

Flex Core Build Machine PMRA

Report Version: 02



Ramani Precision Machines
Private Limited

Post Measure Risk Assessment



Report Issued by
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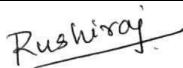
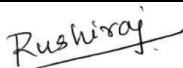
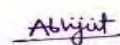
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1 Document Identification

DOCUMENT IDENTIFICATION	
Project Name:	Flex Core Build Machine PMRA
Document Number:	IND-RASVTCFAR-1913
Version:	02
Date:	Mar 12, 2019

	Name	Sign	Date
Lead Author:	Rushiraj Patwardhan		Jul 02, 2019
Author:	Rushiraj Patwardhan		Jul 02, 2019
Reviewed by:	Abhijit Kulkarni		Jun 08, 2020

Customer contact:	Mr. Rahul Verma		
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Table 1 Document Identification

2 List of Revisions

Revision	Description	Changed by	Date
A	Initial Draft	Rushiraj Patwardhan	Apr 18, 2019
B	Internal Review	Abhijit Kulkarni	May 16, 2019
C	Internal Review Accepted & Document Updated	Rushiraj Patwardhan	May 16, 2019
0	Ver 0 Document Generated and Submitted to Customer	Rushiraj Patwardhan	Jun 27, 2019
0A	Post Measure Initial Draft	Rushiraj Patwardhan	Jul 01, 2019
0B	Post Measure Internal Review	Abhijit Kulkarni	Jun 08, 2020
0C	Post Measure Internal Review Accepted & Document Updated	Rushiraj Patwardhan	Jun 08, 2020
01	Ver 01 Document Generated & Submitted to Customer	Rushiraj Patwardhan	Jun 10, 2020
02	Ver 02 Document Generated & Submitted to Customer	Rushiraj Patwardhan	Jun 22, 2020

Table 2 List of Revisions

3 General Information

3.1 Project Information

MACHINE INFORMATION	
Machine Name:	Flex Core Build Machine
Manufacturer:	Ramani Precision Machines Private Limited
Machine Type:	Assembly Machine
Serial Number:	RPM/DNMN/FOCCB01/94870
Date of Manufacture:	2019
Machine Certification:	To Be CE Marked

Table 3 Machine information

PILZ PERSONNEL / ASSESSMENT DATE	
Initial Risk Assessment	
Lead Author:	Rushiraj Patwardhan
Date of assessment:	Mar 12, 2019
Post measures Risk Assessment	
Lead Author:	Rushiraj Patwardhan
Date of assessment:	Mar 12, 2019

Table 4 Pilz Personnel / Assessment Date

RAMANI PRECISION MACHINES PRIVATE LIMITED PERSONNEL	
Name:	Function / Job Title:
Mr. Rahul Verma	Technical Director

Table 5 Ramani Precision Machines Private Limited Personnel

3.2 Motivation

According to Annex I of the Machinery Directive 2006/42/EC, “The manufacturer of machinery or his authorized representative must ensure that a risk assessment is carried out in order to determine the health and safety requirements which apply to the machinery. The machinery must then be designed and constructed taking into account the results of the risk assessment.”

Annex I of the Machinery Directive 2006/42/EC also requires that the manufacturer shall by the iterative process of risk assessment:

- Determine the limits of the machinery, which include the intended use and any reasonably foreseeable misuse thereof
- Identify the hazards that can be generated by the machinery and the associated hazardous situations
- Estimate the risks, taking into account the severity of the possible injury or damage to health and the probability of its occurrence
- Evaluate the risks, with a view to determining whether risk reduction is required, in accordance with the objective of this Directive
- Eliminate the hazards or reduce the risks associated with these hazards by application of protective measures

To ensure their legislative responsibilities of placing machinery on the market that complies with the requirements of applicable directives, Ramani Precision Machines Private Limited Derabassi plant have requested Pilz to undertake a Risk Assessment on the Flex Core Build Machine.

To ensure the appropriate procedure for this Risk Assessment, the harmonised standard EN ISO 12100 “Safety of machinery - General principles for design - Risk assessment and risk reduction” has been followed. This standard gives guidance for decisions during the design of machinery by the manufacturer and describes principles for a consistent and systematic approach to risk assessment.

A Risk Assessment has been carried out on the Flex Core Build Machine at Ramani Precision Machines Private Limited Derabassi plant on the Mar 12, 2019.

After the risk reduction measures a Post Measure Risk Assessment has been carried out on the Flex Core Build Machine at Ramani Precision Machines Private Limited Derabassi plant on the Mar 12, 2019.

3.3 Method of risk analysis

In accordance with ISO 12100, the risk assessment is implemented in a series of logical steps to enable a systematic examination of the hazards associated with machinery. Risk assessment is followed, whenever necessary by risk reduction as described in clause 6 of ISO 12100: 2010. When this process is repeated, it gives an iterative process for eliminating hazards as far as possible and for implementing safety measures.

The risk assessment methodology approach includes:

- Risk analysis
 - Determination of limits
 - Hazard identification
 - Risk estimation
- Risk evaluation

The risk assessment provides the information required for the risk evaluation, which in turn allows judgements to be made on the safety of machinery.

The following diagram shows the step-by-step process of risk analysis:

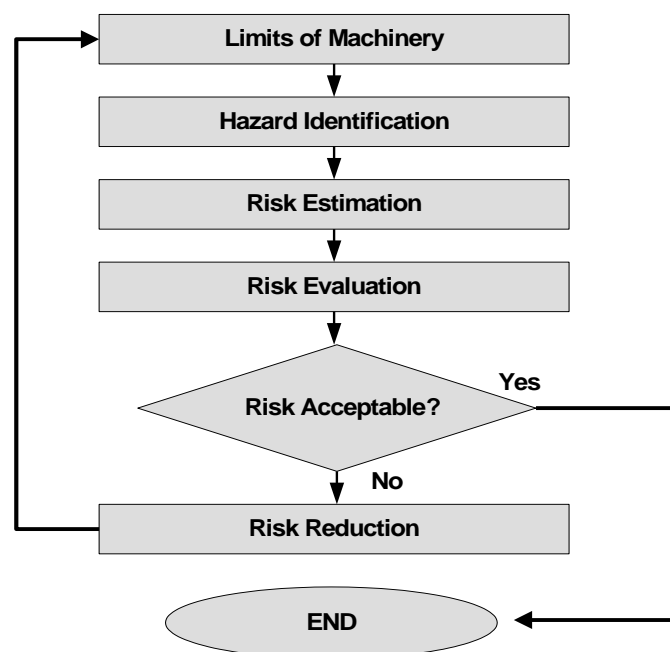


Figure 1 Method of Risk Analysis

3.4 Limits of Report

This risk assessment report is based on information that was accumulated during the on-site risk assessment of the Flex Core Build Machine in Ramani Precision Machines Private Limited On the Mar 12, 2019. This risk assessment forms part of a CE Marking project.

The information was accumulated in the following fashion:

1. Discussions with engineering personnel
2. Reviewing all available machine technical information
3. Conducting a physical examination of the machine
4. Interviewing machine operators

In order to ensure the accuracy of the risk assessment for the machine, it is imperative that the information provided on the date of the risk assessment be correct and reliable. Pilz cannot take any responsibility for judgements made on inaccurate or lack of information.

The following technical information was made available for the Flex Core Build Machine:

DOCUMENTATION EXAMINED			
N°	Document Name	Type	Issue Date
RPM/DNMN UK/2019	FOCCB FINAL CONTROL CIRCUIT.bak	Electrical Drawings	10/03/2019
01	FOCCB SAFETY PROGRAM1	Safety PLC Program	12-3-2019
DNMN-FOCCB-175-00	FINAL PNEUMATIC CIRCUIT-FOCCB 180318 (REV - R5)	Pneumatic Drawings	18-01-2018
FOCCB-00-00	General Layout	Mechanical Drawings	09-03-2018
Not Available	SAFETY IO LIST FLEX	Safety I/O list	22-06-2018

Table 6 Documentation examined

The following technical information was made available for the Flex Core Build Machine during Post Measure Risk Assessment:

DOCUMENTATION EXAMINED			
N°	Document Name	Type	Issue Date
RPM/DNMN UK/2019	FOCCB FINAL CONTROL CIRCUIT.bak	Electrical Drawings	10/03/2019
01	FOCCB SAFETY PROGRAM1	Safety PLC Program	12-3-2019
DNMN-FOCCB-175-00	FINAL PNEUMATIC CIRCUIT-FOCCB 180318 (REV - R5)	Pneumatic Drawings	18-01-2018
FOCCB-00-00	General Layout	Mechanical Drawings	09-03-2018
Not Available	SAFETY IO LIST FLEX	Safety I/O list	22-06-2018
RPM/2019/F OCCB01	Machine Manual [FLEX CORE BUILD MACHINE]	Operating Manual	Jun 08, 2020

Table 7 Post Measure Documentation examined

Every effort is made to evaluate the risk associated with each hazard identified throughout the report, however it may not be possible to quantify the risk with all hazards. When this is not possible the hazards are assessed in relation to their conformance with all relevant Legislation. Each hazard is identified individually throughout the report; the outcome from the accumulation of hazards has not been evaluated.

Human error and misuse related to areas such as incorrect feeding of the machine, incorrect use of materials and operator ability to operate the machine are not considered to be under the scope of this report. Only clear foreseen misuse of the machine was considered.

4 Machine Assessment

4.1 Basic Machine Description

The machine is assembly machine by assembling a heat exchanger in semi-automatic mode. Operator loads the aluminium tubes into the fixture. Foot pedal switch is pressed by operator. Then operator loads the fins into the respective fixture and presses the foot pedal switch by coming out of light curtains. The Servo drives moved at desired position as per the recipe of the program. Operator checks and then carried out final tamping. LHS & RHS servo drives goes to final desired position for compressing the tubes and fins. LHS & RHS Servo retracts back to safe position where LHS & RHS Swivel servos can rotate to assemble header plate in tubes. Once the core is assembled, the LHS & RHS servos retract so that the operator can unload the assembled core.



Picture 1 Flex Core Build Machine general view

4.2 Machine Control System Description

The control system for this machine is PLC based. An Allen Bradley make Compact Logix CAT 1769-ECR PLC carries out all standard control functions of the machine. A PILZ make PNOZ mB0 Safety PLC carries out the safety control functions of the machine. The emergency stop, door monitoring safety switches, light curtains, mode selection switches are monitored by safety PLC.



Picture 2 Flex Core Build Machine main control panel

4.3 Machine Specifications

The following data contains the general specifications of the machine:

MACHINE LIMITS	
Intended Environment:	Industrial
Required Level of Training:	Introductory Training
Operated By:	Plant Operators, Maintenance and Technical Personnel
Intended Use:	The machine is assembly machine by assembling a heat exchanger in semi-automatic mode.
Machine Lifetime:	20 years
Machine Dimensions:	4562 (L) X 4824 (W) X 3123 (H) in mm
Machine Environment:	The machine is located on the shop floor of Ramani Precision Machines Private Limited Derabassi Plant. The shop floor is clean and dry with an ambient temperature suitable for the machine.

OPERATIONAL AND MAINTENANCE INFORMATION	
Operational Information	
Raw Material:	Aluminium tubes, Fins & Header Plates
Emergency Stopping Time:	NA
Machine Cycle Time:	Depending upon the type of product
Number of Operators (Normal Use):	01
Number of Control Positions:	01
Maintenance Information	
Maintained By:	Trained Permanent Staff
Maintenance Frequency:	Monthly
Cleaning:	Maintenance Personnel
Jamming Repair:	Maintenance Personnel
Housekeeping:	The house keeping in the area of machine is good.

POWER SOURCES	
Control, Electrical Supply:	24V DC
Main feed, Electrical Supply:	400V AC - 50Hz
Pneumatic Supply:	5 bar
Hydraulic Supply:	Not Applicable

Table 8 Machine Specification and Limits

4.4 Risk Estimation & Evaluation Criteria

In order to identify, estimate and reduce the hazards present in the machine a Preliminary Hazard Analysis was performed using Pilz Hazard Rating (PHR) techniques.

A preliminary hazard analysis produces a line item tabular inventory of non-trivial system hazards and an assessment of their remaining risk after countermeasures have been imposed. The Pilz Hazard Rating technique was used to analyse the risks associated with the machine. This technique offers an analytical approach to the Preliminary Hazard Analysis method.

