

YASKAWA

Machine Controller and AC Servo Drive Solutions Catalog

i³-Mechatronics

MP3000



Certified for
ISO9001 and
ISO14001



JQA-0422 JQA-EM0202

YASKAWA

Ever Forward, Ever Better

100 Years Together with Our Customers

Since its founding in 1915 as a manufacturer for motors, Yaskawa Electric has capitalized on its motor drive technology to provide continuing support for the key industries of the times, first for factory automation, and today, for mechatronics and robotics.

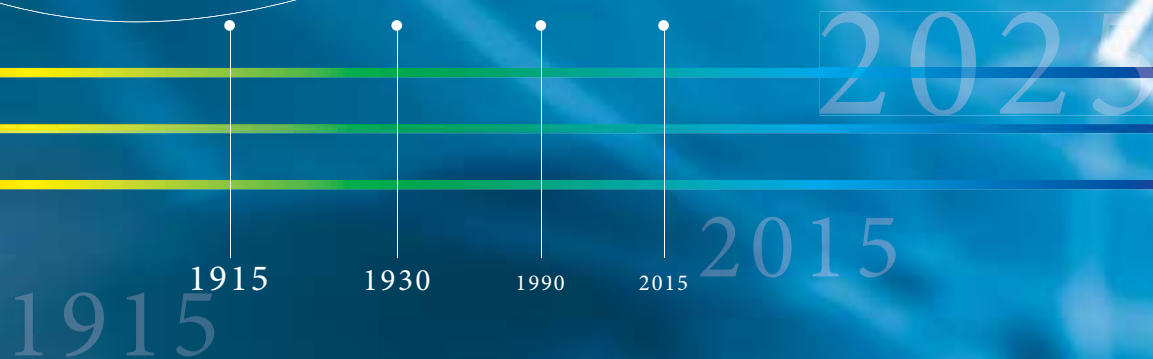
Today, Yaskawa is striving to make effective use of its technologies developed in the motion control, robotics, and system engineering sectors, and is also taking on the challenges of achieving the highly efficient utilization of natural energy and the creation of a society in which people and robots exist side-by-side.

Throughout our extensive 100-year history, we have consistently sought to develop the world's leading technologies and applications that would best delight and be most useful to our customers. Yaskawa will continue to treasure the results, technologies, and reputation we have achieved thus far, and look ahead to create "e-motional solutions" for emerging global challenges.

Motion Control

Robotics

System Engineering





Environmental Energy



Robotics Human Assist



Mechatronics Solutions

i³-Mechatronics

Changing Motion, Changing the World

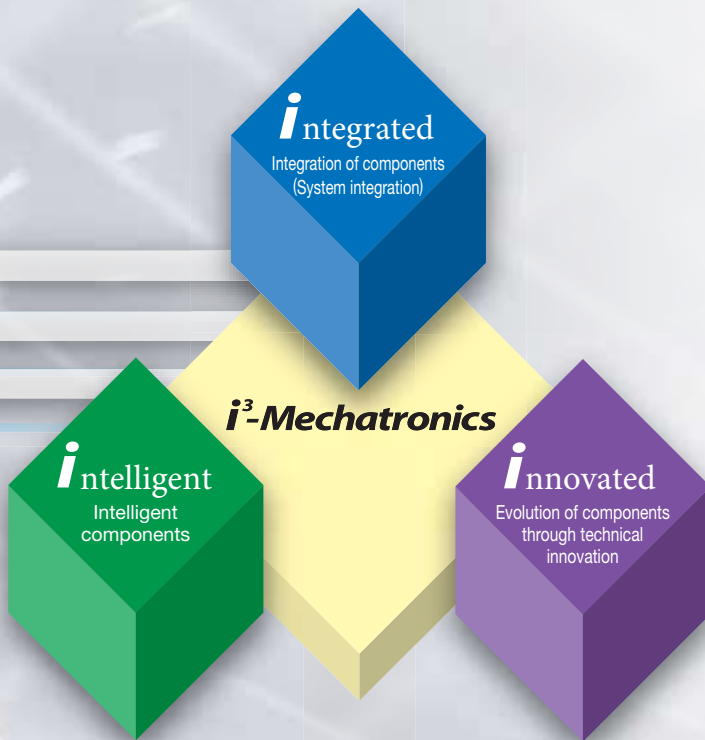
Yaskawa is committed to developing innovative mechatronics products and offering new solutions to the world.

Yaskawa's technology and mechatronics products are used in a wide-variety of industrial sectors, systems, and machinery, and enable ultra-high-speed and ultra-precision control. In addition to industrial sectors, our motion technology has a nearly limitless range of applications, including familiar sectors such as lifestyles, medicine, and welfare. Changing the motions performed by motors creates new concepts and products that can change the world.



Motion Control Solution

APPLICATIONS



Yaskawa carries out Motion & Control Business activities based on the concept of **i³-Mechatronics** (Integrated, Intelligent, and Innovated).



- Semiconductor
- Electronic parts
- Liquid crystal
- Machine tools



- Food/packing
- Transfer
- Textile

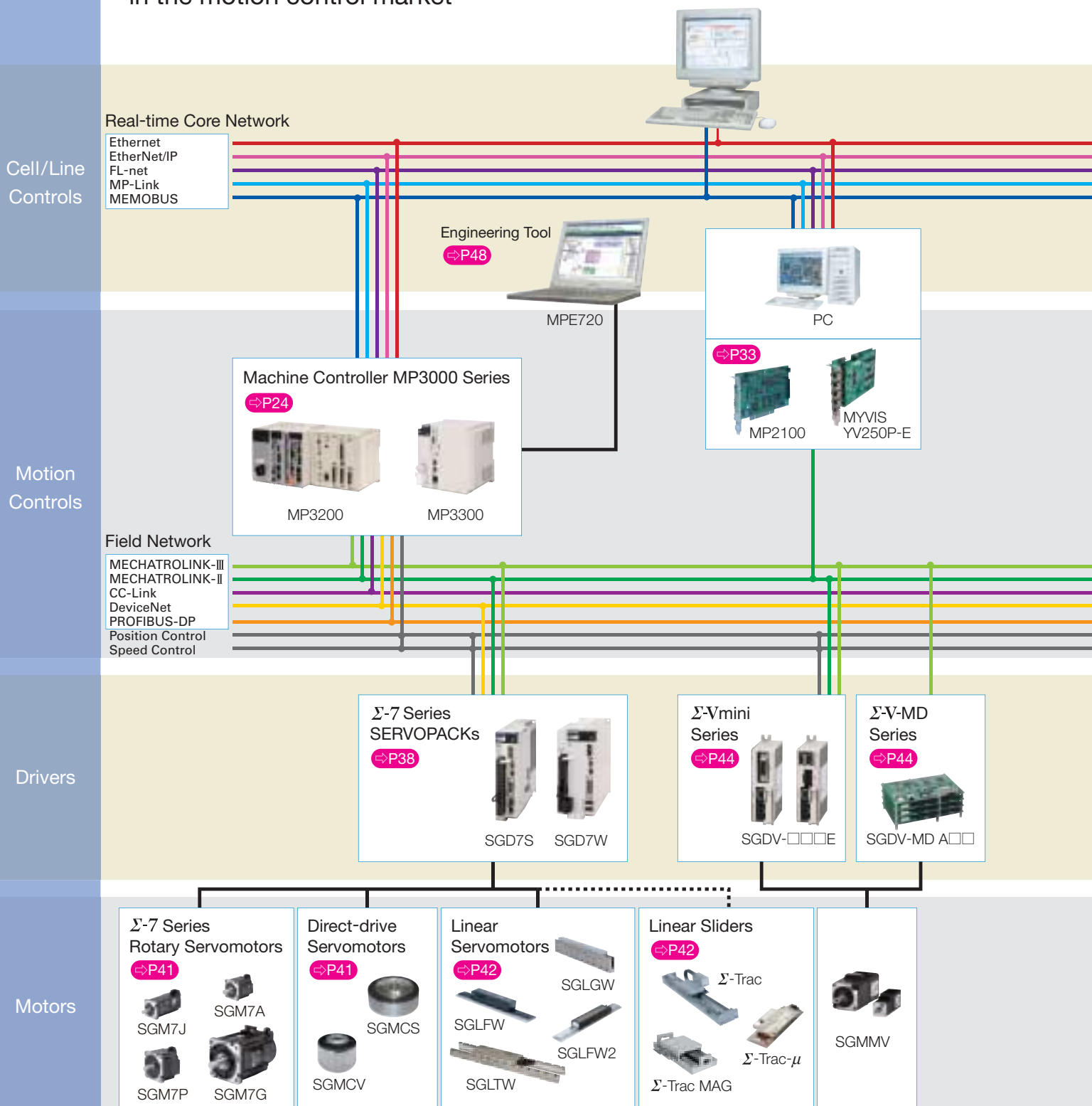


- Injection/molding
- Material processing
- Robots



Product Lineup

The advantage of Yaskawa's mechatronics systems in the motion control market



Note: These linear sliders must be used with Σ-V SERVOPACKS.

Support for industrial standard networks for open system architecture

We provide components compatible with the industrial standards required for mechanical system configurations including real-time core networks to connect controllers and field networks to connect equipment.

- Support for systems around the world through compliance with international standards. (Consult with Yaskawa for information on support for standard networks.)
- Supports multi-vendor system configurations.

Real-time core networks : Ethernet, MODBUS (MEMOBUS), FL-net, EtherNet / IP

Field networks : MECHATROLINK-III, MECHATROLINK-II (Consult with Yaskawa for information on support for other networks.)

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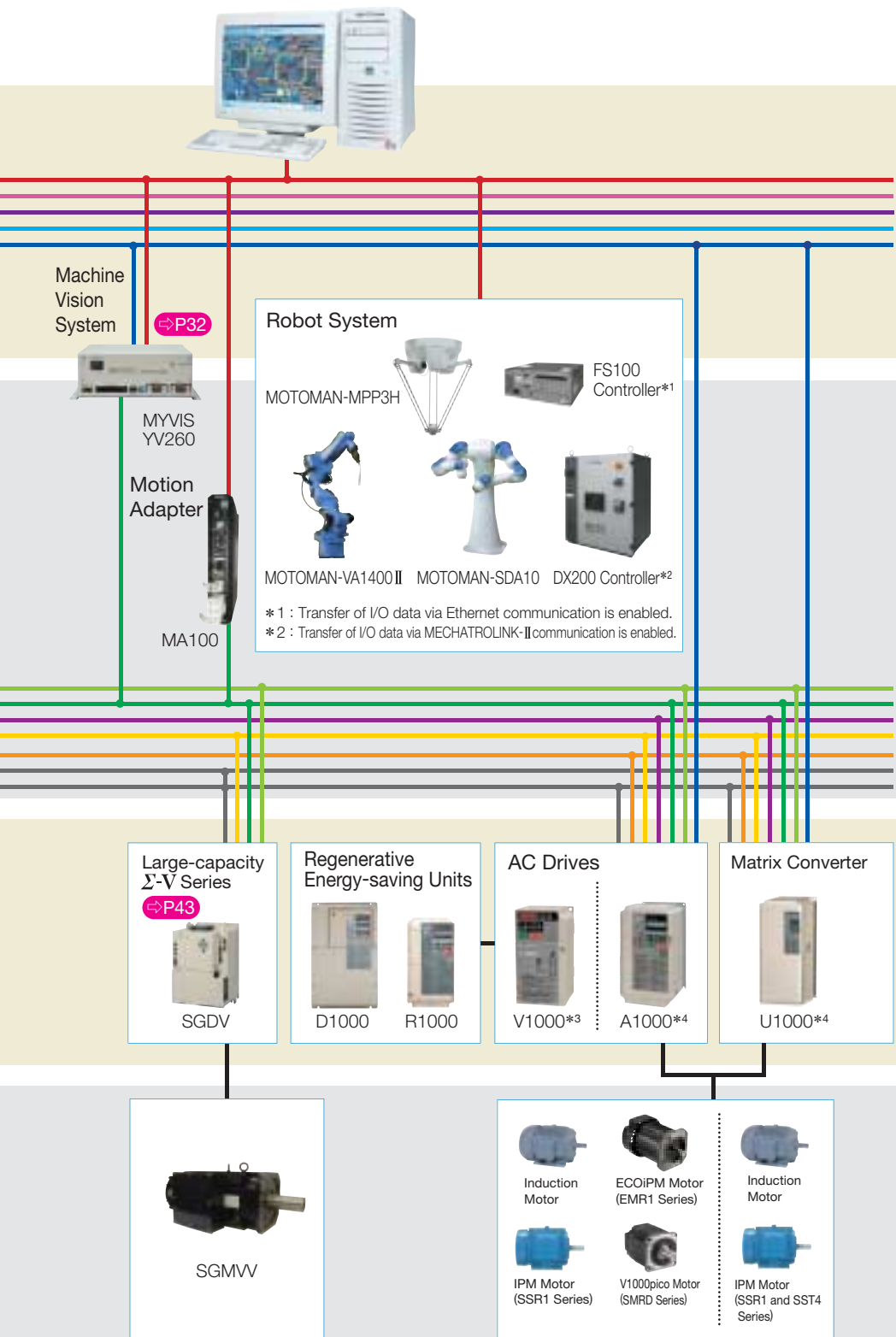
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*3: Compatible with CompoNet and CANopen
 *4: Compatible with CANopen and LONWORKS

MECHATROLINK, the motion network from our motion control expertise

High-performance mechanical systems can be constructed, in combination with our mechatronics components.

● Servo systems and input/output equipment necessary for configuring mechanical systems can be easily connected, providing high-speed response.

● 1 : n synchronous communication for high-precision motion control.

● Certification under the SEMI E54.19 standard has been acquired. (This standard covers the sensor and actuator networks of semiconductor production systems.)

● Communication specifications MECHATROLINK-II : Transmission speed : 10 Mbps; communication cycle : 250 μ s and higher; transmission distance : 50 m max.

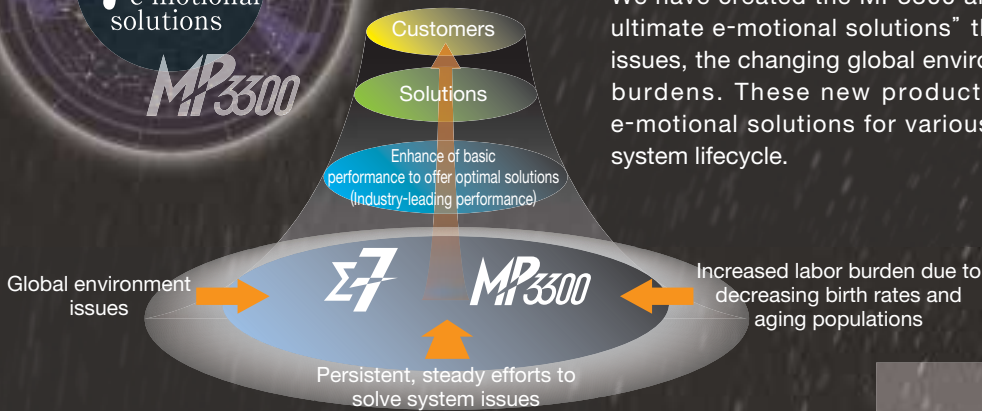
MECHATROLINK-III : Transmission speed : 100 Mbps, Communication cycle : 125 μ s and higher; transmission distance : 75 m between stations

Note: The communication specifications of MECHATROLINK differ depending on the specifications of the Machine Controllers, SERVOPACKS, and AC Drives used. For further details, check the communication specifications of each equipment.



Motion control is one of Yaskawa's strengths, and our technology enables ultra-high-speed and ultra-precision control in industrial sectors around the world. Our basic philosophy is to design and develop products from a user-oriented perspective, and we strive to remain true to this ideal.

We have created the MP3300 and the Σ -7 series to offer "7 ultimate e-motional solutions" that address various system issues, the changing global environment, and increasing labor burdens. These new products allow Yaskawa to offer e-motional solutions for various situations throughout the system lifecycle.



Selection

Developers and designers

Major advantages
Enables selection from wide variety of products.

Seven ultimate solutions

- 1 System performance** The superlative performance of our existing products has reached newer heights. System performance is given another lift by utilizing new solutions.
- 2 Ease of use** We have eliminated hassles with adjustment procedures and significantly reduced startup time.
- 3 Environmental performance** Our products meet overseas specifications and exacting operating conditions. You can also easily create energy-saving systems when using our ultimate solutions.
- 4 Safety and security** System can be operated safely because our Servo Drives comply with safety standards and safety is ensured by monitoring.
- 5 Support** We support our customers every step of the way from product selection to product maintenance. We also offer support solutions that are one step ahead of our competitors.
- 6 Lineup** We have expanded our product lines and built up our product series to be compatible with other company systems. Selecting the products of your motion systems is now a one-step process.
- 7 Compatibility** Our products are the same size as existing products so they can easily be swapped out. The compatibility of programs and parameters is also preserved. By replacing products, you can easily improve the performance of your system.

- Reduced Servomotor sizes **P10**
- Expanded specification ranges **P14**
- Examination of multi-axis regeneration
- Σ -7S/W ● MP3300
- Rotary/Direct Drive/Linear Motors
- Partner's Products **P18**
- Optimize applications **P10**
- Σ -7-EX/FT
- Functional compatibility **P19**
- Mounting compatibility **P19**
- Application compatibility **P19**



1 Ultimate system performance

The superlative performance of our existing products has reached newer heights. System performance is given another lift by utilizing new solutions.

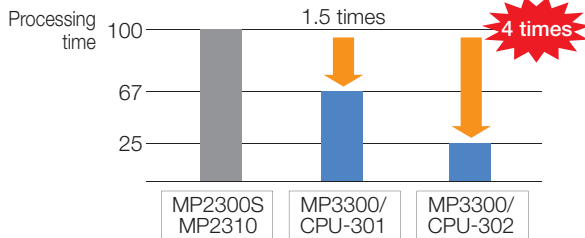


MP3300

- ★ Operates 1.5 times faster
- ★ 64-bit data types (double-precision real numbers, quadruple-length integers) supported
- ★ MECHATROLINK-III provided as a standard feature

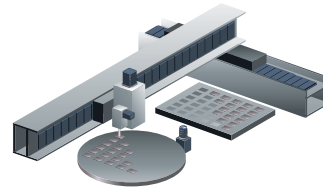
Fastest in the industry

Improved CPU performance*



*: Ladder operation speed where the scan time of the MP2300S/MP2310=100

Double-precision real-number, 64-bit integer data for higher precision



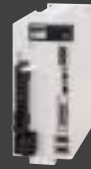
With double-precision real-number, 64-bit integer data, rounding errors during arithmetic calculations are reduced, and control at higher levels of precision can be achieved.



Σ-7S

- ★ 3.1 kHz response frequency
- ★ FT specifications to optimize applications (to be released)
- ★ Improved vibration suppression

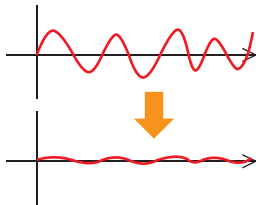
Fastest in the world



Σ-7W

- ★ 2-axis SERVOPACKs (200 W x 2 axes to 1 kW x 2 axes)
- ★ 3.1 kHz response frequency
- ★ Improved vibration suppression

Ripple compensation



Σ-7 SERVOPACKs can reduce speed ripples caused by motor cogging, even for machines for which speed loop gains cannot be set high. This ensures smooth operation.

Enhanced vibration suppression function

- **Notch filter**
Suppresses high-frequency vibrations of 500 Hz or higher.
⇒ Number of filters increased from 2 to 5.
 - **Anti-resonance control**
Suppresses vibrations at frequencies ranging from several hundred Hz to 1 kHz.
⇒ Vibrations can now be suppressed at multiple frequencies in comparison with one frequency in earlier models.
 - **Vibration suppression**
Suppresses vibrations at low frequencies (30 Hz and lower).
⇒ Vibrations can now be suppressed at two different frequencies in comparison with one frequency in earlier models.
- These functions can be adjusted automatically using the autotuning function.



Σ-7 servomotors

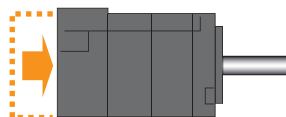
- ★ Compact dimensions (approx. 80% smaller than our earlier models)
- ★ High-resolution 24-bit encoder incorporated (16,777,216 pulses/rev)
- ★ Maximum torque: 350% (small capacity)

Smallest in the industry

Highest in the industry

Compact dimensions

Models: SGM7J, SGM7A
□40 mm (50/100/150 W)



Approx. 80% smaller than earlier models.

High-resolution, 24-bit encoder

Encoder resolution comparison

Σ-V series
20 bits =
1 million pulses/rev (approx.)

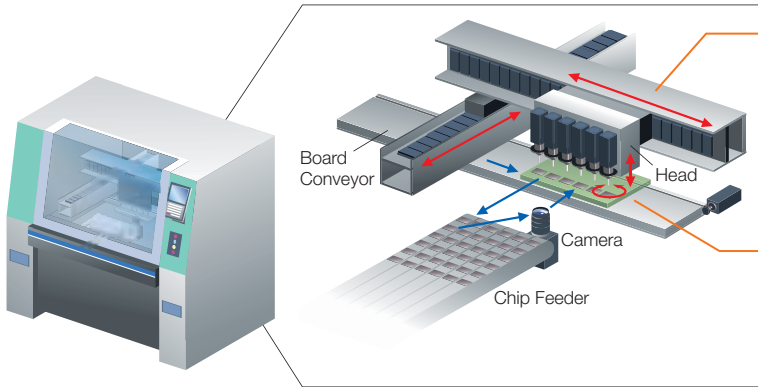
Σ-7 series
24 bits =
16 million pulses/rev (approx.)



16 times higher!

Solution for 50-W or greater models

The superlative performance of our products and the broad spectrum of their functions will resolve whatever issues you may have.



Pick and Place Solutions

Issue A customer wants to improve the positioning accuracy to accommodate the increasingly microscopic sizes of the components to be mounted.

Solution Achieve high-precision positioning. (Refer to Issue 1.)

Issue Vibration results when the operating speed is increased to improve the takt time.

Solution Dramatically improve the vibration suppression.

