Cabling Solutions for Automation White Paper

Enhanced reliability, new opportunities

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Synopsis

This report is intended to give a general overview of the machine tool and automation market – which includes industrial, service and personal robotics – and to provide information about how Nexans is serving this diverse and growing sector.

The paper opens with a definition of the role automation plays in the world economy, and outlines recent trends in machine tool technology and robotics. New challenges and opportunities are presented in six key areas, each of which has important repercussions on cables and cabling. Customer incentives and expectations are outlined. The second section presents Nexans' overall solutions in the five key areas that apply to industrial automation, and then briefly reviews other solutions and service capabilities applicable to new automation markets.

This report is followed by an Appendix containing a list of recent Nexans success stories, innovations and references.

I. INTRODUCTION: FROM THE FACTORY FLOOR TO THE SERVICE INDUSTRY

"In spite of the worldwide economic and financial crisis, robotics and automation is still one of the fastest growing industries of the last 20 years. And this unbelievable success story will go on for many more years – as well for industrial as for service robotics!"

Dr. Andreas Bauer, Chairman International Federation of Robotics Industrial Robot Supplier Group

1. The place of automation in the world economy

The world sales of **industrial robots** in 2008 achieved the second highest level ever recorded: more than 113,000 units worldwide. This followed four years of exceptional growth worldwide.[1] Generally speaking, the number of industrial robots has been increasing in Asia, slightly declining in the Americas, and leveling out in Europe.[2]

In 2008, there were 60,300 robot shipments to Asian countries which meant an overall increase of about 4%. In Japan (the world's largest market), supplies fell by 8% to about 33,100 units, while supplies increased in Korea by 28% to 11,600 units, largely due to the auto and electronics industry. China increased its robot stock by 20% (7,900 units) to serve the emerging automotive sector, while the supply in robots to India was down by 5%. Meanwhile, sales to Taiwan surged by 40%. Total supplies in all other Asian markets rose by around 10% and in Australia by 6%.

About 17,200 industrial robots were supplied to the Americas in 2008, which meant a drop of 12% compared to the previous year due to the recession, the credit crunch and over-production woes hitting the automotive industry. The European situation was more robust, with about 35,100 units being sold. This was due to the metal and machinery industry, pharmaceuticals and cosmetics, the food and beverage industry and electronics, while sales to automotives and rubber and plastics stagnated.

According to the International Federation of Robotics (IFR), in 2009 robotic sales slumped by some 50%. However, by the end of 2009, a slow recovery was already on its way driven by emerging markets in Asia.[3] Today, the IFR forecasts that by 2012, the number of robots sold will equal those sold in 2008.

In money terms this means that the annual value of the market will soon increase to the $6.2 billion (4.6 billion euros) achieved in 2008. If the cost of software, peripherals and systems engineering are included, this figure is three times as large, i.e. $19 billion (14.2 billion euros) worldwide.

With more than one million industrial robots in operation at present, "robot density" (i.e. the number of multipurpose industrial robots per 10,000 persons) provides a very revealing

[1] According to the IFR Statistical Department: "2008 World Robot Market"
http://www.bara.org.uk/news/pr/2009/PR_Industrial_Robots_30092009.pdf
[2] All of the following figures can be found in the "Executive Summary of World Robotics 2009 Industrial Robots and World Robotics 2009 Service Robots" available at
http://www.worldrobotics.org/downloads/2009_executive_summary.pdf
[3] IFR Statistical Department: "The Robotics Industry is looking ahead…"
http://www.worldrobotics.org/downloads/IFR_Press_release_18_Feb_2010.pdf

international picture. Japan is still the leader in robot density, with 295 robots for every 10,000 manufacturing workers. This is almost 10 times the world average, and nearly twice that of Singapore (169), Korea (164) and Germany (163)[4]

Other country-based, world and regional figures are as follows: Sweden: 126, Italy: 124, Finland: 98, Belgium: 89, USA: 86, Spain: 84, World: 32, Europe: 50, Americas: 31, Asia Pacific: 27, Africa: 2.

According to a United Nations Economic Commission report, the automotive industry is still the world leader in terms of density, with 1 robot for every 10 workers. It is also interesting to note that the automotive industry (33%), electrical and electronics (10%) and chemicals, rubbers and plastics (9.5%) account for over one-half of all industrial robots worldwide.

