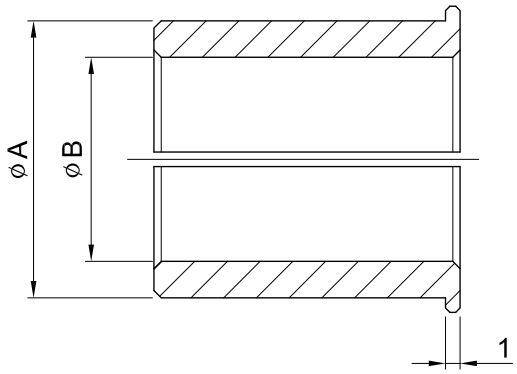
Bushing

軸套



軸套內徑為所使用伺服馬達的輸出軸軸徑。下表中沒有的情況下需要插入軸套，在您所使用的輸出軸軸徑的近似值中選擇大值。

For motor shaft diameters not listed, gearboxes will be supplied with a bush to suit.

The bore sizes may be supplied as a larger bore with a bush.

連接軸_孔徑 Shaft Bore ØA / ØB 軸套_孔徑 Bushing Bore	8	11	14	19	22	24	28	32	35
6	●	●							
6.35	●								
8		●							
9		●							
10			●						
11			●						
12			●						
12.7			●						
14				●					
15.85				●					
16				●		●	●		
19					●	●	●		
22						●	●	●	
24							●		●
28								●	●
32									●

Collet Locking Mechanism

筒夾式連結機構

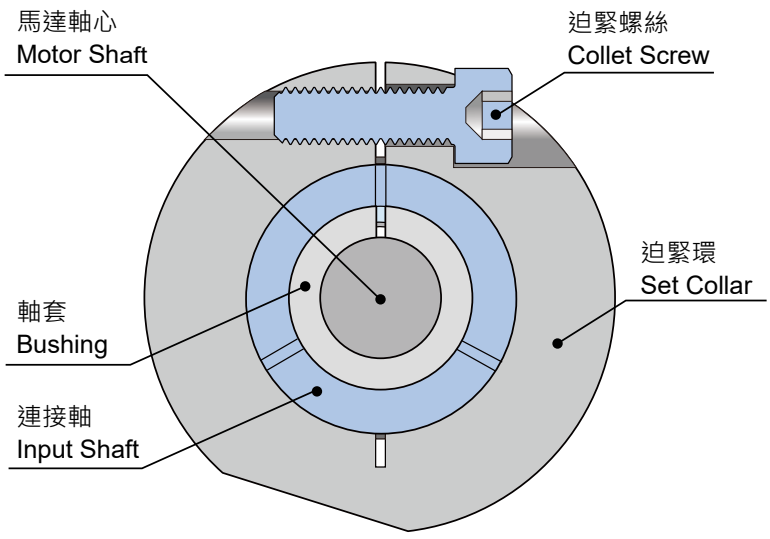
迫緊螺絲及迫緊環扭矩表 Collet Screw & Set Collar Torque Table

型號 Model													迫緊螺絲規格 Spec. of Collet Screw	螺絲強度等級 Screw Grade	螺絲鎖緊扭矩 Tighten Torque (Nm)	迫緊扭矩 Clench Torque (Nm)	鍵 key
SB SE	SBT PBT	SD	SR	SDH	SF	SA	PB	SN	SNL	FA	FB	FC FCL					
44	44	47	-	64	-	50	44	50 60	50 60 70	50	50	50	M4 x P 0.7	12.9	4.83	87	
62	62	64	82	90	62	70	62	70 80	80 90	70 80 90	70	70	M5 x P 0.8	12.9	10	164	
90	90 120	90	100	110	75	90	90	90 115	120	100	90	90	M6 x P 1.0	12.9	16.3	233	
120	142	110	132	140	100	120 160	120	120 155 160	155 160	120	120	120	M8 x P 1.25	12.9	41	423	
142	180	140	-	200	142	-	142	-	-	142	145	145	M10 x P 1.5	12.9	81	678	
180 220	-	200 255	-	255	180	-	180 220	-	-	180	180 220	-	M10 x P 1.5	12.9	81	678	●
270 330	-	-	-	-	-	-	-	-	-	-	-	-	M12 x P 1.75	12.9	110	813	●

※ 馬達扭矩超過迫緊扭矩時，可能導致打滑。

It will cause slip when motor torque exceeds clench torque.

孔徑 Input Bore	Ø35	Ø38	Ø42	Ø48	Ø55	Ø60	Ø75
鍵 Key	10 x 8	10 x 8	12 x 8	14 x 9	16 x 10	18 x 11	20 x 12



Reference Selection Table of Motor

馬達選用參考表

單段 1-Stage

Model																																
	SB SE	-	-	44	-	-	-	-	62	-	-	-	-	90	-	-	-	-	120	-	-	-	-	-	142	-	-	-	180	-	220	270	330
	PB	-	-	44	-	-	-	-	62	-	-	-	-	90	-	-	-	-	120	-	-	-	-	-	142	-	-	-	180	-	220	-	-
	SBL	-	44	-	-	-	-	-	62	-	-	-	-	90	-	-	-	-	-	-	120	-	-		142	-	-	-	180	-	220	-	-
	SBT SEL PBT	44	-	-	-	-	62	-	-	-	-	-	-	-	-	90	-	120	-	-	-	-	-	142		-	180	-	-	220	-	-	-
	SD	-	47	-	-	-	-	-	64	-	-	-	-	90	-	-	-	-	-	-	-	110	-	-	140	-	-	-	200	-	255	-	-
	SDL	-	-	47	-	-	-	64	-	-	-	-	-	90	-	-	-	-	-	-	110	-	-	-	-	140	-	-	200	-	255	-	-
	SR	-	-	-	-	-	-	-	-	82	-	-	-		-	100	-	-	-	132	-	-	-	-	-	-	-	-	-	-	-	-	-
	SF	-	-	-	-	-	-	-	62		-	-	-	75	-	-	-	-	-	-	-	100	-	-	142	-	-	-	180	-	-	-	-
	SFL	-	-	-	-	-	-	-	-	62	-	-	-	-	75	-	-	-	-	-	100	-	-	-	142	-	-	-	180	-	-	-	-
	SA	-	-	-	-	-	50	-	-	70	-	-	-	-	-	90	-	-	-	-	120 160	-	-	-	-	-	-	-	-	-	-	-	-
	SN	-	-	-	50	60	-	-	70	-	80	-	-	-	115	-	-	-	-	-	120	-	155 160	-	-	-	-	-	-	-	-	-	-
	SNL	-	50 60	-	-	-	-	70	-	-	-	-	80 90	-	-	-	120	-	-	-	-	-	-	-	-	-	155 160	-	-	-	-	-	-
	FA	-	-	-	50	-	-	-	70	-	-	80 90	-	-	100	-	-	-	120	-	-	-	-	-	142	-	-	-	180	-	-	-	-
	FB、FE	-	-	50	-	-	70	-	-	-	-	-	-	90	-	-	-	-	120	-	-	-	-	-	145	-	-	180	-	220	-	-	-
	FC	-	50	-	-	-	-	-	70	-	-	-	-	-	-	90	-	-	-	-	120	-	-	-	145	-	-	-	-	-	-	-	-
	FCL	-	50	-	-	-	-	-	-	70	-	-	-	-	-	90	-	-	-	-	120	-	-	-	145	-	-	-	-	-	-	-	-
	FN	-	50	-	-	-	-	-	70	-	-	-	-	-	-	90	-	-	-	-	120	-	-	-	155	-	-	-	-	-	-	-	-
	FNL	-	50	-	-	-	-	-	-	70	-	-	-	-	-	90	-	-	-	-	120	-	-	155	-	-	-	-	-	-	-	-	-

入力孔徑 Input Bore / 容量 Power	8	8 11	8 9 11	8 10 11 14	8 9 10 12.7 14	11 14	11 14 19	11 14 16 19	14 19	14 16 19	16 19	14 19 22 24	16 19 22 24	19 22 24	19 24	19 22 24 28 32	22 24	22 24 28 32	24 28	24 28 32	24 28 32 35	24 28 32 35 38	28 32 35	28 32 35 38	32 35 38	35 38	35 38 42 48	35 38 42 48 55	42 48 55	38 42 48 55	48 55 60 65 70	55 60 65 75
100 W	●	●	●	●	●																											
200 W		●	●	●	●	●	●	●																								
400 W				●	●	●	●	●	●	●	●	●	●																			
750 W							●	●	●	●	●	●	●	●	●	●																	
1 kW												●	●	●	●	●	●	●	●	●	●	●										
1.5 kW												●	●	●	●	●	●	●	●	●	●	●										
2.2 kW																●		●	●	●	●	●	●	●								
3.75 kW																●		●	●	●	●	●	●	●								
5.5 kW																						●		●	●	●	●	●				
7.5 kW																						●		●	●	●	●	●				
11 kW																											●	●	●	●		
15 kW																											●	●	●	●		
22 kW																											●	●	●	●	●	
30 kW																												●	●	●	●	●
37 kW																																●
45 kW																																●
55 kW																																●
75 kW																																●

※ 以上表格僅供參考，選用時仍須以『額定輸出扭矩』為依據。The table is for reference. The selected model shall be based on rated output torque.

