Thank-you for purchasing the SLS® equipment, accessories, and auxiliary machines that will transform your site into a 3D Systems® SLS™ process facility for DuraForm® materials. Please read this guide, complete the facility checklist, then contact 3D Systems Customer Support to schedule equipment installation.

In accordance with laboratory equipment safety standards (EN61010-1, Sect. 5.4.4). If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired. Observe all warning labels, and conform to all safety rules described in this manual.
ABOUT THIS GUIDE

Use this guide to help you prepare your facility for SLS® equipment and auxiliary machine installation. It gives you the information and guidance you need to complete the SLS™ Process Facility Checklist. Complete this checklist and send it to 3D Systems when you’re ready to have your equipment installed.

Read this section to help you find what you need in this guide—and in other SLS™ process documentation.

- Hazard Warnings .................. 3
- Safety Precautions ................ 3
- What’s Inside? ..................... 4
- Facility Checklist .................. 4
- About SLS Equipment and Auxiliary Machines ................. 4
- Facility Requirements Sections ........... 5
- Receiving & Moving Equipment .......... 6
- Contacting 3D Systems ............... 6
- Glossary .................................. 6
- Other Useful Documents ............... 7
Hazard Warnings

You will find the following types of warnings in this guide. Always heed these warnings. Ignoring them can expose the people, equipment, and other valuable property in our facility to the hazards listed below.

<table>
<thead>
<tr>
<th>WARNING TYPE</th>
<th>HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Alert</td>
<td>Machine damage, part damage, and/or data loss.</td>
</tr>
<tr>
<td>Electric shock</td>
<td>Injury or death from electric shock, or, equipment damage due to electrostatic discharge (ESD)</td>
</tr>
<tr>
<td>Laser radiation</td>
<td>Eye injury or blindness; burn injury; fire.</td>
</tr>
<tr>
<td>Crush</td>
<td>Injury or death from crushing weight.</td>
</tr>
</tbody>
</table>

See the Safety section for descriptions of safety labels on your SLS equipment.

Safety Precautions

As you prepare your facility for installation, be sure to follow all safety guidelines in the Safety section starting on p.119.

In addition, to ensure your safety, and the safety of others in your facility, use only trained and certified personnel to do the facility preparation work this guide requires. This includes:

- Receiving and moving equipment
- Electrical wiring
- Plumbing compressed air and nitrogen
- Heating, ventilation, and air conditioning (HVAC) modifications
- Building structure modifications

After you receive your SLS equipment and auxiliary machines, do not allow anyone to connect electrical power, compressed air, or nitrogen to any of these devices. This must only be done by your 3D Systems-certified Customer Support Engineer (3D CSE) during installation.

Attempts to install SLS equipment or auxiliary machines by non-3D Systems-certified personnel could result in serious injury and equipment damage.
What’s Inside?

To help you find the information you need, each section of this SLS Process Facility Guide is summarized below.

Facility Checklist

[p.13] Here’s where you find the form you must fill out and submit to 3D Systems before scheduling installation.

Click on Facility Checklist to view the form. You can fill in the form on your computer and email it to 3D Systems Customer Support, or, print the form, fill it out by hand, then fax it.

Be sure to complete the Facility Information portion of your Facility Requirements Checklist. This will help expedite support and service for your facility.

After your facility is ready, 3D Systems will work with you to schedule an installation visit by your 3D CSE.

About SLS Equipment and Auxiliary Machines

[p.16] This section includes descriptions and installation requirements for all SLS equipment and auxiliary machines. The installation requirements refer you to one or more facility requirements sections in this guide. (See Facility Requirements Sections on page 5.)

This section also includes brief summaries of the installation procedures your 3D CSE will perform. (With a general idea of what your 3D CSE must do to install the machines, you can better prepare.)

Your 3D CSE installs all SLS equipment and auxiliary machines.

The About Equipment section also tells you what supplies you must procure before your 3D CSE arrives for installation. Examples include electrical and compressed air fixtures, distilled water, propylene glycol, and nitrogen (if you did not order 3D Systems’ Nitrogen Generator).
Any supplies you procure must be on site before your 3D CSE arrives.

A licensed electrician must be available to connect facility power to SLS equipment and auxiliary machines while your 3D CSE is on site.

Facility Requirements Sections

Several “facility requirements” sections in the middle of this guide address items on your Facility Checklist.

For example, each requirements section lists:

- The type of utilities, connections, and supplies that must be in your facility before installation.
- The specifications, instructions, and any other information you need to meet these requirements.

All requirements sections are listed below in the order they’re typically addressed.

Specifications [p.49] provides tables of technical data for 3D Systems’ SLS equipment. Refer to these specifications as you work through the rest of the planning sections. (Specifications also appear on the SLS Process Facility Layout drawing.)

Room Requirements [p.59] lists size, access, floor, and atmosphere requirements for the SLS process room or area in your building.

Electrical Requirements [p.66] provides electric power requirements for 3-phase and 1-phase SLS equipment and auxiliary machines. It covers input power, overcurrent protection, 3-phase transformer options, and grounding requirements.

Compressed Air Requirements [p.78] lists supply, plumbing, and connection requirements for equipment that uses compressed air; i.e., the SLS system, IRS, BOS, Nitrogen Generator, and Bead Blaster.

Nitrogen & Coolant [p.84] describes SLS system nitrogen supply options (Nitrogen Generator or liquid nitrogen) and Chiller coolant mix requirements. Nitrogen and coolant purchasing information is also provided.

The SLS system is the only machine in your SLS process facility that requires nitrogen and coolant.
Network Requirements [p.91] covers cabling and connection requirements for the 3D Systems PowderNet network. (SLS equipment uses this network to send and receive powder transfer messages.)

SLS Powder Requirements [p.93] tells you what’s required for storing, handling, and transporting DuraForm plastic SLS powders in your facility. It includes instructions for proper powder container grounding.

Safety [p.119] lists the safety requirements your facility must meet—and guidelines everyone in your facility must follow—so you can run the SLS process in your facility without risking injury or damage to your equipment or property.

Receiving & Moving Equipment [p.97] After you make all the additions and modifications to your facility specified in the Facility Requirements Sections (listed on p.5 above), read and follow the instructions in the Receiving & Moving Equipment section near the end of this guide.

This section describes all aspects of SLS equipment and auxiliary machine transportation, handling, and storage; such as:

- What you receive in the shipments that arrive at your SLS process facility before installation.
- How to properly unload and unpack the various components.
- How to safely and properly move and place the SLS equipment and auxiliary machines in your building.

Contacting 3D Systems [p.141] This section lists address, telephone, and email contact information for 3D Systems’ offices worldwide, as well as 3D Systems’ Customer Support Hotline phone numbers.

Glossary [p.144] Defines SLS process terms used in this guide, and other SLS process documentation.

ℹ️ Click on any red SLS process term in this guide to display the definition.
Other Useful Documents

After installation, the documents listed below will help you get the most out of the equipment and materials in your SLS process facility. You can find them in the ..dtm\docs folder of your LS software installation hard drive (except for the Build Setup and Sinter online Help, which you access through the Build Setup and Sinter applications).

**SLS Process Facility Layout** illustrates SLS process requirements for facility electrical power, room atmosphere, compressed air, nitrogen, and coolant. It also shows dimensions and a recommended arrangement for your SLS equipment and auxiliary machines. (This layout was sent to you before installation. A pdf copy is included in the ..dtm\docs folder for reference. (23348-101-00)

**Material Safety Data Sheets (MSDS’s)** online copies of the printed MSDS’s that ship with DuraForm plastic SLS powder are available for download from 3D Systems’ web site. Make sure everyone in your facility who handles DuraForm materials reads the MSDS’s and follows the safety guidelines in them. To order extra copies of these MSDS’s, request 3D Systems document part numbers:

- 24134-S02-00; DuraForm PA MSDS-US
- 24134-S12-00; DuraForm PA SDS-EU

**SLS Process User’s Guide** describes how to create finished SLS parts made of DuraForm® plastic SLS powder using 3D Systems’ SLS equipment, accessories, and auxiliary machines.

Specifically, the User’s Guide guide covers how to:

- Use SLS equipment, supplies, auxiliary machines, and materials safely.
- Perform SLS process procedures; from preparing an SLS build, to building SLS parts, to breaking out and finishing SLS parts.
- Operate the SLS equipment, including the SLS system, RCM, IRS, and the BOS.

**Build Setup Help** provides detailed instructions on how to use the Build Setup application to create and modify build packet you can run on the SLS system. To view Build Setup Help, run the Build Setup program, then select **Help > Help on Build Setup ...** from the main window menu bar. For help on the currently selected Build Setup command or window, press function key F1.

You can also run Build Setup from the Sinter Application by clicking the **Setup** toolbar button.
**Sinter Help** provides detailed instructions on how to use the Sinter application to run and manage builds on the SLS system. To view Sinter Help, run Sinter, then select **Help > Online Help** from the main window menu bar. For help on the currently selected Sinter command or window, press function key F1.

**Material Guides** give you the material, machine, and software configuration information you need to build good parts with the SLS process. Each **Material Guide** describes SLS processing characteristics for one family of 3D Systems’ DuraForm plastic SLS powder materials, such as **DuraForm PA**. They also include safety and regulatory guidelines for DuraForm material handling.
PREPARING FOR INSTALLATION

You prepare for facility for installation by working through the SLS process Facility Checklist. The Facility Checklist is a separate form you can print and fill out, or fill out on your computer. Each item on the Facility Checklist refers you to a facility requirements section in this guide. The corresponding sections provide all the information you need to meet the requirements on the list.

Before you begin preparing your facility, read the following topics:

- Before Installation ......................... 10
- What Your Facility Room Needs ........... 10
- Connections You Must Prepare ............ 11
- When You are Ready for Installation ...... 12
Before Installation

Before you contact 3D Systems to schedule SLS equipment and auxiliary machine installation, you must do the following:

✓ Procure supplies, such as (but not limited to) Chiller coolant, compressed air equipment, and nitrogen¹ equipment.

   This guide provides recommended sources and purchasing information for supplies you must procure.

✓ Complete the facility requirements in each “Requirements” section of this guide. These are summarized on the Facility Checklist. See What Your Facility Room Needs below.

✓ Submit your completed Facility Requirements Checklist” (page 27) to 3D Systems Customer Support via fax, mail, or e-mail.

✓ Contact 3D Systems Customer Support to review and verify your facility’s readiness.

The Facility Checklist must be completed before your 3D CSE can install any SLS equipment or auxiliary machines on your site.

What Your Facility Room Needs

When you complete the requirements, your SLS process facility room or area should have:

✓ Enough floor space for the equipment plus clearances listed in Room Requirements.

✓ A level floor and 3-m (10-ft) high ceiling (minimum).

✓ Doors/passages into the room that are large enough to move the equipment through on a pallet jack or forklift.

✓ Heat and air conditioning (A/C) ducts, and a passive vent duct to the outside for nitrogen exhaust. (See Nitrogen & Coolant on page 84.)

   Your 3D CSE installs the nitrogen exhaust line from your SLS system(s) into this duct.

✓ Sufficient coolant (distilled H₂O and propylene glycol) on hand. (See Nitrogen & Coolant on page 84.)

✓ Sufficient nitrogen on site (if you’re using liquid nitrogen tanks instead of the Nitrogen Generator), with the supply line available in the SLS system room or area.

¹. You don’t need nitrogen if you will be using the recommended 3D Systems Nitrogen Generator.
Connections You Must Prepare

When you complete the requirements, your SLS process facility should have the following ready to connect near the SLS equipment that uses them:

✓ Electrical service panels and outlets.
  See Electrical Requirements on page 66.

✓ Compressed air lines with valves and couplings.
  See Compressed Air Requirements on page 78.

✓ Nitrogen supply tubing (if you’re using liquid nitrogen tanks).
  See Nitrogen & Coolant on page 84.

✓ Nitrogen exhaust vent tubing.
  See Nitrogen & Coolant on page 84.

✓ Facility ground connection(s) for powder containers.
  See SLS Powder Requirements on page 93.

✓ Network cabling routed with jacks.
  See Network Requirements on page 91.

Your 3D CSE will supervise final electrical, air, nitrogen, and network connections to all SLS equipment and auxiliary machines. The CSE will also plumb and connect all powder transport tubing.

⚠️ Do not install any powder transport tubes or network cables. Your 3D CSE will install these.

💡 To save time and money, make sure you have sufficient wire, hose, tubing and fittings on site before installation. You will also need an electrician on site to wire connect your machines to facility electrical panels.
When You are Ready for Installation

Do not attempt to install any equipment you receive from 3D Systems yourself. Injury or damage could result. Follow all safety guidelines in Receiving & Moving Equipment on page 97 when you move your equipment into the SLS process room/area.

Once your facility is verified ready and you’ve scheduled an installation date with your 3D CSE through 3D Systems Customer Support, read the following:

- **Receiving & Moving Equipment** starting on page 97. This will show you how to properly unpack the equipment and move it into place. It will also help you estimate shipping costs and container storage requirements.

- **Safety** starting on page 119.
  - Verify that your facility will operate within the guidelines in this section.
  - Have all personnel you expect to work in or around the SLS process facility read and follow the guidelines in the Safety section.
  - Verify that your facility complies with any and all local safety regulations not explicitly covered in the Safety section.
FACILITY CHECKLIST

Fill out the facility checklist in this section. After you complete all the requirements in the checklist, contact 3D Systems Customer Support to schedule installation.

In the sections after this checklist, you will find all the requirements your facility must meet before your SLS equipment and auxiliary machines can be installed. After your facility meets all the requirements in each section, complete and sign the Facility Checklist on page 15 and submit it to 3D Systems Customer Support for review. (You can complete and submit the Facility Checklist online here.)

When Customer Support receives your completed checklist, a 3D Systems Customer Support Engineer (3D CSE) will contact you to verify your facility’s readiness. When the 3D CSE is confident that all facility requirements are met, he will schedule a trip to your site to install the SLS equipment and auxiliary machines.

All facility requirements must be met before 3D Systems Customer Support can schedule a trip to your facility to install SLS equipment and auxiliary machines at your facility.

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- Submitting your Checklist .................. 14
- Facility Checklist ............................. 15
### About the Checklist

Each facility feature on the checklist is covered in order in the subsequent “requirements” sections of this guide. Each of these sections list the specific requirements for a facility feature and any instructions you need to meet them. In some cases, you must refer to the SLS Process Facility Layout drawing (p/n 23348-101-00); for example, when you lay out the room(s) or wire electrical power. The instructions tell you when you need to refer to this drawing.

- After your facility meets all the requirements for a section, check off that section on the Facility Checklist.
- If you have any questions regarding facility requirements, contact your 3D Systems Sales representative or 3D Systems Customer Support.

### Submitting your Checklist

When you believe your facility is fully prepared for installation, submit your completed Facility Checklist online or by email to support-sls@3dsystems.com, or, contact your 3D Systems Sales representative or the 3D Systems Customer Support Hotline to get a fax number you can sent your Checklist to.

Soon after receiving your Checklist, your 3D CSE will contact you to discuss your facility preparations and schedule installation.
Facility Checklist

**IMPORTANT:** You must complete and sign this form before scheduling installation. 3D Systems reserves the right to receive compensation for nonproductive time and travel due to false or incorrect information on this form. (Click **here** to complete and submit this form online.)

