

Packaging

Automation Solutions

**Sharpen your edge
with high speed solutions**



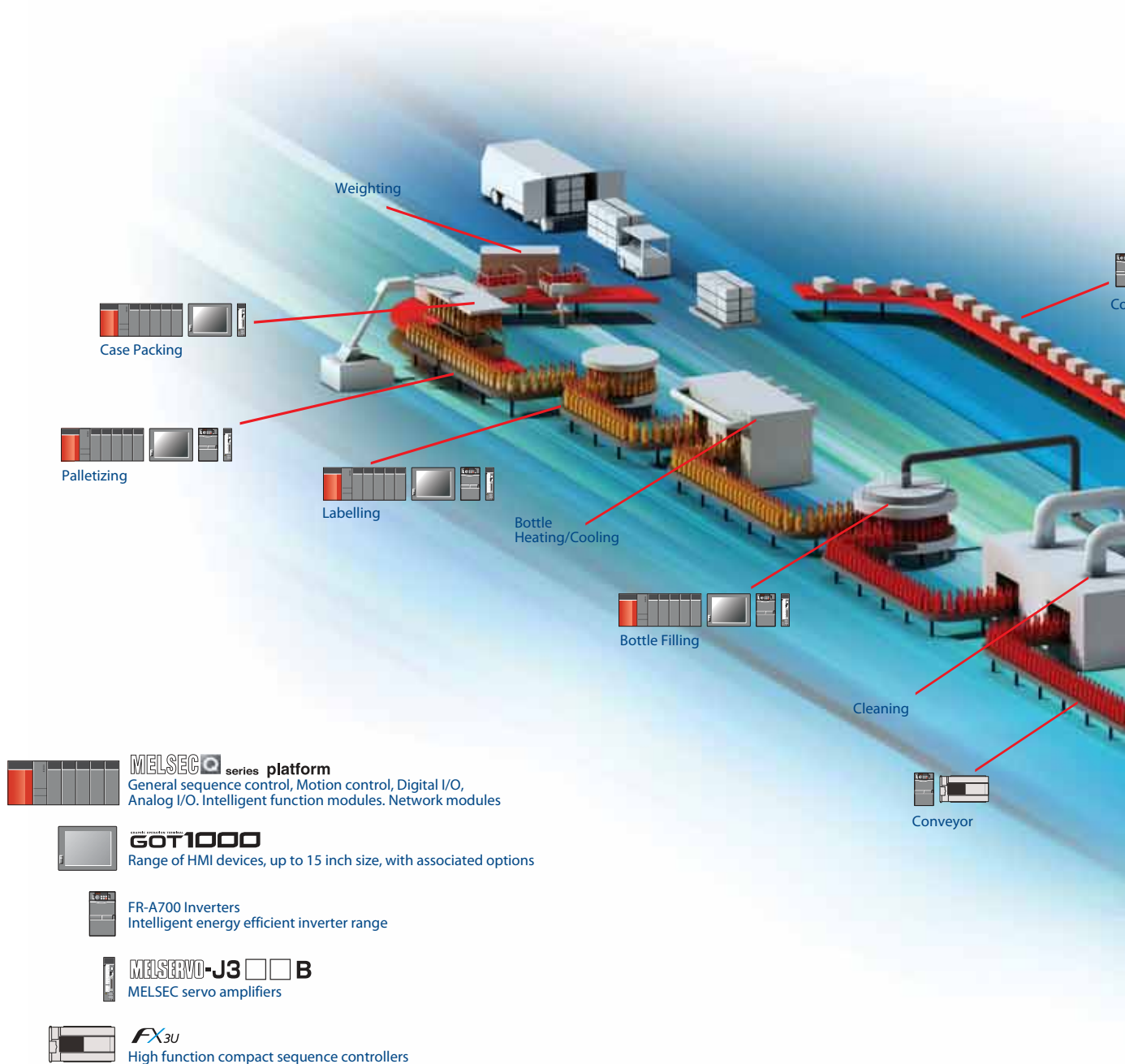
**Bottle filling /// Labelling /// Horizontal + Vertical pillow ///
Case packing /// Bagging /// Palletizing ///**

Realizing total solutions

Mitsubishi Electric is a leading supplier of automation products and solutions worldwide. Together with this leading position, we possess an extensive range of expertise not only in packaging but also across other industries. Mitsubishi Electric, known for its high quality and diverse range of automation products, boasts a whole range of solutions to meet your needs.

Our experience covers the full range of packaging disciplines including filling, labelling and bagging applications. Because of this accumulated knowledge and expertise you can rely on us to offer flexible solutions to meet your needs.

Mitsubishi Electric is of course a major provider of automation solutions, but what is often forgotten is that it is also a major user of those solutions in its role as one of the manufacturing powerhouses behind the Japanese and Asian economies. This unique position really allows us to understand the needs of other manufacturers as you drive for the optimum balance of cost control, investment and maintaining your competitive edge.



MELSEC series platform
 General sequence control, Motion control, Digital I/O, Analog I/O. Intelligent function modules. Network modules

GOT1000
 Range of HMI devices, up to 15 inch size, with associated options

FR-A700 Inverters
 Intelligent energy efficient inverter range

MELSERVO-J3 B
 MELSEC servo amplifiers

FX3U
 High function compact sequence controllers

High speed performance at a low cost is key

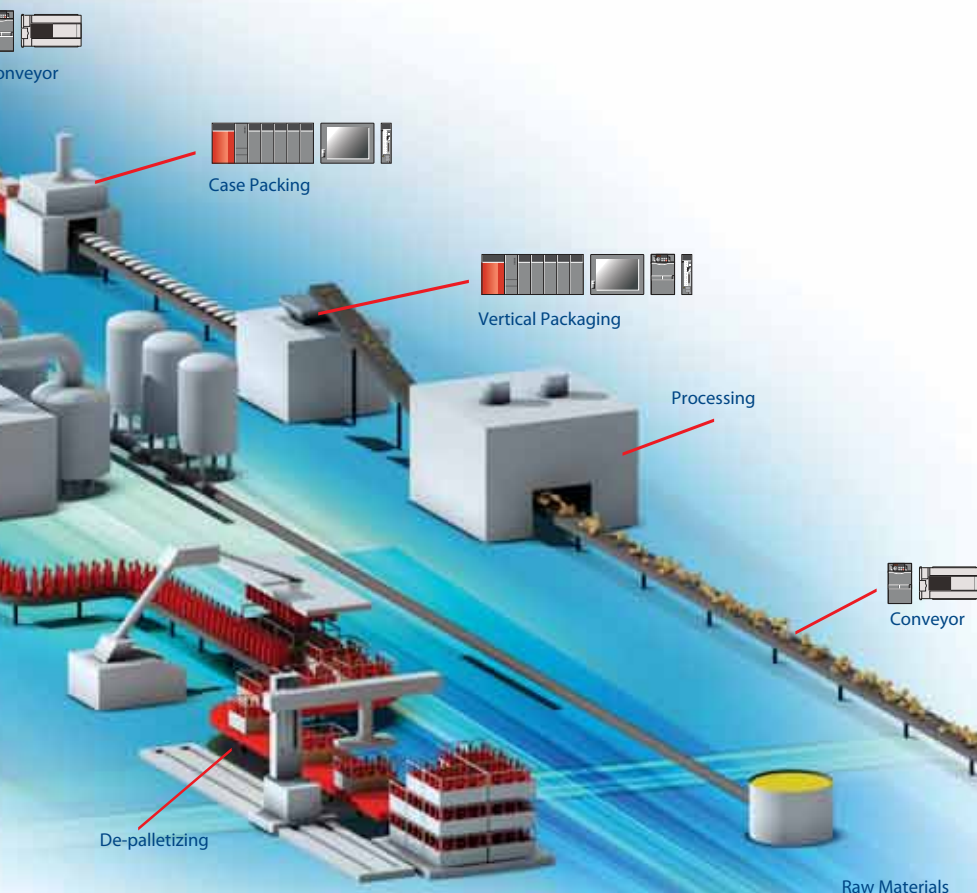
Mitsubishi Electric's controller series is based on the System Q Automation Platform, providing an integrated architecture for all aspects of control such as General, Process, Motion, and IT control. Designing high speed, high yield systems as required by the packaging industry is second nature with System Q.

