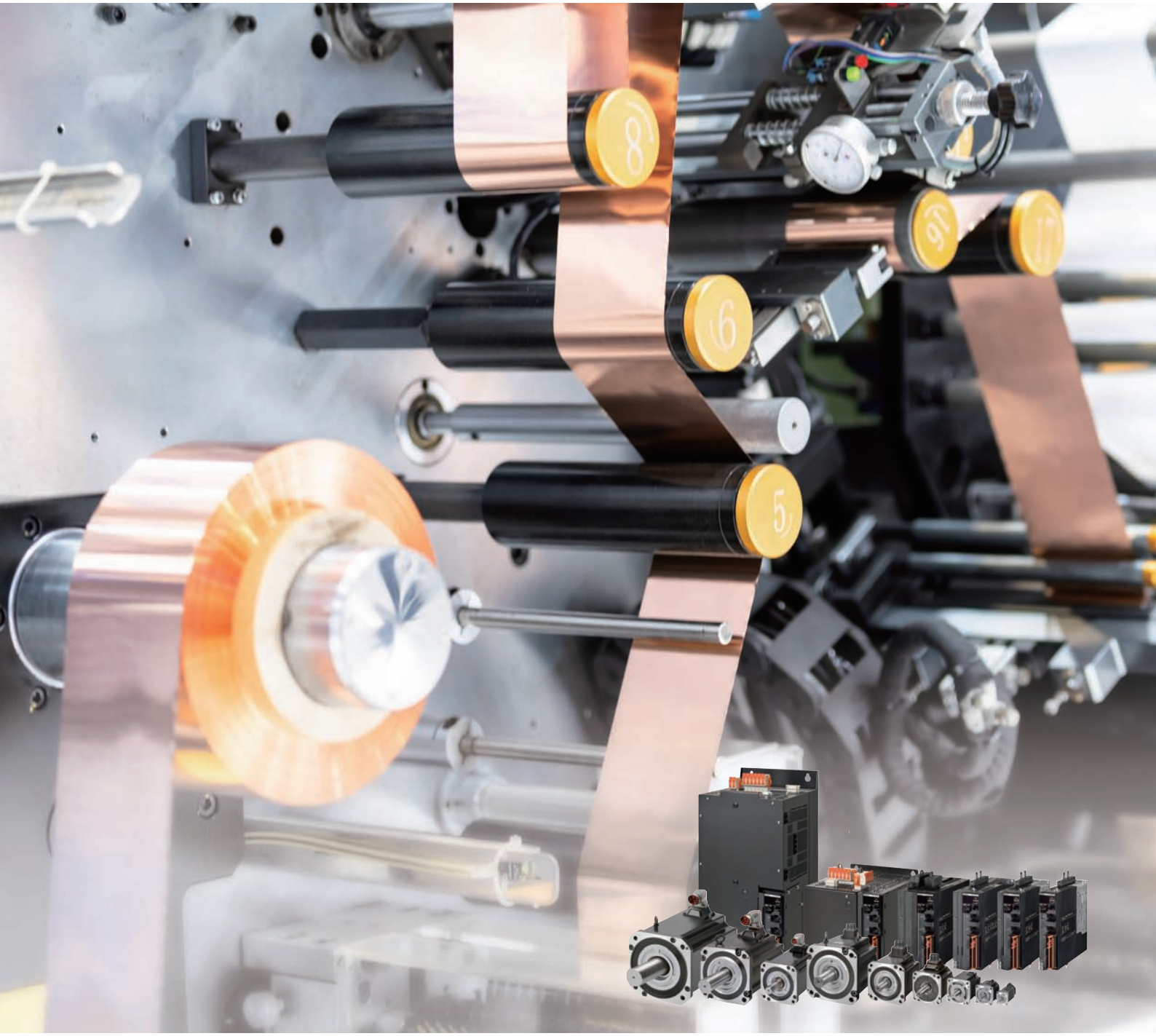
AC Servo System
1S Series with SS1/SLS Safety Sub-Functions

OMRON

Effortlessly Achieve Enhanced Uptime and Safety in Your Machines



Safety over EtherCAT®

SS1/SLS equipped servo system quickly realizes production machines with both improved uptime and high safety

The demand for safety shutdown and safety monitoring functions that comply with the international standard IEC 61800-5-2 (EN61800-5-2) has been increasing recently, mainly in the European and U.S. markets.
To meet such requirements, we have added the SS1/SLS-equipped model to the 1S-series AC Servo System.

