

Buyers Guide: Get the Gearbox You Need

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After many years of discussing gearboxes with engineers, we have developed a questionnaire we use to ensure that all the necessary details of an application have been found. This is used, even if the engineer specifies our standard part number.

The correct gearbox may have been chosen - but:

- Q1.** Are there any lower cost alternatives to consider based on the specific application?
- Q2.** Is the gearbox appropriate for the operating environment?
- Q3.** Could a smaller gearbox be selected, based on the duty cycle?

Some of these questions may seem simple but they allow us to think about the application as a complete system. The brief explanation of various gearbox sizing parameters below may help you clarify your application before calling a gearbox manufacturer. With this information, gearbox manufacturers can better assist you in selecting the correct gearbox for your intended application.

Standard, Modified Standard, or Complete Custom. Your Choice:

This tells us quickly where we must focus. If you say, "I need a standard," then all other avenues are eliminated. Some companies, like ours, are willing to customize their standard gearboxes.

Main Specs:

Published specifications are standard and need no clarification except for ratio and backlash.

Ratios are generally standard from 1:1 to 120:1, but can be higher depending upon the gearbox. Many manufacturers can supply custom ratios at initially higher prices and when quantities are ordered they are usually priced similar to standard ratios. Delivery time is a factor when considering a custom ratio.

Most gearboxes have backlash ratings of less than 1 degree (60 arc-minutes). Many are rated at half a degree (30 arc-minutes). After this point "low backlash" gearboxes come into play for positioning applications. Depending upon the manufacturer and the gearbox type, low backlash can start at 10 arc-minutes and can be 8, 5 or even

1 arc-minute. When you get down to 1 arc-minute there may not be many manufacturers that can supply such a high precision gearbox. This may be a consideration.

Operation - Duty Cycle:

While most performance specifications are based on a 24 hour/day, generally any 8 or 12 hours for 5 days a week is considered full time operation. Maximum heat rise will occur well within 8 to 12 hours of operation time.

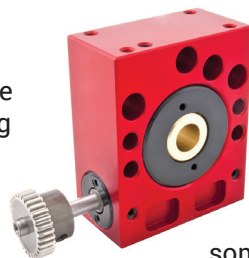
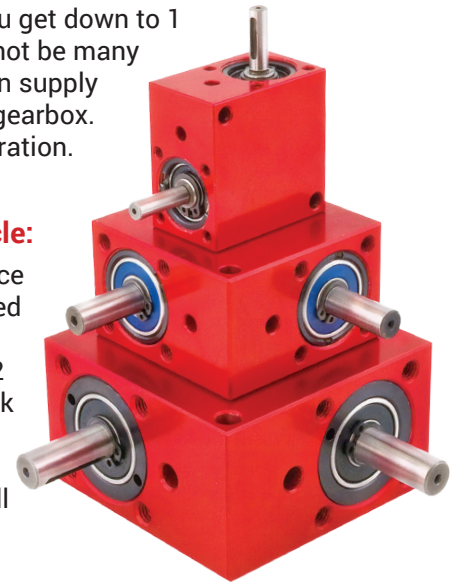
There are many applications that have a low duty cycle where you can use a smaller gearbox without degrading life or destroying gear teeth. Most manufacturers rate the gearboxes for wear strength, giving a wide margin over actual gear teeth ratings. So if a gearbox is used in a step and hold cycle with the step cycle short and the hold time long (compared to the step cycle), it is possible that a smaller gearbox or a slightly modified smaller gearbox can be used.

For example, in one defense contractor application for a sea going vessel, we chose a gearbox rated at 100 Nm. Without considering the duty cycle, someone may have specified a gearbox with twice that rating. But seeing the device would only be adjusted through a hand crank 6 to 8 times a year, we knew we would have some room.

Plus, we changed the gear and the worm material to a harder heat-treated metal. Our gearbox not only met specifications, it had extra capacity. The design request was for a rating of 150 Nm and we provided almost 200 Nm with stronger teeth, which also afforded a wider margin of safety. However, had the application required more than 1000 rpms, this gearbox would have been the wrong choice.

Temperature Range:

Below -20° Celsius, special low temperature greases are required. Operating temperature is required to ensure proper function.



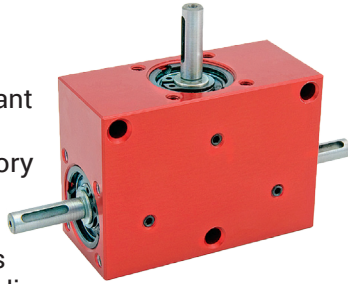
Grease - Oil:

This is related to temperature, but there may be other considerations. Gearboxes can be supplied with vacuum rated grease, no grease at all, and oils for higher or lower temperature operation.

Environment:

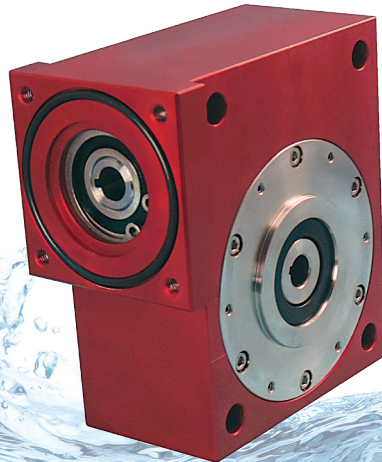
This is one of the most important specification areas. Once we are outside the standard factory environment every factor becomes important.

