Machinery Safety Tech Talk

PILZ
THE SPIRIT OF SAFETY

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Why Safety?

- Keep all your fingers and all your toes!!
- Improves relationship – workers and employer
- Improved individual and team morale
- Reduces downtime and increases efficiency
- Reduced need for troubleshooting / reactive maintenance
- Creates a culture of accountability and care
- Best performing companies have the best safety
- Performing strongly in safety - better marketing image

OSHA

OSHA Fine

Department of Labor finds LaFayette insulation manufacturer ignored safety standards after investigation of worker's serious head injury

Bonded Logic Inc. exposed workers to hazardous energy, lack of machine guarding

LAFAYETTE, GA – A 21-year-old line operator at a LaFayette, Georgia, insulation manufacturer suffered severe head trauma after being caught in a machine's roller. A U.S. Department of Labor investigation determined that the employer willfully ignored federal workplace safety standards.

The department's Occupational Safety and Health Administration issued citations to Bonded Logic Inc. for two willful, two repeat and 10 serious violations after its investigation of the Aug. 24, 2022, incident. OSHA inspectors found the employer willfully failed to develop and use lockout/tagout procedures to prevent machines from sudden starts or movements during maintenance, and did not control the release of stored energy while machines were serviced.

OSHA has proposed $423,432 in penalties.

Additionally, OSHA identified repeat violations for not installing safety guards on machines and failing to certify forklift operators. The agency also cited the company for failing to:

- Conduct an evaluation to identify permit-required confined spaces and develop and implement a permit-required confined space program.
- Train employees on the hazards associated with permit-required confined spaces and complete entry permits prior to entering those spaces.
- Ensure energy control devices were applied to all energy sources during maintenance or servicing.
- Maintain proper guarding of chains and sprockets on machinery.

"Bonded Logic put profits before safety and now a young worker must cope with the aftermath of a horrible and preventable injury," said OSHA Area Office Director Jeffery Stawowy in Atlanta-West. "The employer's failure to develop and ensure the use of lockout procedures for employees who work near and perform maintenance on dangerous machinery is hard to comprehend."

OSHA inspected Bonded Logic in 2018 and 2021, issuing three serious and five other-than-serious violations for hazards associated with eye protection, machine guarding, housekeeping, powered industrial trucks and confined space.

Bonded Logic Inc. markets and manufactures several thermal and acoustical insulation products for multiple industries.

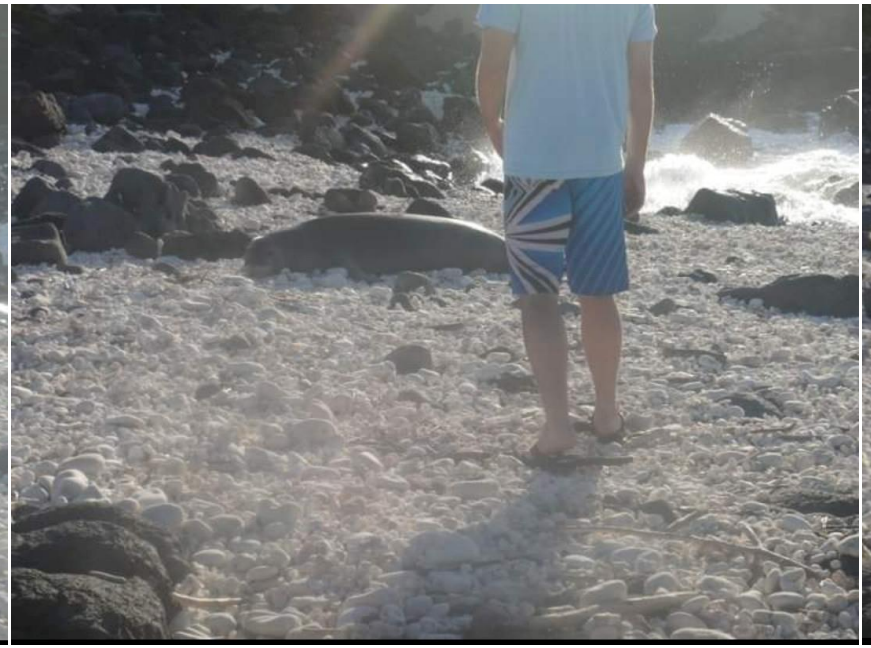
The company has 15 business days from receipt of the citations and penalties to comply, request an informal conference with OSHA, or contest the findings before the independent Occupational Safety and Health Review Commission.

Risk Assessment

- ***SAFETY BEGINS WITH A RISK ASSESSMENT!!!***

- The machine risk assessment should cover all phases of its life
- It should consider correct use and reasonably foreseeable misuse.
- It should also cover all personnel who will interface with the machine during this life span.