Alignment Solutions

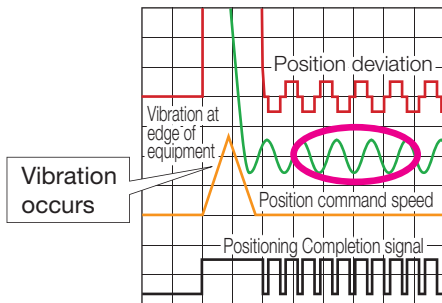
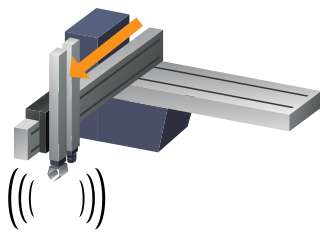
Issue A customer wants to speed up the alignment operation that uses image processing.

Solution By applying the Σ -7S-FT SERVOPACK with triggers at pre-set positions, high-speed non-stop alignment can be achieved. (Refer to Issue 2.)

Issue 1 We want to increase productivity by suppressing vibration of equipment.

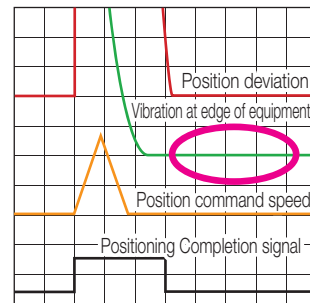
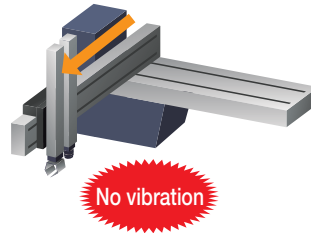
Problem

Vibration occurs at two different frequencies at the edges of equipment and it takes a while for the vibration to stop.



Solution

Vibration at two different low-frequencies is suppressed simultaneously with the automatic adjustment function.



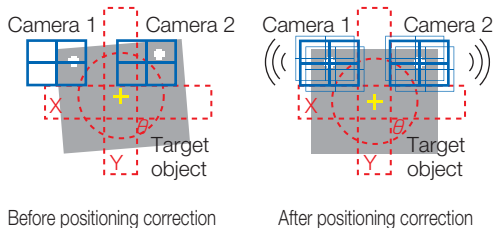
Two different low-frequencies can be suppressed simultaneously.

No vibration occurs

Issue 2 We want to improve positioning accuracy to handle increasingly smaller workpieces.

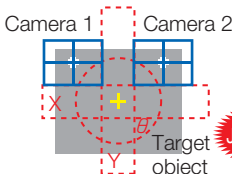
Problem

Positioning accuracy needs to be improved because parts that are handled are becoming increasingly smaller.



Solution

High-precision positioning becomes possible for precision workpieces by replacing the existing drive with the Σ -7 Servo Drive.



Vibration when stopped. $\pm 10\text{nm}$ level also possible.
Note: This will depend on the installation conditions.



Highest performance in the industry

Σ -7S SERVOPACKS

- 3.1 kHz response frequency
- Improved vibration suppression

Σ -7 Servomotors (High-resolution encoders)

24 bits = 16,777,216 pulses/rev.
For 20 mm lead ball screws
1.2 nm resolution

Just the trick!

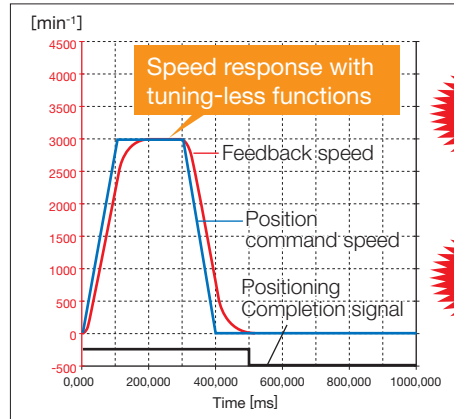
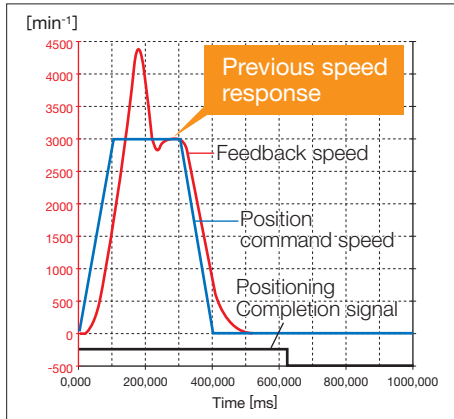
We have eliminated hassles with adjustment procedures and significantly reduced startup time.

Σ -7 : Features of Σ -7 MP3300 : Features of MP3300

No need to adjust servo gains Σ -7

With Yaskawa's original tuning-less function, systems can run without vibration for a load with 30 times (max.) of the load moment of inertia. Systems remain stable even with load changes during operation.

When the allowable load moment of inertia ratio is 30 times:



Setup time reduced

Takt time reduced

	Σ -V Series	Σ -7 Series
Allowable load moment of inertia ratio	30 times (max.)	30 times (max.)
Max. control gain	Speed loop gain 40 Hz (approx.)	Speed loop gain 70 Hz (approx.)

Automatic setup using the self-configuration function MP3300

The self-configuration function automatically recognizes the configuration of all the MP3300 optional units and modules, as well as all slave devices (servo units and I/O devices) connected to the MECHATROLINK motion network. This function eliminates the need for definition input work, and delivers vastly shortened startup times. The self-configuration function generates the definition files listed below.

- Module configuration definition
- I/O register assignments
- Communication parameters for Communication Module
- Servo Drives connected to MECHATROLINK (servo parameters and user definitions)
- I/O devices connected to MECHATROLINK (number of input and output points)

● Using the DIP Switch



● Using the MPE720 support tool



Multi-axis tuning possible on one screen MP3300

Issue

It is difficult to set up and perform adjustments for units with many axes. We must connect a PC tool to the SERVOPACK and perform the adjustments for each individual axis, which means we are wasting a large amount of man-hours.

Solution

Instead of opening an adjustment screen for each axis, multi-axis tuning can be performed on one screen, which dramatically reduces the setup time.



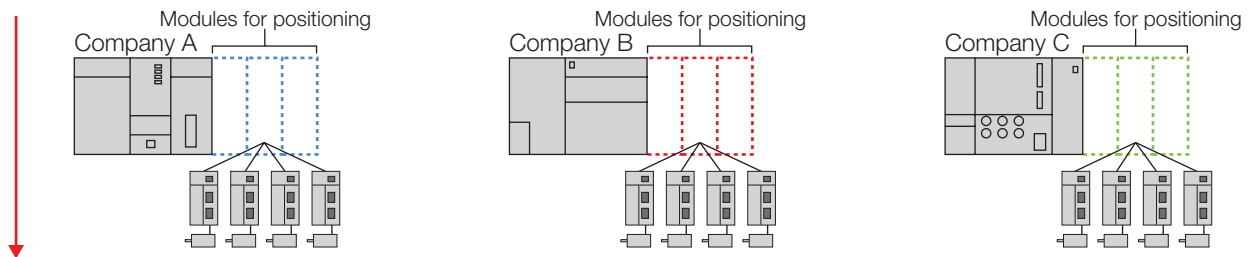
Multi-axis one-parameter tuning screen (Using MPE720 Ver.7) Under development

Save time and reduce costs with Yaskawa's ideal motion control system MP 3300

Simplify the construction of standardized drive systems that work with any PLC using Yaskawa's ideal motion control system for servo drives.

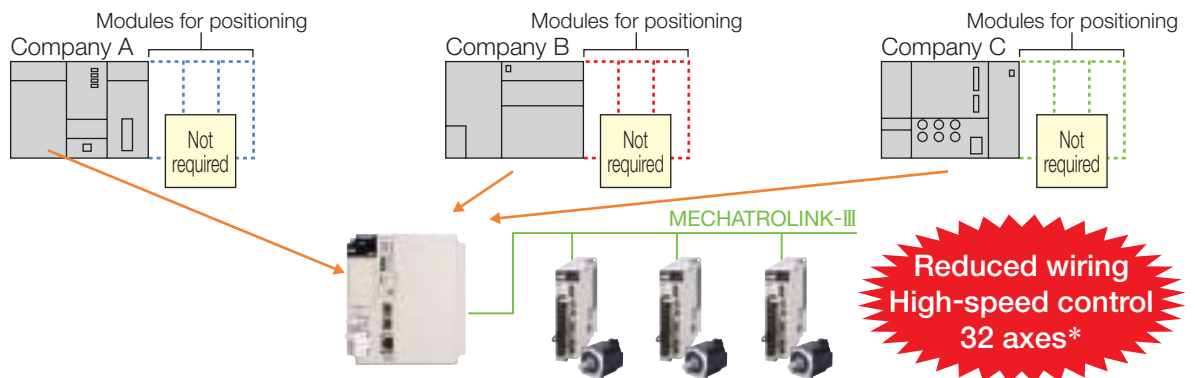
Positioning Systems that Use PLC

Issue When similar systems but different types of PLCs are used, motion control programs will be different for each PLC, as shown below.



Positioning System with MP3300

Solution The same motion control programs can be used by applying the MP3000 Series, which can be connected to the PLC of each company.

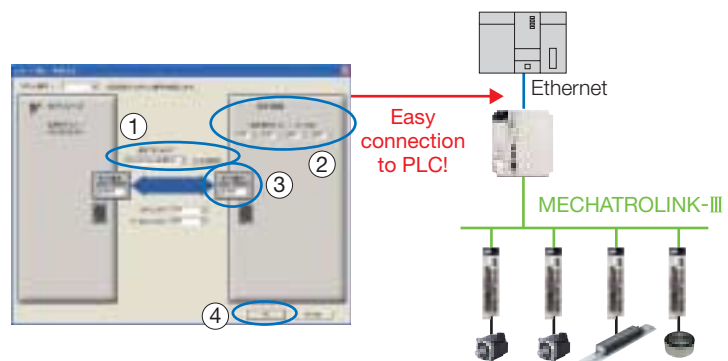


*: When the CPU-301 or -302 module (32 axes) is used.

PLC connection with a simple setup and easy programming MP 3300

Procedure

- ① Select a PLC product.
- ② Enter the IP address of the PLC.
- ③ Enter the port number of the PLC.
- ④ Establish the connection by clicking the OK Button.



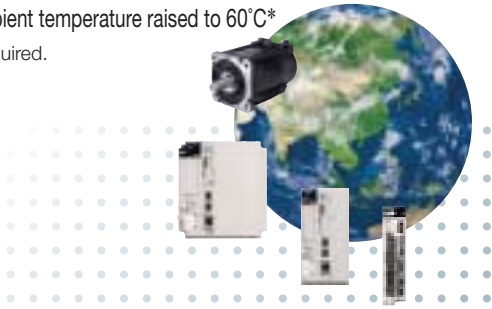
3 Environmental performance

Our products meet overseas specifications and exacting operating conditions. You can also easily create energy-saving systems when using our ultimate solutions.

Satisfies specifications for use overseas and in harsh operating conditions MP 3300 Σ -7

- 240 VAC supply voltage also supported
- High-altitude use increased to 2,000 meters above sea level*
- Maximum ambient temperature raised to 60°C*

* : Derating required.



Waterproof protective structure upgrade to IP67 rating Σ -7

[SGM7J, SGM7A (IP22 for 7.0 kW) and SGM7G models]

Protective Structure (IEC60034-5)

IP 67

◎ Rating for protection from water:
The units can be used even when they are immersed in water under specific conditions (immersed at a depth of 1 m below the surface of the water for 30 minutes).

◎ Rating for protection from contact and entry of solid foreign objects:
Safe dust-proof structure
Structure is completely protected from the entry of dust.

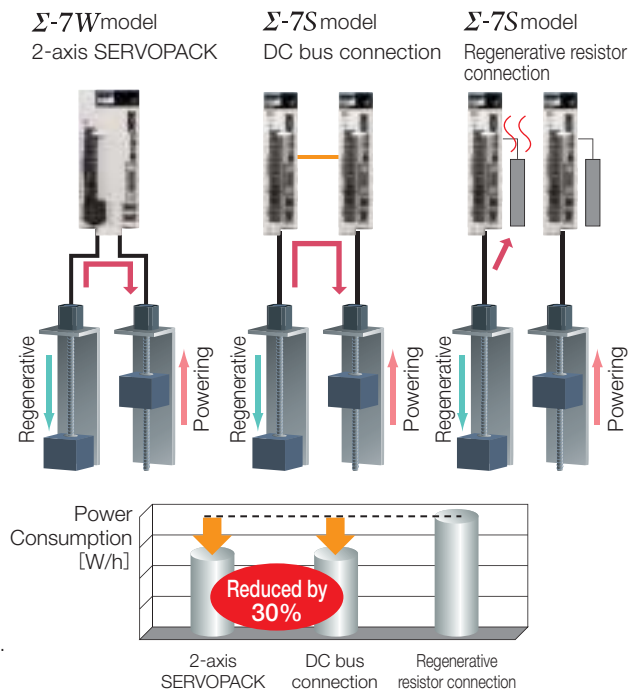
Saves energy with effective use of regenerative energy Σ -7

Regenerative energy can be effectively used between two axes when using a 2-axis integrated SERVOPACK or single-axis SERVOPACKs with a DC bus connection. This saves energy in equipment where regenerative energy was previously consumed by regenerative resistors.

Features

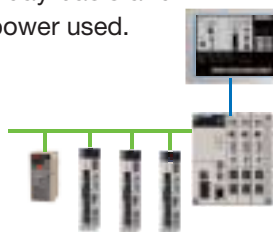
- Energy savings for all equipment
 - Supplies regenerative energy that was discarded as heat to other axes.
 - Reduces the amount of electrical power consumed.
- Eliminates the need for regenerative resistors*
 - Uses regenerative energy and eliminates the need for regenerative resistors.
 - Lowers the cost of systems and saves space.
 - Reduces temperature increases commonly caused by the use of regenerative resistors.

* : Regenerative resistors may be required, depending on machine configurations.



Supports energy conservation with visual motion system MP 3300 Σ -7

A power monitor for the motion system connected to the MP3300 is provided. This feature supports the monitoring of the power on a day-to-day basis and annual plans for reducing the level of power used.



Monitoring of the amount of energy used enabled

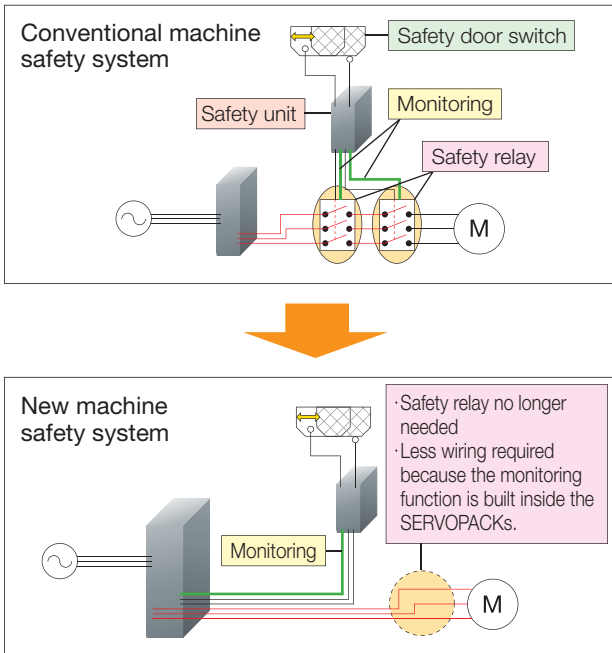
Axis	Energy Used [kWh]	Power [kW]
Axis 1	0.002	0.002
Axis 2	0.021	0.095
Axis 3	0.000	0.760
Axis 4	0.000	9.883
Axis 5	0.002	9.316

Monitoring display (image)

Satisfies requirements of the SIL 3 of the IEC 61508 functional safety standards (first in Japan)

Certification under this standard will improve the safety of our customers' systems and reduce the costs associated with additional safety certification. It will also be easier to implement compliant safety systems for press machines and other systems on the market in Europe and other regions. This certification will also reduce the man-hours required for wiring connections and the number of peripheral devices.

Stop Category 0 (Safe Torque Off) incorporated



Features

- Meets safety standards for SIL 3 of the IEC 61508
Yaskawa will become the first company in Japan to acquire SIL3 certification for its servo drives. This indicates a significant improvement in safety compared to the Σ -V series.
- Improved functions with safety option module
The safety option module (SGDV-OSA01A) for the Σ -V series can also be used with the Σ -7 series. The following functions meet the requirements stipulated under IEC 61800-5-2:*
STO: Safe Torque Off (immediate removal of power to motor)
SS1: Safe Stop 1 (removal of power after motor has decelerated and stopped)
SS2: Safe Stop 2 (maintenance of power after motor has decelerated and stopped)
SLS: Safely Limited Speed (limit placed on motor speed)
The responsiveness of these safety functions is significantly enhanced without going through a host system.

* : SIL2 applies when a system is used with the safety option.

Protect systems from high temperatures MP3300 Σ -7

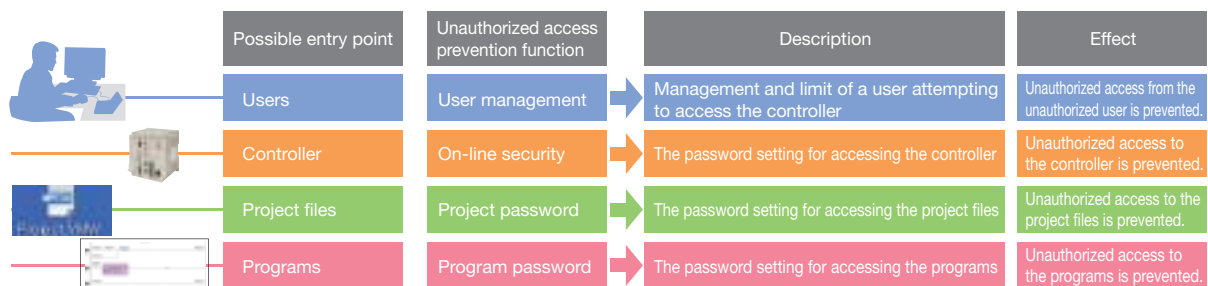
MP3300, Σ -7 SERVOPACKs, and servomotors are equipped with temperature sensors that can directly monitor temperatures of machines and detect abnormalities to prevent failures. Real-time temperatures can be viewed on a display by using MP3300.



Temperature monitoring display (image)

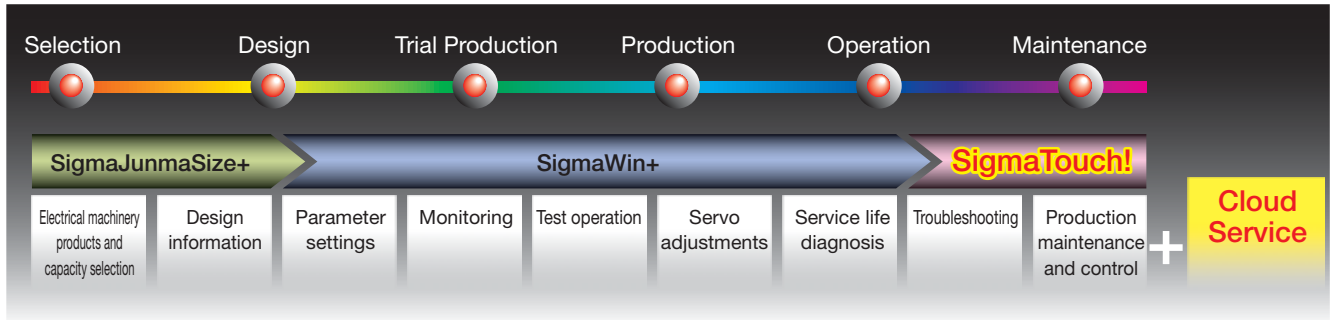
Several kinds of powerful functions to prevent unauthorized access MP3300


Security functions stand guard to block off multiple possible entry points including programs, projects, controllers, and users.




Yaskawa supports our customers in all their decisions, from product selection to production maintenance, and offers solutions that are always one step ahead of our competitors.

Yaskawa's MechatroCloud offers Build To Order (BTO) services. The SigmaTouch! smartphone application can be used to enhance product lifecycle management and maintenance service.








MechatroCloud is a new cloud service provided by the Yaskawa Electric.

MechatroCloud is available in Japan only.
*See page 20 for the details on MechatroCloud.



Details of service

- ◎ **Build To Order service**
Customers can place orders after specifying the parameters they want when their SERVOPACKs are shipped from the factory.
- ◎ **Product management and maintenance service**
The product manufacturing information used specifically by each customer can easily be saved and displayed at any time.

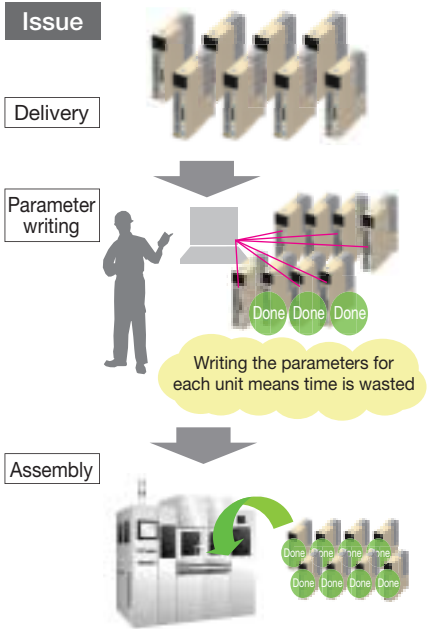
How to use the service

Register as a corporate member of our customer Web services. You can use MechatroCloud after you have registered.

Single or multiple orders possible after specifying parameters (BTO) Σ-7

Customers can now place single or multiple orders for SERVOPACKs in the Σ-7 series after specifying parameters at the factory shipment stage. It is no longer necessary to write the parameters at the system assembly site, which means that production lead times can be reduced.

