

SIEMENS



SIMATIC Safety Workshop

Experience the fast and easy way to safe machines – at highest productivity

SIMATIC Safety Workshop - Agenda

Introduction

- Why Machine Safety?
- Why Safety PLC's?
- Product Highlights
- Safety Applications



Less
Time

Hands-on

- Hardware & PG (Laptop) Setup
- Wiring - Safety input & output
- Hardware & Software Exercises
- Final Exercise



More
Time

Why Safety?

Workplace Injuries – Is that why we are here?

321,000
people die
every year

Every year, more than **2 million people***) the worldwide as a result of work-related diseases

In addition, **321,000 fatal industrial accidents***) are registered

OSHA (2010) has estimated the total cost of a irreversible injury (indirect cost plus direct costs) to be **\$101,467**. Clearly, machine-related injuries take a heavy toll on employers and employees

\$101,467 per
irreversible
injury



In most countries, legal regulations therefore stipulate that only **safe machines should be put into production**

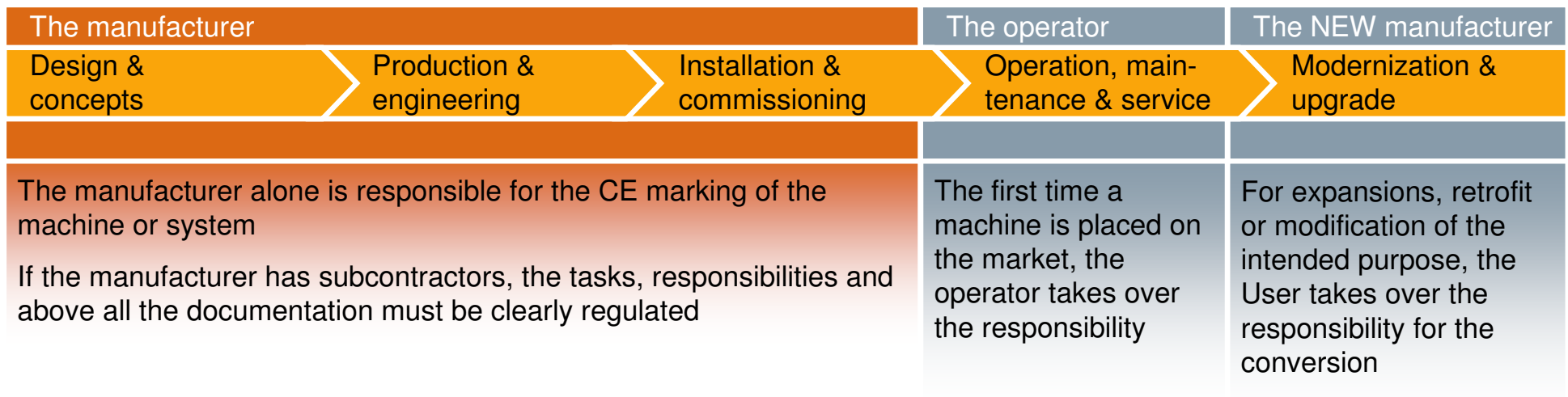
Siemens offers **complete** safety solutions

- Comprehensive product portfolio for the functional safety of machines
- Solutions for small compact machines as well as highly flexible plants
- Comprehensive consulting and support

Source: **Estimations by the** International Labor Organization (ILO)

Who is responsible for safety?

In every phase of a machine's or system's life, safety-related tasks and responsibilities arise



+ The responsibility lies with the manufacturer, operator, modernizer or importer depending on the phase of the machine's lifecycle. Within the individual phases, different tasks result for the person responsible

SIMATIC Safety Integrated

The fast and easy way to safe machines – at highest productivity

Siemens is the global Number 1 in machine safety

- The latest IHS Study 2014 has confirmed Siemens as the world's leading manufacturer of functional safety technology
- One of the success factors: the integration of high-quality safety functions into standard products!

- Siemens is the **trendsetter** in integrating safety functions into standard products
- Siemens offers the best-integrated, most efficient safety engineering
- Siemens sets the standard in customer support with safety consulting & services, throughout the complete machine safety lifecycle



What can SIMATIC Safety do for you?

...the highest possible integration of safety in an automation system

SIMATIC Safety – Automation solution with integrated safety functionality

- Highest possible integration
- Highest flexibility through max. scalability
- Forward compatibility for max. investment protection
- Totally Integrated Automation Portal
 - The integrated engineering framework



The faster, more cost-effective route to an optimum solution

SIMATIC Safety Integrated

One engineering, one controller,
one network for standard and
fail-safe automation



