

Typical Specifications for Wound Rotor Motors

.....Hp,RPM, {25} Cycles, {208} Volts, {2} Phase, Wound Rotor
 {60} {220} {440} {550}

Induction Motors For Driving.....Motor Shall Be Arranged for
 (Application)

{Horizontal} Mounting And Shall Be Provided With A.....
 {Vertical} (Open, Splashproof, etc.)

Type of Enclosure, NEMA {Class A} Insulation and {Ball} Bearings.
 {Class B} {Sleeve}

Typical Specifications for Synchronous Motors

.....Hp,RPM,Per Cent P.F.,Volts, {2} Phase, {25} Cycles,
 {3} {60}

Synchronous Motors of the {Belted} Type for Driving.....
 {Coupled} {Engine} (Application)

Motor Shall be Arranged for {Horizontal} Operation and Shall Be Provided With
 {Vertical}

A.....Type of Enclosure. Motor Shall be Capable
 (Open, Splashproof, etc.)

of Developing A Starting Torque of Per Cent Full Load Torque, A Pull-In
 Torque of Per Cent Full Load Torque, And A Pull-Out Torque of
 Per Cent Full Load Torque. The Motor Field Shall Be Excited From A

{Direct Connected Exciter} Which {Shall} Be Included With The Motor.
 {Belted Exciter} {Shall Not}
 {M-G Set Exciter} {d-c Bus}

the power factor. With purchased power, if the rates include a clause embodying a penalty for low power factor, or a bonus for high power factor, the saving in power costs may often make a very good return on the investment required for the corrective equipment.

Synchronous motors are used to drive fans, blowers, pumps, compressors and other applications. Compressor applications having a high peak torque require the use of flywheels to smooth out power peaks; and should always be referred to the electrical manufacturer for recommendations.

Synchronous motors are provided with built-in damper windings on the rotor and operate during the starting period similarly to squirrel-cage motors. After the motor is nearly up to speed, field excitation is applied and the motor draws into step at synchronous speed. After excitation is applied the motor runs at exactly constant speed and will remain at this speed until a load approaching the pull-out load is reached, whereupon the motor pulls out of synchronism and stops.

In applying synchronous motors consideration must be given to the torque the motor can develop on pull-in, that is, at the instant when field

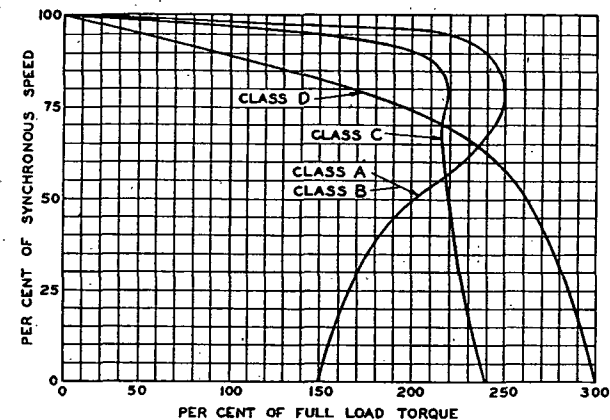


FIG. 5. SPEED TORQUE CHARACTERISTICS OF SQUIRREL-CAGE MOTORS

excitation is applied. Table 2 tabulates typical application requirements of synchronous motor drives, listing starting, pull-in, and pull-out torques.

Typical specifications for synchronous motors are shown on page 616.

Multi-Speed motors provide flexibility in many types of drives. Synchronous motors can be furnished only with a 2 to 1 ratio in speed; single winding. Squirrel-cage induction motors may be 2, 3 or 4 speed. Two-speed induction motors are usually of single winding type, having a 2 to 1 speed ratio such as 600 rpm and 1200 rpm, or may be double winding. Three-speed induction motors are always two winding, and four-speed motors are usually two winding with a 2 to 1 speed ratio

TABLE 2. TYPICAL APPLICATION REQUIREMENTS OF SYNCHRONOUS MOTOR DRIVES SHOWING STARTING, PULL-IN AND PULL-OUT TORQUES

APPLICATION		METHOD OF CONNECTING MOTOR TO LOAD	STARTING CONDITIONS	TORQUES			REMARKS
				Start-ing	Pull-in	Pull-Out	
Fans	Exhaust and Ventilating	Coupled or Belted	Usually Loaded	50	60-125	150	WR ² of Fan Must be Considered
Blowers	Cycloidal Positive	Coupled or Engine Type	Unloaded	40-60	40-60	150	Two-Speed Motors Sometimes Used
	Blowing Engines Reciprocating	Engine Type	Unloaded	40	40-60	150	
	Turbo High Speed	Direct Connected or Step Up Gear	Unloaded (Intake Closed)	30	50	150	WR ² of Blower Must be Considered
Compressors	Air	Engine Type	Unloaded	40	40	150	Flywheel Effect Important
	Ammonia and Ammonia Booster	High Speed—Belted Low Speed—Engine Type Occasionally Coupled	Unloaded (By By-Pass)	40	40	150	Flywheel Effect Important
	Freon	High Speed—Belted Low Speed—Engine	Unloaded (By By-Pass)	45	60	150	Flywheel Effect Important
	Gas Reciprocating	High Speed—Belted Low Speed—Engine	Unloaded (By By-Pass)	40	40	150	Flywheel Effect Important