Issue



Writing the parameters for each unit means time is wasted

➔

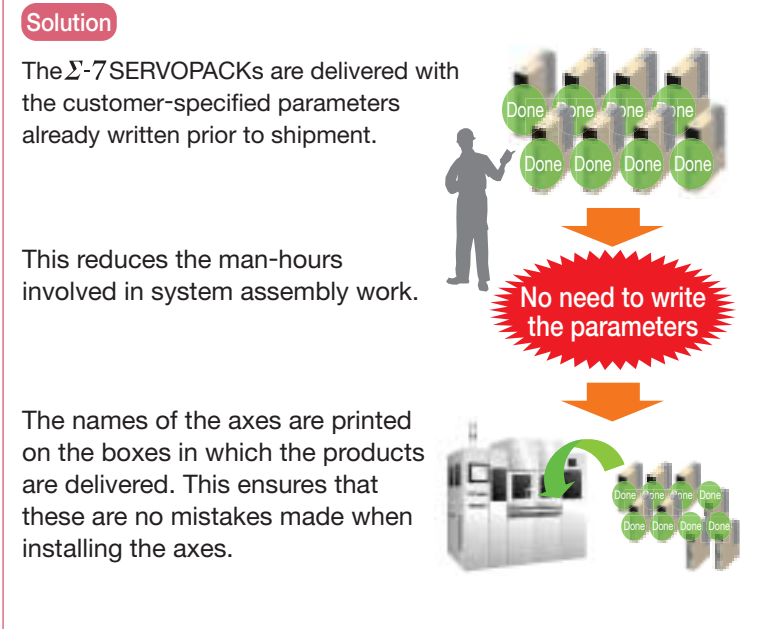
Solution

The Σ-7 SERVOPACKs are delivered with the customer-specified parameters already written prior to shipment.

This reduces the man-hours involved in system assembly work.

No need to write the parameters

The names of the axes are printed on the boxes in which the products are delivered. This ensures that these are no mistakes made when installing the axes.



Product management and maintenance service MP 3300 Σ-7

- Manufacturing information for each product can be easily viewed by using SigmaTouch!, Yaskawa's smartphone application. To view, simply hold your smartphone over the QR code of the product.
- MechatroCloud can also be used with SigmaWin+.

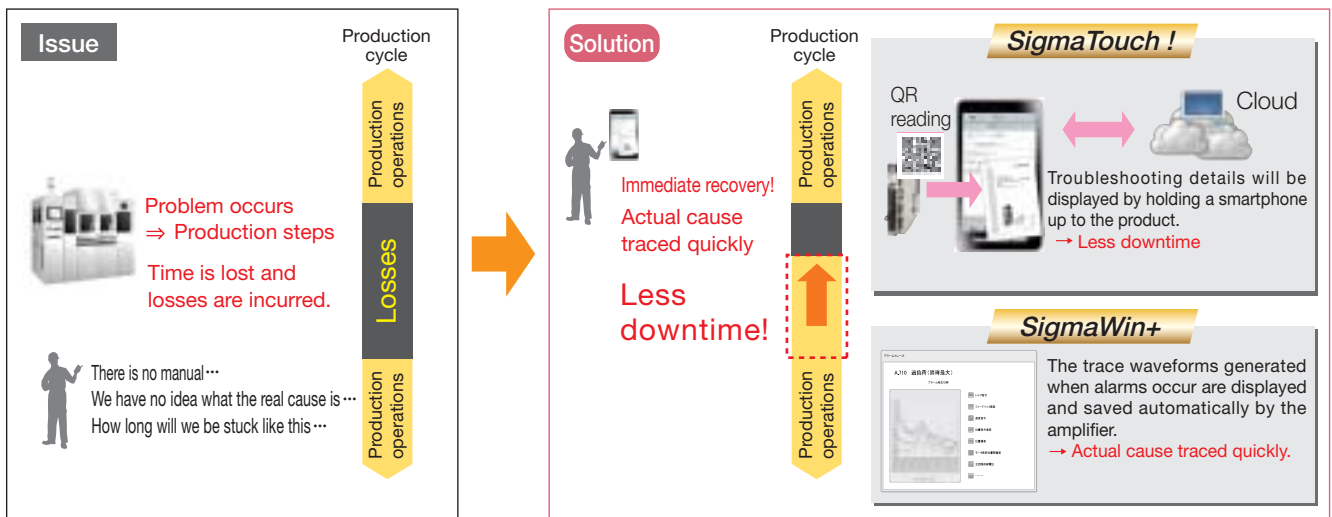
Features:
 Simply hold your smartphone over the QR code of the product to access the MechatroCloud service.
 · You can view the product manufacturing information and the troubleshooting information stored in the MechatroCloud.
 · You can view manuals for servomotors, servo drives, and machine controllers.



Note: QR code is a registered trademark of Denso Wave Incorporated.

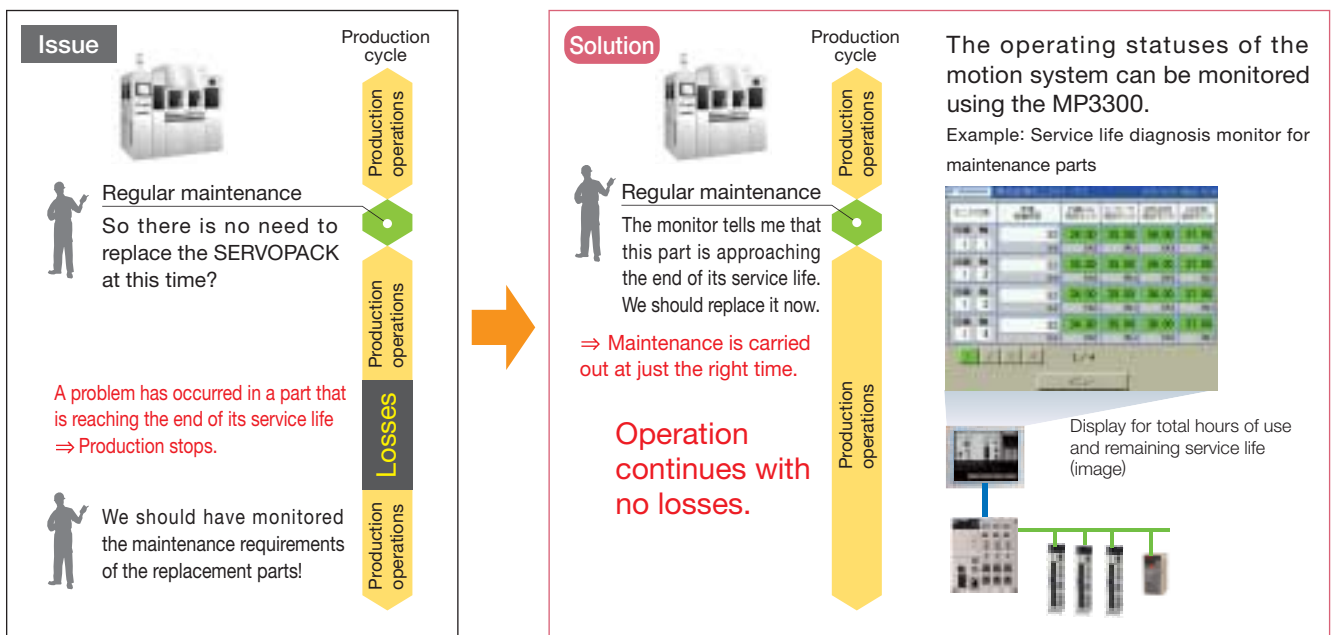
Easier and faster troubleshooting options MP 3300 Σ-7

Operators can use smartphones on-site to display the amplifier manual and troubleshooting details. The trace waveforms generated when alarms occur can be saved automatically, and the real causes of problems can be tracked faster, which reduces downtime.

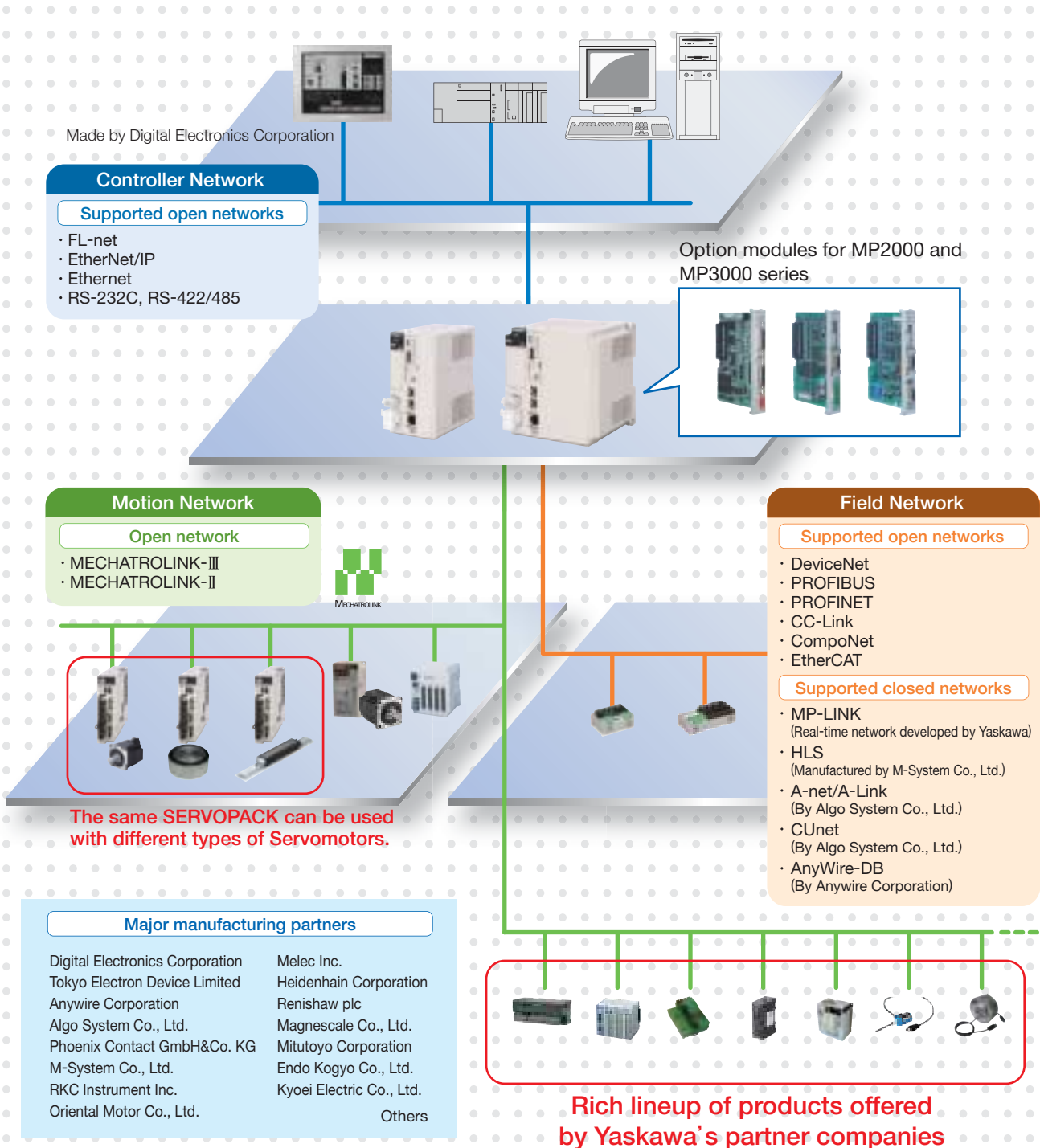


Planned maintenance possible by monitoring the operational status MP 3300 Σ-7

The service life of a product can be estimated, and users are notified when the parts should be replaced. System failure can be prevented because parts can be replaced before products fail or a fault occurs.



We have expanded our product lines and built up our product series to be compatible with other company systems. Selecting the products of your motion systems is now a one-step process.



Our products are the same size as existing products so they can easily be swapped out. The compatibility of programs and parameters is also preserved. By replacing products, you can easily improve the performance of your system.

Machine Controller	External sizes and installation	Parameters and applications
	<p>Compatible with MP2000 series</p> <p>MP2000 Series MP3300</p>	<p>Program applications for the MP2000 series can be converted and used with the MP3300.</p> <p>MP2000 applications MP3300 applications</p>
SERVOPACK	<p>Installation interchangeability with the models in the Σ-V SERVOPACK having the same capacity is featured for the SERVOPACKs. The Σ-7 SERVOPACKs have improved shapes for mounting holes. With this new shape, it is much easier to insert a screwdriver.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Mounting holes on Σ-V top</p> </div> <div style="text-align: center;"> <p>Mounting holes on Σ-7 top</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>Mounting holes on Σ-V bottom</p> </div> <div style="text-align: center;"> <p>Mounting holes on Σ-7 bottom</p> </div> </div>	<p>A parameter conversion mode is provided. The parameters of the Σ-V SERVOPACKs can be used with the Σ-7 SERVOPACKs, when using the SigmaWin+ parameter converter.</p>
Servomotor	<p>The Σ-7 SERVOPACKs are compatible with models of the same capacity in the Σ-V series SERVOPACKs.</p> <div style="display: flex; justify-content: center; align-items: center; gap: 20px;"> <div style="text-align: center;"> <p>Σ-V</p> <p>200 W □60 mm</p> </div> <div style="font-size: 2em; color: orange;">➔</div> <div style="text-align: center;"> <p>Σ-7</p> <p>200 W □60 mm</p> </div> </div>	

MechatroCloud is a cloud service offered by the Motion Control Division of Yaskawa Electric. With this service, it is now easier and more convenient to use Yaskawa's motion control products. A wide range of services are now available through Yaskawa's website, smartphone applications, and QR codes.

Note: "QR code" is a registered trademark of DENSO WAVE, Inc.



BTO Service

You can order customized SERVOPACKs from the website!



Use BTO
for
free!

Parameter settings
can be customized
for your equipment
when ordering!

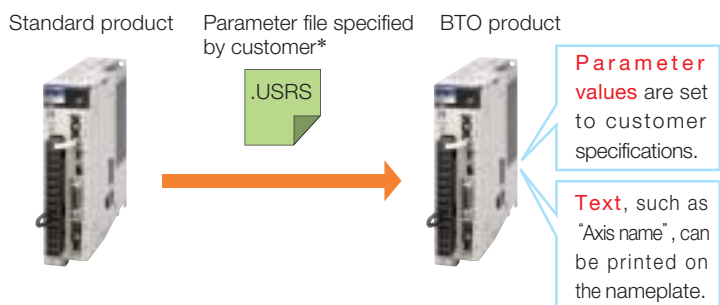
With the ready-to-use
parameter settings, you
can reduce the time required
to assemble your equipment.

See page 16 for an example of how BTO can be used.



In the BTO (build to order) service available from Yaskawa, parameters for SERVOPACKs are set to the values specified by customers when placing orders. Customers can order customized SERVOPACKs by simply registering parameter specifications on the website. If customers must assemble multiple pieces of the same equipment and/or different equipment on site at one time, they can eliminate the time to write over parameters by simply ordering SERVOPACKs with customized parameters through the BTO service.

Note: To use MechatroCloud service, you must register your name under the corporate membership of the e-mechatronics website, the Yaskawa Electric website for product and technical information.



* : Use a parameter file for version 5.71 or later versions of SigmaWin+.

MechatroCloud Introduction Videos – Now on YouTube

Use the standard bar code reader on your smartphone to read these codes and view videos on YouTube.

"YouTube" is a trademark or a registered trademark of Google Inc.

BTO service



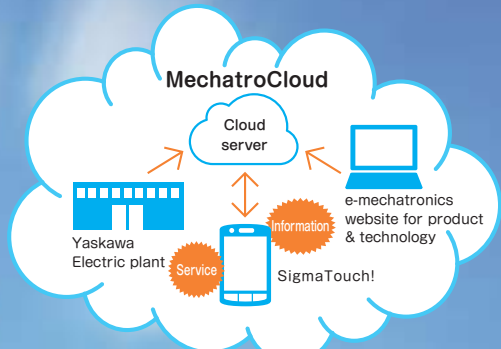
SigmaTouch!



Easy troubleshooting with SigmaTouch!
Anytime, Anywhere



Use SigmaTouch! for free!



Innovative service that links users to cloud data!



Simply read the QR code!

Easily search for product information using SigmaTouch!

See page 17 for examples of how SigmaTouch! can be used.

SigmaTouch! can be downloaded from Google Play Store, the contents distribution service for Android. "Android" and "Google Play" are trademarks or registered trademarks of Google Inc.

"SigmaTouch!" is a smartphone application for MechatroCloud. Product information, such as manufacturing information and parameter lists, can be viewed by simply reading the QR codes of Yaskawa Electric's products with a smartphone camera. Alarm details and troubleshooting information can also be viewed on the smartphone, which can greatly reduce recovery time.



QR code



SigmaTouch!

- Product manuals
- Inquiries
- Alarm list
- Parameter list

etc.

Note: The QR codes can be read with Android OS 4.0.3 or later versions. The Android must be connected to the network to use this service.

Machine Controller

The MP Machine Controller series anticipates the needs of increasingly complex and advanced systems to offer customers the most optimal solutions.

In the 1990s, Yaskawa introduced Machine Controllers to the motion control market that was dominated at the time by programmable controllers. Since then, Yaskawa has evolved as a top manufacturer of Machine Controllers and is turning customer problems into opportunities.

These efforts have included improvements in the high-speed performance of machines and systems, enhancement of productivity by reducing takt times, and monitoring the operation status.



MP3000
Series

MP3000

Modular Type



Machine Controller

MP3300 NEW

The base unit, CPU modules and optional modules can be freely combined to create a Machine Controller best suited to the user's control scale and control panel size.



Machine Controller

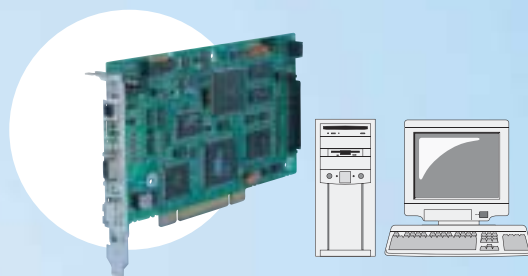
MP3200

Motion, vision, and robotics systems deliver the highest possible machine performance.

Board Type

Machine Controller MP2100

51 motion Application Program Interfaces (API) are available to effectively achieve the desired motion control using a personal computer.



MP3000 Series

The MP3000 series includes an extensive lineup of Machine Controllers and develop the most ideal system scale and meet motion requirements. In addition, diversified functions, performances, and services are available to support customer needs throughout the entire machine lifecycle.



MP3000

Features

Ultimate system performance

Equipped with the fastest CPU, the MP3300 Machine Controller makes it simple to construct a high-speed, high-accuracy, and multi-axis system by connecting units that support MECHATROLINK-III.

Ultimate ease of use

The adjustments to a multi-axis system can be completed in a short time using the MPE720 Ver. 7 engineering tool. It is also easy to add a motion system to an existing sequence system.

Ultimate environmental performance

The power consumption of the motion system can be monitored, which helps to conserve energy.

Ultimate safety and security

Security measures have been enhanced to prevent the outflow of know-how. In addition, temperature sensors installed in the MP3300 enable early identification of abnormal temperatures in the system.

Ultimate support

The support available from Yaskawa now makes it easier to handle large-volume data, such as system operation statuses. This improves traceability at the production site. New support services such as Yaskawa's MechatroCloud service make it even more convenient for users to store and manage product information.

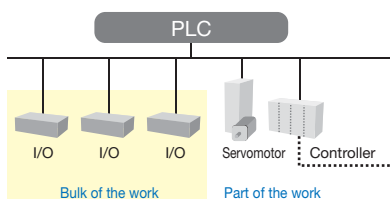
Ultimate lineup

In addition to the Σ -7 series of AC Servo Drives, a strong lineup of products is also available from Yaskawa's partners.

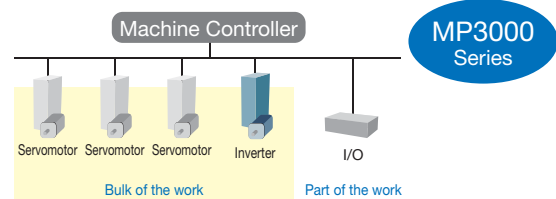
Ultimate compatibility

Program applications for the MP2000 series can be converted and used with the MP3000 series.

Machine Controller and PLC (Programmable Logic Controller) : How do They Differ ?



- ◎ Excellent at controlling I/O.
- ◎ Focuses more on connectability to various I/O devices than axes synchronization.
- ◎ Most are modules.



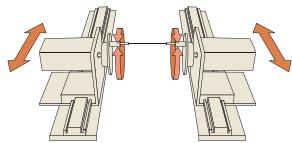
- ◎ Ideal for controlling machines and devices.
- ◎ Focuses on precise synchronous and high-speed control on multiple motors.
- ◎ The optimal controller models can be selected based on the device requirements.

Four all-in-one control modes

Every aspect of control from simple to complex operations can be achieved using one CPU without adding optional modules for each kind of control.

Synchronous Phase Control

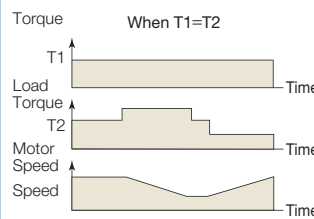
Speed control with position compensation (electronic shaft) or position control with 100% speed feed forward (electronic cam). Multi-axis servomotors can be controlled synchronously.



0.3 mm dia. mechanical pencil lead does not break.

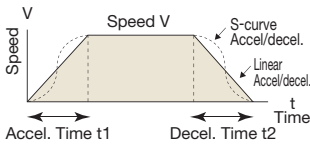
Torque Control

Generates a constant torque, regardless of speed.



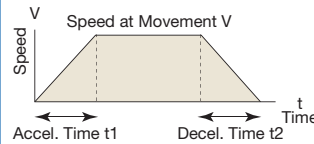
Position Control

Advances to the target position, and stops or holds.



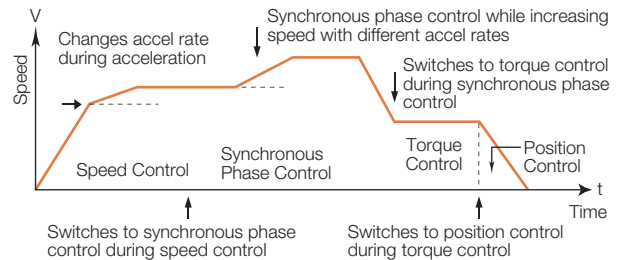
Speed Control

Turns the motor at the specified speed, with user-defined acceleration/deceleration slopes.



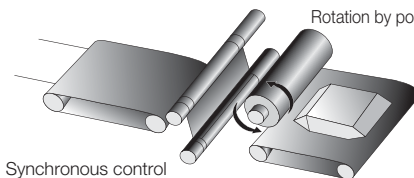
Switch between any of the modes while online

The MP3000 series can switch between these four modes while online.



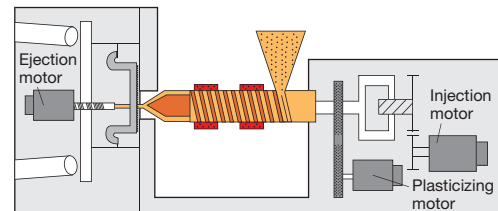
● Packaging machines

Synchronized phase control enables cutting, sealing and other kinds of processing that are synchronized with the movement of the workpiece.



