



# MF-X 系列

標準背隙、經濟型減速機

Standard Backlash, Economy Planetary Gearbox

- 一段背隙：6-8 弧分
- 減數比：3-1000
- 一段負載時效率達 98%
- 1 Stage-Minimal backlash: 6-8 arc-min
- Ratio: 3-1000
- 1 Stage-High efficiency: 98%

# 產品結構特點

## COMPONENT CHARACTERISTICS

### 行星齒

選用鎳鉻鉬合金鋼，齒面經滲碳熱處理，耐磨性高及耐高衝擊，齒型精修處理，能提升齒輪精度及降低噪音，內孔使用滿針滾針軸，具高耐磨與高強度。

### Planetary Gear

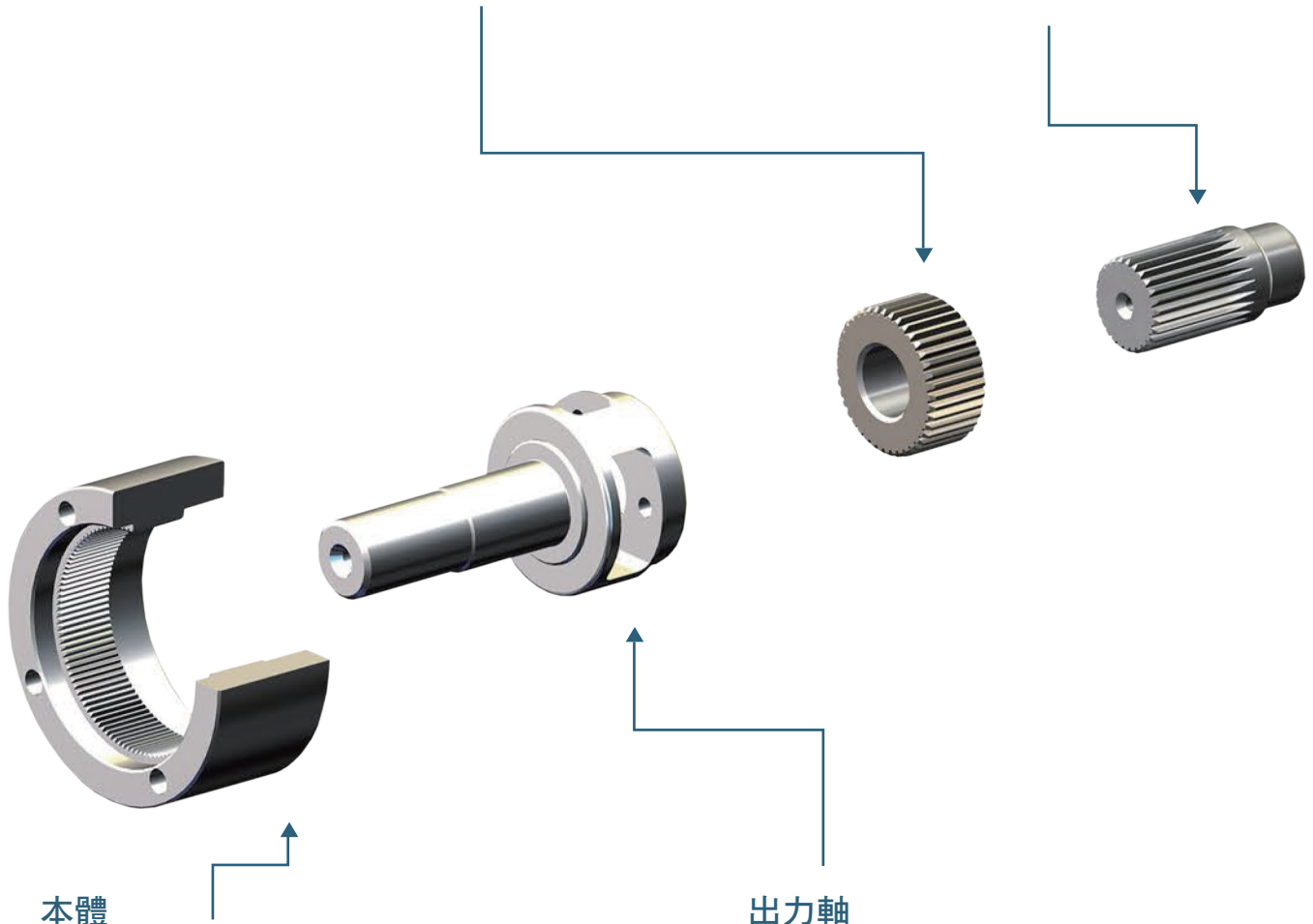
Nickel chromium molybdenum alloy steel gear is manufactured with carburizing heat treatment for high abrasion resistance and impact toughness and by honing process to increase gear precision and low noise operation. Internal gear bore uses needle roller to obtain higher abrasion resistance and strength.

