



ENGINEERING UNITS, CONVERSIONS & FORMULAE

SI (Systeme Internationale) Basic Units – from which all other units can be derived:

Quantity	Unit	Symbol	Imperial Unit
Length	metre	m	inch
Mass	kilogram	kg	pound
Time	second	s	(same)
Electric current	Ampere	A	(same)
Temperature	Kelvin	K	Fahrenheit

Other units of measurement, and their relationship to basic SI units.

Quantity	Unit	Symbol	Relationship	Imperial Unit
Angle	radian	rad	1 rad = 1 m/m	
	degree	°	1° = 1 rad x π/180	
Area	square metre	m ²	1 m ² = 1m.m	square foot square inch
Frequency	Hertz	Hz	1 Hz = 1 s ⁻¹	cycle/sec (c/s)
Force	Newton	N	1 N = 1kg.m/sec ²	
	tonne	t	1 t = 1000 kgf	ton
	kilogramforce	kgf	1 kgf = 9.81 N	poundforce (lbf)
Pressure	Pascal	Pa	1 Pa = 1 N/m ²	
	Bar	bar	1 bar = 10 ⁵ Pa	lbf/inch ² (psi)
Energy	Joule	J	1 J = 1 N.m	
Power	Watt	W	1 W = 1 J/s	
	kilowatt	kW	1 kW = 1000W	horsepower
Elec.potential	Volt	V	1 V = 1 kg.m ² /A ² .s ³	
Elec.resist.	Ohm	Ω	1 W = 1 V/A	
Elect. capacity	Farad	F	1 F = 1 A.s/V	
Temperature	degree. Celsius	°C	1° C = 1°K	Fahrenheit
Note: the kelvin scale starts at absolute zero i.e 0°K the Celsius scale starts at 273°K i.e 0°C (freezing point of water) K and C degree intervals are the same				
Speed	metre/second	m/sec		mile per hour foot/sec
Angular	radian/second revolution/min	rad/s rev/min	1 rad/s = 1 m/m.s 1 rev/min = π/30 rad/s	
	Newton metre	Nm	1 Nm = 1 kg.m ² /sec	foot.pound pound.inch
Volume	Cubic metre	m ³	1 m ³ = 1m.m.m	cubic inch
	Litre	ℓ	1ℓ = 1m ³ /1000	Imperial Gallon
Acceleration	metre/second squared radian/second squared	m/sec ² rad/sec ²	1m/sec ² = 1m/s/s 1 rad/sec ² = 1m/m.s.s	ft/sec ²
	Angular			
Inertia	MR ²	kg.m ²	1kg.m ² = 1 kg.m.m	pound.inch ²
Viscosity	centiStoke	cSt	1 cSt = 1mm ² /s	

Some common units are multiples or submultiples of the above.

They use 'preferred' prefixes which indicate multiples or submultiples of basic units and make the resultant unit more relevant to the engineering business.

Prefix	Symbol	Factor
mega	M	x 1,000,000
kilo	k	x 1,000
milli	m	÷ 1,000
micro	μ	÷ 1,000,000

e.g. the Watt is a small amount of power (an average light bulb consumes 60 Watts) so the kilowatt, i.e. 1000 Watts, is more commonly used in power transmission.

Megawatts i.e. 1,000,000 Watts, are a useful unit of measure for power station capacity.

CONVERSION FACTORS

Some of the more common Imperial units are mentioned above. The following table gives a comprehensive range of metric units and factors for their conversion to appropriate Imperial units.

Length

Millimetres x 0.0394 = inches	Inches x 25.4 = millimetres
Metres x 39.37 = inches	Inches x 0.0254 = metres
Metres x 3.281 = feet	Feet x 0.305 = metres
Metres x 1.094 = yards	Yards x 0.914 = metres
Kilometres x 0.6213 = miles	Miles x 1.61 = kilometres

Force

Newtons x 0.225 = lbf	lbf x 4.45 = newtons
kgf x 2.205 = lbf	lbf x 0.454 = kgf
Metric ton x 0.984 = ton (1000kgf)	Ton x 1.02 = metric ton (2240 lbf)
kgf x 9.81 = Newtons	Newtons x 0.102 = kgf (1000kgf)