<table>
<thead>
<tr>
<th>Contact name</th>
<th>Phone (1)</th>
<th>Phone (2)</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone &amp; Fax</strong></td>
<td>Phone (1)</td>
<td>Phone (2)</td>
<td>Fax</td>
</tr>
<tr>
<td><strong>Email address</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Facility address</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Date submitted</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **☐ Room Requirements** completed [p.59]
- **☐ Electrical Requirements** completed [p.66]
  
  Measured facility power: ________ VAC, ________ Hz, ________ Phase

- **☐ Compressed Air Requirements** completed [p.78]
- **☐ Nitrogen & Coolant Requirements** completed [p.84]
- **☐ Network Requirements** completed [p.91]
- **☐ SLS Powder Requirements** completed [p.93]

**Signature**
ABOUT EQUIPMENT

This section describes the equipment, tools, materials, and supplies you need to run your SLS process facility. It starts with a summary, then separately details all required and optional components.

Your 3D CSE installs the equipment described in this section when your facility is ready. (“Ready” means your facility meets all the requirements on the Facility Checklist.) You might not have all the equipment in this section, since some of it is optional. If you see optional equipment you need, but did not order, contact 3D Systems Customer Support.

Make sure any supplies you must procure are at your facility before your 3D CSE arrives to install your equipment.

- Equipment Summary .......................... 17
- Equipment Descriptions ....................... 27
  - sPro SLS System ............................. 27
  - RCM ........................................... 29
  - Chiller ....................................... 30
  - Nitrogen Generator ......................... 32
  - Room Oxygen Monitor ...................... 33
  - IRS. .......................................... 37
- IPC ............................................. 39
- BOS ............................................ 41
- BOS Pro 230 Work Platform ................. 43
- Dust Collector ................................ 44
- Bead Blaster .................................. 45
- Transformers ................................. 46
- Vacuum Cleaner .............................. 47
- Equipment You Supply ...................... 48
Equipment Summary

This section summarizes the SLS equipment and auxiliary machines you receive when you purchase one or more sPro SLS systems.

3D Systems manufactures, supplies, and installs all SLS equipment. We also supply and install all non-3D systems auxiliary machines so you can have a single source for purchasing, service, and support.

3D Systems goes to great lengths to qualify the auxiliary machines we supply. Though we don’t manufacture this equipment, we are fully certified to support, service, and maintain it. We cannot provide supplier or purchasing information for auxiliary machines, nor can we install or service any auxiliary machines you procure from anyone other than 3D Systems.
## SLS equipment list

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MODEL</th>
<th>MINIMUM</th>
<th></th>
<th>PART NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SLS system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sPro 140</td>
<td></td>
<td>1</td>
<td>facility</td>
<td>101100-00</td>
<td>• Match RCM and BOS Pro to SLS system model (140 or 230)</td>
</tr>
<tr>
<td>sPro 230 (tall)</td>
<td></td>
<td>1</td>
<td>facility</td>
<td>104000-00</td>
<td>• Includes SLS Pro Accessories Kit (p.23).</td>
</tr>
<tr>
<td>Frame Riser Kit-SLS system</td>
<td>for sPro 230</td>
<td>1</td>
<td>SLS system (sPro 230 only)</td>
<td>104001-00</td>
<td>Installed after SLS system moved into place</td>
</tr>
<tr>
<td><strong>RCM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCM 140 or RCM 230 (tall)</td>
<td></td>
<td>2</td>
<td>SLS system</td>
<td>101000-00 or 100900-00</td>
<td>• Match RCM model to SLS system model (140 or 230)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>SLS system</td>
<td></td>
<td>• Two RCMs enable fast build change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Three(+) RCMs enable continuous building</td>
</tr>
<tr>
<td><strong>Integrated Recycling Station</strong></td>
<td>IRS</td>
<td>1</td>
<td>(up to) 3 SLS systems</td>
<td>105600-00</td>
<td>• Blends virgin and used powder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Refills SLS system feed hopper(s) automatically</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Enables continuous building</td>
</tr>
</tbody>
</table>
SLS equipment list (continued)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MODEL</th>
<th>MINIMUM</th>
<th>PART NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent Powder Cartridge</td>
<td>IPC</td>
<td>1</td>
<td>IRS</td>
<td>24134-901&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Two(+) full IPCs on hand enables continuous building</td>
</tr>
<tr>
<td>Breakout Station</td>
<td>BOS sPro 140 or BOS sPro 230</td>
<td>1</td>
<td>SLS system</td>
<td>104002-00 or 104003-00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Automatically sends recycled powder to the IRS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Includes BOS Pro Accessories Kit (p.26).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame Riser Kit-BOS</td>
<td>for BOS sPro 230</td>
<td>1</td>
<td>BOS sPro 230 (only)</td>
<td>104004-00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Installed after BOS Pro 230 moved into place</td>
</tr>
<tr>
<td>Work Platform</td>
<td>for BOS sPro 230</td>
<td>1</td>
<td>BOS sPro 230 (only)</td>
<td>included with BOS sPro 230</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Full, easy access to elevated BOS sPro 230 work chamber</td>
</tr>
<tr>
<td>Nitrogen Generator</td>
<td>–</td>
<td>1</td>
<td>SLS system</td>
<td>104011-02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Nitrogen from facility compressed air supply enables continuous building&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Includes all required filters, nitrogen supply tubing, and nitrogen valve control cables</td>
</tr>
</tbody>
</table>

<sup>a</sup> This IPC part number is for DuraForm PA only.

<sup>b</sup> Liquid nitrogen supply required if Nitrogen Generator is not used.
### Auxiliary machine list

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MODEL</th>
<th>MINIMUM</th>
<th>PART NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chiller</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiller, 60 Hz</td>
<td></td>
<td>1</td>
<td>2600-03879</td>
<td>• Match Chiller model to facility power</td>
</tr>
<tr>
<td>Chiller, 50 Hz</td>
<td></td>
<td>1</td>
<td>2600-03880</td>
<td>• Requires SLS Chiller Kit that ships in the SLS sPro Accessories Kit crate.</td>
</tr>
<tr>
<td>Room Oxygen Monitor*</td>
<td>AC powered w/DC battery-backup</td>
<td>1</td>
<td>104267-00</td>
<td>Required in SLS system room(s) or area(s)</td>
</tr>
<tr>
<td>Dust Collector</td>
<td>3-phase 208/400 VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum Cleaner</td>
<td>Non-ignition 1- or 3-phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bead Blaster*</td>
<td>(Optional/recommended) 3-phase (1-phase EU only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-3D Systems</td>
<td>Auxilliary machines</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Auxiliary machine list (continued)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MODEL</th>
<th>MINIMUM</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Collector</td>
<td>208 V / 60 Hz</td>
<td>1</td>
<td>BOS sPro; connects to BOS sPro; removes airborne dust</td>
</tr>
<tr>
<td></td>
<td>400 V / 50 Hz</td>
<td>1</td>
<td>BOS sPro; requires Dust Collector Duct Kit included in the BOS sPro Accessories Kit. (See p.26.) Connects to BOS sPro; removes airborne dust • Match Dust Collector model to facility power to ensure the correct 3-phase motor starter is installed and prewired before shipment. • Requires Dust Collector Duct Kit included in the BOS sPro Accessories Kit. (See p.26.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The Dust Collector crate also includes the following items which your 3D CSE installs: • 4-in O.D. inlet collar for duct hose (installed on site) • Outriggers with 4-in diameter casters (optionally installed) • 6-in I.D. × 10 ft flexible trunk duct with support arm and mounting inlet collar.</td>
</tr>
<tr>
<td>Non-ignition Vacuum Cleaner</td>
<td>115 VAC, 60 Hz, 1-phase</td>
<td>1</td>
<td>facility; cleans DuraForm powder off floors and equipment • Fully grounded with HEPA filtered exhaust for powder handling safety</td>
</tr>
<tr>
<td></td>
<td>230 VAC, 50-60 Hz, 1-ph</td>
<td>1</td>
<td>facility</td>
</tr>
<tr>
<td></td>
<td>380 VAC, 60 Hz, 3-phase</td>
<td>1</td>
<td>facility</td>
</tr>
</tbody>
</table>
### Auxiliary machine list (continued)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MODEL</th>
<th>QTY</th>
<th>PER</th>
<th>PART NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bead Blaster</td>
<td>480 VAC, 60 Hz, 3-ph</td>
<td>1</td>
<td>facility</td>
<td>26107-101-00c</td>
<td>• Removes unsintered powder from hard-to-reach portions of SLS parts</td>
</tr>
<tr>
<td></td>
<td>240 VAC, 50 Hz, 3-ph</td>
<td>1</td>
<td>facility</td>
<td>same</td>
<td>• Requires facility compressed air and glass bead “sandblasting” media</td>
</tr>
<tr>
<td></td>
<td>380–415 VAC, 50 Hz, 1-ph</td>
<td>1</td>
<td>facility</td>
<td>same</td>
<td></td>
</tr>
</tbody>
</table>

a. Room Oxygen Monitor is optional but highly recommended for nitrogen safety.
b. Bead Blaster is optional, but highly recommended for better, faster part finishing.
c. All Bead Blaster input power options use the same part number. Specify your required input voltage, frequency, and phase when you order this option.
## SLS sPro Accessories Kit

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>U/M</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halogen lamp kit, containing</td>
<td>2</td>
<td>assy</td>
<td>Spare halogen lamps for SLS system process chamber</td>
</tr>
<tr>
<td>• Halogen lamp MR-16</td>
<td>1</td>
<td>ea</td>
<td>Halogen lamp</td>
</tr>
<tr>
<td>• Molex connector 43025-0200</td>
<td>1</td>
<td>ea</td>
<td>Lamp connector</td>
</tr>
<tr>
<td>• Molex pin terminal 16-02-0102</td>
<td>2</td>
<td>ea</td>
<td>Lamp terminals</td>
</tr>
<tr>
<td>SLS 140 &amp; 230 X-Y calibration kit, containing:</td>
<td>1</td>
<td>assy</td>
<td>SLS system laser X-Y calibration</td>
</tr>
<tr>
<td>• Black mylar exposed photographic emulsion sheets (23 × 23) in</td>
<td>5</td>
<td>ea</td>
<td>Verify laser vector drawing quality; offset and scale correction</td>
</tr>
<tr>
<td>• Grid pattern mylar sheets (545 x 545) mm</td>
<td>5</td>
<td>ea</td>
<td>Verify laser accuracy over part bed</td>
</tr>
<tr>
<td>Ethanol squeeze bottle: 18 oz (500 ml)</td>
<td>1</td>
<td>ea</td>
<td>Cleaning IR sensor lens and laser window</td>
</tr>
<tr>
<td>Magics RP STL file manipulation software from Materialise corporation</td>
<td>1</td>
<td>ea</td>
<td>Edit STL files before adding them to SLS builds</td>
</tr>
<tr>
<td>Screwdriver, Torx T-20</td>
<td>1</td>
<td>ea</td>
<td>Opening SLS system process chamber access panels for cleaning</td>
</tr>
<tr>
<td>Dust cloths</td>
<td>1</td>
<td>pkg</td>
<td>Cleaning equipment</td>
</tr>
<tr>
<td>Foam swabs (50 pack)</td>
<td>2</td>
<td>pkg</td>
<td>Cleaning SLS system IR sensor lens</td>
</tr>
<tr>
<td>Lens cleaning tissue (280 pack)</td>
<td>2</td>
<td>ea</td>
<td>Cleaning SLS system laser window</td>
</tr>
<tr>
<td>Plastic barrel scoop (8.5 × 4.75) in</td>
<td>1</td>
<td>ea</td>
<td>Scooping DuraForm powder from RCM docked in BOS during breakout</td>
</tr>
</tbody>
</table>
### SLS sPro Accessories Kit (continued)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>U/M</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLS part cleaning tool set</td>
<td>1</td>
<td>ea</td>
<td>SLS part cleaning</td>
</tr>
<tr>
<td>Hog bristle glue brush, (1 × ¾) in</td>
<td>1</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td>Acid brush (1 × 2) in</td>
<td>1</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td>Paint brush, nylon bristle (3 in)</td>
<td>1</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td><strong>SLS Chiller Kit</strong>, containing:</td>
<td>1</td>
<td>assy</td>
<td>Connect Chiller coolant hoses between the SLS system’s COOLANT INLET and COOLANT OUTLET and the Chiller; filter coolant fluid before sending to SLS system; filter chiller condenser air inlet, provide 1-year supply of chiller filters and coolant fluid</td>
</tr>
<tr>
<td>• Coolant fluid filter assembly</td>
<td>1</td>
<td>ea</td>
<td>Connects to coolant outlet; includes housing with 10-μm fluid filter cartridge, mounting bracket, and fasteners</td>
</tr>
<tr>
<td>• 10-μm coolant filter cartridge</td>
<td>2</td>
<td>ea</td>
<td>Replacement fluid filter cartridge</td>
</tr>
<tr>
<td>• High-pressure synthetic rubber hose with textile braid reinforcement (½-in I.D.)</td>
<td>10(32)</td>
<td>m(ft)</td>
<td>Coolant inlet and outlet hoses (cut to length on site); heavy duty, vulcanized, oil- and glycol-resistant</td>
</tr>
<tr>
<td>• Hose clamp, worm drive 20 mm (¾ in) diameter</td>
<td>6</td>
<td>ea</td>
<td>Connect inlet and outlet hoses to barbed fittings at SLS system gauge panel and at rear of Chiller</td>
</tr>
<tr>
<td>• Ball valve (½ in)</td>
<td>1</td>
<td>ea</td>
<td>Coolant hose plumbing</td>
</tr>
<tr>
<td>• Reduction fitting (¾-in to ½-in)</td>
<td>2</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td>• Hose adapter, 13 mm (½ in)</td>
<td>2</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td>• Condenser air filter (406 × 508 × 0.12) mm</td>
<td>4</td>
<td>ea</td>
<td>Replacement filters for condenser air intake; install behind Chiller front grille</td>
</tr>
</tbody>
</table>
### SLS sPro Accessories Kit (continued)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY</th>
<th>U/M</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat transfer fluid</td>
<td>5 (1.3)</td>
<td>L (gal)</td>
<td>DOWFROST® (US/Asia) or DOWCAL® 20 (EU) corrosion-inhibiting propylene glycol-based heat transfer fluid.</td>
</tr>
<tr>
<td>Distilled water</td>
<td>10 (2.6)</td>
<td>L (gal)</td>
<td>Distilled water with resistivity of (1 to 3) MΩ/cm² at 25 °C</td>
</tr>
</tbody>
</table>

**Use only distilled water in coolant mix.**

**Do not use tap water or deionized water.**

Mixing tap water, deionized water, or anything but distilled water with the heat transfer fluid can contaminate the cooling system and void the laser system warranty.
## BOS sPro Accessories Kit

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>QTY</th>
<th>U/M</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Collector Duct Kit, containing:</td>
<td>9201-20804</td>
<td>1</td>
<td>assy</td>
<td>Connect vacuum air flow to the BOS sPro at the work chamber air outlet</td>
</tr>
<tr>
<td>• 4-inch I.D. rubber duct hose</td>
<td></td>
<td>10 (3)</td>
<td>ft (m)</td>
<td>Connects between the Dust Collector (4-in O.D. inlet collar on left side) and the BOS work chamber vacuum outlet</td>
</tr>
<tr>
<td>• Duct hose clamps</td>
<td></td>
<td>2</td>
<td>ea</td>
<td>Connects the flexible duct hose at the Dust Collector inlet and BOS vacuum outlet</td>
</tr>
</tbody>
</table>
Equipment Descriptions

3D Systems supplies, installs, supports, and services the SLS equipment and auxiliary machines described in this section.

sPro SLS Center

FUNCTIONS • SLS SYSTEM
- Builds SLS parts in a removable cylinder (RCM) for faster build turn-around
- Automatically supplied with powder from IRS
- Standard height and tall models available

INSTALLATION • SLS SYSTEM

Installation prerequisites and procedures for your sPro SLS system are summarized below.

