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Risk Assessment

Mechanical and electrical hazards in the conceptual machine design

Customer:	**Valeo Friction Materials India Pvt. Ltd. — Chennai** No. 16-A, Sengundram Industrial Area, Melrosapuram (via Singaperumal Koil) Kanchipuram District, Chennai – Tamil Nadu, India 603204 Chennai Tamilnadu India
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1 Project information

1.1 Contacts

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1.2 Version control

Version	Date	Description	Editor
0.1	8/4/2025	First Draft	Muthu Vignesh R

2 Introduction

2.1 Scope of service

(1) The risk assessment includes an analysis of the **mechanical hazards** and risks emanating from the respective machine, system or incomplete machine, as well as the **electrical hazards** and risks caused by the electrical equipment of the machine.
(2) The risk assessment is carried out on the basis of ISO 12100.
(3) The risk assessment is created on the basis of the explanations, descriptions and information as well as technical documents for the machine provided by the machine manufacturer. They are the essential elements for obtaining information and defining the minimum requirements for risk reduction measures for each machine. The overall effectiveness of the solutions recommended in this report is largely based on correct, accurate and complete information from the machine manufacturer.
(4) The assessment extends to the tasks on the machine specified by the machine manufacturer and coordinated with regard to the scope of services in the phases of setup, operation, cleaning, maintenance and troubleshooting of the machine life cycle phases in accordance with ISO 12100.
(5) SICK recommends measures to reduce risk in accordance with the 3-step method of ISO 12100 in order to create the conditions for the safe operation of a machine. Recommendations for risk-reducing measures are based on the currently relevant legal requirements, guidelines, requirements from standards and company-specific requirements (if applicable and known to SICK).
(6) For risk-reducing measures in the area of functional safety, a corresponding required Performance Level (PLr according to ISO 13849-1) is assigned on the basis of the risk identified.
(7) After a 4-eye check, the results are made available to the machine manufacturer in printed or electronic form (pdf) in the form of a report.
(8) Other hazard types that SICK cannot conclusively assess (e.g. hazards from heat, noise, hazardous substances, radiation, etc.) are identified and documented if they are obvious to SICK. SICK does not evaluate or recommend any measures to reduce the risk of these hazards. SICK recommends consulting a recognized specialist for further evaluation and protection.
(9) SICK does not provide any information on the static dimensioning and stability of the machine and the components contained in the machine.
(10) The risk assessment process aims to determine the level of an existing risk in order to make informed decisions about risk reduction. In some cases, a residual risk cannot be avoided, so that additional organizational measures are required (e.g. work instructions, signs, use of personal protective equipment, etc.).
(11) The risk reduction measures recommended by SICK are based on experience and the interpretation of the applicable standards. The aim of this report is to provide an overview of the health-endangering risks of a machine in order to develop a suitable strategy for protecting people who work on the machine. With the information in the report, the machine manufacturer can select suitable risk reduction measures and at the same time decide whether the subsequent residual risk of a machine is acceptable.
(12) Recommendations for risk reduction measures are always manufacturer-neutral.

Due to the restricted types of hazards taken into account, this risk assessment does **not represent a complete** risk assessment.

The following machines were evaluated as part of the risk assessment service. The evaluated risks and recommended risk reduction measures follow for each machine.

Machine type	Manufacturer	Machine name	Asset No.
Standalone	MM Tech Hydraulics	Truck Preform Retrofit	Not Available

2.2 Impacts of legal requirements

In the present case, SICK has been commissioned to carry out a (partial) risk assessment on behalf of the client, based on the information provided by the client. All information provided by the client that has been incorporated into this risk assessment must be checked for correctness by the client.
The scope of the risk assessment carried out by SICK is limited to certain types of hazards and life cycle phases / tasks. It remains the responsibility of the machine manufacturer to evaluate all hazard types and activities not considered here in order to ensure a complete risk assessment.

2.3 Disclaimer

This risk assessment in the concept phase is intended to show the machine manufacturer dangers and risks in accordance with the agreed scope of services in order to assess which risk-reducing measures should be taken into account for the machine design.

(1) The results of this risk assessment are based exclusively on the information made available to us and the intended use notified to us. SICK assumes no liability for damage caused by incorrect, incomplete or inaccurate information or subsequent changes.

(2) The scope of services only takes mechanical and electrical hazards into account. Other types of hazard (such as noise, radiation, etc.) must additionally be considered and assessed by the machine manufacturer and are not the subject of this risk assessment.

(3) Identified risks are provided with appropriate risk-reducing measures by SICK. The machine manufacturer may have to take additional measures. The machine manufacturer must assess and decide whether the resulting residual risk is an acceptable / tolerable residual risk. Accordingly, SICK does not guarantee that the evaluated machine will be safe after the recommended risk reduction measures have been implemented. This assessment is ultimately the responsibility of the machine manufacturer and may require further considerations and / or measures.

(4) The machine manufacturer exempts SICK and its affiliated companies (as defined below) from all claims - including claims by third parties - that are based on non-compliance with the above information or on the inaccuracy or incompleteness of its information or on subsequent changes.

An "affiliated company" is a natural or legal person who controls another natural or legal person or is controlled by another natural or legal person or is jointly controlled by another natural or legal person with another natural or legal person. Control in this sense means the authority to influence the company and its business policy directly or indirectly on the basis of voting securities or voting rights, regardless of whether the authority was established by contract or otherwise.

3 Relevant Regulations and Standards

3.1 List of laws and regulations

Name	Date of Issue	Title
2006/42/EG	2006	Machinery Directive

3.2 List of standards

Name	Date of Issue	Title
ISO 12100	2010	Safety of machinery – General principles for design – Risk assessment and risk reduction
ISO 13849-1	2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
IEC 62061	2021	Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems
IEC 60204-1	2016	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
ISO 13850	2015	Safety of machinery - Emergency stop function – Principles for design
ISO 13855	2010	Safety of machinery – Positioning of safeguards with respect to the approach speeds of parts of the human body
ISO 13857	2019	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
ISO 14119	2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 14120	2015	Safety of machinery - Guards – General requirements for the design and construction of fixed and movable guards
ISO 4414	2010	Pneumatic fluid power - General rules and safety requirements for systems and their components

4 Machine: Truck Preform Retrofit

4.1 Machine identification

Machine data				
Machine name		Truck Preform Retrofit		
Manufacturer		MM Tech Hydraulics		
Machine type		Standalone		
Manufacturing date		8/4/2025		
Re-manufacturing date		8/4/2025		
Model No.		Not Available		
Serial No.		Not Available		
Asset No.		Not Available		
Asset location	**Line**	Valeo Friction Materials India pvt. Ltd.		
	Building	No. 16-A, Sengundram Industrial Area,		
	Factory	Valeo Friction Materials India Pvt. Ltd.		
	Street	Melrosapuram (via Singaperumal Koil) Kanchipuram District, Chennai – Tamil Nadu, India		
	City	Chennai	**Zip code**	603204
	State	Tamilnadu		
	Country	India		

4.2 Technical machine documentation

The risk assessment is based on the following documents provided by the machine manufacturer.

Documents	Version	Date
Electrical Drawing R9	1	8/4/2025
Preform Work Instruction	1	8/14/2025

4.3 Limits of the Machine

Limits of the Machine						
Intended use	Form yarn into preforms of specified ID, OD, and weight for clutch facing production, using pressure plate, rollers, nozzle, and knurling plate. Operates in manual or auto mode with integrated safety interlocks and sensors.					
Reasonably foreseeable misuse	Feeding yarn or adjusting nozzle during operation. Bypassing safety interlocks. Clearing jams/cleaning without LOTO. Using hands instead of tools for jam removal. Operating without PPE. Using incorrect yarn or parameters. Disabling/muting sensors.					
Expected/ known malfunctions, errors & faults	Yarn feed tangling or breakage. Load cell drift affecting weight accuracy. Pneumatic cylinder unexpected movement. Sensor failure or misalignment. Pressure plate overheating or sticking. Control panel faults causing stoppage or unplanned start. Loose/worn knurling plates or rollers. Electrical faults from damaged wiring or dust.					
Time limits	**Days / year**	335	**Hours / day**	22	**Shifts / day**	3
Space limits	Approx. 3 m × 2 m area (machine footprint + operator workspace) Adequate clearance for material handling and maintenance Unobstructed emergency exits nearby					
Environmental conditions	Temperature: 20–35°C Humidity: <70% non-condensing Dust-controlled, industrial ventilated space Stable electrical and pneumatic supply					

Machine parameters		
Processed workpieces/ raw materials		Impregnated yarn which contains fibers copper and resins(composite material)
Capacity		1000 nos per shift with 3 shifts and it is an automated process
Manufacturing process description		Friction material yarn is loaded into a container and automatically fed through a pulley arrangement to the yarn guide section. The eccentric unit is manually set with ID and OD wheels to match product dimensions. In the preforming zone, rotary motions and a pressing cylinder twist, shape, and compact the yarn into the required form. The machine operates 24×7 in three shifts, with adjustments made 1–4 times per shift. Operators set parameters via HMI, verify the first part, and monitor weight tolerance during production. Non-conforming products after 10–15 consecutive errors stop the feed until correction. Knurling plate changes occur every 6–12 months, preventive maintenance is quarterly, and cleaning is done each shift.
Operating modes		Automatic Manual
Power supply	**Electrical**	415 VAC, 24 VDC
	Pneumatic	5 bar
	Hydraulic	0
	Other	Not Available

4.4 Picture(s)

Picture(s)	
Machine Side view	
Machine Front View	Control panel is provided on the bottom of the machine sufficient space is present for trouble shooting or maintenance
Finished good receipt area	Area where the unload tray / trolley is placed for collecting finished goods

Not Available - Retrofit project	

4.5 Tasks performed at the machine

Affected persons	Skill	Skill description
Operator	Instructed	Trained staff and experience production supervisors and line in charge for quality inspections
Maintenance person	Skilled	Trained staff electrical or maintenance team member
Visitor	Unskilled	Visitor Non technical non trained with basic safety induction while entering the plant with PPE
Material handlers	Unskilled	Technical Trained staff Bi-yearly update on training with good engineering practice
Quality Inspection	Instructed	Technical Trained staff Bi-yearly update on training with good engineering practice