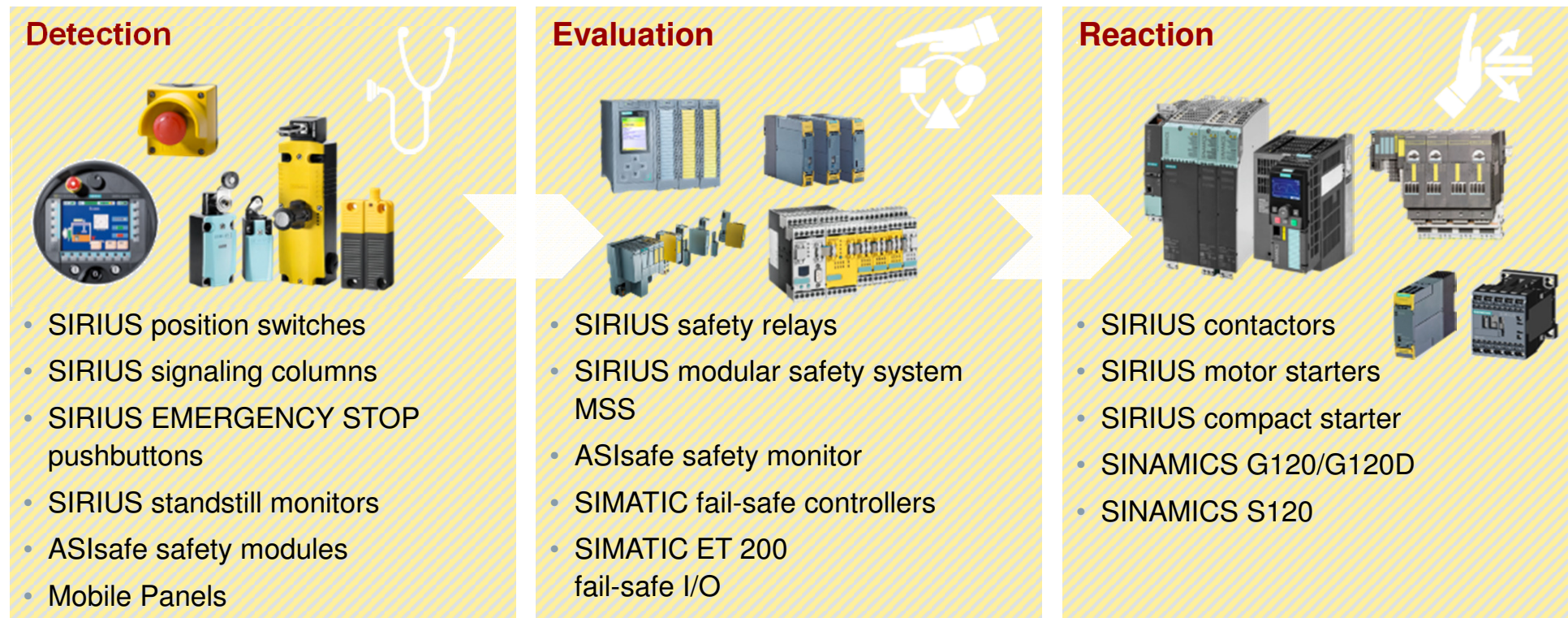
Automation solution

Automation solution

Safety Functions

Integrated safety engineering

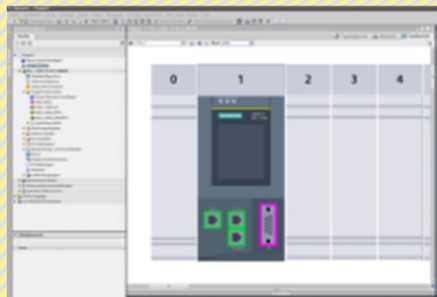
The Siemens product portfolio for safety applications in the manufacturing industry



What's New?

SIMATIC Safety in the TIA Portal

Fail-Safe Engineering



STEP 7 Safety Advanced V13

- + F-program structure auto-generated
- + TÜV Certified – Safety library/functions

Fail-Safe Controller



S7-1500F for Advanced Control

- + Field proven coded processing
- + Faster and with onboard status display

Fail-Safe I/O



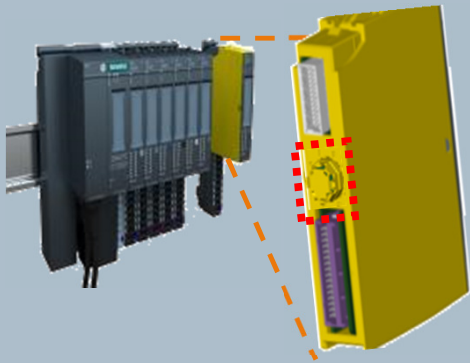
ET 200SP

- + No DIP Switches
- + Hot Swappable

SIMATIC Safety Integrated ET200SP, F-Addressing

ET 200SP F-I/O modules

✓ Addressing by means of:
coding element



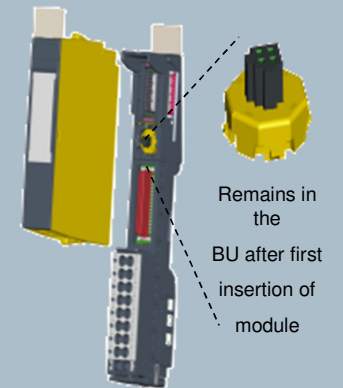
Delivery state



Module is inserted



Module is pulled



No more DIP Switches, now intelligent coding module

SIMATIC S7-1200F Highlights

Safety

- Free safety logics programming
- TÜV-certified library with all conventional safety functions
- Validation support through standard-compliant program documentation
- Easy reusability thanks to library concept
- Applicability for safety-related tasks in accordance with IEC 62061 up to SIL e and ISO 13849 up to PL e

