To the international press

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2007: 6,5 million robots in operation world-wide

Japan has the highest robot density

In 2011 more than 18 million robots will populate the world

At the end of 2007 about 1 million industrial robots and 5.5 million service robots were worldwide operating in factories, in dangerous or tedious environment, in hospitals, in private houses, in public buildings, underwater, underground, on fields, in the air, in the space – robots are everywhere! Up to the end of 2011 more than 17 million service robots and 1.2 million industrial robots will populate the world, reports the IFR Statistical Department in the new study “World Robotics 2008”, which was published on Wednesday in Frankfurt.

Industrial robots – key component to industrial automation!

In 2007, 114,365 new industrial robots were installed worldwide, the world market grew by 3%. In terms of value the market grew by 11% to almost US$6 billion. This generally does not include the cost of software, peripherals and systems engineering. The actual robotic systems market value may be about two or three times as large. The world market for robot systems in 2007 can therefore be estimated to be in the order of US$18 billion.

As in recent years, the results in the major regions were quite different: **decline in Asia, recovery in the Americas, continuing growth in Europe.** In 2007, about 59,300 robots were supplied to Asian countries (including Australia), about 4% fewer than in 2006. **The main markets, Japan and the Republic of Korea, saw a continuing decline in robot**

investments, as did Taiwan. On the other hand, the emerging markets, such as China, the Southeast Asian countries and India, all achieved significant increases in supply. The electrical/electronics industry, which invested very heavily in 2005, cut robot purchases by half in 2006 and continued to cut back in 2007 throughout Asia and Australia. Supplies to the automotive industry also decreased further. Supplies to all other industries only decreased slightly.

In Japan, the largest market in Asia and the world, supplies fell by 3%, to about 36,100 units. After the substantial investments within the automotive and electrical/electronics industry in 2005, purchases in both sectors were down in 2006 and 2007. The fall was somewhat compensated by increased sales to the chemical/rubber and plastics industry and the medical devices industry.

Robot supplies fell by 6% in the Republic of Korea (the second largest Asian robot market) in 2007, to about 10,100 units. A slump in orders from nearly all industries – especially motor vehicle suppliers - was partly offset by stronger investment in the electronics industry and the automotive parts industry.

Robot investment is still booming in China, the third largest Asian robot market, with 6,600 units supplied in 2007, an increase of 14% on the previous year. Here, demand is increasing in all industries, including the automotive sector. The supply of industrial robots was up by 11% in India. Robot sales to Taiwan (Province of China) declined by 44%.

Total supplies in all other Asian markets, including Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam, surged by 25%. In Australia, sales increased, but only by 2%.

About 19,600 industrial robots were supplied **to the Americas in 2007, 9% more than in 2006**. Strong demand from the motor vehicle industry in the highly competitive U.S. and Canadian markets was the main reason for this solid result. Sales and production volumes of cars have stagnated or even declined over the last few years, which have also witnessed changes in the respective market shares of the individual manufacturers. The car market in the United States and Canada declined once again in 2007. The "Detroit 3" – GM, Ford and Chrysler – had to cut production while Japanese and Korean companies gained market share and continued to increase their capacities. As such, the increase in robot shipments to the automotive industry was mainly the result of investment by foreign firms. 'General industry' i.e. all other industries – reduced robot purchases by 4%. .

Robot supplies to Mexico were expected to increase in 2007, but in fact they were down. It seems that investments that had been announced were postponed until 2008. Strongly increasing demand for industrial robots has been registered in Argentina and Brazil. Deliveries to these countries almost doubled.

Sales of industrial robots in Europe were up by 15% to about 34,900 units, the highest number of robots ever recorded in one year. This was the result of surging investments in the non-automotive sector as well as in the motor vehicle industry.

Germany – the largest market for industrial robots in Europe – was the engine of growth in Europe. Supplies of industrial robots surged by 30% to about 14,900 units, the highest number of robots ever recorded in one year for the country. This was due to significantly increased demand from almost all industries, especially the motor vehicle industry, the metal and engineering industry, the glass industry, the electrical/electronics industry and the food and beverage industry.

