Inertia and the Use of Inertia Figures to Aid Selection

Example Gearbox
3:1 ratio, 90% efficient, 0.52kg cm^2 (0.000052kg m^2) relflected inertia at input

So, if acceleration = 10 Rads/sec^2

Input torque needed = inertia (in kg m^2) x acceleration (in radians per second)

Input torque needed = 0.000052 kg m^2 x 10 Rads/sec = 0.00052Nm

Also, if inertia of load 0.0062 kg m^2 (62 kg cm^2) at output of unit
Reflected inertia at input will go upto 0.00817 kg m^2 (81.7kg cm^2)
Torque now will need to be 0.0817Nm.

Using the calculations below :-

$$J_T = J_M + \frac{J_L}{R^2\, n}$$

J_T (kg m^2) x acceleration at input (radians per second) = acceleration torque needed Nm

J_T = total reflected inertia at input of gearbox unit (kg m^2)
J_M = reflected inertia of gearbox (kg m^2)
J_L = inertia of load at gearbox output (kg m^2)
R = ratio :1
n = efficiency %

1 radian (rad) = 57.5928°
1 kg m^2 = 10,000 kg cm^2
1 kg m^2 = 1,000,000,000 g mm^2
1 m^2 = 1,000,000 mm^2
1 m^2 = 10,000 cm^2

$1.0 \times 10^{-2} = 0.01$
$1.0 \times 10^{-3} = 0.001$
$1.0 \times 10^{-4} = 0.0001$
$1.0 \times 10^{-5} = 0.00001$
$1.0 \times 10^{-6} = 0.000001$
$1.0 \times 10^{-7} = 0.0000001$

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