### 太陽齒

選用鎳鉻鉬合金鋼，齒面經滲碳熱處理，耐磨性高及耐高衝擊。齒型精修處理，能提升齒輪精度及降低噪音。

### Sun Gear

Nickel chromium molybdenum alloy steel gear is manufactured with carburizing heat treatment for high abrasion resistance and impact toughness and by honing process to increase gear precision and low noise operation



### 本體

採用鉻鉬合金鋼及一體成型設計，精密度高及輸出扭矩大，表面處理採電鍍化學鎳，具有高抗蝕效果。

### Ring Gear

With Cr-Mo alloy steel and one-piece construction for internal gear to deliver high precision and large output torque. Gearbox surface is coated with nickel electroplating for high resistance to corrosion.

### 出力軸

使用鉻鉬合金鋼，採一體成型設計確保大扭力輸出之結構剛性，表面用無電解鎳處理，具備高防鏽蝕的功能

### Output Shaft

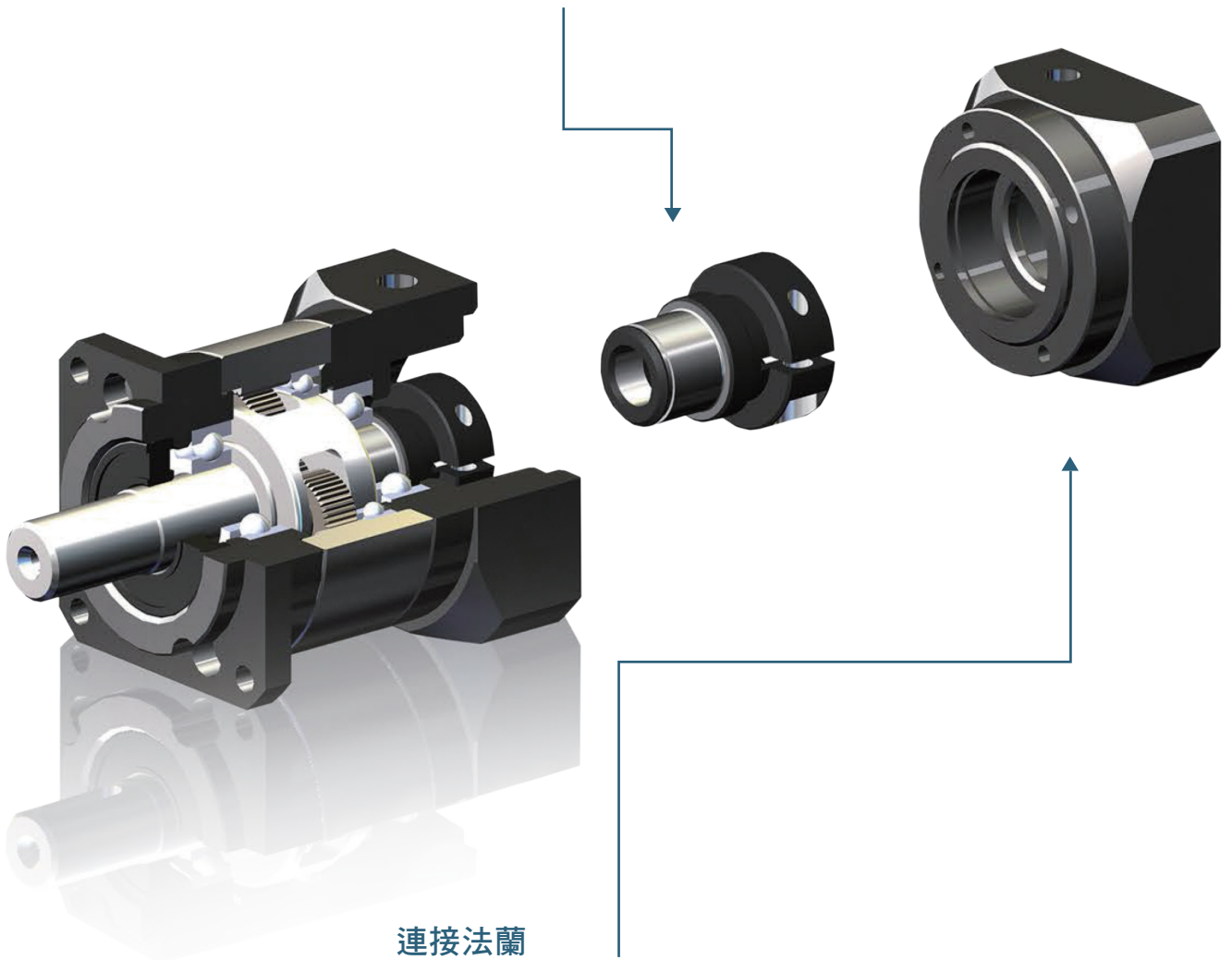
Cr-Mo alloy steel shaft with one-piece design and structural rigidity to ensure large torque output. Surface coated with electroless nickel plating for high resistance to corrosion.

