NEMA Minimum Recommended Diameters
PA NOTE

Why is sprocket diameter important?

For a given horsepower and speed, the total belt pull is related to the motor sprocket size. As the diameter of the sprocket decreases, the total belt pull increases. For example, in a given application using a 100 hp, 1750 RPM motor with a sprocket diameter of 13", the belt pull is approximately 1100 lbs. If the motor sprocket is changed to 6.5", the belt pull will increase to about 2200 lbs. Since belt pull is directly related to bearing and shaft loads, they will also be affected by the sprocket size.

Therefore, the National Electrical Manufacturers Association (NEMA) has developed minimum recommended sprocket sizes for various motors to limit the resultant loads on the shaft and bearings.

When should these minimum diameter recommendations be used?

Anytime an electric motor is used, minimum diameter recommendations should be applied. Gates PowerGrip® and Poly Chain® GT™ catalogs both contain tables listing minimum recommended diameters. Design Flexibility also provides the option of applying NEMA standards. This option should always be used with NEMA motors.

If a minimum is not provided in these tables, it is a good idea to contact the motor manufacturer. The manufacturer should either provide a minimum diameter or verify that the shaft and bearings can handle the loads applied by the belt drive.

Standard NEMA motors are identified by a horsepower and nominal speed. Examples of nominal speeds are 870 RPM, 1160 RPM, 1750 RPM and 3450 RPM. However, the actual operating speed of each motor will vary depending on the application and how heavily it is loaded. This means motors may be encountered that do not match the table speeds exactly. NEMA standards should still be applied in these cases.

When designing a synchronous drive, speeds are often critical and the actual operating speed, not the nominal speed, should be used to determine the speed ratio. The most recent version of Gates Design Flex allows you to apply NEMA standards and then alter the nominal speed +/- 5%. With this enhancement, NEMA minimum diameter recommendations should not be ignored.

As a final suggestion, it is always advisable to provide the belt pull to the user. This will provide the user a way to ensure the shaft and bearings chosen for the driveN machine, in addition to the motor, are adequate.