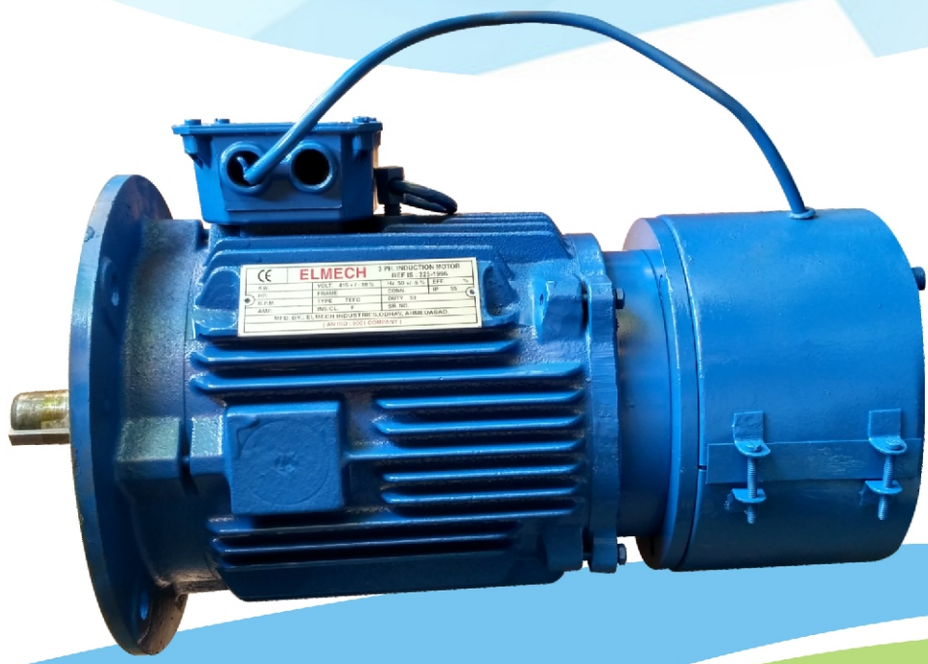
ELMECH INDUSTRIES

IS : 12615

CM/L : 7200109294

CRANE DUTY MOTOR



Elmech make crane and hoist duty motors are ideally suitable for short time and intermittent dueally. These motors are specially designed for frequent starts/stops and reversals.

Major Application
These motors are widely used in following applications :
- Crane duty and Hoist duty application including LT & CT drives
- Material Handling
- Weirs and Sluices
- Lift Duty
- Auxiliary motors in rolling mills

Product Range :

Frame Size	KW Range
71 to 160L	0.37 to 15KW

Standards :
In general these motors conform to following standards

IS/IEC 60034-1 "Rotating Electrical Machines - Part 1 Rating & Performance"	Three Phase Induction Motors Specification
IS : 1231	Dimensions of foot Mounted A.C. induction motors.
IS : 2223	Dimensions of flange Mounted A.C. induction motors.

CE Marks
All motors have CE marketing on the name plate.

ELECTRICAL FEATURES
Operating Conditions
Supply conditions (Voltage & Frequency)
Voltage : 415V± 10%
Frequency : 50 Hz ± 5%
Combined Variation : ± 10%
*Other voltage / Frequency on request.

Ambient
Motors are designed for ambient temperature of 45°C

Altitude
Motors are designed for altitude up to 1000m above mean sea level.

Re-rating Factors
The re-rating application under different conditions of ambient and altitude are obtained by multiplying following factors.

