AC Servo System
1S Series with Safety Functionality

OMRON

Higher Productivity and Safer Environment

Safety over EtherCAT®

SIL3 PLe FUNCTIONAL SAFETY

SYSMAC always in control

Higher productivity and Safer environment

TO ENSURE SAFETY

Manufacturing industry is faced with a growing demand for productivity improvement, with the background of the product diversification due to the economic growth of developed countries as well as the drastic changes in demand due to a growing population in emerging countries.

As processor becomes faster and communications technology becomes sophisticated, automation has been evolved pursuing higher quality and performance.

While productivity during operation has been improved; suspension of production lines is still inevitable for the purpose of maintenance/ emergency stop in order to ensure the safety of operators, which is a challenge in further improving productivity.

TO PROTECT THE SAFETY OF OPERATORS, MACHINERY, AND PRODUCTS

To achieve higher productivity, maintaining all of the following is necessary at high level - ensuring the safety of operators, maintaining the normal operation of production equipment, and reducing the disposal loss of products.

Motion safety provides maintenance under safe condition in addition to an emergency stop in a controlled manner. This ensures the overall safety of maintenance personnel, machinery, and products manufactured by the machinery in production lines.

TOWARDS SUPER-EFFICIENT MANUFACTURING

Omron achieves both motion and safety control at the industry's highest level. We help improve the Overall Equipment Effectiveness by achieving advanced-level manufacturing and higher productivity.

Advanced safety control for “Human”, “Machine” and “Product”

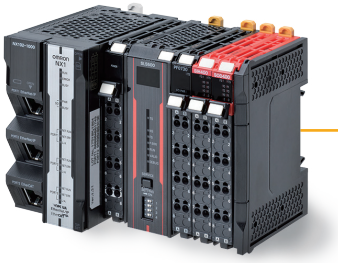
Manufacturing and maintenance **without machine stopping**

Avoiding interference of machine and product by **keeping control** when unexpected shut down

Zero-loss production thanks to synchronized emergency stop

Simplifying Motion and Safety

The 1S servo drive with motion safety functionality provides protection for the machine operators from fatal injuries and shorter machine downtimes. Integrating motion safety functions into the servo drive minimize costs, components and wiring complexity. This model supports motion safety but it is even further evolved based on the concept of the standard 1S series. With the highest-level of motion control performance and safety functionality, productivity can be further improved.



EtherCAT

Safety over EtherCAT

SIL3 PLe FUNCTIONAL SAFETY

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.

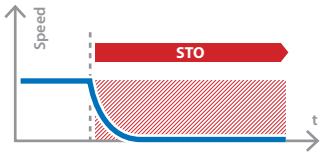
Servo features

- 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

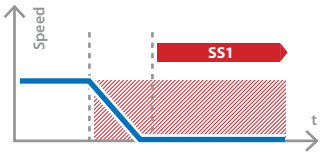
STO SS1 SS2 SOS SLS SLP SDI SBC (PLe SIL3) with FSoE

SIL3 PLe FUNCTIONAL SAFETY



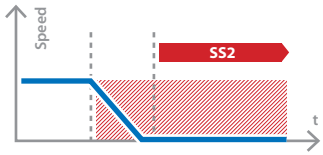
Safe Torque Off (STO)

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.



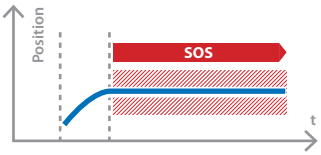
Safe Stop 1 (SS1)

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.



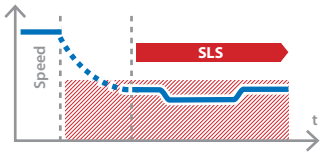
Safe Stop 2 (SS2)

Timed SOS. SOS is activated after some delay.



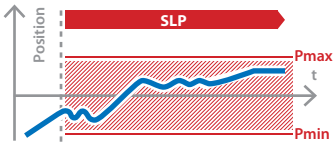
Safe Operating Stop (SOS)

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



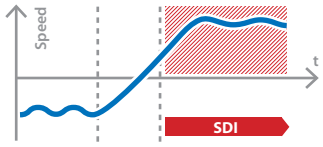
Safely-Limited Speed (SLS)

Drive monitors that a certain maximum speed is not exceeded.



