

P202X-000
Machine Name
Safety Concept
Sample Report

Machine Name

Customer Name
Machine Location



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Agreement Letter

Company Company Name
Project Number P202X-000
Subject Machine Name
Attention Euchner / Safe-T-Sense

Dear Mr. Customer,

Safe-T-Sense is pleased to provide Company Name. with a Safety Concept for the Machine Name located at Location. This report considers customer requirements including technical specifications, technical clarifications and verbal requirements to define the functional specification for the safety upgrade.

Please review this specification and sign below, indicating you agree with the engineering solution(s) we recommend.

Safe-T-Sense will not start the Engineering design phase until this document is signed. Any changes made by Company Name. after this document is signed and/or after the engineering phase is started will need to be evaluated and might constitute a change order that would require additional funding.

Sincerely,



Signature Date
Mike Poynter
Engineering Manager
Safe-T-Sense, LLC

Signature Date
Contact Name
Title
Company Name

1. Data

1.1 Project

Project Name:	Project Name
Document Number	P202X-000
Version	1.0
Machine Location	Location

1.2 Revision History

Version	Date	Author	Description
Rev 0.0	xx-xx-xxxx	Mike Poynter – Engineering Manager	Document Template Creation – Overall layout, format and included information
Rev 1.0	xx-xx-xxxx	Mike Poynter – Engineering Manager	Initial document generation

1.3 Documentation

Risk Assessment Report	Risk Assessment Report.pdf
Drawings	Machine Drawings.pdf
Program	N/A

1.4 Other Applicable Documents

Regulations, Standards	ISO 13849-1, 2015, Safety of Machinery – Safety related parts of control system, General principles for design ANSI B11.19-2019, Performance Requirements for Risk Reduction Measures ANSI B11.26, 2018, Functional Safety for Equipment: General Principles for the design of safety control systems ISO 13850, 2015, Safety of Machinery – Emergency stop function – Principles for design ISO 13855, 2010, Safety of machinery – Positioning of safeguards with respect to the approach speeds of parts of the human body ISO 13857, 2008, Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs ISO 14118, 2000, Safety of machinery – Prevention of unexpected start-up ISO 14119, 2013, Interlocking devices associated with guards, principles for design and selection ISO14120, 2015, Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards ISO 4414, 2010, Pneumatic Fluid Power – General Rules and Safety Requirements for Systems and Their Components
Plant standards	N/A
Other applicable documents	N/A

2. Project Description

The Company Machine Name safety upgrade solution will design and re-engineer the safety circuits to meet the requirement of Cat X, PL x per ISO 13849-1:2015. and the risk assessment previously performed. The safety circuit will be designed to be expandable for further machine upgrades.

2.1 Machine Safety Solution Overview

The Company Machine Name has been divided into 4 zones, please see Figure 1

- Zone 1: Material Infeed
 - Consists of the area in front of the side loader up to the end of the roller conveyors. This area includes the guarded enclosure for the machine.
- Zone 2: Material Outfeed
 - Consists of the area where materials exist the machine enclosure and outfeed conveyor.
- Zone 3: Material Adjustment Area
 - Consists of the rear of the machine up to the roller conveyor.
- Zone 4: Collector
 - Consists of the collector enclosure and duct to the machine enclosure.

The concept of the STS upgrade solution is shown in Figure 2.

Zone 1:

- Fixed guards and hinged gates shall be replaced with ones that are at least 60" in height and with a smaller mesh size such that the hazards cannot be reached. The machine area shall have guards installed underneath the machine zone and roller conveyor to limit access through the material infeed area.
- The existing low guards in between the two machine zones shall be removed to allow proper access to the electrical enclosure.
- The existing non-locking interlock on the hinged gate will be changed to a guard locking interlock. This interlock will disable the machine motions, and auxiliary equipment when a request to enter signal is given. Once the hazardous motions have been stopped, the interlock is then able to unlock.
- 3 Laser scanners (LS1, LS2, LS3) shall be installed around the machine area, and when the scanning zone is interrupted, the machine motions shall be halted. The machine shall be prevented from retracting when the zone is interrupted. The machine may resume operation once the zone is clear and a reset signal has been received. Operation shall resume using a separate start control from the reset control.
- LS1 will monitor the machine area and prevent GS1 from locking. If detection occurs while GS1 is locked, the machine motions, auxiliary equipment will stop and be prevented from resuming motion until the area has been cleared and a reset signal and separate start signal have been given.
- A Laser scanner shall be installed onto the machine paired with an auditory device. When the LS4 detection zone is interrupted, the auditory device shall emit a warning noise to indicate the