Note: kgf = kilogram force and lbf = pounds force

Area

Sq millimetres x 0.0026 = sq inches	Sq inches x 645.2 = sq millimetres
Sq metres x 10.764 = sq feet	Sq feet x 0.093 = sq metres
Sq metres x 1.196 = sq yards	Sq yards x 0.836 = sq metres

Inertia

Kilogram metre squared (kg m²) x 23.73 = Pound feet squared (lbf ft²)

Temperature

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

$$^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C}) + 32$$

Volume

Cubic metres x 35.317 = cubic feet	Cubic feet x 0.02831 = cubic metres
Cubic metres x 1.308 = cubic yards	Cubic yards x 0.7645 = cubic metres

Fluid Volume & Pressure

Litres x 0.22 = imp. gallons	Imp. gallons x 4.546 = litres
Litres x 0.035 = cubic feet	Cubic feet x 28.32 = litres
Bar x 14.5 = pounds per sq inch (lbf/in ² or psi)	Pounds per sq inch x 0.069 = bar

Torque

Newton metre (Nm) x 0.735 =	Pounds feet (lbf ft)
Newton metre (Nm) x 8.85 =	Pounds inches (lbf in)
Kilogram force metre (kgf m) x 9.81 =	Newton metre (Nm)

Power

Kilowatt (kW) x 1.34 = horse power (hp)	Horse power (hp) x 0.746 = kilowatt (kW)
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The German Pferdestärke (PS) and French Cheval-vapeur (CV) are similar to the UK/US horse power.

Pi (π)

The mathematical ratio π (pi) = 3.14159

FORMULAE

Formulae regularly used in power transmission and general engineering.

Power, Torque and Speed

These are the basic parameters of rotational power transmission, related by the following formulae

$$\text{Power (kW)} = \frac{\text{Torque (Nm)} \times \text{rotational speed (rev/min)}}{9550}$$

$$\text{Torque (Nm)} = \frac{\text{Power (kW)} \times 9550}{\text{Rotational speed (rev/min)}}$$

Torque, Inertia and Acceleration

The above power / torque formulae are used for applications at their normal running speed.

If the inertia of an application is known, the higher torque necessary to accelerate the load from rest to running speed can be calculated.

$$\text{Torque (Nm)} = \text{Inertia (kg.m}^2\text{)} \times \text{acceleration (rad/sec}^2\text{)}$$

For linear motion, a similar formula gives the force required to accelerate a mass in a straight line.

$$\text{Force (N)} = \text{Mass (kg)} \times \text{acceleration (m/sec}^2\text{)}$$

The above formulae can be applied using deceleration, to calculate braking torque or force.

Hydraulic Pumps, Motors & Cylinders

$$\text{Shaft Torque (Nm)} = \frac{\text{Displacement (cm}^3\text{/rev)} \times \text{pressure (bar)}}{20 \pi}$$

$$\text{Cylinder force (N)} = \text{Pressure (bar)} \times \text{area (m}^2\text{)} \times 10^5$$

Speed Ratio

Speed ratio is a feature of many transmission drives. Ratio is usually described by a number > 1.0, followed by “:1”. Speed reduction (usually), or increasing, must be specified.

$$\text{Ratio} = \frac{\text{Faster machine speed (rev/min)}}{\text{Slower machine speed (rev/min)}}$$

E.g. Belt drive from a 1000 rev/min motor to a blower at 500 rev/min has a 2:1 reduction ratio. Same motor driving a fan at 1500 rev/min needs a 1.5:1 increase ratio.

Gearmotor with a 6-pole (960 rev/min) motor, having a 48 rev/min output speed has a 20:1 reduction ratio.

Chain drive using two 23 tooth sprockets has a 1:1 ratio.

Centre Distance Calculation

Belt length, given pulley diameters and centre distance:

$$\text{Length (L)} = 2C + \frac{(D-d)^2}{4C} + 1.57 (D+d)$$

where

- L = Pitch length of belt in millimetres.
- C = Centre distance in millimetres.
- D = Pitch diam. of large pulley in millimetres.
- d = Pitch diam. of small pulley in millimetres.

Centre distance, given pulley diameters and belt length:

$$\text{Centre Distance (C)} = A + \sqrt{A^2 - B} \quad \text{where}$$

$$A = \frac{L}{4} - 0.3925 (D + d) \quad \text{and} \quad B = \frac{(D - d)^2}{8}$$

The above formulae can also be used for chain lengths, using sprocket pitch diameters.

