



Changes for the Better

MITSUBISHI PROGRAMMABLE AND MOTION CONTROLLERS
HIGH SPEED PACKAGING SOLUTIONS

Filling
Horizontal
Vertical
Labelling
Palletizing
Bagging



Horizontal
Vertical
Labelling
Palletizing
Bagging

Filling

Vertical

Horizontal

Labelling

Palletizing

Bagging

Case Packing

Case Packing
Filling

Horizontal

Vertical

Labelling

Palletizing

Bagging

Case Packing

Filling

Horizontal

Vertical

Labelling

Palletizing

Bagging

Case Packing

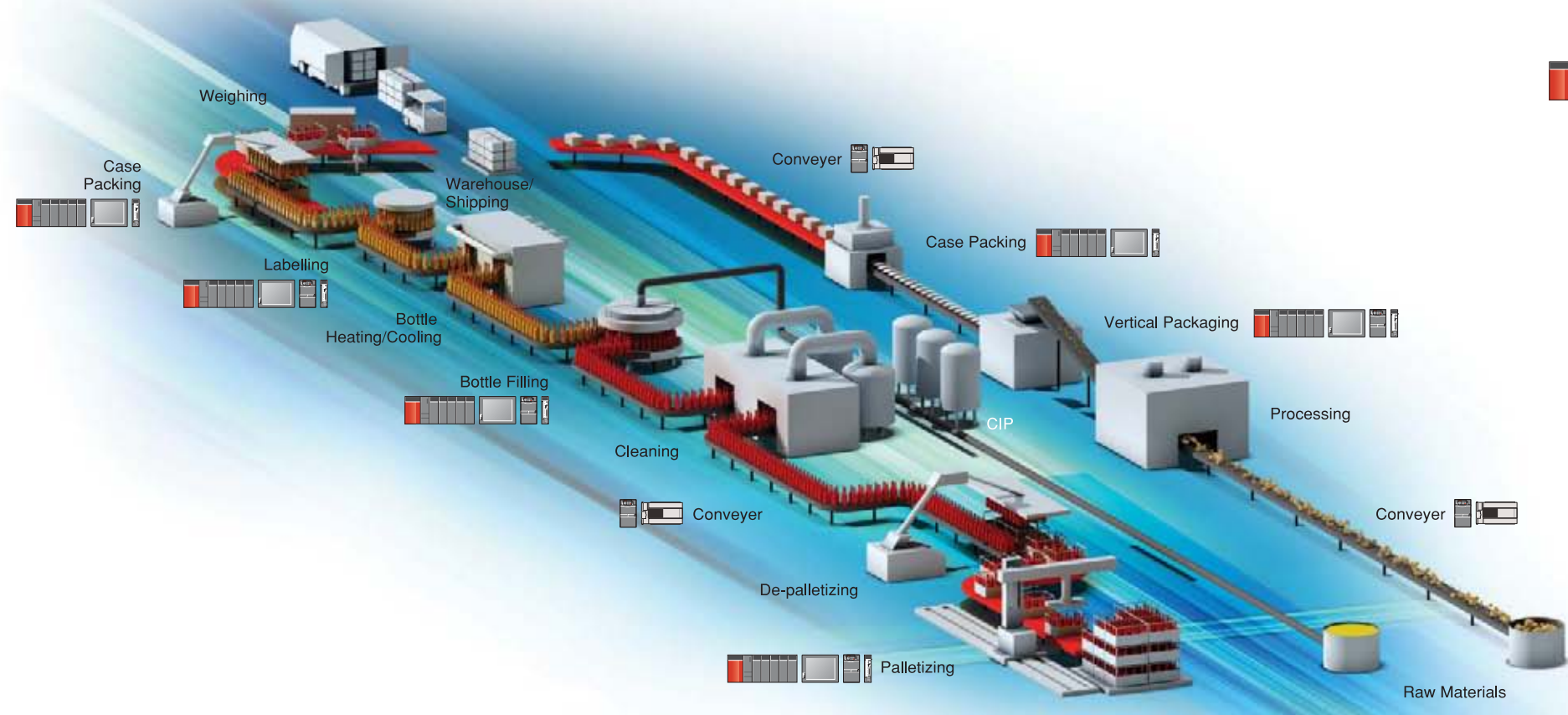
Filling






Horizontal

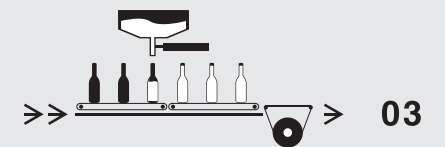
Vertical



SHARPEN YOUR EDGE
**WITH HIGH SPEED
PACKAGING SOLUTIONS**



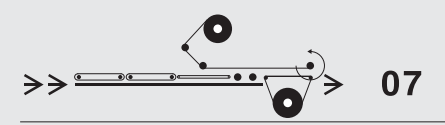
-  **MELSEC Q series platform**
General sequence control, Motion control, Digital I/O, Analog I/O, Intelligent function modules, Network modules
-  **GOT1000**
Range of HMI devices, up to 15inch size, with associated options
-  **A700 Inverters**
Intelligent energy efficient inverter range
-  **MELSERVO-J3** □ □ □ **B**
MELSEC servo amplifiers.
-  **FX3U**
High function low cost brick type sequence controllers



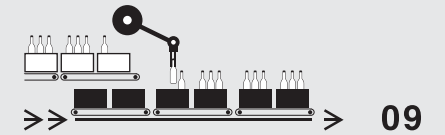
Bottle Filling 03



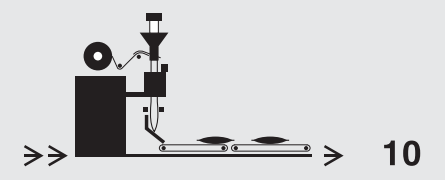
Labelling 05



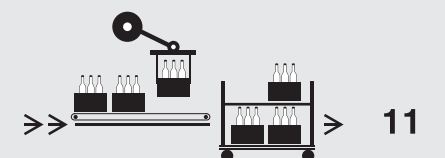
Horizontal/vertical pillow 07



Case Packing 09



Bagging 10



Palletizing 11

From enterprise to device level control, total solutions are realized

Mitsubishi Electric is a leading supplier of automation products and solutions worldwide. Together with this leading position, we possess an extensive range of expertise in not only 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 specific to your needs. Ranging from filling applications, labeling, and bagging to name a few, we offer flexible solutions to meet the requirements of these applications and more. Our expert technical and marketing teams have extensive experience in the packaging industry, and provide the right know how, and application knowledge to suit your specific needs.