2. From machine tools to robotics

Machine tools are powered mechanical devices, typically used to fabricate metal and plastic components of machines by the selective removal of material. They include industrial drills, gear shapers, hobbing machines, lathes, milling machines, shapers and grinders.[5] Generally confined to two-dimensional movements, some machine tools can also operate in three axes.

A truly global market, the machine tool industry has seen a recent resurge after disappointing figures in 2009 (following a boom year in 2008). According to the VDW (German Association of the Machine Industry and Machine Tool Producers), the world export volume in 2008 for machine tools rose by nearly 6% to some 30.7 billion euros.[6] And so, machine tools are going to continue to be a steady and growing market worldwide by 2011, especially from China and India, but also from the USA, Russia and Brazil, whose economies are getting back on track for growth.[7]

The ten largest machine toolmakers in Europe are located in Germany, making it No. 1 in terms of production (23% of world production), followed by Japan (19%), then Italy (10%), Taiwan (9%), Switzerland (7%), the US (4%), South Korea (4%), Belgium (3%) and China (3%), and China's production is constantly rising. Customers mainly come from the automotive, electronics, machinery and aircraft manufacturing industries. China is presently the prime importer of machine tools, with 17% share of the world import volume, worth nearly 5.1 billion euros.[8]

As machine tools become more complex and intelligent, they approach the second sector: industrial automation, or robotics, which takes machine control and production to new levels of sophistication, often by using the power of the Internet over Industrial Local Area Networks.

The **industrial robotics** segment (which evolved in parallel with machine tools) was developed over the second half of the last century and consists of immobile, single or multiple task robots

[4] These figures and the following ones come from "The Rise of the Machines": http://spectrum.ieee.org/robotics/industrial-robots/the-rise-of-the-machines
[5] From the Machine Tool Encyclopedia, available at www.variedtastes.com/encyclopedia/Machine_tool/
[6] Consult VDW at http://www.vdw.de/bin/load_file_inter.pl?p_bereich=wirtschaft&p_paket_id=11&p_dok_id=10001402&p_typ=doc&p_sprache=d
[7] See "German machine tool industry anticipates significant recovery in demand for 2010" at http://www.cemat-network.com/index.php?id=497&L=1
[8] See publication "The German Machine Tool Industry in 2008" at http://www.vdw.de/bin/load_file_inter.pl?p_bereich=wirtschaft&p_paket_id=11&p_dok_id=10001402&p_typ=doc&p_sprache=d

that have little interaction with humans or the surroundings. They are basically used in manufacturing and factory floor automation. According to ISO Standard 8373, they are an *"automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes."*[9] Recent models which use a 2D image to develop a 3D image can move through six axes: X,Y, Z, pitch, yaw and roll for precision handling. Mechanical design range from Cartesian or gantry robots to cylindrical, spherical, SCARA, articulated, parallel mechanical structures. Typical applications include welding, painting, ironing, assembly, palletizing, product inspection and testing.

Advanced "vision-guided" robots can impart a wide range of benefits to factories. They can be installed on current assembly lines to reduce equipment costs, downtime and workplace injuries. Because they can handle positioning variations, they eliminate the need for costly, custom-built fixtures. By spotting scattered parts in 3D space, they make manual loading unnecessary. In addition, they support a high degree of customization. In the automotive industry they can identify different requirements, like different sized doorframes, and react to eliminate the need for multiple lines or time-consuming changeovers. Thus, the same line can assemble different model types on the same automobile platform.[10]

It is perhaps significant that for its 2009 publication of World Robotics statistics and trends, the IFR has decided to separate industrial robots (above) from **service robots**, which are now published in two separate reports. Furthermore, service robots, themselves, are broken down into professional robots and personal robots.

There are about 63,000 units of **professional service robots** in the world, with a third of that number in defense, rescue and security applications (30%). The remainder consist of field robots (mainly for milking, 24%); cleaning robots (9%); medical robots (8%); underwater systems (8%); construction and demolition (7%); mobile robot platforms (6%). The total value for these professional service robots amounted to $11.2 billion (8.4 billion euros) by the end of 2008. Forecasts indicate that about 50,000 new service robots are scheduled to be produced by 2012.[11]

In contrast, **personal service robots** are an extremely large mass market consumer category which are relatively low-cost domestic appliances items, like vacuum cleaners (e.g. IRobots' remarkable Roomba[12]) and lawn-mowing robots. However there is a growing market of entertainment and leisure robots (toys) and robots for handicap assistance, personal transportation and home security and surveillance. In 2008, nearly one million vacuum cleaning robots were sold, almost double the amount sold in the previous year. Some 12 million service robots for personal and private use are likely to be sold by 2012.