Reference Selection Table of Motor

馬達選用參考表

雙段 2-Stage

Model																														
	SB-A SE-A	-	44A	-	-	-	62A	-	-	-	90A	-	-	-	120A	-	-	-	-	-	142A	-	-	180A	-	-	220A	-	270A
	PB-A	-	44A	-	-	-	62A	-	-	-	90A	-	-	-	120A	-	-	-	-	-	142A	-	-	180A	-	-	-	-	-
	SBL	62	-	-	-	-	-	-	-	90	-	-	-	120	-		-	142	-	180	-	-	-	-	-	-	220	-	-
	SBL-A	44A	-	-	-	-	-	-	-	62A	-	-	-	90A	-		-	120A	-	142A	-	-	-	-	-	-	180A	220A	-
	SD	47 64	-	-	-	-	90	-	-	-	110	-	-	-	-	140	-	-	-	-	200	-	-	255	-	-	-	-	-
	SDH	-	64	-	-	-	-	90	-	-	-	-	-	-	-	-	110	-	-	-	-	140	-	-	200	-	-	255	-
	SDL	-	47 64	-	-	-	-	-	90	-	110	-	-	-	-	-	-	140	-	-	-	-	200	-	-	-	255	-	-
	SR	-	-	-	-	-	-	-	-	82	-	100	132	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	SF-A	-	-	-	-	-	-	-	-	62A	-	-	75A	-	-	-	-	100A	-	-	142A	-	-	180A	-	-	-	-	-
	SFL	-	62	-	-	-	75	-	-		100	-		-	-	-	-		142	-	180	-	-	-	-	-	-	-	-
	SFL-A	-		-	-	-	-	-	-	62A	-	-		75A	-	-	-	100A	-	142A		-	-	-	-	-	180A	-	-
	SA	-	-	-	-	50	-	-	-	70	-	-	90	-	-	-	-	120 160	-	-	-	-	-	-	-	-	-	-	-
	SN	-	-	50	60	-	70	-	80	-	-	-	90	115	-	-	-	120 155 160	-	-	-	-	-	-	-	-	-	-	-
	FB、FE	-	50	-	-	70	-	-	-	-	90	-	-	-	120	-	-	-	-	-	145	-	-	-	-	180	-	220	-
	FC	50	-	-	-	-	70	-	-	-	-	-	90	-	-	-	-	120	-	-	145	-	-	-	-	-	-	-	-
	FN	50	-	-	-	-	70	-	-	-	-	-	90	-	-	-	-	120	-	-	155	-	-	-	-	-	-	-	-

容量 Power \ 入力孔徑 Input Bore	8 11	8 9 11	8 10 11 14	8 9 10 12.7 14	11 14	11 14 16 19	14	14 16 19	14 19	16 19 22 24	19	19 24	19 22 24	22 24 28 32	22 24 28 32 35	24	24 28 32	24 28 32 35	28 32 35	28 32 35 38	32	35 38	35 38 42 48 55	38	35 38 42 48	38 42 48 55	42 48 55	48 55 60 65 70
100 W	●	●	●	●																								
200 W	●	●	●	●	●	●																						
400 W			●	●	●	●	●	●	●																			
750 W						●		●	●	●	●	●	●															
1 kW										●			●	●	●													
1.5 kW										●		●	●	●	●	●	●	●										
2.2 kW														●	●		●	●	●	●								
3.75 kW														●	●		●	●	●	●	●							
5.5 kW															●			●	●	●		●	●	●	●	●		
7.5 kW																				●		●	●	●	●	●		
11 kW																							●		●	●	●	
15 kW																							●		●	●	●	
22 kW																							●		●	●	●	●
30 kW																							●			●	●	●

※ 以上表格僅供參考，選用時仍須以『額定輸出扭矩』為依據。The table is for reference. The selected model shall be based on rated output torque.

Glossary

減速機專用名詞解釋

速比 i

輸出轉速與輸入轉速的比值，減速比 = 輸入轉速 ÷ 輸出轉速。

例如：減速機輸入端轉速 n_1=3000RPM，輸入扭矩 T_1=20Nm，減速比為 10，或稱 i=10，

輸出端轉速 n_2 ＝輸入轉速 n_1 / i=300RPM。

轉出端扭矩 T_2= 輸入扭矩 $T_1 \cdot i$=200Nm (不考慮效率時)

輸出端慣量 J_2= 輸入端慣量 $J_1 \cdot i^2$

Gear Ratio (i)

The gear ratio i indicates the factor by which the gearhead transforms the three relevant parameters of motion (speed, torque and mass moment of inertia). The factor is a result of the geometry of the gearing elements (Example: i = 10).

n_1 = 3000 rpm $\xrightarrow{:i}$ n_2 = 300 rpm

T_1 = 20 Nm $\xrightarrow{\cdot i}$ T_2 = 200 Nm

J_2 = 10 kgm^2 $\xrightarrow{:i^2}$ J_1 = 0.10 kgm^2

輸入轉速 n_1 [rpm]

減速機的驅動速度，如減速機與電機直接相連，則轉速值與電機轉速相同。

Input Speed (n_1) [rpm]

Input Speed is same as motor speed, if the motor direct connected gearbox.

輸出轉速 n_2 [rpm]

輸出轉速按照下列公式通過輸入轉速 n_1 和傳動比 i 計算出來。

$$n_2 = \frac{n_1}{i}$$

Output Speed (n_2) [rpm]

The output speed is caculated by the formula related to input speed n_1 and reducition ratio i.

額定輸入轉速 n_{1N} [rpm]

連續運轉模式 (S1)，輸入轉速須小於等於額定輸入轉速，本目錄中的額定輸入轉速是在環境溫度為 20° C 的條件下測得的，環境溫度較高時，或齒箱表面溫度超過 90° C 請降低輸入轉速 n_1。

Nominal Input Speed (n_{1N}) [rpm]

Input speed of gearbox shall be less than nominal input speed in the model of continuous operation (S1). Nominal input speed (n_{1N}) is measured at environment temperature 20° C. If the environment temperature is higher or the temperature of gearbox surface exceeds 90° C, please lower input speed (n_1).

Glossary

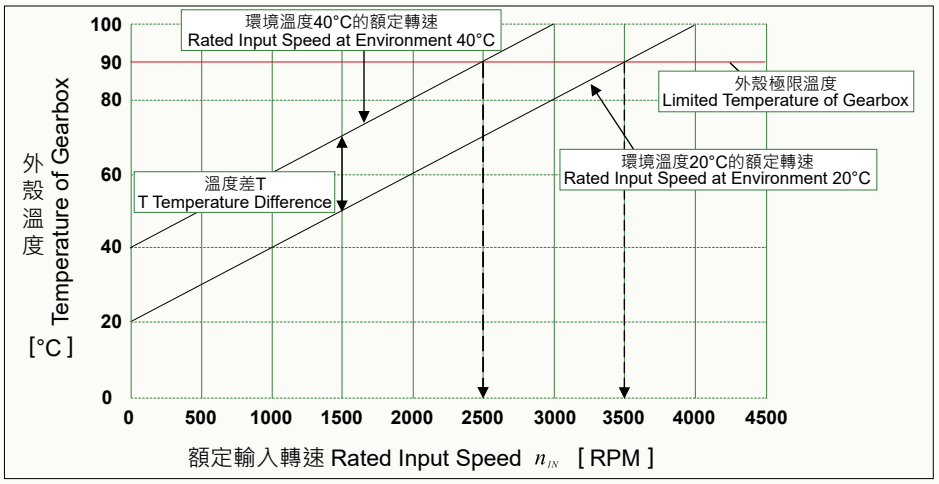
減速機專用名詞解釋

轉速 n [rpm]

減速機選型時必須要考慮的兩個轉速是最大輸入轉速和額定輸入轉速。為間歇工作制選用減速機時，要考慮不能超過最大輸入轉速 n_{1B}。為連續工作制選用減速機時，要考慮不能超出額定輸入轉速 n_{1N}。額定轉速受到減速機外殼溫度的限制，這個溫度不能超過 90° C。從下圖中可以看出，環境溫度越高時，減速機的溫度也提前達到額定溫度。換句話說，在環境溫度高時必須降低轉速。

Speed (n) [rpm]

Two speeds are of relevance when selecting a gearbox: the maximum speed and the nominal speed at the input. The maximum permissible speed n_{1B} must not be exceeded because it serves as the basis at cyclic operation. The nominal speed n_{1N} must not be exceeded at continuous operation. The housing temperature limits the nominal speed, which must not exceed 90° C. The nominal input speed specified in the catalogue applies to an ambient temperature of 20° C. As can be seen in the diagram below, the temperature limit is reached more quickly in the presence of an elevated outside temperature. In other words, the nominal input speed must be reduced if the ambient temperature is high. The values applicable to your gearbox are available from LIMING on request.