The Evaluation methodology based on Pilz criteria and experience, an evaluation of the factors, Degree of Possible Harm (DPH), Probability of Occurrence of a Hazardous Event (PO), Possibility of Avoidance (PA) and Frequency and/or duration of Exposure (FE), and has been performed on the risk related with each hazard. A Pilz Hazard Rating has then been calculated from the following formula:

$$PHR = DPH \times PO \times PA \times FE$$

Where the above parameters can take the following values:

Degree of Possible Harm (DPH)

0.25	Scratch / Bruise
0.5	Laceration / cut / mild ill health effect/ minor burns
3	Fracture minor bone – fingers, toes
5	Fracture major bone – hand, arm, leg
8	Loss of 1 or 2 fingers/ toes or major burns
11	Leg / hand amputation, partial loss of hearing or eye
15	Amputation of 2 legs/hands, total loss of hearing/sight in both ears/eyes
25	Critical injuries or permanent illness/condition/injury
40	Single Fatality
65	Catastrophe

Possibility of Occurrence of Hazard Event (PO)

0.05	Almost impossible
1.25	Unlikely
2.5	Possible
4	Probable
6	Certain

Possibility of Avoidance (PA)

0.75	Possible
2.5	Possible under certain circumstances
5	Not Possible

Frequency of Exposure (FE)

0.5	Annually
1	Monthly
2	Weekly
3	Daily
4	Hourly
5	Constantly

The maximum and minimum numerical values that could be assigned to each factor for every hazard are shown in the following table.

	PHR	Risk	Comment
	1 - 10	Negligible Risk	Presents practically no risk to health and safety, no further risk reduction measures are required.
	11 - 20	Very Low Risk	Presents very little risk to health and safety, no significant risk reduction measures are required, may necessitate the use of personal protective equipment and/or training.
	21 - 45	Low Risk	Risk to health and safety is present, but low. Risk reduction measures must be considered.
	46 - 160	Significant Risk	The risk associated with the hazard is substantial enough to require risk reduction measures. These measures should be implemented at the next suitable opportunity.
	161 - 500	High Risk	Potentially dangerous hazard, which requires risk reduction measures to be implemented urgently.
	501+	Very High Risk	Risk reduction measures should be implemented immediately, corporate management should be notified.

Table 9 PHR Numerical Range

After a complete examination of the machine based on applicable standards, a numerical value was determined for each factor while conducting the Risk Assessment and the Pilz Hazard Rating was calculated. The calculated number was then used to evaluate the risk associated with the hazard by comparison with predetermined acceptable levels.

The calculated Pilz Hazard Rating ranges from 1 to 9750 where 1 is the lowest showing minimum and 9750 is the highest risk.

4.5 Findings

The following tables contain detailed descriptions of the hazards found during the risk assessment. Each hazard is described individually but considered as a part of the system.

4.5.1 Mechanical Section

This section covers all the hazards related to Mechanical parts of the machine.




Picture 3 Mechanical Section

Hazard Identification		Hazard No:	1.1
Title	Loading of components		
Location	Machine Front		
Target	Lower Limbs		
Activity	Normal Operation		
Task	Operation		
Sub Task	Feeding, loading of raw material		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	The component such as assembly component and its child parts loading is carried out manually by operator. This present Mechanical Hazard with the consequence of Crushing hazard to the operator during loading of the heavy component.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	75	Summary Level:	Significant Risk
Risk Reduction		Reference	
There should be standard procedure which includes safe way of handling the components as well as Operator training. Use of adequate PPE should be mandatory during the operation. All this information's should be available in operating or instruction manual. Necessary training should be provided to the operators.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment		
Assessment Date	Jun 08, 2020	
Degree of Possible Harm	3	
Probability of Occurrence of a Hazardous Event	0.05	
Possibility of Avoidance	2.5	
Frequency And / Or Duration of Exposure	4	
Pilz Hazard Rating (PHR)	1	
Summary Level	Negligible Risk	
Risk Reduction Measures Description		Reference
<p>The machine operating manual is made available for this machine. In section C, there are suitable guidelines made available which includes safe way of handling for loading of components. Use of adequate PPE is mandatory during the machine operations. All this information's are made available in operating manual.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		EN ISO 12100
Residual Risk		
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>Necessary training should be provided to the operators.</p>		

Hazard Identification		Hazard No:	1.2
Title	Access to Pinch Points_Front		
Location	Machine Front		
Target	Finger/Hand		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is possible access to various mechanical pinch points of machine from front side during operations. This present Mechanical Hazard with the consequence of Crushing to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	125	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access required is frequent for loading and unloading the components light curtains should be installed at operator sides. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtains should be installed at safe distance in accordance with EN ISO 13855.		EN ISO 13855 EN ISO 12100 IEC 61496-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	2	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	2
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The possible access to various mechanical pinch points are restricted by installing suitable sizes fixed covers. The operator loading & unloading area is also installed with Keyence make GL-R70HG light curtains. The light curtains are connected and monitored by PILZ PNOZ mB0 safety controller. The hazardous movements of the machine are stopped when this light curtains are interrupted.</p> <p>The stop time measurement of the machine is carried out by OEM. Based on the response time of the actuators the safety distances of light curtains are calculated and it would be 247 mm. The light curtains are installed at 342 mm from the hazardous points which is well beyond the calculated safety distance.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 13855 EN ISO 12100 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

Hazard Identification		Hazard No:	1.3
Title	Access to Pinch Points_LHS		
Location	Machine LHS		
Target	Finger/Hand		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-finding		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is possible access to various mechanical pinch points from LHS of the machine. This present Mechanical Hazard with the consequence of Crushing to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access is required for fault findings, repairing activities the light curtains should be installed at this area. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtains should be installed at safe distance in accordance with EN ISO 13855.		EN ISO 13855 EN ISO 12100 IEC 61496-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

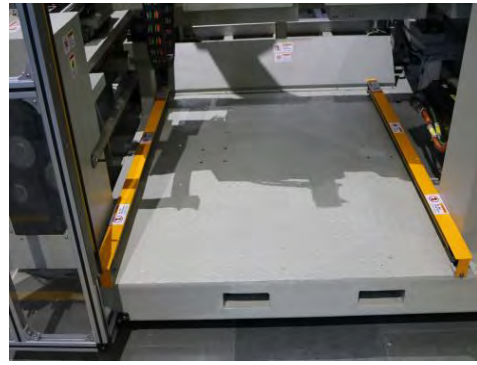


Picture 4 Hazard 1.3, Image 1, LHS of the machine

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The possible access to various mechanical pinch points are restricted by installing suitable sizes fixed covers. There is no separate light curtain safety control system is installed. However, there is reflector arrangement for front side light curtain which includes the LHS of the machine. The hazardous movements of the machine are stopped when this light curtains are interrupted.</p> <p>The stop time measurement of the machine is carried out by OEM. Based on the response time of the actuators the safety distances of light curtains are calculated and it would be 247 mm. The light curtains are installed at 342 mm from the hazardous points which is well beyond the calculated safety distance.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 13855 EN ISO 12100 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	



Picture 5 Hazard 1.3, Image 1, Fixed guarding with warning signs




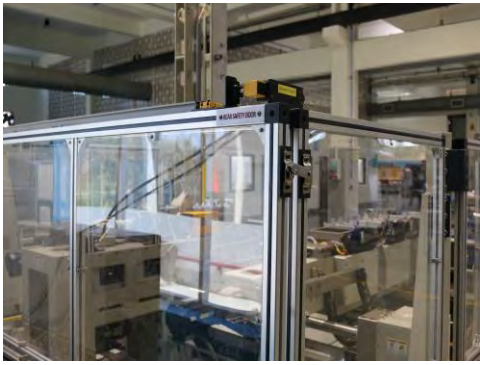
Picture 6 Hazard 1.3, Image 2, LHS of the machine

Hazard Identification		Hazard No:	1.4
Title	Access without Disturbing Light Curtain		
Location	Machine RHS		
Target	Finger/Hand		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-findings		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing/Impact		
Description	It is necessary that operator and / or maintenance access the machine infeed area to complete Fault-finding/Troubleshooting and cleaning activities. Being present in machine RHS infeed area, there is possible access to the controls present on operating panel like safety reset, secured access finger scanner without disturbing light curtain installed at front side. This present Mechanical Hazard with the consequence of Crushing Finger or impact when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
Fixed guarding that confirms to ISO 14120 should be placed in this area to prevent access to the machine hazards in accordance with EN ISO 13857. Guards affixed in such a manner (for example, by screws, nuts, welding) that it can only be opened or removed by the use of tools or by destruction of the affixing means.		EN ISO 13857 EN ISO 14120 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>Fixed guarding that confirms to ISO 14120 is placed in this area to prevent access to the machine hazards in accordance with EN ISO 13857. Guards affixed in such a manner (for example, by screws, nuts, welding) that it can only be opened or removed by the use of tools or by destruction of the affixing means.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 14120 EN ISO 13857</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

Hazard Identification		Hazard No:	1.5
Title	Crushing Hazard		
Location	Machine RHS & Rear		
Target	Finger/Hand		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-findings		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is open access to hazardous movements of the machine from RHS & rear side. This present Mechanical Hazard with the consequence of Crushing Finger or hand when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
Fixed guarding that confirms to ISO 14120 should be placed in this area to prevent access to the machine hazards in accordance with EN ISO 13857. Guards affixed in such a manner (for example, by screws, nuts, welding) that it can only be opened or removed by the use of tools or by destruction of the affixing means. OR If frequents access is required for maintenance personnel during maintenance or fault finding activities then the operable doors should be installed in accordance with EN ISO 14120 and these operable guards should be monitored by safety control system in accordance with EN ISO 13849-1.		EN ISO 13857 EN ISO 14120 EN ISO 12100 EN ISO 13849-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>Fixed guarding that confirms to ISO 14120 is placed in this area to prevent access to the machine hazards in accordance with EN ISO 13857. Guards affixed in such a manner (for example, by screws, nuts, welding) that it can only be opened or removed by the use of tools or by destruction of the affixing means.</p> <p>However, there are two operable guards as service doors are installed on the machine located at RHS and rear side of the machine for frequent access required for maintenance personnel during maintenance, fault findings activities. The service doors are installed with safety door monitoring switches. When any of the service door is opened then all the machine hazardous movements are stopped through safety control system.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 14120 EN ISO 13857 EN ISO 13849-1</p>
Residual Risk	
Operating and Safety instructions should be followed during operation of the machine.	



Picture 7 Hazard 1.5, Image 1, Rear side door



Picture 8 Hazard 1.5, Image 2, Safety magnetic door switch



Picture 9 Hazard 1.5, Image 3, RHS door

Hazard Identification		Hazard No:	1.6
Title	Falling of Assembled Component		
Location	Machine Front		
Target	Entire Body		
Activity	Normal Operation		
Task	Operation		
Sub Task	Feeding, filling, loading of raw material		
Hazard Type	Other Hazards		
Sub Type			
Description	The operator unloads the assembled component from fixture. This present crushing hazard as there is a possibility of falling that component while unloading from the fixture.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	75	Summary Level:	Significant Risk
Risk Reduction		Reference	
Define the suitable guidelines for manual loading and unloading of the components.		EN ISO 12100	
Use of adequate PPE should be mandatory during normal operation as well as maintenance activity of the machine.			
Possible Residual Risk			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment		
Assessment Date	Jun 08, 2020	
Degree of Possible Harm	3	
Probability of Occurrence of a Hazardous Event	0.05	
Possibility of Avoidance	2.5	
Frequency And / Or Duration of Exposure	4	
Pilz Hazard Rating (PHR)	1	
Summary Level	Negligible Risk	
Risk Reduction Measures Description		Reference
<p>The machine operating manual is made available for this machine. In the manual, section C provides the suitable guidelines for safe handling of the components. In addition to this, there are safety instructions available in the operating manual.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		EN ISO 12100
Residual Risk		
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>Use of adequate PPE is mandatory during normal operation as well as maintenance activity of the machine.</p>		

Hazard Identification		Hazard No:	1.7
Title	Sharp Edges		
Location	Machine		
Target	Finger		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard as a result of		
Sub Type	Sharp edges		
Description	There are sharp edges present on the corners of front polycarbonate guards. Contact with sharp edges of a machinery elements or a tool can lead to cuts and lacerations.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	0.5	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	25	Summary Level:	Low Risk
Risk Reduction		Reference	
The corners of the front fixed guard should be round in shape. Also, There should not be any sharp pointed edge. The operator training should be provided for safe working with spare parts / child parts. Personal protective equipment as hand gloves should be warned during working on the machine.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	0.5	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	0.5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>There are no sharp pointed edges available on the corners of the front fixed guard.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>The operator training should be provided for safe working with spare parts / child parts.</p> <p>Personal protective equipment as hand gloves should be warned during working on the machine.</p>	