scanner detection zone has been interrupted. After a defined period of time, the machine zone will stop should the detection zone remain interrupted. The machine shall be speed maintained to below 250mm/s during regular production. Once the machine reaches the end of the conveyor, additional programing will be needed to prevent unintended stopping when the LS4 detection zone is interrupted by the machine frame.

Zone 2:

- The existing tunnel guard on the material outfeed conveyor shall be increased such that the clamps are at least 850mm away from the end of the guard. The conveyor shall be considered part of the safety guard, and no gaps shall be allowed that allows access to the machine hazardous motions.
- The existing tunnel guard interlock shall be upgraded to a dual channel non-locking interlock. When the GS2 interlock is open, the machine zone motions shall be stopped.
- The existing material outfeed conveyor will be replaced with one that does not have gaps between conveyor rollers. Any new hazards shall be evaluated, and sufficient risk reduction measures shall be implemented.
- The existing machine local disconnect shall be replaced with an emergency stop pushbutton ES1. When pressed, all motions on the machine shall be stopped. The other emergency stop devices in the current safety circuit shall be updated to stop all motions to avoid confusion on span of control.

Zone 3:

- New guarding shall be installed around the electrical panel to prevent whole body access to zone 1.
- The existing perimeter guarding shall be removed to allow access to the conveyor for periodic adjustments by personnel. There shall be new guarding installed to allow support for the new light curtains to be recommended and to limit undetected access to the machine.
- New light curtains, LC1 and LC2, will be installed along the new guarding in an L shape. When the detection area is broken, the machine zone motions will be prevented from running. The machine zone will be unable to retract while the curtain is interrupted. The LS4 functions of the machine zone will function independently from the function of LC1 and LC2.

Zone 4:

- The machine zone shall be relocated to allow easier access to the rear of the machine.
- The machine zone shall have a fixed guard added to the output that will prevent access to the hazardous motion.

