

High Tech High Precision



傳動裝置的解決方案 / 減速機的領導品牌

品質第一、顧客滿意

利茗機械股份有限公司專業從事高科技的各種減速馬達及螺旋齒輪減速機：蝸桿蝸輪減速機、行星式減速機的設計、研發、生產。近年來肩負著顧客們對產品質量與價格的追求，不斷地在提高減速機的高性能，實現效率的最大化和提供廣泛的技術資源等方面做著不懈的努力。

公司奉行『品質第一、顧客滿意』及『勤、誠、信』的經營理念，不斷吸納專業人才，使得公司始終擁有一批掌握業界高階技術的科技人才。公司以積極務實的作風，借鑒各種先進的管理經驗，不斷實現自我完善，建立起良好企業文化。在減速機家族中，行星減速機以其體積小，承受扭力大，傳動效率高，減速範圍寬，精度高，而被廣泛應用於伺服、步進、直流等傳動系統中。在保證精密傳動的前提下，主要被用來降低轉速，增大扭矩和降低負載電機的轉動慣量比。高扭矩，低背隙及運轉安靜是 LIMING 減速機三大設計特點。LIMING 減速機一直位居市場領導地位。

Quality First & Customer's Satisfaction

Li Ming Machinery Co., Ltd. is specialist in design, R&D and manufacturing of a wide range of high-tech gear motor and helical gear reducers, worm gear reducers, planetary gear reducers. In recent years, to meet customers' requirements of quality and price, we have been dedicated to constantly upgrade the performance of gear reducer, maximize efficiency, and provide the most comprehensive technical supports. Under the company's policy of [Quality First; Customer Satisfaction and Intelligence; Sincerity; Honesty], we have invited many highly experienced talents.

At Li Ming, we have a team with outstanding background in high-tech field. Li Ming's outstanding enterprise culture results from its practicality, constantly learning the advanced management system and a commitment to excellence.



High Accuracy & Efficiency Profit

Among the wide range of speed reducers, the planetary gear reducer features compact construction, high-torque resistance, high transmission efficiency, wide range of speed reduction and high accuracy.

The planetary gear reducers are widely applied in servo, stepping and DC transmission system. With its outstanding feature of high precision transmission, the planetary gear reducer is excellent for reducing speed, increasing torque and reducing torsional inertia ratio. High torque, low backlash and low noise are three key feature of Li Ming's gear reducers, and these are the reasons why Li Ming gear reducers are in the leading position on the market.



Integrated

Manufacturing with Full Range of Automatic Equipment

自動化加工設備

秉持對減速機各部份零件的獨特加工特性的認知，我們自行開發設計一系列高效率自動化的加工設備，以配合系列高性能加工機械。

本公司經驗豐富的技術員，掌握零件加工特性精度控制，嚴格品質管制以確保所有零組件的精度及性能。一系列自動化加工設備為零件加工精度穩定性提供最穩固的基礎。

Integration / Automation Machining Equipment

Based on our acknowledgement of the unique processing characteristics of speed reducers on all parts, we have developed and designed a series of high-efficiency automatic machining equipment, to work with high-performance processing machines.

Our well-experienced technicians take good control of precision in our parts, and stringent quality control to ensure the best precision and performance of all parts and components. A series of automatic processing equipment provides the most solid foundation for the consistency of precision in the machining of parts and components.



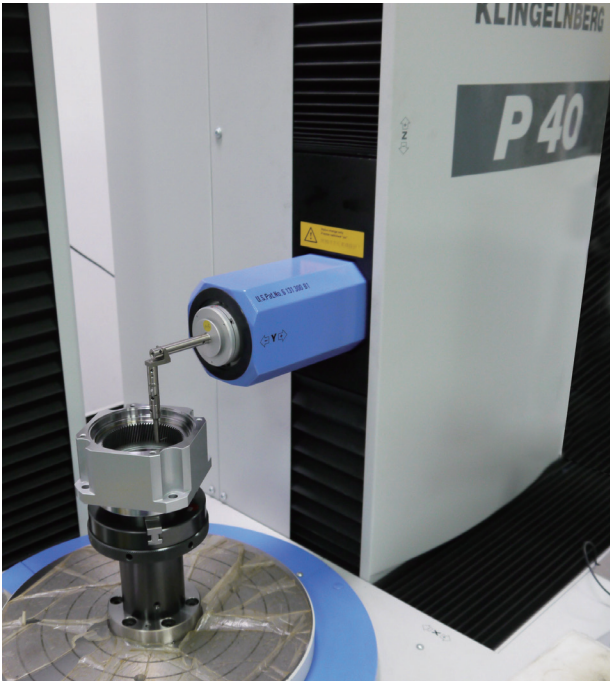
Automatic Processing Equipment

一貫作業的加工設備

利茗機械公司為增進技術精良，斥資購置整套最新 CNC 電腦加工機械設備，以精密零件加工，配合優秀工程人員，提升零件精度，確保穩定的品質。

Automatic Processing Equipment

To enhance technical improvement, Li Ming Machinery Company has placed a huge investment in the purchase of a whole set of the latest generation of Computer Numerically-Controlled (CNC) machines and equipments, in combination with distinguished engineering personnel, to upgrade the precision of parts and ensure stable quality.



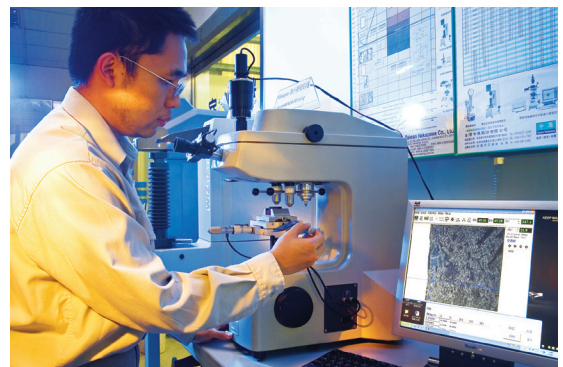


Comprehensive Quality Control System

「全面品管」不只是口號

「全面品管」在利茗公司絕不是一句口號。我們對品質政策的執著，對每一個品質要求都訂有嚴格的品質標準書，迅速而確實的品質管制。

每一個零件從最初的進料製程，裝配完成品的運轉等檢驗測試，鉅細靡遺，以完全符合您的要求及利茗的品質標準。品管部門有先進的檢驗設備，作精密的量測。「工卻善其事，必先利其器」，我們精密的檢驗儀器，是品質信賴的保證。



Comprehensive Quality Control isn't a Mere Slogan

Comprehensive Quality Control] is never a mere slogan of Li Ming Company. We adhere to our quality policy. To each quality requirement, we have to set up rigorous quality standards for prompt and accurate quality control every single part is subjected to comprehensive inspection and tests, from initial receipt of material to assembly of finished products and regular operation, to completely satisfy your requirement. Our quality control department has the most advanced inspection equipment conducting precision measurement. A good tool is the master of all good works, our precision inspection equipments are the best assurance of our reliable quality.

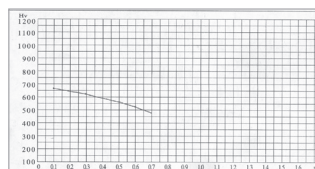


Heat Treatment

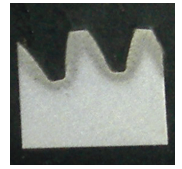
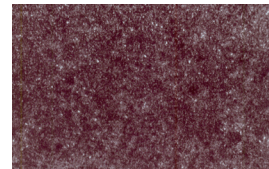
熱處理

獨特真空滲碳齒輪兼具表面硬度與心部韌性，不但耐磨耗，且能在承受重負載的情況下，保持高嚙合精度。

Unique vacuum carburization treatment has the features of high surface hardness and interior toughness. It is hard-wearing and hard-tearing. It will keep good engagement under heavy loading.



* 硬度分布圖 Hardenability curve



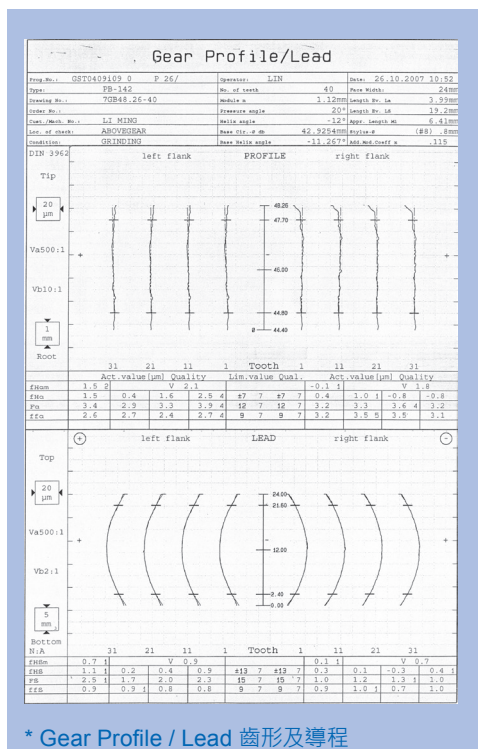
* 金相組織相片 Metallograph

High Precision Gear Machining

高精度齒輪加工

行星齒輪及太陽齒輪材料採用高級之鎳鉻鉬合金鋼 (SNCM220)，切削加工後，經滲碳熱處理至硬度 57~60HRC，再進行齒面研磨，確保齒輪精度在 DIN6 級以內，比只有表面的氮化處理，獲得最佳的耐磨耗和耐衝擊韌性，壽命更長。

The planetary gear and sun gear are manufactured from high quality NI-Cr-Mo alloy steel (SNCM220), precision machined and carburized to hardness 57-60HRC. Precision teeth grinding assures gear accuracy reaches DIN6 class. It provides better wear resistance, impact resistance and longer service life than gears with only surface nitrided.



* Gear Profile / Lead 齒形及導程

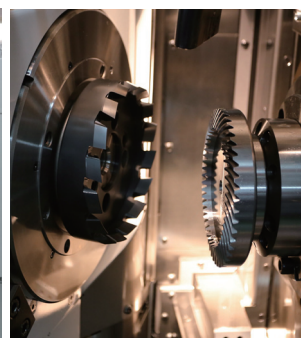
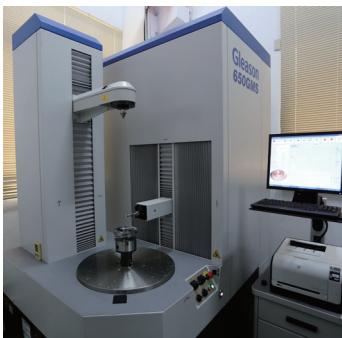
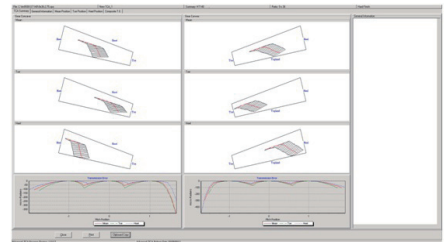
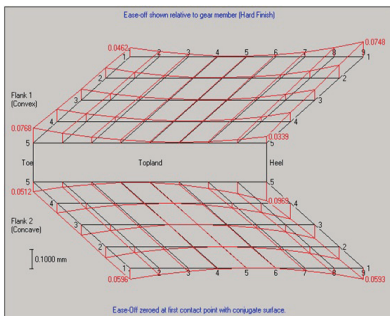
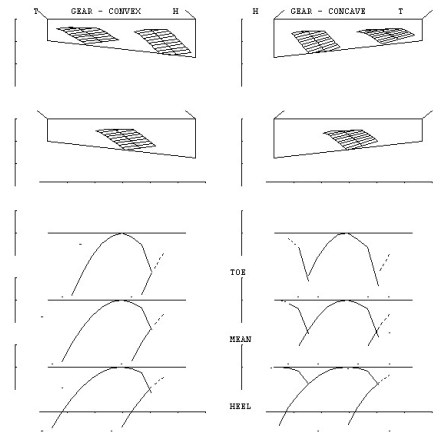


Advanced Manufacturing Technology

先進的製造技術

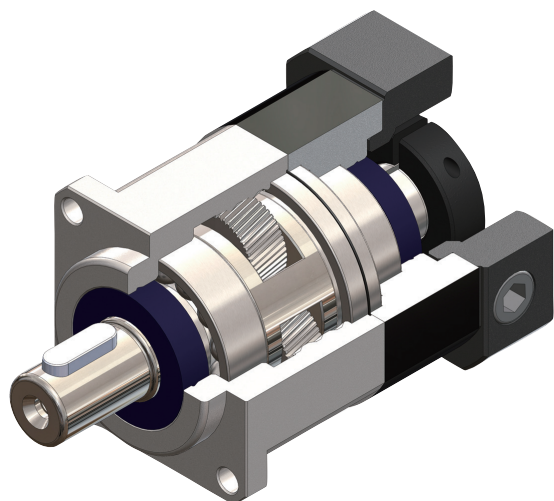
使用高階的設計軟件及世界級的高精密的加工設備，並配合全面品質確保設計輸入到輸出端的品質一致的閉循環 (Close Loop) 生產流程。

Using high-tech design software and world-class high-precision processing equipment, and with comprehensive quality control. Designed to ensure the quality of the input to the output of the same closed loop production process.



PB series

PB



- 全系列單段背隙 ≤ 8 弧分
1-Stage Backlash ≤ 8 arcmin
- 全系列雙段背隙 ≤ 12 弧分
2-Stage Backlash ≤ 12 arcmin

Indication of Model Numbers

機種型號表示

PB	90	10	□	MOTOR
減速機機型 Type	型號 Model	速比 Ratio	出力軸鍵槽 Output Shaft Keyway	馬達型號 Motor Type
PB	44 62 90 120 142 180 220	單段 1-Stage 3, 4, 5, 6, 7, 8, 9, 10 雙段 2-Stage 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 90, 100	<input type="checkbox"/> 標準品 · 有鍵槽 Standard (Keyway) N: 實心軸 · 無鍵槽 Solid Output Shaft (No Keyway)	

靜音
使用高精度斜齒輪實現順暢安靜地運轉。

Quiet operation
Helical gears contribute to reduce vibration and noise.

高扭矩
比一般正齒輪行星減速機扭矩高。

High Torque
High output torque is in comparison with spur gear planetary gear reducers.

高效率
單段式在 97% 以上 · 雙段式在 94% 以上。

High Efficiency
Efficiency for 1-stage model exceeds 97%; 2-stage model exceeds 94%.

馬達連接板的模組化設計
獨特的馬達連接板模組化設計 · 適用於任何廠牌法蘭型式的伺服馬達。

Modular Design of Motor Connection Plate
The special modular design of motor connection plate is suitable for any flange mounting servomotors.

潤滑脂不洩漏 · 維護方便
使用高粘度 · 不易分離的潤滑脂 · 有效防潤滑脂洩漏 · 在產品壽命期內無需更換潤滑脂 · 安裝更便捷。

No grease leakage & Maintenance-free
Perfect solution using high viscosity anti-separation grease. No need to replace the grease during product life. Convenient in stallation is the advantage.

Features of PB Series

PB 系列產品特性

PB

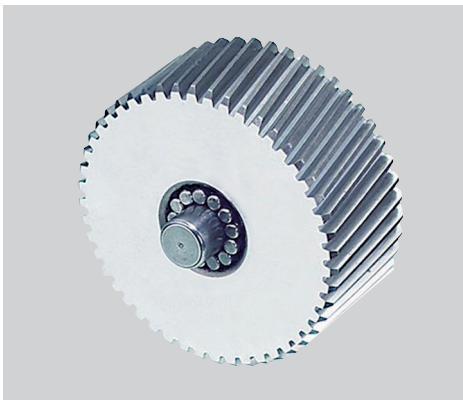


一體式行星臂架及雙懸臂設計

行星臂架與輸出軸採一體式的結構設計，以確保提高扭轉剛性及精確度。

Integrated Planetary Arm Bracket

The planetary arm bracket and the output shaft are one-piece constructed to increase torsional rigidity and accuracy.



滿針滾針軸承設計

行星齒輪的傳動介面採用不含保持器之滿針滾針軸承，增加接觸面積以提高結構剛性及使用壽命。

Full Needle Roller Bearings Design

The planetary gear transmission employs full needle roller bearings without retainer to increase the contact surface, which greatly upgrades structural rigidity and service life.

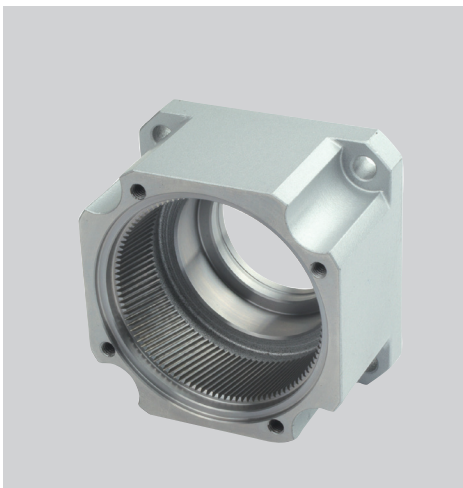


筒夾式連結機構

輸入端與馬達的連結採用筒夾式的鎖緊機構，並經動平衡分析，以確保在高輸入轉速下結合介面的同心度和平衡度，及零背隙的動力傳遞。

Collet Locking Mechanism

The input-end and the motor are coupled through a collet locking mechanism. It has passed dynamical balance analysis to assure concentricity and balance on the connection and no backlash for power transmission while running at high speed.



一體式螺旋內齒輪箱

齒輪箱和內環齒輪採一體式的設計，減速機構採用螺旋齒輪設計，齒形嚙合率為一般正齒輪的二倍以上，具有運轉平順、低噪音、高輸出扭矩和低背隙的特性。

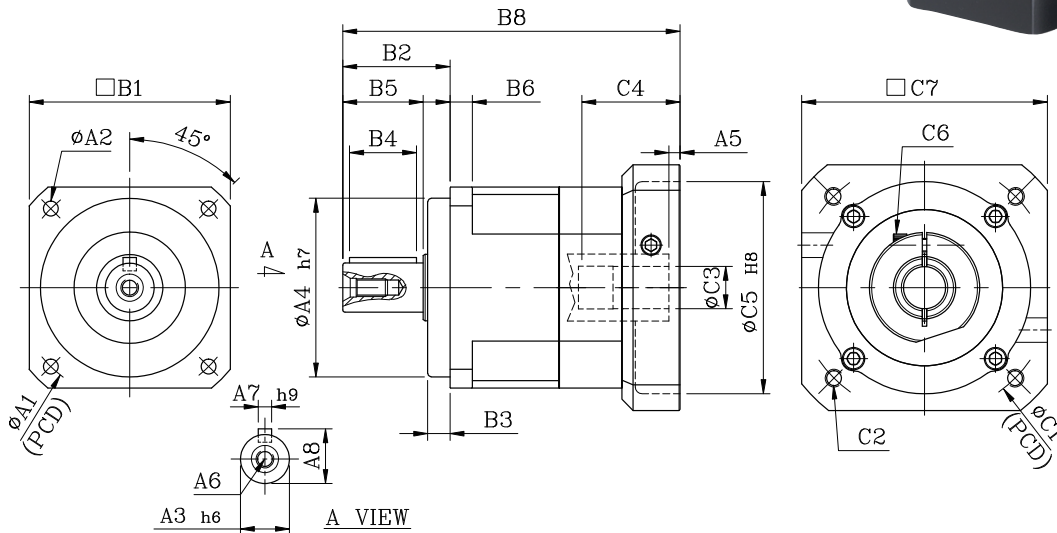
One-piece Helical Gear Box

The gear box and internal ring gear are one-piece constructed. The speed reduction mechanism employs helical gears, which provides two times meshing rate of teeth when comparing with regular spur gears. In addition, it also has features of extremely smooth running, low noise, high output torque and low backlash.

