Global Partner. Local Friend.

PackML SOLUTION
Open, Efficient and Flexible Packaging Automation

- Simplification
- Maximized Line Uptime
- Flexibility
- Cost Savings
- Reusability
- Simplified Training

Points of contact

Tokyo
FA Global Solution Technical Department
(TEL:+81-3-3218-6422)
Tokyo
Asian Business Development Department
(TEL:+81-3-3218-6284)
China (Shanghai)
Mitsubishi Electric Automation (China) Ltd.
(TEL:+86-21-2322-3030)
China (Beijing)
Mitsubishi Electric Automation (China) Ltd. Beijing Branch
(TEL:+86-10-6518-8830)
China (Tianjin)
Mitsubishi Electric Automation (China) Ltd. Tianjin Branch
(TEL:+86-22-2813-1015)
China (Guangzhou)
Mitsubishi Electric Automation (China) Ltd. Guangzhou Branch
(TEL:+86-20-8923-6730)
Taiwan (Taichung)
Taichung: Mitsubishi Electric Taiwan Co., Ltd.
(TEL:+886-4-2359-0688)
Taiwan (Taipei)
Setsuyo Enterprise Co., Ltd.
(TEL:+886-2-2299-9917)
Korea
Mitsubishi Electric Automation Korea Co., Ltd.
(TEL:+82-2-3660-9605)
ASEAN
MITSUBISHI ELECTRIC ASIA PTE. LTD.
(TEL:+65-6473-2308)
Thailand
MITSUBISHI ELECTRIC FACTORY AUTOMATION (THAILAND) CO.,LTD.
(TEL:+66-2682-6522)
Indonesia
PT. MITSUBISHI ELECTRIC INDONESIA
(TEL:+62-21-2961-7797)
Vietnam (Hanoi)
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED Hanoi Branch
(TEL:+84-24-3937-8075)
Vietnam (Ho Chi Minh)
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED
(TEL:+84-28-3910-5945)
India (Pune)
MITSUBISHI ELECTRIC INDIA PVT. LTD. Pune Branch
(TEL:+91-20-2710-2000)
India (Gurgaon)
MITSUBISHI ELECTRIC INDIA PVT. LTD. Gurgaon Head Office
(TEL:+91-124-463-0300)
India (Bangalore)
MITSUBISHI ELECTRIC INDIA PVT. LTD. Bangalore Branch
(TEL:+91-80-4554-8772)
India (Chennai)
MITSUBISHI ELECTRIC INDIA PVT. LTD. Chennai Branch
(TEL:+91-44-4554-8772)
India (Ahmedabad)
MITSUBISHI ELECTRIC INDIA PVT. LTD. Ahmedabad Branch
(TEL:+91-79-6512-0063)
North America
MITSUBISHI ELECTRIC AUTOMATION, INC.
(TEL:+1-847-478-2100)
Mexico
MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch
(TEL:+52-55-3067-7500)
Brazil
MITSUBISHI ELECTRIC DO BRASIL COMÉRCIO E SERVIÇOS LTDA.
(TEL:+55-11-4689-3000)
Brazil (Boituva)
MELCO CNC DO BRASIL COMÉRCIO E SERVIÇOS S.A.
(TEL:+55-15-3363-9900)
Europe
MITSUBISHI ELECTRIC EUROPE B.V. Polish Branch
(TEL:+48-12-347-65-00)
Germany
MITSUBISHI ELECTRIC EUROPE B.V. German Branch
(TEL:+49-2102-486-0)
UK
MITSUBISHI ELECTRIC EUROPE B.V. UK Branch
(TEL:+44-1707-28-8780)
Czech Republic
MITSUBISHI ELECTRIC EUROPE B.V. Czech Branch
(TEL:+420-251-551-470)
Russia
MITSUBISHI ELECTRIC EUROPE B.V. Russian Branch St.Petersburg office
(TEL:+7-812-633-3497)
Turkey
MITSUBISHI ELECTRIC TURKEY A.S Ümraniye Branch
(TEL:+90-216-526-3990)
Packaged goods manufacturers are constantly seeking ways to cut costs per package unit. At the same time, their lines must be flexible and ready to introduce innovative packaging solutions. As more manufacturers adopt OEE (Overall Equipment Effectiveness) principles to measure the performance, quality and machine availability of their entire line, this analysis requires the collection of uniform data across machines and lines. Packaging Machinery Language (PackML) provides a standardized way to collect this data, and simplifies the functionality of Manufacturing Execution Systems (MES), even in a multi-vendor environment. By providing a unified appearance and functionality between different vendors, PackML allows the operator to look at any display screen on the line and see a familiar interface. PackML was proposed by the OMAC Packaging Workgroup and has continued to evolve since then. It features the state model for even more advanced machine integration, the concept of PackTags and easy-to-use templates. The most recent ISA88 industry standard incorporates OPW’s PackML and PackTags.

