

Powder Disposal System

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1 Statutory Information

Disclaimer

The information contained in this document is confidential and only for informing intended recipient. This information may not be used, published or redistributed without the prior written consent of Cybernetik Technologies Pvt. Ltd. Legal action will be taken against the violator.

Warranty

The warranty period will be 12 months from the date of successful testing at Cybernetik. The warranty work against any manufacturing defects in the equipment or parts of the equipment designed and manufactured by us. Warranty on bought-out items by Cybernetik is restricted by the warranty period specified by the specific vendors. Any extended warranty for the bought-out items, unless stated otherwise in the above document, will be charged extra. Under all circumstances our liability arising out of any manufacturing defects/workmanship if any, will be restricted to the ex-works price of the offered system and not extended to any consequential damage. Our warranty extends to the system provided by us and is not related to any other machinery or related equipment which may be linked to the system. Warranty above said will not be applicable if usage and maintenance instruction are not properly adhered to as per our guidelines and instructions. The warranty does not apply to normal wear, improper storage and maintenance, failure to observe operating instructions, manhandling and use of system beyond defined use as per agreement. Replacement of defective components, described above, does not include international freight, customs and duties, as applicable. It also doesn't include manpower cost required for reinstallation of the said item.

In the event of replacement of any individual element (subject to conditions mentioned above), the said element needs to be sent back to Cybernetik and the replacement/repair will be done by individual equipment manufacturer and this will be facilitated by Cybernetik.



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2 Purpose of this Manual

This manual contains instructions for:

- Installation Instruction
- Power up and Operation Sequence
- Alarm troubleshooting
- Preventive Maintenance

The manual is organized as below,

Table 1: Outline of the manual

Chapter	Description
Purpose of this Manual	This chapter
General Safety Instruction	Safety instructions to be followed.
System Description	Information on working and product description
Operation	Power up sequence and Operating Procedure.
Alarm Diagnostic and Troubleshooting	How to diagnose and troubleshoot the alarms in the system.
Preventive Maintenance	Information about maintenance schedule.
Spare Parts List	Contains the mechanical/electrical spare list.

3 General Safety

3.1 Identify the Safety



When you see the above symbol on your machine or in this manual, be alert to the potential for personal injury. Follow recommended precautions and safe operating practices.

3.2 Understand Signal Words



DANGER: Danger refers to the state of being exposed to harm, risk, or the potential for adverse consequences that may threaten one's well-being, safety, or life.

WARNING: A warning is a communication or signal that alerts individuals to the presence of a potential danger, threat, or problem, urging them to take precautionary measures or actions to avoid harm or adverse outcomes.

CAUTION: Caution is a state of alertness and careful consideration, typically exercised in response to potential risks or dangers.

3.3 Safety Instruction

- Always keep work area clean.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.
- Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs.
- Additional safety information contained on parts and components sourced from suppliers that is not reproduced in this manual.
- Learn how to operate the system. Do not let anyone operate the system without instruction.

3.4 Safety Equipment

Use the following safety equipment within the work area:

1. Safety Helmet, Safety goggles, preferably with side shields, Protective shoes and gloves, First-aid kit, Fire extinguisher



3.5 Transport the System Safely

A disassembled system is best transported on a flatbed carrier. Use crane to lift the system assemblies and load it on a heavy hauler for transportation.

Before transporting the system, make sure that the sub-assemblies are having suitable attachment points. Use chains to secure the system assemblies to the carrier.



4 Introduction

4.1 About

The **Tote Loading, Discharge & Powder Processing System** is a high-safety, custom-engineered solution designed for the controlled handling and processing of aluminum powder under inert and enclosed conditions. Developed to address the critical risks associated with fine metal powders, the system automates the complete workflow—from tote loading and precise positioning to inert gas purging, controlled discharge, powder transfer, and final product collection—while ensuring maximum process safety and operational reliability.

This system integrates robust mechanical handling equipment, sealed storage hoppers, roller and screw conveyors, and advanced inert gas purging technology. Intelligent sensors, interlocks, and oxygen monitoring systems work in coordination to maintain an oxygen-deficient environment, effectively minimizing the risks of oxidation, dust ignition, and explosion. Controlled discharge mechanisms, combined with vibratory and hammering devices, ensure complete material evacuation and accurate batch transfer.

The aluminum powder is seamlessly conveyed to the reaction chamber through a metered screw conveyor, enabling consistent feed rates and effective process isolation. Inside the reaction chamber, controlled nitrogen injection and continuous agitation ensure uniform reaction conditions, while dedicated exhaust systems safely handle gases and fumes generated during processing. The finished product is then securely collected in sealed drums, ready for safe storage and handling.

With minimal manual intervention, enhanced safety controls, and precise material management, the Tote Loading, Discharge & Powder Processing System delivers a reliable, scalable, and high-performance solution. Its application-focused design ensures uninterrupted operation, improved batch consistency, and compliance with stringent safety standards, setting a benchmark in aluminum powder handling and processing systems.

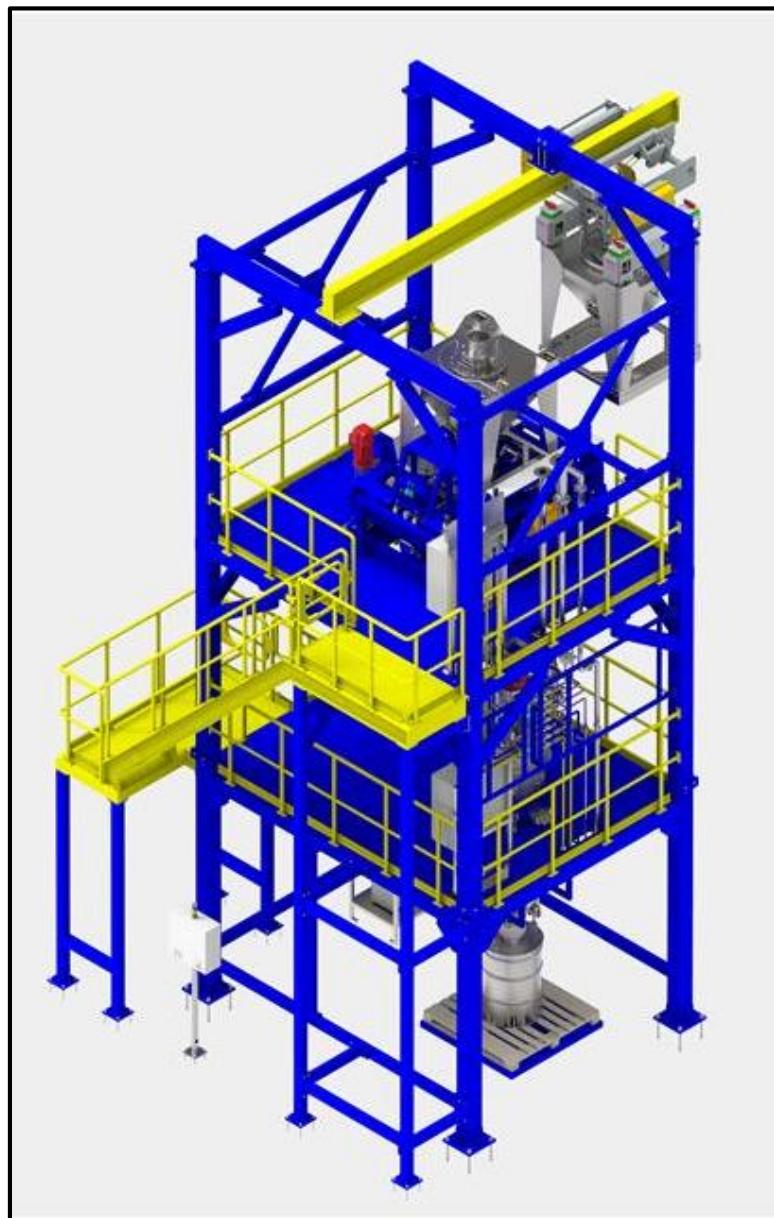


Figure 1: Isometric View

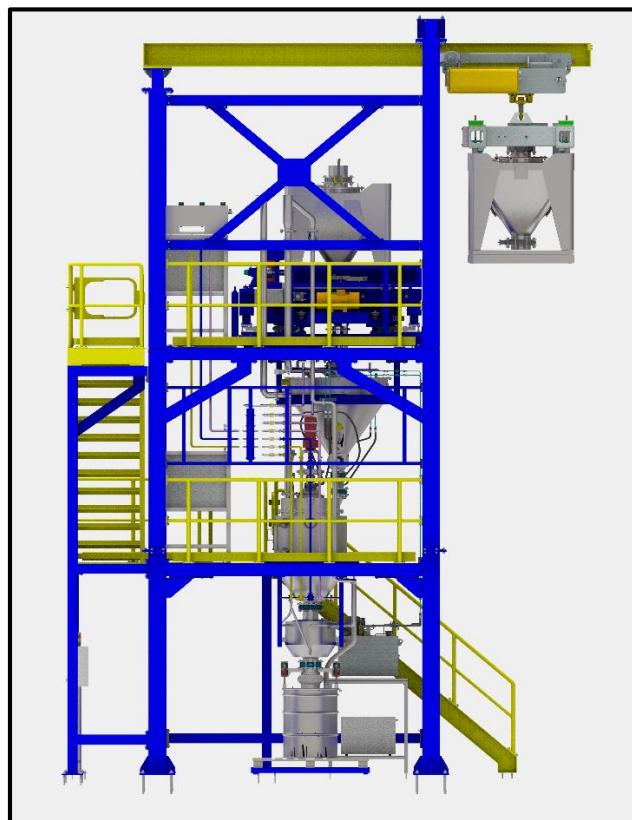


Figure 2: Side View

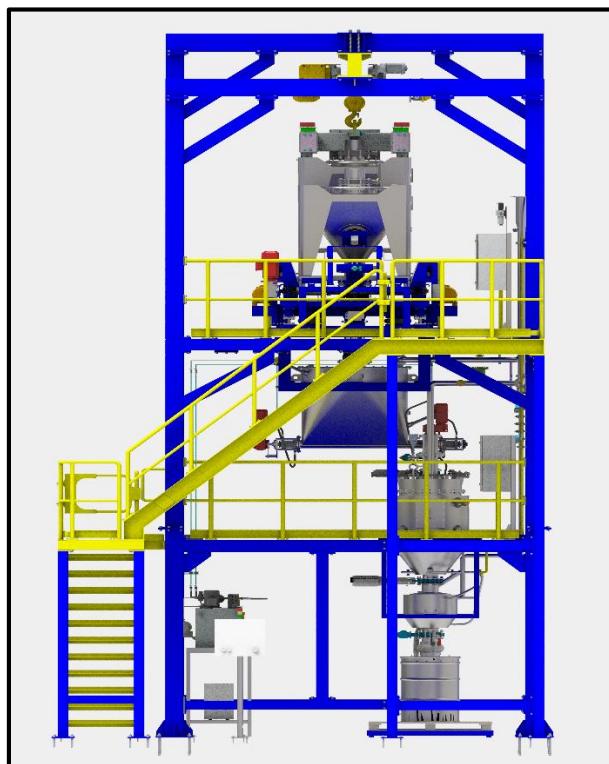


Figure 3: Front View

5 Technical Specifications

This chapter consists of both mechanical and electrical specifications. It has a set of information and requirements for the product in order for it to work as it was meant to.

Table 2: Technical Specification

Technical Specifications		
1	MATERIAL OF CONSTRUCTION (MOC)	SS-304 (FOR CONTACT PART) MS- (FOR STRUCTURE)
2	SURFACE FINISH	SS-304 - (FOR CONTACT:- MIRROR FOR NON -CONTACT:-GLASS BEAD) MS- (POWDER COATED)
3	COLOR CODE FOR MS	RAL 5002 (ULTRAMARINE BLUE) RAL 1004 (GOLDEN YELLOW) FOR RAILING
4	TOTAL STATIC WEIGHT OF STRUCTURE	~ 11000 Kg
5	TOTAL STATIC WEIGHT OF DISCHARGE STATION	~ 13000 Kg

5.1 Electrical Specifications

Requirements:

1. Need separate earth pit for Instrumental Earthling (IE) and Power Earthling (PE).
2. Earth resistance should be below 5 Ohm.

Following are the electrical specifications of the system.

Table 3: Electrical Details

Control Panel	
Power Supply	480 VAC, 60Hz, 3 Phase
Connected Load	12 kW, 16 HP , 26 AMP
Design Load (connected *1.25)	15 kW, 20 HP , 32 AMP

Table 4: Start –Up Sequence

Sr. No	System Start Up Sequence
1	Turn On Main Panel Power Switch.
2	Turn On all MCB's & MPCB's.
3	Check PLC and IO module get started.
4	Check HMI get started.
5	Check Prestart Condition on HMI is Healthy.
6	Check Safety Condition is healthy on HMI.
7	Put System In auto mode,
8	Tower Lamp Indicates Green Blinking. (Auto Selected)
9	Press system start button for 3 seconds. (System gets started)
10	Tower Lamp Indicates Solid Green. (Auto Started)
11	System is started.

5.2 Tower Lamp Status

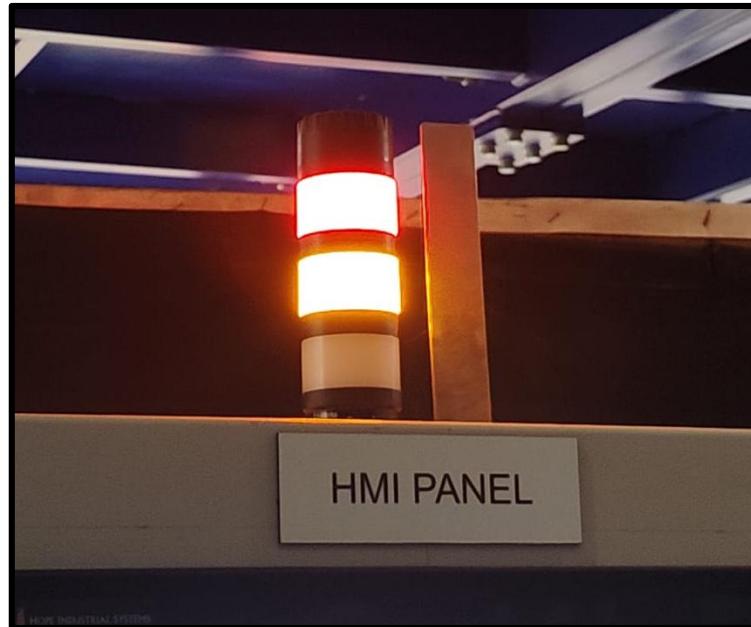


Figure 4: Tower Lamp

The following table describes the light color status shown by dome lamp.

Table 5: Light Color Status

Lamp Color	Status
Fault (Steady Red)	System is at Fault and requires RESET
Manual (Amber)	Manual Operation is done
Auto (Green)	System is set at Auto Mode

6 Operation

6.1 Startup sequence

Follow below Power up sequence.

1. Switch on the main Isolator switch on the control panel.



Figure 5: Isolator Switch

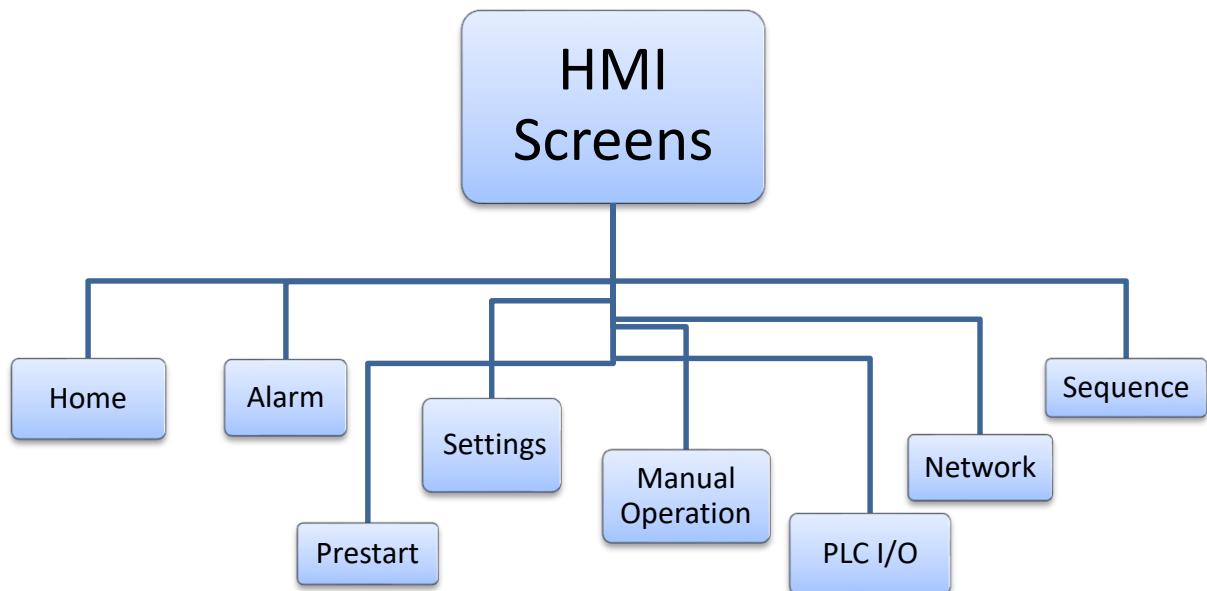
2. Switch on all the MCBs, MPCBs, inside the panel.



Figure 6: MCBs, MPCBs, RCCBs

3. Check the incoming power supply parameters from the VFD meter.

The below figure shows the overall layout of the HMI



8 Process Flow

Powder Disposal System – Detailed Description

The Tote Loading, Discharge & Powder Processing System is designed to safely handle aluminium powder through controlled mechanical handling, inert gas purging, and enclosed transfer operations. The entire system installed on the top floor ensures precise material handling while minimizing risks associated with dust generation, oxidation, and explosion. All operations are monitored through sensors, interlocks, and controlled sequencing to maintain process safety and consistency.

1. Tote Loading Operation

Aluminium powder required for the process is pre-filled into totes with a specified and accurately weighed quantity, ensuring batch consistency.

The loading operation is performed using an overhead hoist system. The hoist lifts the filled tote from the staging area and carefully places it onto the designated tote loading station on the top floor.

Once the tote is positioned:

- Mechanical guides ensure accurate centering and orientation of the tote with respect to the conveyor and discharge station.
- Sensors confirm the correct placement of the tote on the loading station and verify that it is seated correctly and ready for further operation.

After successful detection and validation, the tote is transferred from the loading station to the discharge station using a roller conveyor system.

The conveyor provides smooth, controlled movement of the tote while maintaining alignment and minimizing mechanical shocks.

Following transferring via roller conveyor, the tote is securely locked in position using mechanical stoppers. These stoppers prevent any unintended movement, tipping, or vibration during discharge operations.

2. Tote Discharge & Inert Gas Purging

At the discharge station, a sealed and insulated storage hopper is positioned directly below the tote outlet. All joints and interfaces of the hopper are fully sealed to prevent leakage of powder or air.

An automatic discharge valve is installed between the tote outlet and the storage hopper in order to discharge the Argon Gas into the Storage Hopper.

Before initiating powder discharge:

- Argon gas is introduced into the storage hopper through the automatic valve and dedicated purging ports.
- The argon purging displaces atmospheric air and establishes an inert environment inside the hopper and discharge zone.
- Oxygen concentration within the hopper is continuously monitored using an oxygen analyser.

Once the oxygen level is reduced to below 5%, aluminium powder is discharged from the tote into the hopper. Argon purging continues throughout the discharge process to maintain inert conditions and eliminate the risk of oxidation, dust ignition, or explosion.

To ensure complete and efficient emptying of the tote:

- External hammering devices and vibratory mechanisms are activated intermittently.
- These mechanisms help dislodge any powder adhering to the internal walls or corners of the tote, preventing material retention and ensuring accurate batch transfer.

After complete discharge is confirmed, the valve is closed, and the empty tote can be released and moved out of the system.

3. Powder Transfer to Reaction Chamber

The aluminium powder collected in the storage hopper is transferred to the reaction chamber using a screw conveyor system. The screw conveyor provides controlled, metered feeding of the powder, ensuring a uniform and consistent flow rate into the downstream process.

A screw conveyor's main function is to transport materials horizontally, vertically, or at an incline by rotating a helical screw blade (flighting) inside a tube or trough, effectively pushing the material from an inlet to an outlet, making it ideal for controlled feeding and moving materials.

The screw conveyor also acts as a barrier between the hopper and reaction chamber, minimizing backflow of gases and maintaining process isolation.

Inside the reaction chamber:

- An agitator continuously mixes the incoming powder to maintain homogeneity and prevent localized accumulation.
- Nitrogen gas is introduced into the chamber to initiate and control the burning or reaction process under regulated conditions.
- The controlled nitrogen atmosphere ensures stable reaction behaviour while minimizing safety risks.

The gases, fumes, and smoke generated during the reaction are collected and routed through dedicated exhaust pipelines. These pipelines are designed to handle high temperatures and particulate-laden gases and direct them safely toward the exhaust.

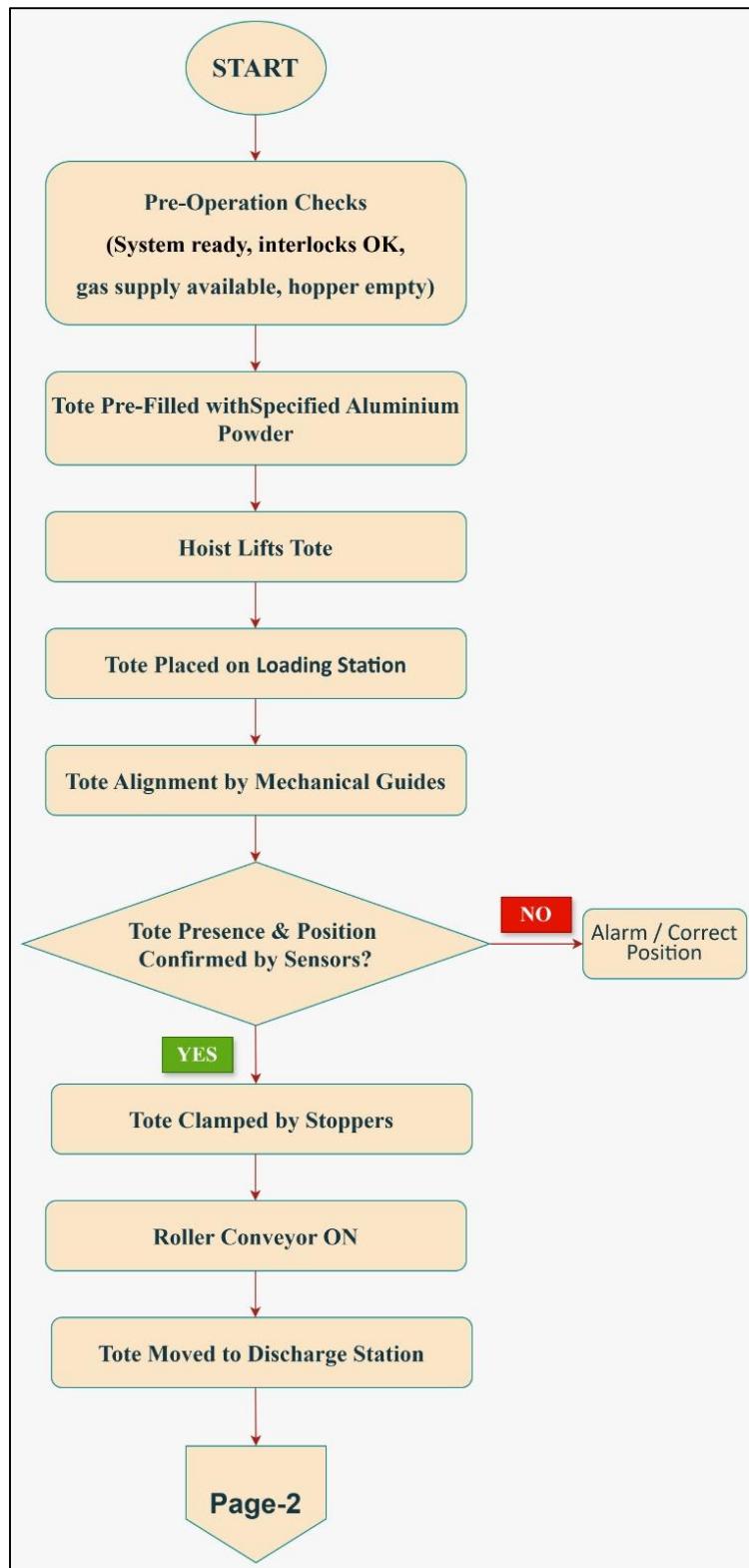
4. Product Collection

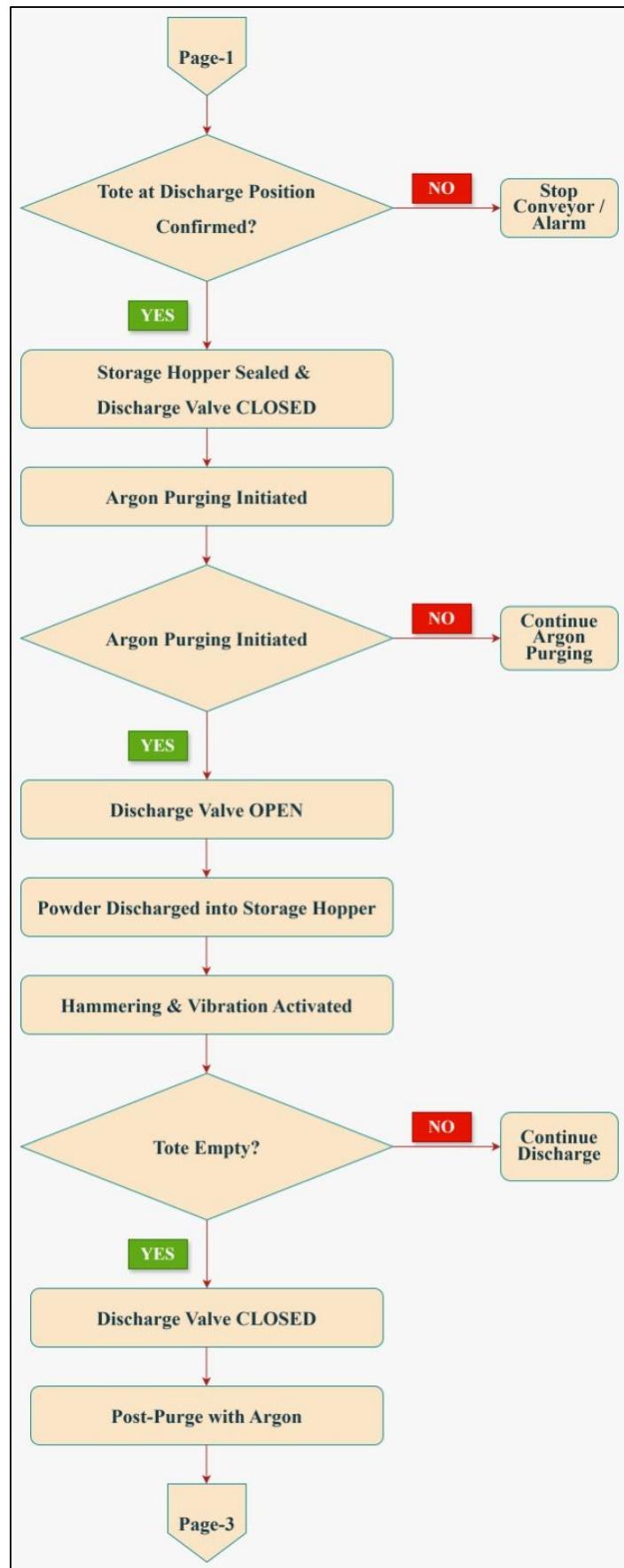
The final processed product exiting the reaction chamber is directed into collection drums located at the discharge point. These drums are designed for safe handling and storage of the processed material.