Usability (for standard and safety)

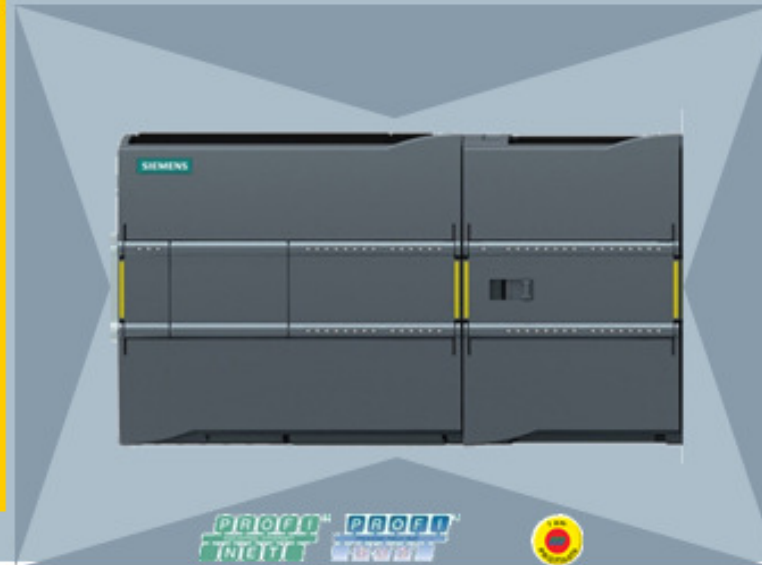
- Uniform look & feel
- Uniform symbols and data consistency
- Comprehensive and integrated diagnostics

Diagnostics

- System diagnostics
- Web server

Investment protection through compatibility

Easy portability of user programs
S7-1200FC <-> S7-1500F <-> PC-based automation



S7-1200FC-CPU's

(only DC/DC/DC- and DC/DC/Rly)

- S7-1214FC
- S7-1215FC

Fail-safe S7-1200 IO-Module

- SM 1226 F-DI 16 x 24VDC
- SM 1226 F-DQ 4 x 24VDC
- SM 1226 F-DQ 2 x Relay

STEP 7 Safety Advanced V13 SP1

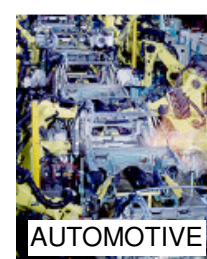
- S7-1200FC & S7-300/400/1500

STEP 7 Safety Basic V13 SP1

- Same function as Safety Advanced (but only S7-1200FC)

Centralized solution for standalone machines !!

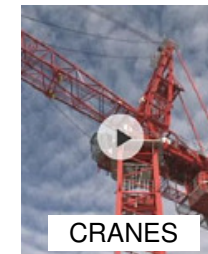
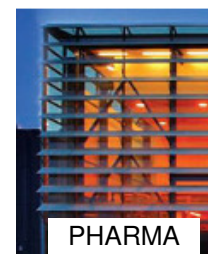
Safety Applications Everywhere ! Automotive, Aerospace, Material Handling and more



NORTH AMERICAN SAFETY REFERENCES



WORLD-WIDE SAFETY REFERENCES



Siemens Safety Integrated

Machine Safety Life-Cycle Support — USA

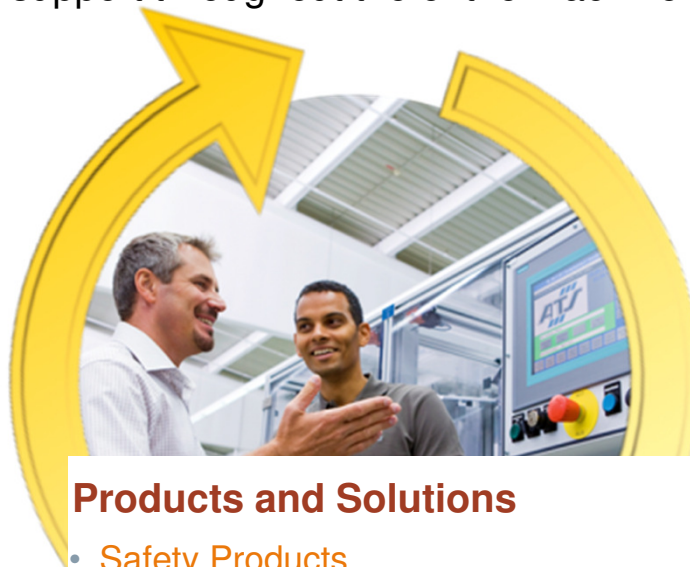
Siemens provides competent support throughout the entire machine safety lifecycle