Mitsubishi Electric is the automation powerhouse behind the manufacturing economy of Japan and most of the Asia-Pacific region. Starting in 1921 from a shipbuilding background, Mitsubishi Electric has grown to over \$30Billion Multinational Corporation with an estimated 100,000 plus employees worldwide. With an extensive range of automation products from nano PLCs, to high-performance, high-scale controllers, inverters, robots, servos, and HMIs, offering an innovative line-up of automation products. When choosing Mitsubishi Electric, you will immediately know you have chosen the right manufacturer for your every day needs.

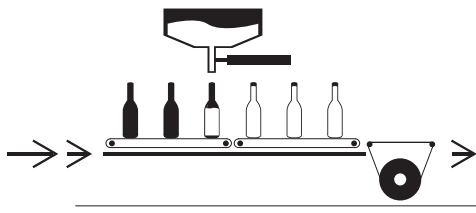
High speed performance at a low cost is key

Mitsubishi Electric's controller series is based on the Q series 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 for Q Series. Integrating the Motion CPU and Sequence CPU on the same base, realises a highly accurate and high speed solution. The Q Series also has an extensive range of digital, analog, and intelligent I/O to further enhance and specify your application. Choosing Q series as your main controller is surely the right decision for today's high speed application needs. Whatever

packaging solution you are addressing, the Q Series has a solution to fit.

Meeting packaging needs

Taking a quick glance at Mitsubishi Electric's virtual factory, its easy to realize how our full range of automation products can integrate together to provide the total and correct solution whatever the application requires. Take advantage of simple low cost advantages with the FX series of controllers. Move to high speed registration with multiple axes with the Q series platform. Whatever the case, Mitsubishi Electric has a solution for you. Further, utilizing the SSCNETIII 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.

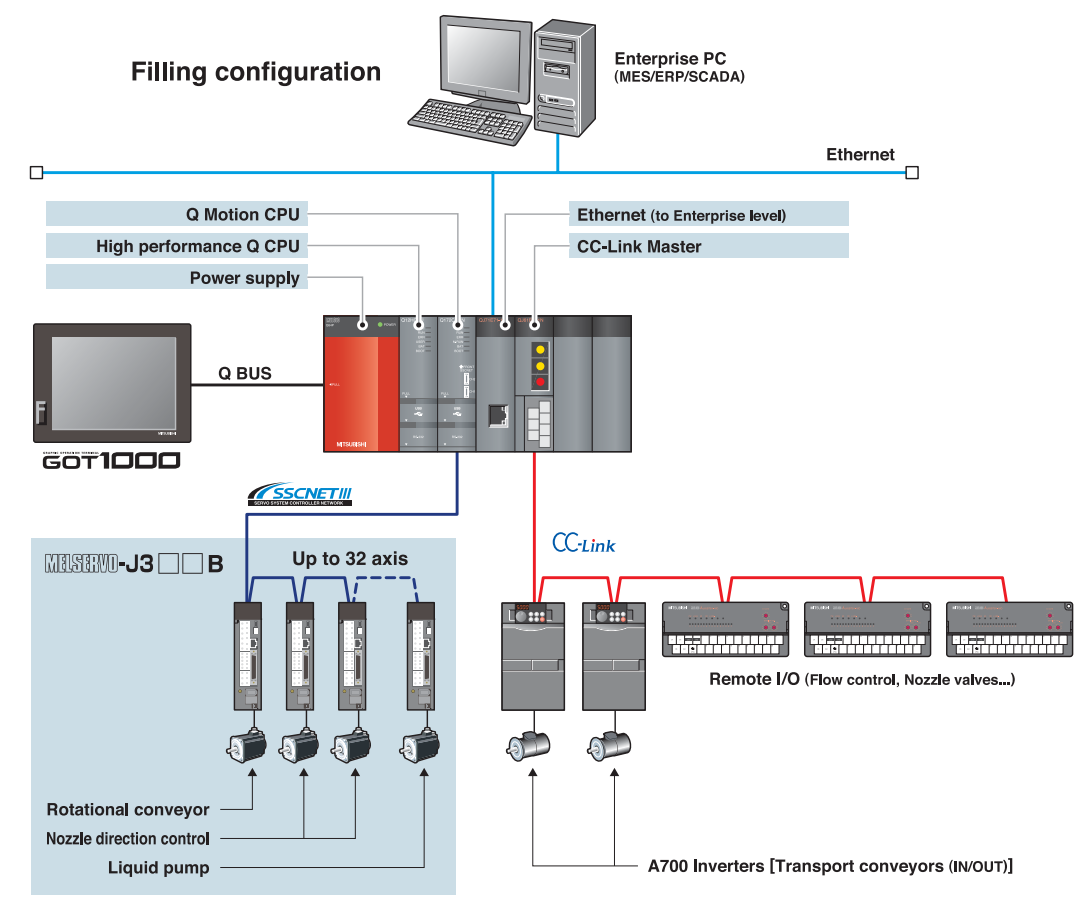
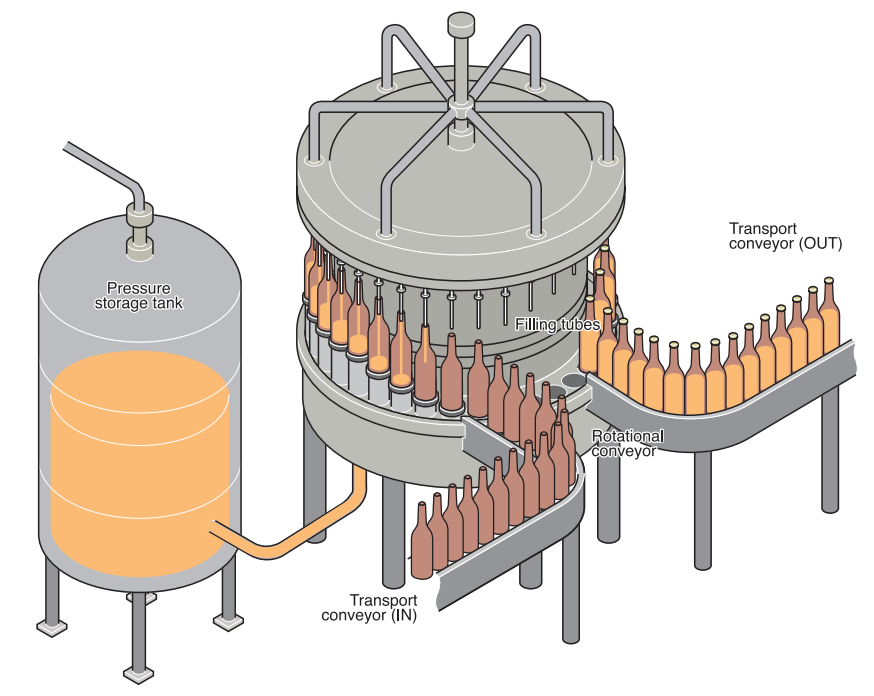


