



Precision Gearhead Application Considerations

In selecting a gearhead, one must be mindful that gearhead selection will impact more than just the output speed and torque level at the output shaft. Some of the considerations to keep in mind should include:

Backlash: Backlash is a characteristic of gearhead and gear train construction that allows bidirectional shaft play. It can be caused by generous tolerances in gear design, tooth wear over time, slight machining errors in the gear cutting process, etc. It is measured at the output shaft of the gearbox and can vary typically from 1-7 degrees. Backlash is load dependent and will increase as the load increases. Backlash can cause significant error in a positioning system and should be compensated for. Typically, shaft encoders are mounted on the motor shaft and not the output gear shaft of small DC gearmotors. This means that the motor armature position can be different than the expected position of the output gear shaft by the level of backlash in the gear. 3 degrees at the output shaft of a gearhead could mean hundreds of encoder pulse at the motor depending on the resolution of the encoder and the ratio of the gearbox. For example, if you are using a 512 pulse shaft encoder and you have a gearhead ratio of 43:1, 3 degrees of backlash at the gearhead output shaft could mean up to 183 encoder pulses of error systematically. Backlash can be eliminated in 1 direction by placing load tension on the shaft before initiating a move. For more dynamic bidirectional applications backlash can be compensated for electronically by using an external absolute encoder for comparison to the shaft encoder. The motion control electronics can then be programmed to correct position error.

Bearing Choice: Ball bearings are typically specified in applications where high radial and axial shaft loads are present. Be advised, however, that using ball bearings can increase audible noise in some cases. Please refer to the gearhead datasheet for shaft loading specifications. Sintered bearings are available for lower torque applications characterized by lower radial shaft loading and constant load characteristics.

Care should be used when press fitting components to a gearhead output shaft. We recommend not exceeding the press fit force ratings specified in the gearhead datasheet. This can damage the bearings and the internal gears themselves. In some cases, gearhead shaft bearings (ball bearings only) are preloaded with a small wave washer under the retaining ring on the bearing. Exceeding the press fit force specification on the datasheet can damage this wave washer and negate the preload on the bearing. This will affect the performance of the bearing and should always be avoided.

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Lubrication The gear and bearing lubrication can be a defining factor in gearhead performance. Gearhead bearing systems and gear trains are lubricated for life. Re-lubrication is not needed, and is not recommended. The use of non-approved lubricants on or around the gearheads or motors can negatively impact their function and life expectancy. The standard lubricants for reduction gears are formulated to provide optimum life performance with minimum current consumption at no-load condition.

Input Speed and Direction of Rotation: The input speed specification on the gearhead datasheet refers to the input speed recommended in order to maximize gearbox life. This specification is not intended to limit the gearheads to input speeds below the specification. It can be considered to be a safe mean value for operation. Your application may not require the maximum lifetime performance of the gearhead and this input speed specification may be safely exceeded depending on the performance requirements. Contact your Micro-Drives applications engineer for assistance if you have any questions on the gearhead input speed.

All gearheads offered by Micro-Drives are reversible. In the datasheets you may see an equal or not equal symbol. Don't let this confuse you. This simply means that when positive voltage is applied to the positive terminal of the motor and negative to the negative terminal that the output shaft of the gearhead, depending on the ratio, is equal to the direction of rotation of the motor or is not equal to the direction of rotation of the motor. If you have any question on any of the specifications in our datasheets, don't hesitate to contact one of our application engineers for assistance.

Blocking, Stalling, and Backdriving: In general we do not recommend that our gearheads are blocked while the motor is under power. Due to the wide range of ratios available for gearheads and it is highly probable that the motor has enough power, even at low current, to "overpower" the gearhead if it is blocked or stalled. This means that the torque generated at the motor is enough to strip the gears in the later stages of the gearhead or even to shear off the output shaft. Careful consideration should be paid to setting up the appropriate current limits in an application if the gearhead must be blocked to stop it.

Backdriving our gearheads is not recommended. Backdriving means that a torque is applied to the gearhead output shaft which in turn will reverse drive the input stages of the gearhead. This can damage the gearhead in a myriad of ways including causing it to jam or simply breaking off the output shaft.

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