## 入力軸

採用模組化設計，能搭配各廠牌，伺服馬達出力軸，表面染黑處理。

## Input Shaft

Modularized design can be used for various dimensions of servo motors. Shaft surface is coated with black oxide finishing.



## 連接法蘭

採用模組化設計，適合各式伺服馬達組裝，表面採用噴砂陽極技術處理，提高防氧化效果。

## Connecting Flange

Modularized design can be used for various dimensions of servo motors. Sandblasting and Anodizing painting on surface to improve the anti-corrosion capacity.

# 機型代碼

## MF-X SERIES ORDERING CODE



### MF40X - L1 - 10 - K - Motor

型號 Model
MF40X
MF60X
MF90X
MF120X
MF150X
MF180X
MF220X

段數 Stage
L1: (Ratio 3-10)
L2: (Ratio 15-100)
L3: (Ratio 120-1000)

馬達 Motor
馬達廠牌、型號 Motor Brand & Model

減速比 Ratio
請參閱目錄第 18 頁，減速比組成表。 Please refer to page 18 "Ratio Composition Table".

出力軸 Output shaft	
K:	軸帶鍵 With Key
S:	光軸 Without Key

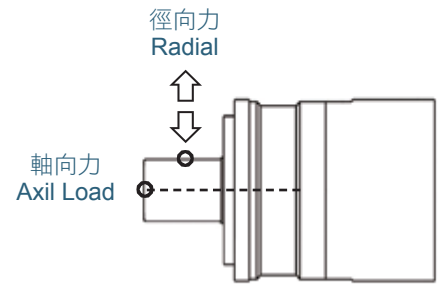
容許徑向力：垂直於軸心的力量

容許軸向力：平行於軸心的力量

容許徑和容許軸向力與減速機的出力軸轉速及施力點的距離相關。

轉速越快，容許徑向力會降低。

負載的距離越遠，容許的徑向力也隨之降低。



\* Permitted Radial Load :The force exerts perpendicular to output shaft

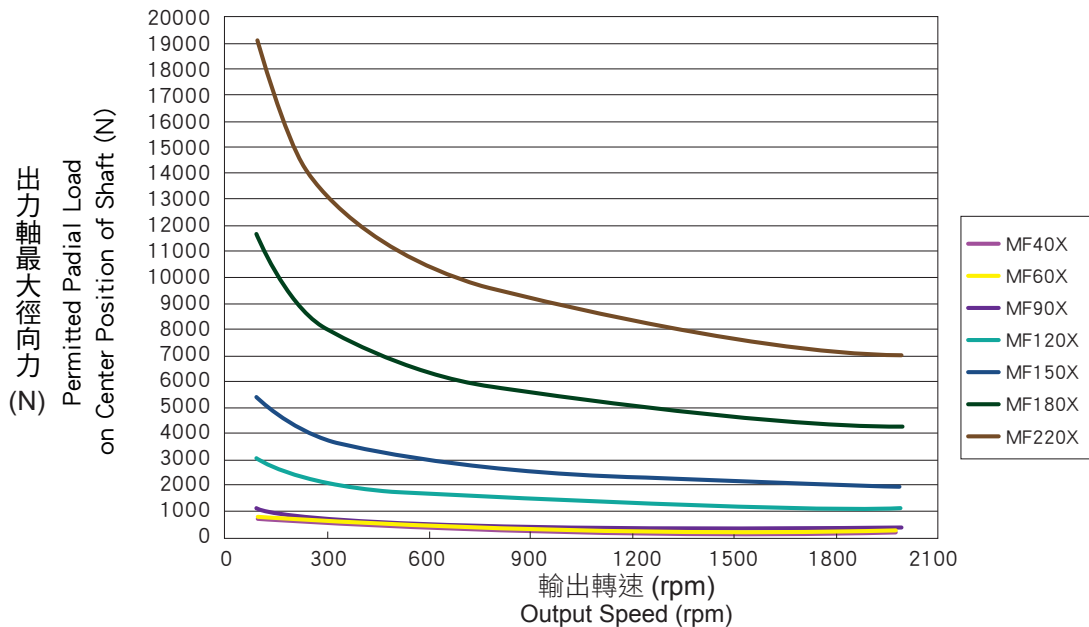
\* Permitted Axil Load :The force exerts parallel to output shaft

The radial & axial loads are related to the speed and application point on output shaft.

