AC Servo System
1S Series with safety functionality

OMRON

Higher Productivity and Safer Environment

Safety over EtherCAT®

SYSMAC always in control

Safer environments lead to higher productivity

TODAY'S CONSUMERS WANT MORE

Manufacturers face a growing demand for productivity improvements and flexibility as consumers seek a more diverse product offering. State-of-the-art automated solutions help companies meet this demand with minimal downtime for product changeovers.

Despite these improvements, production line suspensions remain inevitable for maintenance and safety purposes. This can hamper efforts to further boost productivity.

SAFETY HELPS MEET CONSUMER DEMAND

Safety is an essential component of ensuring productivity. The same systems that protect operators also help minimize damage to equipment and manufactured products that might occur during an emergency.

Motion safety supports maintenance under safe conditions and ensures that emergency stops happen in a controlled manner.

THE HIGHEST LEVEL OF MOTION AND SAFETY CONTROL

Omron achieves both motion and safety control at the industry's highest level. We help improve overall equipment effectiveness (OEE) by achieving advanced-level manufacturing and higher productivity.

For a safety solution that promotes ultra-efficient manufacturing, choose Omron.

Advanced safety control for people, machines and products

- Manufacturing and maintenance **without machine stoppages**
- No machine-product interference when control is maintained throughout unexpected shutdowns
- **Zero-loss production** thanks to synchronized emergency stop

Simplifying motion and safety

The 1S servo drive with motion safety functionality protects machine operators from fatal injuries and helps shorten instances of machine downtime. Integrating motion safety functions into the servo drive minimize costs, minimizes the number of components, and reduces wiring complexity. Based on the concept of the standard 1S Series, this servo model achieves the highest level of motion control and safety functionality.

EtherCAT

Safety over EtherCAT

SIL3 PLe

NO WIRING

- The NX-series Safety Network Controller in combination with the NX1 Machine Automation Controller provides real-time safety control of up to 12 motors using EtherCAT and FSoE.

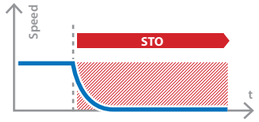
Servo features

- Power range from 200 W to 3 kW
- 20 bit high resolution encoder
- 350% momentary maximum torque (200 V, 750 W max.)
- Battery-free absolute multi-turn encoder
- Safety over EtherCAT (FSoE)

High adaptability for machine safety

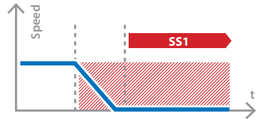
STO SS1 SS2 SOS SLS SLP SDI SBC (PLe SIL3) with FSoE

SIL3 PLe



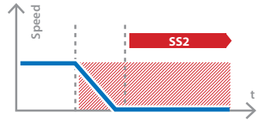
Safe Torque Off (STO)

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.



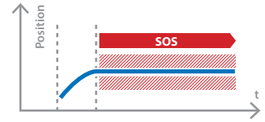
Safe Stop 1 (SS1)

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.



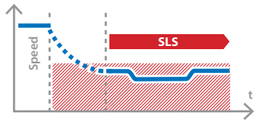
Safe Stop 2 (SS2)

Timed SOS. SOS is activated after some delay.



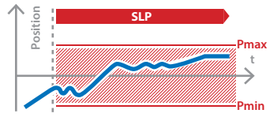
Safe Operating Stop (SOS)

Motor stays standstill in the stop position. Torque in the shaft is allowed.



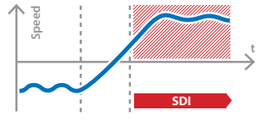
Safely-Limited Speed (SLS)

Drive monitors that a certain maximum speed is not exceeded.



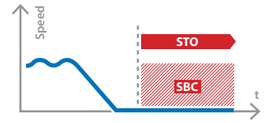
Safely-Limited Position (SLP)

Drive monitors that actual position is inside "safe" limits.



Safe Direction (SDI)

Drive guarantees that the movement occurs only in one direction (rotation).