MODEL : PB

單段 1-Stage

RATIO : 3.4.5.6.7.8.9.10



unit : mm

Code	Model	44	62	90	120	142	180	220
A	A1	50	70	100	130	165	215	250
	A2	4.5	5.5	6.8	9	11	13	17
	A3	13	16	22	32	40	55	75
	A4	35	50	80	110	130	160	180
	A5	5	6	9·23.5	10·20	10	11.5	12.5
	A6	M4 × P0.7	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 × P2.0
	A7	5	5	6	10	12	16	20
	A8	15	18	24.5	35	43	59	79.5
B	B1	44	62	90	120	142	180	220
	B2	26	36	48	65	92	106	139
	B3	5	7	10	12	15	20	30
	B4	15	20	30	40	65	70	90
	B5	20	28	36	50	74	82	104
	B6	5	8	10	12	15	16	20
	B7	95	115·123	164.5·179	205·215	260.5	323.5	367.5
C	C1	46·60·63	70·75·90	90·100·115·145	115·145·165	145·165·200	200·215·265	200·265·300
	C2	M3·M4·M5	M4·M5·M6	M5·M6·M8	M6·M8·M10	M8·M10·M12	M10·M12·M16	M12·M16
	C3	8·9·11	14·19	19·22·24	24·28·32	28·32·35	38·42·48·55	42·48·55
	C4	26	33.5·41.5	59·73.5	67·77	84.5	114.5	117.5
	C5	30·40·50	50·60·70	70·80·95·110	95·110·130	110·130·180	114.3·180·230	114.3·230·250
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5	M10 × P1.5
	C7	46·55	64·70·80	92·110·130	122·130·150	146·150·190	182·200·250	222·250·265

規格 Model No.	代號	單位 Unit	速比 Ratio	44	62	90	120	142	180	220
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	3	17	54	145	301	553	1067	1786
			4	15	48	128	269	491	940	1587
			5	14	45	132	278	510	1050	1770
			6	13	41	125	252	466	985	1680
			7	13	41	123	258	473	975	1645
			8	12	39	115	241	442	942	1605
			9	11	40	120	227	412	875	1490
			10	12	40	116	246	452	930	1565
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	3~10	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque						
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3~10	3 倍額定輸出扭矩 3 Times of Rated Output Torque						
額定輸入轉速 / Rated Input Speed	n_{IN}	rpm	3~10	3,000	3,000	3,000	3,000	3,000	3,000	2,000
最大輸入轉速 / Max. Input Speed	n_{IB}	rpm	3~10	6,000	6,000	6,000	5,000	5,000	4,000	3,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	3~10	3	6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	3~10	360	1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	3~10	180	560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	3~10	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)						
效 率 / Efficiency	η	%	3~10	$\geq 97\%$						
使用溫度 / Operating Temperature		°C	3~10	-25° C ~ +90° C						
潤 滑 / Lubrication			3~10	全合成潤滑油脂 Synthetic Grease						
防護等級 / Protection Class			3~10	IP65						
安裝方向 / Mounting Position			3~10	任意方向 Any						
噪 音 值 / Noise Level		dB	3~10	≤ 56	≤ 58	≤ 60	≤ 63	≤ 65	≤ 67	≤ 70
重 量 / Weight $\pm 3\%$		Kg	3~10	0.58	1.35	3.69	8.63	14.55	≤ 28.3	≤ 42.5

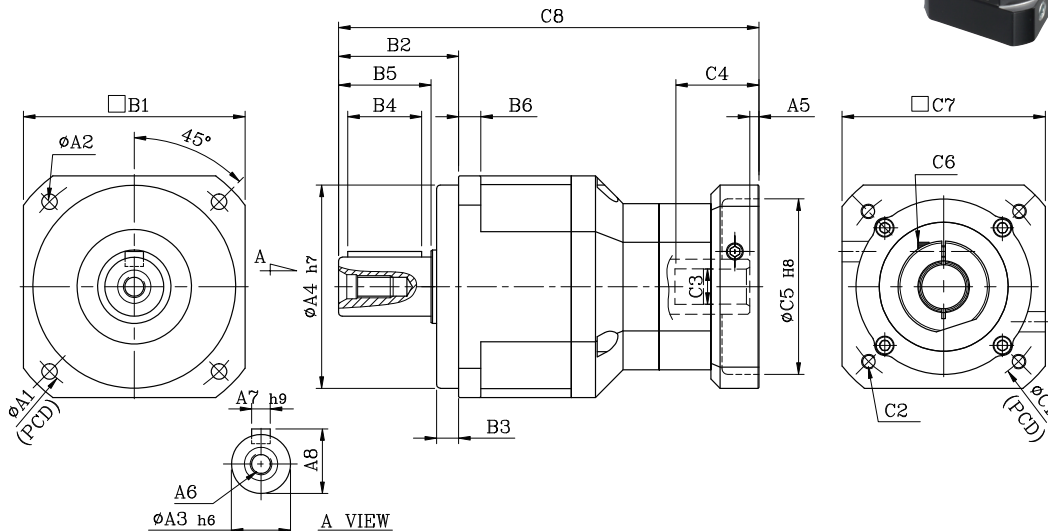
Mass Moments of Inertia (kg.cm²)

速比 Ratio	44	62	90	120	142	180	220
3	0.03	0.16	0.61	3.25	9.21	28.98	59.61
4	0.03	0.14	0.48	2.74	7.54	23.67	54.37
5	0.03	0.13	0.47	2.74	7.42	23.29	53.27
6	0.03	0.13	0.45	2.65	7.25	22.75	51.72
7	0.03	0.13	0.45	2.62	7.14	22.48	50.97
8	0.03	0.13	0.44	2.58	7.07	22.59	50.84
9	0.03	0.13	0.44	2.57	7.04	22.53	50.63
10	0.03	0.13	0.44	2.57	7.03	22.51	50.56

MODEL : PB

雙段 2-Stage

RATIO : 15.20.25.30.35.40.50.60.70.80.90.100



unit : mm

Code	Model	62	90	120	142	180	220
A	A1	70	100	130	165	215	250
	A2	5.5	6.8	9	11	13	17
	A3	16	22	32	40	55	75
	A4	50	80	110	130	160	180
	A5	5	6	9·23.5	10·20	10	11.5
	A6	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 × P2.0
	A7	5	6	10	12	16	20
	A8	18	24.5	35	43	59	79.5
B	B1	62	90	120	142	180	220
	B2	36	48	65	92	106	139
	B3	7	10	12	15	20	30
	B4	20	30	40	65	70	90
	B5	28	36	50	74	82	104
	B6	8	10	12	15	16	20
C	C1	46·60·63	70·75·90	90·100·115·145	115·145·165	145·165·200	200·215·265
	C2	M3·M4·M5	M4·M5·M6	M5·M6·M8	M6·M8·M10	M8·M10·M12	M10·M12
	C3	8·9·11	14·19	19·22·24	24·28·32	28·32·35	38·42·48·55
	C4	26	33.5·41.5	59·73.5	67·77	84.5	114.5
	C5	30·40·50	50·60·70	70·80·95·110	70·95·110·130	110·130·180	114.3·180·230
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5
	C7	46·55	64·70·80	92·110·130	122·130·150	146·180·190	182·200·250
	C8	139.5	172.5·180.5	241·255.5	298.5·308.5	358.5	446.5

PB series

規格 Model No.	代號	單位 Unit	速比 Ratio	62	90	120	142	180	220
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	15	54	145	301	553	1067	1786
			20	48	128	269	491	940	1587
			25	45	132	278	510	1050	1770
			30	41	125	252	466	985	1680
			35	41	123	258	473	975	1645
			40	39	115	241	442	942	1605
			50	45	132	278	510	1050	1770
			60	41	125	252	466	985	1680
			70	41	123	258	473	975	1645
			80	40	115	241	442	942	1605
			90	40	120	227	412	875	1490
100	40	116	246	452	930	1565			
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	15~100	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque					
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	15~100	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 / Rated Input Speed	n_{IN}	rpm	15~100	3,000	3,000	3,000	3,000	3,000	3,000
最大輸入轉速 / Max. Input Speed	n_{IB}	rpm	15~100	6,000	6,000	5,000	5,000	4,000	4,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	15~100	6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	15~100	1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	15~100	560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	15~100	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效 率 / Efficiency	η	%	15~100	$\geq 94\%$					
使用溫度 / Operating Temperature		°C	15~100	-25° C ~ +90° C					
潤 滑 / Lubrication			15~100	全合成潤滑油脂 Synthetic Grease					
防護等級 / Protection Class			15~100	IP65					
安裝方向 / Mounting Position			15~100	任意方向 Any					
噪 音 值 / Noise Level		dB	15~100	≤ 58	≤ 60	≤ 63	≤ 65	≤ 67	≤ 70
重 量 / Weight $\pm 3\%$		Kg	15~100	1.6	4.04	9.49	17	≤ 34.1	≤ 57.3

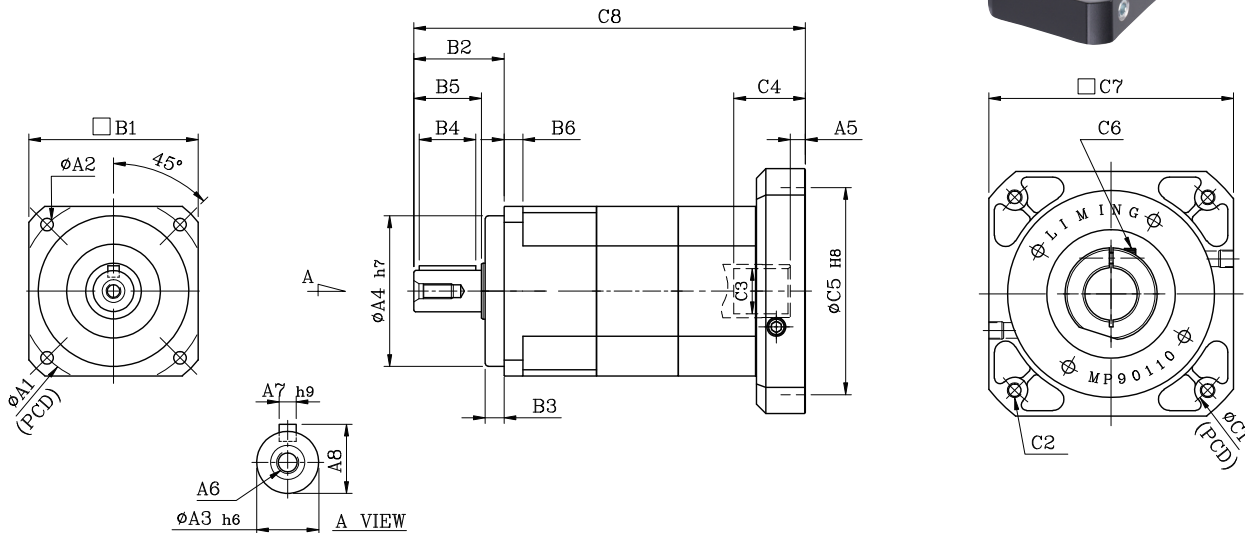
Mass Moments of Inertia (kg.cm²)

速比 Ratio	62	90	120	142	180	220
15	0.03	0.14	0.46	2.63	7.3	22.79
20	0.03	0.14	0.46	2.63	7.3	22.79
25	0.03	0.14	0.46	2.63	7.1	22.79
30	0.03	0.14	0.46	2.43	7.1	22.59
35	0.03	0.14	0.44	2.43	7.1	22.59
40	0.03	0.14	0.44	2.43	6.92	22.59
50	0.03	0.14	0.44	2.43	6.92	22.59
60	0.03	0.14	0.43	2.39	6.72	21.83
70	0.03	0.14	0.43	2.39	6.72	21.83
80	0.03	0.14	0.43	2.39	6.72	21.83
90	0.03	0.14	0.40	2.39	6.72	21.60
100	0.03	0.14	0.40	2.39	6.72	21.60

MODEL : PB-A

雙段 2-Stage

RATIO : 15.20.25.30.35.40.50.60.70.80.90.100



unit : mm

Code	Model	44A	62A	90A	120A	142A	180A	220A
A	A1	50	70	100	130	165	215	250
	A2	4.5	5.5	6.8	9	11	13	17
	A3	13	16	22	32	40	55	75
	A4	35	50	80	110	130	160	180
	A5	5	6	9-23.5	10-20	10	11.5	12.5
	A6	M4 × P0.7	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 × P2.0
	A7	5	5	6	10	12	16	20
	A8	15	18	24.5	35	43	59	79.5
B	B1	44	62	90	120	142	180	220
	B2	26	36	48	65	92	106	139
	B3	5	7	10	12	15	20	30
	B4	15	20	30	40	65	70	90
	B5	20	28	36	50	74	82	104
	B6	5	8	10	12	15	16	20
C	C1	46-60-63	70-75-90	90-100-115-145	115-145-165	145-165-200	200-215-265	200-265-300
	C2	M3-M4-M5	M4-M5-M6	M5-M6-M8	M6-M8-M10	M8-M10-M12	M10-M12	M12-M16
	C3	8-9-11	14-19	19-22-24	24-28-32	28-32-35	38-42-48-55	42-48-55
	C4	26	33.5-41.5	59-73.5	67-77	84.5	114.5	117.5
	C5	30-40-50	50-60-70	70-80-95-110	95-110-130	110-130-180	114.3-180-230	114.3-230-250
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5	M10 × P1.5
	C7	46-55	64-70-80	92-110-130	122-130-150	146-150-190	182-200-250	222-250-265
	C8	121	156.8-148.8	208-222.5	261-271	327	404.5	460.5

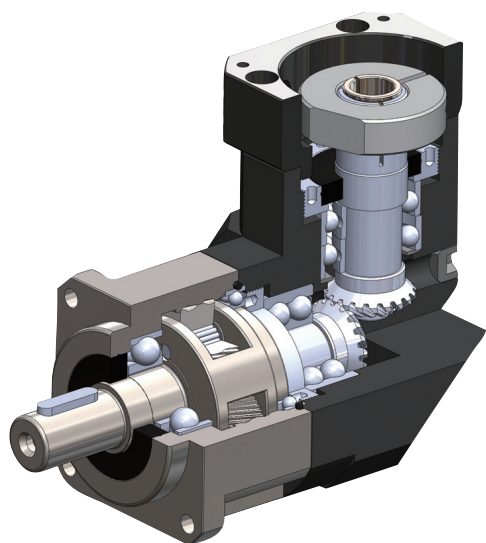
規格 Model No.	代號	單位 Unit	速比 Ratio	44A	62A	90A	120A	142A	180A	220A
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	15	17	54	145	301	553	1067	1786
			20	15	48	128	269	491	940	1587
			25	14	45	132	278	510	1050	1770
			30	13	41	125	252	466	985	1680
			35	13	41	123	258	473	975	1645
			40	12	39	115	241	442	942	1605
			50	14	45	132	278	510	1050	1770
			60	13	41	125	252	466	985	1680
			70	13	41	123	258	473	975	1645
			80	12	40	115	241	442	942	1605
			90	11	40	120	227	412	875	1490
			100	12	40	116	246	452	930	1565
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	15~100	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque						
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	15~100	3 倍額定輸出扭矩 3 Times of Rated Output Torque						
額定輸入轉速 / Rated Input Speed	n_{1N}	rpm	15~100	3,000	3,000	3,000	3,000	3,000	3,000	3,000
最大輸入轉速 / Max. Input Speed	n_{1B}	rpm	15~100	6,000	6,000	6,000	5,000	5,000	4,000	4,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	15~100	3	6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	15~100	360	1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	15~100	180	560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	15~100	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)						
效 率 / Efficiency	η	%	15~100	$\geq 94\%$						
使用溫度 / Operating Temperature		°C	15~100	-25° C ~ +90° C						
潤 滑 / Lubrication			15~100	全合成潤滑油脂 Synthetic Grease						
防護等級 / Protection Class			15~100	IP65						
安裝方向 / Mounting Position			15~100	任意方向 Any						
噪 音 值 / Noise Level		dB	15~100	≤ 56	≤ 58	≤ 60	≤ 63	≤ 65	≤ 67	≤ 70
重 量 / Weight $\pm 3\%$		Kg	15~100	0.86	2	5.48	10	21.4	≤ 42	≤ 59

Mass Moments of Inertia (kg.cm²)

速比 Ratio	44A	62A	90A	120A	142A	180A	220A
15	0.03	0.03	0.14	0.46	2.63	7.3	22.79
20	0.03	0.03	0.14	0.46	2.63	7.3	22.79
25	0.03	0.03	0.14	0.46	2.63	7.1	22.79
30	0.03	0.03	0.14	0.46	2.43	7.1	22.59
35	0.03	0.03	0.14	0.44	2.43	7.1	22.59
40	0.03	0.03	0.14	0.44	2.43	6.92	22.59
50	0.03	0.03	0.14	0.44	2.43	6.92	22.59
60	0.03	0.03	0.14	0.43	2.39	6.72	21.83
70	0.03	0.03	0.14	0.43	2.39	6.72	21.83
80	0.03	0.03	0.14	0.43	2.39	6.72	21.83
90	0.03	0.03	0.14	0.40	2.39	6.72	21.60
100	0.03	0.03	0.14	0.43	2.39	6.72	21.83

PBL series

PBL



- 全系列單段背隙 ≤ 12 弧分
1-Stage Backlash ≤ 12 arcmin
- 全系列雙段背隙 ≤ 15 弧分
2-Stage Backlash ≤ 15 arcmin

Indication of Model Numbers

機種型號表示

PBL	90	—	10		—	MOTOR
減速機機型 Type	型號 Model		速比 Ratio	出力軸鍵槽 Output Shaft Keyway		馬達型號 Motor Type
PBL	44 62 90 120 142 180 220		單段 1-Stage 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20 雙段 2-Stage 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200	<input type="checkbox"/> 標準品 · 有鍵槽 Standard (Keyway) N: 實心軸 · 無鍵槽 Solid Output Shaft (No Keyway)		

靜音
使用斜齒輪實現順暢安靜地運轉。

Quiet operation
Helical gears contribute to reduce vibration and noise.

高扭矩
比一般正齒輪行星減速機扭矩高。

High Torque
High output torque is in comparison with spur gear planetary gear reducers.

高效率
單段式在 95% 以上 · 雙段式在 92% 以上。

High Efficiency
Efficiency for 1-stage model exceeds 95%; 2-stage model exceeds 92%.

馬達連接板的模組化設計
獨特的馬達連接板模組化設計 · 適用於任何廠牌法蘭型式的伺服馬達。

Modular Design of Motor Connection Plate
The special modular design of motor connection plate is suitable for any flange mounting servomotors.

潤滑脂不洩漏 · 維護方便
使用高粘度 · 不易分離的潤滑脂 · 有效防潤滑脂洩漏 · 在產品壽命期內無需更換潤滑脂 · 安裝更便捷。

No grease leakage & Maintenance-free
Perfect solution using high viscosity anti-separation grease. No need to replace the grease during product life. Convenient in stallation is the advantage.

Features of PBL Series

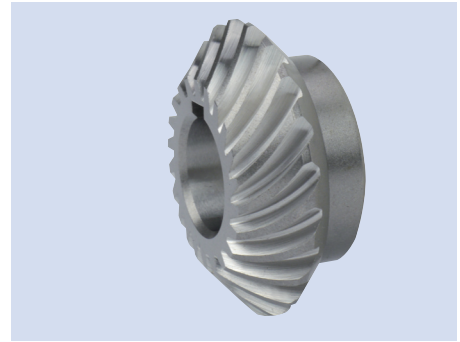
PBL 系列產品特性

螺旋傘齒輪

螺旋傘齒輪傳動效率高·傳動比穩定·圓弧重疊係數大·承載能力高·傳動平穩平順·工作可靠·結構緊湊·耐磨損·壽命長。

Spiral Bevel Gear

Spiral bevel gear is excellent in transmission efficiency, stability, durability, large arc overlapping factor, heavy loading, compact structure, wear-resisting and long service life.



一體式行星臂架及雙懸臂設計

行星臂架與輸出軸採一體式的結構設計·以確保提高扭轉剛性及精確度。

Integrated Planetary Arm Bracket

The planetary arm bracket and the output shaft are one-piece constructed to increase torsional rigidity and accuracy.

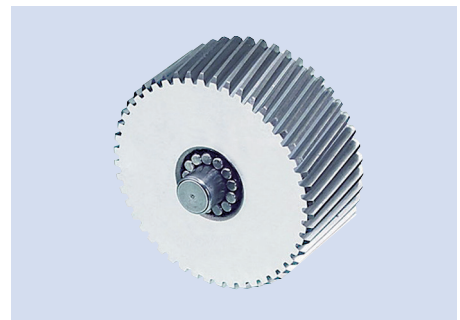


滿針滾針軸承設計

行星齒輪的傳動介面採用不含保持器之滿針滾針軸承·增加接觸面積以提高結構剛性及使用壽命。

Full Needle Roller Bearings Design

The planetary gear transmission employs full needle roller bearings without retainer to increase the contact surface, which greatly upgrades structural rigidity and service life.



筒夾式連結機構

輸入端與馬達的連結採用筒夾式的鎖緊機構·並經動平衡分析·以確保在高輸入轉速下結合介面的同心度和平衡度·及零背隙的動力傳遞。

Collet Locking Mechanism

The input-end and the motor are coupled through a collet locking mechanism. It has passed dynamical balance analysis to assure concentricity and balance on the connection and no backlash for power transmission while running at high speed.

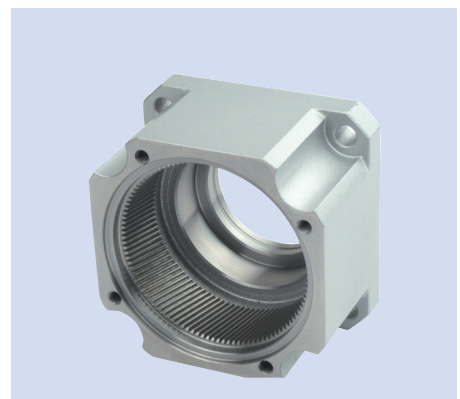


一體式螺旋內齒輪箱

齒輪箱和內環齒輪採一體式的設計·減速機構採用螺旋齒輪設計·齒形嚙合率為一般正齒輪的二倍以上·具有運轉平順·低噪音·高輸出扭矩和低背隙的特性。

One-piece Helical Gear Box

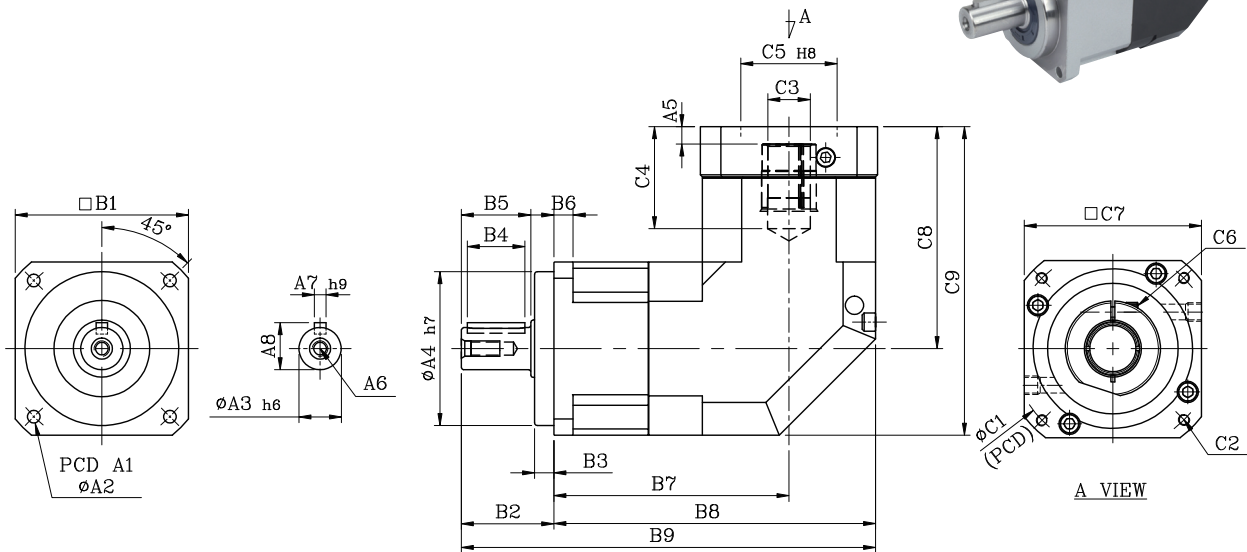
The gear box and internal ring gear are one-piece constructed. The speed reduction mechanism employs helical gears, which provides two times meshing rate of teeth when comparing with regular spur gears. In addition, it also has features of extremely smooth running, low noise, high output torque and low backlash.