[9] According to textsheet.com's online technical dictionary.
[10] Consult Industrial Market Trends: "Rise, Robot" by Katrina C. Arabe at http://news.thomasnet.com/IMT/archives/print/2005/03/rise_robot.html
[11] Again, from: "Executive Summary of World Robotics 2009 Industrial Robots and World Robotics 2009 Service Robots" available at http://www.worldrobotics.org/downloads/2009_executive_summary.pdf
[12] For video demonstration, please consult: http://www.irobot.com/filelibrary/Roomba_Videos/560video.html

3. New challenges and their impact on cables

3.1 Mobility and sense

Early machine tools and robots were often large, hydraulically-powered and immobile. Their movements were originally linear, two or three dimensional, and there was little scope for line flexibility or manipulative dexterity. For years, these "dumb" monsters were able to boost output only by accelerating speed or improving assembly precision; however, they were incapable of adjusting to any sort of change. If a part was a millimeter out of position, the machine would not recognize the fact, and grind to a halt, often with disastrous consequences.

New generation robots will have a sense of touch as well, as force-feedback sensors are refined. This will enable them to identify texture, detect small pressure changes and carry out extremely precise tasks. Today's newest industrial robots are frequently mounted to an overhead rotary axis or to a linear rail to provide access to broader areas to process equipment below. For example, a single robot mounted overhead could tend three or more machining centers grouped in either a cluster or linear configuration. Ultimately, industrial robots will gain the autonomy predicted for service and domestic automation based on web-centric and wireless solutions.

To achieve mobility and sense, robotic cables are going to have to be more flexible and reliable with the ability to deliver both data and energy, and handle overall network complexity.

3.2 Higher intelligence

Even with rudimentary intelligence, machine tools and robots showed an ability to generate gains in plant productivity, efficiency and quality. With advances in microprocessor speeds and artificial intelligence, automation will make further gains as flexible automation tools. Multiple sensors and advanced mechanics will make it possible to automate jobs that have never been attempted before, for example in semiconductor manufacturing where human assembly has reached its limits in terms of speed and quality.

Higher intelligence will be achieved by harnessing powerful commercially available microprocessors to create platforms which can handle a host of sensors, actuators and servos. An Integrated Core Processing (ICP) system will probably support all of the embedded computing elements for several robots and subsystems, making it possible to handle more functions than ever before, and support multiple applications, making automation extremely flexible. Digital Signal Processing (DSP) will require the incorporation of more optical fibre on assembly lines, and the processor system will have to be designed with redundancies to protect against a single point of failure.

To deliver higher intelligence, robotic cables will have to evolve from older ASI-bus control cables to Profibus (12 Mbits/s) and Profinet cables (100 Mbit/s) for Industrial Ethernet LAN cables which also deliver Power Over Ethernet (POE) to power machines, phones, cameras, etc.

3.3 Internet networking

Closely related to the above, is the question of networking. In the past, plant managers running automation control systems via Programmable Logic Controllers (PLCs) were a world away from

IT managers running Office Ethernet LANs for management. Today, all this is changing, with Ethernet rapidly becoming a common network connecting all devices, machine tools, robots and equipment on the factory floor with the front/back office. The result is greater efficiency and transparency along the entire production chain, with faster strategic decision-making.

PC-based computer simulation and robot calibration packages enable managers to use off-line programming to develop and test their robot programs before downloading to the actual production line. Human Machine Interfaces (HMIs) are simpler to use, with full-color touch screens and Windows-type programs. Finally, marketing, financial analysis, Internet commerce, parts commerce and procurement, training and even maintenance are brought together in one continuum to increase productivity and competitiveness.

To assure Internet networking, chain, control, bus and sensor cables on the machine, and Industrial Ethernet LANs and Profinet solutions beyond the machine must be combined for both management and production on a common platform and over longer distances.

3.4 Compactness

Since the variety of functions involved with automation is going to expand, there is going to be a pressing need to accommodate more diversity on the factory floor. This means smaller and lighter machines, often related to nanotechnology and nanoscale assembly. Micro-Electro-Mechanical Systems (MEMS) combined with nanotech sensors will not only be used for manufacturing ever smaller products robotically, they will also be used within the "smart" products, themselves.

