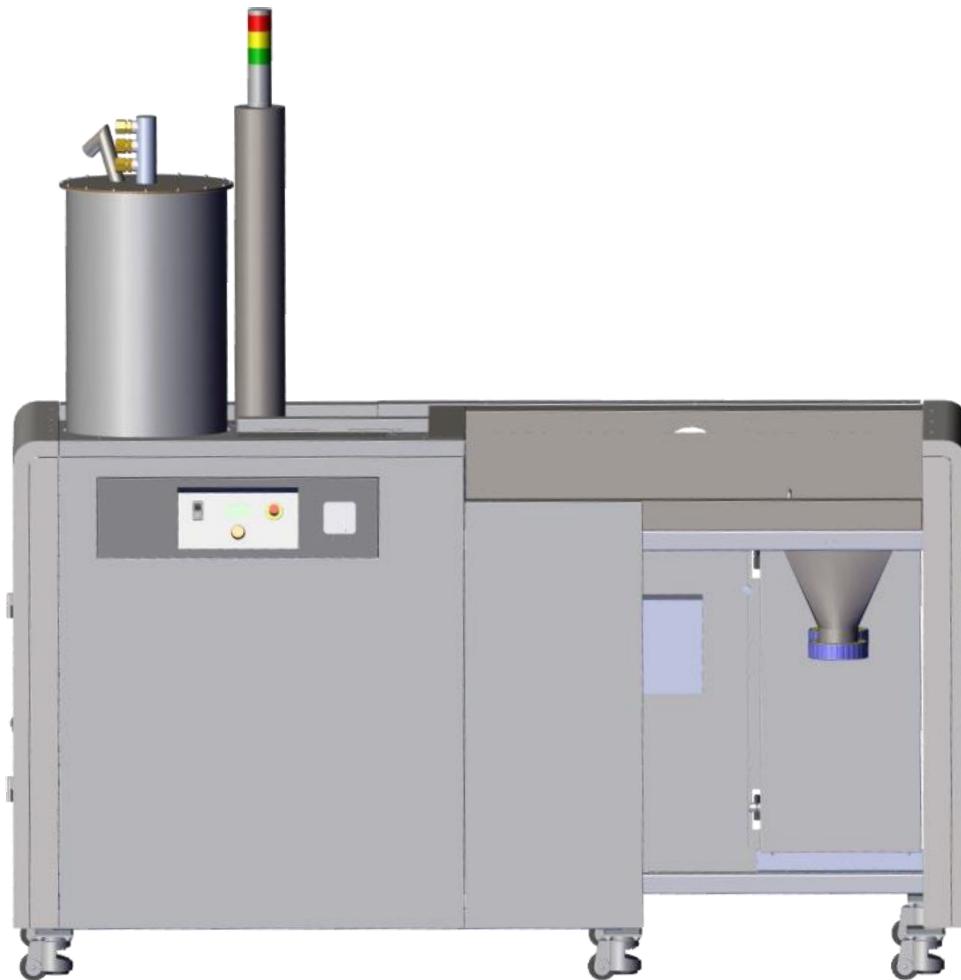


SLS SINGLE USE MQC SYSTEM

User Guide

Original Instructions



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1 INTRODUCTION

Thank you for purchasing the 3D Systems ProX™ MQS (Material Quality Control) 3D Production Printer, auxiliary SLS equipment, and 3D Systems materials! Before you start printing parts with your process facility, please read this guide carefully to enjoy optimum process performance and longer equipment service life .

ABOUT THIS GUIDE

This guide describes how to operate and maintain your ProX® Material Quality Control (MQC) System used for the SLS process . For part printing instructions, refer to the [Material Guide](#) for your specific material.

WHAT'S INSIDE?

MQC System Operations

This section details the operation of the MQC System including part breakout .

Safety Guidelines and Instructions

The Safety section tells you what you need to know to avoid injury or equipment damage . Read this section before you switch on power to any SLS equipment or handle any material .