Bottle Filling

Its 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 a 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 has to be precisely controlled as to eliminate the risk of frothing and overflow of the liquid itself. By using Mitsubishi Electric's motion controller CPU (based on the Q series 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 as 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

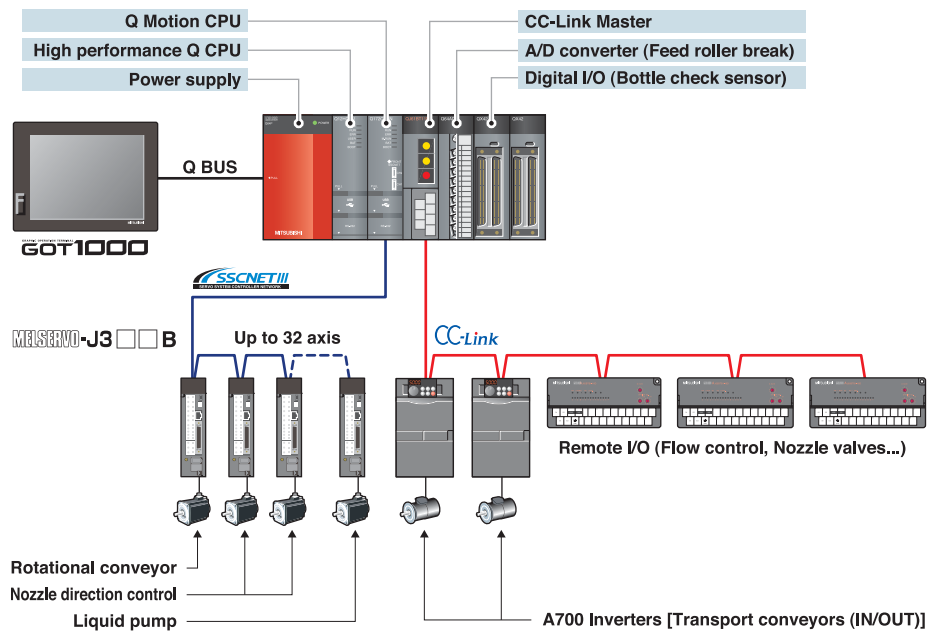
In addition to the motion controller, the actual transfer and conveyor aspects of the application can be controlled using Mitsubishi Electric's intelligent and energy saving drives via the open device level network CC-Link, centralized on the Q series controller. The fast rates of bottles being fed into the machine can be controlled by the Q series together with CC-Link network offering high transmission speeds of 10Mbps with program speeds in the milliseconds. The Q series also enables connectivity to upper level systems via its Ethernet option module allowing real-time production data to be fed into ERP/MES systems. This continuous monitoring allows factory managers to report on actual

bottling performance in real-time without having to rely on statistical data. In addition to local on rack I/O, CC-Link offers an extensive range of remote I/O modules ensuring that most system components such as flow control valves, nozzle valves, etc., will have a means of being controlled by the Q series. 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 50Mbps 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 operability of the bottle filling machine.

