The market distribution of servo motors and the introduction of well-known brands

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Servo motor science

The word "servo" derives from the Greece word for "slave". A "**servo motor**" can be understood as a motor that absolutely obeys the command of the control signal: the rotor is stationary until the control signal is issued; When the control signal is issued, the rotor rotates immediately; When the control signal disappears, the rotor can be stopped instantly. Servo motor is a micro motor used as an actuator in an automatic control device, and its function is to convert electrical signals into angular displacement or angular velocity of the rotating shaft.

The servo motor for the robot requires fast bus communication between the controller and the servo; The accuracy of the servo is high; In addition, there are processing requirements for the base material. In particular, like the robot end effector (claw) should use a motor with as small volume and mass as possible, especially when fast response is required, the servo motor must have high reliability and stability, can withstand harsh operating conditions, can carry out very frequent forward and reverse and acceleration and deceleration operations, and can withstand overload in a short time.

Special requirements for robot servos

Servo motors are divided into two categories: AC servo and DC servo, and the basic structure of AC servo motors is similar to that of AC induction motors (asynchronous motors). On the stator, there are two excitation windings Wf and control windings WcoWf with a phase space displacement of 90° electrical angle, which are connected to a constant AC voltage, and the AC voltage or phase change applied to Wc is used tc achieve the purpose of controlling the operation of the motor. The AC servo motor the characteristics of stable operation, good controllability, fast response, high sensitivity, and strict nonlinearity indicators of mechanical characteristics and adjustment characteristics (less than 10%~15% and less than 15%~25% respectively).

The basic structure of DC servo motor is similar to that of general DC motor. Motor speed n = E/K1j = (Ua-IaRa)/K1j, where E is the armature back electromotive force, K is constant, j is the magnetic flux per pole, Ua, Ia is the armature voltage and armature current, Ra is the armature resistance, change Ua or change the φ, can control the speed of the DC servo motor, but generally use the method of controlling the armature voltage, in the permanent magnet DC servo motor, the excitation winding is replaced by a permanent magnet, and the magnetic flux φ constant. The DC servo motor has good linear adjustment characteristics and fast time response.

The importance of servo motors

The control systems and automation products of **industrial robots** mainly involve servo motors, reducers, controllers and sensors. The servo motor is the power system of the industrial robot, which is generally installed at the "joint" of the robot and is the "heart" of the robot's movement.

At present, the joint drive of the robot is inseparable from the servo system, the more joints, the higher the flexibility and accuracy of the robot, and the more servo motors to

be used. The robot has high requirements for the servo system, which must meet the conditions of fast response, high starting torque, large dynamic torque inertia ratio, wide speed regulation range, and adapt to the shape of the robot to achieve small size, light weight, acceleration and deceleration operation, etc., and require high reliability and stability. At present, industrial robots use more AC servo systems.

Market distribution of servo motors

At present, in the Chinese industrial machinery market, the mainstream suppliers include Panasonic, Yaskawa and Mitsubishi in Japan, as well as Lenze and Bosch Rexroth in Europe and United States. From the perspective of market share, the current market share of foreign servo companies in China is 75%. Among them, Japan brands accounted for 50%; European and American brands account for 25%. Domestic brands only occupy about 20% of the market share.

At present, China's low-end servo system has been able to achieve large-scale mass production, but the high-end servo system has not yet formed a commercialization mass production capacity, and the domestic demand for precision servo motor control system mainly depends on imports. With the promotion of support policies for the robot industry and the continuous improvement of domestic servo technology, the pace of import substitution of China's servo system will accelerate.

A well-known brand of servo motor at home and abroad

Lenz

Lenze AG is one of Germany's leading industrial innovators with around 3,200 employees worldwide. Around 300 employees work in research and development in Germany. The main focus is on products, solutions, systems and services for mechanical and electronic drives. Headquartered in Hamelin, Germany, the company was founded in 1947 by Hans Lenz.

Lenze's product range includes frequency converters, servo drives, gear units, motors, brakes and clutches. In addition, it features automation solutions that integrate software, visualization and control, as well as systems engineering, coupling technologies and services.

In 1997, the Lenze Group officially entered the Chinese market with the opening of an office in Beijing, China. Lenze is committed to continuously expanding its presence in China and steadily establishing the Chinese market. In 2007, the Lenze Group

established a wholly owned subsidiary, Lenze (Shanghai) Transmission Systems Co., Ltd., in Shanghai, China.