MODEL : PBL

單段 1-Stage

RATIO : 3.4.5.6.7.8.9.10.12.14.16.18.20



unit : mm

Code	Model	44	62	90	120	142	180	220
A	A1	50	70	100	130	165	215	250
	A2	4.5	5.5	6.8	9	11	13	17
	A3	13	16	22	32	40	55	75
	A4	35	50	80	110	130	160	180
	A5	6	6	9·23.5	10·20	10	12.5	12.5
	A6	M4 × P0.7	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 × P2.0
	A7	5	5	6	10	12	16	20
	A8	15	18	24.5	35	43	59	79.5
B	B1	44	62	90	120	142	180	220
	B2	26	36	48	65	92	106	139
	B3	5	7	10	12	15	20	30
	B4	15	20	30	40	65	70	90
	B5	20	28	36	50	74	82	104
	B6	5	8	10	12	15	16	20
	B7	76	84.5	122.1	148	165.5	223.6	231.6
	B8	98	115.5	167.1	208	236.5	313.6	341.6
C	B9	124	151.5	215.1	273	328.5	419.6	480.6
	C1	46·60·63	70·75·90	90·100·115·145	115·145·165	145·165·200	200·215·265	200·265·300
	C2	M3·M4·M5	M4·M5·M6	M5·M6·M8	M6·M8·M10	M8·M10·M12	M10·M12·M16	M12·M16
	C3	8·9·11	14·19	19·22·24	24·28·32	28·32·35	38·42·48·55	42·48·55
	C4	27	33.5·41.5	53·67.5	67·77	85	117	117
	C5	30·40·50	50·60·70	70·80·95·110	95·110·130	110·130·180	114.3·180·230	114.3·230·250
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5	M10 × P1.5
	C7	46·55	64·70·80	92·110·130	122·130·150	146·150·190	182·200·250	222·250·265
	C8	61	77	115.3·129.8	141·151	174	235	235
C9	83	108	160.3·174.8	201·211	245	325	345	



規格 Model No.	代號	單位 Unit	速比 Ratio	44	62	90	120	142	180	220
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	3	17	54	145	301	553	1067	1786
			4	15	48	128	269	491	940	1587
			5	14	45	132	278	510	1050	1770
			6	13	41	125	252	466	985	1680
			7	13	41	123	258	473	975	1645
			8	12	39	115	241	442	942	1605
			9	11	40	120	227	412	875	1490
			10	12	40	116	246	452	930	1565
			12	13	41	125	252	466	985	1680
			14	13	41	123	258	473	975	1645
			16	12	39	115	241	442	942	1605
			18	11	40	120	227	412	875	1490
20	12	40	116	246	452	930	1565			
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	3~20	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque						
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3~20	3 倍額定輸出扭矩 3 Times of Rated Output Torque						
額定輸入轉速 / Rated Input Speed	n_{IN}	rpm	3~20	3,000	3,000	3,000	3,000	3,000	3,000	2,000
最大輸入轉速 / Max. Input Speed	n_{IB}	rpm	3~20	6,000	6,000	6,000	5,000	5,000	4,000	3,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	3~20	3	6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	3~20	360	1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	3~20	180	560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	3~20	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)						
效率 / Efficiency	η	%	3~20	$\geq 95\%$						
使用溫度 / Operating Temperature		°C	3~20	-25° C ~ +90° C						
潤滑 / Lubrication			3~20	全合成潤滑油脂 Synthetic Grease						
防護等級 / Protection Class			3~20	IP65						
安裝方向 / Mounting Position			3~20	任意方向 Any						
噪音值 / Noise Level		dB	3~20	≤ 60	≤ 62	≤ 65	≤ 67	≤ 69	≤ 71	≤ 73
重量 / Weight $\pm 3\%$		Kg	3~20	0.99	2.1	6.88	12.5	23.16	51	

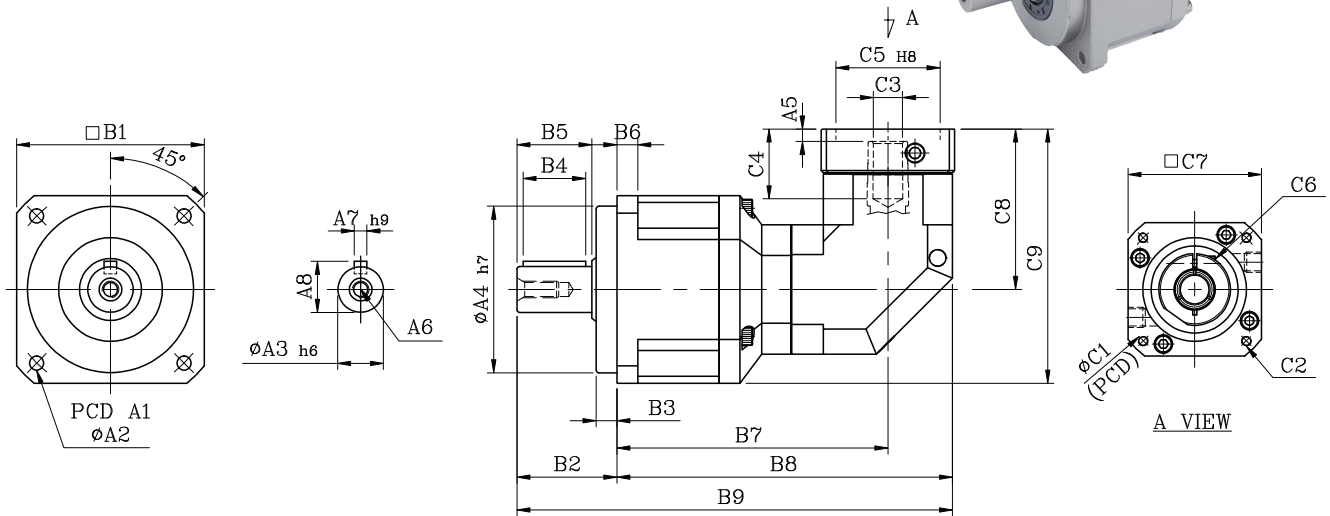
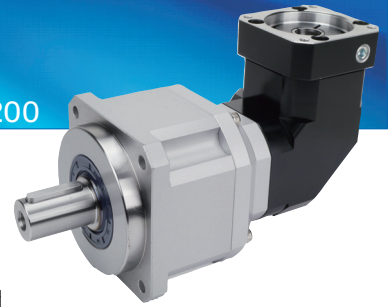
Mass Moments of Inertia (kg.cm²)

速比 Ratio	44	62	90	120	142	180	220
3	0.09	0.36	2.28	6.85	23.5	68.2	135.0
4	0.09	0.36	2.28	6.85	23.5	68.2	135.0
5	0.09	0.36	2.28	6.85	23.5	68.2	135.0
6	0.09	0.36	2.28	6.85	23.5	68.2	135.0
7	0.09	0.36	2.28	6.85	23.5	68.2	135.0
8	0.09	0.36	2.28	6.85	23.5	68.2	135.0
9	0.09	0.36	2.28	6.85	23.5	68.2	135.0
10	0.09	0.36	2.28	6.85	23.5	68.2	135.0
12	0.03	0.08	1.88	6.20	21.8	65.5	119.2
14	0.03	0.08	1.88	6.20	21.8	65.5	119.2
16	0.03	0.08	1.88	6.20	21.8	65.5	119.2
18	0.03	0.08	1.88	6.20	21.8	65.5	119.2
20	0.03	0.08	1.88	6.20	21.8	65.5	119.2

MODEL : PBL

雙段 1-Stage

RATIO : 15.20.25.30.35.40.50.60.70.80.90.100.120.140.160.180.200



unit : mm

Code \ Model	62	90	120	142	180	220	
A	A1	70	100	130	165	215	250
	A2	5.5	6.8	9	11	13	17
	A3	16	22	32	40	55	75
	A4	50	80	110	130	160	180
	A5	6	6	9·23.5	10·20	10	12.5
	A6	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 × P2.0
	A7	5	6	10	12	16	20
	A8	18	24.5	35	43	59	79.5
B	B1	62	90	120	142	180	220
	B2	36	48	65	92	106	139
	B3	7	10	12	15	20	30
	B4	20	30	40	65	70	90
	B5	28	36	50	74	82	104
	B6	8	10	12	15	16	20
	B7	110.5	130	181.6	214.5	249.5	313.6
	B8	132.5	161	266.6	274.5	320.5	403.6
	B9	168.5	209	291.6	366.5	426.5	542.6
C	C1	46·60·63	70·75·90	90·110·115·145	115·145·165	145·165·200	200·215·265
	C2	M3·M4·M5	M4·M5·M6	M5·M6·M8·M10	M6·M8·M10	M8·M10·M12	M10·M12·M16
	C3	8·9·11	14·19	19·22·24	24·28·32	32·35·38	38·42·48·55
	C4	27	33.5·41.5	53·67.5	67·77	85	117
	C5	30·40·50	50·60·70	70·80·95·110	70·95·110·130	110·130·180	114.3·180·230
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5
	C7	46·55	64·70·80	92·110·130	122·130·150	146·150·190	182·200·250
	C8	61	77	115.3·129.8	141·151	174	235
	C9	92	122	175.3·189.8	212·222	264	345

規格 Model No.	代號	單位 Unit	速比 Ratio	62	90	120	142	180	220
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	15	54	145	301	553	1067	1786
			20	48	128	269	491	940	1587
			25	45	132	278	510	1050	1770
			30	41	125	252	466	985	1680
			35	41	123	258	473	975	1645
			40	39	115	241	442	942	1605
			50	45	132	278	510	1050	1770
			60	41	125	252	466	985	1680
			70	41	123	258	473	975	1645
			80	40	115	241	442	942	1605
			90	40	120	227	412	875	1490
			100	40	116	246	452	930	1565
			120	41	125	252	466	985	1680
			140	41	123	258	473	975	1645
			160	40	115	241	442	942	1605
180	40	120	227	412	875	1490			
200	40	116	246	452	930	1565			
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	15~200	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque					
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	15~200	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 / Rated Input Speed	n_{IN}	rpm	15~200	3,000	3,000	3,000	3,000	3,000	2,000
最大輸入轉速 / Max. Input Speed	n_{IB}	rpm	15~200	6,000	6,000	5,000	5,000	4,000	3,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	15~200	6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	15~200	1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	15~200	560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	15~200	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效率 / Efficiency	η	%	15~200	$\geq 92\%$					
使用溫度 / Operating Temperature		°C	15~200	-25° C ~ +90° C					
潤滑 / Lubrication			15~200	全合成潤滑油脂 Synthetic Grease					
防護等級 / Protection Class			15~200	IP65					
安裝方向 / Mounting Position			15~200	任意方向 Any					
噪音值 / Noise Level		dB	15~200	≤ 62	≤ 65	≤ 67	≤ 69	≤ 71	≤ 73
重量 / Weight $\pm 3\%$		Kg	15~200	2	6.1	12.5	23.2	41.42	

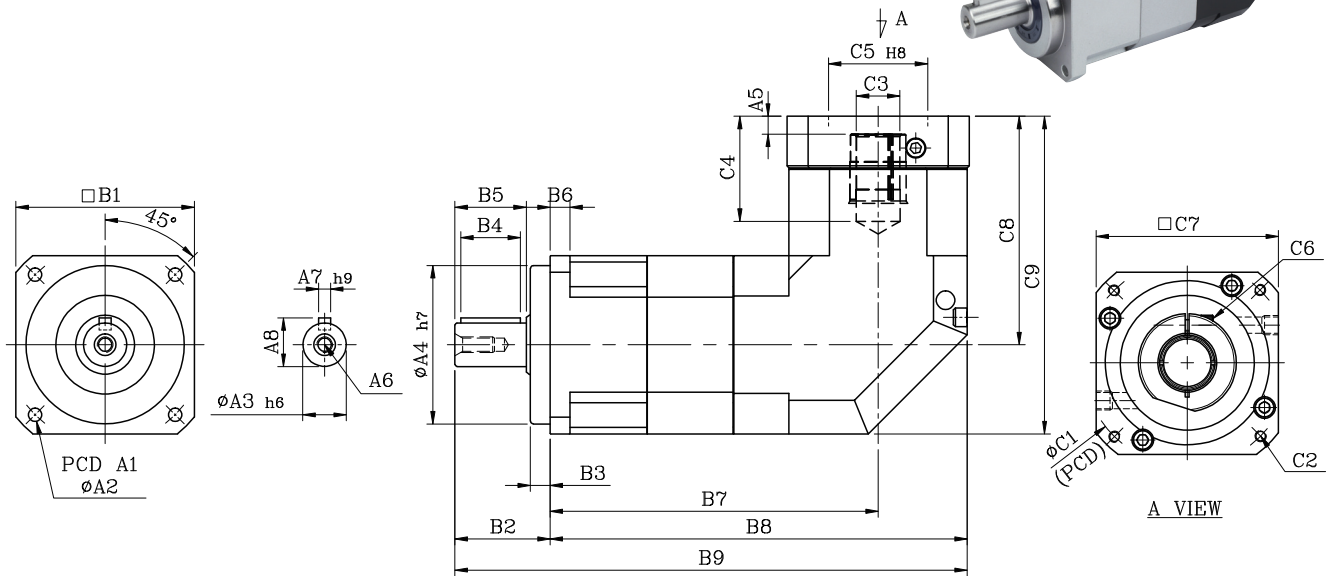
Mass Moments of Inertia (kg.cm²)

速比 Ratio	62	90	120	142	180	220
15	0.09	0.36	2.28	6.85	26.2	70.1
20	0.09	0.36	2.28	6.85	26.2	70.1
25	0.09	0.36	2.28	6.85	23.1	68.2
30	0.09	0.36	2.28	6.85	23.1	68.2
35	0.09	0.36	2.28	6.85	23.1	68.2
40	0.09	0.36	2.28	6.85	23.1	68.2
50	0.09	0.36	2.28	6.85	23.1	68.2
60	0.09	0.36	2.28	6.85	23.1	68.2
70	0.09	0.36	2.28	6.85	23.1	68.2
80	0.09	0.36	2.28	6.85	23.1	68.2
90	0.09	0.36	2.28	6.85	23.1	68.2
100	0.09	0.36	2.28	6.85	23.1	68.2
120	0.03	0.10	1.88	6.20	21.2	65.1
140	0.03	0.10	1.88	6.20	21.2	65.1
160	0.03	0.10	1.88	6.20	21.2	65.1
180	0.03	0.10	1.88	6.20	21.2	65.1
200	0.03	0.10	1.88	6.20	21.2	65.1

MODEL : PBL-A

雙段 1-Stage

RATIO : 5.20.25.30.35.40.50.60.70.80.90.100.120.140.160.180.200



unit : mm

Code	Model	44A	62A	90A	120A	142A	180A	220A
A	A1	50	70	100	130	165	215	250
	A2	4.5	5.5	6.8	9	11	13	17
	A3	13	16	22	32	40	55	75
	A4	35	50	80	110	130	160	180
	A5	6	6	9·23.5	10·20	10	12.5	12.5
	A6	M4 × P0.7	M5 × P0.8	M8 × P1.25	M10 × P1.5	M12 × P1.75	M14 × P2.0	M16 · P2.0
	A7	5	5	6	10	12	16	20
	A8	15	18	24.5	35	43	59	79.5
B	B1	44	62	90	120	142	180	220
	B2	26	36	48	65	92	106	139
	B3	5	7	10	12	15	20	30
	B4	15	20	30	40	65	70	90
	B5	20	28	36	50	74	82	104
	B6	5	8	10	12	15	16	20
	B7	102	118.3	165.6	204	232	304.6	324.6
	B8	124	149.3	210.6	264	303	394.6	434.6
B9	150	185.3	258.6	329	395	500.6	573.6	
C	C1	46·60·63	70·75·90	90·100·115·145	115·145·165	145·165·200	200·215·265	200·265·300
	C2	M3·M4·M5	M4·M5·M6	M5·M6·M8	M6·M8·M10	M8·M10·M12	M10·M12·M16	M12·M16
	C3	8·9·11	14·19	19·22·24	24·28·32	28·32·35	38·42·48·55	42·48·55
	C4	27	33.5·41.5	53·67.5	67·77	85	117	117
	C5	30·40·50	50·60·70	70·80·95·110	95·110·130	110·130·180	114.3·180·230	114.3·230·250
	C6	M3 × P0.5	M5 × P0.8	M6 × P1.0	M8 × P1.25	M10 × P1.5	M10 × P1.5	M10·P1.5
	C7	46·55	64·70·80	92·110·130	122·130·150	146·150·190	182·200·250	220·250·265
	C8	61	77	115.3·129.8	141·151	174	235	235
	C9	83	108	160.3·174.8	201·211	245	325	345

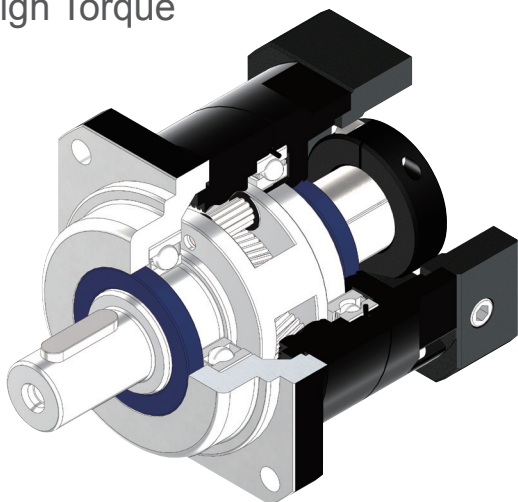
規格 Model No.	代號	單位 Unit	速比 Ratio	44A	62A	90A	120A	142A	180A	220A
額定輸出扭矩 / Rated Output Torque (Nominal output torque)	T_{2N}	Nm	15	17	54	145	301	553	1067	1786
			20	15	48	128	269	491	940	1587
			25	14	45	132	278	510	1050	1770
			30	13	41	125	252	466	985	1680
			35	13	41	123	258	473	975	1645
			40	12	39	115	241	442	942	1605
			50	11	45	132	278	510	1050	1770
			60	12	41	125	252	466	985	1680
			70	13	41	123	258	473	975	1645
			80	13	40	115	241	442	942	1605
			90	12	40	120	227	412	875	1490
			100	11	40	116	246	452	930	1565
			120	12	41	125	252	466	985	1680
			140	13	41	123	258	473	975	1645
			160	13	39	115	241	442	942	1605
180	12	40	120	227	412	875	1490			
200	11	40	116	246	452	930	1565			
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	15~200	1.8 倍額定輸出扭矩 1.8 Times of Rated Output Torque						
最大輸出扭矩 / Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	15~200	3 倍額定輸出扭矩 3 Times of Rated Output Torque						
額定輸入轉速 / Rated Input Speed	n_{1N}	rpm	15~200		3,000	3,000	3,000	3,000	3,000	2,000
最大輸入轉速 / Max. Input Speed	n_{1B}	rpm	15~200		6,000	6,000	5,000	5,000	4,000	3,000
扭轉剛性 / Torsional Rigidity		Nm/arcmin	15~200		6	14	27	60	140	240
容許徑向力 / Max. Radial Force	F_{2rB}	N	15~200		1,120	3,040	6,460	8,830	14,820	48,450
容許軸向力 / Max. Axial Force	F_{2aB}	N	15~200		560	1,520	3,230	4,410	7,410	24,225
使用壽命 / Service Life	L_H	hr	15~200	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)						
效率 / Efficiency	η	%	15~200	$\geq 92\%$						
使用溫度 / Operating Temperature		°C	15~200	-25° C ~ +90° C						
潤滑 / Lubrication			15~200	全合成潤滑油脂 Synthetic Grease						
防護等級 / Protection Class			15~200	IP65						
安裝方向 / Mounting Position			15~200	任意方向 Any						
噪音值 / Noise Level		dB	15~200	≤ 62	≤ 62	≤ 65	≤ 67	≤ 69	≤ 71	≤ 73
重量 / Weight $\pm 3\%$		Kg	15~200	1.5	3	8.15	13.9	29.4		