Icon	Task	Affected persons
	Task group - Setting- New variant change For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only. **Dedicated tasks to this group** • Setting- width ID or OD change in mechanical eccentric	
	Task group - Infeed yarn loading When the yarn infeed is completed, an infeed changeover with new yarn occurs approximately once every hour. After inserting the new yarn, a single job run is monitored, and the weight is checked. Width adjustment is carried out in the eccentric measurement area during the stop, alongside control checks. Finished goods are unloaded from the machine at regular intervals and stacked in the unload tray. **Dedicated tasks to this group** • Feeding yarn and adjusting nozzle	
	Preventive maintenance or Jam clearance During preventive maintenance (once every 3 months) or during fault-finding/troubleshooting of motors, sensors, or mechanical holding tools, the maintenance engineer accesses the control panel and verifies the function of the interlocks. If any actuator malfunctions, the respective actuator is replaced following established administrative control measures.	Maintenance person
	General Cleaning - Autonomous Due to the composite nature of the impregnated yarn (fibers, copper, resins), dust and fine particles can accumulate around the machine perimeter, feed system, and preforming zone. Regular cleaning is recommended once per shift to prevent buildup that may affect product quality or pose slip hazards. Cleaning tasks include removing yarn debris from the pulley arrangement, eccentric measurement area, pressing zone, and unload tray. Preventive maintenance includes lubrication of moving parts, inspection of pneumatic lines, and checking the weighing balance and sensors for contamination or misalignment.	Operator
	Presence around the machine Non-operators include quality personnel and passers-by. Parts on the output table are verified on the weighing scale. The operator changes the yarn raw material approximately five times per shift. A user-defined maintenance task occurs if a yarn infeed jam happens — the maintenance operator opens the safety door and	Visitor

	clears the jam. (Risk awareness: trained staff; competency level: high).	
	Quality inspection Quality technicians or supervisors perform process monitoring at regular intervals, especially when a new part or variant is run on the machine.	Operator
	Setting- width ID or OD change in mechanical eccentric During setting, teaching, or process parameter adjustments, no machine movements occur, and there is no defined condition where the door remains open with the machine operating. Pneumatic Pressure Setting: Pressure adjustments, based on the physical properties of the input material or product variants, can be made while the machine is running, provided all safety doors remain closed. If any door is opened, the machine process stops instantly via the interlock system.	Operator
	Finished component weight monitoring cylinder When a NC rejected component reached via the gravity chute pneumatic cylinder activates and stops the preform component at the monitoring zone before it falls in the unload tray/bin	Quality Inspection Operator
	Feeding yarn and adjusting nozzle Operator feeds yarn into nozzle and aligns position for correct forming. Hands are close to moving rollers and sharp yarn guides.	Operator Material handlers
	Pressure plate & Roller(manual) Operation of emergency to be removed from the task matrix of work instruction manual Ref: VFM/IN QSW P0500-SAFETY Rev. No - 24 Pressure plate and rollers are cleaned of residue and dust, often while hot. Requires access inside guarded area.	Operator
	Knurling plate maintenance Inspecting, cleaning, or tightening knurling plate and bolts, often with tools near sharp surfaces.	Operator
	Push/pull trolleys -material transfer Moving loaded trolleys with yarn or preforms between stations.	Material handlers Operator

5 Risk analysis

5.1 Hazard list according to ISO 12100

	Hazard origin	Risk ID	Hazard source	Task	Risk IN	Risk OUT
Mechanical hazards						
	Approach of a moving element to a fixed part	**R018**	Yarn entry via the pulley arrangement	Setting- New variant change	**6**	**<1**
		R019	Yarn entry via the pulley arrangement	Infeed yarn loading	**5**	**<1**
		R020	Yarn entry via the pulley arrangement	Presence around the machine	**5**	**<1**
		R021	Yarn entry via the pulley arrangement	Setting- width ID or OD change in mechanical eccentric	**6**	**<1**
		R022	Yarn entry via the pulley arrangement	Push/pull trolleys -material transfer	**4**	**<1**
		R033	Finished good area & Main cylinder	Infeed yarn loading	**2**	**<1**
		R034	Finished good area & Main cylinder	Quality inspection	**2**	**<1**
		R035	Finished good area & Main cylinder	Finished component weight monitoring cylinder	**3**	**<1**
		R036	Finished good area & Main cylinder	Pressure plate & Roller(manual)	**2**	**<1**
	Ejected parts	**R016**	Raw material yarn powder parts ejection	Setting- New variant change	**3**	**<1**
		R017	Raw material yarn powder parts ejection	Preventive maintenance or Jam clearance	**3**	**<1**
	Rotating elements	**R005**	Rotating pulleys or moving parts	Setting- New variant change	**2**	**<1**
		R006	Rotating pulleys or moving parts	General Cleaning - Autonomous	**2**	**<1**
		R007	Rotating pulleys or moving parts	Infeed yarn loading	**2**	**<1**
		R008	Rotating pulleys or moving parts	Presence around the machine	**2**	**<1**
		R009	Rotating pulleys or moving parts	Setting- width ID or OD change in mechanical eccentric	**3**	**<1**
		R010	Rotating pulleys or moving parts	Feeding yarn and adjusting nozzle	**2**	**<1**
		R011	Rotating pulleys or moving parts	Knurling plate maintenance	**2**	**<1**
		R012	Rotating pulleys or moving parts	Setting- New variant change	**3**	**<1**
		R013	Rotating pulleys or moving parts	Presence around the machine	**2**	**<1**
		R014	Rotating pulleys or moving parts	Feeding yarn and adjusting nozzle	**2**	**<1**
		R015	Rotating pulleys or moving parts	Pressure plate & Roller(manual)	**2**	**<1**
		R023	Main motor preforming area	Setting- New variant change	**6**	**<1**
		R024	Main motor preforming area	General Cleaning - Autonomous	**5**	**<1**
		R025	Main motor preforming area	Quality inspection	**5**	**<1**
		R026	Main motor preforming area	Setting- width ID or OD change in mechanical eccentric	**6**	**<1**
		R027	Main motor preforming area	Feeding yarn and adjusting nozzle	**5**	**<1**
		R028	Main motor preforming area	Pressure plate & Roller(manual)	**5**	**<1**
		R029	Main motor preforming area	Knurling plate maintenance	**5**	**<1**
		R030	Main motor preforming area	Setting- New variant change	**6**	**<1**
		R031	Main motor preforming area	Infeed yarn loading	**5**	**<1**
		R032	Main motor preforming area	Knurling plate maintenance	**5**	**<1**
Electrical hazards						
	Live parts	**R001**	Control panel Terminals	Preventive maintenance or Jam clearance	**6**	**<1**

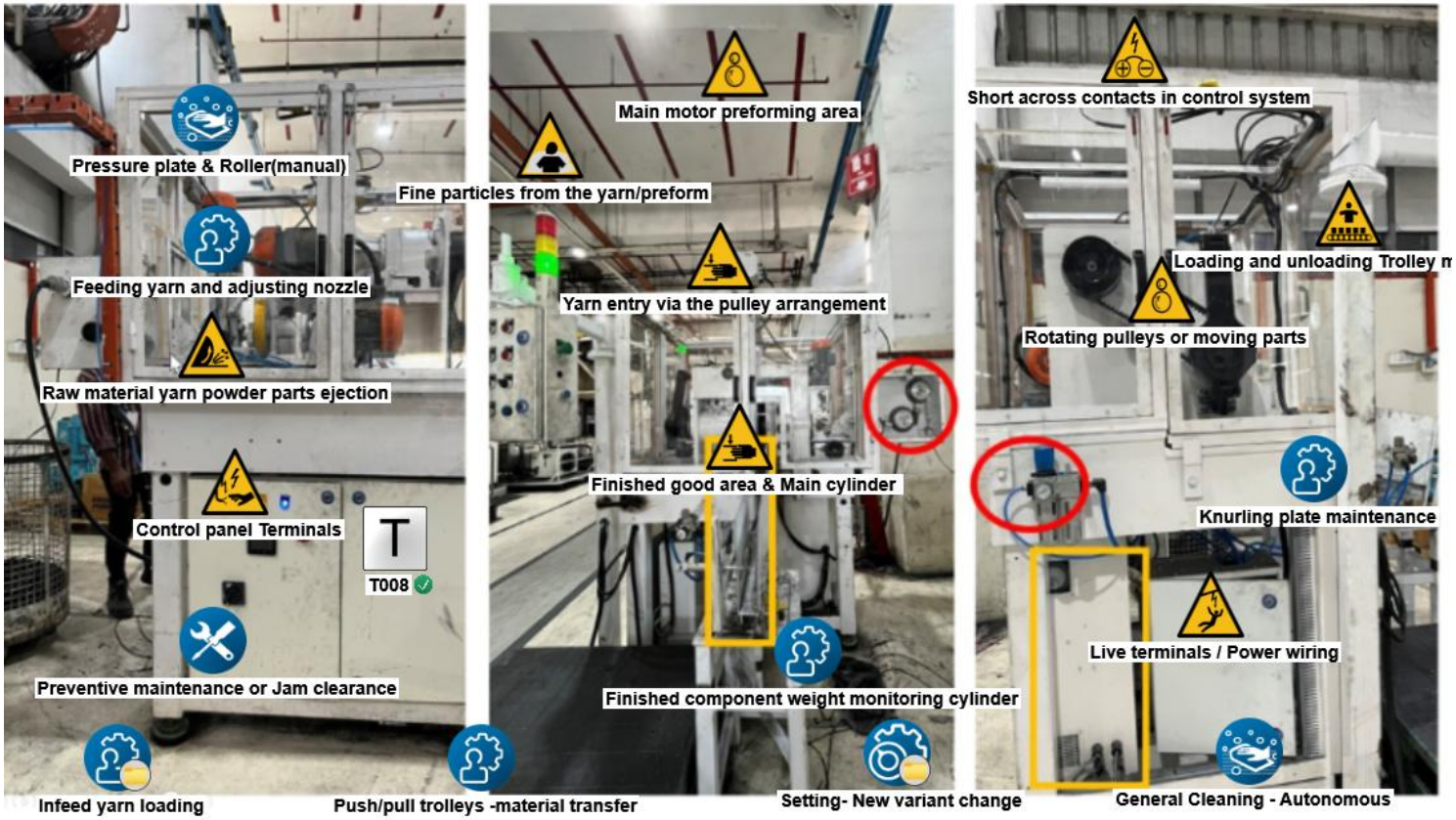
Live parts under high voltage	**R002**	Live terminals / Power wiring	Preventive maintenance or Jam clearance	**6**	**<1**
	R003	Live terminals / Power wiring	General Cleaning - Autonomous	**5**	**<1**
Short-circuit	**R004**	Short across contacts in control system	Preventive maintenance or Jam clearance	**6**	**<1**
Ergonomic hazards					
Repetitive activity	**R040**	Loading and unloading Trolley movement	Finished component weight monitoring cylinder	**3**	**<1**
	R041	Loading and unloading Trolley movement	Push/pull trolleys -material transfer	**1**	**<1**
Environmental hazards					
Dust and fog	**R037**	Fine particles from the yarn/preform	General Cleaning - Autonomous	**2**	**<1**
	R038	Fine particles from the yarn/preform	Presence around the machine	**2**	**<1**
	R039	Fine particles from the yarn/preform	Pressure plate & Roller(manual)	**2**	**<1**

Risk level	Risk level definition
<1	Very low
1	Low
2-3	Increased
4-7	High
8-10	Very high