Temperature is one part of this equation. Ocean salt water applications and washdown applications can be rated using the IP Code. IP codes specify how well sealed a gearbox is against intrusion from foreign matter and covers particle sizes down to no dust entry allowed (first digit 1-6) and water from drops to no water entry allowed (second digit 1-8). An IP67 rating means no dust entry and no water entry at 1 meter submersion.



Input Needs:

These are straight forward except when a custom motor flange is required. Often we are unable to find the part number on the manufacturer's site for many reasons. Emailing this information saves time and allows your supplier to answer your request faster.



Output Needs:

Bores: Basic items such as diameter, length of bore, and keyway are straight forward, however, hex, square, D or splined bores can be done. When it is different than the standard bore it generally will be more expensive in prototype or small quantities.

Shafts: Usually the normal output shaft is round but it can be supplied as a hex, square, D or splined. Key slots need to be specified as to length, width, depth, and location along the shaft. Other alterations might include cross-drilled holes, milled flats or retainer ring grooves.

Output Rotation: Most gearboxes with clockwise (CW) input give a counter-clockwise (CCW) output rotation. Worm gearboxes can be supplied with left hand head angles and will then have a clockwise (CW) output when the input is turned clockwise. There are also gearboxes with dual counter rotating output shafts. The output direction of spur gear boxes depends on the number of gears used in the gear train.

Housing:

If the gearbox is standard, the material is known and is not in question. However if the gearbox will be used in a wash down application such as food processing or a marine situation, a more corrosion resistant material such as stainless steel or aluminum with a hard anodized finish may be required.

If you are looking to modify a standard gearbox, drawings are required with the desired changes clearly noted to ensure there are no misunderstandings between yourself and the gearbox manufacturer.

In custom situations it is important to initially describe any size restrictions to ensure the proposed gearbox fits appropriately into your system.

Other Considerations:

Q. Will this gearbox be used as a speed increaser rather than a reducer?

A. This is important to the manufacturer, because worm gearboxes for example, should never be used as speed increasers, due to increased torque resistance.

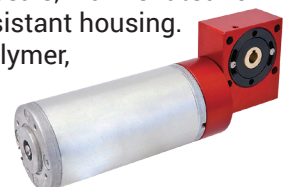
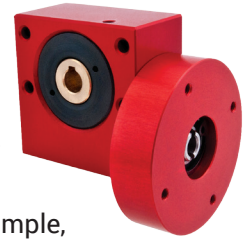
Q. Do you expect the gearbox to maintain position when the power is turned off?

A. Most gearboxes will back drive if there is a load on the output. High ratio worm gearboxes are considered "self locking" but even these may creep backward with time and vibration. Ondrives can provide integral or attached drag brakes to prevent back driving.

Recently a customer designed a lift table using our high ratio worm gearbox driven by a removable hand drill. They expected that the gearbox would lock in place and prevent the table from lowering. It was discovered that on occasion, the table would begin to slowly decline while transferring a heavy load onto the table. This was corrected by installing a small mechanical drag brake on the input shaft.

As in most applications, conversations are needed to clarify the specifications before a quote is issued. Ask that all your specifications, both written and verbal, are included in a formal quote from any manufacturer, to confirm that all quotes are the same and can be properly compared. Some manufacturers will supply a drawing or CAD.stp file for approval.

Ondrives is always ready to think inside and outside the box. In one luxury liner application, there was a complaint of noise from brass worm and output gears in the automatic door openers. Those gearboxes were initially made of 316 stainless components with o-ring seals, marine rated for spray with hard anodized water resistant housing. Our solution was an engineered polymer, almost as hard as brass. After reviewing samples, the owner went with the new solution. ⚙️



Buyers Guide: How to Specify Gearboxes

Are You Looking For: Standard _____ Customized Standard _____ Complete Custom _____

Gearbox Type: Right Angle ___ In-line ___ Parallel ___ Bevel ___ Worm/Wheel ___ Planetary ___ Other _____

Main Specs: Ratio _____ Input rpm _____ Output Torque _____ In-lbs (or Nm) _____ Backlash _____

Operation: 24 Hour/Day _____ Duty Cycle _____

Temp. Range: _____ to _____ Degrees _____ C _____ F _____ Grease _____ Oil _____

Environment: Standard Factory _____ Outdoor _____ Foodgrade _____ Washdown _____ Ocean-Commercial _____

Ocean-Military _____ IP Code _____ Mil Spec. _____ Other _____

Input:

Shaft: Diameter _____ Length _____ Single Input _____ Double Input _____

Bore: Diameter _____ Keyway _____

Flange: NEMA _____ **Custom:** Motor Mfg. _____

Motor Part Number _____ or Send PDF _____

Website Link for Motor _____ or Email Link _____

Output:

Shaft: Diameter _____ Length _____ Single Output _____ Double Output _____

Bore: Diameter _____ Keyway _____ Hex _____ Square _____ D _____ Spline _____

Output Rotation: Same as Input (RH Standard) _____ Opposite Output (LH Counter Rotating) _____

Housing: Cast _____ Machined Aluminum _____ Plastic _____ Stainless _____ Other _____

Size Restrictions _____

Changes From Standard _____

Attach Drawing _____ Other Special Needs _____

Other Requirements: Used as a Speed Reducer _____ Needs to be Self Locking _____

Space Limitations _____
