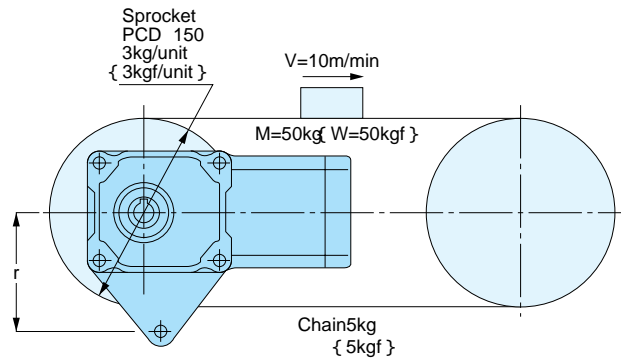


Process of selection and example of selection

Example of Selection In case of Shaft Mount

Application Conveyor (Moderate shock load)
 Conveyor Speed 10m/min
 Weight of Work 50kg
 { Mass of Work 50kgf }
 Type of Drive Chain
 Operating Time 12 hours/day
 Starting & Stopping Frequency 720 times/day
 Area of Use Area of Power Supply Frequency of 60Hz
 Coefficient of Friction Supposed to be 0.2

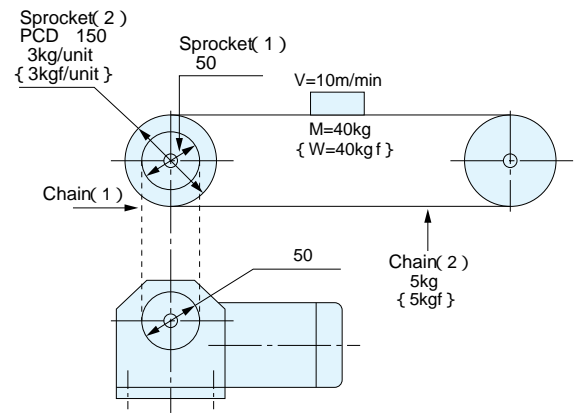


Chain(1), Sprocket(1) and other conditions were neglected for this calculation.

Process of Selection		Example of Selection	
		SI Unit	Gravimetric Unit
Deciding Type	Selection of hollow shaft, right angle shaft, or parallel shaft	Decide on Mini Series F2-Type, F2S-Type (hollow shaft) model considering from the shaft mounting.	
Determining Reduction Ratio	Determine Reduction Ratio: Required Rotation Speed of Output Shaft $i = \frac{1600(\text{assumption})}{}$	Required Rotation Speed of Conveyor Shaft = $\frac{10 \times 1000}{150 \times}$ 21.2 rpm Since the rotation speed of the conveyor shaft and that of the reducer's output shaft are the same. $i = \frac{21.2}{1600} = \frac{1}{75}$ $i = \frac{1}{80}$ Note: Rotation speed of the motor changes in between synchronous rotation speed and rated rotation speed as load changes.	
Checking Torque	Calculate Actual Load Torque(TL)	$T_L = 9.8 \times (50 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 9.0 \text{ N} \cdot \text{m}$	$T_L = (50 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 0.92 \text{ kgf} \cdot \text{m}$
	Calculate equivalent torque(TLE) of output shaft from service factor: (sf given in Table-1 on page E6) $T_{LE} = T_L \times Sf$	Adjust Actual Load Torque(TL) using a Service Factor (Sf). $T_{LE} = 9.0 \times 1.25 = 11.25 \text{ N} \cdot \text{m}$ $T_{LE} = 0.92 \times 1.25 = 1.15 \text{ kgf} \cdot \text{m}$	
	Choose the allowable torque(TA) of output shaft from the performance table, which should be greater than TLE	Select an appropriate model of T_{LE} T_A F2SM-12-80-T40	
Checking Inertia	Calculate Actual Load Inertia	Calculate Actual Load Inertia Moment(IL) $I_L = \{50 \times (\frac{0.15}{2})^2\} + \{ \frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2 \} + \{5 \times (\frac{0.15}{2})^2\}$ $= 0.33 \text{ kg} \cdot \text{m}^2$	Calculate Actual load GD ² (GD _L ²) $GD_L^2 = (50 \times 0.15^2) + (\frac{1}{2} \times 3 \times 0.15^2 \times 2) + (5 \times 0.15^2)$ $= 1.31 \text{ kgf} \cdot \text{m}^2$
	Calculate Load Inertia converted to Motor Shaft	Convert IL into the equivalent value at the motor shaft(I _l) $I_l = I_L \times (i)^2$ $I_l = 0.33 \times (\frac{1}{80})^2$ $= 0.000052 \text{ kg} \cdot \text{m}^2$	Convert GD _L ² into the equivalent value at the motor shaft (GD _l ²) $GD_l^2 = GD_L^2 \times (i)^2$ $GD_l^2 = 1.31 \times (\frac{1}{80})^2$ $= 0.000205 \text{ kgf} \cdot \text{m}^2$
	Calculate Equivalent Inertia using the correction factor corresponding to the operating condition.	Correction factor from the operating condition is 3.	
	From Table-2 on page E6, choose the model which satisfy Equivalent Inertia Allowable Inertia.	Calculate Equivalent Inertia Moment (I _{lE}) $I_{lE} = I_l \times (\text{Correction factor})$ $I_{lE} = 0.000052 \times 3 = 0.000156 \text{ kg} \cdot \text{m}^2$ Choose the model which satisfy I _{lE} Allowable Inertia Moment(I _A)	Calculate Equivalent GD ² (GD _{lE} ²) $GD_{lE}^2 = GD_l^2 \times (\text{Correction factor})$ $GD_{lE}^2 = 0.000205 \times 3 = 0.000615 \text{ kgf} \cdot \text{m}^2$ Choose the model which satisfy GD _{lE} ² Allowable GD ² (GD _A ²)
Final Decision	Select the most appropriate model which satisfy all the conditions required from torque, inertia and O.H.L.	Finally we can determine the model F2SM-15-80-T60 Torque Arm TAF2S-15(Option Number) is recommended. Refer to page E85. In case the torque arm is to be made by customer, the distance(r) from the center of the output shaft to the fixing point, should be no less than 9.1mm by the calculation below: $r = \frac{\text{Actual Load Torque} \times 1000}{\text{Allowable O.H.L. - mass of Reducer}} = \frac{11.25 \{ 1.15 \} \times 1000}{1274 \{ 130 \} - 9.8 \times \{ 4 \}} = 9.1$ * For the calculation formula of Torque Arm, refer to page E85.	

