



**MITSUBISHI  
ELECTRIC**

MITSUBISHI PROGRAMMABLE AND MOTION CONTROLLERS  
MATERIAL HANDLING SOLUTIONS




*Changes for the Better*

**Become Lean and Flexible**

**Empowering  
Industries**



M o v i n g   f o r w a r d   t o g e t h e r

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Mitsubishi Electric believes in the strength of the independent solutions provider. Our ultimate goal is to deliver innovations that empower our customers and allow them to differentiate themselves while setting higher standards within their respective markets.

Mitsubishi Electric has a long history in automation starting from a ship building background over 85 years ago. Since then it has grown to over \$30 Billion Multinational Corporation with an estimated 100,000 plus employees worldwide. Using a constant progression of knowledge, we continue to increase the speed, accuracy, and quality of both our products and business processes. As a result, many of the world's top material handling solutions providers have already discovered that Mitsubishi Electric is the performance standard they can build upon.

#### Integration is the key

Mitsubishi Electric's principle of integrating automation products into one common platform is

a key advantage to applications for today's cost driven requirements. Every aspect of automation control, ranging from low end controllers, to High end controllers, Servo's, Inverters, and HMI's are based on the integrated Automation Platform providing a comprehensive PAC architecture.

#### Meeting the industry needs

Whether your company provides solutions in baggage handling systems, automated warehousing, postal automation, or manufacturing systems; designs single material handling machines or entire automated facilities, Mitsubishi Electric can deliver the tools necessary for the right solution. With Mitsubishi Electric's high function, advanced performance products and technical know how, a complete and truly total solution architecture is easily realized.

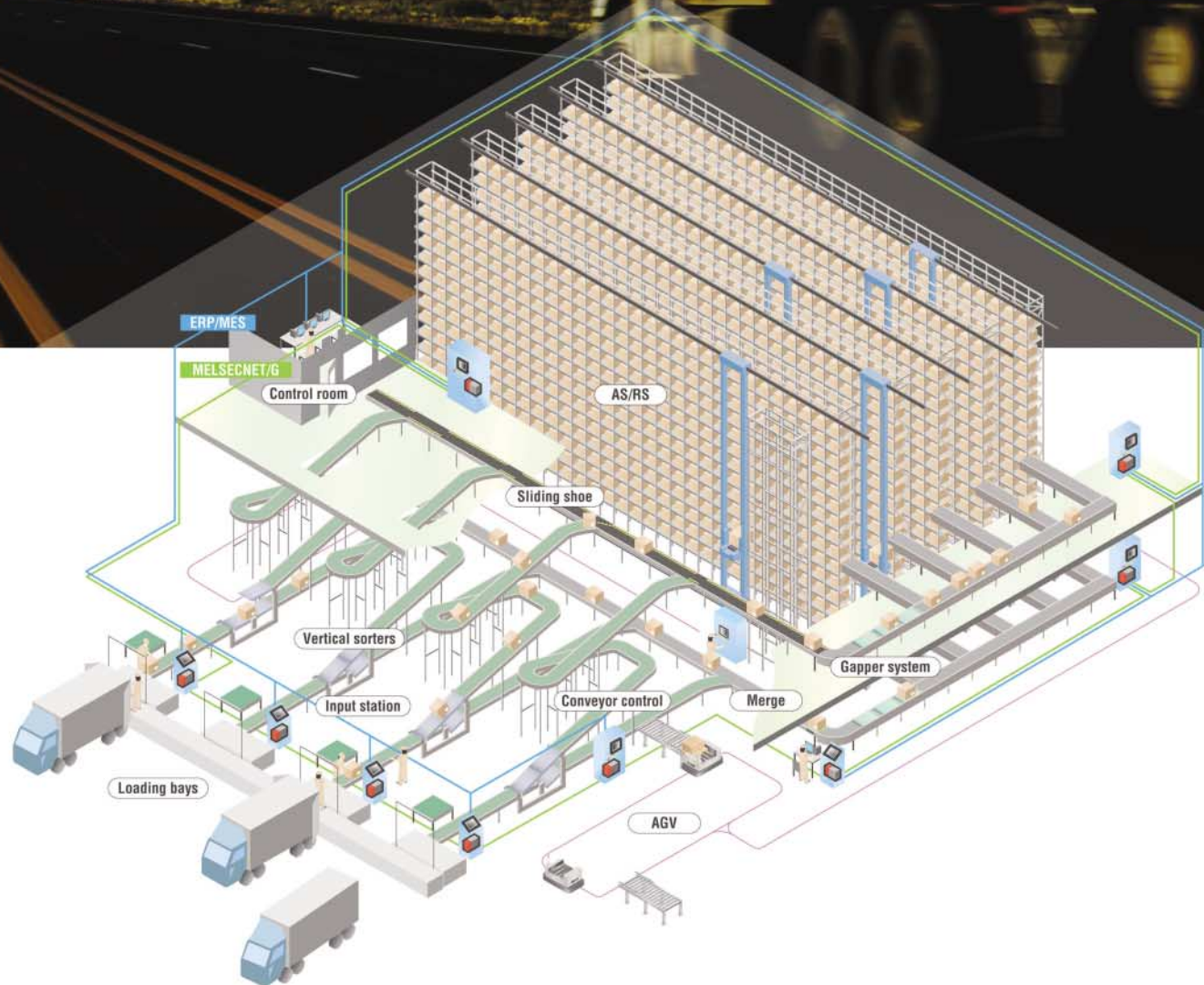




# Manufacturing and Distribution Systems

Getting material from the receiving docks to the shipping docks as quickly as possible with the least amount of errors is critical to any organization's success. This takes high level logistical coordination and error-proofing of repetitive processes. Efficient manufacturing and distribution systems typically result in higher levels of profitability and increased customer satisfaction. However, lean does not happen overnight. It's a process of continual improvement that relies heavily on having a strong plan and even better feedback.

**Create a roadmap to a leaner future**



## Bridging IT and automation control

Having vast amounts of data and handling or processing it efficiently has been a hurdle for not only material handling applications, but automation applications as a whole. Many automation providers allow for the movement of data from one machine to another on the shop floor. However, moving accurate and detailed data from the shop floor up to IT systems has been overlooked by most, resulting in costly down time, process inefficiencies and many other issues.

With Mitsubishi Electric's e-F@ctory solution, these problems have been eradicated. Together with the revolutionary integrated Automation Platform provides a true total solution architecture, not only concentrating on the shop floor, but also providing a direct interface to ERP/MES systems with streamlined real-time data resulting in a "visible" system solution.

## Flexible manufacturing

With so many products and articles being handled in current material handling processes, providing a complete automation platform is paramount to a successful application. Mitsubishi Electric can provide a single centralized automation platform that easily interfaces with bar code readers, pick/place robots, conveyors, weighing machines, scanners, and more. The CC-Link device level network provides a high speed method to integrate such devices easily and at a low cost. Even robots and conveyors can be controlled directly from the controller platform along with interfaces to the GOT1000 HMI series for real time online control and monitoring. With all of this cohesiveness, the right product being delivered to the right destination is ensured.





CONVEYOR SYSTEMS  
 AUTOMATED STORAGE/RETRIEVAL SYSTEMS  
 AUTOMATIC GUIDED VEHICLES

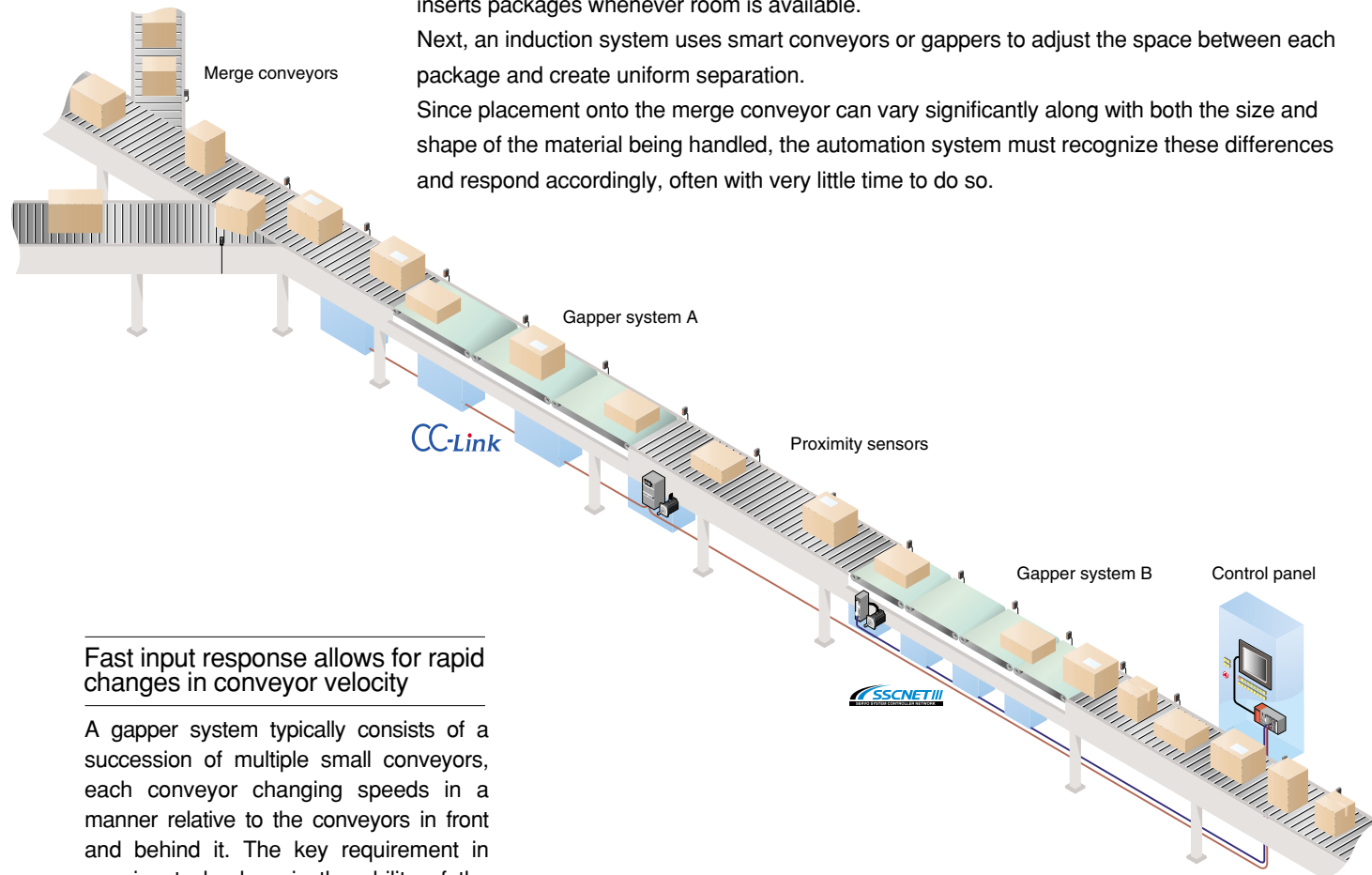
BECOME LEAN AND FLEXIBLE  
 WITH MATERIAL HANDLING SOLUTIONS



# CONVEYOR SYSTEMS

## Merge, gap, slide

In many material handling applications, items are first loaded onto a merge conveyor which matches speeds with the main conveyor and inserts packages whenever room is available. Next, an induction system uses smart conveyors or gappers to adjust the space between each package and create uniform separation. Since placement onto the merge conveyor can vary significantly along with both the size and shape of the material being handled, the automation system must recognize these differences and respond accordingly, often with very little time to do so.