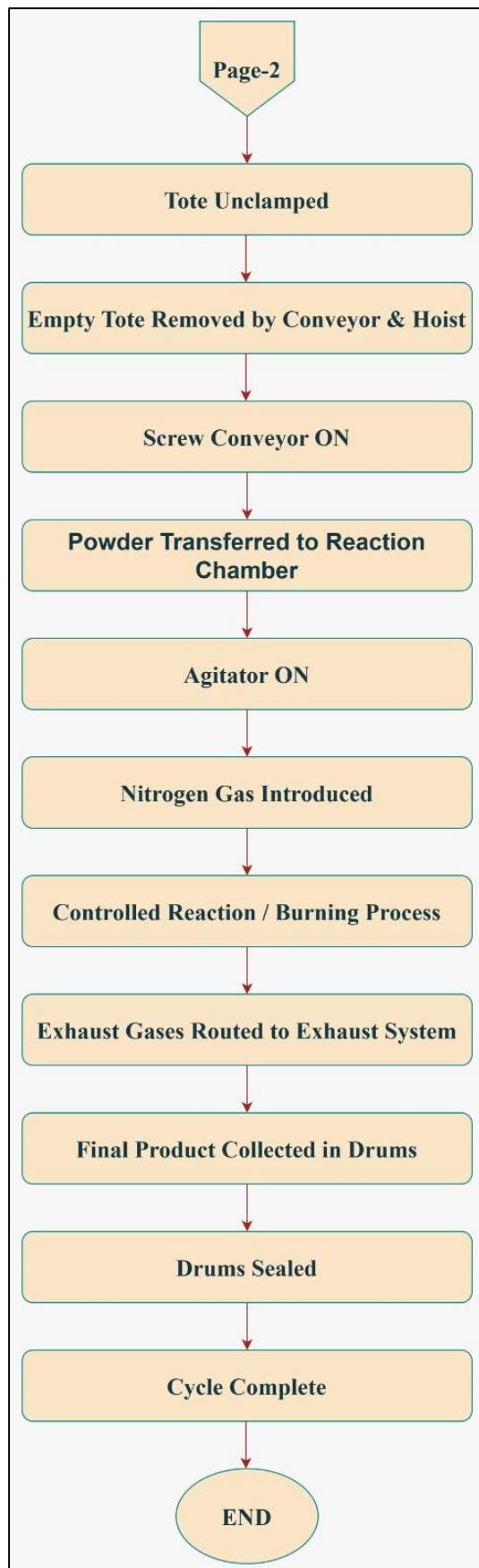
Once filled:

- The drums are sealed to prevent contamination, moisture ingress, and material loss.
- Proper sealing also ensures safe storage and transportation of the finished product.

This completes one full processing cycle, from tote loading to final product collection, under controlled and safe operating conditions.







Welcome Screen

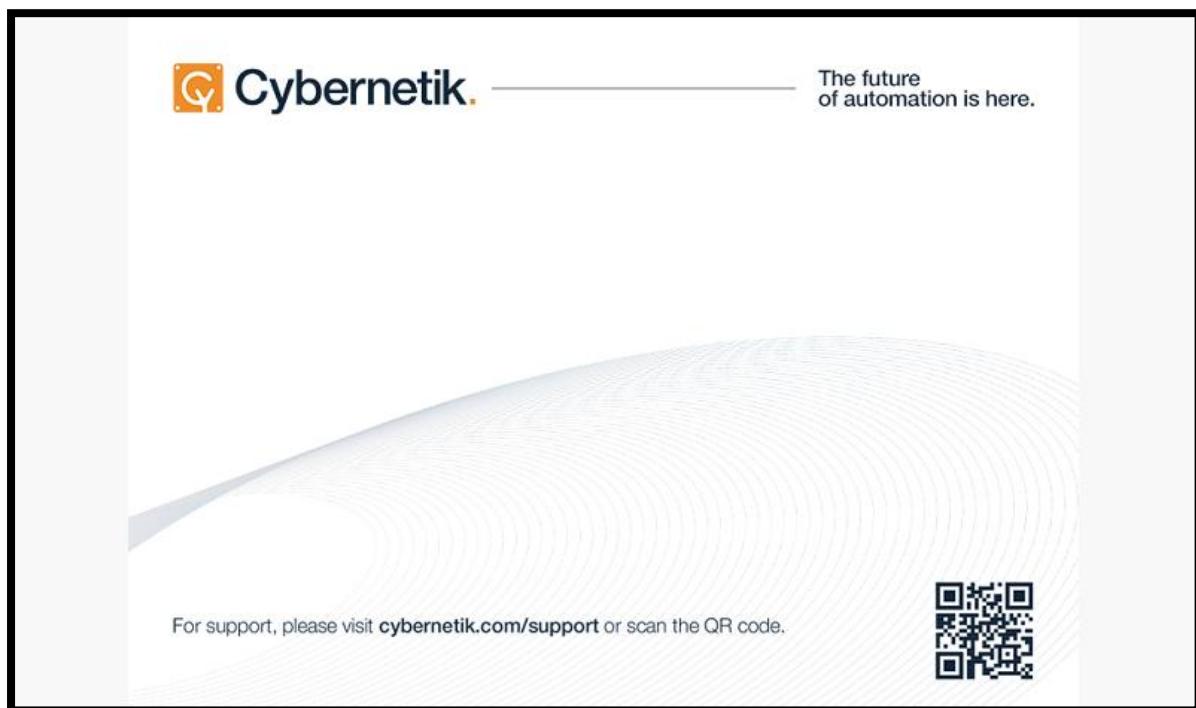
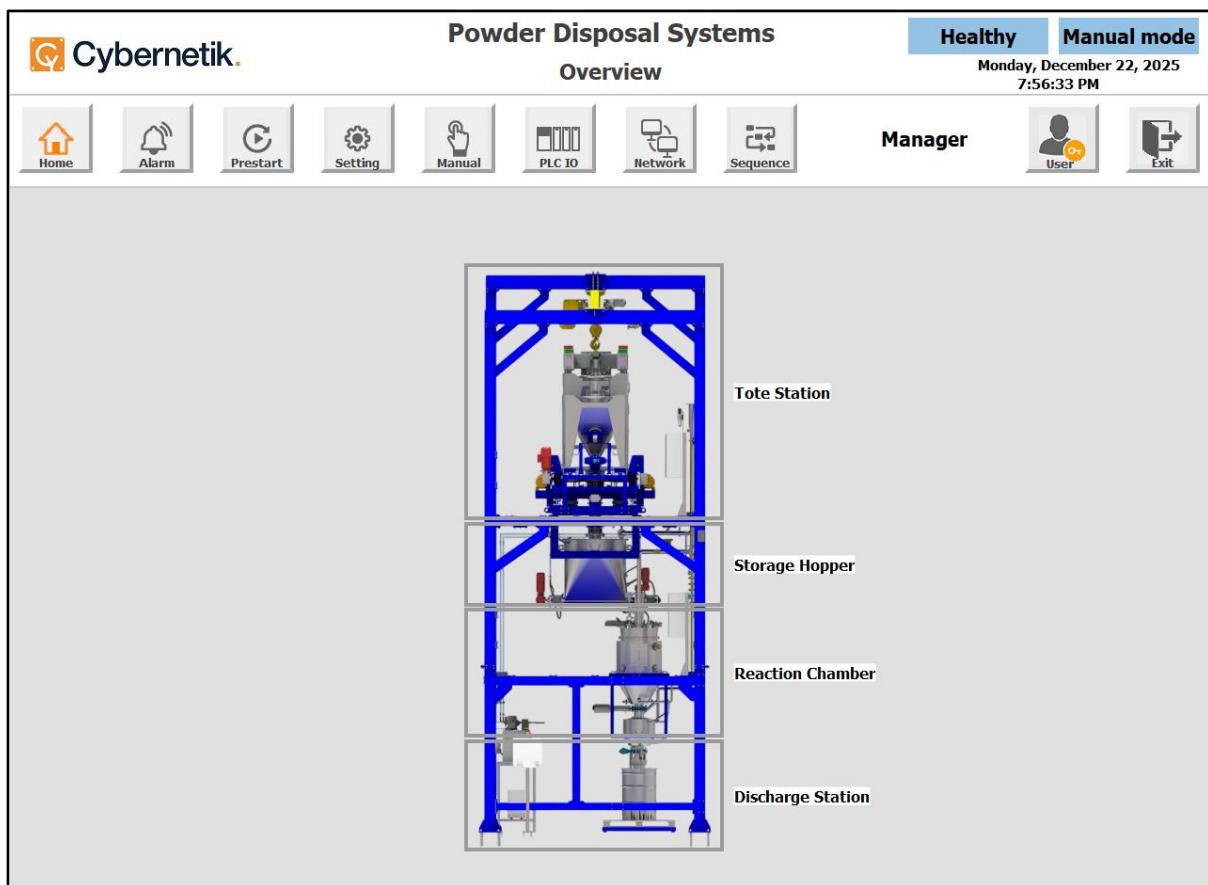


Figure 7: welcome screen

10 Overview

**Figure 8: Overview**

1. Screen Purpose

The Overview screen provides operators and supervisors with a graphical representation of the complete Powder Disposal System.

It allows quick monitoring of:

- System health and operating mode
- Major process stations and material flow
- Navigation to alarms, settings, manual controls, and PLC diagnostics

This screen is typically used for system status verification before start-up, during operation, and for troubleshooting.

2. Header Section

2.1 System Status Indicator

- **Healthy** (top right)
 - Confirms that no active faults or critical alarms are present.
 - If an abnormal condition occurs, this status will change accordingly.

2.2 Operating Mode

- **Manual Mode**
 - Indicates that the system is currently in manual operation.
 - In this mode, individual equipment can be operated manually through the Manual screen.
 - In Auto mode, sequence-based operation is enabled.

3. Navigation Menu (Top Bar)

The top navigation bar allows access to key system functions:

Icon	Screen Name	Function
	Home	Returns to the main overview screen
	Alarm	Displays active and historical alarms
	Prestart	System readiness and interlock checks
	Setting	System parameters and configuration
	Manual	Manual control of individual devices
	PLC IO	Live PLC input/output status
	Network	Communication and network diagnostics
	Sequence	Automatic process sequence monitoring

4. User Information Section

4.1 User Role

- **Manager**
 - Indicates the current logged-in user access level.
 - Determines which controls and settings are accessible.

4.2 User & Exit Buttons

- **User:** Login / user management options.
- **Exit:** Safely exits the HMI interface.

5. System Layout (Central Graphic)

The central area displays a vertical, multi-level schematic of the powder disposal system. This visual layout reflects the actual physical arrangement of equipment from top to bottom.

6. Process Stations Description

6.1 Tote Station (Top Level)

- Location where **powder-filled totes are loaded** into the system.
- Typically involves:
 - Hoist or lifting mechanism
 - Tote positioning and clamping
 - Presence and alignment sensors
- Acts as the **entry point** for powder into the process.

6.2 Storage Hopper (Second Level)

- Temporarily stores powder discharged from the tote.
- Ensures:
 - Controlled buffering of material
 - Continuous and uniform feed to downstream equipment
- May include level sensors and isolation valves.

6.3 Reaction Chamber (Third Level)

- The core processing unit where:
 - Powder undergoes the intended reaction or treatment
- Designed with:
 - Controlled environment
 - Safety interlocks
 - Instrumentation for process monitoring

6.4 Discharge Station (Bottom Level)

- Final stage of the system.
- Processed powder is:
 - Discharged safely
 - Collected into containers or downstream systems
- Includes discharge valves and safety isolation mechanisms.

7. Operational Use of the Overview Screen

Operators should use this screen to:

- Verify **system health before starting operations**
- Confirm **correct operating mode (Manual / Auto)**
- Understand **material flow through different stations**
- Quickly identify the **location of issues** before navigating to detailed screens

10.1 Inerting Process

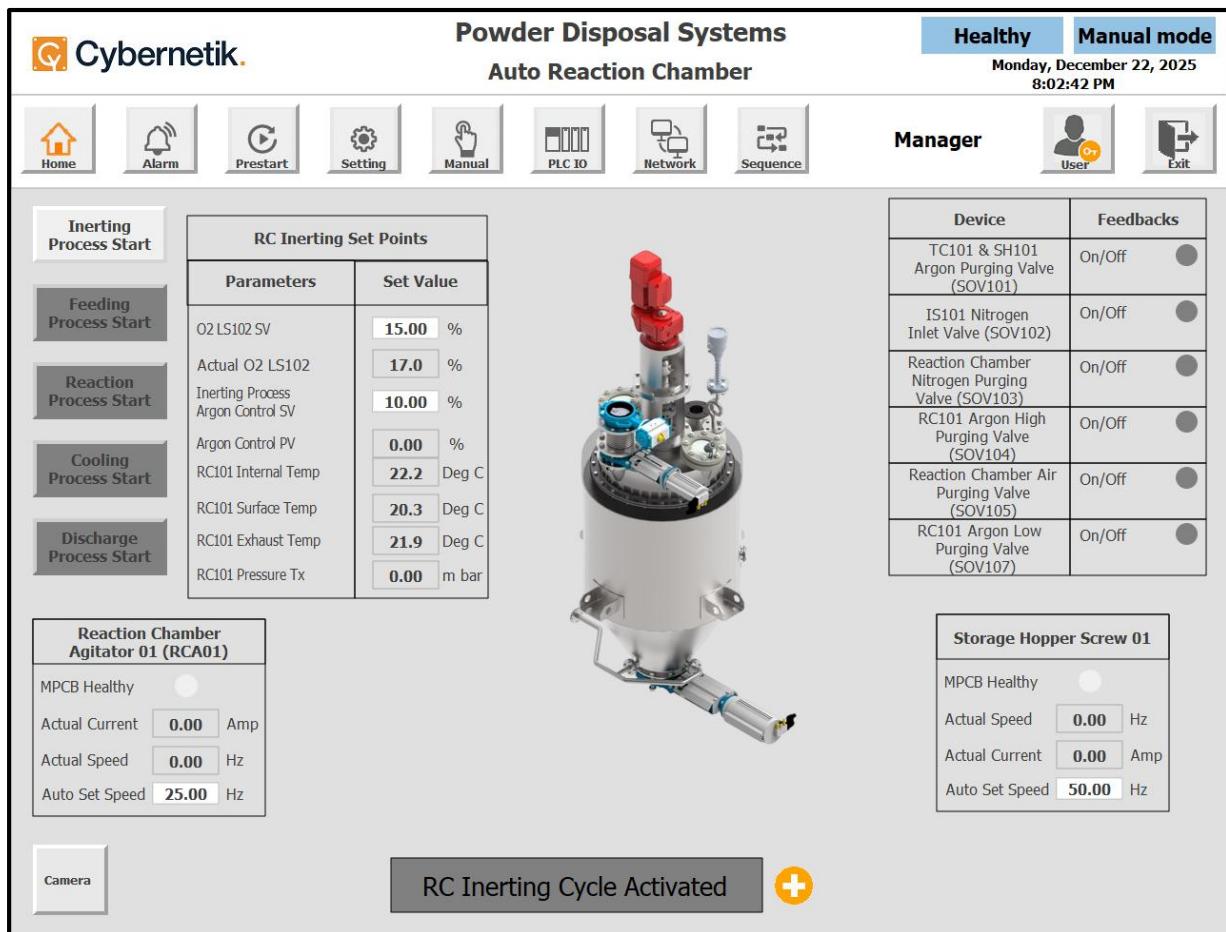


Figure 9: Inerting Process

1. Screen Purpose

The Inerting Process screen is used to monitor and control the Argon Gas regularization during automatic operation, with specific emphasis on inerting, feeding, reaction, cooling, and discharge processes.

This screen provides:

- Process start controls
- Inerting parameter monitoring
- Valve status feedback
- Agitator and screw feeder status
- Real-time temperature, pressure, and Oxygen concentration data

RC Inerting Cycle Status

Status Banner (Bottom Center)

- “**RC Inerting Cycle Activated**”
 - Confirms that the inerting process is currently active.
 - Indicates argon purging and oxygen reduction is in progress.
 - On clicking “+” button at the bottom, the sequence screen for RC01 Inerting is appeared.

2. Header Section

2.1 System Health & Mode

- **Healthy**: No active alarms or faults in the system.
- **Manual mode** (top right): Indicates overall system mode selection.
 - Even when the system is globally in Manual mode, this screen displays automatic sequence logic for the reaction chamber.

3. Navigation Menu

The top navigation bar allows access to:

- **Home** – System overview
- **Alarm** – Alarm and fault monitoring
- **Prestart** – Interlock and readiness checks
- **Setting** – Process configuration
- **Manual** – Manual device operation
- **PLC IO** – Live PLC signal status
- **Network** – Communication diagnostics
- **Sequence** – Auto sequence visualization

4. Process Control Buttons (Left Panel)

The left-hand side contains **process sequence initiation buttons**. These are typically enabled only when all interlocks are satisfied.

4.1 Inerting Process Start

- Initiates the **reaction chamber inerting cycle**.
- Argon purging begins to reduce oxygen concentration to safe limits.

4.2 Feeding Process Start

- Starts controlled feeding of powder into the reaction chamber.
- Enabled only after successful inerting.

4.3 Reaction Process Start

- Initiates the chemical or thermal reaction sequence inside the chamber.

4.4 Cooling Process Start

- Activates cooling logic once the reaction is complete or when required.

4.5 Discharge Process Start

- Starts discharge of processed material from the reaction chamber to the downstream system.

5. RC Inerting Set Points Panel

This panel displays critical inerting parameters and live process values.

5.1 Oxygen Concentration

- O₂ LS102 SV – Oxygen set value (%)
- Actual O₂ LS102 – Real-time oxygen level (%)

5.2 Inerting Control

- Inerting Process Argon Control SV – Argon control set point (%)
- Argon Control PV – Actual argon flow / control value (%)

5.3 Temperature Monitoring

- RC101 Internal Temperature (°C)
- RC101 Surface Temperature (°C)
- RC101 Exhaust Temperature (°C)

5.4 Pressure Monitoring

- RC101 Pressure Tx – Reaction chamber pressure (mbar)

These parameters ensure a **safe, oxygen-free environment** inside the reaction chamber.

6. Reaction Chamber Graphic (Center)

The central 3D representation provides a **visual reference of the reaction chamber assembly**, including:

- Inlet and exhaust connections
- Agitator drive
- Purging and process connections

This visualization helps operators quickly correlate alarms or feedbacks with physical equipment.

7. Device Status & Feedback Panel (Right Side)

This panel shows argon and air purging valve status with real-time on / off feedback.

7.1 Feedback Indication

- **On/Off status lamps** confirm actual valve position.
- Ensures commanded actions are physically executed.

8. Agitator Status Panel

Reaction Chamber Agitator 01 (RCA01)

- **MPCB Healthy** – Motor protection status
- **Actual Current** – Motor current (Amp)
- **Actual Speed** – Running speed (Hz)
- **Auto Set Speed** – Target speed in automatic mode

The agitator ensures **uniform mixing and reaction consistency**.

9. Storage Hopper Screw Status Panel

Storage Hopper Screw 01

- **MPCB Healthy** – Motor protection status
- **Actual Speed** – Screw speed (Hz)
- **Actual Current** – Motor current (Amp)
- **Auto Set Speed** – Automatic feeding speed

This screw controls material feed rate into the reaction chamber.

10. Camera Button

- Provides access to **live camera feed** for visual monitoring of the reaction chamber area.

10.1.1 Inerting Sequence

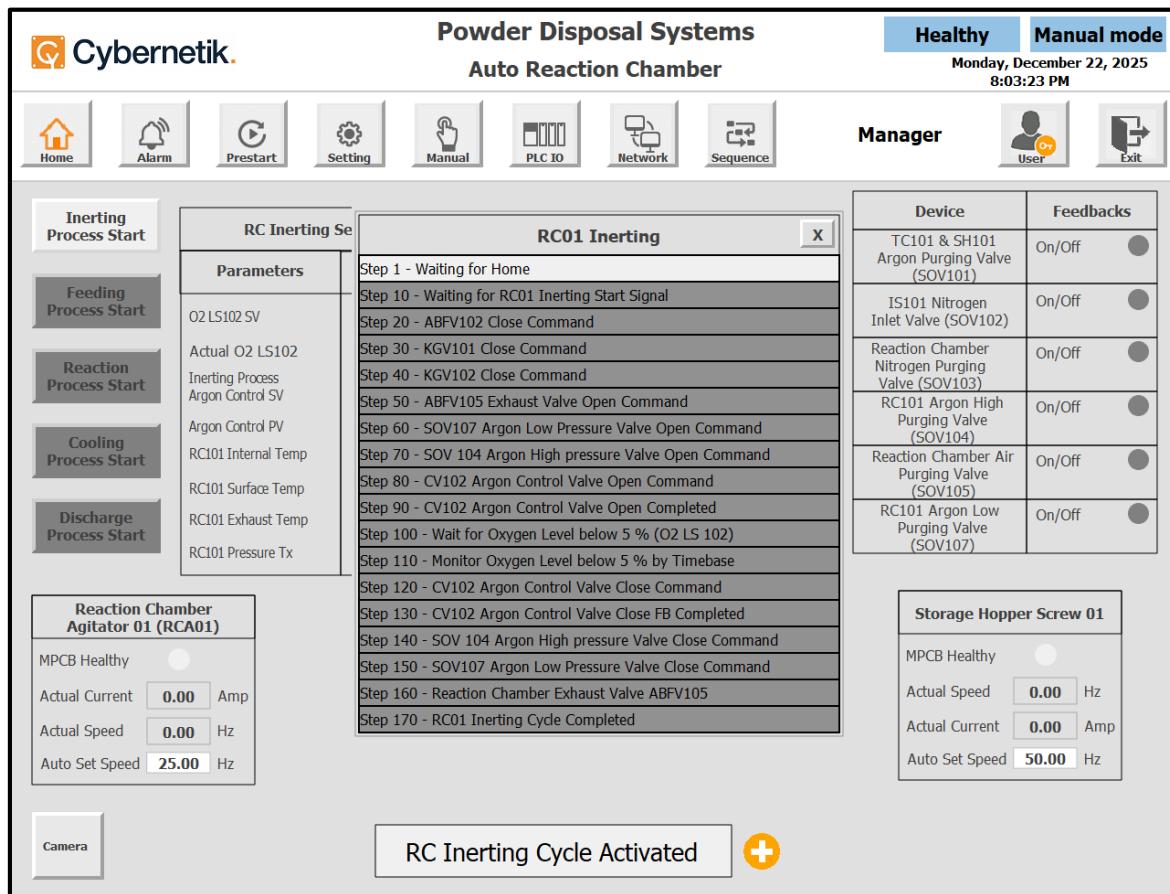


Figure 10: Inerting Sequence

Screen Purpose

The RC01 Inerting screen provides a step-by-step visualization of the automatic inerting sequence of the Reaction Chamber (RC01).

It allows operators to:

- Monitor real-time progress of the inerting cycle
- Verify valve actuation order
- Ensure oxygen concentration is reduced to safe limits
- Confirm successful completion of inerting before feeding or reaction

This screen is primarily used during start-up, safety verification, and troubleshooting.

10.2 Feeding Process

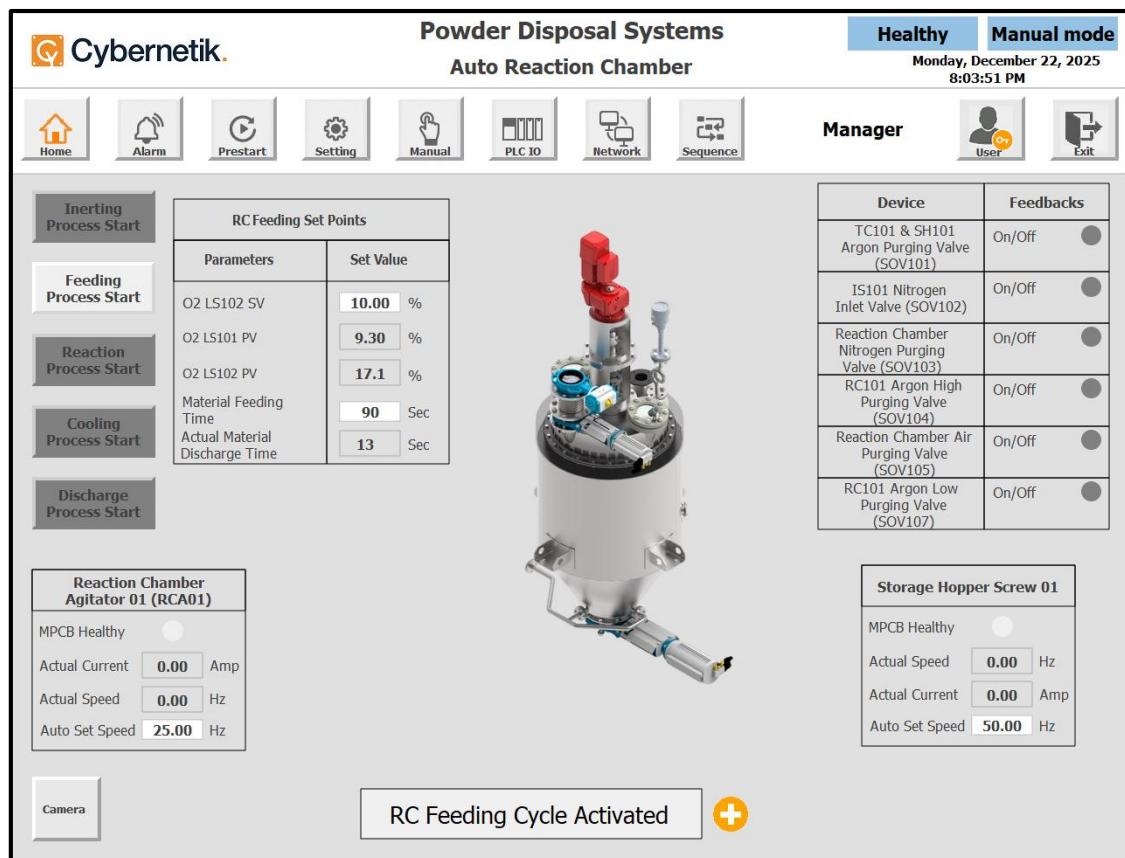


Figure 11: Feeding Process

1. Screen Purpose

The RC Feeding Cycle screen is used to control and monitor the automatic feeding of powder material into the Reaction Chamber (RC01) after successful completion of the inerting cycle.