Hazard Identification		Hazard No:	1.8
Title	Slip Trip		
Location	Machine Perimeter		
Target	People		
Activity	Normal Operation		
Task	Cleaning Maintenance		
Sub Task	Housekeeping		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Slipping, tripping and falling		
Description	The area near to the machine is not clean. All the cables are not routed correctly.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
The area near to the machine should be clean. All the cables should be routed correctly.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	2	Summary Possible Level:	Negligible Risk


Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	2
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The area near to the machine is clean. All the cables are routed correctly.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

4.5.2 Hazard Related to energy equipment (Electrical & Pneumatic)

This section covers the hazards of the machine in relation to the energy types supplied to or generated within the equipment. The energy can be either supplied from outside (e.g. electrical mains) or generated within the machine (e.g. Pneumatic valves)



Picture 10 Hazard Related to energy equipment (Electrical & Pneumatic)

Hazard Identification		Hazard No:	2.1
Title	Access to live parts		
Location	Electrical Panel		
Target	People / Machine		
Activity	Maintenance		
Task	various		
Sub Task	various		
Hazard Type	Electrical Hazards		
Sub Type	Contact of persons with Live Parts (Direct Contact)		
Description	<p>An electrical shock can occur when the body becomes part of the electric circuit, either when an individual comes in contact with both wires of an electrical circuit, one wire of an energized circuit and the ground, or a metallic part that has become energized by contact with an electrical conductor.</p> <p>The severity and effects of an electrical shock depend on a number of factors, such as the pathway through the body, the amount of current, the length of time of the exposure, and whether the skin is wet or dry. The effect of the shock may range from a slight tingle to severe burns to cardiac arrest.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	500	Summary Level:	High Risk
Risk Reduction		Reference	
<p>It should not be possible to come in direct contact with live parts within the electrical control panel for the machine. All electrical devices and cable terminations must be touch proof and should conform to at least IP 2X. Depending on the environment higher requirements might be needed. The control cabinet should be designed and built to conform to EN 60204-1.</p> <p>Conductors and cables shall be selected so as to be suitable for the operating conditions (for example voltage, current, protection against electric shock, grouping of cables) and external influences (for example ambient temperature, presence of water or corrosive substances, mechanical stresses (including stresses during installation, fire hazards) that can exist.</p> <p>Flexible cables of machines shall be so installed or protected as to minimize the possibility of external damage due to factors that include the following cable use or potential abuse:</p> <ul style="list-style-type: none"> • coming into contact with the machine structure during movements • exposure to excessive radiated heat 		EN 60204-1	


Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	10	Summary Possible Level:	Negligible Risk




Picture 11 Hazard 2.1, Image 1, Access to live part from Top side




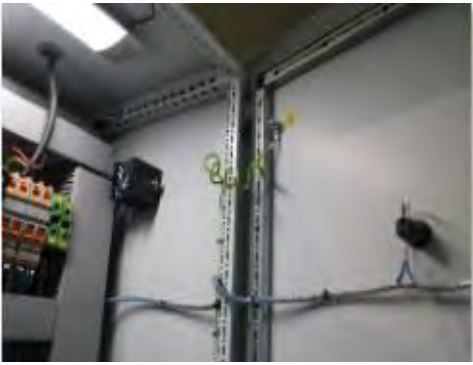


Picture 12 Hazard 2.1, Image 2, Access to live part from Bottom side

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	5
Frequency And / Or Duration of Exposure	1
Pilz Hazard Rating (PHR)	10
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The electrical devices & cable terminations installed inside electrical control panel are touch proof. There is IP2X acrylic cover installed in front of main MCCB switch, which restricts the access to live parts.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN 60204-1
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine. The LOTO policies should be implemented on the machine during the maintenance activities.</p> <p>The maintenance activity should be carried out by competent maintenance personnel.</p>	

	
<p>Picture 13 Hazard 2.1, Image 1, No access to live part from Top & bottom side</p>	

Hazard Identification		Hazard No:	2.2
Title	Protective Earth		
Location	Electrical Panel		
Target	Entire Body		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-findings		
Hazard Type	Electrical Hazards		
Sub Type	Parts which have become live under fault conditions (Indirect Contact)		
Description	The electrical control panel doors are not connected to protective earth. This will not prevent electric shock hazard to the person in contact with parts that may become live under faulty conditions (Indirect Contact).		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	250	Summary Level:	High Risk
Risk Reduction		Reference	
The electrical control panel doors of the machine should be earthed and bonded correctly to prevent indirect contact with live parts. The LOTO policies should be implemented on the machine during the maintenance activities.		EN 60204-1	
Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	10	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	5
Frequency And / Or Duration of Exposure	1
Pilz Hazard Rating (PHR)	10
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The electrical control panel doors of the machine are earthed and bonded correctly to prevent indirect contact with live parts.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN 60204-1
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine. The LOTO policies should be implemented on the machine during the maintenance activities.</p> <p>The maintenance activity should be carried out by competent maintenance personnel.</p>	

	
<p>Picture 14 Hazard 2.2, Image 1, Protective earthing terminals</p>	<p>Picture 15 Hazard 2.2, Image 2, Protective earthing to panel door</p>
	
<p>Picture 16 Hazard 2.2, Image 3, Protective earthing to operating panel door</p>	

Hazard Identification		Hazard No:	2.3
Title	Unstable power supply		
Location	Electrical Panel		
Target	People / Machine		
Activity	Maintenance		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Combination of Hazards		
Sub Type	N/A		
Description	Disturbances or disruptions in power sources as well as failures or faults in the power circuits can result in the malfunctioning of the machine, unexpected machine movement, inability to stop the process or an unexpected injection. These disturbances or disruptions can be the result of a power outage, lightening or other power surges.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	125	Summary Level:	Significant Risk
Risk Reduction		Reference	
Define the limits of the power supply to be in accordance with the requirements out of EN 60204-1. Where a supply interruption or a voltage reduction can cause a hazardous situation or damage, under-voltage protection shall be provided by, for example, switching off the machine at a predetermined voltage level. To protect against the effects of over-voltage due to lightning or switching surges connect devices for the suppression of over-voltage to the applicable power sources and terminals.		EN 60204-1	
Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	5	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	1
Pilz Hazard Rating (PHR)	5
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine electrical main panel is installed with Phase Monitoring relay SELEC 900VPR to monitor the 3 phase power supply of the machine. If the machine main power supply is detected by any disturbances or disruptions as well as faults in the power circuits then it will shut off the main power from the machine.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN 60204-1
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>The LOTO policies should be implemented on the machine during the maintenance activities.</p>	


Hazard Identification		Hazard No:	2.4
Title	Overload or Over current conditions due to faults or misuse		
Location	Machine		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Electrical Hazards		
Sub Type	Overload		
Description	<p>If the equipment is exposed to faults certain overload conditions can occur and make the machine fail dangerously, Examples are</p> <ul style="list-style-type: none"> • over current arising from a short circuit, • overload and/or loss of cooling of motors, • over-speed of machines/machine elements. • over- pressure of the pneumatic circuit 		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	250	Summary Level:	High Risk
Risk Reduction		Reference	
<p>Over current protection shall be provided where the current in a machine circuit can exceed either the rating of any component or the current carrying capacity of the conductors, whichever is the lesser value. State in the installation documentation the data necessary for selecting the over current protective device.</p> <p>Circuits that are capable of attaining or causing abnormal temperatures (e.g. motors) or pressures and therefore can cause a hazardous situation shall be provided with suitable detection to initiate an appropriate control response.</p>		EN 60204-1	
Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	5	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	1
Pilz Hazard Rating (PHR)	5
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine is installed with appropriate overload and over current devices in main electrical panel. The Schneider make circuits breakers of different current capacities are present to avoid any condition related to overload or overcurrent conditions.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN 60204-1
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>The LOTO policies should be implemented on the machine during the maintenance activities.</p>	

Hazard Identification		Hazard No:	2.5
Title	Unexpected Start Up during maintenance		
Location	Machine Front		
Target	People / Machine		
Activity	Maintenance		
Task	Setting Teaching/programming and/or process changeover		
Sub Task	Mounting or changing tools, tool-setting		
Hazard Type	Other Hazards		
Sub Type	Unintended/unexpected start-up		
Description	Various hazards caused by the movement of the Machine. Tool changes require access to the machines hazardous area. With no measures in place there is a possibility that a failure in the control circuit or start-up by a third party could lead to a full or part release of stored energy (e.g. residual accumulator pressure, moving parts as a result of stored pneumatic energy).		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	250	Summary Level:	High Risk
Risk Reduction		Reference	
Provide possibilities to ensure that all energy sources are isolated and dissipated prior to starting the tool change or any other maintenance activities.		EN 60204-1 EN ISO 4414	
Inform the user about necessary steps for a Lockout / Tagout procedure and where to apply locks to prevent unauthorized re-start of the machine.			
Closing of the guard should not initiate a restart of the machine. The acknowledgments have to be done from points with clear visibility to the hazardous area.			
Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	10	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	10
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The electric control panel is installed with an electric isolation switch, which is lockable in off position. Electrical lockable isolator removes all the electrical power from the machine. It is possible to enable or implement LOTO process during the maintenance activity.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN 60204-1 EN ISO 4414</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>The LOTO policies should be implemented on the machine during the maintenance activities.</p>	

Hazard Identification		Hazard No:	2.6
Title	Remaining Pressure of Pneumatic System		
Location	Pneumatic System		
Target	Entire Body		
Activity	Maintenance		
Task	Cleaning Maintenance		
Sub Task	Isolation and energy dissipation		
Hazard Type	Mechanical Hazard as a result of		
Sub Type	Stored energy		
Description	The uncontrolled release of fluids as a result of maintenance work could lead to injection hazard or damages to eyes or skin as a result of the high pressure remaining in the system.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
A lockable pneumatic isolator with dissipation must be provided to the machine. LOTO policies should be implemented during maintenance activities.		EN ISO 4414	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk


Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The machine is installed with a pneumatic isolation switch, which is lockable in off position. Pneumatic lockable isolator dissipates all the pneumatic energy from the machine. It is possible to enable or implement LOTO process during the maintenance activity.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 4414
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>The LOTO policies should be implemented on the machine during the maintenance activities.</p>	



Picture 17 Hazard 2.6, Image 1, Pneumatic Lockable Isolator

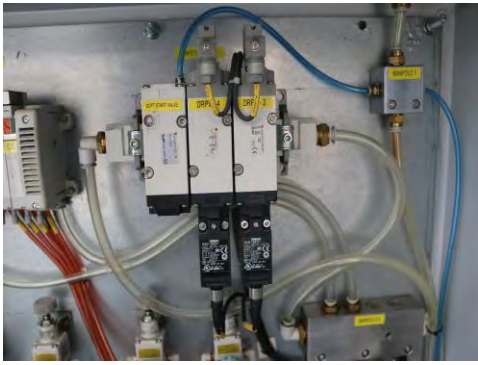
Hazard Identification		Hazard No:	2.7
Title	Operating Control Panel Identification		
Location	Machine Front		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Operating manual controls		
Hazard Type	Ergonomic Hazard		
Sub Type	Inadequate design, location or identification of control devices		
Description	<p>The machine is installed with operating control panel to perform various operating commands. There is no clear identification on the control buttons indicating the control actuators belonging to the respective operations.</p> <p>There is possibility of confusion for operator during the operations.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	37	Summary Level:	Low Risk
Risk Reduction		Reference	
There should be clear identification on the control button indicating the control actuators belonging to the respective operations.		EN 60204-1 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	3	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	3
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>There are clear identification on the control button indicating the control actuators belonging to the respective operations.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN 60204-1 EN ISO 12100</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