Pulley/Sprocket Pitch Diameters

For pitch diameter of a synchronous belt drive pulley or chain sprocket:

$$\text{Pitch dia (mm)} = \frac{\text{Chain/belt pitch} \times \text{no. of sprocket/pulley teeth}}{\pi}$$



Indirect Drive End Loads

For vee and wedge belt drives, the following formulae give a good approximation of loads sensed by shafts and bearings.

Static tension

To determine the static tension, T_s , in the belt(s), measure the force, P , required to depress a belt 16 mm per metre of span, by means of a Belt Tension Indicator or use setting forces recommended in the belt installation instructions.

The static tension, T_s , is given by

$$T_s = 2(16P) \times B \quad (N)$$

where B = the number of belts

P = Setting force in Newtons, for the belt in question.

Centrifugal tension

The centrifugal tension, T_c , developed in a belt is a function of its weight and the square of its belt speed.

$$T_c = M \times S^2 \quad (N)$$

The belt speed, S , is given by:

$$S = \frac{(d \times n)}{19100} \quad (m/s)$$

where d = pitch diameter of either pulley - mm

n = rotational speed of same pulley - rev/min.

M = mass per unit length for the belt section in question.

See pages 35 to 37 for vee and wedge belt mass values

Dynamic tension

To determine the approximate dynamic tension, T_D , imposed by a drive when running, the centrifugal tension per span, T_c , must be subtracted from the static tension, T_s , hence:

$$T_D = 2(16P - T_c) \times B \quad (N)$$

Synchronous Belt Drives

A different rationale applies – consult your Authorised Distributor.

Chain Drives

Approximate end loads can be calculated from the torque being transmitted:

$$\text{End load (N)} = \text{Torque (Nm)}$$

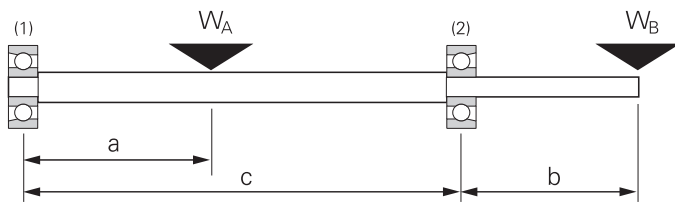
$$\text{Sprocket pitch radius (m) (= } \frac{1}{2} \text{ pitch diameter)}$$

Note that this calculation can be done on either sprocket.

Low torque/small radius (high speed shaft) or high torque/large radius (low speed shaft), give the same answer.

Bearing Loads

The radial load on simple bearing arrangements due to belt/chain drive end loads, gear separating forces, the weight of pulleys or motor rotors etc. can be calculated using "moments" as shown below for two such loads applied to an arrangement of two bearings supporting a horizontal shaft.



Bearing reactions are determined by taking moments about each support.

Taking moments about bearing (2)

$$\text{Radial load on (1)} = \left(W_A \cdot \frac{(c - a)}{c} - W_B \cdot \frac{b}{c} \right)$$

Taking moments about bearing (1)

$$\text{Radial load on (2)} = \left(W_A \cdot \frac{a}{c} + W_B \cdot \frac{(b - c)}{c} \right)$$

The units of radial bearing load will be the same as for the applied loads.

In the above example both applied loads act vertically downward. Bearing reactions will also be vertical but may be upward or downward, depending on the relative values of the applied loads.

Note: The above is a simple example. Comprehensive calculations involving many other factors must be carried out to determine bearing life

Electrical Engineering and Motors

Ohm's Law gives the relationship between Voltage (V), current (A) and resistance (Ω) for "simple" electric circuits (direct current, DC or 'resistive' circuits)

$$\text{Voltage (Volts)} = \text{current (Amps)} \times \text{resistance } (\Omega)$$

Electrical power is also related to voltage and current, but as all machinery is less than 100% efficient, an efficiency, designated η must be applied to calculations

$$\text{Power (Watts)} = \text{voltage (Volts)} \times \text{current (Amps)} \times \eta \text{ (effy.)}$$

AC, or alternating current, electric motors have relatively complex electric circuits.

