METRIC MOTORS

The influx of foreign equipment have put great numbers of metric motors in plants. As a result of this and the age of these motors, we are seeing inquiries for replacement motors that will match the IEC (International Electrical Commission) standards.

To help identify these motors and make suitable replacements, the following information could be useful.

RATING SYSTEM

One of the first things is that ratings are given in kilowatts (KW) rather than horsepower. The first thing to do is to convert from kilowatts to horsepower. It is important to note that even though KW is an electrical term, in this case it is associated with mechanical output (just as horsepower is in this country). A simple factor will make the conversion. Multiply the KW rating of the motor by 1.34 to get the horsepower of the motor. For example, a 2 KW motor would be equal to approximately 2.7 HP and the closest NEMA equivalent would be 3 HP.

The next item of concern would be the speed of the motor. Generally, somewhere on the nameplate of the foreign motor, you find the speed listed in RPM. The convention in Europe seems to be to show the no load speed of the motor and occasionally, the 50 cycle speed may be shown rather than the 60 cycle speed. The following table shows a crossover from the 50 cycle speeds to the equivalent 60 cycle speeds. In some cases, both the 50 and 60 cycle speeds are shown generally separated with a slash, for example, 1500/1800 RPM. this would be a 4 pole motor that U. S. manufacturers would show nameplated with its full load speed. In this case it might be 1725 to 1760 RPM depending on the size of the motor.

	FREQUENCY			
	50 HZ SPEEDS (RPM)		60 HZ SPEEDS (RPM)	
POLES	SYNCHRONOUS	FULL LOAD (Typical)	SYNCHRONOUS	FULL LOAD (Typical)
2	3000	2850	3600	3450
4	1500	1425	1800	1725
6	1000	950	1200	1150
8	750	700	900	850

EFFICIENCY

IEC 60034-30 specifies the efficiency levels for metric 50Hz motors. The equivalent to our EPAct level of energy efficient motors (NEMA MG 1, table 12-11) is IE2; and premium efficient motors (NEMA MG 1, table 12-12) are IE3. Baldor manufactures metric motors to both levels. A new IEC 60034-2-1 test method now measures all losses and is equivalent to IEEE 112b and CSA 390.

FAILURE REPLACEMENT

When an IEC (metric) motor fails in service the most practical way to proceed is to attempt to get an exact metric framed replacement motor. Baldor and other manufacturers offer a limited selection of the most popular ratings for direct replacement.

When direct replacements are not available, the following information should be helpful in adapting NEMA frame motors to the metric application.

FRAME SIZE

European frame sizes are handled in a different way from U. S. frame sizes. They are based on the shaft height (equivalent to our “D” dimension) in millimeters. For example, a 112 frame would have a 112 millimeters shaft height. Convert this to inches by dividing 112 by 25.4 to get an equivalent domestic shaft height. In this case, the shaft height of a 112 frame would be slightly over 4.4 inches and the closest NEMA frame motor would be a 180 series frame (182, 184, 182T or 184T) with a shaft height of 4.5 inches. This is true for IEC base mounted motors. In the case of this motor, it would be necessary to make adjustments on the machine that would allow for either using the 180 series frame domestic motor and aligning the shaft height difference or by selecting a 145T or 56 frame motor (3.5" shaft height) and shimming up to get the proper alignment. The bolt pattern on the bases of IEC motors are given as metric dimensions and it is impossible to get complete interchangeability with NEMA frame sizes. However, it is usually possible on foot mounted motors to adapt to domestic frame sizes by drilling new holes or making other accommodation to accept the different footprint of the NEMA frame motor. IEC frame sizes for rigid base motors and the associated metric dimensions are shown on page 25. (Dimensions are in Millimeters — Divide by 25.4 to get inch equivalents.)

FLANGE MOUNTED MOTORS

Flange mounted motors become a real nemesis for conversion. There are two popular face mounting configurations used on the IEC motors. The most popular is the “B5” configuration which is closest to NEMA “D” flange motors. the important thing to note is that with the B5 flange, the clearance holes are in the flange and the threaded holes are in the mating part, such as the pump, gear reducer or machine. The other popular IEC flange is the B14 flange. In this case, the threaded holes are in the face of the motor much the same as the NEMA “C” face motors.