Integrating a Motion CPU and Sequence CPU on the same base realises a highly accurate and high speed solution. System Q also has an extensive range of digital, analog, and intelligent I/O to further enhance and support your application. Choosing System Q as your main controller is surely the right decision for today's high speed application needs. Whatever packaging solution you are addressing, the System Q has a solution to fit.

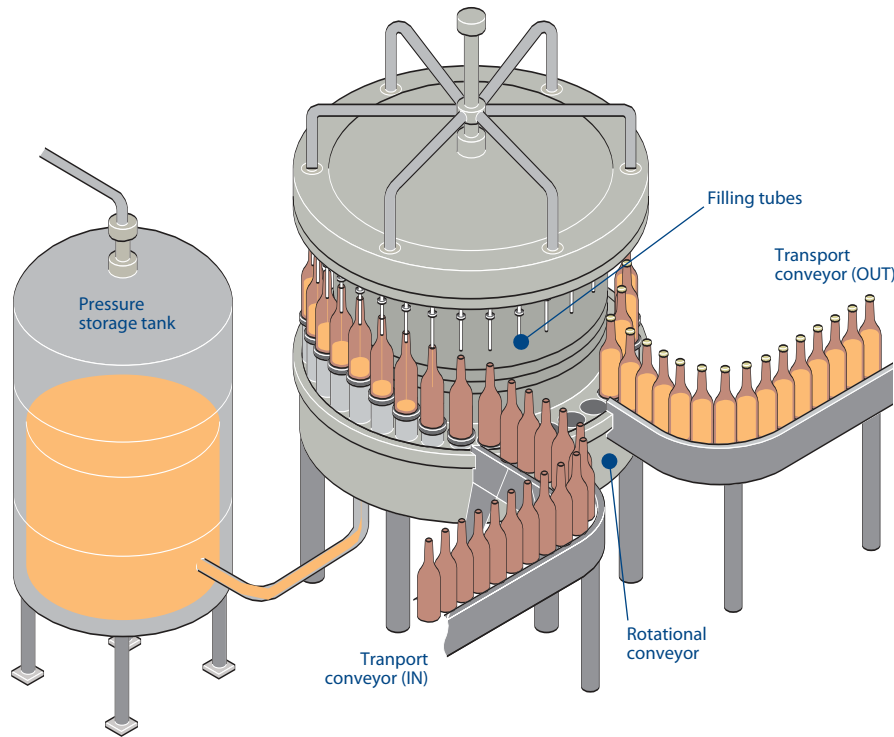
Meeting your needs

Taking a quick glance at Mitsubishi Electric's virtual factory (below), it's easy to realize how our full range of automation products can integrate together to provide the total and correct solution for whatever the application requires.

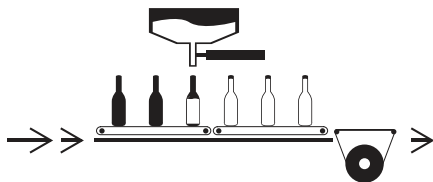
Our wide product range allows you to select the right solution for the task. For example, you could take advantage of the simple, easy to use benefits of our FX series of controllers or move to the high speed registration and multi-axes control of System Q. Whatever the case, Mitsubishi Electric has a solution for you. Further, utilizing the SSCNET III high speed motion control network, provides the final link to high speed positional control. Welcome to Mitsubishi Electric's packaging world. Sharpen your edge with high speed packaging solutions.



Bottle Filling



Bottle filling



It's all in the bottle, filling applications made easy

At first glance, a filling application involving the transport of a liquid product into a solid vessel may seem simple to the untrained eye. But what few people realize is the high accuracy and continuous feed rates required for such high precision and high speed applications.

In fact the highly complex requirements of transporting the vessels, which are usually in the form of bottles, inserting the filling nozzle, controlling the flow rate of the liquid product, requires a highly capable

function controller to handle the immense speeds of this process. With bottle filling, rather than the process having a stop/start profile, the actual process is continuous at breathtaking speeds. Therefore, finding the right automation solutions to meet these requirements is the challenge of most everyday engineers. Mitsubishi Electric provides that solution in as simple and cost effective manner as possible.

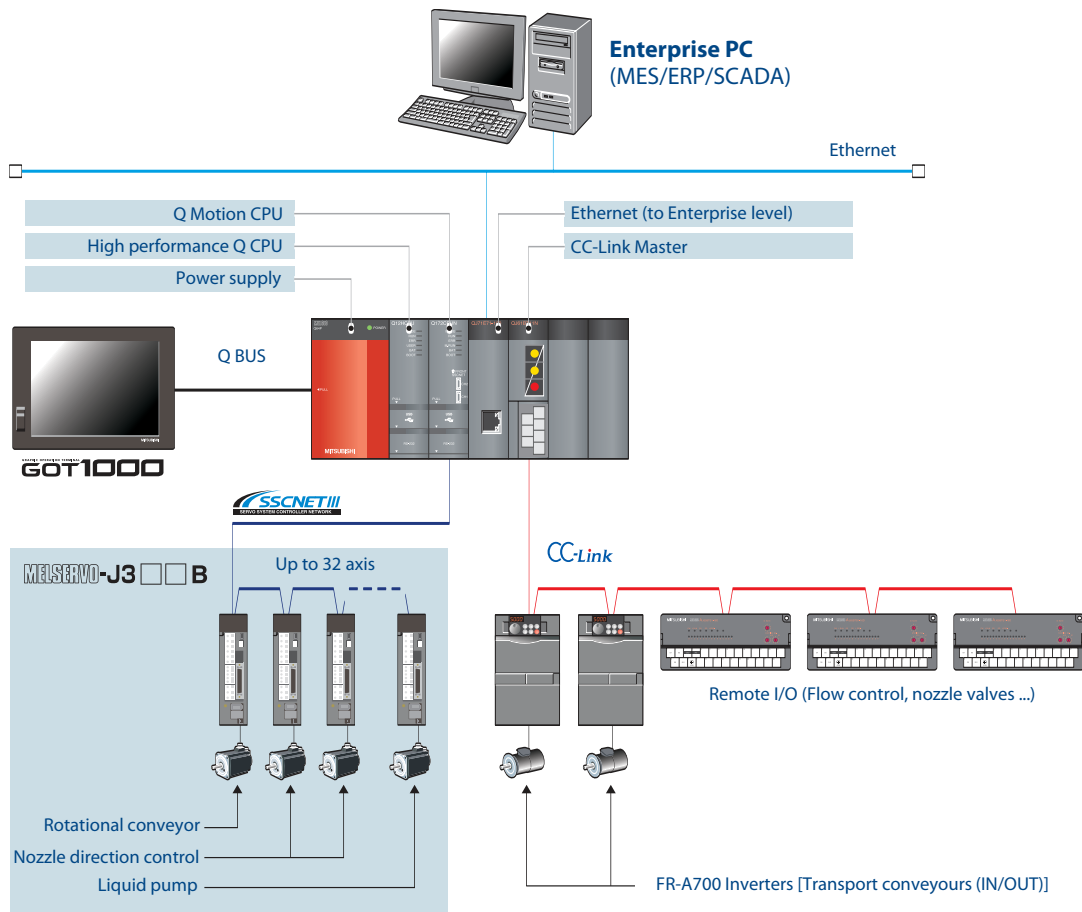
■ Advanced control using electronic camming

The aspect of ensuring that the control of the filling nozzle is completely synchronized with the rotational conveyor and flow controller is the challenge for most bottle filling applications. The controller has to ensure that the liquid is fed accurately into the bottle opening. The flow rate and nozzle height also have to be precisely controlled to eliminate the risk of frothing and overflow of the liquid itself.