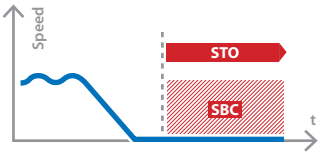
Safely-Limited Position (SLP)

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)

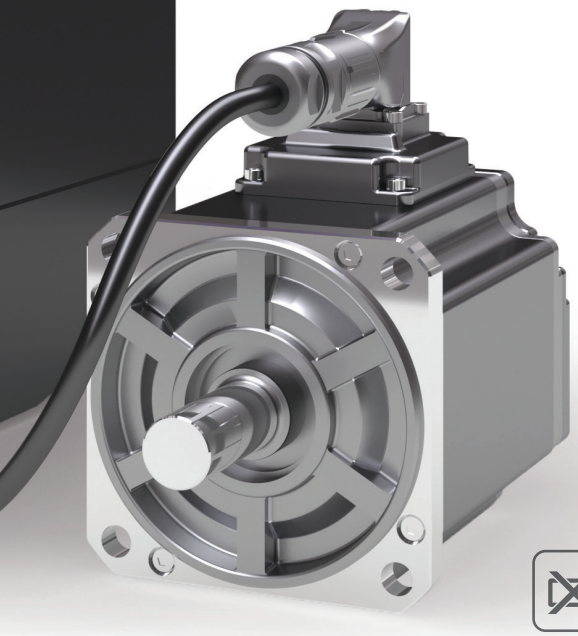
Drive can activate and monitor the status of an external Safe Brake. Drive has dedicated IO's for this functionality. This function is usually linked to STO function.

* 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

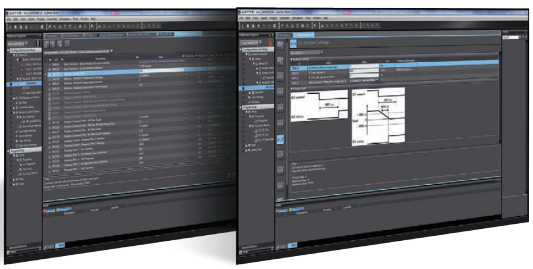
Rotating connector



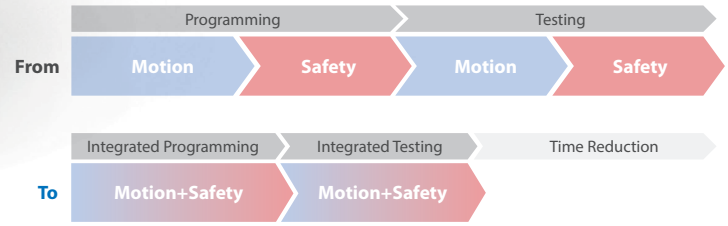
Absolute multi-turn encoder without battery

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

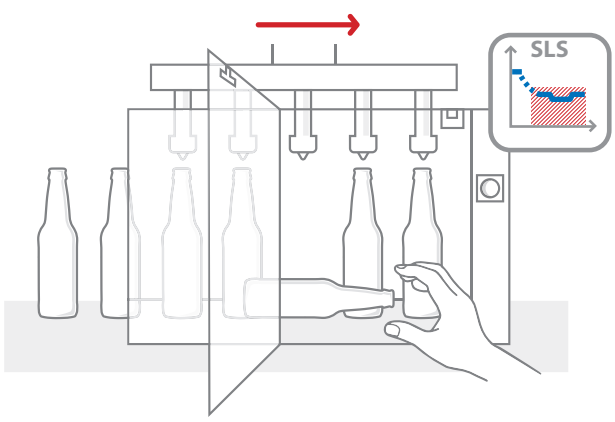
Increase Machine Uptime

ISSUE

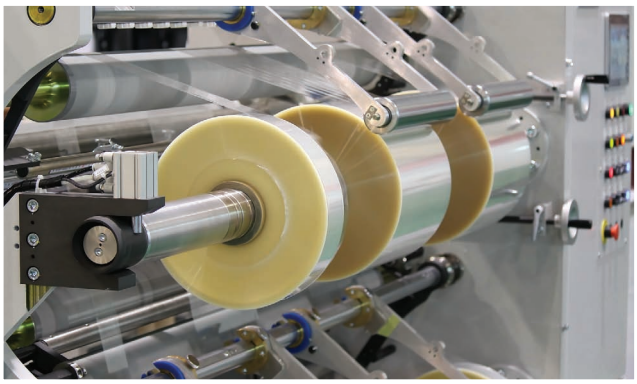
- In a machine operation intervention such as removing a crashed product, the machine is stopped, so there is no production.