● Injection molding machines

Switching from position control to torque control can be executed without deceleration.



Injection (torque control) ← Integration with nozzle (position control)
Return operation (positioning) →

The MP3000 Series Brings a Cornucopia of Solutions

■ Gantry Mechanism and Alignment Stage Mechanism

These mechanisms comprise the basic system used in devices for the manufacturing and the inspection of semi-conductor chips, LCDs, and other components. High precision as well as high acceleration and deceleration are required for these processes. Two axes must be synchronized to control and operate the gantry mechanism.

Advantage Achieves complete synchronous multi-axis control and online adjustment.

■ Solution for Conveyance

Provides a solution for the control mechanism that allows workpieces to be processed in accordance with the speed of the production line.

Advantage Allows the slave axes to follow master axis operation when the inverter is used as the master axis and both the inverter and servo drives are connected through a network.

■ Solution for Winder

Provides a solution for the control mechanism where a winder winds and a feeder unwinds.

Advantage Achieves high-precision winding, feeding, dancer control, and tension control with standard servo drives and inverters. Line control can be constructed easily with user functions set in advance.



The MP3200 is the flagship model of the MP3000 series that integrates motion, vision, and robotics systems to provide the most optimal machine performance. Adjustments, design, and maintenance can be also centrally controlled using the MPE720 Ver. 7 system integrated engineering tool.



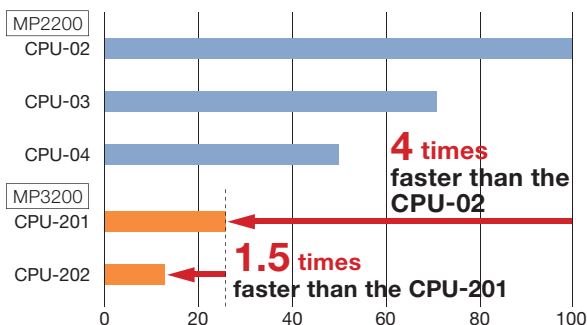
[Catalog No. KAEP88072502]

Takt times improved by ultra-high-performance CPU

◎ Fastest application processing in the industry: 4-axis, 125 μ s

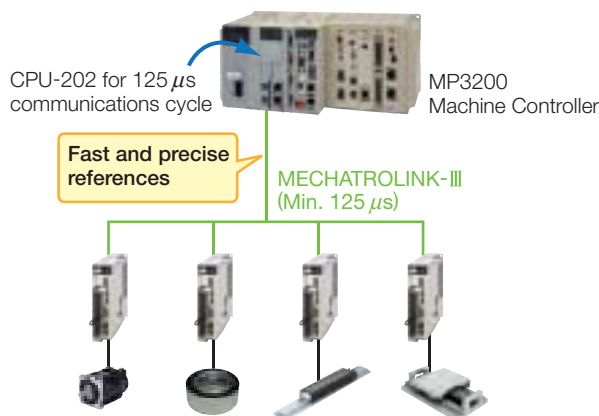
Arithmetic processing must be performed at higher speeds for systems to work faster. The MP3200 features the CPU-202, an ultra-high-speed CPU that runs 1.5 times faster than the CPU-201, to improve takt times.

When the scan time of the CPU-02=100



◎ MECHATROLINK-III: 125 μ s communications cycle

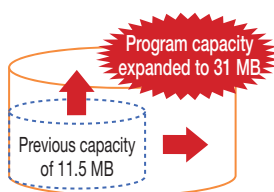
Revolutionize machine accuracy and tracking control precision by combining the CPU-202 module for 125 μ s communications cycle and the Σ -7SERVOPACKs.



Varied applications by expanding program capacity

◎ Application program capacity: 31 MB

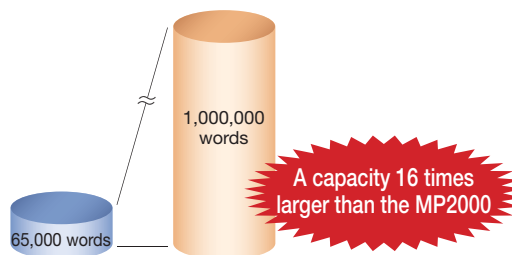
The program capacity has been dramatically expanded to 31 MB (over the previous capacity of 11.5 MB) to support large-scale control systems. The number of application drawings has also been increased significantly to support many different kinds of applications.



Controller Name	MP2200 (Conventional)	MP3200
No. of high-speed scan drawings	200 DWGs	1000 DWGs
No. of low-speed scan drawings	500 DWGs	2000 DWGs
No. of user function drawings	500 DWGs	2000 DWGs

◎ M register capacity: 1 M words

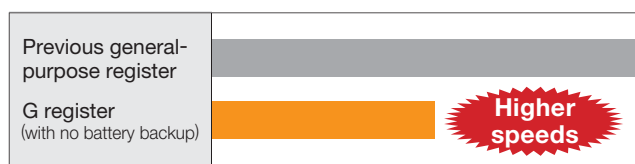
The capacity of the M register (general-purpose register with backup capability) has been greatly expanded for use with system recipes in diversified small-quantity production.



◎ New memory area increases the speed of applications

G register: New capacity of 2 M words

A new G register, a general-purpose register (with no battery backup) has been added, making it possible to process even complex applications at higher speeds.



CPU Unit (CPU-201/202)



Item		Specifications	
		CPU-201	CPU-202
Performance	Communications cycle	250 μ s to 32.0 ms	125 μ s to 32.0 ms
	Minimum scan time setting	0.125 ms	
No. of axes controlled	Built-in CPU	32 axes (MECHATROLINK-III)	
	Virtual	32 axes	
	Maximum	256 axes	
Communication interface	Ethernet	10BASE-T/100BASE-TX port \times 2 (hub)	
Memory	Program capacity	32 MB	

Enhanced Usability and Traceability

- USB memory interface provided as a standard feature.
- Maintainability and traceability improved by the incorporation of the FTP server/client function and logging function.

Flexible System Construction

- MECHATROLINK-III and Ethernet provided as standard features.
- All MP2000 series optional modules* supported.

*: See "Optional Modules" on page 31.

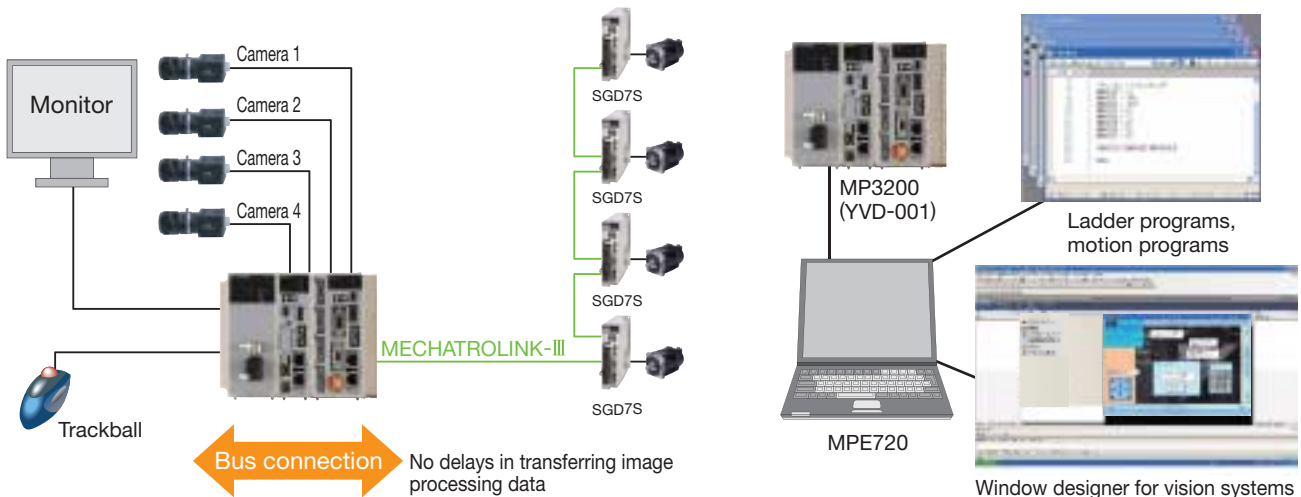
Integration of Motion and Vision Systems

Processing with zero delays

The CPU Unit and Vision Unit are connected using a high-speed bus (an industry first), which enables motion processing and vision processing to be executed with absolutely no communication delays. Four digital interface cameras, each with a different format, can be connected.

○ All image processing executed using combinations of the basic 4 vision commands.

- Development of motion-vision system using MPE720.
- Easy customization of vision systems with window designer.



Vision Unit (YVD-001)



Item	Specifications
Performance	Rate of improved operation: Double*1
Image processing	Blob analysis: Feature extraction and measurement using binary images
	Template matching: Normalized correlation pattern matching
Image input	Camera interface: Mini Camera Link (PoCL) × 4
	No. of pixels: 640 × 480 to 2440 × 2048 (5 megapixels)
Monitor output	Monitor interface: VGA 15-pin D-sub connector
	Display colors: Graphics: 64 colors, Images: 256 gray levels
Operating interface	Trackball: USB mouse interface
Communication interface	Ethernet: 100BASE-TX port × 2 (hub)
Memory	Image capture memory: 64 MB
	Image analysis memory: 32 MB
	Image display memory: 64 MB
	External memory: USB memory (2 GB) of CPU unit
I/O	Trigger input: 4 points
	Flashlight output: 4 points
Programming methods	Image processing programs: Programming at CPU side (ladder language, motion language)
	User window creation: Programming-free (using MPE720 window designer*2 for vision systems)

*1 : Compared with the MYVIS YV260

*2 : Under development

The MP3300 Machine Controller makes it possible to freely combine the Base Unit and CPU modules to match the customer's control scale and control panel size. Combination with the Σ -7 series of AC Servo Drives realizes e-motional motion control in the customer's system.

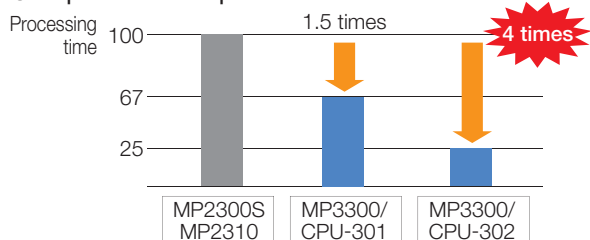


[Catalog No. KAEP88072503]

Enhanced control performance

The MP3300 delivers high-speed and high-level performances, and expands program capacity. The MP3300 is also capable of high-speed, synchronized communication with MECHATROLINK-III compatible Servo Drives and AC Drives.

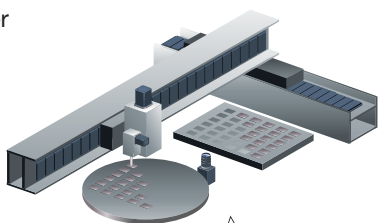
Improved CPU performance*



*: Ladder operation speed where the scan time of the MP2300S/MP2310=100

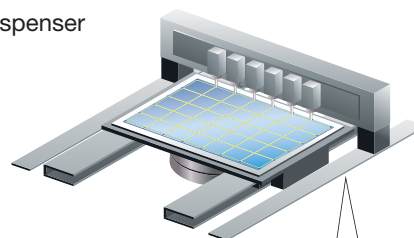
Double-precision real-number, 64-bit integer data for higher precision

Dicer



With double-precision real-number, 64-bit integer data, rounding errors during arithmetic calculations are reduced, and control at higher levels of precision can be achieved.

Dispenser



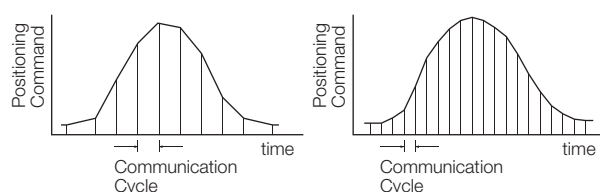
Controlling the path performance in the corner areas is an issue. However, implementing path control with a higher level of precision enhances dispensing quality.

Fastest transmission cycle: 125 μ s (4 stations)

The MECHATROLINK-III motion network, which is among the fastest in the industry, is provided with the main unit CPU of the MP3300 as a standard option. The smoother motion control results in higher levels of precision.

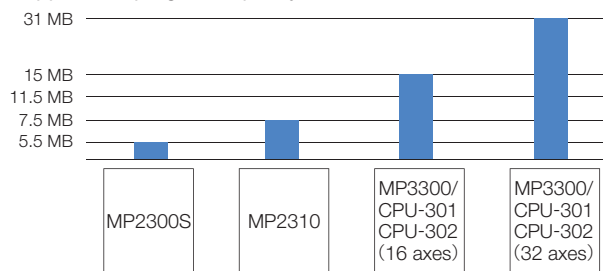
MECHATROLINK-III		
Transmission Speed	Transmission Cycles (Number of Connected Stations)	
100 Mbps	125 μ s (4 stations)	500 μ s (14 stations)
	250 μ s (8 stations)	1.0 ms (16 stations)*

*: The maximum number of stations, including I/O, is 21.



Expanded program capacity

Application program capacity



Number of drawings

Number of drawings	MP2000 series	MP3300/CPU-301/CPU-302
For high-speed scan	200 drawings	1000 drawings
For low-speed scan	500 drawings	2000 drawings
For user function	500 drawings	2000 drawings

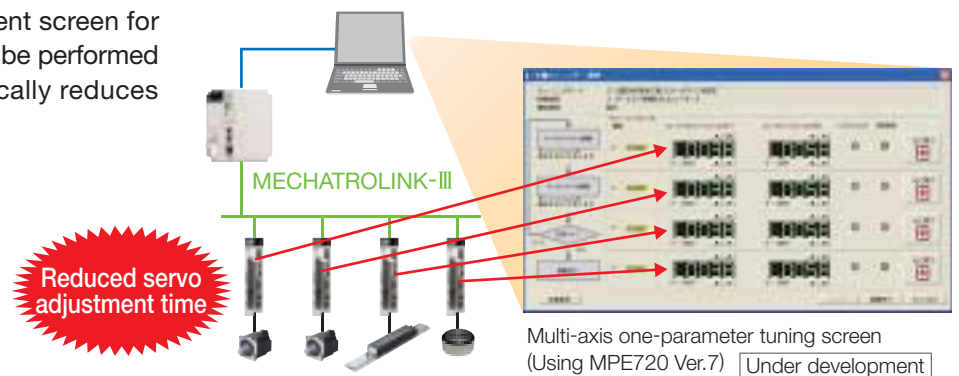
CPU module (CPU-301/302)

Item	Specifications
Model (Abbreviation)	JAPMC-CP3301-1-E [CPU-301(16 axes)]
	JAPMC-CP3301-2-E [CPU-301(32 axes)]
	JAPMC-CP3302-1-E [CPU-302(16 axes)]*
	JAPMC-CP3302-2-E [CPU-302(32 axes)]*
High-speed scan time setting	Min. 250 μ s (CPU-301) Min. 125 μ s (CPU-302)
Flash memory	16 axes: 24 MB (User memory 15 MB) 32 axes: 40 MB (User memory 31 MB)
SRAM	16 axes: 4 MB, 32 axes: 8 MB
DRAM	256 MB
MECHATROLINK	· MECHATROLINK-III \times 2 ports · Master function
Ethernet	10BASE-T/100BASE-TX \times 1 port
Calendar	Seconds, minutes, hour, day, week, month, year, day of week, and timing (battery backup)
USB	· USB 2.0 Type-A host \times 1 port · Compatible devices: USB storage

*: CPU-302 Module uses 2 slots, CPU Slot and Option Slot 1 for the Base Unit.

Better usability

Instead of opening an adjustment screen for each axis, multi-axis tuning can be performed on one screen, which dramatically reduces the setup time.

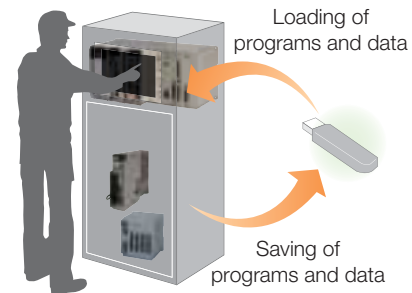


Enhanced maintainability

A storage USB port is provided on the CPU Unit as a standard option, which makes it easy to update the version of the equipment, back up data, and import and export large-volume data. A data logging function also allows the system's operation statuses to be saved in the internal RAM or on a USB memory device. The logging data can be easily accessed from remote host systems. This makes it possible to acquire large volumes of data such as the system's operation statuses, and vastly improves traceability on the production site.

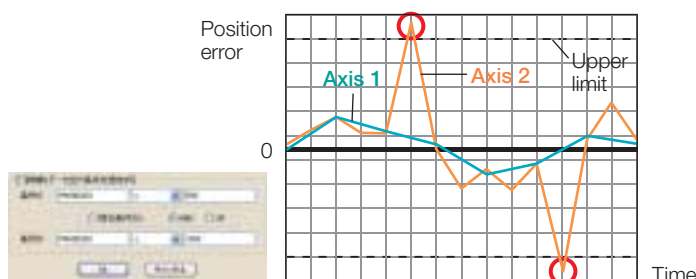
Loading/Saving of programs and data

Operations can be performed using the DIP switches on the CPU Unit body. Even in places where a PC cannot be brought in, you can update the versions of the equipment and back up the data on-site with ease.



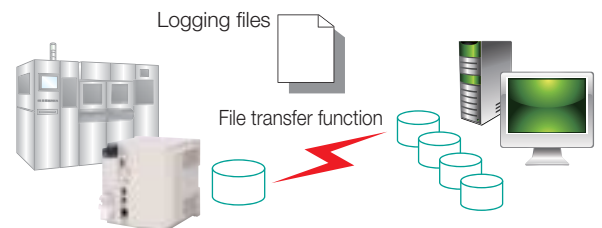
Data logging

Settings can be selected for the conditions under which the logs are output. The logging data is saved only if the values of the specified registers fail to meet the output conditions. This enables a rapid response when trouble occurs.



File transferring

By transferring the system's operation data (logging data and register data) at the specified synchronization, large volumes of operation data can be acquired with no fear that the data may be unexpectedly damaged. As a result, the traceability at the production site is vastly improved.



Complete upper compatibility with the MP2000 series

The full lineup of optional modules and application programs for the MP2000 series can be used with the MP3300. This enables a completely hassle-free upgrade from the MP2000 series to the MP3300, and enhances system performance and functions.

Specification Comparison of MP3200 and MP3300

Items		MP3300		MP3200		Remarks
		CPU-301 (16 axes) CPU-302 (16 axes)	CPU-301 (32 axes) CPU-302 (32 axes)	CPU-201	CPU-202	
Performance comparison of CPU Module*1		CPU-301: 1.5 CPU-302: 4.0	CPU-301: 1.5 CPU-302: 4.0	4.0	6.0	*1: When compared to MP2310 and MP2200/CPU-02
Number of slots (on main rack)		1/3/8		3/5/8		
Rack expansion		Possible				
Multi-CPU configuration		Not possible		Possible*2		*2: Up to 5 modules, including the main CPU module
Ethernet		100Base-TX ×1 port		100Base-TX × 2 ports (HUB)*3		*3: Built-in HUB function
USB I/F		Provided (for storage device)				
MECHATROLINK I/F		Provided (CPU-301 250 μs, CPU-302 125 μs*4)		Provided (250 μs*4)	Provided (125 μs*4)	*4: Minimum communications cycle
Number of controlled axes	SVC	16 axes	32 axes			
	SVR	16 axes	32 axes			
	Maximum number of controlled axes	256 axes (when SVB-01 or SVC-01 optional modules are used, or when racks are expanded)				
Program memory capacity	Data tracing	256 K words	1 M words		Battery backup	
	Table data	1 MB	3 MB			
	M registers	1 M words				
	User memory	15 MB	31 MB			
Optional modules		All MP2000 series optional modules available				
MotomanSync-MP		Ethernet connection		Ethernet MP3000 bus connection		
Basic functions	Number of ladder programs	High-speed scan DWGs: max. 1000, Low-speed scan DWGs: max. 2000, User function DWGs: max. 2000, Motion programs: max. 512				
	Register types	S/M/G/I/O/C/D/#				
	Data types	B/W/L/Q/F/D/A				
	Index registers	Subscripts I /J, and array registers				
	Register capacity	M registers: 1 M words, G registers: 2 M words				
Motion control functions	Slave functions	Supported				
	Slave CPU synchronization	Supported				
Communications functions	Automatic reception	Supported (Maximum number of automatic reception connections: 10)				
	File transfer functions	Supported (FTP server/client)				
Data tracing functions	Number of groups	1, 2, 4 (selectable)				
	Trace memory	256 K words/4 groups	1 M words/4 groups			
	Traceable data points	16 points/group				
Data logging functions	Number of groups	4				*5: When using recommended USB memory device
	Number of log files	Built-in RAM disk (max. 8 MB), or USB memory device (4 GB*5)				
	Data logging points	64 points				
USB memory functions		Backup/restore of project files, data logging, import/export of register data				
Linkage functions for Σ-7 Servo Drives	Servo tracing	Supported				
	Monitoring	Supported				
	Multi-axis tuning	Development planning*6				*6: Under development

Optional Modules

■ Motion Modules



Connects to the SERVOPACK for motion control. Various MECHATROLINK slaves can be connected to the SVC-01 and SVB-01 modules.

Name	Description
SVC-01	MECHATROLINK-III × 1 channel
SVB-01	MECHATROLINK-II × 1 channel
SVA-01	Analog-output 2-axis servo control
PO-01	Pulse-output 4-axis servo control

Note: One CPU can control up to 16 modules.

■ I/O Modules



Provides digital or analog I/O interface.

Name	Description
LIO-01	Digital input: 16 points (sink output mode) Digital output: 16 points (sink output mode) Pulse input: 1 point
LIO-02	Digital input: 16 points (source output mode) Digital output: 16 points (source output mode) Pulse input: 1 point
LIO-04	Digital input: 32 points Digital output: 32 points (sink output mode)
LIO-05	Digital input: 32 points Digital output: 32 points (source output mode)
LIO-06	Digital input: 8 points Digital output: 8 points (sink output mode) Analog input: 1 channel Analog output: 1 channel Pulse counter: 1 channel
DO-01	Digital output: 64 points (sink output mode)
AI-01	Analog input: 8 channels
AO-01	Analog output: 4 channels
CNTR-01	Pulse-input counter

■ Communication Modules



Used to construct an open network. Modules with various types of interfaces are available.

