95.8	95.5	94.5	0.90	0.88	0.80	160	700	225	18.76
275KP2	275#	370	355LX	490	466	449	2980	89.84	95.8	95.5	94.5	0.89	0.85	0.80	160	700	225	19.68
315KP2	315*	425	355LX	555	527	508	2980	102.90	95.8	95.5	94.5	0.9	0.86	0.80	180	650	225	20.48



Product Portfolio & Performance Data



Performance Data for Apex Series Cast Iron Motors
Complying to IE3 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²
	kW	HP		IN	380 V	400 V	415 V	SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT

4 POLE : 1500 RPM																			
0.75KP4	0.75	1.00	80	1.89	1.80	1.73	1420	0.51	82.5	82.5	81.0	0.73	0.68	0.55	225	650	275	0.014	
1.10KP4	1.10	1.50	90S	2.54	2.42	2.33	1420	0.75	84.1	84.0	82.4	0.78	0.71	0.58	200	600	250	0.015	
1.50KP4	1.50	2.00	90L	3.52	3.34	3.22	1430	1.02	85.3	85.3	85.0	0.70	0.60	0.50	300	750	350	0.019	
2.20KP4	2.20	3.00	100L	5.35	5.08	4.90	1450	1.48	86.7	86.7	85.4	0.75	0.70	0.60	200	650	250	0.053	
3.00KP4	3.00	4.00	100L	7.22	6.86	6.61	1450	2.01	87.7	87.5	85.0	0.72	0.64	0.50	250	800	300	0.069	
3.70KP4	3.70	5.00	112M	8.08	7.68	7.40	1435	2.51	88.4	88.4	87.4	0.78	0.75	0.65	200	550	250	0.086	
4.00KP4	4.00	5.50	112M	8.6	8.10	7.90	1445	2.69	88.6	88.6	88.5	0.80	0.75	0.65	225	750	275	0.08	
5.50KP4	5.50	7.50	132S	12.0	11.4	11.0	1450	3.69	89.6	89.6	87.4	0.81	0.76	0.68	225	600	275	0.20	
7.50KP4	7.50	10.0	132M	45.1	42.8	41.3	1455	5.02	90.4	90.4	88.0	0.78	0.74	0.62	240	650	290	0.23	
11KP4	11.0	15.0	160M	22	21.0	20.0	1465	7.31	91.4	91.4	89.4	0.84	0.80	0.72	200	700	250	0.47	
15KP4	15.0	20.0	160L	28	27.0	26.0	1465	9.94	92.1	92.1	91.0	0.84	0.80	0.70	200	700	250	0.59	
18.5KP4	18.5	25.0	180M	35	33.0	32.0	1470	12.26	92.6	92.6	92.0	0.86	0.83	0.76	200	700	250	0.81	
22KP4	22.0	30.0	180L	42	39.0	38.0	1470	14.53	93.0	93.0	92.0	0.81	0.75	0.63	200	700	250	0.95	
30KP4	30.0	40.0	200L	59	56.0	54.0	1470	19.81	93.6	93.6	92.6	0.86	0.82	0.75	225	700	275	1.62	
37KP4	37.0	50.0	225S	72	68.0	66.0	1475	24.43	93.9	93.9	93.0	0.83	0.77	0.74	225	700	275	2.64	
45KP4	45.0	60.0	225M	85	81.0	78.0	1475	29.61	94.2	94.2	93.0	0.83	0.82	0.70	250	700	300	3.13	
55KP4	55.0	75.0	250MX	103	98.0	94.0	1480	36.20	94.6	94.6	94.0	0.84	0.81	0.75	225	700	275	3.45	
75KP4	75.0	100	280S	134	128	123	1485	49.19	95.0	95.0	94.0	0.88	0.84	0.78	250	700	300	7.20	
90KP4	90.0	120	280M	159	151	146	1485	59.03	95.2	95.2	94.0	0.91	0.88	0.82	250	700	300	8.26	
110KP4	110	150	315S	194	185	178	1485	72.00	95.4	95.2	94.6	0.90	0.86	0.80	180	700	225	22.10	
132KP4	132	180	315M	233	221	213	1488	86.29	95.6	95.6	94.9	0.90	0.87	0.83	200	750	250	24.20	
160KP4	160	215	315LX	282	268	258	1485	104.89	95.8	95.8	95.0	0.90	0.86	0.82	200	700	250	26.67	
180KP4	180	240	315LX	317	301	290	1488	117.76	95.9	95.9	95.2	0.90	0.86	0.82	200	700	250	28.23	
200KP4	200	270	315LX	352	334	322	1490	130.67	96.0	96.0	95.3	0.90	0.86	0.82	200	700	250	29.76	
225KP4	225#	300	355LX	405	384	371	1488	147.20	96.0	95.8	95.3	0.88	0.86	0.82	180	700	225	47.75	
250KP4	250	335	355LX	440	418	403	1488	163.56	96.0	96.0	95.5	0.90	0.88	0.84	180	700	225	46.75	
275KP4	280#	375	355LX	492	468	451	1488	183.18	96.0	95.8	95.5	0.90	0.86	0.82	160	700	225	49.56	
315P4	315*	425	355LX	554	526	507	1488	206.08	96.0	96.0	95.8	0.90	0.88	0.84	200	700	250	53.05	



Performance Data for Apex Series Cast Iron Motors
Complying to IE3 Class of IEC 60034-30:2008/IS12615:2011



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	70 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

PRODUCT CODE	RATED POWER		FRAME	FULL LOAD CURRENT (AMP)			FL	FLT	EFFICIENCY %			POWER FACTOR			D.O.L STARTING			GD ²
	kW	HP		IN	380 V	400 V	415 V	SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	SCC %FLT	STT %FLA	POT %FLT
6 POLE : 1000 RPM																		
0.75KP6	0.75	1.00	90S	2.22	2.11	2.03	950	0.77	78.9	78.9	78.8	0.65	0.58	0.45	180	500	225	0.019
1.10KP6	1.10	1.50	90L	3.03	2.88	2.78	935	1.15	81.0	80.2	78.4	0.68	0.58	0.45	200	600	250	0.025
1.50KP6	1.50	2.00	100L	4.25	4.04	2.42	940	1.55	82.5	82.2	81.0	0.60	0.55	0.50	200	500	250	0.052
2.20KP6	2.20	3.00	112M	6.00	5.70	5.19	950	2.26	84.3	84.3	81.0	0.70	0.65	0.50	200	600	250	0.095
3.00KP6	3.00	4.00	132S	7.60	7.30	7.00	965	3.03	85.6	85.6	84.0	0.78	0.72	0.65	220	650	270	0.26
3.70KP6	3.70	5.00	132S	8.50	8.10	9.20	960	3.75	86.5	86.0	84.0	0.65	0.60	0.50	250	500	275	0.26
4.00KP6	4.00	5.50	132M	9.60	9.10	8.80	965	4.04	86.8	86.8	85.0	0.73	0.66	0.54	150	600	200	0.29
5.50KP6	5.50	7.50	132M	12.80	12.2	11.8	950	5.64	88.0	88.0	86.5	0.74	0.66	0.54	150	600	200	0.29
7.50KP6	7.50	10.0	160M	16.38	15.56	15.0	970	7.53	89.1	89.1	86.0	0.80	0.76	0.68	175	500	225	0.46
11KP6	11.0	15.0	160L	17.47	16.60	16.0	975	10.99	90.3	90.3	90.0	0.79	0.73	0.61	200	600	250	0.64
15KP6	15.0	20.0	180L	32.0	30.0	29.0	980	14.91	91.2	91.2	91.0	0.82	0.77	0.67	225	600	250	1.16
18.5KP6	18.5	25.0	200L	3.00	36.0	35.0	975	18.48	91.7	91.7	90.8	0.81	0.77	0.68	225	600	275	1.69
22KP6	22.0	30.0	200L	44.0	42.0	41.0	975	21.98	92.2	92.2	91.0	0.81	0.77	0.68	200	600	250	2.04
30KP6	30.0	40.0	225M	63.0	60.0	58.0	990	29.66	92.9	92.9	91.5	0.78	0.70	0.60	200	600	250	3.84
37KP6	37.0	50.0	250M	72.0	68.0	67.0	985	36.40	93.3	93.3	92.3	0.82	0.77	0.65	175	600	225	4.82
45KP6	45.0	60.0	280S	86.0	82.0	84.0	985	44.50	93.7	93.7	93.0	0.80	0.76	0.70	200	600	250	8.01
55KP6	55.0	75.0	280M	105	100	97.0	985	54.39	94.1	94.1	93.8	0.84	0.80	0.75	200	650	250	9.89
75KP6	75.0	100	315S	140	133	140	990	73.79	94.6	94.6	94.0	0.85	0.81	0.72	160	600	200	20.80
90KP6	90.0	120	315M	169	161	150	990	88.81	94.9	94.9	93.0	0.86	0.82	0.74	200	650	250	22.79
110KP6	110	150	315M	212	201	185	990	108.40	95.1	95.1	94.0	0.87	0.85	0.80	160	600	200	25.22
132KP6	132	180	315LX	257	244	235	985	130.46	95.4	95.4	95.0	0.82	0.78	0.72	160	600	200	27.63
160KP6	160	215	315LX	296	281	271	990	157.33	95.6	95.6	95.0	0.86	0.82	0.74	200	600	250	30.43
180KP6	180	240	355LX	336	319	308	985	177.90	95.7	95.5	95.0	0.85	0.81	0.72	160	600	200	30.93
200KP6	200	270	355LX	373	355	342	985	197.66	95.8	95.5	94.5	0.85	0.81	0.72	160	600	200	32.62
225KP6	225	300	355LX	420	399	384	990	221.40	95.8	95.5	94.8	0.85	0.81	0.72	160	600	200	34.60
250KP6	250	335	355LX	466	443	427	990	245.83	95.8	95.8	94.8	0.85	0.81	0.72	160	600	200	36.45

Note:

1. Performance is subject to IEC/IS tolerances
2. Full load current indicated is given for respective voltage designs
3. For other ratings up to 375 kW, please contact CG Sales



Product Portfolio & Performance Data



Cement



8.2 Specifications - Wound Rotor Motor

Slipring Induction Motor

Range	
Output	3 kW to 350 kW
Frames	NDW112M to NDW450LX
Poles	4, 6, 8, 10

Specification		
	Standard Product	Option
Enclosure	IP55	
Mounting option	B3 (Foot)	B5 (Flange)
Terminal box position	Top	LHS,RHS
Voltage	Up to 3kW 415V λ	Other on request
	Above 3kW 415V Δ	
Frequency	50 Hz	60 Hz
Cooling	IC411	IC410
Lubrication	Frame 112 - 225 double-shielded bearings Frame 250 to 450 online greasing	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	CGL Standard 631 (IS-5)	Other on request
Fan cover	Mild Steel	-
Thermal protection(PTC150)	-	160 and above
Anti condensation heaters	280 and above	160-250 frames
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 20°C to + 45°C	- 40°C, up to 60°C
Duty	S1	S3, S4
RV/RA	As per catalogue	As per requirement

Note:

For 10 Pole ratings and frame NDW450LX, refer to design.



8.2 Specifications - Wound Rotor Motor

SPDP Slipring Motor

Range
Output 7.5 kW to 350 kW
Frames CW160 to CW400
Poles 4, 6, 8, 10

Specification	Standard Product	Option
Enclosure	IP23	
Mounting option	B3 (Foot)	V1 (Vertical Flange)
Terminal box position	RHS, LHS	-
Voltage	Up to 3kW 415V λ	Other on request
	Above 3kW 415V Δ	
Frequency	50 Hz	60 Hz
Cooling	IC411	-
Lubrication	Frame 160 - 225 double-shielded bearings Frame 250 to 400 online greasing	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	CGL Standard 631 (IS-5)	Other on request
Fan cover	-	-
Thermal protection(PTC150)	-	160 and above
Anti condensation heaters	280 and above	160-250 frames
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 20°C to + 45°C	- 40°C, up to 60°C
Duty	S1	S3, S4
RV/RA	As per catalogue	As per requirement



Performance of TEFC Slipring Motors (4 Pole)

Voltage	415 ±10%	Type	Slip ring (SR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
7.5KZ4SR	7.5	10.0	NDW160M	1440	15	83.0	82.0	80.0	0.84	0.80	0.72	360	12.5	0.48
9.3KZ4SR	9.3	12.5	NDW160L	1440	18	84.0	83.0	81.0	0.84	0.80	0.72	360	15.5	0.35
11KZ4SR	11.0	15.0	NDW160L	1440	22	84.0	83.0	81.0	0.84	0.80	0.72	360	18.5	0.35
15KZ4SR	15.0	20.0	NDW180L	1445	28	88.0	87.0	85.0	0.84	0.80	0.72	340	28.0	1.26
18.5KZ4SR	18.5	25.0	NDW200L	1470	34	89.0	88.0	86.0	0.84	0.80	0.72	315	35.0	2.18
22KZ4SR	22.0	30.0	NDW200L	1470	40	89.0	88.0	86.0	0.85	0.81	0.73	360	36.0	2.34
30KZ4SR	30.0	40.0	NDW225M	1470	55	89.0	88.0	86.0	0.85	0.81	0.73	390	46.0	2.96
37KZ4SR	37.0	50.0	NDW250M	1475	67	91.0	91.0	89.0	0.85	0.81	0.73	425	52.0	4.96
45KZ4SR	45.0	60.0	NDW250M	1475	82	90.0	89.0	87.0	0.85	0.81	0.73	445	60.0	5.70
55KZ4SR	55.0	75.0	NDW280S	1480	97	91.5	91.0	89.0	0.86	0.82	0.74	460	73.0	10.61
75KZ4SR	75.0	100.0	NDW280M	1480	130	92.5	92.0	90.0	0.87	0.83	0.75	490	92.0	12.45
90KZ4SR	90.0	120.0	NDW315S	1480	157	92.5	92.0	90.0	0.86	0.82	0.74	505	106.0	18.22
110KZ4SR	110.0	150.0	NDW315M	1485	192	92.5	92.0	90.0	0.86	0.82	0.74	400	165.0	20.21
125KZ4SR	125.0	175.0	NDW315LX	1480	217	93.0	92.0	90.0	0.86	0.82	0.70	335	221.0	18.90
132KZ4SR	132.0	180.0	NDW315LX	1480	230	93.0	92.0	90.0	0.86	0.82	0.70	335	234.0	18.90
150KZ4SR	150.0	200.0	NDW315LX	1480	260	93.5	92.5	91.0	0.86	0.82	0.70	440	202.0	23.60
160KZ4SR	160.0	215.0	NDW315LX	1480	277	93.5	92.5	91.0	0.86	0.82	0.70	440	215.0	23.60
180KZ4SR	180.0	240.0	NDW355L	1485	317	94.0	93.0	91.0	0.84	0.78	0.66	500	232.0	25.00
200KZ4SR	200.0	270.0	NDW355L	1485	351	94.5	93.5	91.5	0.84	0.78	0.66	540	239.0	26.60
225KZ4SR	225.0	300.0	NDW355LX	1485	394	94.5	94.0	92.5	0.84	0.80	0.70	510	275.0	29.60
250KZ4SR	250.0	335.0	NDW355LX	1485	449	94.5	94.0	92.5	0.82	0.76	0.65	570	275.0	31.60
275KZ4SR	275.0	370.0	NDW355LX	1485	486	94.8	94.0	92.5	0.83	0.77	0.66	630	275.0	35.50
315KZ4SR	315.0	422.0	NDW400LX	1491	549	95.0	94.5	93.0	0.84	0.79	0.70	580	328.0	56.40
350KZ4SR	350.0	470.0	NDW400LX	1491	593	95.5	95.0	93.5	0.86	0.81	0.71	620	359.0	63.40

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



Performance of TEFC Slipring Motors (6 Pole)

Voltage	415 ±10%	Type	Slip ring (SR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
5.5KZ6SR	5.50	7.50	NDW160M	940	12	83.0	82.0	80.0	0.76	0.74	0.66	180	18.5	0.58
7.5KZ6SR	7.50	10.0	NDW160L	940	17	83.0	82.0	80.0	0.76	0.72	0.64	230	19.0	0.77
9.3KZ6SR	9.30	12.5	NDW180M	950	18	86.0	85.0	83.0	0.82	0.78	0.70	255	25.0	1.33
11KZ6SR	11.0	15.0	NDW180L	950	22	86.0	85.0	83.0	0.82	0.78	0.70	255	22.0	1.58
15KZ6SR	15.0	20.0	NDW200L	970	29	89.0	88.0	86.0	0.82	0.78	0.70	295	26.0	2.68
18.5KZ6SR	18.5	25.0	NDW225M	970	35	89.0	88.0	86.0	0.82	0.78	0.70	310	37.0	2.87
22KZ6SR	22.0	30.0	NDW225M	970	42	89.0	88.0	86.0	0.82	0.78	0.70	350	40.0	3.25
30KZ6SR	30.0	40.0	NDW250M	975	56	91.0	90.0	88.0	0.82	0.78	0.70	330	55.0	6.81
37KZ6SR	37.0	50.0	NDW280S	980	67	91.0	90.0	88.0	0.84	0.80	0.72	410	57.0	12.89
45KZ6SR	45.0	60.0	NDW280M	980	80	91.5	91.0	89.0	0.85	0.81	0.73	320	87.0	15.14
55KZ6SR	55.0	75.0	NDW315S	980	98	92.0	91.0	89.0	0.85	0.81	0.73	535	62.0	22.00
75KZ6SR	75.0	100	NDW315M	980	132	93.0	92.0	90.0	0.85	0.81	0.73	470	96.0	24.16
90KZ6SR	90.0	120	NDW315LX	985	169	92.5	92.0	90.0	0.84	0.80	0.70	357	140	24.26
110KZ6SR	110	150	NDW315LX	985	191	93.0	92.0	90.0	0.86	0.82	0.74	410	160	28.00
125KZ6SR	125	175	NDW315LX	985	211	93.8	93.0	91.0	0.88	0.84	0.70	345	214	33.20
132KZ6SR	132	180	NDW315LX	985	222	94.0	93.0	91.0	0.88	0.84	0.70	345	225	33.20
150KZ6SR	150	200	NDW355LX	988	263	94.5	94.0	92.0	0.84	0.78	0.66	400	235	38.20
160KZ6SR	160	215	NDW355LX	988	280	94.5	94.0	92.0	0.84	0.78	0.66	400	250	39.60
180KZ6SR	180	240	NDW355LX	988	315	94.7	94.0	92.0	0.84	0.78	0.66	450	250	44.50
200KZ6SR	200*	270	NDW355LX	988	358	94.7	94.0	92.0	0.82	0.76	0.64	480	260	44.50
225KZ6SR	225	300	NDW400LX	991	397	93.8	93.0	91.0	0.84	0.79	0.70	410	342	76.60
250KZ6SR	250	335	NDW400LX	991	434	94.2	93.5	91.5	0.85	0.80	0.72	475	328	76.60
275KZ6SR	275	370	NDW400LX	992	479	94.0	93.2	91.0	0.85	0.80	0.70	510	336	81.80
315KZ6SR	315*	422	NDW400LX	993	560	94.3	93.5	91.5	0.83	0.78	0.70	570	345	94.60

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



Performance of TEFC Slipping Motors for 45°C / 75°C (8 Pole)

Voltage	415 ±10%	Type	SPDP Slip ring	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
3KZ8SR	3.00	4.00	NDW160M	690	8	80.0	79.0	77.0	0.68	0.64	0.56	230	8.0	0.58
3.7KZ8SR	3.70	5.00	NDW160M	710	9	81.0	80.0	78.0	0.68	0.64	0.56	230	10.0	0.58
5.5KZ8SR	5.50	7.50	NDW160L	710	14	82.0	81.0	79.0	0.68	0.64	0.56	360	10.0	0.80
7.5KZ8SR	7.50	10.0	NDW180L	710	18	84.0	83.0	81.0	0.68	0.64	0.56	350	13.0	1.58
9.3KZ8SR	9.30	12.5	NDW200L	725	22	86.0	85.0	83.0	0.68	0.64	0.76	300	19.5	2.68
11KZ8SR	11.0	15.0	NDW200L	725	26	87.0	86.0	84.0	0.68	0.64	0.56	300	23.0	2.68
15KZ8SR	15.0	20.0	NDW225M	730	34	87.0	86.0	84.0	0.70	0.66	0.58	350	27.0	3.06
18.5KZ8SR	18.5	25.0	NDW225M	730	42	88.0	87.0	85.0	0.70	0.66	0.58	360	32.0	3.63
22KZ8SR	22.0	30.0	NDW250M	730	45	91.0	90.0	88.0	0.74	0.70	0.62	260	52.0	6.81
30KZ8SR	30.0	40.0	NDW280S	735	62	91.0	90.0	88.0	0.74	0.70	0.62	440	43.0	12.89
37KZ8SR	37.0	50.0	NDW280M	735	76	91.0	90.0	88.0	0.74	0.70	0.62	520	45.0	15.14
45KZ8SR	45.0	60.0	NDW315S	735	93	91.0	90.0	88.0	0.74	0.70	0.62	320	88.0	21.66
55KZ8SR	55.0	75.0	NDW315M	735	112	91.0	90.0	88.0	0.75	0.71	0.63	320	108.0	24.16
75KZ8SR	75.0	100	NDW315LX	730	155	91.0	90.0	88.0	0.74	0.67	0.56	357	128.0	28.00
90KZ8SR	90.0	120	NDW315LX	735	185	91.5	90.5	88.0	0.74	0.67	0.56	410	133.0	33.20
110KZ8SR	110	150	NDW355LX	740	224	92.5	92.0	90.0	0.74	0.70	0.60	335	197.0	42.60
125KZ8SR	125	175	NDW355LX	740	261	92.5	91.5	89.0	0.72	0.66	0.54	370	204.0	47.80
132KZ8SR	132	180	NDW355LX	740	268	92.5	91.5	89.0	0.74	0.68	0.56	370	224.0	47.80
150KZ8SR	150	200	NDW355LX	740	292	93.0	92.3	90.5	0.77	0.72	0.60	410	230.0	57.20
160KZ8SR	160	215	NDW355LX	740	311	93.0	92.3	90.5	0.77	0.72	0.60	410	245.0	57.20
180KZ8SR	180	240	NDW400LX	743	357	93.5	92.5	90.0	0.75	0.70	0.58	460	241.0	87.80
200KZ8SR	200	270	NDW400LX	742	385	93.8	92.8	90.5	0.77	0.72	0.60	460	267.0	87.80
225KZ8SR	225	300	NDW400LX	742	444	93.8	92.8	90.5	0.75	0.68	0.56	510	270.0	94.60

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



Performance of SPDP Slipring Motors (4 Pole)

Voltage	415 ±10%	Type	SPDP Slip ring	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP21/23

