

FUKUTA[®]

極 速 傳 動 · 無 遠 弗 屆

**SPINDLE
SERVO
MOTOR**

主軸伺服馬達



www.fukuta-motor.com.tw

創新：

積極創新，追求顧客滿意及公司永續繁榮。
時時刻刻，力求創新，以顧客需求為導向，提供顧客滿意之產品與服務進而有效地創造利潤，促使公司永續繁榮。

熱忱：

熱忱互助，共同達成顧客、公司與個人三贏之目標。尊重人性，塑造和諧明朗的工作環境；熱忱互助，關懷顧客，關心同事，共創顧客、公司、個人三贏之榮景。

誠信：

誠信踏實，以優良的產品與服務貢獻社會。
因應社會需求本乎誠信踏實之原則，持續致力於提供更好品質，更低成本之產品與服務，以貢獻社會。



理念

Innovation is to create aggressively, pursue customers' satisfaction and maintain the company's ever-lasting prosperity. We strive for creativity and innovation at all time. Based on the concept of customer-oriented, we provide satisfying products and service to our customers so that we can make profits efficiently and maintain the company's substantial prosperity.

Sincerity is to help each other enthusiastically and achieve the win-win goals of customers, company, and individuals. We respect humanity and make a harmonious work

environment. Helping each other enthusiastically means to care about our customers and colleagues so that we can have prosperous future of customers, company, and individuals.

Credibility is to offer the society excellent products and service. In order to meet the demands of society, we continue to make efforts based on the honest principle to provide services and products of best quality and less cost so as to make contributions to the society.

富田經營團隊決策人

張金鋒
Gordon Chang




公司沿革與專利認證

- 中華人民共和國實用新型專利 ZL 97 2 26013.7 專利權 組合式馬達外殼【1999年2月】
- 台灣新式樣第 063157 號專利權 第三十四類動力機械 馬達框架（一）【1999年4月】
- 台灣新式樣第 063210 號專利權 第三十四類動力機械 馬達框架（二）【1999年4月】
- 德國 Motorgehause unter der nummer 4 98 12 301.4 【1999年7月】
- 台灣新型第 147591 號專利權 組合式馬達框架【1999年10月】
- 2001年1月榮獲優良設計標誌。
2001年1月榮獲台灣精品獎。
- 2002年1月榮獲台灣精品獎。
- 2003年1月榮獲台灣精品獎。
- 2004年感應伺服馬達Frame225榮獲第十三屆台灣精品標誌。
- 2005年成立上海鑫永電機科技有限公司
（上海市奉賢區柘林鎮），朝向跨國整合經營模式
- 2006年全系列通過中華人民共和國CCC強制性產品認證
2006年榮獲經濟部技術處2006年度產業創新成果表揚
- 2007年與日本美國客戶分別簽訂風力發電機轆跑車馬達（全電式）技術合作案

申請日期	類別	案件名稱	證書號
2002.11.26	台灣新型	馬達之散熱結構	M241873
2003.04.03	台灣新型	馬達定子固定結構改良	M241867
2004.01.20	台灣新型	水車馬達出力軸改良	M250452
2005.07.27	台灣新型	發電機結構改良	M280595
2006.01.18	台灣新型	利用風力發電之設備	M294573
2006.06.28	美國發明	人體檢測系統	7146855
2006.10.27	台灣新型	發電穩壓系統	
2006.12.05	台灣新型	發電機風扇改良	

Obtain the patent in the worldwide.

- China patent No. ZL 97 2 26013.7 in February of 1999
- Taiwan patent No. 063157 in April of 1999
No.063210 in April of 1999
No.147591 in October of 1999
- Germany patent Motorgehause unter der Number 4 98 12 301.4 in July of 1999
- Awarded the symbol of excellence  and employ the "IT'S VERY WELL MADE IN TAIWAN" Awarded the Excellence Design Winner.