A Story in Three Pictures



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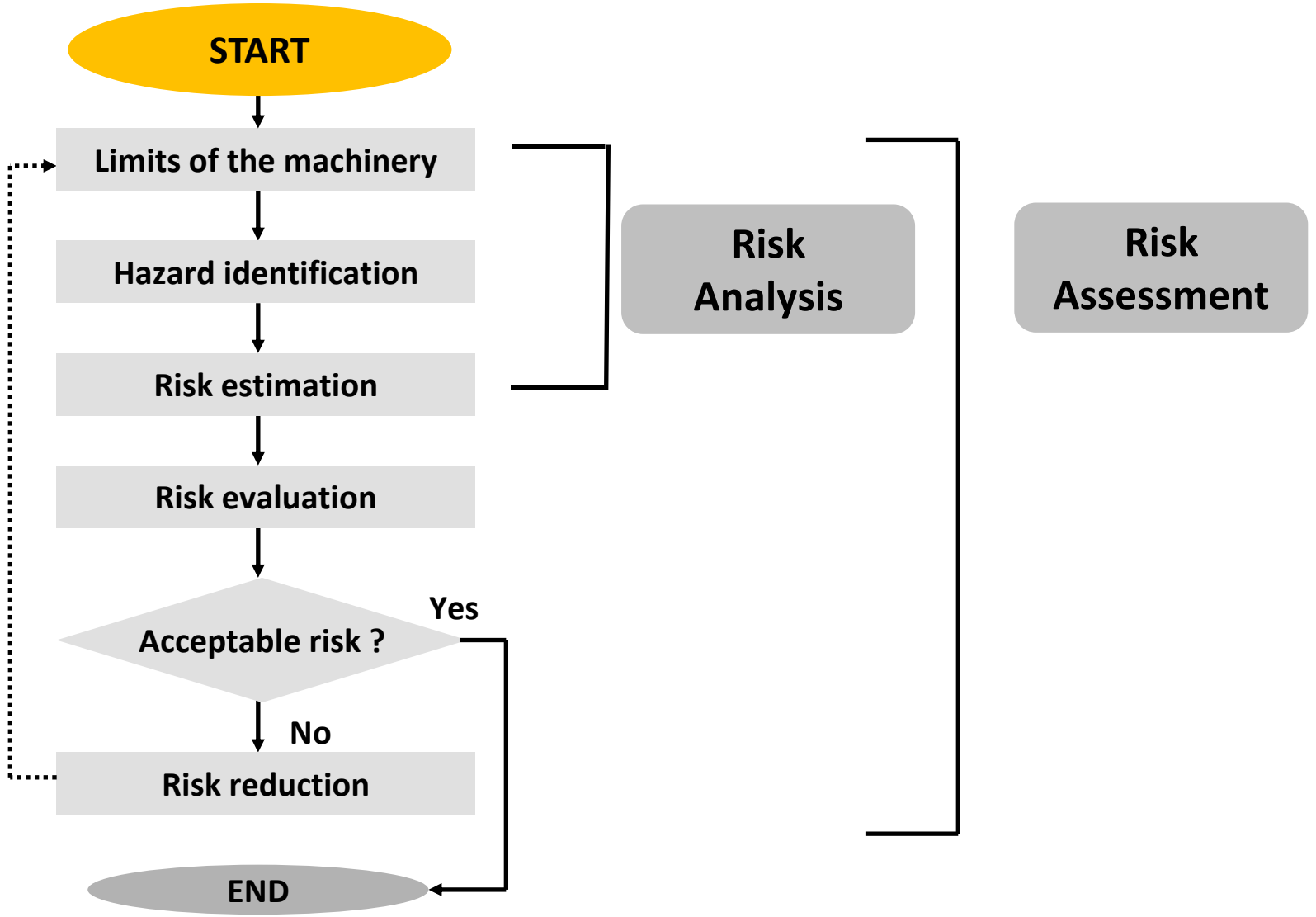
Overview of Risk Assessment Method

EN ISO 12100



ISO 12100
Clause 5

Clause 5 of the ISO 12100 deals with all aspects of the risk assessment.

Clause 5.2 covers information for risk assessment which should include:

- Machinery description and specification
- Relevant regulations, standards and other applicable documents
- Previous experience of use of machine type
- Ergonomic principles

Both Qualitative and quantitative information should be taken into consideration where relevant.

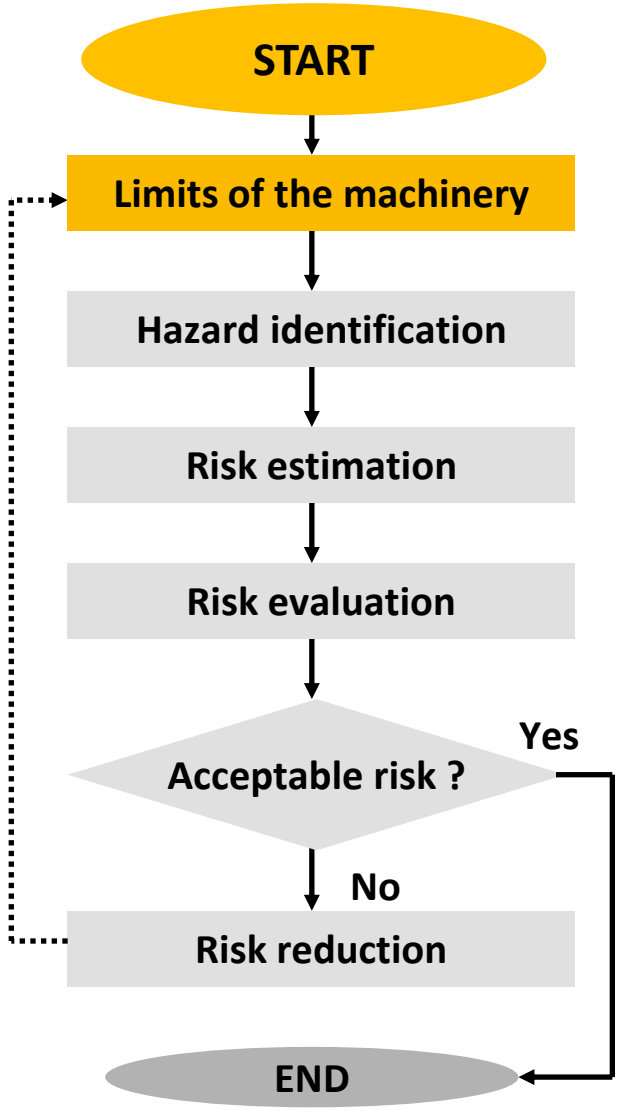
The absence of an accident history, a small number of accidents or low severity shall not be taken as automatic presumption of low risk