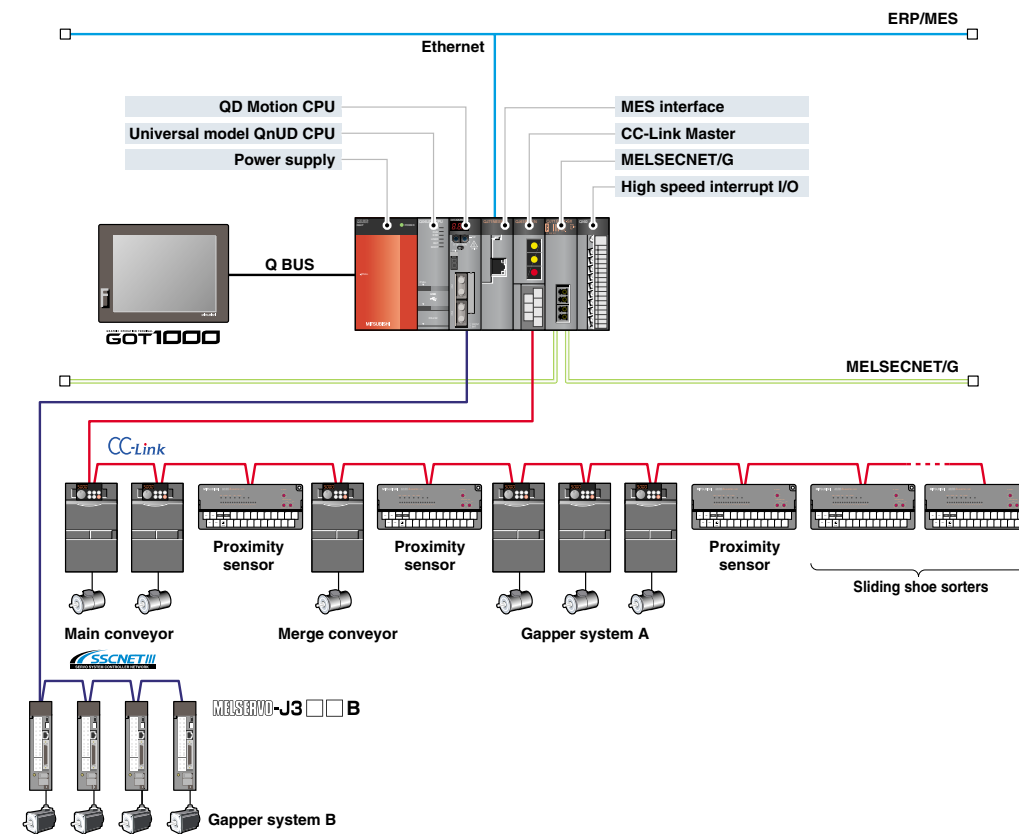


### Fast input response allows for rapid changes in conveyor velocity

A gapper system typically consists of a succession of multiple small conveyors, each conveyor changing speeds in a manner relative to the conveyors in front and behind it. The key requirement in gapping technology is the ability of the system to sense product and change conveyor velocity in a very short amount of time. During ultra fast time intervals, proximity sensors send updates to the controller regarding product location, which then calculates new speeds to be sent to inverters or servo amplifiers. Even with rapid velocity commands, the conveyors must accelerate or decelerate without any overshoot or undershoot occurring.

From simple induction systems to the most advanced gapper designs, Mitsubishi Electric delivers with various controller performance levels from the QD75P position module to the new QD series with integrated high-speed BUS [back-plane] for fast multiple CPU communication. In addition, remote I/O and interrupt modules range from standard 20msec response times to the faster 50microsec QI60 up to the

extremely fast 10microsec Q172LX devices. CC-link compatible A700 inverters coupled with CC-link remote I/O provide a very strong baseline that satisfies the majority of induction system requirements. For gapper conveyors that require an extra boost of performance, the SSCNET/III based MR-J3-B servo system can be easily added into the integrated Automation Platform, taking "high speed" to a new standard.



### Synchronizing the lines of communication

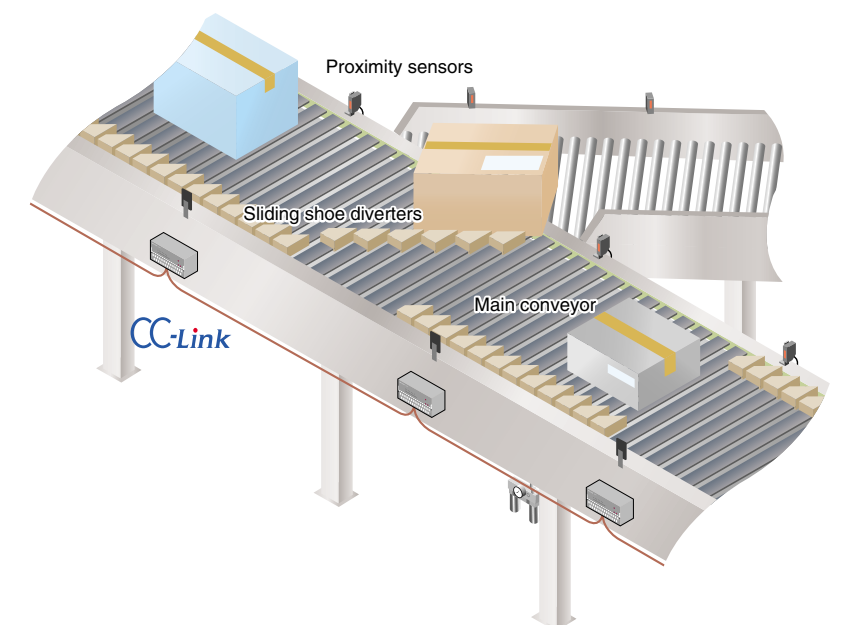
One of the challenges of sortation is how to transfer from one conveyor to another without stopping or damaging products. Mitsubishi Electric's communication networks are optimized for maintaining synchronous control of multiple axes. The servo network SSCNET/III is a full-duplex 50 mega baud system where data communication is both bidirectional and high-speed (Synchronous deterministic communication) yet has zero possibility of data collisions which otherwise could cause timing delays and unwanted downtime. Furthermore, the network cycle of SSCNET/III is designed to match that of the controller and the servo amplifier. Therefore, all critical motion devices are synchronized and the system is allowed to perform in real-time. This is a huge performance benefit when using electronic gearing or coordinating the motion between two fast moving axes.

MELSECNET/G is a ultra high-speed 1Gbps redundant Ethernet topology communication system for inter-controller communication, allowing various subsystems in a material handling system

to all communicate deterministically in a peer-to-peer manner. The sortation subsystem can communicate upstream with an AS/RS system or an AGV command station and prepare those devices for the material they are about to receive. When the time comes, the product can be transferred cleanly to its new carrier without any delay.

In addition, CC-Link, an open standard from the CC-Link Partner Association

(CLPA), allows for high-speed access to I/O and other devices over long distances. Unlike with other similar networks, adding I/O and increasing distance between devices does little to impede the performance of the network. Achieve speeds of up to 10Mbps, and bus lengths of up to 1.2km without the use of repeaters. This is especially useful for diverters, such as sliding shoe sorters that have remote I/O elements down the entire length of the conveyor system.







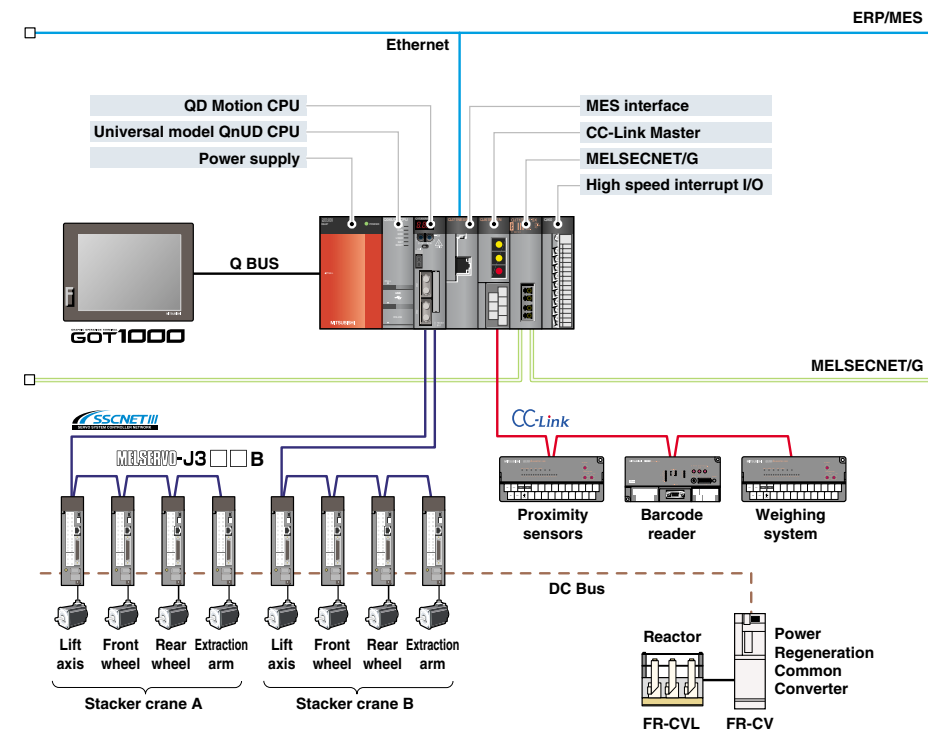
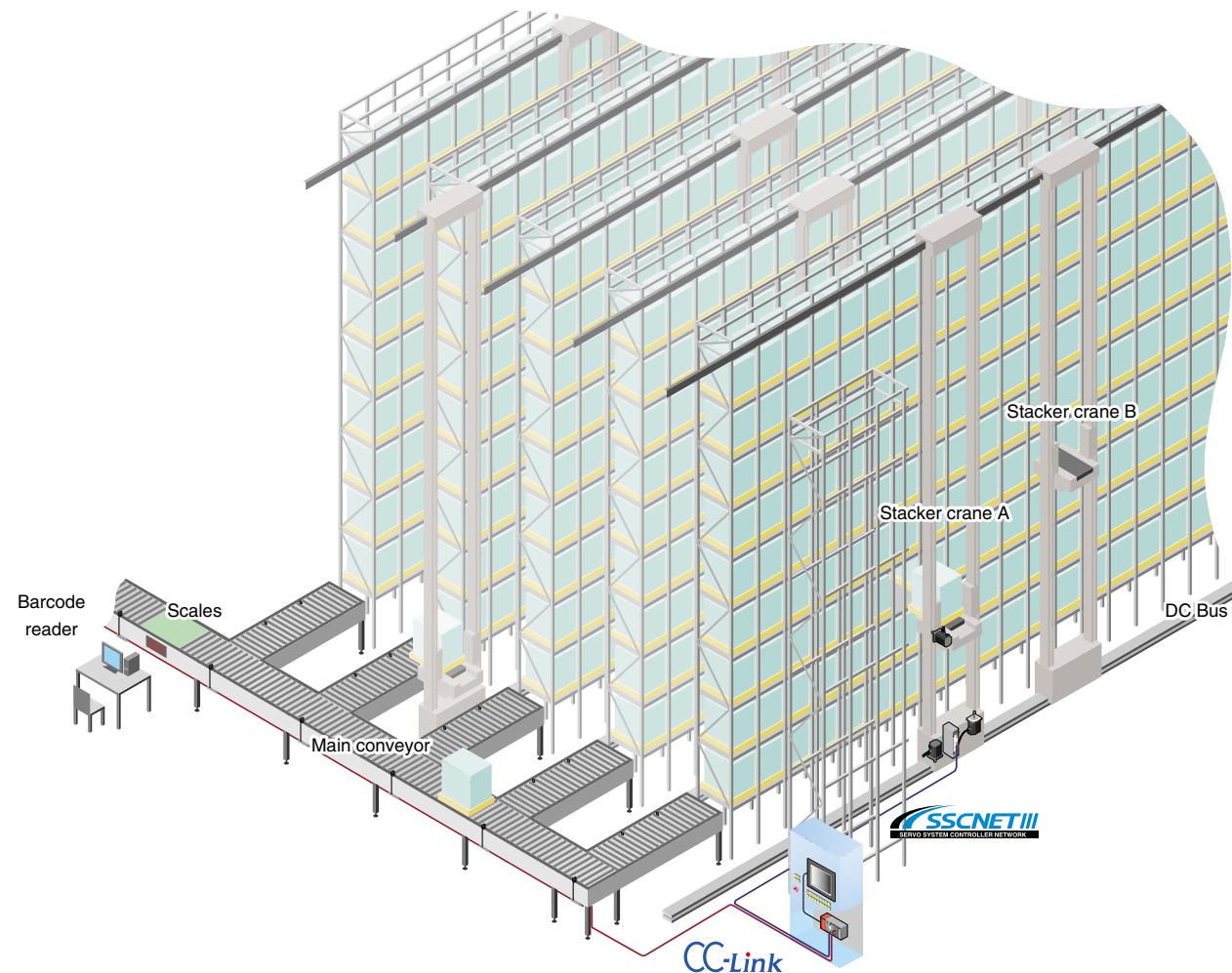
- CONVEYOR SYSTEMS
- AUTOMATED STORAGE/RETRIEVAL SYSTEMS**
- AUTOMATIC GUIDED VEHICLES



# AUTOMATED STORAGE/RETRIEVAL SYSTEMS

## Minimize your breaks

Automated Storage and Retrieval Systems (AS/RS) have many advantages over older warehousing techniques. The ability to store items higher on shelves reduces floor space and the ability to track individual boxes or pallets allows for easy first in-first out systems. In the Baggage Handling System (BHS) industry, Early Baggage Storage (EBS) systems allow for bags to be temporarily stored and then released at the correct time to get on the same flight as the passenger. Since all of these AS/RS systems are typically large, the speed of the transport vehicle is key as it needs to move items in and out as fast as possible.