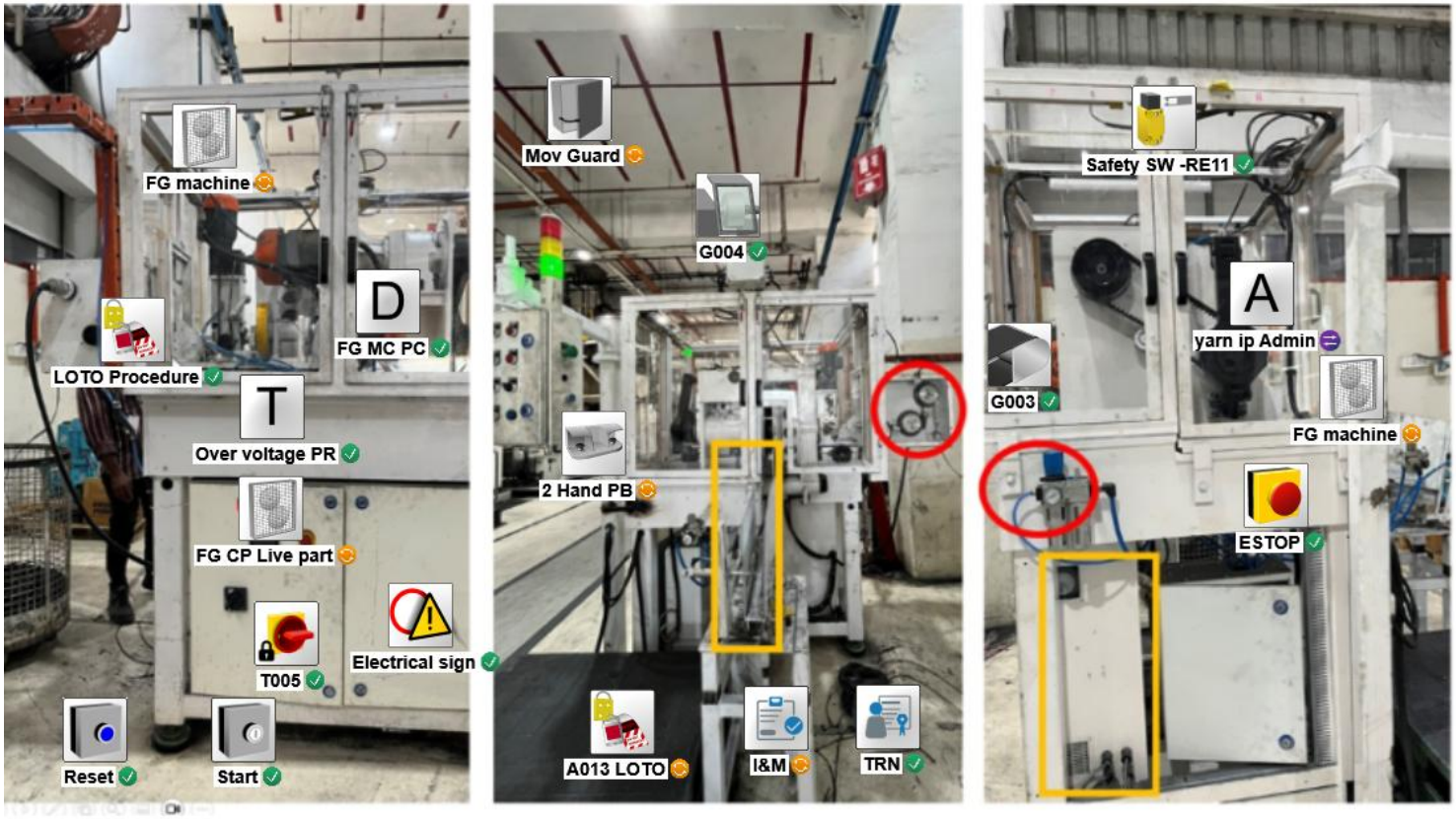
The estimated residual risk (Risk OUT) is not to be equated with an acceptable residual risk. This applies to all risk levels, even 0.
Due to the subjective determination of whether an acceptable risk has been reached, SICK cannot determine whether the achievable residual risk is an acceptable risk for the machine manufacturer. As a partner with specialized experience and technical expertise, SICK can provide assistance and recommendations. Ultimately, however, accepting (or rejecting) the residual risk is the sole responsibility of the machine manufacturer.

5.2 Overview of identified hazards and tasks

Task & Hazards Overview



RRM Control panel side view



5.3 Identified risks

5.3.1 R001

Electrical hazards		
Live parts		
Hazard source	**Consequence**	
Control panel Terminals	Electrocution	
Contact with live terminals causing electric shock.		
Preventive maintenance or Jam clearance		
During preventive maintenance (once every 3 months) or during fault-finding/troubleshooting of motors, sensors, or mechanical holding tools, the maintenance engineer accesses the control panel and verifies the function of the interlocks. If any actuator malfunctions, the respective actuator is replaced following established administrative control measures.	**Affected persons**	
	Maintenance person	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O2	6

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	FG CP Live part	Fixed guard					
	Devices	T005	Emergency off					
Administrative		I&M	Inspection and maintenance					
		LOTO Procedure	Lockout / Tagout					
		TRN	Training					
		Electrical sign	Awareness signs					
Residual risk	injury possible if guards/PPE not reinstalled or rare wiring defect occurs.							

5.3.2 R002

Electrical hazards	
Live parts under high voltage	
Hazard source	**Consequence**
Live terminals / Power wiring	Electrocution
Exposure to live electrical parts poses a serious hazard that can result in severe shock, Contact with live electrical parts due to mechanical damage of unprotected cables. without IP2X protection burns, or fatal electrocution. Risks arise during fault-finding or troubleshooting without isolation, accessing control cabinets without lockout/tagout, or working near damaged insulation and loose wiring. Moisture ingress or conductive yarn dust can increase the likelihood of short circuits. Additional danger exists if untrained personnel attempt repairs or bypass safety devices, leading to uncontrolled energization. Effective controls include strict LOTO procedures, proper enclosure of terminals, regular insulation checks, and restricting electrical work to qualified technicians.	
Preventive maintenance or Jam clearance	
During preventive maintenance (once every 3 months) or during fault-finding/troubleshooting of motors, sensors, or mechanical holding tools, the maintenance engineer accesses the control panel and verifies the function of the interlocks. If any actuator malfunctions, the respective actuator is replaced following established administrative control measures.	**Affected persons** Maintenance person

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	FG CP Live part	Fixed guard					
	Devices	T005	Emergency off					
Administrative		A001	PPE - General					
		Electrical sign	Awareness signs					
		A013 LOTO	Lockout / Tagout					
		I&M	Inspection and maintenance					
Residual risk	Only possible if guards/PPE not reinstalled or rare wiring defect occurs.							

5.3.3 R003

Electrical hazards		
Live parts under high voltage		
Hazard source	**Consequence**	
Live terminals / Power wiring	Electrocution	
Exposure to live electrical parts poses a serious hazard that can result in severe shock, Contact with live electrical parts due to mechanical damage of unprotected cables. without IP2X protection burns, or fatal electrocution. Risks arise during fault-finding or troubleshooting without isolation, accessing control cabinets without lockout/tagout, or working near damaged insulation and loose wiring. Moisture ingress or conductive yarn dust can increase the likelihood of short circuits. Additional danger exists if untrained personnel attempt repairs or bypass safety devices, leading to uncontrolled energization. Effective controls include strict LOTO procedures, proper enclosure of terminals, regular insulation checks, and restricting electrical work to qualified technicians.		
General Cleaning - Autonomous		
Due to the composite nature of the impregnated yarn (fibers, copper, resins), dust and fine particles can accumulate around the machine perimeter, feed system, and preforming zone. Regular cleaning is recommended once per shift to prevent buildup that may affect product quality or pose slip hazards. Cleaning tasks include removing yarn debris from the pulley arrangement, eccentric measurement area, pressing zone, and unload tray. Preventive maintenance includes lubrication of moving parts, inspection of pneumatic lines, and checking the weighing balance and sensors for contamination or misalignment.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	FG CP Live part	Fixed guard					
	Devices	T005	Emergency off					

Administrative	LOTO Procedure	Lockout / Tagout					
	Crush injury	Crush injury					
	A001	PPE - General					
	I&M	Inspection and maintenance					
	TRN	Training					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.						

5.3.4 R004

Electrical hazards		
Short-circuit		
Hazard source	**Consequence**	
Short across contacts in control system	Damage to control components	
Defective wiring, deteriorated insulation, or accumulation of conductive dust can cause short circuits, creating risks of sparks, fire, electric shock, and equipment damage. Control panel failure can stop the machine unexpectedly, causing unplanned downtime and increasing operator exposure to hazardous areas during troubleshooting or restart.		
Preventive maintenance or Jam clearance		
During preventive maintenance (once every 3 months) or during fault-finding/troubleshooting of motors, sensors, or mechanical holding tools, the maintenance engineer accesses the control panel and verifies the function of the interlocks. If any actuator malfunctions, the respective actuator is replaced following established administrative control measures.	**Affected persons**	
	Maintenance person	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**							
	Devices	T	T008	Short circuit monitoring				
Administrative			A001	PPE - General				
			I&M	Inspection and maintenance				
			TRN	Training				
Residual risk	Only possible if guards/PPE not reinstalled or rare wiring defect occurs..							

5.3.5 R005

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A1	O1	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		Mov Guard	Movable guard hinged					
			G003	Partial guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			Crush injury	Crush injury					
			LOTO Procedure	Lockout / Tagout					
			A001	PPE - General					
			I&M	Inspection and maintenance					
			TRN	Training					
Residual risk	if guard is removed or not properly closed after maintenance possible injury.								

5.3.6 R006

Mechanical hazards

Rotating elements

Hazard source	Consequence
Rotating pulleys or moving parts	Crushing

Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.

General Cleaning - Autonomous

Due to the composite nature of the impregnated yarn (fibers, copper, resins), dust and fine particles can accumulate around the machine perimeter, feed system, and preforming zone. Regular cleaning is recommended once per shift to prevent buildup that may affect product quality or pose slip hazards. Cleaning tasks include removing yarn debris from the pulley arrangement, eccentric measurement area, pressing zone, and unload tray. Preventive maintenance includes lubrication of moving parts, inspection of pneumatic lines, and checking the weighing balance and sensors for contamination or misalignment.

Affected persons

Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	Guards		FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			Reset	Reset button					
			Start	Start button					
			ESTOP	E-Stop push button					
Administrative			A001	PPE - General					
			LOTO Procedure	Lockout / Tagout					
			I&M	Inspection and maintenance					
			Crush injury	Crush injury					

Residual risk	If PPE is not worn correctly or is defective, there is a higher chance of injury from contact with moving parts, sharp edges, hot surfaces, or flying fragments. If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.

5.3.7 R007

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Infeed yarn loading		
When the yarn infeed is completed, an infeed changeover with new yarn occurs approximately once every hour. After inserting the new yarn, a single job run is monitored, and the weight is checked. Width adjustment is carried out in the eccentric measurement area during the stop, alongside control checks. Finished goods are unloaded from the machine at regular intervals and stacked in the unload tray.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		G004	Shield					
			G006	Fixed guard					
			FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
		T	Over voltage PR	Device generic					
			Reset	Reset button					
			Start	Start button					

Administrative	TRN	Training					
	Crush injury	Crush injury					
	A001	PPE - General					
	A002	Eye protection					
	I&M	Inspection and maintenance					
	LOTO Procedure	Lockout / Tagout					
Residual risk	Failure to replace guard following maintenance, repair or setup						

5.3.8 R008

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Presence around the machine		
Non-operators include quality personnel and passers-by. Parts on the output table are verified on the weighing scale. The operator changes the yarn raw material approximately five times per shift. A user-defined maintenance task occurs if a yarn infeed jam happens — the maintenance operator opens the safety door and clears the jam. (Risk awareness: trained staff; competency level: high).	**Affected persons**	
	Visitor	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			Reset	Reset button					
			Start	Start button					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
Administrative			I&M	Inspection and maintenance					
			A001	PPE - General					
			TRN	Training					
Residual risk		Failure to replace guard following maintenance, repair or setup							

5.3.9 R009

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Setting- width ID or OD change in mechanical eccentric		
During setting, teaching, or process parameter adjustments, no machine movements occur, and there is no defined condition where the door remains open with the machine operating. Pneumatic Pressure Setting: Pressure adjustments, based on the physical properties of the input material or product variants, can be made while the machine is running, provided all safety doors remain closed. If any door is opened, the machine process stops instantly via the interlock system.	**Affected persons** Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			G004	Shield					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					

Administrative	TRN	Training						
	A001	PPE - General						
	A002	Eye protection						
	I&M	Inspection and maintenance						
	Crush injury	Crush injury						
	LOTO Procedure	Lockout / Tagout						
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.							