	
<p>Picture 18 Hazard 2.7, Image 1, Identification to control buttons</p>	

Hazard Identification		Hazard No:	2.8
Title	Installation of Pneumatic System		
Location	Machine Side		
Target	Entire Body		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard as a result of		
Sub Type	High pressure		
Description	High pressure air escaping from damaged sections of air hoses or from valves while setup or maintenance work is being carried out may cause injury to operator or nearby personal.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	3
Pilz Hazard Rating (PHR):	46	Summary Level:	Significant Risk
Risk Reduction		Reference	
<p>All elements of the pneumatic systems, and especially pipes and hoses, shall be protected against abrasion, contamination, ultra-violet, mechanical damage, or other damage. Whenever it is necessary to dismantle pneumatic systems, the piping and corresponding connections shall be clearly identified. The identification shall correspond to and not conflict with the data on any appropriate drawings.</p> <p>Connecting and changing over air hoses containing high pressure air must only be performed a qualified technician who's has been trained in handling high pressure air with throughout knowledge of this machine. Adequate PPE's such as protective goggles, ear plugs should be used.</p>		EN ISO 12100 EN ISO 4414	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	3
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	3
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The pneumatic system is installed in the separate control panel. The machine uses pneumatic power for various operations. The pneumatic system is installed with dual residual pressure release safety valves (VP744R- 5DZ1-04-MA-X555) for various operations and functioning correctly.</p> <p>During assessment it was observed that the pneumatic piping is supported with elbows and quick fittings correctly. The piping is mounted such a way to minimize the installation stress and located to protect against foreseeable damage and restricted access for adjustments repairs or replacement of components.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 4414</p>
Residual Risk	
<p>Connecting and changing over air hoses connecting high pressure air must only be performed a qualified technician whose has been trained in handling high pressure air with throughout knowledge of this machine.</p> <p>Adequate PPE such as protective goggles, ear plugs should be used.</p>	



Picture 19 Hazard 2.8, Image 1, Proper installation

4.5.3 Hazards related to the control system

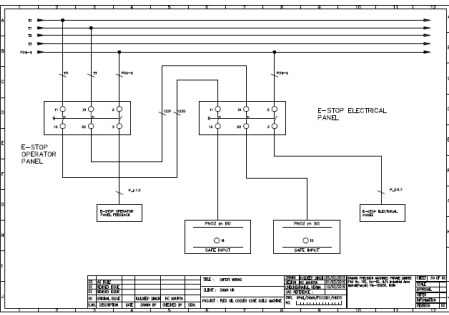


While the hazards related to this section can have consequences of a various nature (mechanical, electrical, pneumatic etc.), the hazards are a result of the design of the control system and how personnel interact with the machine.




Picture 20 Hazards related to the control system

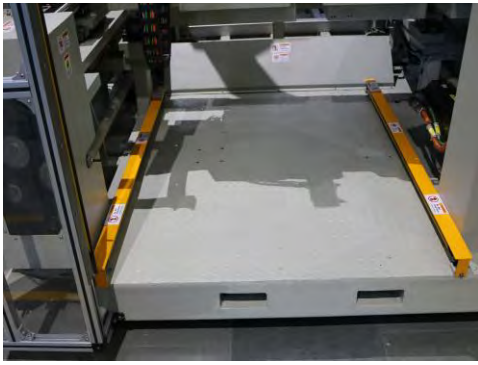
Hazard Identification		Hazard No:	3.1
Title	Emergency Situations		
Location	Machine		
Target	Entire Body		
Activity	All Operations		
Task	All Operations		
Sub Task	All Operations		
Hazard Type	Combination of Hazards		
Sub Type	n/a		
Description	Despite the application of proper design and safety measures there might be foreseeable cases where the wrong operation of the machine and/or the occurrence of faults can lead to a hazardous emergency situation where personnel need to act appropriately.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
<p>According the machinery directive all areas of the machine must be sufficiently covered by emergency stops, to facilitate an emergency event as to EN ISO 13850.</p> <p>The emergency stop safety control system should achieve required performance level in accordance with EN ISO 13849-1.</p>		<p>EN ISO 13850 EN ISO 13849-1 EN ISO 12100</p>	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The operating control panel & main electrical panel are installed with PILZ make emergency stop in accordance with EN ISO 13850 to stop the machine in emergency situations. The PILZ make emergency stop push buttons are connected in series configuration with dual channel and monitored by PILZ PNOZ mB0 safety controller. When emergency stop is pressed then all the hazardous movements of the machine are stopped through safety controller.</p> <p>The dual residual pressure release valves (VP744R- 5DZ1-04-MA-X555) are controlled and monitored through safety output of PILZ PNOZ m B0 safety controller. The STO signals of kinetix drives are routed through fail safe PNOZ S7 safety contact expansion module.</p> <p>The emergency stop safety control system is achieving required performance in accordance with EN ISO 13849-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 13850 EN ISO 13849-1 EN ISO 12100</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

	
<p>Picture 21 Hazard 3.1, Image 1, Electrical Drawing</p>	<p>Picture 22 Hazard 3.1, Image 2, PILZ make Emergency Stop Push Button on Electrical Panel</p>
	
<p>Picture 23 Hazard 3.1, Image 3, PILZ PNOZ m B0 safety controller with PNOZ S7 safety contact expansion</p>	

Hazard Identification		Hazard No:	3.2
Title	Access to Pinch Points_Front		
Location	Machine Front		
Target	Finger/Hand		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is possible access to various mechanical pinch points of machine from front side during operations. This present Mechanical Hazard with the consequence of Crushing to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	125	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access required is frequent for loading and unloading the components light curtains should be installed at operator sides. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtain safety control system should achieve required performance level in accordance with EN ISO 13849-1.		EN ISO 12100 IEC 61496-1 EN ISO 13849-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	2	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	2
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The possible access to various mechanical pinch points are restricted by installing suitable sizes fixed covers.</p> <p>The operator loading & unloading area is also installed with Keyence make GL-R70HG light curtains. The light curtains are connected and monitored by PILZ PNOZ mB0 safety controller. The hazardous movements of the machine are stopped when this light curtains are interrupted.</p> <p>The dual residual pressure release valves (VP744R- 5DZ1-04-MA-X555) are controlled and monitored through safety output of PILZ PNOZ m B0 safety controller. The STO signals of kinetix drives are routed through fail safe PNOZ S7 safety contact expansion module.</p> <p>It is confirmed that light curtain safety control system achieving required performance level in accordance with EN ISO 13849-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 13849-1 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	



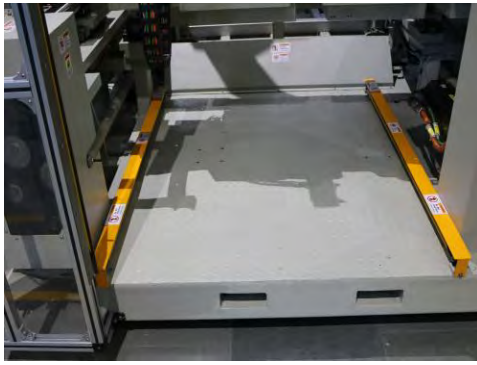
Picture 24 Hazard 3.2, Image 1, Light curtains installation with mirror reflector



Picture 25 Hazard 3.2, Image 2, PILZ PNOZ m B0 safety controller with PNOZ S7 safety contact expansion

Hazard Identification		Hazard No:	3.3
Title	Access to Pinch Points_LHS		
Location	Machine LHS		
Target	Finger/Hand		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-finding		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is possible access to various mechanical pinch points from LHS of the machine. This present Mechanical Hazard with the consequence of Crushing to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access is required for fault findings, repairing activities the light curtains should be installed at this area. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtain safety control system should achieve required performance level in accordance with EN ISO 13849-1.		EN ISO 12100 IEC 61496-1 EN ISO 13849-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The possible access to various mechanical pinch points are restricted by installing suitable sizes fixed covers. There is no separate light curtain safety control system is installed. However, there is reflector arrangement for front side light curtain which includes the LHS of the machine. The hazardous movements of the machine are stopped when this light curtains are interrupted.</p> <p>The dual residual pressure release valves (VP744R- 5DZ1-04-MA-X555) are controlled and monitored through safety output of PILZ PNOZ m B0 safety controller. The STO signals of kinetix drives are routed through fail safe PNOZ S7 safety contact expansion module.</p> <p>It is confirmed that light curtain safety control system achieving required performance level in accordance with EN ISO 13849-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 13849-1 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	




Picture 26 Hazard 3.3, Image 1, LHS of the machine



Picture 27 Hazard 3.3, Image 2, PILZ PNOZ m B0 safety controller with PNOZ S7 safety contact expansion

Hazard Identification		Hazard No:	3.4
Title	Light Curtain Installation		
Location	Machine Front		
Target	Finger/Hand		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing		
Description	There is possible access to various mechanical pinch points of machine from front side during operations. This present Mechanical Hazard with the consequence of Crushing to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	125	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access required is frequent for loading and unloading the components light curtains should be installed at operator sides. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtains should be installed at safe distance in accordance with EN ISO 13855.		EN ISO 13855 EN ISO 12100 IEC 61496-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	2	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	2
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The stop time measurement of the machine is carried out by OEM. Based on the response time of the actuators the safety distances of light curtains are calculated and it would be 247 mm. The light curtains are installed at 342 mm from the hazardous points which is well beyond the calculated safety distance.</p> <p>The operator loading & unloading area is also installed with Keyence make GL-R70HG light curtains. The light curtains are connected and monitored by PILZ PNOZ mB0 safety controller. The hazardous movements of the machine are stopped when this light curtains are interrupted.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 13855 EN ISO 12100 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	



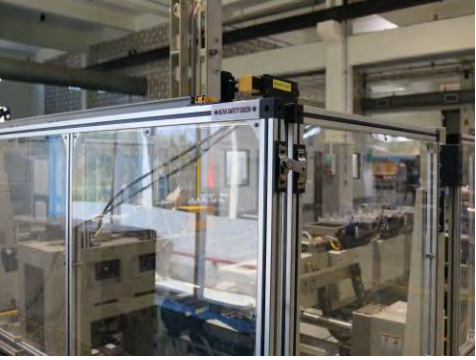



Picture 28 Hazard 3.4, Image 1, Light curtain installed at 342 mm

Flex Core Build Machine - Ramani	
LIGHT CURTAIN- Safety Distance video reference - MVL_4473	
S = (K * T) + C where T= (T1+T2+T3+T4)	242
K:- Approach speed of human hand	2000 mm/sec
T1- Safety relay response time	0 ms
T2- Light curtain response time	0 ms
T3- contactor/Drive response time	0 ms
T4 - pneumatic cylinder	0 ms
Total Stop Time of the Machine	77 ms
T= (T1+T2+T3+T4)	0.077 sec
C = S(d - H mm)	98
Where d - device resolution	25
S - Distance between hazardous area and detection point,	242 mm
Actual distance	342 mm
Actual distance should be more than S	
<small>Note: Consider this as Sample Calculation of Safety Distance for Light Curtain</small>	

Picture 29 Hazard 3.4, Image 2, Minimum Safety Distance calculated S = 242 mm

Hazard Identification		Hazard No:	3.5
Title	Service Doors		
Location	Machine Perimeter		
Target	Finger/Hand		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Fault-findings		
Hazard Type	Mechanical Hazard as a result of		
Sub Type	Crushing		
Description	Access to various hazardous movements of the machine during maintenance, fault findings are possible from RHS and rear side of the machine. This presents drawing in or trapping or crushing finger/hand hazard for operator or maintenance personnel when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
Fixed guarding that confirms to ISO 14120 should be placed in this area to prevent access to the machine hazards in accordance with EN ISO 13857. Guards affixed in such a manner (for example, by screws, nuts, welding) that it can only be opened or removed by the use of tools or by destruction of the affixing means. OR If frequents access is required for maintenance personnel during maintenance or fault finding activities then the operable doors should be installed in accordance with EN ISO 14120 and these operable guards should be monitored by safety control system in accordance with EN ISO 13849-1.		EN ISO 13849-1 EN ISO 14120 EN ISO 13857 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The area is installed with two operable doors as service doors. There is possible access to hazardous movements of the machine from these doors. The operable doors are installed with PILZ make magnetic safety door switches are installed on the sliding door. PILZ make magnetic safety switches are connected in dual channel and monitored by PILZ PNOZ mB0 safety controller.</p> <p>When any of the maintenance door is opened then all the hazardous movements of the machines are stopped through safety controller. The dual residual pressure release valves (VP744R- 5DZ1-04-MA-X555) are controlled and monitored through safety output of PILZ PNOZ m B0 safety controller. The STO signals of kinetix drives are routed through fail safe PNOZ S7 safety contact expansion module.</p> <p>It is confirmed that door monitoring safety control system achieving required performance level in accordance with EN ISO 13849-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 13849-1 EN ISO 12100 EN ISO 14120 EN ISO 13857</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