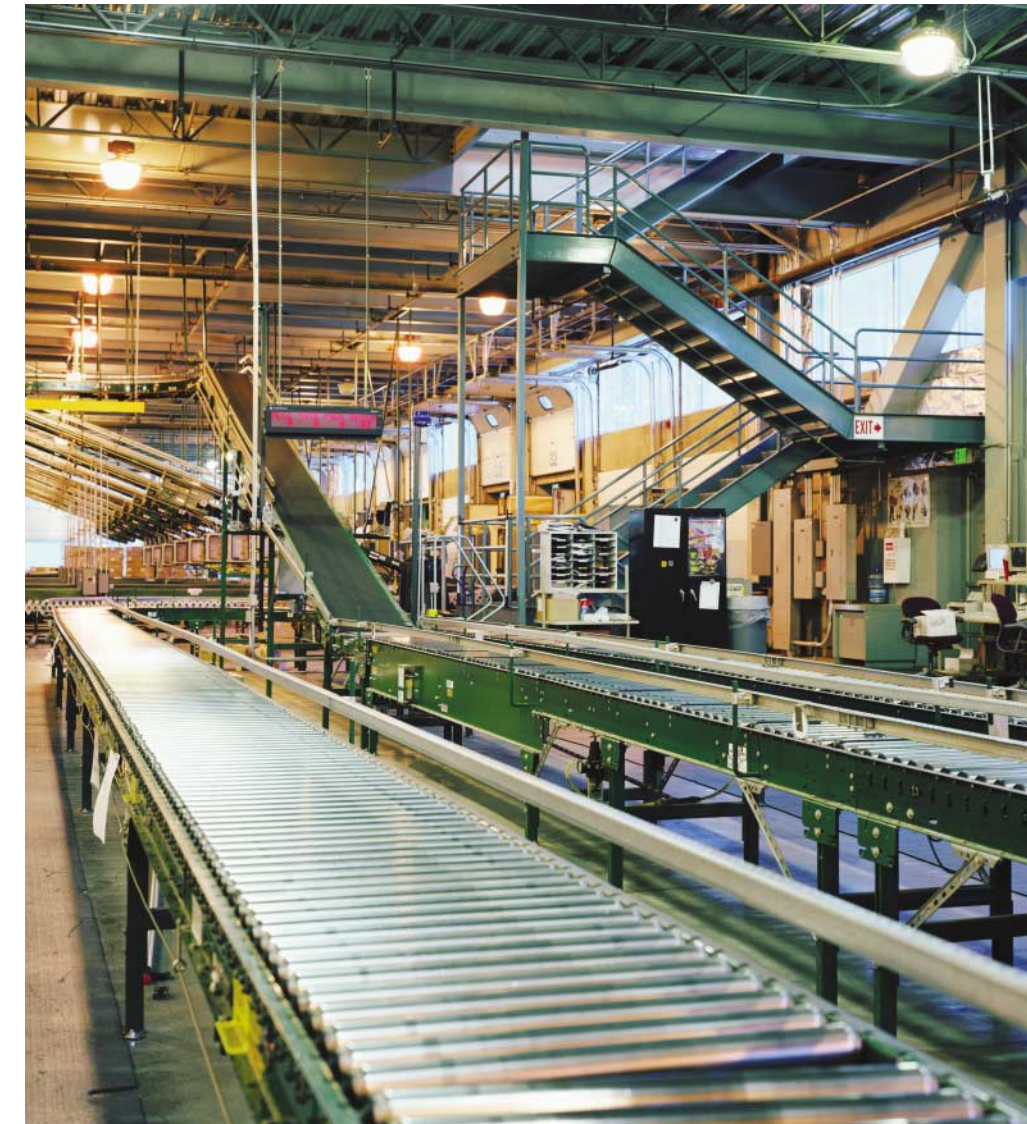


### Advanced real-time auto-tuning for multiple load sizes

AS/RS systems need to be able to move at maximum acceleration and velocity under varying load carrying situations. One of the most extreme cases would be an AS/RS that transports heavy, full pallet-sized loads. If tuned to have the same set of gains for both loaded and unloaded conditions, the system, while stable, may still not be optimized for top performance. The MR-J3 amplifier contains advanced real-time auto-tuning technology that can automatically sense a change in load and alter the PID gains accordingly. This allows for maximum performance even with drastically changing load characteristics.

### DC Buses continuously deliver power

A single stacker crane in an AS/RS system typically has up to 4 axes of motion: Lift, extraction and two traverse drive wheels. All of this motion requires a lot of energy. Since the cranes are moving long distances at high speeds, power is typically delivered via a DC Bus supplied by our FR-CVL series of line regenerative common converters. These converters allow up to six Mitsubishi Electric inverters (VFDs) to be connected in a common DC Bus configuration and provide AC line regeneration.







- CONVEYOR SYSTEMS
- AUTOMATED STORAGE/RETRIEVAL SYSTEMS
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BECOME LEAN AND FLEXIBLE  
WITH MATERIAL HANDLING SOLUTIONS

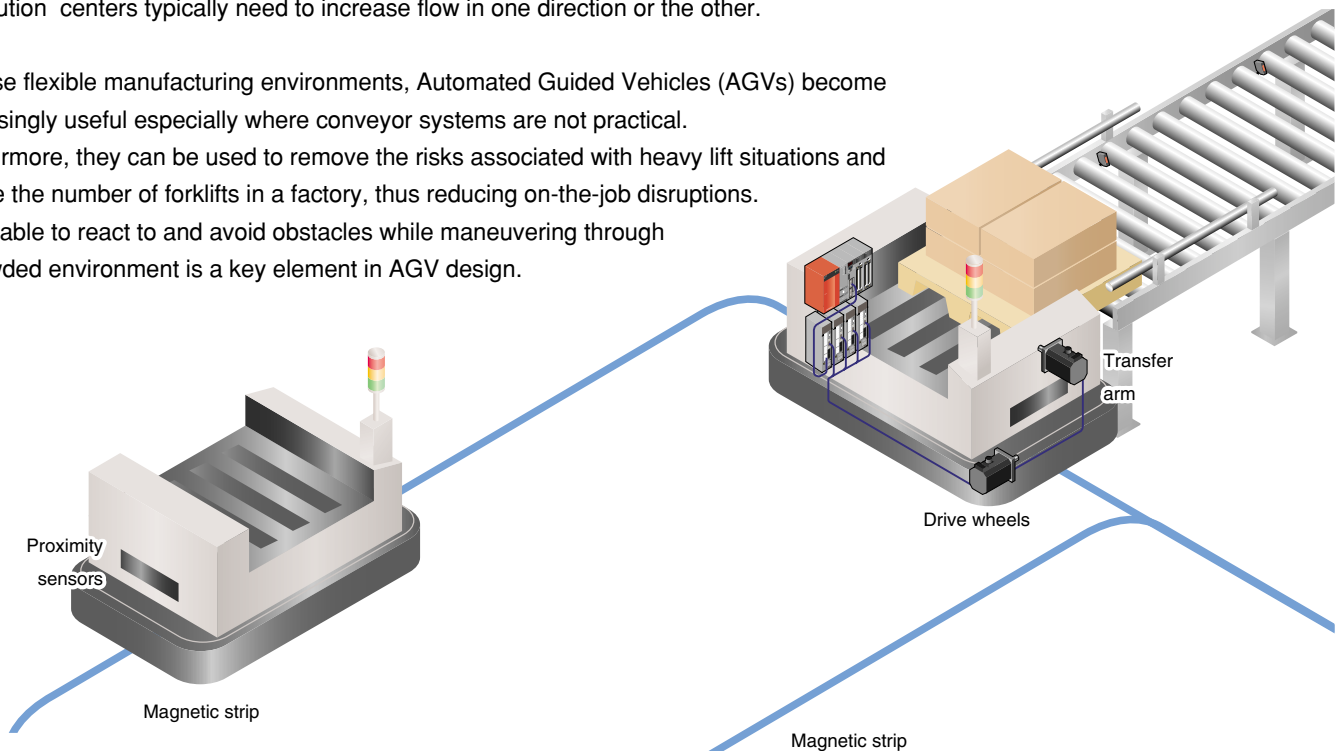


# AUTOMATIC GUIDED VEHICLES

## Add flexibility

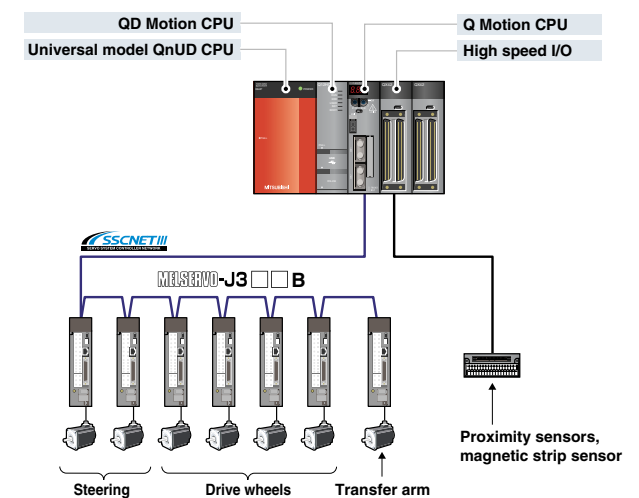
Being able to respond to changing customer demands is a key component of a successful material handling installation. For example, the beginning of the holiday season typically sees a rush of sales and shipments which is followed up by a significant increase in returns and exchanges. In order to accommodate this demand, distribution centers typically need to increase flow in one direction or the other.

In these flexible manufacturing environments, Automated Guided Vehicles (AGVs) become increasingly useful especially where conveyor systems are not practical. Furthermore, they can be used to remove the risks associated with heavy lift situations and reduce the number of forklifts in a factory, thus reducing on-the-job disruptions. Being able to react to and avoid obstacles while maneuvering through a crowded environment is a key element in AGV design.



### Phase and disturbance compensation or smooth all-wheel drive control

Sort floors can be crowded and vibration intensive environments. Therefore, AGVs must be completely stable even with changing external disturbances and have the ability to make quick and precise movements. Using the phase compensation function, all four wheels (or more) of an AGV can be perfectly synchronized. In comparison to two wheel drive, all-wheel drive can increase acceleration, deceleration and of course handling, making incredibly tight turns possible. The phase compensation function adjusts for time delays in the system and allows multiple axes to move together in perfect synchronization. Robust disturbance compensation allows the response to external disturbances to be tuned separately from the main PID loop, thus increasing overall responsiveness.