5.3.10 R010

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Feeding yarn and adjusting nozzle		
Operator feeds yarn into nozzle and aligns position for correct forming. Hands are close to moving rollers and sharp yarn guides.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction					S	E	A	O	Risk OUT
Inherent design					S2	E1	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G004	Shield					
	Devices		Reset	Reset button					
			Start	Start button					
			Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
Administrative			A002	Eye protection					
			A001	PPE - General					
			Crush injury	Crush injury					
			yarn ip Admin	Yarn infeed Handling					
Residual risk	unintended movement or accidental load drop, mainly if someone enters the zone during maintenance, error recovery, or if procedures are not followed.								

5.3.11 R011

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Crushing	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Knurling plate maintenance		
Inspecting, cleaning, or tightening knurling plate and bolts, often with tools near sharp surfaces.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E0	A1	O1	<1
Engineering	**Guards**	Mov Guard	Movable guard hinged					
		G004	Shield					
		FG machine	Fixed guard					
		FG machine	Fixed guard					
	Devices	T005	Emergency off					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
		Safety SW - RE11	Interlock Type 3 RE 11					
Administrative		Crush injury	Crush injury					
		I&M	Inspection and maintenance					
		A001	PPE - General					
		Tamper proof	Tamper resistant fastener					
		TRN	Training					
Residual risk	unintended movement or accidental , mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.							

5.3.12 R012

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Entanglement	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			G004	Shield					
			out feed guard	Fixed guard					
			Mov Guard	Movable guard hinged					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
			2 Hand PB	Two-hand actuating control					
Administrative			TRN	Training					
			A001	PPE - General					
			I&M	Inspection and maintenance					
			Crush injury	Crush injury					
			A002	Eye protection					
			LOTO Procedure	Lockout / Tagout					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.								

5.3.13 R013

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Entanglement	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Presence around the machine		
Non-operators include quality personnel and passers-by. Parts on the output table are verified on the weighing scale. The operator changes the yarn raw material approximately five times per shift. A user-defined maintenance task occurs if a yarn infeed jam happens — the maintenance operator opens the safety door and clears the jam. (Risk awareness: trained staff; competency level: high).	**Affected persons**	
	Visitor	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			G004	Shield					
			Mov Guard	Movable guard hinged					
	Devices		2 Hand PB	Two-hand actuating control					
			T007	Pneumatic shut-off and exhaust valve					
			Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			LOTO Procedure	Lockout / Tagout					
			Crush injury	Crush injury					
			I&M	Inspection and maintenance					
			A001	PPE - General					
		A	yarn ip Admin	Yarn infeed Handling					
			TRN	Training					

Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.

5.3.14 R014

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Entanglement	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Feeding yarn and adjusting nozzle		
Operator feeds yarn into nozzle and aligns position for correct forming. Hands are close to moving rollers and sharp yarn guides.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction					S	E	A	O	Risk OUT
Inherent design					S2	E1	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G004	Shield					
			FG machine	Fixed guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			A002	Eye protection					
			A001	PPE - General					
			I&M	Inspection and maintenance					
			Crush injury	Crush injury					
Residual risk	unintended movement , mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.								

5.3.15 R015

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Rotating pulleys or moving parts	Entanglement	
Rotating pulleys and the moving pressing cylinder present entanglement, crushing, and impact risks if operator hands, clothing, or tools enter the hazard zone during operation or setup.		
Pressure plate & Roller(manual)		
Operation of emergency to be removed from the task matrix of work instruction manual Ref: VFM/IN QSW P0500-SAFETY Rev. No - 24 Pressure plate and rollers are cleaned of residue and dust, often while hot. Requires access inside guarded area.	**Affected persons** Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		Mov Guard	Movable guard hinged					
		FG machine	Fixed guard					
		FG machine	Fixed guard					
	Devices	T005	Emergency off					
		Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		I&M	Inspection and maintenance					
		A001	PPE - General					
		A002	Eye protection					
		TRN	Training					
Residual risk	unintended movement if someone access the zone during cleaning, or if procedures are not followed.							

5.3.16 R016

Mechanical hazards		
Ejected parts		
Hazard source	**Consequence**	
Raw material yarn powder parts ejection	Impact	
Unexpected ejection of preforms or components can occur due to misalignment, overpressure, brittle material breakage, or loose mechanical parts. High-speed release poses risks of impact or laceration from flying fragments. Chute misalignment or overflow may cause preforms to fall unpredictably, while restart after jam clearing can result in sudden material or part discharge toward operators.		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction					S	E	A	O	Risk OUT
Inherent design					S2	E0	A2	O3	<1
Engineering	**Guards**		G004	Shield					
			Mov Guard	Movable guard hinged					
			out feed guard	Fixed guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
Administrative			I&M	Inspection and maintenance					
			Crush injury	Crush injury					
			A001	PPE - General					
Residual risk	Rare fragments may eject if material breaks unexpectedly. PPE and shields control this.								

5.3.17 R017

Mechanical hazards		
Ejected parts		
Hazard source	**Consequence**	
Raw material yarn powder parts ejection	Impact	
Unexpected ejection of preforms or components can occur due to misalignment, overpressure, brittle material breakage, or loose mechanical parts. High-speed release poses risks of impact or laceration from flying fragments. Chute misalignment or overflow may cause preforms to fall unpredictably, while restart after jam clearing can result in sudden material or part discharge toward operators.		
Preventive maintenance or Jam clearance		
During preventive maintenance (once every 3 months) or during fault-finding/troubleshooting of motors, sensors, or mechanical holding tools, the maintenance engineer accesses the control panel and verifies the function of the interlocks. If any actuator malfunctions, the respective actuator is replaced following established administrative control measures.	**Affected persons**	
	Maintenance person	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E1	A1	O1	<1
Engineering	**Guards**		out feed guard	Fixed guard					
			FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
			G004	Shield					
	Devices								
Administrative			A001	PPE - General					
			A002	Eye protection					
			I&M	Inspection and maintenance					
			TRN	Training					
Residual risk		Rare fragments may eject if material breaks unexpectedly. PPE and shields control this.							

5.3.18 R018

Mechanical hazards		
Approach of a moving element to a fixed part		
Hazard source	**Consequence**	
Yarn entry via the pulley arrangement	Cutting or severing	
The yarn entry area contains sharp edges and moving guides; holding the yarn during infeed can cause severe cuts or entanglement injuries if hands enter the feed path while the machine is running.		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
			G004	Shield					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			Reset	Reset button					
			Start	Start button					
Administrative			A001	PPE - General					
			A002	Eye protection					
			Crush injury	Crush injury					
			I&M	Inspection and maintenance					
			TRN	Training					
			LOTO Procedure	Lockout / Tagout					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.								

5.3.19 R019

Mechanical hazards	
Approach of a moving element to a fixed part	
Hazard source	**Consequence**
Yarn entry via the pulley arrangement	Cutting or severing
The yarn entry area contains sharp edges and moving guides; holding the yarn during infeed can cause severe cuts or entanglement injuries if hands enter the feed path while the machine is running.	
Infeed yarn loading	
When the yarn infeed is completed, an infeed changeover with new yarn occurs approximately once every hour. After inserting the new yarn, a single job run is monitored, and the weight is checked. Width adjustment is carried out in the eccentric measurement area during the stop, alongside control checks. Finished goods are unloaded from the machine at regular intervals and stacked in the unload tray.	**Affected persons** Operator Material handlers

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		FG machine	Fixed guard					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		A002	Eye protection					
		LOTO Procedure	Lockout / Tagout					
		A001	PPE - General					
		I&M	Inspection and maintenance					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.							

5.3.20 R020

Mechanical hazards		
Approach of a moving element to a fixed part		
Hazard source	**Consequence**	
Yarn entry via the pulley arrangement	Cutting or severing	
The yarn entry area contains sharp edges and moving guides; holding the yarn during infeed can cause severe cuts or entanglement injuries if hands enter the feed path while the machine is running.		
Presence around the machine		
Non-operators include quality personnel and passers-by. Parts on the output table are verified on the weighing scale. The operator changes the yarn raw material approximately five times per shift. A user-defined maintenance task occurs if a yarn infeed jam happens — the maintenance operator opens the safety door and clears the jam. (Risk awareness: trained staff; competency level: high).	**Affected persons**	
	Visitor	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		G004	Shield					
			FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			A001	PPE - General					
			A002	Eye protection					
			Crush injury	Crush injury					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.								

5.3.21 R021

Mechanical hazards		
Approach of a moving element to a fixed part		
Hazard source	**Consequence**	
Yarn entry via the pulley arrangement	Cutting or severing	
The yarn entry area contains sharp edges and moving guides; holding the yarn during infeed can cause severe cuts or entanglement injuries if hands enter the feed path while the machine is running.		
Setting- width ID or OD change in mechanical eccentric		
During setting, teaching, or process parameter adjustments, no machine movements occur, and there is no defined condition where the door remains open with the machine operating. Pneumatic Pressure Setting: Pressure adjustments, based on the physical properties of the input material or product variants, can be made while the machine is running, provided all safety doors remain closed. If any door is opened, the machine process stops instantly via the interlock system.	**Affected persons** Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		G006	Fixed guard					
			FG machine	Fixed guard					
			G004	Shield					
			Mov Guard	Movable guard hinged					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			I&M	Inspection and maintenance					
			TRN	Training					
			A001	PPE - General					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.								

5.3.22 R022

Mechanical hazards		
Approach of a moving element to a fixed part		
Hazard source	**Consequence**	
Yarn entry via the pulley arrangement	Cutting or severing	
The yarn entry area contains sharp edges and moving guides; holding the yarn during infeed can cause severe cuts or entanglement injuries if hands enter the feed path while the machine is running.		
Push/pull trolleys -material transfer		
Moving loaded trolleys with yarn or preforms between stations.	**Affected persons**	
	Material handlers Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E1	A2	O3	4

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
	Devices	Reset	Reset button					
		ESTOP	E-Stop push button					
		Start	Start button					
		Safety SW - RE11	Interlock Type 3 RE 11					
Administrative		TRN	Training					
		I&M	Inspection and maintenance					
		A001	PPE - General					
		A002	Eye protection					
Residual risk	Risk only if guard is removed or not properly closed after maintenance.							

5.3.23 R023

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction					S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			G003	Partial guard					
			Mov Guard	Movable guard hinged					
			G004	Shield					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			2 Hand PB	Two-hand actuating control					
			T007	Pneumatic shut-off and exhaust valve					
			Reset	Reset button					
			Start	Start button					

Administrative	A002	Eye protection						
	A001	PPE - General						
	LOTO Procedure	Lockout / Tagout						
	Crush injury	Crush injury						
	I&M	Inspection and maintenance						
	TRN	Training						
Residual risk	Possible only if procedures not followed during setup or jam clearing.							