For detailed SLS system installation requirements, see Room Requirements on page 59, Electrical Requirements on page 66, and Nitrogen & Coolant on page 84.

INSTALLATION PREREQUISITES • SLS SYSTEM

- SLS system uncrated and moved into proper room or building area
- Facility (208 VAC WYE, 3-ph) power on a separate 60 A circuit available near SLS system; (your facility might require a 3-phase transformer)
- Compressed air connection available near SLS system at required pressure/flow rate
- Chiller on site

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>sPro 140</td>
<td>101100-00 (std. height)</td>
</tr>
<tr>
<td>sPro 230</td>
<td>104000-00 (tall)</td>
</tr>
</tbody>
</table>
Nitrogen supply on site; either 3D Systems Nitrogen Generator or liquid nitrogen tank(s), along with:

- (For N2 tank supply only): nitrogen inlet tubing from tank supply to SLS system. (The Nitrogen Generator crate contains inlet supply tubing.)
- Tubing from SLS system **N2 EXHAUST** to outside vent
- (Optional): tubing from Nitrogen Generator **O2 EXHAUST** to outside vent. (The Nitrogen Generator crate does not contain optional oxygen exhaust tubing.)

Nitrogen and oxygen must exhaust passively (at ambient pressure). To ensure this, keep the SLS system’s N2 exhaust line (and optional Nitrogen Generator O2 exhaust line) as short as possible and do not install fan(s) in the exhaust vent(s).

- **Room Oxygen Monitor** on site
- **IRS** on site
- **Full IPC** on site
- **RJ45 network socket** near SLS system

INSTALLATION PROCEDURES • SLS SYSTEM

After all SLS system installation requirements are met, your 3D CSE will:

1. Install Frame Riser Kit (sPro 230 only).
2. Level the SLS system.
3. Connect the following to the SLS system:

   - Nitrogen inlet and exhaust tubing
   - Compressed air inlet hose
   - Chiller filter and coolant hoses
   - Room Oxygen Monitor alarm signal cable
   - UI (SLS system computer console on adjustable arm)
   - Powder inlet tube from IRS—and, if you have multiple SLS systems—powder outlet tube(s) to powder inlet(s) on downstream SLS system(s).

   **Tip**: One IRS can supply powder to up to three SLS systems.

4. Verify and calibrate the SLS system laser scanning and thermal control subsystems.
5. Run a test SLS build.
RCM
(Rapid Change Module)

FUNCTIONS • RCM
- Heated cylinder and piston in wheeled frame holds the part cake; includes insulated lid
- Heaters powered by SLS system—no facility power connection
- Standard and tall model available for sPro 140 (std. height) and sPro 230 (tall)

INSTALLATION • RCM
Installation prerequisites and procedures for your RCM(s) are summarized below.

INSTALLATION PREREQUISITES • RCM
✓ All RCMs uncrated and moved into place.
✓ Electrical power connected to SLS system and BOS. (Each of these machines has a large socket you plug the RCM power/data cable into).

INSTALLATION PROCEDURES • RCM
After all RCM installation requirements are met, your 3D CSE will:

1. Verify RCM heaters (using SLS system).
   - The SLS system must be verified before using it to verify the RCM.
2. Load RCM in SLS system and build one or more test parts in it.
3. Unload RCM from SLS system.
4. Load RCM in BOS and break out test parts.

MODEL | PART NO.
--- | ---
RCM 140 | 101000-00 (standard height)
RCM 230 | 100900-00 (tall)
Chiller

50 Hz or 60 Hz model.

Chiller (50 Hz or 60 Hz); both models require separate SLS Chiller Kit.

Coolant inlet from SLS system
[Return]

Coolant reservoir access panel

10-μm Chiller fluid filter mounting location

Drain

Air filter (front)

[Supply] Coolant outlet to Chiller fluid filter, then to SLS system

Chiller connections (rear view)

FUNCTIONS • CHILLER

- Coolant inlet/outlet hoses connect Chiller to SLS system
- Chiller circulates coolant through IPM (Image Projection Module) that houses the SLS system laser and optics
- Chiller filters and cools return coolant before recirculating

INSTALLATION • CHILLER

Prerequisites and procedures for Chiller installation are summarized below.

<table>
<thead>
<tr>
<th>MODEL / ITEM</th>
<th>PART NO.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiller, 60 Hz</td>
<td>2600-03879</td>
<td>1</td>
</tr>
<tr>
<td>Chiller, 50 Hz</td>
<td>2600-03880</td>
<td>1</td>
</tr>
<tr>
<td>SLS Chiller Kita</td>
<td>2600-03881</td>
<td>1</td>
</tr>
</tbody>
</table>

a. Ships in SLS Pro Accessories Kit; contains Chiller filters and coolant plumbing hardware installed by your 3D CSE. Kit also includes a 1-year supply of 2:1 coolant mix (distilled water and DOWFROST® or DOWCAL 20® heat transfer fluid.)

For detailed Chiller electrical and coolant requirements, see Electrical Requirements on page 66 and Nitrogen & Coolant on page 84.
INSTALLATION PREREQUISITES • CHILLER

✓ Chiller and SLS Chiller Kit unpacked and moved into room near SLS system.
✓ Power connected to SLS system
✓ Facility (208-240 VAC, 1ph) power outlet on 20 A circuit separate from SLS system available near Chiller/SLS system.

See Coolant Requirements on page 89 for Chiller coolant mix specifications

⚠ Do not run the SLS system with insufficient or improper coolant. Doing so can damage the cooling system and laser components.

✓ Floor drain for Chiller drain hose. (Drains water that condenses on Chiller cooling coils.)

ℹ 1-year supply of 2:1 coolant mix provided in SLS Chiller Kit.

INSTALLATION PROCEDURES • CHILLER

After all Chiller installation requirements are met, your 3D CSE will:

1. Connect Chiller 10-μm fluid filter to Chiller rear panel.
2. Connect the coolant hoses to the Chiller and SLS system.
3. Connect the Chiller drain hose.
4. Fill Chiller coolant reservoir with 2:1 coolant mix.
5. Install Chiller air filter.
6. Connect power to the Chiller.
7. Adjust coolant flow pressure at the SLS system.
8. Check for coolant leaks in the Chiller, SLS system, and hoses.
Nitrogen Generator

**FUNCTIONS • N₂ GENERATOR**
- Provides continuous supply of nitrogen to SLS system.
- Includes wall mounting bracket, tubing for nitrogen supply and oxygen exhaust, N₂ solenoid valve cables, and internal filters.

**INSTALLATION • N₂ GENERATOR**
Prerequisites and procedures for N₂ Generator installation are summarized below.

**INSTALLATION PREREQUISITES • N₂ GENERATOR**
- N₂ Generator uncrated and moved into room near SLS system and mounting location.

![Compressed air inlet](image)
- Your N₂ Generator mounting location must be able to safely support 36 kg (80 lb).
- Choose a mounting location close to the SLS system to keep the N₂ supply line short as possible.

- Compressed air connection available near N₂ Generator at required pressure/flow rate.

**TABLE**

<table>
<thead>
<tr>
<th>MODEL / ITEM</th>
<th>PART NO.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Generator</td>
<td>104011-02</td>
<td>1</td>
</tr>
<tr>
<td>Carbon filter</td>
<td>100894-00</td>
<td>1</td>
</tr>
<tr>
<td>01M BX filter</td>
<td>101313-00</td>
<td>1</td>
</tr>
<tr>
<td>N₂ membrane filter</td>
<td>101314-00</td>
<td>1</td>
</tr>
<tr>
<td>1M DX filter</td>
<td>103886-00</td>
<td>2</td>
</tr>
</tbody>
</table>
| a. N₂ filters ship in the Nitrogen Generator enclosure.

For detailed SLS system and facility nitrogen requirements, see Nitrogen & Coolant on page 84.
SLS system power connected.

- SLS system power is required to control N2 valves in SLS system. The N2 Generator itself does not use electric power; it runs on compressed air.

- (Optional) tubing from N2 Generator O2 EXHAUST to outside vent. (The N2 Generator crate does not contain optional oxygen exhaust tubing.)

- The N2 Generator oxygen exhaust pressure and flow rate is very low. Excess oxygen buildup is unlikely if the SLS process room meets the ventilation requirements in Room Requirements on page 59.

Oxygen must exhaust passively (at ambient pressure). To ensure this, keep the optional O2 exhaust line as short as possible and do not install a fan in the exhaust vent.

**INSTALLATION PROCEDURES • N2 GENERATOR**

After all N2 Generator installation requirements are met, your 3D CSE will:

1. Mount the N2 Generator on a wall or pillar.
2. Check/install N2 Generator filters.
3. Connect N2 solenoid valve control cables.
4. Connect compressed air and N2 supply lines.
5. (Optional) connect waste O2 exhaust line.
6. Adjust N2 supply pressure at the SLS system.
7. Verify nitrogen purity.

**Room Oxygen Monitor**

<table>
<thead>
<tr>
<th>MODEL / ITEM</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Oxygen Monitor/Alarm controller</td>
<td>Contact 3D Systems Customer Support</td>
</tr>
<tr>
<td>Remote O2 alarm cable</td>
<td>104226-00</td>
</tr>
</tbody>
</table>
**FUNCTIONS • ROOM O2 MONITOR**
- Sounds an alarm and shuts down the SLS system if room oxygen concentration drops below the safe level
- Low oxygen alarm signal wired into SLS system power disconnect circuit at installation to provide safety interlock
- Includes mounting bracket and remote O2 alarm cable that connects to SLS system

**INSTALLATION • ROOM O2 MONITOR**

Prerequisites and procedures for Room O2 Monitor installation are summarized below.

**INSTALLATION**

- Choose a mounting location close to the SLS system. (The remote O2 alarm cable is only 5 m (16 ft) long.) The location should be at eye level.
- Power connected to SLS system (to test Room O2 Monitor alarm function)
- Facility (85-265 VAC 1-ph) power outlet on 15 A circuit separate from SLS system available near the Room O2 Monitor. (The O2 Monitor’s AC power cord is 6 ft (1.8 m) long.)

**INSTALLATION PROCEDURES • ROOM O2 MONITOR**

After all Room O2 Monitor installation requirements are met, your 3D CSE will:

1. Mount the Room O2 Monitor controller and sensor on a wall or pillar.
2. Connect the 5 m (16 ft) remote O2 alarm cable to the SLS system.
3. Connect AC power to the Room O2 Monitor.
4. Test and verify low O2 alarm and SLS system shutdown on low O2 alarm.

**INSTALLATION PREREQUISITES • ROOM O2 MONITOR**

- Room O2 Monitor uncrated and moved into room near SLS system and mounting location.

**For detailed Room O2 Monitor installation requirements, see Safety on page 119. Also refer to the operating instructions that came with your O2 monitor.**

**Your Room O2 Monitor mounting location must be able to safely support 14 kg (30 lb); the weight of the O2 Monitor plus battery.**
IRS
(Integrated Recycling Station)

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS</td>
<td>105600-00</td>
</tr>
</tbody>
</table>
FUNCTIONS • IRS

- Unloads virgin DuraForm powder from the IPC into the Virgin bin via the IRS umbilical.
- Receives used part cake powder from the BOS and stores it in the Used bin.
- Blends virgin and used powder in a defined ratio (the “% Virgin”) and stores it in the Blender bin.
- Sends blended powder to the SLS system when the SLS system feed hopper is low.

INSTALLATION • IRS

The installation prerequisites and procedures for your IRS are summarized below.

INSTALLATION PREREQUISITES • IRS

- IRS uncrated and moved into place;
- The IRS bin tops ship separate from the bin bottoms and enclosure. They IRS is assembled on site during installation.

INSTALLATION PROCEDURES • IRS

After all IRS installation requirements are met, your 3D CSE will:

1. Assemble IRS bin tops to IRS frame after frame is in place
2. Connect powder transport tubes between IRS bins and between the IRS, SLS system, and BOS
3. Connect IPC to IRS and unload the initial batch of powder into the IRS
4. When unloading is complete, the IRS automatically blends powder and sends it to the SLS system until the SLS system feed hopper is full. After that, your 3D CSE can begin the test build.
IPC

(Intelligent Powder Cartridge)

---

**IPC DEPOSIT AND FACTORY REFILL SYSTEM**

- The following is for reference only. For complete information, see the “IPC Terms & Conditions” included in the equipment quotation you received from 3D Systems.

- When you order an IPC you are charged a deposit. The deposit is refunded after 3D Systems receives the empty, undamaged IPC. 3D Systems does not pay interest on IPC deposits.

- You can keep an IPC free for 6 months. If you keep it longer than 6 months, you are charged a late fee each month until the IPC is returned to 3D Systems. (There is no maximum on this fee.)

- If you return an IPC damaged beyond normal wear and tear, you are charged for repair. The repair charge can equal, but will not to exceed, the deposit.

---

**MODEL**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPC</td>
<td>24134-901a</td>
</tr>
</tbody>
</table>

a. This IPC part number is for DuraForm PA only.

---

**FUNCTIONS • IPC**

Factory-refillable, RFID-tagged, palletized container of virgin DuraForm powder; used to refill the IRS Virgin bin.

- Ships full of DuraForm plastic SLS powder on integral pallet and crate.
- Empty IPC ships back to factory for refill
- Requires compressed air supply from IRS

---

**SHIPPING • IPC’S TO & FROM YOUR FACILITY**

When you’re ready to return one or more empty IPCs to 3D Systems for refilling, contact 3D Systems’ designated freight forwarder to schedule pick-up. 3D Systems pays for shipping empty IPCs from your facility to ours.
After refilling, you can pick up your full IPC(s) from 3D Systems’ facility, or, have 3D Systems ship the full IPC(s) to you. You pay to ship full IPCs from 3D System’s facility to yours.

**INSTALLATION • IPC**

Verify that your facility meets the prerequisites below before your 3D CSE arrives for installation.

**INSTALLATION PREREQUISITES • IPC**

✓ Full IPC moved close enough to IRS to connect IRS umbilical and overpressure sensor air line.

ℹ️ The IRS umbilical (air/powder tubing harness) and overpressure sensor line are both approximately 3 m (10 ft) long.

✓ The IPC is housed in a crate. At no point should the crate be opened. All the necessary connections to the IRS are available through access opening in the crate.

✓ It is acceptable to stack the crated IPCs, but never stack them more than two high.

**INSTALLATION PROCEDURES • IPC**

After installation requirements are met, your 3D CSE will do the following:

1. Connect IRS umbilical to full IPC.
2. Connect overpressure sensor line to IPC cover.
3. Unload IPC into IRS Virgin bin.

See also Compressed Air Requirements on page 78.
BOS (Breakout Station)

FUNCTIONS • BOS

- Covered work table for breaking SLS parts out of a build in an RCM
- Sifts used part cake powder
- Sends sifted powder to IRS Used bin in **RECYCLE** mode
- Sends used powder to waste drum in **DISPOSAL** mode
- Dust Collector connects to vacuum duct on left or right side to BOS work chamber to minimize airborne dust during breakout.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOS sPro 140</td>
<td>104002-00 (standard height)</td>
</tr>
<tr>
<td>BOS sPro 230</td>
<td>104003-00 (tall)</td>
</tr>
<tr>
<td>BOS sPro Accessories Kit&lt;sup&gt;a&lt;/sup&gt;</td>
<td>(See p.26.)</td>
</tr>
</tbody>
</table>

<sup>a</sup> Ships in the BOS Pro crate; contains **Dust Collector Duct Kit** (p/n 9201-20804) which is assembled to the BOS Pro by your 3D CSE during installation.
INSTALLATION • BOS
Verify that your facility meets the prerequisites below before your 3D CSE arrives for installation.