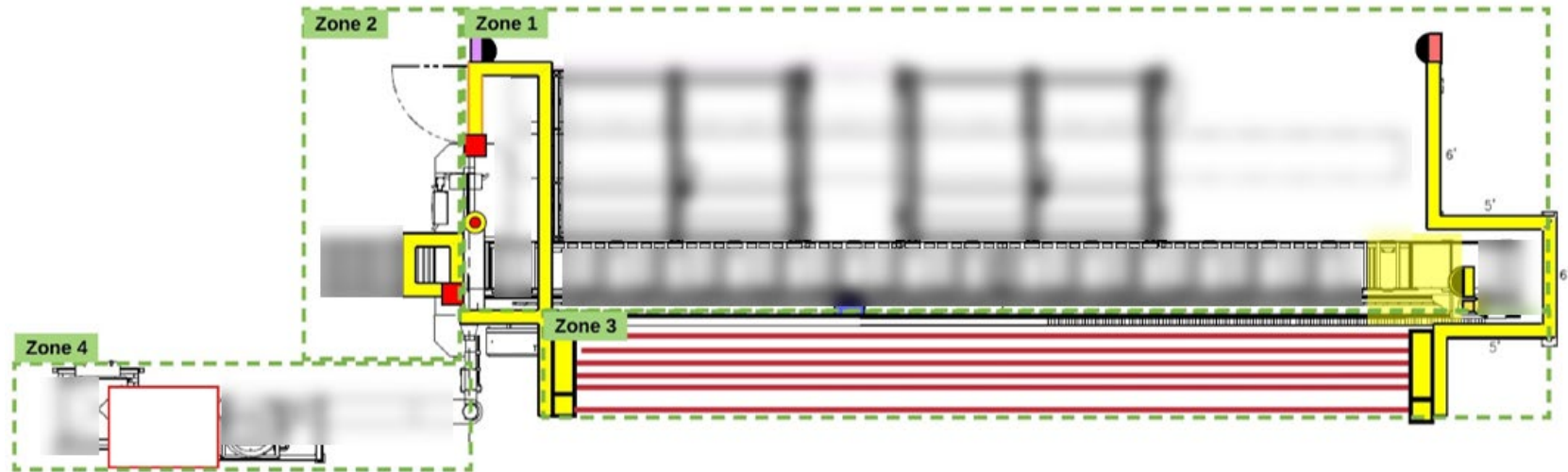


Figure 1: Machine Zones

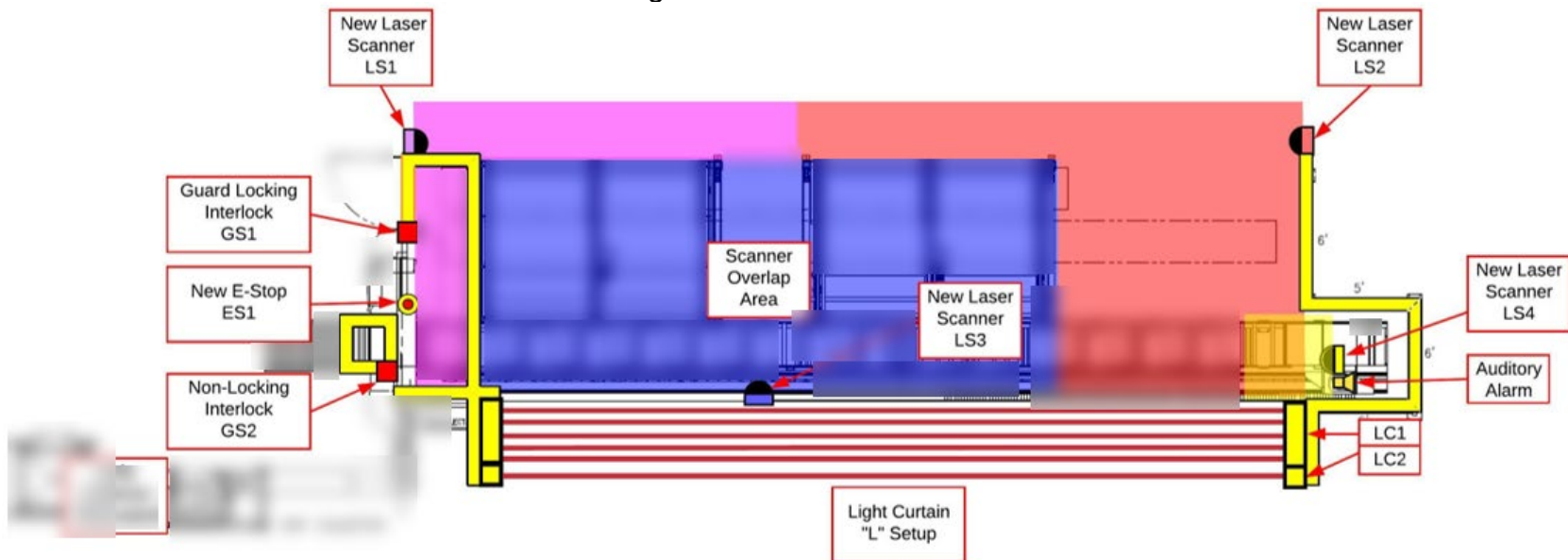


Figure 2: Safety Solution Layout

2.2 Control System Overview

Input Devices

- The new emergency stop (ES1) and existing E-Stops shall be wired into the new and existing Point I/O racks through new safety input cards.
- The replaced interlocks (GS1 and GS2) shall be wired into the new safety I/O racks through new safety input cards. The existing guard locking interlock shall also be integrated into the new safety system through the new safety input cards.
- The new laser scanners (LS1, LS2, LS3, and LS4) shall be wired into the new safety I/O racks through new safety input cards.
- The new light curtains (LC1 and LC2) Shall be wired into the existing safety I/O rack through new safety input cards.
- The feedback wires of the pneumatic valves, redundant contactors, and drives (STO hard wiring only) shall be wired into the new and existing safety I/O racks through the new safety input cards.

