



Smart Solutions.
Strong Relationship.

Energy Efficient AC Motors

IE2 Efficiency class




Apex Series
a green solution

Crompton Greaves Ltd

As one of the world's leading engineering corporations, CG provides end-to-end solutions, helping its customers to use electrical power effectively and to increase industrial productivity with sustainability. CG was established in 1937 in India; and, since then the company has retained its leadership position in the management and application of electrical energy.

CG is leading manufacturer of electric motors, with motor solutions, which benefits a wide range of customers. Our products are used in almost every industrial application including general manufacturing, petrochemicals, food processing, pharmaceuticals where they drive fans, pumps, compressors, conveyors, lifts and cranes, amongst other things.

Our core competencies lie in our design facility conforming to the international quality standards. We make continuous effort, to bring out the latest, most advanced product into market-place. We continuously add many new services, features and introduce new solutions so as to ensure complete customer satisfaction.

Apex Series

Apex IE2 series is a green solution by CG to save energy, as growing cost of energy calls for power savings at each possible step of manufacturing. Electric motor driven systems used in industrial process consume about 70% of electricity.

These motors are complying with new efficiency requirements of IEC60034-30:2008 IS12615:2011 standard. Apex aluminium motor range covers ac squirrel cage induction motors with output from 0.75kW to 7.50 kW in frame sizes GD80 TO GD132M. Apex series cast iron range covers ac squirrel cage induction motor with output from 0.75 kW to 250 kW in frame NG80 to ND355LX. They are being used in various range of application from food processing to chemical & heating to refrigeration.

Quality assurance

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 accepted.

Benefits of Apex Series Motors

- High efficient at low running cost
- Low vibration and noise
- High torque with smooth acceleration

Multi Mount

(Aluminium 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.

IEC 60034-30:2008 / IS 12615-2011 Specifications

International Electro technical Commission (IEC) standard IEC 60034-30:2008 defines energy-efficiency (IE code) classes for single speed, three-phase, 50 and 60 Hz induction motors. The efficiency levels defined in IEC 60034-30 are based on test methods specified in IEC 60034-2-1:2007

The standard defines three International energy efficiency classes (IE classes).

- IE1 = Standard efficiency (EFF2 in the former European classification scheme)
- IE2 = High efficiency (EFF1 in the former European classification scheme and equivalent to EPA in the USA for 60 Hz)
- IE3 = Premium efficiency (equivalent to NEMA Premium in USA for 60 Hz)

The standard covers almost all motors (for example standard, marine, brake motors, geared motor)

- Single speed, three-phase, 50 Hz and 60 Hz
- 2, 4 or 6 poles
- Rated output from 0.75 to 375 kW
- Rated voltage up to 1000 V
- Duty type S1 (continuous duty) or S3 (intermittent periodic duty) with a rated cyclic duration factor of 80 percent or higher
- Capable of operating direct online

The following motors are excluded from the standard :

- Motors made solely for converter operation.
- Motors completely integrated into a machine (for example, pump, fan or compressor) that can not be tested separately from the machine.
- Motors rated for duty cycles S4 and above except if an equivalent S1 duty is specified by the driven equipment manufacturer.

Additional Specifications of IS 12615-2011

The motors are capable of delivering rated output with,

- terminal voltage differing from its rated value by not more than $\pm 10\%$, or
- frequency differing from its rated value by not more than $\pm 5\%$, or
- the sum of absolute percent variations of (a) & (b) not exceeding 10%

The fixing dimensions and shaft extensions of motors are conforming to the values specified in IS 1231 and IS 2223.

The relationship between output, in kW and frame number are according to IS 1231.

Apart from efficiency, Indian Standard defines following performance parameters for IE2 motors

- 1) Full load Speed
- 2) Full load Current
- 3) Breakaway Torque
- 4) Breakaway Current

IEC 60034-2-1:2007 / IS 15999 (Part 3 / sec 1) Specification

The standard introduces new rules concerning the testing methods to be used for determining losses and efficiency. It offers two ways of determining efficiency; the direct and indirect methods. The standard specifies the following parameters for determining efficiency using the indirect method:

- 1) Reference temperature
- 2) Four options for determining PLL (additional load losses):
 - a. Measurement- PLL calculated from load tests
 - b. Estimation- PLL at assigned value 2.5% -1.0% of input power at rated load between 0.1 kW and 1000 kW
 - c. Mathematical calculation - E_h star - alternative indirect method with mathematical calculation of PLL
 - d. PLL from removed rotor and reverse rotation test

Winding losses in stator and rotor are determined at (25°C + actual temperature rise measured)

The resulting efficiency values differ from those obtained under the previous IEC testing standard, IEC 60034-2:1996.