ISO 12100
Determination of limits

Clause 5.3: Determination of limits of Machinery
This should take into account all phases of machinery life

To include such things as:

- Use limits:
  - Operating modes and intervention requirements
  - Intended use foreseeable use and reasonably foreseeable misuse or malfunction
  - Anticipated levels of training
  - Exposure to other persons to the hazards where it can be reasonably foreseen
- Space limits:
  - Range of movement
  - Space requirements for people to interact with machine during operation/maintenance.
  - Human interaction (operator machinery interface)
  - Machine power supply interface



ISO 12100
Determination of limits

Clause 5.3: Determination of limits

Time limits:

- The life limit of machine and components based on intended use and foreseeable misuse
- Recommended service intervals

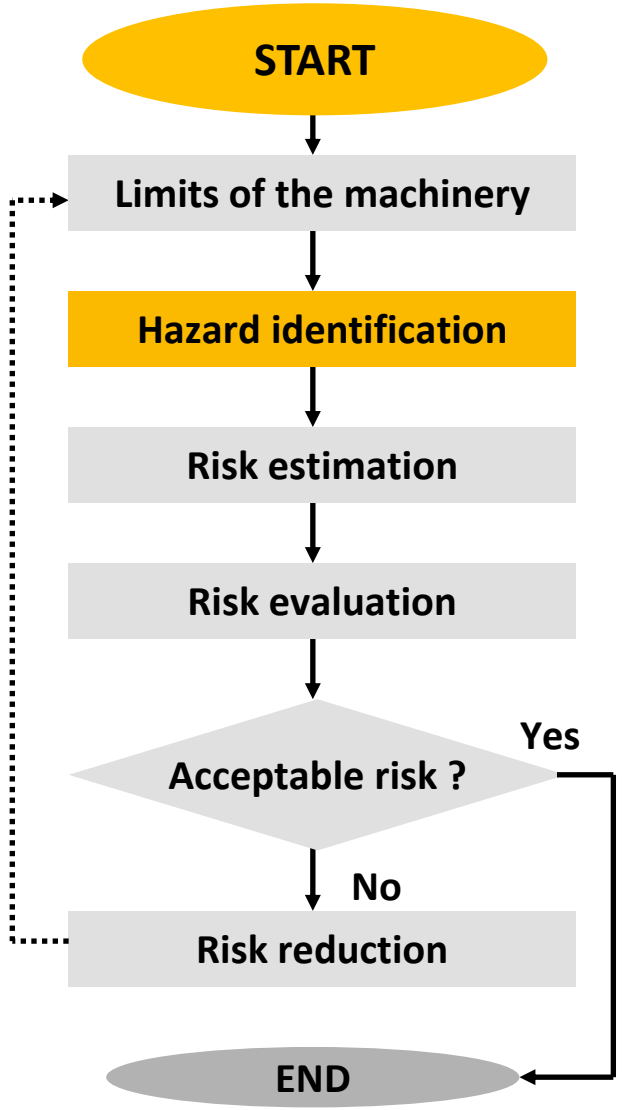
Other limits:

- Environmental
- Housekeeping/ cleaning requirements.
- Properties of materials being processed

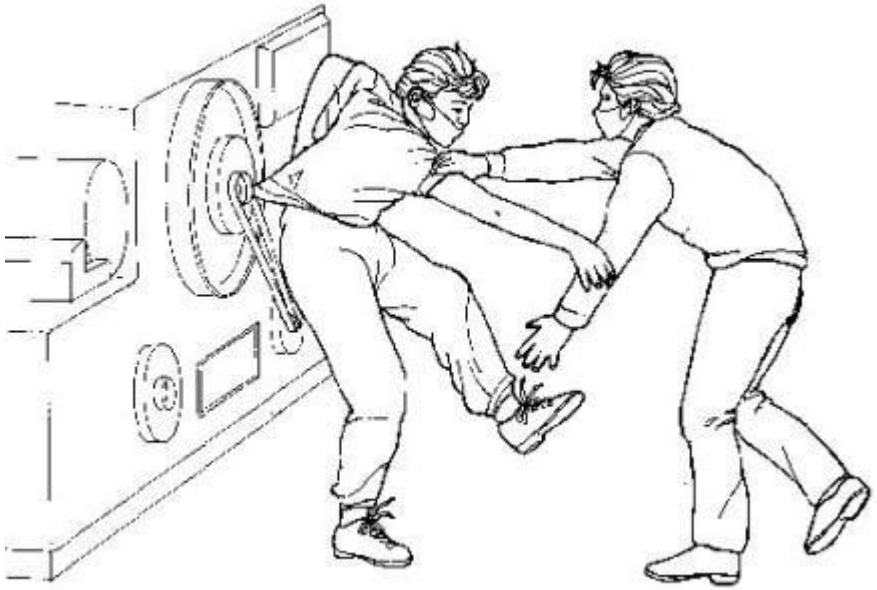
ISO 12100
Hazard Identification

- Task identification should consider all tasks associated with every phase of the machine. The following are examples of what to take into account:
  - Setting
  - Teaching, training
  - Programming
  - Operation
  - Cleaning
  - Maintenance