背隙等級 P2, 背隙 <8 arcmin , 額定轉矩輸出
P2, Backlash <8 arcmin, Rated Torque Output

A. 背隙愈小、溫升愈高、背隙 P0(<3ArcMin) 時平均上升 3~5 度。
B. 背隙為 Ps 時 (<1ArcMin) 時平均上升 5~10 度。
C. 背隙為 Ps、P0 時適用於 S5 間歇運轉模式，背隙 P2 可用於 S1 連續運轉模式。
D. 背隙為 Ps、P0 時，入力轉轉速應在額定輸入轉速 (Rated Input Speed) 以內。
E. 輸入轉速為最大輸入轉速 (Max Input Speed) 適用於 S5 間歇運轉模式。
F. 特殊運用場合請與本公司連繫。

A. The smaller the backlash, the higher the temperature rise. When the backlash P0 ("<"3" arcmin), the average rise is 3~5 degrees.
B. When the backlash is Ps (<1 arcmin), the average rise is 5~10 degrees.
C. When the backlash is Ps and P0, it is suitable for cyclic operation S5, and the backlash P2 can be used for continuous operation S1.
D. When the backlash is Ps and P0, the input rotation speed should be within the Rated Input Speed.
E. The Max Input Speed is suitable for cyclic operation S5.
F. Please contact our company for special applications.

Glossary

減速機專用名詞解釋

最大輸入轉速 n_{1B} [rpm]

適用間歇工作制模式 (S5)。本目錄中的最大輸入轉速是在環境溫度為 20° C 的條件下測得的，環境溫度較高時，或齒箱表面溫度超過 90° C 請降低輸入轉速 n_1。

Max Input Speed (n_{1B}) [rpm]

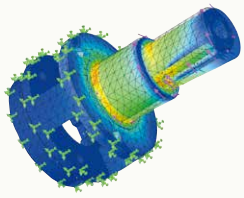
It is applied to cyclic operation (S5). Max. input speed is measured at environment temperature 20° C. If the environ ment temperature is higher or the temperature of gearbox surface exceeds 90° C, please lower input speed (n_1).

額定輸出扭矩 T_{2N} [Nm]

指減速機長時間（連續工作制）可以加載的扭矩（無磨損)。

Nominal torque (Rated Output Torque) (T_{2N}) [Nm]

The nominal torque T_{2N} is the torque continuously transmitted by a gearbox during a long period of time, i.e. in continuous operation (without wear).



CAE 分析 CAE Analysis

加速扭矩 T_{2B} [Nm]

指工作周期每小時少於 1000 次時允許短時間加載到輸出端的最大扭矩。工作周期每小時大於 1000 次時，須考慮沖擊因素。T_{2B} 是周期工作制選型時的最大值，實際使用中的加速扭矩 (T_{2b}) 必須小於 T_{2B}。否則會縮短減速機的壽命。

Acceleration Torque (T_{2B}) [Nm]

The acceleration torque T_{2B} is the maximum permissible torque that can briefly be transmitted at the gearbox output end under the duty clcye < 1000/h cycles. For > 1000/h cycles, the impact factor must be taken into account. T_{2B} is the max. parameter in cyclic operation. Application acceleration torque (T_{2b}) shall be smaller than T_{2B}; otherwise the gearbox service life will be reduced.

空載扭矩 T_{012} [Nm]

指加載到減速機上以克服齒輪箱內的摩擦力的扭矩。

No Load Running Torque (T_{012}) [Nm]

The no load running torque is the torque which must be applied to a gearbox in order to overcome the internal friction; it is therefore considered lost torque.

逆轉扭矩 [Nm]

從出力軸端施力，開始旋轉時的最小扭矩，較大的型號或較高的減速比需要較大的扭矩來逆轉。

Back Driving Torque [Nm]

The back driving torque is the minimum torque to start the rotation from the output side of gearbox.
A larger size or a higher ratio gearbox requires greater back driving torque.

Glossary

減速機專用名詞解釋

急停扭矩 (最大輸出扭矩) T_{2NOT} [Nm]

指減速機輸出端所能加載的最大扭矩。這個扭矩可在減速機壽命期內加載 1000 次。超過 1000 次可能會造成內部零件的破壞。(備註：SERVOBOX 系列機型為 $T_{2NOT} = 3 \cdot T_{2N}$； 即 3 倍額定輸出扭矩)。

Emergency Stop Torque (Max. Output Torque) (T_{2NOT}) [Nm]

The emergency stop torque T_{2NOT} is the maximum permissible torque at the gearbox output end and must not be reached more than 1000 times during the service life of the gearbox. It must never be exceeded to prevent inside parts from damage. LIMING SERVOBOX $T_{2NOT} = 3 \cdot T_{2B}$ (3 times of rated output torque)

平均壽命 [h]

指減速機在週期運轉、額定負載下，額定輸入轉速時的工作時間，連續運轉使用時降低使用壽命 1/2。
平均壽命，不是任何具體的減速機實際使用壽命的保證，它是一個平均「計算壽命」，衍生自產業公式 (註)，專有的計算和假設，和其他因素，例如實際測試結果或模擬軟件 (CAE)。這些因素考慮到金屬材料，熱處理，齒輪和軸承的設計等。實際的使用壽命 , 根據客戶的應用及實際現場條件 , 可能與標稱的使用壽命有差異。

Average Service Life [h]

Average service life is the working time of gearbox running at rated loading and nominal input speed at cyclic operation.
The service life is not a guarantee of the actual service life of the gear reducer. It is an average calculated life derived from industry formulas (*), and other factors such as running test results, CAE (Computer Aided Engineering) software and so on. These factors take into consideration the metal composition, heat treatment, the design of the gearing and bearings, as well as calculated loads. Service life calculations are not based on actual field conditions or applications, and do not represent a quarantee with respect to expected life, performance, or other characteristics of gear reducer in any given application or use. The actual service life could vary substantially from the nominal service life.

註 : 產業公式參考以下組織所訂之標準 Industry formula Refer to the following standardization organization
GB/T 3480-1997 , ISO 6336-1~6336-3:1996

ISO: 國際標準組織 International Organization for Standardization
GB: 中華人民共和國國家標準 (國標 GB) Guobiao standards (Chinese National Starndards)
DIN: 德國標準 Deutsches Institut für Normung : (German Institute for Standardization)
AGMA: 美國齒輪製造協會 American Gear Manufacturers Association
JIS: 日本標準協會 Japanese Standards Association

軸向力 F_{2A} [N]

是指平行於軸心的一個力，它平行於輸出軸，它的作用點與輸出軸端有一定的軸向偏 (y_2) 時，會形成一個額外的彎撓扭矩。軸向力超過樣本所示的額定值時，須用聯軸器來抵消這種彎撓力。

Axial Force (F_{2A}) [N]

The axial force F_{2A} acting on a gearbox runs parallel to its output shaft. The force runs perpendicular to its output shaft. It may be applied with axial offset via a lever arm y_2 under certain circumstances, in which case it also generates a bending moment. If the axial force exceeds the permissible catalogue values, additional design features (e.g. couplings) must be implemented to absorb these forces.

Glossary

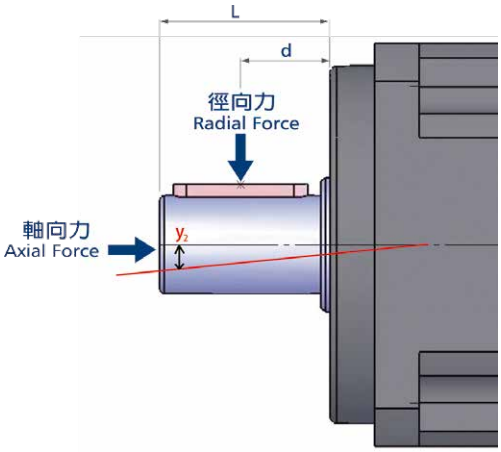
減速機專用名詞解釋

徑向力 F_{2R} [N]

指垂直作用於軸向力的一個力。它的作用點與軸端有一定的軸向距離 (d)，這個點成一個槓桿點，橫向力形成一個彎撓扭矩。

Radial Force (F_{2R}) [N]

The radial force is the force acting at right angles to axial force. It acts perpendicular to the axial force and can assume an axial distance of (d) in relation to the shaft end, which acts as a lever arm. The radial force produces a bending moment.



