



AF*SERIES*

高速閉迴路油電式精密射出機

High-Speed / Closed-Loop Hybrid Injection Molding Machine

AF油電式射出機

AF Hybrid injection Molding Machine

AF系列具有以下優異性能：

- 加料單元使用電動馬達進料，精準且省能源。
- 採高剛性鎖模結構及單缸射出結構，適合高速射出。
- 油電複合結構形成雙迴路系統，大幅縮短成型時間。
- 採用高性能模組化控制器，反應速率達2ms。
- 適合精密電子產品及超薄件高速射出成型作業。

The AF series has the following features:

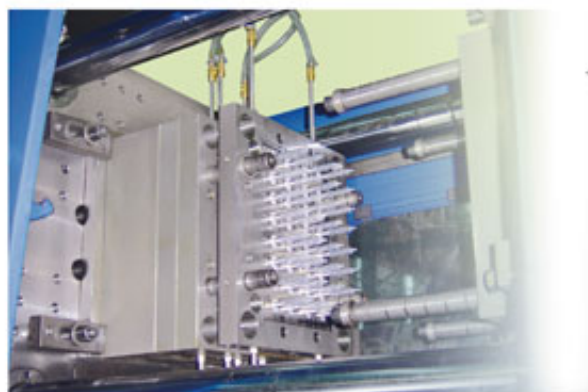
- An injection unit equipped with an electric motor for feeding and an electric motor for charging, which are accurate and energy-saving.
- Designed with a highly rigid clamping structure and a single cylinder injection structure, suitable for high speed injection.
- A hybrid structure with a double-loop system to reduce the cycle time.
- Adopts a new controller with a response rate of up to 2ms.
- Suitable for high-speed injection molding of electronic parts and ultra thin-walled products.

AF系列油電射出機結合了油壓及電氣兩種結構，一方面具有全電式定位精準的特性，一方面保有油壓結構高推力的特性。換言之，AF系列油電以低於全電式射出機的成本，卻能有效改善傳統油壓精度不佳的問題，而且大幅降低污染性及噪音問題。

採用最新的電動馬達驅動技術及全閉迴路控制，將傳統油壓射出機最耗能的加料部分改為先進的「電動螺桿驅動結構」。

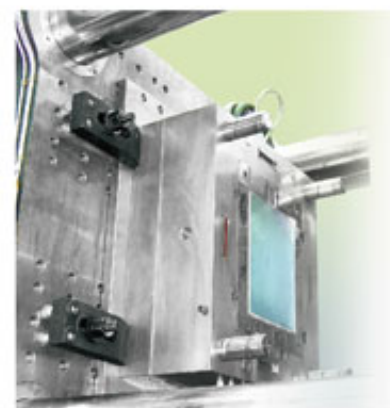
The Hybrid Injection Molding Machine (AF Series) combines both hydraulic and electrical structures. On one hand, the electrical system enables the machine to process at high accuracy whilst consuming less energy, on the other hand, the hydraulic system maintains the specific feature of holding the high pressure. It is cost-effective compared to its Fully-Electrical Injection Machine counterpart, likewise it effectively improves energy consumption and inaccurate precision (issues encountered in the traditional hydraulic systems) and also largely reduces pollution and noise issues.

AF series is equipped with a new highly rigid structure and a German made closed-loop high response servo valve. Traditional hydraulic injection, which is the most energy-consuming action, is replaced for an advanced electric screw drive structure to reduce energy while charging.