INSTALLATION PREREQUISITES • BOS
✓ BOS uncrated and moved into place
✓ Dust Collector uncrated and moved near left or right side of BOS, close enough to connect the vacuum duct hose
✓ 208-240 VAC, 1ph facility power outlet on 15 A circuit separate from SLS system available near the BOS.
✓ Facility compressed air connection near BOS
✓ RJ45 network jack near BOS
✓ Two 20-L (5-gal) plastic waste bags with rubber bands to place under BOS sifter and waste chute outlets

INSTALLATION PROCEDURES • BOS
Your 3D CSE will do the following:

1. (BOS Pro 230 only) install Frame Riser Kit.
2. Assemble BOS powder transporter to BOS (after BOS moved into place)
3. Connect recycled and waste powder transport tubes.
4. Connect power and compressed air to BOS.
5. Connect BOS to network.
6. Connect Dust Collector to left or right BOS chamber vacuum duct.

See also Electrical Requirements on page 66, Compressed Air Requirements on page 78, and SLS Powder Requirements on page 93.
BOS sPro 230 Work Platform

FUNCTIONS • WORK PLATFORM

- Strong, stable elevated platform to stand on when breaking out parts in a tall BOS sPro 230.
- Added height puts all areas of BOS breakout chamber within easy reach.
- Wheels on left side legs make it easier to move platform.
- Rubber feet on platform legs prevent floor damage.

INSTALLATION • WORK PLATFORM

Your facility must meet the following prerequisites before your 3D CSE arrives to perform installation:

INSTALLATION PREREQUISITES • WORK PLATFORM

✓ BOS sPro 230 uncrated and placed.

INSTALLATION PROCEDURES • WORK PLATFORM

1. Assemble Work Platform wheels and wheel guards to legs.
2. Move platform into position in front of BOS.
Dust Collector

Your BOS Pro requires vacuum air to draw airborne DuraForm powder out of the work chamber during breakout. 3D Systems recommends the following Dust Collectors if your facility does not have vacuum equipment.

**FUNCTIONS • DUST COLLECTOR**

- Draws airborne powder out of the BOS chamber during breakout through a flexible vacuum duct.
- Collects airborne powder in the internal dust drawer for disposal.

**INSTALLATION • DUST COLLECTOR**

Your facility must meet the following prerequisites before your 3D CSE arrives to perform installation:

- Dust Collector uncrated and moved near left or right side of BOS—close enough to connect the Dust Collector Duct Kit duct.
- Dust Collector worldwide input power options:
  - US/Asia: 208 VAC, 60 Hz, 3-ph
  - EU: 400 VAC, 50 Hz, 3-ph
- 208 VAC, 60 Hz, 3-ph or 400 VAC, 50 Hz, 3-ph facility power on a 20 A circuit separate from SLS system. (The Dust Collector consumes 6 A on average.)

**MODEL • PART NO.**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Collector - 208 V</td>
<td>9201-50243</td>
</tr>
<tr>
<td>Dust Collector - 400 V</td>
<td>9201-50244</td>
</tr>
<tr>
<td>Dust Collector Duct Kit</td>
<td>(See p.26.)</td>
</tr>
</tbody>
</table>

* Ships in BOS Pro Accessories Kit. See p.26 for kit content description.
Bead Blaster

**FUNCTIONS • BEAD BLASTER**

- Removes powder from delicate and hard-to-reach areas of SLS parts using an air-pressurized stream of tiny glass beads.

**INSTALLATION • BEAD BLASTER**

Prerequisites for Bead Blaster installation are summarized below.

**INSTALLATION PREREQUISITES • BEAD BLASTER**

✓ Bead Blaster uncrated and moved near installation location.

✓ 600 kPa (87 psi) compressed air line available near machine.

✓ Bead Blaster input power options:
  - US/Asia: 480 VAC, 60 Hz, 3-ph
  - EU: 240 VAC, 50 Hz, 3-ph

✓ Facility power on a circuit separate from SLS system. (Contact your local 3D Systems Customer Support representative for complete 1- or 3-phase Bead Blaster electrical requirements, such as breaker ratings and 3-phase power cable wiring.)

---

**MODEL | PART NO.**

<table>
<thead>
<tr>
<th>Bead Blaster&lt;sup&gt;a&lt;/sup&gt;</th>
<th>26107-101-00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify input power: 3-phase&lt;sup&gt;b&lt;/sup&gt; or 1-phase (EU only)</td>
<td>26107-101-00</td>
</tr>
<tr>
<td>Bead Blaster Spare Parts Kit</td>
<td>26109-101-00</td>
</tr>
<tr>
<td>Bead Blaster Media</td>
<td>26110-101-00</td>
</tr>
</tbody>
</table>

---

<sup>a</sup> Includes spare parts kit and media
<sup>b</sup> For 3-phase input power, also specify voltage and frequency as either 480 VAC/60 Hz or 240 VAC/50 Hz.
Transformers
(3-phase)

Your facility might need one or more 3-phase transformers to meet the input power requirements for the equipment below:

- sPro SLS System
- Dust Collector
- Bead Blaster (3-phase model)
- Vacuum Cleaner (3-phase model)

3D Systems sells 3-phase transformers for the SLS system—but not for any of the 3-phase auxiliary machines.

If you need a transformer for the 3-phase Dust Collector, Bead Blaster, or Vacuum Cleaner, your local 3D Systems Customer Support representative can help you find a supplier before you schedule installation.

**Electrical Requirements** *(p.66)* lists input power requirements for all SLS equipment and auxiliary machines.

**SLS System 3-Phase Transformer** *(p.69)* lists SLS system transformers for various facility input

**FUNCTIONS • SLS SYSTEM TRANSFORMER**

- Converts facility 3-phase power to the 208 VAC WYE, (50 or 60) Hz input power required by the SLS system.
- Provides **25 kVA** per SLS system.

**FUNCTIONS • AUXILIARY MACHINE TRANSFORMER(S)**

- Converts facility 3-phase power to the input power required by the Dust Collector, Bead Blaster, or Vacuum Cleaner.
- Provides the apparent power (kVA) each Dust Collector, Bead Blaster, or Vacuum Cleaner requires.

> Each Dust Collector requires **3 kVA**.
INSTALLATION • TRANSFORMERS

All transformers must be on site and wired into facility power before your 3D CSE arrives for installation.

During installation, your 3D CSE will help your electrician connect power from transformer(s) to the SLS equipment and auxiliary machines.

The Dust Collector, Bead Blaster, and Vacuum Cleaner can share a transformer (or power circuit), however, they must not share the SLS system transformer (or power circuit).

The SLS system requires a dedicated 3-phase power circuit. Do not connect any other equipment to the SLS system power circuit or transformer.

Vacuum Cleaner (Non-ignition)

Non-ignition vacuum cleaner with HEPA filter

<table>
<thead>
<tr>
<th>VACUUM CLEANER MODEL (^a)</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 VAC, 60 Hz, 1-phase</td>
<td>4100-03730</td>
</tr>
<tr>
<td>230 VAC, 50–60 Hz, 1-phase</td>
<td>4100-03749</td>
</tr>
<tr>
<td>380 VAC, 60 Hz, 3-phase</td>
<td>9201-20455</td>
</tr>
</tbody>
</table>

a. All vacuum cleaners include attachments

FUNCTIONS • NON-IGNITION VACUUM CLEANER

Electrically grounded vacuum with HEPA filter for cleaning DuraForm powder residue off floors and equipment.

See Optional Safety Equipment on page 138.
Equipment You Supply

You must procure the equipment listed below from third-party suppliers. This equipment must be on site before your 3D CSE arrives for installation.

**Transformers for 3-phase auxiliary machines** other than the SLS system.

See Transformers on page 46 and Auxiliary Machines: 3-phase Transformers on page 73.

**Laser safety barriers or curtains** (Flex-Guard or Ever-Guard barriers from KENTEK Corp.) surround the SLS system when the laser is serviced and laser safety interlocks are defeated.

**1.5 m (5 ft) platform ladder** for installation and service.

**Storage cabinet** for maintenance parts.

**Anti-static floor mats** placed in front of SLS system, IRS, and BOS to prevent electrostatic discharge from damaging the electronics in these machines.
SPECIFICATIONS

Refer to the tables of technical specifications for 3D Systems-manufactured SLS equipment in this section as you work through the facility requirements that follow.

For Chiller, Room Oxygen Monitor, Dust Collector, Bead Blaster, Non-ignition Vacuum Cleaner, and transformer specifications, see the manufacturer’s documentation that shipped with these machines.

- sPro SLS System .......................... 50
- Rapid Change Module (RCM) .......... 53
- Integrated Recycling Station (IRS) .... 55
- Intelligent Powder Cartridge (IPC) ..... 56
- Breakout Station (BOS) ................. 57
- BOS sPro 230 Work Platform .......... 58

Many of the specifications in this section are illustrated on the SLS Process Facility Layout drawing (23348-101-00).
## sPro SLS System

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>sPro 140</th>
<th>sPro 230(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H × W × D</td>
<td>(197 × 184 × 185) cm (78 × 72 × 73) in</td>
<td>(220 × 184 × 185) cm (87 × 72 × 73) in</td>
</tr>
<tr>
<td>Stacklight height</td>
<td>36 cm (14 in)</td>
<td>36 cm (14 in)</td>
</tr>
<tr>
<td>Weight(^b)</td>
<td>1480 kg (3263 lb)</td>
<td>1730 kg (3814 lb)</td>
</tr>
<tr>
<td>Build volume (in RCM)</td>
<td>140 L (5 ft(^3)) (550 × 550 × 460) mm (22 × 22 × 18) in</td>
<td>230 L (8 ft(^3)) (550 × 550 × 750) mm (22 × 22 × 30) in</td>
</tr>
</tbody>
</table>

\(a\) sPro 230 is 23 cm (9 in) taller than sPro 140

\(b\) Weights are uncrated/empty; see also Equipment crate weights and dimensions on page 105 for shipping weights and dimensions.

<table>
<thead>
<tr>
<th>CLEARANCES</th>
<th>sPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front (for hinged RCM bay door)</td>
<td>122 cm (48 in)</td>
</tr>
<tr>
<td>Rear (for service access)</td>
<td>76 cm (30 in)</td>
</tr>
<tr>
<td>Right and left side (for hinged process chamber and overflow access doors)</td>
<td>51 cm (20 in)</td>
</tr>
</tbody>
</table>
### ELECTRICAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>sPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and frequency</td>
<td>208 VAC, 50-60 Hz</td>
</tr>
<tr>
<td>Current</td>
<td>38 A (normal), 48 A (peak)</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>Phase connection type</td>
<td>WYE</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>60 A</td>
</tr>
</tbody>
</table>

*a. The SLS system must be connected to a separate, dedicated facility power circuit; input power and facility breaker ratings are the same for both sPro models.*

### COMPRESSED AIR

<table>
<thead>
<tr>
<th>Parameter</th>
<th>sPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>550-620 kPa (80-90 psi)</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>120 L/min (4 scfm)</td>
</tr>
<tr>
<td>Quality*</td>
<td>CDA (Clean Dry Air)</td>
</tr>
<tr>
<td>Air Inlet</td>
<td>Industrial interchange male coupling plug; ¼-in coupling size</td>
</tr>
</tbody>
</table>

*a. Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)*
### NITROGEN

<table>
<thead>
<tr>
<th>Specification</th>
<th>sPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>N\textsubscript{2} supply pressure</td>
<td>150-200 kPa (22-29 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>20 L/min (0.7 scfm)</td>
</tr>
<tr>
<td>Purity \cdot N\textsubscript{2} supply</td>
<td>98%</td>
</tr>
<tr>
<td>N\textsubscript{2} inlet supply</td>
<td>0.375-18 NPT female</td>
</tr>
<tr>
<td>N\textsubscript{2} outlet exhaust</td>
<td>0.750-14 NPT female</td>
</tr>
<tr>
<td>N\textsubscript{2} inerted volume</td>
<td>334 L</td>
</tr>
</tbody>
</table>

### COOLANT

<table>
<thead>
<tr>
<th>Specification</th>
<th>sPro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure\textsuperscript{a}</td>
<td>414 kPa (60 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>4 L/min</td>
</tr>
<tr>
<td>Base fluid</td>
<td>Distilled H\textsubscript{2}O with resistivity of (1 to 3) M\textOmega/cm\textsuperscript{2} at 25 °C</td>
</tr>
</tbody>
</table>
| Additive                      | Corrosion-inhibiting, propylene glycol-based heat transfer fluid; 3D Systems recommends:  
  • DOWFROST\textsuperscript{®} (US/Asia), or,  
  • DOWCAL\textsuperscript{®} 20 (EU) |
| Coolant mix ratio             | 2 parts base fluid : 1 part additive |
| Coolant inlet                 | 0.500-14 NPT female coupling   |
| Coolant outlet                | 0.500-14 NPT female            |

\textsuperscript{a}. Coolant pressure is regulated on the Chiller; coolant flow is regulated on the SLS system.
Rapid Change Module (RCM)

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>RCM 140</th>
<th>RCM 230a</th>
</tr>
</thead>
<tbody>
<tr>
<td>H × W × D</td>
<td>(112 × 94 × 101) cm (44 × 37 × 40) in</td>
<td>(135 × 94 × 101) cm (53 × 37 × 40) in</td>
</tr>
<tr>
<td>Build volume</td>
<td>140 L (5 ft³) (550 × 550 × 460) mm (22 × 22 × 18) in</td>
<td>230 L (8 ft³) (550 × 550 × 750) mm (22 × 22 × 30) in</td>
</tr>
<tr>
<td>Weightb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• empty</td>
<td>260 kg (573 lb)</td>
<td>360 kg (794 lb)</td>
</tr>
<tr>
<td>• full (DuraForm PA)</td>
<td>377 kg (831 lb)</td>
<td>551 kg (1215 lb)</td>
</tr>
<tr>
<td>• powder net wgt. (DuraForm PA)</td>
<td>117 kg (258 lb)</td>
<td>191 kg (421 lb)</td>
</tr>
</tbody>
</table>

a. RCM 230 has the same X and Y dimensions as RCM 140, but is 23 cm (9 in) taller in Z.
b. See also Equipment crate weights and dimensions on page 105 for shipping weights and dimensions.