When changing over

Issue

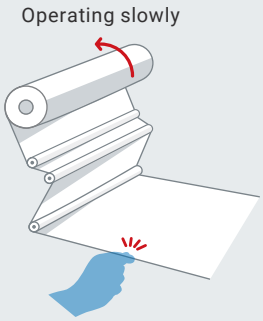
- In a coil change, the machine operator has to set the material in each roll with inching or jog function. It makes the change over complex and time consuming.

▼

Reduce changeover time

Solution

- Machine operator can set the material in the roll with Safely-Limited Speed and introduce the sheet smoothly with Safe Direction function. It helps the operator to reduce the change over time and complexity.



The machine continues to run at a safe speed, allowing the operator to change over without stopping it.

When trouble occurs

Issue

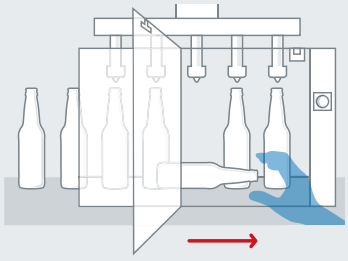
- In a machine operation intervention such as removing a crashed product, the machine is stopped, so there is no production.

▼

Minimize operation intervention time

Solution

- You can pickup the product safely with Safely-Limited Speed function. The production line is running at limited speed but it is not stopped.
- Machine restarts smoothly from speed limit to normal speed.



The machine continues to run at a safe speed, allowing the operator to remove a crashed product without stopping it.

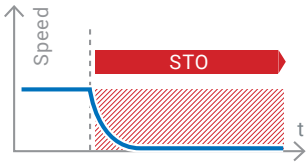
Ensuring Safety and Efficiency: Preventing Loss During Emergency Stops and Maintaining Continuous Operation

SIL2 PLd FUNCTIONAL SAFETY

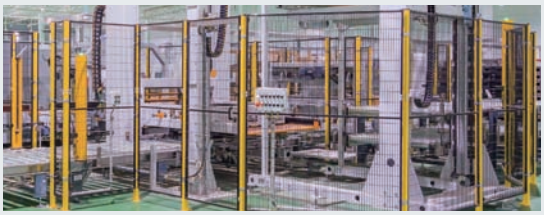
STO SS1 SLS (PLd SIL2) with FSoE

Safe Torque Off (STO)

Torque is safely removed from the motor. Motor stops by Inertia (or Dynamic Brake). It is the ultimate safest function. When other safety functions fail the drive executes STO.



If an operator approaches the operating machine



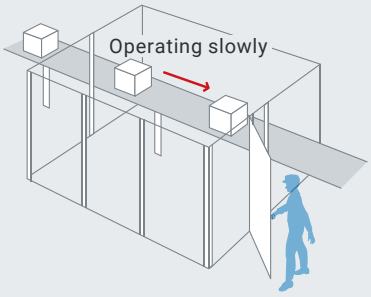
Issue

- If an operator opens the safety fence, the operating machine will stop.

Avoid machine stops

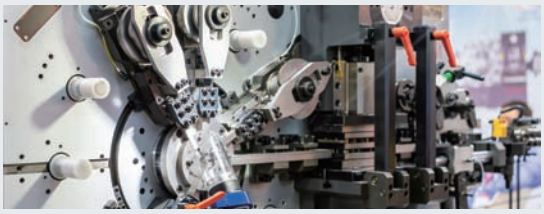
Solution

- When an operator opens the safety fence, the Safety-Limited Speed function is activated, and the machine continues to operate at a safe speed without stopping.



The machine continues to run at a safe speed, allowing an operator to adjust it without stopping.

At the time of the emergency stop



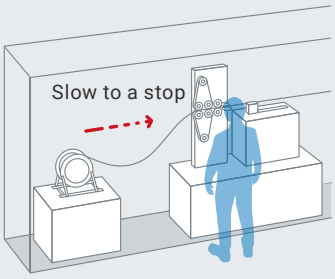
Issue

- An emergency machine stop may cause products or drives to be out of synchronization, resulting in product disposal or damage to the machine.
- It takes time to restore the system because it needs to be readjusted to synchronize.

Recovering smoothly

Solution

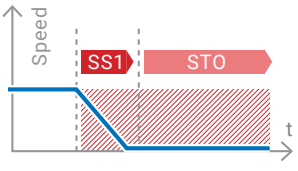
- Safe Stop 1 function allows each drive unit to decelerate to a controlled stop, maintaining synchronization and preventing product disposal and mechanism damage.
- Maintaining synchronization ensures a smooth recovery.