◀ AF-200: 32穴針筒
AF200: 32 Cavities of Syringe

17吋導光板成型 ▶
17" Light guide plate molding



AF油電vs油壓式射出機特性比較

Comparisons between Hydraulic and Hybrid Injection Molding Machines

項目 Feature	AF油電複合式 AF Hybrid	油壓式 Hydraulic
定位精度 Screw position precision	加料採電動馬達，計量精準 Adopts an ESD structure to fill material, which achieves better precision.	油壓慣性大，定位精度較差 High inertia, results in slight precision inaccuracy.
穩定性及重現性 Stability and repeatability	採用閉迴路控制，穩定性及重現性佳 Adopts a closed-loop system, allowing good stability and repeatability.	採開迴路系統，穩定性較差 Adopts an open-loop system, making stability inadequate.
應答性及加減速反應 Response and speed reaction	採用高應答伺服閥及高反應控制器，加減速反應靈敏 Adopts a high-response servo valve and controller that responds quickly to speed changes.	採一般油壓閥，應答性較差 Adopts a general hydraulic valve, making response inadequate.
瞬間高速輸出 High-speed injection	標配ACC ACC compatible for high speed injection	可用ACC (加購) ACC available (with additional charges)
薄壁高速成型能力 The ability to perform thin-wall and high speed molding	標配ACC、伺服閥及高剛性結構，適合薄壁高速成型，長期耐用度高 Durable and suitable for thin-walled products or high speed molding using its ACC, servo valve, and rigid structure.	需特殊改良 Requires particular enhancements to achieve it.
購置成本 Purchasing and installing cost	成本適中 Cost-effective.	相對較低 Relatively low.



▲ 3C零件
Precies 3C parts

優異特點 Specific Features



高剛性夾模系統

- 高剛性夾模系統設計，比舊式機種提高30%的機構剛性，確保模具壽命。
- 高速單缸設計，比傳統雙缸結構更適用於高速射出應用。

High Rigidity Clamping Unit

- The highly rigid clamping design has upgraded its rigidity, for up to 30% stronger, compared to conventional one; and also it is free from mold deformation.
- The high-speed single cylinder design is more suitable for high-speed injection molding compared to the conventional double cylinder.



LUBE潤滑系統

循環式注油系統，油量分配平均，潤滑效率高，增長曲肘壽命。

LUBE Lubrication system

The circulatory lubrication system distributes oil equally and achieves highly efficient lubrication to enhance toggle life.



開模定位裝置（選配）

以流量比例閥搭配軟體控制，最佳狀態下定位可達 $\pm 0.5\text{mm}$ ，確保高速成型穩定性。

Patented mold position device (optional)

With the flow proportional control valve controlled by software, the positioning can reach $\pm 0.5\text{mm}$ under the best conditions, to ensure the stability of high-speed molding.





ACC蓄壓系統

高應答蓄壓器，提供高速射出所需能源。

ACCumulator System

Equipped with a quick responding ACC that supplies energy for high-speed injection.



電動馬達加料系統

- 使用高應答性電動馬達加料系統，實現開關模與加料同動之複合式動作，可有效縮短成型週期，達到高效率成型。
- 使用電動馬達進料系統，可有效節省加料能源消耗達20~30%

ESD Charging System

- Adopts a high-response electric motor for its material feeding system to attain simultaneous movements of mould opening (or clamping) and material feeding, thus shortening cycle time and achieving high performance molding.
- Adopts an ESD (Electric Screw Drive) structure, thus, reducing power consumption during material feeding by approx. 20~30%.