Safe Brake Control (SBC)

Drive can activate and monitor the status of an external Safe Brake. Drive has dedicated IO's for this functionality. This function is usually linked to STO function.

* Note: motor brake is "holding brake", not safe.

Quick Installation : One Cable

- Power, encoder and brake in one pre-assembled cable with IP67 connector
- Pluggable connectors for easy pre-wiring and system maintenance
- Fast and secure screw-less push-in in all connectors

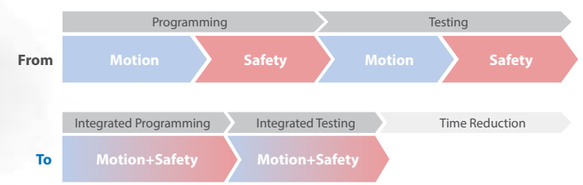
Rotating connector

Absolute multi-turn encoder without battery

Time Reduction: Integrated Programming and Testing

- Auto definition of I/F variables
- Motion safety function blocks
- Graphical GUI
- Integrated Data Trace

Motion Safety



Motion Safety

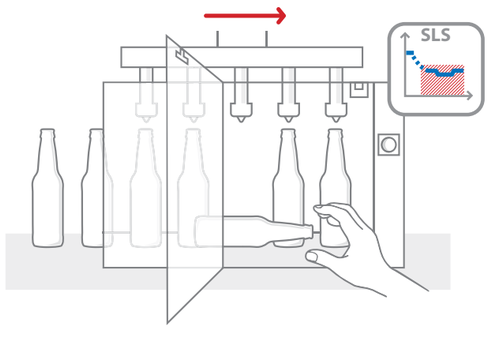
Increase Machine Uptime

ISSUE

- In a machine operation intervention, such as to remove a crashed product, the machine is stopped, and production cannot occur.

SOLUTION

- You can safely pick up the product with the Safely-Limited Speed function. The production line is running at limited speed but it is not stopped.
- The machine will restart smoothly from the speed limit to it's normal speed.



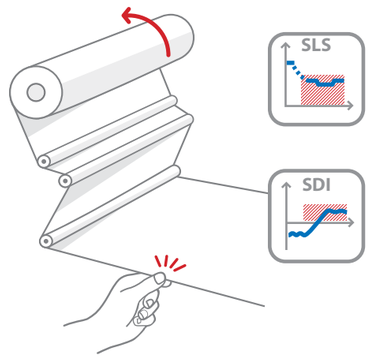
Minimize operation intervention time

ISSUE

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

SOLUTION

- The machine operator can set the material in the roll with Safely-Limited Speed and introduce the film smoothly with the Safe Direction function. This helps the operator to reduce the change over time and complexity.



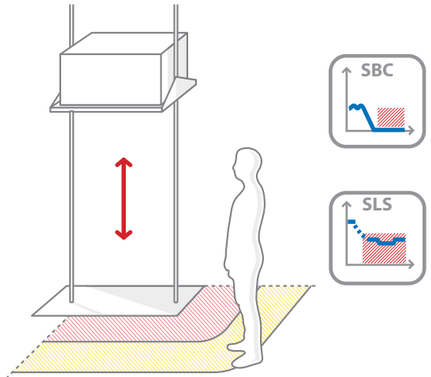
Reduce changeover time

ISSUE

- In a machine operation intervention, the stacker is stopped, so production cannot occur.

SOLUTION

- When the operator is close, the stacker run slowly with Safely-Limited Speed without stopping.
- If the operator gets too close, then the Safe Brake Control function is activated to hold the stacker in a safer mode.



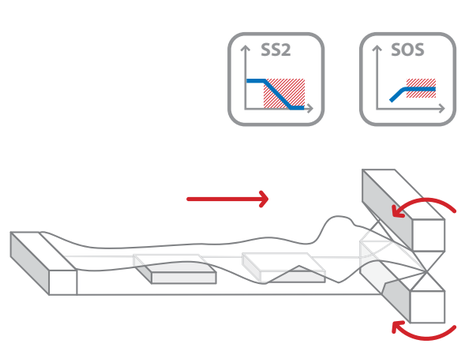
Avoid machine stops

ISSUE

- Disposal of product waste occurs. If the power to a motor is stopped following an emergency stop, film may be caught in the machine.