Example of Selection Gearmotor(with motor)

- Application Conveyor (Moderate shock load)
- Conveyor Speed 10m/min
- Weight of Work 40kg
- { Mass of Work 40kgf }
- Type of Drive Chain (Located on the center of shaft)
- Operating Time 12 hours/day
- Starting & Stopping Frequency 720 times/day
- Area of Use Area of Power Supply Frequency of 60Hz
- Coefficient of Friction Supposed to be 0.2



Chain(1), Sprocket(1) and other conditions were neglected for this calculation.

Process of Selection		Example of Selection	
		SI Unit	Gravimetric Unit
Deciding Type	Selection of right angle shaft or parallel shaft	Decide on a GTR Mini Series H-Type (right angle shaft) considering the mounting space.	
Determining Reduction Ratio	Determine Reduction Ratio: Required Rotation Speed of Output Shaft $i = \frac{1600(\text{assumption})}{\text{Required Rotation Speed}}$	Required Rotation Speed of Conveyor Shaft = $\frac{10 \times 1000}{150 \times \pi} = 21.2 \text{ rpm}$ Since the diameter of sprocket for conveyor shaft and that of reducer output shaft are the same, we obtain. $i = \frac{21.2}{1600} = \frac{1}{75}$	
Checking Torque	Calculate Actual Load Torque(TL) Calculate equivalent torque(TLE) of output shaft from service factor: (sf given in Table-1 on page E6) $T_{LE} = T_L \times S_f$ Choose the allowable torque(TA) of output shaft from the performance table, which should be greater than TLE	$T_L = 9.8 \times (40 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 7.5 \text{ N}\cdot\text{m}$ $T_{LE} = 7.5 \times 1.25 = 9.4 \text{ N}\cdot\text{m}$	$T_L = (40 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 0.77 \text{ kgf}\cdot\text{m}$ $T_{LE} = 0.77 \times 1.25 = 0.96 \text{ kgf}\cdot\text{m}$
Checking Inertia	Calculate Actual Load Inertia Calculate Load Inertia converted to Motor Shaft Calculate Equivalent Inertia using the correction factor corresponding to the operating condition.	Calculate Actual Load Inertia Moment(IL) $I_L = \{40 \times (\frac{0.15}{2})^2\} + \{ \frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2 \} + \{ 5 \times (\frac{0.15}{2})^2 \}$ $I_L = 0.27 \text{ kg}\cdot\text{m}^2$ Convert IL into the equivalent value at the motor shaft(I _ℓ) $I_{\ell} = I_L \times (i)^2$ $I_{\ell} = 0.27 \times (\frac{1}{80})^2 = 0.000042 \text{ kg}\cdot\text{m}^2$	Calculate Actual load GD ² (GD _L ²) $GD_L^2 = (40 \times 0.15^2) + (\frac{1}{2} \times 3 \times 0.15^2 \times 2) + (5 \times 0.15^2)$ $GD_L^2 = 1.08 \text{ kgf}\cdot\text{m}^2$ Convert GD _L ² into the equivalent value at the motor shaft(GD _ℓ ²) $GD_{\ell}^2 = GD_L^2 \times (i)^2$ $GD_{\ell}^2 = 1.08 \times (\frac{1}{80})^2 = 0.000169 \text{ kgf}\cdot\text{m}^2$
		Correction factor from the operating condition is 3.	
		Calculate Equivalent Inertia Moment(I _{ℓE}) $I_{\ell E} = I_{\ell} \times (\text{Correction factor})$ $I_{\ell E} = 0.000042 \times 3 = 0.000126 \text{ kg}\cdot\text{m}^2$ Choose the model which satisfy I _{ℓE} Allowable Inertia Moment(I _A)	Calculate Equivalent GD ² (GD _{ℓE} ²) $GD_{\ell E}^2 = GD_{\ell}^2 \times (\text{Correction factor})$ $GD_{\ell E}^2 = 0.000169 \times 3 = 0.000507 \text{ kgf}\cdot\text{m}^2$ Choose the model which satisfy GD _{ℓE} ² Allowable GD ² (GD _A ²)
		HLM-18 ^ℓ -80-T60	
Checking O.H.L.	Determine K1 by the type of drive Table-5 on page E8 Determine k2 by the location of the load Table-6 on page E8 $O.H.L. = \frac{T_{LE} \times K_1 \times K_2}{R}$ *R: Pitch Circle Radius of sprocket, etc. equipped to reducer shaft Select O.H.L. Allowable O.H.L. from the performance table	$K_1 = 1$ $K_2 = 1$ $O.H.L. = \frac{9.4 \times 1 \times 1}{2 \times 1000} = 376 \text{ N}$	$O.H.L. = \frac{0.96 \times 1 \times 1}{2 \times 1000} = 38.4 \text{ kgf}$
		Select the model which satisfy O.H.L. Allowable O.H.L., then found HLM-15 ^ℓ -80-T15	
Final Decision	Select the most appropriate model which satisfy all the conditions required from torque, inertia and O.H.L.	The most appropriate model is HLM-18 ^ℓ -80-T60	