Bosch Rexroth

Bosch Rexroth is one of the world's leading experts in drive and control technology for a wide range of machinery and systems, including safe, precise, efficient and cost-effective drive and control technology. The company integrates global application experience to develop innovative products and tailor-made system solutions and services for customers in every market segment of mobile machinery, mechanical applications and engineering, factory automation and renewable energy.

Bosch Rexroth also offers its customers a wide range of hydraulic, electronic drive and control, pneumatic, gear, linear drive and assembly technologies. The company operates in more than 80 countries, employs more than 37,500 professionals and generated sales of nearly 6.5 billion euros worldwide in 2012.

Yaskawa

Yaskawa Electric is a world-class manufacturer of transmission products. Yaskawa Electric (China) Co., Ltd. is a wholly foreign-owned enterprise fully invested by Japan Yaskawa Electric Co., Ltd. with a history of nearly 100 years, registered in Shanghai in April 1999 with a registered capital of 31.1 million US dollars. Business scope: Yaskawa brand inverters, servo motors, controllers, robots, various system engineering equipment, accessories and other mechatronics products. Our business areas include drive control business, **motion control** business, systems engineering business, and robotics business.

Yaskawa Electric is a professional manufacturer in the field of motion control, is the first company in Japan to do servo motors, its products are known for stable and fast, cost-effective, is the world's largest sales, the most used servo brand. Yaskawa offers a wide range of servo and controller products for a wide range of applications, from general industrial machinery to semiconductor and electronic component manufacturing equipment.

Panasonic

Panasonic entered China in 1992, in 2004 in Zhuhai factory began to produce servo system, in recent years servo product shipments have been in a leading position, in the

domestic sales of German servo products to small power-based, products to "low price and high quality" and have a strong competitiveness.

Siemens

Siemens is one of the world's largest electrical and electronics companies, with 150 years of success, ranking 21st on the Fortune 500 in 2003 and the largest among electrical and electronic companies. Siemens is a large international company with six main areas of focus: information and communication, automation and control, power, transportation, medical systems and lighting.

Siemens' Industry business area offers globally unique automation technology, industrial control and drive technology, and industrial software for all the needs of production companies, covering the entire value chain – from product design and development to product production, sales and service.

B&R

B&R (B&R) is a global leader in automation technology, headquartered in Eggelsberg, Austria, founded in 1979 by Erwin Bernecker and Josef Rainer. In August 1996, B&R established a subsidiary in Shanghai, B&R Industrial Automation (Shanghai) Co., Ltd., to serve the Chinese market.

Today, B&R's products and solutions are widely used in the field of mechanical automation, such as packaging, printing, plastics, textile, food and beverage, machine tools, semiconductors, pharmaceuticals and other industries; and process automation, such as electric power, metallurgy, municipal, transportation, petroleum, chemical and cement industries.

New Time

Founded in 1995, Shanghai Xinshida Electric Co., Ltd. is a high-tech enterprise specializing in R&D, production and sales of industrial control, transmission control, motion control and robot products and serving the world.

Since its establishment, Xinshida has always been committed to the research and development, manufacturing and sales of industrial automation control products. Based on its own research achievements in motion control and drive scale, Xinshida has determined the business growth bias of motion control and industrial robots. Robot is one of the highest-end products of industrial automation control, is the most

representative control, drive, execution integration products, Xinshida research and development of Lecheng based on Ethernet bus technology of high-performance embedded motion controller and servo system for the rapid promotion of robot products in the market provides a technical realization platform.

Huazhong CNC

Wuhan Huazhong CNC Co., Ltd. was founded in 1994, with independent intellectual property rights of servo drive and spindle drive device performance indicators reached the international advanced level, self-developed 5-axis linkage high-end CNC system has more than 150 units in the automobile, energy, aviation and other fields of successful application. More than 60 kinds of special numerical control systems developed by the company are used in textile machinery, woodworking machinery, glass machinery, injection molding machinery, radar, artillery and other weapons and equipment. The company's infrared thermal imaging camera products have been widely used in steel, energy, chemical, medical and other industries.

Guangzhou CNC

Guangzhou CNC Equipment Co., Ltd. (GSK) - South China CNC industry base, domestic leading professional complete machine tool CNC system supplier.

The main business includes: CNC system, servo drive, servo motor R & D and production, CNC machine tool chain marketing, machine tool numerical control engineering, industrial robots, precision CNC injection molding machine development, CNC high-skilled personnel training.