- Annex B of the ISO 12100 standard outlines the Origin of the hazard and the potential consequence of that hazard as part of hazard identification



ISO 12100
Hazard Identification - Mechanical Examples



- Crushing
- Shearing
- Cutting and severing
- Entanglement
- Drawing-in or trapping
- Impact
- Stabbing and puncture
- Friction and abrasion
- High-pressure fluid injection
- Ejection
- Pressure & Vacuum

ISO 12100
Hazard Identification - Non Mechanical Examples

- Electrical

  Inadequate design of Control Systems

  Noise

  Vibration

  Thermal - High / Low Temperature, Fire & Explosion

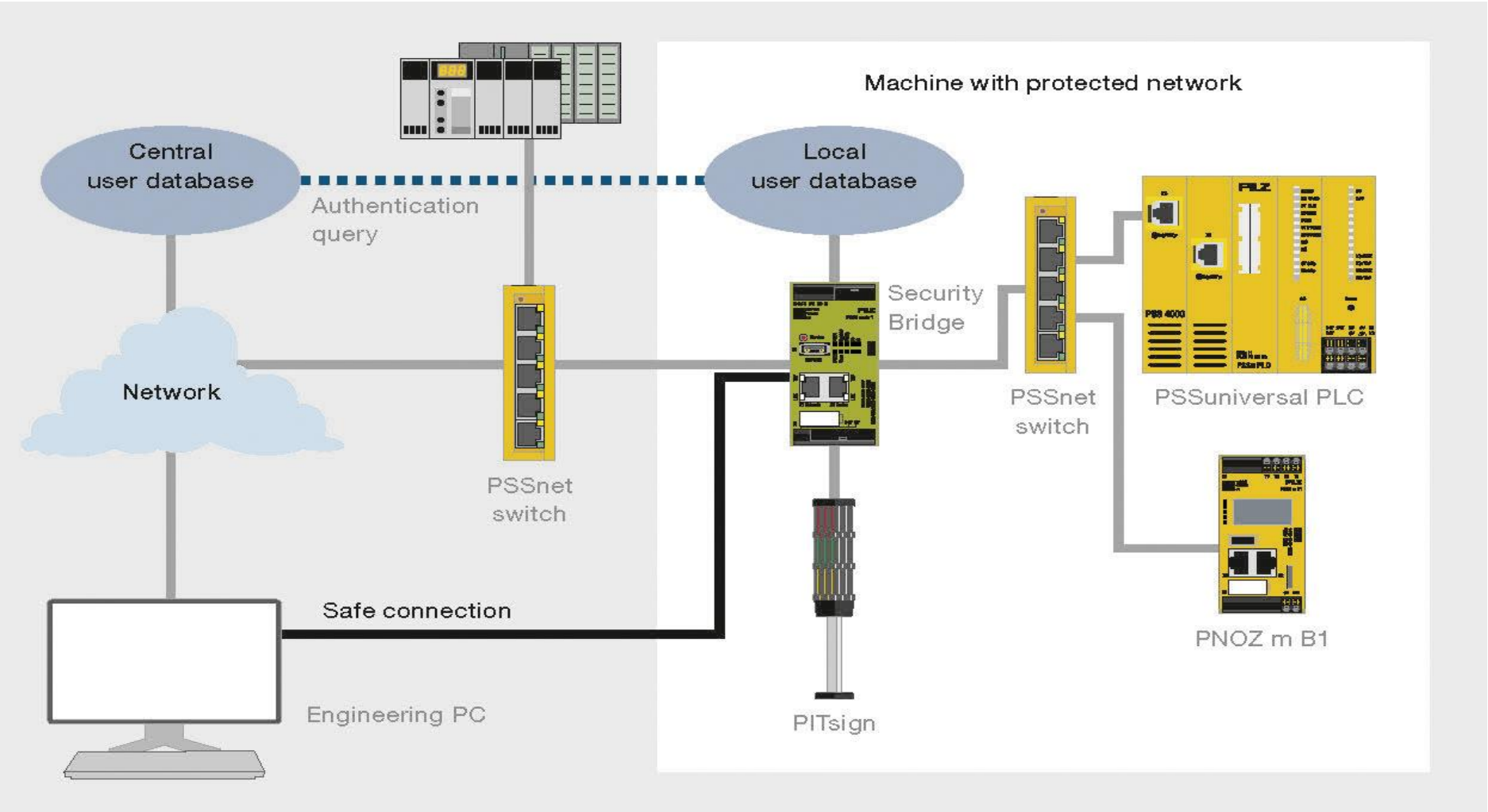
- Material/ Substance hazards - Inhalation of Mist, Chemical Agents, Biological