By using Mitsubishi Electric's motion controller CPU (based on the System Q automation platform), cam profiles can be controlled intelligently with software camming systems that replace hardware based methods which are prone to error and profile deviation. This method is very flexible for example, if the bottle type has to be changed, the cam profile software can be simply exchanged without resulting in an overhaul of the system itself.

■ Linking high speed networks

In addition to the motion controller, the actual transfer and conveyor aspects of the application can be controlled using Mitsubishi Electric's intelligent and energy saving drives. These are integrated into the total system via the open device level network CC-Link. The fast rates of bottles being fed into the machine can be controlled by System Q together with a CC-Link network, offering high transmission speeds of 10 Mbps with program speeds in the milliseconds. System Q also enables connectivity to upper level control and management systems via its Ethernet option module allowing real-time production data to be fed into ERP/MES systems.

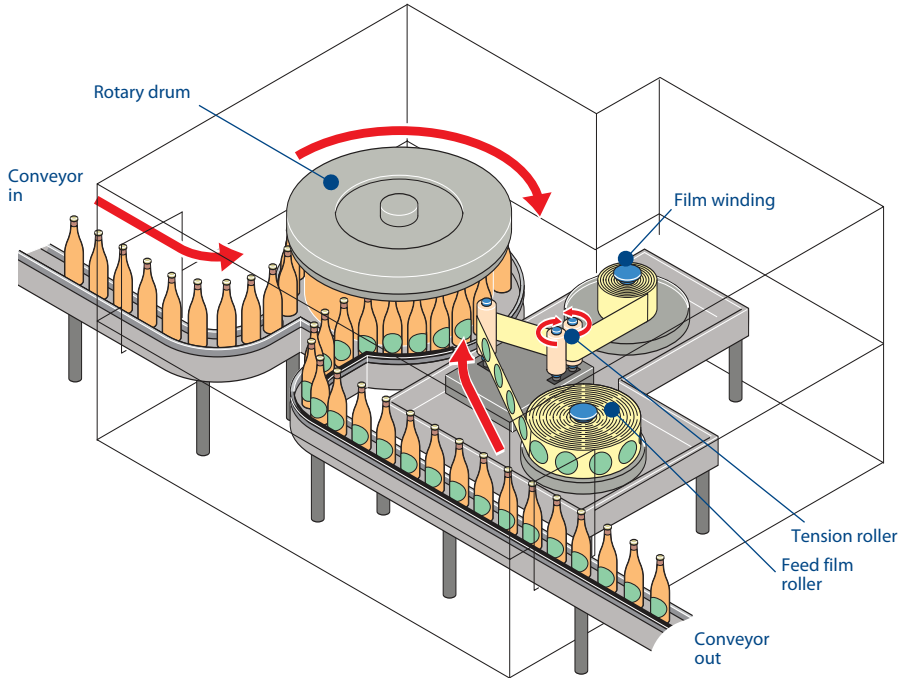


Filling Configuration

This continuous monitoring allows factory managers to report on actual bottling performance in real-time without having to rely on statistical data. CC-Link can also be used to compliment the local rack I/O with an extensive range of remote I/O modules ensuring that most system components such as flow control valves, nozzle valves, etc., are all simply and easily linked back to the main controller, System Q. The high speed servo drives are controlled directly by the motion controller that is on the Q series platform via the high speed SSCNET III, fiber optic network.

This network achieves speeds of up to 50 Mbps ensuring high speed and high accuracy when synchronising the rotational conveyor, nozzle control and liquid pump together using the cam profile according to the bottle shape. These cam profiles can be easily switched between using the GOT1000 human machine interface screen, providing a user friendly interface to the operation of the bottle filling machine.

Labelling

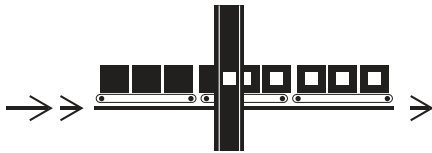


This is a result of today's high speed labelling machines ensuring labels are adhered correctly on the target product with as little deviation as possible. With bottle or cylindrical vessel labelling as it's also known, everything is done at a very high speed with immense accuracy.

The label has to be fed at a constant rate to prevent stretching, warping, and even tearing of the label film sheet to ensure that all products have a label correctly placed. Labels come in a host of sizes and can be placed in a number of ways, be it cold glue, hot glue, shrinkwrap or general wrap around types. When designing a labelling machine the control architecture has to support all these variances with as little disruption to productivity as possible.

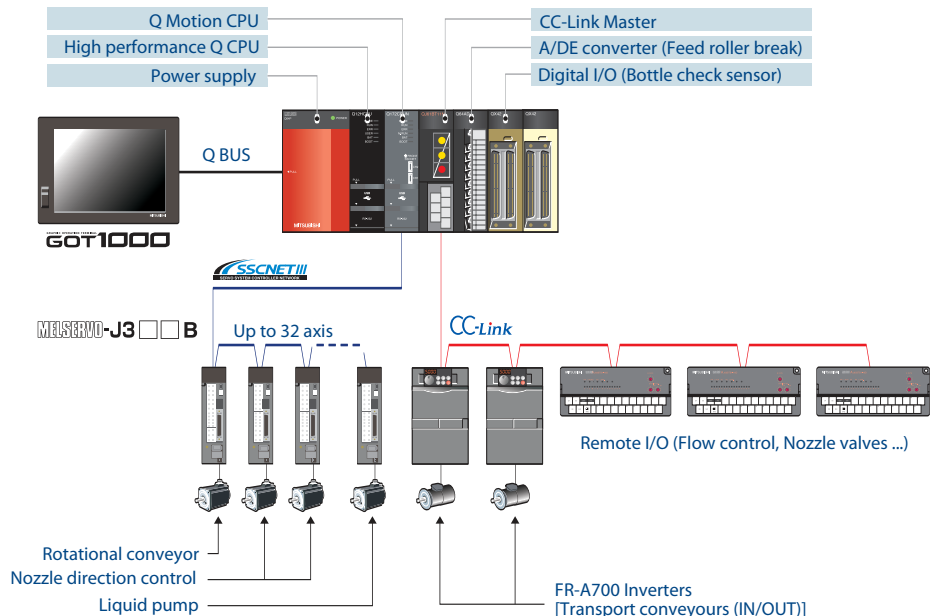
■ High speed registration

Achieving these requirements is second nature for Mitsubishi Electric's System Q automation platform. Together with Q motions high speed registration functionality, labels are guaranteed to be placed accurately with little distortion. By adding the Q CPU logic controller, the rotary drum, feed roller brake and bottle sensors can be controlled easily and at high speed with simple ladder logic programming. As with most applications an interface is essential to provide a means of human interaction with the machine.



