

trinity

SAFETY LOGIC FOR SEAMLESS HRC TUTORIAL

Laboratory of Manufacturing Systems and Automation (LMS)

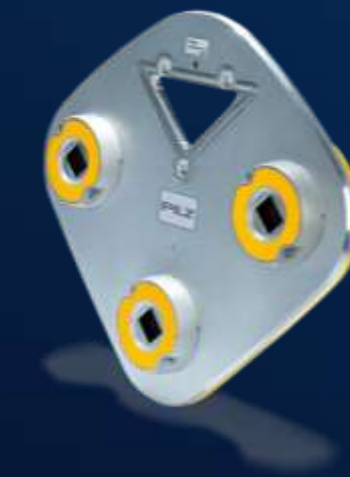
 www.trinityrobotics.eu



The TRINITY project has received funding from the European Union's Horizon 2020 research and innovation programme under the GA 825196

Pre-requisites

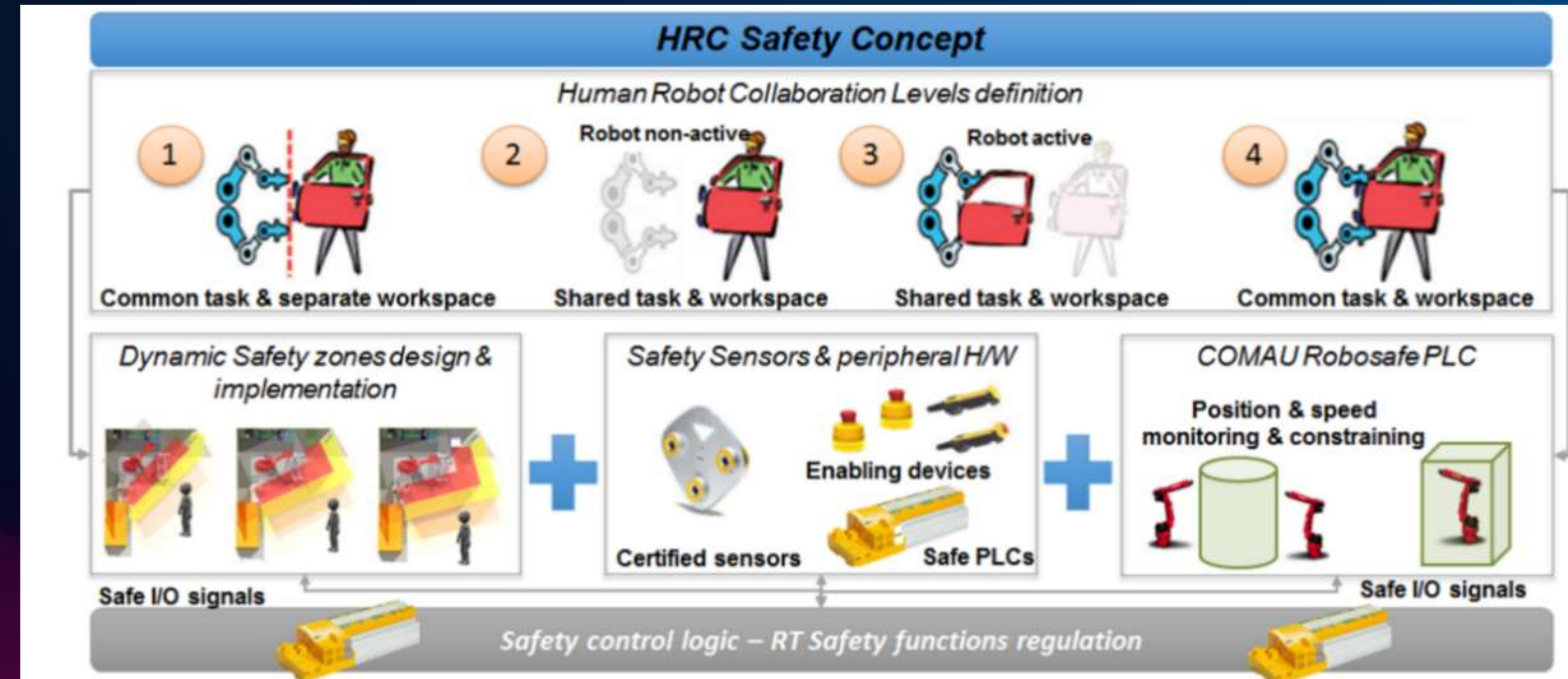
- Windows Operating system
- License for the full version of the SafetyEye Configurator software
This will be provided by the company that SafetyEye purchased
Guidelines for software also provided by the company.
- Minimum desktop related hardware requirements:
 - CPU: Intel Core i7 10th Generation.
 - Disk: SSD 250 GB.
 - RAM: 32 GB.
 - GPU: NVIDIA GTX 1050.