從減速機出力軸連接鏈條齒輪等傳動機構時，會承受徑向力，徑向力。OHL 的計算公式如下：

T= 機構端扭力　　s= 負荷系數　　$OHL = \frac{T \cdot s \cdot f \cdot p}{R}$

f= 驅動方式的載重系數　　R= 皮帶輪或鏈輪半徑

p= 位置系數：負載點小於等於 d 時，p=1

負載點大於 d 時，p=1.5

The gearbox will bear radial force while its output shaft connected with transmission machinery, such as chain pulley. The O.H.L. formula of radial force is as below :

T= Torque of transmission machinery

s= Service factor

f= Driven Coefficient

R= Radius of pulley or chain wheel

p= Position Factor: loading position less than d, p=1

loading position larger than d, p=1.5

$$OHL = \frac{T \cdot s \cdot f \cdot p}{R}$$

軸伸徑向載荷、軸向載荷

選擇減速機的附加依據是輸出軸伸出端上的徑向載荷和軸向載荷。軸的強度和軸承的承載能力決定了許用軸伸的徑向載荷。產品樣本中給出的最大允許值是指在最不利的方向作用在軸伸出端中點（即 1/2L 處）的力。當作用力不在中點時。越接近軸肩，允許的徑向載荷就越大；相反，作用點離軸肩越遠，允許的徑向載荷就越小。

Shaft Extension Radial Load, Axial Load

Additional concerned for selecting the gear box is the radial load and axial load on the extended end of the output shaft. The strength of the shaft and the load-bearing capacity of the bearing determine the allowable radial load of the shaft extension. The maximum allowable value given in the product catalog refers to the force acting in the most unfavorable direction at the midpoint of the extended end of the shaft (i.e. at 1/2L). When the force is not at the midpoint. The closer to the shaft shoulder, the greater the allowable radial load; conversely, the farther the point of action is from the shaft shoulder, the smaller the allowable radial load.

荷系數表 (s) Service factor table				
傳動機負荷等級 Loading classification	每日使用時間 Running per Day			
	0.50 hr	2 hr	8-10 hr	10-24 hr
均一負荷 Uniform	0.80	0.90	1.00	1.25
中衝擊 Medium shock	0.90	1.00	1.25	1.50
重衝擊 Heavy shock	1.00	1.25	1.50	1.75

驅動方式載重系數 Driven Coefficient (f)	
驅動方式 Driving Mode	(f)
鏈條、齒型皮帶 Chain Pulley	1.00
齒輪 Gear	1.25
V 型皮帶 V-Belt	1.50
平皮帶 Flat-Belt	2.50

- 正轉、逆轉或起動、停止，1 小時內達 10 次以上者，請將右表的值乘以 1.2。
  CW/CCW operation or start-up/stop reaches 10 times or more within 1 hour, please multiply by 1.2.

Glossary

減速機專用名詞解釋

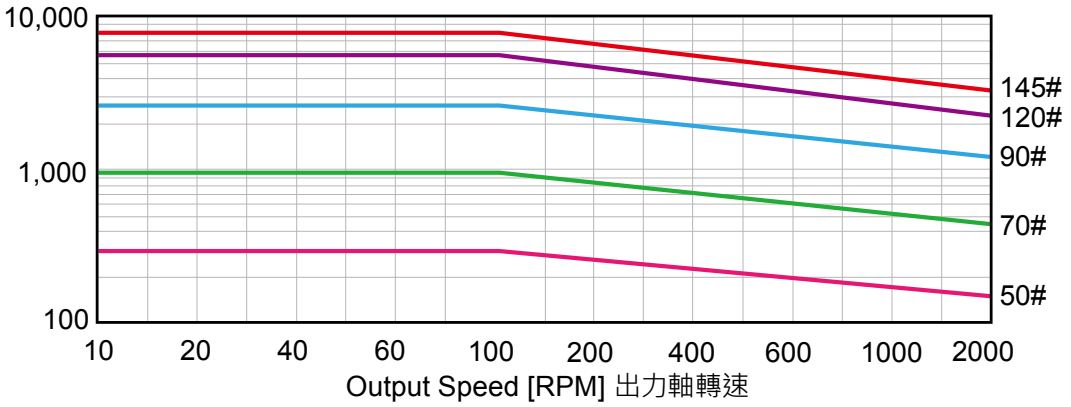
容許徑向力 F_{2rB} [N]

當輸出轉速為 100RPM，徑向作用力在出力軸 1/2 處時所容許之最大力，轉速增加時遞減。

Permitted Radial Force (F_{2rB}) [N]

The maximum allowed radial force in the 1/2 position of output shaft in the condition of output speed 100 RPM. This value is decreasing when the running speed is increasing.

FB Permitted Radial Force on Center Position of Shaft [N] FB 出力軸中心點容許徑向力



容許軸向力 F_{2aB} [N]

當輸出轉速為 100RPM 時，最大容許之軸向作用力。

Permitted Axial Force (F_{2aB}) [N]

The maximum allowed axial force in the condition of output speed 100 RPM.

傳動效率 η [%]

由於摩擦引起的損失總是使有效率小於 1，也就是少於 100%。樣本上的效率是齒輪箱在額定負載情況下，減速機的傳輸效率。

Transmission efficiency η [%]

Efficiency (η) is the ratio of output power to input power. Power lost through friction reduces efficiency to less than 1 or 100%.

$$\eta = \frac{P_{out}}{P_{in}} = \frac{P_{in} - P_{lost}}{P_{in}}$$

Glossary

減速機專用名詞解釋

噪音 [dB]

樣本上的數值是輸入轉速為 3000rpm，減速比 i=10，或 i=100(2 段時)，不帶負載，離減速機一米距離時測量的。一般而言電機轉速越高時，噪音越高；負載越大時，噪音越大。

Noise Level [dB]

The operating noise specified in our catalog relates to gearboxes with the ratio i=10 or i=100 (2 stage) at input speed 3,000 rpm and no loading running. Noise level is measured at 1M distance from the gearbox. Higher speed results to higher noise level; higher loading results to higher noise level.

轉動慣量 J [Kg.cm^2]

表示一個物體盡力保持自己轉動狀態（或靜止或轉動）特性的一個值。樣本中的值均指輸入端。

Mass moment of inertia (J) [Kg.cm^2]

The mass moment of inertia J is a measurement of the effort applied by an object to maintain its momentary condition (at rest or moving).

慣量比 λ

是指負載慣量與傳動系統慣量（電機加上減速機）之間的比值。這個比值決定了系統的可控性。λ 值越大，也就是各轉動慣量差值越大，高動態的動作過程就越難精確控制，建議盡可能將入值控制在 < 5。減速機可以將負載慣量降低 1 / i^2。

Rate of mass moment of inertia (λ)

The ratio of mass moment of inertia λ is the ratio of external inertia (application side) to internal inertia (motor and gearbox). It is an important parameter determining the controllability of an application. Accurate control of dynamic processes becomes more difficult with differing mass moments of inertia and as λ becomes greater. LIMING recommends that a guideline value of λ < 5 is maintained. A gearbox reduces the external mass moment of inertia by a factor of 1 / i^2.

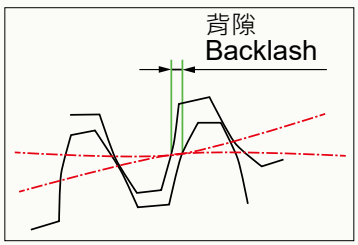
Simple applications ≤ 10
Dynamic applications ≤ 5
Highly dynamic applications ≤ 1

回程間隙 j_t [arcmin]

指減速機輸出軸與輸入端的最大偏差角，測量時先將齒輪輸入端固定住，然後在輸出軸加載額定扭矩的 2% 扭矩，減速機輸出端有一個微小的角位移，此角位移即為回程間隙。單位是 " 弧分 "，即一度的六十分之一度。

Torsional Backlash (j_t) [arcmin]

Torsional backlash j_t is the maximum angle of torsion of the output shaft in relation to the input. Torsional backlash is measured with the input shaft locked. The output is then loaded with a defined test torque (2% rated output torque) in order to overcome the internal gearhead friction. The main factor affecting torsional backlash is the face clearance between the gear teeth.



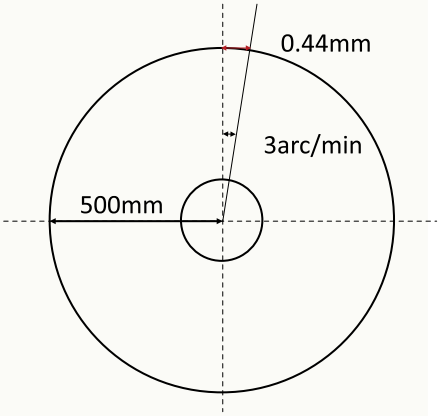
Glossary

減速機專用名詞解釋

弧分 [Arcmin]

一個圓有 360 度，1 度可分為 60 弧分，即一個圓有 21600 弧分，如回程間隙標為 1 arcmin 時，意思是說減速機轉一圈，輸出端的角偏差 1 / 60°。
在實際應用中，這個角偏差與軸直徑及轉盤大小有關。
例如：輸出端轉盤半徑為 500mm 時，齒輪箱精度為 j_t = 3' 時，減速機轉一圈的偏差為 b = 0.44mm。

$$b = \frac{2 \cdot \pi \cdot r \cdot j_t}{21600}$$



Angular minute [Arcmin]

A degree is subdivided into 60 angular minutes (= 60 arcmin = 60’). In other words, if the torsional backlash is specified as 1 arcmin, for example, the output can be turned 1/60°. The repercussions for the actual application are determined by the arc length.
EX: A pinion with a radius r = 500 mm on a gearhead with standard torsional backlash j_t= 3’ can be turned b = 0.44 mm.