  Radiation

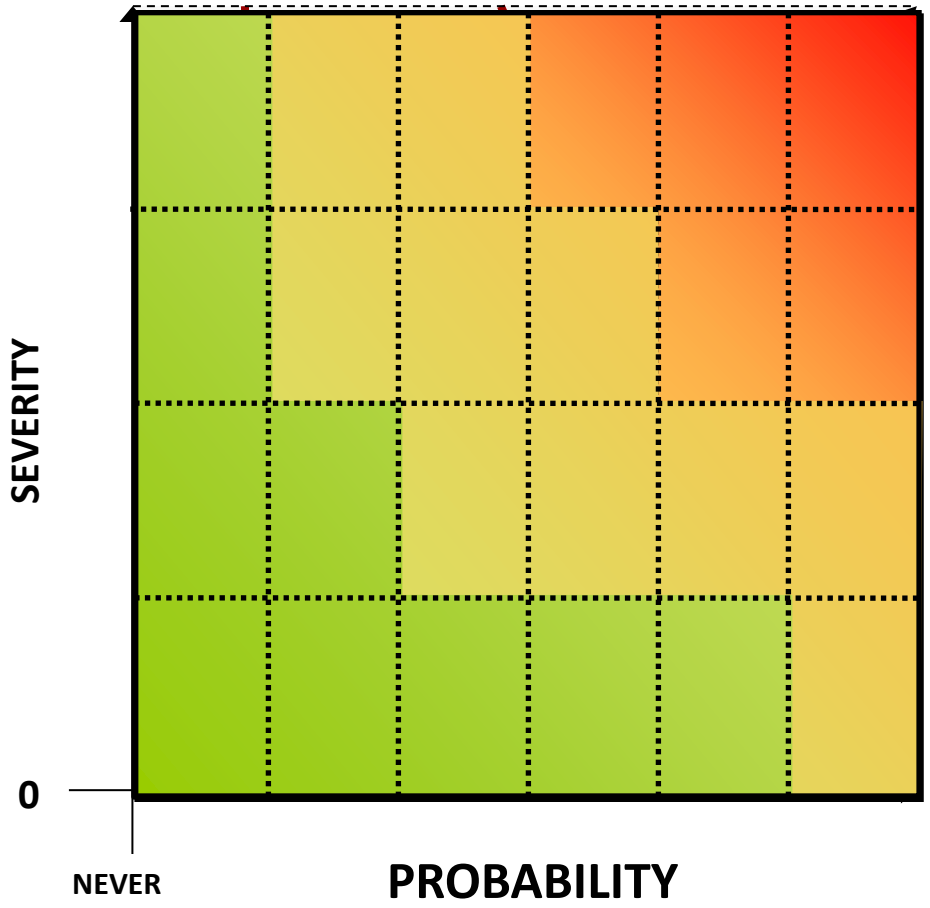
  Hazards associated with the environment in which the machine is used – dust, fog, moisture, pollution

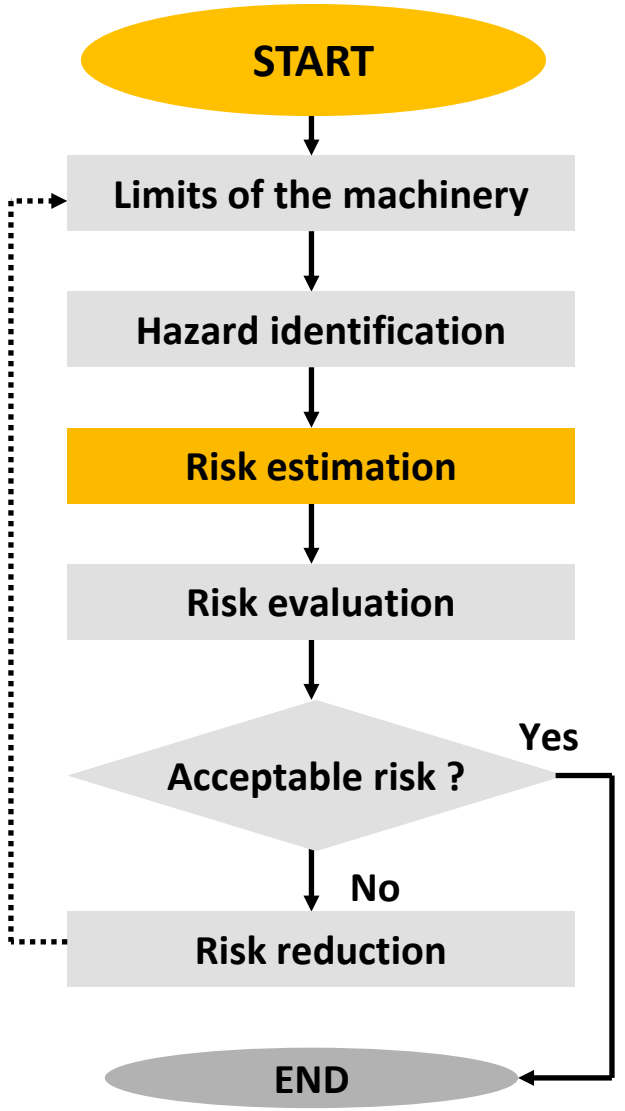
ISO 12100
Hazard Identification - Security

- There is no safety without security!