The machine stops slowly to avoid product disposal or damage to the mechanism.

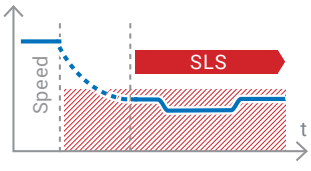
Safe Stop 1 (SS1)

Timed STO. The torque in the motor is removed at a certain (settable) time after SS1 activation, so the controller has time to stop the load in a controlled manner before the STO is executed. As a Stop Category 1 product, it can be used as an emergency stop function as defined in ISO 13840.



Safely-Limited Speed (SLS)

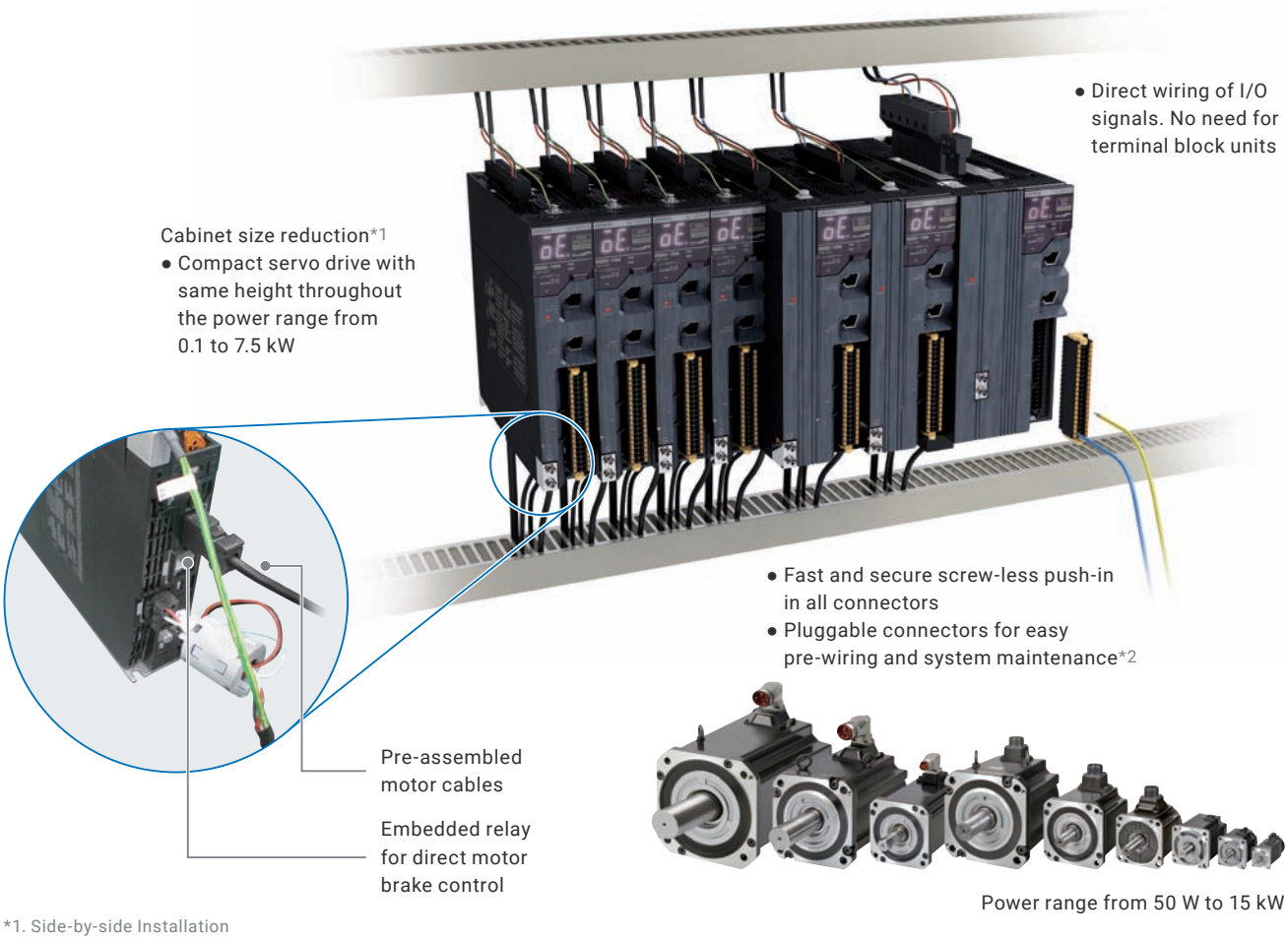
Drive monitors that a certain maximum speed is not exceeded.