Mass Moments of Inertia (kg.cm²)

速比 Ratio	44A	62A	90A	120A	142A	180A	220A
15	0.09	0.36	2.28	6.85	23.50	55.2	80.2
20	0.09	0.36	2.28	6.85	23.50	55.2	80.2
25	0.09	0.36	2.28	6.85	23.50	50.4	76.5
30	0.09	0.36	2.28	6.85	23.50	50.4	76.5
35	0.09	0.36	2.28	6.85	23.50	50.4	76.5
40	0.09	0.36	2.28	6.85	23.50	50.4	76.5
50	0.09	0.36	2.28	6.85	23.50	50.4	76.5
60	0.09	0.36	2.28	6.85	23.50	50.4	76.5
70	0.09	0.36	2.28	6.85	23.50	50.4	76.5
80	0.09	0.36	2.28	6.85	23.50	50.4	76.5
90	0.09	0.36	2.28	6.85	23.50	50.4	76.5
100	0.09	0.36	2.28	6.85	23.50	50.4	76.5
120	0.03	0.08	1.88	6.20	21.80	48.7	74.2
140	0.03	0.08	1.88	6.20	21.80	48.7	74.2
160	0.03	0.08	1.88	6.20	21.80	48.7	74.2
180	0.03	0.08	1.88	6.20	21.80	48.7	74.2
200	0.03	0.08	1.88	6.20	21.80	48.7	74.2

FA series

使用斜齒輪實現 Helical Gear
 高靜音 Quiet Operation
 高扭矩 High Torque



- 全系列單段背隙 ≤ 8 弧分
 1-Stage Backlash ≤ 8 arcmin
- 全系列雙段背隙 ≤ 12 弧分
 2-Stage Backlash ≤ 12 arcmin

Indication of Model Numbers

機種型號表示

FA	80	-	10	□	-	MOTOR
減速機機型 Type	型號 Model		速比 Ratio	出力軸鍵槽 Output Shaft Keyway		馬達型號 Motor Type
FA	50 80 90 100 120		單段 1-Stage 3, 4, 5, 7, 10 雙段 2-Stage 15, 20, 25, 30, 35, 40, 50, 70, 100	<input type="checkbox"/> 標準品 · 有鍵槽 Standard (Keyway) N: 實心軸 · 無鍵槽 Solid Output Shaft (No Keyway)		

Features of FA Series

FA 系列產品特性



螺旋齒輪設計及高精度齒輪加工

減速機構採用螺旋齒輪設計，齒形嚙合率為一般正齒輪的二倍以上，具有運轉平順、低噪音、高輸出扭矩和低背隙的特性。

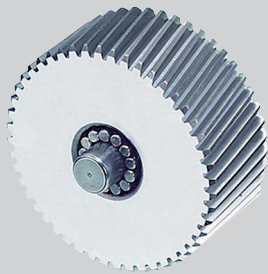
材料採用高級鎳鉻鉬合金鋼 (SNCM220)，切削加工後，經滲碳熱處理至硬度 57~60HRC，再進行齒面研磨，確保齒輪精度 DIN6 級以內。

Helical Gear Design

The speed reduction mechanism employs helical gears, which provides two times meshing rate of teeth when comparing with regular spur gears. In addition, it also features extremely smooth running, low noise, high torque output and low backlash.

High Precision Gear Machining

Manufactured from high quality Ni-Cr-Mo alloy steel (SNCM220), precision achined and carburized to hardness 57-60 HRC. Precision teeth grinding assures gear accuracy reaches DIN6 class.



滿針滾針軸承設計

行星齒輪的傳動介面採用不含保持器之滿針滾針軸承，增加接觸面積以提高結構剛性及使用壽命。

Full Needle Roller Bearings Design

The planetary gear transmission employs full needle roller bearings without retainer to increase the contact surface, which greatly upgrades structural rigidity and service life.

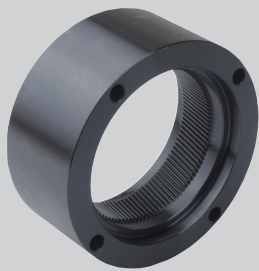


一體式行星臂架

行星臂架與輸出軸採一體式的結構設計，以確保提高扭轉剛性及精確度。

Integrated Planetary Arm Bracket

The planetary arm bracket and the output shaft are one-piece constructed to increase torsional rigidity and accuracy.



一體式齒輪箱本體

齒輪箱和內環齒輪採一體式的設計，提高結構剛性及輸出扭矩。

One-piece Gear Box & Advanced Surface Treatment

The gear box and internal ring gear are one-piece constructed.



筒夾式連結機構

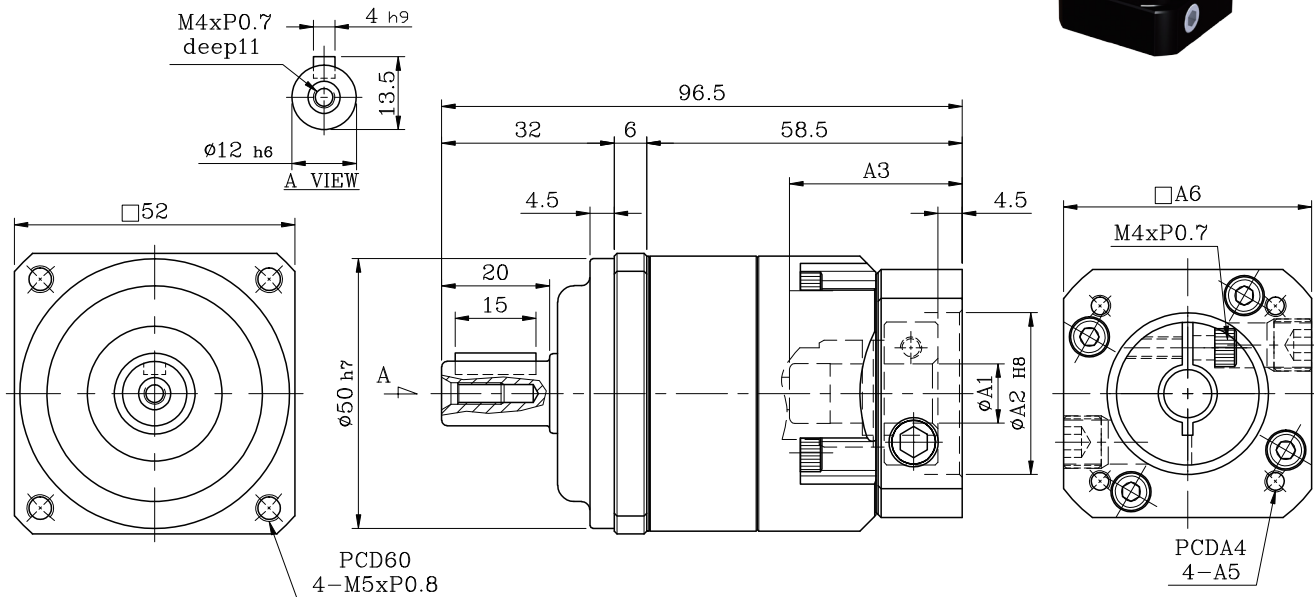
輸入端與馬達的連結採用筒夾式的鎖緊機構，並經動平衡分析，以確保在高輸入轉速下結合介面的同心度和平衡度，及零背隙的動力傳遞。

Collet Locking Mechanism

The input-end and the motor are coupled through a collet locking mechanism. It has passed dynamical balance analysis to assure concentricity and balance on the connection and no backlash for power transmission while running at high speed.

MODEL : FA50

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6
1		30	32	45	M3	46
2	8	30	32	46	M4	46
3	1	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

FA50-1 特性表

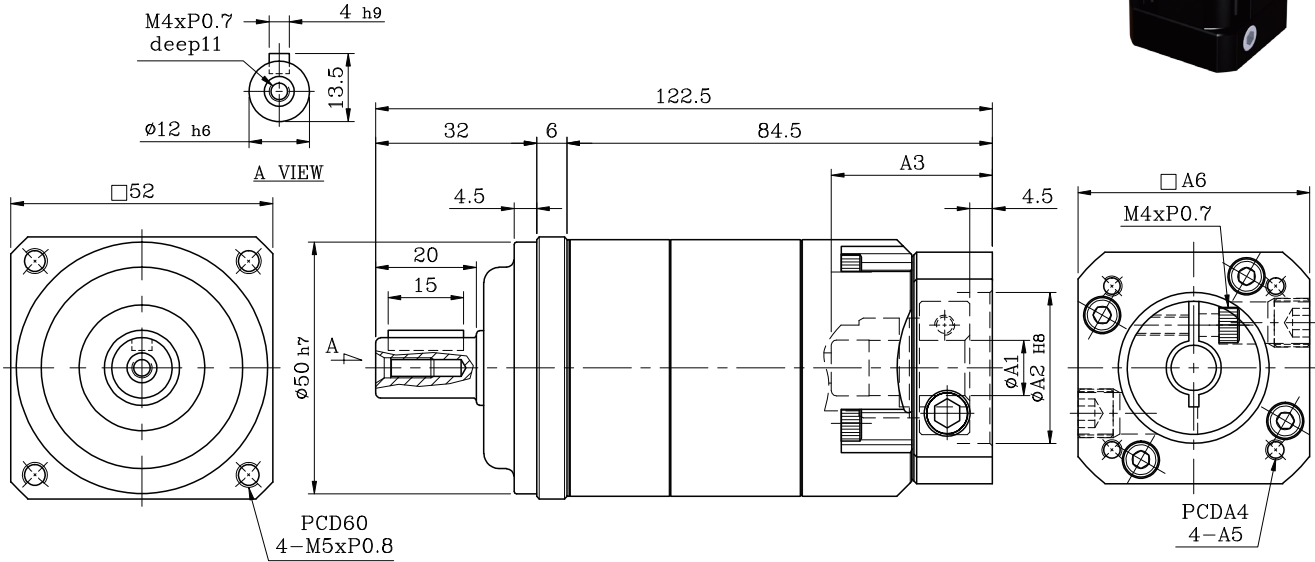
減速比 Ratio	代號	單位 Unit	3	4	5	7	10
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	19	16	16	15	14
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	34	29	29	27	25
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.03	0.03	0.03	0.03	0.03
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque				
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000				
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000				
扭轉剛性 Torsional Rigidity		Nm/arcmin	3				
容許徑向力 Max. Radial Force	F_{2rB}	N	350				
容許軸向力 Max. Axial Force	F_{2aB}	N	180				
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation : >20,000 (S1 Continuous Operation : >10,000 hrs)				
效率 Efficiency	η	%	$\geq 97\%$				
使用溫度 Operating Temperature		°C	-25°C ~ +90°C				
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease				
防護等級 Protection Class			IP 65				
安裝方向 Mounting Position			任意 Any				
噪音值 Noise Level		dB	≤ 58 dB				
重量 Weight $\pm 2\%$		Kg	0.64				

MODEL : FA50

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



FA50



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

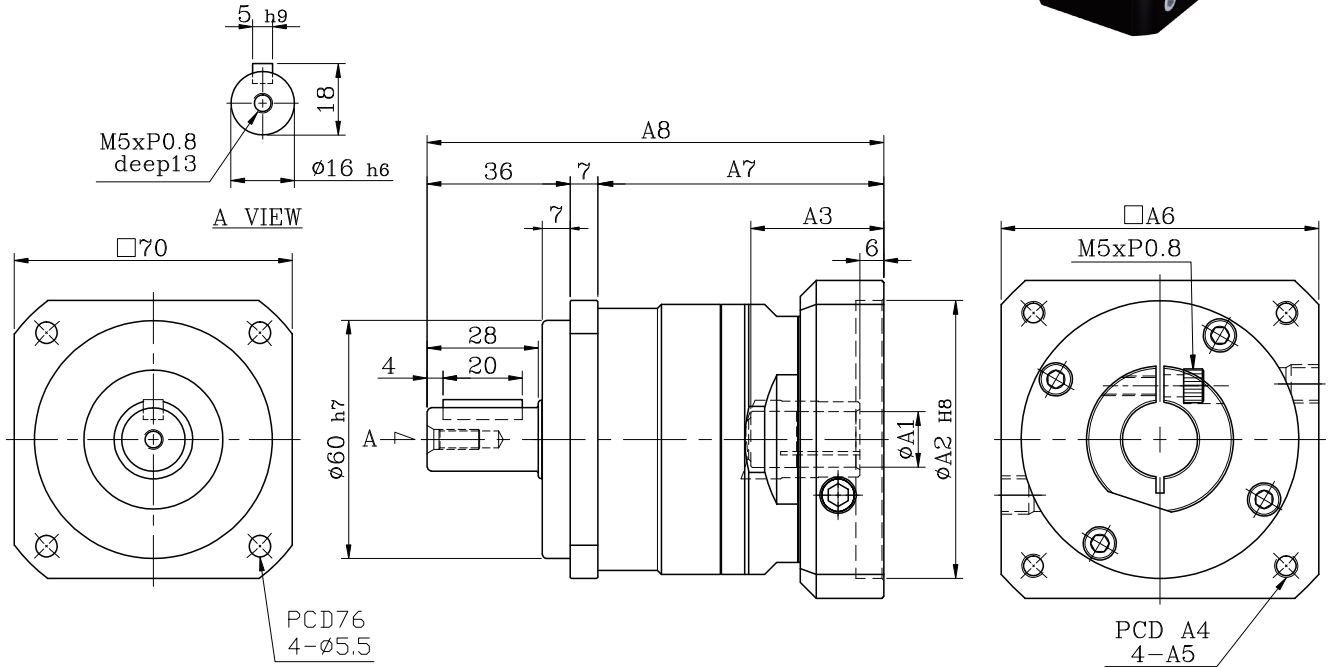
NO.	ØA1	ØA2	A3	A4	A5	A6
1		30	32	45	M3	46
2	8	30	32	46	M4	46
3	1	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

FA50-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	19	16	16	19	15	16	16	15	14
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	34	29	29	34	27	29	29	27	25
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	3								
容許徑向力 Max. Radial Force	F_{2rB}	N	350								
容許軸向力 Max. Axial Force	F_{2aB}	N	180								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 60 dB								
重量 Weight ±2%		Kg	0.96								

MODEL : FA70

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6	A7	A8
1	14	50	33.5	70	M5	64	72	115
2	17	60	33.5	75	M6	70	72	115
3	19	70	33.5	85	M6	80	72	115

FA70-1 特性表

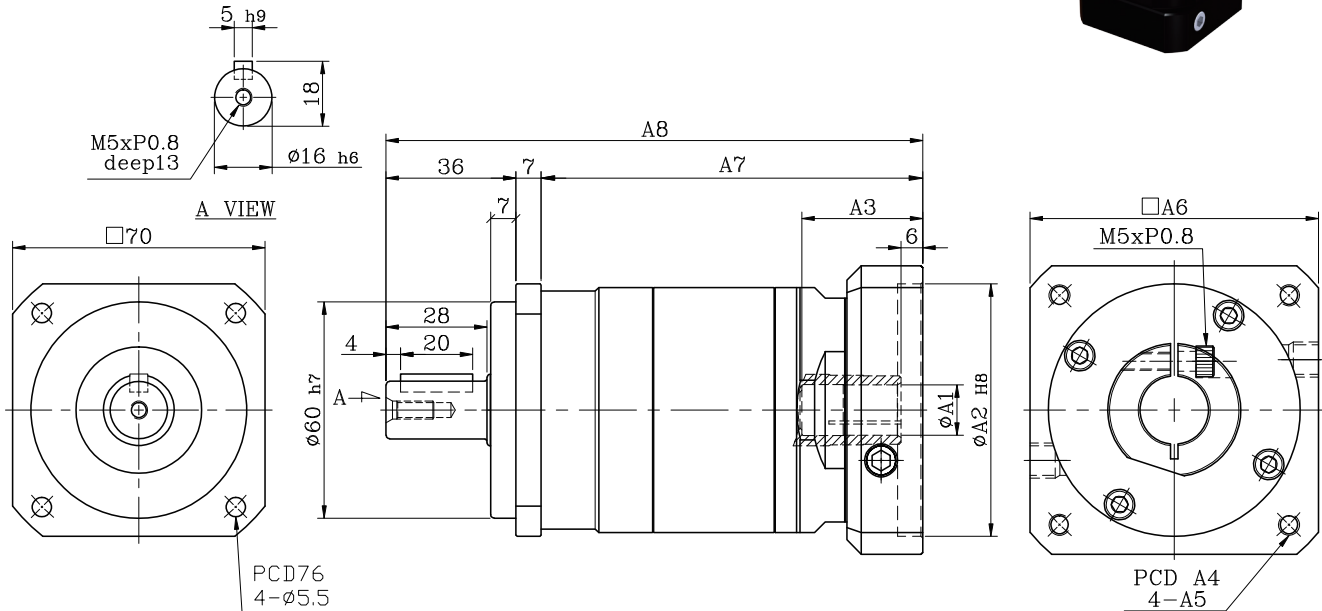
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	54	48	45	41	40	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	97	86	81	74	72	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.16	0.14	0.13	0.13	0.13	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	5					
容許徑向力 Max. Radial Force	F_{2rB}	N	800					
容許軸向力 Max. Axial Force	F_{2aB}	N	400					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 58 dB					
重量 Weight $\pm 2\%$		Kg						

MODEL : FA70

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



FA70



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

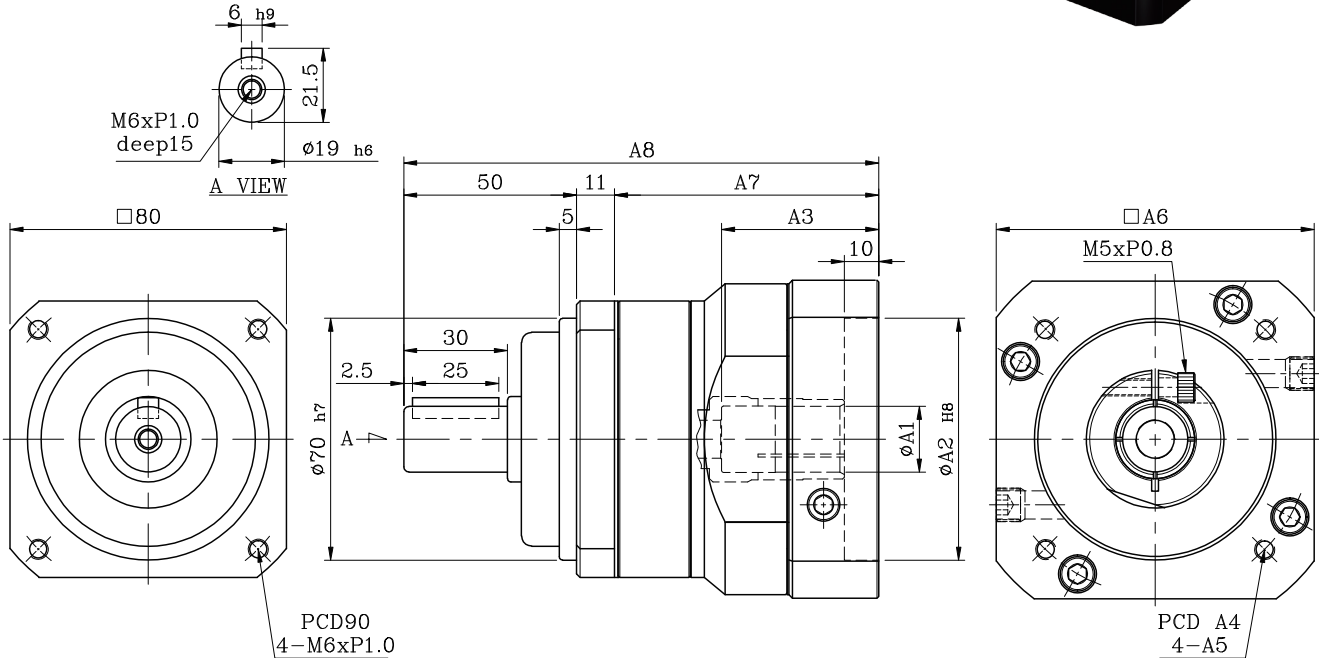
NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1	14	50	33.5	70	M5	64	105.8	148.8
2	?	60	33.5	75	M6	70	105.8	148.8
3	19	70	33.5	85	M6	80	105.8	148.8

FA70-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	54	48	45	41	41	39	45	41	40
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	97	86	81	74	74	70	81	74	72
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	5								
容許徑向力 Max. Radial Force	F_{2rB}	N	800								
容許軸向力 Max. Axial Force	F_{2aB}	N	400								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 60 dB								
重量 Weight ±2%		Kg	2.1								

MODEL : FA80

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		50	33.5	70	M5	80	64.5	125.5
2	14	70	45.5	90	M6	92	76.5	137.5
3	17	80	45.5	100	M6	92	76.5	137.5
4	19	95	45.5	115	M6	110	76.5	137.5