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
7.5KD4SR	7.50	10.0	CW160M	1410	16	82.0	81.0	79.0	0.82	0.78	0.70	375	12	0.41
9.3KD4SR	9.30	12.5	CW160L	1420	19	83.0	82.0	80.0	0.82	0.78	0.70	380	16	0.53
11KD4SR	11.0	15.0	CW160L	1420	22	84.0	82.0	80.0	0.82	0.78	0.70	390	18	0.53
15KD4SR	15.0	20.0	CW180M	1420	31	83.0	82.0	80.0	0.82	0.78	0.70	390	23	0.53
18.5KD4SR	18.5	25.0	CW180M	1420	36	84.0	83.0	81.0	0.86	0.80	0.72	480	23	0.91
22KD4SR	22.0	30.0	CW180L	1420	42	86.0	85.0	83.0	0.84	0.80	0.72	480	28	1.16
30KD4SR	30.0	40.0	CW200M	1440	57	87.0	86.0	84.0	0.84	0.80	0.72	470	39	1.79
37KD4SR	37.0	50.0	CW200L	1440	70	87.0	86.0	84.0	0.84	0.80	0.72	430	52	2.11
45KD4SR	45.0	60.0	CW225M	1450	82	89.0	88.0	86.0	0.85	0.81	0.73	576	49	2.65
55KD4SR	55.0	75.0	CW225M	1460	102	89.0	88.0	86.0	0.84	0.80	0.72	576	59	2.65
75KD4SR	75.0	100	CW250S	1460	135	90.5	90.0	88.0	0.84	0.80	0.72	505	88	4.77
90KD4SR	90.0	120	CW250MX	1460	158	92.0	91.0	89.0	0.86	0.82	0.74	500	110	7.15
110KD4SR	110	150	CW280M	1455	198	91.0	90.0	88.5	0.85	0.80	0.70	250	275	9.23
132KD4SR	132	175	CW280MX	1460	227	92.0	92.0	91.0	0.88	0.84	0.72	300	275	11.07
160KD4SR	160	215	CW315M	1470	279	94.0	93.5	92.5	0.85	0.80	0.70	420	230	14.64
180KD4SR	180	240	CW315MX	1470	306	93.0	92.5	91.0	0.88	0.85	0.78	465	206	17.43
200KD4SR	200	270	CW315MX	1475	342	93.5	93.0	91.0	0.87	0.84	0.76	580	225	20.91
225KD4SR	225	300	CW315MX	1475	378	94.0	93.5	92.0	0.88	0.85	0.78	580	250	22.20
250KD4SR	250	335	CW355L	1480	440	94.0	93.5	92.0	0.84	0.80	0.72	510	305	28.00

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



Performance of SPDP Slipring Motors (6 Pole)

Voltage	415 ±10%	Type	SPDP Slip ring	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP21/23

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
5.5KD6SR	5.50	7.50	CW160M	935	14	80.0	79.0	77.0	0.72	0.68	0.60	280	13	0.51
7.5KD6SR	7.50	10.0	CW160L	935	17	83.0	82.0	80.0	0.72	0.68	0.60	260	19	0.65
9.3KD6SR	9.30	12.5	CW180M	940	19	83.0	82.0	80.0	0.82	0.78	0.70	300	20	1.14
11KD6SR	11.0	15.0	CW180M	940	23	83.0	82.0	80.0	0.82	0.78	0.70	500	14	1.14
15KD6SR	15.0	20.0	CW180L	945	31	83.0	82.0	80.0	0.82	0.78	0.70	510	18	1.33
18.5KD6SR	18.5	25.0	CW200M	960	38	86.0	85.0	83.0	0.78	0.74	0.66	515	23	2.20
22KD6SR	22.0	30.0	CW200L	965	46	86.0	85.0	83.0	0.78	0.74	0.66	485	28	2.30
30KD6SR	30.0	40.0	CW225M	965	60	88.0	87.0	85.0	0.78	0.74	0.66	536	35	3.35
37KD6SR	37.0	50.0	CW225M	970	74	89.0	88.0	86.0	0.78	0.74	0.66	536	42	3.35
45KD6SR	45.0	60.0	CW250S	970	88	89.0	88.0	86.0	0.80	0.76	0.68	507	53	5.70
55KD6SR	55.0	75.0	CW250M	975	104	90.0	89.0	87.0	0.82	0.78	0.70	515	65	6.66
75KD6SR	75.0	100	CW280S	975	134	91.5	91.0	89.0	0.85	0.81	0.73	300	154	10.09
90KD6SR	90.0	120	CW280M	975	160	92.0	91.0	89.0	0.85	0.81	0.73	360	160	13.44
110KD6SR	110	150	CW315S	973	196	92.0	91.5	90.0	0.85	0.82	0.76	290	250	17.50
132KD6SR	132	175	CW315MX	975	234	92.5	92.0	91.0	0.85	0.82	0.76	345	250	20.83
160KD6SR	160	215	CW315MX	980	299	93.0	92.5	91.0	0.80	0.75	0.68	360	263	26.66
180KD6SR	180	240	CW355L	980	319	93.5	92.5	91.0	0.84	0.79	0.69	425	271	36.30
200KD6SR	200	270	CW355L	975	346	93.5	92.5	91.0	0.86	0.81	0.72	540	238	36.30
225KD6SR	225	300	CW355L	980	396	94.0	93.0	91.0	0.84	0.79	0.69	540	267	38.70
250KD6SR	250	335	CW355L	980	440	94.0	93.0	91.0	0.84	0.80	0.70	450	350	40.70

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



Performance of SPDP Slipring Motors (8 Pole)

Voltage	415 ±10%	Type	SPDP Slip ring	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP21/23

CG PRODUCT CODE	RATED POWER		FRAME SIZE	FL RPM	FLC AMPS	EFFICIENCY			POWER FACTOR			OC ROTOR VOLTS	ROTOR AMPS	GD ² KGM ²
	kW	HP				FL	3/4L	1/2L	FL	3/4L	1/2L			
3.7KD8SR	3.7	5.0	CW160M	700	10	78.0	77.0	75.0	0.68	0.64	0.56	230	9	0.51
5.5KD8SR	5.5	7.5	CW160L	700	14	80.0	79.0	77.0	0.68	0.64	0.56	235	15	0.65
7.5KD8SR	7.5	10.0	CW180M	705	19	82.0	81.0	79.0	0.68	0.64	0.56	350	13	1.14
9.3KD8SR	9.3	12.5	CW180L	705	24	82.0	81.0	79.0	0.68	0.64	0.56	345	17	1.45
11KD8SR	11.0	15.0	CW180L	705	27	82.0	81.0	79.0	0.70	0.66	0.58	345	20	1.45
15KD8SR	15.0	20.0	CW200M	720	35	84.0	83.0	81.0	0.71	0.67	0.59	240	40	2.20
18.5KD8SR	18.5	25.0	CW200L	720	43	84.0	83.0	81.0	0.72	0.68	0.60	235	50	2.20
22KD8SR	22.0	30.0	CW225M	720	49	86.0	85.0	83.0	0.73	0.69	0.61	235	60	3.35
30KD8SR	30.0	40.0	CW225M	720	65	87.0	86.0	84.0	0.74	0.70	0.62	235	80	3.35
37KD8SR	37.0	50.0	CW250S	720	79	89.0	88.0	86.0	0.74	0.70	0.62	465	50	5.70
45KD8SR	45.0	60.0	CW250M	725	95	89.0	88.0	86.0	0.74	0.70	0.62	480	59	6.66
55KD8SR	55.0	75.0	CW280S	730	109	90.0	89.0	87.0	0.78	0.74	0.66	425	79	10.65
75KD8SR	75.0	100.0	CW280M	730	149	90.0	89.0	87.0	0.78	0.74	0.66	535	83	13.44
90KD8SR	90.0	120.0	CW315S	730	180	91.5	91.0	89.0	0.76	0.72	0.64	490	112	19.16
110KD8SR	110.0	150.0	CW315MX	730	218	91.0	91.0	89.0	0.77	0.73	0.65	360	230	21.66
132KD8SR	132.0	175.0	CW355L	740	265	93.5	92.5	90.5	0.74	0.67	0.55	410	200	40.30
160KD8SR	160.0	215.0	CW355L	740	326	93.6	92.7	91.0	0.73	0.66	0.54	490	203	47.80
180KD8SR	180.0	240.0	CW355L	740	361	93.8	93.0	91.5	0.74	0.67	0.55	525	213	51.00
200KD8SR	200.0	270.0	CW355L	740	411	94.0	93.5	92.0	0.72	0.65	0.52	560	222	53.90

FL = Full Load; FLC = Full Load Current; OC = Open Circuit

Note: All Performance figures are subjected to tolerances as per IS 325 - 1996

* Rotor with class F temperature rise

1. For 10P ratings and frame NDW450LX refer to division

2. For Bar wound rotors design, RV/RA will be as per CG standards



8.3 Apex Series Flameproof Area Motor

Apex Series Cast Iron construction motor (Flameproof area)

Range	
Output	0.18 kW to 355 kW
Frames	E80 TO E355
Poles	2,4,6,8
Efficiency	IE2, IE3



Specification	Standard Product	Option
Frame sizes	E80 - E355	-
Enclosure	IP55	IP56, IP65, IP66
Mounting option	Foot(B3)	Flange(B5), Face(B14) up to 132 frame
Terminal box position	RHS	LHS, TOP
Voltage	Upto 3kW 415Vλ	other on request
	Above 415VΔ	
Frequency	50 Hz	60 Hz
Cooling	IC411	IC410
Lubrication	Frame 80 - 225 double-shielded bearings Frame 250 to 355 online greasing	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	CGL Standard 631 (IS-5) - IE1	On request
	Yellow grey (RAL 7034) - IE2	On request
	Water blue (RAL 5021) - IE3	On request
Fan cover	Mild Steel	-
Thermal protection(PTC150)	-	80-355
Anti condensation heaters	-	132-355
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 20°C to + 50°C	- 40°C, up to 60°C

The above specification and options give a brief summary of features available for the Apex series cast iron range.
For a full listing of optional features, please contact CG sales.

**CG Ex'e' and Ex'n' Motors**

Range	
Output	0.18 kW to 355 kW
Frames	ND80 TO ND355 NG80 to NG 132S
Poles	2,4,6,8



Specification	Standard Product	Option
Frame sizes	ND80 to ND355	-
Enclosure	IP55	IP66
Zone	2	
Gas group	IIC	
Mounting	B3	Other per request
Voltage	Up to 3 kW	415A
	Above 3kW	415Δ
Frequency	50Hz	60Hz*
Cooling	IC411	
Insulation	Class F	Class H
Ambient Temperature	-20°C to 45°C	Standard output at different Ambient 45°C 50°C 55°C 60°C 100% 92% 85% 78%
Altitude	<1000	
Efficiency	IE2 as per IEC60034	On request
Approvals	PESO, Karandhikar, ERTL	

*For more details on full specifications please contact CG sales



General Technical Details of Hazardous Area Motors

→ Quality Assurance

Stringent quality procedure is observed from first design to finish product in accordance with international quality systems. All of our manufacturing facilities have accredit with ISO 9001 OHSAS 18001 & ISO 14001 been assessed to meet these requirements, a further assurance that only the highest possible standards of quality are accepted.

→ CG Flameproof Motors

CG has the widest manufacturing range of low voltage motors suitable for hazardous area. These motors are designed to suit the ignitable atmospheres present in hazardous locations such as Zone1, Zone 2. Motors are suitable for various temperature classes & gas groups.

We have technical and design expertise in this very specialize market and are able to ensure the correct selection of motors for any application taking into account of two most important factors to be considered, safety and compliance to various statutory norms of various countries.

CG flame proof motors are designed tested and manufactured in accordance with latest national and international standards, following are the salient features offered:

APEX series motors are designed to have low vibration, noise and high torque with smooth acceleration throughout the life of the motors. These features makes our motors the most preferred choice for various industrial applications.

Salient features:

- Rugged cast iron construction
- Low vibration and noise
- Excellent aesthetics
- Motors are with metallic fan
- Specially designed cooling fins for better heat dissipation
- Rigid foot construction for low vibration
- IP55 protection
- Bigger terminal box for proper termination of cables

Optional features:

- Suitable for operation with VFD
- Motors can be offered with plug and socket
- Specially designed terminal box to accommodate 3 nos of auxiliary boxes
- Encoder and external fan arrangement
- Mild steel enclosure can also be offered as per request temperature range¹ - 20 deg to 60 deg
- Special slip ring flame proof motors for mine application
- Special mine ventilation flame proof motors
- CG Apex series motors are made in the state of the art manufacturing facility with complete in house process die casting, winding, machining, assembly & testing. CG has its own stamping unit where in exclusive CG designed profiles are made
- IP56, IP65, IP66 protection



Certificates/approvals		CG offering		
		Enclosure	Gas group	Range
BASEEFA	Notified agency for testing & certification (for Atex, IECEEx)	Type 'd'	IIA IIB	E80 to E400LX
DGMS	Regulatory body Govt. of India for approvals	Type 'd'	I	E90 to E315L
	of installation of products in mines	Type 'd'	IIA IIB	E80 to E400LX
PESO	Statutory authority Govt. of India for	Type 'd'	IIA IIB IIC	E80 to E400LX
	framing rules/ acts for equipment	Type 'e'	IIA IIB IIC	ND80 to ND/NG355
	used in petroleum /explosive area	Type 'n'	II	ND80 to ND/NG355
BIS	National Standards Body of India, issues licenses	Type 'd'	I IIA IIB	E80 to E400LX

Classification of explosive atmospheres according and IEC

The following standards define areas according to the presence of gas or dust in the atmosphere:

IEC/EN 60079-10-1 Gas
IEC/EN 60079-10-2 Dust

Type of Enclosures

Ex 'd' Flameproof enclosure in accordance with IEC 60079-1

Machines constructed to contain an internal explosion and prevent the transmission of flame to the external Atmosphere.

Operating temperature is such that it cannot ignite any surrounding gases.

Applicable zones: Zone 1 and 2

Ex 'n' Non-sparking in accordance with IEC 60079-15

Machines constructed to contain an internal explosion and prevent the transmission of flame to the external Atmosphere.

Operating temperature is such that it cannot ignite any surrounding gases.

Applicable zones: Zone 1 and 2

Ex 'e' Increased safety in accordance with IEC 60079-7

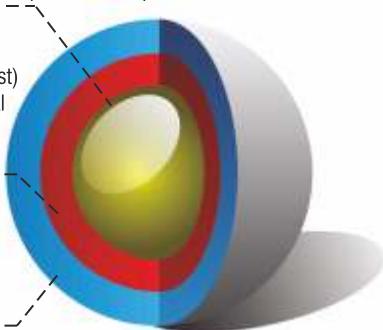
Machines that do not emit dangerous sparks or temperatures when starting or during normal operation. Special additional safety measures are taken.

Applicable zones : Zone 1 and 2

Zone 0 (Gas) / 20 (Dust) Continuously
Permanent presence of explosive atmosphere

Zone 1 (Gas) / 21 (Dust)
Occasionally Incidental
presence of explosive
atmosphere during
normal duty

Zone 2 (Gas) / 22 (Dust)
Abnormal condition
Presence of explosive atmosphere
only by accident, but not during
normal duty



→ Hazardous Area

According to IEC 60079-10 standard, Explosive Atmosphere is a "mixture with air, under atmospheric conditions, of flammable substances is the form of gas, vapors, dust, fibers, or flings which, after ignition, permits self-sustaining propagation. Hazardous Area is "an area in which an explosive atmosphere is or may be expected to be present , in quantities such as to require special precautions for the construction, installation and use of equipment". For this reason, motors with explosion proof protection are built in such a way to not allow the explosion in the hazardous areas, where they are installed. Explosions may occur either due to the transfer of flames or overheating. The hazardous areas are classified per zones, groups and temperature classes, according to the International Electrotechnical Commission (IEC) and National Electrical Committee (NEC).

→ Temperature Classification

A mixture of hazardous gases and air may be ignited by coming with a hot surface. The conditions under which a hot surface will ignite a gas depend on surface area, temperature, and the concentration of the gas. The same can be said about combustible dusts. The T code of a product denotes the maximum surface temperature that a T code of T3 means that is maximum surface temperature will not exceed 200°C provided it is operated in a ambient temperature defined by the manufacturer.



General Technical Details of Hazardous Area Motors

Temp. Class as per IS:3681 and IEC 79-7	Ignition Temperature (°C)	
	Above	Up to and including
T1	450	-
T2	300	450
T3	200	200
T4	135	200
T5	100	135
T6	85	100

If a hazardous gas is present, the equipment used in the installation must be given an appropriate T classification in order to maintain the integrity. If that hazardous gas is, say, hydrogen, then all equipment used must meet the T6 rating. This means that all equipment used must not have a surface temperature of greater than 85°C must not be used as this will then increase the likelihood of an explosion by igniting the hydrogen in the atmosphere.



→ Classification of Hazardous Gases

Hazardous gases have been classified in IS:2148, VDE 0171 & 5572 (Pt 1) and are associated only with flame proof enclosures. These gases are listed in Table 3.

Note: Flame proof motors are offered suitable for Gas Groups I, IIA & IIB only. For gases not mentioned, please refer the relevant Indian Standards

GAS GROUP	GAS OR VAPOUR	TEMP. CLASS.
I	Methane (Firedamp)	T1
II A	Ammonia	T1
	Industrial methane*	T1
	Carbon monoxide	T1
	Propane	T1
	Butane	T2
	Benzene	T1
	Cyclohexane	T2
	Acetone	T1
	Ethyl acetate	T1
	Amyl acetate	T2
	Methanol	T1
	Ethanol	T2
	n-Butanol	T2
II B	1 , 3 - Butadiene	T2
	Ethylene	T2
	Diethyl ether	T4
	Ethylene oxide	T2
	Coke-oven gas	T1
II C	Hydrogen	T1



Standards and Certifications for Hazardous Area Motors



Karandikar Laboratories

IECEx certification mark

TYPE EXAMINATION REPORT
Electrical Equipment for Explosive Atmospheres
01 Report Number: KLPL/EX/16/002X Dated. 5th January 2016

02 Electrical Equipment: AC Squirrel Cage Induction Motor Range Frame sizes: E80 to E355

03 Manufacturer: Crompton Greaves Ltd. (LT Motors Division)

04 Address: 11-A-02, MIDC Industrial Area, Ahmednagar 411111, Maharashtra, India 402 009
21-B-108/109, MIDC Industrial Area, Ahmednagar 411111, Maharashtra, India 402 009
31-B-147/150, MIDC Industrial Estate, Colavane Bawali, Guna-403 513, India.

05 This equipment and any acceptable variations thereof are specified in the schedule to this TE Report and the documents therein referred to.

06 Karandikar Laboratories Pvt. Ltd. certifies that this equipment has been found to comply with the requirements of the following standards relating to the design and construction of electrical apparatus for explosive gas atmospheres. This TE Report was issued as verification that a sample, representative of production, was assessed and tested and found to comply with the IS / IEC standards listed below:

ISIEC 60079-0:2000
ISIEC 60079-11:2000
ISIEC 60079-15:2000

07 The sign X placed after the TE Report number, indicates that the equipment is subject to special conditions of safe use specified in the schedule to this TE Report.

08 The sign Y placed after the TE Report number, indicates that a sample, representative of production, was assessed and tested and found to comply with the IS / IEC standards listed below:

ISIEC 60079-0:2007
ISIEC 60079-1:2008
ISIEC 60079-15:2008

09 The Evaluation and Test results are recorded in KLPL's confidential report No. KLPL/EX/COIN-15/001 Dated 5th January 2015.

10 The sign Y placed after the TE Report number, indicates that the equipment is subject to special conditions of safe use specified in the schedule to this TE Report.

11 This TE Report does not indicate compliance with electrical safety and performance requirements other than those expressly included in the above listed standards.

12 The marking of the Equipment shall include the following:
*Ex tb IIC T^{**}C D A IP 66 (-20°C ≤ Ta ≤ +60°C)*
(** Refer Table 2 on page 5 of 7)

R.K. Paranjape - Director

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Karandikar Laboratories

IECEx certification mark

TYPE EXAMINATION REPORT
Electrical Equipment for Explosive Atmospheres
01 Report Number: KLPL/EX/15-003X Dated. 5th January 2015

02 Electrical Equipment: AC Squirrel Cage Induction Motor Range Frame size: 80 to 355

03 Manufacturer: Crompton Greaves Ltd. (LT Motors Division)

04 Address: 11-A-02, MIDC Industrial Area, Ahmednagar 411111, Maharashtra, India 402 009
21-B-108/109, MIDC Industrial Area, Ahmednagar 411111, Maharashtra, India 402 009
31-B-147/150, MIDC Industrial Estate, Colavane Bawali, Guna-403 513, India.

05 This equipment and any acceptable variations thereof are specified in the schedule to this TE Report and the documents therein referred to.

06 Karandikar Laboratories Pvt. Ltd. certifies that this equipment has been found to comply with the requirements of the following standards relating to the design and construction of electrical apparatus for explosive gas atmospheres. This TE Report was issued as verification that a sample, representative of production, was assessed and tested and found to comply with the IS / IEC standards listed below:

ISIEC 60079-0:2007
ISIEC 60079-1:2008
ISIEC 60079-15:2008

07 The Evaluation and Test results are recorded in KLPL's confidential report No. KLPL/EX/COIN-15/001 Dated 5th January 2015.

08 The sign Y placed after the TE Report number, indicates that the equipment is subject to special conditions of safe use specified in the schedule to this TE Report.

09 This TE Report does not indicate compliance with electrical safety and performance requirements other than those expressly included in the above listed standards.

10 The marking of the Equipment shall include the following:
*Ex tb IIC T^{**}C D A IP 66 (-20°C ≤ Ta ≤ +60°C)*
(** Refer Table 2 on page 5 of 6)

R.K. Paranjape - Director

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SGS Baseefa

IECEx certification mark

Certificate Number
Baseefa15ATEX0150X

Issued 29 October 2015
Page 1 of 6

1 TYPE EXAMINATION CERTIFICATE
Equipment Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

2 Type Examination Certificate Baseefa15ATEX0150X

3 Equipment: A Range of Induction Motors of Frame Size 80 to 355

4 Manufacturer: Crompton Greaves Limited

5 Address: LT Motors Division, A-42, MLD.C. Ahmednagar 411 111, India

6 This equipment and any acceptable variation thereof is specified in the schedule to this certificate and the documents therein referred to.

7 Baseefa certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment of Category 3 intended for use in potentially explosive atmospheres as given in Annex II to European Directive 94/9/EC of 23 March 1994.

The examination was conducted in accordance with the International Report No.

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN60079-0:2012 + A11:2013 EN60079-15:2010
except in respect of those requirements listed in item 18 of the Schedule.

10 If the sign X is placed after the certificate number, it indicates that the equipment is subject to special conditions as specified in the schedule to this certificate.

11 This TYPE EXAMINATION CERTIFICATE relates only to the design of the specified equipment and not to specific items of equipment subsequently manufactured.