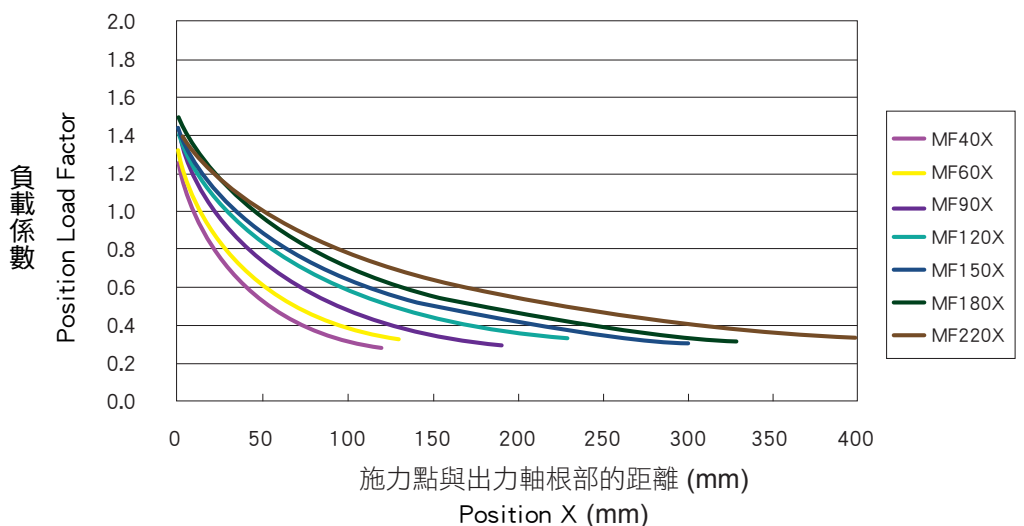
The radial & axial loads are decreased when the output shaft runs faster.

The radial & axial loads are decreased when the application points away from root segment of shaft.

徑向負荷表  
Radial Load Chart (MF-X)



負載係數表  
Load Factor Chart (MF-X)



# 馬達功率、減速比選用

## SELECTION REFERENCE TABLE & RATIO SELECTION TABLE

		MF-X 系列減速機選用參考表 (依據伺服馬達輸出功率選擇) MF-X Series Selection Reference (Based on The Motor Output Torque)																
馬達功率 Motor Output Power	減速機型號 Model	比數 Ratio																
		1/3	1/4	1/5	1/6	1/7	1/8	1/10	1/15	1/20	1/25	1/30	1/35	1/40	1/50	1/60	1/70	1/100
50W	MF40X	●	●	●	●	●	●	●	●	●	●	●	●	●				
100W	MF40X	●	●	●	●	●	●	●	●	●	●	●	●	●				
	MF60X	●	●	●		●		●	●	●	●	●	●	●	●		●	●
200W	MF60X	●	●	●		●		●	●	●	●	●	●	●	●			
	MF90X	●	●	●		●		●	●	●	●	●	●	●	●		●	●
400W	MF60X	●	●	●		●		●	●	●	●	●	●	●				
	MF90X	●	●	●		●		●	●	●	●	●	●	●	●		●	
500W	MF90X	●	●	●		●		●	●	●	●	●	●	●				
	MF120X	●	●	●		●		●	●	●	●	●	●	●	●		●	●
750W	MF90X	●	●	●		●		●	●	●	●							
	MF120X	●	●	●		●		●	●	●	●	●	●	●	●			
1.0KW	MF120X	●	●	●		●		●	●	●	●	●	●	●	●			
	MF150X	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
1.5KW	MF120X	●	●	●		●		●	●	●	●	●	●	●				
	MF150X	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●
2.0KW	MF150X	●	●	●	●	●		●	●	●	●	●	●	●	●			
	MF180X	●	●	●		●		●	●	●	●	●	●	●	●		●	●
3.5KW	MF150X	●	●	●	●	●		●	●	●	●	●						
	MF180X	●	●	●		●		●	●	●	●	●	●	●	●			
5.0KW	MF150X	●	●	●	●	●		●	●	●								
	MF180X	●	●	●		●		●	●	●	●	●	●	●				
7.0KW	MF180X	●	●	●		●		●	●	●								
	MF220X		●	●		●		●		●	●	●						
11.0KW	MF180X	●	●	●		●		●										
	MF220X		●	●		●		●		●								
12.0KW	MF220X		●	●		●		●										
15.0KW	MF220X		●	●		●		●										

備註：

1. 可以依馬達輸出功率選用該比數有 '●' 記號之減速機型號。
2. 當應用於扭矩或慣性矩較大之場合，必須選用較大一級減速機。
3. 上表未列出之比數，如有需要請洽詢業務工程師。

Note：

1. By the motor output power, select the suitable gearbox models with '●' mark in above table.
2. When applied to a bigger torque or torsional rigidity mechanism, we suggest using a larger size gearbox.
3. Please contact us at vgm@vgmgear.com for ratios not being listed in above table.