FA80-1 特性表

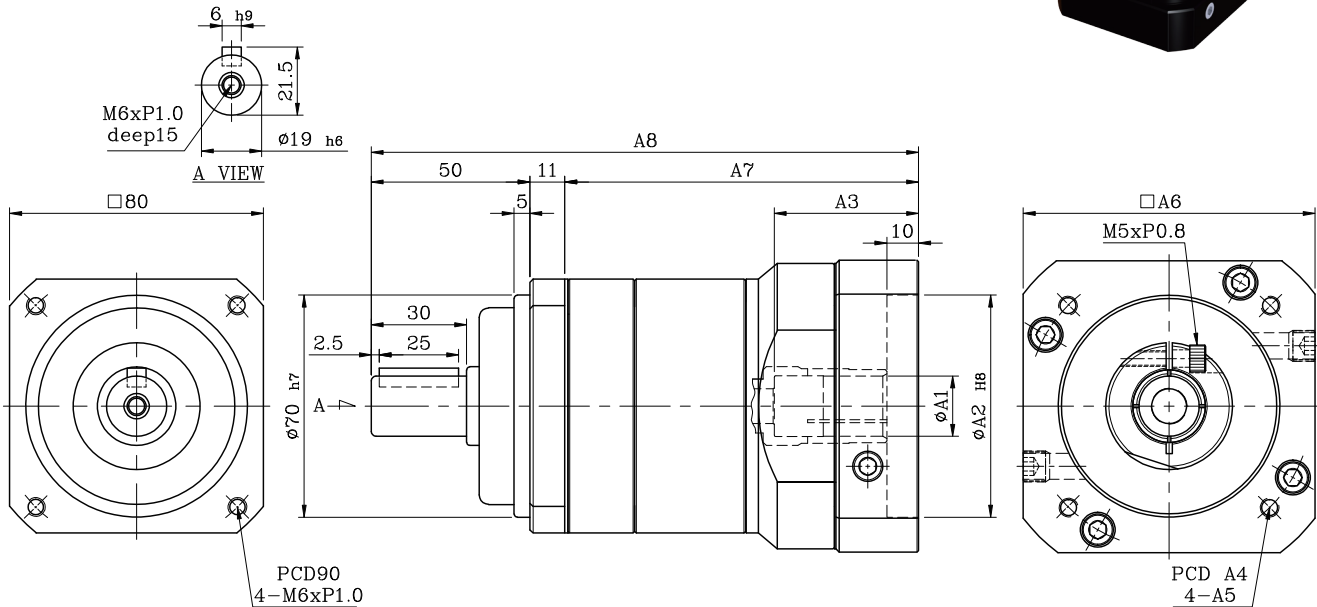
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	112	110	108	105	100	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	202	198	194	189	180	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.48	0.38	0.38	0.38	0.35	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	12					
容許徑向力 Max. Radial Force	F_{2rB}	N	1,200					
容許軸向力 Max. Axial Force	F_{2aB}	N	600					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 60 dB					
重量 Weight $\pm 2\%$		Kg	1.6					

MODEL : FA80

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



FA80



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

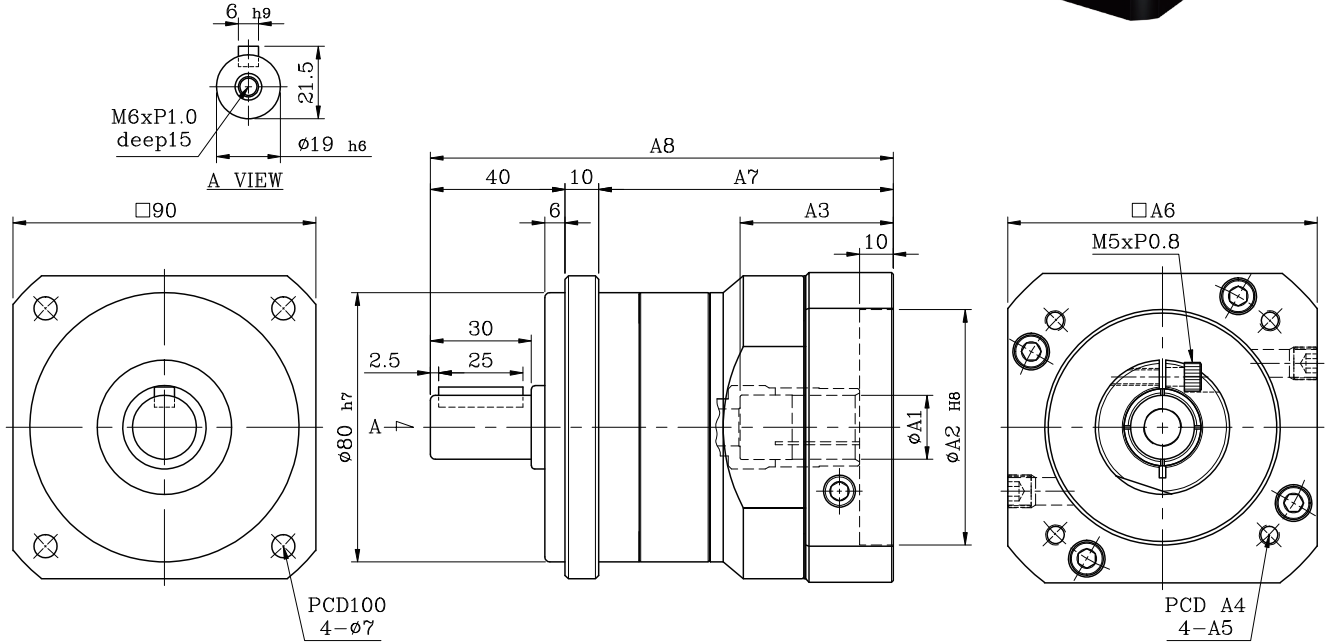
NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		50	33.5	70	M5	80	99.5	160.5
2	14	70	45.5	90	M6	92	111.5	172.5
3	?	80	45.5	100	M6	92	111.5	172.5
4	19	95	45.5	115	M6	110	111.5	172.5

FA80-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	112	110	108	112	105	110	108	105	100
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	202	198	194	202	189	198	194	189	180
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.41	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	12								
容許徑向力 Max. Radial Force	F_{2rB}	N	1,200								
容許軸向力 Max. Axial Force	F_{2aB}	N	600								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 62 dB								
重量 Weight ±2%		Kg	2.8								

MODEL : FA90

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

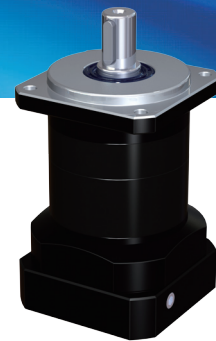
NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6	A7	A8
1		70	45.5	90	M6	92	87.5	137.5
2	14	80	45.5	100	M6	92	87.5	137.5
3	?	95	45.5	115	M6	110	87.5	137.5
4	19	110	45.5	145	M8	130	87.5	137.5

FA90-1 特性表

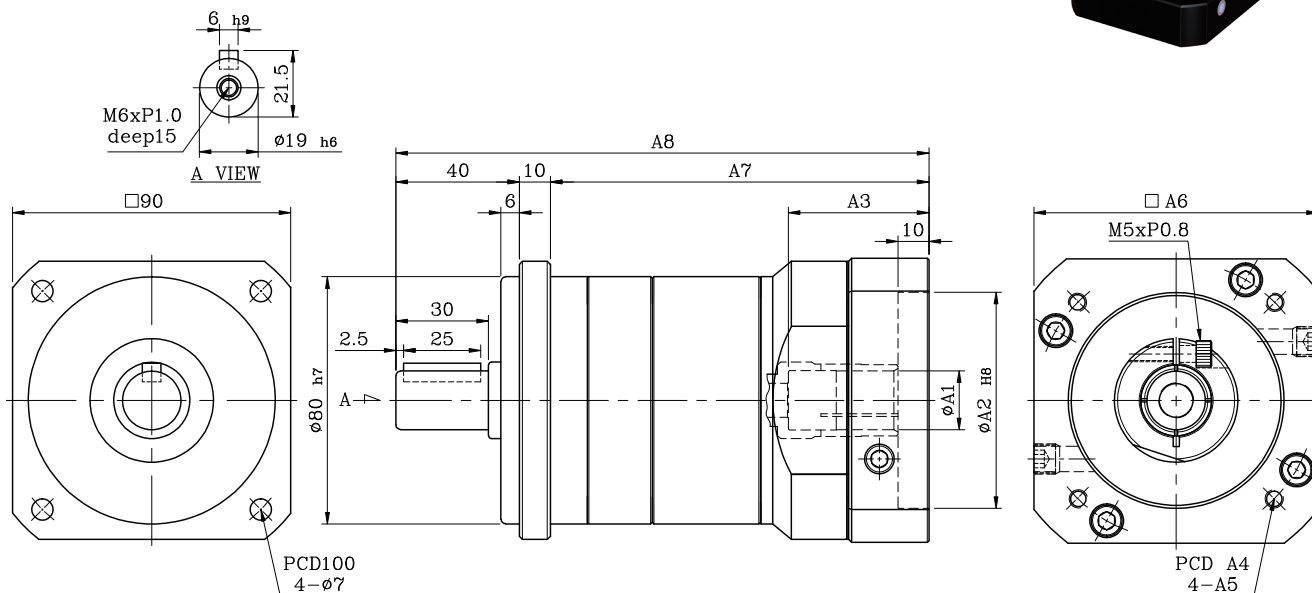
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	112	110	108	105	100	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	202	198	194	189	180	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.48	0.38	0.38	0.38	0.35	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	12					
容許徑向力 Max. Radial Force	F_{2rB}	N	1,200					
容許軸向力 Max. Axial Force	F_{2aB}	N	600					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 60 dB					
重量 Weight $\pm 2\%$		Kg	1.96					

MODEL : FA90

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



FA90



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

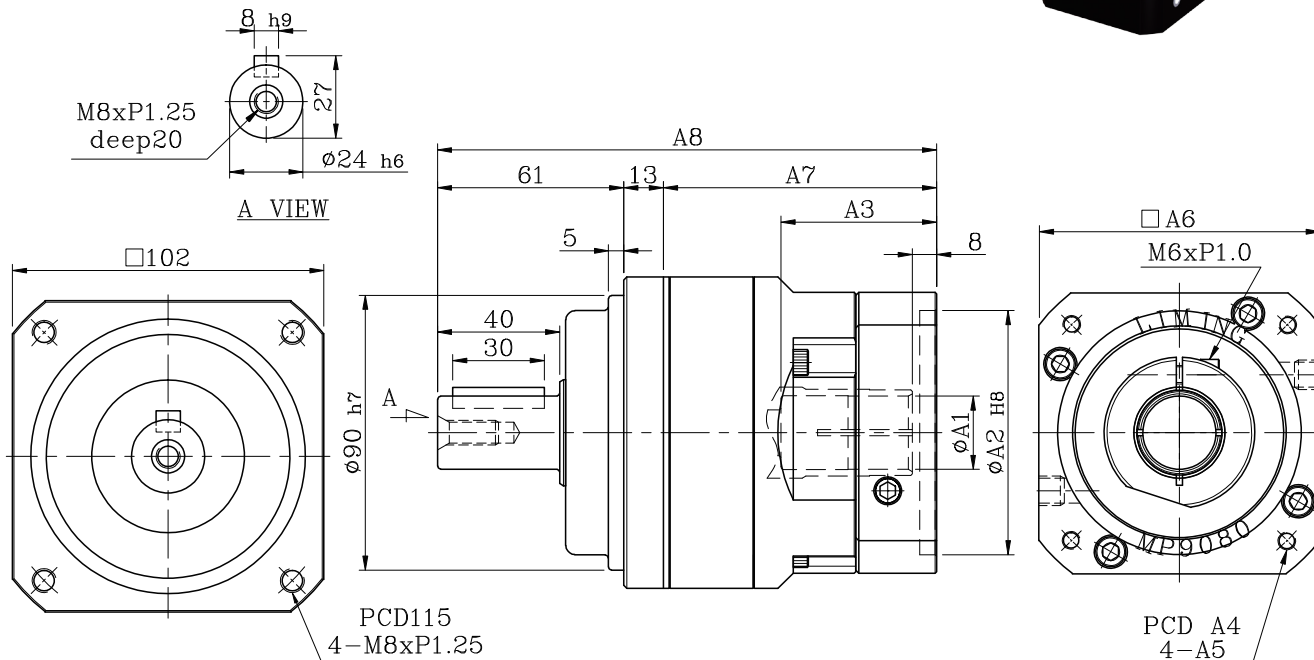
NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6	A7	A8
1		70	45.5	90	M6	92	122.5	172.5
2	14	80	45.5	100	M6	92	122.5	172.5
3	1	95	45.5	115	M6	110	122.5	172.5
4	19	110	45.5	145	M8	130	122.5	172.5

FA90-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	112	110	108	112	105	110	108	105	100
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	202	198	194	202	189	198	194	189	180
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.41	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	12								
容許徑向力 Max. Radial Force	F_{2rB}	N	1,200								
容許軸向力 Max. Axial Force	F_{2aB}	N	600								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : 20,000 (S1 連續運轉 : 10,000 hrs) S5 Cycle Operation: 20,000 (S1 Continuous Operation: 10,000 hrs)								
效率 Efficiency	η	%	$\geq 95\%$								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 62 dB								
重量 Weight $\pm 2\%$		Kg	3.06								

MODEL : FA100

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6	A7	A8
1		70	51	90	M6	92	89.5	163.5
2	19	80	51	100	M6	92	89.5	163.5
3	?	95	51	115	M6	110	89.5	163.5
4	24	95	51	115	M8	110	89.5	163.5
5		110	51	145	M8	130	89.5	163.5
6		110	65.5	145	M8	130	104	178

FA100-1 特性表

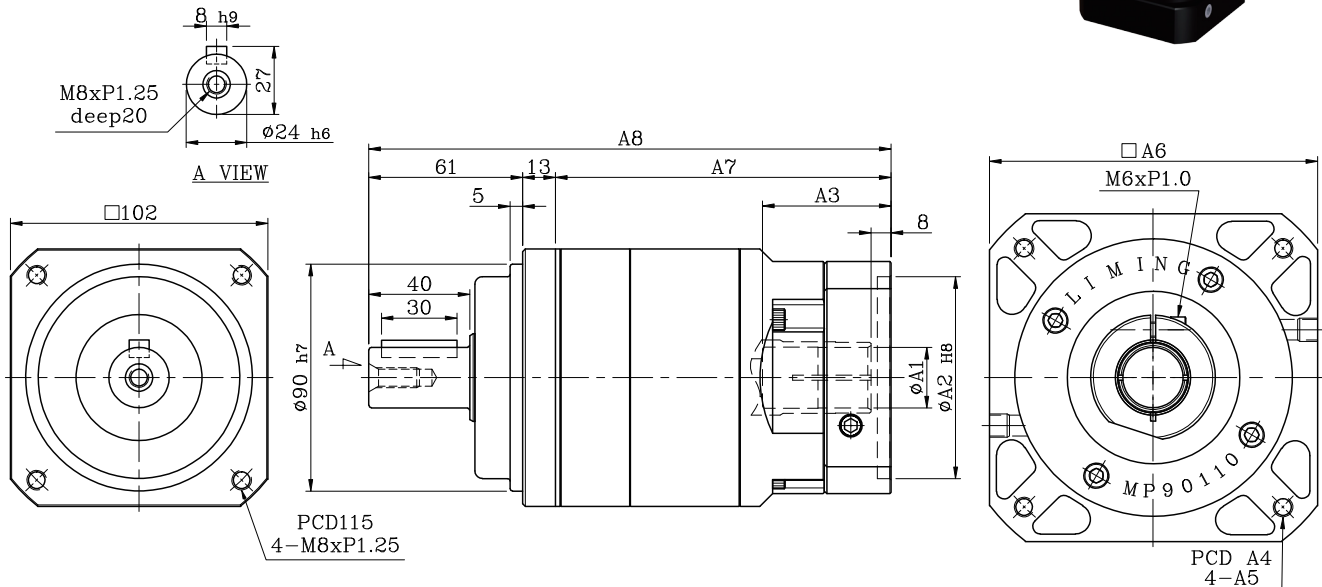
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	165	146	160	149	141	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	297	263	288	268	254	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.6	0.45	0.45	0.45	0.41	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	14					
容許徑向力 Max. Radial Force	F_{2rB}	N	3,200					
容許軸向力 Max. Axial Force	F_{2aB}	N	1,600					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 65 dB					
重量 Weight $\pm 2\%$		Kg	3.76					

MODEL : FA100

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



FA100



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		70	51	90	M6	92	133	207
2	19	80	51	100	M6	92	133	207
3	?	95	51	115	M6	110	133	207
4	24	95	51	115	M8	110	133	207
5		110	51	145	M8	130	133	207
6		110	65.5	145	M8	130	147.5	221.5

FA100-2 特性表

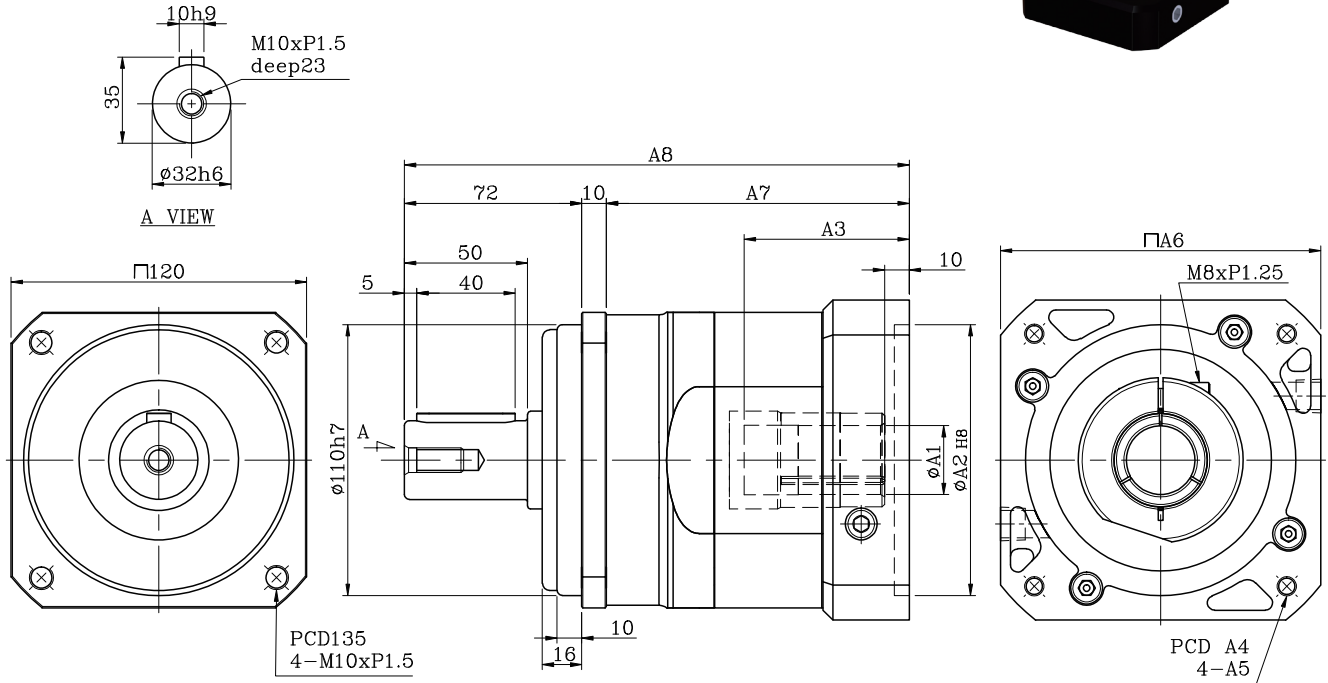
減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	165	146	160	165	149	146	160	149	141
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	297	263	288	297	268	263	288	268	254
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	14								
容許徑向力 Max. Radial Force	F_{2rB}	N	3,200								
容許軸向力 Max. Axial Force	F_{2aB}	N	1,600								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 67 dB								
重量 Weight ±2%		Kg	5.92								

MODEL : FA120

RATIO : 5.7.10 (單段 1-Stage)



FA120



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		95	67	115	M6	122	123	205
2	24	95	67	115	M8	122	123	205
3	28	110	67	145	M8	130	123	205
4	32	110	77	145	M8	130	133	215
5		130	67	165	M10	150	123	205

FA120-1 特性表

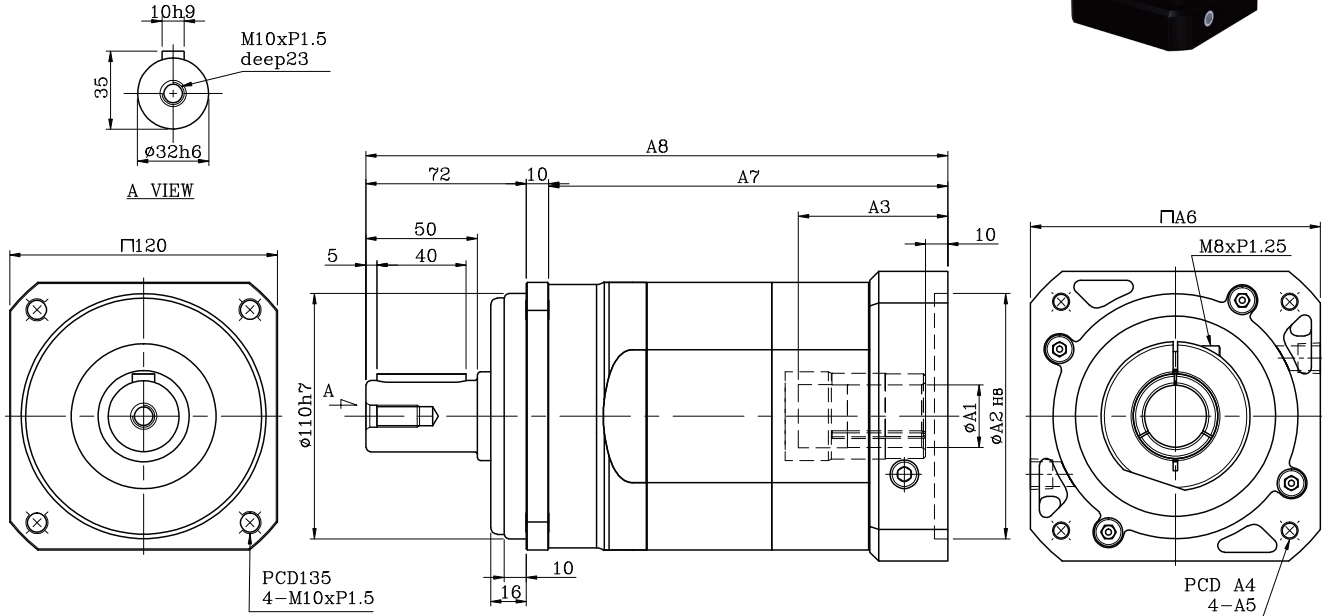
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	286	255	264	245	234	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	515	459	475	441	421	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	3.21	2.64	2.64	2.62	2.51	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	23					
容許徑向力 Max. Radial Force	F_{2rB}	N	5,220					
容許軸向力 Max. Axial Force	F_{2aB}	N	2,600					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 67 dB					
重量 Weight $\pm 2\%$		Kg	7.43					