# Baggage Handling Systems

In baggage handling, the goal is to have the passenger and their bag get on the same plane. Airport expansion along with inline security measures and a decrease in layover times at major hubs has created the need for extremely efficient and high speed baggage handling systems (BHS). Mitsubishi Electric has the complete toolset necessary for a fully integrated solution. When a passenger takes a high-speed tram between terminals in order to catch a connecting flight, the person's baggage must be delivered equally as fast. This typically requires the use of a high-speed Destination Coded Vehicle (DCV) system. On the other end of the spectrum, sometimes passengers check-in earlier than the airline anticipates. If the bag was sent directly to the terminal gate, it might board an earlier scheduled flight. Therefore, Early Baggage Storage (EBS) systems are used to quickly store bags and then retrieve them at the proper timing.

**Stay on schedule from start to finish**

## Maintain control with high redundancy

Mitsubishi Electric delivers all of the critical components for complete control and visibility of baggage flow throughout the airport. High performance redundant CPUs, motion controllers, linear and rotary servo amplifiers and motors, operator interfaces, distributed I/O and safety are all available direct from one source. The required high speed characteristics and performance are easily realized with Mitsubishi Electric's integrated Automation Platform, which consolidates motion and sequence control, reducing cycle latency, and improving performance.

Together with the high performance, high speed characteristics of the Q Series controller, maintaining control and eliminating downtime are pre-requisites of any BHS system. With the Q Series

redundant system, control is maintained with a control and standby CPU. In addition, the network topology is also redundant, therefore ensuring system wide control in the event of a failure or power loss to the system.

## Easily integrate RFID-based tracking

Expanding to fit a system's requirements is the specialty of the integrated Automation Platform. RFID is becoming increasingly popular in BHS due to how easy it makes scanning moving baggage and because of its ability to store information in the tag itself. Successful scan ratios reach close to 100% in many new applications, reducing error and increasing throughput. RFID can be integrated simply by using the serial interface module on the Q series, or by interfacing directly from the CC-Link serial interface block.

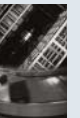






IN-LINE AND VERTICAL SORTATION  
HIGH SPEED LOOP SORTATION

BECOME LEAN AND FLEXIBLE  
WITH MATERIAL HANDLING SOLUTIONS



# IN-LINE AND VERTICAL SORTATION

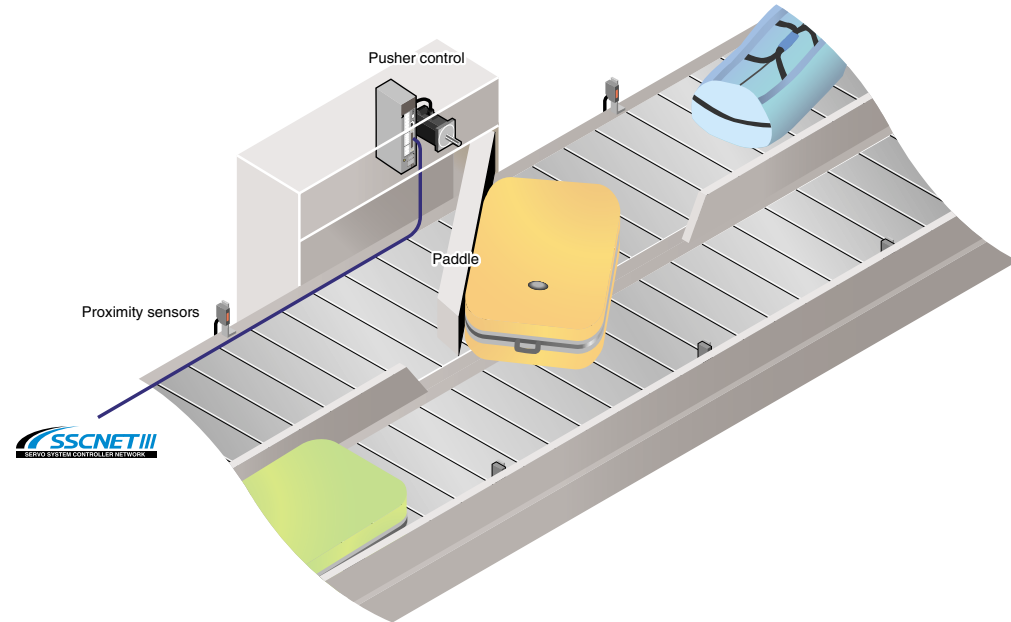
## Keep moving while sorting it all out

Earlier, sliding shoe sorters were mentioned. Many applications also use pusher devices and vertical sortation systems when heavier items need to be transferred.

While these types of machines are commonly seen in the various material handling industries, they are particularly useful in baggage handling systems. An airport typically has check-in counters on one floor with baggage claim on another.

Furthermore, a high-speed loop sortation system is usually running at the lowest level, playing catch-up with the passengers on high-speed trams.

Large pusher systems are used between conveyors in order to move large pieces of luggage that often differ greatly in shape and size. Vertical sortation systems change the flow of material to either go up or go down. In this way, a single in-line system can easily redirect product to the correct end-location.



### Smooth acceleration and deceleration

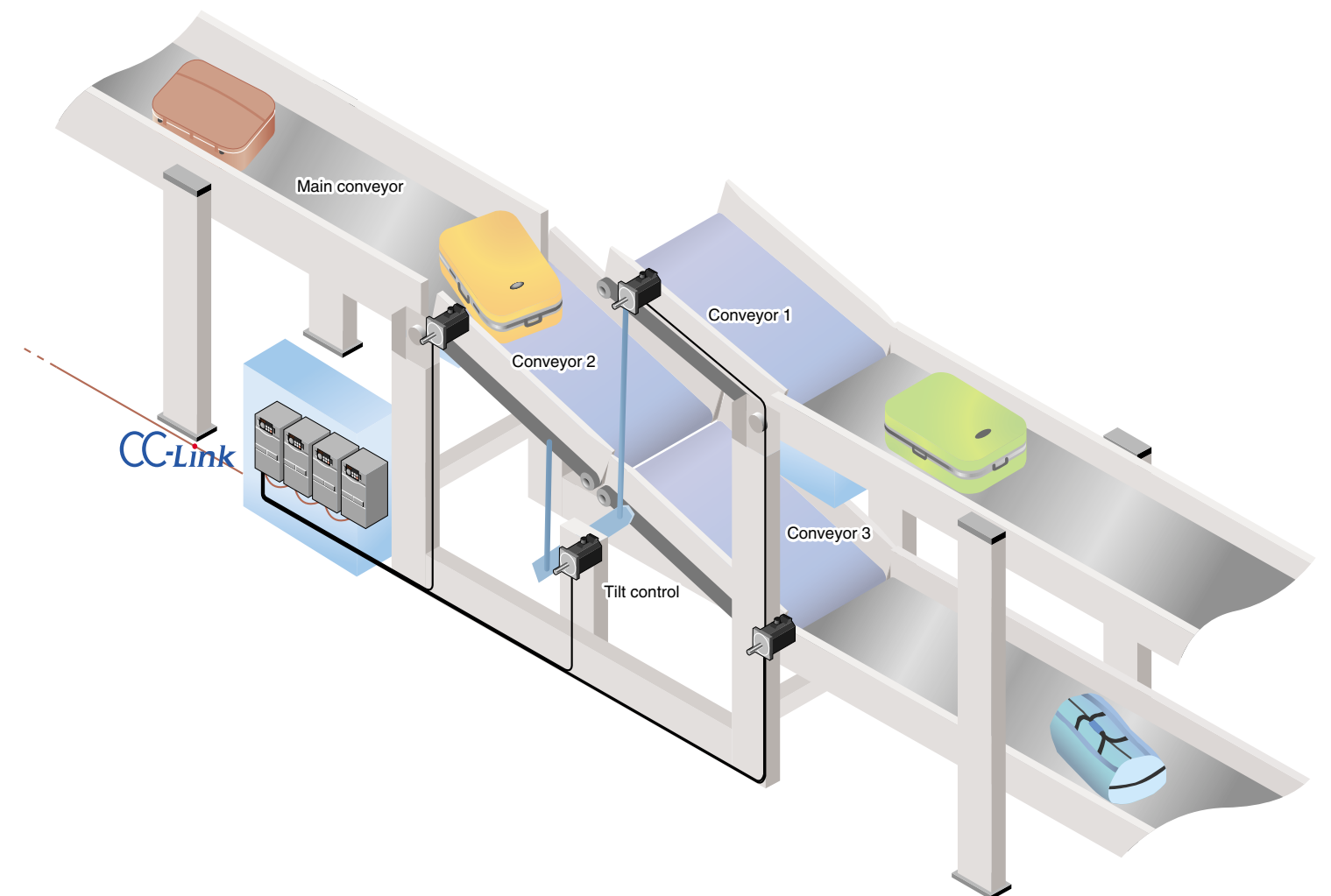
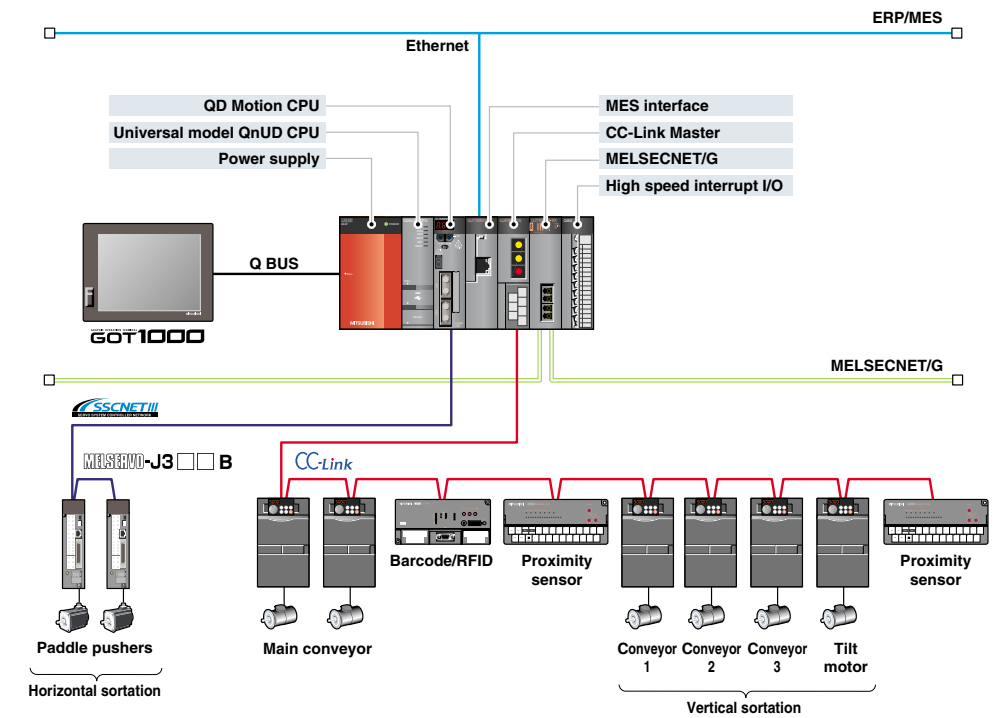
For applications that are moving very large and sometimes fragile objects, it is crucial that when ramping up or down to various velocities that acceleration and deceleration is accomplished smoothly. Mitsubishi Electric's intelligent MR-J3 servo is an obvious choice to most when it comes to top performance at all speeds.

What may be unknown to some is that Mitsubishi Electric's variable frequency drives (VFDs) are reaching servo-like

performance. The A700 has many similar auto tuning capabilities as the MR-J3 series and is capable of vector control with or without an encoder. Conveyors see sudden load fluctuations every time a product is introduced or removed from them. Our A700 VFDs have extremely high response to these changing load conditions and therefore limit jerking and speed fluctuations.

The Real Sensorless Vector (RSV) motor control system provides unequalled dynamic performance, ensuring a wider speed range, smoother operation and lower motor currents than

ever before. RSV starts with a highly accurate motor 'map', obtained during an auto-tune procedure which applies alternating voltage to the motor and determines critical motor characteristics. At the heart of RSV is the Adaptive Flux Observer system which compares actual motor behavior during operation with the theoretical model. Instead of a response to a change in load or speed being fixed, any variations between the theoretical and the actual motor response measured in operation are analyzed by the Flux Observer, which constantly refines the motor map as speed and load conditions change.