This screen allows operators to:

- Initiate the feeding sequence
- Monitor oxygen concentration during feeding
- Control material feed duration
- Verify agitator and screw feeder operation
- Ensure feeding occurs under safe, inert conditions

2. Header Information

- **System Status:** Healthy
confirms no active alarms or faults.

- **Operating Mode:** Manual mode
Indicates global system mode; feeding sequence logic operates automatically once started.

3. Process Start Controls (Left Panel)

Feeding Process Start

- Initiates the automatic RC feeding cycle.
- Enabled only when:
 - RC inerting cycle is completed
 - Oxygen level is below the defined safe limit
 - All feeding interlocks are satisfied

Other process buttons (Inerting, Reaction, Cooling, and Discharge) remain inactive during feeding.

4. RC Feeding Set Points Panel

This panel displays configured set values and live feedbacks relevant to the feeding process.

4.1 Oxygen Monitoring

- **O₂ LS102 SV (%)**
Oxygen set point limit for safe feeding operation.
- **O₂ LS101 PV (%)**
Real-time oxygen concentration at feeding-related measurement point.
- **O₂ LS102 PV (%)**
Real-time oxygen concentration inside the reaction chamber.

Feeding is interlocked if oxygen exceeds the set limit.

4.2 Feeding Timing Parameters

- **Material Feeding Time (Sec)**
Duration for which material is fed into the reaction chamber.
- **Actual Material Discharge Time (Sec)**
Elapsed feeding time during the cycle.

These timers ensure **controlled and repeatable material dosing**.

5. Agitator Status Panel

Reaction Chamber Agitator 01 (RCA01)

- MPCB Healthy – Motor protection status
- Actual Current (Amp)
- Actual Speed (Hz)
- Auto Set Speed (Hz)

The agitator runs at the predefined speed to ensure uniform material distribution during feeding.

6. Storage Hopper Screw Status Panel

Storage Hopper Screw 01

- MPCB Healthy
- Actual Speed (Hz)
- Actual Current (Amp)
- Auto Set Speed (Hz)

The screw feeder controls the material feed rate into the reaction chamber and operates only for the configured feeding time.

7. Feeding Cycle Status Indication

Status Banner (Bottom Center)

“RC Feeding Cycle Activated”

- Confirms that the feeding sequence is currently in progress.
- Updates upon cycle completion or interruption due to fault or interlock.

8. Camera Access

- Provides live visual monitoring of the feeding area.
- Recommended during:
 - Initial commissioning
 - Process optimization
 - Abnormal feeding behaviour

10.2.1 Feeding Process Sequence

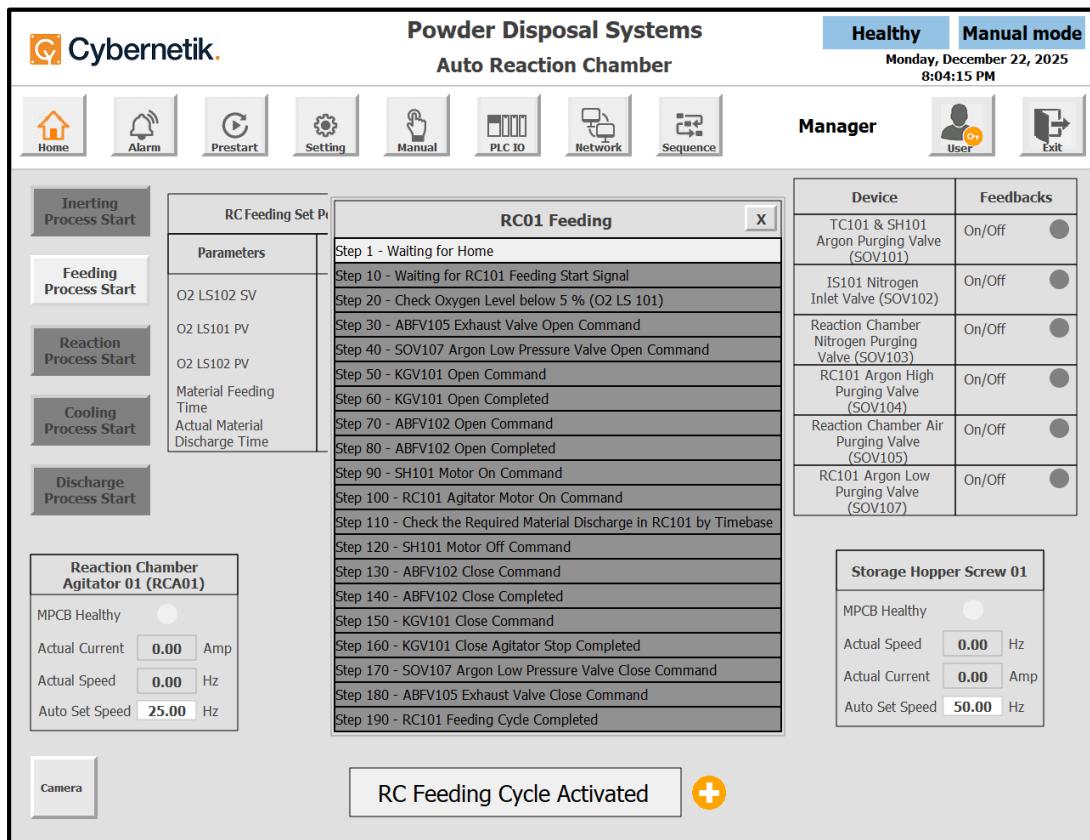


Figure 12: Feeding Process Sequence

Screen Purpose

The RC01 Feeding Sequence screen displays the step-by-step automatic logic used to feed material into the Reaction Chamber (RC01) under inert conditions.

This screen allows operators to:

- Track the real-time progress of the feeding cycle
- Verify correct valve and motor actuation order
- Ensure oxygen concentration remains within safe limits
- Confirm successful completion of the feeding cycle before reaction start

This screen is mainly used for operation monitoring, commissioning, and fault diagnostics.

10.3 Reaction Process

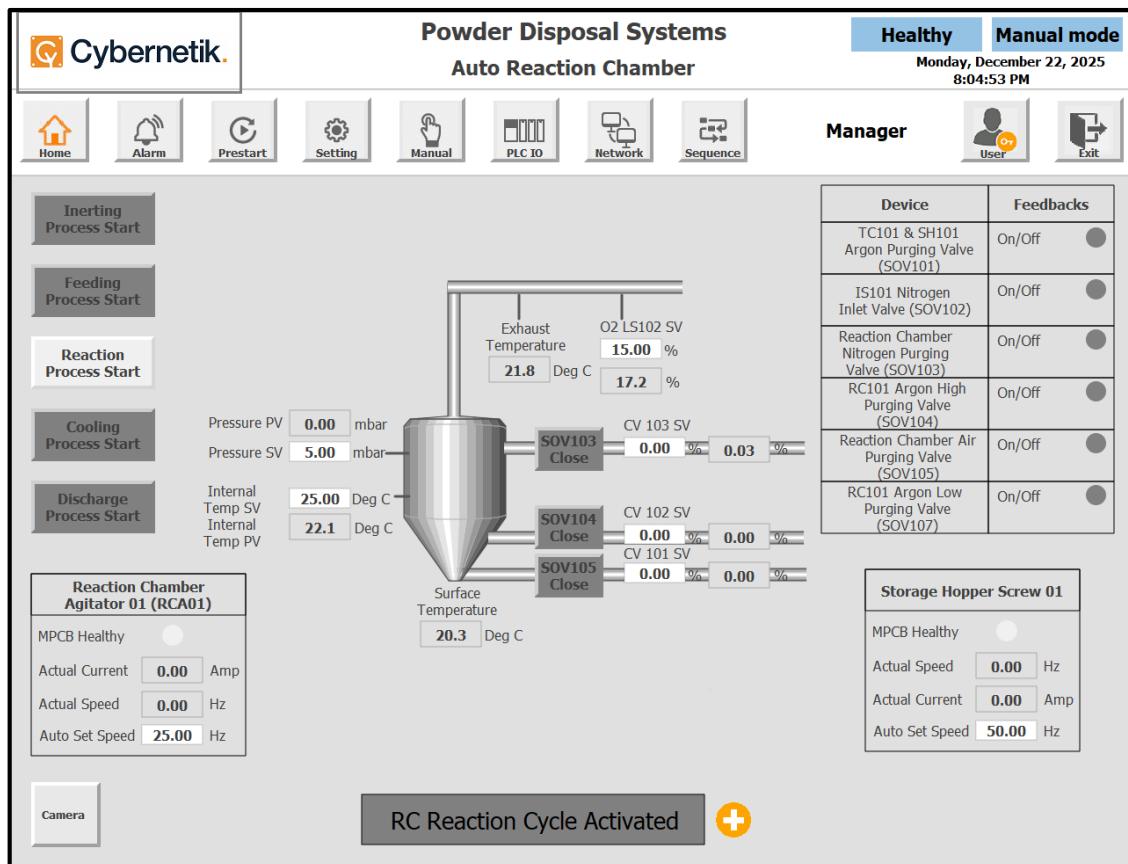


Figure 13: Reaction Process

1. Screen Purpose

The **RC Reaction Cycle screen** is used to monitor and control the automatic reaction process inside the Reaction Chamber (RC01) after completion of inerting and feeding cycles.

This screen provides real-time visibility of:

- Reaction chamber pressure, temperature, and oxygen levels
- Purging valve status during reaction
- Agitator operating condition
- Safety interlocks active during the reaction phase

2. Header Information

- **System Status:** Healthy
indicates no active alarms affecting reaction operation.

- **Operating Mode:** Manual mode
the overall system mode is Manual; however, the reaction sequence runs automatically once started.

3. Process Start Controls (Left Panel)

Reaction Process Start

- Initiates the **automatic RC reaction cycle**.
- Enabled only when:
 - Inerting cycle is completed
 - Feeding cycle is completed
 - Oxygen concentration is within safe limits
 - All reaction-related interlocks are satisfied

Other process start buttons remain disabled during reaction.

4. Reaction Chamber Process Parameters (Center Panel)

The central schematic represents the **Reaction Chamber with live process values**.

4.1 Oxygen Monitoring

- **O₂ LS102 SV (%)** – Oxygen set point limit for reaction safety
- **O₂ LS102 PV (%)** – Actual oxygen concentration inside RC01

Reaction is interlocked if oxygen exceeds the set point.

4.2 Pressure Monitoring

- **Pressure SV (mbar)** – Allowed pressure limit
- **Pressure PV (mbar)** – Actual chamber pressure

Maintains safe operating pressure during reaction.

4.3 Temperature Monitoring

- **Internal Temp SV (°C)** – Desired internal temperature
- **Internal Temp PV (°C)** – Actual internal temperature
- **Surface Temperature (°C)** – Reaction chamber outer surface temperature
- **Exhaust Temperature (°C)** – Temperature of exhaust gases

These values ensure controlled and safe reaction conditions.

5. Gas & Valve Control Section

Displays valve command status and control values:

Valves Shown

- **SOV103** – Reaction chamber nitrogen purging valve
- **SOV104** – Argon high-pressure purging valve
- **SOV105** – Reaction chamber air purging valve
- **SOV107** – Argon low-pressure purging valve

Control Valves

- **CV101 / CV102 / CV103**
 - Set values (%) and process values (%) shown for fine gas control.

All valves remain interlocked and sequenced automatically during the reaction cycle.

6. Device Feedback Panel (Right Side)

Displays On/Off feedback for:

- Argon purging valves
- Nitrogen inlet valve
- Air purging valve

This confirms correct valve operation throughout the reaction.

7. Agitator Status Panel

Reaction Chamber Agitator 01 (RCA01)

- **MPCB Healthy** – Motor protection status
- **Actual Current (Amp)**
- **Actual Speed (Hz)**
- **Auto Set Speed (Hz)**

The agitator operates continuously during the reaction to ensure uniform heat and material distribution.

8. Storage Hopper Screw Status

Storage Hopper Screw 01

- Shown in stopped condition during reaction
- Feeding is interlocked and disabled in this phase

9. Reaction Cycle Status Indication

Status Banner (Bottom Center)

“RC Reaction Cycle Activated”

- Confirms the reaction sequence is in progress.
- Changes to completed or fault status at the end of the cycle.

10. Camera Access

- Allows live visual monitoring of the reaction chamber area.

10.3.1 Reaction Process Sequence

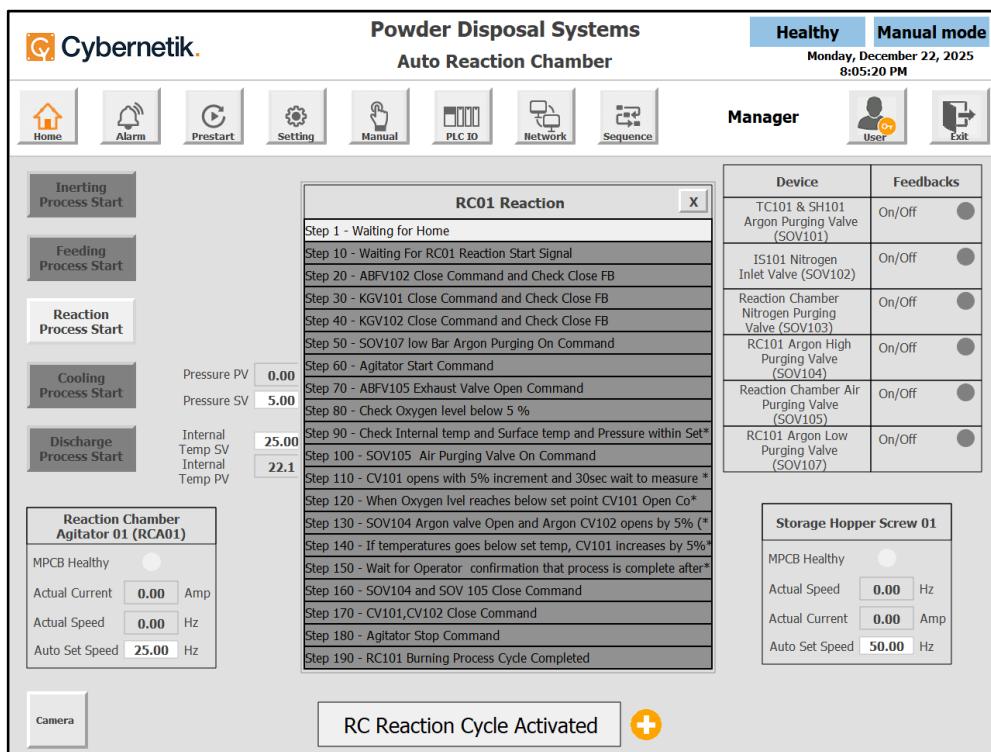


Figure 14: Reaction Process Sequence

Screen Purpose

The RC01 Reaction Sequence screen displays the step-by-step automatic logic controlling the reaction (burning) process inside the Reaction Chamber (RC01). It allows Manager to:

- Monitor real-time progression of the reaction sequence
- Verify correct valve, agitator, and gas control actions
- Ensure oxygen, temperature, and pressure remain within safe limits
- Confirm safe completion of the reaction cycle before cooling or discharge

This screen is primarily used during operation monitoring, commissioning, and fault diagnosis.

10.4 Cooling Process

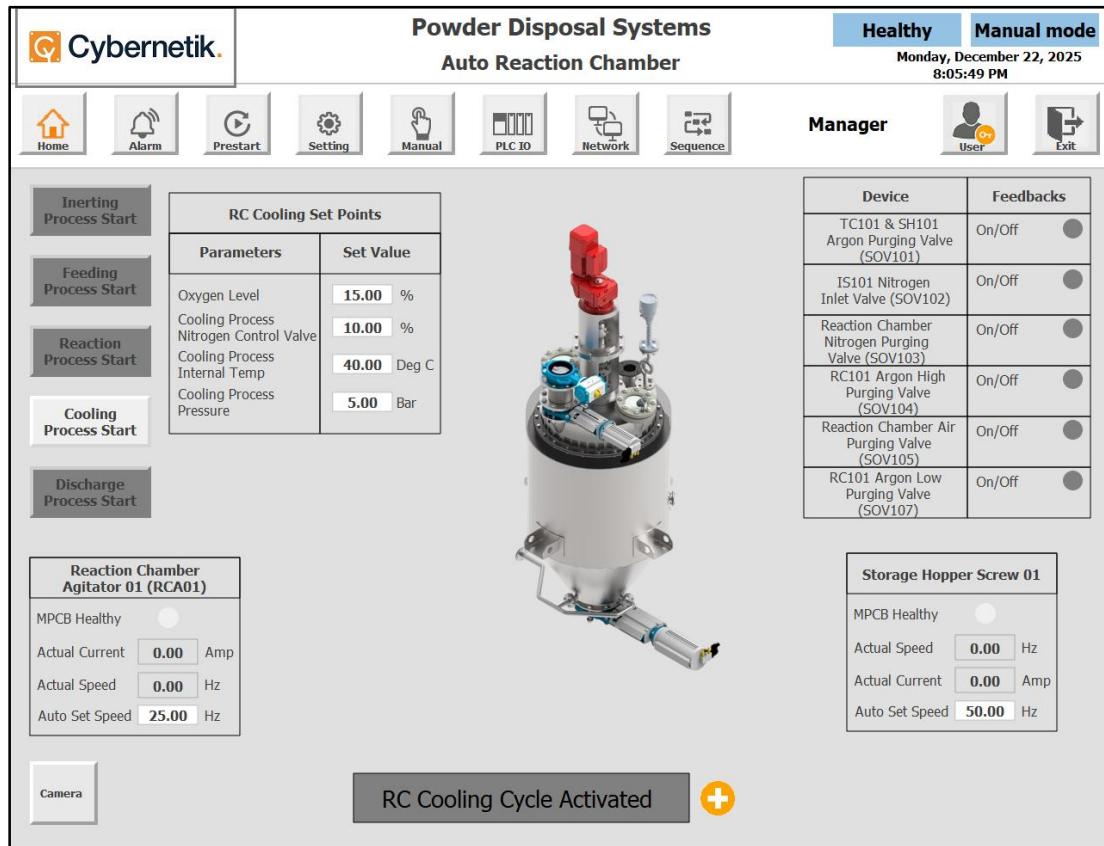


Figure 15: Cooling Process

1. Screen Purpose

The **RC Cooling Cycle screen** is used to control and monitor the automatic cooling of the Reaction Chamber (RC01) after completion of the reaction (burning) cycle. This screen ensures:

- Controlled reduction of internal temperature
- Maintenance of a safe and inert atmosphere during cooling
- Stabilization of chamber pressure before discharge
- Safe preparation of the system for the discharge cycle

2. Header & System Information

- System Status:** Healthy
indicates no active alarms affecting the cooling operation.
- Operating Mode:** Manual mode
Overall system mode is Manual; the cooling sequence executes automatically once initiated.

3. Process Start Controls (Left Panel)

Cooling Process Start

- Initiates the **automatic RC cooling cycle**.
- Enabled only when:
 - Reaction cycle is completed
 - Chamber pressure is within allowable limits
 - No active alarms are present
 - Cooling interlocks are satisfied

Other process start buttons remain disabled during cooling.

4. RC Cooling Set Points Panel

This panel displays configured set points used to control the cooling process.

Cooling Parameters

- **Oxygen Level (%)**
Maximum allowable oxygen concentration during cooling to maintain safety.
- **Cooling Process Nitrogen Control Valve (%)**
Set value for nitrogen flow used to cool and inert the chamber.
- **Cooling Process Internal Temperature (°C)**
Target internal temperature at which the cooling cycle is considered complete.
- **Cooling Process Pressure (Bar)**
Maximum allowable pressure during cooling.

These parameters ensure the cooling process is **controlled, repeatable, and safe**.

5. Gas Valve Status & Feedback Panel (Right Side)

Displays **real-time On/Off feedback** for valves involved during cooling:

- TC101 & SH101 Argon Purging Valve (SOV101)
- IS101 Nitrogen Inlet Valve (SOV102)
- Reaction Chamber Nitrogen Purging Valve (SOV103)
- RC101 Argon High Purging Valve (SOV104)
- Reaction Chamber Air Purging Valve (SOV105)
- RC101 Argon Low Purging Valve (SOV107)

These feedbacks confirm correct gas flow and isolation throughout the cooling cycle.

6. Storage Hopper Screw Status Panel

Storage Hopper Screw 01

- Remains stopped and interlocked during cooling.
- Feeding and discharge operations are disabled until cooling completion.

10.4.1 Cooling Process Sequence

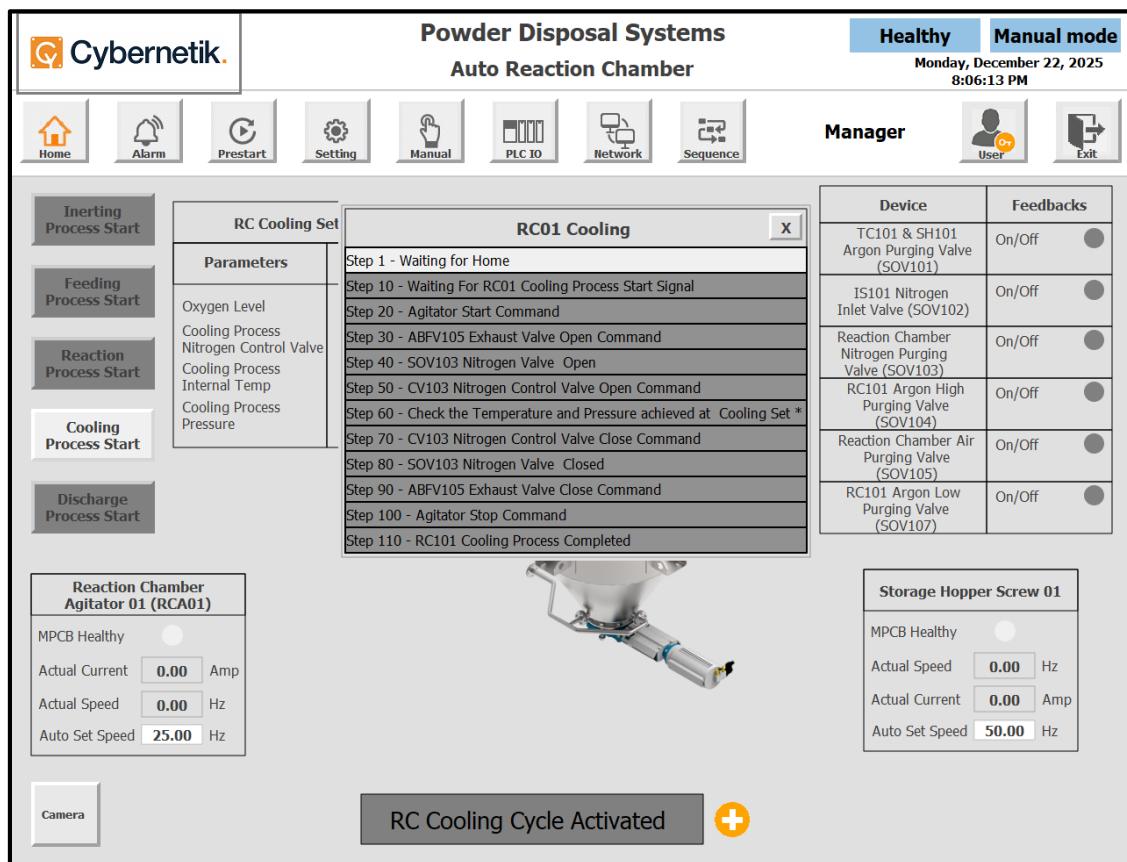


Figure 16: Cooling Process Sequence

- On Clicking the “+” icon at the bottom will display a pop-up for configuring the Sequence RC Cooling Cycle.
- This screen represents the Reaction Chamber Cooling Process (RC01 Cooling) within the Powder Disposal System.
- It allows the operator to monitor, control, and verify the automatic cooling and inert gas purging sequence after a reaction cycle.