MODEL : FA120

RATIO : 25.35.50.70.100 (雙段 2-Stage)



FA120



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

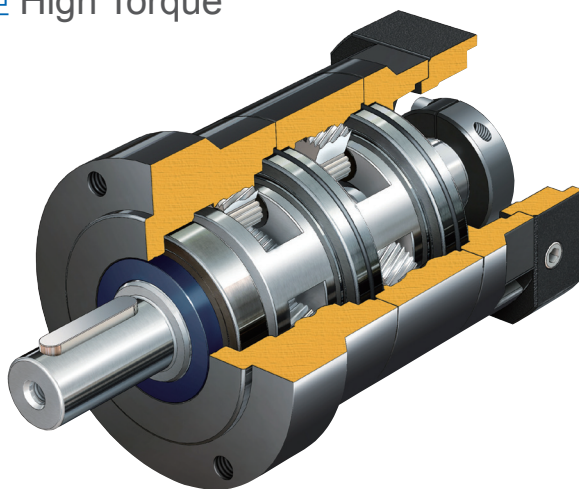
NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		95	67	115	M6	122	123	205
2	24	95	67	115	M8	122	123	205
3	28	110	67	145	M8	130	123	205
4	32	110	77	145	M8	130	133	215
5		130	67	165	M10	150	123	205

FA120-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	286	255	264	286	245	255	264	245	234
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	518	459	475	514	441	459	475	441	421
轉動慣量 / Mass Moments of Inertia		kg.cm ²	2.64	2.64	2.64	2.64	2.64	2.64	0.51	0.51	0.51
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	23								
容許徑向力 Max. Radial Force	F_{2rB}	N	5,220								
容許軸向力 Max. Axial Force	F_{2aB}	N	2,600								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 69 dB								
重量 Weight ±2%		Kg	10.3								

SN series

使用斜齒輪實現 Helical Gear
 高靜音 Quiet Operation
 高扭矩 High Torque



- 全系列單段背隙 ≤ 8 弧分
 1-Stage Backlash ≤ 8 arcmin
- 全系列雙段背隙 ≤ 12 弧分
 2-Stage Backlash ≤ 12 arcmin

Indication of Model Numbers

機種型號表示

SN	80	-	10	□	-	MOTOR
減速機機型 Type	型號 Model		速比 Ratio	出力軸鍵槽 Output Shaft Keyway		馬達型號 Motor Type
SN	50 60 70 80 115		單段 1-Stage 3, 4, 5, 7, 10 雙段 2-Stage 15, 20, 25, 30, 35, 40, 50, 70, 100	□ 標準品 · 有鍵槽 Standard (Keyway) N: 實心軸 · 無鍵槽 Solid Output Shaft (No Keyway)		

Features of SN Series

SN 系列產品特性

SN



螺旋齒輪設計及高精度齒輪加工

減速機構採用螺旋齒輪設計，齒形嚙合率為一般正齒輪的二倍以上，具有運轉平順、低噪音、高輸出扭矩和低背隙的特性。

材料採用高級鎳鉻鉬合金鋼 (SNCM220)，切削加工後，經滲碳熱處理至硬度 57~60HRC，再進行齒面研磨，確保齒輪精度 DIN6 級以內。

Helical Gear Design

The speed reduction mechanism employs helical gears, which provides two times meshing rate of teeth when comparing with regular spur gears. In addition, it also features extremely smooth running, low noise, high torque output and low backlash.

High Precision Gear Machining

Manufactured from high quality Ni-Cr-Mo alloy steel (SNCM220), precision achined and carburized to hardness 57-60 HRC. Precision teeth grinding assures gear accuracy reaches DIN6 class.

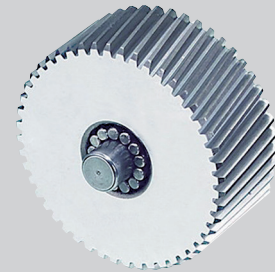


一體式行星臂架

行星臂架與輸出軸採一體式的結構設計，以確保提高扭轉剛性及精確度。

Integrated Planetary Arm Bracket

The planetary arm bracket and the output shaft are one-piece constructed to increase torsional rigidity and accuracy.



滿針滾針軸承設計

行星齒輪的傳動介面採用不含保持器之滿針滾針軸承，增加接觸面積以提高結構剛性及使用壽命。

Full Needle Roller Bearings Design

The planetary gear transmission employs full needle roller bearings without retainer to increase the contact surface, which greatly upgrades structural rigidity and service life.

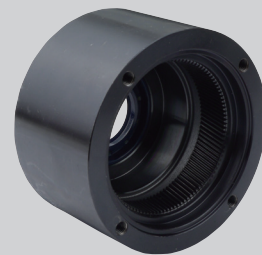


筒夾式連結機構

輸入端與馬達的連結採用筒夾式的鎖緊機構，並經動平衡分析，以確保在高輸入轉速下結合介面的同心度和平衡度，及零背隙的動力傳遞。

Collet Locking Mechanism

The input-end and the motor are coupled through a collet locking mechanism. It has passed dynamical balance analysis to assure concentricity and balance on the connection and no backlash for power transmission while running at high speed.



一體式齒輪箱本體

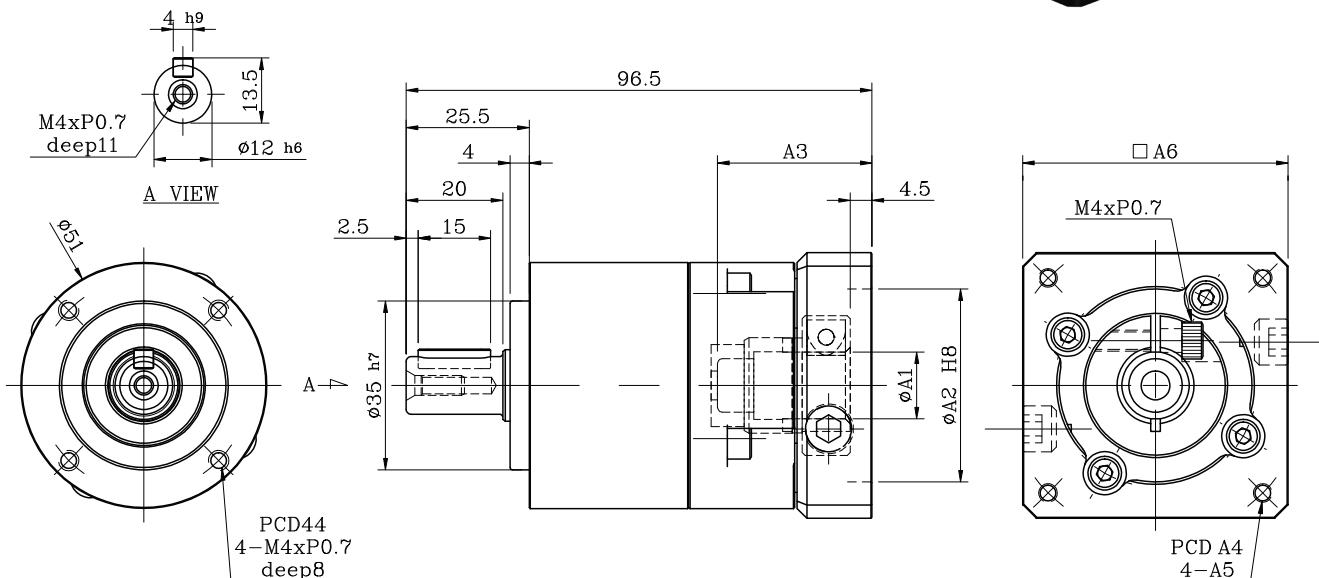
齒輪箱和內環齒輪採一體式的設計，提高結構剛性及輸出扭矩。

One-piece Gear Box & Advanced Surface Treatment

The gear box and internal ring gear are one-piece constructed.

MODEL : SN50

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6
1		30	32	45	M3	46
2	8	30	32	46	M4	46
3	?	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

SN50-1 特性表

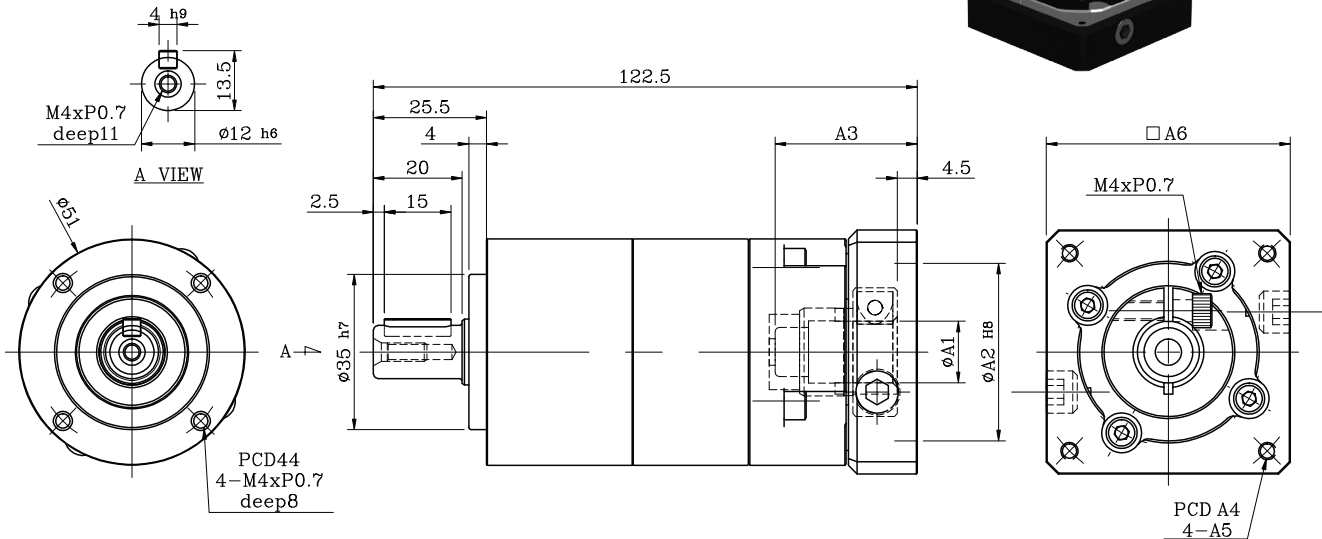
減速比 Ratio	代號	單位 Unit	3	4	5	7	10
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	17	15	14	13	12
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	31	27	25	23	22
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.03	0.03	0.03	0.03	0.03
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque				
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000				
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000				
扭轉剛性 Torsional Rigidity		Nm/arcmin	3				
容許徑向力 Max. Radial Force	F_{2rB}	N	320				
容許軸向力 Max. Axial Force	F_{2aB}	N	160				
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)				
效率 Efficiency	η	%	≥ 97%				
使用溫度 Operating Temperature		°C	-25°C ~ +90°C				
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease				
防護等級 Protection Class			IP 65				
安裝方向 Mounting Position			任意 Any				
噪音值 Noise Level		dB	≤ 58 dB				
重量 Weight ±2%		Kg	0.73				

MODEL : SN50

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



SN50



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

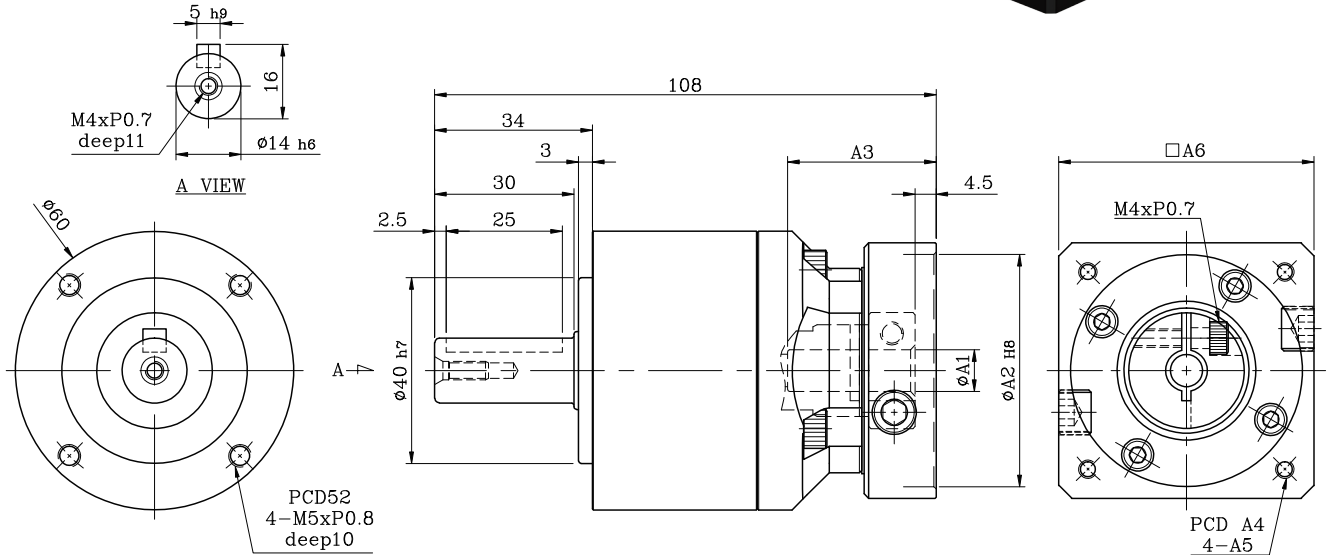
NO.	ØA1	ØA2	A3	A4	A5	A6
1		30	32	45	M3	46
2	8	30	32	46	M4	46
3	?	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

SN50-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	17	15	14	13	13	12	14	13	12
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	31	27	25	23	23	22	25	23	22
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	3								
容許徑向力 Max. Radial Force	F_{2rB}	N	320								
容許軸向力 Max. Axial Force	F_{2aB}	N	160								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 60 dB								
重量 Weight ±2%		Kg	1.05								

MODEL : SN60

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6
1		30	32	45	M3	46
2	11	30	32	46	M4	46
3	1	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

SN60-1 特性表

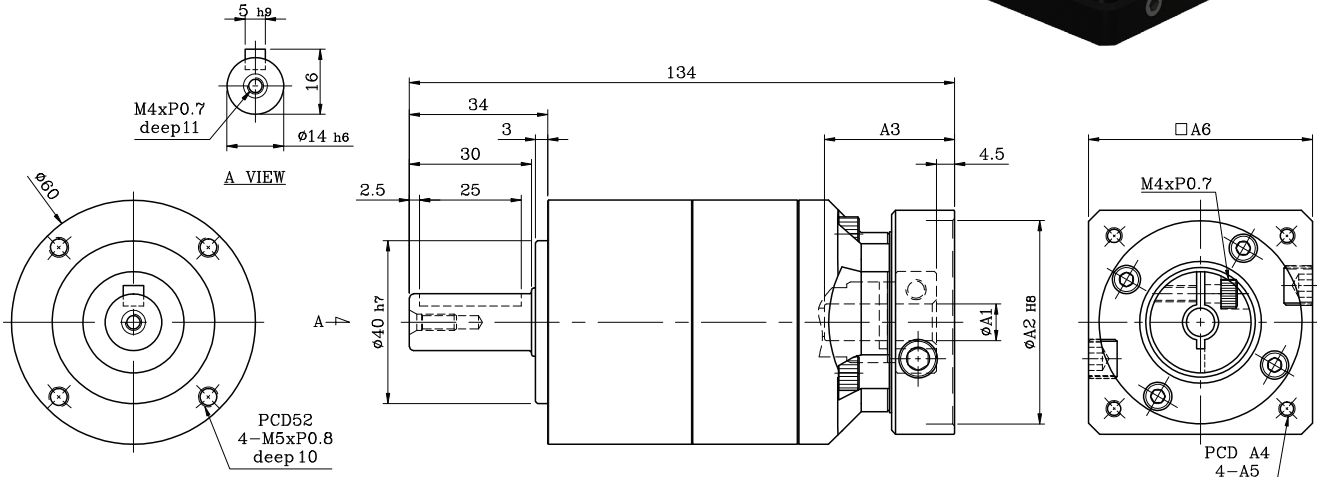
減速比 Ratio	代號	單位 Unit	3	4	5	7	10
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	28	38	40	35	25
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	50	68	72	63	45
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.06	0.06	0.06	0.06	0.06
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque				
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000				
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000				
扭轉剛性 Torsional Rigidity		Nm/arcmin	4				
容許徑向力 Max. Radial Force	F_{2rB}	N	460				
容許軸向力 Max. Axial Force	F_{2aB}	N	230				
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)				
效率 Efficiency	η	%	≥ 97%				
使用溫度 Operating Temperature		°C	-25°C ~ +90°C				
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease				
防護等級 Protection Class			IP 65				
安裝方向 Mounting Position			任意 Any				
噪音值 Noise Level		dB	≤ 58 dB				
重量 Weight ±2%		Kg	0.99				

MODEL : SN60

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



SN60



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

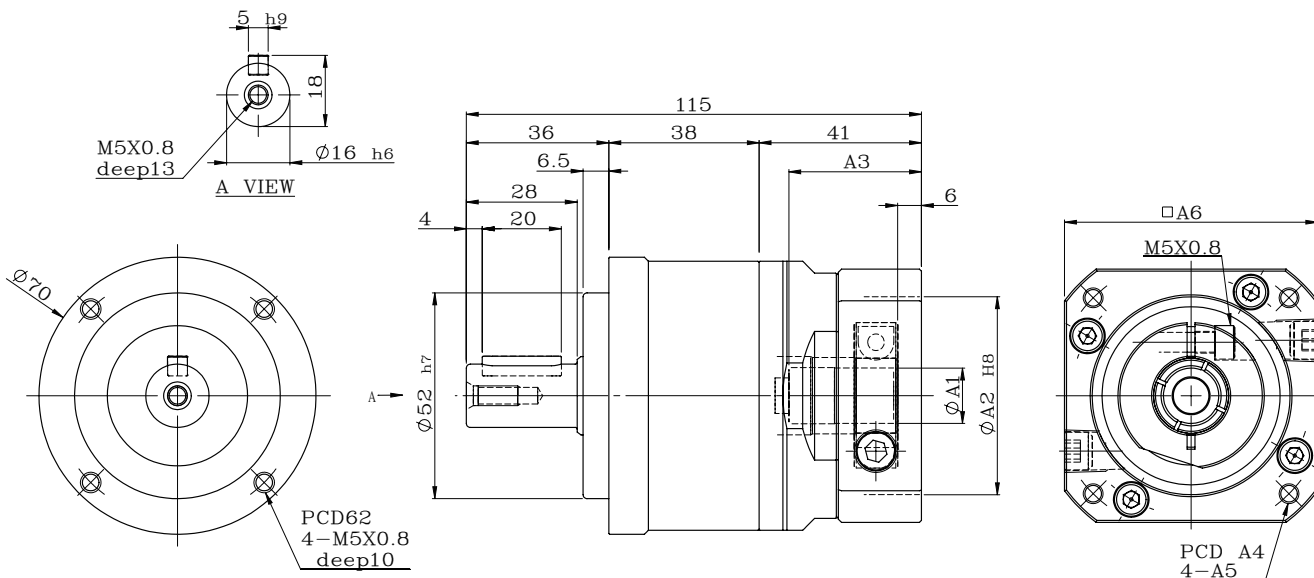
NO.	ØA1	ØA2	A3	A4	A5	A6
1		30	32	45	M3	46
2	11	30	32	46	M4	46
3	?	30	32	48.5	M3	55
4	14	40	32	63	M5	55
5		50	32	70	M5	60

SN60-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	28	38	40	28	35	38	40	35	25
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	50	68	72	50	63	68	72	63	45
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	4								
容許徑向力 Max. Radial Force	F_{2rB}	N	460								
容許軸向力 Max. Axial Force	F_{2aB}	N	230								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 60 dB								
重量 Weight ±2%		Kg	1.46								

MODEL : SN70

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6
1	14	50	33.5	70	5	70
2	17	60	33.5	75	6	75
3	19	70	33.5	90	6	80