Italy – the second largest market - grew by 14%, to 5,800 units. This was the result of strong demand from the automotive industry and a remarkable increase in supply in almost all other industries.

The yearly supply of industrial robots in France decreased by 11% to about 2,700 units. As in 2006, supplies to the automotive industry plummeted. The chemical industry also purchased fewer robots than in 2006. The beginnings of a recovery in robot sales to the machinery industry, a significant increase in robot supplies to the metal industry, and a remarkable increase in robot supplies to the food industry all helped to counterbalance these decreases to a certain degree.

Sales to Spain and the United Kingdom were down.

Robot sales to Central/Eastern European countries surged by 61%. In particular, the Czech Republic, Poland and Russia all saw significant increases in robot supplies.

Robot density – indicator of automation

The **number of multipurpose industrial robots per 10,000 persons employed in manufacturing industry**, or alternatively, the **number of multipurpose industrial robots per 10,000 production workers in manufacturing industry**, reflect the degree of automation in a country.

With 310 operating robots per 10,000 employees in the manufacturing industry **Japan has by far the highest robot density in the world**. Although it has to be taken in account that the operational stock of includes to a certain degree all types of robots, Japan is by far the most automated country in the world.

It is followed by **Germany** with a density of operating 234 robots per 10,000 employees in the manufacturing industries. Thereafter follows the **Republic of Korea** with a robot density of 185 robots. Here also it has to be considered that the operational stock still includes to a certain degree all types of robots.

Italy and the **United States** had 116, each, and **Swede**n 115 robots per 10,000 employed in manufacturing industry. All other surveyed countries had robot densities under 100.

One robot per 5 production workers were operating in the automotive industry in Japan.

In the automotive industry – the origin customer of industrial robots – the robot density is still remarkably higher than in all other industries. Japan and Italy are in the lead with 2,100 robots and 1,772, respectively per 10,000 production workers in the automotive industry. Thereafter follows Germany with a density of 1,439, United States 997, France 929, United Kingdom 794, Spain 763 and Sweden 600. The technological level with respect to robotics is thus rather homogeneous in the motor vehicle industry in most of the above-mentioned countries.

Future of Industrial robots – technical trends and customer trends

There is a worldwide trend towards automation in the "non-automotive industry", which was strongly apparent in 2007. Robot suppliers are offering increasingly tailored solutions to these customers. The metal industry, the food and beverage industry, the glass industry, the pharmaceutical and medical devices industry, and the photovoltaic industry continued to increase their robot investments.

The main customer – the automotive industry – is changing. Significant growth in unit sales of cars can only be realised in the growing markets of India, Southeast Asia, Russia and other Eastern European countries. In these countries, demand is mainly for small and low-cost cars. In the mature car markets of Western Europe, North America, Japan and the Rep. of Korea, growth in value of turnover is only possible as a result of improvements in technology. Furthermore, demand for small, economical and low-cost cars as well as for environmentally-friendly cars is becoming increasingly important also in these markets. Alternative drive systems are gaining in importance given the rising price of fuel.

Motor vehicle suppliers are reorganizing their business with their suppliers. They are reducing the number of direct suppliers. They are outsourcing complete production processes and concentrating on value-adding processes. Automotive parts suppliers have had to restructure in order to meet the demands of motor vehicle suppliers. In both industries, the number of suppliers will consolidate in the coming years.

The automated handling and manipulation of parts and material is gaining substantially in importance in all manufacturing sectors. Manufacturers using machine tools are increasing the hours that factories can stay operational via automation with industrial robots. Robots replace workers as managers of machine tools, providing tools, material and parts from stores near to the machine tool. This enables machining centers to keep running 24 hours a day, 7 days a week.

Palletizing, packaging, picking and placing has gained rapidly in importance over the past three years in Europe. Automation in the food and beverage industry– the principal industry for this application – is very high in Europe. The Americas lag far behind with automation in this sector. Labour is still cheap in many regions in Asia, therefore the degree of automation is still not as high as in Europe.