12 The marking of the equipment shall include the following:
Ex II 3G Ex nA IIC T3 Gc Ta = -20°C to +60°C IP66

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Registered in England No. 430176
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On behalf of SGS Baseefa Limited





Standards and Certifications for Hazardous Area Motors

IECEx Certificate of Conformity

**INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres**
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx BAS 14.0141X	Issue No.:	Certificate history:
Status:	Current		
Date of Issue:	2014-01-07 Page 1 of 3		
Applicant:	Crompton Greaves Limited LT Motors Division A-62, M.I.D.C Ahmednagar 414111 Maharashtra India		
Electrical Apparatus:	The E80 to E132 Squirrel Cage Induction Motors		
Optional accessory:			
Type of Protection:	Flameproof		
Marking:	Ex db IIC T ⁴ Gb IP66 (-20°C ≤ Ta ≤ +***C) – See schedule * ^{**}		
Approved for issue on behalf of the IECEx	R. S. Sinclair		
Certification Body:			
Position:	Technical Manager		
Signature: (for printed version)			
Date:			

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

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SK17 9RZ
United Kingdom

SGS Baseefa

IECEx Certificate of Conformity

**INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres**
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx BAS 14.0155X	Issue No.:	Certificate history:
Status:	Current		
Date of Issue:	2014-01-07 Page 1 of 3		
Applicant:	Crompton Greaves Limited LT Motors Division A-62, M.I.D.C Ahmednagar 414111 Maharashtra India		
Electrical Apparatus:	The E160 to E200 Squirrel Cage Induction Motors		
Optional accessory:			
Type of Protection:	Flameproof		
Marking:	Ex db IIC T ⁴ Gb IP66 (-20°C ≤ Ta ≤ +***C) – See schedule * ^{**}		
Approved for issue on behalf of the IECEx	R. S. Sinclair		
Certification Body:			
Position:	Technical Manager		
Signature: (for printed version)			
Date:			

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:
SGS Baseefa Limited
Rockhead Business Park
Staden Lane
Buxton
Derbyshire
SK17 9RZ
United Kingdom

SGS Baseefa

IECEx Certificate of Conformity

**INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres**
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx BAS 14.0156X	Issue No.:	Certificate history:
Status:	Current		
Date of Issue:	2014-01-07 Page 1 of 3		
Applicant:	Crompton Greaves Limited LT Motors Division A-62, M.I.D.C Ahmednagar 414111 Maharashtra India		
Electrical Apparatus:	The E225 to E315 Squirrel Cage Induction Motors		
Optional accessory:			
Type of Protection:	Flameproof		
Marking:	Ex db IIC T ⁴ Gb IP66 (-20°C ≤ Ta ≤ +***C) – See schedule * ^{**}		
Approved for issue on behalf of the IECEx	R. S. Sinclair		
Certification Body:			
Position:	Technical Manager		
Signature: (for printed version)			
Date:			

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IECEx Certificate of Conformity

**INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres**
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.:	IECEx BAS 14.0157X	Issue No.:	Certificate history:
Status:	Current		
Date of Issue:	2014-01-07 Page 1 of 3		
Applicant:	Crompton Greaves Limited LT Motors Division A-62, M.I.D.C Ahmednagar 414111 Maharashtra India		
Electrical Apparatus:	The E355 Squirrel Cage Induction Motor		
Optional accessory:			
Type of Protection:	Flameproof		
Marking:	Ex db IIC T ⁴ Gb IP66 (-20°C ≤ Ta ≤ +***C) – See schedule * ^{**}		
Approved for issue on behalf of the IECEx	R. S. Sinclair		
Certification Body:			
Position:	Technical Manager		
Signature: (for printed version)			
Date:			

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Certificate issued by:
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Rockhead Business Park
Staden Lane
Buxton
Derbyshire
SK17 9RZ
United Kingdom

SGS Baseefa



Standards and Certifications for Hazardous Area Motors

IECEx Certificate of Conformity

Certificate No.: IECEx BAS 06.0050X
Date of Issue: 2013-10-08 Issue No.: 1
Page 2 of 4

Manufacturer: Crompton Greaves Limited
LT Motors Division
A-62, M.I.D.C.
Ahmednagar 414 111
Maharashtra
India

Additional Manufacturing location (s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Explosive atmospheres - Part 0: General requirements
Edition: 6.0
IEC 60079-1 : 2007-04 Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
Edition: 6

This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report: GB/BAS/ExTR06.0069/00 GB/BAS/ExTR13.0194/00

Quality Assessment Report: GB/BAS/QAR06.0031/04

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx BAS 06.0050X Issue No.: 1
Status: Current
Date of Issue: 2013-10-08 Page 1 of 4

Applicant: Crompton Greaves Limited
LT Motors Division
A-62, M.I.D.C.
Ahmednagar 414 111
Maharashtra
India

Electrical Apparatus: Range of A.C. Induction Motors Frames: E100 to E200
Optional accessory:

Type of Protection: Flameproof

Marking: Ex d IIIB T₄ Gb (-20°C < Ta ≤ +40°C) (*See annex)

Approved for issue on behalf of the IECEx Certification Body: P R S Sinclair

Position: General Manager

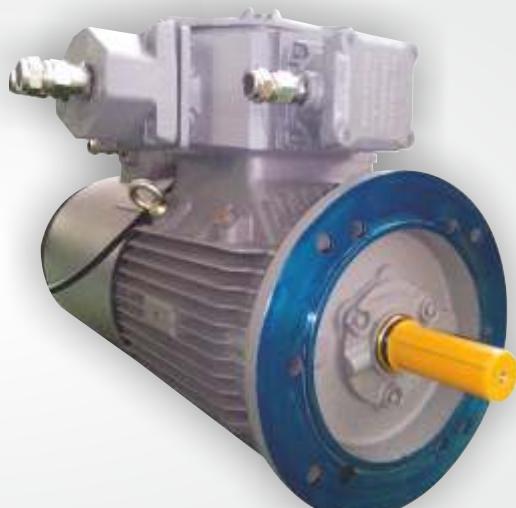
Signature:
(For printed version)

Date: 2013-10-08

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3. The status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by: SGS Baseefa Limited
Rockfield Business Park
Staden Lane
Buxton
Derbyshire
SK17 9RZ
United Kingdom

SGS





Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE2 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT			FULL LOAD CURRENT FL (AMP)			FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
kW	HP	FRAME	380V	IN 400V	415V	RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L	STT %FLT	SCC %FLT		
2 POLE : 3000 RPM																	
0.37	0.50	E80	0.9	0.9	0.9	2880	0.125	72.2	72	65	0.82	0.8	0.7	250	600	300	0.003
0.55	0.75	E80	1.4	1.3	1.3	2870	0.187	75.0	75	72	0.8	0.74	0.7	225	600	275	0.003
0.75	1.00	E80	1.8	1.7	1.64	2870	0.264	77.4	77	74	0.82	0.75	0.65	200	600	250	0.004
1.1	1.50	E90L	2.6	2.4	2.3	2875	0.373	79.6	79.6	77	0.84	0.75	0.62	325	650	350	0.010
1.5	2.00	E90L	3.4	3.2	3.1	2875	0.51	81.3	81.3	80	0.88	0.84	0.75	250	650	300	0.01
2.2	3.00	E90L	5.2	4.9	4.7	2900	0.74	83.2	83	79	0.78	0.71	0.61	300	700	350	0.01
3	4.00	E100L	6.1	5.8	5.6	2900	1.01	84.6	84.6	82.0	0.88	0.84	0.78	225	650	275	0.03
3.7	5.00	E100L	7.8	7.4	7.2	2890	1.2	87.0	87.0	85	0.84	0.8	0.72	250	650	300	0.03
4	5.50	E112M	8.0	7.6	7.4	2910	1.3	85.8	85.8	84	0.88	0.84	0.75	225	700	275	0.04
5.5	7.50	E132M	11	10	10	2910	1.8	87.0	87	85	0.88	0.84	0.8	200	650	250	0.10
7.5	10.00	E132M	15	14	14	2920	2.5	88.1	88.1	85	0.87	0.82	0.70	225	650	225	0.11
9.3	12.50	E160L	18	17	17	2920	3.1	88.8	88.8	86.0	0.88	0.85	0.81	250	650	300	0.14
11	15.00	E160L	21	20	19	2925	3.7	89.4	89.4	87.0	0.9	0.86	0.82	225	700	275	0.17
15	20.00	E160L	29	27	26	2920	5.0	90.3	90.3	89.0	0.88	0.85	0.78	250	700	300	0.17
18.5	25.00	E160L	35	33	32	2920	6.2	90.9	90.9	90.9	0.88	0.85	0.8	200	700	300	0.21
22	30.00	E180L	41	39	38	2920	7.3	91.3	91.3	90.5	0.89	0.85	0.77	250	700	300	0.44
30	40.00	E200L	56	53	51	2950	9.9	92.0	92.0	91.0	0.87	0.86	0.84	200	600	250	0.78
37	50.00	E200L	69	66	63	2945	12.2	92.5	92.5	92.0	0.88	0.86	0.81	160	650	200	0.78
45	60.00	E225M	87	82	79	2960	14.8	92.9	92.6	91.5	0.85	0.8	0.78	200	700	250	1.87
55	75.00	E250M	97	93	89	2975	18.0	93.2	93	92.0	0.92	0.88	0.84	250	700	300	3.40
75	100.00	E280M	132	125	121	2975	24.5	93.8	93	91.5	0.92	0.88	0.84	200	700	250	6.65
90	120.00	E280M	155	147	142	2975	29.5	94.1	94	92.1	0.94	0.9	0.82	175	650	225	6.65
110	150.00	E315M	199	189	182	2980	35.9	94.3	94.3	93	0.89	0.85	0.81	200	700	250	13.31
132	180.00	E315M	236	224	216	2970	43.3	94.6	94	93	0.9	0.88	0.85	175	600	225	13.31
160	215.00	E315L	288	274	264	2977	52.3	94.8	94.6	94	0.89	0.85	0.81	200	700	250	14.75
180	240.00	E315L	320	304	293	2977	58.9	95.0	95	94	0.9	0.85	0.81	200	700	250	16.37
200	270.00	E315L	348	330	318	2980	65.3	95.0	95	93.8	0.92	0.9	0.87	200	750	250	16.37
225	300	E355LX	395	376	362	2980	98.1	95.0	94.6	94.2	0.91	0.88	0.84	160	650	225	16.370
250	335	E355LX	444	422	407	2980	109.5	95.0	94.8	94.2	0.90	0.88	0.84	150	650	225	18.350
275	370	E355LX	494	469	452	2980	120.9	95.0	94.8	94.2	0.89	0.86	0.82	200	650	250	18.350

FL = Full Load; FLC = Full Load Current; FLT = Full Load Torque
SGT. T = Starting Torque; SGT. C = Starting Current

* Performance is subject to IEC/IS tolerances
Full load current indicated are given for respective voltage designs



Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE2 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT			FULL LOAD CURRENT FL (AMP)			FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
KW	HP	FRAME	380V	IN 400V	415V	RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L	STT %FLT	SCC %FLT		
4 POLE : 1500 RPM																	
0.37	0.5	E80	1.0	1.0	0.9	1430	0.252	75.0	72	70	0.73	0.66	0.6	175	500	225	0.004
0.55	0.8	E80	1.5	1.4	1.3	1420	0.377	77.0	77	77	0.74	0.67	0.55	200	500	250	0.007
0.75	1.0	E80	2.0	1.9	1.8	1415	0.518	79.6	79	78	0.73	0.66	0.55	200	500	250	0.007
1.1	1.5	E90L	2.8	2.7	2.6	1435	0.749	81.4	81.4	81.4	0.73	0.67	0.52	200	600	250	0.022
1.5	2.0	E90L	3.9	3.7	3.6	1445	1.021	82.8	80.0	80	0.7	0.65	0.54	200	600	250	0.022
2.2	3.0	E100L	5.1	4.8	4.7	1445	1.477	84.3	84.3	83	0.84	0.7	0.6	200	600	250	0.047
3.7	5.0	E112M	8.4	7.9	7.6	1450	2.5	86.3	86.3	84	0.78	0.74	0.66	200	600	250	0.090
5.5	7.5	E132M	11	11	10	1465	3.7	87.7	87.7	86	0.85	0.8	0.75	200	650	250	0.26
7.5	10.0	E132M	15	15	14	1457	5.0	88.7	88.7	87.2	0.83	0.77	0.66	225	650	275	0.26
9.3	12.5	E160L	19	18	17	1470	6.2	89.3	89.3	88.0	0.85	0.8	0.7	200	600	225	0.39
11	15.0	E160L	22	21	20	1470	7.3	89.8	89.8	88.5	0.86	0.81	0.72	225	700	275	0.45
15	20.0	E160L	31	30	29	1465	10.0	90.6	90.6	90	0.8	0.72	0.61	200	650	250	0.48
18.5	25.0	E180L	35	33	32	1475	12.3	91.2	91.2	90.5	0.89	0.86	0.8	200	600	250	0.81
22	30.0	E180L	42	40	39	1470	14.6	91.6	91.6	89	0.86	0.82	0.75	225	600	275	0.85
30	40.0	E200L	57	55	53	1475	19.8	92.3	92.3	92	0.86	0.82	0.76	200	650	250	1.62
37	50.0	E225S	74	70	68	1470	24.5	92.7	92.7	92	0.82	0.75	0.72	200	600	250	2.70
45	60.0	E225M	82	78	79	1475	29.7	93.1	93.1	92.8	0.85	0.82	0.75	225	650	275	3.13
55	75.0	E250M	102	96	93	1485	36.2	93.5	93.5	93.0	0.88	0.84	0.8	225	600	275	6.28
75	100.0	E280M	133	127	122	1485	49.2	94.0	94.0	93.0	0.91	0.88	0.84	200	650	250	11.6
90	120.0	E280M	165	157	151	1490	59.0	94.2	94.2	94	0.88	0.84	0.8	200	700	250	11.6
110	150.0	E315M	194	185	178	1488	72.0	94.5	94.5	93.5	0.91	0.88	0.82	200	600	250	20.3
132	180.0	E315M	235	224	215	1490	86.2	94.7	94	93.0	0.9	0.86	0.8	180	650	225	20.3
160	215.0	E315L	281	267	258	1488	104.7	94.9	94.9	94.1	0.91	0.88	0.85	200	650	250	26.6
180	240.0	E315L	316	301	290	1488	117.8	95	95	94.5	0.91	0.89	0.86	200	700	250	26.6
200	270.0	E315L	347	330	318	1489	130.8	95.1	95.1	94.7	0.92	0.9	0.86	200	700	250	28.0
225	300.0	E355LX	399	379	366	1490	196.1	95.1	95.1	94.3	0.90	0.88	0.80	150	600	225	29.600
250	335.0	E355LX	444	422	406	1490	219.0	95.1	95.1	93.5	0.90	0.86	0.80	160	600	225	30.000
275	370.0	E355LX	478	454	437	1485	242.7	95.1	95.1	93.1	0.92	0.80	0.80	175	700	225	32.000

FL = Full Load; FLC = Full Load Current; FLT = Full Load Torque
SGT. T = Starting Torque; SGT. C = Starting Current

* Performance is subject to IEC/IS tolerances
Full load current indicated are given for respective voltage designs



Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE2 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT		FRAME	FULL LOAD CURRENT FL (AMP)			FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
			380V	IN 400V	415V			RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L	STT %FLT	SCC %FLT
6 POLE : 1000 RPM																	
0.75	1.00	E90L	2.3	2.2	2.1	940	1.0	75.9	73.5	70	0.65	0.56	0.48	175	500	225	0.020
1.1	1.50	E90L	3.1	2.9	2.8	925	1.6	78.1	77.5	76	0.69	0.62	0.54	200	500	250	0.024
1.5	2.00	E100L	4.4	4.2	4.0	945	2.1	79.8	79.0	77	0.74	0.65	0.56	200	500	250	0.054
2.2	3.00	E112M	5.8	5.5	5.3	960	3.0	81.8	80.8	78.8	0.7	0.66	0.56	175	500	225	0.069
3.7	5.00	E132M	8.1	7.7	7.4	965	5.1	84.3	84.3	83	0.82	0.76	0.64	175	550	250	0.185
5.5	7.50	E132M	13	12	11.9	965	7.6	86	86	85	0.75	0.7	0.6	175	550	250	0.400
7.5	10.00	E160L	16	15	14	975	10.0	87.2	87	87	0.84	0.76	0.64	225	600	275	0.460
11	15.00	E160L	22	21	21	975	15.0	88.7	88.7	87	0.84	0.75	0.65	200	600	250	0.590
15	20.00	E180L	33	31	30	980	20.0	89.7	89.5	89	0.80	0.74	0.63	225	600	250	0.640
18.5	25.00	E200L	37	35	34	975	25.0	90.4	90.4	89.2	0.84	0.8	0.72	200	600	250	1.160
22	30.00	E200L	44	42	40	975	30.0	90.9	90.5	89	0.84	0.8	0.7	200	550	250	1.690
30	40.00	E225M	58	56	54	980	39.8	91.7	91.7	91	0.85	0.81	0.73	200	600	250	2.040
37	50.00	E250M	73	69	66	985	49.9	92.2	92.2	90.5	0.84	0.8	0.78	200	600	250	3.610
45	60.00	E280M	90	85	82	988	59.1	92.7	92.7	92	0.82	0.78	0.7	200	650	250	4.820
55	75.00	E280M	111	105	101	990	73.8	93.1	93.1	92.2	0.81	0.78	0.74	200	700	250	8.010
75	100.00	E315M	141	134	129	990	98.4	93.7	93.2	91	0.86	0.82	0.74	160	600	200	9.890
90	120.00	E315M	169	161	155	990	118.1	94	93.5	91.8	0.86	0.82	0.74	175	600	225	14.120
110	150.00	E315L	206	196	189	985	148.3	94.3	94.3	92.3	0.86	0.82	0.74	175	600	225	17.000
132	180.00	E315L	247	234	226	990	177.1	94.6	94.6	93.6	0.86	0.82	0.74	200	600	250	18.980
160	215.00	E315L	298	283	273	990	211.5	94.8	94.8	92	0.86	0.82	0.74	200	600	250	20.740
180	240.00	E355L	331	315	303	990	236.1	94.9	94.9	94.5	0.87	0.85	0.78	175	600	250	21.900
200	270.00	E355L	376	357	345	990	265.6	95.0	95.0	94.5	0.85	0.81	0.75	130.00	600	225	23.22

FL = Full Load; FLC = Full Load Current; FLT = Full Load Torque
SGT. T = Starting Torque; SGT. C = Starting Current

* Tolerances are applicable as per IEC 60034-1 : 2004
Full load current indicated are given for respective voltage designs



Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE3 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT		FRAME	FULL LOAD CURRENT FL (AMP)			FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
			kW	HP	380V			IN 400V	415V	RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L
2 POLE : 3000 RPM																	
0.75	1.00	E80	1.7	1.7	1.6	2825	0.26	80.7	80.7	80.0	0.87	0.83	0.77	250	600	300	0.000
1.10	1.50	E90L	2.5	2.3	2.2	2890	0.37	82.7	82.7	82.0	0.82	0.76	0.63	325	650	375	0.010
1.50	2.00	E90L	3.2	3.0	2.9	2890	0.51	84.2	84.2	83.5	0.85	0.80	0.75	250	650	300	0.014
2.20	3.00	E90L	4.8	4.6	4.4	2910	0.74	85.9	85.3	83.1	0.81	0.73	0.61	300	700	350	0.014
3.00	4.00	E100L	5.9	5.6	5.4	2910	1.00	87.1	87.1	87	0.88	0.85	0.78	225	650	275	0.028
3.70	5.00	E100L	7.5	7.2	6.9	2890	1.25	87.8	88.10	88.10	0.85	0.82	0.74	250	650	300	0.028
4.00	5.50	E112M	7.8	7.4	7.2	2915	1.34	88.1	88.1	87.6	0.88	0.84	0.75	225	700	275	0.044
5.50	7.50	E132M	10.6	10.1	9.7	2925	1.83	89.2	89.2	89.2	0.88	0.85	0.80	200	600	250	0.117
7.50	10.00	E132M	14.7	14.0	13.5	2920	2.50	90.1	90.1	90.1	0.86	0.84	0.78	250	650	300	0.117
9.30	12.50	E160L	18	17	16	2925	3.10	90.7	90.7	90.0	0.88	0.85	0.81	225	750	275	0.136
11.00	15.00	E160L	20	19	19	2925	3.66	91.2	91.2	91	0.9	0.86	0.82	225	700	275	0.170
15.00	20.00	E160L	28	27	26	2920	5.00	91.9	91.9	90.5	0.88	0.86	0.80	250	700	300	0.170
18.50	25.00	E160L	35	33	32	2920	6.17	92.4	92.4	91.4	0.88	0.85	0.8	275	700	350	0.383
22.00	30.00	E180L	41	39	38	2940	7.29	92.7	92.7	91.5	0.87	0.83	0.77	250	600	300	0.436
30.00	40.00	E200L	55	52	50	2945	9.92	93.3	93.3	92.4	0.89	0.86	0.82	180	700	225	0.440
37.00	50.00	E200L	68	65	62	2945	21.24	93.7	93.5	92.7	0.88	0.86	0.81	160	650	200	3.400
45.00	60.00	E225M	86	81	78	2965	41.81	94	94	93.5	0.93	0.91	0.85	225	700	275	6.650
55.00	75.00	E250M	96	92	88	2970	81.04	94.3	94.3	93	0.92	0.88	0.84	250	700	300	6.650
75.00	100.00	E280M	131	124	120	2975	24.55	94.7	94.5	93.2	0.92	0.88	0.84	200	650	250	6.650
90.00	120.00	E280M	156	149	143	2975	29.47	95	94.9	93	0.94	0.94	0.82	175	600	225	13.310
110.00	150.00	E315M	197	187	181	2980	35.95	95.2	95.2	93.8	0.89	0.87	0.81	250	750	300	10.029
132.00	180.00	E315M	234	222	214	2980	43.14	95.4	95.4	94.8	0.9	0.88	0.85	225	650	275	10.029
160.00	215.00	E315L	283	268	259	2977	52.35	95.6	95.6	95	0.9	0.88	0.86	200	700	250	12.333
180.00	240.00	E315L	318	302	291	2977	58.89	95.7	95.5	95	0.9	0.85	0.81	200	650	250	12.333
200.00	270.00	E315L	345	328	316	2980	65.37	95.8	95.8	95	0.92	0.9	0.87	200	700	250	12.333
225.00	300.00	E355LX	392	373	359	2980	73.54	95.8	94.8	93.3	0.91	0.88	0.84	160	650	225	19.617
250.00	335.00	E355LX	441	419	403	2980	81.71	95.8	95.5	94.5	0.9	0.88	0.84	150	650	225	19.617
275.00	370.00	E355LX	490	466	449	2980	89.88	95.8	95.5	94.5	0.89	0.86	0.82	175	650	225	27.700

Note:

FL= Full Load; FLC= Full Load Current; FLT= Full Load Torque

SGT= Starting Torque; SGTC= Starting Current

* Performance is subject to IEC/IS tolerances

Full Load current indicated is given for respective voltage designs



Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE3 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT			FULL LOAD CURRENT FL (AMP)			FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
KW	HP	FRAME	380V	IN 400V	415V	RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L	STT %FLT	SCC %FLT		
4 POLE : 1500 RPM																	
0.75	1.00	E80	1.9	1.8	1.7	1425	0.52	82.5	82.5	81.0	0.73	0.68	0.55	225	500	325	0.010
1.10	1.50	E90L	2.7	2.6	2.5	1430	0.75	84.1	84.1	83.5	0.73	0.67	0.52	200	600	250	0.022
1.50	2.00	E90L	3.7	3.5	3.4	1440	1.01	85.3	85.3	84	0.72	0.65	0.54	200	600	250	0.022
2.20	3.00	E100L	4.9	4.7	4.5	1450	1.48	86.7	86.7	86	0.78	0.70	0.60	180	600	230	0.047
3.70	5.00	E112M	8.2	7.7	7.5	1450	2.49	88.4	88.4	88.2	0.78	0.74	0.62	200	600	250	0.264
5.50	7.50	E132M	10.8	10.3	9.9	1465	3.66	89.6	89.6	89.6	0.86	0.80	0.75	200	650	250	0.264
7.50	10.00	E132M	15.2	14.4	13.9	1457	5.01	90.4	90.4	90	0.83	0.77	0.66	225	650	275	0.260
9.30	12.50	E160L	18	17	16	1470	6.16	91	91	90	0.87	0.84	0.74	175	700	225	0.448
11.00	15.00	E160L	22	21	20	1470	7.29	91.4	91.4	91	0.83	0.78	0.70	250	600	300	0.448
15.00	20.00	E160L	30	29	28	1465	9.97	92.1	92.1	91.5	0.83	0.78	0.70	200	600	250	0.480
18.50	25.00	E180L	36	34	33	1470	12.26	92.6	92.6	92	0.85	0.80	0.75	200	600	250	0.925
22.00	30.00	E180L	42	40	39	1470	14.58	93	93	92.4	0.85	0.80	0.75	225	600	275	0.925
30.00	40.00	E200L	58	55	53	1470	19.88	93.6	93.6	93	0.83	0.81	0.72	200	600	250	1.793
37.00	50.00	E225S	73	69	67	1475	24.52	93.9	93.9	93	0.83	0.73	0.70	225	700	275	2.700
45.00	60.00	E225M	87	83	80	1475	29.72	94.2	94.2	93.5	0.83	0.82	0.80	250	700	300	3.130
55.00	75.00	E250M	100	95	92	1480	36.20	94.6	94.6	94	0.88	0.84	0.80	225	600	275	6.282
75.00	100.00	E280M	132	125	121	1485	49.19	95	94.6	94	0.91	0.88	0.84	200	650	250	11.622
90.00	120.00	E280M	163	155	149	1488	58.91	95.2	95.2	94.6	0.88	0.84	0.80	200	650	250	11.622
110.00	150.00	E315M	193	183	176	1490	71.91	95.4	95.4	94.8	0.91	0.88	0.82	200	650	250	20.308
132.00	180.00	E315M	233	221	213	1490	86.29	95.6	95.6	94.8	0.90	0.86	0.80	180	650	225	20.310
160.00	215.00	E315L	279	265	255	1488	104.73	95.8	95.8	95	0.91	0.88	0.85	200	650	250	26.068
180.00	240.00	E315L	313	298	287	1488	117.82	95.9	95.9	95.2	0.91	0.88	0.85	225	700	275	24.970
200.00	270.00	E315L	344	327	315	1489	130.83	96	96	95.3	0.92	0.90	0.86	200	700	250	27.990
225.00	300.00	E355LX	396	376	362	1490	147.08	96	96	95.5	0.90	0.88	0.84	150	600	225	28.000
250.00	335.00	E355LX	440	418	403	1490	163.42	96	96	95.5	0.90	0.86	0.81	180	800	225	29.600
275.00	370.00	E355LX	473	449	433	1485	180.37	96	96	95.5	0.92	0.88	0.84	175	700	225	31.600

Note:

FL= Full Load; FLC= Full Load Current; FLT= Full Load Torque

SGT= Starting Torque; SGTC= Starting Current

* Performance is subject to IEC/IS tolerances

Full Load current indicated is given for respective voltage designs



Performance Data for Apex Series Motors (Flameproof)
Efficiency Values Complying to IE3 Class of IEC60034-30:2014



Voltage	415 ±10%	Type	Squirrel cage (SCR)	Ambient	45 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	75 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55

OUTPUT			FULL LOAD CURRENT FL (AMP)				FL	FLT	EFFICIENCY			POWER FACTOR			D.D.L STARTING		POT %FLT	GD ² KGM ²
kW	HP	FRAME	380V	IN 400V	415V	RPM	Kg -m	FL	3/4L	1/2L	FL	3/4L	1/2L	STT %FLT	SCC %FLT			
6 POLE : 1000 RPM																		
0.75	1.00	E90L	2.2	2.1	2.0	940	0.78	78.9	78.9	78.8	0.65	0.56	0.48	175	500	225	0.022	
1.10	1.50	E90L	3.0	2.8	2.7	935	1.15	81	80.2	78.4	0.69	0.60	0.47	180	500	230	0.030	
1.50	2.00	E100L	3.9	3.7	3.6	945	1.55	82.5	82.5	81.25	0.70	0.60	0.50	200	500	250	0.131	
2.20	3.00	E112M	5.7	5.4	5.2	960	2.23	84.3	84.3	84	0.70	0.66	0.56	200	550	250	0.108	
3.70	5.00	E132M	7.9	7.5	7.3	965	3.73	86.5	86.5	86	0.82	0.78	0.66	175	550	225	0.282	
5.50	7.50	E132M	12.2	11.6	11.1	960	5.58	88	87.5	87	0.78	0.72	0.62	175	550	225	0.330	
7.50	10.00	E160L	15	14	14	975	7.49	89.1	89.1	88.5	0.84	0.76	0.64	225	600	275	0.498	
11.00	15.00	E160L	23	22	21	975	10.99	90.3	90.3	90	0.80	0.75	0.65	200	600	250	0.640	
15.00	20.00	E180L	32	30	29	980	14.98	91.2	91.2	91	0.83	0.77	0.66	225	600	275	1.160	
18.50	25.00	E200L	36	35	33	975	18.48	91.7	91.7	90.8	0.84	0.80	0.72	200	600	250	1.690	
22.00	30.00	E200L	43	41	40	975	21.98	92.2	92.2	91	0.84	0.80	0.70	200	550	250	2.040	
30.00	40.00	E225M	61	58	56	980	29.82	92.9	92.9	91.5	0.80	0.77	0.72	200	600	250	3.700	
37.00	50.00	E250M	70	67	64	980	36.77	93.3	93.3	92.3	0.86	0.82	0.78	200	600	250	7.510	
45.00	60.00	E280M	87	83	80	988	44.36	93.7	93.7	93	0.84	0.80	0.74	200	650	250	14.124	
55.00	75.00	E280M	106	100	97	990	54.11	94.1	94.1	93.8	0.84	0.80	0.74	200	600	250	14.124	
75.00	100.00	E315M	140	133	128	990	73.79	94.6	94.6	94.0	0.86	0.82	0.74	160	600	200	24.200	
90.00	120.00	E315M	168	159	153	990	88.55	94.9	94.9	94.0	0.86	0.82	0.74	225	600	275	24.272	
110.00	150.00	E315L	200	190	183	990	108.77	95.1	95.0	95.0	0.88	0.86	0.84	175	600	225	29.851	
132.00	180.00	E315L	239	227	219	990	129.87	95.4	95.4	95.0	0.86	0.82	0.74	175	600	250	29.851	
160.00	240.00	E355LX	296	281	271	990	157.41	95.6	95.6	95.0	0.86	0.82	0.74	200	600	250	35.600	
180.00	240.00	E355LX	328	312	301	985	177.99	95.7	95.5	95.0	0.87	0.85	0.78	150	600	200	45.594	
200.00	270.00	E355LX	373	355	342	985	197.77	95.8	95.5	94.5	0.85	0.81	0.75	130	600	225	45.594	
225.00	300.00	E355LX	410	390	376	990	221.36	95.8	95.8	94.8	0.87	0.85	0.78	175	600	225	49.358	
250.00	335.00	E355LX	449	427	411	990	245.96	95.8	95.8	94.8	0.88	0.87	0.80	175	600	225	49.358	

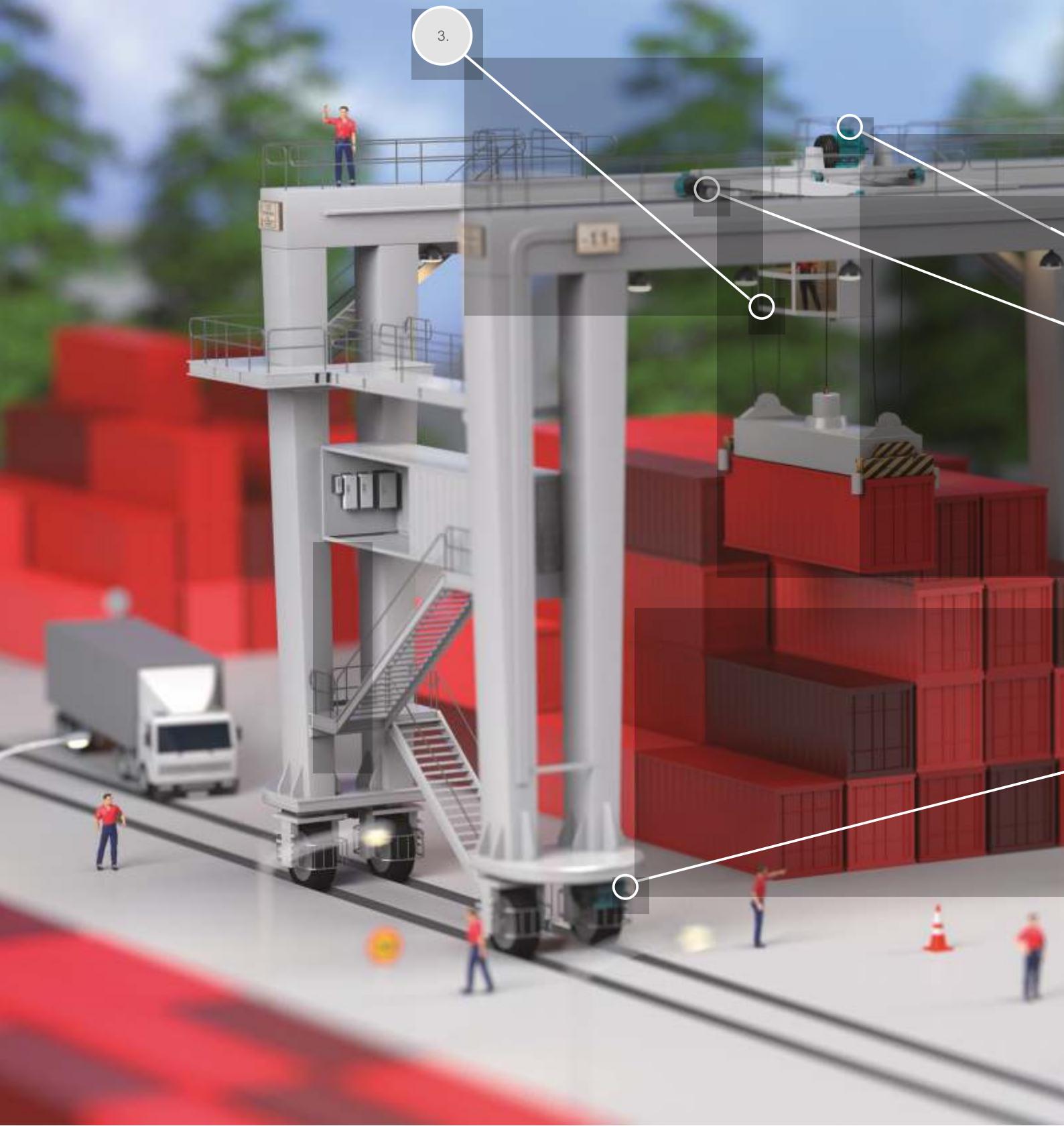
Note:

FL= Full Load; FLC= Full Load Current; FLT= Full Load Torque

SGT= Starting Torque; SGTC= Starting Current

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Full Load current indicated is given for respective voltage designs



Our Motors provide maximum output with minimum power consumption. These robust cast iron motors are suitable for cranes, and prove to be the most productive option. They include brake motors with low maintenance and enhanced liner life.



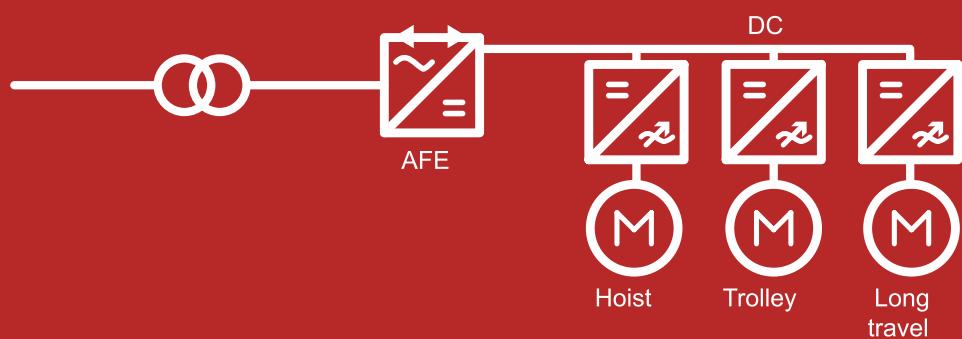
Optimize crane productivity

with CG Prabal Series



2.

Typical regenerative AC drive configuration





8.4 Crane Duty Motors - Squirrel Cage

Range	
Output	0.25 kW to 45 kW
Frames	GD63 to ND225M
Poles	4,6,8

Specification	Standard Offering	Optional
Frame sizes	63 to 225	-
Enclosure	IP55	IP66
Mounting option	Foot (B3) mounting	Flange (B5) ,Face (B14) - upto 132 Frame
Voltage	3 kW and below: 400 λ 3.7 kW and above: 400 Δ	Others as per customer requirement
Frequency	50 Hz	60 Hz
Cooling		
Lubrication	Frame 80 to 225 double-shielded bearings	160 To 225 Online Greasing
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Fan cover	Mild Steel	-
Thermal protection	-	80 to 225 frame
Anti condensation Heaters	-	160 to 225 frame
Inverter Duty (with derate)	Variable Torque - 10:1, Constant Torque - 2:1 (for frame 80 to 132)	Alternative speed range
Ambient temperature	- 20°C to + 50°C	Higher than 50°C; Less than -20°C
Altitude	# 1000m	Higher than 1000 m



**Crane Duty Motors - Slip ring**

Range	
Output	1.80 kW to 116 kW
Frames	DW112M To NDW315M
Poles	6,8,10

Specification	Standard Offering	Optional
Frame sizes	112 to 315	-
Enclosure	IP55	IP66
Mounting option	Foot (B3) mounting	Flange (B5) ,Face (B14)
Voltage	3 kW and below: 400 λ 3.7 kW and above: 400 Δ	Others as per customer requirement
Frequency	50 Hz	60 Hz
Cooling		
Lubrication	Frame 80 to 225 double-shielded bearings	160 To 225 Online Greasing
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Fan cover	Mild Steel	-
Thermal protection	-	80 to 225 frame
Anti condensation Heaters	-	160 to 225 frame
Inverter Duty (with derate)	Variable Torque - 10:1, Constant Torque - 2:1 (for frame 80 to 132)	Alternative speed range
Ambient temperature	- 20°C to + 50°C	Higher than 50°C; Less than -20°C
Altitude	# 1000m	Higher than 1000 m





General Description of Crane Duty Motor

- High starting torque low starting current
- Suitable for frequent Start stop operations
- Suitable for VFD supply
- Motors with class F insulation; Class H on request
- Improved ventilation
- High quality cast iron frame
- Specially designed for crane duty; material handling; hoisting applications



→ Application

Prabal series squirrel cage/slip ring Crane duty motors are specially designed for service on cranes and hoists. They can also be used for similar applications such as material handling equipments, and cranes of all types. These motors can serve as auxiliary motors in rolling mills or wherever intermittent duty drives are required.

These are duty type rated motors developing high starting torque with low starting current. The motors are suitable for frequent starts/stops and reversals. Also rapid acceleration is achieved by high pull out torque/rotor inertia ratio.

→ Typical applications

Crane duty motors are used for following applications in majority:

- Cranes & hoists: long travel drive, cross travel drive, main hoist, auxiliary hoist
- Material handling equipments: various conveyors
- Lifts
- Rolling mills

→ Range

- Manufacturing range for cast iron slip ring crane duty motors is from 112 to 355 frame
- The same for squirrel cage motors in cast iron enclosure is from 80-355 & in aluminum enclosure is from 63-160
- CE marking: All motors are with CE marking

→ Mounting

Squirrel cage crane duty motors are supplied with horizontal foot-mounting. However, motors suitable for foot / flange / face mounting or any combination of these with vertical or horizontal orientation can be offered when required. Slip ring motors are normally available with foot mounting Flange mounting can be supplied on specific request

→ Power supply

Crane duty motors are suitable for 3 phase supply and can be wound for any single voltage from 220 to 650 volts and frequencies from 50 Hz or 60 Hz. The rotor voltage is committed for stator supply of 415 V, 50 Hz. For other supply conditions, Rv to be confirmed from CG

→ Ambient temperature

The motors are rated at 45°C ambient temperature. For temperatures, other than 50°C, a deration factor has to be applied as indicated below



→ Derision Factors

Ambient temperature

Ambient Temperature °C	Derivation factor
<30	1.07
30-45	1.00
50	0.96
55	0.92
60	0.85

Table 1

Altitude

The motors are suitable for altitude upto 1000 m above mean sea level. For altitudes more than this, deration factor shall be as per below:

Altitude in m above MSL	Derivation factor
1000	1.00
1500	0.95
2000	0.90
2500	0.84
3000	0.78
3500	0.75
4000	0.70

Table 2

→ Standard Operating Conditions

Power supply:415 volts,3 phase,50 Hz

Voltage variation: $\pm 10\%$

Frequency variation: $\pm 5\%$

Combined voltage and

frequency Variation: $\pm 10\%$ (absolute sum)

Ambient temperature: 45°C

Altitude:up to 1000m

Standard Specifications Performance and Fixing Dimensions

The motors are manufactured with standard metric frame sizes, and they comply to latest versions IS/IEC Standards

Motors with following steel plant specifications also can be supplied on request:

IPSS: 1-03-003 IPSS:1-03-004.

For detail dimensions, please refer drawings

→ Constructional Features: (MECHANICAL)

Stator frame and end-shields

Made of high quality cast iron conforming to IS:210, ribbed externally to ensure maximum heat dissipation. All components are machined on CNC machines ensuring concentricity and correct alignment. The windings and working parts are completely enclosed and air is forced over the stator body by fan, mounted on the shaft and protected by a cowl. The feet are integrally cast with the body. This ensures sturdiness and resistance to vibrations.

Stator and rotor codes

Both the stator and rotor cores consist of low loss and high permeability steel stampings which are assembled under pressure and rigidly secured by end plates

Enclosure and cooling

Standard crane duty motors have IP55 degree of protection as per IS:4691. IP 56 & 66 can be provided on request. The cooling code of motor is IC 411 as per IS:6362/IEC 60034 - 6



Shafts and bearings

The shaft is of high grade steel and of appropriate diameter to withstand the bending and torsional stresses. All shafts are ultrasonically tested for any minor flaw in the material. Shafts are machined to extreme fine limits to ensure fit and interchangeability of bearings. The motors are provided with single shaft extension. Special shaft extensions like:

- 1) change in diameter and length
- 2) taper shaft, with threaded end, and with hexagonal nut and lock washer
- 3) double shaft extensions, (cylindrical & taper) are available on request.

Motors are provided with deep groove ball bearings. They are mounted with extreme care in dust proof housing. (Refer bearing size table for details). Sealed bearings are provided for motors up to frame 225M. Grease lubricated bearings are used on frames 250 and above. The correct amount of grease is filled in the bearings during manufacturing. On line greasing facility is provided for 250 frame & above to facilitate greasing of bearings without dismantling the motor.

For provision of insulated bearings, please refer to CG.

PRABAL 'E' SERIES MOTORS

FRAME	DE BRG	NDE BRG
ND90 S/L	6205ZZ	6205ZZ
ND100L	6206ZZ	6206ZZ
ND112M	6306ZZ	6206ZZ
ND132S/M	6308ZZ	6208ZZ

Table 3

PRABAL SERIES MOTORS

(Bearing references for single shaft extension)

FRAME	DE BRG	NDE BRG
GD63	6202ZZ	6202ZZ
GD71	6203ZZ	6203ZZ
ND80	6204ZZ	6204ZZ
ND90 S/L	6205ZZ	6205ZZ
ND100L	6206ZZ	6205ZZ
ND112M	6306ZZ	6205ZZ
ND132S/M	6308ZZ	6208ZZ
ND160M/L	6309-2RS	6209-2RS
ND180M/L	6310-2RS	6210-2RS
ND200L	6312-2RS	6212-2RS
ND225S/M	6313-2RS	6213-2RS
ND250S/M/MX	6314	6314
ND280S/M	6318	6318
ND315S/M/L/LX	6319	6319
ND355S/M/L	6321	6321
ND355LX	6322	6322
ND400LX	6322	6322
NDW112M	6306ZZ	6305ZZ
DW132S/M	6208ZZ	6307ZZ
NDW160M/L	6309-2RS	6309-2RS
NDW180ML	6310-2RS	6310-2RS
NDW200L	6312-2RS	6312-2RS
NDW225S/M	6313-2RS	6313-2RS
NDW250S/M/MX	6314	6314
NDW280S/M	6318	6318
NDW315S/M/L/LX	6319	6319
NDW355S/M/L	6321	6321
NDW355LX	6322	6322
NDW400LX	NU322	6322

GD: Aluminium Series

ND: Cast Iron Squirrel Cage

DW/NDW: Cast Iron Slip Ring

Table 4

Terminal Box

Terminal box is provided with IP55 degree of protection. The box can be turned through 360 in steps of 90 to give cable entry from any one of four positions. The terminal boxes are suitable for BS screwed conduit. However, fittings like double compression type cable glands are available on request.



Terminal box position can be provided as below:

FRAME SIZE	ROTOR TYPE	Standard TB POSITION	Other possible TB positions
112-315	Slip ring	Top	RHS or LHS
355	Slip ring	At 45°, Stator TB on RHS from DE Rotor TB on LHS from DE	-
63-71	Squirrel cage	TOP	-
80-315	Squirrel cage	TOP	RHS or LHS
355	Squirrel cage	At 45°, TB on RHS from DE	At 45°, TB on LHS from DE
ND250MX	SCR	RHS	LHS
NDW250MX	SCR	RHS	LHS

Table 5

→ Interchangeability and spares

All Prabal series crane duty motors are built to standardized designs and all spare parts are interchangeable.

→ Constructional features (Electrical)

Class of Insulation:

Stator: Class F insulation with temperature rise limited to class B Rotor: Class H insulation with temperature rise limited to class F Prabal series crane duty motors with higher class for stator insulation (class H) can also be offered on request.

→ Windings

Stator windings:

Stator winding (and rotor winding in case of slipring motors) consists of enameled copper wire impregnated with superior quality class F varnish which is rigid at all working temperatures.

Stator in motors with frame 280 & above are manufactured with vacuum pressure impregnation process as a standard. All rotors irrespective of frame size are processed with vacuum pressure impregnation. This gives added electrical & mechanical strength to the winding for high number of starts. The varnish has a high insulation resistance and excellent resistance to moisture, saline atmosphere, acidic/ alkaline fumes, and also to oil and grease. The insulation gives complete reliability under all atmospheric conditions, including humid tropical climates. Stator and rotor wound packs are subjected to surge test before impregnation.

Rotor Windings:

1. Wound rotor

Rotors of slip ring motors are wound and impregnated similar to stator windings. In addition, rotor windings are braced with resi-glass banding. This gives protection against centrifugal forces experienced by overhang during over speed and frequent reversals. Gel coat is provided on the winding overhang for better consolidation and protection from vibration. Strip wound rotors are provided on frames 355 and above.