SN70-1 特性表

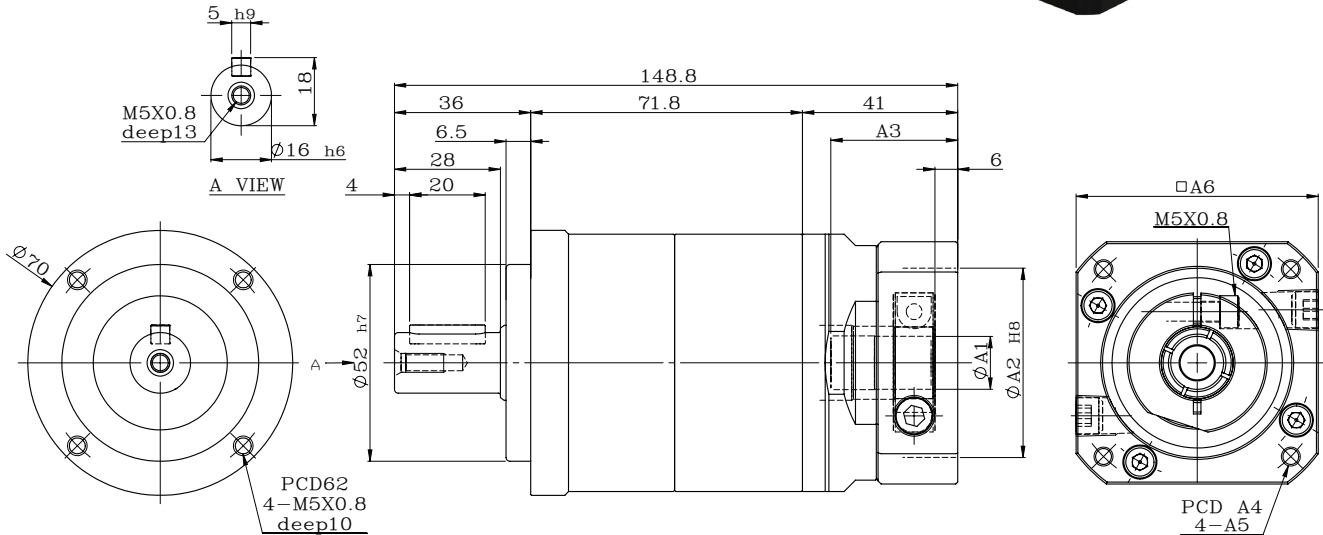
減速比 Ratio	代號	單位 Unit	3	4	5	7	10
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	54	48	45	41	40
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	97	86	81	74	72
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.15	0.15	0.13	0.13	0.13
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque				
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000				
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000				
扭轉剛性 Torsional Rigidity		Nm/arcmin	5				
容許徑向力 Max. Radial Force	F_{2rB}	N	800				
容許軸向力 Max. Axial Force	F_{2aB}	N	400				
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)				
效率 Efficiency	η	%	$\geq 97\%$				
使用溫度 Operating Temperature		°C	-25°C ~ +90°C				
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease				
防護等級 Protection Class			IP 65				
安裝方向 Mounting Position			任意 Any				
噪音值 Noise Level		dB	≤ 58 dB				
重量 Weight $\pm 2\%$		Kg	1.25				

MODEL : SN70

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



SN70



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

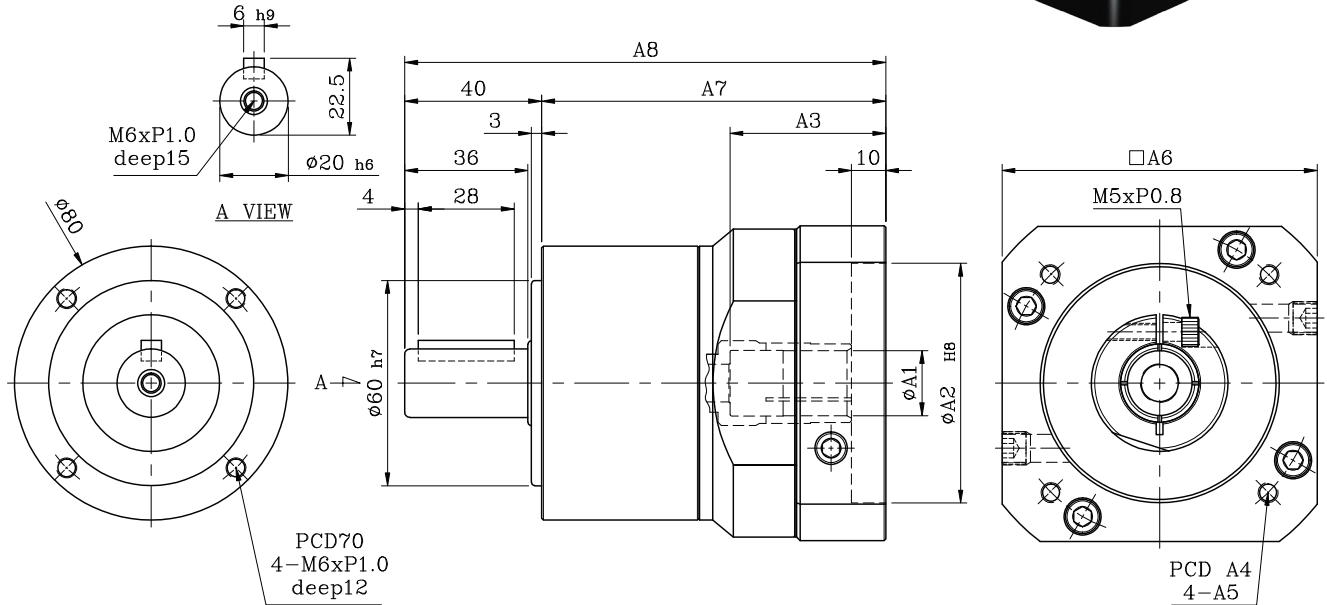
NO.	ØA1	ØA2	A3	A4	A5	A6
1	14	50	33.5	70	5	70
2	17	60	33.5	75	6	75
3	19	70	33.5	90	6	80

SN70-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	54	48	45	41	41	39	45	41	40
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	97	86	81	74	74	70	81	74	72
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	5								
容許徑向力 Max. Radial Force	F_{2rB}	N	800								
容許軸向力 Max. Axial Force	F_{2aB}	N	400								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 60 dB								
重量 Weight ±2%		Kg	1.9								

MODEL : SN80

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

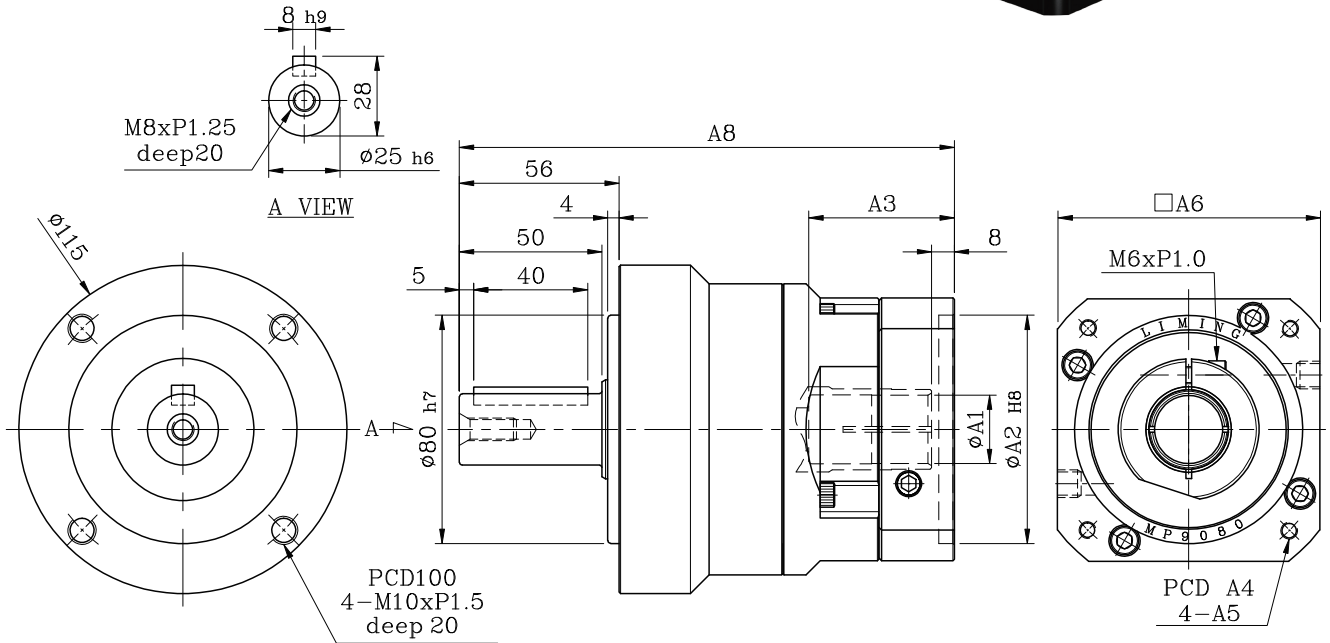
NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8
1		70	45.5	90	M6	92	100.5	140.5
2	14	80	45.5	100	M6	92	100.5	140.5
3	1	95	45.5	115	M6	110	100.5	140.5
4	19	110	45.5	145	M8	130	100.5	140.5

SN80-1 特性表

減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	112	110	108	105	100	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	202	198	194	189	180	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.48	0.38	0.38	0.38	0.35	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	12					
容許徑向力 Max. Radial Force	F_{2rB}	N	1,300					
容許軸向力 Max. Axial Force	F_{2aB}	N	660					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs)					
效率 Efficiency	η	%	≥ 97%					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 60 dB					
重量 Weight ±2%		Kg	2.1					

MODEL : SN115

RATIO : 3.4.5.7.10 (單段 1-Stage)



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	$\phi A1$	$\phi A2$	A3	A4	A5	A6	A7	A8
1		70	51	90	M6	92	60	173.5
2	19	80	51	100	M6	92	60	173.5
3	?	95	51	115	M6	110	60	173.5
4	24	95	51	115	M8	110	60	173.5
5		110	51	145	M8	130	60	173.5
6		110	65.5	145	M8	130	74.5	188

SN115-1 特性表

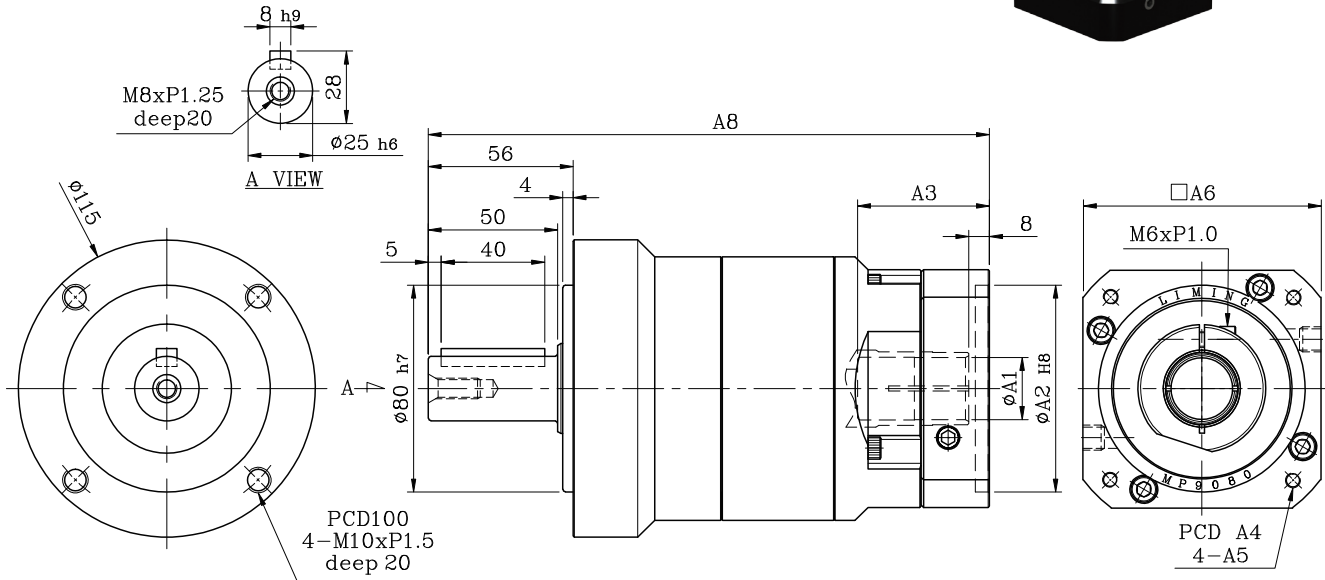
減速比 Ratio	代號	單位 Unit	3	4	5	7	10	
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	165	146	160	149	141	
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	297	263	288	268	254	
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.6	0.45	0.45	0.45	0.41	
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque					
額定輸入轉速 Rated Input Speed	n_{IN}	rpm	3,000					
最大輸入轉速 Max. Input Speed	n_{IB}	rpm	5,000					
扭轉剛性 Torsional Rigidity		Nm/arcmin	14					
容許徑向力 Max. Radial Force	F_{2rB}	N	3,200					
容許軸向力 Max. Axial Force	F_{2aB}	N	1,600					
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)					
效率 Efficiency	η	%	$\geq 97\%$					
使用溫度 Operating Temperature		°C	-25°C ~ +90°C					
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease					
防護等級 Protection Class			IP 65					
安裝方向 Mounting Position			任意 Any					
噪音值 Noise Level		dB	≤ 65 dB					
重量 Weight $\pm 2\%$		Kg	4.98					

MODEL : SN115

RATIO : 15.20.25.30.35.40.50.70.100 (雙段 2-Stage)



SN115



入力法蘭尺寸表 Dimension of Input Flange

unit:mm

NO.	ØA1	ØA2	A3	A4	A5	A6	A7	A8	
1	19	70	51	90	M6	92	103.5	217	
2		80	51	100	M6	92	103.5	217	
3		95	51	115	M6	110	103.5	217	
4		24	95	51	115	M8	110	103.5	217
5		110	51	145	M8	130	103.5	217	
6		110	65.5	145	M8	130	118	231.5	

SN115-2 特性表

減速比 Ratio	代號	單位 Unit	15	20	25	30	35	40	50	70	100
額定輸出扭矩 Rated Output Torque (Nominal Output Torque)	T_{2N}	Nm	165	146	160	165	149	146	160	149	141
最大加速扭矩 / Max. Acceleration Torque	T_{2B}	Nm	297	263	288	297	268	263	288	268	254
轉動慣量 / Mass Moments of Inertia		kg.cm ²	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
最大輸出扭矩 Max. Output Torque 急停扭矩 / Emergency Stop Torque	T_{2NOT}	Nm	3 倍額定輸出扭矩 3 Times of Rated Output Torque								
額定輸入轉速 Rated Input Speed	n_{1N}	rpm	3,000								
最大輸入轉速 Max. Input Speed	n_{1B}	rpm	5,000								
扭轉剛性 Torsional Rigidity		Nm/arcmin	14								
容許徑向力 Max. Radial Force	F_{2rB}	N	3,200								
容許軸向力 Max. Axial Force	F_{2aB}	N	1,600								
使用壽命 Service Life	L_H	hr	S5 周期運轉 : >20,000 (S1 連續運轉 : >10,000 hrs) S5 Cycle Operation: >20,000 (S1 Continuous Operation: >10,000 hrs)								
效率 Efficiency	η	%	≥ 95%								
使用溫度 Operating Temperature		°C	-25°C ~ +90°C								
潤滑 Lubrication			全合成潤滑油脂 Synthetic Grease								
防護等級 Protection Class			IP 65								
安裝方向 Mounting Position			任意 Any								
噪音值 Noise Level		dB	≤ 67 dB								
重量 Weight ±2%		Kg	6.92								

Selection Table of Motor for Reference

馬達選用參考表

型號 Model	PB	44	62	90	120	142	180	220
	FA	50	70, 80, 90	100	120			
	SN	50, 60	70, 80	115				
	FB	50	70	90	120	145	180	220
容量 Power	Input Bore 入力孔徑	8、9、11	14、16、19	19、24	24、28、32	35、38	38、42、48	42、48、55
100w	●		●					
200w			●					
400w			●	●				
750w				●	●			
1kw				●	●			
1.5kw				●	●	●		
2.2kw					●	●		
3.75kw					●	●	●	
5.5kw						●	●	●
7.5kw							●	●
11kw								●
15kw								●
22kw								●

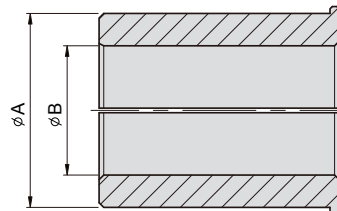
※ 以上表格僅供參考，選用時仍須以『額定輸出扭矩』為依據。

The table is for reference. The selected model shall be based on rated output torque.

BUSHING

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。



連接軸_孔徑 軸套_孔徑	8	11	14	19	22	24	28	35	38	42	48
6	●		●								
6.35	●		●								
8		●	●								
9		●	●								
10			●	●							
11			●								
12			●	●							
12.7				●							
14				●		●					
16				●		●					
19					●	●	●				
22						●	●	●			
24							●	●			
25							●				
25.4								●			
28								●		●	
32								●			
35									●	●	
38									●	●	
42											●

Collet Screw & Set Collar Torque Table

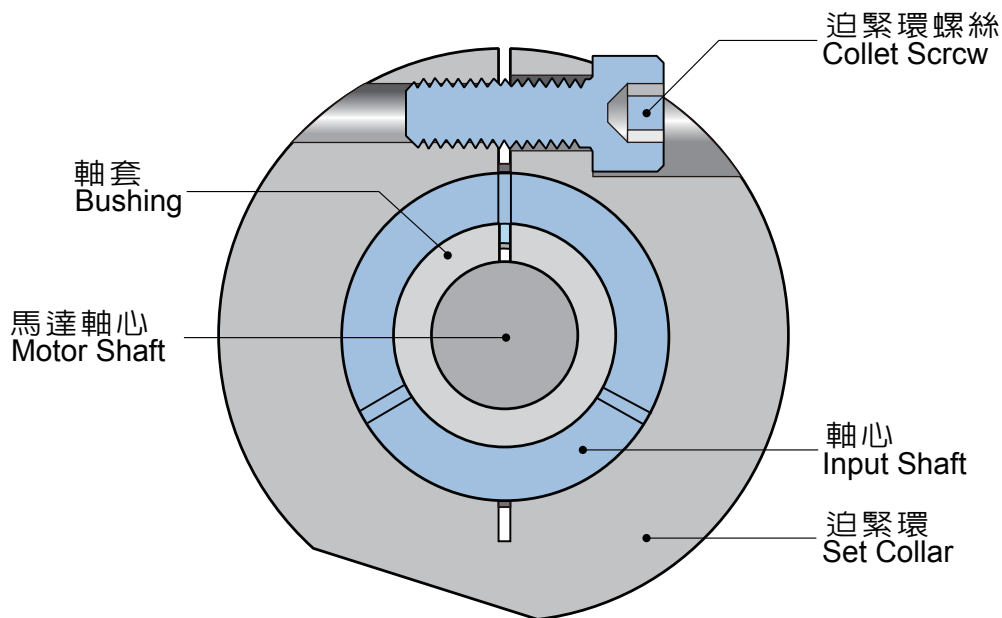
迫緊螺絲及迫緊環扭矩表

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
PB	FA	SN	FB					
44	50	50 60	50	M3 x P0.5	12.9	2.2	58	
62	70 80 90	70 80	70	M5 x P0.8	12.9	10	164	
90	100	115	90	M6 x P1.0	12.9	16.3	233	
120	120		120	M8 x P1.25	12.9	41	423	
142			145	M10 x P1.5	12.9	81	678	
180			180	M10 x P1.5	12.9	81	678	●
220			220	M10 x P1.5	12.9	81	678	●

※ 馬達扭矩超過迫緊扭矩時，可能導致打滑。

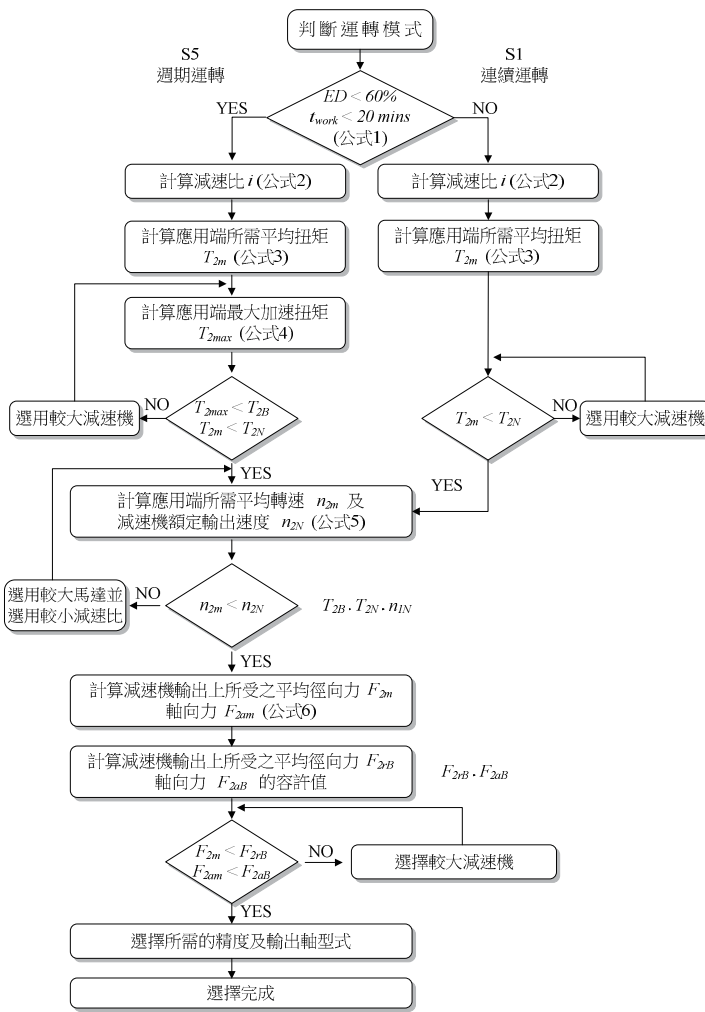
It will cause slip when motor torque exceeds clench torque.