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.



Minimize operation intervention time

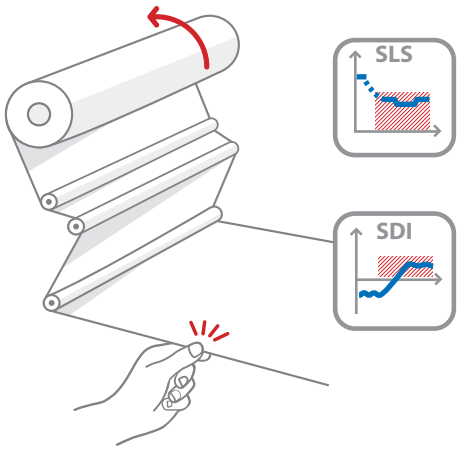


ISSUE

- 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.

SOLUTION

- Machine operator can set the material in the roll with Safely-Limited Speed and introduce the film smoothly with Safe Direction function. It 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 there is no production.

SOLUTION

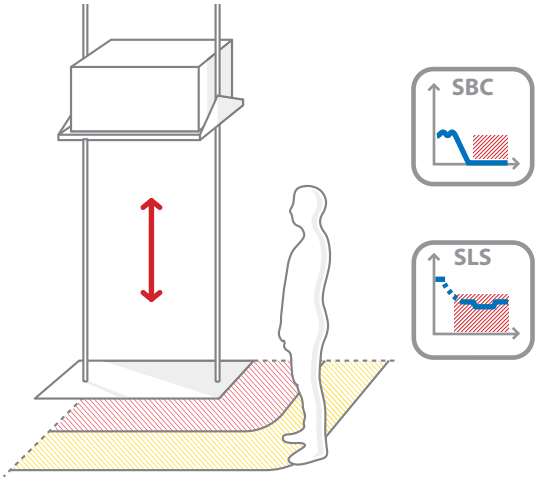
- When the operator is close, the stacker run slowly with Safely-Limited Speed without stopping.
- If the operator gets too close, then the Safe Brake Control function is activated to hold the stacker in a safer mode.

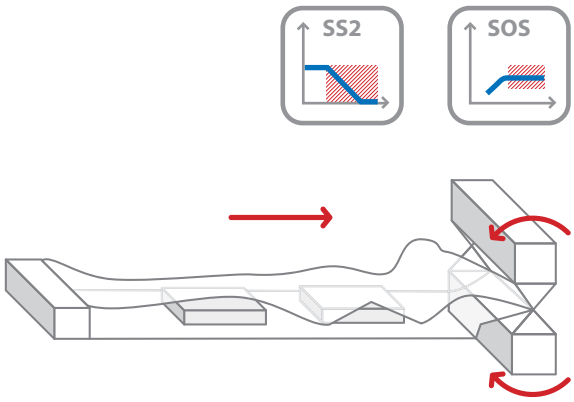
ISSUE

- 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.