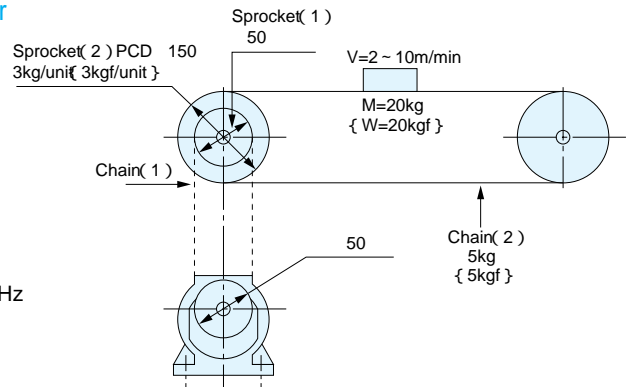
Parallel Shaft Performance Table/ Dimension
Gearmotor with Brake
Water-resistant Gearmotor with Brake
Speed Control Gearmotor
Gearmotor with Clutch /Brake
GT-Type Gearmotor with Brake
Right Angle Shaft Performance Table/ Dimension
Gearmotor with Brake
With Water-resistant Brake Motor
Speed Control Gearmotor
Concentric Hollow Shaft Concentric Solid Shaft Performance Table/ Dimension
Gearmotor with Brake
With Water-resistant Brake Motor
Speed Control Gearmotor
Parallel Shaft GTR-L Series Performance Table/ Dimension
Reversible Gearmotor with Brake
Speed Control Gearmotor with Brake

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Process of selection and example of selection

An example of Selection Speed Control Gearmotor

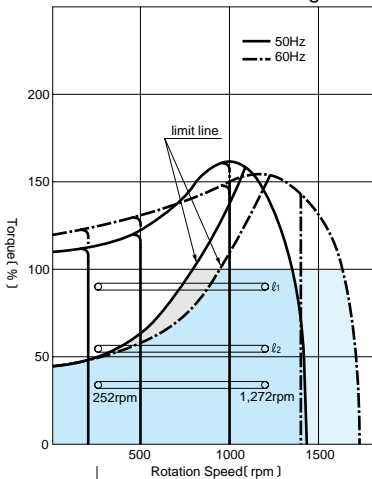
Application Conveyor (Moderate shock load)
 Conveyor Speed 2 ~ 10m/min
 Weight of Work 40kg
 (Mass of Work 40kgf)
 Type of Drive Chain(Located on the center of shaft)
 Operating Time 12 hours/day
 Starting & Stopping Frequency ... 10 times/day
 Area of Use Area of Power Supply Frequency of 60Hz
 Coefficient of Friction Supposed to be 0.2



Chain(1), Sprocket(1) and other conditions were neglected for this calculation.