創意領先 · 品質立見

富田電機自創立以來，以嚴謹的公司組織為後盾，致力於研發的工作，產品推陳出新，並堅持走自創品牌 FUKUTA 路線來貫徹『為傳統動力添新價值觀』的理想。更獲得了 ISO 9001, CE 等國際認證，肯定了我們多年來對產品研究的努力。唯有如此才能以創新的產品與技術滿足客戶多樣需求，提供迅速確實的服務，以高品質及準確交貨期給予顧客充分信賴及安全感，是富田電機不變的執著。

Forwarding Innovation Makes External Prior Quality

Since establishment, FUKUTA ELEC. & MACH. is based on a strict company organization. We make efforts on innovation to produce the latest products. Furthermore we keep working on FUKUTA, the brand established by ourselves, to achieve the goal of "Adding new value attitude on traditional working procedure". The international certifications such as ISO 9001, CE, CSA consent our effort on innovating products for several years. That also allows us to satisfy customers' demands by the latest product and technique and to offer the correct and immediate services. The external insistence of FUKUTA ELEC. & MACH. is to give customers the complete trust and assurance by high quality and punctual delivery.



Creativity & Enthusiasm
Honesty



ISO 9001 國際品質認證

品質 管理



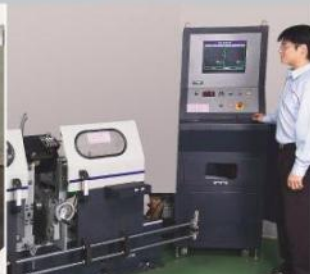
定子
Stator



跑台台測試
Running-Test Machine



三次元測量
CMM Measurement



精密校正
High-speed Balance
Equipment



定子3Q檢測
Hi-pot test

DIVERSIFIED ECONOMY

應用例：

CNC銑床機械
CNC車床機械
CNC磨床機械
複合加工機
專用加工機

Some applied fields

CNC Milling Machine
CNC Lathe
CNC Surface Grinder Machine
Complex Machine
Special Purpose Machine



產品應用

應用範圍寬廣高速主軸伺服之馬達，再搭配相關驅動器，可滿足非常特殊且多用途的需求，此對CNC產業機械產品提供最佳的馬達驅動。富田高速主軸伺服馬達使用於需要非常可靠、無需保養、高精度定位，高特性行為及速度之應用產業場合。

Typical application fields

The wide range of Spindel servo motors combined with the respective drives satisfies special and multiple application purposes, and offers optimum motor drives for CNC industrial machinery and robots. The FUKUTA Spindel servo motors are addressed to applications where absolute reliability, absence of any maintenance, positioning accuracy, high performances and velocity are required.



伺服器馬達的特徵：

高動態響應：

不使用永久磁鐵結構，且由於轉矩及慣量之密切配合之下，又有著低的二次轉子阻抗下，使在所有的速度範圍內有著高的加減速動態特性。

穩定之運轉特性：

因轉矩是由感應式電流產生，具有完美磁性分佈之高密度磁通所生，故藉由保持整個速域非常低之轉矩漣波而可得到全然穩定之旋轉運動及伺服器動作。

最大與額定轉矩之良好關係：

富田感應型伺服馬達有良好之電流峰值及額定電流關係，而產生高比例之最大轉矩，甚至在轉矩與體積重量關係密切，而允許有緊密的運用和最好的空間運用率。

堅固簡單不需保養：

因沒有永久磁鐵，故它沒有減磁，即因震動或撞動(特別適用於移動機器)造成破損之危險，它不須偵測磁極位置，因磁通方向是由電壓來決定，在馬達軸心裝上編碼器，回授可精確控制速度位置，因它沒有集電器、碳刷或磁鐵，故它是非常穩固簡單且可靠的。