Support

- [Safety Consultants](#)
- [Safety Core Team](#)
- [Safety Validation](#)

Implementation

- [Siemens Solution Partners – Safety](#)
- [Safety Functional Examples](#)
- [Safety Training](#)
- [Risk Assessment Training](#)



Products and Solutions

- [Safety Products](#)
- [Safety Software](#)
- [Wireless Safety](#)
- [PC-Based Safety](#)
- [BMS](#)

Safety Education

- [Machine Safety Standards](#)
- [Safety Webinars](#)
- [Newsletter](#)
- [Safety White Papers](#)
- [Siemens Safety Website](#)

Compliance

- [OSHA Website](#)
- [Consensus Standards](#)
- [Risk Assessment Standard](#)
- [Safety Evaluation Tool - SET](#)



SIMATIC Safety Integrated Workshop

Objectives of Safety Workshop:

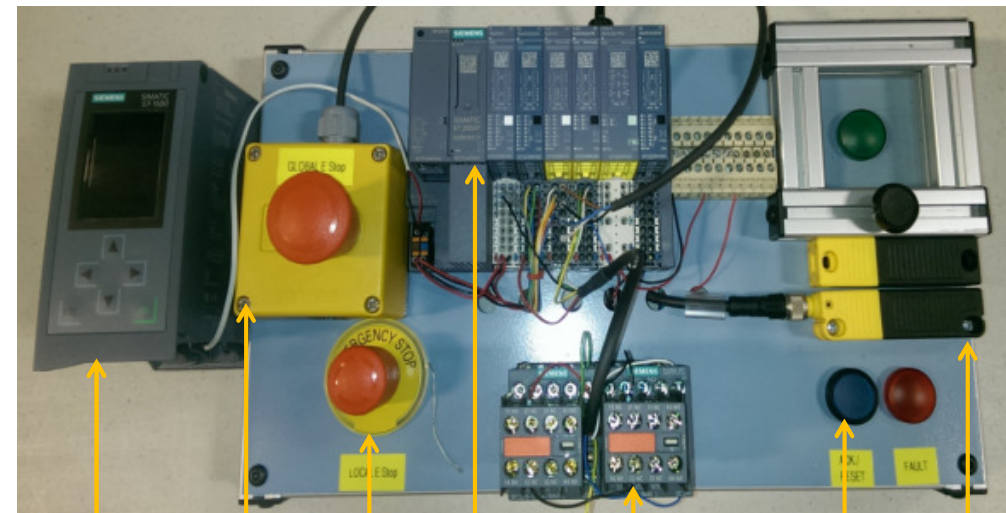
- **Understanding Safety** – Review of points that are necessary, while working with Safety.
- **Redundancy** – Higher Safety Levels need to include redundancy & how this is achieved can be seen from the I/O module wiring exercises.
- **Diagnostics** – See how to increase uptime by utilization of the built in enhanced diagnostics.

Siemens Industrial Academy, FY15
Safety Hands-on Exercise

- 🔴 STEP #1 - Hardware & PG (Laptop) Setup
- 🔴 STEP #2 - Wiring Safety input & output
- 🔴 STEP #3 - Hardware & Software Exercise
- 🔴 STEP #4 - Final Exercise

TEST

Enter the correct password, to confirm your
“First Successful Safe Step into the future”.



