YASKAWA

SAFE MOTION SYSTEMS

FUNCTIONAL SAFETY OVER ETHERCAT (FSoE)

IT'S PERSONAL

400 VOLT FT91 ETHERCAT SAFETY SERVO AMPLIFIER

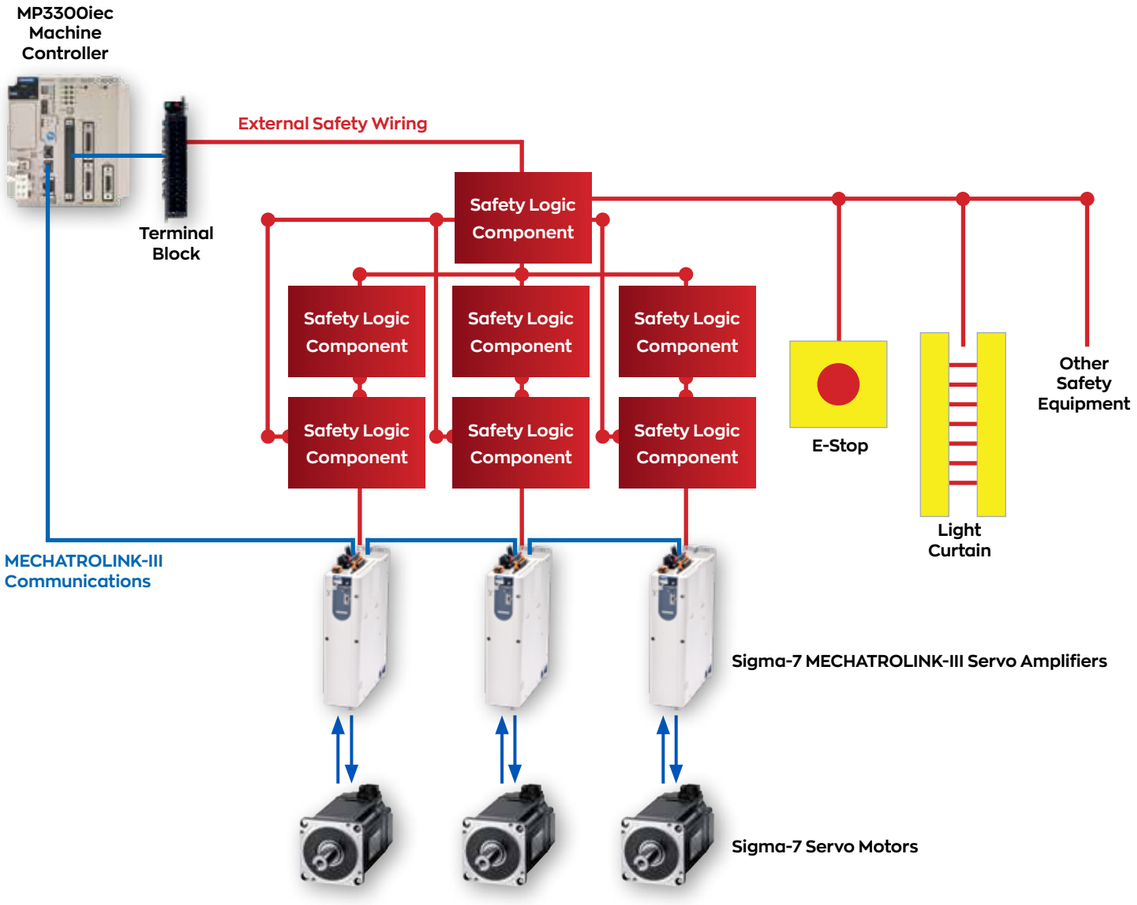
ENSURE MACHINE SAFETY WITH YASKAWA

The FT91 servo amplifier offers Functional Safety over EtherCAT (FSoE) and simplified wiring to greatly reduce machine design complexity and overall commissioning time.