<table>
<thead>
<tr>
<th>ELECTRICAL</th>
<th>RCM 140</th>
<th>RCM 230</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input powera</td>
<td>from RCM cable on SLS system or BOS</td>
<td>from RCM cable on SLS system or BOS</td>
</tr>
<tr>
<td>Cylinder heatersb</td>
<td>• top</td>
<td>• top</td>
</tr>
<tr>
<td></td>
<td>• middle</td>
<td>• upper-middle</td>
</tr>
<tr>
<td></td>
<td>• bottom</td>
<td>• lower-middle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• bottom (“stretch” heater)</td>
</tr>
<tr>
<td>Piston heater</td>
<td>under piston top plate</td>
<td>under piston top plate</td>
</tr>
</tbody>
</table>

a. The RCM is remotely powered by the SLS system or BOS through the RCM cable.
b. blanket heaters that wrap around outside of part cylinder
## Integrated Recycling Station (IRS)

### Dimensions

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>H × W × D</td>
<td>272 × 133 × 117 cm</td>
</tr>
<tr>
<td></td>
<td>(107 × 52 × 46) in</td>
</tr>
<tr>
<td>Stacklight height</td>
<td>28 cm (11 in)</td>
</tr>
<tr>
<td>IRS umbilical length</td>
<td>3 m (10 ft)</td>
</tr>
<tr>
<td>Weight</td>
<td>350 kg (772 lb)</td>
</tr>
<tr>
<td>Door clearance (left and right sides)</td>
<td>51 cm (21 in)</td>
</tr>
</tbody>
</table>

### Compressed Air

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>620-690 kPa</td>
</tr>
<tr>
<td></td>
<td>(90-100 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>750 L/min (27 scfm)</td>
</tr>
<tr>
<td>Quality&lt;sup&gt;a&lt;/sup&gt;</td>
<td>CDA (Clean Dry Air)</td>
</tr>
<tr>
<td>Air inlet</td>
<td>Industrial interchange male coupling plug; ¼-in coupling size</td>
</tr>
</tbody>
</table>

### Electrical

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and frequency</td>
<td>208/240 VAC, 50/60 Hz</td>
</tr>
<tr>
<td>Current</td>
<td>3 A (normal), 3 A (peak)</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>15 A</td>
</tr>
</tbody>
</table>

### Bin Capacities

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blender bin</td>
<td>72 L (2.5 ft³)</td>
</tr>
<tr>
<td>Virgin bin (new powder)</td>
<td>240 L (8.5 ft³)</td>
</tr>
<tr>
<td>Used bin (used powder)</td>
<td>240 L (8.5 ft³)</td>
</tr>
</tbody>
</table>

---

<sup>a</sup> Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)

<sup>b</sup> Weight is uncrated/empty; see also Equipment crate weights and dimensions on page 105 for shipping weights and dimensions.
## Intelligent Powder Cartridge (IPC)

### Dimensions

<table>
<thead>
<tr>
<th>H \times W \times D</th>
<th>(105 \times 87 \times 87) \text{ cm} \ (41 \times 34 \times 34) \text{ in}</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS umbilical length</td>
<td>3 m (10 ft)</td>
</tr>
<tr>
<td>IPC overpressure sensor air tube length</td>
<td>3 m (10 ft)</td>
</tr>
</tbody>
</table>

### Weight

<table>
<thead>
<tr>
<th>Full shipping weight</th>
<th>150 kg (330 lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty shipping weight</td>
<td>50 kg (110 lb)</td>
</tr>
<tr>
<td>Net weight of DuraForm PA powder</td>
<td>100 kg (220 lb)</td>
</tr>
</tbody>
</table>

### Compressed Air

<table>
<thead>
<tr>
<th>Supply(^a)</th>
<th>From IRS. No separate facility compressed air connection required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality(^b)</td>
<td>CDA (Clean Dry Air)</td>
</tr>
<tr>
<td>Air inlet</td>
<td>Bulkhead connector on IPC pallet for IRS umbilical</td>
</tr>
<tr>
<td>Air outlet</td>
<td>0.375-in ID Push-Lok coupling on IPC lid for overpressure sensor tube</td>
</tr>
</tbody>
</table>

### Electrical

<table>
<thead>
<tr>
<th>Input power(^d)</th>
<th>None. No separate facility electrical connection required</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID</td>
<td>Passive tag embedded in IPC pallet</td>
</tr>
</tbody>
</table>

---

\(^a\) The IRS controls IPC air pressure and flow via the IRS umbilical and overpressure sensor air line.

\(^b\) Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)

\(^c\) When filled with DuraForm PA powder

\(^d\) IRS umbilical ground cable must be attached to the IPC clamping bolt before unloading IPC.
# Breakout Station (BOS)

## Dimensions

<table>
<thead>
<tr>
<th></th>
<th>BOS 140</th>
<th>BOS 230</th>
</tr>
</thead>
<tbody>
<tr>
<td>H × W × D</td>
<td>192 × 203 × 115 cm (76 × 80 × 45 in)</td>
<td>215 × 203 × 115 cm (85 × 80 × 45 in)</td>
</tr>
<tr>
<td>Stacklight height</td>
<td>54 cm (21 in)</td>
<td>54 cm (21 in)</td>
</tr>
<tr>
<td>Weight(^a)</td>
<td>481 kg (1060 lb)</td>
<td>519 kg (1145 lb)</td>
</tr>
</tbody>
</table>

\(^a\) Weights are uncrated/empty; see Receiving & Moving Equipment on page 97 for crated weights and dimensions.

## Clearances

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Front (for hinged access door)</td>
<td>76 cm (30 in)</td>
</tr>
<tr>
<td>Right side (service only)</td>
<td>61 cm (24 in)</td>
</tr>
</tbody>
</table>

## Electrical

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and frequency</td>
<td>208-240 VAC, 50-60 Hz</td>
</tr>
<tr>
<td>Current</td>
<td>2 A (norm.), 3.5 A (peak)</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>15 A</td>
</tr>
</tbody>
</table>

## Compressed Air

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>420-480 kPa (60-70 psi)</td>
</tr>
<tr>
<td>Flow rate</td>
<td>250 L/min (9 cfm)</td>
</tr>
<tr>
<td>Quality(^a)</td>
<td>CDA (Clean Dry Air)</td>
</tr>
</tbody>
</table>

\(^a\) Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)

## Network

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>TCP/IP (proprietary)</td>
</tr>
<tr>
<td>Connector</td>
<td>RJ45 female</td>
</tr>
</tbody>
</table>
## BOS 230 Work Platform

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H × W × D</strong></td>
<td><strong>Load</strong></td>
</tr>
<tr>
<td>(23 × 175 × 71) cm</td>
<td>113 kg (250 lb) (max.)</td>
</tr>
<tr>
<td>(9 × 69 × 28) in</td>
<td></td>
</tr>
<tr>
<td><strong>Weight(^a)</strong></td>
<td><strong>Number of people</strong></td>
</tr>
<tr>
<td>59 kg (129 lb)</td>
<td>One (max.)</td>
</tr>
</tbody>
</table>

\(^a\) Weights are uncrated/empty; see Receiving & Moving Equipment on page 97 for crated weights and dimensions.
ROOM REQUIREMENTS

Your SLS process facility must be inside a building. All SLS process facility room(s) in the building must meet the room construction and atmospheric requirements in this section.

- Room Construction ....................... 60
- Room Atmosphere ......................... 64
- Room Requirements Checklist ............ 65

Note: A Facility Layout Poster for sPro 140/23 SLS Center and its accessories is available separately.
Room Construction

The room(s) or area(s) you choose to install your SLS process facility in must be comfortable and safe to work in. You will need enough space to move around and access equipment, good temperature controls, and adequate ventilation. The doors and halls leading in have to be large enough to fit the equipment through. Finally, the floors must be level and able to safely bear the load of the equipment.

SLS Process Room Dimension Requirements

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room size</td>
<td>Refer to SLS Process Facility Layout drawing and Equipment Clearance Requirements on page 61.</td>
</tr>
<tr>
<td>Minimum access door (W × H)a</td>
<td>180.3 × 212.1 cm (71 × 83.5 in)</td>
</tr>
<tr>
<td></td>
<td>(...slightly less than a U.S. standard 6 ft × 7 ft double door)</td>
</tr>
<tr>
<td>Ceiling height (minimum)</td>
<td>305 cm (10 ft)</td>
</tr>
</tbody>
</table>

a. You must remove the UI mounting arm bracket to get the SLS system through the minimum door clearance. (See Receiving & Moving Equipment on page 97.)
## Equipment Clearance Requirements

<table>
<thead>
<tr>
<th>MACHINE</th>
<th>SIDE</th>
<th>DOOR SWING RADIUS</th>
<th>CLEARANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>sPro SLS System</td>
<td>Front</td>
<td>122 cm (48 in)</td>
<td>To open RCM bay door and maneuver RCM:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recommended: 160 cm (63 in) from Front</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 150 cm (59 in) from Front</td>
</tr>
<tr>
<td></td>
<td>Right &amp; Left</td>
<td>51 cm (20 in)</td>
<td>To open Right &amp; Left side process chamber access doors and overflow chute doors:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recommended: 61 cm (24 in) from Right &amp; Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 56 cm (22 in) from Right &amp; Left</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>Lift-off panel (service access only)</td>
<td>For adequate service access:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recommended: 76 cm (30 in) from Rear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 51 cm (20 in) from Rear</td>
</tr>
<tr>
<td>Chiller</td>
<td>Front</td>
<td>Lift-off filter panel</td>
<td>For adequate air circulation and heat transfer:</td>
</tr>
<tr>
<td></td>
<td>Right &amp; Left</td>
<td>n/a</td>
<td>Recommended: 40 cm (16 in) from all sides</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>IRS</td>
<td>Front</td>
<td>Lift-off panel (service access only)</td>
<td>For comfortable operator panel access:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Recommended: 81 cm (32 in) from Front</td>
</tr>
<tr>
<td></td>
<td>Right &amp; Left</td>
<td>51 cm (20 in)</td>
<td>To open Right &amp; Left side IRS enclosure access doors for service:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(service access only)</td>
<td>• Recommended: 61 cm (24 in) from Right &amp; Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 56 cm (22 in) from Right &amp; Left</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>Lift-off panel (service access only)</td>
<td>For adequate service access to IRS enclosure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recommended: 70 cm (28 in) from Rear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 60 cm (24 in) from Rear</td>
</tr>
</tbody>
</table>
### Equipment Clearance Requirements

<table>
<thead>
<tr>
<th>MACHINE</th>
<th>SIDE</th>
<th>DOOR SWING RADIUS</th>
<th>CLEARANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOS</td>
<td>Front</td>
<td>68 cm (27 in)</td>
<td>To maneuver RCM, open front waste bag access door, comfortably access operator panel, and (for BOS 230 only) to allow room for BOS 230 Work Platform:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Recommended: 160 cm (63 in) from Front</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 150 cm (59 in) from Front</td>
</tr>
<tr>
<td></td>
<td>Right</td>
<td>Lift-off panel</td>
<td>For adequate service access to BOS enclosure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(service access only)</td>
<td>• Recommended: 80 cm (32 in) from Right</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 60 cm (24 in) from Right</td>
</tr>
<tr>
<td></td>
<td>Rear</td>
<td>Lift-off panel</td>
<td>For adequate service access to BOS enclosure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(service access only)</td>
<td>• Recommended: 70 cm (28 in) from Rear</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Minimum: 60 cm (24 in) from Rear</td>
</tr>
</tbody>
</table>

---

a. Also refer to SLS Process Facility Layout drawing.
b. Local regulations may require more clearance than 3D Systems recommends.
### SLS Process Room Floor Requirements

<table>
<thead>
<tr>
<th>FLOOR</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor type</td>
<td>Vibration-free; hard surface; uncarpeted; first floor preferred for SLS system</td>
</tr>
<tr>
<td>Floor level</td>
<td>Flat to within 25.4 mm (1 in) below SLS system, IRS, and BOS</td>
</tr>
</tbody>
</table>

#### Floor Loads:
- Maximum distributed floor load (under SLS system) | 1.14 N/cm² (240 lb/ft²) |
- Maximum point floor load (under SLS system foot pad) | 130 N/cm² (27,151 lb/ft²) |
- Distributed floor load (under IRS) | 1.14 N/cm² (240 lb/ft²) |
- Point floor load (under IRS foot pad) | 130 N/cm² (27,151 lb/ft²) |
- Distributed floor load (under BOS 230) | 1.14 N/cm² (240 lb/ft²) |
- Point floor load (under BOS 230) | 130 N/cm² (27,151 lb/ft²) |

---

*a. The worst-case maximum floor load for all SLS equipment and auxiliary machines is under the sPro 230 SLS systems with a full RCM 230 loaded.*
Room Atmosphere

The SLS process facility room or area must have good temperature controls and adequate ventilation for operator safety and comfort—and for proper equipment operation.

SLS Process Room Atmosphere Requirements

<table>
<thead>
<tr>
<th>ATMOSPHERE</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room temperature controls</td>
<td>Heating and air conditioning installed</td>
</tr>
<tr>
<td></td>
<td>A/C not blowing on top of SLS system</td>
</tr>
<tr>
<td>Temperature</td>
<td>Operating range: (16 to 27) °C</td>
</tr>
<tr>
<td></td>
<td>Setpoint range: (18 to 24) °C</td>
</tr>
<tr>
<td></td>
<td>Stability: ± 2 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>≤ 70% (non-condensing)</td>
</tr>
<tr>
<td>Room air changes</td>
<td>4 per hour minimum</td>
</tr>
<tr>
<td>Heat dissipation&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17 kW (58000 Btu/h) per sPro 230 during build</td>
</tr>
<tr>
<td>Atmospheric corrosives</td>
<td>None</td>
</tr>
</tbody>
</table>

<sup>a</sup> Heat dissipation values are additive for each SLS system and RCM. The values shown are “worst case” in that they assume all electrical energy input converts to waste heat in the room.
# Room Requirements Checklist

## Room size and access

- SLS process room large enough allow comfortable access [p.60] [layout]
- Equipment placed to allow adequate clearance for service and ventilation [p.60] [layout]
- Ceiling at least 3 m (10 ft) high [p.60]

## Room Floor

- Room floor vibration-free and uncarpeted [p.63]
- Floor meets required level specification under SLS System, IRS, and BOS [p.63]
- Floor able to safely bear maximum (“worst case”) distributed and point loads under SLS System and throughout room. [p.63]

## Room Atmosphere

- Room temperature controls and ductwork installed (and not blowing cold air on SLS System) [p.64]
- Temperature and humidity specifications can be maintained at all times in all areas of the SLS process facility [p.64]
- No corrosives in SLS process room; airborne and otherwise [p.64]
- Room air changes often enough to provide safe ventilation and prevent heat buildup when equipment is operating [p.64]
Facility electrical power supplied to your SLS equipment and auxiliary machines must meet the requirements in the sections below.

- SLS System 3-phase Power and Cable… 67
- SLS System 3-Phase Transformer …… 69
- Auxiliary Machines: 3-phase Power and Cables. …………… 70
- Auxiliary Machines: 3-phase Transformers ………………… 73
- Auxiliary Machines: Single-phase Equipment ……………… 74
- Auxiliary Machines: Grounding Requirements …………….. 76
- Auxiliary Machines: Electrical Checklist. ………………….. 77

**IMPORTANT** - The SLS system requires a dedicated 3-phase power circuit. Do not connect any other equipment to an SLS system power circuit—especially a 3-phase Dust Collector, Bead Blaster, or Vacuum Cleaner. (Dedicated power circuits are preferred for all other SLS equipment, but not required.)

**BEFORE SCHEDULING INSTALLATION** You must install all required electrical wiring, service panels, outlets, and overcurrent protection in your SLS process room(s) or area(s). Decide where you want to place your equipment first, then have a licensed electrician wire your SLS process facility and mount the service panels and outlets in convenient locations.

Refer to the SLS Process Facility Layout drawing (p/n 23348-101-00) for more electrical information.
**SLS System 3-phase Power and Cable**

Connect your sPro SLS system(s) to a dedicated 3-phase power supply with a 3-phase power cable. The input power supply and power cable must both meet the requirements below.

See SLS System 3-Phase Transformer on page 69 if your 3-phase input power supply is not 208 VAC WYE.

**SLS System Input Power Requirements**

<table>
<thead>
<tr>
<th>SLS SYSTEM</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>208 ± 5%</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Phase(^a)</td>
<td>3</td>
</tr>
<tr>
<td>Phase connection</td>
<td>WYE(^b)</td>
</tr>
<tr>
<td>Normal operating current</td>
<td>38 A</td>
</tr>
<tr>
<td>Peak operating current</td>
<td>48 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>60 A</td>
</tr>
<tr>
<td>Power rating</td>
<td>17.3 kVA (additive for multiple SLS systems)</td>
</tr>
</tbody>
</table>

\(^a\) The SLS system also supplies single-phase power to the internal computer—but not the Chiller.

