

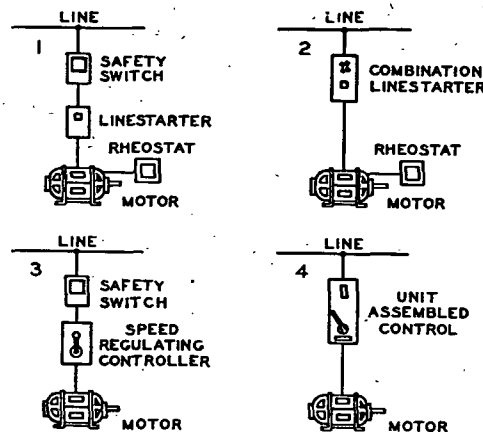
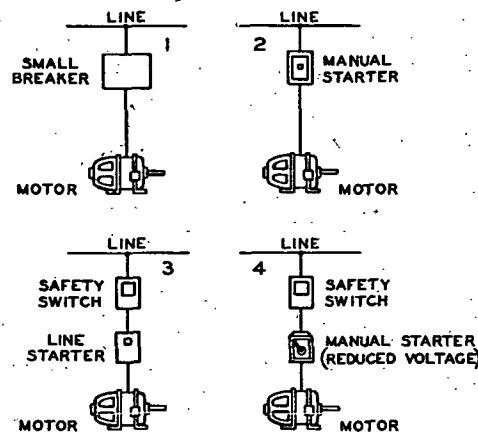


FIG. 12. RECOMMENDED CONTROLS FOR WOUND RÓTOR MOTORS

Timing relays which provide for automatic acceleration may be used for control. With this feature the motor will always start at low speed and automatically accelerate to the desired speed. Decelerating relays may be used to reduce the shock effect of the braking action to the motor and drive when the speed is reduced from a higher to a lower speed.

Single Phase motor control usually consists only of a line starter, either manual or magnetic. In some cases it is desirable also to provide a disconnect switch. Fig. 13 illustrates the recommended controls.

Typical specifications for single phase motor control are shown on page 622.



Arrangements 2, 3 and 4 are optional for motors up to 7½ hp, 220 volts.

FIG. 13. RECOMMENDED CONTROLS FOR SINGLE PHASE MOTORS

GEAR MOTORS

A gear motor is a self-contained combination of any type of a-c or d-c motor and an enclosed speed-reducing gear, providing a more compact and readily adaptable unit than is obtained by using a motor coupled to a gear reducer. Gear motors are available in sizes up to 75 hp with output shaft speeds from about 4 to 1430 rpm, making it possible to couple or to connect by gear or chain to nearly any machine. High speed motors are used, generally 1800 rpm on 60 cycles, thus obtaining the advantages of high motor power factor and efficiency. The gearing efficiency is also high, usually about 98 per cent for a single reduction of the helical or spur type, that is, a 2 per cent loss for one reduction or 4 per cent loss for a double reduction. Consequently, the over-all performance of the gear motors is much higher than a combination of open gearing, belting, countershaft, or other arrangement, which would otherwise be required. Gear motors are used extensively to drive numerous types of slow speed drives. Besides being more effective than other combination drives in saving space, they are important in reducing maintenance and operating hazards.

GLOSSARY

General Definitions

NEMA is the abbreviation for the *National Electrical Manufacturers Association*.

Speed Regulation (d-c motors) is the change in speed between no-load and full-load, expressed in per cent of full-load speed; for example, a motor having a no-load speed of 1200 rpm and a full load speed of 1140 rpm would have a speed regulation of 5.6 per cent.

Slip (a-c induction motors) is the difference between the motor speed and synchronous speed expressed in per cent of synchronous speed, e.g., a 1200 rpm motor operating at 1140 rpm would have a slip of 5 per cent.

Torque is an expression of the turning effort developed by the motor at the shaft and is usually expressed in ounce-feet for fractional horsepower motors and in pound-feet for motors of larger ratings.

Primary is the term usually applied to the high voltage or line side of a transformer or motor. In the case of the wound rotor motor the primary is the stator winding.

Secondary is the term usually applied to the low voltage or load side of a transformer or motor. In the case of the wound rotor motor the secondary is the rotor winding.

NEMA Classification of Motor Enclosures

Open motors (40 C rise) are self-ventilated machines having no restriction to ventilation other than that necessitated by mechanical construction.

Protected motors (50 C rise) have all ventilating openings in the frame protected by perforated covers.

Semi-Protected motors (50 C rise) have the ventilating openings in the top half of the frame only protected by perforated covers.

Drip Proof motors (50C rise) are so constructed that drops of liquid or solid particles falling on the machine at any angle not greater than 15 deg from the vertical cannot enter the machine either directly or by striking and running along a horizontal or inclined surface.

Splash Proof motors (50 C rise) are so constructed that drops of liquid or solid particles falling on the machine or coming towards it in a straight line at any angle not greater than 100 deg from the vertical cannot enter the machine either directly or by striking and running along the surface.

Totally Enclosed Non-Ventilated motors (55 C rise) are so constructed as to prevent exchange of air between the inside and outside of the case.

Totally Enclosed Fan-Cooled Motors (55 C rise) are similar to totally enclosed, non-ventilated machines except that exterior cooling is provided by means of a fan or fans integral with the machine.

Explosion Proof motors (55 C rise) have an enclosing case designed to withstand an explosion of a specified gas or vapor which may occur within it, and to prevent the