框架：以先進之規範及技術製成，由於有非常密實之大小尺寸及輕重量而有非常突出之機械精度及強度，馬達尺寸到132為止是鋁擠型或鑄鋁，外型方正，並提供內部通風道以確保高散熱及降低共振。

保護：採IP54；可依要求提供更高之保護等級。

定子：具低功率損失之特殊鐵心疊片，特殊之幾何結構確保在運轉時有優良之特性及安靜的運轉。

特性

繞組：縮短節距之雙層繞組，決定了它在FEM曲線上的優勢，因其在諧波頻率及其他的阻尼作用上做一些限制，系統用H級絕緣且結構上承受來自於變頻器作用在伺服馬達產生之熱量，電動應力及電流衝擊，這些材料選擇及含浸方式而允許使用在具有高濕度、高溫度之熱帶地區；另對於高腐蝕性環境之特殊處理也可以提供。

轉子：為鋁壓鑄設計、轉子重量已減輕以使慣量到更低，具有傾斜的鋁龍及適當之槽型以保有良好的特性（甚至在低速時）及免除了在表層之溫度及脈動轉矩。

平衡：依ISO 2373 R級，連同鍵一起作動力平衡，已完全免除振動（甚至在高速）。對於特殊用途可依需求作S級平衡校正。

軸承：此球型軸承適合於高速，且以特殊用油脂潤滑，以保證在高速及高溫下之運作。

熱保護：藉由3個雙金屬片熱開關，提供熱保護，其為串接方式並且附於繞組上。接點在正常下為接合的，當繞組溫度到達對絕緣有危險時予以打開。

通風：採輔助風扇通風，其風量穩定而與馬達轉速無關，此保證了在任何操作條件下良好冷卻，如此，在低額定及低峰值電流之伺服馬達可以被使用，甚至在非常低的速度下也可有大的定轉矩區，而不必降低責任周期因素。

編碼器：標準結構具有一空心軸，並且以鋁外殼包覆，以確保適當之結構保護，電力之連接是使用10-PIN銷之連接頭。

High dynamical response

The induction-type servomotor doesn't use permanent magnets. The high relation between torque and inertia-together with a low secondary impedance of the rotor enables high dynamical performances with considerable acceleration and deceleration available over all speed ranges.

Stable operation performance

The variation of speed is obtained through absolute stable rotary motion and servo-action by reducing the torque ripple over entire speed range. Since the torque is generated by a high-density flux with perfect magnetic distribution drove from the induced sinusoidal current.

Excellent relation between maximum and rated torque

The FUKUTA servomotor enables a high relation between peak current and rated current so as to enable high rates of maximum torque. Furthermore, the servomotor presents an extremely perfect relation between torque and volume/weight which permits compact applications and best use of available space.

Sturdy & simple construction not requiring maintenance

Since the FUKUTA servomotors do not have permanent magnets, there's no risk of demagnetization, of breakage due to fragility from vibrations or impacts, especially for the servomotors used on moving machines. Moreover, the position of magnet poles are unnecessary to be detected for driven because the direction of magnetic flux is determined by the voltage. The use of encoder set on the motor shaft feedback for controlling of the speed and position with accuracy. The structure, therefore, is extremely simple, sturdy & reliable and does not require any maintenance, since there are no collectors, brushes or magnets.

Housing

The housing is built according to advanced criteria and technology. Further to the compact size and small weight, these servomotors offer an outstanding mechanical accuracy and sturdiness. The housings are made of extrusion and die-cast aluminum for motor-frame sizes up to 132. The body is a square shape. It is provided with internal ventilation channels in order to ensure a high thermal dissipation and to reduce vibration.

Bearings

The ball-type bearings are suitable for high speed and lubricated with special greases that offer best response to high speed and temperature.

Thermal protections

The servomotors are provided with a thermal protection by means of 3 metallic double-slices thermal switches, which are connected in series and incorporated in the windings. The contact is normally closed (NC), and it opens when the temperature of the windings reaches a temperature which is dangerous for the insulating system.