SIMATIC
1516F

LOCAL
E-STOP

ET200SP
I/O

ACK /
RESET

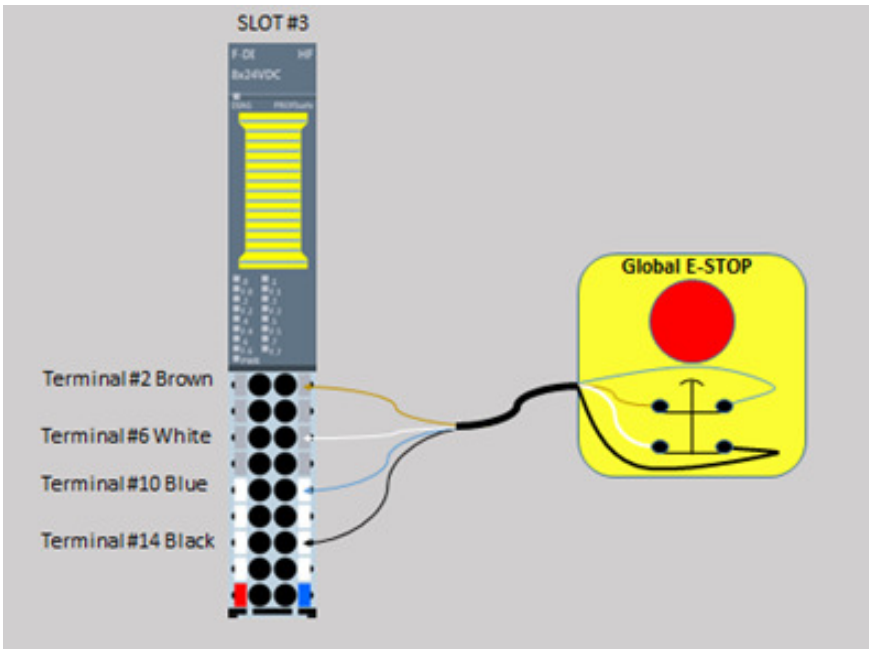
GLOBAL
E-STOP

CONTACTORS
WITH F/B

DOOR
CONTROL

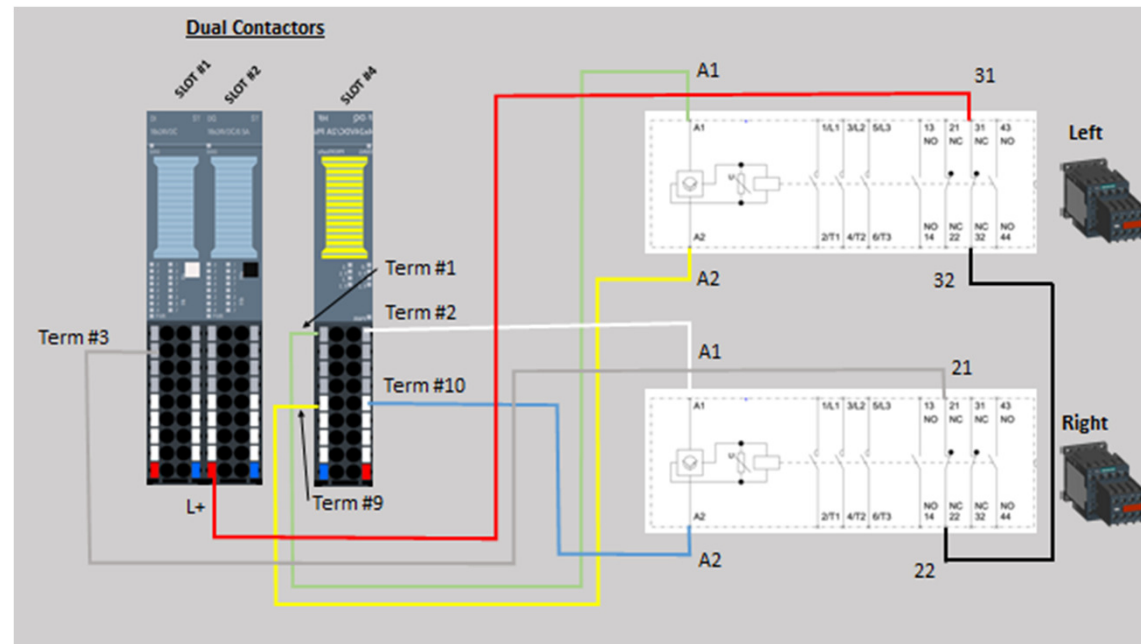
Siemens Industrial Academy, FY15 Safety Hands-on Exercise - Wiring

+ Safety Input Wiring Global E-Stop



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+ Safety Output Wiring Contactors with feedback signal

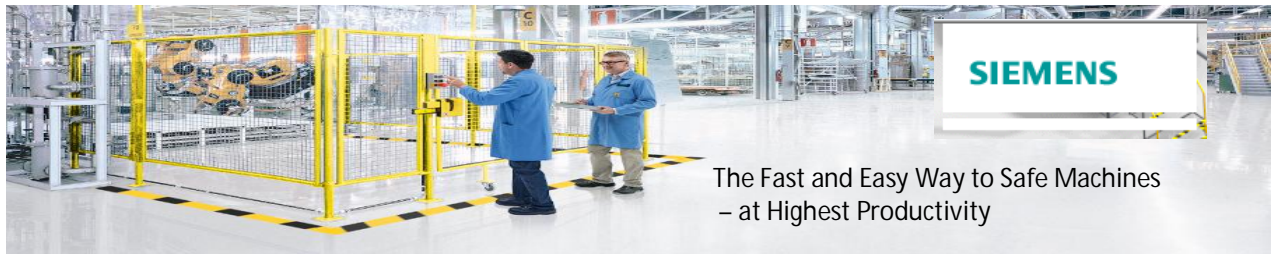


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SIMATIC Safety Workshop

Thank You !



SIMATIC Safety Integrated Workshop

Objectives of Safety Workshop:

- **Understanding Safety** – Review of points that are necessary, while working with Safety.
- **Redundancy** – Higher Safety Levels need to include redundancy & how this is achieved can be seen from the I/O module wiring exercises.
- **Diagnostics** – See how to increase uptime by utilization of the built in enhanced diagnostics.

Exercises:

1) Check the 1516F-CPU & ET200SP fail-safe I/O modules: Which ones have the TÜV SÜD Functional Safety Mark?

(Please ensure the demo is powered off before removing the cards to look for this mark)

- CPU S7-1516F
- ET200SP Fail-safe Input module
- ET200SP Fail-safe Output module
- ET200SP Standard Input/Output modules
- All of the above



2) In a Safety PLC, what is allowed?