The Competitive Edge of PackML

From process owners to OEM’s and line manufacturers, upgrading to PackML immediately begins to generate measurable return on your investment.

- **Advantage 1**: Streamline Device Installation
  Devices from different manufacturers can be connected on the same line.

- **Advantage 2**: Simplify Maintenance & Training
  Unified ‘look and feel’ and operability reduce human error.

- **Advantage 3**: Enhance Productivity Management
  Collection of uniform OEE data across machines and lines.

**Reduced System Construction & Operation Costs**
PackML for the power of visualization

There are three keys to understanding how PackML works and its advantages: State Model, PackML Modes and PackTag.

KEY 1: STATE MODEL

This model provides a standard vocabulary to describe the current machine operating state, for example, “execute” (running) or “idle” (stopped). This language is generic – that means that it is not unique to a distinctive function or characteristic of a machine. The state language universally applies to all machines. Other standard states include “held” (operator ordered pause) and “suspended” (machine is waiting for supply from upstream in the line.)

Changing from One State to Another

Under PackML, a change in machine state can occur due to:

1) A change in the internal condition of the machine or a networked machine;
2) Operator action;
3) Programmed control of the machine; or
4) A command initiated by a remote monitoring computer.

State Transition Model

PackML has a state transition model that clearly defines the commands available for changing from one state to another. As shown in this chart, a change from the IDLE state can be initiated by a Start command (STARTING State), a Stop command (STOPPING State) or an Abort command (ABORTING State). Some states (EXECUTE) automatically change to another state unless interrupted by a command.

For OEM’s and end users

BENEFITS OF PackML STANDARDIZATION...

For the end user

For the packaging line operator, the advantages of PackML adoption are clear. Before ordering a new packaging line or retrofitting your existing line, or if you are considering introducing OEE or MES in a multi-vendor environment, take a moment to consider these benefits.

Simplification: Configuration of line operation and systems is simplified and streamlined, even in a multi-vendor environment.
Maximized Line Uptime: All operator tasks from maintenance to troubleshooting are eased by the consistent “look and feel” across the line. In addition, the learning curve for everyone from operators to engineers and managers is reduced.
Flexibility: PackML is future-ready. Your investment in the software and library is reusable when expanding the system or implementing line changes, saving time and costs.
Cost Savings: By leveraging the full functionality of your systems, the PackML solution actually can reduce the total cost of investment. The efficiencies of reusable hardware and software results in a line that costs less to build, operate and maintain.

For the OEM

Today, packaging machines are increasingly complex. They must respond to product diversity while delivering higher rates of performance. They must be designed for easier changeover and feature improved interfaces. The PackML solution answers the challenges of engineering integration and issues such as software development and training with a proven industry standard.

Reduced Development Time: Templates provided by component makers are PackML ready, saving your business valuable time and the cost of development.
Reusability: Don’t reinvent the wheel for every development project. With PackML, the time and effort invested in programming is reusable.
Reduced Debugging / Start-up: By reducing the volume of code to test and adoption of modular software programming, the amount time required to debug the system and get the customer on line is significantly reduced.
Simplified Training: PackML can make after-sale support easier. The standardized templates of PackML solution means the same familiar graphic operation terminal screen even for different types of machines, thereby simplifying training.

“SEE” YOUR PACKAGING PROCESS

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For the OEM

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**KEY 2: PackML MODES**

A variety of modes are defined by the user. Three commonly used machine modes are Producing (Automatic), Maintenance and Manual. However, if needed, PackML allows users to create an unlimited number of modes, for example, even a Semi-Automatic or Cleaning Mode.

### Production Mode

This is the mode for routine production. The machine operates in response to commands entered directly by the operator or issued by another system.

### Maintenance Mode

This mode is used for troubleshooting and testing operational improvements. The machine can be operated independently of other machines in a line.

### Manual Mode

Typically used for testing and verifying drives, this mode enables direct control of the machine.