	
<p>Picture 30 Hazard 3.5, Image 1, PILZ make magnetic safety switch at rear maintenance door</p>	<p>Picture 31 Hazard 3.5, Image 2, RHS maintenance door</p>
	
<p>Picture 32 Hazard 3.5, Image 3, PILZ make magnetic safety switch at RHS maintenance door</p>	<p>Picture 33 Hazard 3.5, Image 4, PILZ PNOZ m B0 safety controller with PNOZ S7 safety contact expansion</p>

Hazard Identification		Hazard No:	3.6
Title	Trapped Person		
Location	Machine Infeed		
Target	Entire Body		
Activity	Maintenance		
Task	Fault-finding/Troubleshooting		
Sub Task	Dismantling/removal of parts, components, devices of the machine		
Hazard Type	Mechanical Hazard with the consequence of		
Sub Type	Crushing/Impact		
Description	It is necessary that operator and / or maintenance access the machine infeed area to complete Fault-finding/Troubleshooting and cleaning activities. This present Mechanical Hazard with the consequence of Crushing or impact to operator when accessed.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
The suitable guards to prevent the possible access to hazardous movements of the machine should be installed. As the access is required for fault findings, repairing activities the light curtains should be installed at this area. When light curtains are disturbed the hazardous movements should be stopped by safety controller. The light curtain safety control system should achieve required performance level in accordance with EN ISO 13849-1.		EN ISO 12100 IEC 61496-1 EN ISO 13849-1	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine infeed area is covered by installing Keyence make light curtains arrangement. The light curtains are interface with PILZ PNOZ m B0 safety controller. The electrical circuit is designed such a way that it will not be possible to start the machine unless the person or operator got out from the hazardous zone and closes the guards/doors.</p> <p>Additionally, secured access fingerprint scanner is installed on the main operating panel at front side. The main safety reset push button is installed on the operating panel to restart the machine functionality after any kind of interruptions for safety components. The dual residual pressure release valves (VP744R- 5DZ1-04-MA-X555) are controlled and monitored through safety output of PILZ PNOZ m B0 safety controller. The STO signals of kinetix drives are routed through fail safe PNOZ S7 safety contact expansion module.</p> <p>It is confirmed that light curtain safety control system achieving required performance level in accordance with EN ISO 13849-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN ISO 12100 EN ISO 13849-1 IEC 61496-1</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

<p>Picture 34 Hazard 3.6, Image 1, LHS light curtains of the machine</p>	<p>Picture 35 Hazard 3.6, Image 2, PILZ PNOZ m B0 safety controller with PNOZ S7</p>
<p>Picture 36 Hazard 3.6, Image 3, Machine infeed light curtains</p>	<p>Picture 37 Hazard 3.6, Image 4, Safety Reset</p>
<p>Picture 38 Hazard 3.6, Image 5, Secured Access</p>	

Hazard Identification		Hazard No:	3.7
Title	Reset Button		
Location	Machine Front		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Restarting the machine after stopping/interruption		
Hazard Type	Ergonomic Hazard		
Sub Type	Inadequate design, location or identification of control devices		
Description	The machine is not installed with reset button for restarting of the machine after stopping/interruption.		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Not Acceptable
Risk Reduction		Reference	
The color of the reset button should be blue in accordance with EN 60204-1.		EN 60204-1 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	
Probability of Occurrence of a Hazardous Event	
Possibility of Avoidance	
Frequency And / Or Duration of Exposure	
Pilz Hazard Rating (PHR)	N/A
Summary Level	
Acceptable	
Risk Reduction Measures Description	Reference
<p>The machine is installed with reset button for restarting of the machine after stopping/interruption. The color of the reset button is blue in accordance with EN 60204-1.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN 60204-1 EN ISO 12100</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	




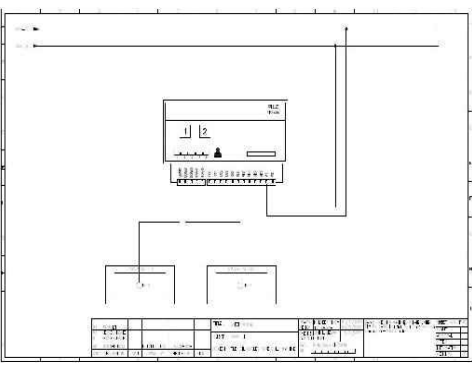




Picture 39 Hazard 3.7, Image 1, Blue Color Reset Push Button

Hazard Identification		Hazard No:	3.8
Title	Operating mode Selection		
Location	Machine		
Target	People / Machine		
Activity	Normal Operation - Maintenance		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Other Hazards		
Sub Type	Unintended/unexpected start-up		
Description	<p>The machinery need to run in various operating modes. If machinery is not designed to allow for its use in several control or operating modes, it can act differently to the operator's expectation or what the machine is set-up for.</p> <p>This is especially hazardous where different protective measures and/or work procedures are selectable.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:	8	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	3
Pilz Hazard Rating (PHR):	150	Summary Level:	Significant Risk
Risk Reduction		Reference	
Provide specific operating modes (e.g. automatic mode, manual mode, etc.). Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode. The selector may be replaced by another selection means, which restricts the use of certain functions of the machinery to certain categories of operators (e.g. access codes for numerically controlled functions). Inform that the key for the selector switch (or access code) should be removed and held by a competent person.		EN 60204-1 EN ISO 13849-1 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	8	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	3
Pilz Hazard Rating (PHR):	3	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	8
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	3
Pilz Hazard Rating (PHR)	3
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine is installed with PILZ make PIT mode to select the specific mode for the machine operations. PILZ make PIT mode is having two type of the modes i.e. Automatic mode and Change over mode.</p> <p>Additionally, for secured access, there is finger print access request scanner installed on the operating panel which gives the authorized access rights to mode of the machine. The machine is also password protected.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>EN 60204-1 EN ISO 13849-1 EN ISO 12100</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

	
<p>Picture 40 Hazard 3.8, Image 1, PILZ make PIT mode with RFID keys</p>	<p>Picture 41 Hazard 3.8, Image 2, Auto/Manual Key switch</p>
	
<p>Picture 42 Hazard 3.8, Image 3, Secured Access for changing mode</p>	<p>Picture 43 Hazard 3.8, Image 4, Electrical Drawing for PILZ PIT mode</p>


4.5.4 Ergonomic and work process related hazards

This section is concerned with the "fit" between the user, machine and their environment. It takes account of the interfaces to the machine and equipment and if it suits the user's physical and cognitive capabilities and limitations



Picture 44 Ergonomic and work process related hazards

Hazard Identification		Hazard No:	4.1
Title	Stability		
Location	Machine Perimeter		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Mechanical Hazard as a result of		
Sub Type	Instability		
Description	The work process generates dynamic forces. This could lead to the loosening and/or moving machine elements which as a result break the machine and harm people in the near vicinity. The machine is not fixed to the ground.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	8	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	60	Summary Level:	Significant Risk
Risk Reduction		Reference	
The machine should be properly fixed to the ground. There should not be any potential for the machine to fall over or move unexpectedly.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	8	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	8
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	0.75
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
	
Risk Reduction Measures Description	Reference
<p>The dynamic load due to operation of the machine is typically small compared to the static weight of the machine. There is no potential for the machine to fall over or move unexpectedly.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

Hazard Identification		Hazard No:	4.2
Title	Physical Handling Of Machine Elements And Parts		
Location	Machine		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Control/inspection		
Hazard Type	Ergonomic Hazard		
Sub Type	Unhealthy posture		
Description	The design of the machine does not allows for the variability of the operator's physical dimensions, strength and stamina.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	8	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	60	Summary Level:	Significant Risk
Risk Reduction		Reference	
<p>There should not be any repetitive activities or intensive physical strain foreseen.</p> <p>The area should be highlighted where personnel do not need to access without any maintenance activity.</p> <p>However, there are areas where space for movements of the parts of the body is restricted. These are only in areas where personnel do not generally need to access except for the maintenance.</p>		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	8	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk


Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	8
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	0.75
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>No repetitive activities or intensive physical strain foreseen. However, there are areas where space for movements of the parts of the body is restricted. These are only in areas where personnel do not generally need to access except for the maintenance.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

Hazard Identification		Hazard No:	4.3
Title	Physical and Psychological Stress		
Location	Machine Front		
Target	Entire Body		
Activity	Normal Operation		
Task	Operation		
Sub Task	Control/inspection		
Hazard Type	Ergonomic Hazard		
Sub Type	Mental overload/boredom		
Description	<p>There is no machine-determined work rate or monitoring needed that requires lengthy concentration. There is no irritating dazzle and there are no dangerous stroboscopic effects on moving parts due to the lighting.</p> <p>The intended conditions of use faced by the operator are likely to create discomfort, fatigue and physical and psychological stress over time.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	37	Summary Level:	Low Risk
Risk Reduction		Reference	
<p>The intended conditions of use faced by the operator should be unlikely to create discomfort, fatigue and physical and psychological stress over time.</p> <p>The suitable guidelines should be mentioned in operating manual of the machine.</p>		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	4
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	0.75
Frequency And / Or Duration of Exposure	4
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine operating manual is made available for this machine. In section C, there are suitable guidelines made available which includes safe way of handling for loading of components. Use of adequate PPE is mandatory during the machine operations. All this information's are made available in operating manual.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>It is necessary that well trained operator required for operating machine on the basis of operating procedure mentioned in the operating manual.</p>	



Hazard Identification		Hazard No:	4.4
Title	Noise generated from machine		
Location	Entire Machine		
Target	Entire Body		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Noise Hazards		
Sub Type	Whistling pneumatics		
Description	Noise is created from pneumatic actuators Long exposure to high noise levels can result in hearing loss.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	11	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	5
Pilz Hazard Rating (PHR):	171	Summary Level:	High Risk
Risk Reduction		Reference	
Measure the noise level and ensure through design measures that the emission of airborne noise is reduced. Use low noise emission components and if necessary partially or completely enclose. Inform the user about the noise levels of the machine as indicated in machinery directive. Inform if hearing protection must be provided to personnel, which must be worn constantly while in the area of the operating machine in accordance to applicable user work equipment regulations.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	11	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	5
Pilz Hazard Rating (PHR):	6	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment		
Assessment Date	Jun 12, 2020	 <p>Report No: TUV/PTL/19-20/EMC-ON/0008</p> <p>Pg. 13 of 33</p> <p>12.8 Sound Pressure Test</p> <p>a) Test Condition: Specification: ISO 12100:2010</p> <p>b) Test Procedure: Take measurement of sound at 1 meter distance from EUT through Sound level meter.</p> <p>c) Requirements: The weighted emission sound pressure level at workstations shall not exceed 80 dB (A)</p> <p>d) Observations: Pl see section 13.5 for table.</p> <p>e) Results: Complied.</p>
Degree of Possible Harm	11	
Probability of Occurrence of a Hazardous Event	0.05	
Possibility of Avoidance	2.5	
Frequency And / Or Duration of Exposure	5	
Pilz Hazard Rating (PHR)	6	
Summary Level		
Negligible Risk		
Risk Reduction Measures Description		Reference
<p>It is confirmed by the manufacturer that noise measurement testing is carried out on the machine. The noise measurement report is made available for this machine. The suitable guidelines are mentioned in the operating manual of the machine.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		EN ISO 12100
Residual Risk		
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>Information about measured noise level should be available into the operating manual.</p>		

Hazard Identification		Hazard No:	4.5
Title	Lighting in work area		
Location	Machine Infeed		
Target	People / Machine		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Ergonomic Hazard		
Sub Type	Insufficient visibility		
Description	Internal parts requiring frequent inspection and adjustment, and maintenance areas are reliant on good visibility. There is no sufficient Lighting provision is available in operating area and it is difficult for operator to visualize machine operations.		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
There should be sufficient Lighting provision available in operating area and so that it will be easy for operator to visualize machine operations.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	
Probability of Occurrence of a Hazardous Event	
Possibility of Avoidance	
Frequency And / Or Duration of Exposure	
Pilz Hazard Rating (PHR)	N/A
Summary Level	
Acceptable	
Risk Reduction Measures Description	Reference
<p>There is sufficient Lighting provision available in operating area and so that it is easy for operator to visualize machine operations.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	



Picture 45 Hazard 4.5, Image 1, Lighting provision in electrical panel

Hazard Identification		Hazard No:	4.6
Title	Transportation of machine		
Location	Entire Machine		
Target	People / Machine		
Activity	Transport		
Task	Transport		
Sub Task	Lifting		
Hazard Type	From load falls, collisions, machine tipping caused by:		
Sub Type	Uncontrolled loading		
Description	The machine is commissioned at Shop floor of Ramani Precision Machine Pvt Ltd and would be transported complete assembly to their customer. During transportation, it is planned to lift the entire machinery. There present hazard of falling machine tripping during lifting and loading machine.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	40	Possibility of Avoidance:	5
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	0.5
Pilz Hazard Rating (PHR):	125	Summary Level:	Significant Risk
Risk Reduction		Reference	
There should be suitable guideline mentioned in their machine manuals for lifting and transportation of the machines. Also on the machine lifting points should be provided to lift the machine by overhead crane. The instruction mentioned in the manuals should be followed strictly to avoid this hazard.		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	40	Possibility of Avoidance:	0.75
Probability of Occurrence of a Hazardous Event:	1.25	Frequency And / Or Duration of Exposure:	0.5
Pilz Hazard Rating (PHR):	18	Summary Possible Level:	Very Low Risk

Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	40
Probability of Occurrence of a Hazardous Event	1.25
Possibility of Avoidance	0.75
Frequency And / Or Duration of Exposure	0.5
Pilz Hazard Rating (PHR)	18
Summary Level	
Very Low Risk	
Risk Reduction Measures Description	Reference
<p>There are suitable guidelines mentioned under machine unloading document for lifting and transportation of the machine. In addition to this, operating manual is made available for this machine with section A which describes the guidelines for transportation of the machine.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary</p>	EN ISO 12100
Residual Risk	
Operating and Safety instructions should be followed during operation of the machine.	