The above formulae apply, but need modifying by a 'power factor',

$$\text{Power Factor} = \text{cosine of the circuit phase angle, designated } \cos \sigma$$

For single phase AC electric motors:

$$\text{Power (Watts)} = \text{voltage (Volts)} \times \text{current (Amps)} \times \cos \sigma \text{ (PF)} \times \eta \text{ (effy.)}$$

In 3 phase AC electric motors, the applied voltage reaches the windings at a different value depending on whether the supply is connected in star (Y) or delta (Δ) configuration, hence 3 Φ electric motor power is usually equal to the above $\times \sqrt{3}$

AC electric motor speed is a function of supply frequency (Hz) and the number of pairs of poles, in the stator winding.

$$\text{'Synchronous' speed} = \frac{\text{supply frequency(Hz)} \times 60}{\text{pairs of poles}} \quad (\text{rev/min})$$

Most everyday electric motors are 'asynchronous', meaning they 'slip' below synchronous speed, to run at around 95-97% synchronous speed when on load.

e.g. A 6-pole (= 3 pairs), motor connected to the European standard 50 Hz supply will run at:

$$\frac{50 \text{ (Hz)} \times 60 \times 96\% \text{ (average slip)}}{3 \text{ (pairs of poles)}} = 960 \text{ rev/min}$$

Standard Motor Ratings - Three Phase

The ratings in the table below are based on Premium Efficiency (EFF1) IP55 multivoltage motors. Other manufacturers' motor performance data will be different.