It must be noted that efficiency values are only comparable if they are measured using the same method.

REFERENCE STANDARDS

Standards	Description
IEC 60034-1:2010	Rotating electrical machines - Rating & Performance
IEC 60034-30:2008	Rotating electrical machines - IE Code for Efficiency Classes
IEC 60034-2-1:2007	Rotating electrical machines - Determination of Losses & Efficiency
IEC 60034-5:2006	Rotating electrical machines - Degrees of protection
IEC 60034-9:2007	Rotating electrical machines - Noise Limits
IEC 60034-14:2007	Rotating electrical machines - Vibration Limits
IEC 60072-1:1991	Rotating electrical machines - Dimensions
IS 1231:1974	Rotating electrical machines - Dimensions foot mounted
IS 2223-1983	Rotating electrical machines - Dimensions flange mounted

APEX SERIES

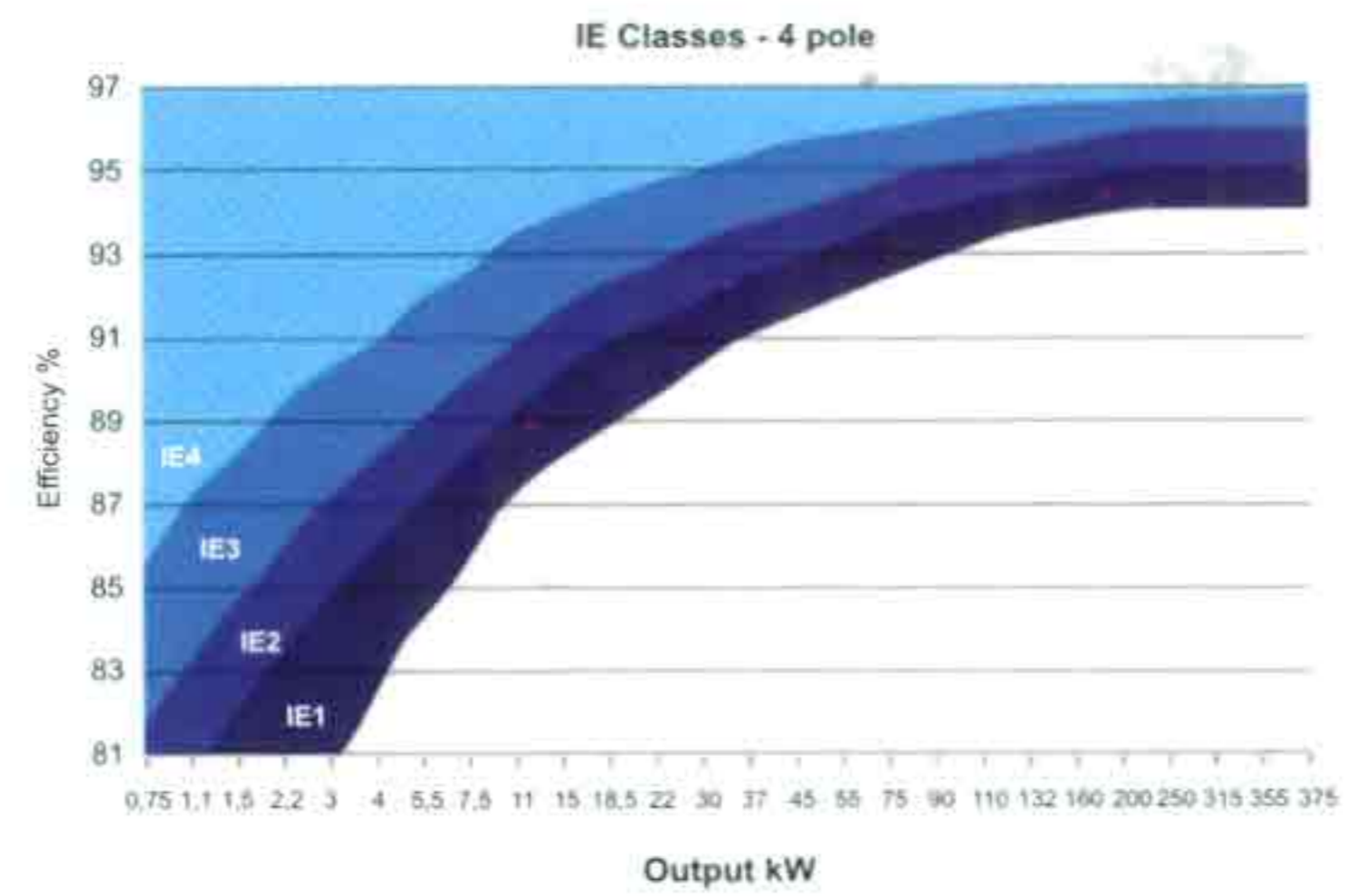
INTRODUCTION

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

Output kW	IE1 Standard Efficiency			IE2 High Efficiency			IE3 Premium Efficiency		
	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
1.1	75.0	75.0	72.9	79.6	81.4	78.1	82.7	84.1	81.0
1.5	77.2	77.2	75.2	81.3	82.8	79.8	84.2	85.3	82.5
2.2	79.7	79.7	77.7	83.2	84.3	81.8	85.9	86.7	84.3
3	81.5	81.5	79.7	84.6	85.5	83.3	87.1	87.7	85.6
4	83.1	83.1	81.4	85.8	86.6	84.6	88.1	88.6	86.8
5.5	84.7	84.7	83.1	87.0	87.7	86.0	89.2	89.6	88.0
7.5	86.0	86.0	84.7	88.1	88.7	87.2	90.1	90.4	89.1
11	87.6	87.6	86.4	89.4	89.8	88.7	91.2	91.4	90.3
15	88.7	88.7	87.7	90.3	90.6	89.7	91.9	92.1	91.2
18.5	89.3	89.3	88.6	90.9	91.2	90.4	92.4	92.6	91.7
22	89.9	89.9	89.2	91.3	91.6	90.9	92.7	93.0	92.2
30	90.7	90.7	90.2	92.0	92.3	91.7	93.3	93.6	92.9
37	91.2	91.2	90.8	92.5	92.7	92.2	93.7	93.9	93.3
45	91.7	91.7	91.4	92.9	93.1	92.7	94.0	94.2	93.7
55	92.1	92.1	91.9	93.2	93.5	93.1	94.3	94.6	94.1