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**KEY 3: PACKTAGS**

PackTags define certain PLC variables and standardize how packing line data including state and mode commands are communicated. It facilitates not only machine-to-machine communication, but also communication within a machine, for example between a PLC and a controller, and between machines and higher-level information systems. By providing only the raw data necessary to calculate performance, this standard supports OEE or other methods of analyzing machine efficiency. As part of OMAC’s Plug-and-Pack™ guidelines, PackTags ease and reduce time for integration of packaging machines even from different vendors, enable automatic start-up and shutdown of lines, and accelerate troubleshooting and analysis.
MITSUBISHI ELECTRIC PackML

The Solution Beyond the Standard

Based on the OMAC PackML standard, the Mitsubishi Electric PackML solution not only delivers all the advantages of standardization including a reduced learning curve for operators and increased reliability, but also addresses many manufacturer concerns about deploying a standard. From streamlining the deployment of the PackML standard to providing predefined HMI templates and ready-made function blocks to speed configuration, the Mitsubishi PackML solution simplifies the entire journey and eliminates many of the costly extras of implementation. Moreover in a multi-vendor environment, Mitsubishi PackML’s efficient use of PLC resources lets you use a smaller PLC.

Mitsubishi’s PackML Implementation Package offers a variety of tools and support including an Event Test Screen to simulate an event being generated and cleared in the Unit Machine, sample mode screens with elements that can be copied and used on other screens created by OEMs, and a comprehensive User Guide.

Modularize Coding

By modularization of machine programs, Mitsubishi PackML makes coding not only more organized and easier to debug, but also reusable. The ISA-88 physical hierarchy for code modules contains six levels (global company level to individual functions). The diagram on the next page shows the bottom three levels which focus on the individual machine: Machine (Unit or UN): Processing activity modules; Equipment Module (EM): Functional modules to perform limited activities; and Control Module (CM): Single function modules. PackML commands flow down from the Unit Machine level through the Equipment Modules to the Control Modules. As each module completes its task, the status is reported back up the chain.

Superior Communication

Ready-to-use tables for conversion of PLC labels into PackTags on the OPC server and OPC Server configuration profiles to accelerate system implementation are just a few Mitsubishi PackML solution features that facilitate automatic exchange of data between devices.

PackTags Implementation

PackTags are implemented as a part of the Mitsubishi PackML Template system. OPC tags can be added manually one at a time. For a large number of tags, all tags can be created in Excel and easily imported to the OPC server.

Time Saving Tools

Mitsubishi’s PackML Implementation Package offers a variety of tools and support including an Event Test Screen to simulate an event being generated and cleared in the Unit Machine, sample mode screens with elements that can be copied and used on other screens created by OEMs, and a comprehensive User Guide.
BUILDING SOLUTIONS THAT WORK

Overview
Seeking to improve every aspect of their filling operation, this customer in the food and beverage industry came to Mitsubishi Electric with a long list of expectations: reduced labor, lower machine costs, less waste, and faster output. Our comprehensive PackML Solution not only met but exceeded expectations.

Filling Line (Pre-Solution)
- A loading arm rotates and forms each container with heat before placing it on the conveyor.
- The conveyor carries each item to the filler station where two servos perform the filling process.
- Containers are then manually picked and placed onto a pallet.

Mitsubishi Electric Solution
Mitsubishi Electric combined PLC, HMI, motion and robot programming under a single platform to provide the customer with a total solution.
- Q Platform Sequence Controller (Q03UDECPU)
- Servo Amplifier (MR-J3-B)
- Servo Motors (HF-SP, HF-JP)
- MES Interface IT Module (QJ71MES96)
- IQ Platform Motion Controller (Q172DCPU)
- Graphic Operation Terminal (GOT2000)
- “Pick and Place” Robot

Beyond “Filling”
From high-speed filling to stretch wrapping, Mitsubishi Electric PackML solutions can impact the bottom line of every packaging line with…
- Increased Output & Less Scrap
- Quick Product Changeover
- Reduced Labor
- Immediate Cost Savings

RESULTS
Full PackML Implementation
- Easy integration and modification to meet specific machine requirements.
- Enhanced operability thanks to standardized function blocks, alarm and event handling, HMI screens and full PackTag compatibility.

CAM Function
(with Mechanical Support Language)
- Reduced programming time with easy-to-create CAM profiles.
- Reduced labor cost and machine cost.

Single Platform Solution
- Higher machine OEE (faster throughput and product changeovers, less scrap) by integrated multi-CPU technology for a high-speed backplane.
- Reduced TCO (reduced inventory, less downtime).
- Easy system scalability as the business grows.