Improved machine design. Increased machine productivity

Designed to meet the machine requirements, the 1S servo technology optimizes the full cycle, through the machine design, installation and commissioning tasks and finally to the maintenance once in production. In addition to the traditional motion solution, the 1S servo offers high resolution multi-turn encoder without battery backup, safety network built-in and improved loop control allowing accurate and higher machine productivity.

Optimized installation and commissioning tasks



Cabinet size reduction*1
- Compact servo drive with same height throughout the power range from 0.1 to 7.5 kW

- Direct wiring of I/O signals. No need for terminal block units

- Fast and secure screw-less push-in in all connectors
- Pluggable connectors for easy pre-wiring and system maintenance*2

Pre-assembled motor cables

Embedded relay for direct motor brake control

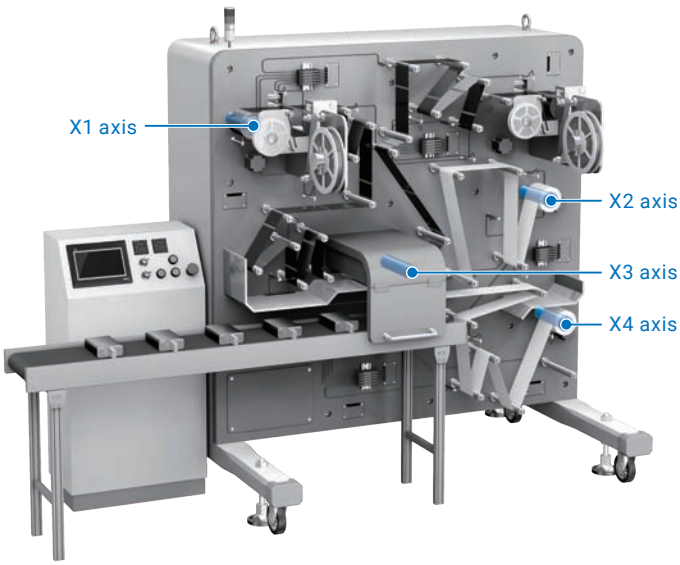
Power range from 50 W to 15 kW

*1. Side-by-side Installation
For servo drivers of 3 kW or less, limit the operating ambient temperature of Servo Drive from 0 to 45°C when the distance is less than 10 mm.
For servo drivers of 4 kW or more, the distance between servo drivers must be 40 mm or more.

*2. Except 15 kW (200 V)

Quick and easy multi-axis setup and tuning

With the multi-axis tuning wizard of the Sysmac Studio, load inertia of the assembled machine can be estimated, facilitating tuning.



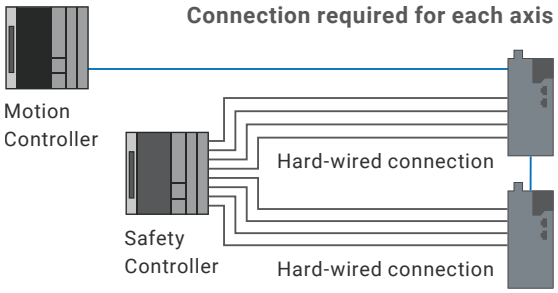
Easy tuning of up to 4 axes

Accelerate Commissioning with Integrated Safety for Motion Control

Achieve Wiring Efficiency in Safety Systems with Safety over EtherCAT® (FSoE)

With FSoE, a safety system can be built using EtherCAT cables, eliminating extra wiring. Therefore, even when disassembling and transporting manufactured machines to overseas locations, FSoE reduces the amount of wiring and rewiring work. In addition to the NJ/NX series machine automation controllers, the PMAC series*2 multi-axis motion controller can be connected.

Previous



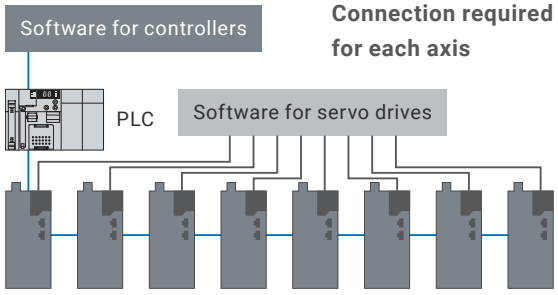
1S Series with SS1/SLS Safety

*2. PMAC is an abbreviation for Programmable Multi Axis Controller.