SOLUTION

- Even in the event of machine stoppage due to an emergency stop, disposal of product waste will not occur.
- Power is continuously supplied to a motor even during the emergency stop, therefore preventing film from getting caught in the machine.

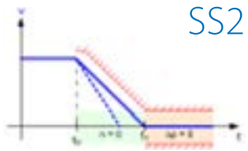


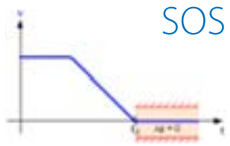
Zero startup rejects

Benefits of safe motion for applications

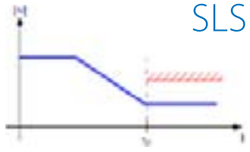
Packaging

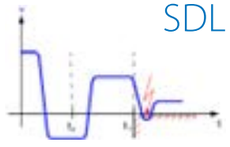
Film tension can be kept constant while motor power is maintained during emergency stop. Using Safe Direction, pinch points can be avoided by only allowing motion in a safe direction.





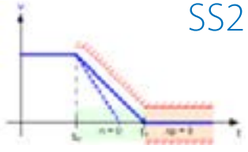
Operators can continue maintenance and operation without shutting down the machine to adjust the machine or clear product jams with safety monitoring for each axis. These capabilities can also benefit changeovers.

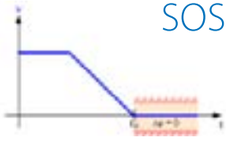




Filling

It is possible to maintain synchronization between multiple motors during machine safe stop condition by keeping the motors powered during this condition to avoid misalignment during start up.

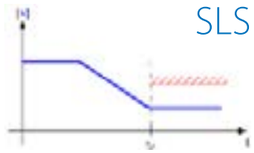


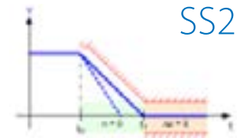


Benefits of safe motion for applications

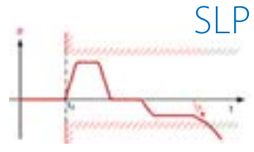
Turntables

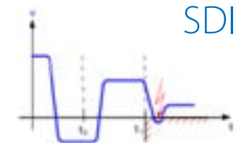
Operators can access the machine to load and unload parts while servo power is maintained, eliminating servo on/off time and possible motor shift from powering off.





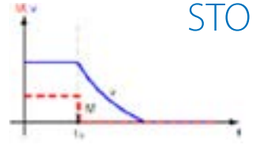
Maintenance time can be reduced by adjusting and clearing jams while the machine runs at either a safe speed or in a direction to avoid injuries as well as increase OEE.



