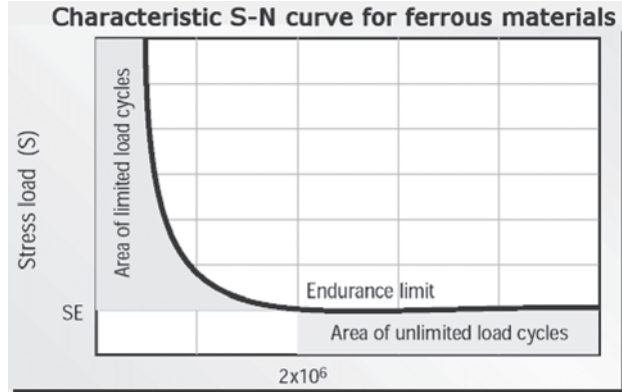


### DEFINITION OF THE RATED TORQUE

Torque rating of the NEUGART gearhead is in line with the applicable proven rating standards (AGMA, DIN, ISO).

The listed rated (nominal) torque of the gearhead is based on the endurance limit of the component's gears and shafts, which means the gears will endure an unlimited number of load cycles as long as the load torque does not exceed the gearhead-rated torque. Next to the endurance limit nominal torque, a "30000 rotations - torque value" is listed for low-duty cycle peak load applications.



**Internal Bearings** (Needle bearings) are designed for a defined number of hours **L10 life at 100 rpm output shaft speed according to the bearing rating standards.** (output shaft means the slow speed shaft)

**L10 Design Life:**

**PLE and PLFE Gearheads: 30000 hrs**

**WPLE, WPLFE, and WGE Gearheads: 20000 hrs**

The clear rating definition / rating practice allows an easy, transparent, and reliable gearhead sizing and selection based on the "Required Gearhead Torque Rating"  $T_{RGRT}$

Basic rule

$$T_N \text{ (Selected Gearhead Rated Torque)} \geq T_{RGRT} \text{ (Required Gearhead Torque Rating)}$$

### 1) Determine the required gearhead torque rating:

For a reliable long gearhead operation life:

$$T_{RGRT} \text{ (Required Gearhead Torque Rating)} = T_{MAT} \text{ (Max. Application Torque)}$$

$T_{MAT}$  (Max. Application Torque) - is the highest torque load repeatedly occurring during a characteristic load cycle for the given application.

If the number of the load cycles with the maximum torque is only a few thousand over the expected gearhead life and the duration of the peak load cycles is only a few seconds, the max-application torque can exceed the gearhead-rated torque. See page 39, case C2, contact Neugart USA LP.

Frequently, the exact application data and the  $T_{MAT}$  peak torque are not known, but a selected servo motor needs to be matched up with the suitable size gearhead. To determine  $T_{MAT}$  and the required gearhead torque rating  $T_{RGRT}$ , proceed as follows:

#### A) - Selection for a specific servo motor - no other load and application related details known:

$$T_{RGRT} = T_{MAT} = T_{Mpeak} \times i$$

#### B) - Selection for a specific servo motor - motor and load inertia and non-dynamic friction load are known:

$$T_{RGRT} = [(T_{Mpeak} - T_{LR}) \times (1-k) + T_{LR}] \times i$$

$T_{RGRT}$  : Required Gearbox Torque Rating;

$T_{Mpeak}$  : Motor Peak Torque;

$T_N$  : Selected Gearhead Rated Torque

$T_L$  : Friction Load Torque at the output

$T_{LR} = T_L / i$  : Friction Load Torque at the input

$J_M$  : Motor Rotor Inertia

$k$  : Inertia Factor  $k = \frac{J_M}{(J_{LR} + J_M)}$

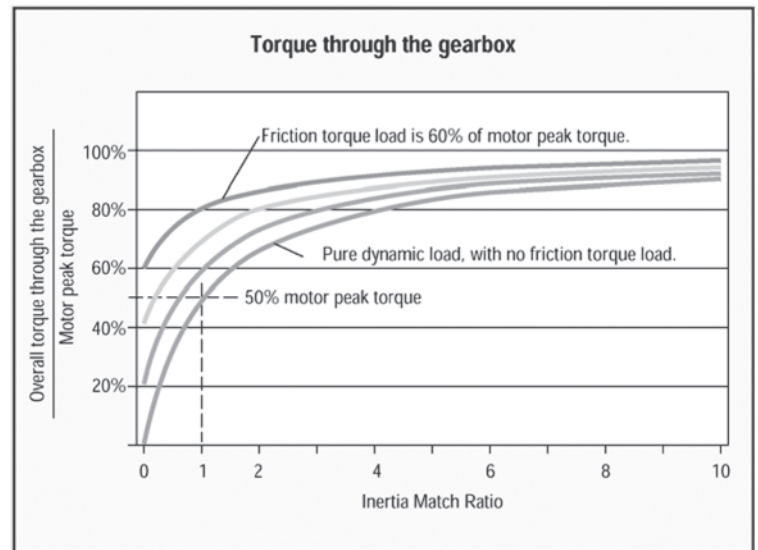
$J_{LR}$  : Reflected Load Inertia ( $J_{LR} = J_L / i^2$ )

$i$  : Gearbox Ratio

The ratio of inertial match  $IMR = J_{LR} / J_M$  is closely related to the Inertia Factor  $k = 1 / (IMR + 1)$

For a fast assessment of the peak torque loading of the gearhead, as a function of the inertia match and friction load in % of the motor peak torque, use the depicted curves. ►

Curves shown are for friction torque 0%, 20%, 40% and 60% of the motor peak torque.



### C) - Selection for application with known detailed load cycle information

C-1 - High-duty cycle operation - such as multiple load cycles per minute and expected gearhead life is more than 5000 hrs, or peak load is applied more than 30000 output shaft rotations during the expected life:

**Apply Method B (see page 38)**

C-2 - Low-cycle operation - few peak load cycles, expected gearhead life is below 5000 Hrs, or peak load is applied, less than 30000 output shaft rotations during the expected life :

**Select a gearbox with a “30000 rotations - torque value” larger or equal to application peak torque or submit detailed data to Neugart USA for sizing assistance.**

NOTE: This described selection method is based on controlled, defined acceleration and deceleration. If the application has frequent undefined shock or impact-loads (such as due to undefined jerk in the motion profile), please consult NEUGART USA.

### Gearhead L10 life calculation

$$L_{\text{actual}} = L_{10N} \times (T_N / T_{EQ})^{3.3} \times 100 / n_{EQ}$$

$T_N$  : gearhead rated torque       $T_{EQ}$  : mean Load (according to bearing calculation standards)  
 $n_{EQ}$  : mean output speed (according to bearing calculation standards)       $L_{10N} = 30000$  hrs

## 2. Check Motor and Gearhead geometrical compatibility, output shaft loading, operation conditions

After a Neugart servo gearhead size is selected based on the required gearhead torque rating,  $T_{RGRT}$ :

- check motor shaft diameter

**motor shaft diameter must not exceed maximum input pinion bore diameter of selected gearhead**

- check gearhead output shaft loading if substantial axial and/or radial loads are present in the application

- check recommended maximum unsupported motor weight (support it, if required)

- check max input speed, ambient (operating) temperature, required IP class

User friendly sizing / selection and life calculation programs are available at

[www.neugartusa.com](http://www.neugartusa.com) - (► MotorMatch utility)