Slipring and brushgear

All sliprings are made of cupro-nickel. The slipring unit is having high insulation resistance ensuring minimum wear and breakdown. The brush holders are assembled as a complete unit which can be easily replaced. The slipring enclosure is dust proof & has a cover with accessibility for inspection. The slip rings are epoxy moulded / fabricated type as per requirement.



Motor GD SQ

For large no. of starts, it is necessary that the accelerating time of the system should be as small as possible. For this purpose, total inertia of the system (motor GD sq. + Load GD sq.) should be minimum. Motor GD sq. value and permissible load GD sq. are indicated in the tables.



→ Additional losses and temperature rise

Harmonics of voltage & current in a cage induction motor supplied from a converter cause additional iron & winding losses in the stator & the rotor.

There is no simple method to calculate the additional losses & no general statement can be made about their value. When the motor is tested with converter supply at rated load, base voltage & base frequency, the permissible temperature rise will be within the limits of the insulation system used. For example when a motor having class F insulation system is tested with sinusoidal supply at rated voltage, rated frequency & rated load, may have temperature rise within class B limits. However, when the same motor is tested with converter supply under same test conditions, the temperature rise will be within class F limits. It is assumed that, while testing with converter supply, the HVF factor of converter output supply, is maximum 3%.

Hence the outputs of crane duty inverter driven motors are as listed here.

→ General requirement

All additional general requirements like accessories, paint shade, insulation class, degree of protection, voltage and frequency variation shall be available at extra cost. The cost structure of extra features is same as that for standard motors.

→ Definitions

All additional general requirements like accessories, paint shade, insulation class, degree of protection, voltage and frequency variation shall be available at extra cost. The cost structure of extra features is same as that for standard motors.

The terms used frequently in intermittent duty drive and hoisting are as below:

I. Duty:

Operation of the motor at load including no load and de-energized period to which the motor is subjected, including the sequence and duration.

2. Cyclic duration factor (CDF):

The ratio between the period of loading including starting and electric braking and the duration of the duty- cycle expressed as percentage.

3. Starting:

The process of energizing a motor to bring it upto rated speed from rest.

4. Jogging or inching:

This is an incomplete start during which the motor does not attain more than 25% of the rated speed.

5. Electric braking:

A system in which a braking action is applied to an electric motor by causing it to act as a generator.

6. D.C. Injection braking:

A form of braking of an induction motor in which a separate dc supply is used to magnetize the motor.

7. Plug braking:

A form of electric braking of an induction motor obtained by reversing the phase sequence of its any two lines.

8. Regenerative braking:

A system of electric braking in which energy is returned to the supply system.



→ Intermittent duty type ratings

The basis of the ratings is that of thermal capability, taking into account,

- i) Frequency of starting (starting class)
- ii) Percentage of time during each operating cycle the motor is energized, (CDF)
- iii) The number and type of cycle per hour, (duty class)
- iv) and the inertia of the motor and the load

→ Classification of starting

The starting classification for a motor indicates the maximum permissible number of starts per specified inertia, taking into account complete starting, jogging or inching and electric braking. Rating for the commonly used starting, i.e. 6,150 and 300 starts/hour class, are listed in this publication. However, following factors can be used to calculate output rating for different number of starts and CDFs.

Starts/hour	40%CDF	60%CDF
600	0.7	0.67
500	0.8	0.74
400	0.9	0.8
300	1	Listed
200	1.1	0.96
150	Listed	1
100	1.21	1.05
50	1.28	1.1

Equivalent starts per hour:

When calculating for the duty, allowance should be made for inching and reverse current braking on the following basis:

Squirrel cage motors:

- 4 jogs or inching or jerks = 1 start
- 1 plug braking = 3 starts
- 1 dc injection braking = 2 starts
- 1 plug reversal = 4 starts

Slipring motors:

- 4 jogs or inching or jerks = 1 start
- 1 plug braking = 0.8 starts
- 1 plug reversal = 1.8 starts

The duty types S2 to S5 are explained in detail below:

Short time duty (duty type S2):

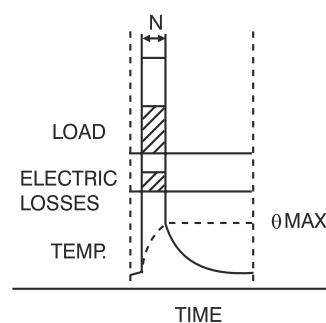
Operation at constant load during a given time, less than that required to reach thermal equilibrium, followed by a rest and de-energised period of sufficient duration to re-establish machine temperatures within 2°C of the coolant. (See figure 1). The recommended values for the short time duty are 10, 30 and 90 minutes.

Duty type:

Crane duty applications can be classified into duty types S2 to S10. The duty types are as per table 4 below:

Duty type	Description
S2	Short-time duty
S3	Intermittent periodic duty
S4	Intermittent periodic duty with starting
S5	Intermittent periodic duty with electric braking
S6	Continuous operation periodic duty
S7	Continuous operation periodic duty with electric braking
S8	Continuous operation periodic duty with related load/speed changes
S9	Duty with non-periodic load and speed variations
S10	Duty with discrete constant loads and speeds

Table 8



θ MAX = MAX. TEMP. ATTAINED DURING DUTY CYCLE

N = OPERATION AT CONSTANT LOAD

SHORT TIME DUTY, DUTY TYPE S2

Figure 1



Intermittent periodic duty (duty type S3):

A sequence of identical duty cycle, each including a period of operation at constant load and a rest and de-energised period. These periods being too short to attain thermal equilibrium during one duty cycle. (See Fig. 2) In this duty type, the starting current dose not significantly affect the temperature rise. Unless otherwise specified, the duration of the duty cycle is 10 minutes. The recommended values for the CDF are 15,25, 40 and 60 percent.

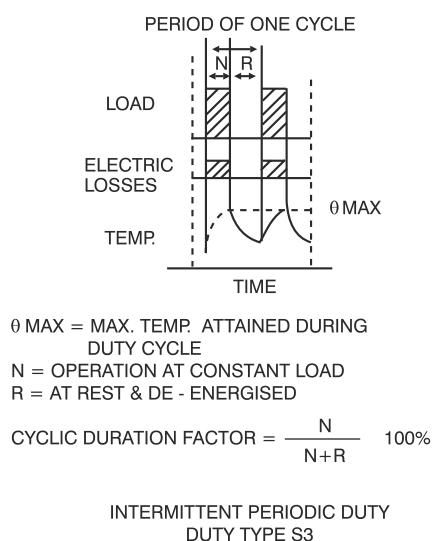


Figure 2

Intermittent periodic duty with starting (duty type S4):

A sequence of identical duty cycles, each cycle including a significant period of starting, a period of operation at constant load and a rest and de-energised period. These periods being too short to attain thermal equilibrium during one duty cycle. (See Figure 3) In this duty, the stopping of the motor is obtained either by natural deceleration after disconnection of the supply or by means of braking such as mechanical brake which does not cause additional heating of the windings.

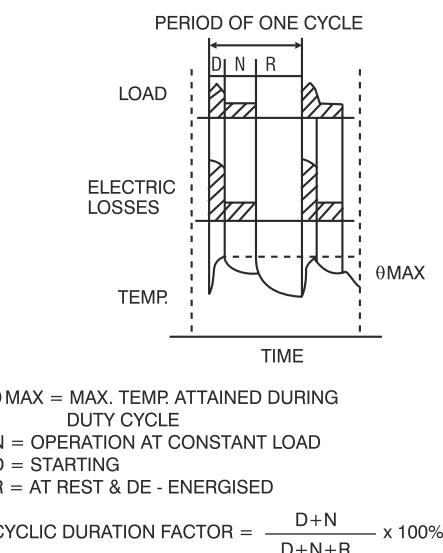


Figure 3

Intermittent periodic duty with starting and braking (duty type S5):

A sequence of identical duty cycles, each cycle consisting of a period of starting, a period of operation at constant load, a period of rapid electric braking and rest and de-energised period. The operating and rest and de-energised periods being too short, to attain thermal equilibrium during one duty cycle. (See Fig. 4)

Note : In all above types of duties, the loading period and rest period of the cycle are so short that the steady state temperature is not reached. While working on these identical cycles continuously, the motor temperature rise must not exceed the permissible values for a given class of insulation.

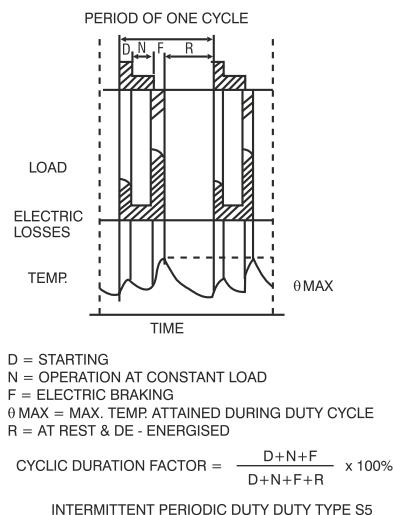


Figure 4



Selection of motors for hoist motions:

For hoisting motor, the power required shall not be less than that computed from the following:

$$Kw = \frac{MVCvCdf}{6.12 E} \times \frac{1}{Camb}$$

Where, derating factor will be taken as 12%, Kw = one hour power rating for dc motors & power rating at (S - 40%) cyclic duration factor for ac motors

M = mass of rated load on hook plus weight of hook block & wire ropes in tones

V = specified hoisting speed in M/min

E = combined efficiency of gears & sheaves

= $(0.93)n \times (0.98)m$ for sleeve bearings

= $(0.95)n \times (0.99)m$ for antifriction bearings

= $(0.985)n \times (0.99)m$ for hardened profile ground & oil splashed lubricator, where

n = number of pairs of gears, m = total number rotating sheaves passed over by each part of the moving rope attached to the drum

Cv = service factor for vertical motion depending on type of motors,

= 0.67 for ac motors,

= 0.5 for dc motors

Cdf = duty factor

$Camb$ = Derating factor for ambient temperature as per table 1.

For an ac hoist motor, the specified full load hoist speed must be obtained at not more than rated torque, therefore, the calculated full load kw must be multiplied by:

$$\frac{(100\text{-rated slip \%})}{(100\text{ total ohms at full speed \%})}$$

Where sufficient information is not available values given in table 9 below for duty cycles, cyclic duration factor & starting class corresponding to mechanism class shall be used.

The values given are based on the following formula:

$$\text{Cyclic duration factor} = \frac{\text{Operating time} * 100}{\text{Operating time} + \text{idle time}}$$

Recommended cyclic duration factor & starting class:

Mechanism Class	Duty cycle Number of cyclic class (c) Cycles/hour percent	Recommended cyclic duration factor percent	Starting class (c) Equivalent starts/hr
M1	Upto5 cycles 25	25	90
M2	Upto5 cycles 25	25	90
M3	10 to 15 cycles 40	40	150
M4	16 to 20 cycles 40	40	150
M5	21 to 30 cycles 60	60	300
M6	31 to 40 cycles 60	60	300
M7	41 to 50 cycles 100	100	600
M8	51 to 60 cycles 100	100	600

Table 9



Selection of motors for crane travel or trolley traverse:

It is assumed that the drive mechanism from the motor to the track wheels will use enclosed gearing mounted on anti-friction bearings. The actual efficiency of the drive will be adopted in making calculations. Where actual efficiency values are not available the efficiency of the drive shall be taken in the range of 0.85 to 0.9.

For the track wheel with anti-friction bearings the rolling friction at these bearing plus the Friction between the track wheels with an average drive efficiency of 0.875 will give an overall friction factor of 8.0 kgf per tonne of the mass moved for calculation of the motor horse power or torque. In the case of wheels with the plain bearings an overall friction factor of 13.0 kgf per tonne of the mass moved may be used.

Selection of motors for crane Travel or Trolley Traverse:

For bridge travel or trolley traverse the power of the motor required shall not be less than that computed from the following:

$$kW = \frac{MVSCdf}{6117T} \frac{(F+1100a)}{981N} \quad \text{for indoor cranes}$$

$$kW = \frac{MVSCdf}{6117T} \frac{(F+1100a)}{981N} + \frac{RwV}{6117T} \quad \text{for outdoor cranes, where}$$

- KW = one hour power rating for D.C motors and power rating at 40 percent cyclic duration factor for A.C motors
- M = mass of crane or trolley plus mass of max rated load in tones;
- V = specified free running speed M/min;
- N = mechanical efficiency of gearing. For spur and helical gears it can be taken as 0.95 per reduction
- T = Factor introduced by the permissible motor torque
during acceleration exceeding the motor-rated torque. As a general guidance value of T may be taken as 1:7 for motors having pull out torque of 275 percent full load torque. Lower value of T should be taken for corresponding lower value of pull out torque
= 1.3 of D.C motor pull out torque*100
= 1.6 for A.C motor 160*full load torque
- F = overall friction factor
= 8kgf per tonne for wheel on anti friction bearing.
= 13 kgf. per tonne for wheels on plane Bearings
- Cdf = duty factor
- Rw = load due to service wind acting horizontally, which can be obtained by multiplying the horizontal exposed area by the service wind by taking drag co-efficient into consideration;
- a = average linear acceleration of the crane or the trolley in cm/s² till the mechanism reaches 90 percent of free running speed. For the value of average linear acceleration refer as given in table 10; and
- S = service factor aimed at providing adequate motor heat dissipation capacity as given in table 10.



Acceleration values

Speed to be Reached M/min	Acceleration in cm/s ² Low and Moderate speed with Long Travel	Acceleration in cm/s ² for Moderate and High Speed (Normal Application)	Acceleration in cm/s ² for High Speed with High Acceleration
240	-	50	67
190	-	44	58
150	-	39	52
120	22	35	47
100	19	32	43
60	15	25	33
40	12	19	-
25	10	16	-
15	8	-	-
10	7	-	-

Table 10

2.0 ELECTRICAL FEATURES

- Motor output (kW) and polarity
- Supply voltage and frequency with variations.
- Type of rotor: squirrel cage or slipring
- Class of insulation and ambient temperature.
- Method of starting
- Requirement of starting torque, pull out torque, starting current
- Load torque of the driven equipment.
- In case of slipring motors, requirements of rotor voltage and rotor current
- Type of power supply: Sinusoidal or through inverter drive

3.0 DETAILS OF DUTY CYCLE

- Duty type: S2, S3, S4, or S5.
- Duty cycle details preferably with a sketch if different from S2, S3, S4, or S5.
- Number of starts per hour.
- Method of braking: plugging, dc injection / mechanical brake
- No. of reversals per hour.
- Cyclic duration factor (CDF).
- Load inertia referred to motor speed. (GD sq.)

4.0 MECHANICAL FEATURES

- Enclosure
- Degree of protection
- Mounting
- Fixing dimensions: If CG standard motor fixing dimensions are not acceptable, please let us have your specific requirements, preferably with a drawing with a drawing
- Shaft extension : Please let us have your requirements of special shaft extension, if any, with a drawing.
- Any other relevant data



Enquiries

When making an enquiry or when ordering a crane duty motor, please furnish the following information. This will enable to supply you Prabal series motors most suitable for your cranes and hoists

1.0 DETAILS OF CRANE

- Class of cranes
- Type of crane
- Tonnage of crane
- Operating speed
- Type of motion: Hoisting or traveling or traversing.



Performance Data for TEFC Slipring Motor

Duty : S4/S5,150 Starts / Hour **CDF :** 25% & 40%, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage: 415 V \pm 10%,

Frequency : 50 Hz \pm 5%

Starting time : 3 secs

Ambient / Temperature rise : 50°/70°C

Altitude : up to 1000 m

4 POLE

FRAME	CDF 25%							CDF 40%							RV	GD ²	GD ²	NET Wt
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	VOLT	MOTOR	LOAD			
DW132S	4.0	5.5	1389	3.9	8.6	21	3.60	4.90	1400	4.3	6.92	23	140	0.17	0.163	88		
DW132M	6.3	8.6	1405	3.3	14	20	5.30	7.20	1420	4.0	12.0	24	170	0.21	0.185	111		
NDW160M	9.5	13	1450	3.2	19	18	8.50	11.5	1455	3.5	17.0	20	217	0.35	0.82	141		
NDW160L	14	19	1455	3.5	28.5	25	12.5	17.0	1460	3.9	27.0	28	250	0.46	1.19	165		
NDW180L	19	26	1461	3.6	37.5	35	17.0	23.0	1465	4.0	34.5	39	275	1.26	1.56	235		
NDW200L	23	31	1467	3.5	44.5	32	21.0	28.5	1470	3.9	41.0	35	315	2.18	1.8	285		
NDW200L	27	37	1468	3.6	52	33	25.0	34.0	1470	3.9	48.0	36	360	2.34	2.05	285		
NDW225M	37	50	1470	3.4	64	42	33.0	45.0	1473	3.8	58.0	47	380	2.96	2.75	410		
NDW250S	46	62.5	1471	3.6	83	49	41.0	56.0	1474	4.1	74.0	55	340	4.96	3.4	565		
NDW250M	56	76	1479	3.8	102	60	50.0	68.0	1481	4.2	93.0	67	445	5.7	3.7	600		

FRAME	CDF 60%							CDF 100%							RV	GD ²	GD ²	NET Wt
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	VOLT	MOTOR	LOAD			
DW132S	3.20	4.4	1411	4.9	7.40	20	-	-	-	-	-	-	140	0.17	0.163	88		
DW132M	4.80	6.5	1428	4.4	11.0	22	-	-	-	-	-	-	170	0.21	0.185	111		
NDW160M	7.50	10	1460	4.0	15.5	18	-	-	-	-	-	-	217	0.35	0.82	141		
NDW160L	11.0	15	1465	4.4	23.5	25	-	-	-	-	-	-	250	0.46	1.19	165		
NDW180L	15.0	20	1469	4.5	30.0	34	-	-	-	-	-	-	275	1.26	1.56	235		
NDW200L	18.5	25	1474	4.4	37.0	31	-	-	-	-	-	-	315	2.18	1.80	285		
NDW200L	22.0	30	1474	4.4	43.0	32	-	-	-	-	-	-	360	2.34	2.05	285		
NDW225M	30.0	40	1475	4.2	53.0	43	-	-	-	-	-	-	380	2.96	2.75	410		
NDW250S	37.0	50	1477	4.5	69.0	50	-	-	-	-	-	-	340	4.96	3.40	565		
NDW250M	45.0	60	1483	4.8	86.0	60	-	-	-	-	-	-	445	5.70	3.70	600		

For performance of Frames other than above, please contact CG Sales.



Performance Data for TEFC Slipring Motor

Duty : S4/S5,300 Starts / Hour **CDF** 40% & 60%, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V \pm 10%,

Frequency : 50 Hz \pm 5%

Starting time : 3 secs

Ambient / Temperature rise : 50°/70°C

Altitude: up to 1000 m

6 POLE

FRAME	CDF 40%							CDF 60%							RV	GD ²	GD ²	NET Wt
	O/P	O/P	SPEED	POT	FLA	RA	O/P	O/P	SPEED	POT	FLA	RA	RV	MOTOR				
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT		kg			
DW132S	3.20	4.40	1411	4.9	7.40	18	3.0	4.0	1417	5.2	7.10	19	140	0.17	0.163	88		
DW132M	4.80	6.50	1428	4.4	11.0	19	4.5	6.0	1432	4.7	10.5	20	170	0.21	0.185	111		
NDW160M	7.50	10.0	1460	4.0	15.5	13	6.5	8.8	1466	4.6	13.8	15	217	0.35	0.82	141		
NDW160L	10.5	14.0	1466	4.6	23.0	19	9.5	13.0	1470	5.1	21.0	21	250	0.46	1.19	165		
NDW180L	15.0	20.0	1469	4.6	29.0	26	13	17.5	1473	5.1	27.0	30	275	1.26	1.56	235		
NDW200L	18.0	24.0	1474	4.5	36.0	24	16	22.0	1477	5.0	32.0	27	315	2.18	1.80	285		
NDW200L	21.0	29.0	1475	4.6	42.0	25	19	26.0	1477	5.1	38.0	27	360	2.34	2.05	285		
NDW225M	28.0	38.0	1477	4.5	50.0	32	25	34.0	1480	5.0	46.0	36	380	2.96	2.75	410		
NDW250S	35.0	48.0	1478	4.7	66.0	37	31	42.0	1480	5.4	60.0	42	340	4.96	3.40	565		
NDW250M	42.0	57.0	1483	5.1	82.0	46	38	51.5	1486	5.7	76.0	51	445	5.70	3.70	600		

For performance of Frames other than above, please contact CG Sales.





Performance Data for TEFC Slipring Motor

Duty : S3, S4 /S5, 150 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V± 10%,

Frequency : 50 Hz ± 5%

Starting time : 3 secs

Ambient / Temperature rise : 50°/70°C

Altitude : up to 1000 m

6 POLE

FRAME	CDF 25%								CDF 40%								Cat Ref
	O/P		O/P	SPEED	POT	FLA	RA	O/P	O/P		SPEED	POT	FLA	RA	RV	GD ²	GD ²
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg	
NDW112M	1.80	2.41	920	2.5	5	12	1.8	2.41	920	2.5	5.11	12.0	90	0.11	0.11	63	1.80KZ6SR TOP
DW132S	3.00	4.00	913	2.6	7	16	2.6	3.50	925	3.0	5.87	14.0	120	0.33	0.33	88	2.60KZ6SR TOP
DW132M	5.05	6.75	916	3.1	12	30	4.5	6.03	925	3.5	11.04	27.0	120	0.40	0.40	111	4.50KZ6SR TOP
NDW160M	7.50	10.0	955	2.9	17	27	6.7	9.00	960	3.2	15.0	24.2	180	0.46	0.46	141	6.7KZ6SR
NDW160L	10.5	14.0	930	2.7	20	27	9.0	12.07	940	3.2	17.0	23.0	260	0.64	0.64	165	9KZ6SR
NDW180L	14.5	19.5	945	3.1	29	37	13.2	17.50	950	3.4	26.0	34.0	230	1.19	1.19	235	13.2KZ6SR
NDW200L	22.5	29.8	949	3.3	45	52	17.6	23.60	960	4.2	35.0	41.0	255	2.32	2.32	285	17.6KZ6SR
NDW225S	28.5	38.2	965	2.7	53	65	24.6	32.99	970	3.1	46.0	56.0	270	3.32	3.32	380	24.6KZ6SR
NDW225M	34.5	46.5	966	2.7	66	83	30.5	40.90	970	3.1	58.0	73.0	300	3.71	3.71	410	30.5KZ6SR
NDW250S	40.0	53.5	961	2.7	76	96	36	48.28	965	3.0	68.0	86.0	290	4.89	4.89	565	36KZ6SR
NDW250M	46.5	62.0	978	2.3	87	100	42	56.32	980	2.5	79.0	90.0	300	6.81	6.81	600	42KZ6SR
NDW280S	61.5	82.0	971	2.8	109	136	53.5	71.74	975	3.2	95.0	118	269	8.77	8.77	670	53.5KZ6SR
NDW280M	76.0	102	971	2.9	139	121	66.5	89.18	975	3.3	122	106	385	10.07	10.07	750	66.5KZ6SR
NDW315S	107	144	977	2.9	188	159	93	126.0	980	3.3	163	138	425	17.35	17.35	1050	
NDW315M	134	179	976	3.1	233	164	116	156.0	979	3.6	202	142	495	19.46	19.46	1130	

For performance of Frames other than above, please contact CG Sales.