Improvements in sensor technology like robot vision, force sensing and environment recognition will enhance quality control and inspection. Improvements in communications such as remote operation and better human-machine interfaces will open up new customer groups such as small and medium sized companies. Improvements in system technology, like off-line programming, safety and multi-robot cooperation will guarantee sophisticated solutions for automating processes.

Installations of industrial robots continue to grow between 2008 - 2011

In 2008, investments in manufacturing industries are losing momentum. The robotics market still increased in the first half of 2008 worldwide by 8% according to the IFR Quarterly Shipment Statistics. Whereas in the first quarter of 2008, robot shipments still rose in all regions, growth in robot installations lost speed in the second quarter of 2008. So we expect a moderate increase worldwide of about 4% over the course of 2008. The dark clouds of a worsening global economic outlook will affect robot installations in 2009 and probably also in

2010. But we do not anticipate a sharp decrease. Why? Industrial robots are a key component in automating processes. Productivity, labour shortages caused by demographic shift, high quality standards, environmental regulations, reduction of tedious and even dangerous jobs, energy and infrastructure costs, inflexible production etc. will pose new challenges to automation technology and will stimulate the demand for robots in all manufacturing sectors. Last but not least, investments in the emerging markets will continue apace. A strong global recovery can be expected by 2011 at the latest.

The world market for industrial robots is projected to increase by 4% from 114,365 units in 2007 to 118,900 in 2008. From 2009, it will rise by a yearly average of 4.1% to 134,100 in 2011.

In 2008, Europe will be up by 6% to a new peak level. North America will be down slightly by 1%, while Brazil will continue to grow substantially. Total Americas will stagnate at a high level. Demand in China, India, ASEAN, Central/Eastern Europe and South America will again increase at an above-trend rate. Robot supplies will stagnate in Japan, while in the Republic of Korea growth of about 8% can be expected. Total Asia/Australia will grow by 6%.

An average growth in robot shipments world-wide of about 4% per year can be expected between 2009 and 2011. Stagnating or only slowly growing investments by motor vehicle suppliers world-wide will be compensated – to a certain degree - by more vigorous demand across all other industries. In Europe and in the Americas, average growth will be about 3% per year, and in Asia/Australia 5% per year.

Case studies in World Robotics : Industrial robots increase productivity!

Just three examples:

Salami under control:
High speed robots with specially developed grippers increased performance up to 25% compared with manual loading and open up new prospects for cost-effectiveness. (ABB Robotics)

Industrial robots build houses
Grinding, brushing, stapling, and gluing of boards by industrial robots just-in-time and meet the extreme short lead times in the construction industry. (KUKA Roboter)

Extreme versatility in tight spaces
Flexibility, small footprint and maximum availability of a dual-arm industrial robot increased productivity and global competiveness of a German machinery company. (Motoman)

Service Robots: assistants in private and professional life

Service robots for professional use: 49,000 units installed up to the end of 2007

With 12,000 units, service robots in defense, rescue and security applications accounted for 25% of the total number of service robots for professional use installed up to the end of 2007. They are followed by field robots (mainly milking robots) with 20%, cleaning robots and underwater systems with 12% each. Construction and demolition robots (9%), medical robots (9%) and mobile robot platforms for general use (7.4%) come in the next ranges. Minor installation numbers were counted for logistic systems, inspection systems and public-relations robots.

The total value of service robots for professional use installed up to the end of 2007 was about US$7.8 billion. The most expensive robots are underwater systems, medical robots, milking robots and robots for defense, rescue and security applications.

Service robots for personal and private use: about 3.4 million units for domestic use and about 2.0 million units for entertainment and leisure sold up to end 2007

Service robots for personal and domestic use are recorded separately, as their unit value generally is only a fraction of that of many types of service robots for professional use. They are also produced for a mass market with completely different pricing and marketing channels.

So far, service robots for personal and domestic use are mainly in the areas of domestic (household) robots, which include vacuum cleaning and lawn-mowing robots, and entertainment and leisure robots, including toy robots, hobby systems and education and training robots.

Up to the end of 2007 about 3.3 million vacuum cleaner and more than 110,000 lawn mowers were sold. The total value amounted to about US$1.3 billion.