Speed rev/min	Output Power		Frame Size	% of Full Load						Current (A)		Torque (Nm)			Weight kg
				Efficiency			Power Factor								
	kW	Hp		50	75	100	50	75	100	In	II / In	Cn	TI / Tn	Tb / Tn	
2-pole															
2760	0.12	0.16	63	58.0	64.8	65.5	0.51	0.64	0.74	0.36	5.0	0.41	2.5	2.7	7
2730	0.18	0.25	63	63.5	68.5	69.5	0.62	0.76	0.81	0.46	4.4	0.65	2.2	2.2	7
2730	0.25	0.33	63	64.0	68.5	71.2	0.58	0.71	0.80	0.63	4.5	0.86	2.2	2.2	7
2810	0.37	0.50	71	69.0	73.8	74.5	0.63	0.77	0.85	0.84	5.5	1.26	2.7	2.9	8
2790	0.55	0.75	71	72.5	76.6	76.7	0.68	0.80	0.86	1.20	5.7	1.91	2.5	2.5	9
2795	0.75	1.00	80	76.5	80.5	80.5	0.73	0.82	0.86	1.56	6.8	2.54	2.8	2.8	12
2820	1.10	1.50	80	81.0	83.0	83.6	0.64	0.76	0.84	2.26	7.8	3.76	3.0	3.0	13
2860	1.50	2.00	90S/L	83.2	84.9	84.5	0.68	0.80	0.85	3.01	7.3	4.94	2.5	2.5	20
2865	2.20	3.00	90S/L	84.0	86.0	86.6	0.64	0.76	0.83	4.42	8.4	7.38	3.3	3.1	23
2895	3.00	4.00	100L	84.5	87.0	88.3	0.73	0.83	0.87	5.64	8.9	9.72	2.7	2.8	28
2900	4.00	5.50	112M	87.0	88.4	88.6	0.72	0.83	0.87	7.49	8.2	13.40	2.4	3.0	39
2870	5.50	7.50	112M	87.5	88.5	88.6	0.78	0.86	0.89	10.10	7.7	18.40	2.3	2.7	45
2935	5.50	7.50	132S	88.5	90.0	90.1	0.71	0.81	0.86	10.20	8.0	18.00	2.4	2.9	55
2925	7.50	10.00	132S	88.5	90.6	90.8	0.72	0.82	0.87	13.70	8.0	24.10	2.2	2.7	85
2910	11.00	14.70	160M	92.4	92.7	92.3	0.86	0.88	0.88	19.50	6.5	36.10	2.1	2.4	106
2935	15.00	20.10	160M	92.5	93.1	92.5	0.89	0.88	0.89	26.20	7.7	48.80	2.6	3.0	116
2930	18.50	24.80	160L	93.4	93.8	93.1	0.85	0.89	0.90	32.00	7.8	60.30	2.9	3.6	129
2950	22.00	30.00	180M	92.5	93.6	93.7	0.76	0.85	0.87	39.00	8.6	71.30	2.8	2.7	180
2955	30.00	40.00	200L	92.8	93.7	94.0	0.84	0.88	0.89	51.80	7.4	97.00	2.7	2.4	245
2960	37.00	50.00	200L	93.0	94.0	94.3	0.71	0.81	0.87	65.10	8.3	119.00	2.6	2.6	60
2960	45.00	60.00	225S/M	93.6	94.5	94.7	0.82	0.88	0.90	76.20	8.5	145.00	2.4	2.9	385
2960	55.00	75.00	250S/M	94.3	95.1	95.0	0.85	0.89	0.91	91.80	8.3	178.00	2.3	3.0	470
2975	75.00	100.00	280S/M	93.0	94.4	95.0	0.81	0.86	0.88	129.00	7.1	241.00	1.6	2.6	680
2975	90.00	125.00	280S/M	94.4	95.5	95.8	0.83	0.87	0.89	152.00	8.2	289.00	1.8	2.7	740
4-pole															
1475	0.12	0.16	63	56.5	62.5	64.5	0.43	0.55	0.65	0.41	4.5	0.80	2.3	2.4	8
1400	0.18	0.25	63	58.0	64.0	67.5	0.44	0.55	0.66	0.58	4.6	1.26	2.1	2.4	8
1400	0.25	0.33	71	69.0	73.0	75.0	0.50	0.61	0.69	0.70	5.0	1.67	2.7	2.8	9
1395	0.37	0.50	71	69.0	74.0	75.5	0.47	0.59	0.69	1.03	5.0	2.54	2.5	2.6	9
1430	0.55	0.75	80	72.0	77.0	78.0	0.56	0.69	0.78	1.30	6.0	3.71	2.3	2.5	12
1420	0.75	1.00	80	76.0	78.6	80.1	0.62	0.75	0.82	1.65	5.7	4.98	2.3	2.3	14
1445	1.10	1.50	90S/L	80.0	83.8	83.8	0.59	0.72	0.80	2.37	7.0	7.32	2.3	2.7	25
1450	1.50	2.00	90S/L	80.5	84.6	85.2	0.54	0.68	0.77	3.30	7.5	9.76	2.6	3.0	24
1425	2.20	3.00	100L	85.3	86.4	86.4	0.65	0.77	0.83	4.43	7.4	14.80	2.5	2.6	29
1430	3.00	4.00	100L	84.5	86.5	87.5	0.64	0.76	0.83	5.96	7.8	19.70	2.6	3.0	34
1445	4.00	5.50	112M	87.1	88.3	88.6	0.66	0.77	0.83	7.85	6.6	26.80	1.8	2.3	43
1465	5.50	7.50	132S	88.0	89.6	90.1	0.69	0.79	0.85	10.40	8.5	36.10	2.1	2.8	65
1465	7.50	10.00	132M	89.0	90.0	90.4	0.71	0.81	0.86	13.90	8.2	48.10	2.2	2.7	68
1460	11.00	14.70	160M	90.7	91.6	91.2	0.67	0.76	0.80	21.80	6.1	71.90	2.0	2.6	111
1465	15.00	20.10	160L	91.1	92.1	91.8	0.66	0.76	0.80	29.40	6.4	97.80	2.3	2.8	121
1470	18.50	25.00	180M	91.6	93.0	93.4	0.65	0.77	0.82	34.90	8.1	120.00	2.7	2.8	175
1475	22.00	30.00	180L	92.2	93.5	93.7	0.71	0.81	0.86	39.40	8.6	143.00	2.8	2.9	195
1475	30.00	40.00	200L	93.0	94.0	93.9	0.67	0.78	0.83	55.60	7.0	194.00	2.4	2.6	240
1475	37.00	50.00	225S/M	93.0	94.0	94.1	0.75	0.84	0.87	65.20	7.2	240.00	2.2	2.7	365
1475	45.00	60.00	225S/M	93.9	94.4	94.4	0.80	0.86	0.89	77.30	7.4	292.00	2.3	2.8	400
1475	55.00	75.00	250S/M	94.1	94.7	94.6	0.76	0.85	0.89	94.30	7.4	356.00	2.3	2.8	450
1485	75.00	100.00	280S/M	93.9	95.1	95.2	0.79	0.85	0.88	129.00	7.2	483.00	2.2	2.4	660
1485	90.00	125.00	280S/M	94.3	95.1	95.3	0.79	0.85	0.88	155.00	7.8	579.00	2.4	2.6	795
6-pole															
900	0.18	0.25	71	49.0	57.0	61.0	0.42	0.51	0.60	0.71	3.5	1.97	1.9	2.0	11
900	0.25	0.33	71	53.0	63.0	67.0	0.39	0.48	0.55	0.98	3.5	2.60	1.9	2.0	12
925	0.37	0.50	80	62.0	67.5	70.0	0.48	0.61	0.70	1.09	4.7	3.82	1.9	2.0	14
920	0.55	0.75	80	62.0	68.5	70.3	0.48	0.63	0.72	1.57	4.8	5.79	2.0	2.2	16
920	0.75	1.00	90S/L	74.0	77.7	77.7	0.50	0.63	0.72	1.94	4.8	7.72	1.9	2.0	22
920	1.10	1.50	90S/L	72.0	77.7	77.7	0.48	0.61	0.71	2.88	5.0	11.60	2.1	2.2	23
945	1.50	2.00	100L	79.0	81.5	81.5	0.49	0.60	0.70	3.80	5.5	14.90	2.0	2.2	26
950	2.20	3.00	112M	81.5	84.0	83.8	0.52	0.64	0.72	5.26	6.2	22.30	2.1	2.3	45
960	3.00	4.00	132S	82.0	85.0	86.5	0.53	0.67	0.74	6.76	6.0	29.40	1.9	2.3	59
960	4.00	5.50	132M	85.0	86.6	87.2	0.56	0.69	0.76	8.71	6.5	40.50	2.0	2.3	68
965	5.50	7.50	132M	84.5	87.5	87.6	0.53	0.65	0.73	12.40	6.8	54.90	2.1	2.3	79
970	7.50	10.10	160M	89.3	90.4	90.0	0.53	0.65	0.71	16.90	5.4	73.80	2.1	2.4	121
970	11.00	14.70	160L	89.9	90.8	90.3	0.56	0.68	0.74	23.90	5.7	108.30	2.2	2.6	134
965	15.00	20.00	180L	91.0	91.9	91.6	0.79	0.86	0.89	26.60	7.3	149.00	2.5	2.6	183
975	18.50	25.00	200L	90.7	92.7	92.9	0.69	0.77	0.84	34.20	6.5	181.00	2.3	2.5	224
975	22.00	30.00	200L	91.0	92.6	92.9	0.65	0.75	0.82	41.70	7.0	216.00	2.3	2.6	235
985	30.00	40.00	225S/M	91.3	93.0	93.5	0.75	0.81	0.85	54.50	7.0	291.00	2.5	2.6	366
980	37.00	50.00	250S/M	91.8	94.0	94.0	0.75	0.81	0.82	69.70	7.0	361.00	2.3	2.4	450
980	45.00	60.00	280S/M	91.5	93.4	94.2	0.68	0.78	0.83	83.30	7.2	439.00	2.4	2.7	610
985	55.00	75.00	280S/M	92.3	93.9	94.3	0.65	0.76	0.81	104.00	7.0	534.00	2.3	2.5	655

