



## Linear Drive System For Laser Cutting Industry



### Performance

	Ratio <sup>(1)</sup>	5		7	
		Pinion Module No.	2		
Pinion Teeth No.		33	37	33	37
Nominal Output Torque $T_{2N}$	Nm	165		130	
Max. Acceleration Torque $T_{2B}$	Nm	247.5		195	
Emergency Stop Torque $T_{2NOT}$	Nm	495		390	
Max. Drive Force $F_{2T}$	N	6913	6172	5447	4863
No Load Running Torque	Nm	0.7			
Backlash <sup>(2)</sup>	arcmin	$\leq 3$			
Torsional Rigidity	Nm/arcmin	22			
Nominal Input Speed $n_{1N}$	rpm	3,600			
Max. Input Speed $n_{1B}$	rpm	6,000			
Max. Drive Speed $V_{Max}$	m/s	4.4	3.1	4.9	3.5
Service Life <sup>(3)</sup>	hr	20,000			
Operating Temp.	°C	-10° C ~ 90° C			
Lubrication		Synthetic Lubrication Grease			
Mounting Position		All Directions			
Running Noise <sup>(4)</sup>	dB(A)	$\leq 59$			
Efficiency $\eta$	%	$\geq 97\%$			
Inertia	kg.cm <sup>2</sup>	4.52			

### Order Code

**L - 24 - 5 - 33**

Teeth No. 33T / 37T

Ratio R5 / R7

Motor Shaft<sup>(5)</sup> 19 / 22 / 24

(1) Ratio (  $i = N_{in} / N_{out}$  )

(2) Backlash is measured at 2% of Nominal Output Torque  $T_{2N}$

(3) Continuous operation is not recommended

(4) These values are measured by gearbox with ratio 7 at 3,000 rpm without loading

(5) Motor adapter specification please refer to the dimension of linear drive system



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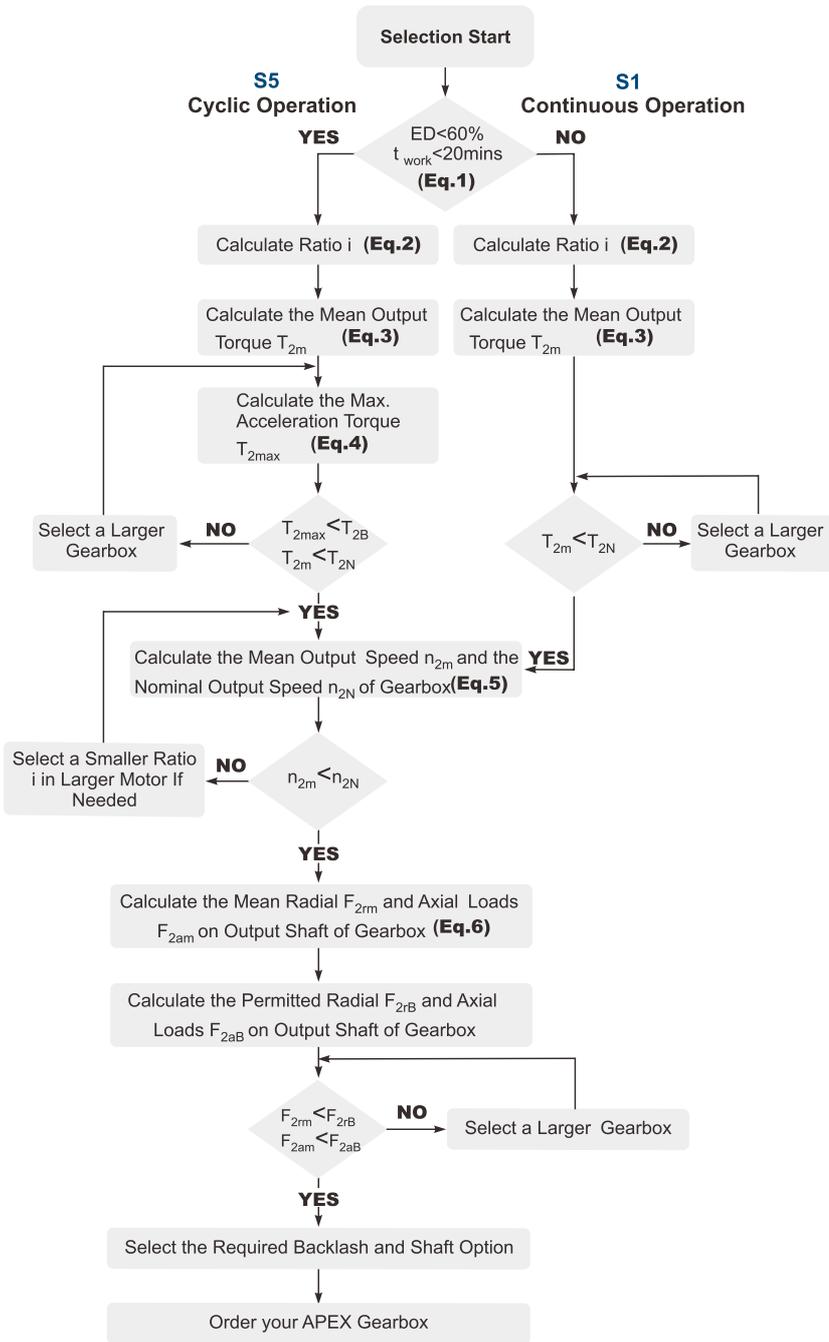
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**APEX-2019-10-L24 Series-1.0En-TWN**