Variation in Ambient & Altitude (Table 1)

Amb. Temp. (°C)	Permissible output as % of rated value	Altitude above sea level (Meters)	Permissible output as % of rated value
< 30	107	1000	100
30-45	100	1500	97
50	96	2000	94
55	92	2500	90
60	87	3000	86
		3500	82
		4000	77

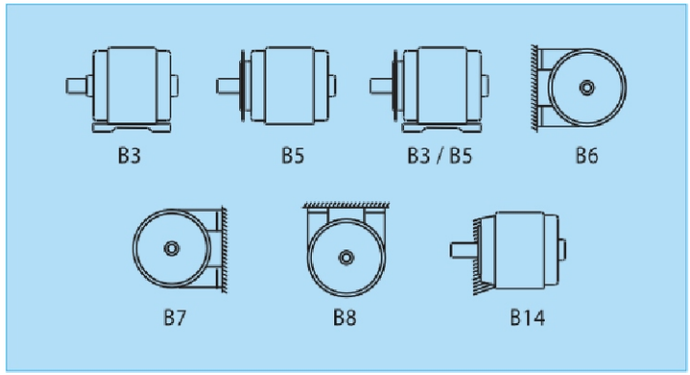
Insulation
The motors are provided with class F insulation scheme with temperature rise limited to class B limits.

Winding
The stators are wound with modified polyester enamel covered (temp class 155°C) copper wires as per IS 13730:3 and impregnated with class F varnish. However motors wound with dual coated copper wires and VPI can be provided on request.

Thermal Protection (for Winding & Bearing)
PTC thermistors / thermostats / RTDs etc. can be embedded in stator winding on request.

Earthing Terminals
Two earthing terminals are provided, one on the body and other in the terminal box.

Type of Construction
Standards motors are designed for foot mounting (B3). Motors up to frame 160L are also suitable for B6, B7, B8, V5 and V6 mounting.
Motors can be supplied in Flange mounting (B5). Flange mounted motors up to frame 160L are also suitable for V1 and V3 mounting.

Horizontal Mounting


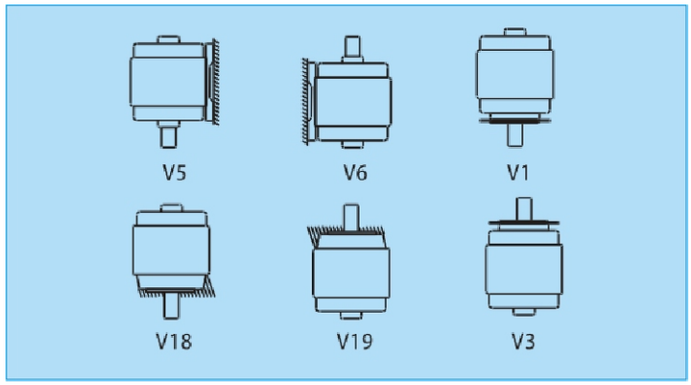
Vertical Mounting


Table 3

Frame Size	Bearing Nos. C3 clearance		Terminal Box Type / Location	Terminal		No. & size of Cable entries	Max cond. Cross Sec area (mm^2)
	DE	NDE		No.	Size		
71	6203 ZZ	6203 ZZ	gk030/Top	3	M4	1x3/4"	4
80	6204 ZZ	6204 ZZ	gk130/Top	3*	M4	1x3/4"	6
90S, 90L	6205 ZZ	6205 ZZ	gk230/Top	3*	M4	2x1"	10
100L	6206 ZZ	6205 ZZ	gk330/Top	6	M4	2x1"	10
112M	6206 ZZ	6205 ZZ	gk330/Top	6	M4	2x1"	10
132S, 132M	6208 ZZ	6208 ZZ	gk330/Top	6	M5	2x1"	10
160M, 160L	6309 ZZ	6308 ZZ	gk330/Top	6	M5	2x1"	16

*3 Terminals up to and including 1.5kW & 6 terminals for higher outputs.

Special Design Features
- Increased air gap between stator and rotor.
- Special rotor design.

Types of duties.
The various operating cycle of driven machines can be classified into eight basic duties, ranging from S1 to S8 They are as follows.