→ → [Diagram of a bottle on a conveyor with a label] → Labelling

Accurate high speed labelling

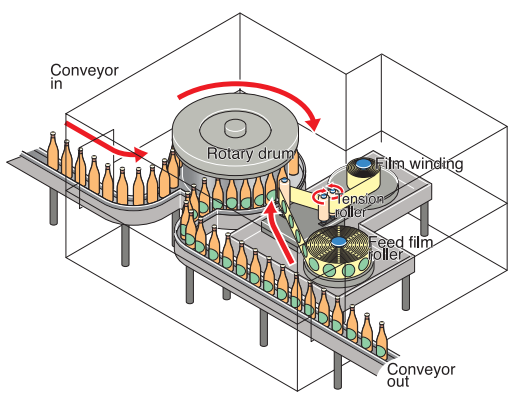
Ever wondered how when walking in the supermarket all the bottle labels are facing the same way looking almost identical in terms of positioning and orientation? This is a result of today's high speed bottle labelling machines ensuring labels are adhered correctly on the target product with as little deviation as possible. With bottle or cylindrical vessel labelling as it's known in the industry, 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, and to ensure that all products have a label placed correctly. Labels come in host of sizes and can be placed in a number of ways, be it cold glue, hot glue, shrink wrap, 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

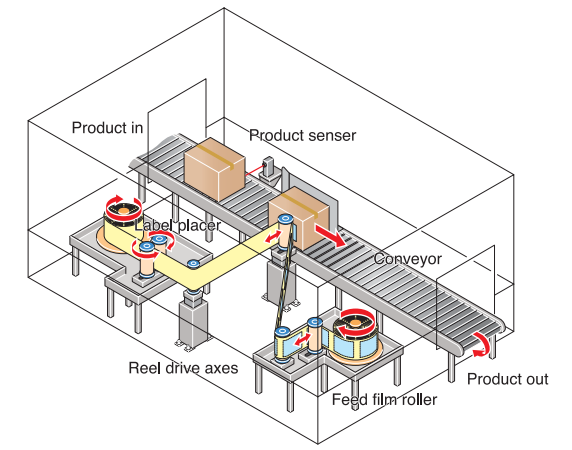
Achieving these requirements is second nature for Mitsubishi Electric's Q series automation platform. Together with Q motions high speed registration functionality, labels are guaranteed to be placed accurately with little distortion. By adding the Q CPU logic controller, the rotary drum, feed roller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

machine. With the GOT1000 touch screen high resolution architecture, monitoring, debugging, and label parameter profile changes can be displayed and controlled via the high speed Q bus connection. Using the high speed MR-J3 series with SSCNETIII for high speed servo control, the film winding reel and tension roller can be controlled accurately 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 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 on the SSCNET III 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 labeler, 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 to harmonize the motion of the product conveyor and the label reel drive axis.

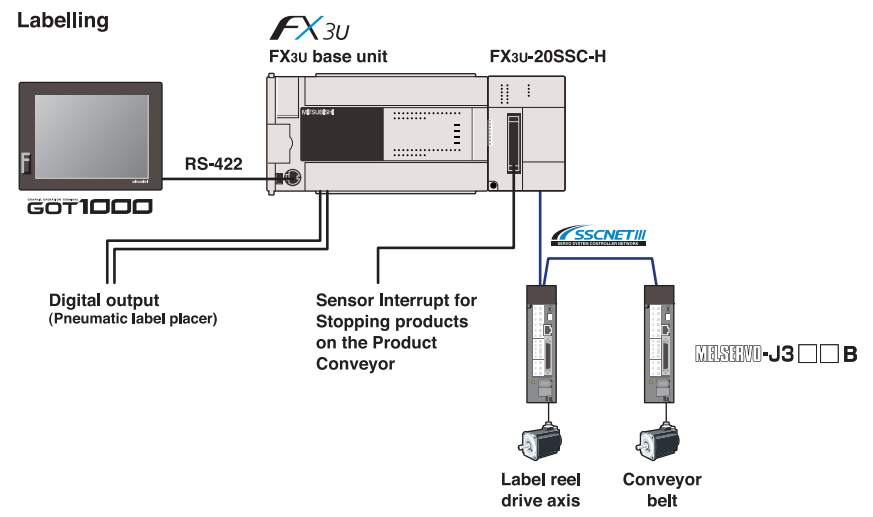


Product conveyor control

As boxes are loaded onto the product conveyor at regular intervals, a motion sensor device transmits an interrupt signal to the FX3U-20SSC-H connector 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 FX3U-20SSC-H optical communication. 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 box away and await the next incoming product.