Efficiency, power factor and current values are based on 400V supply

- Cn = Full load torque
- II / In = Locked rotor current
- TI / Tn = Locked rotor torque
- Tb / Tn = Breakdown torque
- In = Full load current

Both CEMEP level EFF 1 and EFF 2 motors are available from your local Authorised Distributor. (EFF 1 are on the Government technology list and approved for Enhanced Capital Allowances).

Countering the Climate Change Levy

From April 2001 the UK Government introduced a 0.45p/kWh levy on electrical energy, squeezing further the slim margins made across industry. The principle is to move the burden of taxation from efficient operations to inefficient energy users, and uses a carrot and stick approach.

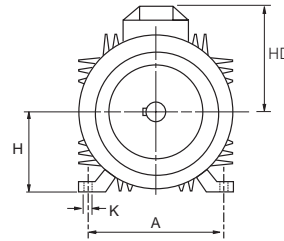
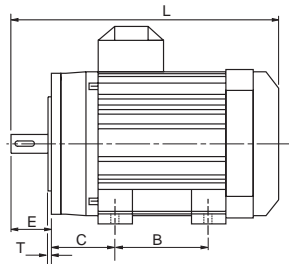
The CCL at 13%, is the stick while the carrot is in the form of Enhanced Capital Allowances (ECA's) which encourage companies to invest in a specified range of energy efficient equipment. This includes inverters and motors available from your local Authorised Distributor.