Performance Data for TEFC Slipring Motor

Duty : S3, S4 /S5, 150 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V \pm 10%,

Frequency : 50 Hz \pm 5%

Starting time : 3 secs

Ambient / Temperature rise : 50°/70°C

Altitude : up to 1000 m

6 POLE

FRAME	CDF 60%						CDF 100%												Cat Ref
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	RV VOLT	GD ² MOTOR	GD ² LOAD	NET Wt kg			
NDW112M	1.5	2.00	933	3.0	4.20	10	1.50	2.00	933	3.0	5.0	10	90	0.11	0.11	63	1.80KZ6SR TOP		
DW132S	2.2	3.00	937	3.5	6.20	12	2.00	2.70	942	3.9	6.0	11	120	0.33	0.33	88	2.60KZ6SR TOP		
DW132M	4.0	5.50	933	3.9	10.0	24	3.50	4.70	942	4.5	9.5	21	120	0.40	0.4	111	4.50KZ6SR TOP		
NDW160M	5.5	7.50	967	3.9	12.0	20	4.80	6.40	971	4.5	11	17	180	0.46	0.46	141	6.7KZ6SR		
NDW160L	7.5	10.0	950	3.8	14.0	19	6.50	8.80	957	4.4	12	17	260	0.64	0.64	165	9KZ6SR		
NDW180L	11	15.0	958	4.1	21.0	28	9.50	12.7	964	4.7	18	24	230	1.19	1.19	235	13.2KZ6SR		
NDW200L	15.5	21.0	965	4.8	31.0	36	13.0	17.5	970	5.7	26	30	255	2.32	2.32	285	17.6KZ6SR		
NDW225S	20	27.0	976	3.8	37.0	46	17.5	23.5	979	4.4	33	40	270	3.32	3.32	380	24.6KZ6SR		
NDW225M	26	35.0	974	3.6	49.0	62	22.5	30.0	978	4.2	43	54	300	3.71	3.71	410	30.5KZ6SR		
NDW250S	30	40.0	971	3.6	57.0	72	26.0	35.0	975	4.2	49	62	290	4.89	4.89	565	36KZ6SR		
NDW250M	35	47.0	983	3.0	66.0	75	31.0	41.5	985	3.4	58	66	300	6.81	6.81	600	42KZ6SR		
NDW280S	45	60.0	979	3.8	80.0	99	40.0	53.6	981	4.3	71	88	269	8.77	8.77	670	53.5KZ6SR		
NDW280M	55	75.0	979	4.0	102	88	49.0	65.7	982	4.5	91	78	385	10.07	10.07	750	66.5KZ6SR		
NDW315S	80	107	983	3.8	141	119	70.0	94.0	985	4.4	127	104	425	17.35	17.35	1050			
NDW315M	100	135	982	4.2	178	122	88.0	117.9	984	4.7	160	108	495	19.46	19.46	1130			

Duty : S3, S4 /S5, 300 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

6 POLE

FRAME	CDF 25%						CDF 40%												Cat Ref
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLA Amp	RA Amp	RV VOLT	GD ² MOTOR	GD ² LOAD	NET Wt kg			
NDW112M	1.8	2.41	920	2.5	5.11	12.0	1.50	2.00	933	3.0	5.00	10	90	0.11	0.11	63	1.80KZ6SR TOP		
DW132S	2.6	3.50	925	3.0	5.87	14.0	2.20	3.00	937	3.5	5.50	12	120	0.33	0.33	88	2.60KZ6SR TOP		
DW132M	4.5	6.03	925	3.5	11.04	27.0	4.00	5.50	933	3.9	10.0	24	120	0.40	0.40	111	4.50KZ6SR TOP		
NDW160M	6.7	9.00	960	3.2	15.0	24.2	5.50	7.50	967	3.9	13.0	20	180	0.46	1.60	141	6.7KZ6SR		
NDW160L	9.0	12.07	940	3.2	17.0	23.0	7.50	10.0	950	3.8	15.0	19	260	0.64	2.20	165	9KZ6SR		
NDW180L	13.2	17.5	950	3.4	26.0	34.0	11.0	15.0	958	4.1	22.0	28	230	1.19	3.10	235	13.2KZ6SR		
NDW200L	17.6	23.6	960	4.2	35.0	41.0	15.0	20.0	966	4.9	30.0	35	255	2.32	4.00	285	17.6KZ6SR		

For performance of Frames other than above, please contact CG Sales.



Performance Data for TEFC Slipring Motor

Duty : S4 /S5, 300 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions:

Voltage : 415 V \pm 10%,

Frequency : 50 Hz \pm 5%

Starting time : 3 secs

Ambient / Temperature rise: 50°/70°C

Altitude: up to 1000 m

6 POLE

FRAME	CDF 25%								CDF 40%												
	O/P		O/P		SPEED	POT	FLA	RA	O/P		O/P		SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt	Cat Ref
	kW	HP	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg				
NDW225S	24.6	32.99	970	3.1	46	56	20	27	976	3.8	38.0	46	270	3.32	4.8	380	24.6KZ6SR				
NDW225M	30.5	40.9	970	3.1	58	73	26	35	974	3.6	50.0	62	300	3.71	5.3	410	30.5KZ6SR				
NDW250S	36	48.28	965	3	68	86	30	40	971	3.6	57	72	290	4.89	6.4	565	36KZ6SR				
NDW250M	42	56.32	980	2.5	79	90	35	47	983	3.0	66	75	300	6.81	7.5	600	42KZ6SR				
NDW280S	53.5	71.74	975	3.2	95	118	45	60	979	3.8	80	99	269	8.77	9	670	53.5KZ6SR				
NDW280M	66.5	89.18	975	3.3	122	106	55	75	979	4.0	101	88	385	10.07	10.3	750	66.5KZ6SR				
NDW315S	93	126	980	3.3	163	138	80	107	983	3.8	140	119	425	17.35	12.6	1050					
NDW315M	116	156	979	3.6	202	142	100	135	982	4.2	174	122	495	19.46	14.5	1130					

FRAME	CDF 60%								CDF 100%												
	O/P		O/P		SPEED	POT	FLA	RA	O/P		O/P		SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt	Cat Ref
	kW	HP	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg				
NDW112M	1.5	2	933	3.0	5.0	10	-	-	-	-	-	-	-	90	0.11	0.11	63	1.80KZ6SRTOP			
DW132S	2	2.7	942	3.9	5.0	11	-	-	-	-	-	-	-	110	0.33	0.33	88	2.60KZ6SRTOP			
DW132M	3.5	4.7	942	4.5	9.0	21	-	-	-	-	-	-	-	110	0.4	0.4	111	4.50KZ6SRTOP			
NDW160M	5	6.7	970	4.3	12.0	18	-	-	-	-	-	-	-	180	0.46	1.6	141	6.7KZ6SR			
NDW160L	6.5	8.8	957	4.4	13.0	17	-	-	-	-	-	-	-	260	0.64	2.2	165	9KZ6SR			
NDW180L	9.5	12.7	964	4.7	19.0	24	-	-	-	-	-	-	-	230	1.19	3.1	235	13.2KZ6SR			
NDW200L	13	17.5	970	5.7	26.0	30	-	-	-	-	-	-	-	255	2.32	4	285	17.6KZ6SR			
NDW225S	18	24	978	4.2	34.0	41	-	-	-	-	-	-	-	270	3.32	4.8	380	24.6KZ6SR			
NDW225M	22.5	30	978	4.2	43.0	54	-	-	-	-	-	-	-	300	3.71	5.3	410	30.5KZ6SR			
NDW250S	26	35	975	4.2	50.0	62	-	-	-	-	-	-	-	290	4.89	6.4	565	36KZ6SR			
NDW250M	31	41.5	985	3.4	59.0	66	-	-	-	-	-	-	-	300	6.81	7.5	600	42KZ6SR			
NDW280S	41	55	981	4.2	73.0	90	-	-	-	-	-	-	-	269	8.77	9	670	53.5KZ6SR			
NDW280M	51	68	981	4.3	94.0	81	-	-	-	-	-	-	-	385	10.07	10.3	750	66.5KZ6SR			
NDW315S	72	96.5	985	4.3	127.0	107	-	-	-	-	-	-	-	425	17.35	12.6	1050				
NDW315M	90	120	984	4.6	157.0	110	-	-	-	-	-	-	-	495	19.46	14.5	1130				

For performance of Frames other than above, please contact CG Sales.



Performance Data for TEFC Slipring Motor

Duty : S4 / S5, 150 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions:

Voltage : 415 V \pm 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz \pm 5%

Altitude : up to 1000 m

Starting time: 3 secs

8 POLE

FRAME	CDF 25%								CDF 40%									
	O/P		O/P		SPEED	POT	FLA	RA	O/P		SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg		
DW132S	1.85	2.50	712	2.8	5.7	10	1.7	2.3	715	3.0	5.2	9	120	0.33	0.40	88		
DW132M	2.7	3.80	712	2.8	8.2	15	2.5	3.4	715	3.0	7.6	14	120	0.4	0.50	111		
NDW160M	5.2	7.00	698	2.8	15	23	4.8	6.4	702	3.0	14	21	135	0.46	1.90	141		
NDW160L	7.5	10.0	697	2.7	20	27	6.7	9.0	703	3.0	17.5	24	170	0.64	2.20	165		
NDW180L	11.5	15.5	709	2.8	27	32	9.3	12.5	717	3.5	22.0	26	210	1.19	4.50	235		
NDW200L	15.5	21.0	710	2.9	34	37	13.5	18.0	715	3.3	30.0	32	240	2.32	7.11	285		
NDW225S	23	31.0	731	2.6	58	63	20.2	27.2	733	3.0	50.5	55	225	3.32	9.70	380		
NDW225M	29	38.8	729	2.3	70	65	26	35.0	731	2.6	63.0	58	270	3.71	11.5	410		
NDW250S	37	50.0	728	2.0	86	78	31.5	42.2	731	2.4	73.0	66	290	4.89	13.0	565		

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only.

For strip wound rotors, RV value will be different. Please contact CG Sales.





Performance Data for TEFC Slipring Motor

Duty : S4/S5, 150 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V ± 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz ± 5%

Altitude : up to 1000 m

Starting time : 3 secs

8 POLE

FRAME	CDF 25%								CDF 40%									
	O/P	O/P	SPEED	POT	FLA	RA	O/P	O/P	SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt		
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg		
NDW250MX	43.2	58	724	2.0	95	83	37	50	728	2.3	81	71	325	5.43	15.6	600		
NDW280S	56	76	733	2.2	113	173	48	64	735	2.6	97	148	200	8.77	19.5	670		
NDW280M	70	94	732	2.3	147	176	59	79	735	2.7	124	148	235	10.07	25.4	750		
NDW315S	87	116.7	732	2.7	174	176	72	26.5	735	3.3	144	146	285	17.35	30	1050		
NDW315M	106	142	732	2.6	221	169	86	115.3	735	3.2	179	137	360	19.46	36	1130		
NDW315LX	120	161	729	3.1	240	184	105	141	732	3.5	210	161	390	25	43.8	1220		
NDW355LX	150	200	725	2.7	315	197	132	177	728	3.1	277	173	475*	35	52.5	2260		

FRAME	CDF 60%								CDF 100%									
	O/P	O/P	SPEED	POT	FLA	RA	O/P	O/P	SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt		
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg		
DW132S	1.5	2	719	3.4	4.59	8	1.3	1.8	706	3.8	4.5	7	120	0.33	0.4	88		
DW132M	2.2	3	719	3.4	6.69	12	2.0	2.7	707	3.7	6.5	11	120	0.4	0.5	111		
NDW160M	4.1	5.5	709	3.5	12	18	3.7	5	688	3.9	11	16	135	0.46	1.9	141		
NDW160L	5.3	7.3	713	3.8	14	19	4.8	6.4	684	4.2	12	17	170	0.64	2.2	165		
NDW180L	7.5	10	723	4.3	18	21	6.7	9	704	4.8	16	19	210	1.19	4.5	235		
NDW200L	11.5	15.5	720	3.9	26	27	10.1	13.5	703	4.4	22	24	240	2.32	7.11	285		
NDW225S	16.7	22.4	736	3.6	42	45	14.5	19.5	726	4.2	36	40	225	3.32	9.7	380		
NDW225M	20	27	735	3.4	48	45	17.8	23.9	722	3.8	43	40	270	3.71	11.5	410		
NDW250S	26	35	734	2.9	60	54	22.0	29.5	723	3.4	51	46	290	4.89	13	565		
NDW250M	30	40	732	2.8	66	58	26.1	35	719	3.3	57	50	325	5.43	15.6	600		
NDW280S	40	53.5	738	3.1	81	123	34.3	46	729	3.6	69	106	200*	8.77	19.5	670		
NDW280M	50	67	737	3.2	105	125	41.8	56	729	3.8	88	105	235	10.07	25.4	750		
NDW315S	60	80	738	4.0	120	122	52.2	70	729	4.5	104	106	285	17.35	30	1050		
NDW315M	75	100	737	3.7	156	119	64.2	86	730	4.3	134	102	360	19.46	36	1130		
NDW315LX	95	127	734	3.9	190	146	-	-	-	-	-	-	390	25	43.8	1220		
NDW355LX	120	161	730	3.4	252	157	-	-	-	-	-	-	475*	35	52.5	2260		

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only.
For strip wound rotors, RV value will be different. Please contact CG Sales.



Performance Data for TEFC Slipring Motor

Duty : S4/S5, 300 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V \pm 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz \pm 5%

Altitude : up to 1000 m

Starting time : 3 secs

8 POLE

FRAME	CDF 25%								CDF 40%									
	O/P		O/P		SPEED	POT	FLA	RA	O/P		SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg		
DW132S	1.7	2.3	715	3	5.2	9	1.5	2	719	3.4	5	8	120	0.33	0.4	88		
DW132M	2.5	3.4	715	3	7.6	14	2.2	3	719	3.4	7	12	120	0.4	0.5	111		
NDW160M	4.8	6.4	702	3	14	21	4.1	5.5	709	3.5	12	18	135	0.46	1.9	141		
NDW160L	6.7	9	703	3	17.5	24	5.3	7.3	713	3.8	14	19	170	0.64	2.2	165		
NDW180L	9.3	12.5	717	3.5	22	26	7.5	10	723	4.3	18	21	210	1.19	4.5	235		
NDW200L	13.5	18	715	3.3	30	32	11.5	15.5	720	3.9	26	27	240	2.32	7.11	285		
NDW225S	20.2	27.2	733	3	50.5	55	16.7	22.4	736	3.6	42	45	225	3.32	9.7	380		
NDW225M	26	35	731	2.6	63	58	20	27	735	3.38	48	45	270	3.71	11.5	410		
NDW250S	31.5	42.2	731	2.4	73	66	26	35	734	2.9	60	54	290	4.89	13	565		
NDW250M	37	50	728	2.3	81	71	30	40	732	2.8	66	58	325	5.43	15.6	600		
NDW280S	48	64	735	2.6	97	148	40	53.5	738	3.1	81	123	200	8.77	19.5	670		
NDW280M	59	79	735	2.7	124	148	50	67	737	3.2	105	125	235	10.07	25.4	750		
NDW315S	72	26.5	735	3.3	144	146	60	80	738	3.9	120	122	285	17.35	30	1050		
NDW315M	86	115.3	735	3.2	179	137	75	100	737	3.7	156	119	360	19.46	36	1130		
NDW315LX	105	141	732	3.5	210	161	95	127	734	3.9	190	146	390	25	43.8	1220		
NDW355LX	132	177	728	3.1	277	173	115	154	731	3.5	253	155	475*	35	52.5	2260		

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only. For strip wound rotors, RV value will be different. Please contact CG Sales.





Performance Data for TEFC Slipring Motor

Duty : S4/S5, 300 Starts / Hour, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V \pm 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz \pm 5%

Altitude : up to 1000 m

Starting time : 3 secs

8 POLE

FRAME	CDF 60%								CDF 100%										
	O/P	O/P	SPEED	POT	FLA	RA	O/P	O/P	SPEED	POT	FLA	RA	RV	GD ²	GD ²	NET Wt			
	kW	HP	RPM	%FLT	Amp	Amp	kW	HP	RPM	%FLT	Amp	Amp	VOLT	MOTOR	LOAD	kg			
DW132S	1.30	1.80	723	3.9	4.3	7	-	-	-	-	-	-	7	120	0.33	0.40	88		
DW132M	2.00	2.70	722	3.7	6.6	11	-	-	-	-	-	-	11	120	0.40	0.50	111		
NDW160M	3.70	5.00	713	3.9	12	17	-	-	-	-	-	-	16	135	0.46	1.90	141		
NDW160L	4.80	6.40	716	4.1	14	17	-	-	-	-	-	-	17	170	0.64	2.20	165		
NDW180L	6.70	9.00	726	4.9	18.5	18	-	-	-	-	-	-	19	210	1.19	4.50	235		
NDW200L	10.0	13.5	724	4.4	25	26	-	-	-	-	-	-	24	240	2.32	7.11	285		
NDW225S	15.0	20.0	737	4.0	46.5	41	-	-	-	-	-	-	40	225	3.32	9.70	380		
NDW225M	19.0	25.5	736	3.8	54	42	-	-	-	-	-	-	40	270	3.71	11.5	410		
NDW250S	22.0	29.5	737	3.4	58	46	-	-	-	-	-	-	46	290	4.89	13.0	565		
NDW250M	26.0	35.0	735	3.3	61	48	-	-	-	-	-	-	50	325	5.43	15.6	600		
NDW280S	35.0	47.0	739	3.6	78	108	-	-	-	-	-	-	106	200	8.77	19.5	670		
NDW280M	43.0	57.6	739	3.8	100	107	-	-	-	-	-	-	105	235	10.07	25.4	750		
NDW315S	53.0	71.0	739	4.5	117	102	-	-	-	-	-	-	106	285	17.35	30.0	1050		
NDW315M	64.0	86.0	739	4.3	151	101	-	-	-	-	-	-	102	360	19.46	36.0	1130		
NDW315LX	82.0	110	736	4.5	164	126	-	-	-	-	-	-	-	390	25.00	43.8	1220		
NDW355LX	105	141	733	3.9	239	147	-	-	-	-	-	-	475*	35.00	52.5	2260			

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only.

For strip wound rotors, RV value will be different. Please contact CG Sales.





Performance Data for TEFC Slipring Motor

Duty : S4/S5, 150 Starts / Hour, **CDF :** 25% & 40%, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions:

Voltage : 415 V \pm 10%,

Frequency : 50 Hz \pm 5%

Starting time : 3 secs

Ambient / Temperature rise: 45°/75°C

Altitude : upto 1000 m

10 POLE

FRAME	CDF 25%								CDF 40%								NET Wt kg
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC Amp	RA Amp	RV VOLT				
NDW225S	16.5	22.0	573	2.3	47	41	15.0	20	575	2.5	43	37	230	3.32	9.90	380	
NDW225M	22.0	30.0	570	2.0	62	42	18.5	25	575	2.4	52	35	285	3.71	11.1	410	
NDW250MX	26.0	35.0	570	3.0	69	60	22.0	30	575	3.5	58	51	260	5.43	17.9	600	
NDW280S	46.0	61.5	576	2.0	118	161	38.0	51	580	2.4	98	133	215	8.77	23.3	670	
NDW280M	57.0	76.4	575	2.0	145	150	46.5	62	580	2.5	118	122	215	10.07	31.0	750	
NDW315S	70.0	94.0	583	2.1	167	193	60.0	80	585	2.5	143	165	210	17.35	37.4	1050	
NDW315M	77.0	103	584	2.4	180	146	66.0	88	586	2.8	155	125	295	19.46	46.0	1130	
NDW315LX	93.0	126	589	2.9	222	183	83.0	113	590	3.2	198	163	325	25.0	57.0	1220	
NDW355LX	117	159	583	3.1	275	196	105	143	585	3.5	247	176	385*	35.0	71.0	2260	

10 POLE Duty : S4/S5, 150 Starts / Hour, CDF 60% & 100%, Insulation : Stator cl. F / Rotor cl. F

FRAME	CDF 25%								CDF 40%								NET Wt kg
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC Amp	RA Amp	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC Amp	RA Amp	RV VOLT				
NDW225S	11.5	15.5	581	3	36	28	10.0	13.5	583	4	31	25	230	3.32	9.9	380	
NDW225M	15.0	20.0	580	3	47	28	13.2	17.7	582	3	41	25	285	3.71	11.1	410	
NDW250M	18.0	24.0	580	4	52	42	15.5	21.0	582	5	45	36	260	5.43	17.9	600	
NDW280S	32.0	43.0	583	3	90	112	28.0	37.5	585	3	79	98	215	8.77	23.3	670	
NDW280M	40.0	53.5	583	3	112	105	34.0	46.0	585	3	95	89	215	10.07	31.0	750	
NDW315S	50.0	67.0	588	3	131	138	42.0	56.0	590	4	110	116	210	17.35	37.4	1050	
NDW315M	55.0	75.0	588	3	142	104	47.0	62.5	590	4	121	89	295	19.46	46.0	1130	
NDW315LX	73.0	99.0	591	4	192	143	62.0	84.0	593	4	163	122	325	25.0	57.0	1220	
NDW355LX	92.0	125	587	4	238	154	78.0	106	589	5	202	131	385*	35.0	71.0	2260	

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only. For strip wound rotors, RV value will be different.

Please contact CG Sales.

**Performance Data for TEFC Slipring 10 Pole, Duty: S4/S5****Duty :** S4/S5, 300 Starts / Hour, **CDF :** 25% & 40%, **Insulation :** Stator cl. F / Rotor cl. F

Standard operating conditions :

Voltage : 415 V ± 10%,

Frequency : 50 Hz ± 5%

Starting time : 3 secs

Ambient / Temperature rise : 50°/70°C

Altitude : up to 1000 m

10 POLE

FRAME	CDF 25%								CDF 40%											
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC	RA	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC	RA	RV VOLT	GD ² MOTOR kg.m.sq.	GD ²	NET Wt kg				
NDW225S	15	20	575	3	43	37	11.5	15.5	581	3	36	28	230	3.32	9.90	380				
NDW225M	20	27	573	3	57	38	15.0	20.0	580	3	47	28	285	3.71	11.1	410				
NDW250M	23	31	574	4	61	53	18.0	24.0	580	4	52	42	260	5.43	17.9	600				
NDW280S	42	56	578	3	108	147	32.0	43.0	583	3	90	112	165	8.77	23.3	670				
NDW280M	50	67	578	3	127	131	40.0	53.5	583	3	112	105	215	10.07	31.0	750				
NDW315S	62	83	585	3	148	171	50.0	67.0	588	3	131	138	210	17.35	37.4	1050				
NDW315M	70	94	585	3	164	133	55.0	75.0	588	3	142	104	295	19.46	46.0	1130				
NDW315LX	83	113	590	3	198	163	70.0	95.0.	592	4	184	137	325	25.0	57.0	1220				
NDW355LX	105	143	585	4	247	176	88.0	119	587	4	228	148	385*	35.0	71.0	2260				

10 POLE Duty : S4/S5, 300 Starts / Hour, CDF 60% & 100%, Insulation : Stator cl. F / Rotor cl. F

FRAME	CDF 25%								CDF 40%											
	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC	RA	O/P kW	O/P HP	SPEED RPM	POT %FLT	FLC	RA	RV VOLT	GD ² MOTOR kg.m.sq.	GD ²	NET Wt kg				
NDW225S	10.0	13.5	591	4	31	25	-	-	-	-	-	-	230	3.32	9.90	380				
NDW225M	13.5	18.0	590	3	42	26	-	-	-	-	-	-	285	3.71	11.1	410				
NDW250M	16.0	21.5	588	5	47	37	-	-	-	-	-	-	260	5.43	17.9	600				
NDW280S	28.0	37.5	591	3	79	98	-	-	-	-	-	-	165	8.77	23.3	670				
NDW280M	34.0	46.0	591	3	95	89	-	-	-	-	-	-	215	10.07	31.0	750				
NDW315S	44.0	59.0	590	3	115	121	-	-	-	-	-	-	210	17.35	37.4	1050				
NDW315M	50.5	67.7	590	4	130	96	-	-	-	-	-	-	295	19.46	46.0	1130				
NDW315LX	62.0	84.0	596	4	163	122	-	-	-	-	-	-	325	25.00	57.0	1220				
NDW355LX	78.0	106	596	5	202	131	-	-	-	-	-	-	385*	35.00	71.0	2260				

* Note: Rotor Voltage (RV) value mentioned above is for wire wound rotors only.
 For strip wound rotors, RV value will be different. Please contact CG Sales.