Protection

All the servomotors are built in IP54 protection. Superior grades can be supplied on request.

Stator

It consists of special laminations with low power loss having a special geometry in order to provide good performances and silent run during operation.

Winding

With double layer of shortened pitch, it determines advantages in the F. E. M. curve due to the effect of elimination of some of the harmonic frequencies and damping of others. The structure of FUKUTA servomotors adopts H class insulation and supports the thermal, electro-dynamical stress and inrush current that is supplied by inverter. The choice of these materials and the method of soak permit using of the servomotors in tropical climate with considerable thermal amplitudes at high humidity degrees. Special treatment for very corrosive ambience can be supplied on request.

Construction form

The servomotors are built according to construction feature shown in chart in conformity with IEC 34-7 and CEI 2-14 n. 724 publications.

Rotor

The rotor is of die-cast aluminum design and has been lightened so to reduce the rotor inertia to a minimum. The rotor consists of a cage with inclination, number of slots and a suitable shape to enable perfect operation also at very low speed and to reduce temperature on surface layer and furthermore avoid cogging torque.

Balancing

Balancing is carried out dynamically with an integer key according to ISO 2373 grade R to suppress vibration also at high speed. On request, for special applications balancing according to grade S can be carried out.



Ventilation

Ventilation is obtained by an auxiliary electric fan which generates a constant air-flow and independent of the speed of the servomotors. This ensures an excellent cooling in any operating condition. In this way, low rate & low peak-current servomotors can be chose. Even at low speed, it still can offer a wide constant-torque range without reducing the duty cycle.

Encoder

The standard configuration provides a hollow shaft and is housed in an appropriate aluminum case to ensure strong mechanical protection. As to the electrical connection, a 10-PIN connector is used.

測試模式

跑合模式Running Mode：均速分段跑合Running in different speed section.