Accurate high speed labelling

Ever wondered how, when walking in a supermarket, all the bottle labels are facing the same way looking almost identical in terms of positioning and orientation?

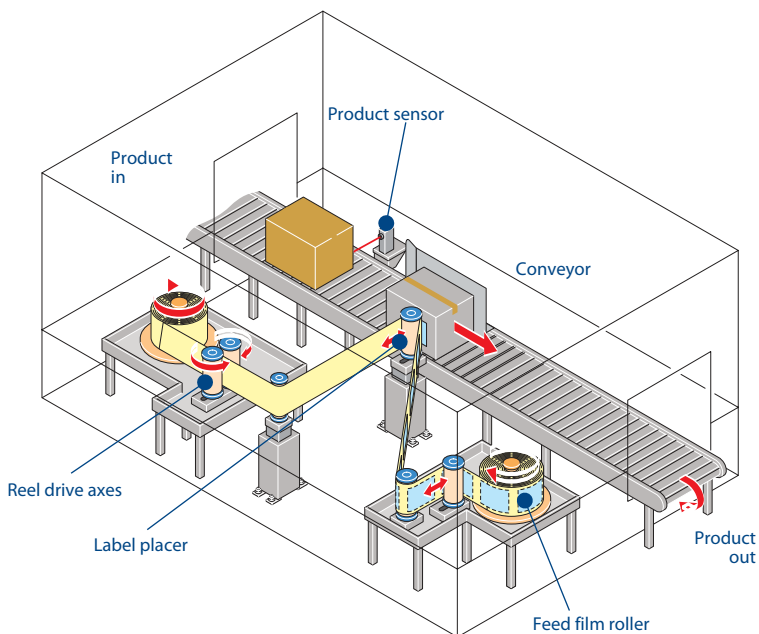


With the GOT1000's high resolution touch screen, monitoring, debugging and label parameter profile changes can be displayed and controlled with instant connection via the high speed Q bus connection. Using the MR-J3 servo amplifier series with SSCNET III for high speed servo control, the film winding reel and tension roller can be accurately controlled to ensure continuous label winding being presented to the bottle. The servo drive incorporates a patented auto tuning function which maintains the feed rate of the film even when the inertia of the drum changes due to the reel being transferred from the feed to winding rollers.

■ **Integration made simple, box your solution to go**

From intermittent speed labelling applications, where product conveyor belts are used, to the more complex applications requiring interpolation and servo motor monitoring a wide selection of FX products is readily available for easy system integration. With the FX3U-20SSC-H controller, synchronous control of two axes over the SSCNET III motion network adds powerful benefits to labelling applications where timing is critical for label precision and placement.

In large-scale labelling applications such as the robust box labeller, a simple setup is essential for hassle-free maintenance and reduced cost of ownership. This is achieved with the FX3U controller at the core of the system. It is used to harmonize the motion of the product conveyor and the label reel drive axis.

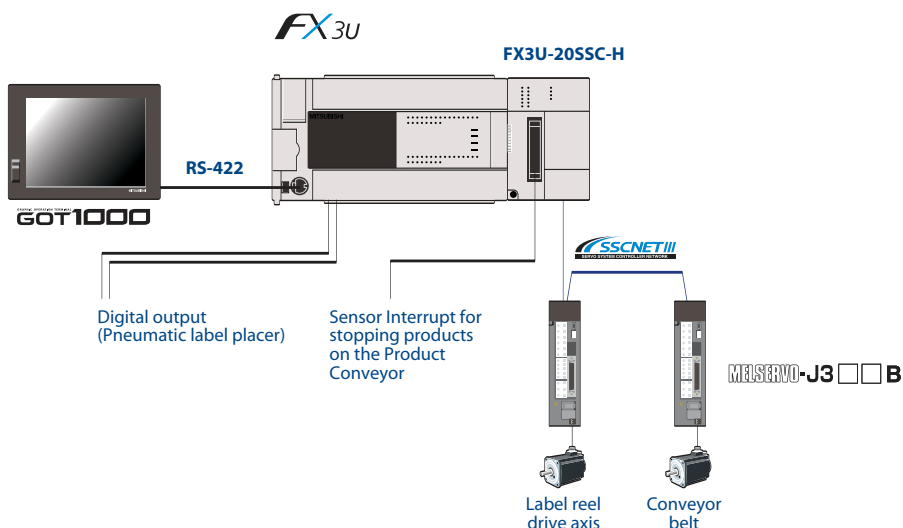


■ **Product conveyor control**

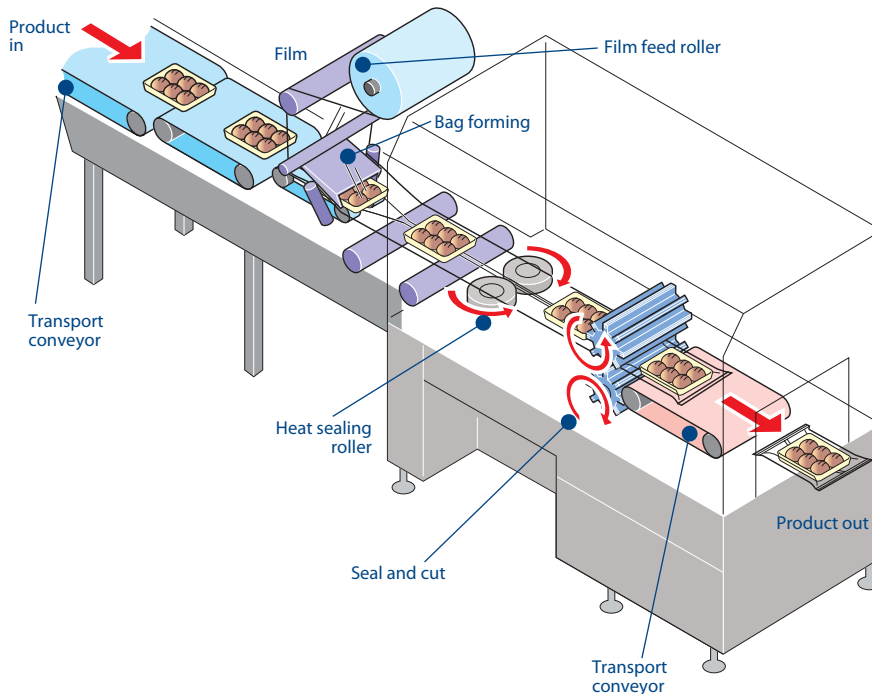
As boxes are loaded onto the product conveyor at regular intervals, a motion sensor transmits an interrupt signal to the FX3U-20SSC-H controller each time the front end of a box is detected. A box then travels a specified interrupt distance before stopping in front of the pneumatically driven label placing edge.

■ **Label reel drive axis**

When a box reaches the label placing edge, a positioning complete flag from the conveyor axis sends an output signal from the FX3U PLC to move the label placing edge toward the box. The label reel drive axis simultaneously starts to move with the conveyor drive axis using the optical SSCNET III communication of the FX3U-20SSC-H. After the label has been fully applied, both axes stop for the label placing edge to retract to its home position. The label reel drive then advances the film slightly using another sensor to prepare the next label while the conveyor axis moves again to carry the finished product away and await the next incoming product.