$$b = \frac{2 \cdot \pi \cdot r \cdot j_t}{21600}$$

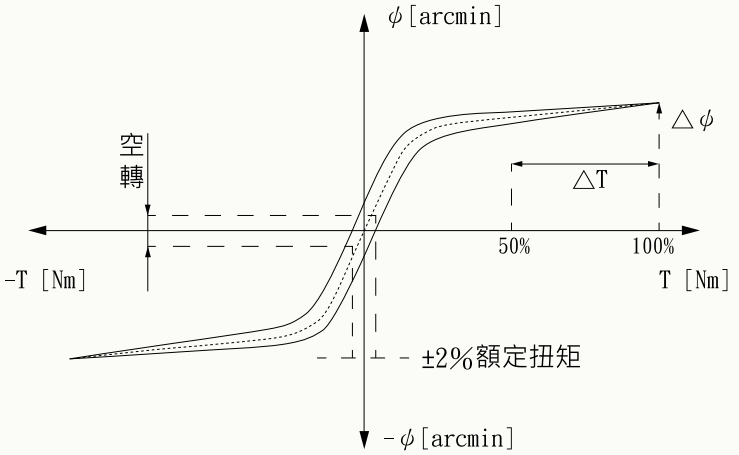
遲滯曲線

滯滯檢測是為了得出減速機的扭轉剛度，通過檢測得到遲滯曲線。檢測時，先將減速機輸入端固定住，然後在輸出端的兩個旋轉方向分別持續地加載到 T_{2B} 最大加速扭矩，繼而逐步卸載，用儀器記綠下扭矩的仿差角，得到的曲線是一條閉合曲線，從中可以計算出減速機的回程間隙 (j_t) 和扭轉剛度 (C_{t21})。

Hysteresis Curve

The hysteresis is measured to determine the torsional rigidity of a gearbox. The result of this measurement is known as the hysteresis curve. If the input shaft is locked, the gearhead is loaded with a torque that increases continuously up to T_{2B} and is then relieved at the output in both directions. The torsional angle is plotted against the torque. This yields a closed curve from which the torsional backlash and torsional rigidity can be calculated.

$$C_{t21} = \frac{\Delta T}{\Delta \phi}$$



Glossary

減速機專用名詞解釋

扭轉剛度 C_{t21} [Nm/Arcmin]

由加載力距和所產生的扭轉角之間的比率來定義。$C_{t21} = \frac{\Delta T}{\Delta \phi}$

它說明需要用多大的扭矩才能把輸出軸轉動一弧分。扭轉剛度是從遲滯曲線得出的。在曲線圖上只需要關注 T_{2B} 的 50% 和 100% 這個範圍，這個範圍內，曲線可看成是一條直線。

Torsional rigidity (C_{t21}) [Nm/Arcmin]

Torsional rigidity is defined as the quotient of applied torque and generated torsion angle.

$$C_{t21} = \frac{\Delta T}{\Delta \phi}$$

It consequently shows the torque required to turn the output shaft by one angular minute. The torsional rigidity can be determined from the hysteresis curve. Only the area between 50% and 100% of T_{2B} is considered because this area of the curve profile can be considered linear.

運轉模式

選擇減速機時必需考慮運轉的模式。(連續運轉 S1，週期運轉模式 S5)

Operating modes

(continuous operation S1 and cyclic operation S5)

When selecting a gearbox, it is important to consider whether the motion profile is characterized by frequent acceleration and deceleration phases in cyclic operation (S5) as well as pauses, or whether it is designed for continuous operation (S1), i.e. with long phases of constant motion.

連續運轉模式 (S1)

連續運轉模式有工作週期所定義，假如工作週期 ED 大於 60%，或連續運轉時間大於 20 分鐘，則為連續運轉模式 (S1)。

Continuous operation (S1)

Continuous operation is defined by the duty cycle. If the duty cycle is greater than 60% or longer than 20 minutes, this qualifies as continuous operation.

週期運轉模式 (S5)

連續運轉模式有工作週期所定義，假如工作週期 ED 小於 60%，或連續運轉時間小於 20 分鐘，則為週期運轉模式 (S5)。

Cyclic operation (S5)

Cyclic operation is defined by the duty cycle. If the duty cycle is less than 60% and shorter than 20 minutes, it qualified as cyclic operation.

Glossary

減速機專用名詞解釋

工作週期（ED）

t_{work}=t 加速 +t 勻速 +t 減速 =t_a+ t_c+ t_d

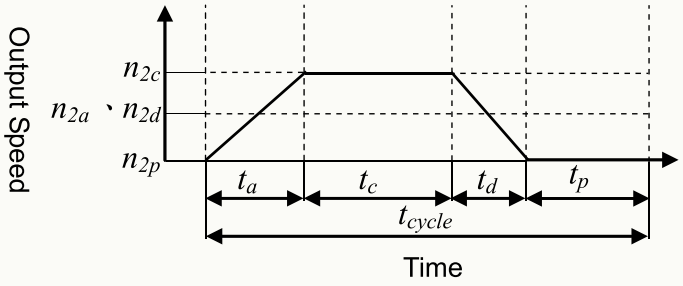
t_{cycle}=t 加速 +t 勻速 +t 減速 +t 暫停 =t_a+ t_c+ t_d+ t_p

ED[%]=t_{work} / t_{cycle} x 100%

ED[min]=t_{work}

Duty cycle (ED)

The duty cycle ED is determined by one cycle. The times for acceleration (t_b), constant travel if applicable (t_c) and deceleration (t_d) combined yield the duty cycle in minutes. The duty cycle is expressed as a percentage with inclusion of the pause time t_e.



$$ED = \frac{t_a + t_c + t_d}{t_{cycle}}, t_{work} = t_a + t_c + t_d$$

t_a Acceleration ， t_c Constant ，

t_d Deceleration ， t_p Pause

段數（級數）

太陽輪及行星輪構成獨立的減速輪系，如減速機內只一個輪系，稱 1 段（級），SERVOBOX 系列行星減速機，1 段（級）減速比從 1/3~1/10，2 段（級）減速比從 1/15~1/100，為得到較大減速比，須多段（級）傳動，透過模組化設計，可結合多個輪系，減速比可達 100~100000 以上。

Stage

The sun gear and planetary gear forms an independent speed reduction gear system. If the there is only one gear system in the gear reducer, it is defined as one stage transmission. In order to achieve higher speed reduction ratio, multiple stages transmission is required. LIMING's standard gear reducers are classified into one stage and two-stage transmission. Speed reduction ratio range is from 3 to 100. The modular construction combined with multiple stages transmission allows speed reduction ratio 100~100,000 and over.

Glossary

減速機專用名詞解釋

防護等級 (IP)

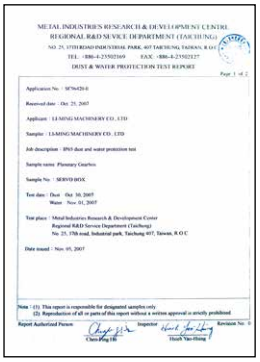
本公司產品採用密封式全油封設計，確保潤滑油脂不洩漏(IP65)。

防護等級 (IP) 是由 IEC 60529 標準所制訂，其二位數，分別代表固體顆粒與液體的侵入防護等級。

Degree of protection (IP)

The protective class IP65 sealed design avoids leakage problem.

The various degrees of protection are defined in IEC 60529 “Degrees of protection offered by enclosure (IP code)”. The IP degree of protection (IP stands for International Protection) is represented by two digits. The first digit indicates the protection against the ingress of impurities and the second the protection against the ingress of water.



● 金屬工業研究發展中心 IP65 測試報告

IP65 Test Report by Metal Industries & Development Center.

體物件防護 Protection against contact and against solid foreign objects.		液體防護 Protection against ingress of water.	
第一位數 1st numeral	說明 Description	第二位數 2nd numeral	說明 Description
0	無防護 Non-protected	0	無防護 Non-protected
1	可阻擋大於 50mm 的物體 Protected against solid foreign objects of >50mm ø	1	可阻擋垂直落下的液體 Protected against vertically falling water drops
2	可阻擋大於 12.5mm 的物體 Protected against solid foreign objects of >12.5mm ø	2	可阻擋垂直到 15 度角的噴灑液體 Protected against vertically falling water drops when enclosure tilted up to 15°
3	可阻擋大於 2.5mm 的物體 Protected against solid foreign objects of >2.5mm ø	3	可阻擋垂直到 60 度角的噴灑液體 Protected against spraying water when enclosure tilted up to 60°
4	可阻擋大於 1mm 的物體 Protected against solid foreign objects of >1.0mm ø	4	可阻擋到所有角度的噴灑液體 Protected against splashing water
5	防塵 (無可構成損壞的堆積) Protected against ingress of dust (dust-protected)	5	可阻擋低壓水柱 Protected against water jets
6	無塵 Protected against ingress of dust by underpressure (dust-tight)	6	可阻擋高壓水柱 Protected against powerful water jets
		7	防護短時進水 Protected against the effects of temporary immersion in water
		8	防護長期進水 Protected against the effects of continuous immersion in water

Glossary

減速機專用名詞解釋

工作溫度

是指減速機在連續工作和週期工作狀態下所能允許的溫度。目前 SERVOBOX 系列的減速機能在 -25° C ~ +90° C 度環境下工作。考慮工作溫升，環境溫度應在 -25° C ~ +45° C 之間。

Operating Temperature

The Operating Temperature indicates the allowable temperature of gearbox at continuous and cyclic operation SERVOBOX series work in -25° C ~ +90° C.
Consider working temperature, ambient temperature should be in -25° C ~ +45° C.