5.3.24 R024

Mechanical hazards

Rotating elements

Hazard source	Consequence
Main motor preforming area	Cutting or severing

Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions

General Cleaning - Autonomous

	Affected persons
Due to the composite nature of the impregnated yarn (fibers, copper, resins), dust and fine particles can accumulate around the machine perimeter, feed system, and preforming zone. Regular cleaning is recommended once per shift to prevent buildup that may affect product quality or pose slip hazards. Cleaning tasks include removing yarn debris from the pulley arrangement, eccentric measurement area, pressing zone, and unload tray. Preventive maintenance includes lubrication of moving parts, inspection of pneumatic lines, and checking the weighing balance and sensors for contamination or misalignment.	Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction					S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	Guards		FG machine	Fixed guard					
			G004	Shield					
			Mov Guard	Movable guard hinged					
	Devices		Reset	Reset button					
			Start	Start button					
			Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					

Administrative	A001	PPE - General						
	A002	Eye protection						
	TRN	Training						
	I&M	Inspection and maintenance						
	Crush injury	Crush injury						
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury. Possible only if procedures not followed during setup or jam clearing.							

5.3.25 R025

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Quality inspection		
Quality technicians or supervisors perform process monitoring at regular intervals, especially when a new part or variant is run on the machine.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		FG machine	Fixed guard					
			G004	Shield					
			out feed guard	Fixed guard					
			Mov Guard	Movable guard hinged					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					
Administrative			A002	Eye protection					
			A001	PPE - General					
			Crush injury	Crush injury					
			TRN	Training					
Residual risk		If PPE is not worn correctly or is defective, there is a higher chance of injury from contact with moving parts, sharp edges, hot surfaces, or flying fragments. If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.						

5.3.26 R026

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Setting- width ID or OD change in mechanical eccentric		
During setting, teaching, or process parameter adjustments, no machine movements occur, and there is no defined condition where the door remains open with the machine operating. Pneumatic Pressure Setting: Pressure adjustments, based on the physical properties of the input material or product variants, can be made while the machine is running, provided all safety doors remain closed. If any door is opened, the machine process stops instantly via the interlock system.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction					S	E	A	O	Risk OUT
Inherent design					S3	E0	A1	O1	<1
Engineering	**Guards**	out feed guard	Fixed guard						
		Mov Guard	Movable guard hinged						
		G004	Shield						
	Devices	Safety SW - RE11	Interlock Type 3 RE 11						
		Reset	Reset button						
		Start	Start button						
		ESTOP	E-Stop push button						

Administrative		Crush injury	Crush injury					
		A002	Eye protection					
		I&M	Inspection and maintenance					
		TRN	Training					
		A001	PPE - General					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.							

5.3.27 R027

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Feeding yarn and adjusting nozzle		
Operator feeds yarn into nozzle and aligns position for correct forming. Hands are close to moving rollers and sharp yarn guides.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
		T005	Emergency off					
Administrative		TRN	Training					
		A001	PPE - General					
		Crush injury	Crush injury					
		LOTO Procedure	Lockout / Tagout					
Residual risk	unintended movement or accidental load drop, mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.							

5.3.28 R028

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Pressure plate & Roller(manual)		
Operation of emergency to be removed from the task matrix of work instruction manual Ref: VFM/IN QSW P0500-SAFETY Rev. No - 24 Pressure plate and rollers are cleaned of residue and dust, often while hot. Requires access inside guarded area.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction					S	E	A	O	Risk OUT
Inherent design					S3	E0	A1	O1	<1
Engineering	**Guards**		G004	Shield					
			Mov Guard	Movable guard hinged					
			FG machine	Fixed guard					
	Devices		T005	Emergency off					
			Safety SW - RE11	Interlock Type 3 RE 11					
			Reset	Reset button					
			Start	Start button					
			ESTOP	E-Stop push button					
Administrative			Crush injury	Crush injury					
			I&M	Inspection and maintenance					
			A001	PPE - General					
			A002	Eye protection					
			TRN	Training					
			Tamper proof	Tamper resistant fastener					

Residual risk	unintended movement mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.

5.3.29 R029

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Cutting or severing	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Knurling plate maintenance		
Inspecting, cleaning, or tightening knurling plate and bolts, often with tools near sharp surfaces.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		T005	Emergency off					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		TRN	Training					
		I&M	Inspection and maintenance					
		A002	Eye protection					
		A001	PPE - General					
		Crush injury	Crush injury					
Residual risk	unintended movement or accidental load drop, mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.							

5.3.30 R030

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Entanglement	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Setting- New variant change		
For every new variant, setting or teaching is carried out using mechanical levers; no programming changes are made in the control system. Access to the control logic remains restricted to the maintenance and machine OEM electrical team only.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E3	A2	O3	6

Risk reduction					S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S3	E0	A1	O1	<1
Engineering	**Guards**		Mov Guard	Movable guard hinged					
			G003	Partial guard					
			G004	Shield					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
			T007	Pneumatic shut-off and exhaust valve					
			Reset	Reset button					
			Start	Start button					

Administrative	A001	PPE - General						
	A002	Eye protection						
	yarn ip Admin	Yarn infeed Handling						
	Crush injury	Crush injury						
	I&M	Inspection and maintenance						
	TRN	Training						
	LOTO Procedure	Lockout / Tagout						
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury. Possible only if procedures not followed during setup or jam clearing.							

5.3.31 R031

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Entanglement	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Infeed yarn loading		
When the yarn infeed is completed, an infeed changeover with new yarn occurs approximately once every hour. After inserting the new yarn, a single job run is monitored, and the weight is checked. Width adjustment is carried out in the eccentric measurement area during the stop, alongside control checks. Finished goods are unloaded from the machine at regular intervals and stacked in the unload tray.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		FG machine	Fixed guard					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		TRN	Training					
		yarn ip Admin	Yarn infeed Handling					
		I&M	Inspection and maintenance					
		A001	PPE - General					

Residual risk	If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.

5.3.32 R032

Mechanical hazards		
Rotating elements		
Hazard source	**Consequence**	
Main motor preforming area	Entanglement	
Main motor area, knurling plate, and rotating rollers are accessible, presenting risks of entanglement, shear, and cuts. The knurling plate edges and sharp ridges on rollers can cause severe lacerations during operation. Shear points exist where yarn is gripped and cut/torn in the forming process. Additionally, exposed metal edges on guide plates, chutes, and mechanical fixtures increase injury risk during changeovers or jam clearing, especially if performed without full isolation. These hazards require safeguarding, interlocking, and tool-assisted interventions		
Knurling plate maintenance		
Inspecting, cleaning, or tightening knurling plate and bolts, often with tools near sharp surfaces.	**Affected persons**	
	Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S3	E2	A2	O3	5

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S3	E0	A1	O1	<1
Engineering	**Guards**	FG machine	Fixed guard					
		G004	Shield					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		A002	Eye protection					
		I&M	Inspection and maintenance					
		Tamper proof	Tamper resistant fastener					
		A001	PPE - General					
Residual risk	Unintended movement, mainly if someone access the zone during maintenance, error recovery, or if procedures are not followed.							

5.3.33 R033

Mechanical hazards		
Approach of a moving element to a fixed part		
Hazard source	**Consequence**	
Finished good area & Main cylinder	Crushing	
If a non-conforming part is sensed by the load cell, the pneumatic cylinder activates automatically. Any body part in its path can be in a crush zone, causing injury.		
Infeed yarn loading		
When the yarn infeed is completed, an infeed changeover with new yarn occurs approximately once every hour. After inserting the new yarn, a single job run is monitored, and the weight is checked. Width adjustment is carried out in the eccentric measurement area during the stop, alongside control checks. Finished goods are unloaded from the machine at regular intervals and stacked in the unload tray.	**Affected persons**	
	Operator Material handlers	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E2	A1	O1	<1
Engineering	**Guards**		G006	Fixed guard					
			FG machine	Fixed guard					
			Mov Guard	Movable guard hinged					
			G003	Partial guard					
			G004	Shield					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			2 Hand PB	Two-hand actuating control					
			ESTOP	E-Stop push button					
			Reset	Reset button					
			Start	Start button					

Administrative		A001	PPE - General					
		I&M	Inspection and maintenance					
		A002	Eye protection					
		Crush injury	Crush injury					
		TRN	Training					
		LOTO Procedure	Lockout / Tagout					
		yarn ip Admin	Yarn infeed Handling					
Residual risk	If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.							

5.3.34 R034

Mechanical hazards		
	Approach of a moving element to a fixed part	
Hazard source		**Consequence**
Finished good area & Main cylinder		Crushing
If a non-conforming part is sensed by the load cell, the pneumatic cylinder activates automatically. Any body part in its path can be in a crush zone, causing injury.		
	Quality inspection	
Quality technicians or supervisors perform process monitoring at regular intervals, especially when a new part or variant is run on the machine.		**Affected persons**
		Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E1	A2	O3	<1
Engineering	**Guards**	G006	Fixed guard					
		G004	Shield					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		Crush injury	Crush injury					
		A001	PPE - General					
		TRN	Training					
		I&M	Inspection and maintenance					
Residual risk	If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.							

5.3.35 R035

Mechanical hazards

Approach of a moving element to a fixed part

Hazard source	Consequence
Finished good area & Main cylinder	Crushing

If a non-conforming part is sensed by the load cell, the pneumatic cylinder activates automatically. Any body part in its path can be in a crush zone, causing injury.

Finished component weight monitoring cylinder

	Affected persons
When a NC rejected component reached via the gravity chute pneumatic cylinder activates and stops the preform component at the monitoring zone before it falls in the unload tray/bin	Quality Inspection Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction				S	E	A	O	Risk OUT
Inherent design		D	FG MC PC	Polycarbonate guard	S2	E0	A1	O1	<1
Engineering	Guards		FG machine	Fixed guard					
			G004	Shield					
			Mov Guard	Movable guard hinged					
			FG machine	Fixed guard					
	Devices		Safety SW - RE11	Interlock Type 3 RE 11					
			Reset	Reset button					
			Start	Start button					
			ESTOP	E-Stop push button					
Administrative			LOTO Procedure	Lockout / Tagout					
			Crush injury	Crush injury					
			A001	PPE - General					
			TRN	Training					
			I&M	Inspection and maintenance					
Residual risk				If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury. If safe work procedures are not followed or updated regularly, there is chance of accidents from unsafe actions, outdated practices, or missed hazard controls.					

5.3.36 R036

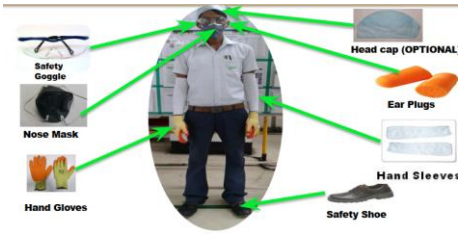
Mechanical hazards	
Approach of a moving element to a fixed part	
Hazard source	**Consequence**
Finished good area & Main cylinder	Crushing
If a non-conforming part is sensed by the load cell, the pneumatic cylinder activates automatically. Any body part in its path can be in a crush zone, causing injury.	
Pressure plate & Roller(manual)	
Operation of emergency to be removed from the task matrix of work instruction manual Ref: VFM/IN QSW P0500-SAFETY Rev. No - 24 Pressure plate and rollers are cleaned of residue and dust, often while hot. Requires access inside guarded area.	**Affected persons** Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E1	A1	O1	<1
Engineering	**Guards**	FG machine	Fixed guard					
		G004	Shield					
		Mov Guard	Movable guard hinged					
	Devices	Safety SW - RE11	Interlock Type 3 RE 11					
		Reset	Reset button					
		Start	Start button					
		ESTOP	E-Stop push button					
Administrative		TRN	Training					
		A001	PPE - General					
		I&M	Inspection and maintenance					
		Crush injury	Crush injury					
Residual risk	If a safeguard is accidentally not reinstalled after maintenance or setup, there remains a chance of exposure to hazardous parts, leading to possible injury.							