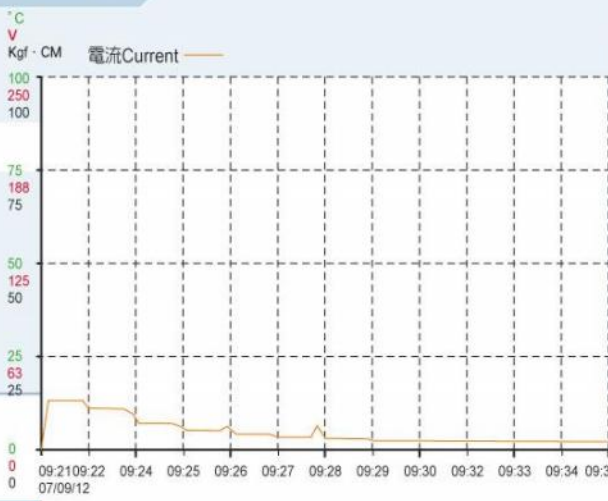
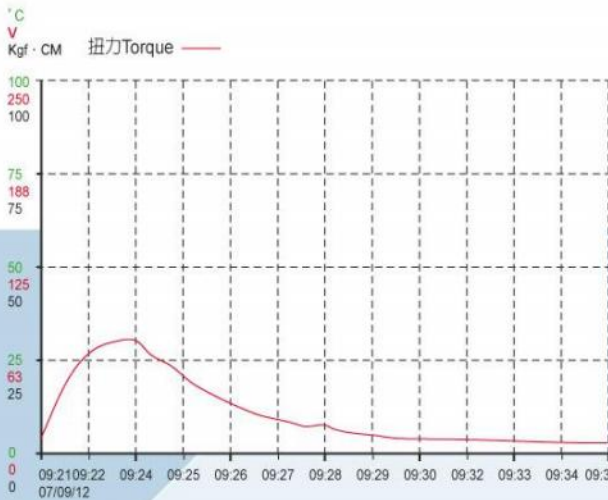
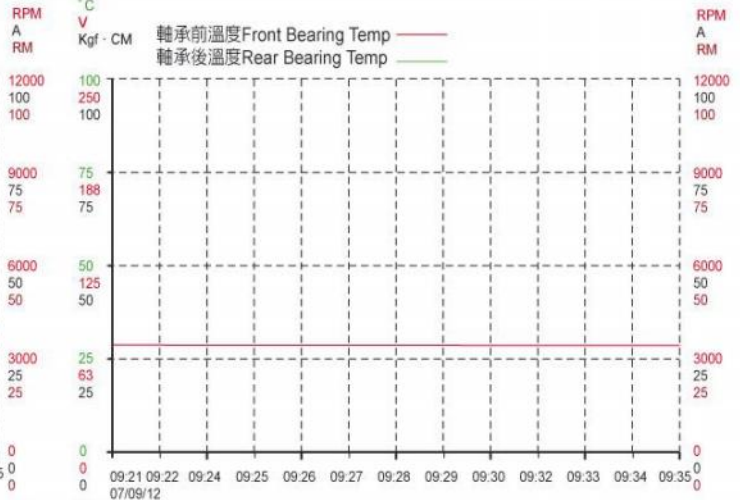
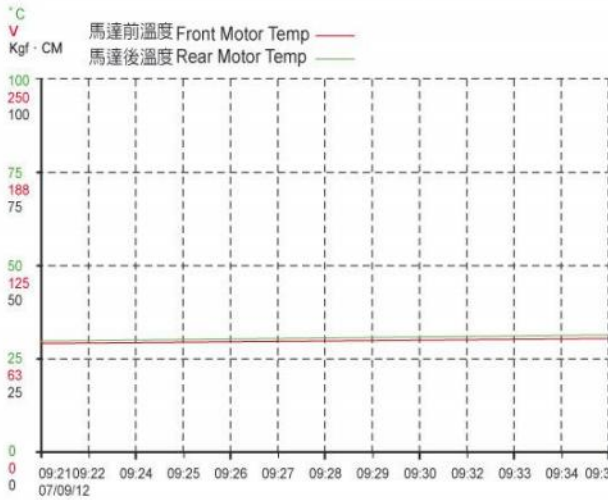
最高轉速Top Speed：8000RPM