潤滑

行星減速機在整個使用期間無需更換潤滑油。本公司標準品使用全合成潤滑脂 (0 號)，可視情況選用其他潤滑油。

Lubrication

It's no essential to replace lubricant during the service life. Lubrication of standard products uses synthetic grease (0#). It depends on the application, there are other grease available.

筒夾式鎖緊機構

利用摩擦力連接馬達軸心及減速機，並經動平衡分析，以確保在高輸入轉速下結合面的同心度和零背隙的動力傳遞。

Collet Clamping

The Collet Clamping ensure a frictional between motor shaft and gearbox. It has passed dynamical balance analysis to assure concentricity and no backlash at high input speed operation.

軸套

當馬達軸徑比減速機入力孔小時，需要一個軸套去補償尺寸才能夾緊。

Bushing

If the motor shaft diameter is smaller than the input bore of gearbox, a bushing is used to compensate the difference in diameter.

Glossary

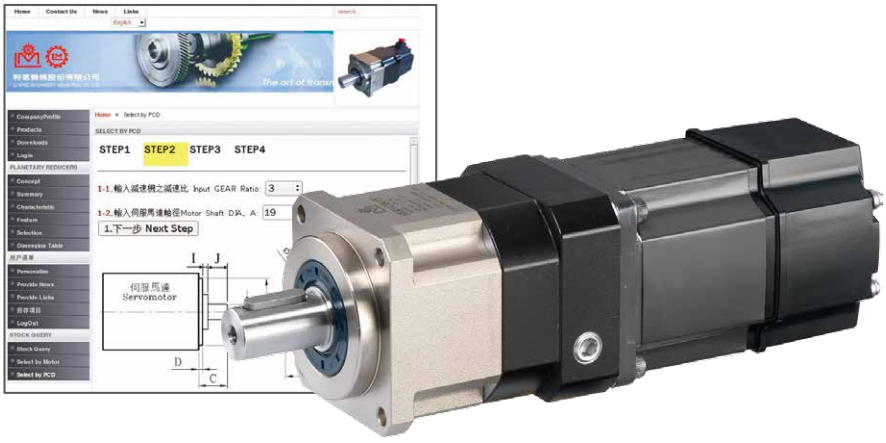
減速機專用名詞解釋

連接版設計

適合各種廠牌伺服馬達及其它馬達安裝，安裝最容易。本型錄只列出一般尺寸，需要其它尺寸時，請上本公司網站查詢。

Design of connecting plate

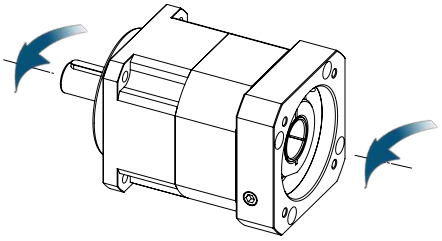
Design of connecting plate is suitable for various servo motors or others, and also easy for installation. General dimension is shown on the catalogue. Please find other dimensions from our website.



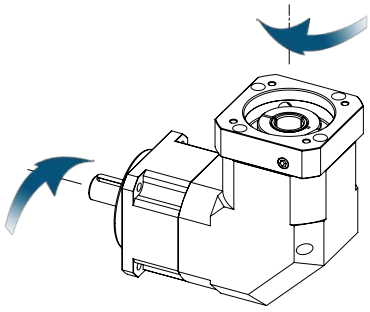
Rotation Directions

旋轉方向

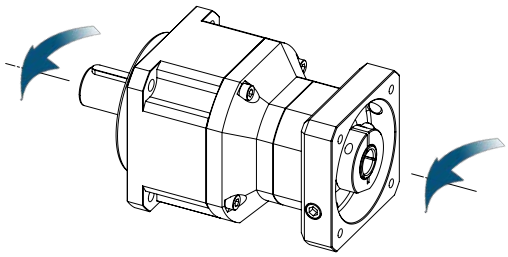
單段行星減速機
1-Stage Planetary Reducer



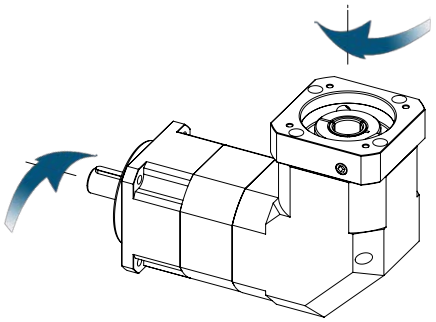
單段傘齒行星減速機
1-Stage Spiral Bevel Gear & Planetary Reducer



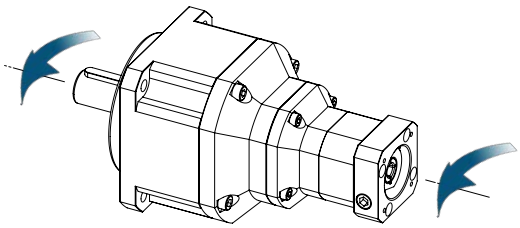
雙段行星減速機
2-Stage Planetary Reducer



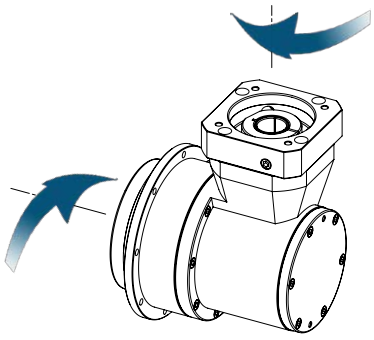
雙段傘齒行星減速機
2-Stage Spiral Bevel Gear & Planetary Reducer



三段行星減速機
3-Stage Planetary Reducer



單段戟齒輪行星減速機
1-Stage Hypoid Gear & Planetary Reducer



1. 計算減速比 i (公式 1)

↓

2. 計算應用端平均扭矩 T_{2m} (公式 2)
應用端平均扭矩 T_{2m} < 額定輸出扭矩 T_{2N}

↓

3. 判斷運轉模式 (S1 或 S5)
S5：負載運轉週期 ED < 60%
S5：負載運轉時間 t_{work} < 20 分鐘 (公式 3)

↓

4. 假如運轉模式為週期性運轉模式 (S5)
計算應用端最大加速扭矩 T_{2max} (公式 4)
應用端最大加速扭矩 T_{2max} < 最大加速扭矩 T_{2B}

↓

5. 計算應用端所需平均轉速 n_{2m} 及
減速機額定輸出速度 n_{2N} (公式 5)
$n_{2m} < n_{2N}$

↓

6. 計算減速機輸出所受之平均徑向力 F_{2rm} (公式 6)
平均徑向力 F_{2rm} < 容許徑向力 F_{2rB}

↓

7. 計算減速機輸出所受之平均軸向力 F_{2am} (公式 7)
平均軸向力 F_{2am} < 容許軸向力 F_{2aB}

↓

8. 選擇所需的減速機精度及輸出軸型式

↓

9. 選擇完成

S5 週期運轉之建議事項

一般的應用慣量須符合以下公式：

$$\frac{J_L}{i^2} \le 4 \cdot J_m$$

最適當的應用慣量須符合以下公式：

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

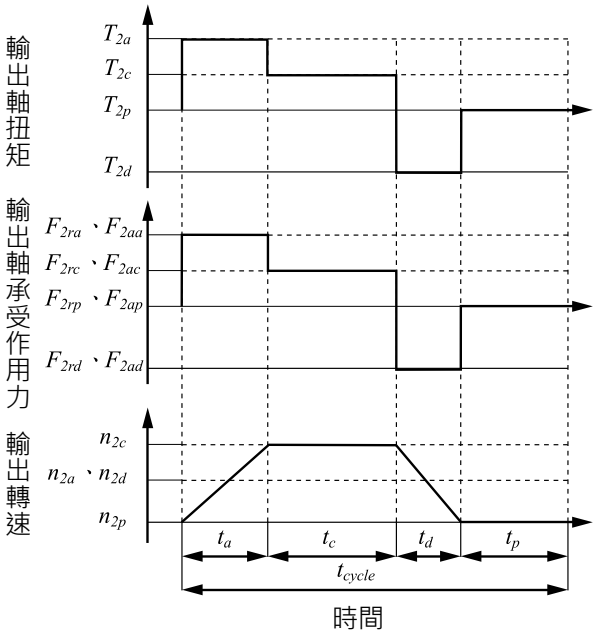
J_L 負載慣量，J_m 馬達慣量

T_{2n}: 請參考目錄「額定輸出扭矩」

F_{2rB}: 請參考目錄「容許徑向力」

公式 1. $$i \cong \frac{n_m}{n_{work}}$$

n_m: 馬達輸出速度，n_{work}: 實際應用速度



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

公式3. $$ED = \frac{t_a + t_c + t_d}{t_{cycle}}, t_{work} = t_a + t_c + t_d$$

t_a:加速，t_c:等速，t_d:減速，t_p:停止

公式4. $$T_{2max} = T_{mB} \cdot i \cdot k_s \cdot \eta$$

T_{mB}:馬達最大輸出扭矩，η:減速機運轉效率

K_s 負載係數

K_s	週期次數 / 小時
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

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

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

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

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

公式7. $$F_{2am} = \sqrt[3]{\frac{n_{2a} \cdot t_a \cdot F_{2aa}^{\ 3} + n_{2c} \cdot t_c \cdot F_{2ac}^{\ 3} + n_{2d} \cdot t_d \cdot F_{2ad}^{\ 3}}{n_{2a} \cdot t_a + n_{2c} \cdot t_c + n_{2d} \cdot t_d}}$$