MF-X 系列比數組成 MF-X Series Ratio Composition Table			
減速機各段可選擇基本減速比數 Ratio Table for Each Stage			
減速機型號 Model	一段式比數 Stage (L1)	二段式比數 Stage (L2)	三段式比數 Stage (L3)
MF40X	3, 4, 5, 6, 7, 8, 10	15, 20, 25, 30, 35, 40, 50	
MF60X	3, 4, 5, 7, 10	12, 15, 16, 20, 21, 25, 28, 30, 35, 40, 50, 70, 100	120, 150, 200, 250, 300, 350, 400, 500, 700, 1000
MF90X	3, 4, 5, 7, 10	12, 15, 16, 20, 21, 25, 28, 30, 35, 40, 50, 70, 100	120, 150, 200, 250, 300, 350, 400, 500, 700, 1000
MF120X	3, 4, 5, 7, 10	12, 15, 16, 20, 21, 25, 28, 30, 35, 40, 50, 70, 100	120, 150, 200, 250, 300, 350, 400, 500, 700, 1000
MF150X	3, 4, 5, 6, 7, 10	12, 15, 16, 20, 21, 25, 28, 30, 35, 40, 50, 60, 70, 100	120, 150, 200, 250, 300, 350, 400, 500, 700, 1000
MF180X	3, 4, 5, 6, 7, 10	12, 15, 16, 20, 21, 25, 28, 30, 35, 40, 50, 60, 70, 100	120, 150, 200, 250, 300, 350, 400, 500, 700, 1000
MF220X	4, 5, 7, 10	16, 20, 25, 28, 35, 40, 50, 70, 100	

MF-X 系列轉動慣量表										
	段數	比數	MF40X	MF60X	MF90X	MF120X	MF150X	MF180X	MF220X	
轉動慣量表 kg x cm <sup>2</sup>	L1	3	0.02	0.05	0.93	2.34	10.76	26.48	—	
		4	0.01	0.05	0.93	1.95	8.89	21.51	75.08	
		5	0.01	0.05	0.9	1.88	8.55	20.6	75.91	
		6	0.01	—	—	—	8.47	20.39	—	
		7	0.01	0.05	0.88	1.83	8.42	20.26	74.73	
		8	0.01	—	—	—	—	—	—	
		9	—	—	—	—	—	—	—	
		10	0.01	0.05	0.88	1.82	8.38	20.15	74.85	
		L2	15	0.01	0.05	0.89	1.86	8.51	20.5	—
			20	0.01	0.05	0.89	1.86	8.51	20.5	75.11
	25		0.01	0.05	0.89	1.86	8.51	20.5	75.11	
	30		0.01	0.05	0.89	1.83	8.51	20.5	—	
	35		0.01	0.05	0.88	1.82	8.4	20.2	80.46	
	40		0.01	0.05	0.88	1.82	8.37	20.13	75.95	
	45		—	—	—	—	—	—	—	
	50		0.01	0.05	0.88	1.82	8.37	20.13	75.11	
	60		—	—	—	—	8.37	20.13	—	
	70		—	0.05	0.88	1.82	8.37	20.13	74.68	
	80	—	—	—	—	—	—	—		
	90	—	—	—	—	—	—	—		
100	—	0.05	0.88	1.82	8.37	20.13	74.68			

MF-X Series Reducer Moment of Inertia Table										
	Stage	Ratio	MF40X	MF60X	MF90X	MF120X	MF150X	MF180X	MF220X	
Moment of inertia Table kg x cm <sup>2</sup>	L1	3	0.02	0.05	0.93	2.34	10.76	26.48	—	
		4	0.01	0.05	0.93	1.95	8.89	21.51	75.08	
		5	0.01	0.05	0.9	1.88	8.55	20.6	75.91	
		6	0.01	—	—	—	8.47	20.39	—	
		7	0.01	0.05	0.88	1.83	8.42	20.26	74.73	
		8	0.01	—	—	—	—	—	—	
		9	—	—	—	—	—	—	—	
		10	0.01	0.05	0.88	1.82	8.38	20.15	74.85	
		L2	15	0.01	0.05	0.89	1.86	8.51	20.5	—
			20	0.01	0.05	0.89	1.86	8.51	20.5	75.11
	25		0.01	0.05	0.89	1.86	8.51	20.5	75.11	
	30		0.01	0.05	0.89	1.83	8.51	20.5	—	
	35		0.01	0.05	0.88	1.82	8.4	20.2	80.46	
	40		0.01	0.05	0.88	1.82	8.37	20.13	75.95	
	45		—	—	—	—	—	—	—	
	50		0.01	0.05	0.88	1.82	8.37	20.13	75.11	
	60		—	—	—	—	8.37	20.13	—	
	70		—	0.05	0.88	1.82	8.37	20.13	74.68	
	80	—	—	—	—	—	—	—		
	90	—	—	—	—	—	—	—		
100	—	0.05	0.88	1.82	8.37	20.13	74.68			