As automation expands to create ever larger products, like jumbo jets, at the other end of the scale a new world of Microsystems is developing which can sense and control the environment. Because MEMS devices are manufacturing using batch fabrication techniques similar to those used for integrated circuits, unprecedented levels of functionality can be placed on a small silicon chip at relatively low cost. The move towards compactness is already transforming the automotive, biomedical and electronics market.

The new generation of compact industrial equipment requires smaller, lighter, often miniaturized cables which make important space gains while delivering equal or superior levels of reliability and performance.

3.5 Standardization

A recent Japanese study[13] notes a transition from basic industrial robots towards the symbiotic robot, capable of more autonomy, learning, recognition and even human interaction on the factory floor.

However, it sees the greatest impediment to progress being a lack of standardization. Robots have been developed and manufactured using proprietary, integrated systems, so that each manufacturer has a different architecture and there is no common platform. A symbiotic

[13] By Masayoshi Yokomachi of the Machinery System Technology Development Department of NEDO, the presentation is available at www.omg.org/docs/robotics/o5-01-04.pdf

industrial robot needs specific and complex application software in addition to open interfaces and modularized functional components.

Robotic systems require cables and solutions which do not lock users into technological dead-ends. Backward compatibility is essential, especially in the area of copper LANs connectivity.

3.6 Safety and eco-friendliness

Safety is a growing concern among machine tool and robotic equipment manufacturers, industry, and the public-at-large. The production line is a dynamic entity which requires nearly continuous operation to optimize the investment/output ratio, especially for variable production runs of customized products. Therefore, there must be no breakdowns or flowage stops, whether for a standard or customized product.

Equipment must be capable of operating reliably in often dangerous and hazardous conditions (especially where dangerous materials are involved, or in tough environments undersea, or in the air). To ensure worker safety, automation equipment must be fire-safe, and not generate dangerous smoke and gases in the event of a fire. The entire production process must be environmentally safe. Wherever possible dangerous materials should be eliminated, and discarded or obsolete materials recycled.

To fully meet the RoHS directive (Restriction of Hazardous Substances in electrical and electronic equipment), in all critical areas, cables should be Halogen-Free Flame (or Fire)-Retardant (HFFR), and designed for quick and easy removal and recycling.

4. Incentives and customer expectations

To achieve recovery and growth in the coming years, the manufacturing industry has strong incentives to improve production processes through new robotic systems so as to:

- Decrease product life cycles;
- Shorten time-to-market;
- Increase global competitiveness;
- Adjust to demographic shifts;
- Conform to environmental regulations;
- Lower energy costs;
- Reduce operating and capital costs;
- Improve product quality and consistency;
- Increase output rates;
- Create more flexibility;
- Reduce material waste.

Whether a wholesaler, a component and system supplier, a complete automation system manufacturer (OEM) or an end-user, all would like to see automation equipment which is more mobile, compact and intelligent, with the possibility of Internet networking. They would also like more control and data functions to facilitate operations and contribute to production, packaging and delivery. Above all, they want both commercial off-the-shelf cable products that can assure interoperability and easy procurement, and high-end cables which can help lower “expense per

unit produced" and enhance efficiency and reliability. Safety is also a prime concern, for the assembly line, for workers, and for the plant and its surroundings.

Thus, the machine tool and automation/robotics industry also has specific expectations from cable manufacturers:

- High performance for efficient integration and distributed control;
- Quality, reliability and durability to avoid costly stoppages;
- Availability and fast delivery for production line flexibility;
- Resistance to harsh environments and imperviousness to EMI;
- Safety for personnel, e.g. lead- and cadmium-free and easy recycling;
- Conformity to international standards, and cross-industry compatibility;
- Excellent service, from design and testing to support and maintenance.

II. NEXANS: MOTIONLINE™ FOR MACHINE TOOLS, ROBOTS AND FLOWLINES

One weak link can interrupt the production chain and delay the delivery of a product resulting in financial loss. To prevent this, Nexans manufactures a full range of MOTIONLINE™ reliable, dynamic cables to assure the interconnection, control and process efficiency of machine tools, robots and flowlines. MOTIONLINE™ cables conform to all major international safety standards, such as German (VDE), Canadian (CSA), American (ANSI), Chinese (CCC) and UL worldwide. MOTIONLINE™ includes everything from miniaturized control cables to state-of-the-art industrial Profinet cables to bring the office and the production floor closer together. Efficiency begins with an up-front requirement analysis. Then, our Nexans research centers test the cables currently used, and strive to surpass them in terms of performance, durability, chemical and oil-resistance. This constant move from benchmarking to theory and then back to practical implementation results in customized designs, modularity and appropriate materials that can fit neatly into the entire production process. Together with the world's leading robot and industrial equipment manufacturers, Nexans is creating standards to streamline automation worldwide.