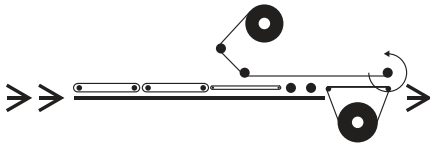
Horizontal + Vertical Pillow



The inline feed of the product is synchronised with the film packaging which is fed from the feed roller into a forming station which forms the packaging around the product. The package is then sealed and cut away from the film train, resulting in a completely packaged product ready for boxing or other packaging processes. Various processes need to be synchronised with this application as it requires a high level of flexibility to cater for a diverse range of shapes and sizes. System Q is ideal for such applications as programming can be kept simple with the Q CPU logic controller, high accuracy maintained with the Q motion controller easily integrated with an efficient user interface such as the GOT1000. Hence these products are combined into a truly total solution.

■ Phase compensation is the key

The high accuracy demands of this type of machine are not a problem for the Q motion controller and MR-J3 series of servo drives together with SSCNET III servo network. As mentioned with bottle filling, a cam profile can be very easily designed and implemented by using software based tools. In addition to this, the Q motion controller incorporates a phase compensation algorithm which ensures that the encoder phase angle and cam phase angle are precisely in synchronization. In general this means that the packaging cutters can be precisely synchronised with the feed of the conveyor, hence providing an accurate cut at high speed.



From tubes to pillows, sealing packaging solutions for all

Probably the most common type of packaging machines, aside from bottle filling applications, are the pillow type machines used to package a whole host of products, from candy bars, pizzas and breads to pharmaceuticals and other non food products. These machine types are known as "pillow" because of the distinct shape of the packaging film being formed around the product to be packaged. There is often a variance of 2 or 3 specific sealing points which are then cut to individually package the product ready for shipping. The products are fed into the machine in a number of different ways using conveyors, hoppers, rotating arms etc.

■ **Maintaining the right tension**

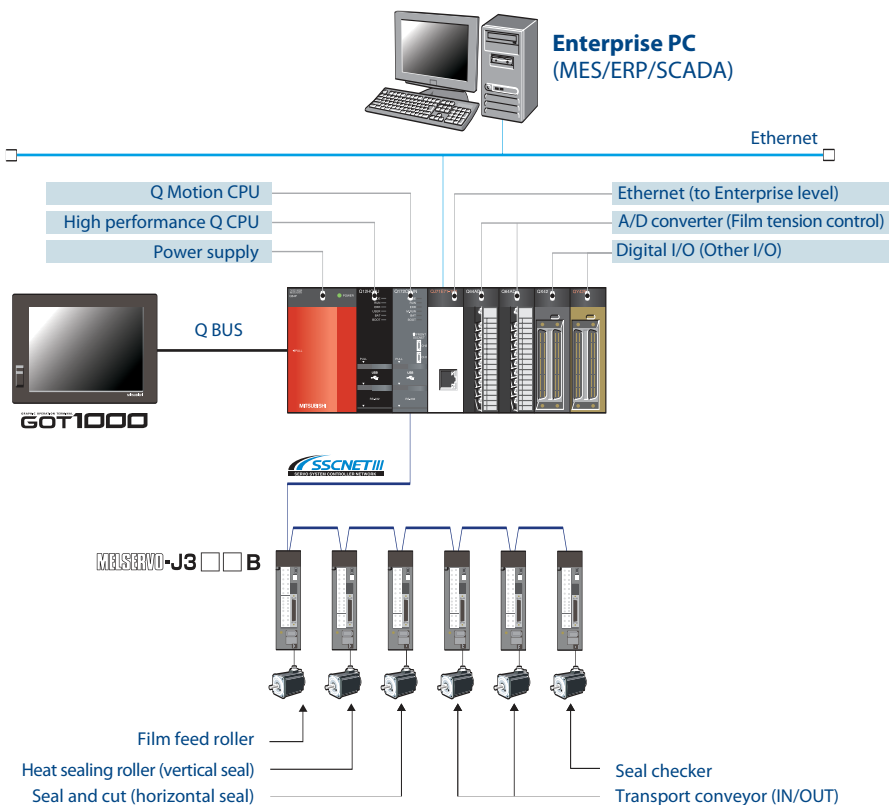
Another important aspect of pillow type packaging machines is the tension control mechanism. It ensures the packaging film is presented to the forming station precisely with reduced chance of stretching, flapping and warping of the film. Simply by utilizing the range of high resolution analog to digital converter modules available for System Q the tension control mechanism, which usually comes in the form of a potentiometer with a counterweight at its end, is interfaced into the System Q controller. This control can then be easily managed within the logic program inside the QCPU, continuously maintaining the right packaging film tension in real time.

■ **Flexible to the changing ways of inline feeders**

As mentioned earlier, pillow type machines require flexible operation due to the range of products that are packaged and the host of different packaging film types. This is easily achieved by using a GOT1000, as a diverse range of parameter profiles can be stored and retrieved to suit the specific process.

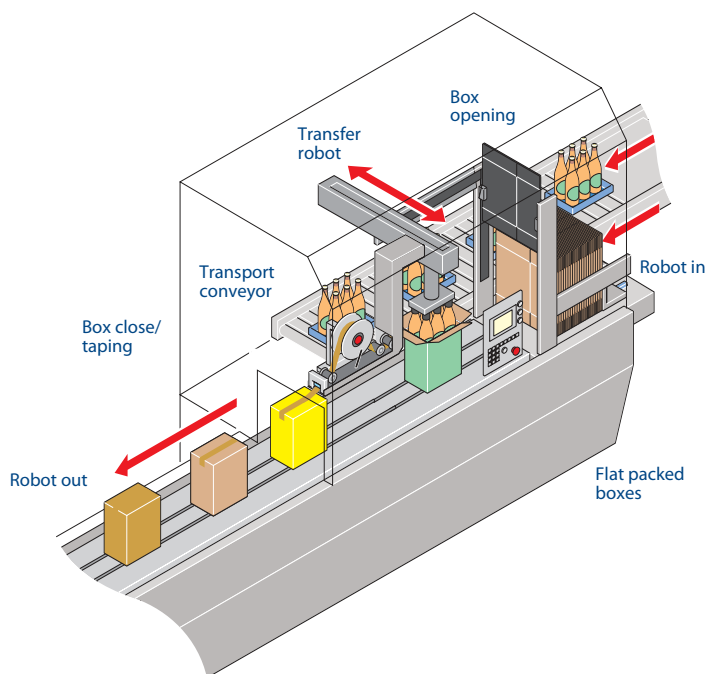
For example, if the machine was to switch from packaging medium to large size chocolate cookies, packaging profile data can be called up in the GOT1000 specific to each biscuit size. This data can be stored within a memory card inserted in the human machine interface, allowing a substantial number of profiles to be stored. Real time data can also be updated to database servers in enterprise systems simply using an Ethernet interface module installed in the System Q automation platform.

Therefore, System Q is ideal for plant wide packaging machines, where real time shop floor data is monitored to improve productivity and reduce system downtime. Mitsubishi Electric really offers a high function solution without the setup worries and costs that are normally associated with such systems. This solution maintains high cycle counts and diverse flexibility from a cost effective base.