# 技術規格表

## TECHNICAL SPECIFICATIONS TABLE

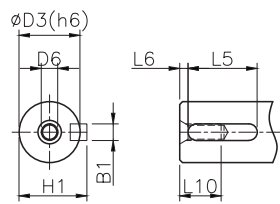
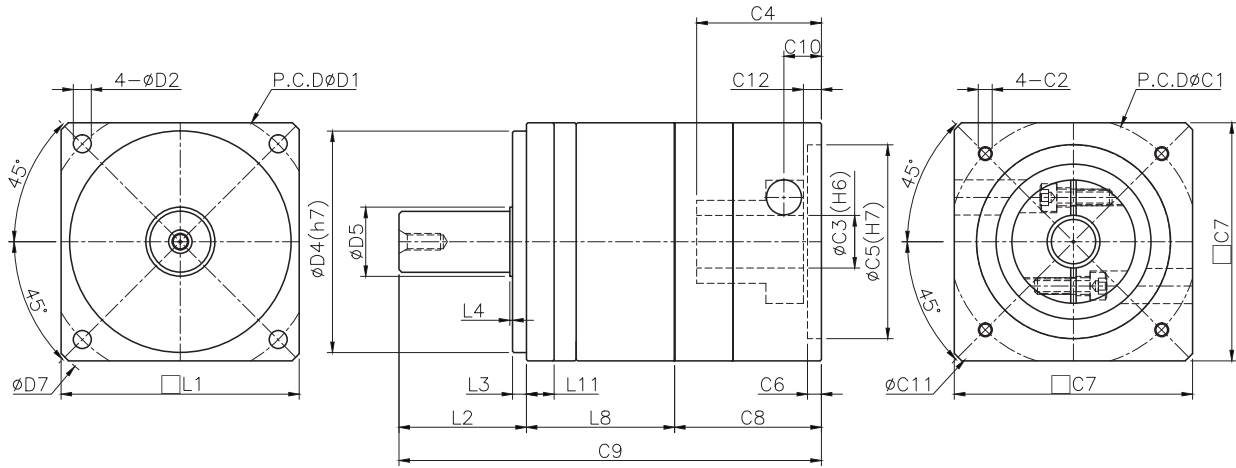
MF-X 系列技術規格 Technical Specifications										
規格 Specification	單位 Unit	段數 Stage	比數 Ratio	MF40X	MF60X	MF90X	MF120X	MF150X	MF180X	MF220X
額定輸出扭矩 $T_{2N}$ Normal Output Torque	Nm	L1	3	16	50	125	235	500	1,000	—
			4	17	35	136	225	580	1,090	1,530
			5	17	42	152	256	660	1,215	1,900
			6	16	—	—	—	610	1,060	—
			7	15	46	136	306	540	1,135	1,620
			8	13	—	—	—	—	—	—
		L2	10	13	25	94	225	460	935	1,500
			15	13	35	125	210	500	1,000	—
			20	14	35	142	285	530	1,090	1,530
			25	13	42	158	320	660	1,215	1,900
			30	14	42	146	308	610	1,200	—
			35	13	42	136	306	540	1,135	1,620
			40	11	25	118	252	530	1,090	1,530
			45	—	—	—	—	—	—	—
			50	12	25	156	320	660	1,215	1,500
			60	—	—	—	—	610	1,060	—
			70	—	46	135	306	540	1,135	1,620
			80	—	—	—	—	—	—	—
90	—	—	—	—	—	—	—			
100	—	25	94	225	460	935	1,500			
急停扭矩 Emergency Stop Torque	Nm	L1, L2	3-100	3倍額定輸出扭矩 3 Times of Nominal Output Torque						
額定輸入轉速 $n_{1N}$ Normal Input Speed	rpm	L1, L2	3-100	3,000	3,000	3,000	2,500	2,500	2,500	2,000
最大輸入轉速 $n_{1B}$ Max. Input Speed	rpm	L1, L2	3-100	6,000	6,000	6,000	5,000	5,000	5,000	4,000
標準背隙 Standard Backlash	arcmin	L1	3-10	≤10	≤10	≤8	≤8	≤6	≤6	≤6
		L2	15-100	≤15	≤15	≤12	≤12	≤10	≤10	≤10
扭轉剛性 Torsional Rigidity	Nm/arcmin	L1, L2	3-100	3	6	12	25	51	142	215
容許徑向力 $F_{rB}$ Max. Radial Load	N	L1, L2	3-100	750	1,200	2,500	5,600	9,000	14,200	48,000
容許軸向力 $F_{aB}$ Max. Axial Load	N	L1, L2	3-100	375	600	1,250	2,800	4,500	7,100	24,000
平均使用壽命 Average Life Time	hr	L1, L2	3-100	20,000						
全負載時效率 $\eta$ Efficiency of Full Load	%	L1	3-10	≥98%						
		L2	15-100	≥95%						
淨重 Net Weight	kg	L1	3-10	0.5	1.05	2.9	7.46	15.1	26	50.3
		L2	15-100	0.69	1.34	3.75	9.44	18.9	34.33	66.1
使用溫度 Operating Temp	°C	L1, L2	3-100	-10°C ~ +90°C						
潤滑 Lubrication		L1, L2	3-100	鋰基複合全合成潤滑油脂 Lithium Complex Synthetic Lubrication						
安裝方向 Mounting Position		L1, L2	3-100	任意方向 All Directions						
防護等級 Degree of Protection		L1, L2	3-100	IP65						
噪音值 Running Noise	dBA	L1, L2	3-100	≤65	≤65	≤65	≤68	≤68	≤70	≤72