Process of Selection		Example of Selection	
		SI Unit	Gravimetric Unit
Deciding Type	Decide on Right Angle Shaft or Parallel Shaft	Decide on a GTR Mini Series G-Type (parallel shaft) considering the mounting space.	
Determining Reduction Ratio	Determine Reduction Ratio: Required Rotation Speed of Output Shaft $i = \frac{1550(\text{assumption})}{\text{Required Rotation Speed of Output Shaft}}$	Required Rotation Speed of Conveyor Shaft = $\frac{2 \times 1000}{150 \times \pi} \sim \frac{10 \times 1000}{150 \times \pi} = 4.2 \sim 21.2\text{rpm}$ Required Rotation Speed of gearmotor is also 4.2 ~ 21.2rpm. Calculate ratio i using larger rpm, 21.2rpm. $i = \frac{21.2}{1550} \sim \frac{1}{73}$ (for 50Hz, use " 1300 ") From model chart, take ratio $i = \frac{1}{60}$, less than $i = \frac{1}{73}$ and the closest.	
Checking Torque	Calculate Actual Load Torque(TL) Calculate equivalent torque(TLE) of output shaft from service factor: (sf given in Table-1 on page E6) $TLE = TL \times Sf$ Choose the allowable torque(TA) of output shaft from the performance table, which should be greater than TLE	$TL = 9.8 \times (20 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 4.6\text{N}\cdot\text{m}$ Adjust Actual Load Torque(TL) using a Service Factor (Sf). $TLE = 4.6 \times 1.25 = 5.8\text{N}\cdot\text{m}$ Select an appropriate model of TLE TA Consider from loading torque $= 0.59\text{kgf}\cdot\text{m}$ and ratio $i = \frac{1}{60}$, GLP-12-60-S25 GLP-15-60-S40 or select GLP-15-60-S60 Calculate motor shaft rotation speed, Max rotation speed $21.2 \times 60 = 1272\text{rpm}$ Minimum rotation speed $4.2 \times 60 = 252\text{rpm}$ Confirm torque loading factor is under limit line.(Figure-1) torque loading factor GLP-12-60-S25: $\frac{5.8}{6.66} \times 100 = 87\%(l_1)$ GLP-15-60-S40: $\frac{5.8}{10.8} \times 100 = 54\%(l_2)$ GLP-15-60-S60: $\frac{5.8}{16.7} \times 100 = 35\%(l_3)$ therefore, select GLP-15-60-S60	$TL = (20 + 3 \times 2 + 5) \times 0.2 \times \frac{150}{2 \times 1000} = 0.47\text{kgf}\cdot\text{m}$ Adjust Actual Load Torque(TL) using a Service Factor (Sf). $TLE = 0.47 \times 1.25 = 0.59\text{kgf}\cdot\text{m}$ Select an appropriate model of TLE TA Consider from loading torque $= 0.59\text{kgf}\cdot\text{m}$ and ratio $i = \frac{1}{60}$, GLP-12-60-S25 GLP-15-60-S40 or select GLP-15-60-S60 Calculate motor shaft rotation speed, Max rotation speed $21.2 \times 60 = 1272\text{rpm}$ Minimum rotation speed $4.2 \times 60 = 252\text{rpm}$ Confirm torque loading factor is under limit line.(Figure-1) torque loading factor GLP-12-60-S25: $\frac{0.59}{0.68} \times 100 = 87\%(l_1)$ GLP-15-60-S40: $\frac{0.59}{1.1} \times 100 = 54\%(l_2)$ GLP-15-60-S60: $\frac{0.59}{1.7} \times 100 = 35\%(l_3)$ therefore, select GLP-15-60-S60