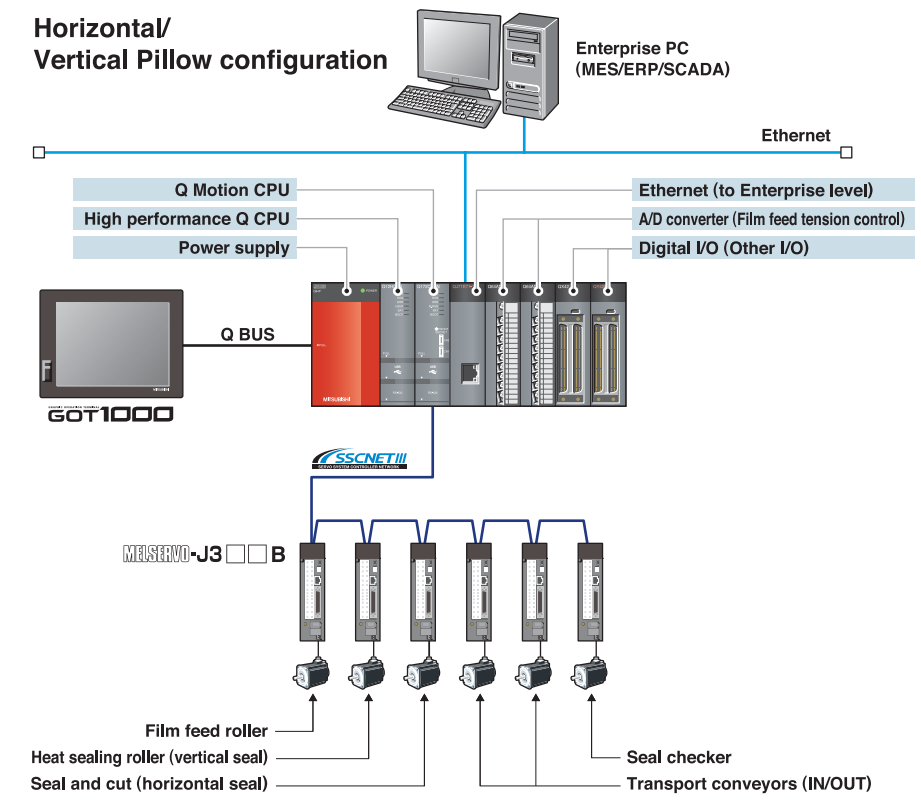
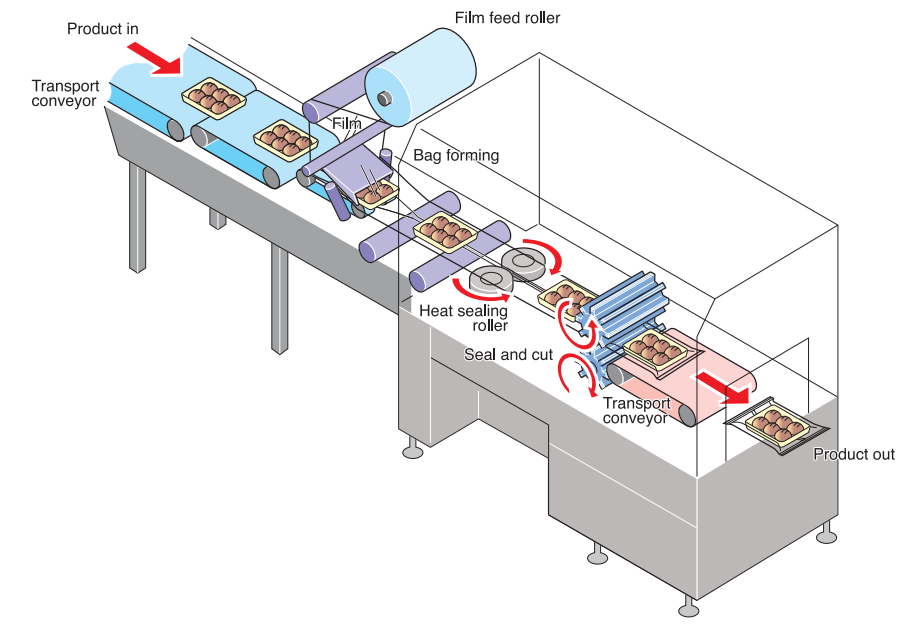
Horizontal/Vertical Pillow

From tubes to pillows, sealing packaging solutions for all

Probably the most common type of packaging machine aside from bottle filling applications, pillow type machines are used to package a whole host of products, from candy bars, pizzas, and breads to pharmaceutical, and other non food products. These machine types are known as pillow because of the distinct shape of the packaging that resembles a pillow. This design is a result of the packaging film being formed around the product to be packaged, with a variance of 2 or 3 specific sealed 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. The inline feed of the product is synchronised with the film packaging which is fed via a 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 single product ready for boxing or

other packaging processes. Various processes are synchronised with this application, requiring a level of flexibility to cater for a diverse range of shapes and sizes. The Q series automation platform is ideal for such applications, as programming can be kept simple with the QCPU logic controller, high accuracy maintained with the Q motion controller, an efficient user interface using the GOT1000. Hence these products are combined into a truly total solution.



Phase compensation is the key

Due to the high accuracy of this machine, the Q motion controller and MR-J3 series of servo drives together with SSCNETIII servo network are more than ideal for providing such performance as required for pillow type machines. As mentioned with bottle filling, the cam profile can be very easily designed and implemented by using a software based tool. 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 cutter can be precisely synchronised with the feed of the conveyor, hence providing an accurate cut at high speed.

Maintaining the right tension

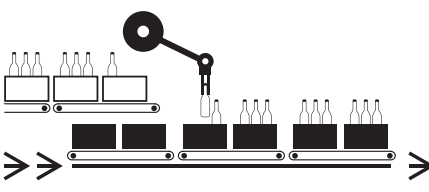
Another important aspect of pillow type packaging

machines is the tension control mechanism that ensures the packaging film is presented to the forming station precisely with reduced chance of stretching, flapping, and warping of the film. Simply, utilizing the range of high resolution analog to digital converter modules available for the Q series automation platform, the tension control mechanism, which usually comes in the form of a potentiometer with a counterweight at its end, is interfaced into the QCPU general controller by using this module. This control can then be easily controlled 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 before, pillow type machines have to remain flexible in operation due to the range of products that require this type of packaging, with a whole host of different packaging film types. This problem can be easily overcome with the

GOT1000, as a diverse range of parameter profiles can be called up suiting the specific process to be incorporated. I.e., 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. Also, these 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 simple using an Ethernet interface module installed on the Q series automation platform. Therefore, the Q series is ideal for plant wide packaging machines, where real time shop floor data are 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 at such a low cost.

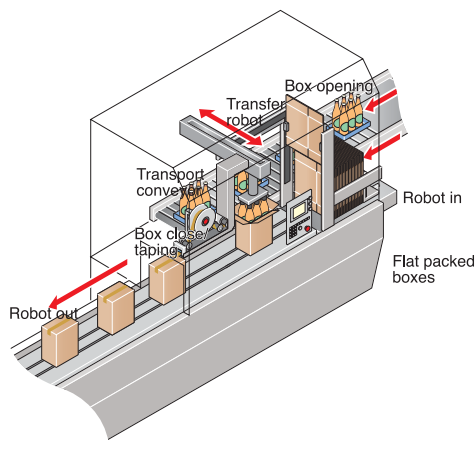


Case Packing

Preparing for distribution with case packing

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, resisting the elements in the process. Case packers are designed on 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. Although first designed using actuators and pneumatic components, more and more machines are being controlled by automated controllers minimizing downtime and improving productivity throughout the machine. Mitsubishi Electric's Q Series Automation Platform is significantly designed to meet these needs offering a flexible range of products that can be designed for a specific application.