Safety Controller

- The existing PLC in this system is a safety programmable logic controller, which is currently connected via ethernet to existing safety I/O devices.
- The existing PLC shall be upgraded to a safety programmable logic controller with safety input and output cards to implement the safety system.

Output Devices and Signals

- The existing redundant contactors will be tied into the new safety PLC through the use of the new safety I/O racks using new safety cards.
- The existing Kinetix 5000 and Powerflex 525 drives may be controlled using safety outputs from the safety I/O, or through the existing ethernet connections.
- The existing pneumatic dump valve is not sufficient for a PL d circuit. A redundant pneumatic dump valve will be installed and tied into the new safety I/O rack through new safety output cards. Additional feedback pressure sensors may be installed to detect pressure past the safety valve.

2.3 The safety devices list

These will be the **Major** safety devices used in this project. Quantities and accessories will not be included in this list.

#	Location	Part Number	Manufacturer	Description
1	Panel	1769-L33ERM	Allen-Bradley	Safety PLC controller, 2MB memory, Compact Logix 5370 L3, up to Cat 4 PLe 
2	Panel	1734-AENTR	AB	Point I/O – Dual Port Network Adapter 
3	Panel	1734-IB8S	AB	Point I/O – 8 Point Safety Input module, 24VDC up to Cat 4 PLe 
4	Main Panel	1734-OB8S	AB	Point I/O – 8 Point Safety Output module, 24VDC, up to Cat 4 PLe 
5	GS1	124225	Euchner	CTP-L1 Interlock Unicode, guard locking, 2 OSSD, 24 VDC, M12 8-pin Up to SIL3, Cat 4 / PLe 
6	GS2	117328	Euchner	CES-I-AP Interlock Multicode, Non-contact interlock, 2 OSSD, 24 VDC, 5m Flying lead cable Up to SIL3, Cat 4 / PLe 

#	Location	Part Number	Manufacturer	Description
7	LS1 LS2 LS3 LS4	SZ-V04	Keyence	SZ-V Laser Scanner 8.4m protective range, 190° scan, 0.79° resolution, Up to SIL2, Cat 3 / PL d 
8	LC1	GLR64H	Keyence	GL-RH 25mm Resolution Light Curtain 49.21' Range, 50.39" Total Length Up to SIL3, Cat 4 / PLe 
9	LC2	GLR48H	Keyence	GL-RH 25mm Resolution Light Curtain 49.21' Range, 37.80" Total Length Up to SIL3, Cat 4 / PLe 
10	ES1	XN1E-LV413Q4MR	IDEC	XN E-Stop Pushbutton Latching, RED illuminated, 1NO-3NC, 44mm mushroom head, 33.5mm, 24 V AC/DC 
11	Pneumatic valve	VP744-5DZ1-04N-M-X538	SMC	Residual Pressure Release Valve, Up to Cat 4. 1/2" Connection. 

2.4 Hazardous Motion List

Listed below are the hazardous motions and the energy source/control that will be addressed in this safety integration project.

2.4.1 Electrical Motion

#	Motion Description	Energy Source	Section
1	MTRXXXX – Back Servo Motor	480VAC to Servo Drive	Zone 1
2	MTRXXXX – Servo Motor	480VAC to Servo Drive	Zone 1
3	MTRXXXX – Motor	480VAC to Servo Drive to 30HP motor	Zone 2

2.4.2 Hydraulic Motion

There are no hazardous hydraulic motions identified in this machine.