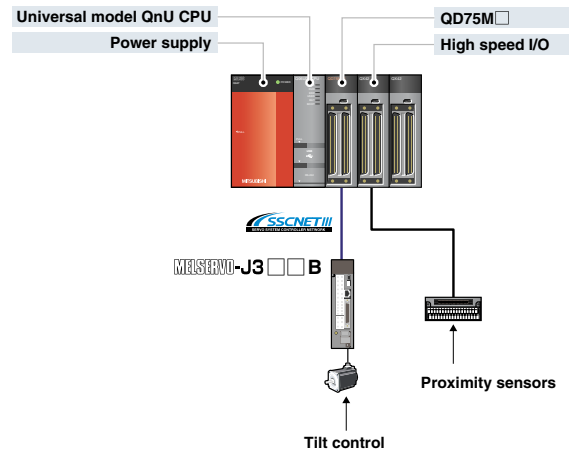
IN-LINE AND VERTICAL SORTATION  
HIGH SPEED LOOP SORTATION

BECOME LEAN AND FLEXIBLE  
WITH MATERIAL HANDLING SOLUTIONS



# HIGH SPEED LOOP SORTATION

## Run faster and be on time



Loop sorters are the highways of material handling. They consist of an endless loop of segmented carriers (Destination Coded Vehicles or Sorting Transfer Vehicles) that take the product to a specific target location. Since the carriers stay on the loop and don't exit with the product, transfer conveyors or tilt tray sorters are used to divert the product from the carrier. This requires knowledge of what is on the DCV or STV in real-time and having the product exit at the required location. Fully electronic tilt mechanisms allow for trays to tilt through curves to counter centrifugal forces.

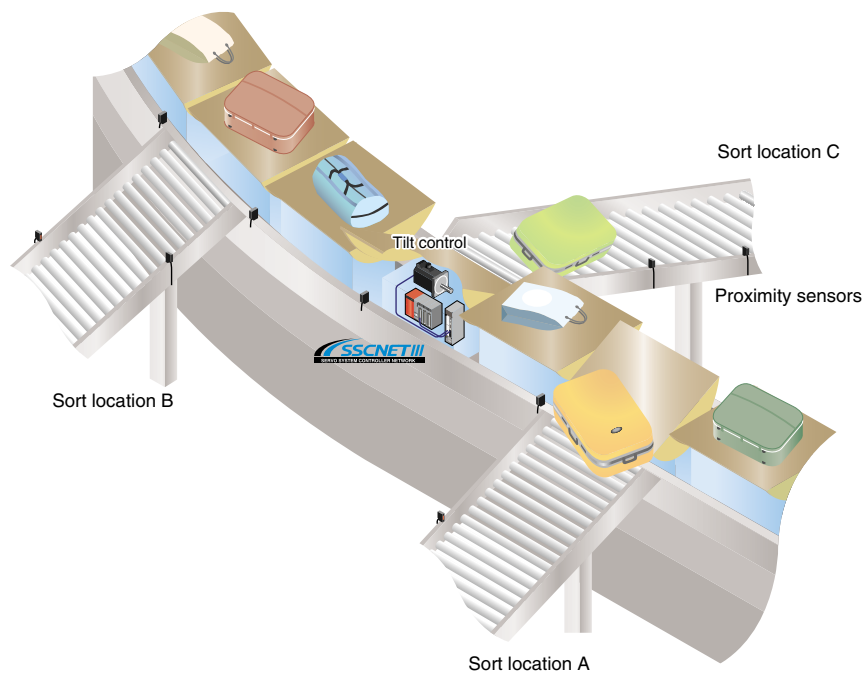
Compact yet powerful servo systems are ideal for solutions on the move

The Mitsubishi Electric MR-J3 servo system is compact, yet provides high torque at high speeds. In our research laboratories around the world, scientists are doing fundamental research in electricity and magnetism. Experiments in stator and winding methods, along with changes to the orientation and shape of the magnets has led to breakthroughs in motor technology. Mitsubishi Electric's

revolutionary design in servo motor mechanics has reduced the overall size of the motor and resulted in an increased power efficiency. The low cogging design allows for higher velocities coupled with higher torque. Like many of our products, the MR-J3 servo motor is a real-world example of scientific advancement aiding product design and development.

Realizing a cost efficient solution consisting of Q series universal controller and QD75 positional module is second nature for the

Q series range. Having so much generic modules on offer, realizes a solution fit for the application without sacrificing key functional requirements and performance. The QD75 offers up to 4 simultaneous axes that can be utilized for a cost driven system requiring high precision control. Features supported such as, linear/circular interpolation, speed control, positioning to speed switchover are standard. The QD75 also supports connection to the SSCNET III high speed 50MBaud communication network.





# Postal Automation

Like most other industries, the postal industry is trending towards higher throughput at lower costs. With increased competition from online bill generation and payment and email-based advertising, a very large portion of many postal operations' incomes is decreasing. At the same time, world population is increasing and with it, the number of deliverable addresses. This creates a very difficult situation for postal companies. Lower revenue coupled with a more demanding and larger customer base has forced a move towards more advanced sorting and tracking techniques that can allow for drastically reduced overhead, decreased delivery time and increased customer satisfaction.

**C o n f i r m   y o u r   r e s u l t s**

## Become a part of your customer's transformation plan

From the latest "Strategic Transformation Plan" created by the United States Postal Service, to the "Cap Qualite Courier" program of France's La Poste and Royal Mail's "Flats Automation Project" in the United Kingdom, many major mail services around the world have initiated new programs to directly address the above needs. These programs are funding extremely large investments in new flat sortation machines, mixed sortation machines and technology that enables large-scale, real-time tracking of mail. Utilize Mitsubishi Electric's extensive product range to offer solutions that

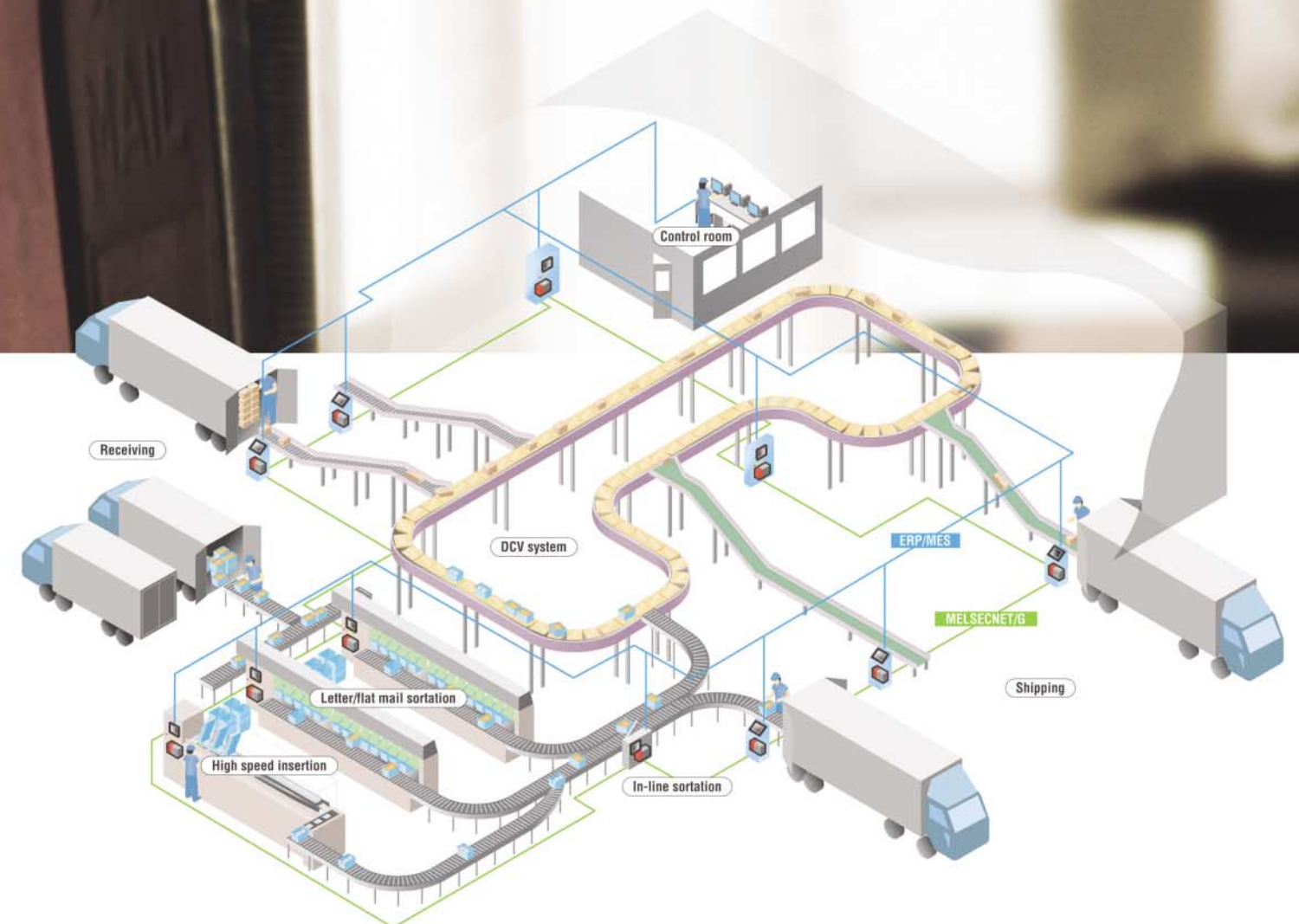
meet every aspect of your customer's future plans and goals.

## Easily track progress from send to receipt

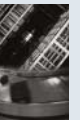
The move towards commercialization of many public mail services (such as in Japan and France), which are typically the largest delivery services in many countries, is pushing postal services to differentiate and add new and unique services to their customer base. This added pressure on them is great news for automation providers to the postal automation market. Customers of OEM postal automation machine makers will desire high-speed, high-throughput, highly reliable systems with flexible network options that allow them to view mail flow

throughout the entire delivery process.

Thankfully, Mitsubishi Electric is in the business of delivering solutions specifically for the OEM company's success. Everyone around the world right now is talking about Industrial Ethernet but only Mitsubishi Electric has delivered an Ethernet solution that truly connects all levels of the process. By simply adding an MES module to a machine's PLC configuration, the ability to obtain data from every sensor, amplifier and motor becomes instantly obtainable via a standard Ethernet connection. Track mail flow down to the latest sensor in the system, see instantly if it's about to be returned due to an unreadable address or change its destination on the fly.



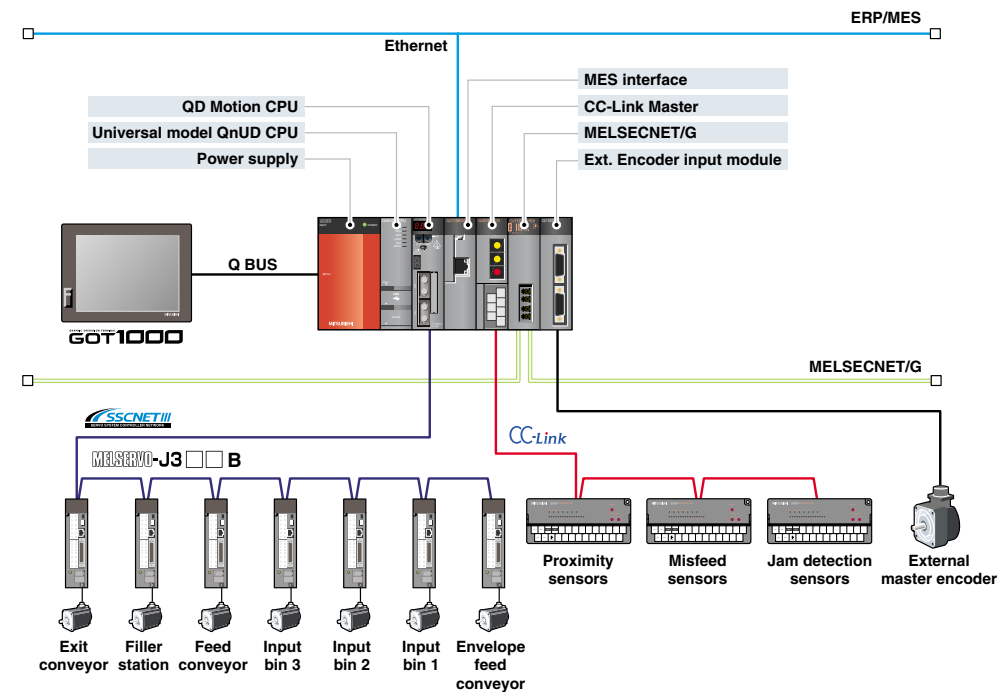




# H I G H S P E E D I N S E R T I O N

## Seal the envelope

High speed insertion deals with inserting flat material into envelopes. This can be anything from single to multi-fold advertisements, magazines and even CD's and DVD's. The technology is quickly getting more advanced and has trended towards extremely high throughput machines. While insertion systems are not typically found in major postal sorting hubs, they are used frequently at printing, marketing and advertising, and direct-mail services companies.