Direct HMI Connection
- Ease of use from programming to monitoring, operation and diagnostics plus program upload/download capability via the USB port.
- Reduced maintenance time and cost due to ladder monitor/editor.

SSCNET III Communication
- Plug & Play wiring eases set-up and configuration for reduced engineering and wiring costs.
- High-speed motion network and 100% noise immunity for reduced machine downtime.
- Automatic parameterization increases positioning accuracy for reduced scrap.

MES Interface
- Direct data connection to IT systems eliminated intermediate PCs on the factory floor.
- Data aggregation from other factory floor devices contributed to improved security and standardization.
THE NEXT GENERATION FACTORY

e-F@ctory is Mitsubishi Electric’s factory automation initiative. Through our solutions, Mitsubishi Electric aims to boost the performance of manufacturing enterprises by delivering reduced TCO, maximized productivity, and seamless integration.

The e-F@ctory Alliance
Teaming with best-in-class suppliers, Mitsubishi Electric creates partnerships that promise the most comprehensive solutions possible.

SI Partners
Total support for construction and operation

Software Partners
Software for collection, analysis and management of operational data

Device Partners
Sensors, measurement and control devices

FACTORY FLOOR
Mitsubishi Electric and other leading automation suppliers provide users with the simple and total integration of all elements necessary to challenge new levels of productivity. Seamless integration from actuators, PLCs and sensors to the latest in robot technology and completed machine tools.

MES INTERFACE
The essential link between the manufacturing environment and business operations is assured by connectivity solutions provided by Mitsubishi Electric and e-F@ctory partners. Direct integration spanning the factory floor and IT systems including legacy databases and MES/ERP systems is the key to optimization for improved output.

ERP/MES
e-F@ctory recognizes the importance of MES and ERP in a manufacturing enterprise, and can offer the services of a range of partners in this application space.

SEAMLESS
SLMP, CC-Link IE, and OPC
for seamless data communications
Seamless data communication from the plant-level enterprise network to the factory floor network is assured by the SLMP connection protocol between CC-Link IE and Ethernet products, the open 1Gbps CC-Link IE Control standard for manufacturing networks, and the OPC interoperability standard for the seamless, secure and reliable flow of information in the industrial automation space.

KNOW-HOW
Global Group Power
Operating over 230 factories and laboratories in 121 countries and active in diverse fields from the space industry to home products, Mitsubishi Electric knows the importance of reliable, efficient, user-friendly factory automation and control. Behind every Mitsubishi Electric FA solution is access to the know-how and practical insights of our entire worldwide group.

e-F@ctory Alliance
Over 3000 direct and indirect partners ready to build of custom-er-focused solutions.
e-F@ctory solutions let our customers take advantage of the expertise of leading companies who specialize in the following fields:

- CAD/CAM
- Manufacturing Process
- SCADA Systems
- Communication
- Monitoring
- Vision Systems
- Electrical Power Solutions
- Network Visualization
- Enclosure and Fittings
- Programming
- Enterprise Connection
- Project Management

Experience
e-F@ctory has been developed and used over 10 years

EXPERIENCE
Making plant processes “visible” and optimizing production for over a decade.

Since the dawn of the modern factory automation era, Mitsubishi Electric has developed and provided solutions to enhance the integration of the business and production environments directly with MES and ERP connectivity solutions. In addition, the company also provides outstanding automation hardware, including PACs, PLCs, CNC, inverters, Servo and motion systems, HMIs, Robots, Low voltage switchgear, EDM machines, and Laser processing machines.
Global Service and Support

GLOBAL NETWORK

Complete service and support from consulting and design to implementation and maintenance of your PackML solution is backed by Mitsubishi Electric's global network of sales offices and FA Centers.

Mitsubishi Electric FA business group is supporting manufacturing not only in Japan but also all over the world. We use various local services to support our customer needs for example local showrooms, FA mobile display caravans, global information service, training schools, 3-year warranty, 7-year repair policy as well as field service and local repair.

Please feel free to contact your local Mitsubishi Electric FA office. With FA Centers established in many regions all over the world as core operations, we offer various services to our customers in close cooperation with local sales offices, branch offices and agencies.

You can purchase your Mitsubishi Electric FA products in any country and in addition, we will support your global business with repair, training in local language and other services at your local sites.

A WORLD OF SOLUTIONS

Mitsubishi Electric 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 is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and 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 Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 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.