Horizontal/Vertical Pillow configuration

Case Packing

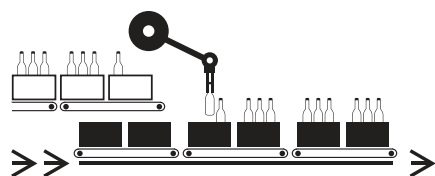


■ Easy wiring and fast communications with CC-Link

With such an extensive range of moving components in the machine, i.e., conveyor sensors, box folding pneumatics, seal tape cutters, and cutter sensors, CC-Link is an ideal solution for a cost effective and highly responsive communication medium. Deciding on decentralized I/O clearly has its benefits as it cuts down wiring and reduces the amount of hardware required on the control side, which in turn reduces overall machine costs.

■ Providing high speed control with servo system accuracy

The Q series Motion System is eminently suitable for complex systems with many moving parts, as seen in typical packaging machinery. It offers the high degree of synchronization required to prevent errors in machine processes such as box opening, taping and transfer conveyors. The System Q PLC controller ensures that the whole system works efficiently and also provides a way of interfacing all the various non servo components with the high speed aspects of the machine. Although speed is usually associated with packaging systems, in this architecture accuracy takes priority to prevent products from being spoiled while being boxed for distribution. System Q's high speed functionality ensures that all these data variances are processed at high speed with little downtime.

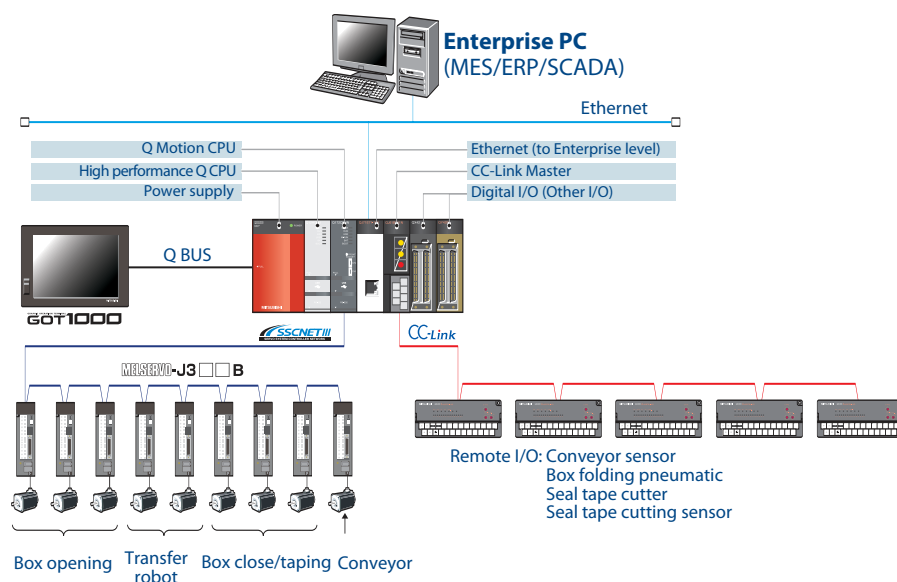


Although often using actuators and pneumatic components, more and more machines are being controlled by automated controllers minimizing downtime and improving productivity throughout the machine. System Q is specifically designed to meet these needs offering a flexible range of products that can be configured for a specific application.

Preparing for distribution

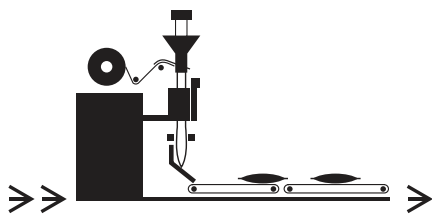
■ Product conveyor control

Usually products require a final packaging stage that comes in the form of a cardboard case or carton. These case packers prepare the products for the final journey to the point of sale. Case packers are designed for speed but also have a gentle rhythm as to prevent damage to the core products when being placed or wrapped around with a solid medium.



Case packing configuration

Bagging



Fast, efficient, cost effective

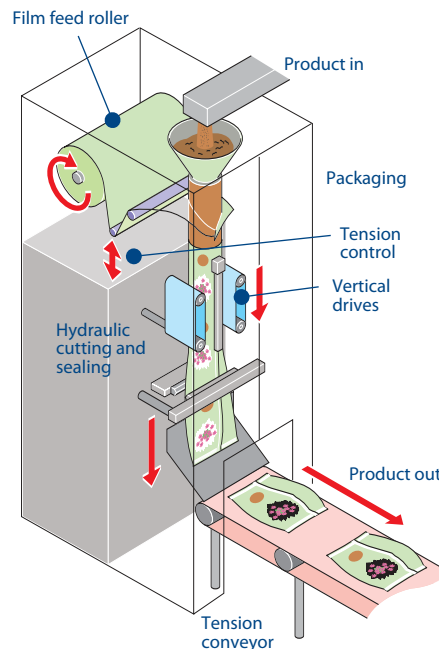
For simple bagging machines, where the end product is placed in a plain bag, pouch or sack, Mitsubishi Electric's FX Series PLCs offer a wide range of controllers with special function blocks, adapters and serial communication boards to fit a complete application solution. With gentle handling for smooth control during the bagging of delicate products, a simple setup is often desired for high quality, dependable operation. The FX Series positioning controllers include several options for basic point-to-point control that can be used in a variety of applications.

Essential sections of control

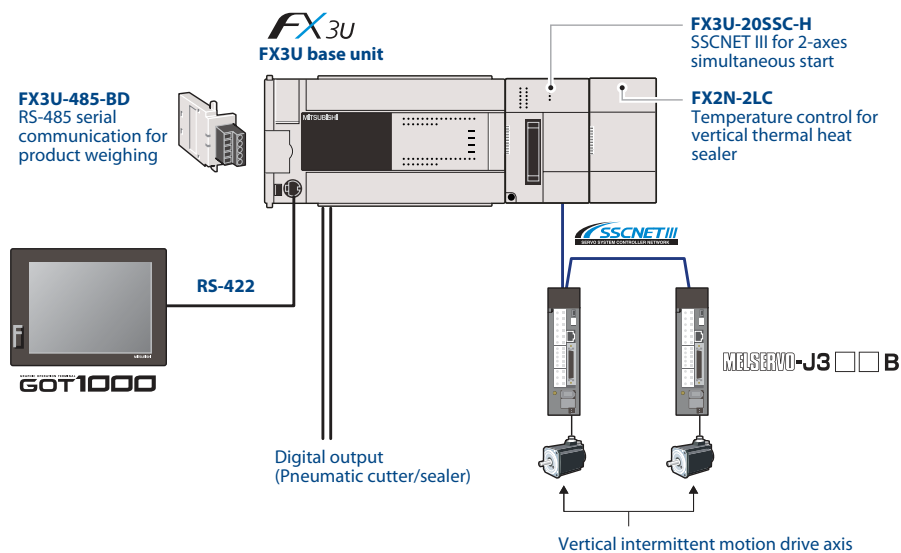
Three essential sections of control are needed for a vertical intermittent tubular bagging machine. To orchestrate the communication between various devices, Mitsubishi Electric's FX3U PLC offers a compact solution with room for system expansion. The components that are most critical for precision control in a tabular bagging system include hardware for volume dosing, thermal heat sealing and two axes for vertical intermittent motion.