Methodology
Risk Estimation - Risk Matrix





Hazard Rating Number system (HRN)

Numerical values are assigned to the following factors in order to evaluate the risk related with a hazard

- The likelihood of occurrence (LO)
- The frequency of exposure (FE)
- The degree of possible harm (DPH)
- The number of persons at risk (NP)

Multiplication of the factors yields the HRN:

HRN = LO x FE x DPH x NP

The HRN determines a priority for corrective action based on a numeric range.

ALARP – As Low As Reasonably Practicable

Risk Assessment Methods & Systems

Degree of possible harm (DPH), taking into account the worst credible case

Scratch / bruise	0.1
Laceration / mild ill-effect	0.5
Break minor bone or minor illness	2
Break major bone or major illness	4
Loss of one limb, eye, hearing loss (permanent)	6
Loss of two limbs, eyes (permanent)	10
Fatality	15

Frequency of exposure to the hazard (FE)

Infrequent	0.1
Annually	0.2
Monthly	1
Weekly	2.5
Daily	2.5
Hourly	4
Constantly or Greater than once each 15 minutes	5

Likelihood of occurrence (LO) of contact with hazard

Almost impossible, possible only under extreme circumstances	0.05
Highly unlikely though conceivable	0.5
Unlikely but could occur	1
Possible but unusual	2
Even chance, could happen	5
Probable, not surprising	8
Likely, only to be expected	10
Certain, no doubt	15

Number of persons exposed to the hazard (NP)

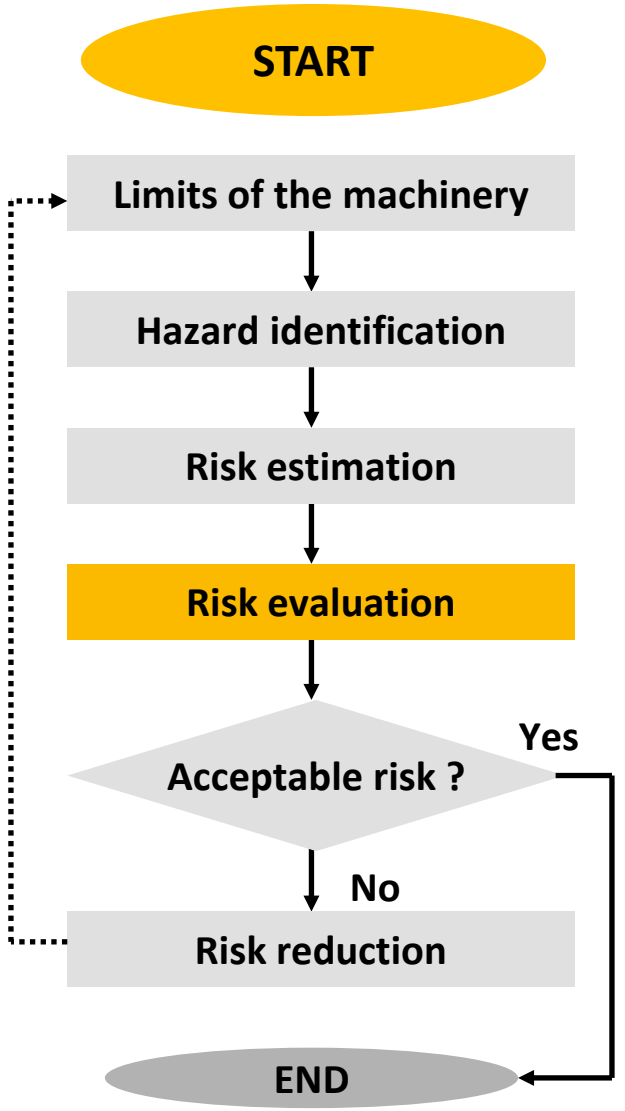
1 to 2 persons	1
3 to 7 persons	2
8 to 15 persons	4
16 to 50 persons	8
More than 50 persons	12

Risk Assessment
Risk Evaluation

Hazard Rating Number system (HRN)