75	92.7	92.7	92.6	93.8	94.0	93.7	94.7	95.0	94.6
90	93.0	93.0	92.9	94.1	94.2	94.0	95.0	95.2	94.9
110	93.3	93.3	93.3	94.3	94.5	94.3	95.2	95.4	95.1
132	93.5	93.5	93.5	94.6	94.7	94.6	95.4	95.6	95.4
160	93.7	93.8	93.8	94.8	94.9	94.8	95.6	95.8	95.6
200	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
250	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
315	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
355	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
375	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8

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 these reason the starting performance of energy efficient motors differs somewhat from motors with a 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 the same output power. Individually, this difference depends on the construction principle of the motor and should be checked with manufacturer when replacing motors in a n existing installation. It must be ensured that the control protective device is properly sized and setup.
- 6) As per IEC60034-30 : 2008 motors specially designed,
 - For special requirement of the driven machine (e.g heavy starting duty, special torque stiffness and/or breakdown torque characteristics, large number of start/stop cycles, very low rotor inertia)
 - For special characteristics of grind supply (e.g limited starting current, high tolerances of voltage and/or frequency)
 - For special ambient conditions (e.g very low ambient temperature, smoke extraction motors, high altitudes of installation)
 - may not be able to achieve higher efficiency classifications.



Most electricity today is generated by burning fossil fuels and producing steam which is then used to drive a steam turbine that in turn, drives an electrical generator.