10.5 Discharge Process

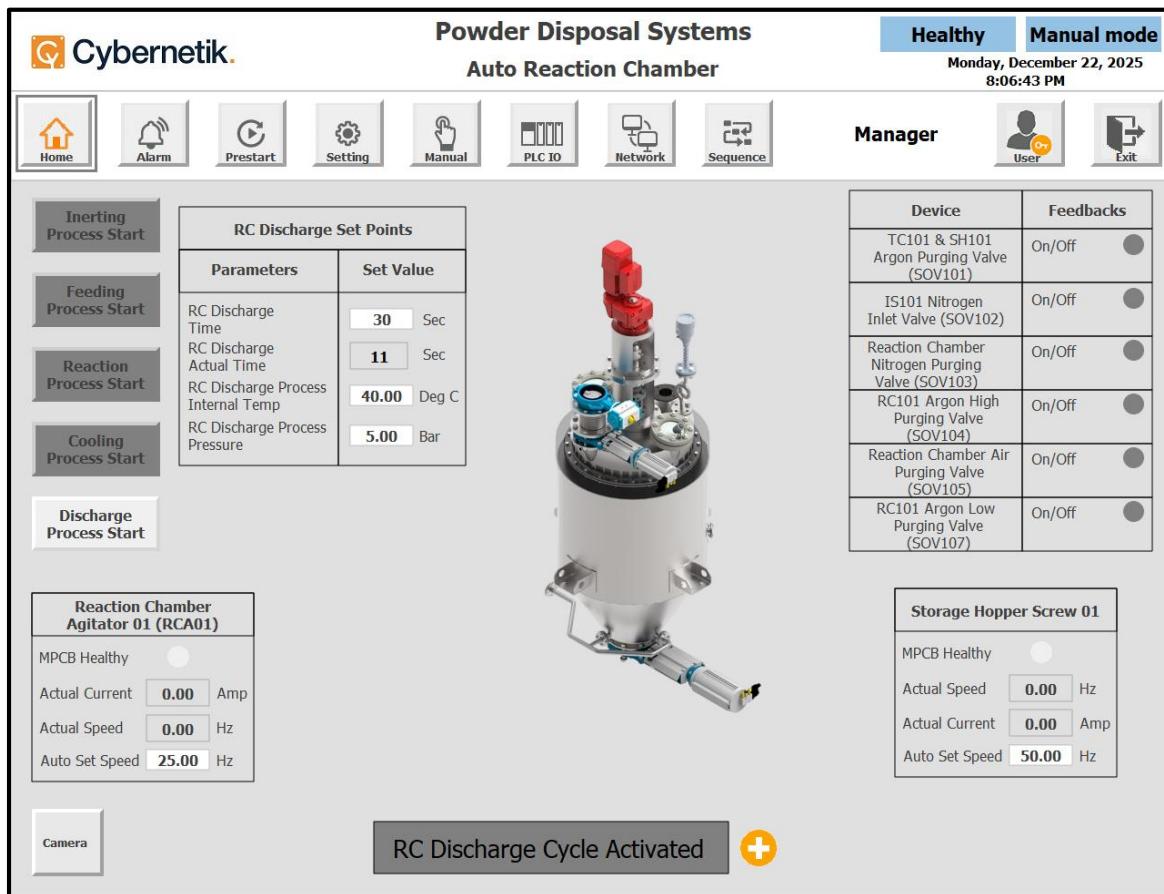


Figure 17: Discharge Process

1. Purpose of the Screen

The **RC01 Discharge screen** is used to monitor, control, and verify the discharge of processed material from the Reaction Chamber (RC01) after the reaction and cooling phases are completed.

This screen ensures that:

- Discharge occurs only under safe temperature and pressure conditions
- The chamber remains under a controlled inert atmosphere
- The agitator and discharge screw operate correctly
- All interlocks and field device feedbacks are satisfied before and during discharge

The discharge process is executed automatically once initiated and requires operator supervision only.

2. Header Section Description

2.1 System Health Status

- **Healthy:** Confirms normal operation of PLC, communication networks, field devices, and safety interlocks.
- If unhealthy, discharge operation is inhibited.

2.2 Control Mode Indicator

- **Manual Mode** indicates the current system mode.
- Manual intervention is restricted to authorized personnel.

3. Process Start Panel (Left Vertical Section)

This panel displays the available process stages:

- Inerting Process Start
- Feeding Process Start
- Reaction Process Start
- Cooling Process Start
- **Discharge Process Start**

Only the **Discharge Process Start** button is enabled on this screen.
All other process start buttons are disabled due to process interlocks.

4. RC Discharge Set Points Panel

4.1 Purpose

This panel displays the configured set points that govern the discharge operation. These values are predefined during system configuration and ensure safe discharge conditions.

4.2 Parameter Description

4.2.1 RC Discharge Time (Set Value)

- **Set Value:** 30 seconds
- Defines the **maximum allowed discharge duration**.
- Prevents prolonged discharge that could lead to uncontrolled flow or equipment stress.

4.2.2 RC Discharge Actual Time

- Displays the **actual elapsed discharge time**.
- Used to confirm that discharge is progressing as expected.

4.2.3 RC Discharge Process Internal Temperature

- **Set Value:** 40.00 °C
- Maximum allowable internal chamber temperature for safe discharge.

4.2.4 RC Discharge Process Pressure

- **Set Value:** 5.00 bar
- Ensures chamber pressure remains within safe mechanical limits during discharge.

5. Device Status & Feedback Panel (Right Side)

5.1 Purpose

This panel displays real-time feedback from all field valves involved in discharge and inerting.

Each device indicates:

- On / Off status
- Confirmation of command execution from PLC

6. Reaction Chamber Agitator Section

6.1 Reaction Chamber Agitator 01 (RCA01)

Displays motor operating parameters:

- **MPCB Healthy**
Indicates motor protection circuit breaker status.
- **Actual Current (Amp)**
Shows motor load during operation.
- **Actual Speed (Hz)**
Displays real-time agitator speed.
- **Auto Set Speed (Hz)** – 25.00 Hz
Predefined speed used during discharge to prevent material bridging.

7. Storage Hopper Screw Section

7.1 Storage Hopper Screw 01

Displays the status of the discharge screw conveyor:

- **MPCB Healthy** – Motor protection status
- **Actual Speed (Hz)** – Screw rotation speed

- **Actual Current (Amp)** – Motor load
- **Auto Set Speed (Hz)** – 50.00 Hz

This screw transfers discharged material safely to the storage hopper.

8. Discharge Cycle Status Indicator

8.1 RC Discharge Cycle Activated

Displayed at the bottom centre of the screen.

This indicates:

- Discharge logic is active
- All interlocks have been satisfied
- Automatic sequence is running

Operator intervention is not required unless an alarm occurs.

10.6 Discharge Station

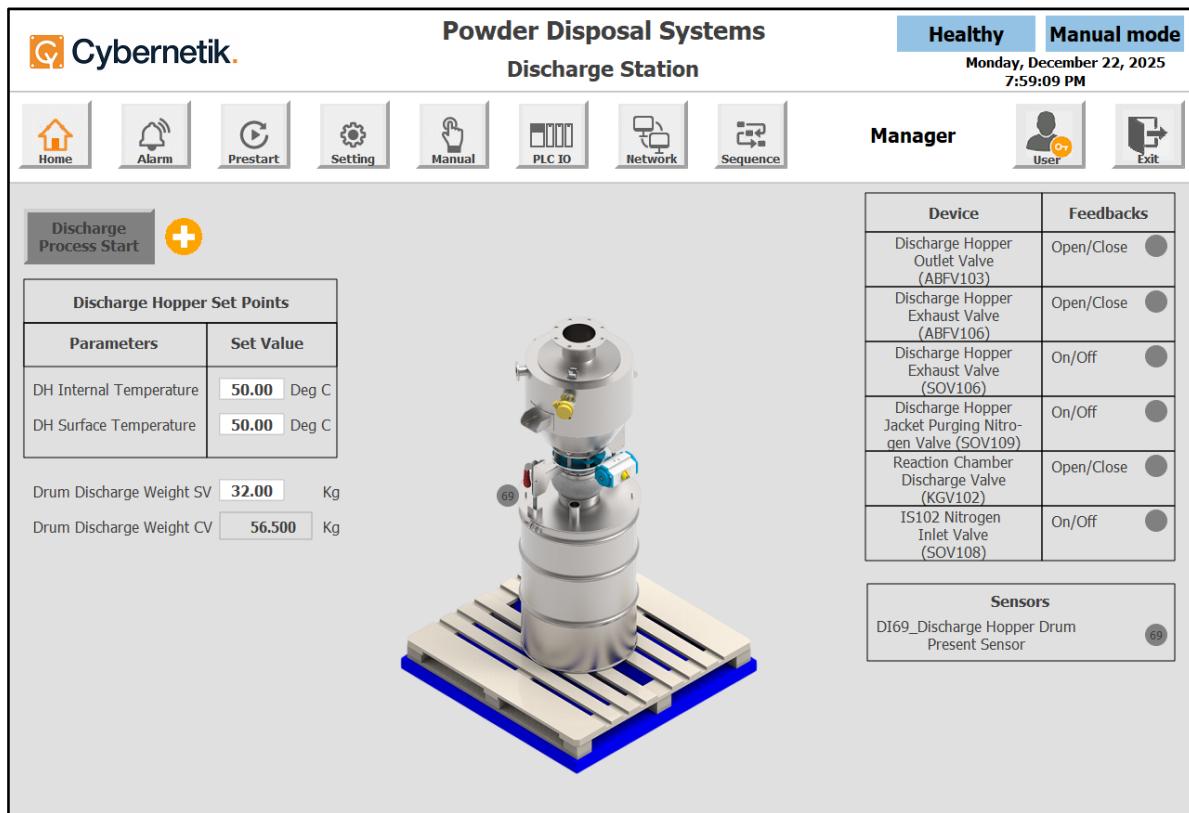


Figure 18: Discharge Station

1. Purpose of the Screen

The **Discharge Station screen** is used to monitor and control the final discharge of processed powder from the discharge hopper into a drum or container.

This screen ensures that:

- Discharge is performed only when temperature conditions are safe
- The correct drum is present and positioned
- The target discharge weight is achieved accurately
- Inert conditions are maintained during discharge
- All valves and safety interlocks function correctly

The discharge operation is semi-automatic, requiring operator supervision.

2. Header Section Description

2.1 System Identification

Powder Disposal Systems – Discharge Station

identifies the specific plant section being controlled.

2.2 System Health Status

- **Healthy** indicates all PLC, network communication, sensors, and field devices are functioning normally.
- If unhealthy, discharge initiation is blocked.

2.3 Control Mode

- **Manual Mode** indicates the current control selection.

3. Discharge Process Start

3.1 Discharge Process Start Button

- Initiates the discharge sequence.
- Enabled only when all interlocks are satisfied:
 - Drum present
 - Temperature below set limits
 - No active alarms
 - Previous process completed

A “+” indicator confirms operator action to start the process.

4. Discharge Hopper Set Points Panel

4.1 Purpose

Displays the **set points and actual values** used to control discharge safety and accuracy.

4.2 Parameter Description

4.2.1 DH Internal Temperature

- **Set Value:** 50.00 °C
- Maximum allowable internal hopper temperature.
- Prevents overheating during powder handling.

4.2.2 DH Surface Temperature

- **Set Value:** 50.00 °C
- Limits external surface temperature to protect operators.

4.2.3 Drum Discharge Weight – Set Value (SV)

- **Set Value:** 32.00 kg
- Target weight of powder to be discharged into the drum.

4.2.4 Drum Discharge Weight – Current Value (CV)

- Displays the actual measured weight in real time.
- Used to stop discharge automatically once SV is reached.

5. Device Status & Feedback Panel (Right Side)

5.1 Purpose

Shows real-time **command and feedback status** of all valves used during discharge.

5.2 Device Descriptions

5.2.1 Discharge Hopper Outlet Valve (ABFV103)

- Controls powder flow from hopper to drum.
- **Open/Close** status feedback confirms correct actuation.

5.2.2 Discharge Hopper Exhaust Valve (ABFV106)

- Releases air or excess pressure during discharge.
- Prevents pressure build-up inside the hopper.

5.2.3 Discharge Hopper Exhaust Valve (SOV106)

- Solenoid-controlled exhaust valve.
- Supports fine control of venting.

5.2.4 Discharge Hopper Jacket Purging Nitrogen Valve (SOV109)

- Supplies nitrogen to the hopper jacket.
- Maintains inert conditions and prevents oxidation.

5.2.5 Reaction Chamber Discharge Valve (KGV102)

- Isolates the reaction chamber from the discharge hopper.
- Opens only after all discharge interlocks are satisfied.

5.2.6 IS102 Nitrogen Inlet Valve (SOV108)

- Supplies nitrogen to the discharge station.
- Maintains positive pressure and inert atmosphere.

6. Sensor Section

6.1 Drum Present Sensor

- DI69 – Discharge Hopper Drum Present Sensor**
- Confirms drum is correctly placed before discharge starts.
- If the sensor is OFF, discharge initiation is blocked.

10.7 Auto Tote Station

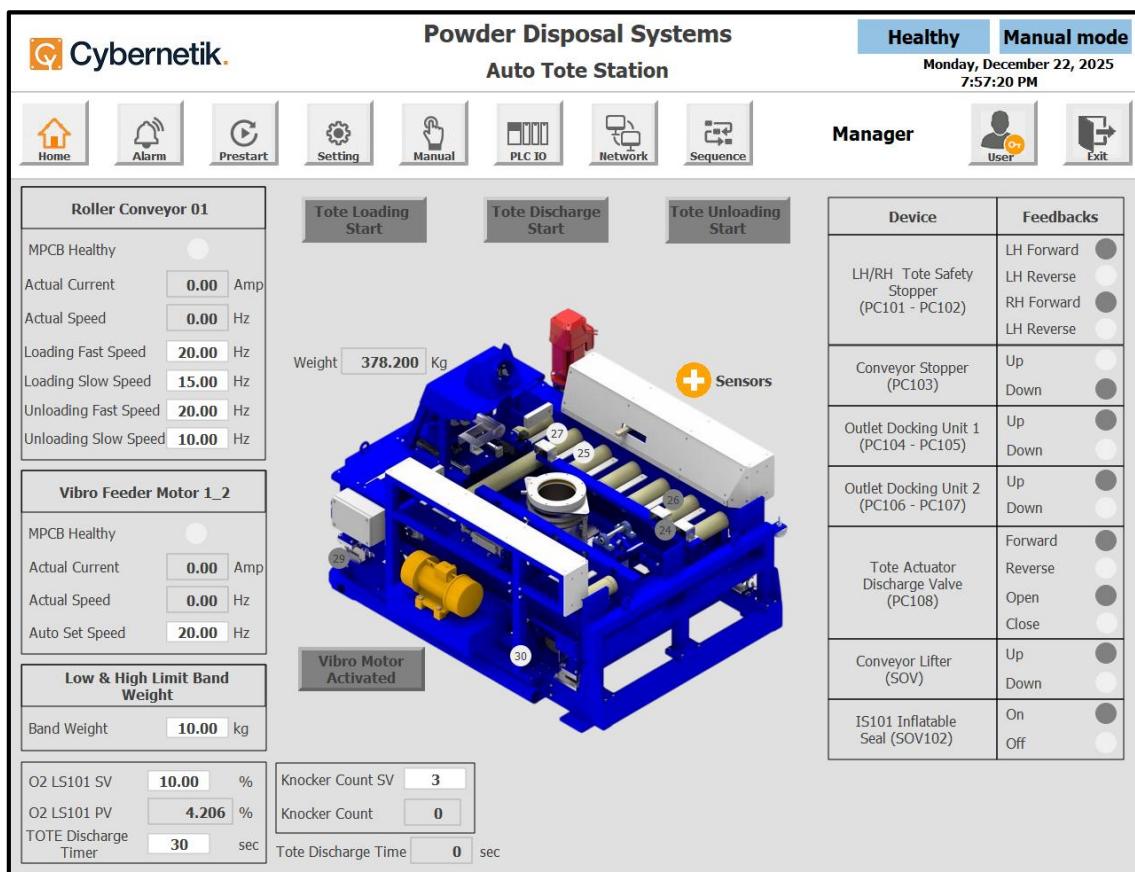


Figure 19: Auto Tote Station

1. Screen Overview

This screen represents the **Auto Tote Station** of the Powder Disposal System. It is used for automatic loading, discharge, and unloading of powder-filled totes via a roller conveyor and Vibro-based material handling system.

The system is shown in:

- Manual Mode**
- Healthy system status**

This screen allows the operator to:

- Start tote-related processes
- Monitor conveyor, Vibro feeder, and safety devices
- Observe tote weight and discharge parameters
- Verify feedback from actuators and sensors

2. Process Control Buttons (Top-Center)

The following process start buttons are provided:

- **Tote Loading Start**
initiates the tote loading sequence onto the conveyor.
- **Tote Discharge Start**
starts the controlled discharge of powder from the tote.
- **Tote Unloading Start**
Initiates removal of the empty tote from the station.

These buttons are enabled only when all safety interlocks and prerequisites are satisfied.

3. Roller Conveyor 01 – Status & Speed Control (Left Panel)

This section displays operational details of **Roller Conveyor 01**:

- **MPCB Healthy** – Indicates motor protection status
- **Actual Current (Amp)** – Real-time motor current
- **Actual Speed (Hz)** – Current conveyor speed

Configurable Speeds:

- Loading Fast Speed
- Loading Slow Speed
- Unloading Fast Speed
- Unloading Slow Speed

These speeds ensure smooth tote positioning and controlled movement during loading and unloading operations.

4. Vibro Feeder Motor 1–2 Section

This section monitors the **vibratory feeder motor**, used to assist material flow:

- **MPCB Healthy**- Indicates motor protection status
- **Actual Current**- Real-time motor current
- **Actual Speed**- Current conveyor speed
- **Auto Set Speed**- Set default speed of the motor

The Vibro feeder improves powder flow consistency during discharge.

A status indicator “**Vibro Motor Activated**” confirms when the Vibro motor is running.

5. Tote Weight Monitoring

At the center of the screen:

- **Weight Display (Kg)**

shows the real-time measured weight of the tote during loading or discharge.

This value is critical for:

- Verifying filled quantity
- Ensuring discharge completion
- Maintaining batch accuracy

6. Limit Band & Discharge Parameters (Bottom-Left)

6.1 Low & High Limit Band Weight

- **Band Weight (kg)**

Defines acceptable weight tolerance during operation.

6.2 Oxygen Monitoring

- **O₂ LS101 Set Value (%)** - It represents the maximum allowable oxygen level inside the tote / discharge area during operation.
- **O₂ LS101 Process Value (%)**-This is the actual, real-time oxygen concentration measured by the oxygen sensor LS101.

Ensures oxygen concentration remains within safe limits during discharge.

6.3 Tote Discharge Timer

- Defines maximum discharge duration to avoid overexposure or incomplete discharge.

7. Knocker System Parameters

The knocker assists material flow by applying mechanical vibration.

- **Knocker Count SV** – Set number of knocker pulses
- **Knocker Count** – Actual pulses completed
- **Tote Discharge Time (sec)** – Actual discharge duration

This helps prevent material bridging inside the tote.

8. Device Feedbacks & Actuator Status (Right Panel)

This panel provides real-time On/Off or forward / reverse feedback for field devices. Each device shows clear feedback to confirm safe operation.

10.8 Auto Storage Hopper

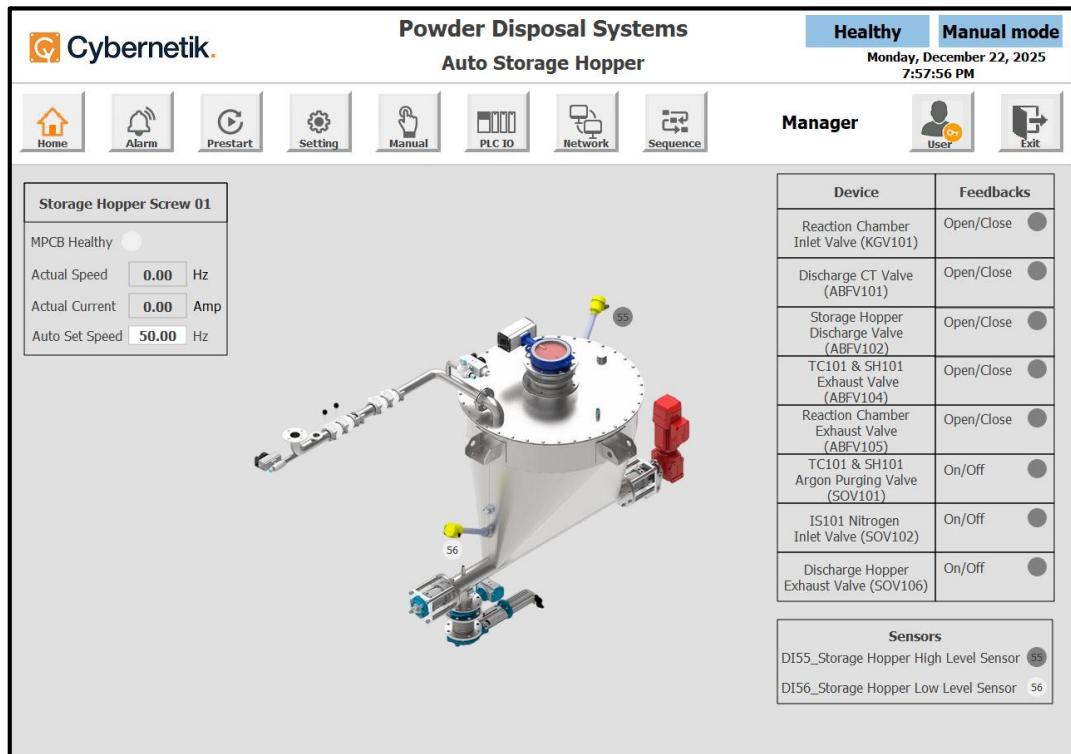


Figure 20: Auto Storage Hopper

1. Screen Overview

The **Auto Storage Hopper** screen is used to monitor and control powder transfer and storage between the Auto Tote Station and the Reaction Chamber. This screen provides real-time status of the storage hopper screw feeder, inlet / discharge valves, purging valves, and level sensors.

The system is currently displayed in:

- **Manual Mode**
- **Healthy system status**

2. Storage Hopper Screw 01 – Drive Status (Left Panel)

This section shows operating parameters of Storage Hopper Screw 01, which transfers powder from the hopper to downstream equipment.

Displayed parameters:

- **MPCB Healthy** – Confirms motor protection circuit is healthy
- **Actual Speed (Hz)** – Real-time operating speed of the screw feeder
- **Actual Current (Amp)** – Motor current drawn
- **Auto Set Speed (Hz)** – Configured operating speed for automatic mode

This ensures controlled and continuous powder feeding.

3. Graphical Equipment Representation (Center)

The central 3D view shows the **Storage Hopper assembly**, including:

- Hopper vessel
- Screw feeder
- Inlet and discharge connections
- Exhaust and purging ports
- Mounted sensors and actuators

This visualization helps operators quickly identify component locations and operating states.

4. Valve Status & Device Control (Right Panel)

This panel provides open / close or on / off feedback of critical valves involved in material transfer and safety purging.

4.1 Material Flow Valves

- **Reaction Chamber Inlet Valve (KGV101)**
Controls powder entry into the reaction chamber.
- **Discharge CT Valve (ABFV101)**
Controls discharge from upstream system into the storage hopper.
- **Storage Hopper Discharge Valve (ABFV102)**
Regulates powder flow from the hopper.

4.2 Exhaust & Pressure Control Valves

- **TC101 & SH101 Exhaust Valve (ABFV104)**
Releases residual gases during operation.
- **Reaction Chamber Exhaust Valve (ABFV105)**
Allows pressure relief from the reaction chamber.

4.3 Purging & Inerting Valves

- **TC101 & SH101 Argon Purging Valve (SOV101)**
Supplies argon for inerting.
- **IS101 Nitrogen Inlet Valve (SOV102)**
Supplies nitrogen to maintain a low-oxygen environment.
- **Discharge Hopper Exhaust Valve (SOV106)**
Exhausts displaced gases during purging or discharge.

Each valve displays its current state to ensure safe operation.

5. Sensor Status (Bottom-Right)

The following level sensors provide continuous hopper level monitoring:

- **DI55 – Storage Hopper High Level Sensor**
Indicates hopper has reached maximum permissible fill level.
- **DI56 – Storage Hopper Low Level Sensor**
Indicates minimum powder level in the hopper.

These sensors are used for:

- Preventing overfilling
- Avoiding empty running of the screw feeder
- Interlocking upstream and downstream operations

10.9 Camera

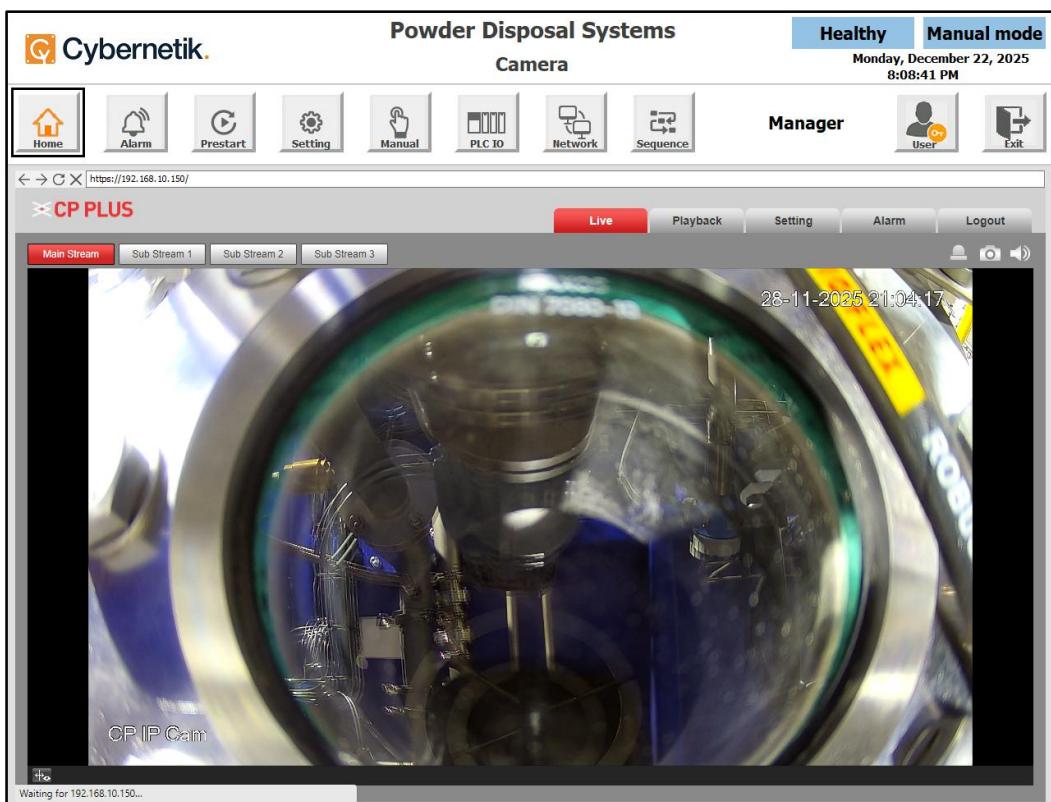


Figure 21: Camera Screen

1. Purpose of the Camera Screen

The **Camera Screen** provides the operator with live visual monitoring of the powder disposal process inside the equipment. It allows real-time observation to ensure:

- Correct operation of internal mechanical components
- Safe powder flow and disposal

- Early detection of abnormal conditions (blockage, spillage, mechanical issues)

This screen is primarily used for **monitoring and verification**, not for direct control of process parameters.