Tables 4

S1	Continuous duty
S2	Short time duty
S3	Intermittent periodic duty
S4	Inetrmittent periodic duty with starting
S5	Intermittent periodic duty with starting and electric braking
S7	Continuous duty with starting and electric braking
S8	Continuous suty with periodic speed changes

Duties S2, S3, S4 and S5 explained with graphs.

(A) S2-Short Time Duty

This includes a period of operation at constant load which are too short to attain thermal equilibrium, followed by rest period of sufficient duration to re-establish equality of temperature with cooling medium in one cycle.

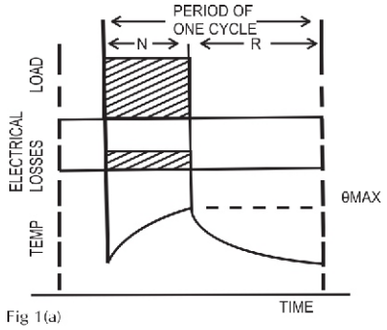


Fig 1(a)

N : Operation under rated conditions.
R : At rest de - energized
O_{Max} : Maximum temperature attained during the duty cycle.

B) S3-Intermittent Periodic Duty

This includes a period of operation at constant load and a de-energized period, which are too short to attain thermal equilibrium during one cycle. The starting current does not significantly affect the temperature rise for this type of duty.

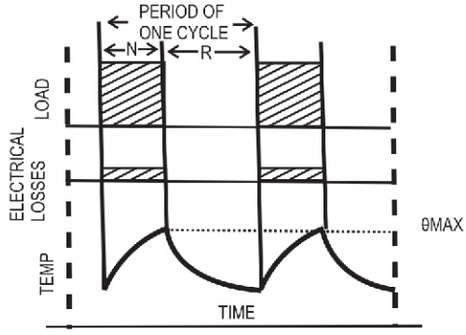


Fig 1(b)

C) S4-Intermittent Periodic Duty with Starting

This includes a period of starting, a period of operation at constant load and a de-energized period, which is too short to attain thermal equilibrium during one cycle. The starting affects temperature rise, as load GD^2 is gigher than rotor GD^2 and / or no. of start/hour is high, for this type of duty. The motor is stopped after switching off either by natural deceleration, or by a mechnical Brake, without additional heating of the windings.

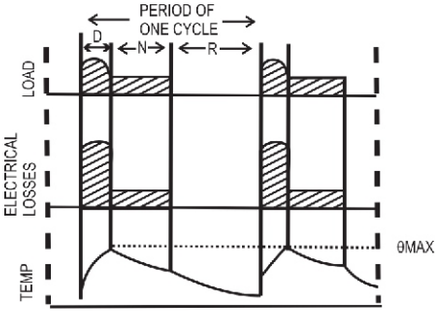


Fig 1(c)

$$\text{Cyclic duration factor} = \frac{D + N}{D + N + R}$$ Where D = Starting

D) S5- Intermittent Periodic Duty with Starting and Electrical Braking

This includes a period of starting, a period of operation at constant load, a period of electrical braking, and de-energized period which are too short to attain thermal equilibrium during one cycle. It is understood that the starting affect temperature rise, as in (c) above, and the stopping also affects temperature rise as braking is carried out electrically. We also supply motors for special types of duties, on enquiry including multi-speed motors with squirrel cage rotors.

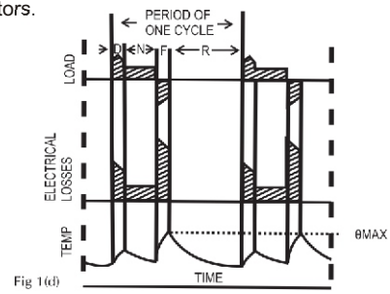


Fig 1(d)

The common cyclic duration factors (CDF) for the above duties are 25%, 40% and 60%. We also supply, on enquiry, motors for other CDF's. The CDF calculations are shown in figures 1(a), 1(b), 1(c), 1(d).