Sysmac Studio's integrated development environment allows you to build safety systems with a single tool.

Configure both controllers and servo drives with one single software. All servo drives are configured via EtherCAT, eliminating cable handling and reducing workloads.

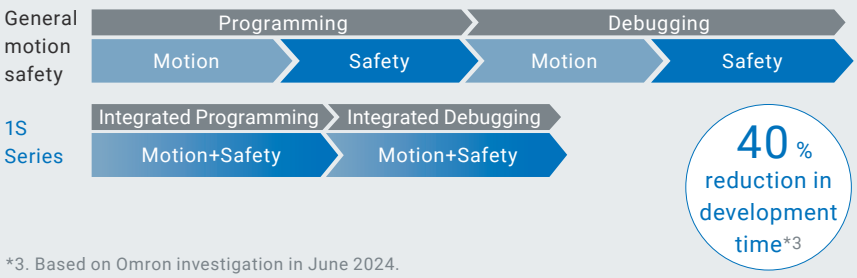
Previous



1S Series with SS1/SLS Safety

The easy configuration function reduces development workloads for safety programs and parameter configuration.

- Simulation of safety programs reduces debugging time.
- Automatic generation of safety programs
- Batch backup of safety parameters
- Visible safety parameters for each device
- Automatic calculation of safety task period



*3. Based on Omron investigation in June 2024.

1S Series Product Lineup

High adaptability for machine safety

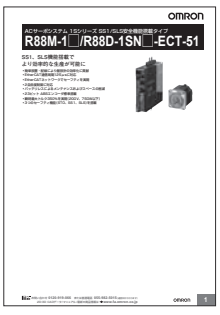
Product		Power range	Safety Functions							
			STO	SS1	SLS	SS2	SOS	SLP	SDI	SBC
	1S Series	50 W to 15 kW	● SIL2 PLd *1							
	1S Series with SS1/SLS Safety Sub-Functions **New**		● SIL2 PLd *1	● SIL2 PLd *3	● SIL2 PLd *2*3*4					
	1S Series with Safety Functionality	200 W to 3 kW	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe	● SIL3 PLe

*1. SIL3 PLe when hard-wiring.
*2. There are conditions for setting the SLS speed monitoring range to less than 100 r/min or for the cable length. Refer to "8-4 Precautions for Correct Use of Safely-Limited Speed (SLS) Function" in the AC Servomotors/Servo Drives 1S-series with Built-in EtherCAT® Communications and SS1/SLS Safety Sub-Functions User's Manual (Cat. No.I696) for details.
*3. Only the method to start the safety functions is possible after the delay time has elapsed. Refer to the manual above for details.
*4. Using the SLS function when a vertical axis, etc., is subject to an unbalanced load may result in a false detection of Safety Present Motor Velocity Error 2 even during normal operation. For axes to which this applies, use the 1S Series with Safety Functionality R88D-1SAN□.

Servo drive comparison and servomotor combination table

Drive	1S Series R88D-1SN□-ECT	1S Series with SS1/SLS Safety Sub-Functions R88D-1SN□-ECT-51 **New**	1S Series with Safety Functionality R88D-1SAN□-ECT
Power supply voltage	100 VAC/200 VAC/400 VAC		200 VAC/400 VAC
Applicable Servomotor rated output	50 W to 15 kW		200 W to 3 kW
Applicable servomotor	 1S Servomotor R88M-1L□/-1M□		 1SA Servomotor R88M-1AL□/-1AM□