2.4.3 Pneumatic Motion

#	Motion Description	Energy Source	Section
1	Rear (Extend / Retract)	90 PSI Air	Zone 2
2	Front (Extend / Retract)	90 PSI Air	Zone 2
3	Section (Up / Down)	90 PSI Air	Zone 2

3. Safety Hazardous Motion Overview

The machine is comprised of four zones, the material infeed, material outfeed, material adjustment area, and the collector. The following are the safety device sets and the span of control. It is important to note that these states will assume the safety has not been reset regardless of the safeguard current state unless otherwise stated.

- Machine Safety OK
 - Comprised of all interlocks being locked or closed, all ESPE detection zones are clear, all E-Stops are not pressed, and there is no detected fault with the PLC. The machine has been reset and can resume function using a separate start command.
- Machine LS Set 1
 - Comprised of the ESPE Laser Scanner Devices LS1, LS2, LS3 detecting an object or person in their designated areas. LS1 has an additional detection area inside an enclosed space that will trigger additional safety when a detection event occurs.
- Machine LS Set 2
 - Comprised of the ESPE Laser Scanner Device LS4 detecting an object or person in the designated area longer than a designated time. During the detection a warning signal will be given.
- Machine LC Set 1
 - Comprised of the ESPE Light curtains LC1 and LC2 detecting an object or person in the designated area.
- Machine GS Set 1
 - Comprised of the interlock GS1 being unlocked.
- Machine GS Set 2
 - Comprised of the interlock GS2 being open.
- Machine No motion
 - Comprised of any emergency stop button being pressed, or if there is a fault detected by the Safety PLC such as a discrepancy or short circuit fault.

Electrical Motions							
Electrical Motion	Machine Safety OK	Machine LS Set 1	Machine LS Set 2	Machine LC Set 1	Machine GS Set 1	Machine GS Set 2	Machine No Motion
MTRXXXX–Servo Motor	Y	Y ¹	N	Y	N	N	N
MTRXXXX–Carriage Servo Motor	Y	Y ¹	N	Y	N	N	N
MTRXXXX–Saw Motor	Y	Y ¹	Y	Y	N	N	N
Motor 1	Y	N	Y	N	N	Y	N
Motor 2	Y	N	Y	N	N	Y	N
Pneumatic Motions							
Pneumatic Motion	Machine Safety OK	Machine LS Set 1	Machine LS Set 2	Machine LC Set 1	Machine GS Set 1	Machine GS Set 2	Machine No Motion
Clamp (Extend / Retract)	Y	N	N	Y	N	N	N
Clamp (Extend / Retract)	Y	N	N	Y	N	N	N
Section (Up / Down)	Y	N	N	N	N	N	N

Y – Motion is allowed in the designated state

N – Motion is prevented in the designated state

¹ LS1 has an additional zone inside the GS1 enclosed area that will stop these motions should an object or person be detected here.

4. Assumptions and Exclusions

Company Name is responsible for documenting the risk assessment for the machine. The safety functionality as described within this document is based on hazards observed and documented within the risk assessment performed on the machine by Safe-T-Sense and Company's request to have the machine be designed to meet a minimum Category X PL x safety rating per ISO 13849-1:2015.

Upon completion of the risk assessment, should any hazards exceed the minimum ratings above, it is the responsibility of Company Name to contact Safe-T-Sense to update this safety concept prior to engaging in any engineering activities.

5. Additional Requirements

As discussed during the STS pre-engineering site visit, Company Name will be responsible for completing the following installations prior to any safety integration as shown in Figure 2.

- Generation of Isolation of Energy Procedures (LOTO).
- Relocation of the machine zone.