\(^b\) If your site has 208 VAC 3-phase input power, verify that the phase connection configuration is Wye, not Delta.

The SLS system requires a dedicated 3-phase power circuit. Do not connect any other equipment to the SLS system power circuit—especially the 3-phase Dust Collector.

**Electrical Noise** The electrical systems in the SLS system meet U.S. and European standards for electrical noise suppression. If your facility power noise levels exceed the applicable standard, install an isolation filter in series between the power panel and the SLS system.
SLS System 3-phase Power Cable Requirements

The 3-phase power cable is customer-supplied and installed by a licensed electrician.

<table>
<thead>
<tr>
<th>SLS SYSTEM POWER CABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| **Type**                | - 5-conductor; 3-phases plus neutral and ground  
                          - Wire size according to local electrical code |
| **Wiring**              | **LABEL** | **WIRE COLOR** | **TERMINAL** |
| **AMERICAS**            | Phase 1   | Red            | 1 / L1       |
|                         | Phase 2   | Black           | 3 / L2       |
|                         | Phase 3   | Blue            | 5 / L3       |
|                         | Neutral   | White           | N            |
|                         | Ground    | Green            | Earth        |
| **EUROPE**              | Phase 1   | Orange           | 1 / L1       |
|                         | Phase 2   | Red              | 3 / L2       |
|                         | Phase 3   | Black            | 5 / L3       |
|                         | Neutral   | White            | N            |
|                         | Ground    | Green/Yellow stripe | Earth        |
| **ASIA/PACIFIC**        | Phase 1   | Red              | 1 / L1       |
|                         | Phase 2   | Black            | 3 / L2       |
|                         | Phase 3   | Blue             | 5 / L3       |
|                         | Neutral   | White            | N            |
|                         | Ground    | Green            | Earth        |

✓ Route the SLS System power cable under the left rear corner of the SLS system enclosure frame and into the AC chassis.
✓ Connect the SLS System power cable ground wire to the ground bus bar in the SLS System’s AC chassis.
SLS System 3-Phase Transformer

If your SLS system 3-phase power supply does not meet the requirements listed under SLS System Input Power Requirements on page 67, you need to purchase a 3-phase transformer before scheduling installation. 3D Systems sells the CE-approved, 50-Hz and 60-Hz 3-phase transformers below. Match the transformer INPUT to your facility’s 3-phase power supply.

<table>
<thead>
<tr>
<th>TRANSFORMER</th>
<th>INPUT</th>
<th>OUTPUT</th>
<th>FREQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>208 VAC Delta</td>
<td>208 VAC Wye</td>
<td>60 Hz</td>
<td></td>
</tr>
<tr>
<td>240 VAC Delta</td>
<td>208 VAC Wye</td>
<td>60 Hz</td>
<td></td>
</tr>
<tr>
<td>480 VAC Delta</td>
<td>208 VAC Wye</td>
<td>60 Hz</td>
<td></td>
</tr>
<tr>
<td>208 VAC Delta</td>
<td>208 VAC Wye</td>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>385-415 VAC Delta</td>
<td>208 VAC Wye</td>
<td>50 Hz</td>
<td></td>
</tr>
</tbody>
</table>

If none of the INPUTs match your facility’s supply, contact 3D Systems Customer Support for help selecting an alternative transformer.

- If you purchase a transformer from a supplier other than 3D Systems, specify a “delta-to-wye” primary-to-secondary configuration.
- Connect the transformer secondary neutral to the transformer secondary ground.
- Do not connect the transformer secondary neutral to the SLS system ground.

- If your site already has 208 VAC 3-phase power, verify that the wiring configuration is Wye, not Delta.
- If you have a 208 VAC Delta output transformer, you can use it to power the SLS system IF you have a qualified electrician reconfigure it for 208 VAC Wye output. If you do this, be sure the electrician also connects a Neutral wire between the reconfigured (Wye-output) transformer and the SLS system facility power panel.
Auxiliary Machines: 3-phase Power and Cables

Connect each Dust Collector, Bead Blaster, and (optionally 3-phase) Vacuum Cleaner to a 3-phase power supply with a 3-phase power cable that meets the requirements in this section.

Do not connect any other 3-phase equipment to the same facility 3-phase power circuit the SLS system is connected to. Doing so can induce noise on the SLS system power circuit and cause malfunctions and build errors.

Dust Collector (3-phase) Input Power Requirements

<table>
<thead>
<tr>
<th>DUST COLLECTOR</th>
<th>SPECIFICATION (US/ASIA)</th>
<th>SPECIFICATION (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>208 ± 5% VAC</td>
<td>400 ± 5% VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Phase connection</td>
<td>Delta</td>
<td>Delta</td>
</tr>
<tr>
<td>Normal operating current</td>
<td>6 A</td>
<td>6 A</td>
</tr>
<tr>
<td>Peak operating current</td>
<td>13 A</td>
<td>13 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>20 A</td>
<td>20 A</td>
</tr>
<tr>
<td>Power rating</td>
<td>3.5 kVA (additive for multiple Dust Collectors)</td>
<td>3.5 kVA (additive for multiple Dust Collectors)</td>
</tr>
</tbody>
</table>

a. Two Dust Collector models are available; p/n 9201-50243 (208 VAC, 60 Hz) and p/n 9201-50244 (400 VAC, 50 Hz).
Dust Collector 3-phase Power Cable Requirements
The 3-phase power cable is customer-supplied and installed by a licensed electrician.

<table>
<thead>
<tr>
<th>DUST COLLECTOR POWER CABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| Type                        |• 4-conductor; 3 phases plus ground  
 • Wire size according to local electrical code |
| Wiring                     |LABEL | WIRE COLOR | TERMINAL |
| AMERICAS                   |Phase 1| Red | 1 / L1 |
|                            |Phase 2| Black| 3 / L2 |
|                            |Phase 3| Blue | 5 / L3 |
|                            |Ground| Green| Earth |
| EUROPE                     |Phase 1| Orange| 1 / L1 |
|                            |Phase 2| Red | 3 / L2 |
|                            |Phase 3| Black| 5 / L3 |
|                            |Ground| Green/Yellow stripe| Earth |
| ASIA/PACIFIC               |Phase 1| Red | 1 / L1 |
|                            |Phase 2| Black| 3 / L2 |
|                            |Phase 3| Blue | 5 / L3 |
|                            |Ground| Green| Earth |

✓ Route the cable into the junction box on the upper right side of the Dust Collector.

✓ Connect the power cable ground wire to the ground bus bar in the Dust Collector’s junction box.
## Bead Blaster (3-phase) Input Power Requirements\(^a\)

<table>
<thead>
<tr>
<th>BEAD BLASTER (3-PH)</th>
<th>SPECIFICATION (US/ASIA)</th>
<th>SPECIFICATION (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>480 VAC</td>
<td>240 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>60 Hz</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Phase connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal operating current</td>
<td></td>
<td>Contact your local 3D Systems Customer Support representative to obtain these electrical specifications, requirements, and power cable wiring information, for the 3-phase Bead Blaster you ordered.</td>
</tr>
<tr>
<td>Peak operating current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power rating</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) One Bead Blaster model is available; p/n 26107-101-00. You must specify the phase, voltage, and frequency on the order. (For EU only) See Single-phase Equipment starting on page 74 for 1-phase Bead Blaster input power requirements.

## Vacuum Cleaner (3-phase\(^a\)) Input Power Requirements

<table>
<thead>
<tr>
<th>VACUUM CLEANER (3-PH)</th>
<th>SPECIFICATION (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>380 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>3</td>
</tr>
<tr>
<td>Phase connection</td>
<td>3</td>
</tr>
<tr>
<td>Normal operating current</td>
<td>If you ordered a 3-phase Vacuum Cleaner, contact your local 3D Systems Customer Support representative to obtain these electrical specifications, requirements, and power cable wiring information.</td>
</tr>
<tr>
<td>Peak operating current</td>
<td></td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td></td>
</tr>
<tr>
<td>Power rating</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) One 3-phase Vacuum cleaner is available; p/n 9201-20455 (380 VAC, 50 Hz). Two single-phase Vacuum Cleaner models are also available. (See Single-phase Equipment starting on page 74 and Vacuum Cleaner on page 47.)
Auxiliary Machines: 3-phase Transformers

If your facility 3-phase power supply does not meet the input power requirements for the Dust Collector, Bead Blaster, or (optionally 3-phase) Vacuum Cleaner listed in Auxiliary Machines: 3-phase Power and Cables starting on page 70, you need to purchase a 3-phase transformer from a third-party supplier before scheduling installation.

3D Systems does not sell 3-phase transformers for Dust Collectors, Bead Blasters, or the 3-phase Vacuum Cleaner.

3D Systems Customer Support can help you find a third-party transformer that meets the following input power requirements:

- Dust Collector (3-phase) Input Power Requirements on page 70
- Bead Blaster (3-phase) Input Power Requirements on page 72
- Vacuum Cleaner (3-phase) Input Power Requirements on page 72

Do not connect any 3-phase equipment to the same facility 3-phase power circuit the SLS system is connected to. Doing so can induce noise on the SLS system power circuit and cause malfunctions and build errors.

Be sure to specify the correct type of 3-phase power your facility has on the Facility Checklist you submit. This will help you and 3D Systems Customer Support determine which Dust Collector and Bead Blaster models you need—and which type(s) of transformer(s) (if any) you need.

There is only one 3-phase Vacuum Cleaner model. A single-phase (380 to 415) VAC/50 Hz Bead Blaster is also available in the EU (only).

For the Dust Collector: Connect the transformer secondary neutral to the transformer secondary ground.

Do not connect the Dust Collector transformer’s secondary neutral to the Dust Collector ground.

Contact your local 3D Systems Customer Support Representative for 3-phase Bead Blaster and Vacuum Cleaner power cable wiring information.
Single-phase Equipment

Connect the following single-phase equipment to a power supply that meets the requirements below.

Requirements are roughly grouped by voltage range to help with outlet and breaker panel planning.

Do not connect any of the single-phase equipment to the same facility 3-phase power circuit the SLS system is connected to. Doing so can induce noise on the SLS system power circuit and cause malfunctions and build errors.

Chiller, BOS Input Power Requirements (208-240 VAC)

<table>
<thead>
<tr>
<th>CHILLER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>208–240 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Normal current</td>
<td>13 A</td>
</tr>
<tr>
<td>Peak current</td>
<td>13 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>20 A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOS</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>208–240 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Normal current</td>
<td>2 A</td>
</tr>
<tr>
<td>Peak current</td>
<td>3.5 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>15 A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VACUUM - EU</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>230 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
</tr>
<tr>
<td>Normal current</td>
<td>6 A</td>
</tr>
<tr>
<td>Peak current</td>
<td>6 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>15 A</td>
</tr>
</tbody>
</table>
# IRS, Room O₂ Monitor, Vacuum, Bead Blaster Input Power Requirements

<table>
<thead>
<tr>
<th></th>
<th>IRS SPECIFICATION</th>
<th>ROOM O₂ MONITOR SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>100–240 VAC</td>
<td>85–265 VAC</td>
</tr>
<tr>
<td>Frequency</td>
<td>50–60 Hz</td>
<td>50–60 Hz</td>
</tr>
<tr>
<td>Phase</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Normal current</td>
<td>3 A</td>
<td>3 A</td>
</tr>
<tr>
<td>Peak current</td>
<td>3 A</td>
<td>3 A</td>
</tr>
<tr>
<td>Facility breaker rating</td>
<td>15 A</td>
<td>30 A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VACUUM - US SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>Normal current</td>
</tr>
<tr>
<td>Peak current</td>
</tr>
<tr>
<td>Facility breaker rating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BEAD BLASTER - EU SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
</tr>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>Normal current</td>
</tr>
<tr>
<td>Peak current</td>
</tr>
<tr>
<td>Facility breaker rating</td>
</tr>
</tbody>
</table>
Grounding Requirements

These grounding requirements apply to all the SLS equipment and auxiliary machines installed in your facility. All connections between powered equipment and power panels must be grounded as shown in the diagram below.

Ground lines must be able to handle the same current as the power conductors to the machines.
Electrical Checklist

All electrically-powered equipment
✓ SLS process room wired by a licensed electrician and ready for equipment connection and power-up [p.66]
✓ Electrical panels and outlets convenient to equipment [p.66]
✓ Sufficient overcurrent protection (breakers/fuses) installed [p.67, p.70, p.74, p.75]

3-phase equipment

SLS SYSTEM
✓ Dedicated 3-phase input power circuit available at panel near SLS system [p.67]
✓ 5-conductor 3-phase power cable connected to facility power supply—ready to connect in SLS system AC chassis. [p.68]
✓ 25 kVA transformer(s) for SLS system on site if required [p.69]

DUST COLLECTOR, BEAD BLASTER (3-PH), AND VACUUM CLEANER (3-PH)
✓ 3-phase input power circuit—separate from SLS system’s—available at panel near Dust Collector (near BOS) [p.70] and Bead Blaster [p.72].

✓ 3-phase power cable(s) connected to facility power supply—ready to connect to 3-phase auxiliary machine(s). [p.71]
✓ Third-party transformer(s) for 3-phase auxiliary machines on site if required [p.73]

1-phase equipment

CHILLER and BOS
✓ 208-240 VAC outlets available near machine [p.74]

IRS, ROOM O2 MONITOR, AND VACUUM CLEANER (1-PH)
✓ 100-240 VAC outlets available near machine [p.75]

BEAD BLASTER (1-PH; EU ONLY)
✓ 380-415 VAC, 50 Hz outlet available near machine [p.75]

Equipment grounding
✓ All connections between powered equipment and power panels/outlets are grounded [p.76]
✓ Ground lines can handle the same current as the machine power conductors [p.76]
Your SLS process facility needs a compressed air supply, distribution, and control system that meets the requirements in this section.

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- Compressed Air Installation Prerequisites 80
- SLS Equipment Air Inlets ..................... 81
- Compressed Air Checklist ...................... 83
- Facility Air Supply ............................. 83
- Equipment Air Inlets ........................... 83
Compressed Air Supply

The sPro SLS System, Nitrogen Generator, IRS, IPC, and BOS all require a reliable compressed air supply to operate. The air drives pneumatic valves, lifts, and powder transport within and between these machines. Your facility compressed air system must have sufficient capacity, and the air must be clean, dry, stable, and continuously available.

SLS Process Facility Overall Compressed Air Supply Requirements

<table>
<thead>
<tr>
<th>AIR SUPPLY</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total pressure capacity</td>
<td>690 kPa (100 psi)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total flow rate capacity</td>
<td>1370 L/min (48 scfm)</td>
</tr>
<tr>
<td>Quality&lt;sup&gt;b&lt;/sup&gt;</td>
<td>CDA (Clean Dry Air) for all SLS equipment and auxiliary machines</td>
</tr>
<tr>
<td>Shut off valves</td>
<td>5: one main shutoff for all machines and one downstream at the SLS system,</td>
</tr>
<tr>
<td></td>
<td>N2 Generator, IRS, and BOS. (The IPC does not require a separate facility</td>
</tr>
<tr>
<td></td>
<td>shutoff.)</td>
</tr>
<tr>
<td>Air supply fitting</td>
<td>(all machines) industrial interchange female coupling plug; ¼-in coupling size&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Air supply tubing</td>
<td>(all machines) polyethylene tubing:</td>
</tr>
<tr>
<td></td>
<td>• 0.75-inch OD (outer diameter)</td>
</tr>
<tr>
<td></td>
<td>• 0.0625-inch (1/16”) wall thickness</td>
</tr>
<tr>
<td></td>
<td>• 0.6875-inch (11/16”) ID (inner diameter)</td>
</tr>
<tr>
<td>Air inlet fitting</td>
<td>(all machines) industrial interchange male coupling plug; ¼-in coupling size&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Total pressure and flow rate capacity is sufficient to drive one: SLS system, N2 Generator, IRS, IPC, and BOS
<sup>b</sup> Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)
<sup>c</sup> e.g., McMaster-Carr p/n 6536K28
<sup>d</sup> e.g., McMaster-Carr p/n 1077T17
Compressed Air Installation Prerequisites

✓ You must purchase and install all SLS process compressed air equipment for your facility.