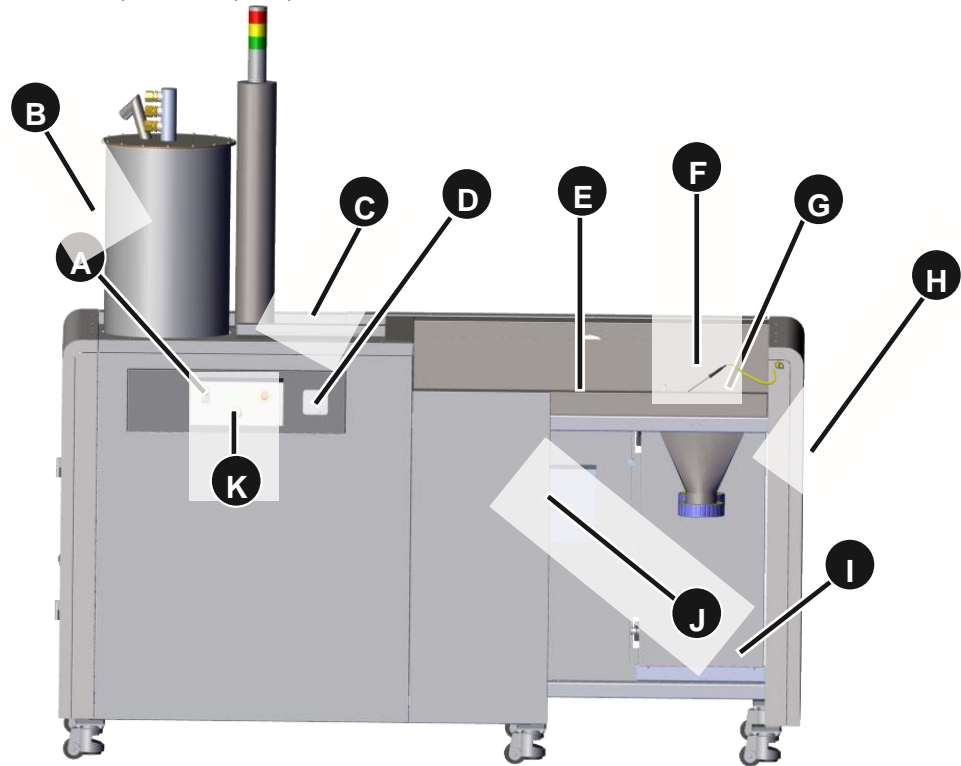
ProX® MQC Single Use System Operations

This section details the operation of the ProX® MQC System including part breakout .

2 INTRODUCTION TO THE MQC

PROX® MATERIAL QUALITY CONTROL (MQC) SYSTEM

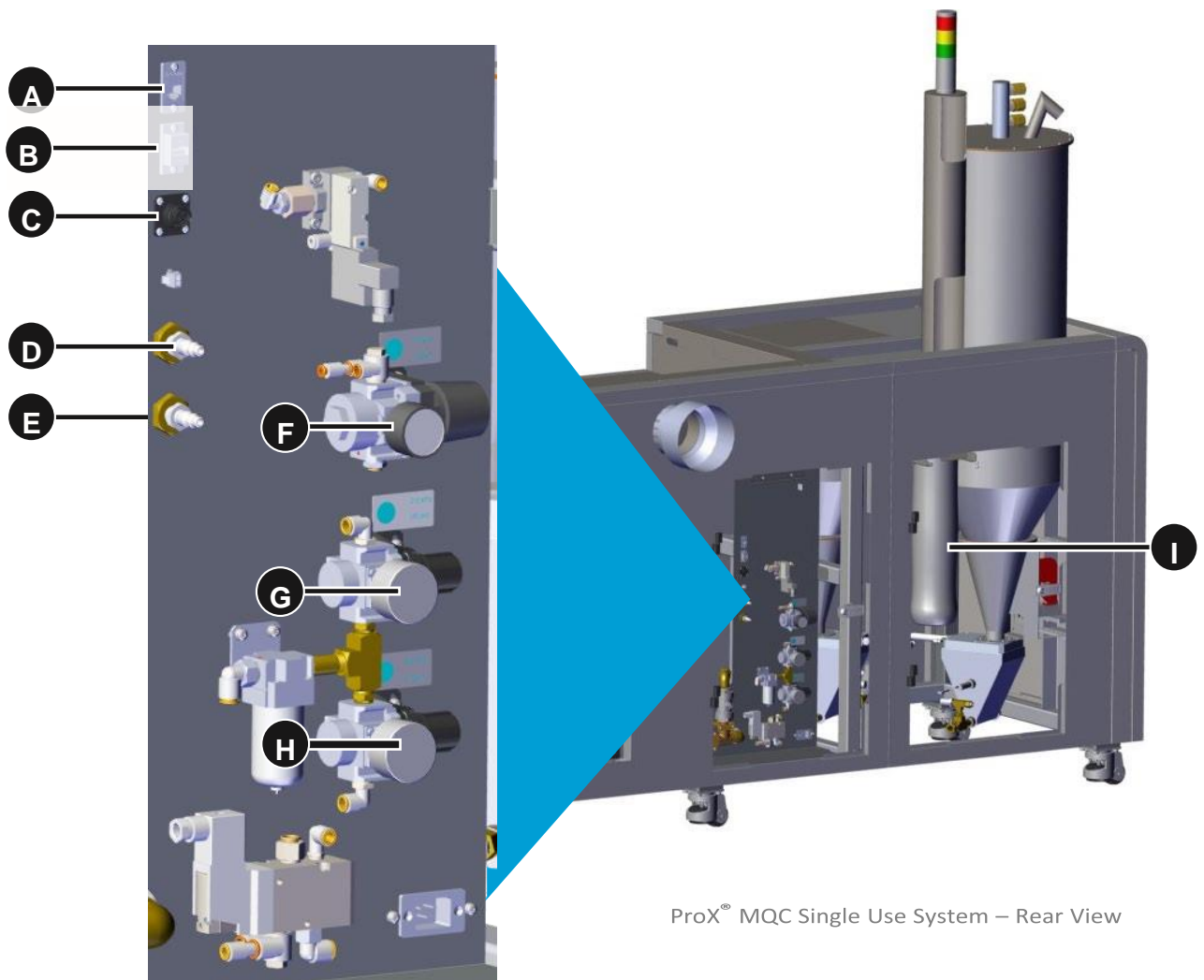
The ProX® MQC Single Use System is designed to be used as the material handling unit for the ProX® SLS 6100 SLS line of printers . It is responsible for delivering material to the printer, storing and mixing fresh and used material, and breaking out the SLS parts from the print cake which is produced by the printer .