An external master encoder ensures proper alignment throughout the machine

By utilizing an external master encoder, the entire insertion system can be synchronized to one axis. This means that as sensors either upstream or downstream obtain new information about the location of inserts, conveyors and diverters can be adjusted for variations in product position all the while maintaining knowledge of their relationship relative to the master encoder.

In fact, utilizing data from various sensors is a key to the success of a high speed insertion machine. Not only does the system need to track the location of material, it also needs to continually check for misfeeds, double-feeds, paper jams and should notify employees when paper needs replacing. CC-Link offers an Open Network standard for interfacing with all of these sensors. It is also extremely easy to deploy and is capable of

handling large numbers of I/O without degradation in performance.

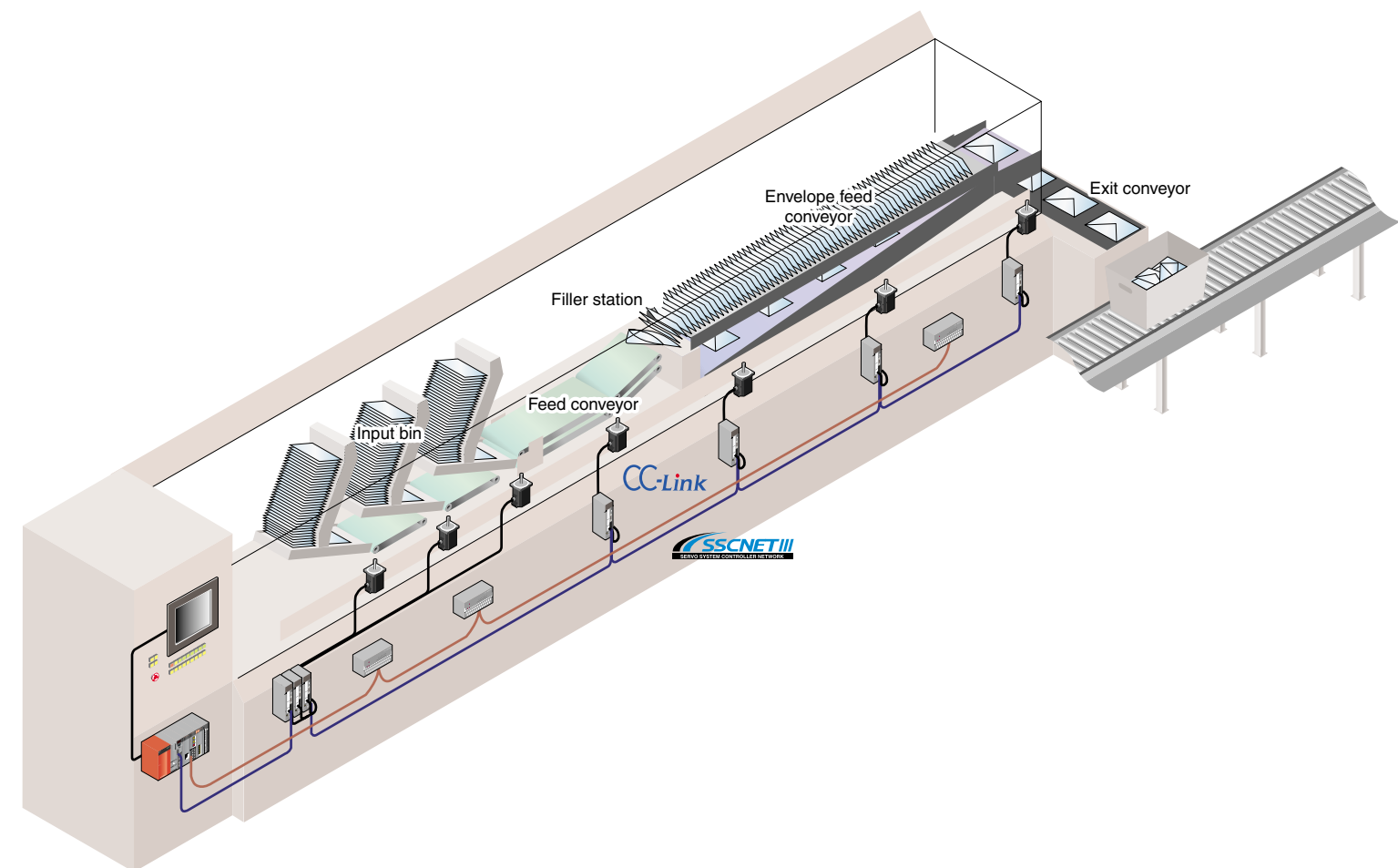
Customize the number of input bins to match your customer's needs

Since SSCNET/III is a multi-drop servo network, additional axes can be added to insertion machines on an as-needed basis. As the customer's requirements and demands grow, so can the system. Even in-field retrofits are made easy. If needed, add an extra motion CPU for an additional 8 to 32 axes for a total of up to 96 axes all from one PLC rack. In addition, MELSECNET/G can be utilized to network multiple insertion machines together. Thus, high levels of job coordination between machines can be accomplished.

Display easy-to-understand information for process control and trouble-shooting

Due to a Mitsubishi Electric designed graphics chip, the GOT1000 series of HMI's is capable of producing 2D data

(graphs, pictograms, etc.) at a rate nearly 4X as fast as competitive products. This means that job data can be streamed straight to the system's HMI and provide the user with up-to-date information in an easily understood format. The high-color, high-contrast display along with the ability to display images, such as JPEGs, allows for trouble-shooting screens that actually uses photos of the system to show the user where attention may be needed. In addition, the GOT1000 gives users multiple ways to trouble-shoot the system. View ladder programs right on the HMI without any additional software or computers. In fact, the One-Touch Ladder Jump function allows users to jump straight to ladder program steps that may have led to a system error. This means that initial trouble-shooting can be started immediately thus reducing downtime and increasing productivity. When more advanced tactics are required, a USB port embedded in the front of the panel allows users to transparently access the controller without needing to open any control







HIGH SPEED INSERTION  
LETTERS AND FLAT MAIL SORTATION

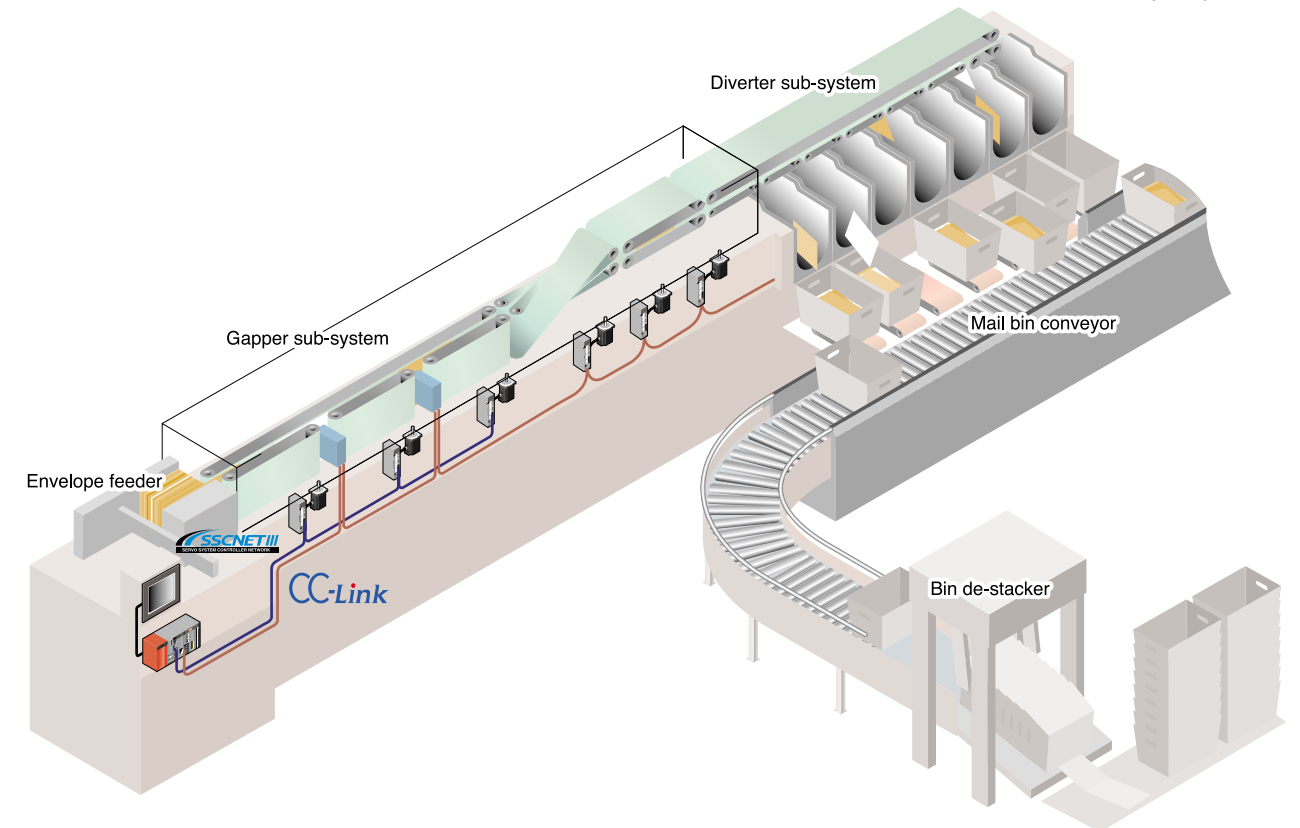
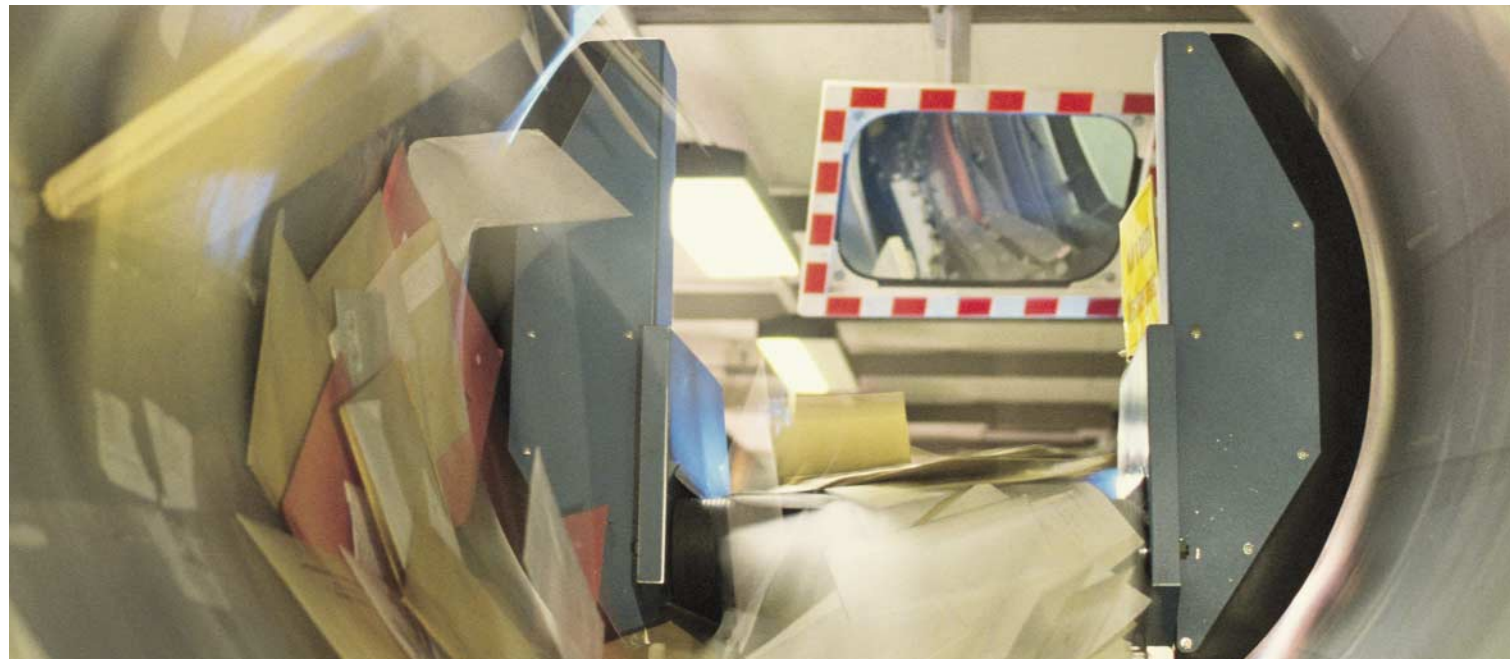
BECOME LEAN AND FLEXIBLE  
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# LETTERS AND FLAT MAIL SORTATION