More serious are concerns about the emissions that result from fossil fuel burning. Burning them results in the conversion of carbon to carbon dioxide, which is then released into the atmosphere. The estimated CO₂ emission from the world's electrical power industry is 10 billion tonnes yearly. This results in an increase in the Earth's levels of atmospheric carbon dioxide, which enhances the greenhouse effect and contributes to global warming. The linkage between increased carbon dioxide and global warming is well accepted though fossil-fuel producers vigorously contest these findings.

According to Environment Canada :

Fossil fuel-fired electric power plants emit carbon dioxide, which may contribute to climate change. In addition, the sector has significant impacts on water and habitat and species. In particular, hydro dams and transmission lines have significant effects on water and biodiversity

Here are some more startling predictions of what changes to climate could cause, and how well be affected:

- Major floods may now start to happen every 10 or 20 years rather than once or twice a century
- Global sea levels could rise by almost a meter by 2100
- Exposure to higher levels of UV light could cause an extra 5,000 deaths a year from skin cancer
- Climate change may drive more of a quarter of land animals and plant species to extinction

Total energy & Feedstock Savings Potentials

The conclusion is that manufacturing industry can improve its energy efficiency by an impressive 18 to 26%, while reducing the sectors CO₂ emission by 19 to 32%, based on proven technology. Identified improvement options can contribute 7 to 12% reduction in global energy and process-related CO₂ emissions. The single most important category is motor systems, followed by chemicals/petrochemicals on an energy savings basis. The highest range of potential sectoral savings for CO₂ emissions is in cement manufacturing. The savings potential under the heading system/life cycle improvements is larger than the individual sub-sectors in part because those options apply to all industries.

	Low-High Potential	Estimates of Technical Savings		Total Energy & Feedstock Savings Potential
	EJ/yr	Mtoe/Yr	Mt CO ₂ /yr	%
Sectoral Improvement				
Chemical / Petrochemicals	5.0-6.5	12-55	370-470	13-16
Iron and steel	2.3-4.5	55-108	220-360	9-18
Cement	2.5-3.0	60-72	480-520	28-33
Pulp and Paper	1.3-1.5	31-36	52-105	15-18
Aluminium	0.3-0.4	7-10	20-30	6-8
Other non-metallic metals				
Minerals and non-ferrous	0.5-1.0	12-24	40-70	13-25
System/life cycle improvement				
Motor System	6-8	143-191	340-750	
Combined head and power stem system	2-3	48-72	110-170	
Process integration	1.5-2.5	36-60	110-180	
Increased recycling	1-2.5	24-60	70-180	
Energy Recovery	1.5-2.3	36-55	80-190	
Total	25-37	600-900	1900-3200	
Global improvement potential-share of industrial energy use and CO ₂ emissions	18-26	% 18-26	% 19-32	%

Reference : Tracking industrial energy efficiency and CO₂ emissions



Conserve Energy for a Brighter Future..!

Apex series Aluminium motors (GD Frames)

Range	
Output	0.75 kW to 7.50 kW
Frames	GD 80 TO GD 132
Poles	2,4,6

Specification		
	Standard Product	Option
Frame sizes	80 to 132	-
Enclosure	IP55	IP56, IP65
Mounting option	Foot (B3)	Flange (B5), Face (B14) or Pad (B30)
Terminal box position	Top	Left hand side (LHS), Right hand side (RHS)
Voltage	3 kW and below: 415 Δ / 400 Δ	380 Δ
	3.7 kW and above: 415 Δ / 400 Δ	380 Δ Others on request
Frequency	50 Hz	60 Hz
Cooling	IC411	IC410
Lubrication	Frame 80 to 132 double-shielded bearings	-
Insulation	Class F	Class H
Temperature rise	Class B	Class F
Paint color	Gentian blue (RAL 5010)	On request
Fan cover	Steel	Plastic
Thermal protection	-	80 to 132 frames
Anti condensation heaters	-	132 frame
Inverter Duty (with derate)	Variable Torque - 10:1,	
	Constant Torque - 2:1	Alternative speed range
Ambient temperature	- 20°C to + 50°C	Higher than 50°C
DC brake	-	80 to 132 frames
Altitude	\leq 1000m	Higher than 1000 m

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