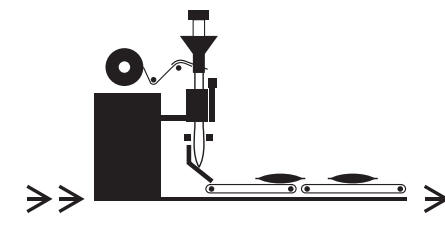
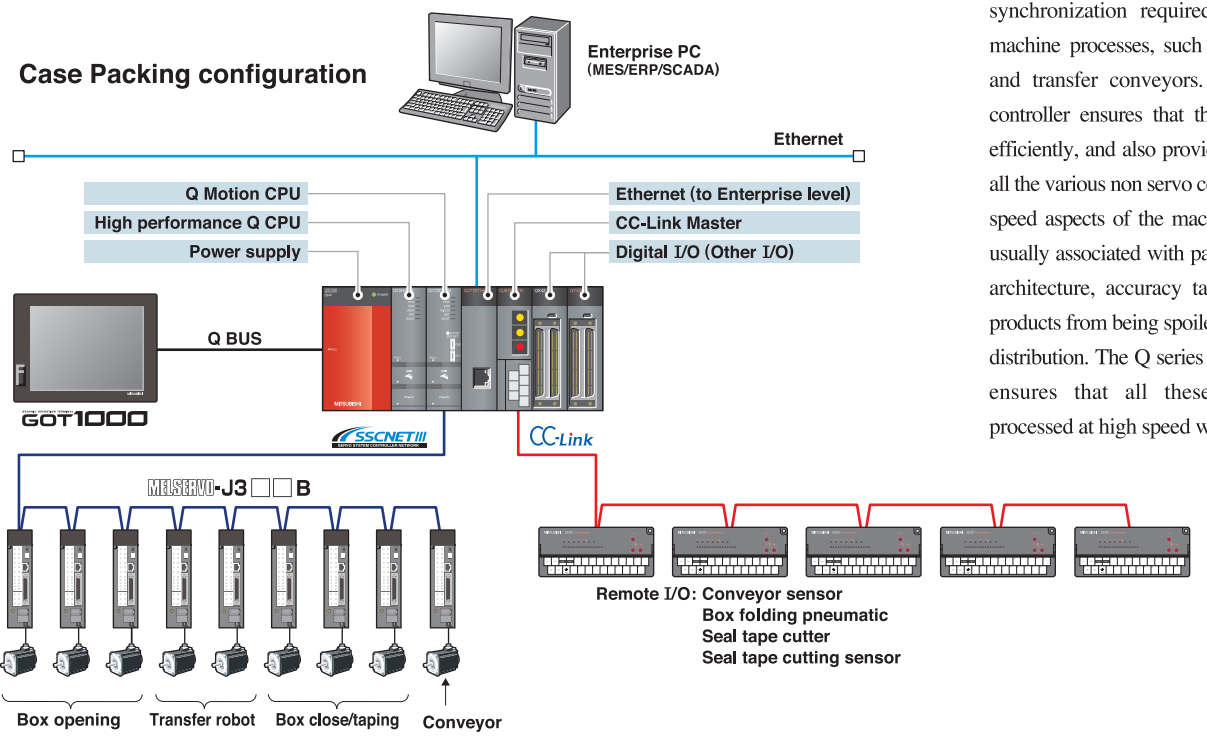


Easy wiring and fast communications with CC-Link

With such an extensive range of moving components in such a machine, i.e., conveyor sensors, box folding pneumatic, seal tape cutter, and cutter sensor; CC-Link is truly 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. The Q Motion System offers the high degree of synchronization required to prevent errors in machine processes, such as box opening, taping and transfer conveyors. The Q series general 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. The Q series high speed functionality ensures that all these data variances are processed at high speed with little downtime.



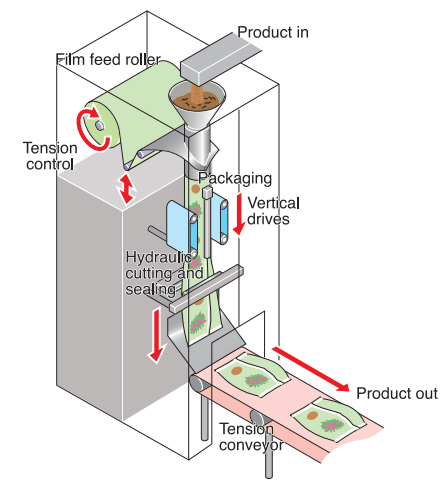
Bagging

Fast, efficient, cost effective bagging

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.

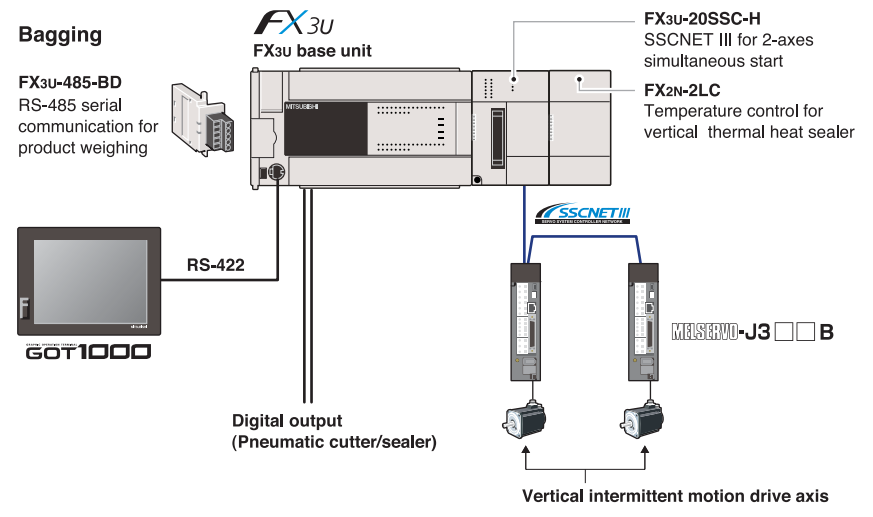
Essential sections of control

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 tubular 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 to allow 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 1-speed positioning operations using mark to move registration techniques. The vertical motion tension arm at the top of the machine operates with a spring system while a mechanical break 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 a completed bag and create a head seam for the next 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