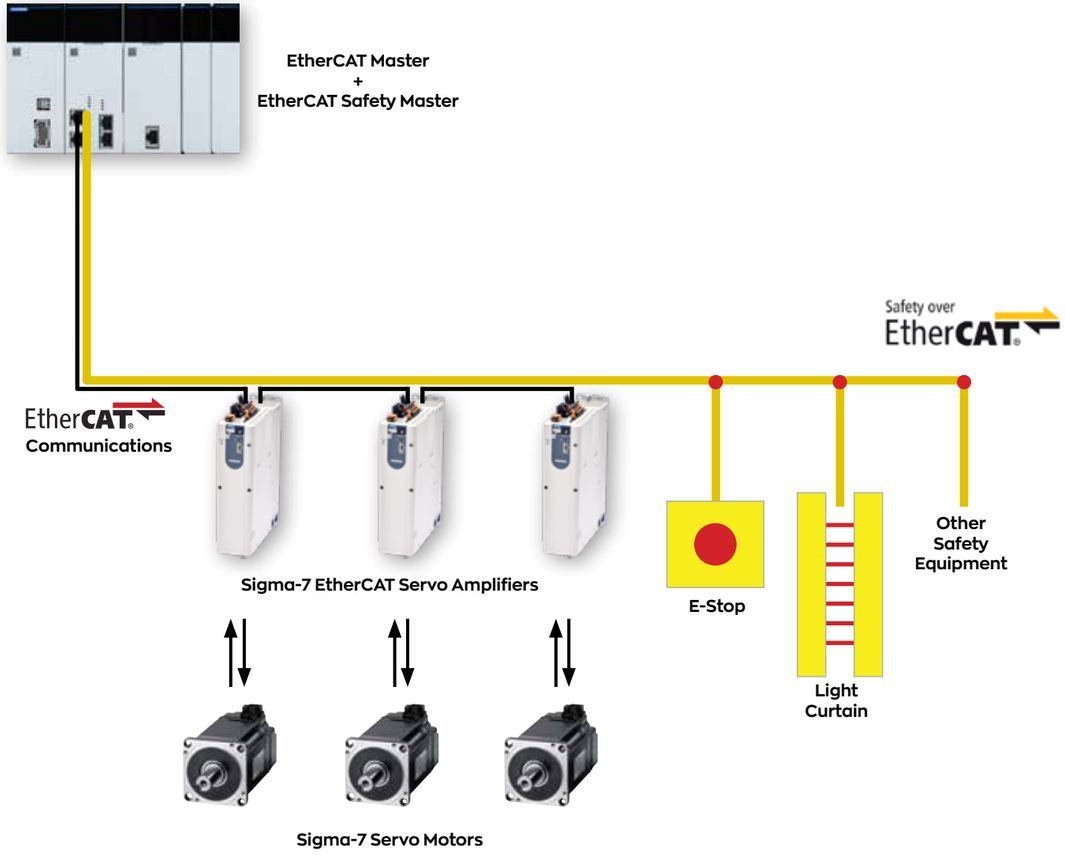
WHAT IF...

- You could reduce engineering hours by simplifying electrical diagram design?
- You could save commissioning time and simplify assembly procedures with fewer cables to wire and test?
- You could shorten your BOM and reduce your machine cost by eliminating safety relays and reducing cable quantities?
- You could condense your electrical cabinet footprint with fewer components to install?

THE OLD SOLUTION: HARD-WIRED SAFETY



THE NEW SOLUTION: NETWORKED SAFETY



INTEGRATED NETWORK SAFETY

On the Established Sigma-7 Platform

BENEFITS

- Faster machine commissioning times
- Simplified safety logic with user friendly software
- System certification to Safety Integrity Level 3 (PLe)

SAFETY RATINGS

Injury severity, frequency, and avoidance are criteria that are used to assess machine safety. Use the chart at right to better understand how machine safety ratings are determined.

Injury Severity Level

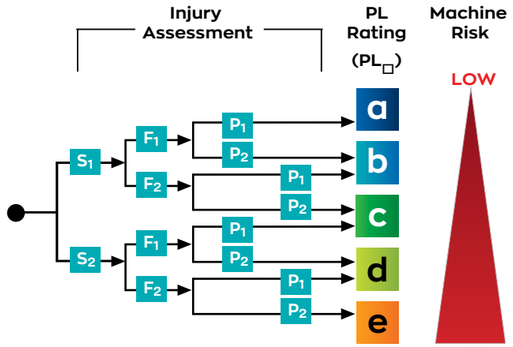
- S1 – Slight (normally reversible injury)
- S2 – Serious (normally irreversible injury or death)

Frequency and/or Exposure Time to Hazard

- F1 – Seldom to less often and/or exposure time is short
- F2 – Frequent to continuous and/or exposure time is long