1. Calculate Ratio i (Eq.1)

↓

2. Calculate mean output torque T_{2m} (Eq.2)
Mean output torque T_{2m} < Norminal output torque T_{2N}

↓

3. To determine Operation mode(S1 或 S5)
S5：ED < 60%
S5：t_{work} < 20min (Eq.3)

↓

4. If operation mode is(S5)
then caculate the Max. Acceleration Torque T_{2max} (Eq.4)
Max accleration torque T_{2max} < accleration torque T_{2B}

↓

5. Calculate the Mean Output speed n_{2m}
and the Nominal Output speed n_{2N} of Gearbox (Eq.5)
$n_{2m} < n_{2N}$

↓

6. Calculate the mean radial force F_{2rm} (Eq.6)
mean radial force F_{2rm} < Max. radial force F_{2rB}

↓

7. Calculate the mean Axial force F_{2am} (Eq.7)
mean axial force F_{2am} < Max. axial force F_{2aB}

↓

8. Select the Required Backlash and Shaft Option

↓

9. Order your LIMING Gearbox

Recommended (for S5 Cyclic Operation)

The general design is given for

$$\frac{J_L}{i^2} \le 4 \cdot J_m$$

The optimal design is given for

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

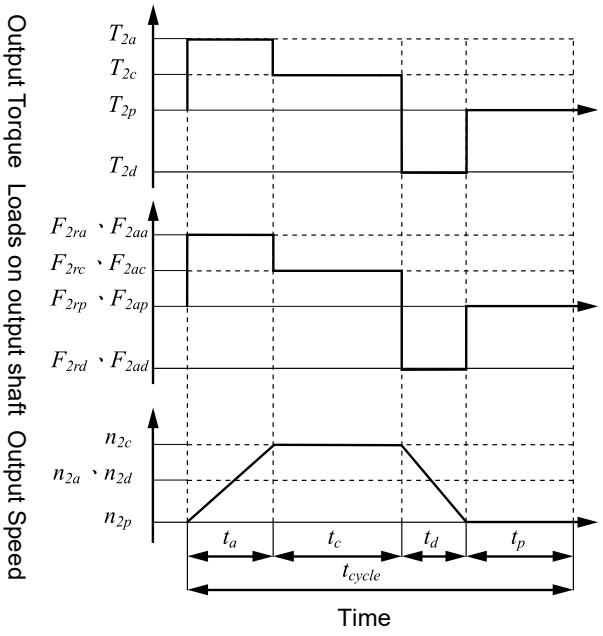
Where J_L is Load Inertia and J_m is Motor Inertia.

T_{2n} please reference catalog 「Rated Output Torque」

F_{2rB} please reference catalog 「Max. Radial Force」

Eq.1 $$i \cong \frac{n_m}{n_{work}}$$

n_m is output speed of the motor, n_{work} is working speed



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

Eq.3 $$ED = \frac{t_a + t_c + t_d}{t_{cycle}}, t_{work} = t_a + t_c + t_d$$

t_a is the time for acceleration, t_c is constant travel,
t_d is the time for deceleration and t_p is the time for pause.

Eq.4 $$T_{2max} = T_{mB} \cdot i \cdot k_s \cdot \eta$$

T_{mB} is the Max. output torque of the motor and η is the efficiency of the gearbox

K_s service factor

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

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

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

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

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

Eq.7 $$F_{2am} = \sqrt[3]{\frac{n_{2a} \cdot t_a \cdot F_{2aa}^{\ 3} + n_{2c} \cdot t_c \cdot F_{2ac}^{\ 3} + n_{2d} \cdot t_d \cdot F_{2ad}^{\ 3}}{n_{2a} \cdot t_a + n_{2c} \cdot t_c + n_{2d} \cdot t_d}}$$

Installation & Critical Applications

安裝與操作限制

操作限制

如果須使用其它的安裝方式或者特殊的輸入轉數時，請與本公司連絡。
此外，當使用者遇到下面所列的任何情況時也必須跟原廠技術人員聯繫：
－使用條件超出額定轉速時。
－使用條件超出額定扭矩時。
－當減速機出現故障時有可能導致使用者受傷的情況時。
－將安裝於旋轉慣性特別大的設備上時。
－將用於起重的捲揚機上 (需要逆止特性) 時。
－當減速機外殼會承受高度動態的負載時。
－當工作環境超過攝氏 -25 度到 +45 度的範圍內時。
－將安裝於有腐蝕性化學品的環境中。
－將安裝在鹽份濕度較高的環境中。
－輻射性高的環境中。
－安裝於氣壓異於正常大氣壓力的環境中。

避免把減速機 (整臺或部分) 浸在水裡或其它液體中。
實際使用時的最高負載扭矩 (*) 絕對不能超過性能表上的額定扭矩的三倍。

(*) 所述的參數是指能承受瞬間短暫的過載，這種情況常出現在滿載啟動，剎車，震動或其它動態操作環境中。

Critical applications

For other mounting positions and/or particular input speeds, please contact our technical persont.
It is also necessary to take due consideration of and carefully assess the following applications by calling our Technical Service:
- The maximum input speed exceeds nominal input speed.
- The maximum output torque exceeds rated output torque.
- Use in services that could be hazardous for people if the reduction unit fails.
- Applications with especially high inertia.
- Use as a lifting winch.
- Applications with high dynamic strain on the case of the reduction unit.
- Ambient temperature under -25° C or over 45° C.
- Use in chemically aggressive environments.
- Use in a salty environment.
- Use in radioactive environments.
- Use in environments pressures other than atmospheric pressure.

Avoid applications where even partial immersion of the reduction unit is required.
The maximum torque (*) that the gear reducer can support must not exceed three times the nominal torque .

(*) intended for momentary overloads due to starting at full load, braking, shocks or other causes, particularly those that are dynamic.

Installation & Critical Applications

安裝與操作限制

安裝注意事項

當安裝減速機時，請注意下列的事項：

－減速機必須牢固地安裝在機器上，避免有任何鬆動或振動的情況。

－將減速機安裝到機器上之前，必須再次確認減速機的輸出軸旋轉方向是否正確。

－如果減速機在使用前已經放置了一段時間 (4 到 6 個月)，而油封又沒有浸在潤滑油中或給予應有之保護措施，建議應該把油封更換，因為有可能油封已經黏在軸上，甚至可能失去彈性而不能發揮正常之功能。

－請盡量避免把減速機放置及安裝在強烈陽光之下，或者在極端惡劣的環境之下，如有可能盡量給予減速機防護措施，以增加使用壽命。

－盡量為馬達的散熱風扇提供足夠的流通空氣，以免影響散熱的效率。

－減速機的標準工作環境是從攝氏 -25 度到 +45 度，如超過這範圍時，請與原廠技術人員聯繫。

－各種零件 (滑輪、齒輪、聯軸器、軸等) 必須安裝在實心或空心軸上，該用專用的螺紋孔或其它工具以確保正確安裝而不會損壞軸承或減速器外端的所有零件。並以潤滑油來潤滑接觸表面避免卡死或氧化。

－啟動時必須逐漸啟動，不要立即把負載提到最高，該逐步增加。

－如有任何在減速機旁的零件、物體或材料會因漏出的油而遭損壞時，應安裝特別的保護或遮擋。

Installation

To install the reduction unit, it is necessary to note the following recommendations:

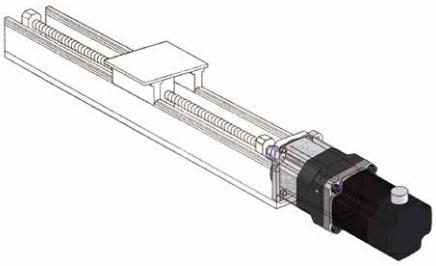
- The mounting on the machine must be stable to avoid any vibration.
- Check the correct direction of rotation of the reduction unit output shaft before fitting the unit to the machine.
- In the case of particularly lengthy periods of storage (4/6 months), if the oil seal is not immersed in the lubricant inside the unit, it is recommended to change it since the rubber could stick to the shaft or may even have lost the elasticity it needs to function properly.
- Whenever possible, protect the reduction unit against solar radiation and bad weather.
- Ensure the motor cools correctly by assuring good passage of air from the fan side.
- In the case of ambient temperatures < -25° C or > +45° C call the Technical Services.
- The various parts (pulleys, gear wheels, couplings, shafts, etc.) must be mounted on the solid or hollow shafts using special threaded holes or other systems that anyhow ensure correct operation without risking damage to the bearings or external parts of the units. Lubricate the surfaces in contact to avoid seizure or oxidation.
- Starting must take place gradually, without immediately applying the maximum load.
- When there are parts, objects or materials under the motor drive that can be damaged by even limited spillage of oil, special protection should be fitted.