孔徑 Input Bore	Ø38	Ø42	Ø48	Ø55
鍵 Key	10 x 8	12 x 8	14 x 9	16 x 10



減速機的選用

如何選用減速機



S5 週期運轉之建議事項

一般的應用慣量須符合以下公式：

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

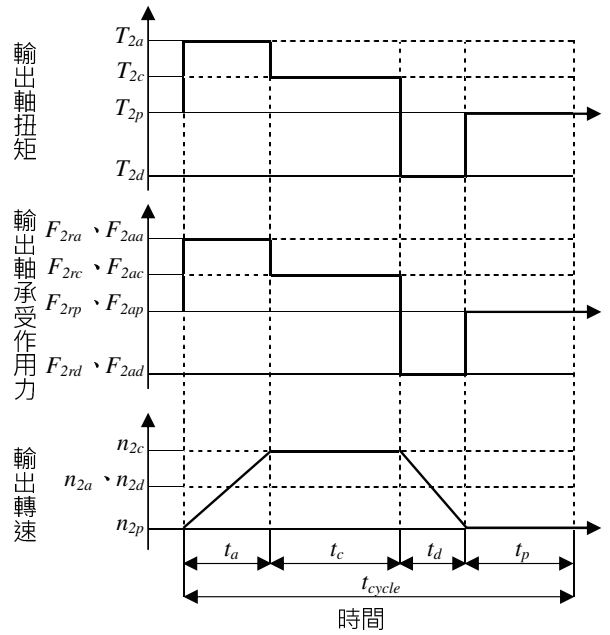
最適當的應用慣量須符合以下公式：

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

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. $ED = \frac{t_a + t_c + t_d}{t_{cycle}}, t_{work} = t_a + t_c + t_d$
 t_a 加速, t_c 等速, t_d 減速, t_p 停止

公式 2. $i \cong \frac{n_m}{n_{work}}$
 n_m 馬達輸出速度, n_{work} 實際應用速度

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

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

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

T_{mB} 馬達最大輸出扭矩, η 減速機運轉效率

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

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

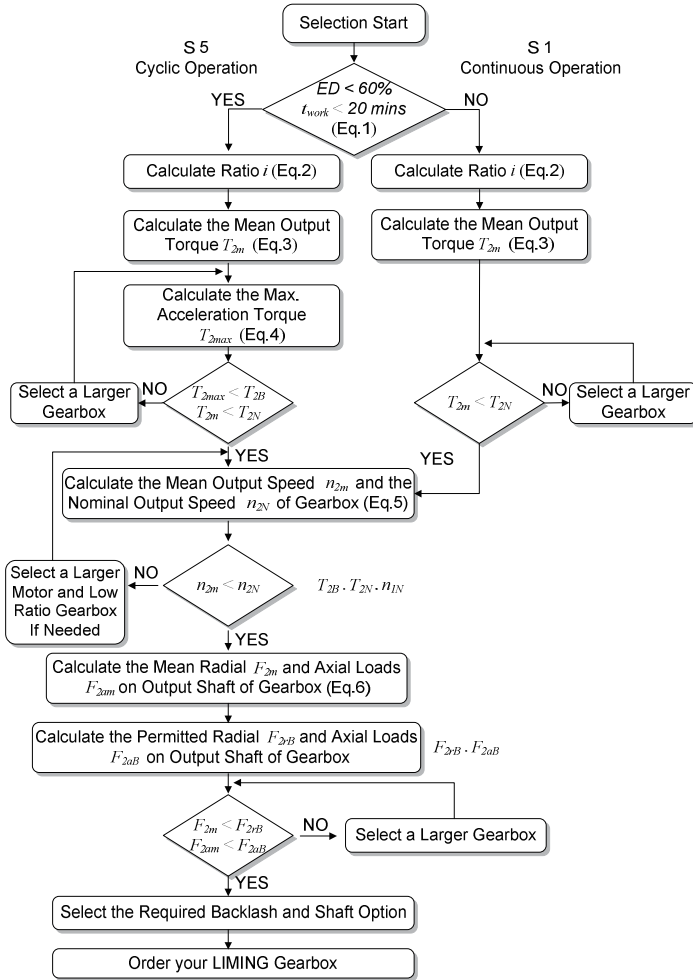
$$n_{2N} = \frac{n_{1N}}{i}$$

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

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

GEARBOX SELECTION

How to Select a Gearbox



Recommended (for S5 Cyclic Operation)

The general design is given for

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

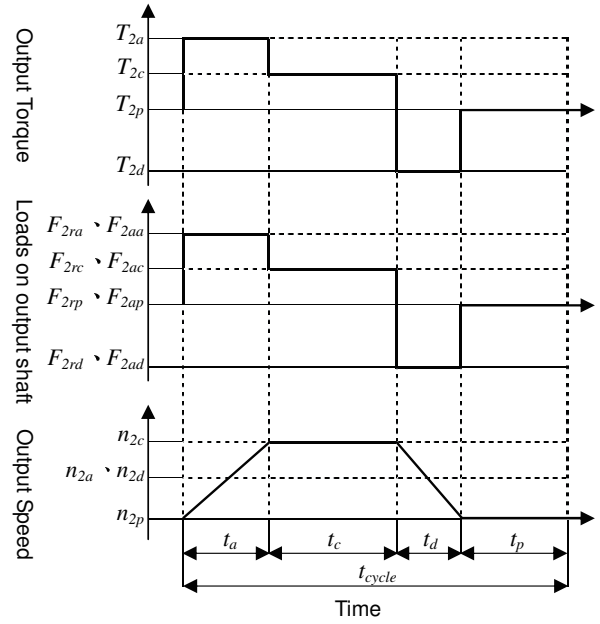
The optimal design is given for

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

J_L Load Inertia · J_m Motor Inertia

T_{2m} : Reference catalog 「Rated Output Torque」

F_{2rB} : Reference catalog 「Max. Radial Force」



$$\text{Eq.1} \quad ED = \frac{t_a + t_c + t_d}{t_{\text{cycle}}}, t_{\text{work}} = t_a + t_c + t_d$$

t_a Acceleration, t_c Constant, t_d Deceleration, t_p Pause

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

n_m Output Speed of the Motor, n_{work} Working Speed

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

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

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

T_{mB} Max. Output Torque of the Motor

η Efficiency of the Gearbox

$$\text{公式 5.} \quad n_{2a} = n_{2d} = \frac{1}{2} \cdot n_{2c}$$

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

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

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

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

減速機專用名詞解釋 Glossary

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 $n_1=3000\text{RPM}$ ·輸入扭矩 $T_1=20\text{Nm}$ ·減速比為 10·或稱 $i=10$ ·

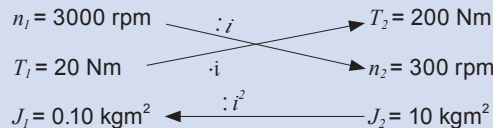
輸出端轉速 $n_2 = \text{輸入轉速 } n_1 / i = 300\text{RPM}$ ·

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

輸出端慣量 $J_2 = \text{輸入端慣量 } J_1 \cdot i^2$

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: $i = 10$).



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。

Output Speed (n_2) [rpm]

The output speed is calculated by the formula related to input speed n_1 and reduction ratio i .

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

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 25° 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 25° C. If the environment temperature is higher or the temperature of gearbox surface exceeds 90° C, please lower input speed (n_1).

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 25° 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 25° C. If the environment temperature is higher or the temperature of gearbox surface exceeds 90° C, please lower input speed (n_1).

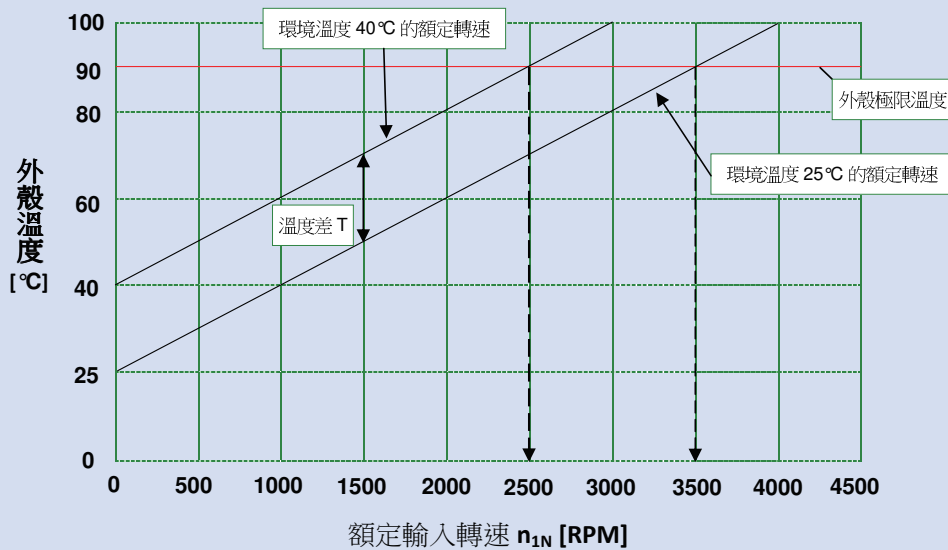
減速機專用名詞解釋 Glossary

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_{IB} 。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_{IN} 。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_{IB} must not be exceeded because it serves as the basis at cyclic operation. The nominal speed n_{IN} 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 25°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 <8ArcMin, 額定轉矩輸出

- 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。

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 requests greater back driving torque.

減速機專用名詞解釋 Glossary

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).

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 $T_{2NOT} = 3 \cdot T_{2B}$; 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)

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 cycle $< 1000/h$ 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.

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 guarantee 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 Standards)

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

減速機專用名詞解釋 Glossary

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]

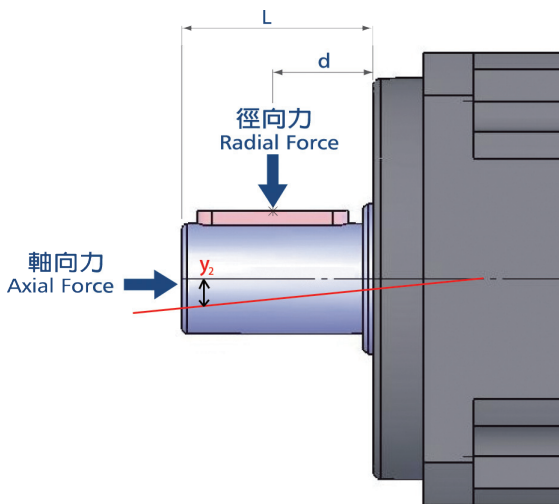
The axial force F_{2A} acting on a gearbox runs parallel to its output shaft. The force runs perpendicular to its output shaft. It may be applied with axial offset via a lever arm y_2 under certain circumstances, in which case it also generates a bending moment. If the axial force exceeds the permissible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

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

T = 機構端扭力
 s = 負荷系數
 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 :

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

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 , $p=1.5$

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。

負荷系數表 (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.

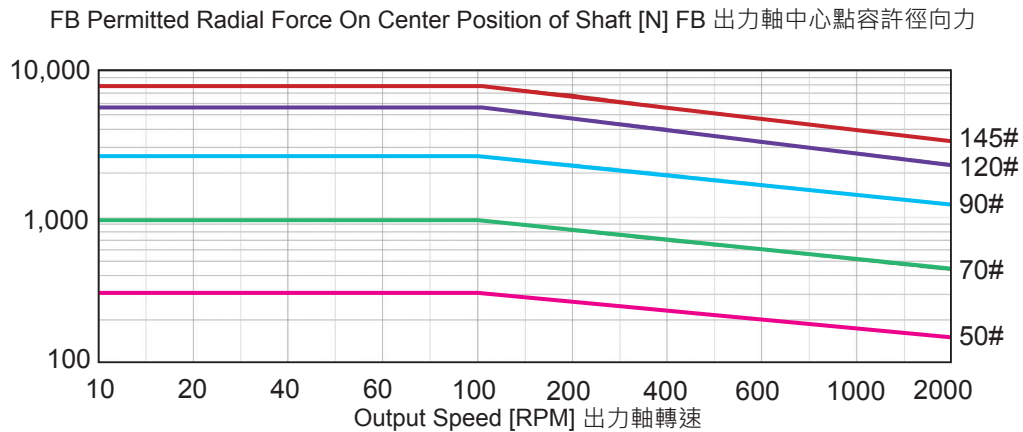
減速機專用名詞解釋 Glossary

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.



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%.

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

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.cm²]

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.cm²]

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).

減速機專用名詞解釋 Glossary

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 $\lambda < 5$ is maintained. A gearbox reduces the external mass moment of inertia by a factor of $1/i^2$.

Simple applications ≤ 10

Dynamic applications ≤ 5

Highlydynamic applications ≤ 1

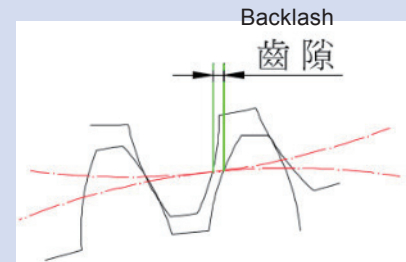
$$\lambda = \frac{J_{\text{負載慣量}} \cdot \frac{1}{i^2}}{J_{\text{電機+減速機}}}$$

回程間隙 j_i [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_i) [arcmin]

Torsional backlash j_i 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.



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 $1/60^\circ$ 。

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 $b = 0.44\text{mm}$ 。

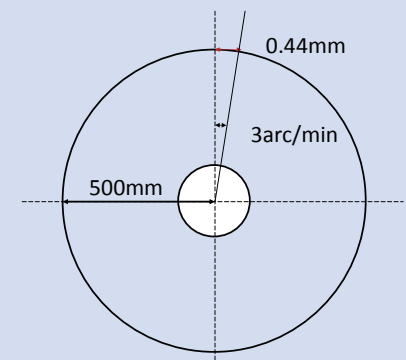
$$b = \frac{2 \cdot \pi \cdot r \cdot j_t}{21600}$$

Angular minute [Arcmin]

A degree is subdivided into 60 angular minutes ($= 60 \text{ arcmin} = 60'$). In other words, if the torsional backlash is specified as 1 arcmin, for example, the output can be turned $1/60^\circ$. The repercussions for the actual application are determined by the arc length.

EX: A pinion with a radius $r = 500 \text{ mm}$ on a gearhead with standard torsional backlash $j_t = 3'$ can be turned $b = 0.44 \text{ mm}$.

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



減速機專用名詞解釋 Glossary

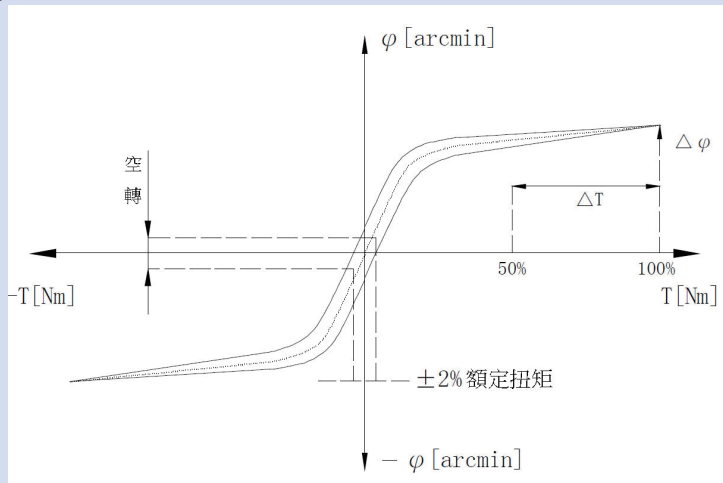
遲滯曲線

遲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，用儀器記錄下扭矩的仿差角，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_r) 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.

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



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.

減速機專用名詞解釋 Glossary

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.

工作週期 (ED)

$$t_{work} = t_{\text{加速}} + t_{\text{勻速}} + t_{\text{減速}} = t_a + t_c + t_d$$

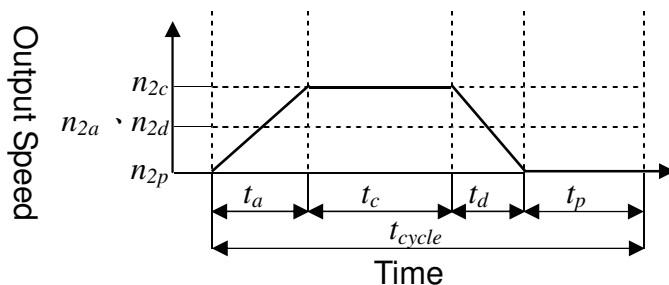
$$t_{cycle} = t_{\text{加速}} + t_{\text{勻速}} + t_{\text{減速}} + t_{\text{暫停}} = t_a + t_c + t_d + t_p$$

$$ED[\%] = t_{work} / t_{cycle} \times 100\%$$

$$ED[\text{min}] = t_{work}$$

Duty cycle (ED)

The duty cycle ED is determined by one cycle. The times for acceleration (t_a), 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_p .



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

t_a Acceleration, t_c Constant,

t_d Deceleration, t_p Pause

減速機專用名詞解釋 Glossary

防護等級 (IP)

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 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.

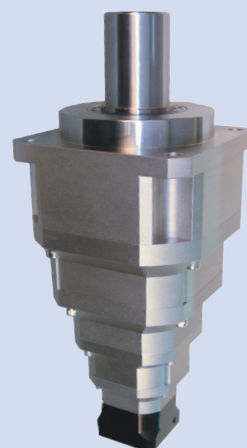
固體物件防護 Protection against contact and against solid foreign objects.		液體防護 Protection against ingress of water.	
第一位數 1st numeral	說明 Description	第二位數 2nd numeral	說明 Description
0	無防護 Non-protected	0	無防護 Non-protected
1	可阻擋大於 50mm 的物體 Protected against solid foreign objects of >50mm ϕ	1	可阻擋垂直落下的液體 Protected against vertically falling water drops
2	可阻擋大於 12.5mm 的物體 Protected against solid foreign objects of >12.5mm ϕ	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 ϕ	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 ϕ	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

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 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. Li Ming'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.



減速機專用名詞解釋 Glossary

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 $-25^{\circ}\text{C} \sim +90^{\circ}\text{C}$ 度環境下工作。

Operating Temperature

The Operating Temperature indicates the allowable temperature of gearbox at continuous and cyclic operation. SERVOBOX series work in $-25^{\circ}\text{C} \sim +90^{\circ}\text{C}$.

潤滑

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

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.

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.

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.

LIMING REDUCERS

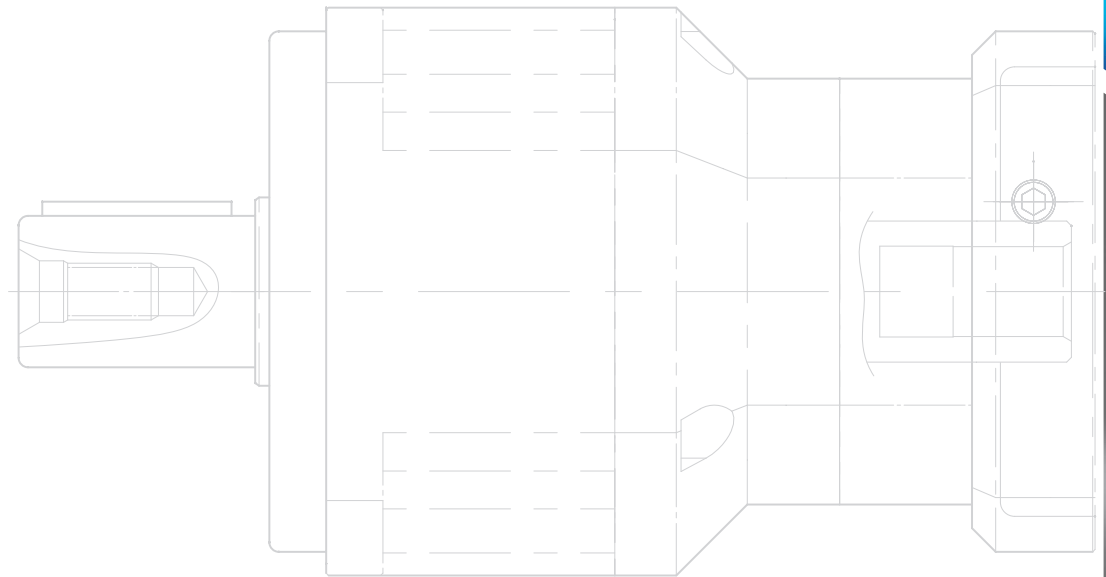
利明牌減速機系列產品

伺服用減速機



一般傳動減速機





2014 年 3 月版

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March, 2014

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