Name	Description
218IF-01	Ethernet (10BASE-T) port × 1 RS-232C port × 1
218IF-02	Ethernet (100BASE-TX) port × 1 RS-232C port × 1
217IF-01	RS-232C port × 1 RS-422/485 port × 1
260IF-01	DeviceNet port × 1 RS-232C port × 1
261IF-01	PROFIBUS port × 1 RS-232C port × 1
262IF-01	FL-net (100BASE-TX) port × 1 (10BASE-TX) port × 1
263IF-01	EtherNet/IP (Scanner and adapter) port × 1
264IF-01	Port for EtherCAT slave × 2 (1 circuit)
265IF-01	CompoNet port × 1
266IF-01	PROFINET master
266IF-02	PROFINET slave
215AIF-01	MPLINK communication/RS-232C CP-215 communication/RS-232C

Note: One CPU can control up to 8 modules.

■ Distributed I/O Modules

I/O devices can be installed in a decentralized manner.

MECHATROLINK-II Compatible Modules

Name	Description
IO2310	64-point I/O (sink mode output)
IO2330	64-point I/O (source mode output)
PL2900	Reversible counter
PL2910	Pulse output
AN2900	Analog input
AN2910	Analog output
IO2900	16-point input
IO2910	16-point output
IO2920	8-point I/O
IO2950	Relay output

MECHATROLINK-III Compatible Modules

Name	Description
MTD2310	64-point input (sink/source input)
	64-point output (sink/source input)
MTA2900	Analog input: 8 channels
MTA2910	Analog output: 4 channels
MTP2900	Pulse input: 2 channels
MTP2910	Pulse output: 4 channels

■ Connection Module

Used to connect the Base Unit to the Connection Modules or connect between the Connection Modules.

Name	Description
EXIOIF	Expansion Interface Module

MYVIS YV260 Network Machine Vision System

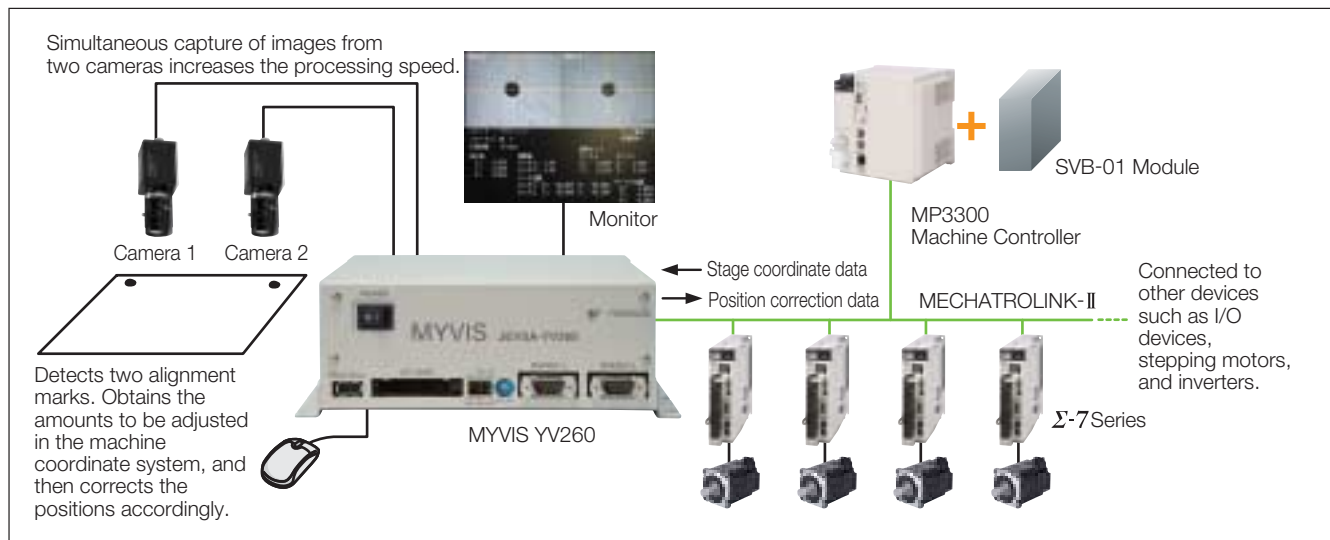
The MYVIS is a high-performance vision system that combines advanced image processing technologies with many of the servocontrol technologies developed by Yaskawa over the years as a pioneer in the field of servo drives.



[Catalog No. KAEP86077500]

Example of System Configuration

In this example, the MYVIS YV260 is connected to the open motion network MECHATROLINK. With MECHATROLINK communications, the MYVIS can receive data on the current position of the motor's axes in succession. Using this data, the necessary adjustments are determined for high-accuracy calibration of the machine coordinate system.



Features

- 1 Compatible with high-resolution camera
 - Digital camera (300,000 to 5,000,000 pixels)
 - Analog camera (300,000 to 1,250,000 pixels)
- 2 High-speed preprocessing of image quality improvement by hardware
- 3 Possible to simultaneously capture images from four cameras
- 4 Compatible with color camera
- 5 Compatible with MECHATROLINK-II and 100-Mbps Ethernet communications

Specifications

Item	Description	
Number of cameras connected	4	
Camera interface	Analog	300,000 to 1,250,000 pixel (1280 × 960)
	Digital (camera link)	300,000 to 5,000,000 pixel (2440 × 2048)
	Simultaneous image capture	4 (2 for 5,000,000 pixel)
	External trigger input	4 simultaneous or individual inputs
Preprocessing	Inter-frame operation, convolution filter (3 × 3), Morphology (Dilation / Erosion)	
Monitor output	VGA or XGA	
External interface	Field network	MECHATROLINK-II
	Ethernet	10BASE-T/100BASE-TX
	Serial communications	RS-232C × 2 channels (115.2 kbps max.)
	Parallel I/O	General purpose output 16 points + alarm 2 points General purpose input 16 points + mode change 3 points + trigger input 1 point
	Trackball	USB mouse interface
Program development	C language (SH-C compiler Ver. 9 or later)	

Board Type

Machine Controller MP2100

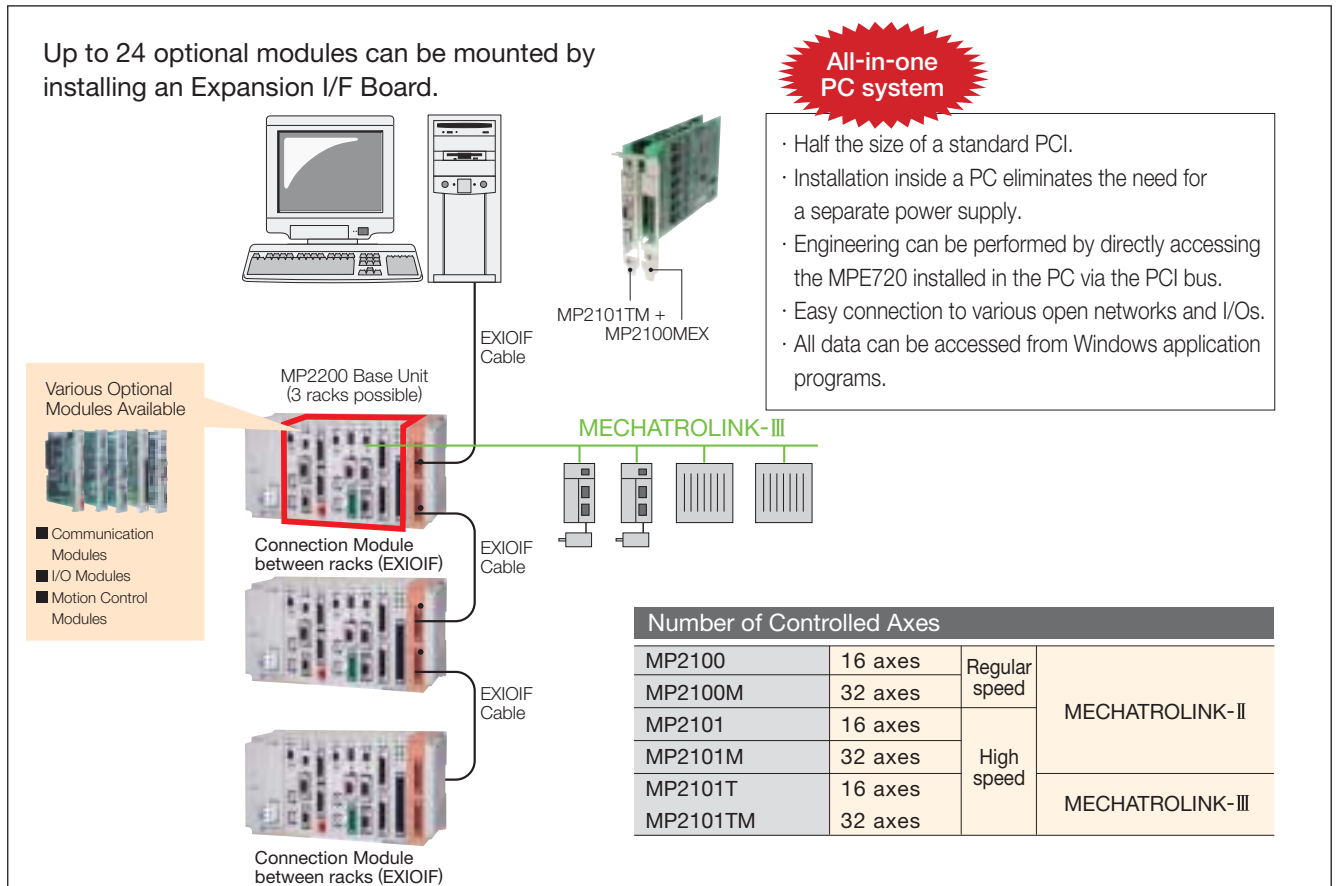


[Catalog No. KAEP88070015]

MP2100 is the perfect controller for machines connected to a personal computer. 51 motion Application Program Interfaces (API) are available to effectively realize the desired motion control using a personal computer.

Example of System Configuration

Up to three racks of additional MP2200 Base Units (up to 24 optional modules) can be connected using the MP2101TM dedicated Rack Expansion I/F Board with EXIOIF Cables and EXIOIF Modules.



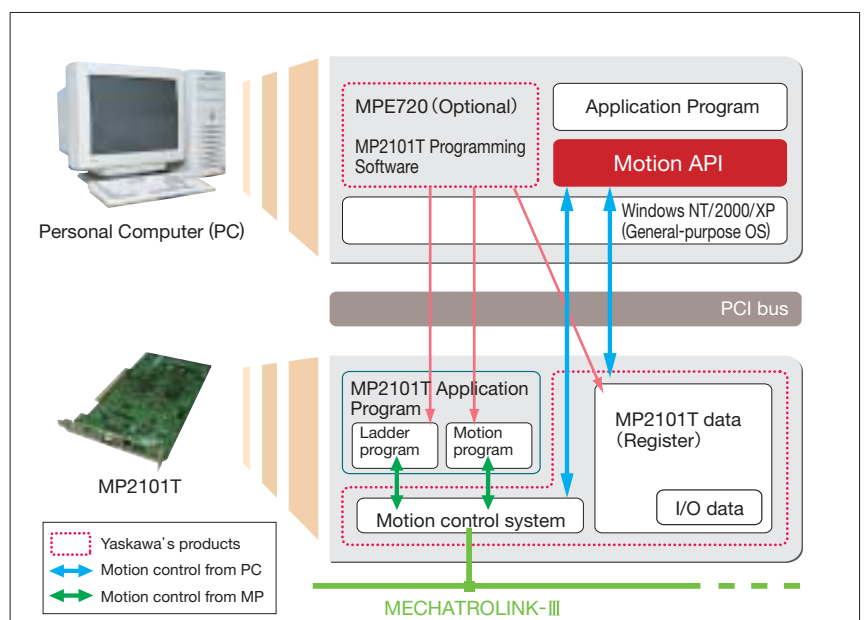
Main Motion APIs

Motion related API

- Device related: Servo ON/OFF
- Positioning: JOG feed, origin return, positioning, external positioning, and specified time positioning
- Interpolation: Linear, circular, and helical interpolation
- Torque reference ● Gear function
- Latch function
- Motion operation: Modification of motion data and parameters

System API

- Register operation: I/O operation
- Alarm: Information acquisition and alarm clearing
- System operation: Opening, closing, and switching of object controller
- Operation calendar



AC Servo Drives

The AC Servo Drives Σ series guarantees maximum performance as the core components of systems.

Yaskawa introduced its AC Servo Drives to the market in 1983, and further marketed the Σ series in 1992. Since then, Yaskawa has continued to develop the Σ series, focusing on making these products compact, and enhancing performance and ease of use. As a result of these efforts, the total shipments of AC servomotors reached 10 million units in March 2012.

Yaskawa will continue to develop world-class AC Servo Drives to provide even greater satisfaction to its customers.

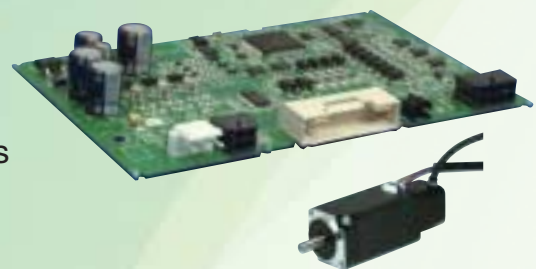


*: Applied upon order

NEW CONCEPT

Σ -S Series

Easy, compact, and low price!
The Σ -S series is recommended for applications that do not conventionally use Servo Drives, and enables servo control of pneumatic and other equipment.



Σ7

NEW

Σ-7 Series



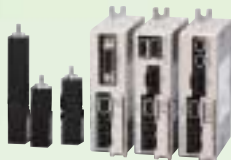
50 W to 15 kW

The Σ -7 series delivers a leading performance based on the concept of "7 ultimate e-motional solutions." These Servo Drives also support a variety of new needs, such as further enhancing safety and incorporating environmentally friendly designs.

3.3 W to 30 W

Σ-Vmini / Σ-V-MD

The powerful Σ -Vmini Servo Drives retain all the leading performance, functionality and ease of use of the Σ -V series in a palm-size package.



Σ-Vmini

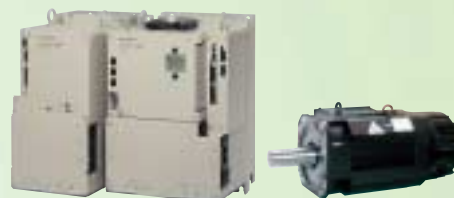


Σ-V-MD

22 kW to 55 kW

Large-capacity Σ-V

Large-capacity Σ -V Servo Drives feature superlative performance, simple startup, and outstanding expand ability. These drives also help achieve considerable energy savings.



The Σ-7 series delivers a world-leading performance based on the concept of “7 ultimate e-motional solutions.” These Servo Drives also support a variety of new needs, such as further enhancing safety and incorporating environmentally friendly designs. This makes it possible to offer solutions that can satisfy a wide range of conditions throughout the system lifecycle.

[Catalog No. KAEPS80000123]



Features

Ultimate system performance

Σ-7 series SERVOPACKs can achieve a high-speed response frequency of 3.1 kHz. Vibration suppression functions have also been enhanced. The motors incorporate 24-bit, high-resolution encoders that further increase system takt times and achieve a high throughput.

Ultimate ease of use

Tuning-less function stability has been increased to approximately twice that of the Σ-V series. This enables swift movement with no vibration or gain adjustment.

Ultimate environmental performance

Specifications have been improved to allow installation in a wider range of environments. These new safe and secure designs enable use even in harsh environments where previously prohibited, such as altitudes of 2,000 m or ambient temperatures of 60°C*1. Regenerative servo energy inside the system can also be effectively used with 2-axis integrated SERVOPACKs or by connecting multiple axes with a DC bus connection.

Ultimate safety and security

Σ-V Servo Drives satisfy of SIL3 the functional safety standard IEC61508 (first certification in Japan*2). Temperature sensors are incorporated as a standard feature, and signs of abnormalities can be caught at an early stage by monitoring the temperature from a host controller.

Ultimate support

- **Build-To-Order service (BTO)**
Products can be shipped from the factory with the specified parameters, which helps to reduce system production lead times.
- **Product control and maintenance support**
Product QR codes can be read using Yaskawa's SigmaTouch! smartphone application. This allows users to view manuals and troubleshooting information.

Ultimate lineup

In addition to Yaskawa's products, our partner companies in the MECHATROLINK Members Association (MMA) offer an extensive lineup of I/O devices and sensors, and provide all the components needed to construct equipment motion systems.

Ultimate compatibility

Mounting compatibility with the Σ-V series is ensured, and Σ-V parameters can be converted simultaneously to Σ-7 parameters using the SigmaWin+ parameter converter.

* 1 : Derating required.
* 2 : As investigated by Yaskawa.



Σ -7S

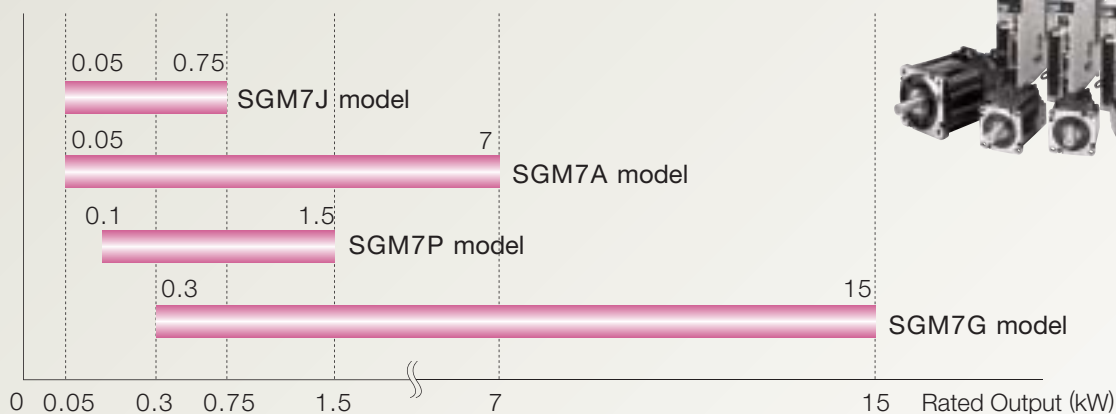
Single-axis SERVOPACK
50 W to 15 kW



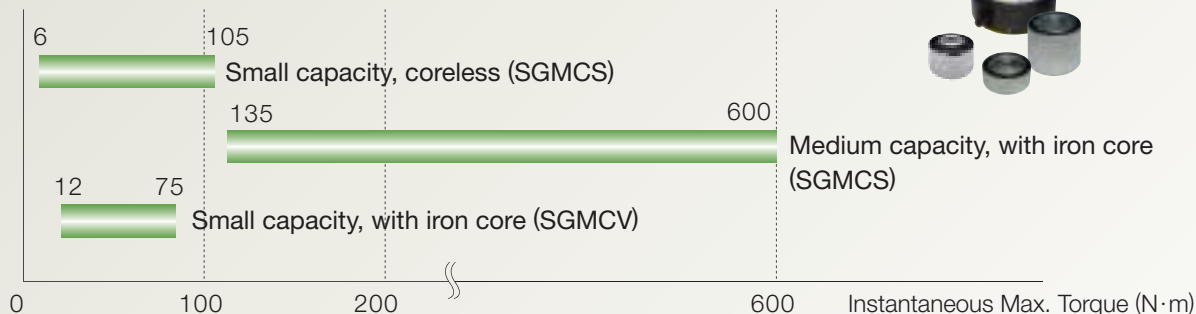
Σ -7W

Two-axis SERVOPACK
200 W to 1.8 kW

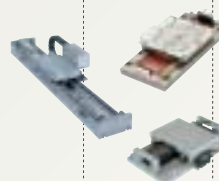
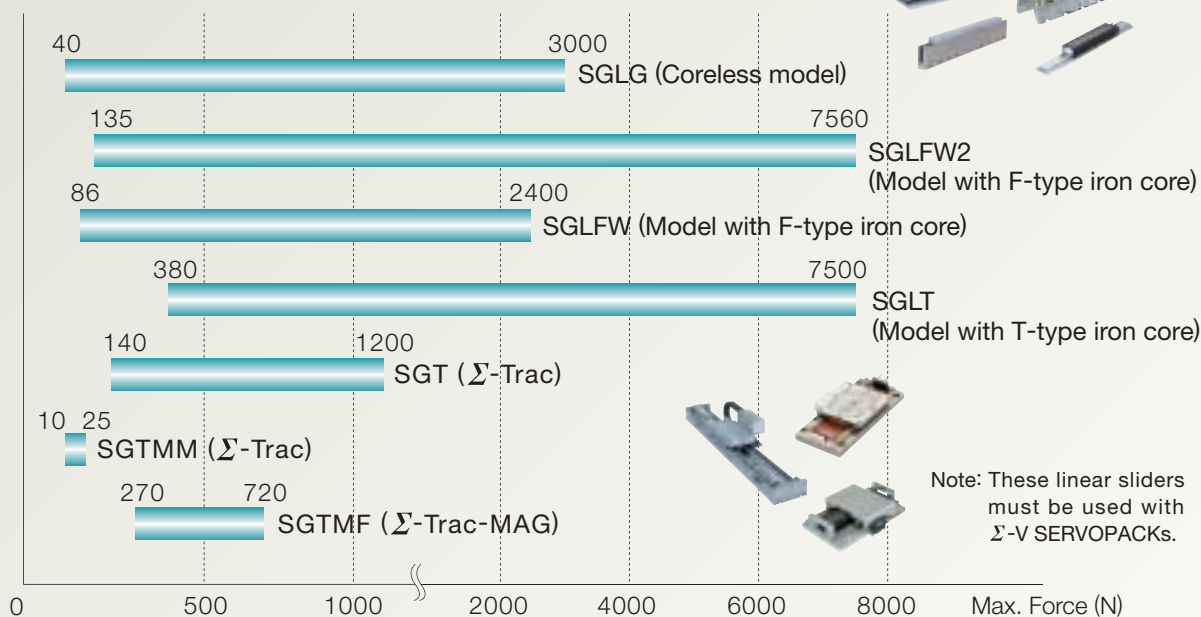
Rotary Servomotors



Direct Drive Servomotors



Linear Servomotors and Linear Sliders



Note: These linear sliders must be used with Σ -V SERVOPACKs.