Figure-1



Process of Selection		Example of Selection	
		SI Unit	Gravimetric Unit
<p>Checking Inertia</p>	<p>Calculate Actual Load Inertia</p>	<p>Calculate Actual Load Inertia Moment (I_L)</p> $I_L = \{20 \times (\frac{0.15}{2})^2\} + \{ \frac{1}{2} \times 3 \times (\frac{0.15}{2})^2 \times 2\} + \{5 \times (\frac{0.15}{2})^2\}$ $= 0.16 \text{ kg} \cdot \text{m}^2$	<p>Calculate Actual Load GD² (GD_L²)</p> $GD_L^2 = (20 \times 0.15^2) + (\frac{1}{2} \times 3 \times 0.15^2 \times 2) + (5 \times 0.15^2)$ $= 0.63 \text{ kgf} \cdot \text{m}^2$
	<p>Calculate Load Inertia converted to Motor Shaft</p>	<p>Convert I_L into the equivalent value at the motor shaft (I_ℓ)</p> $I_\ell = I_L \times (i)^2$ $I_\ell = 0.16 \times (\frac{1}{60})^2$ $= 0.000044 \text{ kg} \cdot \text{m}^2$	<p>Convert GD_L² into the equivalent value at the motor shaft (GD_ℓ²)</p> $GD_\ell^2 = GD_L^2 \times (i)^2$ $GD_\ell^2 = 0.63 \times (\frac{1}{60})^2$ $= 0.00018 \text{ kgf} \cdot \text{m}^2$
	<p>Calculate Equivalent Inertia using the correction factor corresponding to the operating condition.</p>	<p>Correction factor for the operating conditions is 2.</p>	
	<p>From Table-2 on page E6, choose the model which satisfy Equivalent Inertia Allowable Inertia.</p>	<p>Calculate Equivalent Inertia Moment (I_{ℓE})</p> $I_{\ell E} = I_\ell \times (\text{Correction factor})$ $I_{\ell E} = 0.000044 \times 2 = 0.000088 \text{ kg} \cdot \text{m}^2$ <p>Choose the model which satisfy I_{ℓE} Allowable Inertia Moment (I_A)</p>	<p>Calculate Equivalent GD² (GD_{ℓE}²)</p> $GD_{\ell E}^2 = GD_\ell^2 \times (\text{Correction factor})$ $GD_{\ell E}^2 = 0.00018 \times 2 = 0.00036 \text{ kgf} \cdot \text{m}^2$ <p>Choose the model which satisfy GD_{ℓE}² Allowable GD² (GD_A²)</p>
		<p>GLP-12-60-S25</p>	
<p>Checking O.H.L.</p>	<p>Determine K1 by the type of drive Table-5 on page E8 Determine k2 by the location of the load Table-6 on page E8</p>	<p>K₁ = 1 K₂ = 1</p>	
	<p>O.H.L. = $\frac{T_{LE} \times K_1 \times K_2}{R}$</p> <p>*R: Pitch Circle Radius of sprocket, etc. equipped to reducer shaft</p>	<p>O.H.L. = $\frac{5.8 \times 1 \times 1}{50} = 232 \text{ N}$</p> <p>$\frac{2 \times 1000}{2 \times 1000}$</p>	<p>O.H.L. = $\frac{0.59 \times 1 \times 1}{50} = 23.6 \text{ kgf}$</p> <p>$\frac{2 \times 1000}{2 \times 1000}$</p>
	<p>Select O.H.L. Allowable O.H.L. from the performance table</p>	<p>Select the model which satisfy O.H.L. Allowable O.H.L., then found GLP-12-60-S25</p>	
<p>Final Decision</p>	<p>Select the most appropriate model which satisfy all the conditions required from torque, inertia and O.H.L.</p>		<p>The most appropriate model is GLP-15-60-S60</p>

Parallel Shaft Performance Table/ Dimension

Gearmotor with Brake

Water-resistant Gearmotor with Brake

Speed Control Gearmotor

Gearmotor with Clutch /Brake

GT-Type Gearmotor with Brake

Right Angle Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Concentric Hollow Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Parallel Shaft GTR-L Series Performance Table/ Dimension

Reversible Gearmotor with Brake

Speed Control Gearmotor with Brake

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Service Factor (Sf)

GTR Mini Series, GTR-L Series and gearmotors are designed for the operation of 10 hrs/day with moderate shock loads. In case of using in severer condition, adjust the load torque with the Table-1 below.

Table-1

Load Condition	Service Factor(Sf)			Application
	Under 3 hrs/day	3 ~ 10 hrs./day	Over 10 hrs/day	
Uniform Load	1	1	1	Conveyors(uniform load), Screens, Agitators(low viscosity), Sewage Disposal Equipments(light load), Machine Tools(feed shaft), Elevators, Extruders, Distillers
Moderate Shock Load	1	1	1.25	Conveyors(non-uniform or heavy load), Agitators(high viscosity), Machines for Vehicles, Sewage Disposal Equipments(moderate load), Hoists(light load), Paper Mills, Feeders, Food Machines, Pumps, Sugar Mills, Textile Machines
Heavy Shock Load	1	1.25	1.5	Hoists(heavy load), Hammer Mills, Metal Mills, Crushers, Tumblers

Allowable Inertia Moment I (I_A) Allowable GD² (GD_A²)

When operating gearmotors intermittently under high inertia load, critical torque may instantaneously arise at the starting(or stopping in brake gearmotor). This may cause unexpected accident, therefore, be sure that the inertia of the connecting machine should be within the allowable value listed in the Table below, which may vary according to the connecting type and/or starting frequency.