2. Header Section (Top Bar)

2.1 System Status Indicators

- **Healthy:**
Indicates that the system and camera are operating normally with no active faults.
- **Manual Mode:**
Shows that the system is currently in manual operation mode.

2.3 User Information

- **User Role (Manager):**
Indicates the access level of the logged-in user.
- **User Icon:**
Used for user-related functions such as login / logout or user switching.
- **Exit Button:**
Used to safely exit the HMI application.

3. Navigation Menu (Top Icon Bar)

The navigation bar allows the operator to move between different system screens.

Icon	Function
Home	Returns to the main home screen
Alarm	Displays current and historical alarms
Prestart	Pre-operation checks before system start
Setting	Configuration and system settings
Manual	Manual operation controls
PLC I/O	Displays PLC input / output status
Network	Network and communication status
Sequence	Displays process sequence steps

4. Camera Control Panel

4.1 Stream Selection Tabs

- Main Stream
- Sub Stream 1
- Sub Stream 2
- Sub Stream 3

These options allow the operator to switch between:

- High-resolution streams (Main Stream)
- Lower-resolution streams (Sub Streams) for reduced bandwidth usage

5. Viewing Mode Controls

Located above the camera display window:

Control	Description
Live	Displays real-time camera feed (active mode)
Playback	Allows viewing of recorded footage (if storage is enabled)
Setting	Camera configuration options
Alarm	Camera-related alarm settings
Logout	Logs out from the camera interface

6. Camera Display Area

6.1 Live Video Feed

- Displays **real-time internal view** of the powder disposal chamber.
- Used to observe:
 - Internal rotating parts
 - Powder movement

11 Alarm

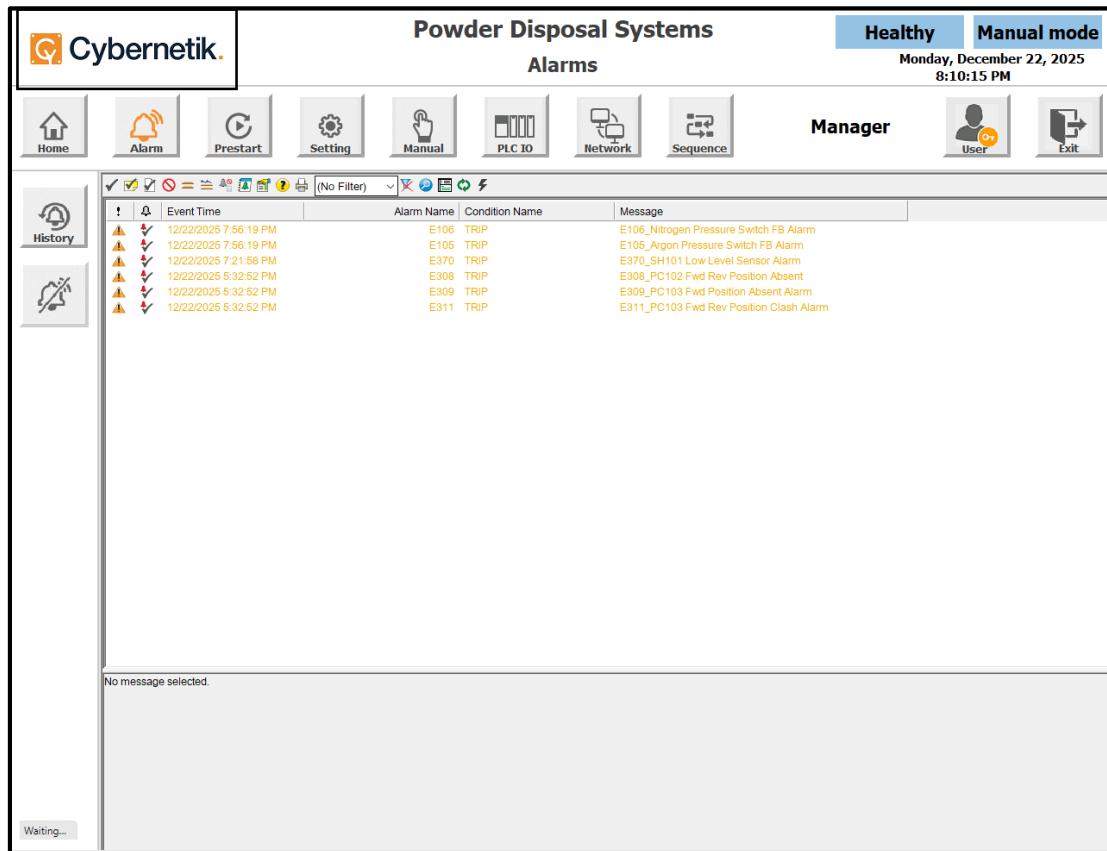


Figure 22: Active Alarms

- This screen lists all currently active alarms in the system.
- Each alarm includes:
 - **Time stamp**
 - **Device & fault description**
- Alarms remain listed until the fault is resolved and acknowledged.
- **Active Alarms** → Current alarms.
- **Alarm History** → Logs of past alarms (useful for recurring issues).

12 Prestart

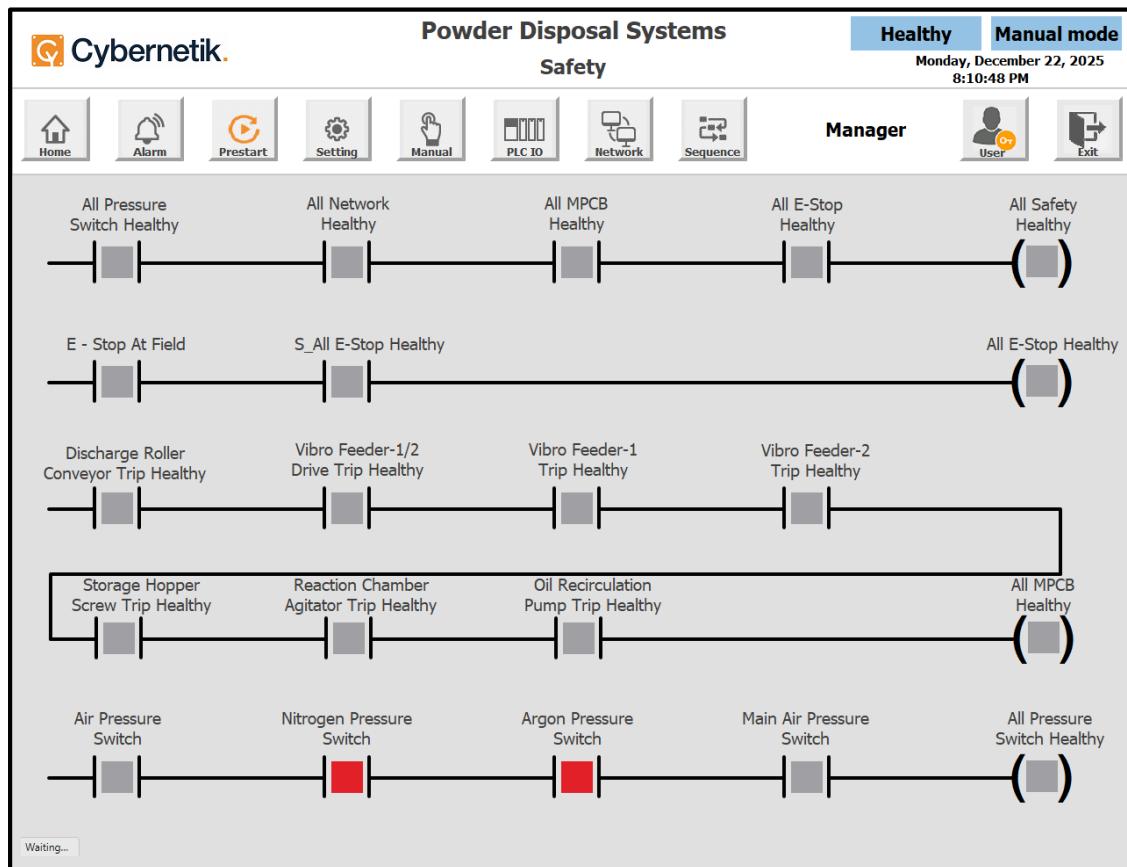


Figure 23: Prestart

1. Purpose of the Safety Screen

The **Safety Screen** provides a real-time overview of all critical safety interlocks and protection devices connected to the Powder Disposal System.

This screen ensures that:

- All mandatory safety conditions are satisfied before operation
- Any unsafe condition is immediately visible to the operator
- The system prevents operation if a safety device is unhealthy

The Safety Screen is **monitoring-only** and does not allow manual bypass of safety devices.

2. Header Section

2.1 System Status

- **Healthy:** Indicates that the overall system safety logic is currently satisfied
- **Manual Mode:** Confirms the system is operating in manual mode

2.3 User Information

- **User Role:** Manager
- **User Icon:** Access to user-related functions
- **Exit Button:** Safely exits the HMI application

3. Safety Logic Representation

The safety logic is displayed in **ladder-diagram format**, familiar to PLC users. Each horizontal rung represents a **group of safety conditions** that must be healthy.

Color Convention

- **Grey:** Healthy / Normal condition
- **Red:** Fault / Unsafe condition
- **Right-side Coil:** Overall status of that safety group

4. Safety Interlock Groups

4.1 Overall Safety Health

Rung:

- All Pressure Switch Healthy
- All Network Healthy
- All MPCB Healthy
- All E-Stop Healthy

Indication:

- **All Safety Healthy (Coil)**

Description:

This rung confirms that **all major safety systems** are healthy. If any individual condition becomes unhealthy, the **All Safety Healthy** status will turn OFF and system operation will be inhibited.

4.2 Emergency Stop (E-Stop) Status

Rung:

- E-Stop at Field
- S_All E-Stop Healthy

Indication:

- All E-Stop Healthy (Coil)

Description:

Monitors all emergency stop push buttons installed in the field.

If any E-Stop is pressed:

- The system immediately enters a safe state
- Motion and operation are stopped
- Operator intervention is required to reset

4.3 Drive & Equipment Trip Status

Rung Includes:

- Discharge Roller Conveyor Trip Healthy
- Vibro Feeder-1/2 Drive Trip Healthy
- Vibro Feeder-1 Trip Healthy
- Vibro Feeder-2 Trip Healthy

Description:

Confirms that all drive protection devices (overload, trip relays, etc.) are healthy. Any trip indicates a mechanical or electrical fault and prevents system operation.

4.4 MPCB (Motor Protection Circuit Breaker) Status

Rung Includes:

- Storage Hopper Trip Healthy
- Reaction Chamber Agitator Trip Healthy
- Oil Recirculation Pump Trip Healthy

Indication:

- All MPCB Healthy (Coil)

Description:

Ensures that all motors protected by MPCBs are in normal condition.

If any MPCB trips, the system will not start or continue operation.

4.5 Pressure Switch Status

Rung Includes:

- Air Pressure Switch
- Nitrogen Pressure Switch
- Argon Pressure Switch
- Main Air Pressure Switch

Indication:

- All Pressure Switch Healthy (Coil)

Description:

Monitors availability of required utility pressures.

In the displayed screen:

- Nitrogen Pressure Switch – Fault (Red)
- Argon Pressure Switch – Fault (Red)

This indicates insufficient or unavailable gas pressure, making the system unsafe for operation.

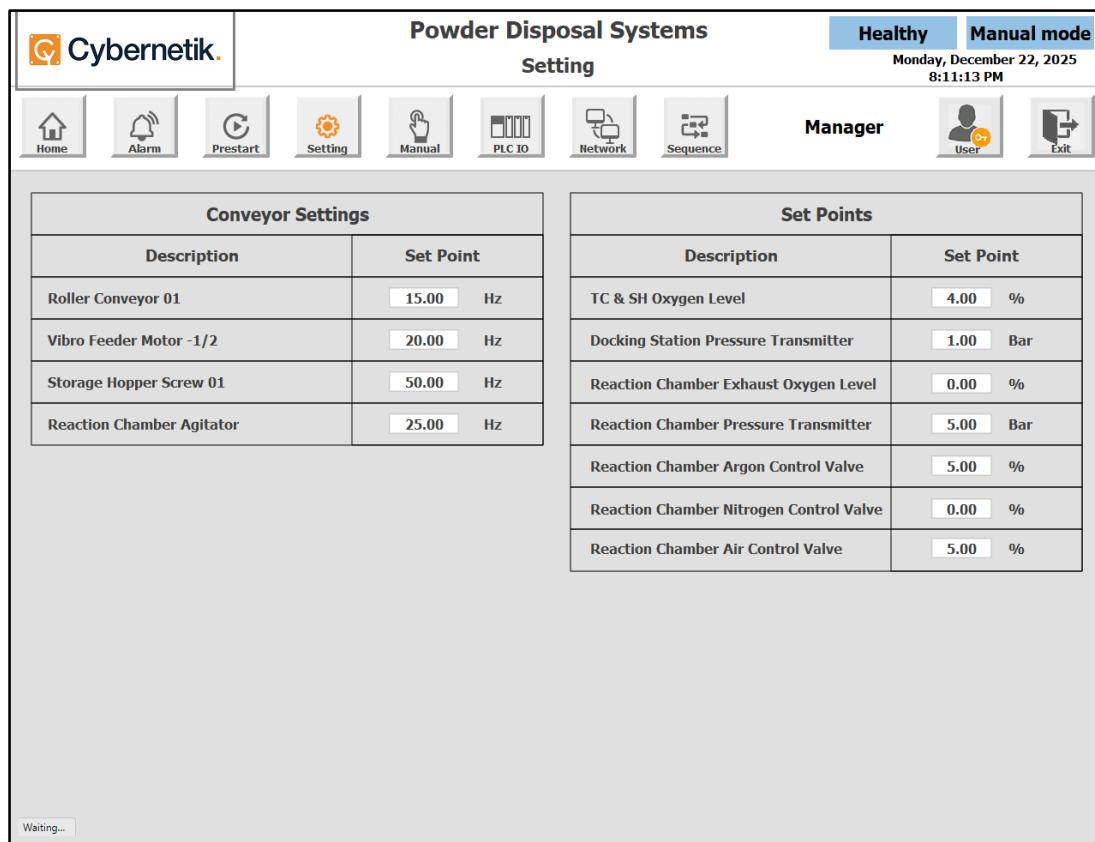


Figure 24: Setting

1. Functional Objective of the Setting Screen

The **Setting Screen** is used to **define and fine-tune operational parameters** that directly influence:

- Material conveying rate
- Powder discharge behaviour
- Mixing and agitation inside the reaction chamber
- Inert gas control
- Oxygen concentration limits
- Pressure safety thresholds

All parameters entered on this screen are continuously monitored by the PLC and are used in:

- Closed-loop control logic
- Interlocks and permissives
- Alarm generation
- Safe shutdown decisions

This screen **does not start equipment**. It only sets reference values used by control logic.

2. Conveyor Settings (Left Panel)

General Description

- All values are entered in **Hz**
- These values act as **reference frequencies** sent to Variable Frequency Drives (VFDs)
- Actual motor speed is proportional to the entered frequency

2.1 Roller Conveyor 01 – Set Point (15.00 Hz)

Function:

Controls the speed of the roller conveyor responsible for transferring powder containers or material through the disposal system.

2.2 Vibro Feeder Motor-1/2 – Set Point (20.00 Hz)

Function:

Controls vibration intensity of Vibro feeders that regulate powder feed rate.

2.3 Storage Hopper Screw 01 – Set Point (50.00 Hz)

Function:

Controls the screw conveyor speed that discharges powder from the storage hopper.

2.4 Reaction Chamber Agitator – Set Point (25.00 Hz)

Function:

Controls the agitator motor speed inside the reaction chamber.

3. Set Points (Right Panel)

General Description

- These values represent **process thresholds**
- Used for:
 - Alarm limits
 - Control valve modulation
 - Safety interlocks
- Any deviation beyond these values triggers **PLC action**

3.1 TC & SH Oxygen Level – Set Point (4.00 %)

Function:

Defines the **maximum permissible oxygen concentration** in these areas.

3.2 Docking Station Pressure Transmitter – Set Point (1.00 Bar)

Function:

Defines minimum pressure required at the docking station to ensure proper sealing and safe connection.

3.3 Reaction Chamber Exhaust Oxygen Level – Set Point (0.00 %)

Function:

Defines target oxygen concentration at the exhaust of the reaction chamber.

3.4 Reaction Chamber Pressure Transmitter – Set Point (5.00 Bar)

Function:

Defines the allowable operating pressure inside the reaction chamber.

3.5 Reaction Chamber Argon Control Valve – Set Point (5.00 %)

Function:

Defines the opening percentage of the argon control valve.

3.6 Reaction Chamber Nitrogen Control Valve – Set Point (0.00 %)

Function:

Defines nitrogen valve opening.

3.7 Reaction Chamber Air Control Valve – Set Point (5.00 %)

Function:

Controls air injection into the chamber during defined operational phases (e.g., cooling or flushing).

14.1 Discharge Station

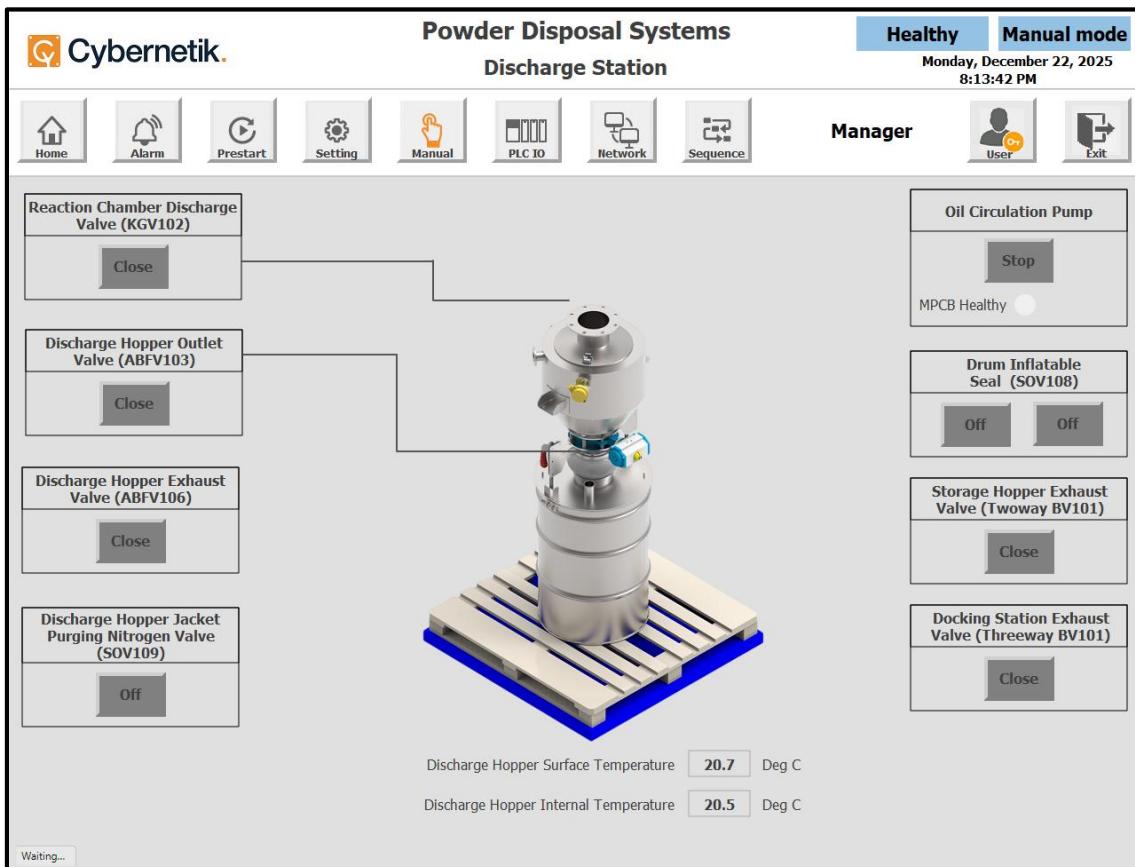


Figure 25: Discharge Station

1. Purpose of the Screen

This HMI screen provides the operator with **manual control and monitoring** of the **Powder Disposal System – Discharge Station**. It allows safe operation of discharge valves, exhaust systems, nitrogen purging, and auxiliary equipment during powder disposal activities.

The screen also displays the **health status, temperatures, and operating mode** of the system.

2. Operating Mode & System Status

- **Operating Mode:** Manual Mode
 - The system is currently set to Manual, allowing individual equipment operation by the operator.
- **System Health Status:** Healthy
 - Indicates all interlocks, sensors, and safety conditions are satisfied.

3. Left-Side Controls – Discharge & Purging Valves

3.1 Reaction Chamber Discharge Valve (KGV102)

- **Function:** Controls powder discharge from the reaction chamber to the discharge hopper.
- **Status Display:** Close
- **Operation:**
 - Opens only when all safety interlocks are satisfied.

3.2 Discharge Hopper Outlet Valve (ABFV103)

- **Function:** Controls material discharge from the hopper to downstream disposal equipment.
- **Status Display:** Close
- **Operation:**
 - Must remain closed during loading and purging.

3.3 Discharge Hopper Exhaust Valve (ABFV106)

- **Function:** Removes dust and displaced gases from the hopper during discharge.
- **Status Display:** Close
- **Operation:**
 - Opened during discharge or venting operations to maintain safe pressure.

3.4 Discharge Hopper Jacket Purging Nitrogen Valve (SOV109)

- **Function:** Supplies nitrogen for inert gas purging of the hopper jacket.
- **Status Display:** Off
- **Operation:**
 - Used to prevent oxidation and eliminate oxygen presence.

4. Right-Side Controls – Auxiliary & Exhaust Systems

4.1 Oil Circulation Pump

- **Function:** Circulates oil for sealing or lubrication purposes.
- **Status:** Stopped
- **MPCB Status:** Healthy
- **Operation:**
 - Must be running before initiating specific discharge operations.

4.2 Drum Inflatable Seal (SOV108)

- **Function:** Inflates sealing mechanism to ensure leak-tight connection between drum and hopper.
- **Status:** Off

- **Operation:**
 - Activated before discharge to prevent powder leakage.

4.3 Storage Hopper Exhaust Valve (BV101 – Two-Way)

- **Function:** Controls exhaust from the storage hopper.
- **Status:** Close
- **Operation:**
 - Used during pressure equalization and venting.

4.4 Docking Station Exhaust Valve (BV101 – Three-Way)

- **Function:** Manages exhaust airflow at the docking station.
- **Status:** Close
- **Operation:**
 - Ensures dust-free docking and undocking of containers.

5. Temperature Monitoring

Displayed at the bottom of the screen:

- **Discharge Hopper Surface Temperature:** 20.7 °C
- **Discharge Hopper Internal Temperature:** 20.5 °C

Purpose:

- Ensures the hopper remains within safe temperature limits
- Helps prevent powder degradation or unsafe conditions

14.2 Reaction Chamber

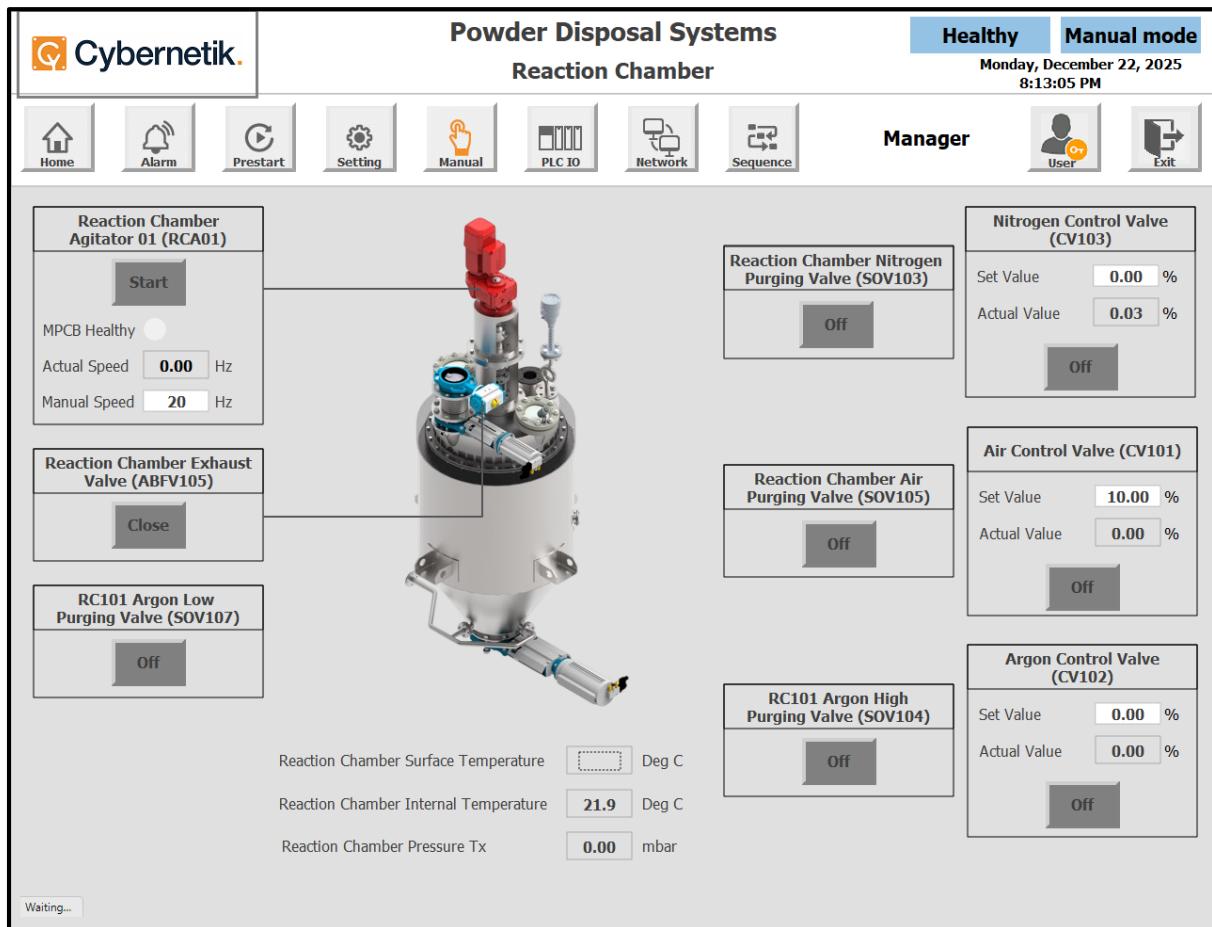


Figure 26: Reaction Chamber

1. Purpose of the Screen

This HMI screen enables **manual operation, monitoring, and control** of the **Reaction Chamber** within the Powder Disposal System. It allows operators to control the agitator, purging valves, gas flow control valves, and exhaust systems while continuously monitoring temperature and pressure parameters.