## Deliver your message

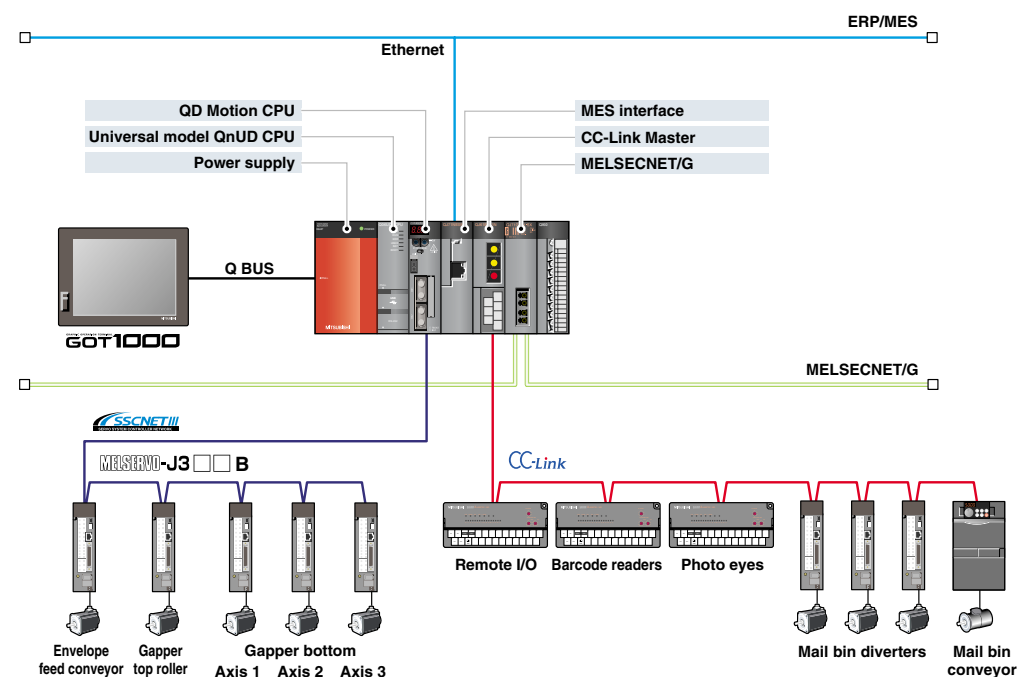
Within the postal automation industry are a variety of markets. Large post offices and airport airmail centers are certainly two examples but even insurance companies, universities, print shops and financial institutions have material handling needs for either their incoming or outgoing mail. Therefore, when it comes to automating the sortation of letters, flat mail and parcels, flexibility is key. Mitsubishi Electric's modular system and various communication networks allow integrators and machine builders to design a system with a base configuration that can expand to meet each of their customer's different needs.



### Reduce the number of passes

One challenge in postal automation is in attempting to separate letters and flat mail and read various styles of handwriting without the need to slow the system down or send mail back through the system for multiple passes. A high-speed, distributed system is key in

creating a flexible and high-performance system. For instance, MES modules allow for real-time monitoring of data, providing insight into process efficiency. Perhaps a specific bar-code reader is misreading too many envelopes and thus an excess of multiple passes is occurring. Identifying these bottle-necks is key to continual improvement, happier customers and higher profits.



### Presort before sending and then intelligently track delivery

In some countries, companies that presort their mail prior to delivery to the post office receive large price discounts. For example, in the United States, presorting letters and flat mail down to a 5-digit zip code can have dramatic results in cost-savings. This is all part of the US Postal Service's new strategic plan which also includes the incorporation of CONFIRM, which uses passive bar-code scanning to obtain in-process information about mail, such as current location and expected delivery dates. These advancements, are more than just about decreasing costs though. It's also about increasing customer satisfaction and creating more reasons for business to continue using paper-based mail. Couple machines together with MELSECNET/G or bring them

online using an MES module. Whatever your visibility needs are, Mitsubishi Electric can open the window for you.

### CC-Link offers speed and expandability

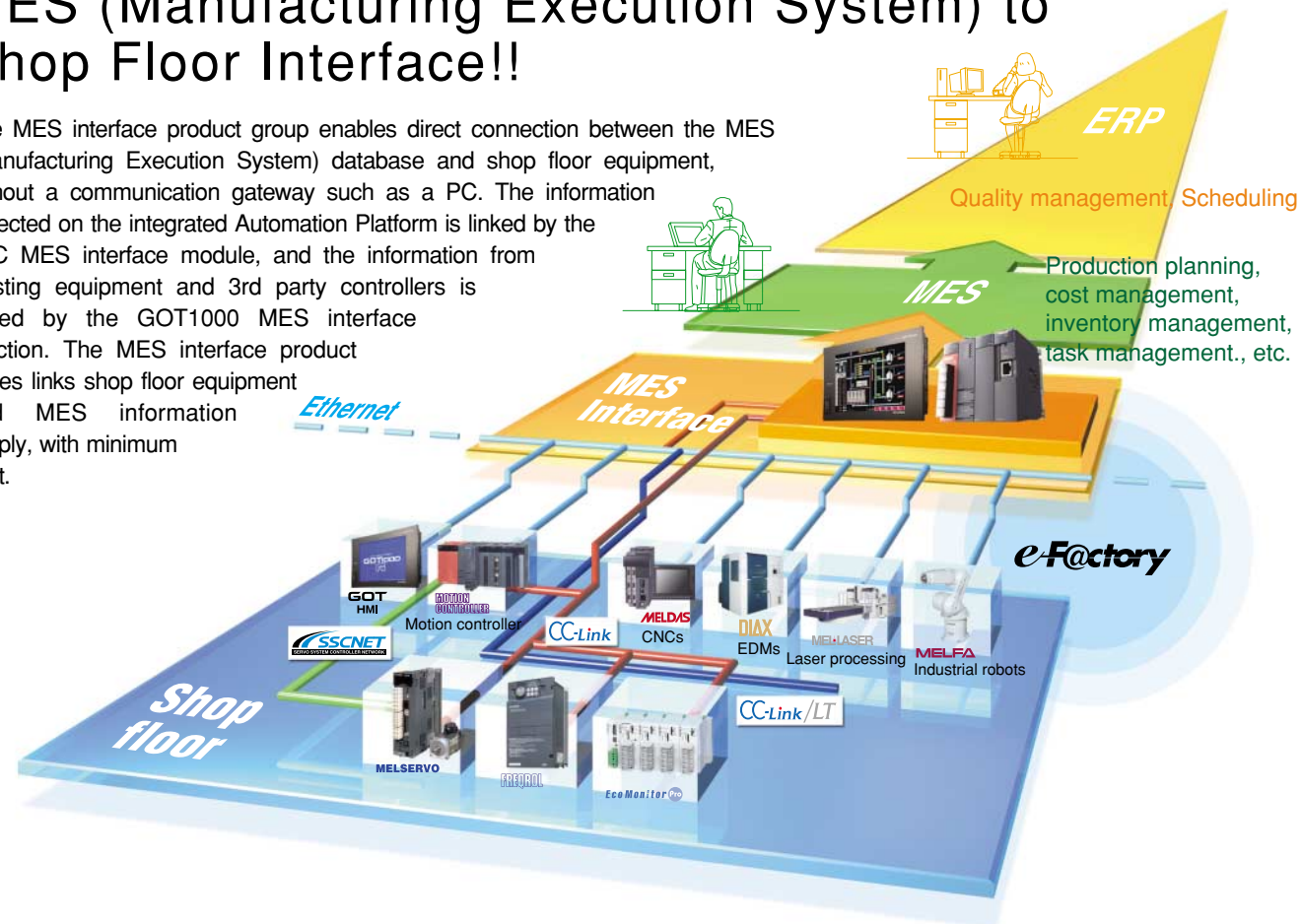
Mitsubishi Electric delivers powerful solutions for the postal automation industry. We have a proven track record in this area and our products can be found on the highest performing machines in the market. Paving the way for this success is the ability to mix and match technology to best suit the application's requirements. CC-Link is often used for interface with downstream sensors and diverters in flat mail sorters. Servo motors and variable frequency drives can both be installed on the same multi-drop network allowing for easy wiring and optimum price-to-performance ratio.





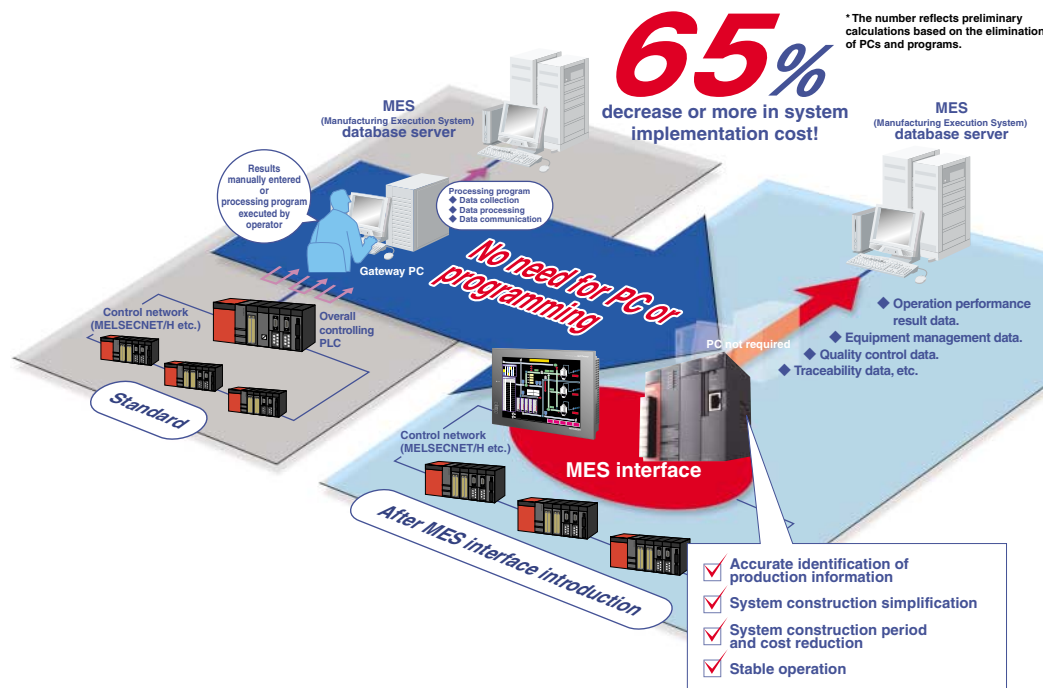
## A Simple Low-Cost MES (Manufacturing Execution System) to Shop Floor Interface!!