Allowable Inertia Moment I by Capacity { GD² } (Motor shaft or Input Shaft Equivalent)

Unit: Inertia Moment I (kg·m² } GD²(kgf·m²) } Table-2

GTR Mini Series						Allowable Inertia Moment I (I _A) { AllowableGD ² (GD _A ²) }
G-Type	GT-Type	Clutch/ Brake	H-Type	F2-Type		
Frame G-12 Frame G-22 (15-25-40-60W)	GT8	Frame G-12 Frame G-15	Frame H-15 Frame H-22 (15-25-40-60W)	Frame F2S-12	Frame F2F-15	0.0001 { 0.0004 }
Frame G-15 Frame G-28 Frame G-32	GT9	Frame G-18	Frame H-18 Frame H-28 Frame H-32	Frame F2S-15	Frame F2F-18	0.0002 { 0.0008 }
Frame G-18 Frame G-40	—	—	Frame H-40	—	—	0.0006 { 0.0025 }

Unit: Inertia Moment I (kg·m² } GD²(kgf·m²) } Table-3

GTR-L Series		
G-Type	Allowable Inertia Moment I (I _A) { AllowableGD ² (GD _A ²) }	Low-torque type Allowable Inertia Moment I (I _A) { AllowableGD ² (GD _A ²) }
Frame G-10	0.00004 { 0.00015 }	—
Frame G-12	0.0001 { 0.0004 }	0.00005 { 0.0002 }
Frame G-15 (25W)	0.0002 { 0.0008 }	0.0001 { 0.0004 }
Frame G-15 (40W)	0.0002 { 0.0008 }	0.00004 { 0.00015 }

Note 1) Motor shaft(input shaft) equivalent inertia moment I = Output shaft inertia moment I × (reduction ratio)²
{ GD² = Output shaft GD² × (reduction ratio)² } (Example: In case the reduction ratio is 1/20, the answer is 1/400.)

Correction Factor for Allowable Inertia Moment I by Operating Condition { Allowable GD² }

Table-4

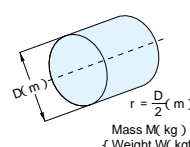
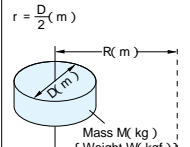
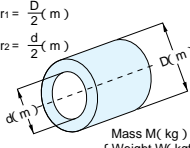
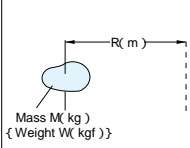
Connection Type	Starting Frequency	Correction Factor
Direct Coupling (without slack)	Under 70 times/day	1
	Over 70 times/day	1.5
By Chain (with slack)	Under 70 times/day	2
	Over 70 times/day	3

Calculation of Inertia Moment I { GD² (Flywheel Effect) }

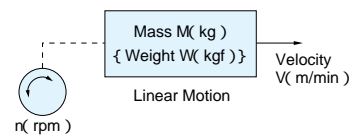
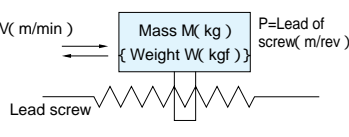
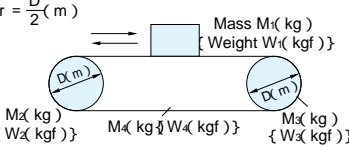
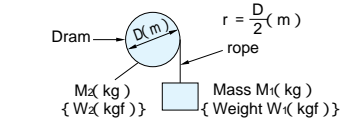
The conversion between the inertia moment(kg·m²)-(SI units) and the gravimetric units GD² (kg·m²) are calculated as follows:

$$I = \frac{GD^2}{4} \begin{cases} G : \text{Gravity(kgf)} \\ D : \text{Rotation Diameter(m)} \\ I : \text{Inertia Moment(kg}\cdot\text{m}^2) \end{cases}$$

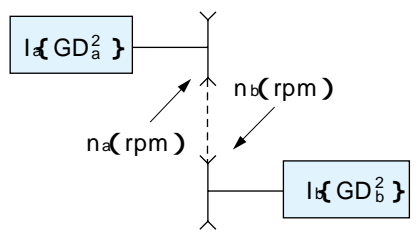
Inertia Moment in Rotation { GD² }

When the center of rotation is concentric with the center of gravity		When the center of rotation is not concentric with the center of gravity	
	SI Unit	Gravimetric Unit	
	$I = \frac{1}{2} Mr^2$ (kg·m ²)	$GD^2 = \frac{1}{2} WD^2$ { kgf·m ² }	
	$I = \frac{1}{2} M(r_1^2 + r_2^2)$ (kg·m ²)	$GD^2 = \frac{1}{2} W(D^2 + d^2)$ { kgf·m ² }	
	(kg·m ²)	{ kgf·m ² }	(kg·m ²)
		{ kgf·m ² }	(when you can ignore size) $I = MR^2$ (kg·m ²)
		{ kgf·m ² }	(when you can ignore size) $GD^2 = 4WR^2$ { kgf·m ² }