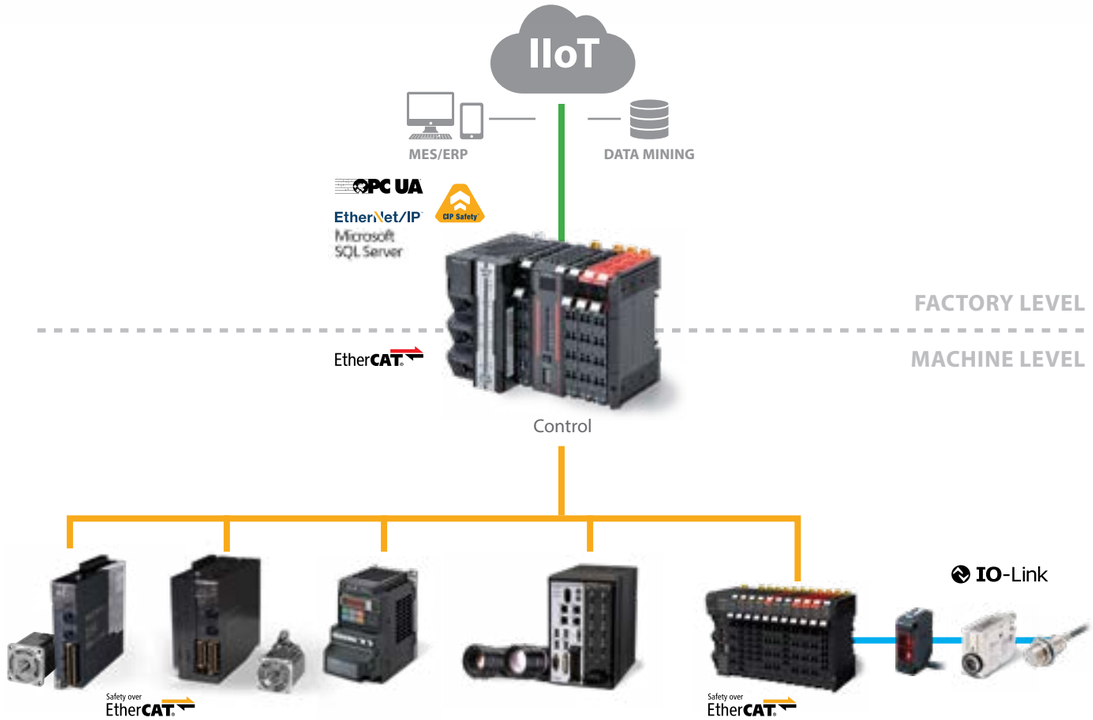


Vertical loads

Safety brakes for stopping loads can be added to vertical systems for enhanced safety without adding extra safety hardware thanks to the presence of Safe Brake Control I/O in the drive.



Sysmac Automation Platform



Software

Sysmac Studio, the integrated automation platform

- One software 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/

Sysmac servo family

Machine Controller

The NX-series Safety Network Controller connected with the NX1 Machine Controller enables the use of both EtherNet/IP + CIP Safety and EtherCAT + FSoE at the same time.

NJ/NX series

- Logic sequence, Motion, Safety, Robotics and Database connection functionality
- Scalable motion control: CPUs from 2 up to 256 axes
- IEC 61131-3 controller
- PLCopen Function Blocks for Motion Control and Safety
- Advanced motion with Robotics functionality
- Built-in EtherCAT and EtherNet/IP ports

Motion

1S Motion Safety servo

- Servo drive for rotary motors
- Up to 3kW
- Battery-free absolute multi-turn encoder
- Advanced safety functions: STO/SS1/SS2/SOS/SLS/SLP/SDI/SBC
- Servo drive for rotary motors with one cable connection

1S Servo System - General purpose servo

- Servo drive for rotary motors
- Up to 15kW
- Battery-free absolute multi-turn encoder
- Safety function: STO

G5 Servo System

- Servo drive for rotary or linear motors
- Rotary motor: Up to 15 kW
- Iron-core and Ironless linear motor models: Up to 2100 N peak force
- Safety function: STO (Hardwired Safe Torque Off only)
- Full closed loop control

Start with a Risk Assessment to increase machine availability

Market forces are driving companies to design, build and go to market faster than ever. At the same time, manufacturers need to achieve higher productivity and meet increasing global quality standards, while ensuring their workers' continued safety. A critical step in meeting all of these requirements is to conduct a risk assessment of the production equipment so that manufacturers can identify both the hazardous workers face as well as advanced safety solutions that will both protect their employees and enable them to be both flexible and efficient in their processes.

A risk assessment is an essential tool for understanding and addressing the machine's functional safety requirements. Not only does a risk assessment identify hazardous situations for employees, but it also provides insights into the machine and its process. These insights can help to identify tasks that require additional or unique safety controls to protect workers while preserving productivity.

For example, there can be situations where removing power from a machine, the traditional solution to protect workers during an intervention, may actually create additional hazardous conditions or simply create a significant delay in restarting production. A good risk assessment will identify these types of situations and suggest advanced safety solutions, such as motion safety functions, that enable manufacturers to meet both their functional safety and production requirements.