5.3.37 R037

Environmental hazards	
Dust and fog	
Hazard source	**Consequence**
Fine particles from the yarn/preform	Suffocation
Dust or fog from the machine parts during preforming can cause breathing discomfort, eye irritation.	
General Cleaning - Autonomous	
Due to the composite nature of the impregnated yarn (fibers, copper, resins), dust and fine particles can accumulate around the machine perimeter, feed system, and preforming zone. Regular cleaning is recommended once per shift to prevent buildup that may affect product quality or pose slip hazards. Cleaning tasks include removing yarn debris from the pulley arrangement, eccentric measurement area, pressing zone, and unload tray. Preventive maintenance includes lubrication of moving parts, inspection of pneumatic lines, and checking the weighing balance and sensors for contamination or misalignment.	**Affected persons** Operator



Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		FG machine	Fixed guard					
		FG machine	Fixed guard					
	Devices							
Administrative		A002	Eye protection					
		A001	PPE - General					
		I&M	Inspection and maintenance					
		TRN	Training					
Residual risk	Minor breathing/eye irritation if PPE not used or cleaning delayed.							

5.3.38 R038

Environmental hazards		
Dust and fog		
Hazard source	**Consequence**	
Fine particles from the yarn/preform	Suffocation	
Dust or fog from the machine parts during preforming can cause breathing discomfort, eye irritation.		
Presence around the machine		
Non-operators include quality personnel and passers-by. Parts on the output table are verified on the weighing scale. The operator changes the yarn raw material approximately five times per shift. A user-defined maintenance task occurs if a yarn infeed jam happens — the maintenance operator opens the safety door and clears the jam. (Risk awareness: trained staff; competency level: high).	**Affected persons**	
	Visitor	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E0	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		FG machine	Fixed guard					
		FG machine	Fixed guard					
	Devices							
Administrative		TRN	Training					
		I&M	Inspection and maintenance					
		A001	PPE - General					
		A002	Eye protection					
Residual risk	Minor breathing/eye irritation if PPE not used or cleaning delayed.							

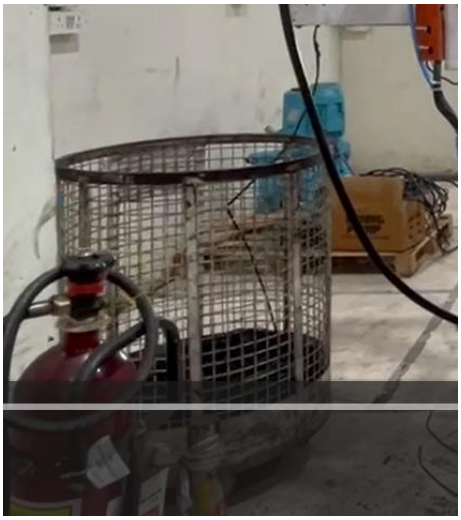
5.3.39 R039

Environmental hazards	
Dust and fog	
Hazard source	**Consequence**
Fine particles from the yarn/preform	Suffocation
Dust or fog from the machine parts during preforming can cause breathing discomfort, eye irritation.	
Pressure plate & Roller(manual)	
Operation of emergency to be removed from the task matrix of work instruction manual Ref: VFM/IN QSW P0500-SAFETY Rev. No - 24 Pressure plate and rollers are cleaned of residue and dust, often while hot. Requires access inside guarded area.	**Affected persons** Operator

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E2	A2	O3	2

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E1	A1	O1	<1
Engineering	**Guards**	G004	Shield					
		Mov Guard	Movable guard hinged					
		FG machine	Fixed guard					
	Devices							
Administrative		A002	Eye protection					
		A001	PPE - General					
		I&M	Inspection and maintenance					
		TRN	Training					
Residual risk	Minor breathing/eye irritation if PPE not used or cleaning delayed.							

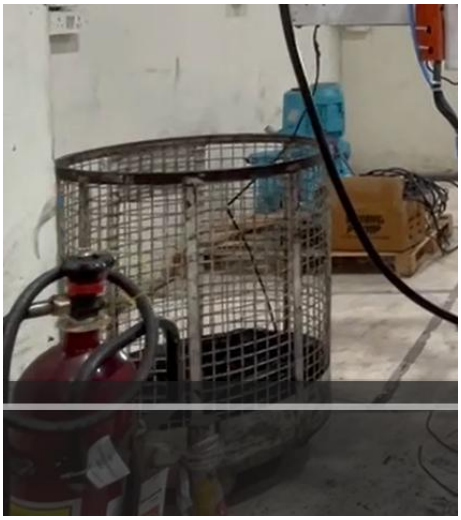
5.3.40 R040

Ergonomic hazards		
Repetitive activity		
Hazard source	**Consequence**	
Loading and unloading Trolley movement	Fatigue	
Moving trolleys during loading and unloading, especially in repetitive cycles, can cause operator fatigue, increasing the chance of strains,		
Finished component weight monitoring cylinder		
When a NC rejected component reached via the gravity chute pneumatic cylinder activates and stops the preform component at the monitoring zone before it falls in the unload tray/bin	**Affected persons**	
	Quality Inspection Operator	

Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E3	A2	O3	3

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E0	A1	O1	<1
Engineering	**Guards**	FG machine	Fixed guard					
	Devices							
Administrative		I&M	Inspection and maintenance					
		A001	PPE - General					
		Crush injury	Crush injury					
		TRN	Training					
Residual risk	Fatigue or strain possible if poor posture or repeated manual handling continues.							

5.3.41 R041

Ergonomic hazards		
Repetitive activity		
Hazard source	**Consequence**	
Loading and unloading Trolley movement	Fatigue	
Moving trolleys during loading and unloading, especially in repetitive cycles, can cause operator fatigue, increasing the chance of strains,		
Push/pull trolleys -material transfer		
Moving loaded trolleys with yarn or preforms between stations.	**Affected persons**	
	Material handlers Operator	

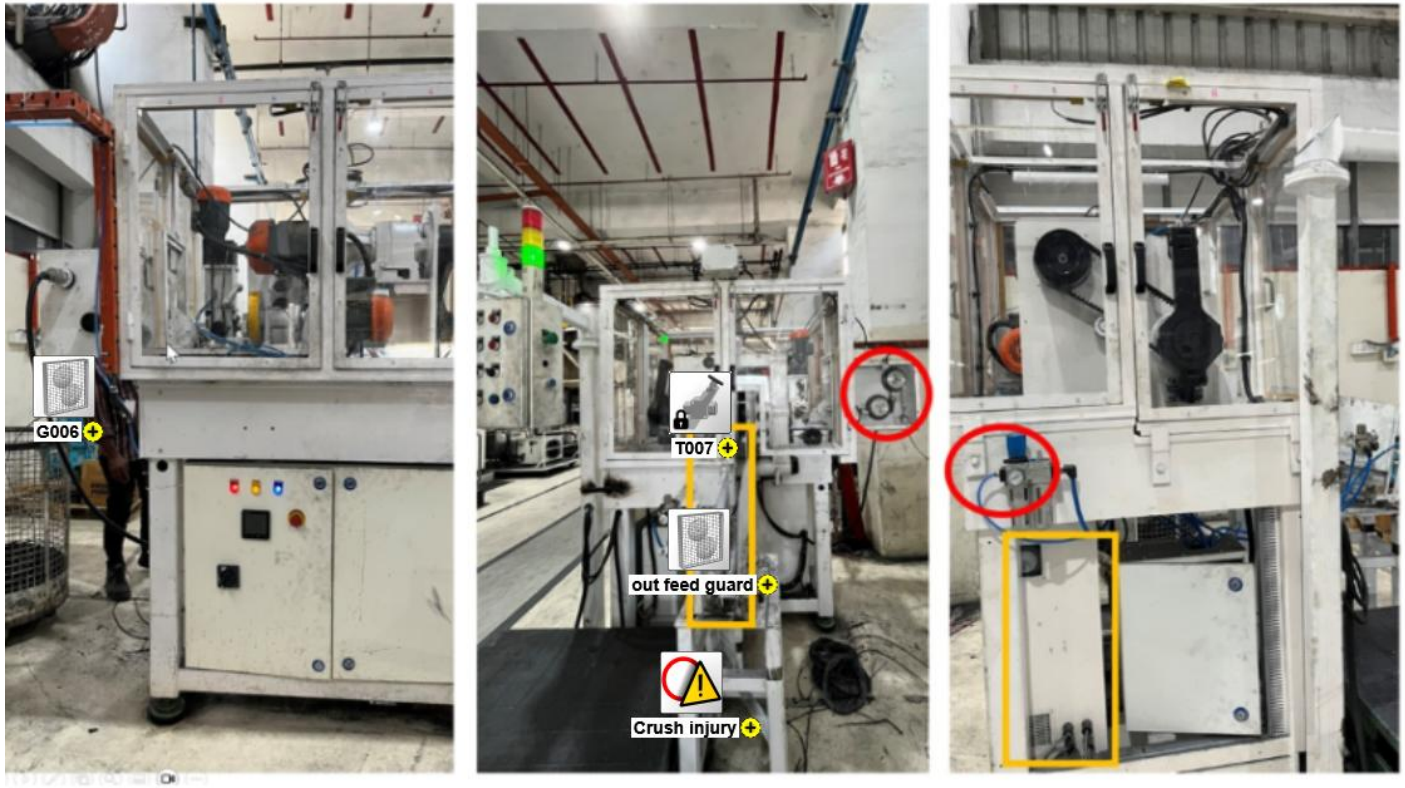
Severity [S]	Exposure [E]	Avoidance [A]	Occurrence [O]	Risk IN
S2	E1	A2	O3	1

Risk reduction				S	E	A	O	Risk OUT
Inherent design				S2	E1	A2	O3	<1
Engineering	**Devices Guards**							
	Devices							
Administrative		I&M	Inspection and maintenance					
		A001	PPE - General					
		TRN	Training					
		Crush injury	Crush injury					
Residual risk	Fatigue or strain possible if poor posture or repeated manual handling continues.							

6 Risk reduction

This chapter describes the risk reduction measures referenced in the individual risk tables. The overviews show the general locations of the measures at the machine.