Inertia Moment in Linear Motion { GD² }

		SI Unit	Gravimetric Unit
Ordinary Use		$I = \frac{1}{4} M \cdot \left(\frac{V}{\cdot n} \right)^2$ (kg·m ²)	$GD^2 = W \cdot \left(\frac{V}{\cdot n} \right)^2$ { kgf·m ² }
Horizontal Linear Motion (driven with lead screw)		$I = \frac{1}{4} M \cdot \left(\frac{P}{\cdot} \right)^2$ $= \frac{1}{4} M \cdot \left(\frac{V}{\cdot n} \right)^2$ (kg·m ²)	$GD^2 = W \cdot \left(\frac{P}{\cdot} \right)^2$ $= W \cdot \left(\frac{V}{\cdot n} \right)^2$ { kgf·m ² }
Horizontal Linear Motion (conveyors, etc.)		$I = M_1 r_1^2 + \frac{1}{2} M_2 r_2^2$ $+ \frac{1}{2} M_3 r_3^2 + M_4 r_4^2$ (kg·m ²)	$GD^2 = W_1 D^2 + \frac{1}{2} W_2 D^2$ $+ \frac{1}{2} W_3 D^2 + W_4 D^2$ { kgf·m ² }
Vertical Linear Motion (cranes, winches, etc.)		$I = M_1 r^2 + \frac{1}{2} M_2 r^2$ (kg·m ²)	$GD^2 = W_1 D^2 + \frac{1}{2} W_2 D^2$ { kgf·m ² }

Conversion of Inertia Moment when Speed Ratio is available



The inertia moment Ib (GD_b²) of the load can be converted into the equivalent value at the na shaft as shown below:

$$I = I_a + \left(\frac{n_b}{n_a} \right)^2 \times I_b$$

$$\{ GD^2 = GD_a^2 + \left(\frac{n_b}{n_a} \right)^2 \times GD_b^2 \}$$

Parallel Shaft Performance Table/ Dimension

Gearmotor with Brake

Water-resistant Gearmotor with Brake

Speed Control Gearmotor

Gearmotor with Clutch / Brake

GT-Type Gearmotor with Brake

Right Angle Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Concentric Hollow Shaft Concentric Solid Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Parallel Shaft GTR-L Series Performance Table/ Dimension

Reversible Gearmotor with Brake

Speed Control Gearmotor with Brake

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Overhung Load (O.H.L.)

An overhung load is a suspending load imposed on a shaft. In the coupling of reducer shaft and other machine, if chains, belts and gears are used, this O.H.L. must be taken into consideration.

$$O.H.L. = \frac{T_{LE} \times K_1 \times K_2}{R} \text{ (N) } \{ \text{kgf} \}$$

T_{LE} : Equivalent output torque imposed on reducer shaft (N·m } kgf·m }
 R : Pitch Circle Radius(m) of sprocket, pulley, gear, etc. attached to reducer shaft.
 K_1 : Factor for the connecting method (Refer to Table-5)
 K_2 : Factor for the load point (Refer to Table-6)

Be sure that the OHL value calculated by above formula should not exceed the allowable OHL value listed in the performance table.

Factor K₁

Table-5

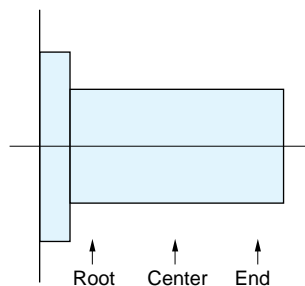
Connecting Method	K ₁
Chain, Timing Belt	1.00
Gear	1.25
V-Belt	1.50

Factor K₂

Table-6

Load Point	K ₂
Root of the shaft	0.75
Center of the shaft	1.00
End of the shaft	1.50

Load Point



Thrust Load

The thrust load values of F2-Type and F2S(hollow shaft) are listed in the performance table. Please contact us for the other models.

Parallel Shaft Performance Table/ Dimension

Gearmotor with Brake

Water-resistant Gearmotor with Brake

Speed Control Gearmotor

Gearmotor with Clutch /Brake

GT-Type Gearmotor with Brake

Right Angle Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Concentric Hollow Shaft Concentric Solid Shaft Performance Table/ Dimension

Gearmotor with Brake

With Water-resistant Brake Motor

Speed Control Gearmotor

Parallel Shaft GTR-L Series Performance Table/ Dimension

Reversible Gearmotor with Brake

Speed Control Gearmotor with Brake

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Overhung Load on a Hollow Shaft(O.H.L.)

Flange Mounting

1. Load Point of O.H.L.

Allowable OHL is calculated at the point 20mm off from the end of output shaft.