2. System Status & Operating Mode

- System Health:** Healthy
 Indicates that all safety interlocks, sensors, and control systems are functioning correctly.
- Operating Mode:** Manual Mode
 Enables individual control of devices for maintenance, testing, or controlled operations.

3. Left-Side Controls – Mechanical & Exhaust Components

3.1 Reaction Chamber Agitator 01 (RCA01)

- **Function:** Provides mixing of material inside the reaction chamber.
- **Control:** Start / Stop
- **Status Indicators:**
 - **MPCB Healthy:** Confirms motor protection circuit is healthy.
 - **Actual Speed:** Displays real-time agitator speed (Hz).
 - **Manual Speed:** Operator-set speed reference (Hz).
- **Operational Note:**
Agitator can only be started when safety interlocks are satisfied.

3.2 Reaction Chamber Exhaust Valve (ABFV105)

- **Function:** Controls exhaust and pressure relief from the reaction chamber.
- **Status:** Close
- **Operation:**
Opened during purging or pressure equalization operations.

3.3 RC101 Argon Low Purging Valve (SOV107)

- **Function:** Supplies low-flow argon for gentle inert purging of the chamber.
- **Status:** Off
- **Operation:**
Used during initial inerting or standby conditions.

4. Right-Side Controls – Gas Purging & Flow Control

4.1 Reaction Chamber Nitrogen Purging Valve (SOV103)

- **Function:** Introduces nitrogen gas into the reaction chamber for inerting.
- **Status:** Off
- **Operation:**
Used to displace oxygen and maintain a safe inert atmosphere.

4.2 Reaction Chamber Air Purging Valve (SOV105)

- **Function:** Supplies air for controlled venting or purging when required.
- **Status:** Off
- **Operation:**
Typically used during maintenance or system clean-up.

4.3 RC101 Argon High Purging Valve (SOV104)

- **Function:** Supplies high-flow argon for rapid inerting.
- **Status:** Off

- **Operation:**
Used during start up or emergency inerting scenarios.

5. Gas Flow Control Valves

5.1 Nitrogen Control Valve (CV103)

- **Function:** Regulates nitrogen flow into the reaction chamber.
- **Set Value:** Operator-defined flow percentage
- **Actual Value:** Real-time measured flow
- **Status:** Off

5.2 Air Control Valve (CV101)

- **Function:** Regulates air flow into the reaction chamber.
- **Set Value:** 10.00 %
- **Actual Value:** 0.00 %
- **Status:** Off

5.3 Argon Control Valve (CV102)

- **Function:** Regulates argon flow into the reaction chamber.
- **Set Value:** Operator-defined
- **Actual Value:** Real-time measured
- **Status:** Off

6. Process Parameter Monitoring

Displayed at the bottom of the screen:

- **Reaction Chamber Surface Temperature:** (Displayed in °C)
- **Reaction Chamber Internal Temperature:** 21.9 °C
- **Reaction Chamber Pressure Transmitter:** 0.00 mbar

Purpose:

- Ensures safe operating temperature and pressure
- Prevents unsafe reactions or over-pressurization
- Provides real-time feedback during purging and mixing

14.3 Storage Hopper

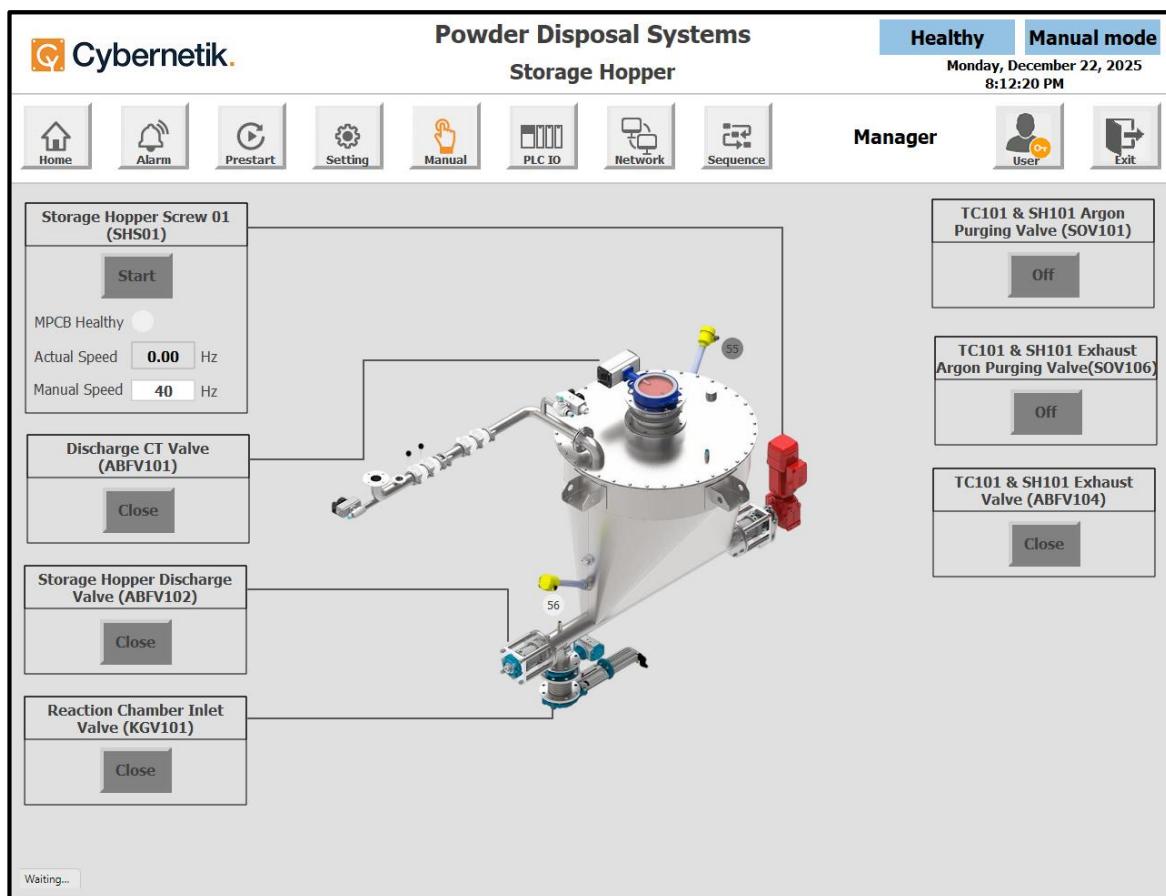


Figure 27: Storage Hopper

1. Purpose of the Screen

This HMI screen provides **manual control and monitoring** of the **Storage Hopper section** of the Powder Disposal System. It allows operators to control the hopper screw feeder, material transfer valves, purging systems, and exhaust valves to ensure safe storage and controlled transfer of powder.

2. System Status & Operating Mode

- System Health:** Healthy
Confirms that all safety interlocks, sensors, and protective devices are operational.
- Operating Mode:** Manual Mode
Enables individual device operation for testing, maintenance, and controlled material transfer.

3. Left-Side Controls – Material Transfer & Drive Equipment

3.1 Storage Hopper Screw 01 (SHS01)

- **Function:** Transfers powder from the storage hopper to downstream equipment.
- **Control:** Start / Stop
- **Status Indicators:**
 - **MPCB Healthy:** Confirms motor protection circuit is healthy
 - **Actual Speed:** Displays real-time screw speed (Hz)
 - **Manual Speed:** Operator-defined speed reference (Hz)
- **Operational Note:**
Screw operation is interlocked with downstream valve positions.

3.2 Discharge CT Valve (ABFV101)

- **Function:** Controls powder discharge from the hopper to the conveying line.
- **Status:** Close
- **Operation:**
Opened only during controlled material transfer.

3.3 Storage Hopper Discharge Valve (ABFV102)

- **Function:** Isolates the storage hopper outlet.
- **Status:** Close
- **Operation:**
Remains closed during standby and purging.

3.4 Reaction Chamber Inlet Valve (KGV101)

- **Function:** Controls powder entry into the reaction chamber.
- **Status:** Close
- **Operation:**
Opened only when reaction chamber conditions are confirmed safe.

4. Right-Side Controls – Purging & Exhaust Systems

4.1 TC101 & SH101 Argon Purging Valve (SOV101)

- **Function:** Supplies argon gas for inert purging of the storage hopper and transfer line.
- **Status:** Off
- **Operation:**
Used to eliminate oxygen and maintain inert conditions.

4.2 TC101 & SH101 Exhaust Argon Purging Valve (SOV106)

- **Function:** Controls exhaust flow during argon purging.
- **Status:** Off
- **Operation:**
Ensures safe venting during inerting operations.

4.3 TC101 & SH101 Exhaust Valve (ABFV104)

- **Function:** Controls exhaust discharge from the hopper system.
- **Status:** Close
- **Operation:**
Opened during pressure relief or purging sequences.

14.4 Tote Station

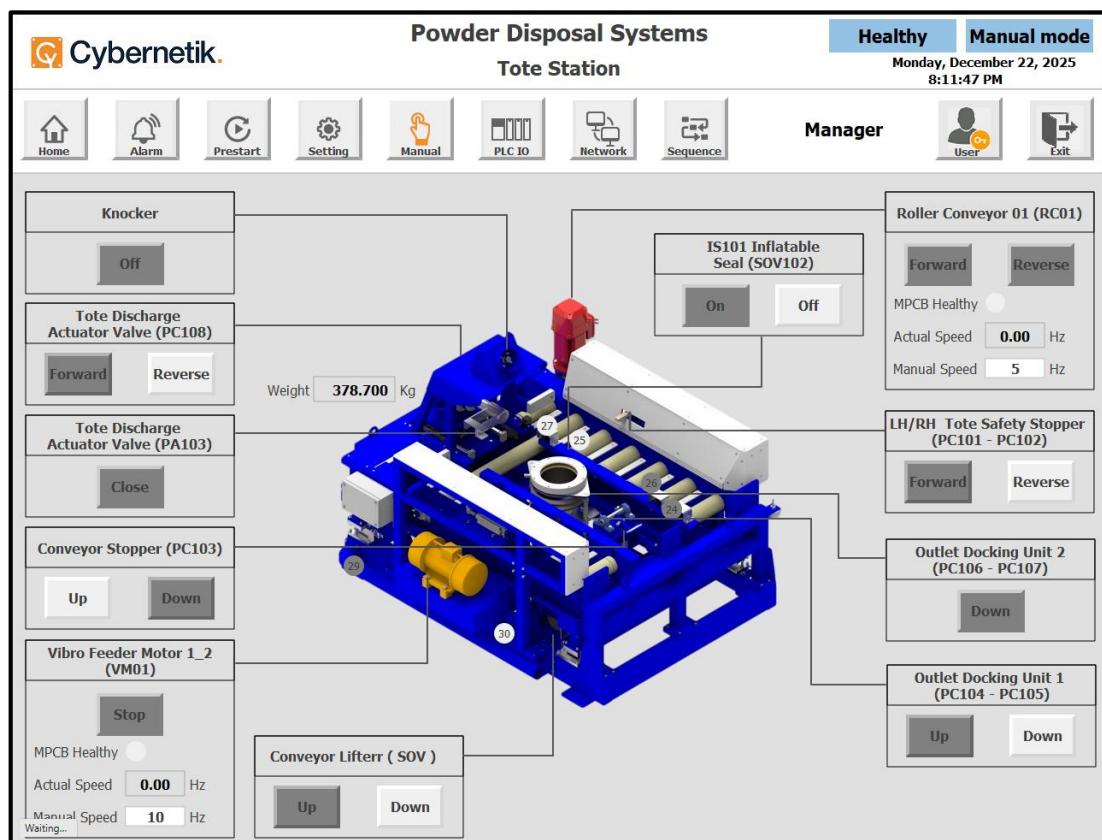


Figure 28: Tote Station

1. Purpose of the Tote Station Screen

The **Tote Station Screen** is used for manual operation, positioning, docking, discharge, and verification of powder totes before powder transfer into the system.

This screen allows the operator to:

- Position the tote correctly
- Dock and seal the tote outlet
- Control discharge mechanisms
- Verify weight reduction during discharge

2. Header and System Status

2.1 Operating Status

- **Healthy:** No active alarms or safety faults
- **Manual Mode:** Confirms manual control is enabled

3. Weight Display

Weight Indicator

- **Weight:** 378.700 kg

Function:

- Displays the **live measured weight** of the tote

4. Left-Side Manual Controls

4.1 Knocker

Control: ON / OFF

Function:

- Activates the knocker mechanism
- Used to dislodge powder sticking inside the tote

Typical Use:

- During discharge when powder flow becomes irregular

Excessive use may damage tote lining.

4.2 Tote Discharge Actuator Valve – PC108

Controls: Forward / Reverse

Function:

- Operates the primary discharge actuator
- Opens or closes the tote outlet mechanically

PLC Interlocks:

- Docking seal must be active
- Safety stoppers engaged

4.3 Tote Discharge Actuator Valve – PA103

Control: Close

Function:

- Secondary actuator for securing the discharge valve
- Ensures full closure after discharge

4.4 Conveyor Stopper – PC103

Controls: Up / Down

Function:

- Physically stops or releases the tote on the conveyor
- Ensures accurate positioning during docking

Usage:

- **Up:** Locks tote position
- **Down:** Allows tote movement

4.5 Vibro Feeder Motor 1_2 – VM01

Controls:

- Stop
- Actual Speed (Hz)
- Manual Speed Set point (Hz)

Function:

- Controls vibration to assist powder discharge

PLC Logic:

- Actual speed feedback confirms motor health
- Manual speed sets vibration intensity

4.6 Conveyor Lifter – SOV

Controls: Up / Down

Function:

- Raises or lowers conveyor section
- Aligns tote outlet with docking unit

5. Right-Side Manual Controls

5.1 Inflatable Seal – IS101 (SOV102)

Controls: ON / OFF

Function:

- Inflates a sealing ring around the tote outlet
- Ensures dust-tight and gas-tight connection

Safety Role:

- Prevents powder leakage
- Maintains inert atmosphere

Discharge is inhibited unless seal is ON.

5.2 Roller Conveyor 01 – RC01

Controls:

- Forward / Reverse
- MPCB Healthy indication
- Actual Speed (Hz)
- Manual Speed (Hz)

Function:

- Moves the tote into and out of docking position

Safety Interlock:

- Disabled during discharge
- Stops immediately if MPCB trips

5.3 LH / RH Tote Safety Stopper – PC101 & PC102

Controls: Forward / Reverse

Function:

- Engages left-hand and right-hand safety stoppers
- Prevents lateral or forward movement of tote

5.4 Outlet Docking Unit 2 – PC106 / PC107

Control: Down

Function:

- Lowers docking unit onto tote outlet
- Ensures mechanical alignment

5.5 Outlet Docking Unit 1 – PC104 / PC105

Controls: Up / Down

Function:

- Raises or lowers docking unit
- Used during docking and undocking sequence

15 Input Output List

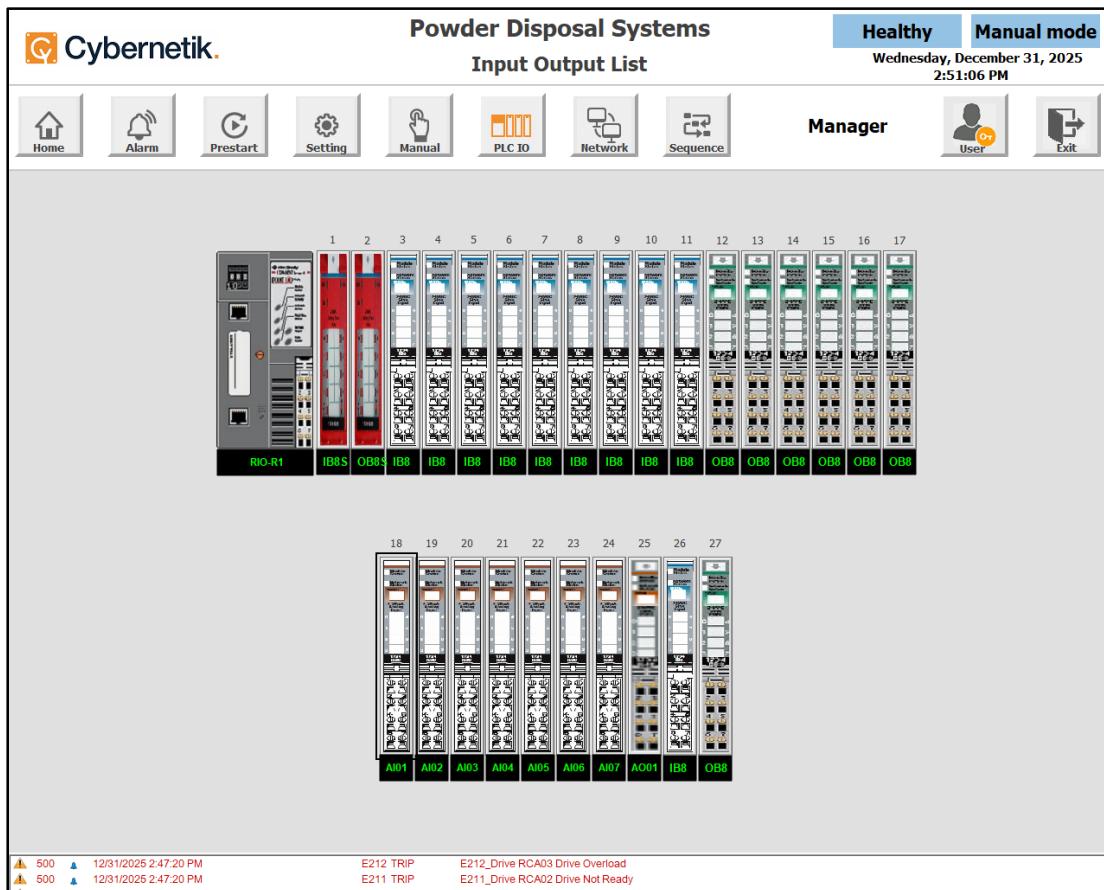


Figure 29: Input Output List

- From the I/O screen, one can check the list of PLC input and output. Healthy I/O's are indicated by green color whereas error is highlighted in red color.
- The list of PLC Input and Output (I/O), includes digital I/O.
- To view the I/O list one has to click on the required PLC I/O card.
- The list shows, the input name and its description.

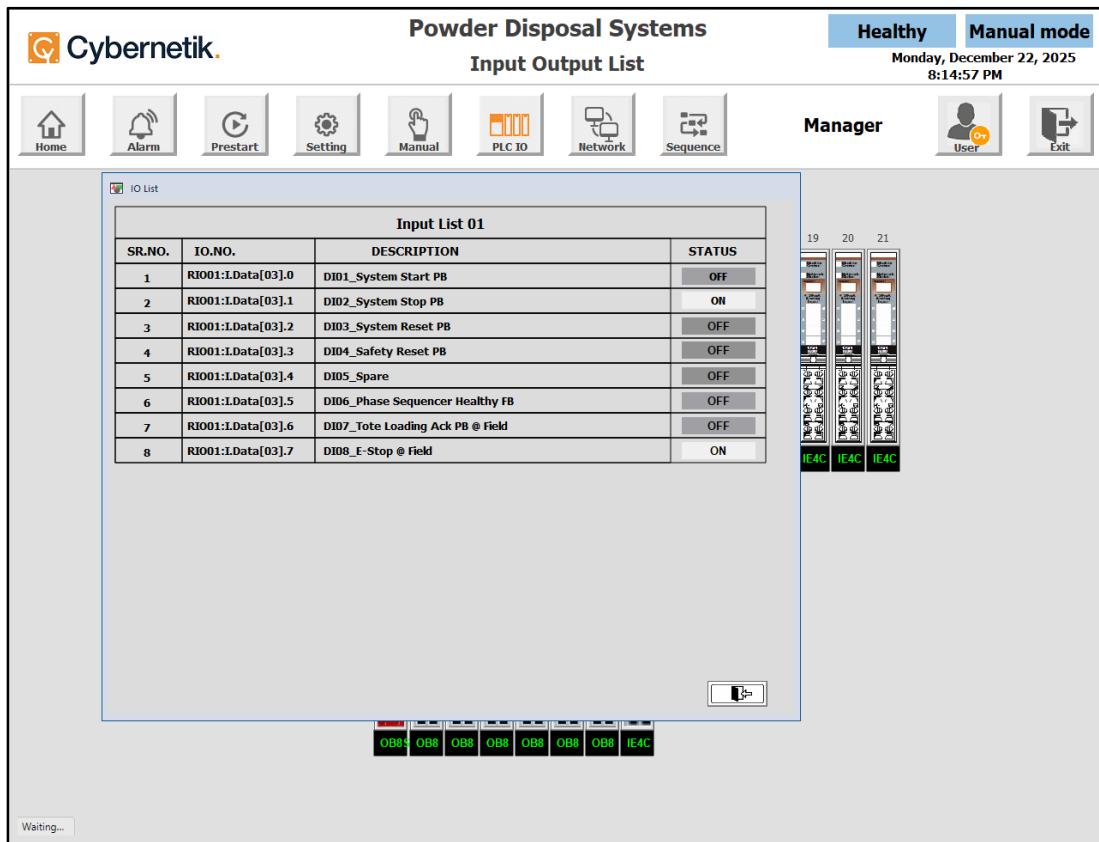


Figure 30: Input List

- **Input Devices:** This section lists all the devices or sensors that provide input to the SCADA system. These could include things like switches, buttons, sensors (such as temperature, pressure, or proximity sensors), and any other devices that send signals to the SCADA.
- **Output Devices:** This part of the list enumerates all the devices controlled by the SCADA. These could include motors, valves, actuators, alarms, indicators, and any other devices that the SCADA can send signals to in order to operate.

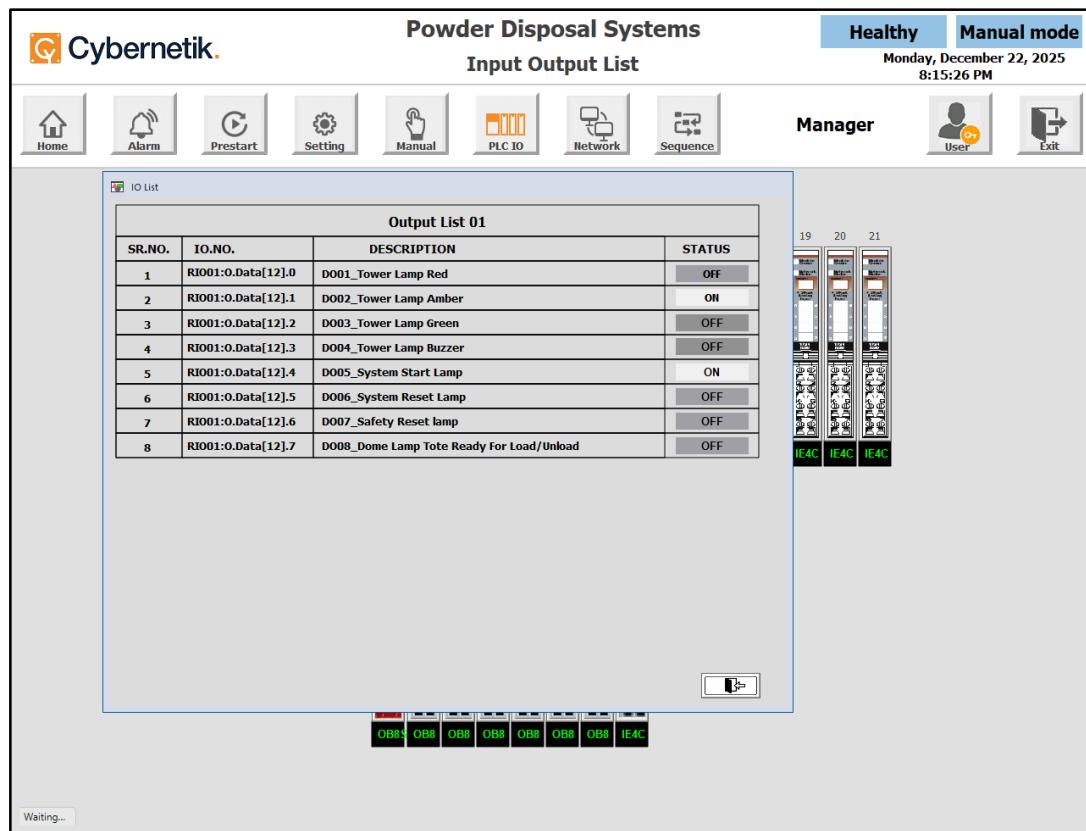


Figure 31: Output List

- Signal Types:** Each input and output point is usually described in terms of the signal type it accepts or generates. This could include analog signals (such as voltage or current), digital signals (binary on/off), or other specialized signal types depending on the specific requirements of the system.
- Descriptions and Labels:** Each input and output point is typically accompanied by a description or label that helps identify its function or location within the system. Clear labelling is crucial for proper system understanding and troubleshooting.
- Control Logic:** In some cases, the I/O list may also include information about the control logic associated with each input and output point. This could include details about how inputs are processed, how outputs are triggered, and any interlocks or safety mechanisms in place.
- Addressing Information:** In systems where devices are connected via a network or bus, the I/O list may include addressing information that specifies how each device is uniquely identified within the system architecture.