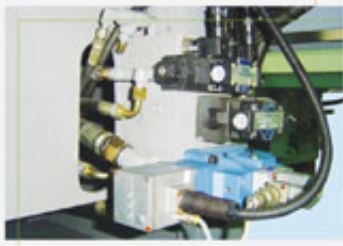
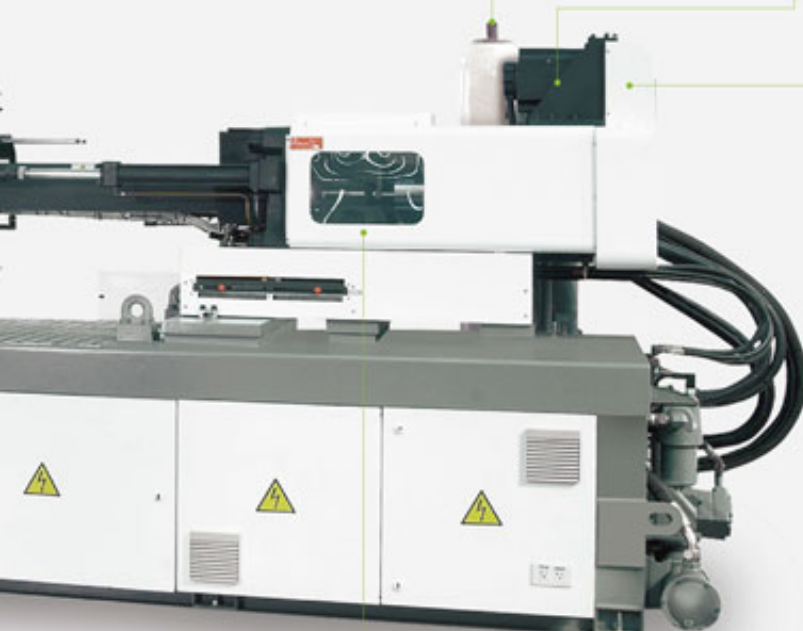


伺服閥閉迴路系統

使用電動全閉迴路控制，搭配高應答性螺桿逆流環設計，使得成品重量安定性。

German made MOOG Closed-loop Servo Valve System

The AF Series is equipped with a digital closed-loop servo control in its hydraulic system and is aided with an innovatively designed Servo Check Ring, thus, guarantees the best stability in a product's weight.



射出壓縮功能（選配）

最適合薄型、大面積及精密產品生產，如導光板精密光學。

Injection Compressing (optional)

Suitable for producing thin-wall, large area and precision products, such as Light Guide Plates for LCD monitors.

射出單元 Injection Unit

- 加料速度誤差 $\pm 0.1\%$
- 時間控制精度0.1秒
- 保壓及背壓控制精度 $\pm 0.5\%$
- 採用線性磁性尺精度達0.1mm
- The tolerance level for charging speed is less than $\pm 0.1\%$.
- Time control accuracy of 0.1 seconds.
- Back pressure and holding pressure precision control of $\pm 0.5\%$.
- Adopts a linear magnetic scale with an accuracy of up to 0.1mm.

AF系列採用最新的馬達驅動技術及全閉迴路控制，將傳統油壓射出機最耗能的加料部分改為先進的「電動螺桿驅動結構」(Electric Screw Drive)，結合德國伺服閥及蓄壓器，最大射速可達700mm/sec (視機種定)。本機種採用新一代單缸射出結構，免除一般雙缸射出之同步問題，非常適合高速成型作業。而本機種之電動結構計量精準、加減速反應靈敏，整體射出精度及穩定性直逼全電式機型。

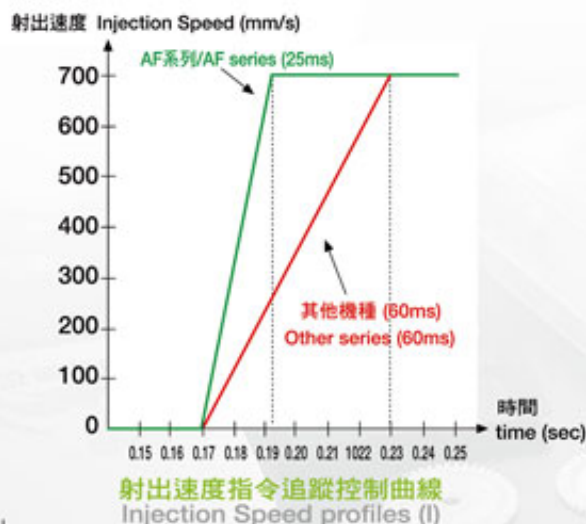
此外，將耗能的加料動作改為電動式驅動，並採用德

傳統型節省20-30%能源，並形成雙迴路系統，可進行加料、蓄壓及開關模的同動複合，大幅縮短成型時間，適合生產超薄及微細複雜的3C電子精密產品，如超薄容器、超薄CD CASE、Smart Card、SD記憶卡、導光板、連接器、精密齒輪等。