SLS Single MQC System – Front View

- A Power Switch:** This switch enables and disables power to the ProX® MQC Single User System .
- B Blended Material Bin:** Material which is a combination of used material and fresh material is stored for production use in this hopper . The system handles this automatically .
- C Fresh Material Input:** Fresh material is loaded at this location . The user must scan the RFID tag on the container across the RFID reader . .
- D RFID Reader:** The RFID reader is used to scan the RFID tag of the material container . This ensures that the system keeps track of material quantity and fresh-to-new powder ratios . The tag must be scanned to unlock the Fresh Material input doors and add the material to the system .

- E Breakout Area:** The print cake is brought here using the Print Transfer Cart Assembly .
- F Reject Chute:** Spent material (as determined by the user) is loaded into the reject chute .
- G Thermocouples:** Two temperature gauges for the print cake are used to determine whether or not the print cake has cooled sufficiently before breaking out the parts.
- H Nitrogen Blanket:** This lid is placed on top of a filled print cake cylinder to control the cooldown of the print cake using nitrogen .
- I Stowaway Area:** Underneath the breakout area, there is a space which can be used to store part extraction cylinders when they are not in use .
- J Sifter:** The user removes the parts from the print cake in the breakout area and places the material for reuse into the sifter .
- K SLS Single MQC System Operator Controls:** User interface for operation of the SLS Single MQC System .