16 Network Architecture

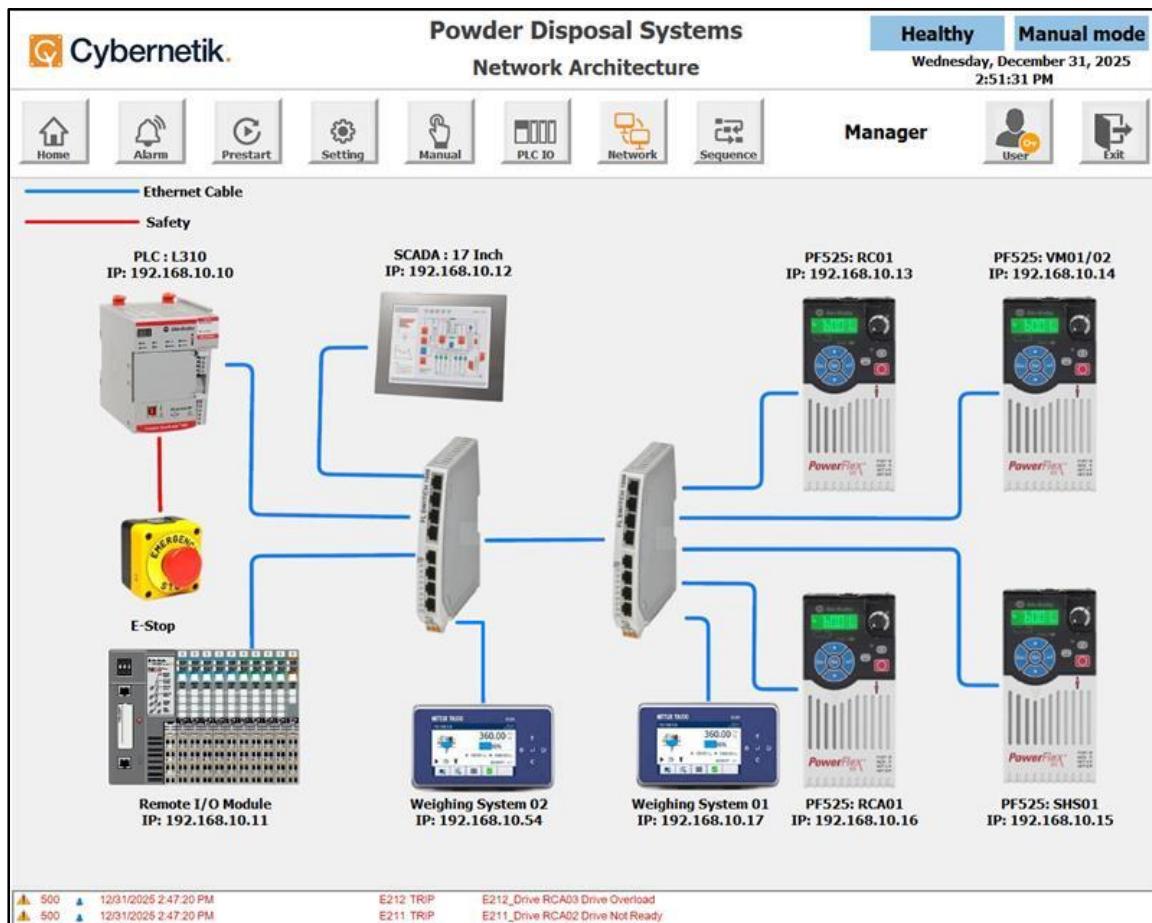


Figure 32: Network Architecture

- This screen gives a visual representation of the **PLC and network topology** for the robotic case packing system.
- It helps operators and maintenance engineers quickly locate devices, IP addresses, and communication paths.

17 Sequence

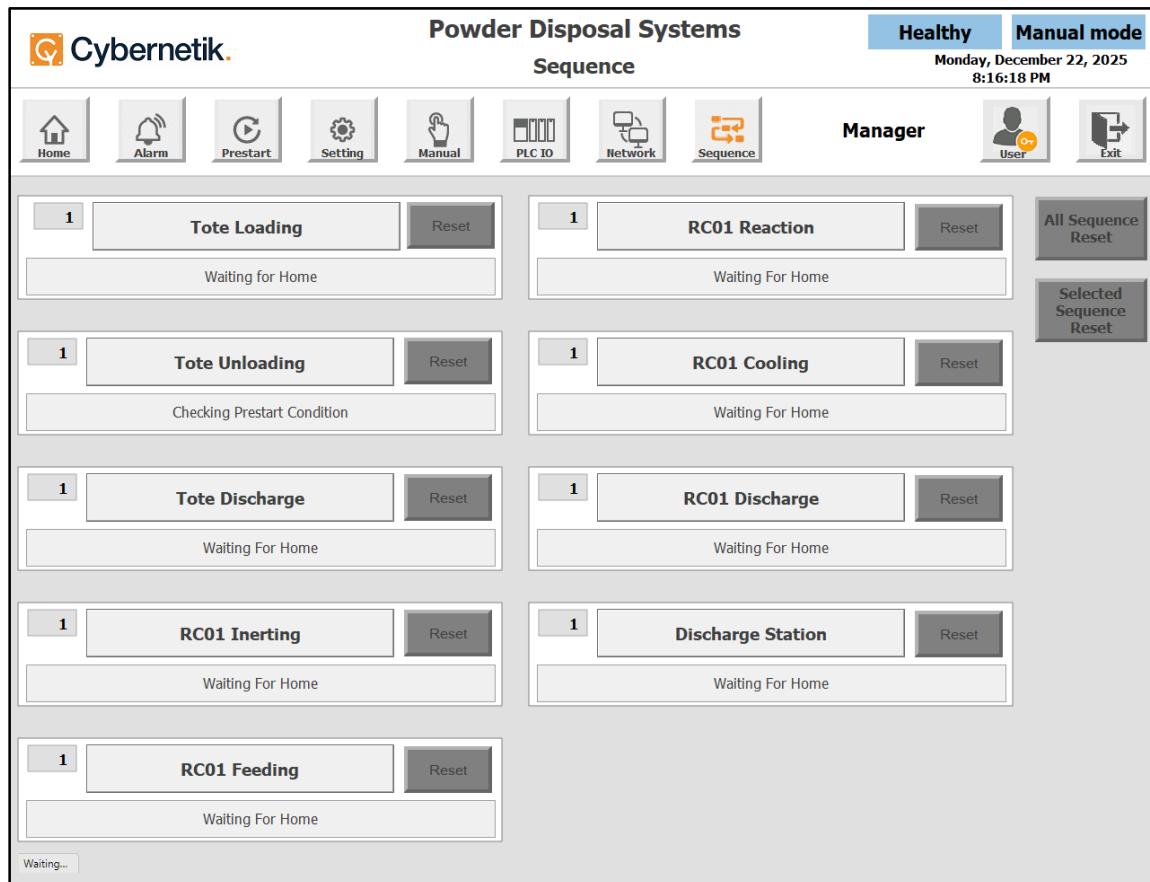


Figure 33: Sequence

The **Sequence Screen** provides a **structured overview and control interface** for all automatic and semi-automatic process sequences involved in the powder disposal operation.

This screen allows the operator to:

- Monitor the execution status of each process sequence
- Start, stop, and reset individual sequences
- Reset all sequences in case of abnormal interruption
- Verify whether each sequence is ready to execute

The Sequence Screen does **not allow direct actuator control**. All actions are executed via predefined PLC logic.

Sr.No	Alar m Code	Alarm Description	Causes	Actions
1	E001	E001_RIO01 Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.
2	E002	E002_DriveRC01 Drive Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.
3	E003	E003_DriveVM01 Drive Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.
4	E004	E004_DriveSHM01 _Drive Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection. 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.
5	E005	E005_DriveRCA01 Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.

Sr.No	Alar m Code	Alarm Description	Causes	Actions
6	E006	E006 Mettler WS01 Communication Fault	Communication Fault occurs due to Disconnection between the Ethernet cable from Remote IO01 to PLC through Ethernet HUB	<ol style="list-style-type: none"> 1. Check the Ethernet cable connection 2. Check the RIO1 Power is ON. 3. Press the Drive Reset button from HMI or Press the Reset button from HMI Panel.
7	E101	E101_E-Stop At HMI_Pressed	HMI Emergency stop button might have been pressed making the system unhealthy to start by breaking the safety circuit.	To make system healthy ready to run, emergency button pressed which is placed on main panel door must be reset by releasing the button.
8	E102	E102_E-Stop At Field Pressed	HMI Emergency stop button might have been pressed making the system unhealthy to start by breaking the safety circuit.	To make system healthy ready to run, emergency button pressed which is placed on main panel door must be reset by releasing the button.
9	E103	E103_Line Monitoring Alarm	1. Phase Failure from Power Supply. 2. Blown Fuse or Tripped Circuit Breaker 3. Loose or Disconnected Wiring	<ol style="list-style-type: none"> 1. Check the incoming power supply 2. Inspect and replace blown fuses or reset the circuit breaker 3. Tighten all connections and check for burnt or damaged wires
10	E104	E104_Air Pressure Switch FB Alarm	Air pressure is low than the required set point.	Required minimum compressed air pressure must satisfy. If it isn't, the air pressure needs to be checked and pressure value must be brought at the required set point.
11	E105	E105_Argon Pressure Switch FB Alarm	Argon pressure is low than the required set point.	Required minimum compressed air pressure must satisfy. If it isn't, the air pressure needs to be checked and pressure value must be brought at the required set point.
12	E106	E106_Nitrogen Pressure Switch FB Alarm	Nitrogen pressure is low than the required set point.	Required minimum compressed air pressure must satisfy. If it isn't, the air pressure needs to be checked and pressure value

				must be brought at the required set point.
13	E107	E107_Docking Inflatable Seal Pressure Switch FB Alarm	Docking Inflatable seal pressure is low than the required set point.	Required minimum compressed air pressure must satisfy. If it isn't, the air pressure needs to be checked and pressure value must be brought at the required set point.
14	E108	E108_Discharge Hopper Inflatable Seal Pressure Switch FB Alarm	Dischargehopper Inflatable seal pressure is low than the required set point.	Required minimum compressed air pressure must satisfy. If it isn't, the air pressure needs to be checked and pressure value must be brought at the required set point.
15	E201	E201_DriveRC01_MPCB Tripped	1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss	1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter
16	E202	E202_DriveRC01_Drive Not Ready	1. Power Supply Issues 2. E-stop is Active	1. Check the incoming power supply voltage and ensure all three phases are present. 2. The emergency stop button is pressed or a safety relay has tripped.
17	E203	E203_DriveRC01_Drive Overload	Motor Overload	Check if the motor is running under excessive load and reduce it if possible.
18	E204	E204_DriveVM01_MPCB_Tripped	1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss	1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter
19	E205	E205_DriveVM01_Drive Not Ready	1. Power Supply Issues 2. E-stop is Active	1. Check the incoming power supply voltage and ensure all three phases are present. 2. The emergency stop button is pressed or a safety relay has tripped.

20	E206	E206_DriveVM01 Drive_Overload	Motor Overload	Check if the motor is running under excessive load and reduce it if possible.
21	E207	E207_DriveSHM01 _MPCB_Tripped	1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss	1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter
22	E208	E208_DriveSHM01 _Drive_Not_Ready	1. Power Supply Issues 2. E-stop is Active	1. Check the incoming power supply voltage and ensure all three phases are present. 2. The emergency stop button is pressed or a safety relay has tripped.
23	E209	E209_DriveSHM01 _Drive_Overload	Motor Overload	Check if the motor is running under excessive load and reduce it if possible.
24	E210	E210_DriveRCA01 _MPCB_Tripped	1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss	1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter
25	E211	E211_DriveRCA02 _Drive_Not_Ready	1. Power Supply Issues 2. E-stop is Active	1. Check the incoming power supply voltage and ensure all three phases are present. 2. The emergency stop button is pressed or a safety relay has tripped.
26	E212	E212_DriveRCA03 _Drive_Overload	Motor Overload	Check if the motor is running under excessive load and reduce it if possible.
27	E213	E213_Oil Recirculation pump _MPCB_Tripped	1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss	1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter

28	E214	E214_Hoist_MPCB_Tripped	<ul style="list-style-type: none"> 1. Overload Condition 2. Short Circuit 3. Phase Imbalance or Phase Loss 	<ol style="list-style-type: none"> 1. Check if the motor is running under excessive load and reduce it if necessary. 2. Replace any damaged cables or faulty component 3. Check input voltage across all three phases using a voltmeter
29	E301	E301_PC101_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
30	E302	E302_PC101_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
31	E303	E303_PC101_Fwd_Rev Position Clash Alarm	<ul style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
32	E304	E304_PC101_Fwd_Rev position Absent	<ul style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
33	E305	E305_PC102_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
34	E306	E306_PC102_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
35	E307	E307_PC102_Fwd_Rev Position Clash Alarm	<ul style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary

36	E308	E308_PC102_Fwd_Rev position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
37	E309	E309_PC103_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
38	E310	E310_PC103_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
39	E311	E311_PC103_Fwd_Rev Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
40	E312	E312_PC103_Fwd_Rev position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
41	E313	E313_PC104_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
42	E314	E314_PC104_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
43	E315	E315_PC104_Fwd_Rev Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage.

				3. Check the air / hydraulic pressure levels and adjust if necessary
44	E316	E316_PC104_Fwd Rev position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
45	E317	E317_PC105_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
46	E318	E318_PC105_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
47	E319	E319_PC105_Fwd _ Rev Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
48	E320	E320_PC105_Fwd _ Rev position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
49	E321	E321_PC106_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
50	E322	E322_PC106_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
51	E323	E323_PC106_Fwd _ Rev Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault	1. Inspect for any physical obstructions in the cylinder's path.

			3. Pneumatic or Hydraulic Pressure Issue	2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
52	E324	E324_PC106_Fwd Rev position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
53	E325	E325_PC107_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
54	E326	E326_PC107_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
55	E327	E327_PC107_Fwd Rev Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
56	E328	E328_PC107_Fwd Rev Position Absent	1. Cylinder is Stuck or Not Moving. 2. Mechanical Obstruction or Misalignment. 3. Pneumatic or Hydraulic Pressure Issue.	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
57	E329	E329_PC108_Fwd Position Absent Alarm	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
58	E330	E330_PC108_Rev Position Absent Alarm	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.

59	E331	E331_PC108_Fwd _ Rev Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
60	E332	E332_PC108_Fwd _ Rev Position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
61	E333	E333_PA103_Fwd Position Absent	Faulty or Misaligned Forward Position Sensor	Inspect the Forward position sensor for proper alignment and secure mounting.
62	E334	E334_PA103_Rev Position Absent	Faulty or Misaligned Reverse Position Sensor	Inspect the Reverse position sensor for proper alignment and secure mounting.
63	E335	E335_PA103_Fwd _ Rev Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
64	E336	E336_PA103_Fwd _ Rev Position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
65	E337	E337_ABFV101_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.

Sr.No	Alar m Code	Alarm Description	Causes	Actions
66	E338	E338_ABVF101_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
67	E339	E339_ABVF101_Open Close Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
68	E340	E340_ABVF101_Open Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
69	E341	E341_ABVF102_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
70	E342	E342_ABVF102_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
71	E343	E343_ABVF102_Open_Close Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air / hydraulic pressure levels and adjust if necessary
72	E344	E344_ABVF102_Open_Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path.

			3. Pneumatic or Hydraulic Pressure Issue	3. Check the air/hydraulic pressure levels and adjust if necessary
73	E345	E345_ABVF103_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
74	E346	E346_ABVF103_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
75	E347	E347_ABVF103_Open_Close Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air/hydraulic pressure levels and adjust if necessary
76	E348	E348_ABVF103_Open_Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
77	E349	E349_ABVF104_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
78	E350	E350_ABVF104_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
79	E351	E351_ABVF104_Open_Close Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air/hydraulic pressure levels and adjust if necessary

80	E352	E352_ABHV104_Open_Close Position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air/hydraulic pressure levels and adjust if necessary
81	E353	E353_ABHV105_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
82	E354	E354_ABHV105_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
83	E355	E355_ABHV105_Open_Close Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment. 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air/hydraulic pressure levels and adjust if necessary
84	E356	E356_ABHV105_Open_Close Position Absent	<ol style="list-style-type: none"> 1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue 	<ol style="list-style-type: none"> 1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air/hydraulic pressure levels and adjust if necessary
85	E357	E357_ABHV106_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
86	E358	E358_ABHV106_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
87	E359	E359_ABHV106_Open_Close Position Clash Alarm	<ol style="list-style-type: none"> 1. Mechanical Obstruction or Misalignment 2. Sensor Fault 	<ol style="list-style-type: none"> 1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage.

			3. Pneumatic or Hydraulic Pressure Issue	3. Check the air/hydraulic pressure levels and adjust if necessary
88	E360	E360_ABVF106_Open_Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air / hydraulic pressure levels and adjust if necessary
89	E361	E361_KGV101_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
90	E362	E362_KGV101_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.
91	E363	E363_KGV101_Open_Close Position Clash Alarm	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air/hydraulic pressure levels and adjust if necessary
92	E364	E364_KGV101_Open_Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air/hydraulic pressure levels and adjust if necessary
93	E365	E365_KGV102_Open Position Absent Alarm	Faulty or Misaligned Open Position Sensor	Inspect the Open position sensor for proper alignment and secure mounting.
94	E366	E366_KGV102_Close Position Absent Alarm	Faulty or Misaligned Close Position Sensor	Inspect the Close position sensor for proper alignment and secure mounting.

95	E367	E367_KGV102_Open_Close Position Clash	1. Mechanical Obstruction or Misalignment 2. Sensor Fault 3. Pneumatic or Hydraulic Pressure Issue	1. Inspect for any physical obstructions in the cylinder's path. 2. Check Reed Switch or sensors for misalignment or damage. 3. Check the air/hydraulic pressure levels and adjust if necessary
96	E368	E368_KGV102_Open_Close Position Absent	1. Cylinder is Stuck or Not Moving 2. Mechanical Obstruction or Misalignment 3. Pneumatic or Hydraulic Pressure Issue	1. Manually test the cylinder movement to check for resistance. 2. Inspect for any physical obstructions in the cylinder's path. 3. Check the air/hydraulic pressure levels and adjust if necessary
97	E369	E369_SH101 High Level Sensor_Alarm	Material level in SH101 exceeds upper limit	1. Verify actual material level. 2. Check for sensor blockage or calibration error. 3. Stop feeding if overfilling continues.
98	E370	E370_SH101 Low Level Sensor_Alarm	Material level in SH101 is below minimum.	1. Inspect tote Outfeed line for blockage. 2. Ensure material supply is adequate. 3. Check low-level sensor health.
99	E371	E371_SH101 Surface Temp High_Alarm	Surface temperature of SH101 above safe operating limit.	1. Reduce Control output or stop heating. 2. Open the Exhaust Valve for cooling system. 3. Verify temperature sensor.
100	E372	E372_SHM01 Screw Temp High_Alarm	Screw temperature in mixer / feeder is too high.	1. Lower screw speed or load. 2. Check lubrication/cooling.
101	E373	E373_RC101 Surface Temperature High_Alarm	RC101 surface temperature above allowable limit.	1. Reduce heater / cooling malfunction check. 2. Inspect RC101 insulation. 3. Validate sensor
102	E374	E374_RC101 Internal	Internal chamber temp of RC101 above limit.	1. Reduce heating demand. 2. Inspect thermocouple

		Temperature High Alarm		
103	E375	E375_RC101 Exhaust Temperature High Alarm	Exhaust gas temperature too high.	<ol style="list-style-type: none"> 1. Check exhaust flow restriction. 2. Inspect exhaust sensor.
104	E376	E376_RC101 Pressure High Alarm	Internal pressure exceeding safe limit.	<ol style="list-style-type: none"> 1. Open Exhaust Valve system. 2. Check pressure transmitter.
105	E377	E377_DH101 Surface Temperature High Alarm	High surface temperature detected in DH101.	<ol style="list-style-type: none"> 1. Reduce heating load. 2. Validate surface RTD / thermocouple.
106	E378	E378_DH101 Internal Temperature High Alarm	Internal DH101 temperature too high.	<ol style="list-style-type: none"> 1. Reduce heater output. 2. Verify internal temperature sensor
107	E379	E379TC101_SH101 1 Exhaust Oxygen Analyser FB_Fault	Feedback signal lost / invalid for O ₂ analyzer (TC101).	<ol style="list-style-type: none"> 1. Check analyzer power and signal wiring. 2. Reset or recalibrate analyzer.
108	E380	E380_RC101 Exhaust Oxygen Analyser FB_Fault	RC101 O ₂ analyzer feedback fault.	<ol style="list-style-type: none"> 1. Inspect analyzer health. 2. Check communication cable. 3. Perform recalibration
109	E381	E381_RC101 Argon Control Valve FB_Fault	Valve position feedback not matching command.	Inspect feedback potentiometer / transmitter.
110	E382	E382_RC101 Nitrogen Control Valve FB_Fault	Valve position feedback not matching command.	Inspect feedback potentiometer / transmitter.
111	E383	E383_RC101 Air Control Valve FB_Fault	Valve position feedback not matching command.	Inspect feedback potentiometer / transmitter

19.1 Mechanical Spare List

Sr.No	Item Code	Parts Description	Used Quantity	Recommended Spares	Critical Spares
1.					
2.					
3.					
4.					
5.					

19.2 Electrical Spare List

Sr.No	Item Code	Parts Description	Used Quantity
1.	6010AB000272	COMPACTLOGIX 5380 CONTROLLER 5069-L310ERS2	1
2.	6010AB000150	SINK SAFETY I/P MODULE 1734-IB8S 24VDC 8 CHANNEL	1
3.	6010AB000151	SOURCE SAFETY O/P MODULE 1734-OB8S 24VDC 8 CHANNEL	1
4.	6010AB000215	ONE PIECE TERMINAL BASE 1734-TOP3 12-SCREW TERMINA	4
5.	6010AB000207	COMPACT I/O POWER TERM RTB KIT 5069-RTB64-SCREW	1
6.	604HOP000002	PANEL MOUNT INDUSTRIAL MONITOR 17" HIS-ML17-CTVI	1
7.	604HOP000003	POWER CORD 10A 1.5M CABLE IEC C-13 TO NA CAC-05	1
8.	604HOP000004	USB TYPE A TO USB TYPE B (M-M)1.8M CABLE CUSB-06	1
9.	604HOP000005	VGA (HD-15)M TO DVI-I M 1.8M CABLE CVGA-DVI-06	1
10.	604PHX000004	DINRAIL MOUNT PC VL3 BPC WITH OS 1376797 PHOENIX	1
11.	6010AB000152	ONE PIECE TERMINAL BASE 1734-TOP SCREW TERMINAL	21
12.	6010AB000021	MODULE 1734-IB8 24VDC 8 CHANNEL SINK I/P MODULE	9
13.	6010AB000022	MODULE 1734-OB8 24VDC 8 CHANNEL SOURCE O/P MODULE	6

Sr.No	Item Code	Parts Description	Used Quantity
14.	6010AB000025	ANALOG MODULE 1734-IE4C 24VDC 4 CH.HIGH DENSITY	5
15.	6010AB000027	ANALOG MODULE 1734-OE4C 24VDC 4 POINT CURRENT O/P	1
16.	6010AB000018	MODULE 1734-AENTR ETHERNET/IP TWISTED IO ADAPTOR	1
17.	6010AB000019	MODULE 1734-EP24DC 24VDC POWER/BUS EXTENSION -AB	2
18.	609RIT000008	PANEL AE 1073 500 760W X 760H X 300D MS RITTAL	1
19.	607TTP000002	WIRING CHANNEL ART NO. 011701070 TBWDN40X60LG2	2
20.	607TTP000003	DIN RAIL ART NO.011700331 TBLS-35/7.5 2 MTR 35MM	1
21.	999CMBS00299	INSULATOR TAPPING M6X30 MM RED COLOR	4
22.	607SIE000648	ISOLATOR SWITCH 3LD21030TK53 3-POLE 25A-SIEMENS	1
23.	610RIT000028	TOP THERM FAN & FILTER SK SK 3238724 4" 24VDC	1
24.	610RIT000011	OUTLET FILTER SK 3238200 4" MAKE RITTAL	1
25.	610BAN000016	LED PANEL LIGHT WLS15XDW0220DSC2 24VDC UL BANNER	1
26.	607SIE011807	DOOR LIMIT SWITCH 3SE5250-0CC05 SIEMENS UL	1
27.	607PND000004	VERISAFE 1.0 VOLTAGE TESTER VS-AVT-C08-L10 PANDUIT	1
28.	607PHX000002	LINE MONITORING RELAY EMD-BL-PH-480 2903527 UL	1
29.	607SIE000462	MPCB 3.5-5A 3RV20111FA10 SIZE : S00 - SIEMENS	1

Sr.No	Item Code	Parts Description	Used Quantity
30.	607SIE000460	MPCB 1.8-2.5A 3RV20111CA10 SIZE : S00 - SIEMENS	2
31.	607SIE000156	MPCB 4.5-6.3A 3RV20111GA10 SIZE : S00 - SIEMENS	1
32.	607SIE000458	MPCB 1.1-1.6A 3RV20111AA10 SIZE : S00 - SIEMENS	3
33.	607SIE000138	AUX CONTACT BLOCK 1NO + 1NC 3RV29011A - SIEMENS	8
34.	607SIE000425	CONTACTOR 7A 24VDC 3RT20151BB41 1NO -SIEMENS	2
35.	6050AB000059	DRIVE PF525 25B-D4P0N104 1.5KW 2HP 3PH MAKE: AB	1
36.	6050AB000050	DRIVE PF525 25B-D2P3N104 0.75KW 1 HP 480VAC -AB	2
37.	6050AB000058	DRIVE PF525 25B-D6P0N104 2.2KW 3HP 3PH MAKE: AB	1
38.	607SIE011734	MCB 2P 2A 5SJ4202-7HG42 10KA BREAK CAP. SIEMENS	1
39.	601PHX000025	ETHERNET SW 1008N UNMANAGED 1085256 8 PORT-PHX	1
40.	610PHX000001	SSR PLC-OSC-24DC/24DC/2 ART NO: 2966634 - PHOENIX	1
41.	610PHX000187	FUSE TERMINAL PT4-HESILA 250(5X20) 3211907- PHOENIX	9
42.	610PHX000183	TERMINAL SINGLE PT 4 3211757- PHOENIX	40
43.	610PHX000185	END COVER FOR PT4 D-ST 4 3030420- PHOENIX	10
44.	610PHX000181	TERMINAL END BRACKET CLIPFIX 35 3022218 - PHOENIX	4

Sr.No	Item Code	Parts Description	Used Quantity
45.	610PHX000019	MARKERS ZB 6 LGS:1-10 ARTICLE NO:1051016:0001	6
46.	610PHX000020	MARKERS ZB 6 LGS:11-20 ARTICLE NO:1051016:0011	4
47.	610PHX000021	MARKERS ZB 6 LGS:21-30 ARTICLE NO:1051016:0021	2
48.	610ETN000002	GLASS FUSE 1A BK/GMA-1-R UL EATON	5
49.	611LAP000386	CABLE FLEX 2.5 SQMM X 1C BROWN 4160503 UL-LAPP	5
50.	611LAP000383	CABLE FLEX 2.5 SQMM X 1C ORANGE 4160509 UL-LAPP	5
51.	611LAP000384	CABLE FLEX 2.5 SQMM X 1C YELLOW 4160510 UL-LAPP	5
52.	611LAP000385	CABLE FLEX 1.5 SQMM X 1C BROWN 4160403 UL-LAPP	100
53.	611LAP000334	CABLE FLEX 1.5 SQMM X 1C ORANGE 4160409 UL-LAPP	25
54.	611LAP000381	CABLE FLEX 1.5 SQMM X 1C YELLOW 4160410 UL-LAPP	25
55.	611LAP000313	CABLE FLEXI 0.5 SQMM X 1C 4160102 BLUE UL-LAPP	10
56.	611LAP000356	CABLE FLEX 0.5 SQMM X 1C BLUE/WHITE 4160126-UL-LAP	10
57.	611LAP000413	CABLE FLEX 0.5SQMM X 1C YELLOW 4160110 MAKE-LAPP	10
58.	611LAP000438	CABLE FLEX 1.5 SQMM X 1C BLUE 4160402 UL-LAPP	10