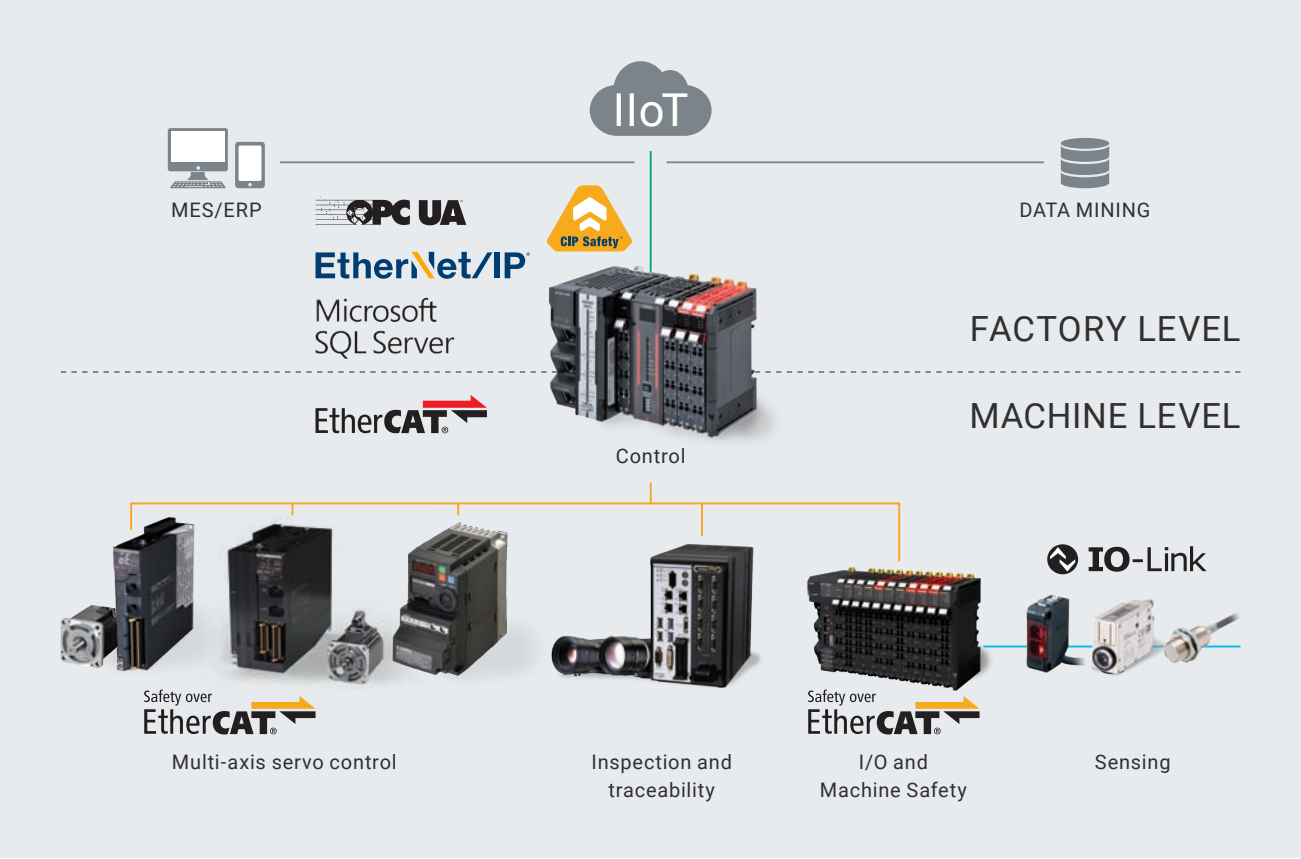
Datasheet



Refer to the data sheet (Cat. No.I928) for details on specifications for AC Servo System 1S Series with SS1/SLS Safety Sub-Functions.

Sysmac Automation Platform

Integrate control, information, and safety, helping speed up all processes from commissioning to operation and maintenance.



Software

Sysmac Studio, the integrated software

- One single tool for logic sequence, motion, safety, robotics, vision and HMI
- Fully compliant with open standard IEC 61131-3
- PLCopen Function Blocks for Motion and Safety
- Supports Ladder, Structured Text and In-Line ST programming with a rich instruction set
- CAM editor for easy programming of complex motion profiles
- Database Connectivity Function Block library

Sysmac Library

- The Sysmac Library is a collection of software functional components that can be used in programs for the NJ/NX Machine Automation Controllers. Sample programs and HMI screen samples are also available.

Please download it from following URL and install to Sysmac Studio.
http://www.ia.omron.com/sysmac_library/

Note: Do not use this document to operate the Unit.

OMRON Corporation **Industrial Automation Company**

Kyoto, JAPAN **Contact : www.ia.omron.com**

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

OMRON ELECTRONICS LLC
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
438B Alexandra Road, #08-01/02 Alexandra
Technopark, Singapore 119968
Tel: (65) 6835-3011 Fax: (65) 6835-3011

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-6023-0333 Fax: (86) 21-5037-2388

Authorized Distributor:

CSM_4_1
Cat. No. I927-E1-04 0326 (0724)