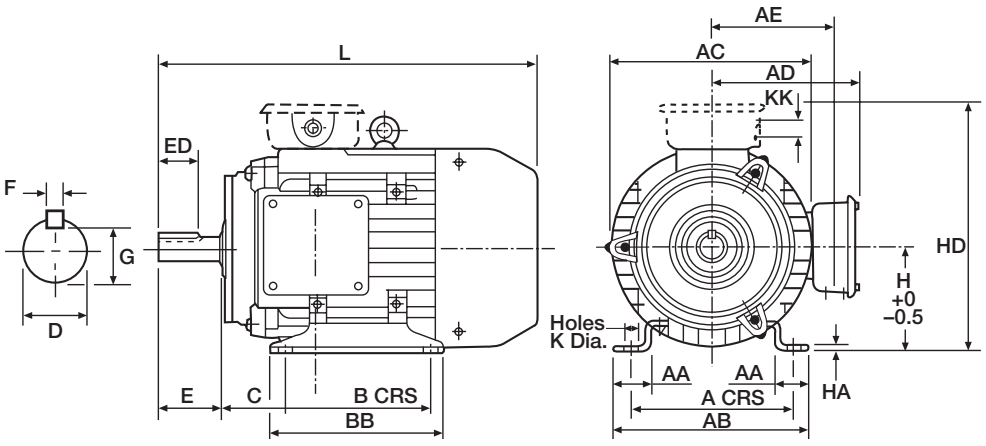
IEC flange mounted motors all have metric rather than inch shaft diameters and where threaded holes are involved, they are metric rather than “inch” threads. To replace metric flange mounted motors, an exact flange mounting equivalent would be necessary unless someone is resourceful enough to make adapter flanges that would convert NEMA “C” face motors to the metric dimensions required. Since this usually is not the case, metric flange mounted motors have to be replaced with metric motors. Page 26 shows typical metric dimensions for B5 and B14 metric motors. Note that dimensions are given in Millimeters.

Baldor is now offering selections of metric, three phase, motors through 200kW. We also stock some permanent magnet DC motors that can be used as replacement units. On a custom basis when reasonable quantities are involved we can build many different metric equivalent motors.

SUMMARY

This information should be useful in your day-to-day dealings in metric replacements.

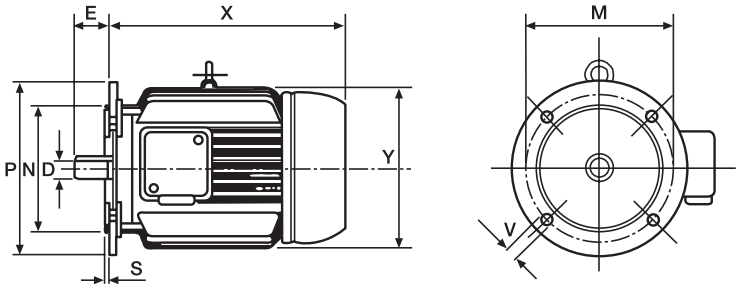
TYPICAL METRIC FOOT MOUNTED DIMENSIONS



Frame Size	Fixing					Shaft					General							
	A	B	C	H	K	D	E	F	G	ED	AA	AB	BB	Typical L	HA	AC	AD	HD
D63	100	80	40	63	7	11	23	3	8.5	10	19	119	100	207	2	126	–	169
D71	112	90	45	71	7	14	30	5	11	14	19	131	110	251	2	126	–	177
D80	125	100	50	80	10	19	40	6	15.5	25	27	157	127	295	4	158	132	212
D90S	140	100	56	90	10	24	50	8	20	32	28	174	127	314	4	178	140	230
D90L	140	125	56	90	10	24	50	8	20	32	28	174	152	339	4	178	140	230
D100L	160	140	63	100	12	28	60	8	24	40	28	184	170	371	4	208	138	251
D112M	190	140	70	112	12	28	60	8	24	40	37	214	170	384	4	243	192	233
D132S	216	140	89	132	12	38	80	10	33	56	38	243	208	463	5	243	234	371
D132M	216	178	89	132	12	38	80	10	33	56	38	243	208	463	5	243	234	271
D160M	254	210	108	160	15	42	110	12	37	80	49	304	304	598	5	329	278	328
D160L	254	254	108	160	15	42	110	12	37	80	49	304	304	598	5	329	278	328
D180M	279	241	121	180	15	48	110	14	42.5	80	51	329	329	698	8	388	317	375
D180L	279	279	121	180	15	48	110	14	42.5	80	51	329	329	698	8	388	317	375
D200L	318	305	133	200	19	55	110	16	49	80	60	380	379	745	10	453	357	410