1. 上述單段減速機(未指定比數)相關規格，主要為使用各型號5比減速機所測得之數據。
2. 減速比：i = 輸入轉速/輸出轉速。
3. 背隙值：為在2%額定輸出扭矩下測試所得之數據。
4. 最大徑向力及最大軸向力：施力於出力軸中心位置，週期負載時間50%，轉速100rpm，條件下所測得之數據。
5. 運轉負載週期<60%狀況下，平均使用壽命如列表數據值；負載週期≥60%之連續運轉狀況下，平均使用壽命可能會降低至正常值的50%以下。
6. 噪音值：距離1公尺，空載運轉，額定輸入轉速，條件下所測得之數據。

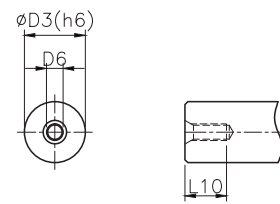
1. Above relative specifications of each model most are measured on 5 : 1 gear ratio
2. Ratios : i = Nin / Nout
3. Backlash : Measured on 2% of nominal output torque
4. Max. Radial and Axial Load : Applied to the output shaft center, and 50% of duty time and at 100 rpm
5. Duty Cycle < 60%, Average Lifetime = List Value; Duty Cycle ≥ 60%, Average Lifetime < 50% List value
6. Noise Level : Numeric measured on idle running in 1m distance, and at nominal input speed



# 尺寸圖 DRAWING & DEMENSION



Shaft Option 1(K)



Shaft Option 2(S)

(單位 : mm)  
(Unit : mm)

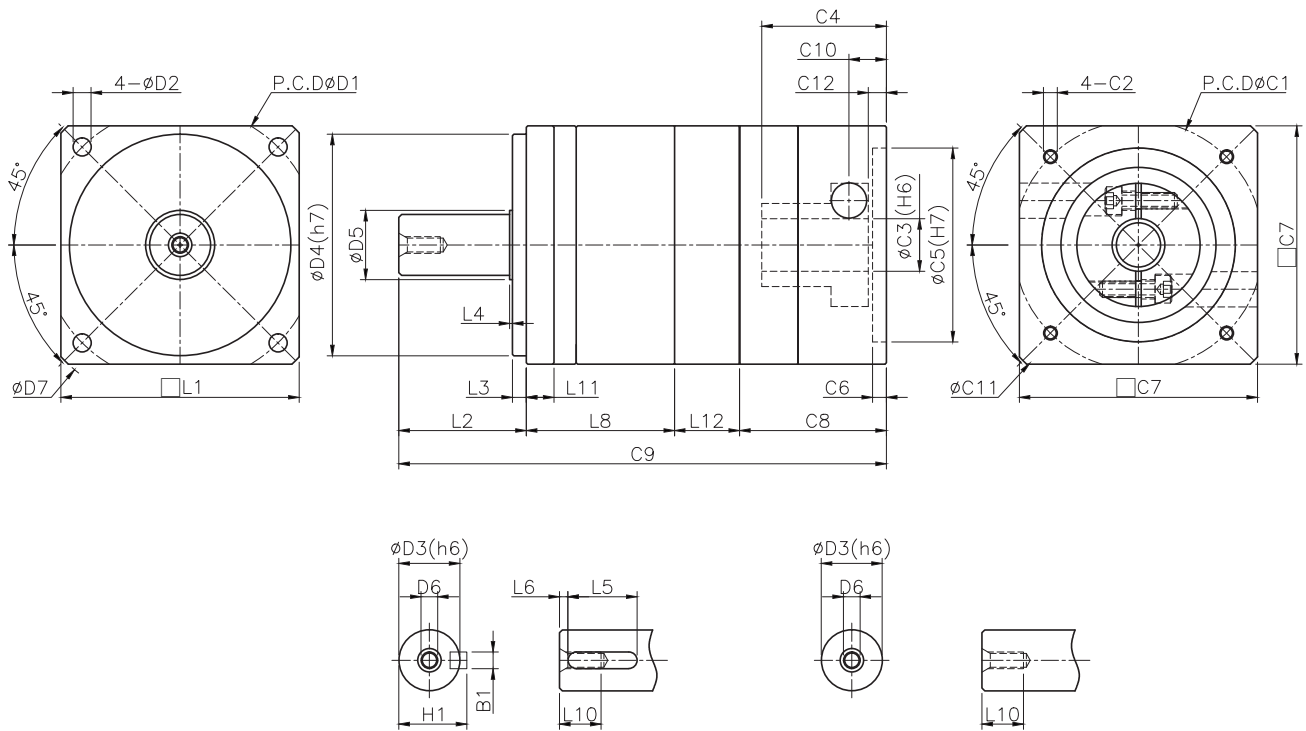
尺寸Size	MF40X-L1	MF60X-L1	MF90X-L1	MF120X-L1	MF150X-L1	MF180X-L1	MF220X-L1
D1	50	70	100	145(130)	165	215	250
D2	3.5	5.5	6.5	8.8	11	13	17
D3	13	16	22	32	38(40)	50(55)	75
D4	35	50	80	110	130	160	180
D5	15	17	25	35	40(45)	60	80
D6	M4×0.7P	M5×0.8P	M6×1.0P	M8×1.25P	M12×1.75P	M12×1.75P(M20×2.5P)	M20×2.5P
D7	60	80	118	160	190	245	292
L1	46	62	86	120	142	182	220
L2	26	33	46	69.5	75	95	123
L3	5.5	5	5	10	4	10	15
L4	1	1.5	1	0.5	3	2	3
L5	15	20	25	40	45	70	90
L6	2	3	3	3	5	6	7
L8	33	43	53.5	70.5	90	95.5	123.5
L10	8	12	15	20	32	42	52
L11	9.5	10	10	15	15	15	20
C1	46	70	90	145	200	200	235
C2	M4x0.7P(MAX)	M5x0.8P(MAX)	M8x1.0P(MAX)	M8x1.25P(MAX)	M12x1.75P(MAX)	M12x1.75P(MAX)	M12x1.75P(MAX)
C3	5-8	6-14	14-19	16-24	19-42	19-42	35-55
C4	26	31	41	66	88	85	128
C5	30	50	70	110	114.3	114.3	200
C6	4	3.5	5	7	6	7	10
C7	46	62	86	120	176	182	220
C8	32.5	37	49.5	77	98	100	148
C9	91.5	113	149	217	263	290.5	394.5
C10	11	12	15	28.5	47	33.5	44
C11	60	80	118	160	240	240	292
C12	6	6	7	20	35	17	27.5
B1	4	5	6	10	10(12)	14(16)	20
H1	14.5	18	24.5	35	41(43)	53.5(59)	79.5