Weighing up the costs

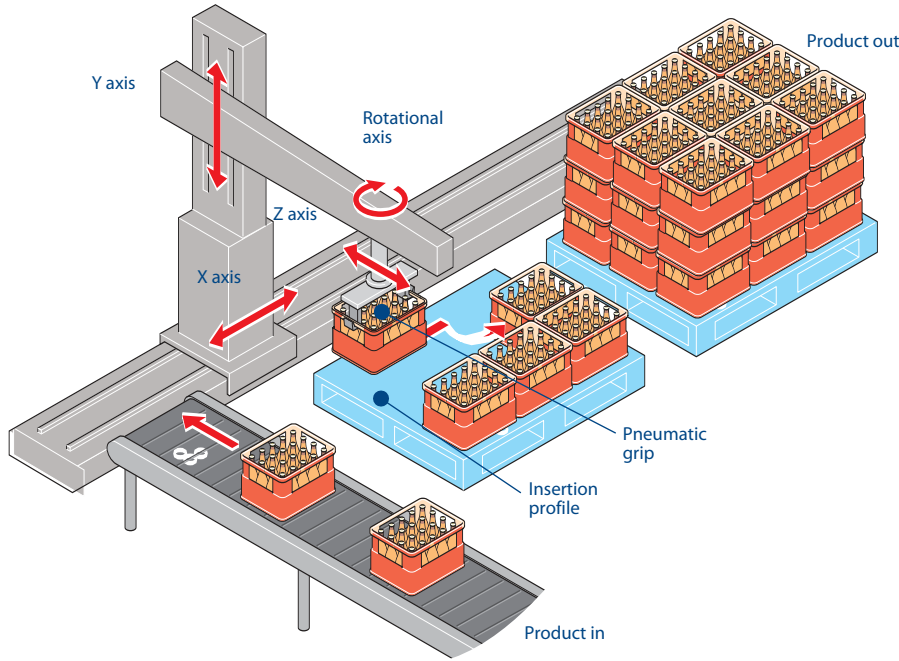
The product portioning system accurately quantifies product mass with a small weighing device. After the correct amount of bulk product has been weighed, RS485 serial communication sends a ready signal to the PLC via the FX3U-485-BD. This then triggers the flap doors to open at the appropriate time. To prevent the foil bagging material from shearing on the tubular fill pipe, two synchronous axes are needed for precise feed control. With a servo system network using SSCNET III technology and the FX3U-20SSC-H controller, two independent axes work together to simultaneously start and stop the single speed positioning operation using the "mark to move" registration techniques. The vertical motion tension arm at the top of the machine operates with a spring system while a mechanical brake controls the inertia of the foil storage roller.



Tubular bagging machines contain heated components for the vertical heat sealing strip and cross sealing horizontal jaws. With the FX3U PLC and the FX2N-2LC temperature controller, temperatures can be regulated to maintain a steady level of heat across the light metallic welding parts. The lower cross sealing jaws are longitudinally moved into place with a pneumatic piston using output control signals from the FX3U PLC. When the jaws come together, heat is applied to seal the top of the completed bag. A cutting device then slices the foil bags apart and a signal is sent to the product feeder's flap doors to dispense the next dose.

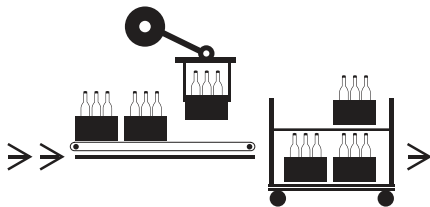


Palletizing



■ Utilizing the 4-axis QD75 as a cost effective solution

For smaller applications, not requiring a motion controller, the QD75 module provides up to 4 axes of high accuracy servo control. Considered as an intelligent function module, QD75 is ideal for controlling directional axes on a palletizing machine. Using simple ladder logic programming and an integrated utility software, the QD75 is very easy to setup and debug. Other aspects of control such as transport conveyors can be controlled using with the FR-A700 series of intelligent AC drives. Connection to System Q is made simply by using the CC-Link open device level network, which can also be used to connect additional devices such as sensors etc. With fast communications of 10 Mbps, CC-Link provides a high speed solution and reduces overall wiring too. The System Q automation platform ensures that a flexible and total solution is realized, with performance and cost reduction optimized.

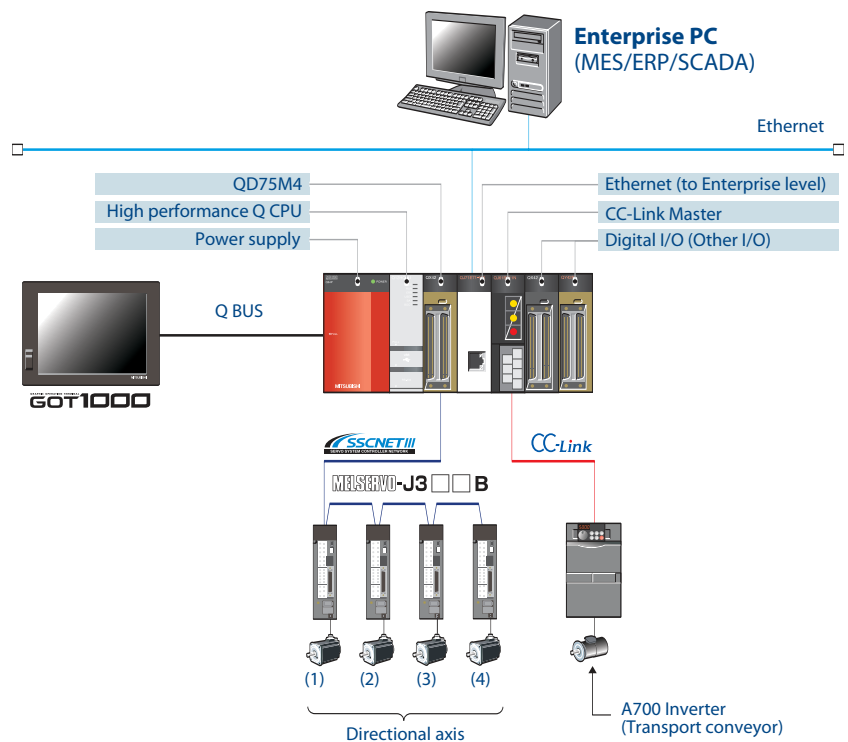


System Q positioning modules, known as the QD75 range, are ideal for such applications.

Optimized performance

■ Palletizing goods efficiently for transport

Palletizing and de-palletizing applications are very similar, the difference being in that one is usually at the plant start point and the latter situated near the shipping section. But the requirements of both these application types is to ensure that the boxed or bagged products are stacked accurately and safely on the transfer conveyors or on pallets, ready for transport. These kinds of systems are usually simple in architecture, and do not require extensive servo control. However, still rely on high performance and high accuracy while keeping the cost down to a minimum.



Guaranteed Quality

Mitsubishi Electric offers an extensive range of high quality automation products. This, along with a proven record of innovation, makes Mitsubishi Electric an easy choice to maintain the upmost reliability of your control system.



System Q - The Automation Platform

■ System Q is more than just a controller

Our automation control concept is based on the System Q automation platform. It is an extensive range of rack mounted controllers from entry level, basic, CPUs up to High performance, multi CPU configurations. Supporting this is a range of digital I/O, high resolution analog and intelligent function modules are available, providing an effective means of interfacing System Q with external equipment and components. In addition to the controller series, various networks are available to enable efficient communication between controllers or devices to save wiring and reduce costs. These are Ethernet (Enterprise level), MELSECNET/H (controller level), CC-Link and Profibus (device level), and AS-Interface (sensor level).