The AF series adopts the latest Electric Screw Drive technology and the newly designed single cylinder injection structure, together with a German made high response closed-loop servo valve and an accumulator, to achieve a maximum injection speed of up to 700mm/sec. So, it is suitable for producing tiny, ultra thin-walled, and complicated 3C electric precise products like light guiding plates for LCD monitors, ultra thin-walled containers, thin-walled CD cases, smart cards, smart media-cards, connector tools, precise gear wheels, etc. The single cylinder injection adopted in the AF series has better advantages over double cylinder injection. Without the balancing issues, single cylinder injection is more flexible and suitable for high-speed injection. The new "AF" series is equipped with an Electric Screw Drive, denoting a motor-driven screw. Therefore, motion control is more precise with its high dynamic response. Also, overall performance rating is almost the same as an "All electric" machine. If compared with a conventional hydraulic motor, the ESD device does save energy, especially when it comes with a Double Vane Pump, and the German made accumulators (all standard on AF series); it saves energy up to 20-30%. Moreover, the cycle time is reduced since the charging motor no longer requires hydraulic power as it is driven by a servo motor when the mold is opening. The mold is opening; working as a "double-loop" method.

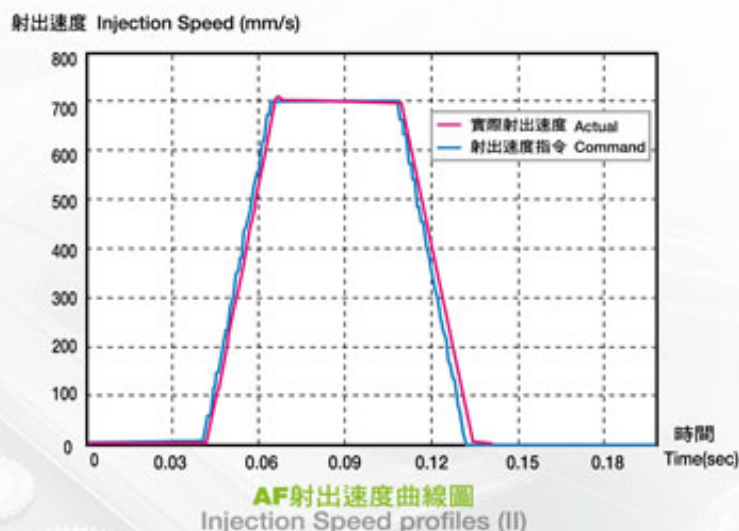
■ 高速射出

- 最大射出速度範圍：350~700mm/sec。
- 射出加減速應答性25ms。



■ High-speed Injection

- Maximum injection speed range: 350~700mm/sec.
- Injection speed response is around 25ms.

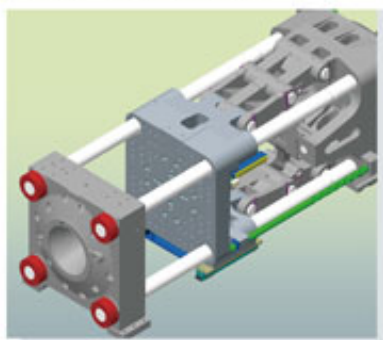


夾模單元 Clamping Unit

- 模板平行度0.05mm
- 具低壓保護功能，確保人員安全及模具壽命
- 開模定位精度 $\pm 0.5\text{mm}$

機械設計首重結構之剛性及強度，尤其面對越來越嚴苛的連續高速運轉需求，使得高剛性機械結構的要求與日俱增。有鑒于此，為了達成持續高速且精密射出的目的，德國製採用全新的高剛性模板結構，高強度且低變形量。鎖模汽缸採用德國航太級油封，適合高速開關模作業。曲肘潤滑採用日本LUBE脫壓作動型電動潤滑系統，潤滑效果強且更為省油。