Applications

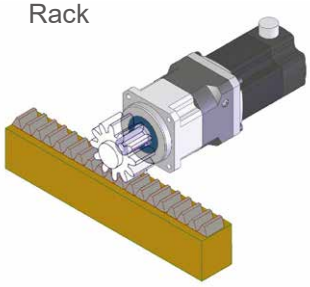
減速機應用範例

○ 線性動作機構 Linear Action

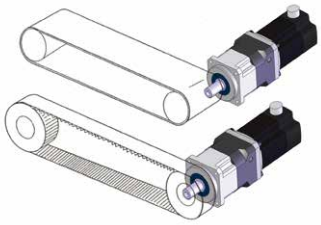
● 滾珠螺桿傳動
Ball Screw



● 齒條傳動
Rack

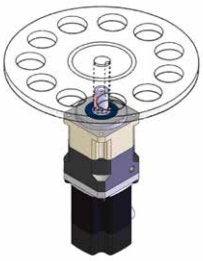


● 滾輪 / 滾筒 / 皮帶
Roller / Belt

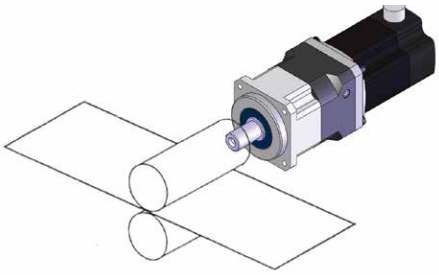


○ 回轉盤機構 Rotary Action

● 分度盤
Index



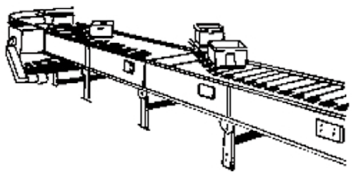
○ 其他機構 Others



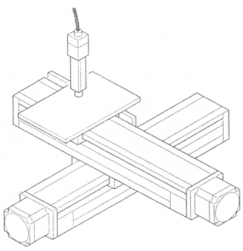
●機器手臂
Robot

●印刷機
Printing Machine

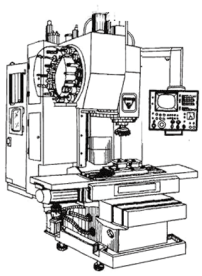
●輸送機
Conveyor



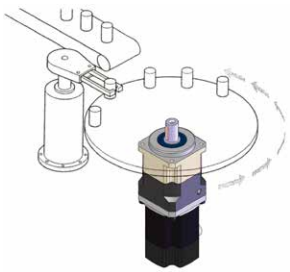
●工作台
Working Table



● CNC 主軸
CNC Spindle

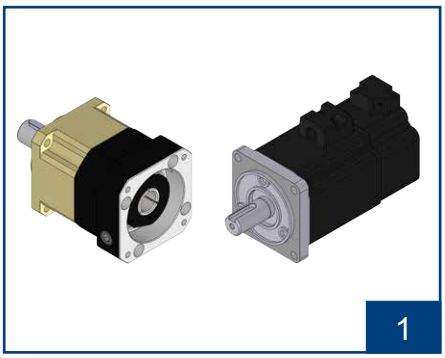


●分割器
Index



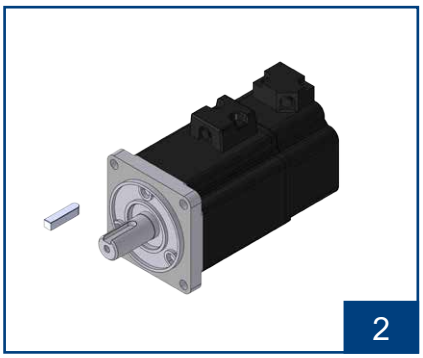
Planetary Gearbox and Motor Mounting Instructions

行星減速機與馬達安裝指南



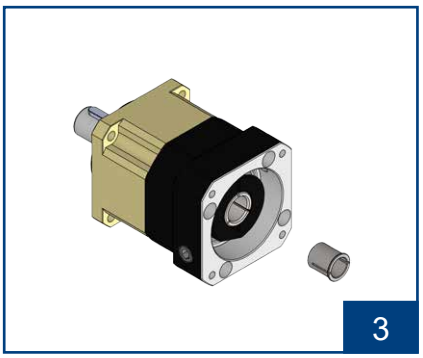
核對馬達型號與減速機規格是否正確。並將配合面擦拭乾淨。

Confirm the motor, and gearbox size. Clean up the mounting surface.



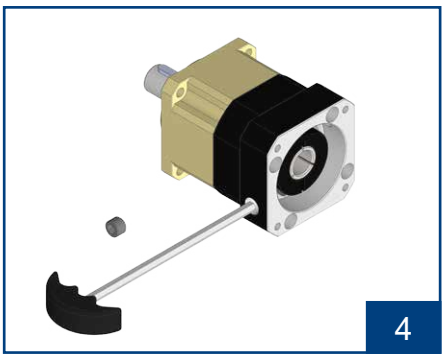
確認減速機與馬達是否有鍵配合。

Confirm whether the reducer and motor are keyed together.



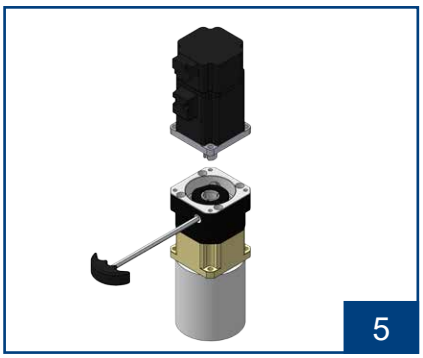
檢查馬達出力軸尺寸，如需軸套，請先裝進減速機入力孔內。

Check motor shaft size and insert bushing into input bore of the gear box if necessary.



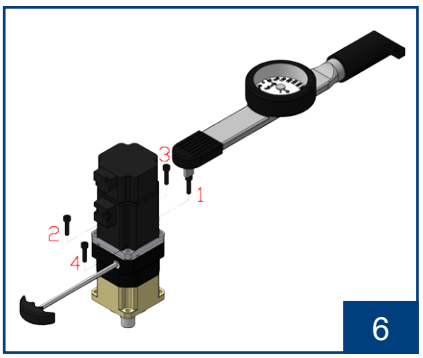
取出塞頭，使用六角扳手將迫緊環螺絲鬆開。並將扳手與螺絲對準孔位。

Remove the plug on the adapter plate. Rotate the set collar till the bolt is line up.



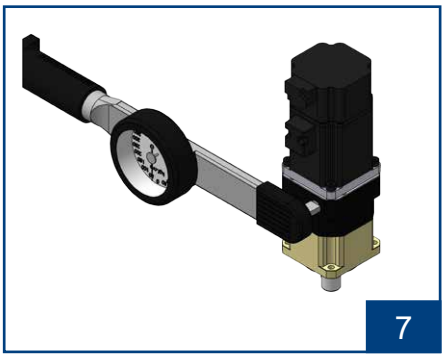
將馬達垂直裝入減速機。

Put the motor into the gearbox vertically.



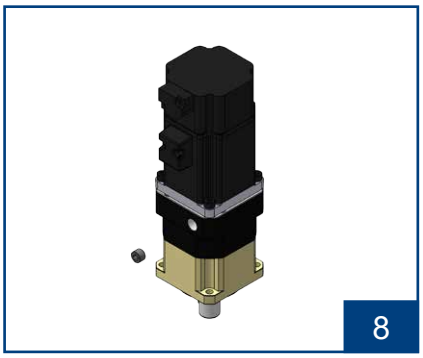
依序 1~4 使用扭力扳手鎖上內六角螺絲。

Tighten the mounting bolt in 1~4 order with torque wrench.



使用扭力扳手將迫緊環螺絲鎖緊。

Tighten the set collar bolt with torque wrench.



裝回塞頭並鎖緊。

Tighten back the screw plug.

1. 務必先鎖緊馬達固定面，才能鎖緊馬達軸心迫緊環。

   Please be sure to tighten motor flange on gear box flange first and then to tighten the set collar on motor shaft.

2. 請依步驟順序組裝，尤其步驟 6、7 不可顛倒。

   Please assembly in order according to above steps, especially for step 6 and step 7.

3. 安裝完畢後，請將塞頭回塞，避免細小物品掉入減速機中。

   Please noted that tighten back the screw plug to protect the gear box.