\* 註 : C1-C6 為標準品最大尺寸，為公制標準馬達連接板尺寸，尺寸依搭配的馬達而改變。如超出尺寸屬特殊規格請與我司聯絡。

\* Note : C1-C6 are metric standard specific dimensions of motor. Please contact us at vgm@vgmgear.com for other specification or customize product.

# 尺寸圖

## DRAWING & DEMENSION



Shaft Option 1(K)

Shaft Option 2(S)

(單位：mm)  
(Unit：mm)

尺寸Size	MF40X-L2	MF60X-L2	MF90X-L2	MF120X-L2	MF150X-L2	MF180X-L2	MF220X-L2
D1	50	70	100	145(130)	165	215	250
D2	3.5	5.5	6.5	8.8	11	13	17
D3	13	16	22	32	38(40)	50(55)	75
D4	35	50	80	110	130	160	180
D5	15	17	25	35	40(45)	60	80
D6	M4×0.7P	M5×0.8P	M6×1.0P	M8×1.25P	M12×1.75P	M12×1.75P(M20×2.5P)	M20×2.5P
D7	60	80	118	160	190	245	292
L1	46	62	86	120	142	182	220
L2	26	33	46	69.5	75	95	123
L3	5.5	5	5	10	4	10	15
L4	1	1.5	1	0.5	3	2	3
L5	15	20	25	40	45	70	90
L6	2	3	3	3	5	6	7
L8	33	43	53.5	70.5	90	95.5	123.5
L10	8	12	15	20	32	42	52
L11	9.5	10	10	15	15	15	20
L12	19	16	23.5	27.2	46	51.5	56.5
C1	46	70	90	145	200	200	235
C2	M4x0.7P(MAX)	M5x0.8P(MAX)	M6x1.0P(MAX)	M8x1.25P(MAX)	M8x1.75P(MAX)	M12x1.75P(MAX)	M12x1.75P(MAX)
C3	5-8	6-14	14-19	16-24	19-42	19-42	35-55
C4	26	31	41	66	88	85	128
C5	30	50	70	110	114.3	114.3	200
C6	4	3.5	5	7	6	7	10
C7	46	62	86	120	176	182	220
C8	32.5	37	49.5	77	98	100	148
C9	110.5	129	172.5	244.2	309	342	451
C10	11	12	15	28.5	47	33.5	44
C11	60	80	118	160	240	240	292
C12	6	6	7	20	35	17	27.5
B1	4	5	6	10	10(12)	14(16)	20
H1	14.5	18	24.5	35	41(43)	53.5(59)	79.5

\* 註：C1-C6 為標準品最大尺寸，為公制標準馬達連接板尺寸，尺寸依搭配的馬達而改變。如超出尺寸屬特殊規格請與我司聯絡。

\* Note: C1-C6 are metric standard specific dimensions of motor. Please contact us at vgm@vgmgear.com for other specification or customize product.

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