- Only Safety Programming
- Safety & Standard Programming
- Only Standard Programming

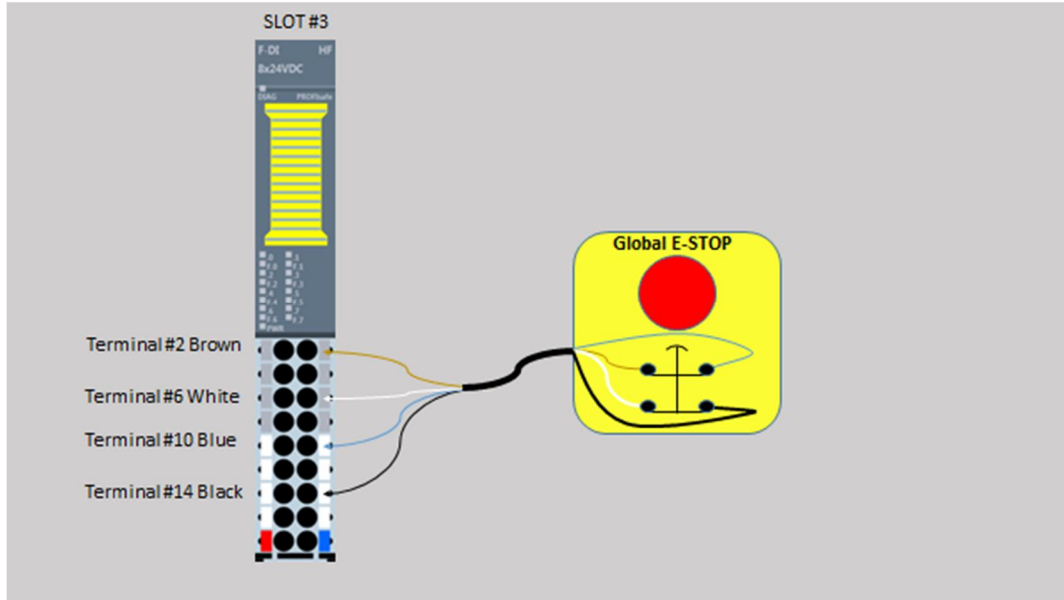
3) How many DIP switches are there on a ET200SP fail-safe module?

- One
- Four
- Eight
- Zero

(Please ensure all the ET200SP I/O modules are properly seated in their base units)

4) Safety Input - E-Stop Button (wiring)

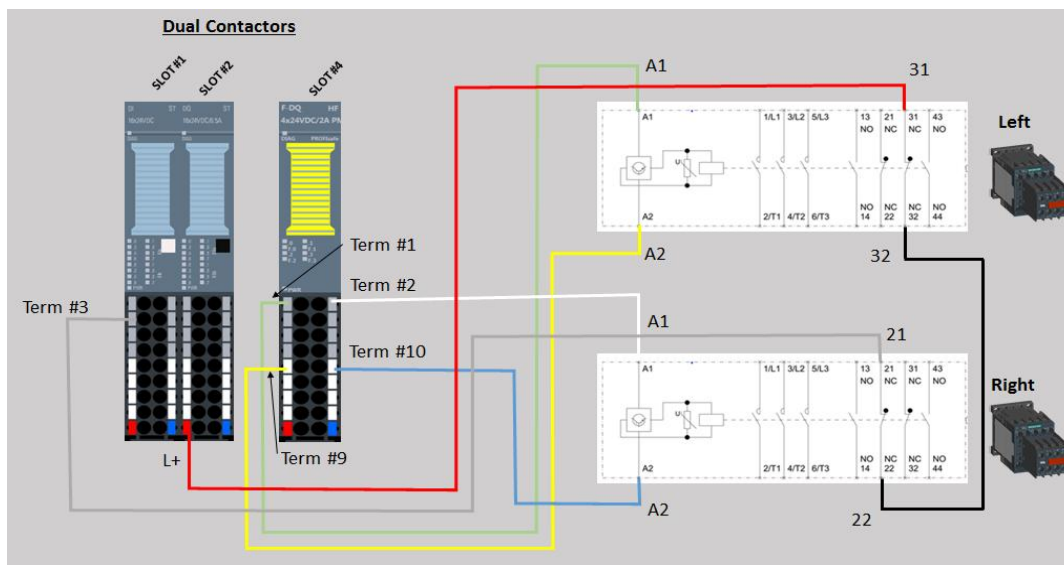
SIL 3, PL e, CAT 4 safety input wiring - to meet this requirement it is necessary to wire the safety inputs redundantly (e.g. 2 Normally Closed contacts on the E-Stop) wired to 2 channels on the fail-safe Input Module. This redundant wiring checks for single point, cross wiring/short circuits related failures (**Test pulses are sent through the contacts at regular intervals**)



5) Safety Output – Contactors with feedback (wiring)

SIL 3, PL e, CAT 4 safety output - to meet this requirement it is necessary to wire two contactors with positively guided contacts & wire 1 set of Normally Closed contacts on each contactor in series, as the feedback signal. This is then wired to 2 channels on the fail-safe Output Module.