The benefits are two fold. The first is reduced energy consumption and therefore cost. The second is the ability to write off 100% of the cost against profits in the first year, with the resultant tax saving.

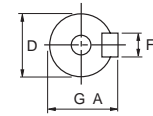


IEC MOTOR INTERFACE DIMENSIONS

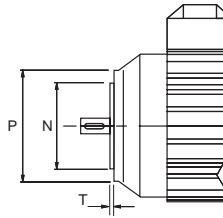
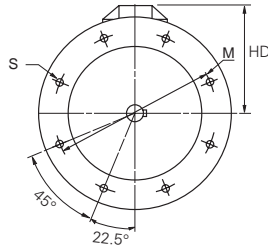
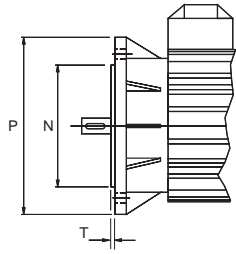
Foot Mount IM1001, B3



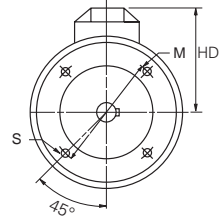
Output shaft



Flange Mount IM3000, B5



Face Mount IM3601, B14



Dimensions

IEC dimensions are highlighted in bold while other dimensions are based on the standard WEG range of motors. Other manufacturers' dimensions may be different, this should only be used as a guide.

Frame Size	Common Dimensions						IM1001					IM13001				IM3601					
	D j6	GA	F	E	L	HD	B3 Foot Mount					B5 Flange Mount				B14 Face Mount					
							A	B	C	K	H	M	N j6	P	S Clear Hole	T	M	N j6	P	S	T
63	11	12.5	4	23	213	101.0	100	80	40	70	63	115	95	140	10	3.0	75	60	90	M5	2.5
71	14	16.0	5	30	248	121.0	112	90	45	70	71	130	110	160	10	3.5	85	70	105	M6	2.5
80	19	21.5	6	40	276	130.0	125	100	50	10.0	80	165	130	200	12	3.5	100	80	120	M6	3.0
90S/L	24	27.0	8	50	330	150.0	140	100+	56	10.0	90	165	130	200	12	3.5	115	95	140	M8	3.0
100L**	28	31.0	8	60	376	160.0	160	140	63	12.0	100	215	180	250	15	4.0	130	110	160	M8	3.5
112M	28	31.0	8	60	388	154.0	190	140	70	12.0	112	215	180	250	15	4.0	130	110	160	M8	3.5
132S	38	41.0	10	80	490	206.5	216	140	89	12.0	132	265	230	300	15	4.0	165	130	200	M10	3.5
132M	38	41.0	10	80	490	206.5	216	178	89	12.0	132	265	230	300	15	4.0	165	130	200	M10	3.5
160M	42	45.0	12	110	637	254.0	254	210	108	15.5	160	300	250	350	19	5.0	-	-	-	-	-
160L	42	45.0	12	110	637	254.0	254	254	108	15.5	160	300	250	350	19	5.0	-	-	-	-	-
180M	48	51.5	16	110	664	270.0	279	241	121	14.5	180	300	250	350	19	5.0	-	-	-	-	-
180L	48	51.5	16	110	702	270.0	279	279	121	14.5	180	300	250	350	19	5.0	-	-	-	-	-
200M	55	59.0	16	110	729	294.0	318	267	133	18.5	200	350	300	400	19	5.0	-	-	-	-	-
200L	55	59.0	16	110	787	294.0	318	305	133	18.5	200	350	300	400	19	5.0	-	-	-	-	-
225S/M	55*/60	59*/64	18	110*/140	817*/847	368.0	356	286/311	149	18.5	225	400	350	450	19	5.0	-	-	-	-	-
250S/M	60*/65	64*/69	18	140	923	368.0	406	311/349	168	24.0	250	500	450	550	19	5.0	-	-	-	-	-
280S/M	65*/75	69*/72	18*/20	140	1036	463.0	457	368/419	190	24.0	280	500	450	550	19	5.0	-	-	-	-	-

* Dimensions for 2 pole motors.

** For frame 100L, 3kW, 4 poles, Premium Efficiency Line, the L dimension is 420 mm

+ For 90L frame size B dimension is 125mm

All dimensions in millimeters