Examples of typical Starting Duties (Table 5)

Starting Duties					Starting Class
Duty Cycle	St/hr	Jogs/hr	Breaking to Stop/hr	Complete plug reversal/hr	No.of Starts/hr thermal Equivalent
S3	60	0	0	0	60
S3	40	80	0	0	60
S3	20	80	20	0	60
S4	150	0	0	0	150
S4	100	200	0	0	150
S5	80	0	80	0	150
S5	65	130	65	0	150
S5	30	160	30	30	150
S4	300	0	0	0	300
S4	200	400	0	0	300
S5	160	0	180	0	300
S5	130	260	130	0	300
S5	60	320	60	60	300

refer above table 1 for examples of typical starting duties and selecation of starting class. Table given here are for load GD^2 equal to or less than rotor GD^2 For cases where load GD^2 > rotor GD^2 the motor should be selected from the table with a higher no. of starts/hr. as per the formula. No. of starts allowed = No. of starts as per table x 2 x GD^2 of rotor/(GD^2 of rotor + GD^2 of load)

How to select Motors for Hoisting and similar duties.

The formula to establish the rated output Pn in KW is :.

$$Pn = \frac{F \times V}{102 \times eff} \text{ KW}$$

Where,
F = Maximum total load in Kg.
V = Hoisting speed in mtrs/sec. and
eff = Overall mechanical efficiency of the driving unit.

For horizontal motion ensure that the rated output Pn of the motor is greater than the power necessary to move the equipment given by :

$$Pn > = \frac{M \times n}{974 \times eff} \text{ KW}$$

Where,
M = Torque reqd. for movement in Kgm.
n = Motor r.p.m.

Inverter Applications :

All crane duty motors are suitable for inverter feed supply. These motor are wound with dual coated winding wires and impregnated with VPI process.

Motors with Integral Brakes :

These motors can be supplied with integral fail safe D.C. brake in frame sizes upto 132M, with built in rectifiers (so that no separate DC supply is required for brake part.) For more details refer brake motors section of the catalogue.

Enquiries :

The following information should be included.
a) Application.
b) Voltage / frequency with variations.
c) Ambient temperature and type of protection required.
d) Mounting.
e) No. of starts/stops per hour with duty and CDF.
f) Load GD^2 referred to motor speed.
g) Load torque or torque/speed curve of driven equipment.

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 :

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

Where sufficient information is not available values given in table 6 below for duty cycles, cyclic duration factor & starting corresponding to mechanism class shall be used. The values given are based on the following formula.

$$\text{CDF} = \frac{\text{Operating time x 100}}{\text{Operating time + idle time}}$$

Recommended Cyclic Duration Factor & starting class,

Table 6

Mechanism Class	Duty cycle No. of cyclic class (c) Cycles/hr (%)	Recommended CDF (%)	Starting class (c) Equivalent starts/hr
M1	Up to 5 / Cycles 25	25	90
M2	Up to 5 / Cycles 25	25	90
M3	Up to 15 / Cycles 40	40	150
M4	Up to 20 / Cycles 40	40	15
M5	Up to 30 / Cycles 60	60	300
M6	Up to 40 / Cycles 60	60	300
M7	Up to 50 / Cycles 100	100	600
M8	Up to 60 / Cycles 100	100	600

Foot Type Brake Motor

Geared Motor

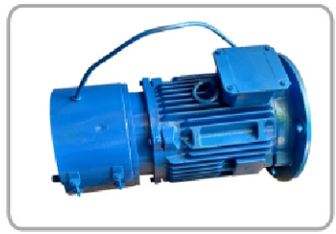
A.C. Disc Brake

A.C. Brake

Flange D.C. Brake

Induction-Brake-Motor

Inline-Helical-Geared-Motor



Crane Duty
Flange Type Brake Motor

ELMECH INDUSTRIES **MFRS OF : All Type Electric Motors & Gear Motors**

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