Performance Data for TEFC Squirrel Cage Induction Motors (DOL)

Duty : S4/S5

Standard operating conditions :

Voltage : 415 V ± 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz ± 5%

Altitude : up to 1000 m

Starting time : 3 secs

Insulation class : F

4 POLE

FRAME	Speed RPM	S4 & S5 DUTY						S4 & S5 DUTY						S4 & S5 DUTY						Starting Current Ratio	Pullout Torque Ratio	Rotor GD ²	Net Wt kg	Load GD ² kg-m ²				
		90 STARTS / HR						150 STARTS / HR						300 STARTS / HR														
		25% or 40% CDF kW	60% FLC kW	100% CDF kW	25% or 40% CDF kW	60% FLC kW	100% CDF kW	40% FLC kW	60% CDF kW	100% FLC kW	40% CDF kW	60% FLC kW	100% CDF kW	40% FLC kW	60% CDF kW	100% FLC kW	40% CDF kW	60% FLC kW	100% CDF kW									
GD63	1330	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	0.25	1.12	5.0	2.75	0.003	5.6	0.02				
GD71	1350	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	0.55	1.84	5.0	2.50	0.004	7.0	0.07				
ND80	1410	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	0.75	2.10	5.0	2.75	0.007	17	0.1				
ND80	1395	1.10	3.20	1.10	3.20	1.10	3.20	1.10	3.20	1.10	3.20	1.10	3.20	0.9	2.60	1.10	3.20	1.10	3.20	0.90	2.60	5.0	2.75	0.007	17	0.15		
ND90S	1390	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	1.50	3.80	5.0	2.75	0.014	22	0.2				
ND90L	1400	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	2.20	5.30	5.5	2.75	0.019	25	0.38				
ND100L	1425	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	3.75	8.00	6.0	2.75	0.03	32	0.45				
ND112M	1430	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	5.50	11.5	6.0	2.75	0.052	45	0.5				
ND132S	1410	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	7.50	15.0	6.0	2.75	0.131	68	0.9				
ND132M	1440	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	9.30	18.5	6.0	2.75	0.161	79	1.0				
ND160M	1460	11.0	21.0	11.0	21.0	9.30	17.7	11.0	21.0	11.0	21.0	9.30	17.7	11.0	21.0	11.0	21.0	9.30	17.7	5.0	2.25	0.31	125	1.1				
ND160M	1460	15.0	30.0	15.0	30.0	11.0	21.0	15.0	30.0	15.0	30.0	11.0	21.0	15.0	30.0	15.0	30.0	11.0	21.0	5.0	2.25	0.31	125	1.2				
ND160L	1460	18.5	34.5	18.5	34.5	15.0	28.0	18.5	34.5	18.5	34.5	15.0	28.0	18.5	34.5	18.5	34.5	15.0	28.0	5.0	2.50	0.47	146	1.9				
ND180M	1475	22.5	42.0	22.5	42.0	18.5	34.5	22.5	42.0	22.5	42.0	-	-	22.5	42.0	22.5	42.0	-	-	5.0	2.50	0.81	170	2.0				
ND180L	1475	27.0	51.0	27.0	51.0	22.5	42.0	27.0	51.0	27.0	51.0	-	-	27.0	51.0	27.0	51.0	-	-	5.0	2.50	0.95	205	3.0				
ND200L	1475	37.0	65.0	37.0	65.0	27.0	51.0	37.0	65.0	37.0	65.0	-	-	37.0	65.0	37.0	65.0	-	-	6.0	2.75	1.62	270	5.0				

For performance of Frames other than above, please contact CG Sales.





Performance Data for TEFC Squirrel Cage Induction Motors (DOL)

Duty : S4/S5

Standard operating conditions :

Voltage : 415 V ± 10%

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz ± 5%

Altitude : up to 1000 m

Starting time : 3 secs

Insulation class : F

6 POLE

FRAME	S4 & S5 DUTY						S4 & S5 DUTY						S4 & S5 DUTY						Starting Current Ratio	Pulldown Torque Ratio	Rotor GD ² kg-m ²	Net Wt kg	Load GD ² kg-m ²		
	90 STARTS / HR						150 STARTS / HR						300 STARTS / HR												
	Speed RPM	25% or 40% CDF kW	60% FLC	100% CDF	25% or 40% CDF kW	60% FLC	100% CDF	40% FLC	60% CDF	100% FLC	40% CDF	60% FLC	40% CDF	60% FLC	40% CDF	60% FLC	40% CDF								
GD63	865	0.17	0.55	0.17	0.55	0.17	0.55	0.17	0.55	0.17	0.55	0.17	0.55	0.17	0.55	0.17	0.55	4	2.25	0.004	7	0.05			
GD71	880	0.37	1.9	0.37	1.9	0.37	1.9	0.37	1.9	0.37	1.9	0.3	1.5	0.37	1.9	0.37	1.9	0.3	1.5	4	2.5	0.011	17	0.11	
ND80	890	0.55	1.7	0.55	1.7	0.55	1.7	0.55	1.7	0.55	1.7	0.55	1.7	0.55	1.7	0.55	1.7	0.5	1.55	4	2.5	0.011	17	0.18	
ND80	890	0.75	2.6	0.75	2.6	0.75	2.6	0.75	2.6	0.75	2.6	0.75	2.6	0.75	2.6	0.75	2.6	0.72	2.5	5	2.5	0.015	22	0.2	
ND90S	935	1.1	3.8	1.1	3.8	1.1	3.8	1.1	3.8	1.1	3.8	1.1	3.8	1.1	3.8	1.1	3.8	0.9	3.1	5	2.5	0.021	25	0.32	
ND90L	880	1.5	5	1.5	5	1.5	5	1.5	5	1.5	5	1.5	5	1.5	5	1.5	5	1.5	5	5	2.5	0.03	32	0.4	
ND100L	900	2.2	6.5	2.2	6.5	2.2	6.5	2.2	6.5	2.2	6.5	1.8	5.3	2.2	6.5	2.2	6.5	1.8	5.3	5	2.5	0.048	45	0.75	
ND112M	910	3.7	10.5	3.7	10.5	3.7	10.5	3.7	10.5	3.7	10.5	3	8.5	3.7	10.5	3.7	10.5	3	8.5	5.5	2.5	0.174	68	0.9	
ND132S	925	5.5	12	5.5	12	5	10.8	5.5	12	5.5	12	5	10.8	5.5	12	5.5	12	5	10.8	5.5	2.5	0.214	79	1.7	
ND132M	920	7.5	17	7.5	17	5.5	12.5	7.5	17	7	16	5.5	12.5	7.5	17	7.5	17	5.5	12.5	5.5	2.5	0.46	120	2.5	
ND160M	970	9.3	19	9.3	19	7.7	15	9.3	19	9.3	19	7.5	15.5	9.3	19	9.3	19	7.2	14.7	5.5	2.5	0.59	148	3.0	
ND160L	970	11	22	11	22	10.5	21	11	22	11	22	10	20	11	22	11	22	10	20	5.5	2.5	0.59	148	3.5	
ND160L	970	15	27	15	27	13	26	15	27	15	27	-	-	15	27	15	27	-	-	6	3	1.16	205	4.5	
ND180L	975	18.5	33	18.5	33	17.5	32	18.5	33	18.5	33	-	-	18.5	33	18.5	33	-	-					5.0	

For performance of Frames other than above, please contact CG Sales.





Performance Data for TEFC Squirrel Cage Induction Motors (DOL)

Duty : S4/S5

Standard operating conditions :

Voltage : 415 V ± 10%,

Ambient / Temperature rise : 50°/70°C

Frequency : 50 Hz ± 5%

Altitude : upto 1000 m

Starting time : 3 secs

Insulation class : F

8 POLE

FRAME	Speed RPM	S4 & S5 DUTY 90 STARTS / HR						S4 & S5 DUTY 150 STARTS / HR						S4 & S5 DUTY 300 STARTS / HR						Starting Current	Pull out Torque	Rotor GD ²	Net Weight
		25% or 40% CDF kW	60% FLC kW	100% CDF kW	25% or 40% CDF kW	60% FLC kW	100% CDF kW	40% FLC kW	60% CDF kW	100% CDF kW	40% FLC kW	60% CDF kW	100% CDF kW	40% FLC kW	60% CDF kW	100% CDF kW	40% FLC kW	60% CDF kW	100% CDF kW				
		CDF kW	FLC kW	FLC kW	CDF kW	FLC kW	FLC kW	CDF kW	FLC kW	FLC kW	CDF kW	FLC kW	FLC kW	CDF kW	FLC kW	FLC kW	CDF kW	FLC kW	FLC kW				
ND90S	680	0.55	2.1	0.47	1.8	0.35	1.3	0.55	2.1	0.47	1.8	0.35	1.3	0.55	2.1	0.47	1.8	0.35	1.3	4	2.25	0.015	22
ND90L	680	0.75	2.6	0.64	2.2	0.48	1.65	0.75	2.6	0.64	2.2	0.48	1.65	0.75	2.6	0.63	2.2	0.47	1.65	4	2.25	0.021	22
ND100L	700	1.1	3.3	1.1	3.3	0.92	2.75	1.1	3.3	1.1	3.3	0.92	2.75	1.1	3.3	1.1	3.3	0.91	2.75	4	2.25	0.03	32
ND100L	700	1.5	5	1.5	5	1.3	4.3	1.5	5	1.5	5	1.3	4.3	1.5	5	1.5	5	1.3	4.3	4	2.25	0.03	32
ND112M	700	2.2	6	2.2	6	2.2	6	2.2	6	2.2	6	2.2	6	2.2	6	2.2	6	2.2	6	4	2.25	0.057	45
ND132S	710	3.7	9	3.2	7.8	24	5.8	3.7	9	3.2	7.8	24	5.8	3.7	9	3.1	7.5	2.3	5.7	4.5	2.25	0.174	68
ND160M	710	5.5	12	4.45	9.7	3.35	7.3	5.5	12	4.4	9.7	3.3	7.3	5.5	12	4.25	9.3	3.25	7.1	5	2.25	0.46	120
ND160M	710	7.5	17	6.6	15	5	11.3	7.5	17	6.5	14.9	4.9	11.3	7.5	17	6.3	14.3	4.75	10.8	5	2.25	0.46	120
ND160L	710	9.3	21	9.3	21	8.5	19.2	9.3	21	9.3	21	8.35	19	9.3	21	9.3	21	8.15	19	5	2.25	0.64	146
ND180M	710	12	26	9.5	21	8.5	18.4	10	21.6	8.2	17.7	-	-	8.5	18.4	7.1	15.4	-	-	5	2.25	0.99	174
ND180L	710	14	31	11.5	25	10	22	12	28	9.5	22	-	-	10	22	8.5	22	-	-	5	2.25	1.16	205

For performance of Frames other than above, please contact CG Sales.





Performance Data for TEFC Squirrel Cage Induction Motors (Inverter-driven)

Duty : S4

Standard operating conditions :

Voltage : $415\text{ V} \pm 10\%$

Starting time : 3 secs

Insulation class : F

Frequency : $50\text{ Hz} \pm 5\%$

Switching frequency : 3-6 kHz

Ambient / Temperature rise : $50^\circ/70^\circ\text{C}$

Voltage rise time : > 0.1 micro sec

Altitude : up to 1000 m

THD : < 2.5%

4 POLE

FRAME	SPEED RPM	90starts				150starts				300starts				Starting Current Ratio	Pull out Torque Ratio	Rotor GD ² kg-m ²	Net Wt kg
		25 & 40% CDF kW	FLA	60% CDF kW	FLA	25% & 40% CDF kW	FLA	60% CDF kW	FLA	25 & 40% CDF kW	FLA	60% CDF kW	FLA				
ND80	1410	1.10	2.90	1.10	2.80	1.00	2.50	0.90	2.40	0.90	2.40	0.80	2.30	5.50	2.75	0.007	17
ND90S	1390	1.50	3.80	1.40	3.70	1.30	3.30	1.20	3.10	1.20	3.10	1.20	3.00	5.50	2.75	0.014	22
ND90L	1400	2.20	5.30	2.10	5.10	1.90	4.60	1.80	4.40	1.80	4.30	1.70	4.10	6.00	2.75	0.019	25
ND100L	1430	3.60	8.30	3.40	7.90	3.10	7.10	2.90	6.80	2.90	6.70	2.80	6.40	6.50	2.75	0.03	32
ND112M	1410	5.50	12.0	5.20	11.5	4.70	10.3	4.50	9.80	4.40	9.70	4.20	9.20	6.50	2.75	0.052	45
ND132S	1440	7.40	15.4	7.10	14.7	6.40	13.2	6.10	12.6	6.00	12.5	5.70	11.8	6.50	2.75	0.131	68
ND132M	1440	9.20	18.5	8.80	17.7	7.90	16.0	7.50	15.2	7.40	15.0	7.10	14.3	6.50	2.75	0.161	79
ND160M	1460	15.0	31.0	14.0	30.0	13.0	27.0	12.0	26.0	12.0	25.0	11.0	24.0	6.50	2.25	0.31	125
ND160L	1460	18.0	36.0	17.0	35.0	15.7	31.0	15.0	30.0	15.0	29.0	14.0	28.0	6.50	2.50	0.47	146
ND180M	1475	22.0	43.0	21.0	41.0	19.0	37.0	18.0	35.0	18.0	34.0	17.0	33.0	6.50	2.50	0.81	170
ND180L	1475	26.0	51.0	24.0	49.0	22.0	44.0	21.0	42.0	21.0	41.0	20.0	39.0	6.50	2.50	0.95	205
ND200L	1475	34.0	67.0	33.0	64.0	30.0	58.0	28.0	55.0	28.0	54.0	27.0	52.0	6.50	2.75	1.62	270
ND225S	1475	43.0	80.0	41.0	77.0	37.0	69.0	35.0	66.0	35.0	65.0	33.0	62.0	6.50	2.50	2.64	345
ND225M	1475	52.0	97.0	50.0	93.0	45.0	84.0	43.0	79.0	42.0	79.0	40.0	75.0	6.50	2.50	3.13	375
ND250M	1470	63.0	116	60.0	111	55.0	100	52.0	95.0	51.0	94.0	49.0	90.0	6.50	2.50	3.45	465
ND280S	1475	87.0	157	83.0	150	75.0	135	71.0	129	71.0	127	67.0	121	6.50	2.50	7.21	600
ND280M	1475	108	195	104	186	94.0	168	89.0	160	88.0	158	83.0	150	6.50	2.75	8.26	630
ND315S	1480	130	229	124	219	112	197	106	187	105	185	100	176	6.50	2.75	11.6	900
ND315M	1485	158	296	151	283	136	255	129	242	128	240	121	228	6.50	2.75	14	950
ND315LX	1485	226	403	216	386	195	347	185	330	183	327	174	310	6.50	2.25	19	1160
NG355LX	1485	394	691	377	662	340	596	323	566	320	560	304	532	6.50	2.25	29.6	2150





Performance Data for TEFC Squirrel Cage Crane Duty Induction Motors (Inverter driven)

Duty : S4

Standard operating conditions :

Voltage: 415 V ± 10%

Starting time : 3 secs

Frequency: 50 Hz ± 5%

Insulation class : F

Ambient / Temperature rise: 50°/70°C

Switching frequency: 3-6 kHz

Altitude: up to 1000 m

Voltage rise time: > 0.1 micro sec

THD: < 2.5%

6 POLE

FRAME	SPEED RPM	90starts				150starts				300starts				Starting Current	Pull out Torque Ratio	Rotor GD ² kg-m ²	Net Wt kg
		25 & 40%	FLA	60%	FLA	25% & 40%	FLA	60%	FLA	25 & 40%	FLA	60%	FLA				
		CDF kW		CDF kW		CDF kW		CDF kW		CDF kW		CDF kW					
ND80	890	0.80	2.40	0.70	2.30	0.65	2.00	0.60	1.90	0.60	1.90	0.60	1.80	4.50	2.50	0.011	17
ND90L	880	1.10	3.20	1.10	3.10	0.95	2.80	0.90	2.60	0.90	2.60	0.80	2.50	5.50	2.50	0.015	22
ND90L	880	1.50	4.20	1.40	4.00	1.30	3.60	1.20	3.50	1.20	3.40	1.20	3.30	5.50	2.50	0.021	25
ND100L	900	2.20	6.00	2.10	5.80	1.90	5.20	1.80	4.90	1.80	4.90	1.70	4.60	5.50	2.50	0.03	32
ND112M	910	3.60	9.20	3.40	8.80	3.10	7.90	2.90	7.50	2.90	7.40	2.80	7.10	5.50	2.50	0.048	45
ND132S	925	5.30	12.5	5.10	12.0	4.60	10.8	4.40	10.3	4.30	10.2	4.10	9.60	6.00	2.50	0.174	68
ND132M	920	7.30	16.6	7.00	15.9	6.30	14.4	6.00	13.6	5.90	13.5	5.60	12.8	6.00	2.50	0.214	79
ND160M	970	9.00	20.2	9.0	19.3	7.90	17.4	8.00	16.5	7.00	16.3	7.00	15.5	6.00	2.50	0.46	120
ND160L	970	13.0	28.1	12.0	26.9	11.0	24.2	10.0	23.0	10.0	22.7	10.0	21.6	6.00.	2.50	0.59	148
ND180L	975	21.0	45.6	21.0	43.7	18.5	39.3	18.0	37.4	17.0	37.0	17.0	35.1	6.50	3.00	1.16	205
ND200L	970	26.0	51.0	24.0	48.8	22.0	44.0	21.0	41.8	21.0	41.4	20.0	39.3	6.00	2.50	1.69	270
ND225M	970	38.0	74.4	37.0	71.2	33.0	64.1	31.0	60.9	31.0	60.3	29.0	57.3	6.00	2.50	3.61	375
ND250M	975	45.0	88.8	43.0	84.9	39.0	76.5	37.0	72.7	37.0	71.9	35.0	68.3	6.50	2.75	4.82	465
ND280S	975	54.0	104.8	52.0	100.3	47.0	90.4	44.0	85.9	44.0	85.0	42.0	80.7	6.80	2.75	8.01	600
ND280M	975	64.0	121.2	61.0	116.0	55.0	104.5	52.0	99.3	52.0	98.2	49.0	93.3	6.50	2.50	9.89	630
ND315S	980	89.0	175.5	85	168.0	77.0	151.3	73.0	143.8	72.0	142.3	69.0	135.1	6.50	2.50	14.1	900
ND315M	985	123	234.4	118	224.3	106	202.1	101	192.0	100	190.0	95.0	180.5	6.50	2.50	17	950
ND315LX	987	177	331.9	170	317.6	153	286.1	145	271.8	144	268.9	137	255.5	6.50	2.25	29.9	1160
ND355LX	987	321	596.9	307	571.2	277	514.6	263	488.9	260	483.7	247	459.5	6.50	2.25	29.7	2150

For performance of Frames other than above, please contact CG Sales.



**Performance Data for TEFC Squirrel Cage Induction Motors (Inverter driven)****Duty : S4**

Standard operating conditions:

Voltage: 415 V ± 10%

Starting time : 3 secs

Frequency: 50 Hz ± 5%

Insulation class : F

Ambient / Temperature rise: 50°/70°C

Switching frequency : 3-6 kHz

Altitude: up to 1000 m

Voltage rise time : > 0.1 micro sec

THD : < 2.5%

8 POLE

FRAME	SPEED RPM	90starts				150starts				300starts				Starting Current Ratio	Pull out Torque Ratio	Rotor GD ² kg-m ²	Net Wt kg
		25 & 40% CDF kW	FLA	60% CDF kW	FLA	25% & 40% CDF kW	FLA	60% CDF kW	FLA	25 & 40% CDF kW	FLA	60% CDF kW	FLA				
ND90S	680	0.3	1.5	0.3	1.4	0.3	1.3	0.3	1.2	0.3	1.2	0.3	1.1	4.5	2.25	0.015	22
ND90L	680	0.7	2.7	0.7	2.5	0.6	2.3	0.6	2.2	0.6	2.2	0.6	2.0	4.5	2.25	0.021	22
ND100L	700	1.5	5.3	1.4	5.1	1.3	4.6	1.2	4.4	1.2	4.3	1.2	4.1	4.5	2.25	0.03	32
ND112M	700	2.2	6.5	2.1	6.2	1.9	5.6	1.8	5.3	1.8	5.3	1.7	5.0	4.5	2.25	0.057	45
ND132M	710	3.7	9.5	3.6	9.1	3.2	8.2	3.0	7.8	3.0	7.7	2.9	7.3	5	2.25	0.214	79
ND160M	710	7	17	7	16	6	14	6	14	6	14	5	13	5.5	2.25	0.46	120
ND160L	710	8	19	8	18	7.0	16	7	16	7	15	6	15	5.5	2.25	0.64	146
ND180M	710	10	25	10	24	9.0	21	9	20	8	20	8	19	5.5	2.25	0.99	174
ND180L	710	12	30	12	28	10.6	25	10	24	10	24	9	23	5.5	2.25	1.16	205
ND200L	720	17	41	16	39	14.5	35	14	33	14	33	13	31	5.5	2.75	2.14	270
ND225S	720	20	47	19	45	17.4	40	17	38	16	38	16	36	5.5	2.25	3.24	345
ND225M	720	24	55	23	53	20.8	48	20	45	20	45	19	43	5.5	2.25	3.61	375
ND250M	730	34	75	32	72	29	65	28	62	27	61	26	58	6	2.25	4.82	465
ND280S	730	42	93	40	89	36	80	34	76	34	75	32	72	5.5	2.5	8.01	600
ND280M	720	51	114	49	109	44	98	42	93	41	92	39	87	6	2.25	9.89	630
ND315S	730	61	138	59	132	53	119	50	113	50	112	47	107	6	2.5	14.1	900
ND315M	730	99	221	94	212	85	191	81	181	80	179	76	170	5.5	2.5	19	950
ND315L	730	121	265	115	254	104	229	99	217	98	215	93	204	5.5	2.25	25.3	1160
ND315LX	730	144	315	138	302	124	272	118	258	117	255	111	243	5.5	2.25	29.9	1160
ND355LX	730	249	517	239	495	215	446	204	424	202	419	192	398	5.5	2.25	36.8	2140

For performance of Frames other than above, please contact CG Sales.



