TABLE 1. CLASSIFICATION OF MOTORS

Power Supply	Type	Speed Characteristics	Full Voltage: Starting Torque	Full Voltage: Starting Current	Hp Range	Type of Application See Footnote †
			Constant Speed Drives			
d-c	1. Shunt	Constant	Normal (with controller)	Normal	All	(*a*) Fans and (*c*) centrifugal pumps and centrifugal compressors
d-c	2. Compound	Variable	High (with controller)	Normal	All	(*b*) (*c*) (*e*) Reciprocating pumps and frequent or hard starting
d-c	3. Series	Variable	High (with controller)	Normal	Small	(*d*) Fans direct connected
Poly-phase a-c	4. Squirrel-Cage General Purpose Class A	Constant	Normal 0.8–1.5 times	High 6–8 times	All	(*a*) Fans and (*c*) centrifugal pumps and centrifugal compressors
Poly-phase a-c	5. Squirrel-Cage Class B	Constant	Normal 0.8–1.5 times	Normal 5–6 times	Medium Small	(*a*) Fans and centrifugal pumps and centrifugal compressors
Poly-phase a-c	6. Squirrel-Cage Class C	Constant	High 2–2.6 times	Normal 5–6 times	Medium Small	(*b*) Reciprocating pumps (*e*) and compressors started loaded
Poly-phase a-c	7. 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
Poly-phase a-c	8. 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
Poly-phase a-c	9. 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	10. Capacitor	Constant	High	Normal	Small	(*b*) Pumps and compressors
Single Phase a-c	11. Capacitor Fan	Constant	Normal	Normal	Small	(*a*) Fans, centrifugal pumps
Single Phase a-c	12. Capacitor Start Induction Run	Constant	High	Normal	Small Fractional	(*a*) Fans (*b*) pumps and compressors
Single Phase a-c	13. Repulsion Induction	Constant	High	Normal	Medium Small	(*a*) Fans (*b*) pumps and compressors
Single Phase a-c	14. Split Phase	Constant and Adjustable	Normal	Normal	Fractional	(*a*) Fans (*b*) pumps and compressors (*d*) fans—direct

†Applications:

a. Drives having medium or low starting torque and inertia (WR^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 WR^2) requires a higher starting and accelerating torque.

d. Fans direct connected.

e. Stoker drives.

TABLE 1. CLASSIFICATION OF MOTORS—(Concluded)

Power Supply	Type	Speed Characteristics	Full Voltage: Starting Torque	Full Voltage: Starting Current	Hp Range	Type of Application See Footnote †
			Adjustable Speed Drives			
d-c	15. Shunt Field Adjustment	Constant	Normal (with controller)	Normal	All	(*a*) Fans and (*e*) centrifugal pumps
d-c	16. Armature Resistance Adjustment	Variable	Normal (with controller)	Normal	All	(*a*) Fans and (*e*) centrifugal pumps
d-c	17. Variable Voltage Control	Constant	Normal (with controller)	Normal	All	(*d*) Fans and centrifugal pumps
Poly-phase a-c	18. Squirrel-Cage High Slip. Transformer Adjustment	Variable	Normal	Normal	Medium Small	(*a*) Fans
Poly-phase a-c	19. Squirrel-Cage Separate Winding or Regrouped Poles	Constant Multi-Speed	Normal or High	Normal or Low	All	(*a*) Fans (*b*) pumps and (*c*) compressors
Poly-phase a-c	20. Wound Rotor	Variable	High (with secondary control)	Low	All	(*a*) Fans (*b*) centrifugal pumps and compressors
Single Phase a-c	21. Repulsion	Variable	High	Normal	Low and Fractional	(*a*) Fans—centrifugal pumps (*b*) compressors
Single Phase a-c	22. Capacitor Low Torque Tapped Winding	Variable Two Speed	Low	Normal	Fractional	(*d*) Fans, direct
Single Phase a-c	23. Capacitor Low Torque Transformer Adjustment	Variable	Low	Low	Fractional	(*d*) Fans
Single Phase a-c	24. Split Phase Regrouped Poles	Constant	Normal	Normal	Fractional	(*d*) Fans

for starting the motor; (3) overload protection for the motor; (4) protection against low voltage; and (5) means for varying the motor speed.

Full voltage starting for motors is preferable because of its lower first cost and simplicity of control. Except for d-c machines, most motors are mechanically and electrically designed for full voltage starting. The starting inrush current, however, is limited in many cases by regulations of power companies because of the voltage fluctuations which may be caused by heavy current surges. It is therefore often necessary to reduce the starting current below that obtained by across-the-line starting. The power supplier should be consulted to determine the allowable inrush current for any given location.

The choice between full voltage and reduced voltage starting is governed almost entirely by inrush current limitations. The starting torque of all motors varies with the starting current and it is therefore necessary to insure that the motor is supplied with sufficient current to develop enough torque to accelerate the load.

In present practice overload protection of motors is obtained by use of thermal overload inverse time limit type protection. The usual setting of such protection devices is at 125 per cent overload, the element trip-