# Selection of the optimum gear box



## Recommended (for S5 Cycle Operation)

The general design is given for

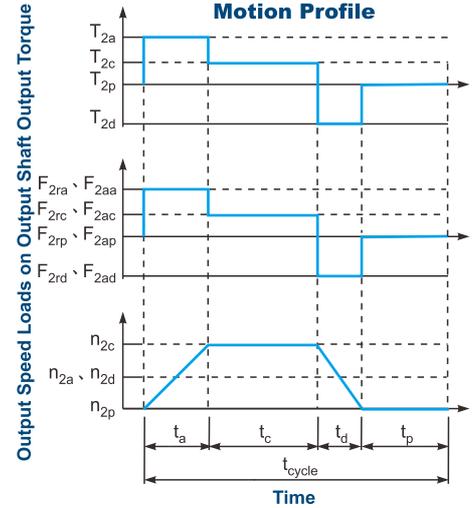
$$\frac{J_L}{i^2} \leq 4 \times J_m$$

The optimal design is given for

$$\frac{J_L}{i^2} \cong J_m$$

$J_L$  Load Inertia

$J_m$  Motor Inertia



$$1. ED = \frac{t_a^3 t_c + t_d^3}{t_{cycle}} \times 100\%, t_{work} = t_a t_c + t_d$$

Index : a. Acceleration, c. Constant, d. Deceleration, p. Pause

(Eq.1)

$$2. i \cong \frac{n_m}{n_{work}}$$

$n_m$  Output Speed of the Motor

$n_{work}$  Working Speed

(Eq.2)

$$3. T_{2m} = 3 \sqrt{\frac{n_{2a} \times t_a \times T_{2a}^3 + n_{2c} \times t_c \times T_{2c}^3 + n_{2d} \times t_d \times T_{2d}^3}{n_{2a} \times t_a^3 n_{2c} \times t_c + n_{2d} \times t_d}}$$

(Eq.3)

$$4. T_{2max} = T_{mB} \times i \times K_s \times \eta$$

where  $K_s$  is

$K_s$	No. of Cycles / hr
1.0	0 ~ 1,000
1.1	1,000 ~ 1,500
1.3	1,500 ~ 2,000
1.6	2,000 ~ 3,000
1.8	3,000 ~ 5,000

$T_{mB}$  Max. Output Torque of the Motor

$\eta$  Efficiency of the Gearbox

(Eq.4)

$$5. n_{2a} = n_{2d} = \frac{1}{2} \times n_{2c}$$

$$n_{2m} = \frac{n_{2a} \times t_a + n_{2c} \times t_c + n_{2d} \times t_d}{t_a^3 t_c + t_d}$$

$$n_{2N} = \frac{n_{1N}}{i}$$

(Eq.5)

$$6. F_{2rm} = 3 \sqrt{\frac{n_{2a} \times t_a \times F_{2ra}^3 + n_{2c} \times t_c \times F_{2rc}^3 + n_{2d} \times t_d \times F_{2rd}^3}{n_{2a} \times t_a^3 n_{2c} \times t_c + n_{2d} \times t_d}}$$

$$F_{2am} = 3 \sqrt{\frac{n_{2a} \times t_a \times F_{2aa}^3 + n_{2c} \times t_c \times F_{2ac}^3 + n_{2d} \times t_d \times F_{2ad}^3}{n_{2a} \times t_a^3 n_{2c} \times t_c + n_{2d} \times t_d}}$$

(Eq.6)