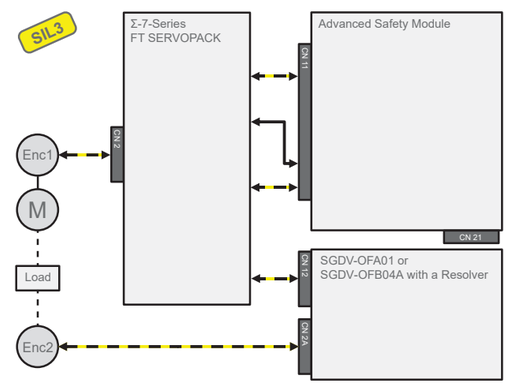
Possibility of Avoiding Hazard or Limiting Harm

- P1 – Possible under specific conditions
- P2 – Scarcely possible



Yaskawa's FSoE servo amplifiers are capable of achieving PLe (equivalent to SIL3) which is suited for machines where serious injuries are possible, the frequency to exposure is long and/or frequent, and the possibility of avoiding injury is scarcely possible

EXAMPLE OF A SIL3 CONFIGURATION



- A secondary encoder or resolver is attached to the load to provide two points of reference to ensure safe operation
- Using the ASM7 card in conjunction with a secondary encoder or resolver is required for the system to be certified to SIL3 (equivalent to PLe)
- This combination also gives the SERVOPACK access to safe motion functions

MODEL NUMBER DESIGNATION

Servo Amplifier + Safety Option Card

400 V NETWORKED SAFETY SERVO AMPLIFIER

SGD7S - 120 D A0 B 800 F91

Product Series

Single-Axis Σ-7 Servo Amplifier

Servo Amplifier Size

Voltage	Code	Output
Three-phase 400 VAC	1R9	0.5 kW
	3R5	1.0 kW
	5R4	1.5 kW
	8R4	2.0 kW
	120	3.0 kW
	170	5.0 kW
	210	6.0 kW
	260	7.5 kW
	280	11 kW
	370	15 kW

Voltage

Code	Specification
D	400V

Interface

Code	Specification
A0	EtherCAT Communications Reference

Design Revision

Code	Specification
A	Design Revision A

Hardware Options

Code	Specification
800	Hardware for use with ASM7

FT/EX Spec

Code	Specification
F91	Firmware for use with ASM7

SAFETY OPTION MODULE

SGD7S - OS B 01 A

Product Series

Single-Axis Σ-7 Servo Amplifier

Module Type

Code	Module
OS	Safety Option Module

Design Revision B

Code	Specification
B	Revision B

Interface Specifications

Code	Specification
01	Advanced Safety Module FSoE
02 *	Advanced Safety Module FSoE + I/O

Design Revision A

Code	Specification
A	Revision A

* Note: SGD7S-OSB02A requires the JUSP-7CN21 safety connector

ACCESSORY

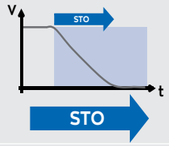
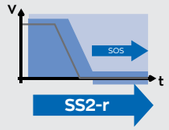
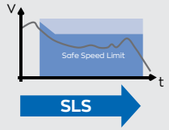
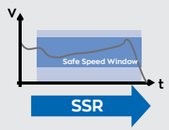
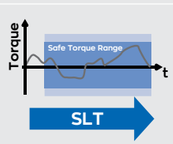
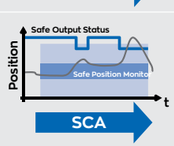
Type	Order Number
Network Safety Option Mount	JZSP-P7R2-8-E

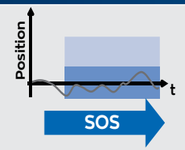
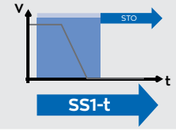
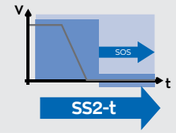
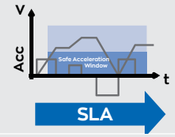
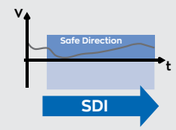
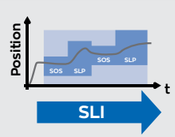
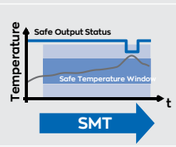
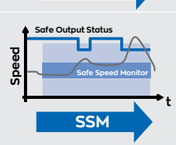
SAFETY FUNCTION HIGHLIGHTS

Take advantage of the following safety functions with Yaskawa's 400 V FSoE servo amplifiers.