■ Highly accurate high speed servo drive systems

The MR-J3 servo series is a diverse range of high accuracy servo motors compatible with the SSCNET III network. SSCNET (Servo System Control Network) is Mitsubishi Electric's proprietary servo control network, achieving



MR-J3 - Advanced servo control

very high speeds of 50 Mbps (full duplex) using a fiber optic transmission medium. These servos include intelligent autotuning functions eliminating vibration and providing high speed highly accurate characteristics. The System Q motion controller forms the base of this control, being a dedicated servo control system CPU that sits within System Q. Q series motion CPUs have a range of dedicated operating systems specific to the application. The Q motion controller can handle up to 32 axes on one CPU, with high speed processing of 3.5 ms easily achieved.

■ Intelligent energy saving AC drives

The FR-A700 series of intelligent inverter AC drives are ideal for pump, fan, and conveyor type applications. Ranging from 200 V to 400 V series, from 0.4 kW up to a maximum 500 kW drive, the FR-A700 series offers a flexible range of drives for almost any type of application. These drives are



FR-A700 - variadores de altas prestaciones

very easy to use having an extensive parameter setup architecture that can be setup on board or by using utility software. Providing economical performance is second nature for the FR-A700 series, using magnetic flux control to ensure optimum motor operation, optimum excitation control minimizing motor loss and reducing the overall power consumption of the drive, to name but a few features.

Complying with international standards

All of Mitsubishi Electric's FA component products have acquired the international quality assurance "ISO9001" and environment management system standard "ISO14001" certification. Mitsubishi's products also comply with various safety standards, European directives, UL Standards, and shipping standards.

■ Global FA Center

"Mitsubishi FA Centers" are located throughout North America, Europe and Asia to help develop products that comply with international standards and to provide attentive services.



Perfect Control

A complete engineering environment

The MELSOFT engineering suite is an extensive range of software for programming, configuration and maintenance of all Mitsubishi automation system elements. For example the GX series is a sophisticated ladder programming tool, debug and maintenance software combined with a utility configuration software which aids in the programless setup of intelligent function modules. Moving up a step is the MX series of software which provides a middleware for connection and monitoring options for external 3rd party software with the Q series, i.e., data logging spreadsheets, and can be a simple alternative to high end SCADA software.



GOT1000 series - control at your finger tips

Leaving the System Q aside, the GTWorks provides a detailed graphical tool for designing screens for the GOT1000 series, with embedded editing tools. MR Configurator is a simple programming and virtual debugging environment for the System Q motion controller. Programming and setting up parameters for the FR-A700 series of intelligent drives could not be simpler with the FR Configurator software. In addition to parameterizing the inverter drives on board, this utility software enables parameterization from your desktop PC. In addition to the MELSOFT programming software is available enaofware series, a diverse range of simulation bling you do debug your program without the need for the actual hardware. MELSOFT is a key essential for today's needs.

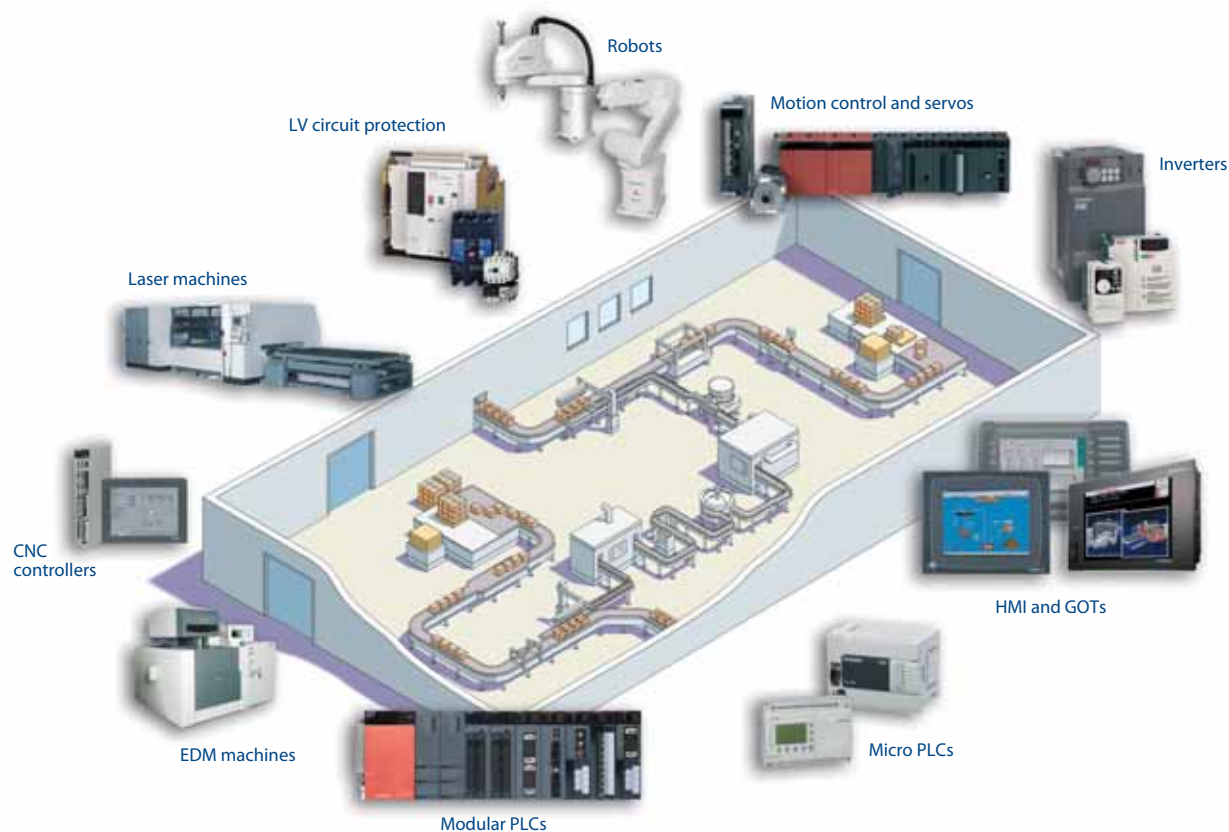
Dedicated HMI solutions

Mitsubishi Electric manufacturers a diverse range of Human Machine Interfaces called GOTs. The GOT1000 range starts from the GT11 5.7 inch compact GOTs, up to the large 15 inch GT15 series. These terminals use TFT display technology and are solely designed for high performance with clear true color high resolution displays. They also include a reliable front mounted USB programming port to enable easy programming and maintenance access without having to open up the cabinet to access the back of the GOT. The GOT can also be connected to existing Mitsubishi networks such as MELSECNET/H and CC-Link, but can also be interfaced directly into the Q series backplane bus, resulting in very high communication speeds. A memory card can also be inserted enabling storage of documents, trend and recipe data, along with CSV files, etc.



MELSOFT is a wide range of software solutions designed to optimize your plant productivity.

A world of automation solutions



Mitsubishi offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

A name to trust

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation represents space development, transportation, semiconductors, energy systems, communications and information processing, audio visual equipment, home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on a Mitsubishi automation solution – because we know first hand about the need for reliable, efficient, easy-to-use automation and control.

As one of the world's leading companies with a global turnover of 3.4 trillion Yen (approximately \$30.8 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

Global partner. Local friend.

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Specifications subject to change /// Art. no. 202673-A /// 01.2007

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