Hazard Identification		Hazard No:	4.7
Title	Maintenance Operations		
Location	Entire Machine		
Target	Entire Body		
Activity	Maintenance		
Task	Cleaning Maintenance		
Sub Task	Dismantling/removal of parts, components, devices of the machine		
Hazard Type	Combination of Hazards		
Sub Type			
Description	The various risks of maintenance operations are presents on entire machine during replacement of hydraulic actuators, press unit, replacement of worn out parts, Falls during maintenance operations.		
Risk Estimation and Evaluation			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	62	Summary Level:	Significant Risk
Risk Reduction		Reference	
Necessary training should be provided to the maintenance people. Use of PPE as hand gloves and safety goggles should be mandatory during the operation. There should be standard procedure which includes safe way of handling maintenance operations. LOTO polices should be followed during maintenance activities. There should be provision by the user of means of access at height if necessary. Training under the responsibility of the manager in maintenance interventions in hazardous areas requiring specific technical knowledge or special skills and should therefore be carried out exclusively by qualified persons (for example, maintenance personnel, specialist).		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	5	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	2
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	5
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	2
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>In machine operating manual, main section C provides the suitable guidelines for the scheduled maintenance. There are tables available for the daily, weekly, monthly checks for the machine and its component maintenance. In order to provide suitable guidelines, safety instructions are also made available for the machine maintenance activity.</p> <p>There is standard procedure which includes safe way of handling maintenance operations.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>It is necessary that any maintenance activity should be carried out by maintenance authorized competent personnel.</p>	

4.5.5 Adequacy of Information for Use and Training

While the hazards related to this section can be of various nature (mechanical, electrical, pneumatic etc.) the origin for those hazards often originate in a lack of information for use



Picture 46 Adequacy of Information for Use and Training

Hazard Identification		Hazard No:	5.1
Title	Inadequate Marking and signs		
Location	Machine Perimeter		
Target	People / Machine		
Activity	Various		
Task	Various		
Sub Task	Various		
Hazard Type	Combination of Hazards		
Sub Type	N/A		
Description	<p>Various plates and markings indicate important information to perform various tasks.</p> <p>There is no electrical warning sign affixed to the electrical parts stating the relevant electrical supply.</p> <p>There is no name plate fixed on the machine indicating general machine information such as machine certification serial number, name of manufacture etc.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
There should be electrical warning sign affixed to the electrical parts stating the relevant electrical supply.		EN ISO 12100	
There should be name plate fixed on the machine indicating general machine information such as machine certification serial number, name of manufacture etc.			
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	
Probability of Occurrence of a Hazardous Event	
Possibility of Avoidance	
Frequency And / Or Duration of Exposure	
Pilz Hazard Rating (PHR)	N/A
Summary Level	
Acceptable	
Risk Reduction Measures Description	Reference
<p>There is an electrical warning sign affixed to the electrical parts stating the relevant electrical supply. There is CE nameplate fixed on the machine indicating general machine information such as machine certification serial number, name of manufacture etc.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
Operating and Safety instructions should be followed during operation of the machine.	





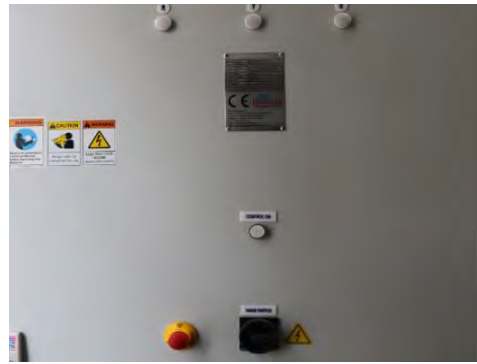
Picture 47 Hazard 5.1, Image 1, Warning signs



Picture 48 Hazard 5.1, Image 2, Warning signs



Picture 49 Hazard 5.1, Image 3, CE nameplate



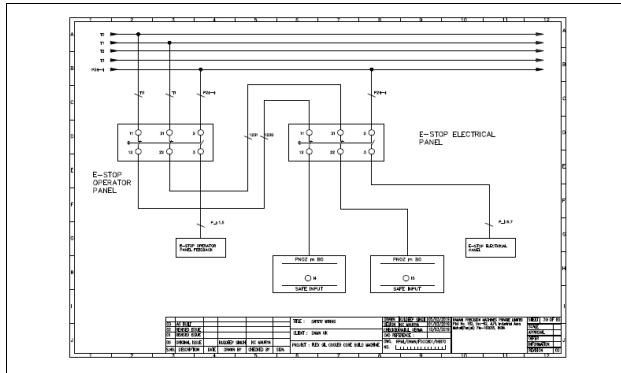
Picture 50 Hazard 5.1, Image 4, Warning signs

Hazard Identification		Hazard No:	5.2
Title	Documentation -Operating Manual		
Location	Machine		
Target	People / Machine		
Activity	Various		
Task	Various		
Sub Task	Various		
Hazard Type	Other Hazards		
Sub Type	Inadequate Documentation		
Description	Inadequate Documentation can lead to errors of fitting, incorrect use of the machine, wrong or insufficient maintenance and other user mistakes during the life cycle of the machinery.		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
<p>A sufficient level of information shall be provided to the user about the intended use of the machine, taking into account all its operating modes. Information for use shall be given in the language(s) of the country in which the machine will be used in.</p> <p>An integral part is the instruction handbook, which should cover all life phases of the machinery. It shall be legible; text should be supported by illustrations.</p> <p>Safety-relevant instructions should be provided in a form readily available to the personnel they are intended for.</p>		IEC 82079-1 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

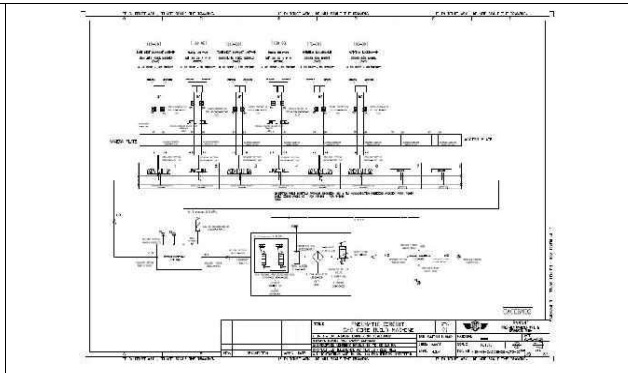
Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	
Probability of Occurrence of a Hazardous Event	
Possibility of Avoidance	
Frequency And / Or Duration of Exposure	
Pilz Hazard Rating (PHR)	N/A
Summary Level	
Acceptable	
Risk Reduction Measures Description	Reference
<p>The machine operating manual is made available for this machine. There are total five sections in the operating manual which describes various information related to machine normal operation as well as safety & maintenance instructions. There are suitable and sufficient information available in the operating manual (RPM/2019/FOCCB01).</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	<p>IEC 82079-1 EN ISO 12100</p>
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p>	

Hazard Identification		Hazard No:	5.3
Title	Inadequate documentation -Drawings		
Location	Machine		
Target	People / Machine		
Activity	Various		
Task	Various		
Sub Task	Various		
Hazard Type	Combination of Hazards		
Sub Type	Combination of Hazards		
Description	<p>Mechanical drawings, electrical drawing, pneumatic drawings have not been made available for this machine. Data sheets for the components installed are also not available.</p> <p>The Mechanical Drawings are required to ensure the machine is assembled correctly and would be of significant importance following major maintenance where the equipment may be partially or fully disassembled.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction	Reference		
The electrical drawings, mechanical drawings, pneumatic drawings and component data sheets are required, in order to verify if the Safety Control System is adequate. These drawings are also of significant importance to the maintenance team for fault-finding. Without correct documentation, there is a very real risk of personnel coming into direct contact with live parts as they would not be fully aware of the energies of components in the electrical enclosures or parts of the machine.	EN ISO 12100		
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment	
Assessment Date	Mar 12, 2019
Degree of Possible Harm	
Probability of Occurrence of a Hazardous Event	
Possibility of Avoidance	
Frequency And / Or Duration of Exposure	
Pilz Hazard Rating (PHR)	N/A
Summary Level	
Acceptable	
Risk Reduction Measures Description	Reference
<p>The electrical drawings, mechanical drawings, pneumatic drawings and component data sheets, safety PLC program are made available for this machine. Those drawings are useful in order to verify if the Safety Control System is adequate.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
Operating and Safety instructions should be followed during operation of the machine.	



Picture 51 Hazard 5.3, Image 1, Electrical Drawing



Picture 52 Hazard 5.3, Image 2, Pneumatic drawings

Hazard Identification		Hazard No:	5.4
Title	Unsuitable tools or equipment		
Location	Entire Machine		
Target	People / Machine		
Activity			
Task	Fault-finding/Troubleshooting		
Sub Task	Replacements of parts, components, devices of the machine		
Hazard Type	Other Hazards		
Sub Type	Inadequate Documentation		
Description	Unsuitable tools or equipment can cause a variety of injuries including cutting and severing, entanglement and punctures.		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
Ensure the correct equipment is used for maintenance work, also inform to check equipment regularly for wear and tear.		EN ISO 12100	
Machine has to be supplied with special tools and equipment for adjustment and servicing (e.g. spanning the tie bar nut) if those are not usually available on the market.			
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment		
Assessment Date	Jun 08, 2020	
Degree of Possible Harm		
Probability of Occurrence of a Hazardous Event		
Possibility of Avoidance		
Frequency And / Or Duration of Exposure		
Pilz Hazard Rating (PHR)	N/A	
Summary Level		
Acceptable		
Risk Reduction Measures Description		Reference
<p>The specific and special tools are supplied to the end user along with the machine. The suitable guidelines are mentioned under section D of the operating manual. The maintenance instructions are made available in the operating manual in section C.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		EN ISO 12100
Residual Risk		
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>It is necessary that any maintenance activity should be carried out by maintenance authorized competent personnel.</p>		

Hazard Identification		Hazard No:	5.5
Title	EMC Disturbance		
Location	Electrical Panel		
Target	Environment		
Activity	Normal Operation		
Task	Operation		
Sub Task	Driving the machine		
Hazard Type	Electrical Hazards		
Sub Type	Electromagnetic phenomena		
Description	<p>This machine incorporates motors and contains electric or electronic circuitry, and is powered by an electrical power source. It is possible that the machine will encounter degradation in the presence of electromagnetic disturbance affecting its intended use.</p> <p>Electrical or electromagnetic disturbances (for example generated by the motor control) can cause failures in the machine control systems.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
<p>Electronic control systems shall be designed and installed as to be protected from electromagnetic interference and operate in a stable state. During installation of electrical and electronic components, the information for use shall be followed. Technical measures shall be applied to limit electromagnetic emissions.</p> <p>Measures need to enhance the immunity of the equipment against conducted and radiated RF disturbance. This can include for example:</p> <ul style="list-style-type: none"> • design of a functional bonding system or the connection of sensitive electrical equipment directly to earth; • separation of sensitive circuits from disturbance sources; • enclosures designed to minimize RF transmission; • appropriate EMC wiring practices. 		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment		
Assessment Date	Mar 12, 2019	
Degree of Possible Harm		
Probability of Occurrence of a Hazardous Event		
Possibility of Avoidance		
Frequency And / Or Duration of Exposure		
Pilz Hazard Rating (PHR)	N/A	
Summary Level		
Acceptable		
Risk Reduction Measures Description		Reference
<p>It is confirmed by the machine manufacturer that the EMC testing is carried out on the machine. The EMC report (TUV/PTL/19-20/EMC-ON/0006 is made available for the machine. Additionally, EMC filter is installed inside the electrical control panel. Majority of the components which are installed inside electrical control panel are CE marked components.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		EN ISO 12100
Residual Risk		
Operating and Safety instructions should be followed during operation of the machine.		