軸承前溫度溫升Front Bearing Temp $28.4 - 24.8 = 3.8$

軸承後溫度溫升Rear Bearing Temp $28.3 - 24.6 = 3.7$

累計跑合時間Total time：0時13分46秒 13min 46sec

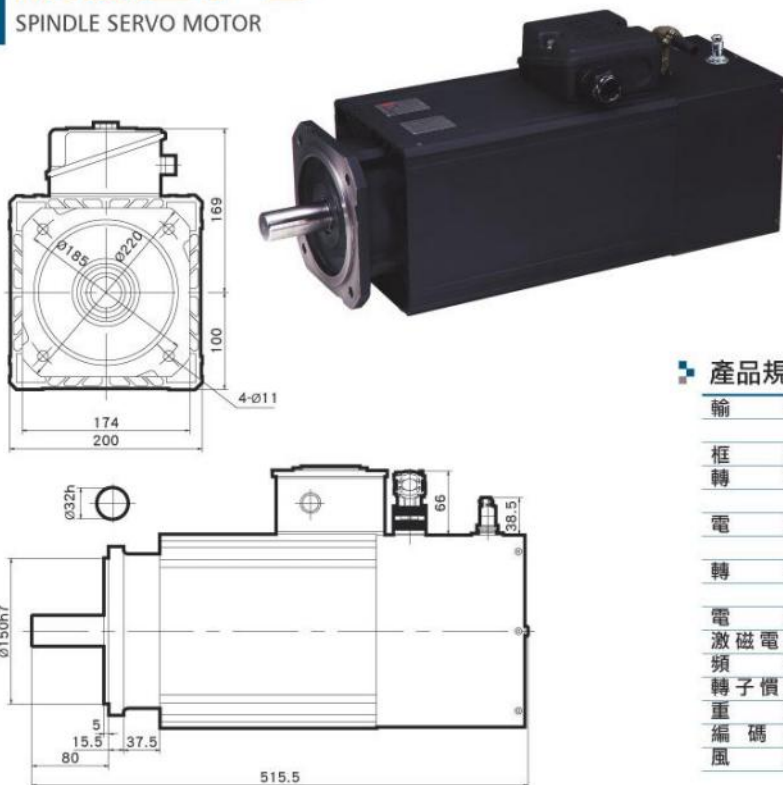
傳動比例Velocity Ratio：1



SP-900 SP3 SP6 / SP8 / SP12

Model: **SP3**

SPINDLE SERVO MOTOR



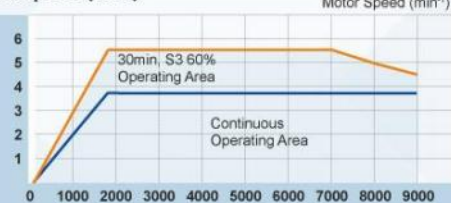
一般條件 General Data

安裝方式	Mounting	IM 3001 (B5)
保護等級	Protection	IP55
絕緣等級	Insulation	Class H
冷卻系統	Cooling system	Forced air cooled
熱保護	Thermal protection	Thermal protector (NC)
軸承潤滑	Bearing lubrication	Grease
噪音	Noise	dB(A) 80
周溫	Ambient temperature	-15°C ~ 40°C
高度	Altitude	1000m ASL

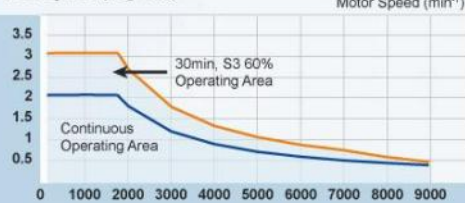
產品規格 Standard

輸出	Output	Continuous rated	kw	3.7
		30min rated, S3 60%	kw	5.5
框號	Frame No.			100L
轉數	RPM	Base speed	min ⁻¹	1750
		Maximum speed	min ⁻¹	9000
電流	Current	3.7 kw Continus rated	A	20.7
		5.5 kw 30min rated	A	30.5
轉矩	Torque	3.7 kw Continus rated	Kg-m	2.06
		5.5 kw 30min rated	Kg-m	3.06
電壓	Voltage		V	170
激磁電流	Magnetising Current		A	13.9
頻率	Frequency		Hz	60
轉子慣量	Rotor inertia (I)		Kg-m ²	0.0076
重量	Weight		Kg	45
編碼器	Encoder		ppr	1024
風扇	Cooling fan	230v 50/60Hz	W	45/45

Output (kw)



Torque (kg-m)



FUKUTA 主軸伺服馬達技術資料 Spindle Servo Motor Technical Datasheet

SP3		3.7KW S1 / 5.5KW 30min, S3 60% 負載特性 (Load Character)										
轉速 RPM		0	1000	1750	2000	3000	4000	5000	6000	7000	8000	9000
3.7kw S1	電壓 Voltage V	19.1	103.2	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0
	電流 Current A	19.9	20.70	20.72	19.13	17.08	16.47	16.34	16.48	16.85	17.60	19.93
	額定轉矩 T Kg-m	2.06	2.07	2.06	1.80	1.20	0.90	0.72	0.60	0.51	0.45	0.40
	輸出功率 Output KW	0.00	2.12	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
5.5kw 30min, S3 60%	電壓 Voltage V	22.0	119.6	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0
	電流 Current A	23.67	30.47	30.49	25.17	22.42	21.81	21.87	22.41	23.71	21.03	18.89
	額定轉矩 T Kg-m	3.06	3.07	3.06	2.68	1.79	1.34	1.07	0.89	0.77	0.60	0.49
	輸出功率 Output KW	0.00	3.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	4.94	4.48

※特性使用依各種工具機專用設計而有所不同
 ※Character can be designed by different purpose.

