

Table 3 Classification of Motors

	Type	Speed Characteristics	Full Voltage		HP Range	Application See Footnotes (a) to (e)
			Starting Torque	Starting Current		
Constant Speed Drives						
Polyphase a-c	Squirrel-cage general purpose Design A	Constant	Normal 1-2.5 times/	High 6-8 times	All	(a) Fans and (c) centrifugal pumps and centrifugal compressors
	Squirrel-cage Design B	Constant	Normal 1-2.5 times/	Normal 5-6 times	Medium Small	(a) Fans and centrifugal pumps and centrifugal compressors
	Squirrel-cage Design C	Constant	High 2-2.5 times/	Normal 5-6 times	Medium Small	(b) Reciprocating pumps (e) and compressors started loaded
	Squirrel-cage Design F	Constant	Low 1.25	Low 4 times	Medium Large	Fans, centrifugal pumps, and compressors
	Wound rotor	Constant or variable	High 1-2.5 times (with secondary control)	Low 1-3 times	All	(a) Hoists (b) reciprocating pumps and compressors (c) and frequent (e) or hard start
	Synchronous high speed	Exactly constant	Normal 0.75-1.75 times	Normal 5-7 times	Medium Large	(a) Fans and centrifugal pumps and centrifugal compressors
	Synchronous low speed	Exactly constant	Low 0.3-0.4 times	Low 3-4 times	Medium Large	(a) Reciprocating compressors starting unloaded
Single-phase a-c	Two value capacitor	Constant	High	Normal	Small	(b) Pumps and compressors
	Permanent split capacitor Capacitor start	Constant	Low	Normal	Fractional	(a) Fans, Blowers
		Constant	Moderate	Normal	Small Fractional	(a) Fans and pumps
	Repulsion Induction	Constant	High	Normal	Medium Small	(a) Fans (b) pumps and compressors
	Split phase	Constant and adjustable	Normal	Normal	Fractional	(a) Fans (b) pumps and compressors (d) fans—direct

to values below 50 percent. Fig. 3 illustrates the characteristics of wound-rotor motors.

Synchronous motors are used for continuous duty applications at constant speed where efficiency and power factor are important. Another advantage of these motors is that of lower initial cost in large sizes and for low speeds when compared with squirrel-cage type motors.

The outstanding advantage of the synchronous motor is that its power factor can be changed to compensate for the low power factor of other drives in the same location. Lagging power factor is an inherent characteristic of all induction apparatus, such as induction motors and neon signs. Unless synchronous motors or capacitors are installed, the plant power factor may be comparatively low. This does not

Table 3 Classification of Motors (Continued)

	Type	Speed Characteristics	Full Voltage		HP Range	Application See Footnotes (a) to (a)
			Starting Torque	Starting Current		
Adjustable Speed Drives						
Polyphase a-c	Squirrel-cage high slip. Transformer adjustment	Variable	Normal	Normal	Medium Small	(a) Fans
	Squirrel-cage separate winding or regrouped poles	Constant multi-speed	Normal or high	Normal or low	All	(a) Fans (b) pumps and (c) compressors
	Wound rotor	Variable	High (with secondary control)	Low (with secondary control)	All	(a) Fans (b) centrifugal pumps and compressors
Single-phase a-c	Repulsion	Variable	High	Normal	Low and Fractional	(a) Fans, centrifugal pumps (b) compressors
	Capacitor low torque tapped winding	Variable two speed	Low	Normal	Fractional	(d) Fans, direct
	Capacitor low torque transformer adjustment	Variable	Low	Low	Fractional	(d) Fans
	Split phase regrouped poles	Constant	Normal	Normal	Fractional	(d) Fans

e. Drives having medium or low starting torque and inertia W/E^2 such as fans and centrifugal pumps or reciprocating pumps and compressors started unloaded.
 b. Drives having high starting torques, such as reciprocating pumps and compressors started loaded.
 c. Similar to (a) except where frequent or hard starting (large W/E^2) requires a higher starting and accelerating torque. d. Fans direct connected. e. Starter drives.
 f. Torque depends on hp rating and speed. See NEMA Standard MG1-4.10 on Motors and Generators.

Table 4 Locked-rotor Current of Three-phase, 60-cycle Motors at 220 Volts *. b

HP	Design B, C, and D Amperes	Design F Amperes	HP	Design B, C, and D Amperes	Design F Amperes
1 or less	24*	..	30	435	270
1½	35	..	40	580	360
2	45	..	50	725	450
3	60	..	60	870	540
5	90	..	75	1085	675
7½	120	..	100	1450	900
10	150	..	125	1815	1125
15	220	..	150	2170	1350
20	290	..	200	2900	1800
25	365	..			

* The locked-rotor current of three-phase, 60-cycle, constant-speed, induction motors, measured with rated voltage and frequency impressed and with rotor locked, shall not exceed the tabulated values.

b. Locked-rotor current at other voltages shall be inversely proportional to the voltage.

* For 1 hp or less the value is given per hp.

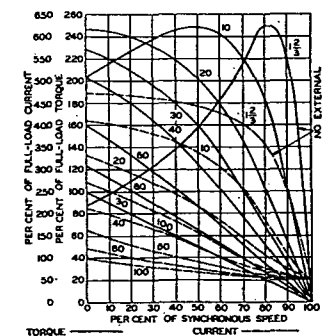


Fig. 3 Speed-Torque-Speed-Current Characteristics of Wound-rotor Motors