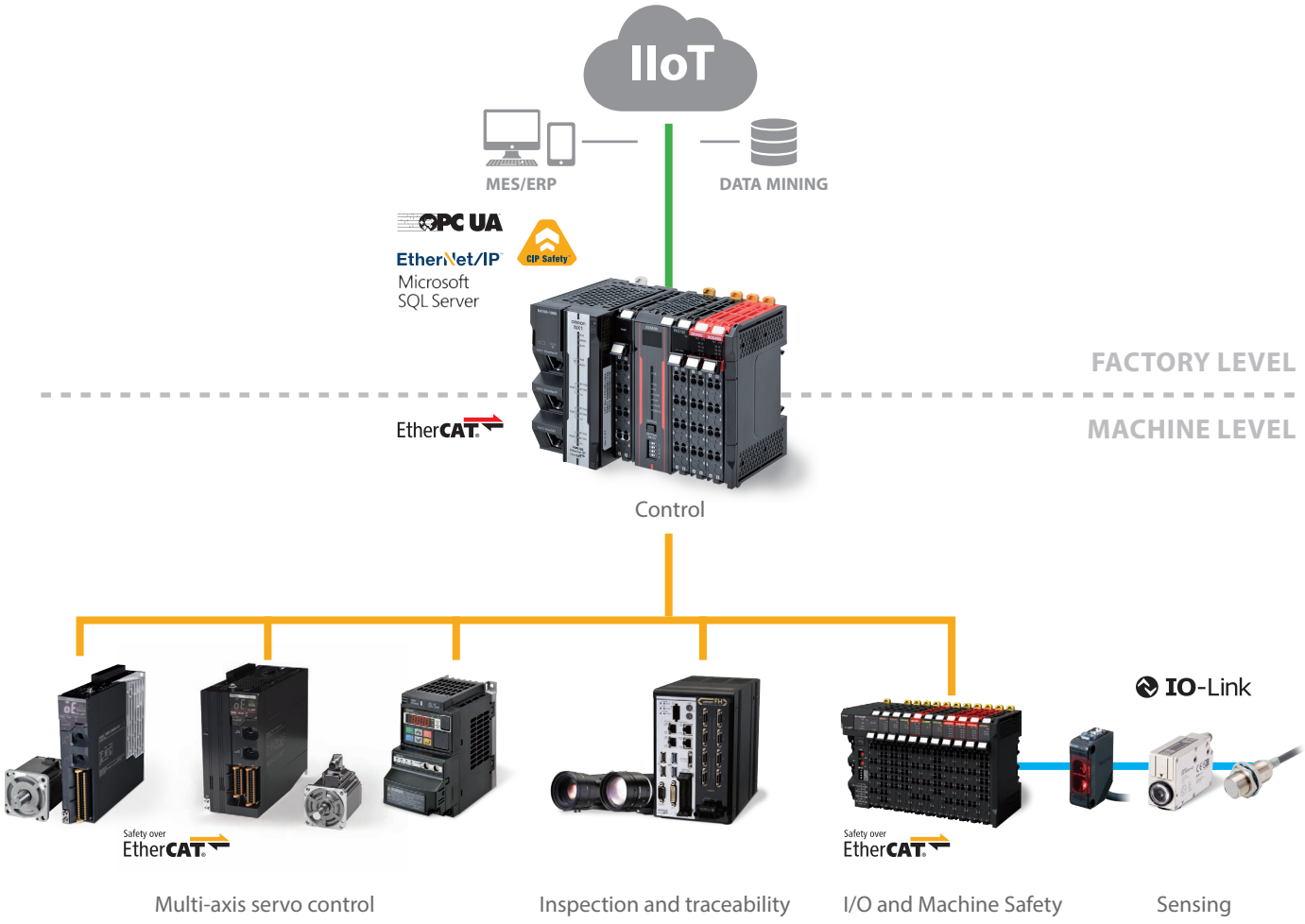




Avoid machine stops

Zero startup rejects

Sysmac Automation Platform



Software

Microsoft SQL Server

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

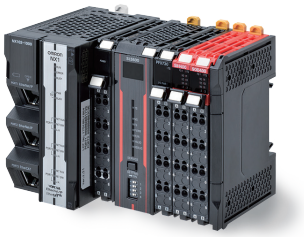
Sysmac Library

- 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/

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

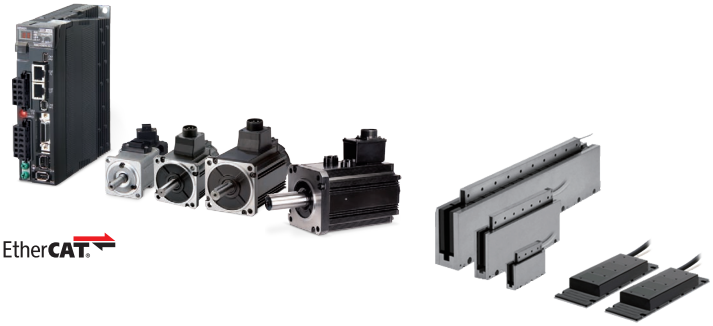
Motion

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

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

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Cat. No. I838-E1-02 1120(0920)