SP-900

SP3

SP6 / SP8

SP12

Model: SP6 / SP8

SPINDLE SERVO MOTOR

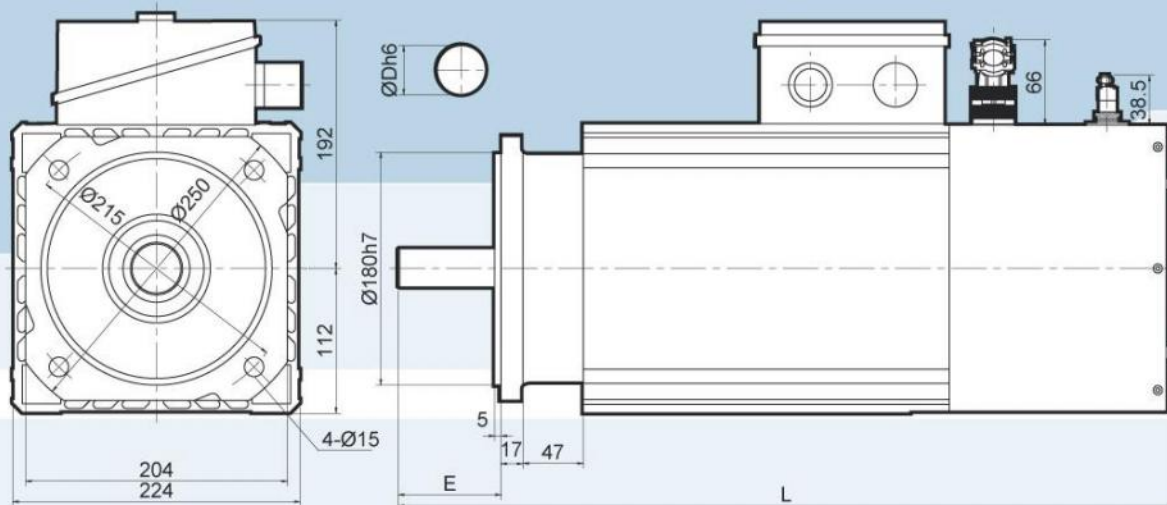


產品規格 Standard

			SP6	SP8
輸出 Output	Continuous rated	kw	5.5	7.5
	30min rated, S3 60%	kw	7.5	11
框號 Frame No.			112L	112X
	轉數 RPM	Base speed	min ⁻¹ 1750	1750
電流 Current	3.7 kw Continuous rated	A	28.9	39.8
	5.5 kw 30min rated	A	35.9	51.6
轉矩 Torque	3.7 kw Continuous rated	Kg-m	3.06	4.18
	5.5 kw 30min rated	Kg-m	4.18	6.13
電壓 Voltage		V	170	170
激磁電流 Magnetising Current		A	19.1	27.1
頻率 Frequency		Hz	60	60
轉子慣量 Rotor inertia (I)		Kg-m ²	0.0171	0.0282
重量 Weight		Kg	65	87
編碼器 Encoder		ppr	1024	1024
風扇 Cooling fan	230v 50/60Hz	W	45/45	45/45

一般條件 General Data

安裝方式 Mounting	IM 3001 (B5)
保護等級 Protection	IP55
絕緣等級 Insulation	Class H
冷卻系統 Cooling system	Forced air cooled
熱保護 Thermal protection	Thermal protector (NC)
軸承潤滑 Bearing lubrication	Grease
噪音 Noise dB(A)	80
周溫 Ambient temperature	-15°C ~ 40°C
高度 Altitude	1000m ASL



	D	E	L
SP6	38	80	604
SP8	48	110	744