Overview of the module features

The main systems of this module are:

- a) COMAU C5G Robosafe system
- b) PILZ PSS4000 Safety PLC
- c) PILZ SafetyEye 3D Monitoring system
- d) Complementary external Safety hardware



These individual sub-systems and the individual components that have been used to implement these sub-systems are presented in the next slides



Overview of the module features

a) Robot's safety hardware and software

At this tutorial has been used the COMAU C5G Robosafe system

This system is based on B&R safety certified PLCs that monitor and regulate in real-time robot's position and speed.

These PLCs inside the robot's controller communicate directly with the motor drivers and they provide the following:

- Robot speed monitoring and regulation
- Robot cartesian position monitoring and constrain



Overview of the module features

b) PILZ PSS4000 Safety PLC

At this tutorial has been used a safety controller from PILZ. However, this can be developed with a safety controller from another provider.

The Safety controller PILZ PSS4000 PLC is the center of the safety system and is that will manage all the Safety of the scenario.

This controller communicates in a safe way with the C5G Robot controller to interchange the safe signals.



Overview of the module features

c) 3D camera system

At this tutorial has been used a safety controller from PILZ. However, this can be developed with a safety controller from another provider.

The third group contains the PILZ software and hardware technologies that monitor the area around the robot.

This contains the SafetyEYE, a 3D safety camera that can monitor randomly-shaped safety zones designed by the user, a safe PLC and the PSS3000,



Overview of the module features

d) External hardware devices

The last group of components contains all the remaining external hardware that is integrated into the PSS4000 and sends specific signals related to the phase of the scenario.

This hardware refers to enabling devices that help the operator guide the robot manually using the manual guidance functionality and to external reset LED/button and emergency stop buttons.



Allen Brandley – Enabling switches: a) 440J-N2NTNPM-NE b) 440J-N21TNPM-NP



Reset button & Indicator lamp



Pre-installation Tasks

1

Obtain license for the full version of the SafetyEye Configurator software

2

Adjust the configuration PC's IP address to be in the same subnetwork as the IP addresses of the "USER" interface on the analysis unit.