SERVOPACKs

MECHATROLINK-III/-II Communications Reference



Single-axis
MECHATROLINK-III
communications
reference Σ -7S



Two-axis
MECHATROLINK-III
communications
reference Σ -7W



Single-axis
MECHATROLINK-II
communications
reference Σ -7S



Analog voltage/
pulse train reference



Command Option
Attachable Type

Real-time communication

A high transmission speed allows real-time transmission of various data required for control.

Cost savings

Multiple stations can be connected to a single MECHATROLINK transmission line, so wiring costs and time are greatly reduced. Also, only one signal connector is required on the host controller. The all-digital network eliminates the need for a converter to change speed/torque references from digital to analog and for a pulse generator to create position references.

High-precision motion control

The SERVOPACK when connected to the host controller in the MECHATROLINK-III/-II network provides not only torque, position, and speed control, but also synchronized phase control that requires advanced control technology. The control mode can be changed online so that the machine can move smoothly in complex motions with great efficiency.

Communications protocol	MECHATROLINK-III	MECHATROLINK-II
Physical layer	Ethernet	Same as RS-485
Baud rate	100 Mbps	10 Mbps
Transmission cycle	Σ -7S: 125 μ s to 4 ms, Σ -7W: 250 μ s to 4 ms	125 μ s to 4 ms
Number of transmission bytes	32 or 48 bytes/station	17 or 32 bytes/station
Number of slaves	62 max.	30 max.
Maximum transmission distance	75 m between stations	50 m total (100 m with Repeater)
Minimum distance between stations	20 cm	50 cm

Analog Voltage/Pulse Train Reference

Analog voltage reference	Speed control	Reference voltage	Max. input voltage	± 12 V (forward speed reference with positive reference)
				Factory setting
Pulse train reference	Torque control	Reference voltage	Max. input voltage	± 12 V (forward torque reference with positive reference)
			Factory setting	3 VDC at rated torque (Input gain setting can be changed.)
	Position control	Reference pulse	Type	Select one: Sign + pulse train, CW + CCW pulse train, or two-phase pulse train with 90° phase differential
			Form	For line driver, open collector
		Max. input pulse frequency*	Line driver	Sign + pulse train, CW + CCW pulse train: 4 Mpps Two-phase pulse train with 90° phase differential: 1 Mpps
			Open Collector	Sign + pulse train, CW + CCW pulse train: 200 kpps Two-phase pulse train with 90° phase differential: 200 kpps
		Clear signal (Position error clear)		For line driver, open collector

* : If the maximum reference frequency exceeds 1 Mpps, use a shielded cable for I/O signals and ground both ends of the shield. Connect the shield at the SERVOPACK to the connector shell.

Command Option Attachable Type

Compatible with all features of the new Σ -V Series

SERVOPACKs can interface with various communication formats by using attachable optional modules for commands.

Note: Be sure to use INDEXER or DeviceNet optional modules for the command option attachable type SERVOPACKs. They will not work without these modules.

See pages 39 and 40 for SERVOPACKs with option modules and details on these option modules.

◎Optimal expandability can be achieved by attaching an optional module to the SERVOPACK.

Combination of SERVOPACKs and Option Modules

✓ : Can be used × : Cannot be used

SERVOPACKs (Model Numbers)			Option Modules	
			Fully-closed Loop Control (SGDV-OFA01A)	Safety (SGDV-OSA01A)
Analog Voltage and Pulse Train Reference (Single Axis: SGD7S-□□□A00A)			✓	✓
MECHATROLINK-II Communications Reference (Single Axis: SGD7S-□□□A10A)			✓	✓
MECHATROLINK-III Communications Reference (Single Axis: SGD7S-□□□A20A)			✓	✓
MECHATROLINK-III Communications Reference (Two Axis : SGD7W-□□□A20A)			×	×
SERVOPACK & Option Module Set (Set Model Number)	SERVOPACK (Model Number)	Command Option Module (Model Number)	✓	×
SERVOPACK with INDEXER Module Mounted (SGD7S□□□AE0A□□□10□)	Command Option Attachable-type (Single-axis: SGD7S-□□□AE0A)	INDEXER (SGDV-OCA03A)		
SERVOPACK with DeviceNet Module Mounted (SGD7S□□□AE0A□□□50□)		DeviceNet*1 (SGDV-OCA04A)		
(SGD7S□□□AE0A□□□60□)		DeviceNet*2 (SGDV-OCA05A)		

*1 : Driven by SERVOPACK control power supply.
*2 : Driven by external power supply.

INDEXER Module INDEXER Module

Simple

- ◎ Interactive methods for everything from adjustment to programming are available with the setup support tool SigmaWin+ for Windows (Ver.5.72 or later).
- ◎ Simple connection to the host controller can be established with the I/O module.



Program Table Editing Window

Smart

- ◎ Special languages are not required, because required operation patterns are easily made by simply setting the data for position and speed in program tables. Optimum operation method supports your application. For positioning, up to 256 steps can be programmed.

〈Operation〉 Program tables,
Position and speed tables (station positioning),
Registration (positioning by external signals),
Serial communication

- ◎ Various functions, including external positioning, JOG table operation, homing, and programmable signal outputs are provided.

Speedy

- ◎ Reliable high-speed, high-precision positioning when combined with high-performance Σ-7S SERVOPACKs.
- ◎ Motion control is accomplished without using motion controllers.

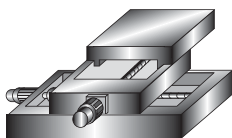
Note: The INDEXER module can be used in combination with the fully-closed module.

Specifications

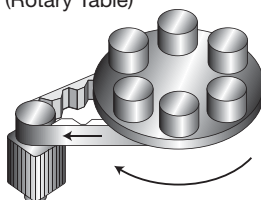
Function	Specifications
Stations for Program Table Operation	256
JOG Speed Setting	16
ZONE Signal Output	32
Serial Communication	HR: ASCII; max. axes: 16 MEMOBUS: Binary
Homing Methods	3
Equally-dividing and Indexing Positioning (Station Positioning Command)	Rotary machine and tool setting

Application Examples

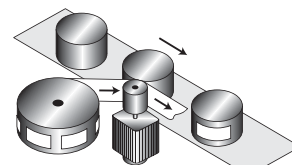
Point-to-point positioning (X-Y Table)



Station positioning (Indexing) (Rotary Table)



Feeding (Labeling Machine)



Using Commands

DeviceNet Module

- ⊙ Compliant with the communication specifications of the DeviceNet open field network.
- ⊙ Maintainability improved by the host controller using DeviceNet to monitor the operating conditions of servo drives, alarm status, and other information.
- ⊙ Full range of positioning functions featured including simple positioning, homing, continuous speed operation, positioning after continuous speed operation, and programmed operation.
- ⊙ Round micro-connectors used for the connectors.
- ⊙ Modules can be driven by two different power-supply methods: servo control power or external power.



Note: The DeviceNet module can be used in combination with the fully-closed module.

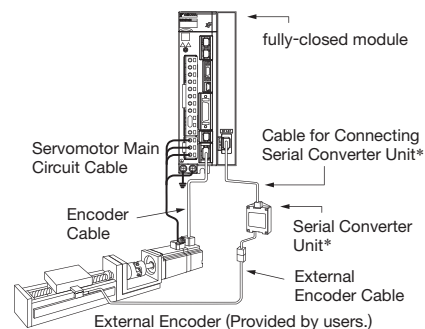
With Feedback

Fully-closed Module

- ⊙ High-precision and high-response positioning by using feedback from detector (such as an external encoder) installed on the machine.
- ⊙ High resolution with external encoders (linear scales).

*: Not required depending on the type of the external encoder.

Note: The fully-closed module can be used in combination with the INDEXER module or DeviceNet module.



With Safety Functions

Safety Module

The Safety Module complies with EN ISO13849-1 (the standards harmonized with EU Machinery Directive 2006/42/EC) and has safety functions equivalent to those stipulated in IEC61800-5-2. By using Σ -7S SERVOPACKs with the safety module, optimum safety designs can be created for mechanical systems to better meet the needs of the industry.

- ⊙ The first product for AC servo drives in Japan that has safety functions equivalent to the following ones stipulated in the international standard IEC
 - Safe Torque Off (STO), Safe Stop 1 (SS1), Safe Stop 2 (SS2), Safely Limited Speed (SLS)
- ⊙ Two safety functions (A and B) are provided and stopping functions can be allocated individually to these safety functions.
- ⊙ With the attachable Safety Modules for SERVOPACKs, system configurations are simplified and compact.



With Functions Defined by IEC61800-5-2

By using the Hard Wire Base Block function (HWBB) of SERVOPACKs, the following four safety functions can be achieved.

Compliance with Safety Standards

Safety Standards	Applicable Standards	Products		Safety Function	Description	Products	
		SERVOPACK	SERVOPACK + Safety Module			SERVOPACK	SERVOPACK + Safety Module
Safety of Machinery	EN ISO13849-1:2008			Safe Base Block Function (SBB function)	This safety function is equivalent to the STO function. It shuts OFF the power supply to the motor.	○	○
	EN 954-1	○	○	Safe Base Block with Delay Function (SBB-D function)	This safety function is equivalent to the SS1 function. It shuts OFF the power supply to the motor after monitoring the deceleration of the motor for the specified length of time.	—	○
	IC 60204-1			Safe Position Monitor with Delay Function (SPM-D function)	This safety function is equivalent to the SS2 function. It monitors the deceleration of the motor for the specified length of time and the position after the motor has stopped.	—	○
Functional Safety	IEC 61508 Series			Safely Limit Speed with Delay Function (SLS-D function)	This safety function is equivalent to the SLS function. It monitors the deceleration of the motor for the specified length of time and the motor speed to make sure it is within the allowable range.	—	○
	IEC 62061	○	○				
	IEC 61800-5-2						
EMC	IEC 61326-3-1	○	○				

Rotary Servomotors



SGM7J model (Medium inertia, high speed)

Rated output	Rated speed / Max. speed (min ⁻¹)
50 W to 750 W	3000/6000

- Instantaneous peak torque (350% of rated torque)
- Protective structure: IP67
- Mounted high-resolution serial encoder: 24 bits
- Cable installation direction is possible both of the toward load, and away from load.



SGM7A model (Low inertia, high speed)

50 W to 7 kW	3000/6000
--------------	-----------

- Instantaneous peak torque (350% of rated torque) *
- Protective structure: IP67 (IP22 for 7.0 kW motor)
- Mounted high-resolution serial encoder: 24 bits
- Cable installation direction is possible both toward load and away from load.*

*: For motors of less than 1 kW



SGM7P model (Medium inertia, flat type)

100 W to 1.5 kW	3000/6000
-----------------	-----------

- Flat type
- Mounted high-resolution serial encoder: 24 bits



SGM7G model (Medium inertia, large torque)

300 W to 15 kW	1500/3000
----------------	-----------

- Protective structure: IP67
- Mounted high-resolution serial encoder: 24 bits

Direct Drive Servomotors



Small capacity, coreless (SGMCS)

Rated torque / Max. torque (N · m)	Rated speed / Max. speed (min ⁻¹)	Diameter dimensions (mm)
2 to 35 / 6 to 105	150 to 200 / 250 to 500	φ135 to φ290

- Directly couples to a load without any mechanical transmission such as a gear
- Powerful and smooth running throughout all the low to high speed ranges
- High-resolution, 20-bit encoder for highly precise indexing
- Easy wiring and piping enabled by the hollow structure



Medium capacity, with iron core (SGMCS)

45 to 200 / 135 to 600	150 / 250 to 300	φ280 to φ360
------------------------	------------------	--------------

- Directly couples to a load without any mechanical transmission such as a gear
- Powerful and smooth running throughout all the low to high speed ranges
- High-resolution, 20-bit encoder for highly precise indexing
- Easy wiring and piping enabled by the hollow structure



Small capacity, with iron core (SGMVC)

4 to 25 / 12 to 75	300 / 500 to 600	φ135 to φ175
--------------------	------------------	--------------

- Compact design using iron core (slot-winding structure)
- High-speed and high-frequency positioning (Max. speed increased by 20%)
- High-resolution, 22-bit encoder for highly precise indexing

Linear Servomotors



SGLG (Coreless model)

- ⊙ Direct-feed mechanism for high-speed and high-precision positioning
- ⊙ Lack of magnetic attraction force helps extend the life of linear motion guides and minimizes noise.
- ⊙ Zero cogging for minimal force ripple

Type	Max. speed (m/s)	Rated force (N)	Peak force (N)
Standard	4 to 5	12.5 to 750	40 to 3000
High force	4.2	57 to 255	230 to 1080



SGLFW2 (Model with F-type iron core)

- ⊙ Direct-feed mechanism for high-speed and high-precision positioning
- ⊙ The large magnetic attraction force between the moving and stationary members can be used to effectively increase the rigidity by preloading the linear guide.
- ⊙ The magnetic preloading on linear guide can help increase the system's frequency response, improving its damping and settling performances.

Standard	2.5 to 5	45 to 2520	135 to 7560
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SGLTW (Model with T-type iron core)

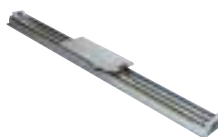
- ⊙ Direct-feed mechanism for high-speed and high-precision positioning
- ⊙ Yaskawa's unique construction principles of the SGLTW linear motors negate the effects of the magnetic attraction force between the relative motor members.
- ⊙ Lack of magnetic attraction force helps extend the life of linear motion guides and minimizes noise.
- ⊙ Very little cogging

Standard	2.5 to 5	130 to 2000	380 to 7500
High force	3.1 to 4.8	300 to 900	600 to 1800

AC Servo Drive Σ -V Series

Note: These linear sliders must be used with Σ -V SERVOPACKs.

Linear Sliders



SGT (Σ -Trac)

- ⊙ For long strokes and high-speed, high-precision positioning (Repetitive positioning accuracy less than ± 1.0 m)
- ⊙ Several tables can be mounted on one magnetic way, and each table can be driven independently.
- ⊙ Standard and high-precision models are available.

Rated force (N)	Max. force (N)	Effective stroke (mm)
47 to 560	140 to 1200	70 to 1950



SGTMM (Σ -Trac- μ)

- ⊙ Ultra-flat profile reduces floor space requirements.
- ⊙ For applications requiring short strokes
- ⊙ Vibration-free transmission device enables high-precision positioning with a repetitive positioning accuracy of ± 0.5 m max.
- ⊙ Locations of armature coils on the stator reduce the effects of heat on the table or workpiece.

3.5 to 7	10 to 25	10 to 65
----------	----------	----------



SGTMF (Σ -Trac-MAG)

- ⊙ Optimum drive for high-acceleration and high-tact operations because of its lightweight moving member.
- ⊙ For short strokes (65 mm to 185 mm)
- ⊙ Cooling units (pipes, etc.) for forced-air or liquid cooling systems can be placed on the fixed side.
- ⊙ Linear scale options: Incremental or absolute.
- ⊙ Improved stroke efficiency*

90 to 200	270 to 720	65 to 185
-----------	------------	-----------

*: Ratio of effective stroke to the total length of drive system

AC Servo Drives

Large-capacity Σ -V Series

Announcing the debut of a large-capacity servo drive series which follows in the footsteps of the series with its superlative performance, simple startup, and outstanding expandability. Considerable energy savings enabled by using a separate converter.



[Catalog No. KAEPS8000086]

Combinations

Combinations	200 V			400 V					
	Rated output	22 kW	30 kW	37 kW	22 kW	30 kW	37 kW	45 kW	55 kW
Servomotor SGMV-	2BA	3ZA	3GA	2BD	3ZD	3GD	4ED	5ED	
SERVOPACK SGDV-	121H	161H	201H	750J		101J	131J		
Converter SGDV-COA	2BAA	3GAA		3ZDA		5EDA			

SGMV Servomotor



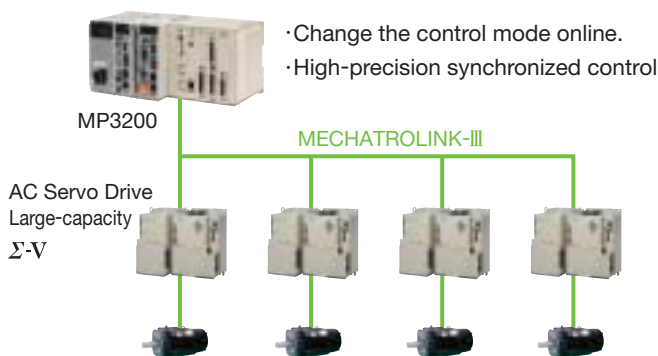
SGDV SERVOPACK



*: For detail, contact your Yaskawa representative.

Upgraded by combining a Machine Controller

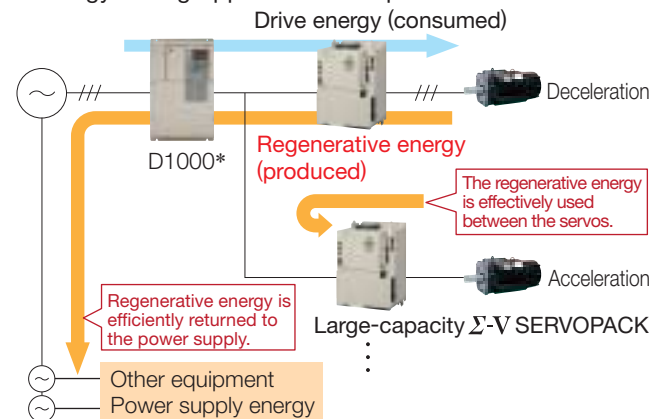
- High torque can be generated with synchronized control of multiple axes.
- The high-precision synchronized control of multiple axes (roller, takeup, etc.) increases quality.
- Seamless switching between position control and torque control improves machine takt time.



Easily build an energy-saving system

By separating the converter, optimal support can be provided for a power regeneration converter or common converter. This paves the way for broad-based energy savings in the systems with, for instance, the regeneration of the energy produced during motor deceleration at the power supply side.

Energy-saving Application Example



*: D1000 is the sine-wave PWM converter able to regenerate power. In combination with an AC drive, realizes high power factor operation, and entirely eliminates problems of power source harmonics.

Application Examples

Machine Tools

Helps meet speed and capacity demands of feed and spindle motors in high-speed, heavy-duty machining applications.

Rotary Cutters

Outstanding acceleration/deceleration torque for high-speed tracking

Transfer Presses

The large-capacity servo drives bring better levels of performance to today's large, high-speed machinery, improving operations with digitalization and making them quieter than ever.

Servo Presses

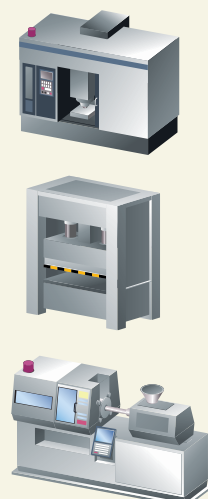
To attain cleaner and more efficient operation, servo presses are now being driven electrically instead of hydraulically. Energy savings in servo presses are also achieved thanks to the use of power regeneration converters.

Injection Molding Systems

High-resolution encoders for higher levels of precision in injection control.

Wire Saws

With a greater cutting force due to the high torque, saws can now cut hard materials. When combined with the MP series, it is possible to synchronize roller shafts, wind-up shafts and other such parts to a high level of precision.



AC Servo Drives

Σ -V mini Series

These ultra-compact Servo Drives retain all the leading performance, functionality and ease of use of the Σ -V series in a palm-size package.

Σ -V mini Servo Drives operate with DC power input (main circuit power supply 24 VDC/ 48 VDC; control power supply 24 VDC), which makes them well-suited for clean room robots and clean AGVs*1 and other battery-driven transport systems.

[Catalog No. KAEPS80000042]

Features

- ◎ Helps reduce the overall size of control boards and machinery.
Servomotor dimensions (See table on right)
SERVOPACK dimensions: 100*2 (H) × 30 (W) × 80 (D) mm
- ◎ Maximum motor speed: 6000 min⁻¹; frequency response: 1.6 kHz
- ◎ Model tracking control, anti-vibration control, and friction compensation functions

*1: Automated Guided Vehicle.

*2: Size: 116 mm including the mounting base



SERVOPACK Model SGDV-□□□E
Servomotor Model SGMMV

Servomotor Specifications

Model SGMMV-	Rated Output (W)	Rated Motor Speed/Max. Motor Speed (min ⁻¹)	Square Flange Dimensions (mm)	Total Length (mm)
B3E	3.3	3000/6000	15	58
B5E	5.5			64
B9E	11			98
A1E	10	3000/6000	25	70
A2E	20			80
A3E	30			90

Σ -V-MD Series A01/A02

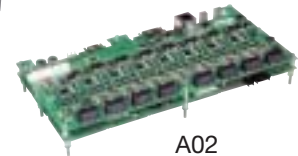
These board-type SERVOPACKs enable multi-axis control of Σ -V mini servomotors.

The machine size and wiring can be reduced by incorporating Σ -V-MD SERVOPACKs into the moving parts of chip mounters and other equipment.

Two types are available: the A01 that enables easy expansion of the number of axes (4, 8, or 12 axes), and the 8-axis integrated type A02.



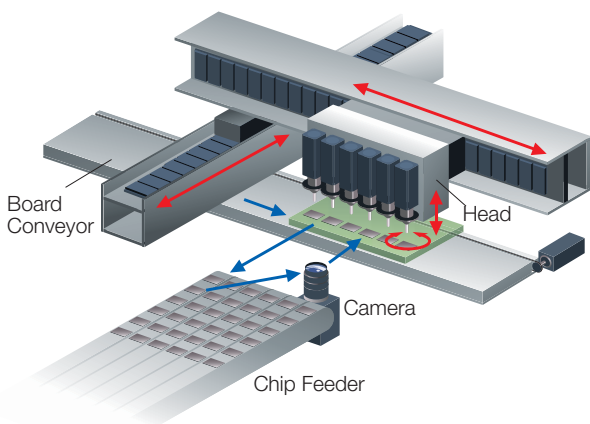
A01(12 axes)



A02

SERVOPACK Model SGDV-MDA□□E□M3A
Servomotor Model SGMMV

Application



SERVOPACK Specifications

Model	SGDV-MD A01	SGDV-MD A02
Number of Axes	4, 8, or 12	8
Interface	MECHATROLINK-III (transmission cycle: 250 μ s to 4 ms)	
Input Power Supply	Main circuit: 24 VDC/ 48 VDC Control circuit: 24 VDC	
Applicable Motor	SGMMV: 3.3 W to 30 W	
Dimensions (mm)	4 axes: 170×115×46 8 axes: 170×115×61 12 axes: 170×115×76	238×120×29

The Σ -S series was developed to be compact, easy to use, and available at a low price, which makes it an ideal product for applications that do not conventionally use Servo Drives.