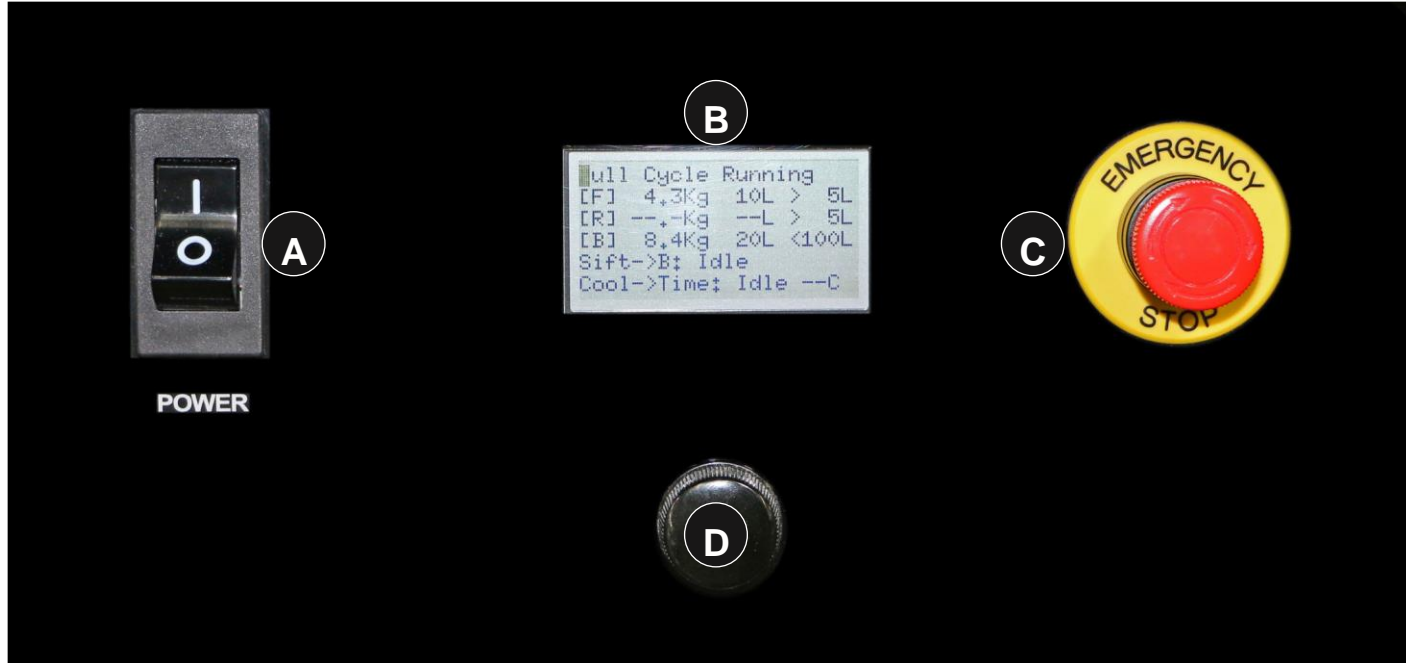


ProX[®] MQC Single Use System – Rear View

- A** Ethernet Adaptor (3x): Network connections to service 1 printer and a laptop (for service personnel only) .
 - B** USB Adapter
 - C** 4-Pin Connector for Oxygen Sensor
 - D** Nitrogen Inlet: Input for nitrogen supply .
 - E** Quick-Disconnect Air Fitting: Input for compressed air coming into the MQC System
 - F** Pressure Regulator (Nitrogen)
 - G** Pressure Regulator (Air)
 - H** Pressure Regulator (Air)
 - I** Transport Filter: The material filter for the ProX® MQC Single Use System .
- PROX® MQC SINGLE USE SYSTEM COMPONENTS**

ProX® MQC Single Use System User Interface

The User Interface, located on the front panel of the ProX® MQC Single Use System, consists of a dial-operated menu screen that allows the user to access the functionality of the system . An E-Stop control is located to the right of the screen and the system power switch is located to the left .



- A Power Switch:** This switch enables and disables power to the ProX® MQC Single Use System.
- B LED Display:** The display is operated using the Control Dial (see below) . It gives the user access to all functionality of the machine .
- C Emergency Stop Button:** Depress the E-Stop button to cut off all power to the machine . This function is usually reserved for situations where the machine cannot be stopped normally .
- D Control Dial:** The user selects functions on the LED Display using this dial control .

