TABLE 5. 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 (with controller)	All	(a) Fans and (c) centrifugal pumps and centrifugal compressors
d-c	2. Compound	Variable	High (with controller)	Normal (with controller)	All	(b) (c) (e) Reciprocating pumps and frequent or hard starting
d-c	3. Series	Variable	High (with controller)	Normal (with controller)	Small	(d) Fans direct connected
Polyphase a-c	4. 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
Polyphase a-c	5. Squirrel-cage Design B	Constant	Normal 1–2.5 times	Normal 5–6 times	Medium Small	(a) Fans and centrifugal pumps and centrifugal compressors
Polyphase a-c	6. Squirrel-cage Design C	Constant	High 2–2.5 times	Normal 5–6 times	Medium Small	(b) Reciprocating pumps (e) and compressors started loaded
Polyphase a-c	7. Wound rotor	Constant or variable	High 1–2.5 times (with secondary control)	Low 1–3 times (with secondary control)	All	(a) Hoists (b) reciprocating pumps and compressors (c) and frequent (e) or hard start
Polyphase 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
Polyphase 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. Two value capacitor	Constant	High	Normal	Small	(b) Pumps and compressors
Single phase a-c	11. Permanent split capacitor	Constant	Low	Normal	Fractional	(a) Fans, Blowers
Single phase a-c	12. Capacitor start	Constant	Moderate	Normal	Small Fractional	(a) Fans and pumps
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.

TABLE 5. 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 (with controller)	All	(a) Fans and (e) centrifugal pumps
d-c	16. Armature resistance adjustment	Variable	Normal (with controller)	Normal (with controller)	All	(a) Fans and (e) centrifugal pumps
d-c	17. Variable voltage control	Constant	Normal (with controller)	Normal (with controller)	All	(d) Fans and centrifugal pumps
Polyphase a-c	18. Squirrel-cage high slip. Transformer adjustment	Variable	Normal	Normal	Medium small	(a) Fans
Polyphase 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
Polyphase a-c	20. Wound rotor	Variable	High (with secondary control)	Low (with secondary control)	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

from 15 min to 2 hr, depending on the size), the horsepower rating required will usually not be less than this constant value, regardless of other parts of the cycle.

If the driven machine is to operate at more than one speed, the horsepower required at each speed must be determined.

4. *Torque.* The torque required to operate the driven machine at every moment between initial breakaway and final shutdown is important in determining the type of motor. A torque-speed curve is desirable and sometimes essential.

The *starting torque* or breakaway torque required by the driven machine may be as low as 10 per cent, as in the case of medium-sized centrifugal pumps, or as high as 225 to 250 per cent of full-load torque, as in the case of a loaded reciprocating two-cylinder compressor. The breakaway torque may vary greatly at different times because of frequency of start, temperature changes, type and amount of lubricant, etc. The motor torque available at the shaft must be well above the torque required by the driven machine, taking into consideration these variables as well as the possibility of low voltage and the type of starter used.

The torque required after breakaway for *acceleration to full speed* varies with different driven machines, remaining at a rather high value throughout acceleration for such machines as loaded compressors and plunger pumps. The torque delivered by the motor must at all points, up to full speed, be in excess of the torque required