6.1 Overview of risk reduction measures

RRM Control panel side view


6.2 Risk reduction measures

	ID	Measure
Inherent safe design		
	D003	**Prevention through design** Accessible parts of machinery shall have no sharp edges, no sharp angles, no rough surfaces, no protruding parts likely to cause injury, and no openings which can "trap" parts of the body or clothing. Crushing and shearing hazards to be avoided via appropriate geometrical design, by proper design of the form and relative location of the mechanical moving components. Typical residual risk: - Modification of the geometrical design
D	FG MC PC	**Polycarbonate guard** Guarding is insufficient at the rear and bottom side and the area where the material is finished and ready for next process of the machine.
Technical protective measures / Engineering controls – Guards		
	FG CP Live part	**Fixed guard** Additional poly carbonate sheet to be added at the bottom of the machine to avoid access and spillage of raw materials to avoid cleaning task additional due to the miss of guards To be designed and positioned according to ISO 14120 and ISO 13857. For existing measures: Height: 200 mm Length: 600 mm Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access
	FG machine	**Fixed guard** Additional poly carbonate sheet to be added at the bottom of the machine to avoid access and spillage of raw materials to avoid cleaning task additional due to the miss of guards To be designed and positioned according to ISO 14120 and ISO 13857. For existing measures: Height: 200 mm Length: 600 mm Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access
	FG machine	**Fixed guard** Additional poly carbonate sheet to be added at the bottom of the machine to avoid access and spillage of raw materials to avoid cleaning task additional due to the miss of guards To be designed and positioned according to ISO 14120 and ISO 13857. For existing measures: Height: 200 mm Length: 600 mm Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access
	G003	**Partial guard** To be designed according to ISO 14120. Wherever possible reach to the moving parts are present Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access

	G004	**Shield** To be designed and positioned according to ISO 14120 and ISO 13857. For existing measures: Height: 150mm Length: 200mm Thickness: 3/5 mm Material: Poly carbonate To avoid reach to live parts inside the control panel during maintenance or trouble shoot Typical residual risk: - Failure to replace guard following maintenance, repair or setup - Failure to adjust guard before operation - Insufficient inspection and maintenance - Failure due to deterioration of material **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access	
	G006	**Fixed guard** Designed and positioned according to ISO 14120 and ISO 13857. **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access	
	Mov Guard	**Movable guard hinged** Multiple hinge doors are present in the machine door identification to be improved up Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF10 – Initiating a stop	
	out feed guard	**Fixed guard** To be designed and positioned according to ISO 14120 and ISO 13857. For existing measures: Height: xxx mm Length: xxx mm Mesh gap dimensions: xx mm Make of the guard: xx Typical residual risk: - Failure to replace guard following maintenance, repair or setup **Assigned Safety Function(s):** SF00 – Permanently preventing entry/access	
Technical protective measures / Engineering controls – Devices			
	2 Hand PB	**Two-hand actuating control** Cycle start push button for push button 1 & push button 2 for cylinder initiation **Assigned Safety Function(s):** SFXX – Two Cycle start Push button	-none-
	ESTOP	**E-Stop push button** Emergency push button in the operator pendant area To be implemented according to ISO 13850 and IEC 60204-1. Typical residual risk: - Operation for purposes other than emergency - Device not readily accessible - Introduction of obstruction preventing actuation **Assigned Safety Function(s):** SF99 – Emergency stop	PLr d
	Over voltage PR	**Device generic** Over voltage and phase sequence electrical monitoring relay is present in the control panel to detect high voltages to trip the circuit	PLr c
	Reset	**Reset button** Reset blue pushbutton to be implemented according to ISO 13849-1 and IEC 60204-1. Blue colored push button with indicator lights recommended. Typical residual risk:	PLr c

		- Inappropriate modification of equipment/fastening solution - Failure to confirm safeguarding space clear of other individuals - Control of reset by person other than exposed operator	
	Safety SW -RE11	**Interlock Type 3 RE 11** Magnetic non contact type switches are installed in the machine doors across the possible access locations Typical residual risk: - Manipulation of the safety switch with actuators Improper location of interlocking guard relative to hazard zone(s) - Improper maintenance/alignment - Insufficient inspection - Inappropriate modification of equipment/fastening solution - Use of uncontrolled spare actuators - Failure due to mechanical wear **Assigned Safety Function(s):** SF11 – Initiating stop and preventing start	PLr d
	Start	**Start button** Start button is initiated through the HMI controls post activation of safety general reset	-none-
	T005	**Emergency off** To be implemented according to IEC 60204-1. Typical residual risk: - Failure to follow documented procedures - Operation for purposes other than emergency - Device not readily accessible	
	T007	**Pneumatic shut-off and exhaust valve** Primary machine pneumatic energy disconnection device. To be implemented according to ISO 4414. Typical residual risk: - Failure to follow documented procedures **Assigned Safety Function(s):** SF01 – Avoiding unexpected start-up	
	T007	**Pneumatic shut-off and exhaust valve** Primary machine pneumatic energy disconnection device. To be implemented according to ISO 4414. Typical residual risk: - Failure to follow documented procedures **Assigned Safety Function(s):** SF01 – Avoiding unexpected start-up	
T	T008	**Short circuit monitoring** appropriately rated MCBs, fuses, or circuit breakers to protect against overload and short circuit.	PLr d
Administrative measures			
	A001	**PPE - General** General PPE as recommended and specified by the machine builder and/or machine owner. Typical residual risk: - Failure to properly use and maintain PPE	
	A002	**Eye protection** Vision protection as recommended and specified by the machine builder and/or machine owner. Typical residual risk: - Failure to properly use and maintain PPE **Assigned Safety Function(s):** SFXX – PPE	
	A013 LOTO	**Lockout / Tagout** To be implemented as supplemental measure to ISO 14118. Paired with device Txxx. Typical residual risk: - Failure to follow documented procedures	

		Assigned Safety Function(s): SF01 – Avoiding unexpected start-up	
	Crush injury	**Crush injury** To implement safety awareness sign that complies to ISO 7010. for crush injury. **Assigned Safety Function(s):** SFXX – Visual Signages for warning	
	Electrical sign	**Awareness signs** To implement safety awareness sign that complies to ISO 7010. To implement awareness sign as according to the requirements stated in ANSI B11.19. Typical residual risk: - Failure to heed warning - Failure to maintain visibility/legibility	
	I&M	**Inspection and maintenance** Inspection and maintenance procedures implemented in accordance to the requirements of Use of Work Equipment Directive 2009/104/EC. Inspection and maintenance procedures implemented in accordance to the local/regional requirements. Typical residual risk: - Failure to perform regular inspection - Failure to maintain risk reduction measures **Assigned Safety Function(s):** SF91 – Indicating safety-relevant alarms	
	LOTO Procedure	**Lockout / Tagout** To be implemented as supplemental measure to ISO 14118. Paired with device and energy identification no and Tag reference. Typical residual risk: - Failure to follow documented procedures **Assigned Safety Function(s):** SF01 – Avoiding unexpected start-up	
	Tamper proof	**Tamper resistant fastener** To implement tamper resistant fixings according to the requirements in ISO 14119 with all actuators wherever it is found possible to manipulate and can be a potential breach suitable incentives for non defeat of interlocks to be practiced applies to fixed guards as well one among the screws to be added as special screws which is available only with authorized personnel Typical residual risk: - Special tool accessible by unauthorized personnel - Failure to replace tamper resistant fastener after completion of task	
	TRN	**Training** Workers to be provided adequate training in accordance to the requirements of Use of Work Equipment Directive 2009/104/EC. Workers to be provided adequate training in accordance to the local/regional requirements. Typical residual risk: - Failure to follow documented training - Initial/regular training not provided or unknown to operator **Assigned Safety Function(s):** SF05 – Monitoring machine parameters	
A	yarn ip Admin	**Yarn infeed Handling** Only trained operator loads the yarn and in feeds to the pulley **Assigned Safety Function(s):** SFXX – Limited people Access	

7 Risk assessment process

7.1 Risk assessment

The level of risk must first be determined and documented as the first step in determining safeguarding measures to reduce the risk of machine hazards. The methodology used by SICK to assess risk is in compliance with the processes described in ISO 12100 and ANSI B11 and is proven to establish a systematic approach to identify, evaluate and reduce risks for people as required by regulations for machine safety. This process must be documented as evidence of the information used to select the appropriate risk reduction measures and determine their minimum performance requirements, as appropriate.

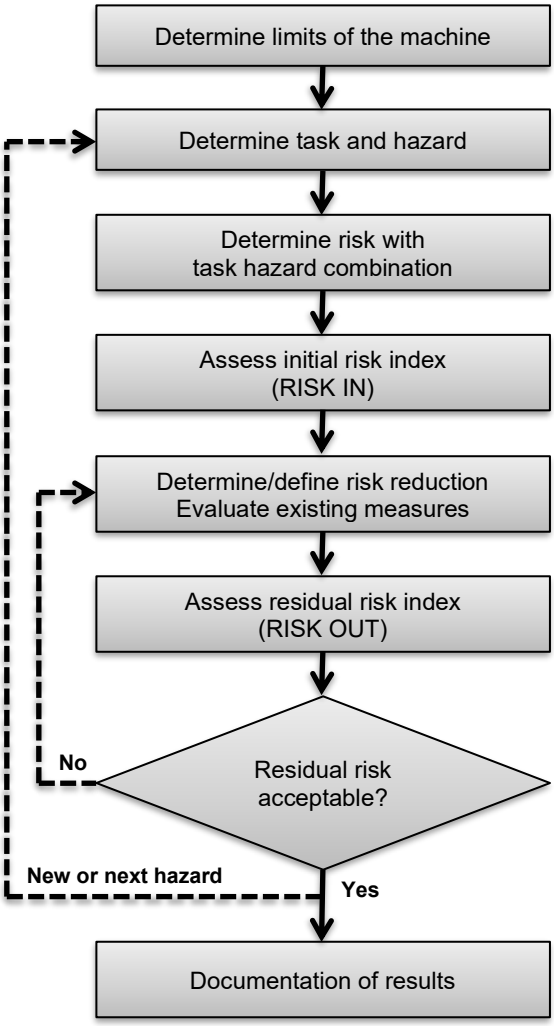


Figure 1: Overview of risk assessment process

7.2 Determination of the machine limits

7.2.1 Use Limits

Use limits include the intended use as well as the reasonably foreseeable misuse of the equipment. Aspects to be taken into account include the following:

- **a)** The different machine operating modes and the different intervention procedures for the users (including interventions required by malfunctions of the machine use),
- **b)** the use of the machinery (e.g., industrial, non-industrial and domestic) by persons identified by sex, age, dominant hand usage, or limiting physical abilities (e.g., visual or hearing impairment, size, strength) – if specific information is not available, the assessment should take into account general information about the intended user population (e.g., appropriate anthropometric data),
- **c)** the anticipated levels of training, experience, or ability of users, such as:
  - **1)** Operators
  - **2)** Maintenance personnel or technicians
  - **3)** Trainees and apprentices
  - **4)** The general public
- **d)** exposure of other individuals to the hazards associated with the machinery where it can be reasonably foreseen, including:
  - **1)** Operators working in the vicinity, e.g., operators of adjacent machinery (i.e., persons likely to have good awareness of the specific hazards)
  - **2)** Non-operator employees in the vicinity, e.g., administrative staff (i.e., persons with little awareness of specific hazards but likely to have good awareness of site safety procedures, authorized routes, etc.)
  - **3)** Non-employees in the vicinity, e.g., visitors (i.e., persons likely to have very little awareness of the machine hazards or the site safety procedures; members of the public, including children where applicable)

7.2.2 Space Limits

Aspects to be taken into account include:

- **a)** Range of movement
- **b)** Space requirements for persons to interact with the machine, e.g., during operation and maintenance
- **c)** Human interaction, e.g., “operator-machine” interface
- **d)** “Machine-power supply” interface

7.2.3 Time Limits

Aspects to be taken into account include:

- **a)** The “life limit” of the machinery and/or of some of its components (e.g., tooling, parts that can wear, electromechanical components), taking into account its intended use and reasonably foreseeable misuse
- **b)** Recommended service intervals

7.3 Determination of tasks and hazards

Following the determination of the limits of the machinery, the essential step in any machine risk assessment is the systematic identification of reasonably foreseeable hazards, hazardous situations and/or hazardous events during all phases of the machine life cycle, i.e.:

a) Transport, assembly and installation
b) Commissioning
c) Use
d) De-commissioning, dismantling and disposal

It is assumed that, when present on machinery, a hazard will sooner or later lead to harm if measures are not taken to eliminate or provide protective measures. Only when hazards have been identified can steps be taken to eliminate them or reduce risks. To accomplish this hazard identification, it is necessary to identify the operations to be performed by the machinery and the tasks to be performed by persons who interact with it, taking into account the different parts, mechanisms or functions of the machine, the materials to be processed, if any, and the environment in which the machine can be used. Task identification should consider all those tasks associated with all the phases of the machine life cycle listed above as considered in the scope of work. Task identification should also take into account, but not be limited to, the following task categories:

a) Setting
b) Testing
c) Teaching/programming
d) Process/tool changeover
e) Start-up
f) All modes of operation
g) Feeding machine
h) Removal of product from machine
i) Stopping the machine
j) Stopping the machine in an emergency
k) Recovery of operation from jam
l) Re-start after unscheduled stop
m) Faultfinding/troubleshooting (operator intervention)
n) Cleaning and housekeeping
o) Preventive maintenance
p) Corrective maintenance

The aim is to identify all reasonably foreseeable hazards, hazardous situations or hazardous events.