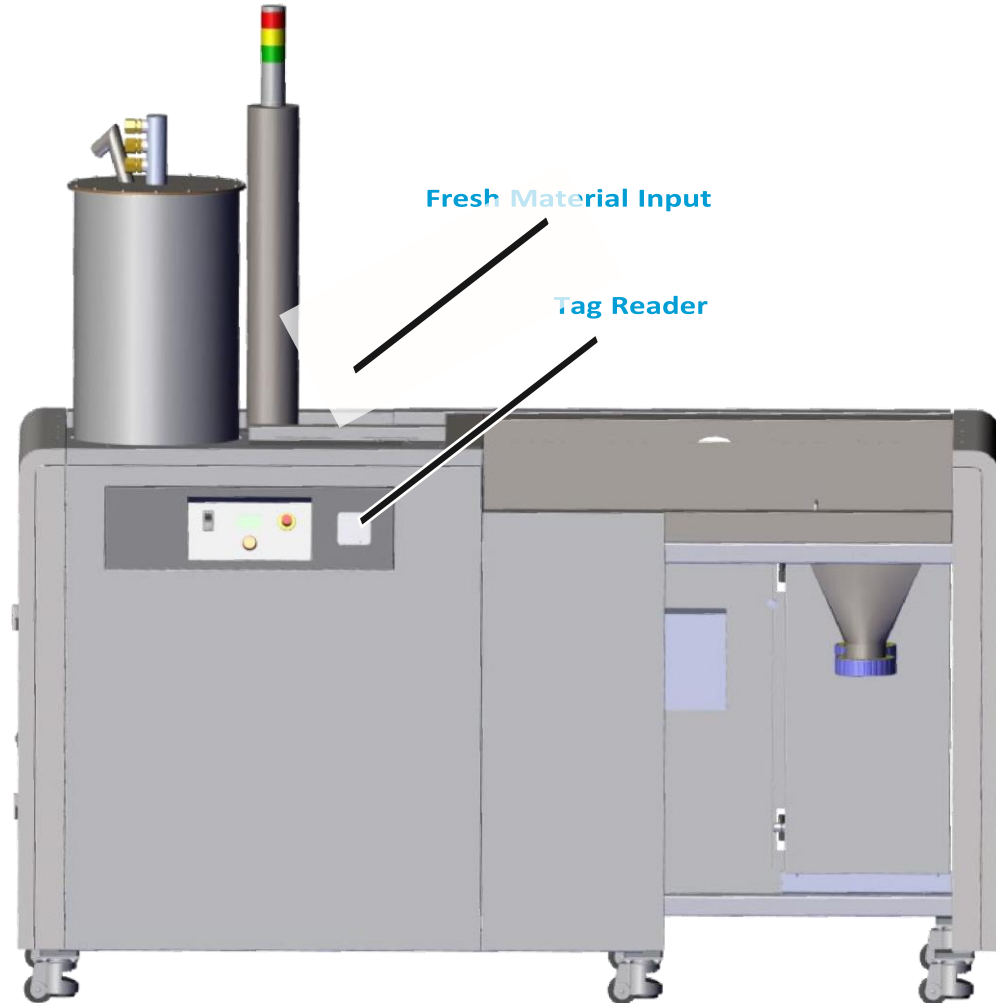
Light Color	Solid	Flashing	Off
Red	E-Stop condition	System fault active	Normal
Yellow	System is in service mode	System warning active and/ or message present on user interface	E-Stop condition or normal
Green	System is active . Printer transports are enabled	System is active . Printer transports are disabled	E-Stop condition or normal



ProX® MQC Single Use System Stack Light Conditions

Fresh Material Input

The material input hatch takes fresh material from the user and feeds it to the ProX® MQC Single Use System . To unlock the hatch, the user must first swipe the tag of the material container across the tag reader.



3 SAFETY GUIDELINES & INSTRUCTIONS

GENERAL GUIDELINES

Before using your SLS equipment, your company should have a safety program in place . The safety program should:

- Point out hazardous equipment, materials, and procedures.
- Explain what to do in case of an emergency.
- Provide information about the hazards of the equipment and materials in the form of Safety Data Sheets (SDS). The Safety Data Sheets are provided with all materials supplied by 3D Systems.

All SLS equipment is designed with safety in mind . However, improper use, malfunctions, and excessive exposure could cause injury .

TRAINING AND INSTRUCTIONS

Follow these general safety guidelines when operating any SLS equipment:

- Do not operate any SLS equipment before receiving proper training.
- Read and follow all operating instructions.
- Follow all safety rules in this section and heed all hazard warnings in this guide.
- Do not try to perform any equipment maintenance procedures you were not trained to do.
- **Operators** are trained to operate the system and perform all the necessary tasks to print a part.

- **Certified service personnel** are those who have completed the 3D Systems service training package and are certified to perform service tasks. Certification may occur at various levels, and servicers should only perform tasks they are authorized and certified to complete.

MACHINE HANDLING

- Do not try to access, service, or adjust any components inside any SLS equipment enclosure.
- Do not try to open any panel or door while a machine is running.
- Do not access any area of the machine near the print chamber during printing.
- Use special caution when handling a heated print cake and when dealing with the heated, inert environment inside the SLS system's print chamber. Take note of all thermal hazard warning labels on the machines.
- Secure electrical cables and coolant hoses to prevent tripping.

MATERIAL HANDLING

- Do not use any material without first reviewing its Safety Data Sheet (SDS).
- To prevent injury and equipment damage, be sure to follow all handling guidelines detailed in the appropriate **Material Guide**.