此外，富強鑫射出機不論是機架、模板或射出結構均以有限元素分析(Finite Element Analysis)來分析變形量及應力分佈情形，以確認設計的強度及安全性。經過嚴謹的分析，不但可確保機械結構的動態特性，防止機台震動，更可藉此獲得最佳結構，延長機台壽命。



■ 高剛性鎖模機構

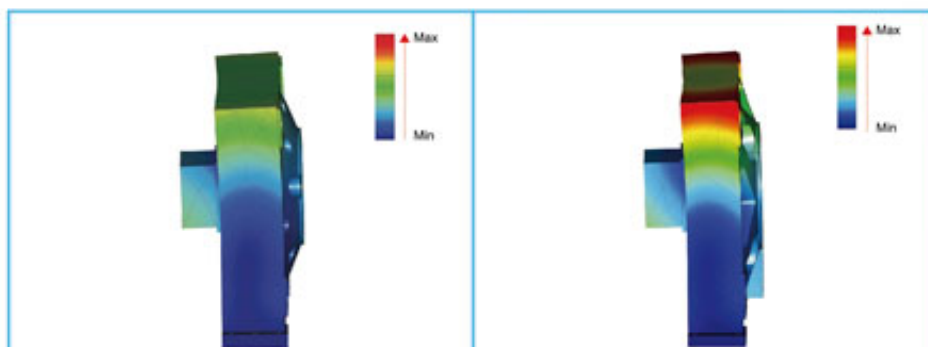
大幅提高夾模系統之剛性與強度，確保射出成型過程中模具的最小變形量。

- The platen parallelism is at 0.05mm.
- It's featured with a low-pressure protection function, ensuring the mold and person's safety.
- The precision level for opening mold position setting is within $\pm 0.5\text{mm}$.

When designing injection machines, the rigidity and durability of its structure are given much considerations. This is due to the increasing demand required for continuous high-speed processing needs. Therefore, FCS employs Finite Element Analysis (FEA) to study the operation of its injection molding machines. This analysis gives the designer a better understanding of the strain and pressure distribution within the machine during operation so as to aid in the design of a more durable, stable and safer machine. Through detailed analysis, FCS is able to maintain a high standard of operational consistency. Thus helps reduce vibration and the product's chances of structural failure. Molded products are deeply influenced by the platen & mold's deformations in dimension and shape. That is why, in order to assure consistent quality in injection molding, the AF series adopts a whole new set of platens with high strength and stiffness to reduce the platen deformity. The Germany made seals installed in the clamping cylinders are capable of high-speed operation. The "LUBE", Lubrication System installed in the machine reduces oil consumption thus achieving all the requirements for high-speed injection molding.

■ High-rigidity Clamping Unit

The upgraded rigidity and strength assures minimal mold deformation during molding process.



AF系列變形量 / AF Series Deformation

其他機種變形量 / Other Machines Deformation



FCS-6500S ▲

產品特點

- 具多階密碼保護功能，記錄與限制各階使用者參數修改。
- 提供統計製程控制及射出波形圖，提高生產品質與效率。
- USB資料存取介面，模具參數、顯示畫面存取便利。
- 採多重通訊介面
(USB、串行接口、Ethernet、EtherCAT、Sercos III)。
- 支援OPC協定，且依據IEC-61131設計，其特點為模組化並易於軟硬體維護。
- 多種語言可供客戶選擇。
- 加熱控制精度0.1°C並有效分段控制，以提升塑化能力。
- 位置控制精度0.1mm，可準確控制動作行程。
- 模具資料上傳及下載。
- 機台停機狀態顯示及記錄。