3

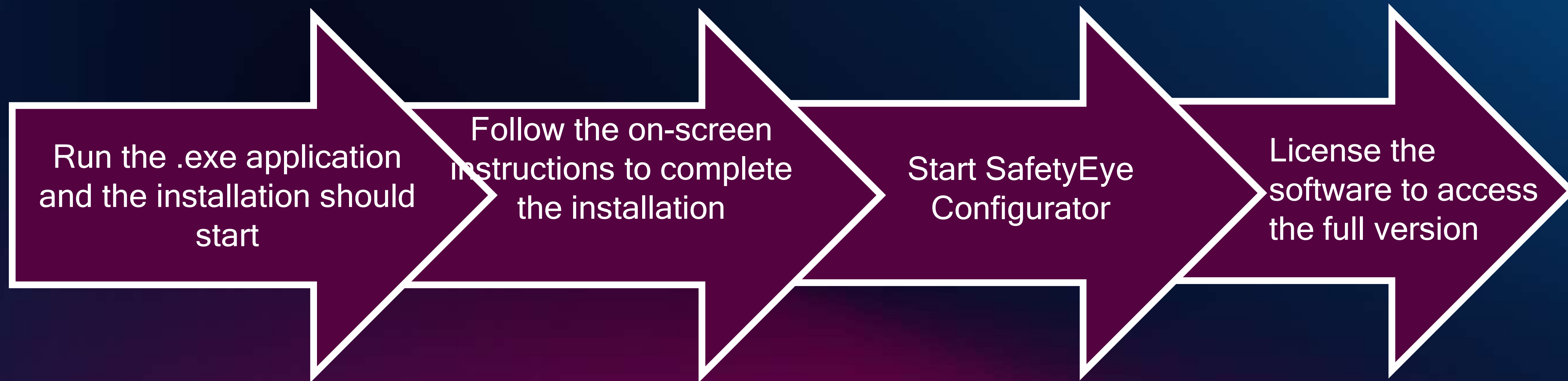
For optimum system performance, a current graphics card with 3D acceleration should be used, and the 3D acceleration should be activated. The PC where SafetyEYE is to be installed should:

- ✓ have a graphics card with 3D acceleration and that the 3D acceleration is activated
- ✓ have current driver of the graphics card installed.



Installation Procedure

- For the SafetyEye Configurator:



Installation Procedure

- For the hardware components:

Connect the components

- ✓ Connect sensing device to the analysis unit
- ✓ Connect the analysis unit to the PSS300 and the to the configuration PC via ethernet cables

Wire indicator light unit to the PSS300

- ✓ Red lamp to O2.0 output
- ✓ Amber lamp to O2.1 output
- ✓ Green lamp to O2.2 output



Configuration

To setup SafetyEye:

1. Connect to SafetyEye

- Click the Start button
- Select SafetyEye from the “Connect to SafetyEye” dialogue box
- Click OK

2. Make SafetyEye settings

- Click the Start button
- Select a hardware name in the “General” tab
- In the “USER interface” tab set IP address of the network
- In the “PSS settings” tab enter serial number and product name of the PSS (see the PSS label)
- Download settings