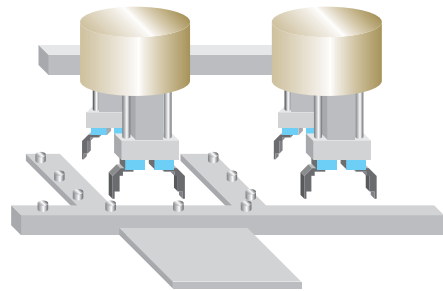


Potential applications of the Σ -S Series in pneumatic equipment

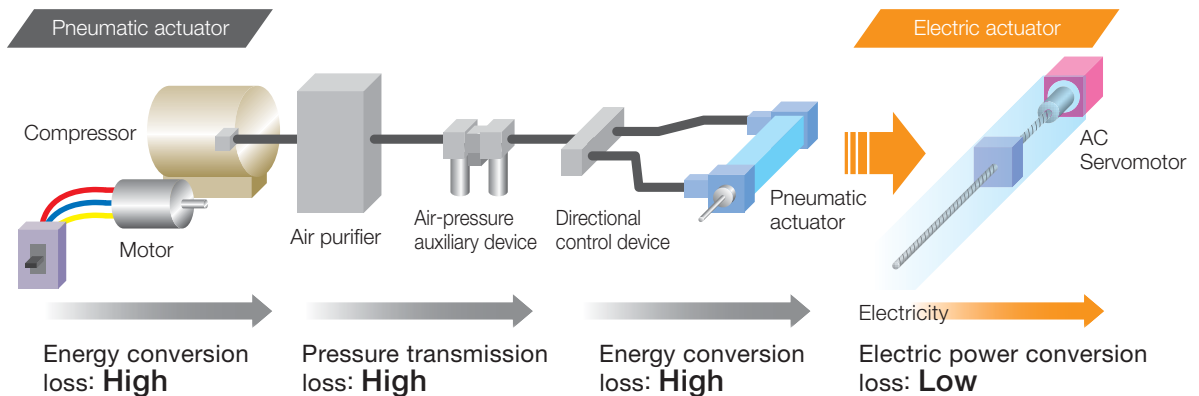
Advantages of the Σ -S Series

- ⊙ Impressive reference tracking capability and reductions in takt time
- ⊙ Easy adjustment of chucking holding power using torque limit
- ⊙ Energy savings achieved and running costs reduced
- ⊙ Multi-point positioning enabled (expanded range of applications)
- ⊙ Low-level operating noise

■ Suggestion 1: Electric chuck



■ Suggestion 2: Electric actuator



Features

- 1. Hold-in-place operation**
Workpiece can be held in place at any torque.
- 2. Multi-point positioning**
Positions can be set according to the size of the workpiece.
- 3. Program tables**
Programming can be simplified by setting numerical values in the tables provided.
- 4. ZONE output**
Users can recognize that the actuator is operating within the specified range.
- 5. Acceleration/deceleration control**
Impacts on the workpiece can be reduced.

SERVOPACK Specifications

- Power supply: 24 VDC (Common input for main circuit and control circuit)
- Reference interfaces (2 types):
 - ① Contact commands (program table method)
 - ② Pulse train references
- Dimensions: 80 mm × 123 mm

Servomotor Specifications

Model SGMSL-	Rated Output (W)	Rated Motor Speed/Max. Motor Speed (min ⁻¹)	Encoder	Square Flange Dimensions (mm)	Total Length (mm)
A3	30	3000/6000	Incremental, 10 bits	25	85
A5	50	3000/3000		40	92

SigmaJunmaSize+ is a Web-based software application used to easily select the optimal YASKAWA servo drives for your machinery. SigmaJunmaSize+ is available from our website at <http://www.e-mechatronics.com>.

Features

1. A wide range of the latest information.
2. A wizard system with a conversational mode to select optimal servo drives.
3. View SigmaJunmaSize+ in your browser wherever internet access is available.
(Enhanced security measures with cryptographics)
4. Available to view and reuse previously input and stored data.

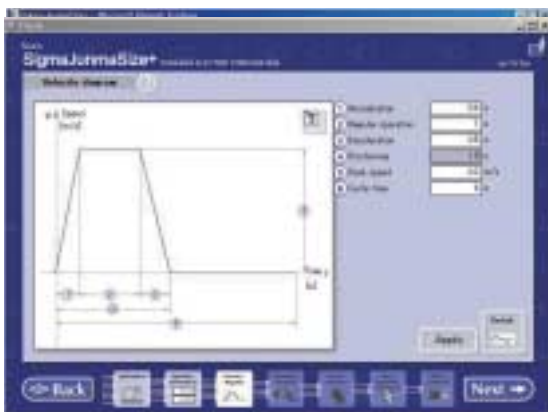
Servo Selection Screen



Application Selection Window



Machine Information Input Window



Velocity Diagram Input Window



Operating Condition Selection Window



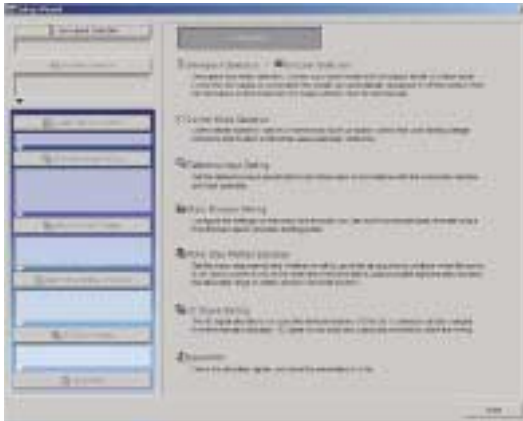
Motor Selection Window



SERVOPACK Selection Window

SigmaWin+ is a Windows-based engineering PC tool with various monitoring functions to make quick and easy adjustments to the settings for Yaskawa servo drives. SigmaWin+ supports a wide-range of operations from setting parameters to trial operation.

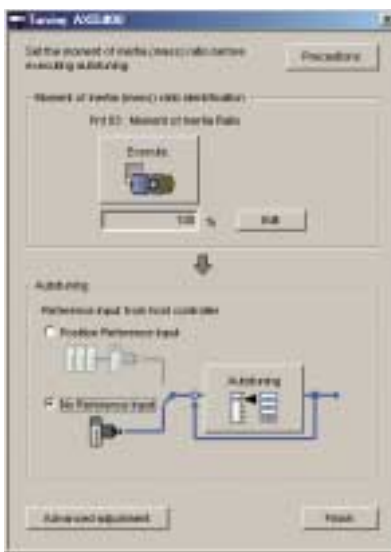
Setup using Wizard



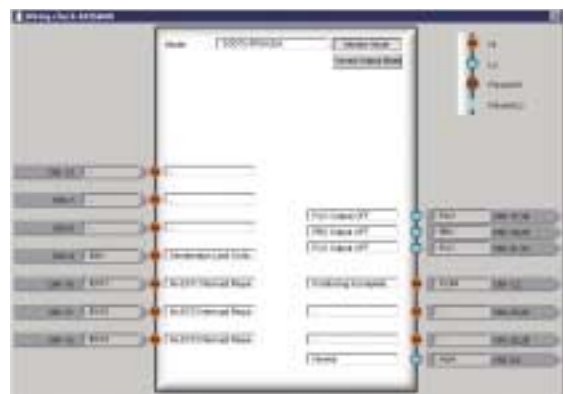
Parameter Edit (at online)



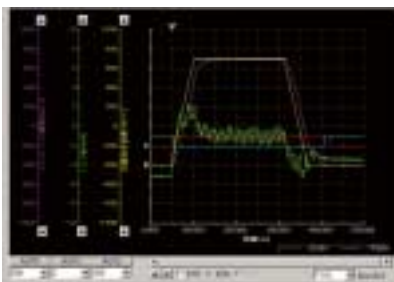
Tuning



Check Wiring



SERVOPACK internal data can be displayed in the monitor just like an oscilloscope.



Calculating Moment of Inertia and Measuring Vibration Frequency



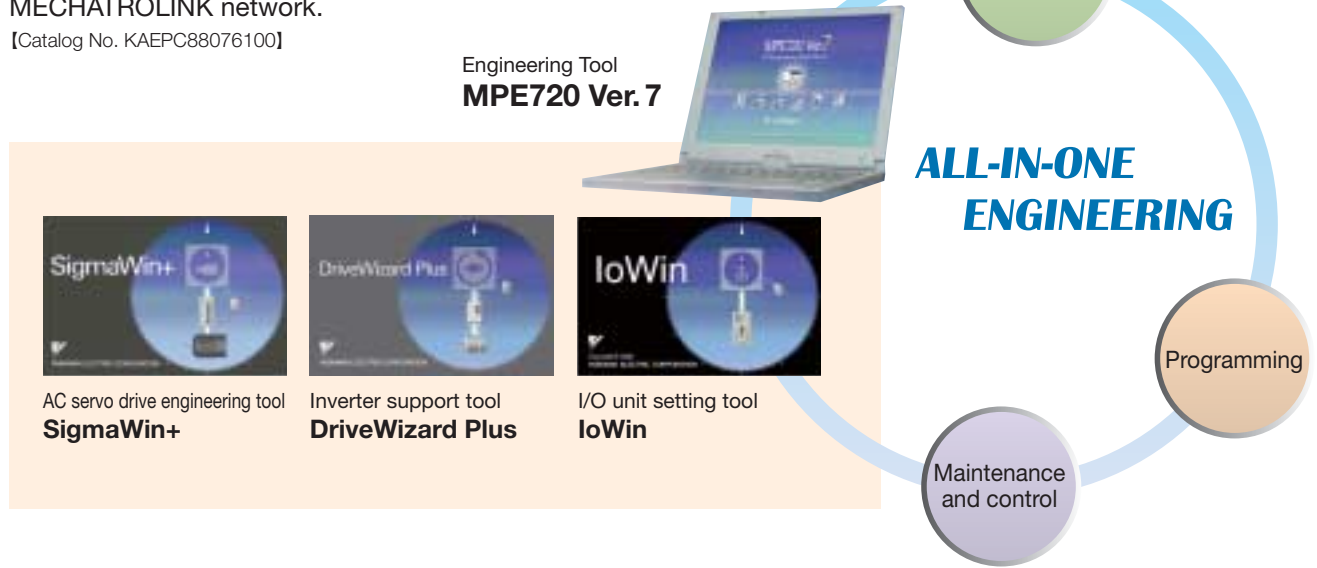
Alarm Display and Alarm Diagnostic Function



A one-stop solution for strengthening the integration environment and system design!

The MPE720 Ver.7 engineering tool integrates the engineering environments for servo, inverter, and I/O devices into a single software package. This enables all-in-one engineering from setup to maintenance of drive units connected to an MP3000 series machine controller via the MECHATROLINK network.

[Catalog No. KAEP88076100]



Execution of parameter settings and monitoring enabled for multiple axes simultaneously

The parameter settings and monitor windows of the drive units can be executed for a multiple number of axes simultaneously. Establishing the settings for the entire system is a simple job, and comparing the monitors on an axis-by-axis basis is also easy.

MC-Configurator

Axis	Address	Current	Speed	Position	Control Mode
Axis 1	0000	0000.0	0000.0	0000.0	0
Axis 2	0001	0000.0	0000.0	0000.0	0
Axis 3	0002	0000.0	0000.0	0000.0	0
Axis 4	0003	0000.0	0000.0	0000.0	0

Simultaneous settings for more than one axis e.g., virtual axis, axis 1, and axis 2

Single display for all settings and monitor windows

Single glance to check status of operations between multiple axes in monitor windows.

Select control mode to view **only parameters in use**

Adjustment work supported by a variety of adjustment functions

A wide variety of functions required for servo adjustments are provided, and these functions support the adjustment work.



Efficiency improved by choosing the programming method that works best for the user

Ladder programming



- A new user interface (UI) enables operations to be undertaken easily by anybody.
- All types of control including position, speed, torque, and phase control are supported.
- Arithmetic expressions in the ladders have been made even simpler by boosting the EXPRESSION instructions.

This system is recommended for:

- Users who are using a PLC

Motion programming



- Positioning and interpolation instructions can be described using single instructions.
- Programs can be very easily edited using expressions in a text format.
- New variable programming can provide PC-like programming.

This system is recommended for:

- Users of PC-based devices and in-house fabricated boards (C language, BASIC language)

Advantages of MECHATROLINK

MECHATROLINK was created based on technology developed by Yaskawa as a specialized network for motion control, and has been made available as an open field network.

Yaskawa helped found the MECHATROLINK Members Association (MMA) in 2003 as a member of the MMA Board Committee. Yaskawa has continued to work with the MMA to promote the use of MECHATROLINK.

MECHATROLINK acquired certification for IEC61784 and IEC61158 international standards from the IEC in August 2014.

IEC61784 and IEC61158 are international standards for specifying industrial computer network protocols. It is expected that the adoption of MECHATROLINK as a standard by the IEC will help promote the worldwide use of MECHATROLINK and contributing greatly to improving the productivity of manufacturing sites around the world.

MECHATROLINK Members Association (MMA)

MMA was established to promote the MECHATROLINK open field network for high-speed motion. The MMA consists of members that develop compatible products and the users of those products. There are five membership ranks: Board Members, Executive Members, Regular Members, User Members, and Registered Members.

There are six Board Member companies in the MMA: M-System Co., Ltd., Oriental Motor Co., Ltd., Digital Electronics Corporation, Yaskawa Electric Corporation, Yaskawa Information Systems Corporation, and Yokogawa Electric Corporation. These companies are responsible for the management of the MMA. The MMA provides global support to its members with branch offices in Germany, the U.S., South Korea, China, and Taiwan. These offices offer technical support and conduct promotional activities tailored to the local conditions in each country.

MECHATROLINK Members Association website: <http://www.mechatrolink.org>

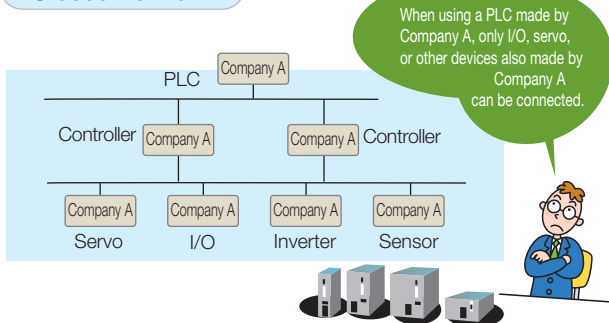
Open Wide variety of available products

The most important point in freely constructing systems is a wide variety of available products.

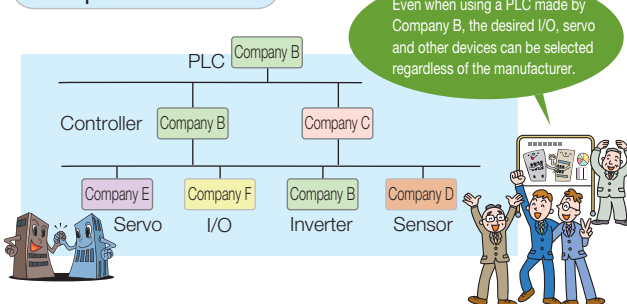
MECHATROLINK adopts open and standardized communication specifications to enable connections between equipment made by different device manufacturers. Customers can arbitrarily select products made by different manufacturers based on criteria such as design, functionality, and cost. By ensuring that their products comply with applicable standards, device manufacturers can also access a larger market.

Difference between an open and closed network

Closed network



Open network



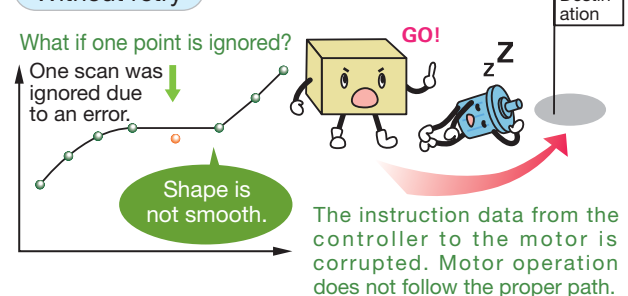
Reliable Guaranteed high communications performance

The most important point in communications is to reliably transmit accurate data.

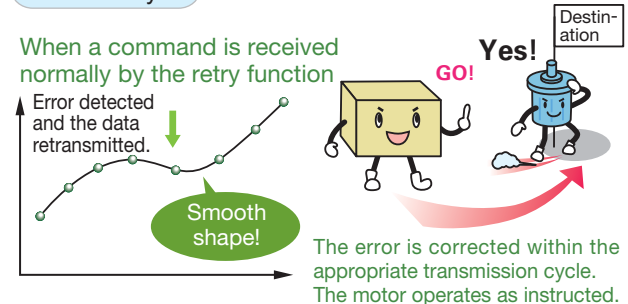
When transmitting digital data in particular, an error in transmitting even 1 bit can corrupt the entire communications data. MECHATROLINK has a retry function that automatically detects command and response communication errors and retransmits the data. Retry is performed within the same transmission cycle, so there is no loss of synchronicity. New industrial connectors and cables are also used, and anti-vibration and noise measures have been enhanced.

Retry function

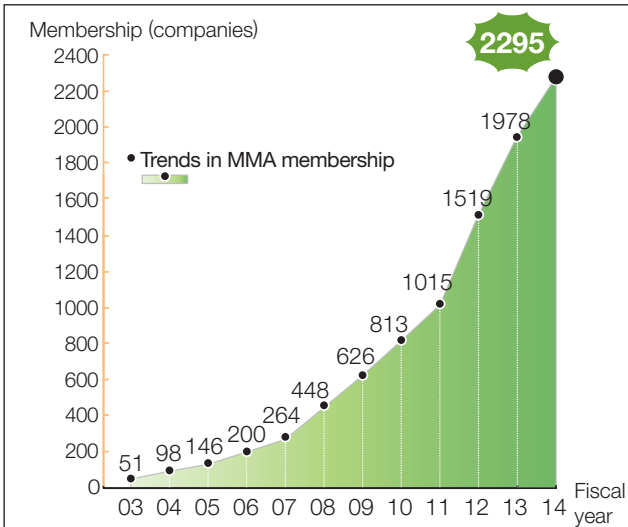
Without retry



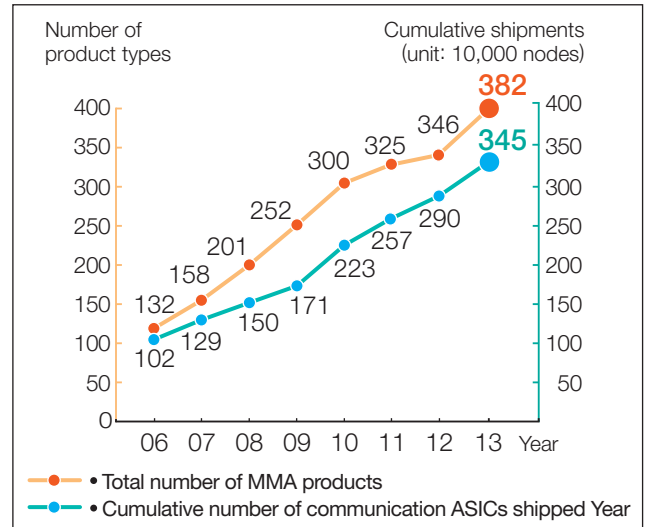
With retry



Expanding MECHATROLINK family



Increasing numbers of product types and nodes



Simple

Low cost, easy maintenance, and expandability

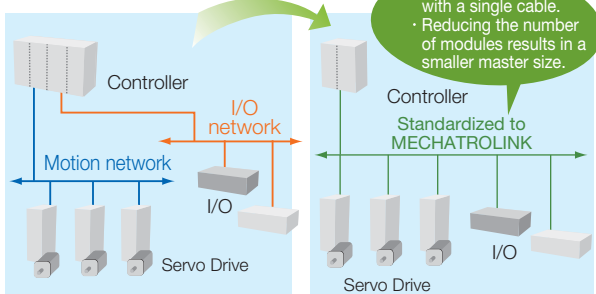
Speedy

Simultaneous control of multiple axes and high-capacity message communications

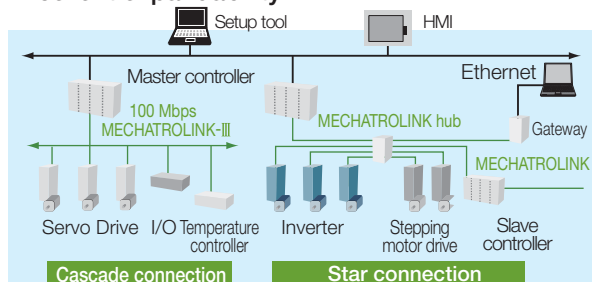
A key point for constructing a low-cost system is to reduce the wiring.

MECHATROLINK can connect a master device with each slave device using a single cable. MECHATROLINK also enables a reduction in the number of master device modules and cables by integrating the motion control network and I/O network into a single wiring system. This reduces costs and facilitates maintenance and system expansion.

Reduction of master device size



Excellent expandability

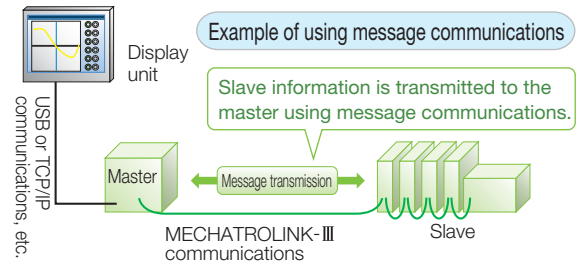


Faster network speeds are required to enhance productivity and increase system scales.

MECHATROLINK-III has a communication speed of 100 Mbps and a transmission cycle of $31.25 \mu s$, which is the best in the industry. This shortens the cyclic communications cycle and enables communications with more slaves per unit time to achieve simultaneous control of up to 62 axes. High-capacity message communication is also possible.

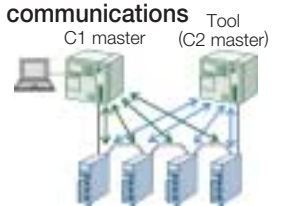
Promotion of message communication

The MMA aims to popularize the use of message communications to improve the ease of maintenance. To achieve this, the MMA actively encourages members to use various compatible product setup tools that comply with MECHATROLINK-III.



MECHATROLINK-III message communications

The C1 master supports message communications. The C2 master can also control the parameters, alarm history, and other data of each slave as a tool master.