The MES interface product group enables direct connection between the MES (Manufacturing Execution System) database and shop floor equipment, without a communication gateway such as a PC. The information collected on the integrated Automation Platform is linked by the PLC MES interface module, and the information from existing equipment and 3rd party controllers is linked by the GOT1000 MES interface function. The MES interface product series links shop floor equipment and MES information simply, with minimum cost.



### The MES Interface: The Key to Realizing a visual platform e-F@ctory.

- Provides accurate information in real-time through direct utilization of internal device information.
- Simplifies system implementation by directly connecting to database(s).
- Eliminates the need for PCs and programs, greatly reducing costs.
- Improves reliability by changing the gateway PC to a PLC.



## “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.

### Integrating all aspects of automation

The automation control system is based around the Q series integrated automation platform which is an extensive range of rack mounted controllers ranging from entry level CPUs to high performance logic, motion controllers, numerical control, and robot controllers, all available on a consolidated high speed backplane. 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 data handling between controllers or devices to save wiring and reduce costs. These are state of the art enterprise level Gigabit Ethernet (MELSECNET/G), controller level (MELSECNET/H), device level (CC-Link), sensor level (CC-Link/LT).



### Highly accurate high speed servo drive systems

The MR-J3 has raised the bar for servo speed and performance. The capacity ranges from 50W to 55kW and includes a full lineup of linear motors as well. High resolution encoders (262,144ppr), advanced auto-tuning and vibration control are all standard and help to provide stability at all speeds. Set-up, diagnostics, and tuning are all easy, thanks to MR-

Configurator, a Windows-based software package. MR-Configurator has many improved diagnostic functions, such as an advanced machine analyzer, software oscilloscope, and high speed monitor. A parameter setting window makes start-up simple, and a USB interface enables high-speed sampling and long-term wavelength measurement.



### 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 can provide the best solution for many kinds of applications. With the highest performance and function of VFD, such as Real Sensorless Vector control and integrated EMC filter. The newest addition to the 700 series is the FR-E700 compact intelligent drive, known for its high performance with its small footprint. This drive can be applied to

a whole range of applications where space is of concern without limiting on high performance functionality. 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 both the A-700 and E700 series, using magnetic flux control to ensure optimum motor operation and ensuring efficient excitation control minimizing motor loss and reducing the overall power consumption of the drive.







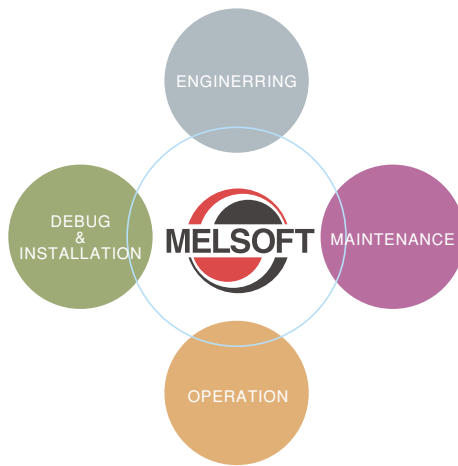
### High resolution human machine interfaces



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.

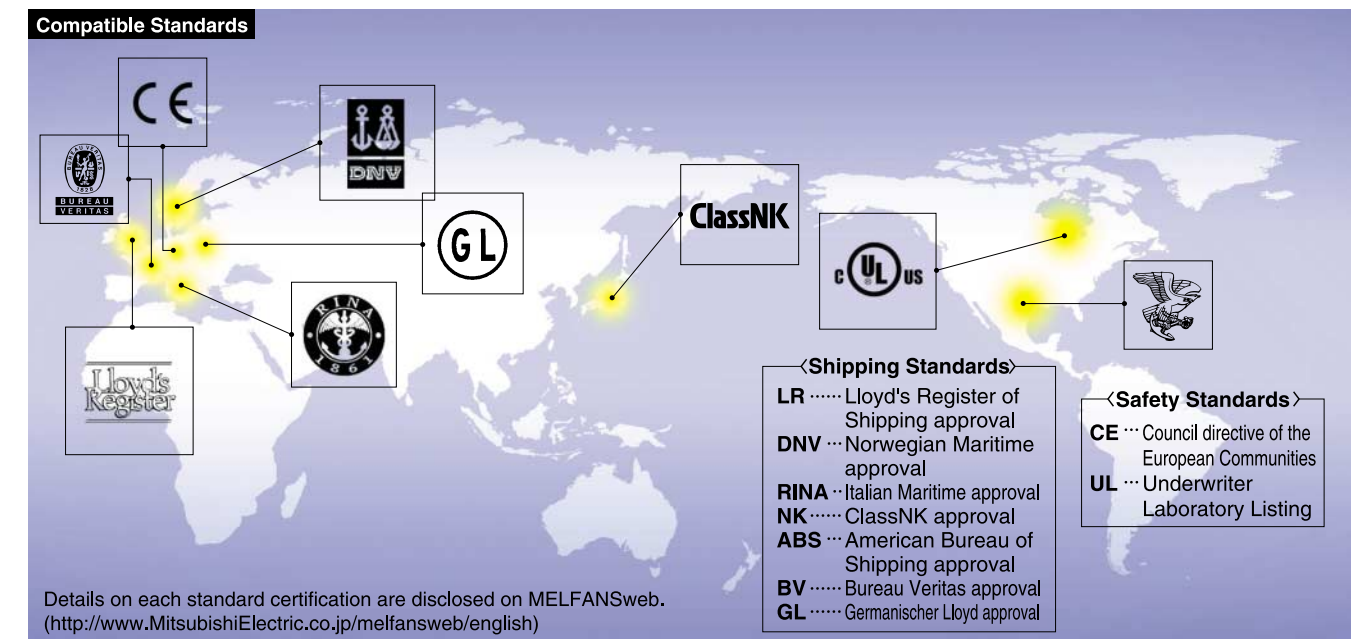
Leaving the controller series aside, the GT series provides a detailed graphical tool for designing screens for the GOT1000 series, with embedded editing tools. MR Configurator is a simple programming and virtual debugging environment for the motion controller. Programming and setting up parameters for 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.



## Ensuring an extensive global support network meeting diverse support 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.



### 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, USA  
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

#### ● Central and Eastern Europe FA Center

MITSUBISHI ELECTRIC EUROPE B.V. CZECH BRANCH  
Radlická 714/113a, 15800 Praha 5, Czech Republic  
Tel: 420-251-551-470 Fax: 420-251-551-471  
The target area: Czech Republic, Poland, Hungary, and Slovakia.

#### ● 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

#### ● SHANGHAI FA CENTER

MITSUBISHI ELECTRIC AUTOMATION (SHANGHAI) LTD.  
1-3/F., Block 5, 103 Cao Bao Road, Shanghai 200233, China  
Tel: 86-21-6121-2460 Fax: 86-21-6121-2424  
The target area: China

#### ● TIANJIN FA CENTER

MITSUBISHI ELECTRIC AUTOMATION (SHANGHAI) LTD. TIANJIN OFFICE  
B-2-801-802, Youyi Building, 50 Youyi Road, Hexi District, Tianjin 300061, China  
Tel: 86-22-28131015 Fax: 86-22-28131017  
The target area: China

#### ● BEIJING FA CENTER

MITSUBISHI ELECTRIC AUTOMATION (SHANGHAI) LTD. BEIJING OFFICE  
Unit 908, 9/F Office Tower 1, Henderson Center, 18 Jianquomennei Dajie, Dongcheng District, Beijing 100005, China  
Tel: 86-10-6518-8830 Fax: 86-10-6518-8030  
The target area: China

#### ● Guangzhou FA Center

MITSUBISHI ELECTRIC AUTOMATION (SHANGHAI) LTD. GUANGZHOU OFFICE  
Rm.1609, North Tower, The Hub Center, No.1068, Xing Gang East Road, Haizhu District, Guangzhou, China 510335  
Tel: 86-20-8923-6713 Fax: 86-20-8923-6715

#### ● TAIWAN FA CENTER

SETSUYO ENTERPRISE CO., LTD.  
6F No.105 Wu-Kung 3rd. RD, Wu-Ku Hsiang Taipei Hsien, Taiwan  
Tel: 886-2-2299-2499 Fax: 886-2-2299-2509  
The target area: Taiwan

#### ● ASEAN FA CENTER

MITSUBISHI ELECTRIC ASIA PTE, LTD.  
307 Alexandra Road #05-01/02 Mitsubishi Electric Building Singapore, 159943  
Tel: 65-6470-2480 Fax: 65-6476-7439  
The target area: Southeast Asia, India

#### ● THAILAND FA CENTER

MITSUBISHI ELECTRIC AUTOMATION THAILAND CO., LTD  
Bang-Chan Industrial Estate No.111, Soi Serithai 54, T. Kannayao, A. Kannayao, Bangkok 10230, Thailand  
Tel: 66-2-906-3238 Fax: 66-2-906-3239



# Mitsubishi Programmable and Motion Controllers

## Safety Precaution

To ensure proper use of the products presented in this catalog, be sure to read the relevant manuals prior to use.

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, USA	Tel: +1-847-478-2100 Fax: +1-847-478-0327
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Rua Correia Dias, 184, Edificio Paraiso Trade Center-8 andar Paraiso, Sao Paulo, SP Brasil	Tel: +55-11-5908-8331 Fax: +55-11-5574-5296
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8, D-40880 Ratingen, Germany	Tel: +49-2102-486-0 Fax: +49-2102-486-1120
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, UK	Tel: +44-1707-276100 Fax: +44-1707-278992
Italy	Mitsubishi Electric Europe B.V. Italian Branch Viale Colleoni 7 1-20041 Agrate Brianza (Milano), Italy	Tel: +39-39-60531 Fax: +39-39-6053312
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80 E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel: +34-93-565-3131 Fax: +34-93-589-1579
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, F-92741 Nanterre Cedex, France	Tel: +33-1-5568-5568 Fax: +33-1-5568-5757
South Africa	Circuit Breaker Industries Ltd. Private Bag 2016, ZA-1600 Isando, South Africa	Tel: +27-11-928-2000 Fax: +27-11-392-2354
Hong Kong	Mitsubishi Electric Automation (Hong Kong) Ltd. 10F, Manulife Tower, 169 Electric Road, North Point, Hong Kong	Tel: +852-2887-8870 Fax: +852-2887-7984
China	Mitsubishi Electric Automation (Shanghai) Ltd. 4F Zhi Fu Plazz, No. 80 Xin Chang Road Shanghai 200003, China	Tel: +86-21-6120-0808 Fax: +86-21-6121-2444
Taiwan	Setsuyo Enterprise Co., Ltd. 6F, No.105 Wu-Kung 3rd Rd, Wu-Ku Hsiang, Taipei Hsine, Taiwan	Tel: +886-2-2299-2499 Fax: +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 3F, 1480-6, Gayang-dong, Gangseo-gu, Seoul 157-200, Korea	Tel: +82-2-3660-9552 Fax: +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building Singapore 159943	Tel: +65-6470-2460 Fax: +65-6476-7439
Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111, Soi Serithai 54, T. Kannayao, 10230 Thailand	Tel: +66-2-517-1326 Fax: +66-2-906-3239
Indonesia	P.T. Autoteknindo Sumber Makmur Muara Karang Selatan Block A/Utara No.1 Kav. No.11, Kawasan Industri/ Pergudangan, Jakarta - Utara 14440, P.O. Box 5045 Jakarta 11050, Indonesia	Tel: +62-21-663-0833 Fax: +62-21-663-0832
India	Messung Systems Pvt., Ltd. Electronic Sadan NO: III Unit No.15, M.I.D.C. Bhosari, Pune-411026, India	Tel: +91-20-2712-3130 Fax: +91-20-2712-8108
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, Rydalmere, NSW 2116, Australia	Tel: +61-2-9684-7777 Fax: +61-2-9684-7245

## MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN  
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN

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