Specific Features

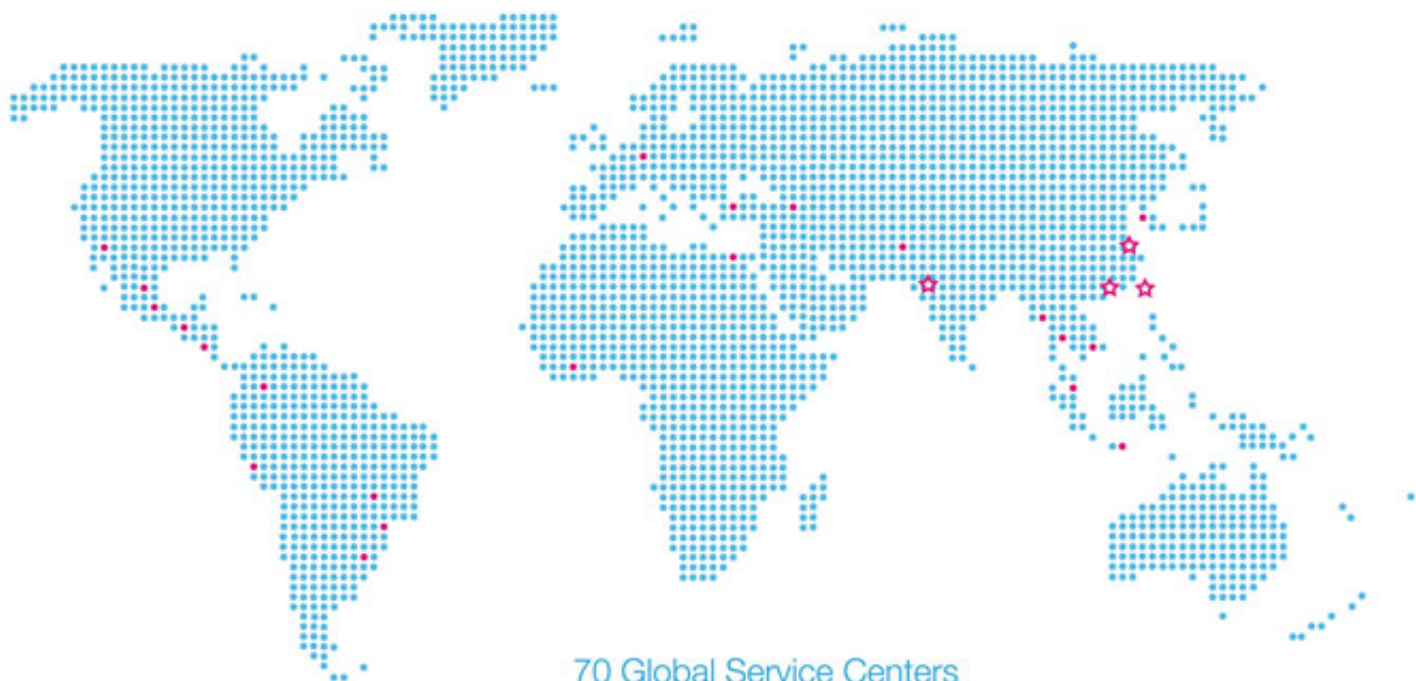
- A multi-level password protection function is used to record and limit the parameters modification from various levels of users.
- Provide statistical process control and injection waveforms to improve production quality and efficiency.
- Convenient access to USB data, mold parameters and display screens.
- Multiple communication interfaces (USB, serial interface, Ethernet, EtherCAT, Sercos III).
- Control supports OPC protocol and has a modular design to easily maintain the software and hardware.
- Multiple languages are available for users.
- Barrel heat zones are accurate to 0.1 degree C to ensure stable material plasticizing.
- Screw position is controlled within 0.1mm to precisely control shot size and cushion position.
- Mold information upload and download.
- Machine downtime status display and recording.