Palletizing goods efficiently for transport

Palletizing goods efficiently for transport

Palletizing and de-palletizing applications are very similar with 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 pallets, ready for the transport to the point of sale. These kinds of systems are usually simple in architecture, and do not require extensive servo systems, however still rely on high performance

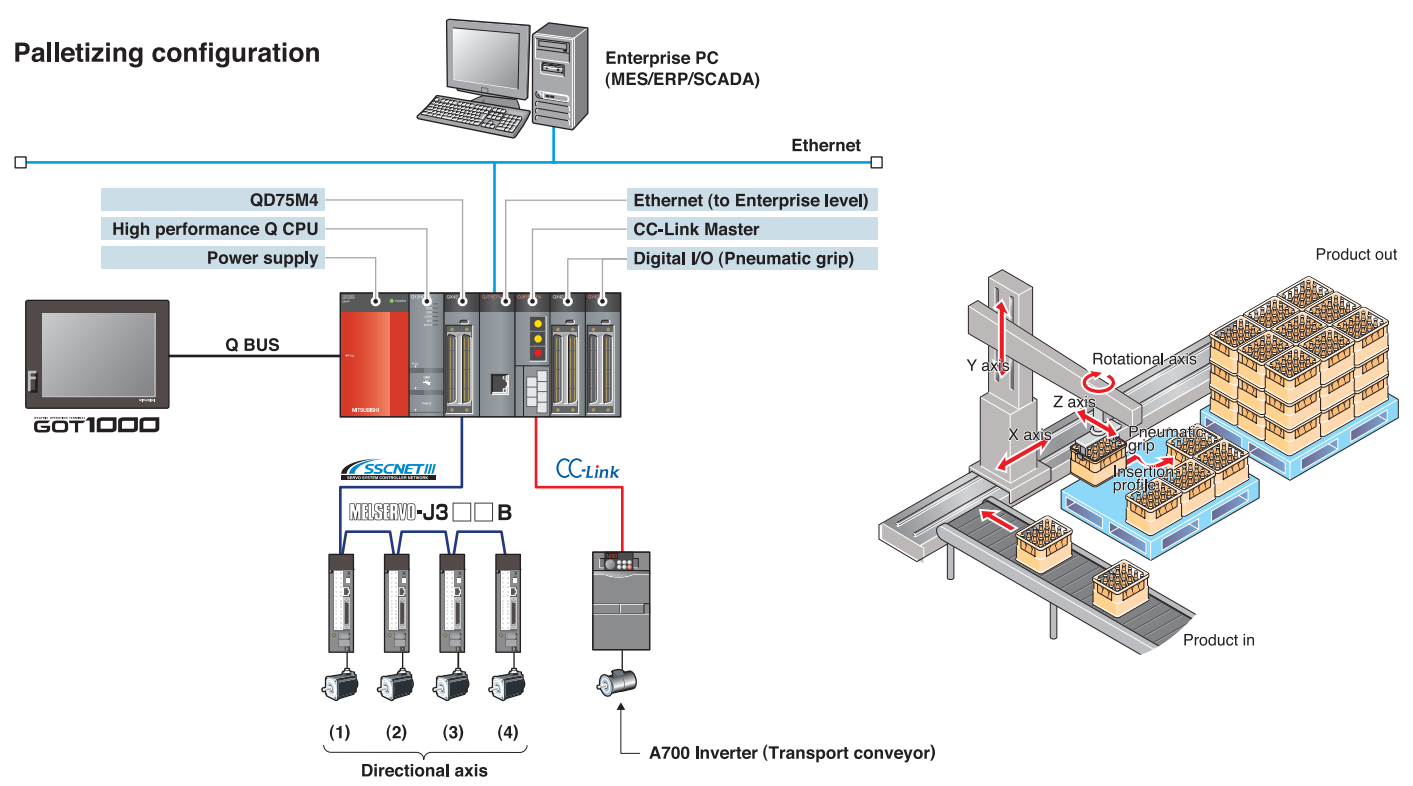
and high accuracy, while keeping the cost down to a minimum. The Q Series positioning modules, known as the QD75 range, are ideal for such applications.

Utilizing the 4-axis QD75 as a cost effective solution

Rather than having a motion controller, the QD75 module provides up to 4 axes of high accuracy servo control directly from the Q series automation platform as an alternative. Considered as an intelligent function module, QD75 is ideal for controlling directional axes on the palletizing machine. Using simple ladder

logic programming and integrated utility software, the QD75 is very easy to setup and debug. Other aspects of control such as transport conveyors can be done with the A700 series of intelligent AC drives. Connecting to the Q series automation platform is done simply with the CC-LINK open device level network, which can also be used to connect additional devices such as sensors etc. With fast communications of 10Mbps, CC-Link provides a high speed solution and reduces overall wiring too. The Q series automation platform ensures that a flexible and total solution is realized, with performance and cost reduction optimized.