✓ Your compressed air supply must meet all local building safety codes and regulations.

✓ All facility compressed air supply plumbing, valves, tubing, and fittings must be installed and ready to connect before scheduling installation.
**SLS Equipment Air Inlets**

The table below lists the compressed air inlet supply requirements for SLS equipment (that uses compressed air) and the optional Bead Blaster.

All SLS equipment listed below ships with a ¼-inch industrial interchange male coupling plug (for example, McMaster-Carr p/n 1077T17).

### SLS Equipment Compressed Air Inlet Requirements

<table>
<thead>
<tr>
<th>AIR INLET</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>sPro SLS system</strong></td>
<td>(Models 140 and 230)</td>
</tr>
<tr>
<td>• inlet pressure</td>
<td>550-620 kPa (80-90 psi)</td>
</tr>
<tr>
<td>• inlet flow rate</td>
<td>120 L/min (4 scfm)</td>
</tr>
<tr>
<td><strong>Nitrogen Generator</strong></td>
<td></td>
</tr>
<tr>
<td>• inlet pressure</td>
<td>620-690 kPa (90-100 psi)</td>
</tr>
<tr>
<td>• inlet flow rate</td>
<td>250 L/min (9 scfm)</td>
</tr>
<tr>
<td><strong>IRS</strong></td>
<td></td>
</tr>
<tr>
<td>• inlet pressure</td>
<td>620-690 kPa (90-100 psi)</td>
</tr>
<tr>
<td>• inlet flow rate</td>
<td>750 L/min (27 scfm)</td>
</tr>
<tr>
<td><strong>IPC</strong></td>
<td></td>
</tr>
<tr>
<td>• inlet</td>
<td>IPC compressed air is supplied and regulated by the IRS via the IRS umbilical air tube and overpressure sensor air line; no separate facility air connection required</td>
</tr>
</tbody>
</table>

**Note:** The table shows the compressed air inlet supply requirements for various SLS equipment. Each piece of equipment has specific requirements for inlet pressure and flow rate to ensure proper operation. The ¼-inch industrial interchange male coupling plug is a standard for most equipment, providing a universal connection option. The table includes the models and requirements for the sPro SLS system, Nitrogen Generator, IRS, and IPC, with detailed specifications for each parameter.
### SLS Equipment Compressed Air Inlet Requirements (cont.)

<table>
<thead>
<tr>
<th>AIR INLET</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOS</td>
<td>(models 140 and 230)</td>
</tr>
<tr>
<td>• inlet pressure</td>
<td>420-480 kPa (60-70 psi)</td>
</tr>
<tr>
<td>• inlet flow rate</td>
<td>250 L/min (9 cfm)</td>
</tr>
<tr>
<td>Bead Blaster</td>
<td>(1-phase and 3-phase models)</td>
</tr>
<tr>
<td>• inlet pressure</td>
<td>600 kPa (87 psi)</td>
</tr>
</tbody>
</table>
Compressed Air Checklist

Facility Air Supply
✓ All facility compressed air supply plumbing, valves, tubing, and fittings are purchased, installed, and meet required specifications [p.79]
✓ Facility has CDA (Clean, Dry Air) supply that meets ISO 8573-1:2001 (cl 2.2.2) [p.79]
✓ Facility compressed air supply has sufficient available pressure and flow capacity to meet “worst case” simultaneous pressure and flow demand from all air-connected equipment.[p.79]
✓ Compressed air supply tubing ready to connect to machines

Equipment Air Inlets
✓ All compressed air supply hose fittings match coupling plug on SLS equipment. [p.81]
NITROGEN & COOLANT

Nitrogen and coolant supplied to your sPro SLS system must meet the requirements in this section.

Your SLS system requires nitrogen and coolant to run. Nitrogen flows into the SLS system and exhausts to the outside. The Chiller circulates coolant through the SLS system IPM (Image Projection Module) to cool the laser and scanning optics.

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- Nitrogen Supply Options ...................... 85
- SLS System
  - Nitrogen Supply Specifications ............. 86
  - Nitrogen Supply and Exhaust Lines ...... 86
- Nitrogen Generator
  - Mounting Requirements ...................... 87

- **Coolant Requirements** ....................... 89
- SLS System Coolant Specifications ........ 89
- **N2 & Coolant Checklist** ....................... 90
- Nitrogen Checklist ......................... 90
- Coolant Checklist ........................ 90

- **N2 Generator Compressed Air Supply** ... 88
- **N2 Generator O2 Exhaust** ................. 88
- **N2 Generator O2 Exhaust** ................. 88
Nitrogen Requirements

The SLS system uses nitrogen when building SLS parts. You can use 3D Systems Nitrogen Generator or liquid nitrogen tank(s) to supply nitrogen to your SLS system, as long as the supply meets the requirements in this section.

You must install a CE-compliant room oxygen monitor/alarm, such as 3D Systems’ Room Oxygen Monitor, in the same room as the SLS system.

If you use liquid nitrogen tanks, you must have a sufficient supply on site before your 3D CSE arrives to install the SLS equipment.

Nitrogen Supply Options

The nitrogen supply you choose depends on your expected consumption.

A Nitrogen Generator requires a larger initial investment than nitrogen tanks, but ensures you never run out of nitrogen during a build—which can also be very costly.

If you use two or more portable liquid nitrogen tanks, install an auto-switching manifold between them to reduce the risk of running out of nitrogen during a build.
Nitrogen Supply and Exhaust Lines

Nitrogen supply lines (if you’re using liquid nitrogen) and nitrogen exhaust lines must be in place before installation. Follow these guidelines for nitrogen supply and exhaust lines:

- Route nitrogen supply lines to the gauge panel at the right rear of the SLS system (viewed from the front).
- Use a 0.375-18 NPT male fitting on the nitrogen inlet line.
- Use a 0.750-14 male NPT fitting on the nitrogen exhaust line.
- Do not use a fan on the nitrogen exhaust line.

Keep the nitrogen lines—especially the exhaust line—as short as possible to ensure proper pressure.

---

### SLS System Nitrogen Supply Specifications

<table>
<thead>
<tr>
<th>N₂ SUPPLY</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purity</strong></td>
<td>Dry, 99% pure</td>
</tr>
<tr>
<td><strong>N₂ inlet</strong></td>
<td>(on SLS system gauge panel)</td>
</tr>
<tr>
<td>- inlet coupling</td>
<td>0.375-18 NPT female</td>
</tr>
<tr>
<td>- inlet pressure</td>
<td>150-200 kPa (22-29 psi)</td>
</tr>
<tr>
<td>- inlet flow rate</td>
<td>20 L/min (0.7 scfm)</td>
</tr>
<tr>
<td><strong>N₂ exhaust outlet</strong></td>
<td>(on SLS system gauge panel)</td>
</tr>
<tr>
<td>- outlet coupling</td>
<td>0.750-14 NPT female</td>
</tr>
<tr>
<td>- exhaust pressure</td>
<td>Must exhaust to outside at pressure 0.0025 bar (1.0 in H₂O); do not install a fan in the nitrogen exhaust line.</td>
</tr>
<tr>
<td><strong>Purge flow</strong></td>
<td>(Liquid nitrogen tanks only) Continuous flow of 20 L/min (0.7 scfm) plus 165 L/min (5.8 scfm) maintaining 103 kPa (15 psi) for 25 min</td>
</tr>
<tr>
<td><strong>Weekly consumption</strong></td>
<td>(Liquid nitrogen tanks only) 120 m³ (4240 ft³) of N₂ gas based on 24 h/day operation with 7 purge cycles</td>
</tr>
</tbody>
</table>
Nitrogen Generator Mounting Requirements

The 3D Systems Nitrogen Generator mounts on a wall or pillar.

⚠️ Your N2 Generator mounting location must be able to safely support 36 kg (80 lb).

✓ Use the diagram at right to identify a suitable mounting location as near as possible to your SLS system.

✓ Choose a mounting location close to the SLS system to keep the N2 supply line short as possible.

✓ Mount the Nitrogen Generator at a comfortable height; (your 3D CSE must periodically change filters in your Nitrogen Generator enclosure during routine maintenance.)
The N2 Generator does not require facility electric power; it runs on compressed air.

The SLS system remotely powers the N2 solenoid valve in the Nitrogen Generator as well as the two N2 solenoids in the SLS system.

You must provide a facility compressed air connection near the N2 Generator mounting location. The N2 Generator compressed air supply must meet the requirements below:

<table>
<thead>
<tr>
<th>N2 GENERATOR SUPPLY AIR</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality*</td>
<td>CDA (Clean Dry Air)</td>
</tr>
<tr>
<td>Air inlet</td>
<td>industrial interchange male coupling plug; ¼-in coupling size; air inlet at top of N2 Generator</td>
</tr>
<tr>
<td>Inlet pressure</td>
<td>620-690 kPa (90-100 psi)</td>
</tr>
<tr>
<td>Inlet flow rate</td>
<td>250 L/min (9 scfm)</td>
</tr>
</tbody>
</table>

* Instrument quality air supply; meets ISO 8573-1:2001 (cl 2.2.2)

The Nitrogen Generator separates nitrogen from ambient air, creating two air streams; N2 supply and O2 waste. (Both exit at the bottom of the N2 Generator.)

The N2 supply stream is ≥ 98% nitrogen. The O2 waste stream is ≤ 40% oxygen.

If your SLS process room meets the air exchange requirements, you can safely vent the O2 waste stream into your room. (The waste stream flow rate is low.)

See SLS Process Room Atmosphere Requirements on page 64 for room air change requirements.

Do not mount your Room Oxygen Monitor near the Nitrogen Generator O2 exit (at the bottom of the N2 Generator). The O2-rich waste air near the O2 exit could mask a hazardously low O2 concentration in the room.
Coolant Requirements

The Chiller circulates coolant through the SLS system IPM (Image Processing Module) to cool the laser and scanning optics.

Do not run the SLS system with insufficient or improper coolant. Doing so can damage the cooling system and laser components.

Your SLS Chiller Kit (which ships in the SLS Pro Accessories Kit (p.23) provides 5 L (1.3 gal) of heat transfer fluid and 10 L (2.6 gal) distilled water with resistivity of (1 to 3) MΩ/cm² at 25 °C. This enables you to fill the Chiller reservoir with coolant when your 3D CSE arrives for installation.

SLS System Coolant Specifications

<table>
<thead>
<tr>
<th>COOLANT SUPPLY</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant Mix</td>
<td>2:1</td>
</tr>
<tr>
<td>• Distilled water 10 L</td>
<td>2 parts</td>
</tr>
<tr>
<td>• DOWFROST (US/Asia) or DOWCAL 20 (EU) inhibited¹, 100% pure propylene glycol</td>
<td>1 part</td>
</tr>
<tr>
<td>Chiller coolant reservoir capacity</td>
<td>5.7 L (1.5 gal)</td>
</tr>
<tr>
<td>Coolant inlet pressureᵇ</td>
<td>414 kPa (60 psi)</td>
</tr>
<tr>
<td>Coolant inlet flow rate</td>
<td>4 L/min</td>
</tr>
<tr>
<td>Coolant inlet coupling (on SLS system gauge panel)</td>
<td>0.500-14 NPT female</td>
</tr>
<tr>
<td>Coolant outlet coupling (on SLS system gauge panel)</td>
<td>0.500-14 NPT female</td>
</tr>
<tr>
<td>Coolant drain outlet (under Chiller)</td>
<td>0.750-18 NPT female</td>
</tr>
</tbody>
</table>

¹ “Inhibited” propylene glycol contains additives that help prevent corrosion in the Chiller and SLS system.
ᵇ Coolant pressure is regulated on the Chiller; coolant flow is regulated on the SLS system.
N₂ & Coolant Checklist

Nitrogen Checklist
✓ Sufficient nitrogen available on site (if using liquid nitrogen) [p.86]
✓ Nitrogen exhaust vent to outside installed (no fan) [p.86]

N₂ Generator only:
✓ Safe mounting location identified [p.87]
✓ Compressed air supply connection ready [p.87]

Coolant Checklist
✓ Coolant from SLS Chiller Kit available on site to fill Chiller reservoir [p.89]

Use only distilled water in coolant mix. Do not use tap water or deionized (DI) water.
Doing so can damage the cooling system and void the laser system warranty.

DO NOT use automobile- or commercial-grade antifreeze or ethylene glycol in the coolant mix.
Doing so can damage the cooling system and void the laser system warranty.
NETWORK REQUIREMENTS

This section covers network cabling and connection requirements for the 3D Systems Powder Management System. SLS equipment uses the Powder Management System network to send and receive powder transfer and system status messages. The IRS is the Powder Management System’s network hub. (All network messages are routed through the IRS.)

The Powder Management Network used by SLS equipment is a closed network separate from your facility’s computer network. You can connect your SLS system computer to your facility’s computer network to set up SLS builds on a remote computer, then transfer the build packet files to your SLS system electronically. However, you cannot connect your facility computers to the Powder Management Network.

- About the Powder Management Network
- Network Checklist
About the Powder Management Network

The SLS® system, IRS, and BOS must all be connected to the Powder Management System network. The IRS is the “master” or “hub” device on this network. It controls all powder transfers within and between itself, the IPC, the SLS® system, and the BOS.

A separate background application (APMU) running on the SLS system computer logs all powder movement within and between SLS equipment.

Before your 3D CSE arrives for installation, you must route network cabling between your IRS hub location and your SLS system and BOS locations. Installing standard Ethernet RJ-45 wall sockets near each machine is recommended.

Network Checklist

✓ SLS process room(s) or area(s) have network cabling installed ready for equipment connection.

✓ Network cables are Category 5 unshielded twisted pair; 10BaseT, 100BaseT

✓ Network RJ-45 wall sockets (if used) are convenient to equipment.
SLS POWDER REQUIREMENTS

This section tells you what’s required to properly store and handle 3D Systems’ DuraForm plastic SLS powders in your facility.

- Powder Storage Requirements ........... 94
- SLS Powder and Sealant Storage Specifications .................. 94
- Powder Handling Requirements ........... 95
- Grounding the IPC ......................... 95
- Powder Checklist ......................... 96
- Storage Checklist ......................... 96
- Handling Checklist ......................... 96
Powder Storage Requirements

Protect 3D Systems DuraForm powder from open flames and sparks and keep portable heating devices a safe distance away. Store flammable liquids away from all powdered materials.