This wiring of 2 contactors along with their feedback checks for single point, contact, cross wiring/short circuits related failures (**Test pulses are sent through the contacts at regular intervals**)



Ensure E-stops are in released state (twist to release) and then put PLC in run mode (Switch behind PLC display. (Press blue button, if flashing)

6) How do you know it's a safety PLC?

Using the front Display on your S7-1500F locate the collective failsafe signature and write it below:

7) Type of safety functions:

(Which **safety input devices** do you see on the demo, use them and observe their functionality on the demo?)

Safety Input Device 1: _____

Safety Input Device 2: _____

Safety Input Device 3: _____

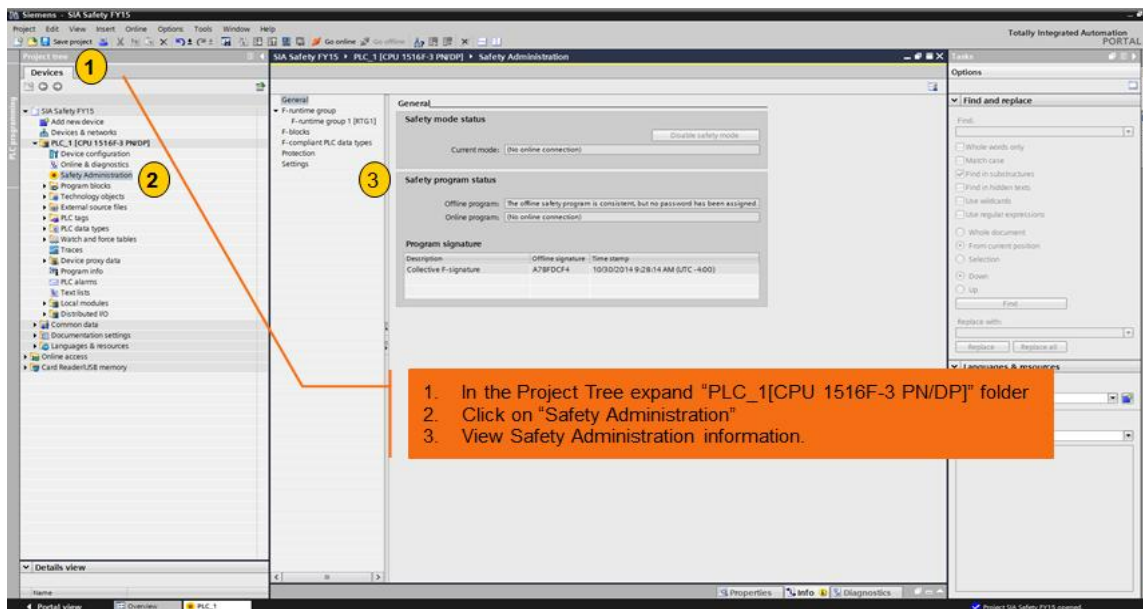
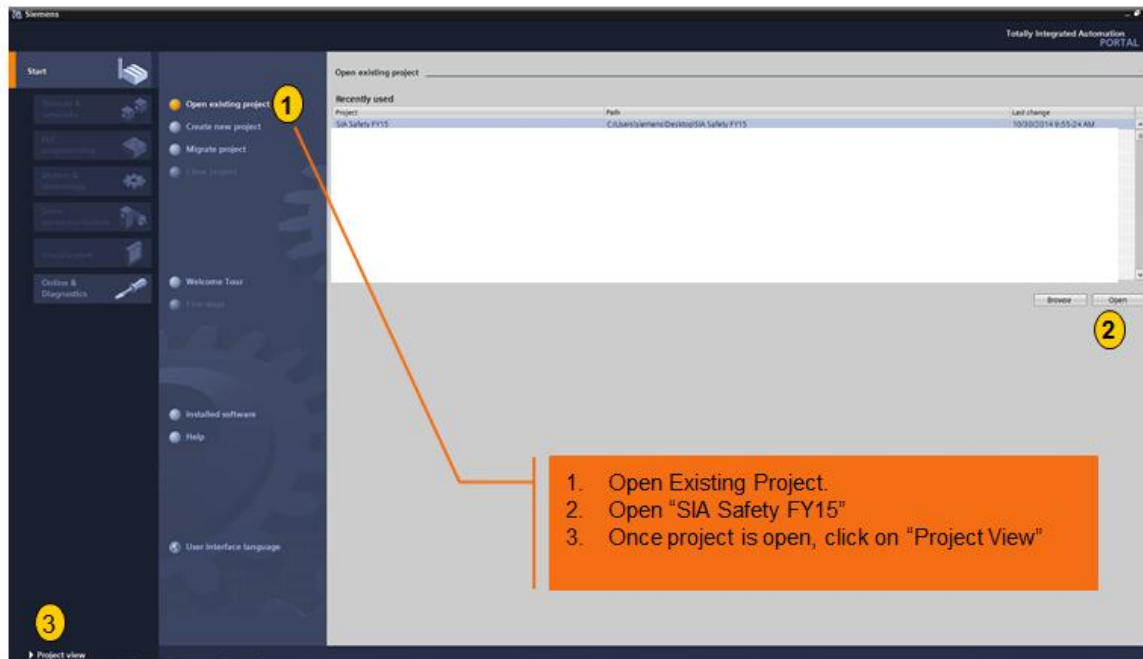
8) Which safety function requires a safety acknowledgement?