Sr.No	Item Code	Parts Description	Used Quantity
59.	611LAP000439	CABLE FLEX 1.5 SQMM X1C BLUE/WHITE 4160426 UL-LAPP	10
60.	611LAP000436	CABLE FLEX 2.5 SQMM X 1C GREEN 4160511 UL-LAPP	10
61.	611LAP000435	CABLE FLEX 1.5 SQMM X 1C GREEN 4160411 UL-LAPP	10
62.	611ETH000001	ETHERNET PATCH CORD CAT 6 LENGTH: 1 METER	4
63.	611ETH000010	ETHERNET PATCH CORD CAT 6 LENGTH: 0.5 METER	2
64.	610GSL000055	GLAND PG-11 POLYAMIDE PART NO.341.1100.1	2
65.	610GSL000056	LOCK NUT PG-11 POLYAMIDE PART NO.792.1100.1	2
66.	610GSL000059	GLAND PG-16 POLYAMIDE PART NO.341.1600.1	10
67.	610GSL000060	LOCK NUT PG-16 POLYAMIDE PART NO.792.1600.1	10
68.	610GSL000102	GLAND PG-21 POLYAMIDE PART NO.341.2100.1	5
69.	610GSL000034	LOCKNUT PG 21 792.2100.1 POLYAMIDE GEISSEL	5
70.	610FIX000008	LUGS INSULATED CORD END TERMINAL L8 2.5 SQMM	50
71.	610FIX000006	LUGS INSULATED CORD END TERMINAL L8 1.5 SQMM	100
72.	610FIX000001	LUGS INSULATED CORD END TERMINAL L8 0.5 SQMM	100
73.	610FUS000017	GLASS FUSE 500MA PSF 0.5A UL PROTECTRON	10

Sr.No	Item Code	Parts Description	Used Quantity
74.	607SIE011860	UL TERMINAL COVER 3LD9221 - 0A FOR 3LD2 ISO. SW	1
75.	610BUS000004	BUSBAR COPPER PATTI (15) X (6)MM	1.500
76.	607SIE000135	MPCB 7-10A 3RV20111JA10 SIZE:S00 - SIEMENS	1
77.	607SIE000410	LINK MODULE S00 / S00 AC / DC 3RA19211DA00 - SIEMENS	1
78.	607SAH000008	UL-TRANSFORMER 1000VA P:480V AC S: 230V AC	1
79.	607SIE011732	MCB 2P 6A 5SJ4206 - 7HG42 10KA BREAK CAP. SIEMENS	2
80.	607SIE011735	MCB 2P 4A 5SJ4204-7HG42 10KA BREAK CAP. SIEMENS	1
81.	610PHX000022	MARKERS ZB 6 LGS:31-40 ARTICLE NO: 1051016:0031	2
82.	610PHX000023	MARKERS ZB 6 LGS:41-50 ARTICLE NO: 1051016:0041	2
83.	613PZT000003	RJ45 SOCKET E2 1RJ459AAK	3
84.	611ETH000004	ETHERNET PATCH CORD CAT 6 LENGTH: 2 METER	3
85.	609RIT000149	PANEL AE 1213500 1000(W) X 1200 (H) X 300(D) MS RITTAL	1
86.	607TTP000002	WIRING CHANNEL ART NO. 011701070 TBWDN40X60LG2	2
87.	607TTP000001	WIRING CHANNEL ART NO. 011701074 TBWDN60X60LG2	3
88.	607TTP000003	DIN RAIL ART NO.011700331 TBLS-35/7.5 2 MTR 35MM	2

Sr.No	Item Code	Parts Description	Used Quantity
89.	999CMBS00299	INSULATOR TAPPING M6X30 MM RED COLOR	6
90.	607SIE000649	ISOLATOR SWITCH 3LD22030TK53 3-POLE 32A-SIEMENS	1
91.	610RIT000028	TOP THERM FAN & FILTER SK SK 3238724 4" 24VDC	1
92.	610RIT000011	OUTLET FILTER SK 3238200 4" MAKE RITTAL	1
93.	610PHX000173	SURGE PROTECTION VAL-US-120/40/1+1 FM TYPE1 2910349	1
94.	607SIE011734	MCB 2P 2A 5SJ4202-7HG42 10KA BREAK CAP. SIEMENS	4
95.	607SIE011735	MCB 2P 4A 5SJ4204-7HG42 10KA BREAK CAP. SIEMENS	2
96.	607SIE011740	MCB 2P 10A 5SJ4210-7HG42 10KA BREAK CAP.SIEMENS	2
97.	607SIE011805	MCB 2P 32A 5SJ4232-7HG42 10KA BREAK CAP. SIEMENS	1
98.	601PHX000021	SMPS ESSENTIAL-PS/1AC/24DC/480W/EE 24V 20A 2910588	1
99.	601PHX000025	ETHERNET SW 1008N UNMANAGED 1085256 8 PORT-PHX	1
100.	608PIZ000007	SAFETY RELAY 777301 PNOZ X2.8P 24 VACDC 3N/O 1N/C	1
101.	610PHX000130	RELAY SLIM PLC-RSC / 24DC / 21 / UWL / IN 1NO + 1NC 1533207	120
102.	607SIE011807	DOOR LIMIT SWITCH 3SE5250-0CC05 SIEMENS UL	1

Sr.No	Item Code	Parts Description	Used Quantity
103.	610PHX000017	LOOPING STRIP FBST 500-PLC-RD RED PART NO 2966786	1
104.	610PHX000018	LOOPING STRIP FBST 500-PLC-BU BLUE PARTNO:2966692	1
105.	610PHX000183	TERMINAL SINGLE PT 4 3211757-PHOENIX	8
106.	610PHX000185	END COVER FOR PT4 D-ST 4 3030420-PHOENIX	5
107.	610PHX000184	TERMINAL DOUBLE PTTB 4 3211786-PHOENIX	30
108.	610PHX000186	END COVER FOR PTTB 4 D-STTB 4 3030462-PHOENIX	5
109.	610PHX000189	SHORT LINK FOR PT 4 & PTTB 4 FBS 20-6 RED 3030365	1
110.	610PHX000190	SHORT LINK FOR PT 4&PTTB 4 FBS 20-6BU BLUE 3032208	1
111.	610PHX000187	FUSE TERMINAL PT4-HESILA 250(5X20) 3211907-PHOENIX	2
112.	610PHX000182	FUSE TERMINAL PT4-HESILED 24(5X20) 3211903-PHOENIX	130
113.	610PHX000019	MARKERS ZB 6 LGS:1-10 ARTICLE NO:1051016:0001	10
114.	610PHX000020	MARKERS ZB 6 LGS:11-20 ARTICLE NO:1051016:0011	4
115.	610PHX000021	MARKERS ZB 6 LGS:21-30 ARTICLE NO:1051016:0021	4
116.	610PHX000022	MARKERS ZB 6 LGS:31-40 ARTICLE NO:1051016:0031	4

Sr.No	Item Code	Parts Description	Used Quantity
117.	610PHX000023	MARKERS ZB 6 LGS:41-50 ARTICLE NO:1051016:0041	4
118.	610PHX000234	MARKER PTTB 4 ZBF 6-LSG:01-03-05...19 0808749	10
119.	610PHX000235	MARKER PTTB 4 ZBF 6-LSG:02-04-06...20 0808749	10
120.	610PHX000236	MARKER PTTB 4 ZBF 6-LSG:21-23-25...39 0808749	4
121.	610PHX000237	MARKER PTTB 4 ZBF 6-LSG:22-24-26...40 0808749	4
122.	610PHX000238	MARKER PTTB 4 ZBF 6-LSG:41-43-45...59 0808749	2
123.	610PHX000239	MARKER PTTB 4 ZBF 6-LSG:42-44-46...60 0808749	2
124.	610PHX000240	MARKER PTTB 4 ZBF 6-LSG:61-63-65...79 0808749	2
125.	610PHX000241	MARKER PTTB 4 ZBF 6-LSG:62-64-66...80 0808749	2
126.	610ETN000002	GLASS FUSE 1A BK/GMA-1-R UL EATON	2
127.	611LAP000355	CABLE FLEX 4 SQMM X 1C BLACK 4160601-UL-LAPP	20
128.	611LAP000452	UL-CABLE FLEX 4 SQMM X 1C WHITE 4160605-LAPP	20
129.	611LAP000304	CABLE FLEXI 1.5 SQMM X 1C 4160401 BLACK UL-LAPP	20
130.	611LAP000310	CABLE FLEXI 1.5 SQMM X 1C 4160405 WHITE UL-LAPP	20
131.	611LAP000313	CABLE FLEXI 0.5 SQMM X 1C 4160102 BLUE UL-LAPP	300

Sr.No	Item Code	Parts Description	Used Quantity
132.	611LAP000356	CABLE FLEX 0.5 SQMM X 1C BLUE/WHITE 4160126-UL-LAP	100
133.	611LAP000438	CABLE FLEX 1.5 SQMM X 1C BLUE 4160402 UL-LAPP	50
134.	611LAP000439	CABLE FLEX 1.5 SQMM X1C BLUE/WHITE 4160426 UL-LAPP	50
135.	611LAP000437	CABLE FLEX 4 SQMM X 1C GREEN 4160611 UL-LAPP	10
136.	611LAP000435	CABLE FLEX 1.5 SQMM X 1C GREEN 4160411 UL-LAPP	10
137.	611LAP000301	CABLE FLEX 1.5 SQMM X 1C GREEN / YELLOW 4160400 UL	20
138.	611LAP000413	CABLE FLEX 0.5SQMM X 1C YELLOW 4160110 MAKE-LAPP	20
139.	613PZT000003	RJ45 SOCKET E2 1RJ459AAK	7
140.	611ETH000001	ETHERNET PATCH CORD CAT 6 LENGTH: 1 METER	2
141.	611ETH000010	ETHERNET PATCH CORD CAT 6 LENGTH: 0.5 METER	4
142.	610GSL000053	GLAND PG-7 POLYAMIDE PART NO.341.0700.1	20
143.	610GSL000054	LOCK NUT PG-7 POLYAMIDE PART NO.792.0700.1	20
144.	610GSL000055	GLAND PG-11 POLYAMIDE PART NO.341.1100.1	2
145.	610GSL000056	LOCK NUT PG-11 POLYAMIDE PART NO.792.1100.1	2
146.	610GSL000059	GLAND PG-16 POLYAMIDE PART NO.341.1600.1	10
147.	610GSL000060	LOCK NUT PG-16 POLYAMIDE PART NO.792.1600.1	10

Sr.No	Item Code	Parts Description	Used Quantity
148.	610GSL000102	GLAND PG-21 POLYAMIDE PART NO.341.2100.1	3
149.	610GSL000034	LOCKNUT PG 21 792.2100.1 POLYAMIDE GEISSEL	3
150.	610PHX000181	TERMINAL END BRACKET CLIPFIX 35 3022218-PHOENIX	15
151.	610FIX000009	LUGS INSULATED CORD END TERMINAL L9 4.0 SQMM	20
152.	610FIX000006	LUGS INSULATED CORD END TERMINAL L8 1.5 SQMM	200
153.	610FIX000007	LUGS INSULATED CORD END TERMINAL L10 1.5 SQMM	100
154.	610FIX000015	LUGS INSU. TWIN CORD END TERMINAL L8 2X1.5 SQMM	150
155.	610FIX000001	LUGS INSULATED CORD END TERMINAL L8 0.5 SQMM	600
156.	610FIX000013	LUGS INSU. TWIN CORD END TERMINAL L8 2X0.5 SQMM	200
157.	610FUS000017	GLASS FUSE 500MA PSF 0.5A UL PROTECTRON	130
158.	600SIE000016	ASSEMBLY UL METAL GREEN LAMP 110VAC SIEMENS	1
159.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1
160.	613SIE000081	INDICATOR LIGHTS GREEN 3SU10516AA400AA0 SIEMENS	1
161.	613SIE000082	ILLUMINATION MODULE GREEN 110VAC 3SU14011BC401AA0	1
162.	610PHX000188	TERMINAL PT 10 3212120-PHOENIX	6

Sr.No	Item Code	Parts Description	Used Quantity
163.	610PHX000224	END COVER FOR PT 10-PE 3212057-PHOENIX	3
164.	610PHX000195	SOCKET MOUNTING FRAME SI-M1A 1404493	1
165.	610PHX000168	ADAPTER PLATE EO-SI-FRAME PART NO:0804522	1
166.	610PHX000054	SOCKET EO-AB/UT/15 125VAC 15A DIN RAIL-0804152	1
167.	610PHX000024	MARKERS ZB 6 LGS:51-60 ARTICLE NO:1051016:0051	2
168.	610PHX000025	MARKERS ZB 6 LGS:71-80 ARTICLE NO:1051016:0071	2
169.	611ETH000004	ETHERNET PATCH CORD CAT 6 LENGTH: 2 METER	5
170.	011FES552363	PRESSURE S/W DIGITAL SPAN-P10R-G18M-PN-PN-L1 PNP	3
171.	011FES572577	CONNECTING LINE NEBS-L1G4-K-5-LE4 572577 FESTO	4
172.	608FES000536	REED SWITCH SMT-8M-A-PS-24V-E-0.3-M8D 574334 FESTO	12
173.	010FES001256	CONNECTING CABLE NEBA-M8G3-U-5-N-LE3 FESTO 8078224	12
174.	608SIC000062	FEMALE CONNECTOR M124P ANGLED 6007303 DOS-1204-WS	15
175.	608HON000006	OXYGEN SENSOR SP XCDALMO1 ATEX/IECEx & AP APPROVED	2
176.	160MTD000202	WEIGHING INDICATOR PANEL IND360 24VDC 27021558 MTD	1
177.	160MTD000243	SUMMING CARD AJB540S 30206112 - METTLER	1
178.	160MTD000087	LOAD CELL 0745A IP68 550KG PART NO.30091050	4

Sr.No	Item Code	Parts Description	Used Quantity
179.	160MTD000104	LOAD CELL CABLE 6CORE-7/24 MTIN 274001 27500437	6
180.	160MTD000090	SS FLEX MOUNTING WM 110-2200KG (FIXED) 27513588	1
181.	160MTD000091	SS FLEX MOUNTING WM 110-2200 (SEMI FLOAT) 27513589	1
182.	160MTD000092	SS FLEX MOUNTING WM 110-2200(FULL FLOAT) 27513590	2
183.	160MTD000081	LOAD PIN 0958 FM 250B-3K 72204027 MAKE:METTLER	4
184.	608PNF000031	PROXI SENSOR NBN40-L2-E2-V1 PNP 24 VDC P&F	6
185.	610BAN000015	DOME LAMP MODEL NO.K90LGP 24VDC PNP BANNER	1
186.	608PNF000330	INDUCTIVE SENSOR MODEL:NBN3-F31-E8-V1 MAKE-P&F	2
187.	610BAN000012	BANNER TOWER LAMP 18-30 VDC TL50GYRA 83222	1
188.	608PNF000331	ACTIVATOR FOR F31 SERIES MODEL NO :BT65A MAKE-P&F	2
189.	608ENH000173	PRESSURETRANSMITTER PMP51B-AABADBH6BM3MBAAAJG5+Z1	1
190.	608ENH000174	E&H I THERMMODULINE TM111-AACBAA7BBD1AA1AA1+SATDZ1	3
191.	608ENH000175	I THERM SURFACE THERMOMETER TST602-BB2C110	4
192.	608ENH000176	UNV.GRAPHIC DATA MANAGER ECOGRAPH T RSG35-C1A+AAC1	1

Sr.No	Item Code	Parts Description	Used Quantity
193.	608ENH000177	POINT LVL.SCH.FTI77-A1ABRRVJ42A1A SOLICAP S FTI77	2
194.	160MTD000268	WEIGHING SCALE NSO 1500KG IND360(P)(III)-NXL1500	1
195.	011FES000871	PRESSURESENSOR:SPAN-B2R-G18F-PNLK- PNVBA-L1 8003300	1
196.	608TEK000005	LIMIT SWITCH NG1HS510L-24VDC ROLLER LEVER-TEKNIC	2
197.	600COS000001	ASSLY FOR CCTV SURVEILLANCE SYSTEM	1
198.	618COS000002	DUAL LIGHT BULLET CAMERA 2MP CP- UNC-TC21L5C-VMD-LQ	1
199.	618COS000003	CP PLUS 128 GB MEMORY CARD	1
200.	618COS000004	CP BULLET CAMERA OUTDOOR HOUSING	1
201.	609RIT000094	PANEL AE 1060500 600W X 600H X 210D MS RITTAL	1
202.	609RIT000278	CP 40 HOUSING COUPLING 6501050 RITTAL	2
203.	610BAN000012	BANNER TOWER LAMP 18-30 VDC TL50GYRA 83222	1
204.	610BAN000013	STAND FOR BANNER TOWER LAMP TL- STD-165 BANNER	1
205.	609RIT000078	PANEL KL 1531510 300W X 200H X 120D MM MS RITTAL	1
206.	609RIT000003	PANEL KL 1502510 200W X 200H X 120D MM MS RITTAL	2

Sr.No	Item Code	Parts Description	Used Quantity
207.	609RIT000008	PANEL AE 1073 500 760W X 760H X 300D MS RITTAL	1
208.	610PHX000184	TERMINAL DOUBLE PTTB 4 3211786-PHOENIX	25
209.	610PHX000186	END COVER FOR PTTB 4 D-STTB 4 3030462-PHOENIX	2
210.	610PHX000183	TERMINAL SINGLE PT 4 3211757-PHOENIX	5
211.	610PHX000185	END COVER FOR PT4 D-ST 4 3030420-PHOENIX	2
212.	610PHX000193	TERMINAL 3 WAY PT 2.5-3L 3210499	80
213.	610PHX000194	END COVER FOR PT2.5-3L D-PT 2.5-3L 3211647	4
214.	610PHX000191	SHORT LINK FOR PT 2.5-3L FBS 20-5 RED 3030226	4
215.	610PHX000192	SHORT LINK FOR PT 2.5-3L FBS 20-5 BLUE 3036929	4
216.	610PHX000181	TERMINAL END BRACKET CLIPFIX 35 3022218-PHOENIX	10
217.	600SIE000002	ASSEMBLY-SYSTEM START METAL PB+LAMP GREEN 24V 1NO	1
218.	613SIE000050	METAL ILLUMINATED PB GREEN 3SU10510AB400AA0 SIEMEN	1
219.	613SIE000051	ILLUMINATION MODULE GREEN 24VDC 3SU14011BB401AA0	1
220.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1

Sr.No	Item Code	Parts Description	Used Quantity
221.	613SIE000054	NO CONTACT FOR 3SU1 3SU14001AA101BA0 SIEMENS	1
222.	600SIE000003	ASSEMBLY-SYSTEM STOP METAL PB RED 24VDC 1NC	1
223.	613SIE000045	PUSH BUTTON METAL RED 3SU10500AB200AA0 SIEMENS	1
224.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1
225.	613SIE000061	NC CONTACT FOR 3SU1 3SU14001AA101CA0 SIEMENS	1
226.	600SIE000004	ASSEMBLY-SYSTEM RESET METAL PB+LAMP BLUE 24V 1NO	1
227.	613SIE000048	METAL ILLUMINATED PB BLUE 3SU10510AB500AA0 SIEMENS	1
228.	613SIE000049	ILLUMINATION MODULE BLUE 24VDC 3SU14011BB501AA0	1
229.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1
230.	613SIE000054	NO CONTACT FOR 3SU1 3SU14001AA101BA0 SIEMENS	1
231.	600SIE000001	ASSEMBLY-SAFETY RESET METAL PB+LAMP YELLOW 24V 1NO	1
232.	613SIE000052	METAL ILLUMINATED PB YELLOW 3SU10510AB300AA0 SIEME	1
233.	613SIE000053	ILLUMINATION MODULE YELLOW 24VDC 3SU14011BB301AA0	1
234.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1

Sr.No	Item Code	Parts Description	Used Quantity
235.	613SIE000054	NO CONTACT FOR 3SU1 3SU14001AA101BA0 SIEMENS	1
236.	600SIE000007	ASSEMBLY- METAL EMERGENCY MUSHROOM PB 40MM SIEMENS	2
237.	613SIE000065	METAL EMERGENCY STOP 3SU10501HB200AA0 SIEMENS	1
238.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1
239.	613SIE000061	NC CONTACT FOR 3SU1 3SU14001AA101CA0 SIEMENS	1
240.	613TEK000018	LEGENDS EMERGENCY STOP ROUND TYPE YELLOW 2LP41	1
241.	613SIE000061	NC CONTACT FOR 3SU1 3SU14001AA101CA0 SIEMENS	1
242.	613TEK000052	CONTROL STATION EMPTY METAL 2 WAY 7001C13 -TEKNIC	1
243.	600SIE00017	ASSEMBLY- YELLOW PUSH BUTTON METAL 1 HOLDER 1NO	1
244.	613SIE000075	PUSH BUTTON METAL YELLOW 3SU10500AB300AA0 SIEMENS	1
245.	613SIE000047	METAL HOLDER FOR METAL 3SU1 MODEL 3SU15500AA100AA0	1
246.	613SIE000054	NO CONTACT FOR 3SU1 3SU14001AA101BA0 SIEMENS	1
247.	610BAN000015	DOME LAMP MODEL NO.K90LGP 24VDC PNP BANNER	1
248.	611LAP000357	CABLE FLEX 0.5 SQMM X 2 CORE 0015002 UL-LAPP	50

Sr.No	Item Code	Parts Description	Used Quantity
249.	611LAP000322	CABLE FLEX 0.5 SQMM X 4G CORE 0015004 UL-LAPP	50
250.	611LAP000366	CABLE SHIELDED 0.25 SQMM X 4C 0044704 LAPP	100
251.	611LAP000318	CABLE FLEX 0.5 SQMM X 7G CORE 0015007 UL-LAPP	50
252.	611LAP000319	CABLE FLEX 0.5 SQMM X 12G CORE 0015012 UL-LAPP	100
253.	611LAP000320	CABLE FLEX 0.5 SQMM X 18G CORE 0015018 UL-LAPP	50
254.	611LAP000321	CABLE FLEX 0.5 SQMM X 25G CORE 0015025 UL- LAPP	50
255.	6110AB000003	ETHERNET CABLE 1585-C8TB-S600 TEAL PVC SHIELDED - AB	50
256.	609PHX000081	RJ45 CONNECTOR CAT6 VS-08-RJ45- 10G/Q-1419001 8POS.	4
257.	611LAP000315	CABLE FLEX 1.5 SQMM X 4G CORE 0011138 UL-LAPP	50
258.	611LAP000451	UL-CABLE FLEX 1.5 SQMM X 5G CORE 0011139-LAPP	25
259.	611LAP000450	UL-CABLE FLEX 4 SQMM X 3G CORE 0011160-LAPP	20
260.	OAP125110048	UHMW CLAMP FOR TOWER LAMP FLAG MOUNTING	1
261.	612AST000001	CABLE TRAY -SS WIREMESH 50(W) X 50(H) X 3M(L)- ASTRA	12
262.	612AST000003	CABLE TRAY -SS WIREMESH 100(W) X 50 (H) X 3M(L)- ASTRA	24

Sr.No	Item Code	Parts Description	Used Quantity
263.	612AST000005	SS JOINTER FOR CABLE TRAY SIZE 50 TO 400MM- ASTRA	100
264.	612AST000007	CABLE TRAY -SS WIREMESH 150(W)X50(H)X3M(L) - ASTRA	12
265.	609RIT000160	PANEL KL 1503510 300(W)X200(H)X120(D) -RITTAL	1

20 Preventive Maintenance

Table given below will cover all the areas in the system where periodic maintenance is very important.

Sr. no.	Activity	Weekly	Monthly	Quarterly	Annually
Mechanical Maintenance					
1	Gear box oil			✓	
2	All nuts and bolts should be tight.		✓		
3	Pneumatic cylinders.			✓	
4	Lifting belt Inspection				✓
5	Cleaning of FRL unit			✓	
6	Inflatable bellow		✓		
7	Flexible bellow		✓		
Electrical Maintenance					
1	All sensor brackets should be checked and make sure that they are properly mounted.			✓	
2	All sensor & there inputs should be checked.		✓		
3	All solenoid valve and there check-nuts should be checked.			✓	
4	Air pressure switch should be checked.			✓	
5	All junction box terminals and lugs should be checked.				✓
6	All Magnetic sensors should be checked.			✓	
7	All reed switches should be checked.		✓		

21 Lifecycle of Material

The definition of life cycle is ‘Consecutive and interlinked stages of a product (or service) system, from raw material acquisition or generation from natural resources to final disposal. Life cycle stages include acquisition of raw materials, design, production, transportation/delivery, use, end-of-life treatment and final disposal.’

Table 6: Life cycle of material

Raw Material	Life	Recycle
SS 304 / S.S.316 / S.S.316L	50 Years	Recycle by sorting, Melting and Purification
Mild Steel	20 Years	Recycle by sorting, Melting and Purification
Rubber (Gasket, “O” ring, etc.	5 years	Recycle by sorting and de-vulcanization.
PVC	50 Years	Recycle by Mechanical recycling / Chemical recycling
Aluminum	40 Years	Recycle by aluminum is sorted and cleaned then melted and uses for further process
Polyurethane	5 Years	Recycle by Mechanical recycling / Chemical recycling
Ultra High Molecular Weight Polyethylene	30 Years	Recycle by Shredding and Resizing then Compounding
Silicon	10 Years	Recycle by grinding or tearing shredded silicone granules into a prepared mold
Plastic	No End life	Recycle
Packaging Material (Paper Box, Wooden Box, Carton Box)	No End life	Recycle
Engine Oil	18 Months (Also depends on its Practical use)	Stored in factory hazard areas

Note: Disposal to be done as per local rules and regulations.