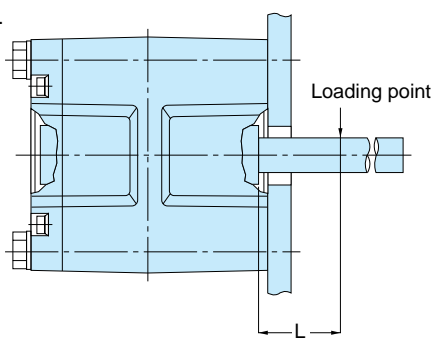
2-1. Adjustment of O.H.L. without any support by pillow

When load point of O.H.L. (L) become greater than 10mm, the allowable O.H.L. can be corrected by the following formula:

$$\text{Bearable O.H.L. (N) (kgf)} = \frac{A+10}{A+L} \times \text{Allowable O.H.L. (N) (kgf)}$$

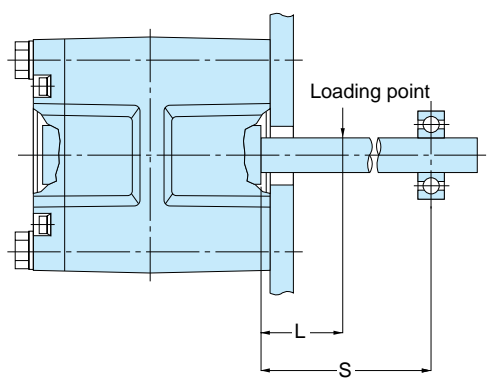
Note) Refer Table-7 for A.

Frame Number	A (mm)
12	43
15	55



2-2. Correction of O.H.L. when supported by pillow at one end

$$\text{Bearable O.H.L. (N) (kgf)} = \frac{S}{S-L} \times \text{Allowable O.H.L. (N) (kgf)}$$



In case of Shaft Mounting

When a customer-made torque arm instead of the optional part is to be prepared, and:

In case of using the torque arm shown in Fig.2.

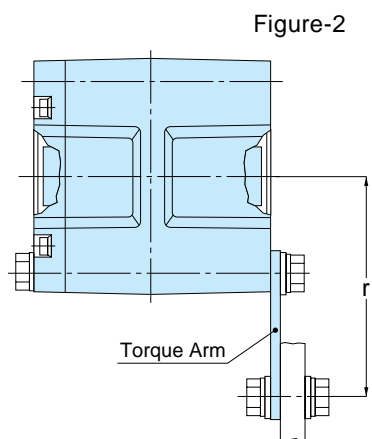
The distance: r, from the center of the output shaft to the fixing point, should be as follows:

SI Units

$$r(\text{mm}) = \frac{\text{Actual Load Torque (N}\cdot\text{m)} \times 1000}{\text{Allowable O.H.L. (N)} - 9.8 \times \text{Mass of Gearmotor (kg)}}$$

Gravimetric Units

$$r(\text{mm}) = \frac{\text{Actual Load Torque (kgf}\cdot\text{m)} \times 1000}{\text{Allowable O.H.L. (kgf)} - \text{Weight of the reducer (kg)}}$$



In case of using the torque arm shown in Fig.3.

The distance: r, from the center of the output shaft to the fixing point, should be as follows:

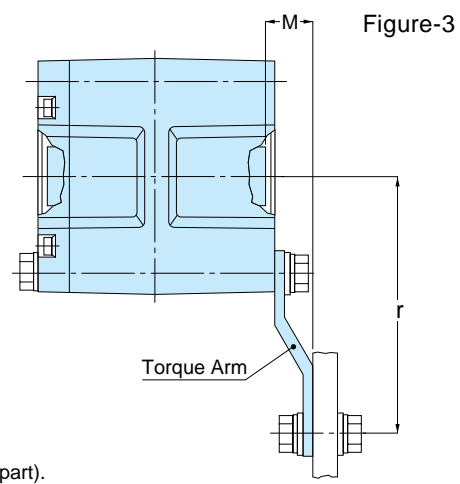
SI Units

$$r(\text{mm}) = \frac{\text{Actual Load Torque (N}\cdot\text{m)} \times (A+M) \times 1000}{\{\text{Allowable O.H.L. (N)} - 9.8 \times \text{Mass of Gearmotor (kg)}\} \times (A+10)}$$

Gravimetric Units

$$r(\text{mm}) = \frac{\text{Actual Load Torque (kgf}\cdot\text{m)} \times (A+M) \times 1000}{\{\text{Allowable O.H.L. (kgf)} - \text{Weight of the reducer (kg)}\} \times (A+10)}$$

Note) Refer to Table-7 for the constant A.



* For the required thickness of torque arm, refer to P. E85 Torque Arm (optional part).

Parallel Shaft Performance Table/ Dimension

- Gearmotor with Brake
- Water-resistant Gearmotor with Brake
- Speed Control Gearmotor
- Gearmotor with Clutch/Brake
- GT-Type Gearmotor with Brake

Right Angle Shaft Performance Table/ Dimension

- Gearmotor with Brake
- With Water-resistant Brake Motor
- Speed Control Gearmotor

Concentric Hollow Shaft Performance Table/ Dimension

- Gearmotor with Brake
- With Water-resistant Brake Motor
- Speed Control Gearmotor

Parallel Shaft GTR-L Series Performance Table/ Dimension

- Reversible Gearmotor with Brake
- Speed Control Gearmotor with Brake

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