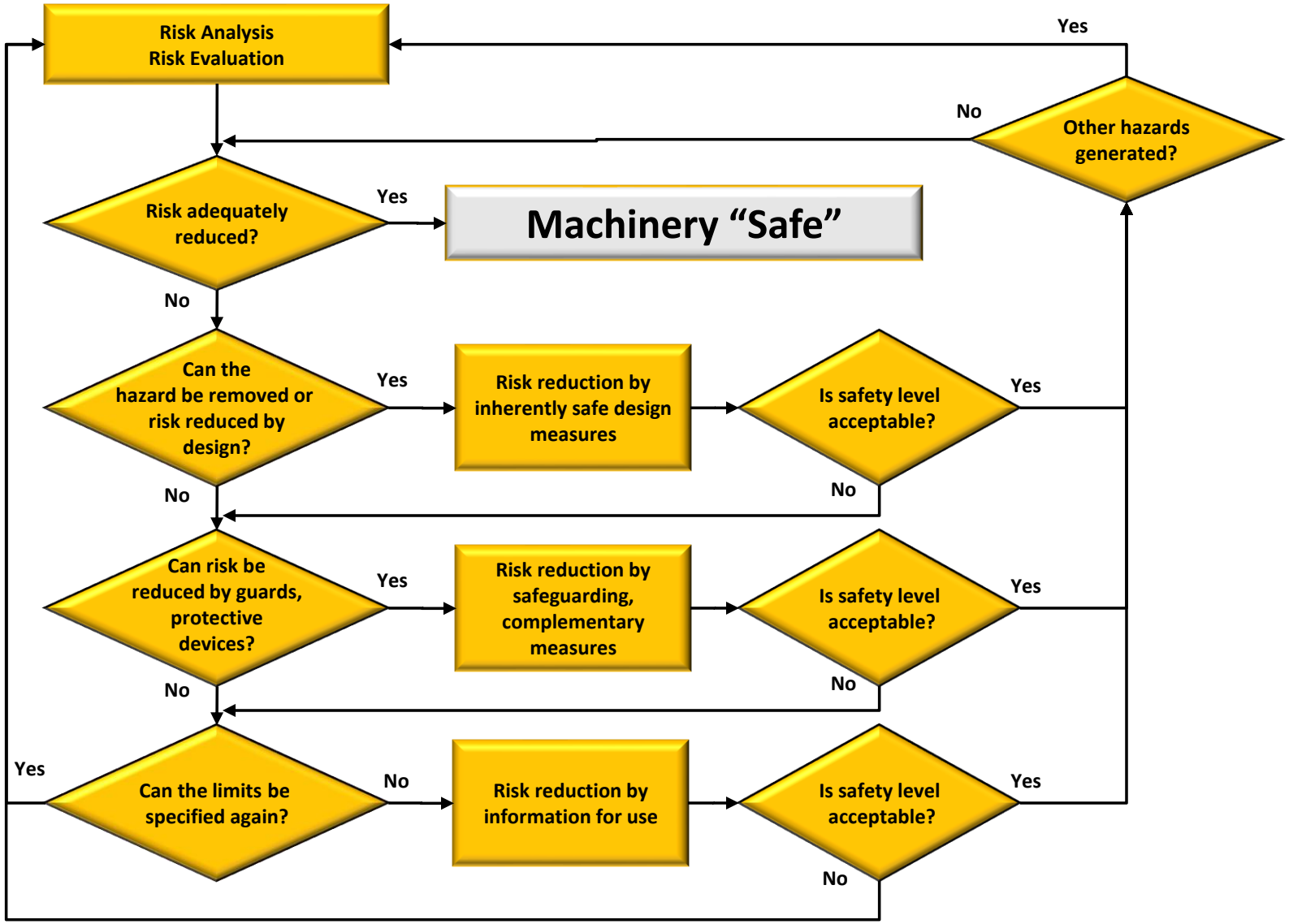
HRN = LO x FE x DPH x NP

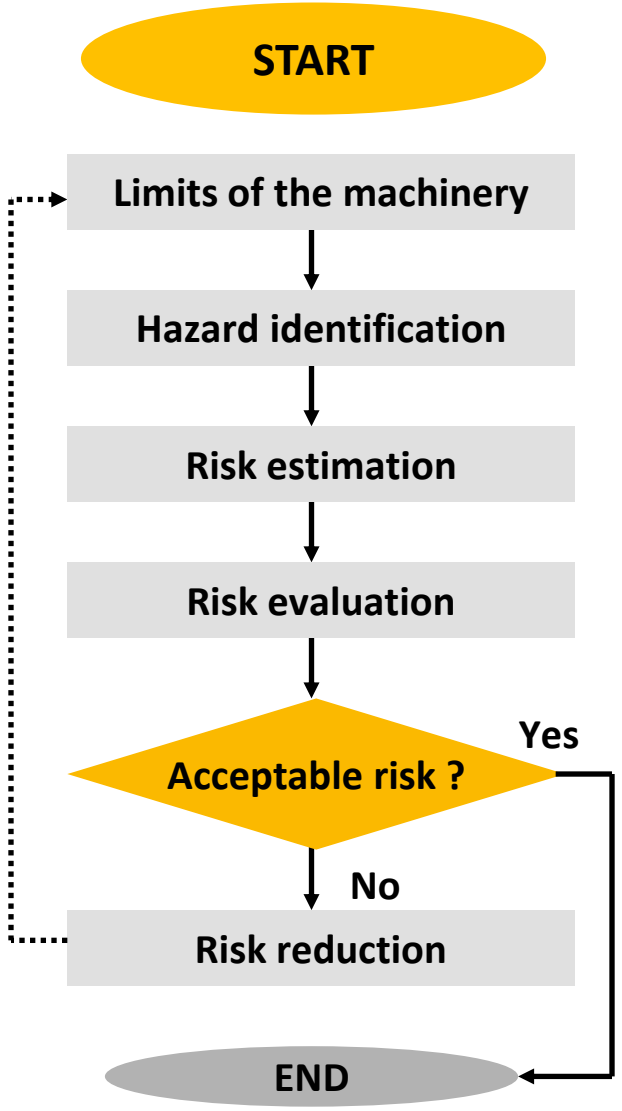
Risk Ratings	
0 - 5	Negligible Risk
5-25	Low Risk
25-50	Significant Risk
50-500	High Risk
>500	Unacceptable Risk



