Risk Estimation using IEC 62061

In order to estimate the risk of a hazard using the IEC 62061 standard, select the severity, probability, frequency and avoidability of the hazard according to the following guidelines and then determine the resulting SIL level from table A.2.6.

Risk estimation fields in Polarion

Severity:
4: death, loss of vision or a hand
3: incurable injury, loss of finger
2: curable injury, medical treatment
1: curable injury, first aid

Frequency
5: <= 1 hour
5: > 1 hour - <= 1 day
4: > 1 day - 2 weeks
3: >2 weeks - <= 1 year
2: > 1 year

Probability
5: Highly probable
4: Probable
3: Possible
2: Rarely
1: Insignificant

Avoidability
5: Impossible to avoid
3: Possible
1: Probable

Some guidelines for choosing the most appropriate level:

Severity:
4) refers to death or a major incurable injury: after recovery it is difficult or impossible for the person to return to the same job
3) refers to a major or incurable injury when it might be possible to return to the job after recovery. This can include a major and severe, but curable injury, e.g. broken bones in the limbs
2) refers to a curable injury, including serious incised wounds, stab wounds and serious bruising, which require medical treatment
1) refers to minor injuries including scratches and minor bruises that require first aid treatment

Frequency:
The level of exposure is determined according to the following considerations:
- the need to access the danger zone considering all forms of machine operation (e.g. normal use, maintenance), and
- the nature of the access, e.g. manual feeding and adjustment of material
The average time between exposure will be estimated, and this will be used to obtain the average frequency of access to the danger zone.

5-4-3-2-1 tables applies when duration < 10 min; if duration > 10 min, the point value of frequency is raised by one. The maximum is 5.

Probability:
The probability of the accident is estimated independently of the other related variables (Frequence and avoidability)

The effect of the safety functions of the electronic control system is not considered. This is mandatory, in order to be able to estimate the magnitude of the risk that users are exposed to if the electronic control system fails

Consider:
- The predictability of the machine components and parts that are relevant for this hazard in different operational modes (e.g. normal operation, maintenance and searching for faults

Concerning humans, consider:
- stress (e.g. caused by schedule pressure, working duty, avoiding an identified hazard) or
- insufficient awareness of information relating to the hazard, which is impacted by factors such as skills, experience and the complexity of the machine or process

The probability of a hazardous event should be set to "highly probable" to describe the restrictions of normal production and worst case scenarios. When any lower value is used, favorable factors must be involved (e.g. a well defined application and high professional skills of users)

Avoidance:
Consider:
- the abrupt, fast or slow occurence of the hazardous situation
- the spacial possibilities to avoid the hazard
- the nature of the component or system, e.g. a knife is typically sharp, a pipe in a dairy environment is typically hot, electricity is typically dangerous by nature although invisible
- the possibilities to identify the hazard, e.g. an electrical hazard: the appearance of a copper wire does not change when it is live or dead. Identification of this requires a measurement device that is used to detect live wires. Environmental conditions such as high noise levels may prevent a person from hearing the startup of the machine

Excerpt from IEC 62061 for computing SIL level

"Using Table A.2.6, where the severity (Se) row crosses the relevant column (Cl), the intersection point indicates whether action is required. The black area indicates the SIL assigned as the target for the SRCF. The lighter shaded areas should be used as a recommendation that other measures (OM) be used."

Severity (Se)	Class (Cl)				
	3-4	5-7	8-10	11-13	14-15
4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
3		(OM)	SIL 1	SIL 2	SIL 3
2			(OM)	SIL 1	SIL 2
1				(OM)	SIL 1

IEC 62061 A.2.6

The Cl index is calculated by adding the numbers estimated for the **frequency of exposure** the **occurrence probability** and the **avoidance probability**.