Nanjing Eston

Founded in 1993, Estun Automation Co., Ltd. is one of the leading enterprises in the manufacturing of high-end intelligent machinery and equipment and its core control and functional components in China.

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伺服电机的市场分布及知名品牌介绍

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伺服电机科普

“伺服”一词源于希腊语“奴隶”的意思。“**伺服电机**”可以理解为绝对服从控制信号指挥的电机：在控制信号发出之前，转子静止不动；当控制信号发出时，转子立即转动；当控制信号消失时，转子能即时停转。伺服电机是自动控制装置中被用作执行元件的微特电机，其功能是将电信号转换成转轴的角位移或角速度。

机器人用伺服电机要求控制器与伺服之间的总线通讯速度快；伺服的精度高；另外对基础材料有加工要求。特别是像机器人末端执行器（手爪）应采用体积、质量尽可能小的电机，尤其是要求快速响应时，伺服电动机必须具有较高的可靠性和稳定性，能经受得起苛刻的运行条件，可进行十分频繁的正反向和加减速运行，并能在短时间内承受过载。

机器人伺服的特殊要求

伺服电机分为交流伺服和直流伺服两大类，交流伺服电机的基本构造与交流感应电动机（异步电机）相似。在定子上有两个相空间位移90°电角度的励磁绕组Wf和控制绕组WcoWf，接恒定交流电压，利用施加到Wc上的交流电压或相位的变化，达到控制电机运行的目的。交流伺服电机具有运行稳定、可控性好、响应快速、灵敏度高以及机械特性和调节特性的非线性度指标严格（要求分别小于10%～15%和小于15%～25%）等特点。

直流伺服电机基本构造与一般直流电动机相似。电机转速n = E / K1j = （Ua - IaRa） / K1j，式中E为电枢反电动势，K为常数，j为每极磁通，Ua、Ia为电枢电压和电枢电流，Ra为电枢电阻，改变Ua或改变φ，均可控制直流伺服电动机的转速，但一般采用控制电枢电压的方法，在永磁式直流伺服电动机中，励磁绕组被永久磁铁所取代，磁通φ恒定。直流伺服电动机具有良好的线性调节特性及快速的时间响应。

伺服电机的重要性

工业机器人的控制系统和自动化产品主要涉及伺服电机、减速机、控制器和传感器等。伺服是工业机器人的动力系统，一般安装在机器人的“关节”处，是机器人运动的“心脏”。

目前，机器人的关节驱动离不开伺服系统，关节越多，机器人的柔性和精准度越高，所要使用的伺服电机的数量就越多。机器人对伺服系统的要求较高，必须满足快速响应、高起动转矩、动转矩惯量比大、调速范围宽，要适应机器人的形体做到体积小、重量轻、加减速运行等条件，且需要高可靠性和稳定性。目前，工业机器人使用的较多的是交流伺服系统。

伺服电机的市场分布

目前，在中国工业机器市场，主流的供应商包括，日本松下、安川、三菱，以及欧洲和美国的伦茨和博世力士乐。从市占率来看，目前国外伺服企业在我国的市场占有率达75%。其中，日本品牌占比为50%；欧美品牌占比达25%。而国产品牌只占据了20%左右的市场份额。

当前我国中低端伺服系统已经能够实现大规模量产，但高端伺服系统尚未形成商品化和批量生产能力，国内对精密伺服电机控制系统的需求主要依赖进口。机器人产业发展风生水起，随着扶持政策对机器人产业的推进，以及国产伺服技术的不断提升，我国伺服系统进口替代的步伐将加快。

国内外伺服电机知名品牌

伦茨

伦茨(LenzeAG)是德国前沿的工业创新型企业之一，在全球拥有约3200名员工。在德国大约有300名员工从事研发工作。主要侧重于用于机械和电子驱动的产品、解决方案、系统和服务。公

司的总部位于德国哈梅林，于1947年由汉斯伦茨成立。

伦茨的产品范围包括变频器、伺服驱动器、减速机、电机、制动器和离合器。此外，它还采用集成了软件、可视化和控制，以及系统工程、耦合技术和服务的自动化解决方案。

Lenze集团于1997年在中国北京设立办事处，正式进入中国市场。Lenze致力于不断扩大其在中国的业务，并稳步建立中国市场。2007年，Lenze集团在中国上海设立了全资子公司，伦茨（上海）传动系统有限公司。