TYPICAL METRIC FLANGE MOUNTED MOTOR DIMENSIONS

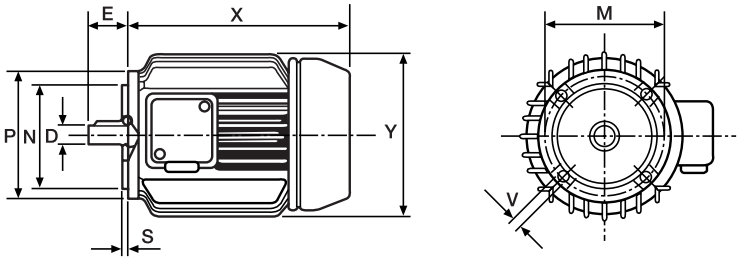
B5



MOTOR SIZE	2 POLES		4 POLES		6 POLES		D	E	N	M	P	S	V	TYPICAL X	Y
	HP	KW	HP	KW	HP	KW									
56 A	0.12	0.09	0.08	0.06	–	–	9	20	80	100	120	2.5	7	167	102
56 B	0.16	0.12	0.12	0.09	–	–									
63 A	0.25	0.18	0.16	0.12	–	–	11	23	95	115	140	3	9	185	122
63 B	0.33	0.25	0.25	0.18	–	–									
71 A	0.5	0.37	0.33	0.25	0.25	0.18	14	30	110	130	160	3.5	9	211	140
71 B	0.75	0.55	0.5	0.37	0.33	0.25									
80 A	1	0.75	0.75	0.55	0.5	0.37	19	40	130	165	200	3.5	11	231	164
80 B	1.5	1.1	1	0.75	0.75	0.55									
90 S	2	1.5	1.5	1.1	1	0.75	24	50	130	165	200	3.5	11	245	181
90 L	3	2.2	2	1.5	1.5	1.1								270	
90 LL	–	–	2.5	1.8	–	–								292	
100 LA	4	3	3	2.2	2	1.5	28	60	180	215	250	4	14	304	207
100 LB	–	–	4	3	–	–								304	
112 M	5.5	4	5.5	4	3	2.2								343	
132 S	7.5-10	5.5-7.5	7.5	5.5	4	3	38	80	230	265	300	4	14	364	259
132 M	12.5	9	10	7.5	5.5-7.5	4-5.5								402	
132 L	–	–	12.5	9	–	–								402	
160 M	15-20	11-15	15	11	10	7.5	42	110	250	300	350	5	18	540	335
160 L	25	18.5	20	15	15	11									
180 M	30	22	25	18.5	–	–	48	110	250	300	350	5	18	600	374
180 L	35	26	30	22	20	15									
200 L	40-50	30-37	40	30	25-30	18.5-22	55	110	300	350	400	5	18	656	416
225 S	–	–	50	37	–	–	* 60	140	350	400	450	5	18	680	416
225 M	60	45	60	45	40	30									
250 M	75	55	75	55	50	37	* 65	140	450	500	550	5	18	742	490
280 S	100	75	100	75	60	45	* 75	140	450	500	550	5	18	892	490
	125	90	125	90	75	55									

** For 2 poles motors: Gr. 225 D = 55; E = 110 Gr. 250 D = 60; E = 140 Gr. 280 D = 65; E = 140*

B14



MOTOR SIZE	2 POLE		4 POLE		6 POLE		D	E	N	M	P	S	V	TYPICAL X	Y
	HP	KW	HP	KW	HP	KW									
63 A	0.25	0.18	0.16	0.12	–	–	11	23	60	75	90	2.5	M5	185	122
63 B	0.33	0.25	0.25	0.18	–	–									
71 A	0.5	0.37	0.33	0.25	0.25	0.18	14	30	70	85	105	2.5	M6	211	140
71 B	0.75	0.55	0.5	0.37	0.33	0.25									
80 A	1	0.75	0.75	0.55	0.5	0.37	19	40	80	100	120	3	M6	231	164
80 B	1.5	1.1	1	0.75	0.75	0.55									
90 S	2	1.5	1.5	1.1	1	0.75	24	50	95	115	140	3	M8	245	181
90 L	3	2.2	2	1.5	1.5	1.1								270	
90 LL	–	–	2.5	1.8	–	–								292	
100 LA	4	3	3	2.2	2	1.5	28	60	110	130	160	3.5	M8	304	207
100 LB	–	–	4	3	–	–									
112 M	5.5	4	5.5	4	3	2.2	28	60	110	130	160	3.5	M8	343	207