Picture 53 Hazard 5.5, Image 1, EMC Filter

Hazard Identification		Hazard No:	5.6
Title	Foreseeable misuse, unintended behaviour		
Location	Machine		
Target	People / Machine		
Activity	Various		
Task	Various		
Sub Task	Various		
Hazard Type	Combination of Hazards		
Sub Type	N/A		
Description	<p>Hazard can arise from the machine use in an unsuitable environment, processing inadequate materials, an inadvertent operation or wrong or insufficient maintenance of the machine. For example, using as a climbing aid, use in potentially explosive environments, underground operation.</p> <p>Unintended behaviour of the operator or reasonably foreseeable misuse of the machine, can be the result of:</p> <ul style="list-style-type: none"> • loss of control of the machine by the operator; • reflex behaviour of a person in case of malfunction or incident during the use of the machine; • behaviour resulting from lack of concentration or carelessness; • behaviour resulting from taking the "line of least resistance"; • behaviour resulting from pressures to keep the machine running in all circumstances; • behaviour of certain persons (e.g. children, disabled persons). 		
Risk Estimation and Evaluation			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Level:	Further Review
Risk Reduction		Reference	
• Instructions for use should draw the user's attention to ways in which the machinery should not be used		IEC 82079-1 EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:		Possibility of Avoidance:	
Probability of Occurrence of a Hazardous Event:		Frequency And / Or Duration of Exposure:	
Pilz Hazard Rating (PHR):	N/A	Summary Possible Level:	Acceptable

Post Measures Risk Assessment		
Assessment Date	Jun 08, 2020	
Degree of Possible Harm		
Probability of Occurrence of a Hazardous Event		
Possibility of Avoidance		
Frequency And / Or Duration of Exposure		
Pilz Hazard Rating (PHR)	N/A	
Summary Level		
Acceptable		
Risk Reduction Measures Description		Reference
<p>All the instructions related to the machine operations are made available in the operating manual for the machine. There are suitable guidelines are available for the daily inspections, scheduled maintenance for the machine. In addition to this, there are safety instructions available to draw attention and create awareness for the user while handling of the machine.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>		IEC 82079-1 EN ISO 12100
Residual Risk		
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>It is necessary that any maintenance activity should be carried out by maintenance authorized competent personnel.</p>		

Hazard Identification		Hazard No:	5.7
Title	Safety Degradation of Equipment due to installation conditions and life time		
Location	Machine Perimeter		
Target	People / Machine		
Activity	Normal Operation- Maintenance		
Task	Cleaning Maintenance		
Sub Task	Dismantling/removal of parts, components, devices of the machine		
Hazard Type	Other Hazards		
Sub Type	Errors of fitting		
Description	<p>The safety of the machine is highly dependent on the correct installation of its components. In case of repair and maintenance activities it is foreseeable that parts can become misplaced or re-installed incorrectly. For example:</p> <ul style="list-style-type: none"> • Guards can be removed for maintenance and not be properly re-attached • Certain parts (e.g. plastic parts of the guards) are subject to wear and tear and have a limited lifetime (mission time) after which the material characteristics change <p>All these conditions can lead to ineffective guarding or safety function which as a result putting the workers at risk.</p>		
Risk Estimation and Evaluation			
Degree of Possible Harm:	11	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	2.5	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	68	Summary Level:	Significant Risk
Risk Reduction		Reference	
<ul style="list-style-type: none"> • Information for use shall contain the requirement for regular inspections of safety functions, safeguards. • Nature and frequency of inspections need to be defined in respect to applicable local regulations. 		EN ISO 12100	
Possible Residual Risk			
Degree of Possible Harm:	11	Possibility of Avoidance:	2.5
Probability of Occurrence of a Hazardous Event:	0.05	Frequency And / Or Duration of Exposure:	1
Pilz Hazard Rating (PHR):	1	Summary Possible Level:	Negligible Risk

Post Measures Risk Assessment	
Assessment Date	Jun 08, 2020
Degree of Possible Harm	11
Probability of Occurrence of a Hazardous Event	0.05
Possibility of Avoidance	2.5
Frequency And / Or Duration of Exposure	1
Pilz Hazard Rating (PHR)	1
Summary Level	
Negligible Risk	
Risk Reduction Measures Description	Reference
<p>The machine operating manual is made available for this machine. In this manual, section C provides the engineering information related to technical specifications related to the machine. In addition to this, section D provides the machine electrical, mechanical & pneumatic drawings along with safety input & output list for the machine. The inspection & maintenance scheduled guidelines are mentioned under section C.</p> <p>Considering risk reduction measures implemented by Ramani Precision Machines Private Limited the hazard is accepted. No further risk reduction measures are necessary.</p>	EN ISO 12100
Residual Risk	
<p>Operating and Safety instructions should be followed during operation of the machine.</p> <p>It is necessary that any maintenance activity should be carried out by maintenance authorized competent personnel.</p>	

4.6 Priority Listing

Priority	Hazard No	Hazard Name	PHR	Risk Level	Post PHR	Post Risk Level
1	4.6	Transportation of machine	125	Significant Risk	18	Very Low Risk
2	2.1	Access to live parts	500	High Risk	10	Negligible Risk
3	2.2	Protective Earth	250	High Risk	10	Negligible Risk
4	2.5	Unexpected Start Up during maintenance	250	High Risk	10	Negligible Risk
5	4.4	Noise generated from machine	171	High Risk	6	Negligible Risk
6	2.3	Unstable power supply	125	Significant Risk	5	Negligible Risk
7	2.4	Overload or Over current conditions due to faults or misuse	250	High Risk	5	Negligible Risk
8	3.8	Operating mode Selection	150	Significant Risk	3	Negligible Risk
9	1.2	Access to Pinch Points_Front	125	Significant Risk	2	Negligible Risk
10	1.8	Slip Trip	62	Significant Risk	2	Negligible Risk
11	3.2	Access to Pinch Points_Front	125	Significant Risk	2	Negligible Risk
12	3.4	Light Curtain Installation	125	Significant Risk	2	Negligible Risk
13	1.1	Loading of components	75	Significant Risk	1	Negligible Risk
14	1.3	Access to Pinch Points_LHS	62	Significant Risk	1	Negligible Risk
15	1.4	Access without Disturbing Light Curtain	62	Significant Risk	1	Negligible Risk
16	1.5	Crushing Hazard	62	Significant Risk	1	Negligible Risk
17	1.6	Falling of Assembled Component	75	Significant Risk	1	Negligible Risk
18	1.7	Sharp Edges	25	Low Risk	1	Negligible Risk
19	2.6	Remaining Pressure of Pneumatic System	62	Significant Risk	1	Negligible Risk
20	2.7	Operating Control Panel Identification	37	Low Risk	1	Negligible Risk
21	2.8	Installation of Pneumatic System	46	Significant Risk	1	Negligible Risk
22	3.1	Emergency Situations	62	Significant Risk	1	Negligible Risk
23	3.3	Access to Pinch Points_LHS	62	Significant Risk	1	Negligible Risk
24	3.5	Service Doors	62	Significant Risk	1	Negligible Risk

25	3.6	Trapped Person	62	Significant Risk	1	Negligible Risk
26	4.1	Stability	60	Significant Risk	1	Negligible Risk
27	4.2	Physical Handling Of Machine Elements And Parts	60	Significant Risk	1	Negligible Risk
28	4.3	Physical and Psychological Stress	37	Low Risk	1	Negligible Risk
29	4.7	Maintenance Operations	62	Significant Risk	1	Negligible Risk
30	5.7	Safety Degradation of Equipment due to installation conditions and life time	68	Significant Risk	1	Negligible Risk
31	3.7	Reset Button	N/A	Not Acceptable	N/A	Acceptable
32	4.5	Lighting in work area	N/A	Further Review	N/A	Acceptable
33	5.1	Inadequate Marking and signs	N/A	Further Review	N/A	Acceptable
34	5.2	Documentation -Operating Manual	N/A	Further Review	N/A	Acceptable
35	5.3	Inadequate documentation - Drawings	N/A	Further Review	N/A	Acceptable
36	5.4	Unsuitable tools or equipment	N/A	Further Review	N/A	Acceptable
37	5.5	EMC Disturbance	N/A	Further Review	N/A	Acceptable
38	5.6	Foreseeable misuse, unintended behaviour	N/A	Further Review	N/A	Acceptable

4.7 Risk Reduction

Due to the hazards detailed in the earlier section 4.6 Findings, it is necessary to carry out a risk reduction for each hazard where the estimated risk is determined to be unacceptable as detailed in the findings.

After the required safety measures are implemented it will be necessary to ensure that the risk posed by each hazard has been reduced to the level specified in this document by performing a final risk evaluation.

On completion of the risk reduction measures and the final risk evaluation, the residual risk associated with all hazards will have to be assessed and documented as part of the risk assessment report. This is the possible risk that a hazard may possess even after risk reduction measures have been implemented due to the fact that it was not possible to design a complete safety solution to eradicate the risk.

In order to inform the user of these residual risks related with the machine that have not been reduced by the design of contra measures, special indications should be included in the operator procedure documentation and warnings should be placed on the machine.

4.8 Hazard Checklist

Hazard Type	Report	Comment
Mechanical Hazard as a result of		
Acceleration, deceleration	N/A	
Angular parts	YES	
Approach of a moving element to a fixed part	YES	
Cutting parts	YES	
Elastic elements	N/A	
Falling or ejected objects	YES	
Gravity	YES	
Height from the ground	N/A	
High pressure	YES	
Instability	N/A	
Kinetic energy	YES	
Machinery mobility	N/A	
Moving elements	YES	
Rotating elements	YES	
Unlevelled, rough, slippery surface	N/A	
Sharp edges	YES	
Stored energy	YES	
Vacuum	N/A	
Mechanical Hazard with the consequence of		
Being run over	N/A	
Being thrown	N/A	
Crushing	YES	
Cutting or Severing	YES	
Drawing-in or Trapping	YES	
Entanglement	YES	
Friction or Abrasion	N/A	
Impact	YES	
Injection	N/A	
Shearing	N/A	
Slipping, tripping and falling	YES	
Stabbing or Puncture	N/A	
Suffocation	N/A	
Electrical Hazards		
Arc	YES	
Electromagnetic phenomena	YES	
Electrostatic phenomena	N/A	
Contact of persons with Live Parts (Direct Contact)	YES	

Not enough distance to live parts under high voltage	YES	
Overload	YES	
Parts which have become live under fault conditions (Indirect Contact)	YES	
Short-circuit	YES	
Thermal radiation	N/A	
Thermal Hazards		
Explosion	N/A	
Flame	N/A	
Objects, material or areas with a high or low temperature	N/A	
Radiation from heat sources	N/A	
Noise Hazards		
Cavitation phenomena	N/A	
Exhausting system	N/A	
Gas leaking at high speed	N/A	
Manufacturing process (stamping, cutting, etc.)	N/A	
Moving parts	YES	
Scraping surfaces	N/A	
Unbalanced rotating parts	N/A	
Whistling pneumatics	YES	
Worn parts	N/A	
Vibration Hazards	N/A	
Cavitation phenomena	N/A	
Misalignment of moving parts	N/A	
Mobile equipment	N/A	
Scraping surfaces	N/A	
Unbalanced rotating parts	N/A	
Vibrating equipment	N/A	
Worn parts	N/A	
Radiation Hazards		
Ionizing radiation sources	N/A	
Low frequency electromagnetic radiation	N/A	
Optical radiation (infrared, visible and ultraviolet), including laser	N/A	
Radio frequency electromagnetic radiation	N/A	
Material/Substance Hazards		
Aerosol	N/A	
Biological or microbiological (viral or bacterial) agent	N/A	
Combustible	N/A	
Dust	N/A	