As for entertainment and leisure robots, it is estimated that about 2 million units had been sold up to the end of 2007. It is expected that the cross-fertilization of PC, home entertainment and robot technologies will become a very substantial business area in the near future. The total value of the stock of entertainment and leisure robots amounted to US$1 billion. These are very low-priced robots. A rather high-end example of entertainment robots, which is still a rather limited market segment, is the ROBOCOASTER® by KUKA (Germany). Its basis is a modified industrial articulated robot, but it has been developed as an attraction system for robot exhibitions and leisure parks such as Legoland®.

The market for robots for handicap assistance is still small, but is expected to double in the next four years. These robots have not yet taken off to the anticipated degree, given their potential with regard to both imaginable need and the existing technological level of the equipment. In a longer perspective, say in the next 10 years, and taking into account demographic shifts and advances in technology, assistive robots for disabled and handicapped persons as well as robotic prostheses are certain to be a key area for service robots. Some major research institutions are focusing on developing prototypes of this kind of robots and robotics-related devices.

Projections for the period 2008-2011: 54,000 new service robots for professional use to be installed

Turning to the projections for the period **2008-2011**, the stock is forecast to increase by some 54,000 units. An application area with strong growth might be **humanoid robots** mostly in the form of toys and hobby systems. However, up till now there have been no significant sales of humanoids as human companions for performing typical everyday tasks in production, office or home environments. Quite a few Japanese companies (HONDA, Kawada, Toyota and others) and also first Korean and Chinese companies are in the process of developing these general-purpose robot assistants beyond the toy and leisure stage. First shipments of these humanoid robots started in 2004, mostly in Japan or to international research laboratories and universities as research and development platforms. It is estimated that about 100 humanoid robots had been produced up to the end of 2007.

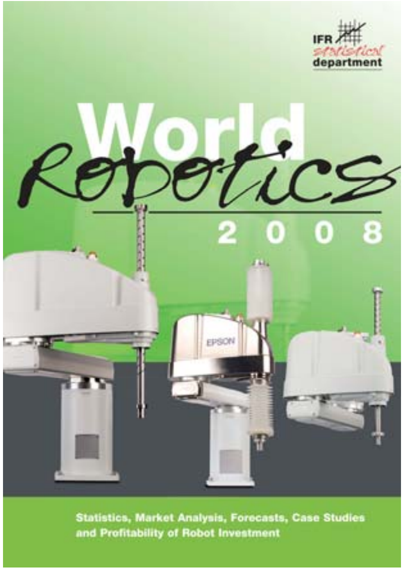
Application areas with strong growth are **defence, rescue and security** applications, **field** robots, **cleaning** robots, **medical** robots and mobile robot platforms for multiple use. The estimated value of sales of service robots for professional use is about more than US$9 billion in the period of 2008 – 2011.

Projections for the period 2008-2011: about 12.1 million units of service robots for personal use to be sold

It is projected that sales of all types of domestic robots (vacuum cleaning, lawn-mowing, window cleaning and other types) could reach over 4.6 million units in the period 2008-2011, with an estimated value of US$3.3 billion.

The size of the market for toy robots and hobby systems is forecast at about 4 million units, most of which, of course, are very low-priced.

About 3.2 million robots for education and training are expected to be sold in the period 2008-2011. Sales of all types of entertainment and leisure robots are projected at well beyond 7.3 million units, with a value of about US$1.8billion.



World Robotics 2008 can be ordered at www.worldrobotics.org

The IFR Statistical Department, which is hosted by the VDMA Robotics + Automation association publishes the study World Robotics every year. This unique publication presents comprehensive global statistics on both industrial and service robots in uniform tables allowing consistent country comparisons. It contains detailed statistical data for some 50 countries, broken down by application areas, industrial branches, types of robots and by other technical and economic variables. Data on production, exports and imports are presented for a selection of countries. Trends in robot densities, i.e. number of robots per 10,000 persons employed in relevant sectors, are also featured. The chapter about Service Robots is written by our partner the Fraunhofer IPA.