Safety motion functions allow machines to keep running, improving maintenance and changeover efficiency while protecting the safety of operators, products, and machinery. They help prevent injuries by ensuring smooth restarts with Safely-Limited Speed or reduce machine intervention by combining Safely Limited Speed and Safe Brake Control. Starting the risk assessment process as early as possible helps designers to understand the machine safety requirements and develop a safety system that will meet the production requirements.

Omron's unique combination of safety and control expertise allows us to offer comprehensive safety solutions. We can train your team on machine safety requirements. We offer risk assessments for machine compliance so you can understand the risks. Finally, we can design and install safety solutions to make your machines safe and productive.

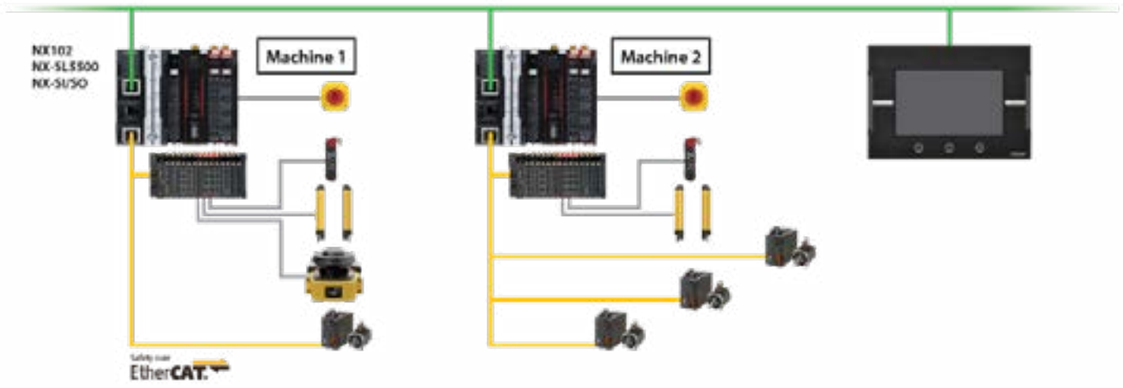
Integrated Safety Solutions

Ideal for applications of any size, the NX-SL5 Series opens the door to a fully integrated safety solution by creating powerful and robust safety systems, while reducing wiring, simplifies setup, and provides intuitive troubleshooting tools for quick diagnostic.

Based on Sysmac Studio and its ability to support two safety networks, CIP Safety over EtherNet/IP and FSoE (FailSafe over EtherCAT), the new generation of NX Safety Controllers offer flexibility to meet functional safety requirements while boosting productivity. Thanks to its FSoE capabilities, the NX-SL5 can easily meet safety requirements for high-speed, high-precision applications and offer seamless integration to logic, and motion control. Its CIP Safety capabilities allow the NX-SL5 to support large-scale production lines or safety interlocking between machines, and integration for third-party devices to the safety solution.

The seamless integration of the 1SA and NX-Safety controller over Sysmac Studio offers a simple way to protect people by implementing advanced safety functions, and contribute to minimizing downtime and maintenance works. By working with the integrated development environment, you can easily design, program and simulate both safety and motion, making commissioning more efficient.

Omron's new approach to functional safety in combination with Sysmac Studio can easily complement any IIoT initiatives by allowing maintenance and production teams to troubleshoot remote safety devices without stepping inside hazardous areas, collect safety data, and monitor diagnostic safety data through an HMI.



NX-SL5 Safety Controller

A quick, easy and flexible way to add safety

CIP Safety

Safety over EtherCAT

NX-SL5 Safety Controller

- Shorten design cycle and start-up with built-in functions: automatic programming and online functional test
- Support scalable safety solutions with safety i/o terminals
- Intuitive troubleshooting tools like built-in data logging and simple automatic test
- Support two safety networks, CIP Safety over EtherNet/IP and FSoE (Safety over EtherCAT)
- Up to 2032 safety I/O points
- Meets EN ISO 13849-1 (PLe/Safety Category 4) and IEC 61508 (SIL3)

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Software
• Programming & Configuration • Runtime

Note: Specifications are subject to change.