1. MOTIONLINE™ cable solutions for manufacturing

For robotic applications, Nexans manufactures a range of special **robotic cables** which carry energy and data on one or several cores. These cables perform excellently under high torsion conditions, and have low break susceptibility under factory conditions. Nexans manufacturers over a hundred sizes in several insulations, including polypropylene (PP), thermoplastic elastomer (TPE) and Nexans' own Thermoplastic Modified (TPM). Nexans is one of the few suppliers to offer a choice of insulations to meet the operating conditions (often extreme heat) in plants.

For production chain applications, Nexans offers four MOTIONLINE™ cable types for machine tools and automated equipment. **Power cables** are used to carry the mainly 600 to 1,000 volts to servos and motors for two-dimensional movements. These cables are extremely flexible and come in several categories according to the thickness of the stranded cores. According to specific types, these cables can contain one or two pairs to connect servo breaks and thermal sensors. **Encoder cables** link the central processing unit, or CPU, to the machine for 3-dimensional movement, and opening/closing functions. This cable is controlling the actual movement of the machine and has to meet all of the mechanical requirements of a power cable, like tight bending radius. Although this cable could represent an infinitesimal part of a robots overall cost, its failure could bring production to a complete halt. That is why Nexans encoder cables are not only custom-designed, they are also tested to endure up to 10 million cycles of operation. When EMI is not a problem, **unshielded power cables** provide a cost-efficient solution for servo-motors operating under harsh conditions. Finally **hybrid cables** combine power, control and data cores within a single cable. These tailor-made cables deliver unsurpassed energy and control capability, meeting the needs of decentralized control systems.

For control applications, Nexans manufactures multi-strand miniature **control cables** with a small bending radius and a long life (up to 5 million cycles). These cables are used for simple on-off control for assembly line machines. Generally, so as not to disturb production when a machine is running, plant managers prefer to change these standard cables during the summer or downtime. As with the more complex encoder cables, these relatively low-cost cables are the critical connection on a costly robot, and must deliver reliable, consistent performance in what can be a very aggressive environment.

As mentioned earlier, there is a definite trend from basic bus applications towards enhanced solutions and eventually wholly net-based control solutions. At the lower end of the scale are **ASI-bus cables** which provide signal transmission for wider control purposes beyond simple servo-motor functions. Co-developed with Siemens this is a convenient flat cable which fits into a special module with pins, making it fast and easy to connect with high security systems, like mail sorting equipment in post offices. **Profibus cables** come in a dozen designs for complex control. Delivering up to 12 Mbits/s, Profibus (also co-developed with Siemens) is now the leading standard in Europe and is widely used in the automotive industry. Superior mechanical and dynamic properties, as well as fast connections account for its continuing market dominance. Finally, there are Nexans **Profinet cables** for Industrial Ethernet LANs. To merge office and factory LANs, Nexans offers a symmetrical copper cable with a data transfer rate of 100 Mbps (Fast Ethernet) in a 2-pair or a starquad, twisted and shielded cable; copper/copper and copper/fibre solutions, with a 12, 24, 48 and 230 volt energy feed to machines, robots, Internet phones, cameras and wireless access points.

Nexans also offers a comprehensive line of Industrial Ethernet Switch Systems with extensive management and security functionalities for such applications. These small and rugged iSwitch Systems are supporting 10 Mbps, 100 Mbps and 1 Gbps data rates. The auto-crossover, auto-

polarity and auto-negotiation functions ensure a compatibility with older devices. The Nexans iSwitch Systems contain up to 3 fibre optic SFP (Small Form Factor Pluggable) uplink ports and up to 8 TP (twisted pair) copper ports. The implemented Power over Ethernet (PoE) feature makes it possible to power, for example, IP cameras, wireless access points, sensors or multifunctional terminals directly via the switch system. A memory card allows non-IT maintenance personnel to replace and reconfigure switch systems quickly and inexpensively. Furthermore, an 'early warning system' feature enables you to increase your network availability dramatically and a cable diagnostic function ensures an easy and fast localization of possible faults on the connected Twisted Pair copper cables.

