Motor Selection Guidelines

Motors are used in a wide variety of applications. In some applications more than one motor design would work; in others, if an exact replacement cannot be found, a similar motor with slight differences in mechanical and electrical characteristics will provide reliable operation. The following selection guide is designed to help you choose the correct motor for your application.

STEP 1: GATHER MOTOR INFORMATION

You will need the following information to properly select a motor. If you are replacing a motor, much of the information can be found on the existing motor nameplate. See the sample nameplate on this page:

1-Phase (PH): Either single (1) or three (3). Match exactly.

2-Voltage (Volts): Match exactly.

3-Horsepower (HP): Very small motors are often rated in watts. Choose an equal or next higher HP.

4-Frame: Match exactly.

5-RPM: Match within 5%.

6-Frequency (Hz): Match exactly.

7-Service Factor (SF): Choose a motor of equal or greater number.

8-Design: See table on this page.

9-Enclosure (Encl.): See table on this page.

10-Duty: If current motor is intermittent duty, you may upgrade to continuous.

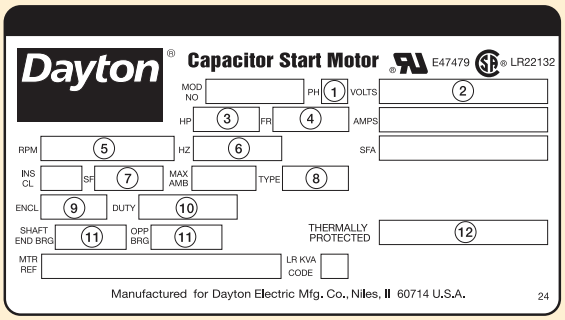
11-Bearing Type: Sleeve or Ball.

12-Thermal Protection: See Thermal Protection Information on this page.

STEP 2: DETERMINE THE RIGHT CATALOG SECTION

By your category: Many motors are listed by category. You will find these categories under "Motors" in the Product Index in the catalog. Turn to the specific page or section to find your motor. If your category is not listed in the index, choose your motor by its characteristics.

By the characteristics: Motor design, horsepower, RPM, frame, voltage, and enclosure. Grainger carries General Purpose motors designed for reliable use in a wide variety of applications, Definite Purpose motors for specific applications,



HVAC motors for various air moving applications, and Pump motors for applications moving water and gases.

General Purpose Motors are designed for mechanical loads (also effective for air moving), and for hard-to-start applications such as conveyors, belt-driven equipment, machine tools, and reciprocating pumps. These motors feature ball bearings to handle heavier radial and axial loads and heavier construction for industrial applications.

Definite Purpose Motors are designed for specific applications such as washdown, hazardous location, farm-duty, etc. Motor features are driven by the specific application's environment.

HVAC Motors are designed mostly for air moving and other light- to medium-duty applications, such as fans and centrifugal pumps, small tools, and office equipment.

Pump Motors are used for pump applications like pool pumps, carbonator pumps, and close-couple pumps. Motor features are driven by the application and move water and gases.

STEP 3: SELECT THE SPECIFIC MOTOR

Match the information gathered in Step 1.

AC MOTOR TYPES

Phase	Design	Typical RPM	Starting Torque as Percent of Full-Load Torque	Comparative Efficiency	Typical Uses
1	Shaded Pole	1050, 1550, 3000	Very Low 50-100%	Low	Small direct-drive fans & blowers
1	Permanent Split Capacitor (PSC)	825, 1075, 1625	Low 75-150%	Moderate	Direct-drive fans & blowers
1	Split-Phase	1140, 1725, 3450	Low to Moderate 130-170%	Moderate	Belt-drive & direct-drive fans & blowers, small tools, centrifugal pumps, & appliances
1	Capacitor-Start	1140, 1725, 3450	Moderate to High 200-400%	Moderate to High	Pumps, compressors, tools, conveyors, farm equipment, & industrial ventilators
3	3-Phase	1140, 1725, 3450	Moderate to High 200-300%	High	Applications where 3-Phase power is available

ENCLOSURE TYPES

Enclosure Type	How Can I Tell?	Where Do I Use This Enclosure?
Open Dripproof (ODP)/ Open/Open Air-Over (OPAO)	Ventilation holes in shell and/or endshield	Clean, dry, nonhazardous environments
Totally Enclosed Fan-Cooled (TEFC)/Totally Enclosed Nonventilated (TENV)	No ventilation holes in shell or endshield	Dirty, moist, nonhazardous environments
Hazardous Location	Enclosed. Must have a UL Hazardous Location nameplate on motor	Designed for use in hazardous environments as defined by National Electrical Code (NEC) classifications. NEC Class and Group are designated on UL Hazardous Location nameplate mounted on motor. See page 6 for more details.

Thermal Protection Information

Motors that start automatically (e.g. thermostat controlled) after tripping and that are located out of operator sight must be protected against dangerous overheating due to failure-to-start or overloading.

This protection may be a separate overcurrent device (e.g. motor starter) complying with Article 430 of the National Electrical Code (NEC), a thermally protected motor (internal motor protection), or an impedance-protected motor.

Motors with automatic reset thermal protection MUST NOT be used where automatic or otherwise unexpected starting of the motor could be hazardous. Applications where automatic restarting could be hazardous include compressors, conveyors, power tools, farm equipment, and some fans and blowers. Where such a hazard exists, always use a manual reset, thermally protected motor.

UL 507 Standard

Any motor used in a fan product, such as bathroom exhaust fans, wall-insert fans, ceiling-insert fans, attic-exhaust fans, whole-house fans, and duct fans, etc., which are built into or within the building structure and which are likely to operate unattended or in situations in which the operator may not detect a locked rotor (stalled motor) condition, must have either a manual reset thermal protector or a thermal cutoff (1-shot) device.

Range hoods, circulating fans, pedestal fans, and ceiling-suspended fans are not included. Agricultural fans are included if they are built into the building structure and are likely to operate unattended or in situations in which the person operating the fan may not detect a locked rotor (stalled motor) condition; they must have either a manual reset thermal protector or a thermal cutoff (1-shot) device.

Premium Efficiency vs. Standard Efficiency

If you operate a 25 HP premium efficiency motor at full load for 24 hr. a day (8760 hr. per yr.) and your cost per kilowatt hr. is 9 cents, you can save $532.00 annually.

This comparison is based on a premium efficiency motor with a 94.1% efficiency rating vs. a high efficiency motor with a 91.0% efficiency rating.

Increased efficiency leads to lower operating temp., resulting in longer life.

Cool Operation: The life of an insulation system doubles for each 10°C reduction in operating temp.

Longer Bearing Life: The lower the temp., the longer the bearing grease will last.

Annual Savings = $0.746 \times HP \times L \times C \times N \left(\frac{100}{E1} - \frac{100}{E2}\right)$

- HP = Motor Horsepower
- L = Percent Load Divided by 100
- C = Energy Cost, Dollars per kW Hr.
- N = Running Time, Hr. per Yr.
- E1 = Efficiency (%) of Standard Efficiency Motor
- E2 = Efficiency (%) of Premium Efficiency Motor