Explosive	N/A	
Fibre	N/A	
Flammable	N/A	
Fluid	N/A	
Fume	N/A	
Gas leaking at high speed	N/A	
Mist	N/A	
Oxidizer	N/A	
Ergonomic Hazard		
Access	YES	
Inadequate design or location of indicators and visual display units	YES	
Inadequate design, location or identification of control devices	YES	
Excessive effort	YES	
Flicker, dazzling, shadow, stroboscopic effect	N/A	
Inadequate local lighting	YES	
Mental overload/boredom	N/A	
Unhealthy posture	N/A	
Repetitive activity	YES	
Insufficient visibility	N/A	
Hazards associated with the environment in which the machine is used		
Dust and fog	YES	
Electromagnetic disturbances	N/A	
Lightning	YES	
Moisture	N/A	
Pollution	N/A	
Snow	N/A	
Temperature	N/A	
Water	N/A	
Wind	N/A	
Lack of oxygen	N/A	
Other Hazards	YES	
Errors in Software	N/A	
Failure of the Control System	YES	
Unintended/unexpected start-up	YES	
Inadequate Documentation	YES	
Errors of fitting	YES	
Breakage, Fatigue	YES	
Combination of Hazards		

4.9 Marking and Documentation Listing

No	Document	Required		Available		Acceptable		Comment
		Yes	No	Yes	No	Yes	No	
1	EC Declaration of Conformity (DoC)	X			X		X	PILZ is not Authorized Representative for this machine.
2	Essential Health & Safety Requirements	X		X		X		
3	IS report	X		X		X		
4	FS report	X		X		X		
5	Performance Level report	X		X		X		
6	Electrical Drawings	X		X		X		
7	Mechanical Drawings	X		X		X		
8	Pneumatic Drawings	X		X		X		
9	Instructions	X			X	X		
10	Test Reports	X		X		X		
11	Image of CE Plate	X		X		X		
12	Machine Component Specifications	X		X		X		

5 Conclusion

This Risk Assessment carried out on Flex Core Build Machine at Ramani Precision Machines Private Limited on the Mar 12, 2019 has found a few areas that need to be addressed in order to bring the machinery up to a level to meets ISO standards and requirements of the European Machinery Directive 2006/42/EC against which the machine was assessed.

The risk assessment has identified some same type of issues on each machine that should be addressed according the standards applicable. The main issues identified on the machines are as follows:

- All the electrical devices and cable terminations are not touch proof and not conforms to at least IP 2X.
- The machine emergency stop control system, door monitoring and light curtain safety control system is not achieving required performance level in accordance with EN ISO 13849-1.
- Noise Measurement report is not made available for the machine.
- Instructions/Suitable guidelines are not made available for this machine.
- The machine documents such as operating manual, maintenance instructions, safety instructions are not available for this machine.
- Operating & maintenance instructions are not directly available on this machine.
- There is no name plate fixed on the machine indicating general machine information such as machine certification serial number, name of manufacture etc.
- The EMC, LVD test report is not made available for this machine.

Pilz recommends that Ramani Precision Machines Private Limited set up a task force comprising members from Safety Management, Engineering, Maintenance and Production to develop a safety upgrade project to resolve safety and conformance issues with the machine.

Pilz and its recognized sub-contractors and suppliers have the ability to implement satisfactory safety solutions, to reduce the risk associated with each hazard that was found to an acceptable level. No machine/hazard was identified which presents an insurmountable challenge.

After the risk reductions measures implemented by Ramani Precision Machines Private Limited Post Measure risk assessment is carried out on Flex Core Build Machine at Ramani Precision Machine Pvt. Ltd Derabassi Plant on Mar 12, 2019 has found some of the risks addressed are reduced to negligible level but major risks require the necessary modification in design of the electrical circuit and machine guarding.

- All the electrical devices and cable terminations are not touch proof and not conforms to at least IP 2X.
- The machine emergency stop control system, door monitoring and light curtain safety control system is not achieving required performance level in accordance with EN ISO 13849-1.
- Noise Measurement report is not made available for the machine.
- Instructions/Suitable guidelines are not made available for this machine.
- The machine documents such as operating manual, maintenance instructions, safety instructions are not available for this machine.
- Operating & maintenance instructions are not directly available on this machine.
- There is no name plate fixed on the machine indicating general machine information such as machine certification serial number, name of manufacture etc.
- The EMC, LVD test report is not made available for this machine.

The Post Measure Risk Assessment report is updated on the basis of machine operating manual received from Ramani Precision Machines Private Limited on Jun 08, 2020, machine test reports on Jun 11, 2020 & photo evidences on Jun 12, 2020. All the risks addressed are reduced to negligible level by necessary modification in design of the electrical circuit and machine guarding except the residual risk remains for the machine transportation activity.

Pilz recommends that Ramani Precision Machine Pvt. Ltd Derabassi Plant should inform operators about the residual risks remaining on the machine and include special instructions in operating procedure documents of the machine. The appropriate warning signs should be placed on the machine to indicate residual risks remaining on the machine.

Pilz India
Jun 22, 2020

APPENDIX 1 Terminology

Machinery / Machine:

Assembly, fitted with or intended to be fitted with a drive system consisting of linked parts or components, at least one of which moves, and which are joined together for a specific application.

Reliability:

The ability of a machine or components, or equipment to perform a required function under specified conditions and for a given period of time without failing.

Safety of machine:

The ability of a machine to perform its function, to be transported, installed, adjusted, maintained, dismantled and disposed of under conditions of intended use specified in the instruction handbook without causing injury or damage to health.

Hazard:

A potential source of harm.

Hazardous situation:

Any situation in which a person is exposed to a hazard or to hazards.

Risk:

A combination of the probability of occurrence of harm and the severity of that harm.

Risk Assessment:

Overall process comprising a risk analysis and a risk evaluation.

Harm:

Physical injury or damage to health.

Danger zone (or Hazard zone):

Any space within and/or around machinery in which a person can be exposed to a hazard.

Exposed person:

Any person wholly or partially in a danger zone.

Operator:

The person or persons given the task of mainly operating machinery. Minor adjusting, maintaining, and cleaning tasks might also be executed.

Preliminary Hazard Analysis:

PHA is an inductive method, whose objective is to identify, for all phases of life of a specified system / subsystem / component the hazards, hazardous situations and hazardous events which could lead to an accident.

Performance Level:

Discrete Level used to specify the ability of the safety-related parts of a control system to perform a safety function under unforeseeable conditions

Safety Component:

A component placed on the market separately to fulfil a safety function when in use and the failure or malfunctioning of which endangers the safety or health of exposed persons

Warning devices:

Visible/audible alarms to trigger avoidance or corrective responses (e.g., signals, lights, signs, horns). Training and discipline in recognizing and responding is necessary. Their value to personnel with vision or hearing impairments is questionable.

Procedures and training:

Formal or informal training, checklists, certification or experience requirements, personal protective equipment use.

Residual risk:

Risk remaining after protective measures have been implemented.

Safeguarding:

Protective measure using safeguards to protect persons from the hazards which cannot reasonably be eliminated or from the risks which cannot be sufficiently reduced by inherently safe design measures

Safety function:

Function of a machine whose failure can result in an immediate increase of the risk(s)

Failure:

The termination of the ability of an item to perform a required function.

Emergency situation:

Hazardous situation needing to be urgently ended or averted.

Machine control system:

System which responds to an input from, for example, the process, other machine elements, an operator, external control equipment, and generates an output(s) causing the machine to behave in the intended manner.

Safety-related electrical control system (SRECS):

Electrical, electronic or programmable electronic part of a machine control system whose failure can result in an immediate increase of the risk(s)

Safety Related Part of a Control System (SRP/CS):

Part of a control system that responds to safety-related input signals and generates safety-related output signals

Diagnostic function:

Function intended to detect faults in the control system and produce a specified output information or activity when a fault is detected.

Safety Integrity:

Probability of a Safety Related Electrical Control System or its subsystem satisfactorily performing the required safety functions under all stated conditions

Task:

Specific activity performed by one or more persons on, or in the vicinity of, the machine during its life cycle.

Reasonably foreseeable misuse:

Use of a machine in a way not intended by the designer, but which can result from readily predictable human behaviour.

Safety of control systems:

Ability of safety-related parts of a control system to perform their safety function(s) for a given time according to their specified category or performance level

Hazardous machine function:

Any function of a machine, which generates a hazard when operating.

Risk reduction, adequate:

Risk reduction at least in accordance with the legal requirements under consideration of the current state of the art.

Protective Measure:

Measure intended to achieve risk reduction.

Inherently Safe Design Measure:

Protective measure which either eliminates hazards or reduces the risks associated with hazards by changing the design or operating characteristics of the machine without the use of guards or protective devices.

Hazard, relevant:

Hazard which is identified (as part of the risk assessment process) as being present at, or associated with the machine.

Hazard, significant:

Hazard which has been identified as relevant and which requires specific action to eliminate or to reduce the risk according to the risk assessment.

Hazardous event:

Event that can cause harm. A hazardous event can occur over a short period of time or over an extended period of time.

Inherently safe design measures:

Protective measure which either eliminates hazards or reduces the risks associated with hazards by changing the design or operating characteristics of the machine without the use of guards or protective devices.

Information for use:

Protective measure consisting of communication links (for example, text, words, signs, signals, symbols, diagrams) used separately or in combination, to convey information to the user.

Intended use:

Use of a machine in accordance with the information for use provided in the instructions.

Risk analysis:

Combination of the specification of the limits of the machine, hazard identification and risk estimation.

Risk estimation:

Defining likely severity of harm and probability of occurrence.

Risk evaluation:

Judgement, on the basis of risk analysis, of whether the risk reduction objectives have been achieved.

APPENDIX 2 Abbreviations

N/A:	Not Available, Not Applicable
Not Accept:	Not Acceptable
BPCS:	Basic Process Control System
SRS:	Safety Requirement Specification
FDS:	Functional Design Specification
HAZOP:	Hazard and Operability Study
EMC:	Electromagnetic Compatibility
CCF:	Common Cause Failure
PDF:	Probability of Failure on Demand
MTBF:	Mean Time Between Failures
MTTF:	Mean Time To Failure
MTTR:	Mean Time To Restoration
PHA:	Preliminary Hazard Analysis
PL:	Performance Level
SIF:	Safety Instrumented Function
SIL:	Safety Integrity Level
SIS:	Safety Instrumented System
SFF:	Safe Failure Fraction
DC:	Diagnostic Coverage
I/O:	Input/Output
FB:	Function Block
PFHD:	Probability of dangerous Failure per Hour
SRCF:	Safety-Related Control Function
SYS:	System
URS:	User Requirement Specification
SRP/CS:	Safety-related part of a control system
SRECS:	Safety-related electrical control system
PLC:	Programmable Logic Controller

APPENDIX 3 Legislative References

Reference	Legislation - EU
2006/42/EC:	Machinery Safety
2014/30/EU:	Electromagnetic Compatibility
2014/35/EU:	Low Voltage equipment

Table 10 Legislative references EU

APPENDIX 4 Normative References

Reference	Standards Title
EN ISO 12100: 2010	Safety of machinery - Basic concepts, general principles for design - Risk assessment and risk reduction
EN ISO 14120: 2015	Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
EN ISO 13857: 2008	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
EN ISO 14119: 2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
EN ISO 13850: 2015	Safety of machinery. Emergency stop. Principles for design
EN ISO 13849-1: 2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 60204-1: 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 82079-1: 2012	Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements
EN ISO 13855: 2010	Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855: 2010)
EN ISO 4414: 2010	Pneumatic fluid power - General rules and safety requirements for systems and their components
EN 61310-1: 2008	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, acoustic and tactile signals)
EN 61310-2: 2008	Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking
IEC 61496-1: 2012	Safety of machinery: electro sensitive protective equipment. Part 1: General prescriptions and tests.

Table 11 Normative references