ALARMS AND WARNINGS

- If you see an error, alarm, or warning message on any SLS equipment display, note the state of that machine's stack light. Clear the alarm, error, or warning message before resuming operation.
- Displayed error, alarm, or warning messages can result from unsafe practices, such as opening an enclosure door or panel when equipment is powered up and running.

SAFETY SYMBOLS AND DEFINITIONS

The following safety labels are posted at various points on the machine to indicate potentially hazardous conditions:



HOT SURFACES HAZARD: There are surfaces and materials in the vicinity that may be hot and could cause severe burns.



ELECTRIC SHOCK HAZARD: High voltage electricity is accessible in the vicinity of this sign or behind the access panel. High voltage can cause severe burns or death. Access panels are for service only and should be opened only by certified service personnel or trained maintenance personnel.



CAUTION: Indicates something may happen that could cause loss of data, damage to equipment, or personal injury.

FIRST AID SECTION – WHAT TO DO



In the case of an accident while using any SLS equipment, seek medical attention immediately. Use the following guidelines for specific safety instances.

Burns

This equipment contains high temperatures and burning laser radiation which could cause 2nd degree burns . Do not attempt to remove any protective panels . There are no user serviceable parts inside .

If a burn occurs, seek first aid and immediate medical attention. Pushing the E-stop button will de-energize the equipment and diffuse the hazardous situation .

Electrocution

The SLS system contains equipment energized at 208 volts, 3-phase delta . Do not attempt to remove protective panels . There are no user serviceable parts inside .

If electrocution occurs, seek first aid and medical attention immediately. Pushing the E-stop button will de-energize the equipment and diffuse the hazardous situation .

Material Inhalation

The part cleaning process may create a choking or air restriction hazard. If someone has difficulty breathing or a “loss of breath” sensation, transport the person to a well-ventilated room or outside of the facility . If the condition persists, seek immediate medical attention .

SLS EQUIPMENT SAFETY FEATURES

A major design goal for all SLS equipment is to provide a safe operating environment . The frame and enclosure designs passively limit hazardous access while the electronics and software actively and automatically sense and react to unsafe conditions when they arise . For example, if the SLS system detects unsafe operating conditions, it will immediately stop operating and, in some cases, shut down completely .



CAUTION: If any SLS equipment safety features fail, your actions may be all that will prevent potentially hazardous operating conditions.

Safety Interlocks

Safety interlock devices on the SLS equipment help prevent accidental laser exposure, electrical shocks, crush injuries, burns, and fires. SLS equipment will not operate unless all safety interlocks are satisfied.



CAUTION: Never try to disable or override any safety interlock device on any SLS equipment. Operating equipment without all safety interlocks enabled can cause equipment damage, injury, or death. If you suspect a safety interlock device is not working properly, do not operate your SLS equipment. Rather, disconnect power from the equipment and contact 3D Systems Customer Support for assistance.

a. Internal panels are for service access only. Several interlocked panels are for customer maintenance: overflow cleanout, blackbody cleaning port, and the filter box located on back of machine.

Limited Access and Barrier Shielding

SLS equipment frame and enclosure designs limit access to the following:

- **Service areas**, such as cabinets and enclosures for electrical power and automation controls. This prevents accidental exposure to electrical shock hazards.
- **Material areas**, such as material feed hoppers, storage bins, and transport tubes. This prevents:
 - burn hazards by minimizing exposure to heated material
 - slip hazards by keeping material from dropping on the floor
 - fire hazards by minimizing airborne dust cloud formation and potential ignition. See SDS for complete material hazard details.

Other Active Safety Features

- The ProX[®] MQC Single Use System, coupled with the **Dust Collector**, removes airborne material during part breakout in accordance with standard industrial ventilation practices.
- An optional room oxygen monitor automatically initiates SLS system shutdown when it detects too little oxygen in the room.
- Software in the SLS system automatically initiates immediate equipment shutdown if certain unsafe conditions are detected during operation.

ELECTRICAL SAFETY

To prevent electrical shock, SLS equipment will not operate unless all external panels are installed and all electrical safety interlock circuits are closed .



ELECTRICAL HAZARD: Hazardous voltage exists inside the enclosures of all SLS equipment. Injury or death from electrical shock can result if you remove external panels or try to defeat safety interlocks. Panels should only be removed, and interlocks should only be defeated, by trained and certified 3D Systems Customer Support personnel.



ELECTRICAL HAZARD: Verify your facility's electrical service ratings before connecting