- Pressing and releasing an ESTOP
- Opening and closing the safety door
- All of the above

Which button would you press for safety acknowledgement/reset (state button color)?



On the PG (Laptop/Programmer) power on if not already powered on, Click on "TIA Portal V13" icon on desktop



9) Safety Administration - One location for all safety information

- a) On the program signature which is the month in the time stamp MONTH: -----
b) What is the time stamp of the safety program signature? TIME: _____

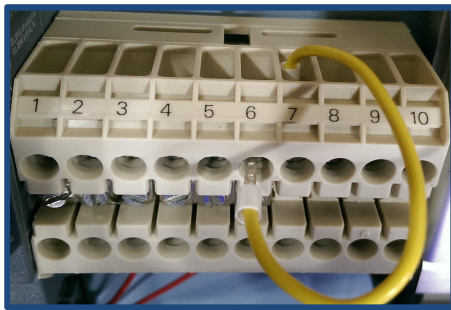


10) Safety Print-out (very important for safety documentation and compliance)

Right click on "Safety Administration", then click on print, then click on "Preview"

Scroll down to bottom of document, now how many pages does it show? _____

11) Diagnostics



Put CPU in STOP mode (Switch behind PLC display) and then perform short circuit (take the yellow wire connected to terminal 7 on the terminal strip and hold it to any terminal 1 through 6, e.g. as shown in the above diagram)

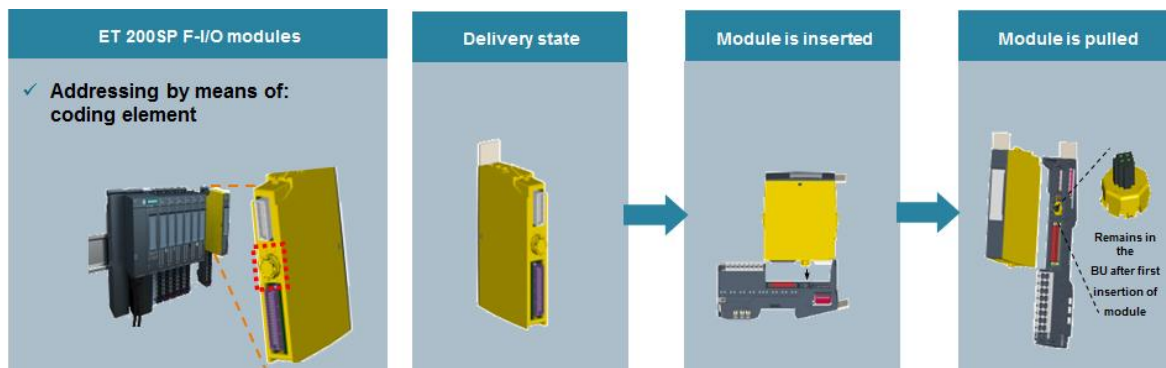
Using the front display – follow the exclamation mark in the red circle till you reach the screen that shows "Input shorted to P on ESTOP CH1" (you may need to scroll the display)?

- What is the status of the LED on F.0 on the Demo? _____
- What is the slot number of the faulted module? _____

Put CPU in RUN mode & press Acknowledge/Reset (blue) button.

12) Maintenance –

On the Demo - Remove F-DQ (Output card), replace with new module from the brown box, check part number F-DQ (6ES7 136-6DB00-0CA0) - "Pay special attention to the coding module – see figure below" Press "Reset" button



How long does it take to switch out the faulty module and get the demo back up “running”?

- < 5 seconds
- less than 15 seconds
- > 30 seconds

Is the PROFIsafe address automatically transferred to the module that is replaced?

- Yes
- No



Final Exercise:

Answer the following questions to crack the Password:

- ✓ How many characters (including digits) are in the safety signature: **A** = ___
- ✓ How many DIP switches are there on a ET200SP fail-safe module: **B** = ___
- ✓ What was the slot number of the faulted module: **C** = ___
- ✓ How many wires from the Global E-Stop did you wire into the ET200SP fail-safe Input module: **D** = ___

Your Password for the Display: ___ ___ ___ ___

A B C D

5 Steps after finishing the final exercise:

- 1) Start Internet Explorer
- 2) Type: 192.168.0.1
- 3) Click on: “Enter”
- 4) Click on: “Custom Pages”
- 5) Click on: “Homepage of the application User Defined Web Page”