Palletizing configuration



Guaranteed Mitsubishi Quality

Mitsubishi Electric provides an extensive range of automation products with a proven record of high quality. This aspect is what makes choosing Mitsubishi Electric for your control system a wise choice, to insure the utmost reliability.



The Q series is more than just a controller

The automation control system is based around the Q series automation platform which is an extensive range of rack mounted controllers ranging from high performance to entry level basic CPUs. Together with this, a range of digital I/O, high resolution analog, and intelligent function modules

are available, providing an effective means of interfacing the controllers 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 (device level), and CC-Link/LT (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 SSCNETIII network. SSCNET stands for Servo System Control Network, and is Mitsubishi Electric's proprietary servo control network, achieving very high speeds of 50Mbps using a fiber optic transmission medium. These servos include intelligent auto

tuning functions eliminating vibration and providing high speed highly accurate characteristics. The Q series motion controller usually forms the base of this control, being a dedicated servo control system CPU that sits on the Q series rack. 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 3.5ms easily achieved when controlling all 32 axes.



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 200v to 400v series, from 0.4kw up to a maximum 500kw drive, the FR-A700 series offers a flexible range of drives for almost any type of application. These drives

are very easy to use having an extensive parameter setup architecture that can be setup on board, by using utility software. Providing economical performance is second nature for the 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.



Guaranteed Mitsubishi Quality



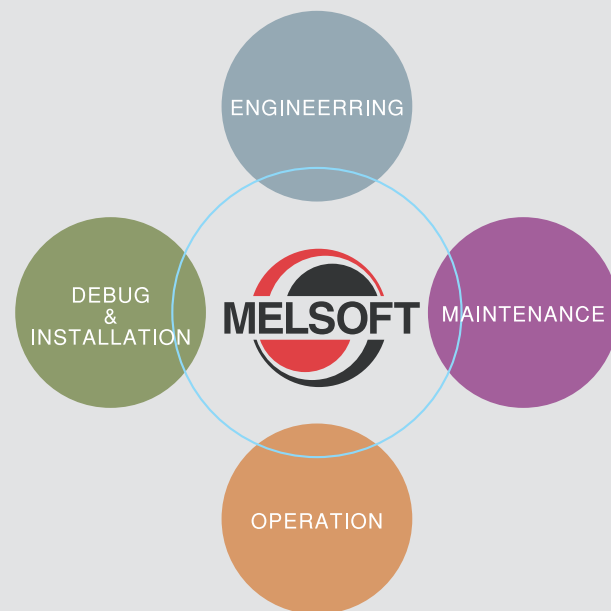
High resolution human machine interfaces

Mitsubishi Electric manufactures a diverse range of Human Machine Interfaces or Graphic Operation Interface as they are in Asia. The GOT1000 range starts from the GT11 5.7 inch compact GOTs, up to the large 15inch GT15 series. These terminals use TFT display technology and are solely designed on high performance with clear true color high resolution

displays. They also include a reliable front mounted USB programming port to enable easy 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, 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. Starting with the GX series which consists of a sophisticated ladder programming tool, debug, and maintenance software combined with utility configuration software which helps when setting up intelligent function modules, without the need for extra programming. Moving up a step is the MX series of software which provides a middleware for connecting and monitoring external 3rd party software with the Q series, i.e., data logging spreadsheets, and can be a simple alternative to high end SCADA software.



Leaving the Q series aside, the GT series 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 Q series motion controller.

Programming and setting up parameters for the A700 series of intelligent drives couldn't 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 series, a diverse range of simulation software is available enabling you to debug your program without the need for the actual hardware. MELSOFT is a key essential for today's needs.

Complying with international quality assurance 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, including UL Standards, and shipping standards.



Compatible Standards

Details on each standard certification are disclosed on MELFANSweb. (<http://www.MitsubishiElectric.co.jp/melfansweb/english>)

Shipping Standards

- LR Lloyd's Register of Shipping approval
- DNV ... Norwegian Maritime approval
- RINA ... Italian Maritime approval
- NK ClassNK approval
- ABS ... American Bureau of Shipping approval
- BV Bureau Veritas approval
- GL Germanischer Lloyd approval

Safety Standards

- CE ... Council directive of the European Communities
- UL ... Underwriter Laboratory Listing

Global FA Center

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

◎ NORTH AMERICAN FA CENTER

MITSUBISHI ELECTRIC AUTOMATION, INC.
500 Corporate Woods Parkway Vernon Hills, IL 60061 U.S.A
Tel: 1-847-478-2100 Fax: 1-847-478-0327
The target area: North America, Mexico

◎ EUROPEAN FA CENTER

MITSUBISHI ELECTRIC EUROPE B.V. GERMAN BRANCH
Gothaer Strasse 8 D-40880 Ratingen, Germany
Tel: 49-2102-486-0 Fax: 49-2102-486-1120
The target area: Europe

◎ UK FA CENTER

MITSUBISHI ELECTRIC EUROPE B.V. UK BRANCH
(Customer Technical Center) Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, UK
Tel: 44-1707-278843 Fax: 44-1707-278992
The target area: UK, Ireland

◎ KOREAN FA CENTER

MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.
B1F, 2F, 1480-6, Gayang-Dong, Gangseo-Ku, Seoul, 157-200, Korea
Tel: 82-2-3660-9607 Fax: 82-2-3664-0475
The target area: Korea

◎ HONG KONG FA CENTER

MITSUBISHI ELECTRIC AUTOMATION (HONG KONG) LTD.
10/F., Manulife Tower, 169 Electric Road, North Point, Hong Kong
Tel: 852-2887-8870 Fax: 852-2887-7984
The target area: China

◎ TIANJIN FA CENTER

MITSUBISHI ELECTRIC AUTOMATION (SHANGHAI) LTD. TIANJIN OFFICE
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