8.5 Brake Motor

8.5.1 LV Brake Motor

→ Kibosh Brake Motors

CG offers Kibosh brake motors, the most reliable range with highly competitive delivery time. Kibosh brake motors are designed to serve various braking applications like crane, hoists, rolling mills, wind mills, elevators etc.

Kibosh covers ac squirrel cage induction motors with output from 0.75 kW to 30 kW in frame sizes NG80 to ND200L cast iron & aluminum body construction.

→ Design and Construction

A Brake Motor is a combination of an AC induction motor and a disc type fail safe electromagnetic brake unit. It consists of following:

- 1) AC Induction Motor
- 2) Rectifier Unit
- 3) Electromagnetic Brake Unit
- 4) Cooling fan at non driving end

Brake:

All standard Brake motors are provided with external DC spring applied fail safe brake "Normally On" which is having following excellent features:

- | | |
|---------------------------------------|--------------------------------------------|
| 1) Power saver | 2) Fast engagement and fast dis-engagement |
| 3) Low heating of brake | 4) Enhanced liner life |
| 5) Dust protecting seal | 6) Compact size |
| 7) Rust protection to all metal parts | 8) Coil with F class insulation |

Because of all above excellent feature, DC fail-safe brake provide following advantages during its operation:

- Lower heating of the brake
- Very fast engagement of the brake
- The booster coil provides very fast release of the brake

Overload capacity:

Motors can withstand the 1.5 rated current for 2 minutes without suffering damage. This feature makes the motor suitable for severe duty applications.

Life of motors:

Kibosh Brake Motors are designed and manufactured with carefully selected and tested insulating materials to ensure long services. The life of the motors mostly depends upon the life of insulating material.

Over speed: All 4,6,8 pole motors are designed for withstanding an over speed of 2.5 times rated synchronous speed or 2000 rpm whichever is less.

→ Operation

Brake motors provide the means of slowing or stopping the driven equipment effectively and safely in a very short time period, the brake unit (DC or AC) are single disc type, mounted on non-driving end of the motor. They are spring applied electrically released unit which provide fail-to-safe operating characteristics such that on interruption, or failure of the power supply the brake will engage and interrupt the load.

With DC brake the brake coil is fed via a rectifier in the motor terminal box for frame size 80 to 200, AC brakes are connected directly to the motor terminal and offered on request.



8.5.1 Kibosh Special Features

Brake Kit :

Every CG make safe area motor, up to 132 frames, is having the unique feature being able to be modified to a brake motor by using brake kit in approximately 30 Minutes

Multi Mount :

(Aluminum motor range upto 7.5 kW)

By simply changing the position of feet ,user is able to convert right ,left or top terminal box position and by changing the standard end shield user can change it for flange or face version.

- Provide high starting torque with low starting current
- Very fast engagement of brakes
- DC and AC brake options.
- No separate terminal box for rectifier and DC supply required.
- Lower maintenance and enhanced liner life
- Proven reliability with long life

Range	
Output	0.55 kW to 30 kW
Frames	80 to 200L
Poles	4,6,8

Specification	Standard Product	Option
Frame Sizes	80 to 200	
Enclosure	IP 55	IP56, IP65
Mounting Option	Foot (B3)	Flange (B5), Face (B14) and combination on request
Terminal Box Position	Top	Left hand side (LHS) / Right hand side (RMS)
Voltage	2.2 kW and below 415 V λ 3.7 kW and above 415 V Δ	Other on request
Frequency	50Hz	60Hz
Cooling	IC411	IC410
Lubrication	Greased for life	Frame 160 to 200 online greasing
Insulation	Class F	Class M
Temperature Rise	Class B	-
DC Brake	Refer Brake Details	AC brake
Paint Shade	RAL9005	As per customer



→ Guidelines for Brake Motor Selection

Before selecting a brake motor it is recommended to check following points:

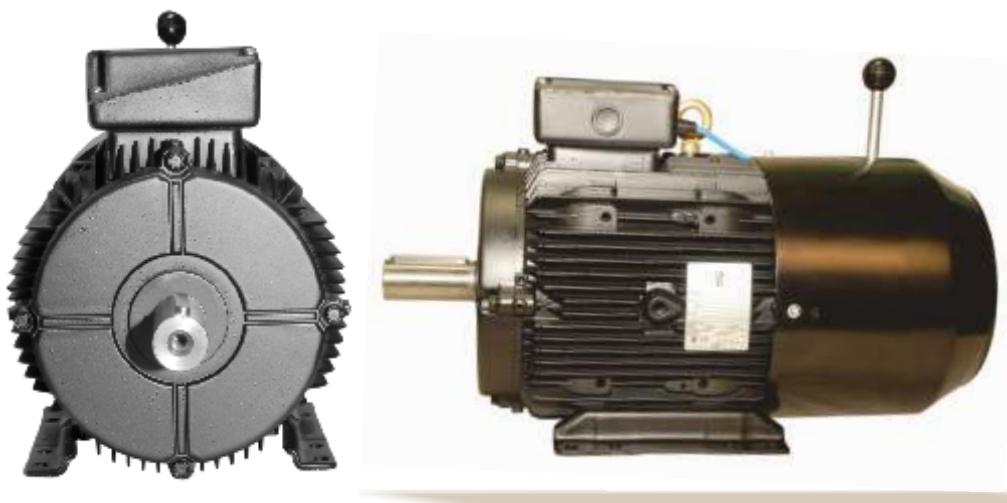
- 1) Application details
- 2) Output and Speed
- 3) Ambient temperature and special environment factor
- 4) Mounting method
- 5) Duty Cycle with number of starts/stops per hour
- 6) Load GD² refer to the motor shaft
- 7) Braking torque required
- 8) Maximum permissible stopping time
- 9) Any other special feature required

→ Quality

Stringent quality procedures are observed from first design to finished product in accordance with the ISO9001 documented quality systems. All of our factories have been assessed to meet these requirements, a further assurance that only the highest possible standards of quality are acceptable.

→ Features

- Fast engagement of brakes
- High starting torque with low starting current
- DC and AC brake options
- No separate terminal box for rectifier and DC supply required
- Lower maintenance and enhanced liner life
- Multi Mount
- Brake Kit





8.5.2 FLP Brake Motor

Flameproof Motor with Brake

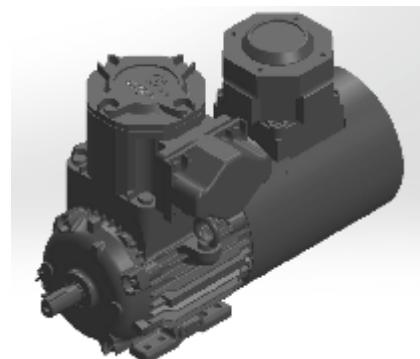
The installation of electric motors where flammable products are continuously handled, processed or storage must comply with the most demanding safety standards in order to guarantee life protection, machines and environment. Following to highest safety

standards, CG Flame proof motors integrate the high performance of the brakes. An effective solution for equipment where fast safety stops are required as well as precise positioning with safety in hazardous areas such as Zone 1 and Zone 2.



Range

Range	
Output	0.37 kW to 11 kW
Frames	E90 to E160
Poles	2, 4, 6, 8
Frequency	50 Hz
Brake I/P voltage	415 VAC
Brake O/P voltage	190 VDC



Features & Benefits

Features	Benefits
High performance braking system	Ensures quick & safe stops. Accurate load positioning. Requires low maintenance
Modern flame retention system with robust frame, end shields and T-Box	Avoid flame propagation from inside the motor to the external side, guaranteeing safety life protection, machines and environment
Additional nameplate	Easy identification of the motors in the factory and traceability
Painting Plan for severe Environments Protection	Special for industrial severe environments, sheltered or not, which may contain Motor suitable to operate in hazardous locations classified as Zone 1 and 2



Applications

Pumps, compressors, fans, blowers, conveyors, gearbox, cranes and other sever duty applications in explosive atmospheres classified as Zones 1 and 2, gas groups IIA or IIB or IIC.

Bearing Details - CAST IRON MOTORS

Bearings			
Frame	Pole	Driving End	Non-Driving End
E90	2,4,6	6205ZZ	6205ZZ
E100	2,4,6	6206ZZ	6206ZZ
E112	2,4,6	6306ZZ	6306ZZ
E132	2,4,6	6308ZZ	6308ZZ
E160	2,4,6	6309-ZZ	6309-ZZ

Brake Details - FLP Brake Motors

Brake Sizes			
Frame	Brake Size	Hub Diameter	Brake Torque (NM)
E90	10	24	16
E100	12	24	32
E112	14	28	60
E132	16	32	100
E160	16 / 18	32	100 / 150





8.6 Crusher Duty Motor

To meet all demanding requirements of crushing industry, CG has designed crusher duty motors. Our crusher series is designed with safety factor 5 and built with a special grade of casting and shaft which provides higher durability and great resistance to impact. CG's Crusher duty motors are specially designed for stone crushing application suitable for:

- Cone crusher
- Gyratory crushers
- Jaw crusher
- Roller crushers
- Impactors
- Pulverisers

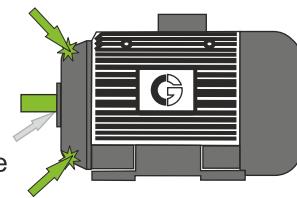
KEY FEATURES AND BENEFITS

→ Built for extreme environment



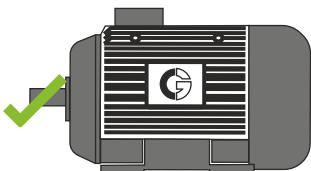
Stator feet have more strength to counter high shock and vibration. It not only increases reliability for crusher application but also provides easier alignment on installation.

→ Engineered for high impact load



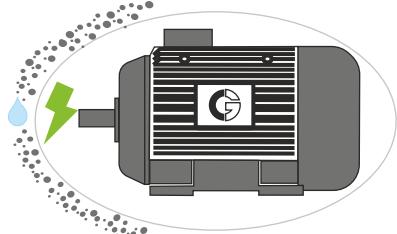
Higher grade and special design of shaft eliminates the chances of failure due to high impact loads. Motor shaft failure is minimized by shifting circlip groove from DE side to NDE side. This improvement in design ensures less stress concentration at DE side.

→ Reliable and Rugged



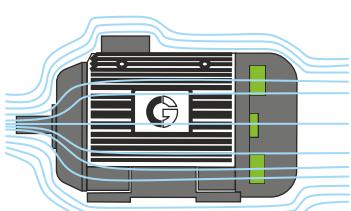
The bearings are designed and engineered for continuous, reliable performance and easy maintenance. For frame 280 and above, Roller bearings with superior load capability are offered as standard on the drive end for extended better life.

→ Excellent ingress protection



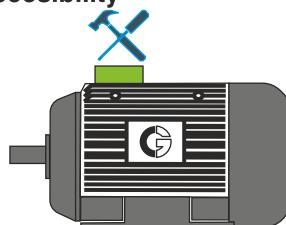
As crusher applications involve exposure to dusty environment, DE side oil seal ensures excellent ingress protection against dust and water. Thus prolonging life of motors and reduces the unnecessary downtime.

→ Better cooling



Specially designed metallic fan in the motor ensures better cooling. Metallic fan has more stable aerodynamic profile providing extended life as compared to plastic fans.

→ Easy accessibility



Improved design has terminal box on top for easy connection. For an easy installation purpose, cast iron split terminal box is given for higher frame. Aluminium box is given for 80 to 132 frames.

Range and Specifications

Range	
Output	0.55 kW to 600 kW
Frames	IEC 80 to IEC 450
Poles	4,6,8



Specification	Standard Product	Option
Frame sizes	IEC 80 - IEC 450	-
Enclosure	IP55	IP56, IP65, IP66
Mounting option	Foot (B3)	Flange (B5), Face (B14)
Terminal box position	TOP	LHS, RHS
Voltage	Up to 3kW 415V λ	On request
	Above 3kW 415V Δ	
Frequency	50 Hz	60 Hz
Cooling	IC411	IC410
Bearings	Frame IEC 80 - IEC 250 : Ball bearings Frame IEC 280 - IEC 450 : Roller bearings	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	Light gray (631 IS-5)	On request
Fan cover	Steel	-
Gel coat	ND 80 to IEC 450	80-132
Anti condensation heaters	ND 280 to IEC 450	80-250
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 20°C to + 50°C	- 40°C, up to 60°C

The above specification and options give a brief summary of features available for crusher duty motors.

For a full listing of optional features, please contact CG sales.



8.7 Smoke Extraction Motors

CG Smoke extraction motors are designed for stringent operating conditions during fire / high temperature ambient conditions. Smoke extraction motor ensures the air circulation in closed environment.

Our smoke extraction motor complies with latest BS EN 12101-3:2015 standard. Smoke extraction motor is a dual function motor.

1) S1 Duty (In normal conditions) : Operation under standard conditions

2) S2 Duty (In case of fire) :

- Removal of smoke and hot gases from accidental fire zones
- Supporting firefighting by creating smoke free zone
- Protecting devices and equipments
- Reducing thermal stresses of components in case of fire
- Minimizing secondary damages by extracting thermal bi-products and hot gases

→ Special features

- Smoke extraction motors are provided with the state of the art insulation system which can withstand the high temperatures during accidental fire conditions
- Motors are provided with flying leads for easy connections
- They are provided with bearings which will work reliably even at high temperatures
- Painting materials are selected such that the paint is durable & protects the motors during high temperature & corrosion due to chemical contents of smoke
- These motors are used for fans which provide standard ventilation in normal working conditions and smoke extraction in emergencies
- Special insulation and impregnation process adapted to the respective temperature/time classes. Maximum thermal utilisation to temperature class
- Special lead wire, terminal block and gasket are used for particular application
- Oil seal or V seal is provided





Range and Specifications

Range	
Output	0.75 kW to 37 kW
Frames	80 to 200L
Poles	2,4,6,8 or dual speed on request
Efficiency class	IE1 / IE2 / IE3

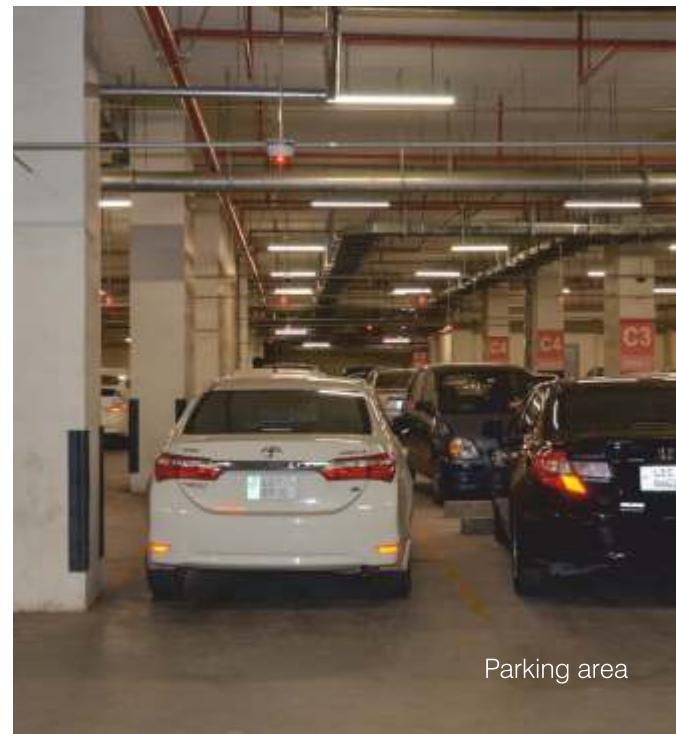
Temperature during accidental conditions

Class	Temperature	Starting
	°C, Time	
F200-120	200°C, 120 min	DOL, VSD
F250-120	250°C, 120 min	DOL, VSD
F300-60	300°C, 60 min	DOL, VSD
F300-120	300°C, 120 min	DOL, VSD

→ Applications

Smoke extraction motor are used where people gather in large numbers are present. Our smoke certified motors with latest standards have been engineered for following applications:

- Tunnels
- Shopping malls
- Airports
- Theatres
- Underground stations
- Enclosed passages & stair cases
- Parking area
- Warehouses
- Factories
- Places with great concentration of people





Range and Specifications - Smoke Extraction

Specification	Standard Product	Option
Efficiency level	IE2	IE3
Electrical performance	As per standard catalog	
Voltage range	Up to 3kW 415 V λ	220V up to 440V
	Above 3kW 415 V Δ	220V up to 440V
Frequency	50 Hz	60 Hz
Voltage variation	$\pm 10\%$	
Frequency variation	$\pm 5\%$	
Combined variation	$\pm 10\%$ absolute sum	
Frame dimensions	As per IEC 60072-1	
Class of insulation	H - Temperature rise limited to Class B	
Ambient temperature	40°C /80°C by resistance method	
Altitude	Maximum of 1000 meter from MSL	
Relative humidity	Up to 95%	
Rating/Duty	S1 in normal condition & S2 during accidental fire.	
Degree of protection	IP55	IP56 and IP66 as per IEC 60034-5
Mounting reference	B3	B5, V1, B14 etc. as per IEC 60034-7
Type of enclosure	Totally enclosed fan cooled	Totally enclosed air over
Terminal box	Cast Iron / Aluminium / Sheet metal cover	
Type of cooling	Externally fan cooled IC411 as per IEC 60034-6.	
Position of terminal box	TOP (Motors with flying leads 1metre.)	RHS / LHS
Terminal box rotation	Terminal box is suitable to rotate in steps of 90°	
Type of starting	Direct on line – Up to & including 3 kW	Star – Delta Starting – 3.7kW & above
Type of Coupling	All types of direct/flexible couplings.	
Direction of rotation	Bi-directional	
Bearings	Metallic shielded ZZ type	Online greasing arrangement
Certification	Conforming to EN 12101-3	
Shaft seal	V-seal / Oil seal	
Vibration level	As per IEC 60034-14 grade A	
Noise level	As per IEC 60034-9	
Paint shade	RAL 7032 (Pebble gray)	



8.8 NEMA E pact / NEMA Premium Motors

Range	(NEMA E pact)
Output	0.75 kW to 150 kW
Frames	143T To 504T
Poles	2,4,6

Range	(NEMA Premium)
Output	0.75 kW to 75 kW
Frames	143T To 405T
Poles	2,4,6

Specification	Standard Product	Option
Frame sizes	143T - 504T	-
Enclosure	IP55	IP56, IP65, IP66
Mounting option	Foot(B3)	Flange(B5), Face(B14)**
Terminal box position	LHS	RHS, TOP**
Voltage	208V, 230V, 460V, 575V	On request
Frequency	60 Hz	50 Hz
Cooling	IC411	IC416
Ball Bearings	Frame 143 - 215 sealed bearings Frame 254 onwards grease-able bearings	
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint colour	Water blue (RAL 5021)	On request
Fan cover	Mild Steel	-
Thermal protection(PTC150)	-	143T - 504T
Anti condensation heaters	-	213T - 504T
Inverter Duty (with derate)	Variable Torque: 10:1, Constant Torque: 2:1	Alternative speed range
Ambient temperature	- 25°C to + 40°C	- 40°C, up to 60°C

The above specification and options give a brief summary of features available for the Nema Motors.

Class 1, Div 2, Group A, B, C, D motors can also be offered.

** Refer to division.



8.9 Higher Output Motors

Performance Data (IEC60034-1) 2004

Voltage	415 ±10%	Type	Foot Mounted	Ambient	50 °C
Frequency	50 Hz ±5%	Duty	S1	Temp Rise (R)	105 °C
Combined	±10% (absolute sum)	Insulation	Class 'F' with Class 'B' temp. rise	Degree of Protection	IP55
				Default Accessories	Space heaters, RTD, BTD

RATED POWER		FRAME	FULL LOAD CURRENT (AMP)	FL	FLT	EFFICIENCY %			POWERFACTOR			D.O.L STARTING			PULLOUT GD ²
kW	HP					IN 415 V	SPEED RPM	IN kg-m	FL	3/4L	1/2L	FL	3/4L	1/2L	
2 POLE : 3000 RPM															
375	505	NG355LX	658	2980	123.00	95.50	94.50	93.00	0.83	0.79	0.70	160	700	225	35.530
400	535	NG355LX	719	2980	131.00	95.50	95.00	93.00	0.81	0.77	0.69	125	700	225	35.530
450	600	NG355LX	771	2985	146.76	95.50	94.00	93.00	0.85	0.83	0.76	125	700	225	35.375
500	670	NG400LX	800	2985	163.06	95.50	94.50	93.00	0.91	0.89	0.84	125	600	150	48.530
560	750	NG400LX	887	2990	182.33	95.50	94.50	93.83	0.92	0.91	0.90	165	700	225	53.600
4 POLE : 1500 RPM															
375	476	ND355LX	621	1492	244.68	95.50	95.00	94.00	0.88	0.85	0.78	160	700	250	53.490
400	535	ND400LX	637	1490	261.34	95.50	95.00	93.50	0.92	0.88	0.85	120	600	200	87.243
450	600	NG400LX	713	1490	294.01	95.50	95.00	93.50	0.92	0.88	0.85	120	600	200	87.399
500	670	NG400LX	800	1492	326.24	95.50	95.50	95.00	0.91	0.89	0.87	110	600	200	87.399
560	750	NG400LX	896	1492	365.39	95.50	95.50	95.00	0.91	0.89	0.87	110	650	200	95.700
630	845	NG400LX	992	1492	411.06	96.00	96.00	94.00	0.92	0.91	0.90	110	650	225	95.700
6 POLE : 1000 RPM															
375	496	ND400LX	641	992	368.01	95.80	95.50	95.00	0.85	0.82	0.75	125	550	200	98.500
400	536.91	NG400LX	685	995	391.36	96.00	96.00	95.50	0.85	0.84	0.79	125	650	280	104.500
450	600	NG400LX	732	991	442.05	96.10	96.00	95.00	0.89	0.85	0.80	125	600	200	104.500
500	670	NG400LX	844	991	491.17	95.80	94.80	92.50	0.86	0.84	0.79	150	600	225	111.000
560	750	NG400LX	944	990	550.66	96.00	96.00	95.60	0.86	0.84	0.79	140	600	225	111.000
630	871	ND450LX	1037	992	618.25	96.00	95.50	95.00	0.88	0.86	0.80	120	600	225	234.000
8 POLE : 750 RPM															
250	335	NG355LX	444	744	327.12	95.50	95.00	94.50	0.82	0.80	0.73	140	500	200	91.727
355	422	NG400LX	646	742	465.76	95.50	94.50	94.00	0.80	0.78	0.76	150	550	200	99.201
375	500	NG400LX	666	742	492.00	95.50	95.00	94.00	0.82	0.80	0.73	140	500	200	99.200
400	503	ND450LX	745	745	522.68	95.80	95.50	94.00	0.78	0.74	0.68	150	600	200	220.900
500	750	ND500LX	906	745	653.35	96.00	96.00	95.50	0.80	0.78	0.68	120	600	250	244.900

Note:

1. VFD suitable for VT : 10% to 100%, CT: 70% to 100%, For CT with speed range below 70%, type of cooling: IC416(Force cooling)



Foundry



Material Handling



Dimension Drawing

175

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