3. Check visible range and lighting

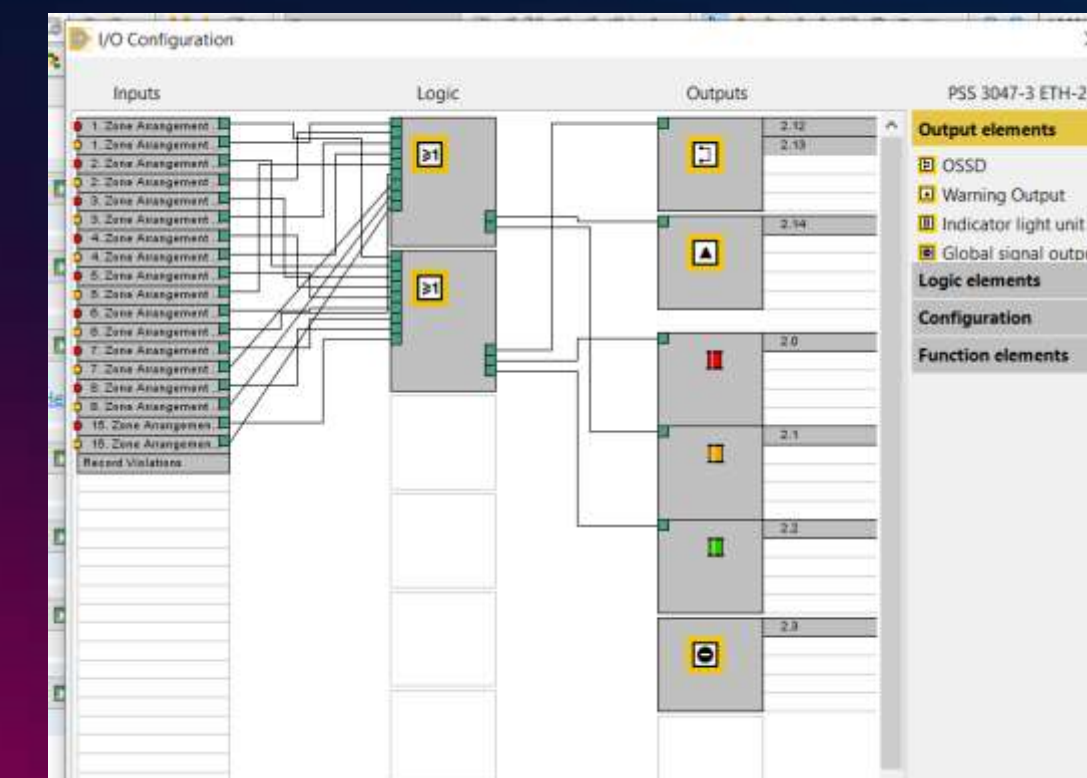
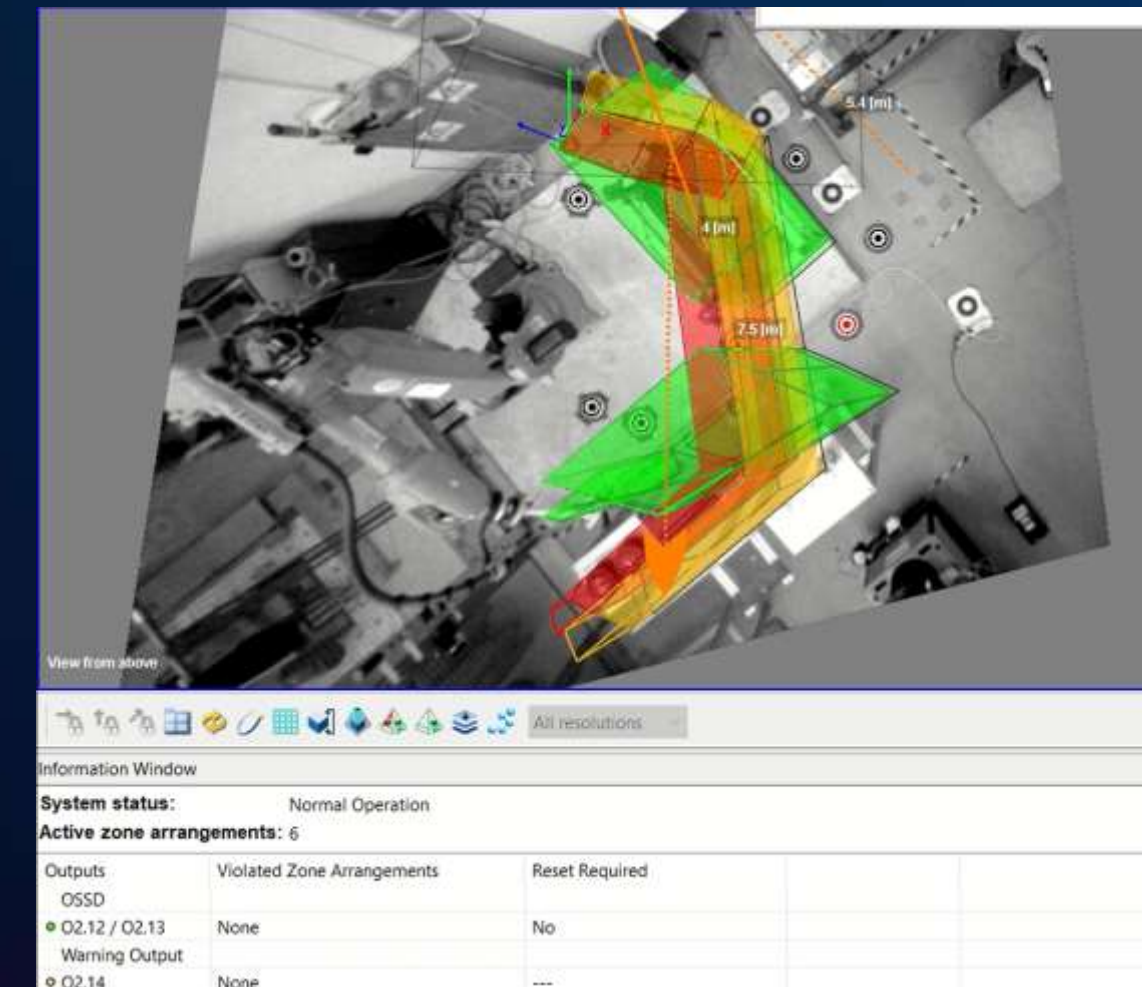
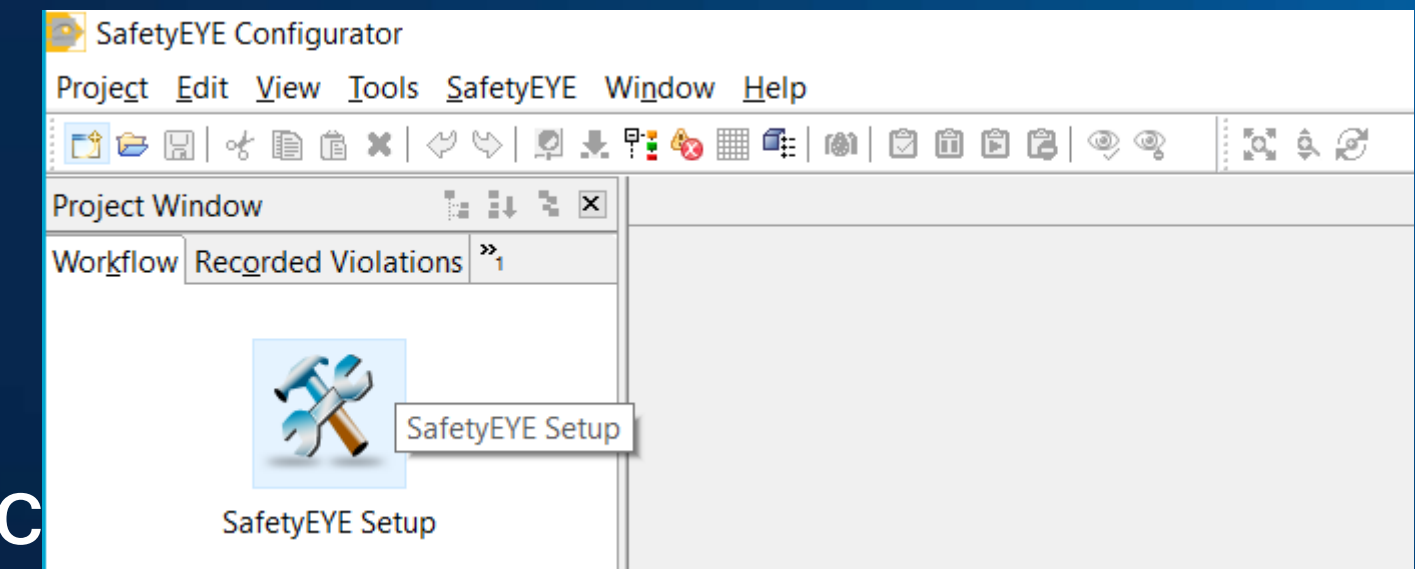
4. Conclude SafetyEye setup by pressing the “Finish” button



Create Project

To setup a SafetyEye project:

1. In the “Project Window”, switch to the “Workflow” tab and click on “Project Setup”
2. Connect to SafetyEye
3. Position setup and position reference markers in the cell
4. Take snapshot and define setup markers
5. Define user coordinate system and define reference markers
6. Configure zones and create a project
 - Draw zones
 - Assign zone arrangements resolutions
 - Configure I/Os
 - Set password to the project
 - Save the project
7. Download the project and violate zone arrangements
8. Mark project as tested and save it
9. Start normal operation by selecting “Start Monitoring Display”



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Thank you!

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