標準及選購配備 Standard & Optional Accessories

配備項目	ITEM
射出安全護罩	Shield for injection
射出止逆裝置	Shot-off Nozzle
雙合金螺桿、料管	Bi-alloy Screw/Barrel
托拉式落料裝置	Sliding material feeding device
旋轉式落料裝置	Rotary type of connection of hopper
曲手：無給油軸承	Oilless bearing (Toggle)
曲手：套鋼	Steel bearing (Toggle)
模壁T型槽	T-slot platen
模壁T型墊板	T-slot board
隔熱墊板	Insulator sheets
活動式模定位圈	Check ring of mold (Replaceable)
成品落下口	Article Collecting Channel
氣動安全門	Pneumatic gate
水流分佈器8入8出(銅製)	Water manifold-8 in & 8 out (copper)
水流分佈器10入10出(銅製)	Water manifold-10 in & 10 out (copper)
CE安全認證	CE mark
電動馬達	Electric motor for material charging
加料油壓馬達	Hydraulic motor for material charging
開模定位迴路	Mold opening positioning device
多段數位背壓(螢幕設定)	Multi-stage back pressure control (Screen set up)
多段數位背壓(螢幕設定及顯示)	Multi-stage back pressure control (Screen set up and display)
射出閉迴路	Closed-loop control for injection
曲手電動注油器(1組)	Auto lubrication system for toggle (1 set)
曲手電動注油器(2組)	Auto lubrication system for toggle (2 set)
曲手潤滑油品-黃油	Toggle lubrication - Grease
曲手潤滑油品-多效齒輪油	Toggle lubrication - Gear oil
單中子	Single core pulling device
雙中子(一公一母)	Double core pulling device
四中子(二公二母)	Four core pulling device
轉牙裝置(計時/計次)	Unscrew device by timer or counter
泵浦高壓過濾器	High pressure filter for pump
系統壓力流量閉迴路(半閉迴路)	Close loop for system pressure and flow
雙迴路(開模與加料同動)	Double loops system (mold open-screw charge start)
三迴路(開模、托模與加料同動)	Parallel movement for material charging & mold ejecting during mold opening
多泵省電迴路裝置	Multi-connection pump for power saving
伺服節能系統	Servo power saving system
射出壓縮	Injection compression
射嘴獨立溫控	Temperature control of injection nozzle
落料口溫度顯示	Temperature display of material feeding section
落料口溫度顯示及控制	Temperature display & control of material feeding section
射出數位尺	Magnetostriction meter for injection
射座電阻尺	Linear potentiometer for injection carriage
夾模電阻尺	Linear potentiometer for clamping
托模電阻尺	Linear potentiometer for ejection
兩個風托(一公一母)	Air ejector sets
電眼檢出	Photo cell drop-out checking device
油溫顯示	Oil temperature display for hydraulic system
油溫顯示及控制	Oil temperature display & control
FCS-6500S微電腦控制器(彩色：KEBA)	FCS-6500S controller (color & key screen:KEBA)
FCS-6500微電腦控制器(彩色觸控：KEBA)	FCS-6500 controller (color & touch screen:KEBA)
電控穩壓器	Power stabilizer for controller
三色警示燈	Three-color alarm lamp
CE安全插座	CE safety socket
電源插座	Power socket (110V/220V)
主電源斷路器	Main power breaker
24H料管自動定時預熱	24 hours auto-preheat for barrel sets
機械、油壓、電氣三重保護裝置	Tri-safety device: mechanical, hydraulic and electrical
乾燥機	Hopper dryer
抽料機	Auto loader
模溫機	Mold temperature controller
乾燥機磁鐵	Magnet of hopper dryer
門式吊桿	Frame hanger
避震器	Anti-vibration mounting pad
工具箱組	Tool box set
標準出車附件	Spare parts
外銷出車附件	Export accessories
機械手電器接口	Robot electrical interface

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