Project name: SISTEMA Example Project

File date: 26/07/2024 14:14:42 Report date: 2/25/2025 Checksum: 1320175a471fb071639f44e7590afca4

PR Project name: SISTEMA Example Project

Project file name:	C:\SISTEMA\db\Projects\en\Projects\en\SISTEMA Example Project.ssm
Creation date:	26/07/2024 09:11:37
Project status:	In Progress
Project number:	20K i9iu13[otjnvpoq3jnrvcocruq348p9u
Project version:	1.0
Authors:	MPoynter
Project managers:	jfiahvfiuqwen;iovfquioehjfilq'ovfojq'f3q
Inspectors:	Joe Safety
Dangerous point/machine:	hazards
Documentation:	Risk Assessment.pdf
Document:	
Version of software:	2.1.1 build 2
Version of standard:	ISO 13849-1:2015, ISO 13849-2:2012
Checksum:	1320175a471fb071639f44e7590afca4
Options:	☒ Use DC intermediate levels for calculation of PFHD (more precise) ☐ MTTFD capping for category 4 lower from 2500 to 100 years.
Status:	✗ red
Note:	There are messages with red status listed for this project (or it's subordinate basic elements). These point out either some unaccomplished conditions or inconsistencies.
Message [Status of Message]:	- Please enter a positive real number for the nop. [red] - For this block an invalid MTTFD value of less than 3 years is computed. [red] - For this channel an invalid MTTFD value of less than 3 years is computed. [red] - The channels MTTFD has been cut from originally 21,759.3 to 100 a. For a channel 100 a is the maximum acceptable mean time to a dangerous failure. [green] - For this subsystem an invalid MTTFD value of less than three years is computed. [red] - Not all the conditions of the chosen category are met. Please check the list of requirements in the tab 'category' of the subsystem. [red] - The current configuration does not allow to calculate the PFHD value using the standard. [red] - Please check whether for the required PL a component with a DC of 0% is in accordance with the requirements of the category 3 in terms of failure detection. [yellow] - Please enter a name for this block. [red] - Please check whether for the required PL a component with a DC of 0% is in accordance with the requirements of the category 3 in terms of failure detection. [yellow] - Please enter a positive real number for the nop. [red] - For this block an invalid MTTFD value of less than 3 years is computed. [red] - For this channel an invalid MTTFD value of less than 3 years is computed. [red] - For this subsystem an invalid MTTFD value of less than three years is



Project name: SISTEMA Example Project

File date: 26/07/2024 14:14:42 Report date: 2/25/2025 Checksum: 1320175a471fb071639f44e7590afca4

PR Project name: SISTEMA Example Project

computed. [red]

- Not all the conditions of the chosen category are met. Please check the list of requirements in the tab 'category' of the subsystem. [red]

- Not all the conditions of the PL are met. Please check the list of additional parameters to determine the PL in the tab 'PL' of the subsystem. [red]

- The current configuration does not allow to calculate the PFHD value using the standard. [red]

- The channels MTTFD has been cut from originally 34,722.2 to 100 a. For a channel 100 a is the maximum acceptable mean time to a dangerous failure. [green]

Print options

☒ Show Safety functions

☐ also show Subsystems

☐ also show Blocks

☐ also show Elements

Contained safety functions

SF Name: Name of the safety function [SF1]

Required: PLr d

Reached: PL -

PFHD [1/h]: -

Status: red

List of devices with a permissible operation time (T10D) of less than 20 years:

- No devices known -

Project name: SISTEMA Example Project

File date: 26/07/2024 14:14:42 Report date: 2/25/2025 Checksum: 1320175a471fb071639f44e7590afca4

EXCLUSION OF LIABILITY

Care has been taken in production of the software SISTEMA, which corresponds to the state of the art. It is made available to users free of charge.

Die Haftung des Institut für Arbeitsschutz der DGUV (IFA) ist damit auf Vorsatz und grobe Fahrlässigkeit (§ 521 BGB) bzw. bei Sach- und Rechtsmängel auf arglistig verschwiegene Fehler beschränkt (523, 524 BGB).

The Institute for Occupational Safety and Health of the German Social Accident Insurance undertakes to keep its website free of viruses; nevertheless, no guarantee can be given that the software and information provided are virus-free. The user is therefore advised to take appropriate security precautions and to use a virus scanner prior to downloading software, documentation or information.

NOTE

This document is not a complete technical documentation according to EN ISO 13849-1:2015, clause 10.

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STS Safety Engineer

Inspectors

STS Engineering Manager

Date, signature:

Authors

xx / xx / xxxx

Inspectors

xx / xx / xxxx