M2M Communication Adapter

Yaskawa Information Systems Corporation

The M2M communication adapter offers one-stop solution for remote control and monitoring as well as management of devices via mobile communications networks. The environment required for remote monitoring is offered as a set.

MMLink-3G, Global Communication Adapter

Seamless remote monitoring and control via 2G and 3G networks.

Features

- 1 Supports connection to 2G and 3G networks.
- 2 Data transfer possible over wide areas
- 3 Equipped with GPS navigation system
- 4 Supports various communications protocols
- 5 Easy initial settings

**MMLink-G, Global Communication Adapter**

Supports connections to GSM networks, the optimal solution for overseas remote monitoring.

Features

- 1 Supports connection to GSM networks that is a major network used overseas.
- 2 Can be used with multi-operator systems (e.g. more than 100 countries).
- 3 Supports LAN and serial interface.

**MMLink-1X, Adapter for CDMA 1X Packet Communications**

Remote operation and control with CDMA 1X

Features

- 1 Supports RS-232C serial and LAN interface and expands the range of applications.
- 2 Easy connection to a network by simply turning the power on (Automatic OTA)
- 3 Easy initial settings via browser.
- 4 Earthquake early warning notifications via networks to minimize damage and injuries.



M2M Cloud Service

MMCloud, Cloud Service for Product Life Cycle Management Support

This is a cloud service that collects and manages the operational information of products and related information in order to support the management of the life cycle of products.

Features

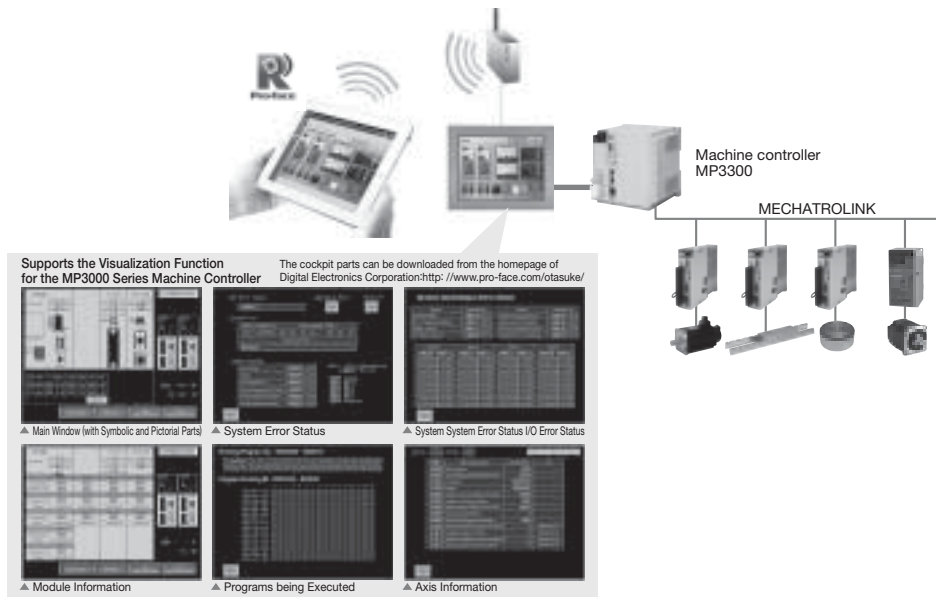
- 1 **Supports management of product life cycle**
Product information that is managed separately can be consolidated and used for work in various processes, including planning, development, sales, inspection, and maintenance.
- 2 **Enables ideal monitoring of equipment located in different locations around the world**
Global-scale monitoring of equipment is made possible by using internet connections and wireless communication networks for mobile phones. User environment is also globalized. Local times of different countries where equipment are used can be displayed and languages can be selected on the screen.
- 3 **Displays collected information in real time**
Collected data, status of customer equipment, information collected via sensors, and GPS information is displayed in graphs and maps so that equipment conditions can be checked in real time. This service can be used to monitor operation status and mobile equipment.
- 4 **Can start with a small-scale operation**
Customers can first use this service with a small investment and a short leadtime by using the standard cloud service. The monitoring scale can be increased in line with the expansion of the customer's business operations.



Website <http://www.ysknet.co.jp/>

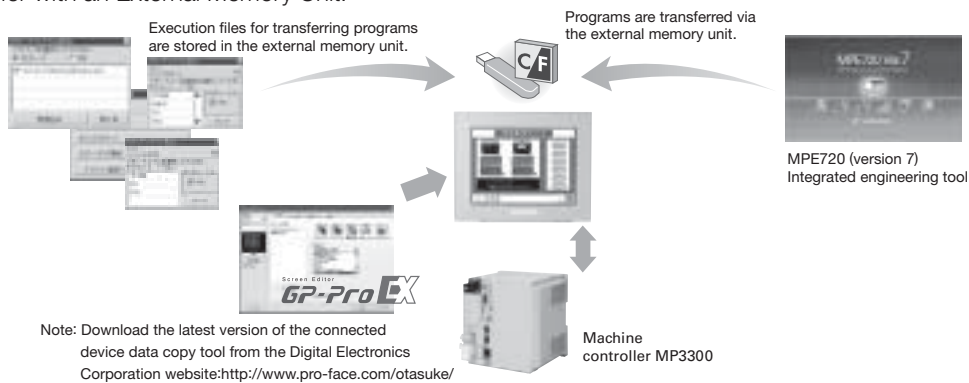
Pro-face GP4000 Series

The GP4000 series display features a touch screen that can be connected directly, without using any application programs, to control devices, such as controllers, servo drives, and AC drives. Current conditions of these devices is displayed on the screen so that they can be set up, adjusted, and maintained on site. Users can easily check operational status, edit registers, identify errors, and update or backup application programs without using a computer. The GP4000 series supports Pro-face Remote HMI, the remote monitoring software for mobile devices. This allows users to view product information on tablets and smartphones anytime, anywhere.

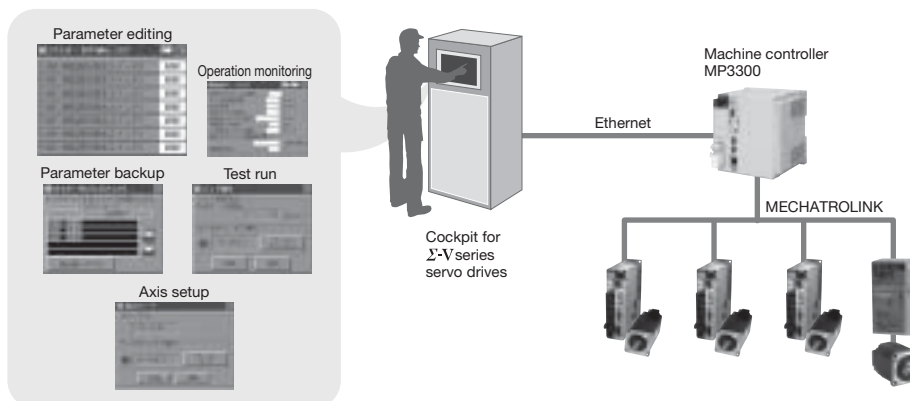


Engineering Support Function

● Program Transfer with an External Memory Unit!



● Adjustment and Maintenance of Servo Drives and Inverters Right on the Touch Panel!



IP Core

Tokyo Electron Device Limited

MECHATROLINK-III Master/Slave IP Core

Model: Master: TIP-ML3MST-PROJ
Slave: TIP-ML3SLV-PROJ

This original IP core for FPGAs manufactured by Xilinx, Inc. significantly reduces the number of components on a board. This reduces development costs and time required for development can be significantly reduced.

- Supports MECHATROLINK-III master and slave functions.
- Delivers a high-speed host interface synchronized with a 66 MHz clock (max.).
- Enables flexible system configuration by using FPGA fabrics.

Website <http://ppg.teldevice.co.jp>

I/O Module

M-System Co., Ltd.

MECHATROLINK-I- and -II-compliant Remote I/O

Model: R7K4FML, R7ML series

- Can handle 16 to 32 discrete I/O signals, and 4 analog input and 2 analog output signals.
- Analog and discrete signals can be mixed.
- 3M screw terminals (2-piece configuration) are used for power supply and I/O terminal blocks. Saves space because relay terminal is not required.
- Channels are insulated.



R7ML Base Module

MECHATROLINK-III-compliant Remote I/O

Model: R7G4FML3, R7G4HML3, R7K4FML3

- Can handle 16 to 32 discrete I/O signals and 4 analog output signals (max.).
- Equipped with discrete I/O, DC input and output, temperature input, rotary encoder input
- High-speed A/D conversion unit (conversion speed: 200μs) available.
- High-speed load cell input unit to be released around March 2015.
- 3M screw terminals (2-piece configuration) are used for power supply and I/O terminal blocks. Saves space because relay terminal is not required.
- Channels are insulated.



R7G4FML3-6

Master Module

HLS (High-speed Link System) Master Module

Model: MPHLS-01

- Master module that can be used with MP2200, MP2300, and MP3300 series machine controllers.
Note: When using this module with a MP3200 machine controller, attach a MP2000 base unit (optional) to the machine controller first and install this module in the base unit.
- Wiring for discrete I/Os and analog I/Os can be reduced with M-System's rich product lineup of remote I/O modules (R7HL and R7F4DH series) that can be connected to the HLS master module.

Website <http://www.m-system.co.jp/>



A-net/A-Link Unit

ALGO System Co., Ltd.

A-net/A-Link Master Unit Module

Model: MPANL00-0

This A-net/A-Link master unit module can be directly attached to the MP3200 Controller. The resulting system needs less wiring and conforms to SEMI E54.17.

Features

- 1 Two H8S units by Renesas Technology Corp. can be added maximum.
- 2 Max. 4032 points can be scanned in 0.95 ms (at 12 Mbps).
Note: The case using two A-Link channels (1 channel: 2016 points/system, 0.95 ms at 12 Mbps).
- 3 Shared memory of 512 Bytes (response speed: 2.36 ms) with A-net.
- 4 Self-diagnostic function.

Website <http://www.algosystem.co.jp/>



WAGO-I/O-SYSTEM 750 Series

Model No. 750-346: Compatible with the 260IF-01 DeviceNet Communication Module

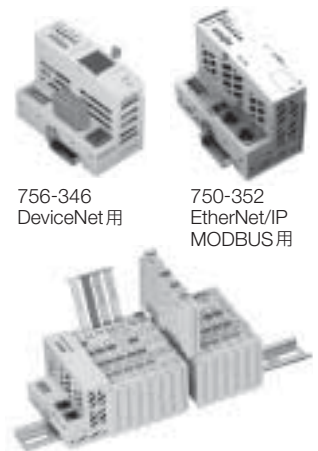
Model No. 750-352: Compatible with the 263IF-01 EtherNet/IP Communication Module and 218-01/02 Ethernet Communication Module.

WAGO-I/O-SYSTEM 750 series I/Os are module-type remote I/Os. Nodes can be constructed by combining a communication unit (bus coupler) with a function module of your choice. Various communication units that are compatible with a wide range of open fieldbus are available.

Yaskawa Electric's MP series machine controllers can be connected via DeviceNet, Ethernet/IP, and Modbus-TCP Ethernet networks. Instruction manuals contain information on easy ways to connect the machine controller.

Function modules are available for a wide range of I/O signal types: digital I/O (2 to 16 channels), analog I/O (± 10 V, 0 to 20 mA, thermocouples), serial communications, counter I/O, etc.

Website <http://www.wago.co.jp/io>



Example of Node Configuration
(Bus coupler + Module)

AnyWire DB Master Module

Model: AFMP-01

The AnyWire DB master module can be connected directly to the machine controllers in the MP3000 series. This module is equipped with the master functions of the AnyWire DB A40 series and is compatible with a variety of I/O terminals in the same series.

Features

- 1 The AnyWire system saves space and reduce costs because fewer cables are reduced and low-cost, general-purpose cables can be used. Time required for wiring is also reduced.
- 2 Highly efficient transmission is achieved with the Dual-Bus system. Analog inputs/outputs (128 words max) can be connected without adversely affecting the digital input/output signal transmission (512 points max).
- 3 General-purpose robot cables, cableveyor, slip rings can be used with the product. This is an ideal module to reduce wiring at drive sections

CC-Link interface board

Models: AFMP-02-C, AFMP-02-CA

These slave interface boards connect the machine controllers in the MP3000 series to the CC-Link master. One CC-Link master can be connected to a maximum of 16 machine controllers in the MP3000 series through the CC-link when the PLC in the Q series (manufactured by Mitsubishi Electric Corporation) is used as a master station. Costs can be reduced and space saved by using the AFMP-02-CA board equipped with wire-saving DB ports.

MECHATROLINK bit-type distributed I/O terminal

Model: AB023-M1

The MECHATROLINK bit-type distributed I/O terminal reduces the wiring required for drive systems that use MECHATROLINK-I and -II. The introduction of this I/O terminal into a MECHATROLINK open-network system significantly reduces total costs and increases system reliability because the MECHATROLINK I/O terminal can be used with any transmission media, such as robot cables and slip rings.

The AnyWire Bitty series for I/O terminals from AnyWire can be connected to this distributed I/O terminal to increase the flexibility in transmissions by supporting the connection of cables for signals from sensors and actuators in the system. It is possible to increase the number of I/O points to 432 by connecting I/Os with a bus that reduces the amount of wiring required.

Website <http://www.anywire.jp>



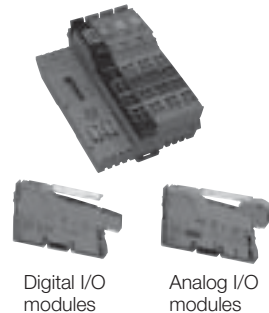
Modular I/O Systems

Phoenix Contact GmbH & Co. KG

MECHATROLINK Inline Bus Coupler

Model: IL MIII BK DI8 DO4-PAC

- The Inline bus coupler, model IL MIII BK DI8 DO4-PAC, has eight digital input terminals and four digital output terminals as a standard feature.
- The Inline modules for I/O signals can be expanded, and 52 modules can be connected.
- A wide range of input and output modules are available, including digital input, digital output, analog input, analog output, and temperature control modules.



Website <http://www.phoenixcontact.com/global/>

Sensor

RKC Instrument Inc.

Module-type Digital Temperature Controller

Model: SRZ · Communications converter module COM-MY
 · Temperature control module Z-TIO
 · Digital I/O module Z-DIO

- Easily construct a multi-channel temperature control system by connecting the MECHATROLINK-compliant communications converter module to the temperature control modules.
- A single temperature control module can control temperatures of four points or two points. Also, 16 modules can be connected for temperature control of maximum 64 points.
- Digital I/O modules to output temperature alarms and to switch operation modes by using contact signals can also be connected.



Website <http://www.rkcinst.com>

Stepping Motor Drive

Oriental Motor Co., Ltd.

Network Converter for Controlled Motors

Model: NETC01-M2 for MECHATROLINK-II
 NETC01-M3 for MECHATROLINK-III

- These network converters convert the MECHATROLINK communication protocol to Oriental Motor's original RS-485 communication protocol. Oriental Motor's products that support the RS-485 protocol (up to 16 axes) can be controlled in MECHATROLINK communications.
- Only a single MECHATROLINK communication cable is required for wiring, reducing the number of wires and saving space.
- Parameters can be set by using an OPX-2A module or MEXE02 software (both sold separately.)



No Out-of-step Stepping Motor and Driver Package

Model: ARL4□□□M-□, ARL6□□□M-□, ARL9□□□M-□

- The MECHATROLINK-II compliant α STEP stepping motor and driver in the ARL-series uses a unique closed-loop control and eliminates missed steps.
- The α STEP does not require tuning or hunting to achieve high-response positioning without any missing steps during sudden load changes or acceleration.
- Only one cable is required to connect the motor to the driver.
- A wide range of products including various types of geared motor, the EZ Limo motorized sliders, and the DG series of hollow rotary actuators can be connected and controlled with MECHATROLINK-II.



Website <http://www.orientalmotor.com>

Controller for
Stepping Motors

Melec Inc.

Controller for Stepping & Servo Motors

Model: C-M581S

- Easy operation by combining I/O bit signals.
- Specially designed software enables you to make settings or confirm operation status on the personal computer.
- Individual control of four axes with compact motion controller: 88.5 mm × 94 mm × 59 mm (W×D×H)

Controller for Stepping Motors

Model: CD-M582S/ADB5432

- Easy operation by combining I/O bit signals.
- Specially designed software enables you to make settings and confirm operation status on the personal computer.
- Individual control of two axes with a relay unit and a DC drive for five-phase motors integrated in the compact design: 75 mm × 91 mm × 82.5 mm (W×D×H)

Website <http://www.melec-inc.com>



Slip Ring

Endo Kogyo Co.,Ltd.

Slip ring for communications and control

Model: SRP-MLII-3

The SRP-ML slip ring enables communications with and control of drive units and systems that include rotating devices.

- Compact and highly durable structure
- Improved reliability with the new brush system that enables uninterrupted communications
- Connected directly by using MECHATROLINK-II cables

Website <http://www.endo-kogyo.co.jp/japanese/sr/con-index.html>



Slip Ring

Kyoei Electric Co., Ltd.

Slip ring system for MECHATROLINK-II communications

Model: SRC120-MLII

This highly functional slip ring transmits data through MECHATROLINK communications from a fixed device to a rotating device.

- Can be packaged with a power device, such as power supply for a motor.
- Complies with RoHS Directive.

Website <http://www.kyoeidenki.jp>



◆ Incremental Linear Encoders

Output Signal	Manufacturer	Linear Encoder Type	Model			Linear Encoder Pitch μm	Resolution nm	Maximum Speed*3 m/s	Support for Polarity Sensor Input	Application to Linear Motors	Application to Fully-closed Loop Control
			Scale	Sensor Head	Interpolator (Serial Converter Unit)						
1 Vp-p Analog Voltage*1	Heidenhain Corporation	Exposed	LIDA48□		JZDP-H003/-H006*5	20	78.1	5	✓	✓	✓
					JZDP-J003/-J006*5		4.9	2	✓	✓	*8
			LIF48□		JZDP-H003/-H006*5	4	15.6	1	✓	✓	✓
					JZDP-J003/-J006*5		1.0	0.4	✓	*8	*8
	Renishaw plc*4	Exposed	RGS20	RGH22B	JZDP-H005/-H008*5	20	78.1	5	✓	✓	✓
					JZDP-J005/-J008*5		4.9	2	✓	✓	*8
Encoder for Yaskawa's Serial Interface*2	Magnescale Co., Ltd.	Exposed	SL7□0□	PL101-RY*6		800	97.7	5	-	✓	✓
				PL101	MJ620-T13*7				✓	✓	*8
		Sealed	SR75-□□□□□LF	-	80	9.8	3.33	-	✓	✓	
			SR75-□□□□□MF	-	80	78.1	3.33	-	✓	✓	
			SR85-□□□□□LF	-	80	9.8	3.33	-	✓	✓	
			SR85-□□□□□MF	-	80	78.1	3.33	-	✓	✓	

◆ Absolute Linear Encoder

Output Signal	Manufacturer	Linear Encoder Type	Model			Linear Encoder Pitch μm	Resolution nm	Maximum Speed*3 m/s	Support for Polarity Sensor Input	Application to Linear Motors	Application to Fully-closed Loop Control
			Scale	Sensor Head	Interpolator (Serial Converter Unit)						
Encoder for Yaskawa's Serial Interface*2	Magnescale Co., Ltd.	Sealed	SR77-□□□□□LF	-	80	9.8	3.33	-	✓	✓	
			SR77-□□□□□MF	-	80	78.1	3.33	-	✓	✓	
			SR87-□□□□□LF	-	80	9.8	3.33	-	✓	✓	
			SR87-□□□□□MF	-	80	78.1	3.33	-	✓	✓	
	Mitutoyo Corporation	Exposed	ST781A	-	256	500	5	-	✓	✓	
			ST782A	-	256	500	5	-	✓	✓	
			ST783A	-	51.2	100	5	-	✓	✓	
			ST784A	-	51.2	100	5	-	✓	✓	
			ST788A	-	51.2	100	5	-	✓	✓	
			ST789A*9	-	25.6	50	5	-	✓	✓	
			ST1381	-	5.12	10	8	-	✓	✓	
	ST1382	-	0.512	1	8	-	✓	✓			
	Heidenhain Corporation	Exposed	LIC4100 series		EIB3391Y*7	-	5	5	-	✓	✓

*1. You must also use a Yaskawa Serial Converter Unit. The output signal will be multiplied by 8 bits (256 divisions) or 12 bits (4,096 divisions) in the Serial Converter Unit.

*2. The multiplier (number of divisions) depends on the Linear Encoder. Also, you must write the motor constant file to the Linear Encoder in advance.

*3. The maximum speeds given in the above table are the maximum applicable speeds of the encoders when combined with a Yaskawa SERVOPACK.

The actual speed will be restricted by either the maximum speed of the Linear Servomotor or the maximum speed of the Linear Encoder (given above).

*4. If you use the origin signals with a Linear Encoder from Renishaw plc, the origin may sometimes be falsely detected. If that occurs, use the BID/DIR signal to output the origin signal only in one direction.

*5. Use this model number to purchase the Serial Converter Unit.

*6. Use this model number to purchase the Sensor Head with Interpolator.

*7. Use this model number to purchase the Interpolator.

*8. Contact your Yaskawa representative.

*9. Contact Mitutoyo Corporation for details on the Linear Encoders.

Note: Confirm detailed specifications, such as the tolerances, dimensions, and operating environment, with the manufacturer of the Encoder before you use it.

◆ Absolute Rotary Encoder

Output Signal	Manufacturer	Linear Encoder Type	Model		Resolution Bits	Maximum Speed* min ⁻¹
			Scale	Sensor Head		
Encoder for Yaskawa's Serial Interface	Magnescale Co., Ltd.	Sealed	RU77-4096ADF		20	2000
			RU77-4096AFFT01		22	2000

*. The maximum speeds given in the above table are the maximum applicable speeds of the encoders when combined with a Yaskawa SERVOPACK.

The actual speed will be restricted by either the maximum speed of the Linear Servomotor or the maximum speed of the Linear Encoder (given above).

Note: Confirm detailed specifications, such as the tolerances, dimensions, and operating environment, with the manufacturer of the Encoder before you use it.

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<http://www.yaskawa.co.jp/en/>

Machine Controller and AC Servo Drive Solutions Catalog

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LITERATURE NO. KAEP S800001 22C <2>-0

Published in Japan June 2015
15-3-13