Risk Estimation Lab

Risk Assessment Overview
Step 6: Risk Reduction





CNC Machine

Risk Assessment Methods & Systems

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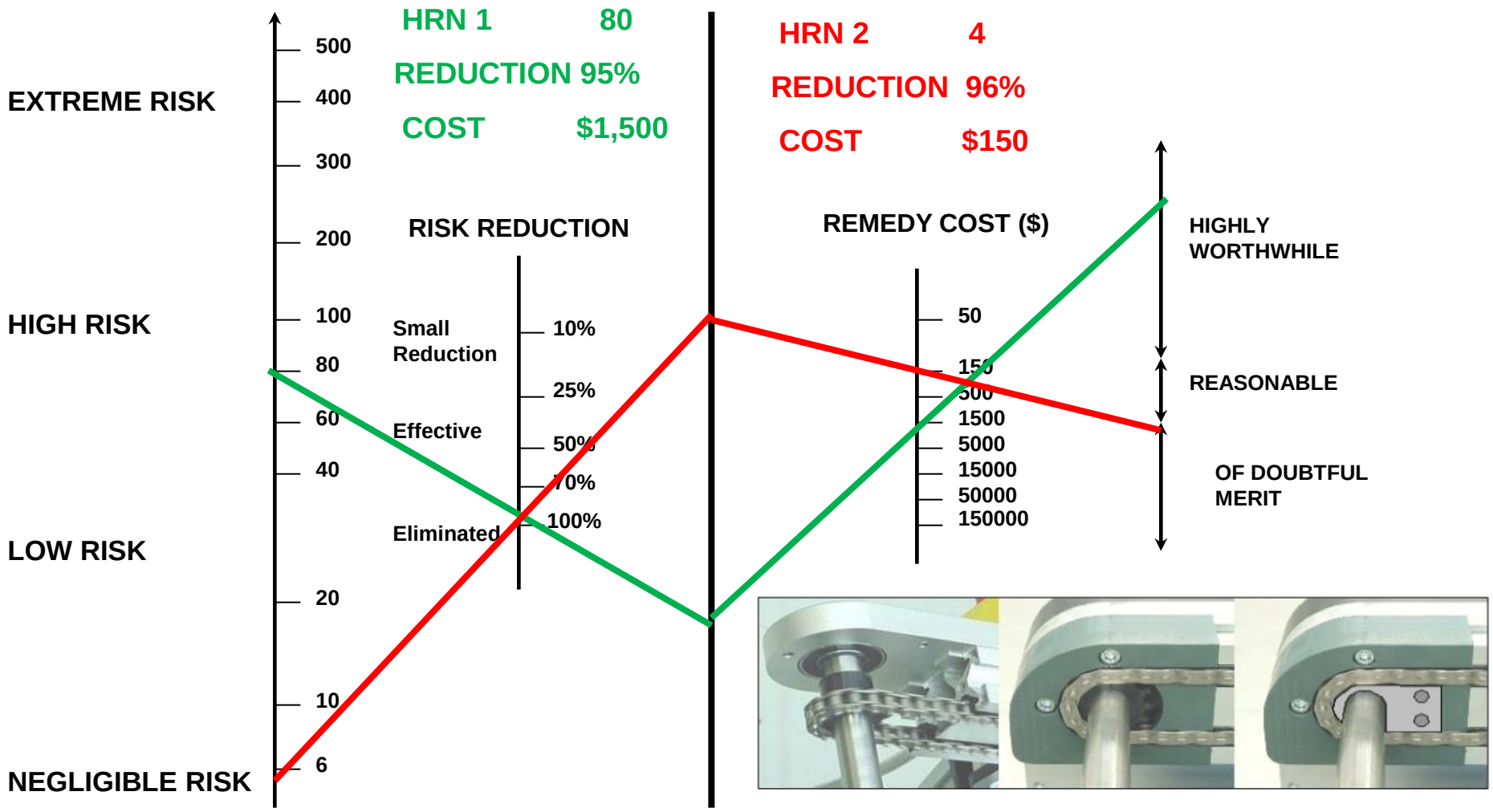
Methodology
Risk Estimation - HRN

Exercise. Hazard Rating Number. Justification.



Introduction to Safety
Key Safety Questions

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When is there an acceptable level of safety?

- The machine/ system/ plant has been assessed
- All hazards have been identified
- Appropriate safety meassures have been designed to reduce the risk to an acceptable level
- Safety system has been implemented
- Practical tests of the safety system and fault simulation on original components, especially in areas where doubt exists, have been performed
- Validated components and principles have been used
- All safety system, test, components etc... are properly documented
- All of above has been done by competent people strictly following current standards and directives
- Trained operators
- Suitable ongoing maintenance

Who should be carrying out safety functions?

Personnel responsible for safety “should be able to demonstrate competence”

- Qualifications, Example: Certified Expert in Functional Safety (CEFS)
- Training: Demonstrates knowledge specific to particular machinery, products or processes
- Experience: Demonstrates knowledge gained through experience

All three combine to ensure the skills required are in place

Safety Validation Overview

Definition:

A Safety Validation process is a documented examination of a machine, process or piece of work equipment carried out under the guidelines of national and/ or international standards comparing the actual status with a desired result

Purpose:

The purpose of the Safety Validation is to check for proper implementation of safety design by verifying the machine safety functions with the requirement specifications

Safety Validation
Requirements for Validation

Tasks performed for validation depend on the machine in question and the life cycle but may include:

- Review of machine risks
- Mechanical guarding examination
- Safety related Control-circuit examination
  - Electrical examination
  - Fluid power system examination
- Safety related Software examination
- Functional safety test