7.4 Risk Estimation

The risk assessment methodology utilized by SICK is designed to easily estimate and then distinguish between high and low risk situations. This process is aimed at producing consistently reproducible and easily understandable results. In order to provide either rough or detailed estimations of the risk parameters, consideration of secondary and sometimes tertiary matrices can be utilized to adapt the process to the requirements and resources of each application. For each risk a risk estimation will be performed using the Scalable Risk Analysis and Evaluation Method [SCRAM] based on a primary evaluation of the risk parameters.

Severity	Exposure	Avoidance	Occurrence				PLr
			O1 – O3	O1	O2	O3	
S1	E0	÷	< 1				a
	E1 – E3	A1, A2		< 1	< 1	< 1	
S2	E0	÷	≤ 1				
	E1	A1		< 1	< 1	1	b
		A2		< 1	1	1	
	E2	A1		1	2	2	c
		A2		1	2	2	
	E3	A1		2	3	3	
		A2		2	3	3	
S3	E0	÷	1				
	E1	A1		3	4	4	d
		A2		3	4	4	
	E2	A1		4	5	5	
		A2		5	5	5	
	E3	A1		5	6	6	
		A2		6	6	6	
S4	E0	÷	1				
	E1	A1		6	7	7	
		A2		7	7	7	
	E2	A1		7	8	8	e
		A2		8	8	8	
	E3	A1		8	9	9	
		A2		9	10	10	
			Risk Index				

Figure 2: Scalable Risk Analysis and Evaluation Method [SCRAM]

Parameter		**Severity of harm S** (simplified estimation)
S1	NEGLIGIBLE	None or negligible (trivial) injury (e.g., small bruises or superficial cuts) which either do not require any treatment or only treatment that is limited to simple and normally available first aid methods and equipment.
S2	SLIGHT	Injuries which can be treated with normally available first aid equipment but require the help of medically trained personnel. - *OR* – The injury (medical condition) will be reversed within three months without treatment, but under monitoring of a medical practitioner.
S3	SERIOUS	Injuries which require treatment by a medical practitioner but do not lead to permanent impairment. - *OR* – Injuries which lead to the loss or permanent damage of parts of the human body (but not total loss) with reversible medical condition.
S4	SEVERE	Injuries which lead to the death of one or more persons. - *OR* – Injuries which require treatment by a medical practitioner in a hospital and may lead to a permanent impairment or loss of parts of the body, limbs, or senses/abilities.

Parameter		**Exposure to hazard E** (simplified estimation)
E0	PREVENTED	Foreseeable exposure or access to the hazard(s) is: eliminated / controlled / limited by inherently safe design measures, - *OR* - exposure is prevented by mechanical and/or control-related safeguarding equipment which is selected and implemented as appropriate for the application. The implemented functional safety performance of the related SRP/CS must meet or exceed the required functional safety performance (PL ≥ PLr). E0 not available for initial estimation of risk
E1	LOW	LOW (E1) can always be assumed if: the exposure frequency is once per work shift, - *AND* - the exposure duration is less than 3 minutes.
E2	MEDIUM	Use level 2 for determination of exposure to hazard. For details see: Whitepaper "Risk Assessment and Risk Reduction for Machinery Part 3".
E3	HIGH	HIGH (E3) can always be assumed, if: access to the hazard zone is required, - *AND* - the exposure frequency is at least twice per work shift, - *AND* - each time the exposure duration is equal to or higher than 1 minute.

Parameter		**Possibility of avoidance A** (simplified estimation)
A1	AVOIDABLE	There are certain conditions that allow the avoidance of harm (such as skilled workers, slow movements, infrequent intervention, low-complexity processes, no sudden or unexpected movements with high acceleration).
A2	NOT AVOIDABLE	The avoidance is nearly impossible due to the lack of indication or awareness of the hazardous situation (such as fast hazardous events, insufficient surrounding space for evasion, high complexity processes, and/or the effect of routine on hazard awareness).

Parameter		**Probability of occurrence O** (simplified estimation)
O1	LOW	LOW (O1) can always be assumed if: the system is not prone to trouble, - AND - the hazard frequency is less than 33% of the presence time.
O2	MEDIUM	Use level 2 for determination of probability of occurrence. For details see: Whitepaper "Risk Assessment and Risk Reduction for Machinery Part 3".
O3	HIGH	HIGH (O3) can always be assumed if: the system is prone to trouble, - AND - the hazard frequency is equal to or higher than 66% of the presence time.

7.5 Risk Evaluation

The initial risk estimation [RISK IN] describes the risk without considering any measures in place. This risk index describes the level of the existing risk on a scale from <1 (low risk) to 10 (very critical risk).
Following risk estimation, a risk evaluation must be carried out to determine if risk reduction is required. If risk reduction is determined to be necessary, appropriate protective measures shall be selected and applied, and the risk assessment process repeated. As part of this iterative process, the designer must check whether additional hazards are introduced, or other risks increased when new risk reduction measures are applied. If additional hazards do occur, they shall be added to the list of identified hazards and appropriate protective measures will be required to address them.

7.6 Selection of Risk Reduction Measures

When the evaluation process determines that additional risk reduction measures are necessary, the selection and application of protective measures should be a decision made according to the risk(s) associated with each application.
When selecting risk reduction measures, it is important to consider that different measures have different effects on the various risk factors. With this in mind, it is always prudent to apply more than one protective measure in order to have the greatest cumulative effect on the reduction of risk. Furthermore, some protective measures are more susceptible to failures or error/misuse than others.

7.7 Evaluate Residual Risk

Following application of one or more risk reduction measures, the residual risk must again be assessed, this time accounting for the protective measures that are already in place as well as any new measures being added to the overall solution. In this report, the estimated residual risk is identified as RISK OUT and is based on the **assumption** that all recommended protective measures have been **implemented and validated according to applicable standards** and will be maintained over time through periodic inspection and maintenance.
The use of guards or safety functions very often results in people no longer being exposed to hazards or having no access. In this case, the parameter [E0] in the exposure group is used to estimate the residual risk. A hazard at which the probability of occurrence is prevented (E0) and additional administrative measures provided by the designer have been implemented by the user is rated with a residual risk index (RISK OUT) of AR (As low as reasonably practicable).

7.8 Achieving Acceptable (Tolerable) Residual Risk

It is important to understand that the intent of the risk assessment process is to identify risks which are not acceptable, apply protective measures based on the level of inherent risk present, and ultimately to reduce the risk to a level deemed acceptable or tolerable by both the organization as well as the affected individuals. While the aim is to achieve residual risk levels that are low or negligible, it is important to point out that the attainable level of residual risk cannot always achieve such a low degree. Instead, acceptable residual risk is often equated to the concept of ‘As Low As Reasonably Practicable’ (ALARP), which is a common best practice to judge the balance of risk and societal benefit.

	The subjective nature of determining if acceptable risk has been achieved precludes SICK from stating whether the residual risk achievable is tolerable to any organization. As a partner with specialized experience and technical expertise, SICK can provide guidance and recommendations to your organization. In the end, however, acceptance (or rejection) of residual risk is the sole responsibility of the organization choosing to place or maintain industrial equipment in the workplace.

8 Information data protection

(Pursuant to Article 13 GDPR)

Subject	Description
Responsible body	SSU – place of jurisdiction SICK India Private Limited 215, Western Edge II,Western Express Highway, 400 066 Mumbai
Purpose of data processing	The Machine Safeguarding Evaluation service supports the purpose to gain knowledge about the safety status of one or more machines in order to recommend appropriate protective measures in the following step
Categories of data	▪ Customer address ▪ Photos/Sketches/Graphics ▪ Writing down interviews
Legal basis	GDPR Art. 6 (1) f) – corporate interests
Corporate interests	Sick has the following interest: ▪ Accurate / verifiable MSE ▪ Storage for proof reasons (§199 Abs. 2 BGB) ▪ Interest of the individual worthy of protection – No detailed report (anonymized)
Consequences of non-delivery of data	The provision of personal data is not required by law or contract. If the required data is refused by the customer, the quality of the evaluation decreases or the evaluation becomes impossible.
Data origin	30 years after preparation of the report
Data origin	SICK only processes data which have been provided to SICK directly or that are originated from the findings of the Machine Safeguarding Evaluation service.
Recipient of the data	SICK AG Erwin-Sick-Straße 1 79183 Waldkirch Germany
Transfers to third countries	No third countries
Logic of the automated decision	No automated decisions are made

You have the right
• for information about personal data concerning you;
• to correct personal data concerning you;
• to delete or block personal data concerning you;
• to object to the processing of personal data concerning you;
• the transferability of personal data concerning you;
• to revoke your consent with effect for the future, provided that any processing of personal data concerning you is based on your consent; and
• complain to a data protection supervisory authority if you believe that the processing of personal data concerning you violates data protection law.

9 Abbreviations

Information of used acronyms / customer definitions	
AOPD	Active opto-electronic protective device
AOPDDR	Active opto-electronic protective device responsive to diffuse reflection
ESPE	Electro sensitive protective device
PL	Performance level
PLr	Performance level required
PPE	Personal protective equipment

10 Risk reduction measures symbols

	Discard measure
	Maintain measure
	Manipulation apparent
	Modify measure
	New recommended measure
	Replace existing device with similar device
	Replace existing measure with other measure

11 Signature

SICK Safety Specialist

Name	
Title	
Date / Signature	

SICK Safety Specialist

Name	
Title	
Date / Signature	

Customer Acknowledgement

Name	
Title	
Date / Signature	

Customer Acknowledgement

Name	
Title	
Date / Signature	

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 11,000 employees and over 50 subsidiaries and equity investments as well as numerous agencies
worldwide, we are always close to our customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services round out our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

Worldwide presence

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

Detailed addresses and further locations: ➔ **www.sick.com**