Besides these Industrial Ethernet Systems, Nexans also offers central media converters and full connectivity, like LANmark Industry IP65/67 outlets which are designed to enable the installation of LANmark-6 Snap-in connectors in industrial and harsh areas, providing the highest performance for Category 6 and Class E LANs, while offering exceptional dust and liquid protection.

To meet the challenges of the sensor-rich assembly line, Nexans also manufactures a complete family of **sensor cables** to measure position, heat, liquid level, pressure, vibration, etc. Thermoplastic Modified (TPM) cables provide exceptional reliability in a 2-5 core cable, which is Halogen-Free Flame (or Fire)-Retardant (HFFR) to protect plants, equipment and personnel.

2. Solutions and services beyond manufacturing

Nexans not only produces numerous cables for machine tools, automation equipment and assembly lines, it also produces special cables for service robots. This is especially important as automation moves off the factory floor, and into public and office buildings (hospitals, laboratories, warehouses, etc.), undersea (oil and gas exploration, pipeline laying) and even into private homes: e.g. personal robot systems, home automation and protection-based on VDI (Video-Data-Image) residential backbones.

Drawing on a vast experience in everything from the infrastructure, industrial and building markets; telecommunications and energy networks; and specific market sectors like aeronautics, aerospace, shipbuilding, automobiles, railways, medicine and material handling, Nexans has constantly innovated to develop every type of cable imaginable for automation/robotic applications.

In addition, Nexans is increasingly taking a solutions and service approach to all of its products which begins with initial process design, and co-development projects with its automation OEM customers, consulting in process upgrades and production line refurbishing, expertise in recycling, training and long-term maintenance operations. Nexans is also dedicated to helping its customers reach their objectives in terms of plant safety, and eco-friendliness.

In the move towards interoperability and open standards, Nexans has worked closely with its customers to find interchangeable components that are easily available everywhere, and do not lock users into obsolete technologies. Often, Nexans solutions are especially designed with backward compatibility and future upgrades in mind, especially in the area of industrial LAN technologies.

Nexans has automation teams at its Research Center in Nuremberg (Germany) and in Lyon (France), and a Competence Center dedicated to metallurgy in Lens (France). They draw on the collective knowledge of 450 researchers and engineers companywide. At Nuremberg, aside from developing new designs in close cooperation with its customers, Nexans measures the electrical properties of its cables under dynamic loads. These include torsion tests, mechanical resistance tests (alternate and roller bending), and temperature tests in both furnaces and low-temperature chambers.

Nexans' innovations and expertise have won the approval of major machine tool and automation/robotics manufacturers, and the Group is already serving new delocalized manufacturing countries. To support line converters and design engineers in their daily work, Nexans has created a specific guide which divides ranges of cables into various application classes. This straightforward allocation allows the right cable to be found quickly, cutting a clear path through the data jungle.

IV. APPENDIX: SOME RECENT NEXANS SUCCESS STORIES, INNOVATIONS AND REFERENCES

- Nexans provided a wide range of robotic cables for the German KUKA Robot Group, the largest producer of robots in Europe and No. 2 worldwide.
- Low capacitance cables are being produced for SEW, a German supplier for robot and machine tool manufacturers.
- Schweiger GmbH integrates all Nexans families in its automated procurement system offering maximum technical and commercial benefits to customers like Index, Grob or Fanuc Automation.
- Lutze uses unshielded power cable in cranes for large production halls and port facilities.
- Nexans developed special hybrid cables with leading German connector producers and harness makers to meet specific connector and environmental factors for all applications.
- With Nexans' new Thermoplastic Modified (TPM) insulation, Nexans control cables have improved dielectric qualities which have made it popular with Bosch Rexroth, a prime supplier for the machine tool industry.
- For its mailing/sorting systems, instead of multicore cables, Siemens preferred an easy-to-install cable which sends several control functions to various "addresses" via a simple two-core ASI-bus cable.
- Originally co-developed with Siemens in 1989, a new version of Nexans Encoder cable accommodates Drive-CliQ networking for servo drives and motors, allowing both flexibility and high dynamic performance for all multi-axis robot systems.
- Nexans is a member of the Profibus Association, developing cables with 14 other companies and connector manufacturers to create a complete system that assures interoperability.
- For Lumberg/Belden, a leader in automation connectors and components, Nexans provided a UL-certified HFFR cable for its Lumflex generation of sensor cables, capable of delivering 5 million flex cycles.
- For Murrelektronik, Nexans provided a wide selection of cable types and colors for sensor/actuator connectivity, tested to 5 million drag-chain cycles and more.