BENEFITS

- 16 Total Supported Safety Functions
- Safe Motion, Safe Standstill and Safe Monitoring supported
- Up to 10 Safety Functions per SERVOPACK can be configured simultaneously

Function	Description	
STO Safe Torque Off		**Safe Torque Off**: This function shuts OFF the power supply to the motor by executing the HWBB function of the servo amplifier according to the safety request input state. The drive cannot generate any hazardous movements. If **STO** is activated when the drive is moving, the motor will run down in an uncontrolled manner.
SS1-r Safe Stop 1 - r		**Safe Stop 1**: Deceleration monitored and time controlled. The safety module will activate **STO**: • If the speed limit is exceeded during deceleration • After the monitoring time has elapsed
SS2-r Safe Stop 2 - r		**Safe Stop 2**: Deceleration monitored and time controlled. The safety module will activate **STO**: • If the speed limit is exceeded during deceleration The safety module will activate **SOS**: • After the monitoring time has elapsed (provided that no limit violation has occurred during deceleration). • If the position deviation exceeds the limit, the safety module will activate **STO**.
SLS Safely Limited Speed		**Safely Limited Speed**: On safety function execution request, the safety module starts to monitor the speed (first deceleration monitoring, then constant speed monitoring). If any speed limit is violated, the safety module will activate the selected stop-ping method, for example **STO** (default).
SSR Safe Speed Range		**Safe Speed Range**: This function adds minimum speed monitoring to the SLS function. In other words, the maximum speed must not exceed a certain value, and the min-imum speed must not drop below a certain value. If either of these limits is violated, the selected motor stopping method will be applied, for example **STO** (default).
SLP Safely Limited Position		**Safely Limited Position:** This function monitors the end positions of previously defined ranges. If the actual position exceeds the limits, the safety module will activate the selected stopping method, for example **STO** (default).
SLT Safely Limited Torque		**Safely Limited Torque:** This function monitors the torque and compares it to the limit. If the torque limit is violated, the safety module will activate the selected stopping method, for example **STO** (default).
SCA Safe CAM		**Safe CAM:** This function provides a safe output signal to indicate whether the motor shaft position is within a specified range. If the actual position exceeds the limits, the safety module will activate the configured safe output signal. Please note that this function does not activate a stopping method after a limit violation.

Function	Description	
SOS Safe Operating Stop		**Safe Operating Stop**: On safety function execution request, the safety module will switch to position monitoring. If the position deviation exceeds the limit, the safety module will activate **STO**.
SS1-t Safe Stop 1 -t		**Safe Stop 1**: Deceleration time controlled. The safety module will activate **STO**: • After the monitoring time has elapsed
SS2-t Safe Stop 2 - t		**Safe Stop 2**: Deceleration time controlled and position monitored. The safety module will activate **SOS**: • After the monitoring time has elapsed • If the position deviation exceeds the limit, the safety module will activate **STO**.
SLA Safely Limited Acceleration		**Safely Limited Acceleration**: This function function monitors the acceleration operation of the motor according to the safety request input state. If the specified acceleration speed is exceeded, the selected motor stopping method will be applied, for example **STO** (default).
SDI Safe Direction		**Safe Direction**: This function prevents the motor from moving in an invalid direction, it can only move in one (defined) direction. If the specified direction is violated, the safety module will activate **STO**..
SLI Safely Limited Increment		**Safely Limited Increment:** This function monitors the movements of the drive for compliance with a defined increment. The reference position is defined when monitoring is activated. If a limit value is violated, the safety module will activate STO.
SMT Safe Motor Temperature		**Safe Motor Temperature:** This function monitors the temperature and compares it to the limit values. If the temperature limit is violated, the safety module will deactivate (Low Output) the assigned safe output. Please note that this is a **monitoring function** that does **not** activate a stopping method after a limit violation.
SSM Safe Speed Monitor		**Safe Speed Monitor:** This function provides a safe output signal to indicate whether the motor speed is below a specified limit. If the speed limit is violated during constant speed monitoring, the safety module will activate the configured safe output signal. Please note that this is a **monitoring function** that does **not** activate a stopping method after a limit violation.

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Yaskawa is the leading global manufacturer of low and medium voltage variable frequency drives, servo systems, machine controllers and industrial robots. Our standard products, as well as tailor-made solutions, are well known and have a high reputation for outstanding quality and reliability.

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