博世力士乐

博世力士乐（BoschRexroth）是全球领先的传动与控制技术专家，致力于为各类机械和系统设备提供安全、精准、高效以及高性价比的传动与控制技术。公司融合全球的应用经验，研发创新的产品，为行走机械、机械应用与工程、工厂自动化及可再生能源每一个细分市场的客户量身定制系统解决方案及服务。

博世力士乐同时为客户提供各种液压、电子传动与控制、气动、齿轮、线性传动及组装技术 `` 司业务遍及全球80多个国家，拥有37，500多名专业员工，2012年全球的销售额近65亿欧

安川

安川电机是世界一流的传动产品制造商。安川电机（中国）有限公司是有近100年历史的日本安川电机株式会社全额投资的外商独资企业，于1999年4月在上海注册成立，注册资金3110万美金。经营范围：安川品牌的变频器、伺服电机、控制器、机器人、各类系统工程设备、附件等机电一体化产品。事业领域包括驱动控制事业、**运动控制**事业、系统工程事业、机器人事业。

安川电机是运动控制领域专业的生产厂商，是日本第一个做伺服电机的公司，其产品以稳定快速著称，性价比高，是全球销售量最大，使用行业最多的伺服品牌。从一般工业用机械到半导体、电子零部件制造设备，安川都能提供适合于各种用途的最匹配的伺服、控制器产品。

松下

松下1992年进入中国，2004年在珠海建厂开始生产伺服系统，近年伺服产品的出货量一直处于领先地位，在国内销售德伺服产品以小功率为主，产品以“低价优质”而且有很强的竞争力。

西门子

西门子是世界上最大的电气和电子公司之一，历经150年来常盛不衰，其营业收入在2003年列财富500强第21位，在电子电气类公司中更是名列榜首。西门子是一家大型国际公司，公司的业务主要集中于6大领域：信息和通讯、自动化和控制、电力、交通、医疗系统和照明。

西门子工业业务领域能够提供全球独一无二的自动化技术、工业控制和驱动技术以及工业软件，能够满足生产企业的所有需求，涵盖整个价值链——从产品设计和开发，到产品生产、销售和服务。

贝加莱

贝加莱（B&R）是一家自动化技术领域的全球性领导厂商，总部位于奥地利Eggelsberg，于1979年由ErwinBernecker先生和JosefRainer先生共同创建。1996年8月，贝加莱在上海成立了服务于中国市场的分公司--贝加莱工业自动化（上海）有限公司。

如今，贝加莱的产品和方案已广泛应用于机械自动化领域，如包装、印刷、塑料、纺织、食品饮料、机床、半导体、制药等行业；以及过程自动化领域，如电力、冶金、市政、交通、石油、化工和水泥等行业。

新时达

上海新时达电气股份有限公司是专业研发生产销售工业控制、传动控制、运动控制和机器人[illegible]并服务于全球的高新技术企业，创立于1995年。

自创立以来，新时达始终致力于产业自动化控制产物的研发、制造和销售。基于自身在运动控制和驱动规模的研究成就，新时达确定了运动控制和产业机器人的业务成长偏向。机器人是产业自动化控制的最高端产物之一，是最具有代表性的控制、驱动、执行一体化产物，新时达研发乐成基于以太网总线技术的高性能嵌入式运动控制器和伺服系统等为机器人产物的市场迅速推广提供了技术实现平台。

华中数控

武汉华中数控股份有限公司创立于1994年，具有自主知识产权的伺服驱动和主轴驱动装置性能指标达到国际先进水平，自主研制的5轴联动高档数控系统已有150多台在汽车、能源、航空等领域成功应用。公司研制的60多种专用数控系统，应用于纺织机械、木工机械、玻璃机械、注塑机械以及雷达、火炮等武器装备。公司红外热像仪产品已广泛应用于钢铁、能源、化工、医疗等行业。

广州数控

广州数控设备有限公司（GSK）--中国南方数控产业基地，国内技术领先的专业成套机床数控系统供应商。

主营业务有：数控系统、伺服驱动、伺服电机研发生产，数控机床连锁营销、机床数控化工程，工业机器人、精密数控注塑机研制，数控高技能人才培训。

南京埃斯顿

埃斯顿自动化公司成立于1993年，是国内高端智能机械装备及其核心控制和功能部件制造业领军企业之一。

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