SLS Powder and Sealant Storage Specifications

<table>
<thead>
<tr>
<th>SLS MATERIAL</th>
<th>RELATIVE HUMIDITY</th>
<th>TEMPERATURE</th>
<th>SHELF LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuraForm PA plastic powder</td>
<td>(30 to 90)% RH, non-condensing</td>
<td>(0–40) °C</td>
<td>2 years</td>
</tr>
<tr>
<td>DuraForm GF plastic powder</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For additional powder safety information, refer to:

- DIN EN 26184 Teil 1/06.91
**Powder Handling Requirements**

Flowing DuraForm® plastic SLS powder can create an electrostatic charge on SLS equipment, powder transport lines, and powder container surfaces. Properly connected grounding clamps and wires on the IPC and waste powder drum lid prevent this charge from building up by draining it to your building’s safety ground.

Also, using the fully grounded non-ignition vacuum cleaner to clean up powder safely drains electrostatic charge.

Electrostatic discharge (ESD) can damage electronics in SLS equipment. The spark from a discharge can also ignite an airborne dust cloud if the cloud is dense enough and the air has enough oxygen. Grounding helps prevent damaging ESD and airborne dust ignition. Always install, and frequently check, the grounding clamps and wires on the IPC and waste powder drum.

**Grounding the IPC**

Always connect the ground wire on the IRS powder umbilical to the IPC band clamp before unloading virgin powder.

ℹ️ Your 3D CSE will demonstrate how to properly connect the IRS umbilical and ground wire to the IPC during installation.
Powder Checklist

Storage Checklist
✓ Powder storage room or area is temperature- and humidity-controlled. [p.94]
✓ No open flames or other sources of potential powder ignition in powder storage area(s) [p.94]

Handling Checklist
✓ Facility ground connection(s) installed in all SLS process room(s) or area(s). [p.95]
✓ ESD mitigation program in place; e.g., anti-static mats [p.95]
RECEIVING & MOVING EQUIPMENT

This section describes the transportation, handling, and storage of SLS equipment and auxiliary machines. For example, it tells you what you will receive in your equipment shipment and how to unload and unpack the various components. It also tells you how to safely and properly move and place the SLS equipment and auxiliary machines in your facility.

Do not attempt to install, assemble, or mount any SLS equipment or auxiliary machines yourself. Installation, assembly, and mounting must only be performed by a trained 3D Systems-certified Customer Support Engineer or Authorized Service Provider.

If you do not unpack your equipment immediately after you receive it, be sure it’s stored in dry indoor area away from any sources of extreme heat or cold.

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- Room and Storage Requirements ...... 99
- What Your Shipment Includes .......... 100
- Shipping Weights and Dimensions .... 105
- Uncrated Weights and Dimensions .... 108
- General Lifting and Moving Safety ..... 110
- Moving the sPro SLS System .......... 112
- Moving the IRS .......................... 114
- Moving the BOS .......................... 116
- Installation Verifications .............. 118
Before Moving Equipment

Before you move any equipment, verify the following:

✓ Room is large enough to allow specified clearances around all sides of the SLS system, Chiller, IRS, and BOS.

✓ Room access door and floor meet the Room and Storage Requirements below.

✓ Equipment on pallet jack or forklift will clear all doors and passageways leading to the installation room.

Refer to the SLS Process Facility Layout (23348-101-00) for illustrated dimension and clearance information. Also see Atmosphere Requirements on page 64 of this guide for detailed SLS process room HVAC, temperature, and humidity requirements.

Before you lift or move any SLS equipment or auxiliary machines, see General Lifting and Moving Safety on page 110 and the specific machine moving instructions at the end of this section.

To ensure load stability and prevent injury when lifting and moving:

- Only lift crated equipment with forks parallel to crate skids and fully inserted in channels between skids.
- Only lift uncrated equipment at lifting points labeled on the equipment frame.
Room and Storage Requirements

The requirements summarized below are detailed in the Room Requirements section starting on page 59.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SPECIFICATION</th>
</tr>
</thead>
</table>
| Minimum\(^a\) access door (W \(\times\) H) | 180.3 \(\times\) 212.1 cm (71 \(\times\) 83.5 in)  
  (slightly less than a U.S. standard 6 ft \(\times\) 7 ft double door) |
| Ceiling height                      | 305 cm (10 ft)                                                                |
| Vibration-free floor                | Required                                                                      |
| Ground floor installation           | Preferred                                                                     |
| Uncarpeted                         |                                                                               |
| Floor level and flatness            | within 25.4 mm (1 in) below SLS system, IRS, and BOS                         |
| Floor load                          | See [SLS Process Room Floor Requirements](#) on page 63 for SLS system, IRS, and BOS point and distributed floor loads |
| Temperature (operating)             | Range: (16 to 27) °C  
  Setpoint: (18 to 24) °C  
  Stability: \(\pm\) 2 °C |
| Humidity (non-condensing)           | \(\leq\) 70%                                                                  |
| Storage                             | Store SLS equipment and auxiliary machines (crated or uncrated) in a dry indoor area away from any sources of extreme heat or cold. |

\(^a\) Minimum access door clearance assumes equipment is moved uncrated with no stacklights installed. If the access door is \(\leq\) 203 cm (80 in) wide, the BOS Pro must go through lengthwise.
What Your Shipment Includes

Your shipment includes all or some of the required and optional equipment listed in this section. It also includes a SLS Pro Accessories Kit containing SLS process supplies.

Lists of equipment along with brief descriptions are provided in this section for convenience. Complete information on 3D Systems SLS equipment and auxiliary machines is in About Equipment on page 16.

Required equipment (see page 101) includes one or more of the following:

- SLS system and RCM’s for building parts
- IRS’s and IPC’s to supply, blend, and transport powder
- BOS’s for breaking out parts.
- 3D Systems and OEM accessories that support required equipment

Optional equipment (see page 103) includes:

- 3D Systems Nitrogen Generator(s)
- OEM safety equipment
- OEM part finishing equipment
- OEM service and maintenance equipment

SLS process supplies include items in the SLS Pro Accessories Kit, such as:

- SLS Chiller Kit
- Laser calibration supplies
- Maintenance and cleaning tools
- Part finishing tools

BOS accessories include items in the BOS Pro Accessories Kit, such as the Dust Collector Duct Kit.

About OEM equipment

Most of the equipment you receive is manufactured by 3D Systems (“SLS equipment”). The rest is manufactured by our OEM partners (“auxiliary machines”).

3D Systems manufactures, supplies, and installs all SLS equipment. We also supply and install all non-3D systems OEM auxiliary machines so you can have a single source for purchasing, service, and support.

Auxiliary machines ship to your facility with the OEM’s operator and maintenance guides to supplement your 3D Systems documentation.
## Required equipment

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLS system</td>
<td>Requires:</td>
</tr>
<tr>
<td></td>
<td>• 3-phase power source&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>• Chiller (50 Hz or 60 Hz)</td>
</tr>
<tr>
<td></td>
<td>• Room Oxygen Monitor</td>
</tr>
<tr>
<td></td>
<td>• $\geq 98%$ pure nitrogen supply (tank or 3D Systems Nitrogen Generator).</td>
</tr>
<tr>
<td></td>
<td>• UI console and swing arm mount, shipped in SLS 140/230 small crate (crate p/n 103863-00); swing arm and UI console mounted after moving SLS system into place.</td>
</tr>
<tr>
<td></td>
<td>• Facility compressed air supply</td>
</tr>
<tr>
<td></td>
<td>• Frame riser kit (sPro model 230 only); ships in separate SLS sPro 230 Frame Riser Kit (crate p/n 104242-00)</td>
</tr>
<tr>
<td>Chiller&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Requires:</td>
</tr>
<tr>
<td></td>
<td>• Single phase power separate from SLS system</td>
</tr>
<tr>
<td></td>
<td>• 5.7 L (1.5 gal) of 2:1 coolant mix that meets SLS System Coolant Specifications on page 89.</td>
</tr>
<tr>
<td>RCM</td>
<td>• Ships with RCM insulated lid</td>
</tr>
<tr>
<td></td>
<td>• Wheeled RCM can be rolled into place after unpacking</td>
</tr>
<tr>
<td></td>
<td>• RCM heaters and piston motor are powered remotely when connected to an SLS system or BOS.</td>
</tr>
</tbody>
</table>
### Required equipment (continued)

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>COMMENT</th>
</tr>
</thead>
</table>
| IRS                | • Shipped in two crates; main IRS frame and IRS bin tops ("hoppers").  
• IRS bin tops mount to frame after main IRS frame is moved into place.  
• Requires facility compressed air supply  
• Powder transport tubes connected between bins and between IRS, SLS system, and BOS at installation |
| IPC                | • Ships full of DuraForm plastic SLS powder material on integral pallet and crate.  
• Empty IPC (still in crate) ships back to factory for refill.  
• Requires compressed air supply from IRS |
| BOS                | • Frame riser kit (BOS model 230 only); ships in separate **BOS Pro 230 Frame Riser Kit** (crate p/n 104243-00)  
• **Dust Collector Duct Kit**, which ships in the **BOS Pro Accessories Kit** inside the BOS crate.  
• Requires facility compressed air supply  
• Powder transport tubes connected between BOS and IRS and waste powder drum at installation |
| Dust Collector     | • Requires 3-phase power separate from SLS system  
• Ships with 10-ft vacuum extension arm for cleaning bead-blasted SLS parts  
• **BOS Pro Accessories Kit** includes **Dust Collector Duct Kit** to connect BOS Pro work chamber to Dust Collector |
| Nitrogen supplyb   | Can use liquid nitrogen tank(s) or a 3D Systems **Nitrogen Generator** (described in the in the table of **Optional equipment** on page 103). |
| Non-ignition        | For safe cleaning of the SLS equipment, auxiliary machines, and room.  
vacuum cleaner      |                                                                                                                                           |

---

*a. Each SLS system must have its own separate 3-phase facility power circuit. Do not allow other equipment, including other SLS systems, to share an SLS system’s facility power circuit. The Chiller and Room Oxygen Monitor must use a single phase power source separate from the SLS system.*
b. Must be on site before your 3D CSE arrives to install the SLS equipment.

### Optional equipment

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>SUPPLIER</th>
<th>COMMENT</th>
</tr>
</thead>
</table>
| Nitrogen generator b     | 3D Systems | • Shipped in Nitrogen Generator crate (p/n 104246-00)  
• Wall mounted and during installation  
• Provides constant source of 98% pure N₂ from facility compressed air supply |
| Room Oxygen Monitor      | OEM      | • Shipped in box inside SLS 140/230 small crate (crate p/n 103863-00)  
• Requires single phase power separate from SLS system.  
• Audible and visible low oxygen alarm  
• Low oxygen alarm signal wired into SLS system power disconnect circuit at installation to provide safety interlock  
• Includes DC backup battery |
| Bead Blaster             | OEM      | • Pneumatic “sandblasting” cabinet - recommended for  
DuraForm SLS part finishing  
• Requires a 600 kPa (87 psi) compressed air source. |
| Powder mixer a           | OEM      | Cement mixer used for blending virgin and recycled powder outside of the IRS.                                                             |
| Laser safety curtains    | OEM      | Required if room cannot be secured during laser service or calibration; (“open beam operations”).  
See Laser Safety in the Safety section of this guide for information and instructions on how to make your facility laser-safe. |
| 1.5 m (5 ft) platform ladder | OEM b    | For installation and service.                                                                                                           |
Optional equipment (continued)

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>SUPPLIER</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage cabinet</td>
<td>OEM</td>
<td>For SLS process facility tools and maintenance parts.</td>
</tr>
<tr>
<td>Anti-static floor mats</td>
<td>OEM</td>
<td>To protect SLS equipment from damaging electrostatic discharge.</td>
</tr>
</tbody>
</table>

a. Only recommended only if your facility has older SLS system(s) in addition to the sPro. 
b. Must be on site before your 3D CSE arrives to install the SLS equipment.
Shipping Weights and Dimensions

The equipment for your SLS process facility ships in several numbered crates and boxes. Check the labels on the crates and boxes to verify that your shipment is complete.

The weights and dimensions in the Equipment crate weights and dimensions table on page 105 include the equipment, the crate or box, and the packing material. Shipping configurations may vary depending on order.

⚠️ For “bare” equipment weights and dimensions (without pallets and crates included), see Uncrated Weights and Dimensions on page 108.

Before you lift or move any SLS equipment or auxiliary machines, see General Lifting and Moving Safety on page 110 and the specific machine moving instructions at the end of this section.

To ensure load stability and prevent injury when lifting and moving:

- Only lift crated equipment with forks parallel to crate skids and fully inserted in channels between skids.
- Only lift uncrated equipment at lifting points labeled on the equipment frame.

### Equipment crate weights and dimensions

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRATE P/N</th>
<th>WEIGHTA</th>
<th>WIDTH</th>
<th>DEPTH</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLS 140/230 large crate</td>
<td>103862-00</td>
<td>2063 kg</td>
<td>198 cm</td>
<td>229 cm</td>
<td>224 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4547 lb</td>
<td>78 in</td>
<td>90 in</td>
<td>88 in</td>
</tr>
<tr>
<td>SLS 140/230 small crate</td>
<td>103863-00</td>
<td>50 kg</td>
<td>66 cm</td>
<td>86 cm</td>
<td>89 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110 lb</td>
<td>26 in</td>
<td>34 in</td>
<td>35 in</td>
</tr>
<tr>
<td>IRS large crate</td>
<td>103868-00</td>
<td>921 kg</td>
<td>145 cm</td>
<td>135 cm</td>
<td>224 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2030 lb</td>
<td>57 in</td>
<td>53 in</td>
<td>88 in</td>
</tr>
</tbody>
</table>
### Equipment crate weights and dimensions (continued)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRATE P/N</th>
<th>WEIGHTA</th>
<th>WIDTH</th>
<th>DEPTH</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS small crate</td>
<td>103867-00</td>
<td>91 kg</td>
<td>66 cm</td>
<td>127 cm</td>
<td>89 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 lb</td>
<td>26 in</td>
<td>50 in</td>
<td>35 in</td>
</tr>
<tr>
<td>BOS 140/230 crate</td>
<td>103865-00</td>
<td>630 kg</td>
<td>221 cm</td>
<td>130 cm</td>
<td>130 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1389 lb</td>
<td>87 in</td>
<td>51 in</td>
<td>51 in</td>
</tr>
<tr>
<td>RCM 140</td>
<td>103864-00</td>
<td>295 kg</td>
<td>109 cm</td>
<td>117 cm</td>
<td>135 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>650 lb</td>
<td>43 in</td>
<td>46 in</td>
<td>53 in</td>
</tr>
<tr>
<td>RCM 230</td>
<td>103876-00</td>
<td>386 kg</td>
<td>109 cm</td>
<td>117 cm</td>
<td>145 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>850 lb</td>
<td>43 in</td>
<td>46 in</td>
<td>57 in</td>
</tr>
<tr>
<td>Chiller</td>
<td>ships in</td>
<td>195 kg</td>
<td>76 cm</td>
<td>104 cm</td>
<td>122 cm</td>
</tr>
<tr>
<td>OEM crate</td>
<td>104246-00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>430 lb</td>
<td>30 in</td>
<td>41 in</td>
<td>48 in</td>
</tr>
<tr>
<td>Nitrogen Generator</td>
<td>104246-00</td>
<td>57 kg</td>
<td>76 cm</td>
<td>84 cm</td>
<td>33 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>126 lb</td>
<td>30 in</td>
<td>33 in</td>
<td>13 in</td>
</tr>
<tr>
<td>SLS 230 Frame Riser Kit</td>
<td>104242-00</td>
<td>113 kg</td>
<td>53 cm</td>
<td>112 cm</td>
<td>147 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250 lb</td>
<td>21 in</td>
<td>44 in</td>
<td>58 in</td>
</tr>
<tr>
<td>BOS 230 Frame Riser Kit</td>
<td>104243-00</td>
<td>68 kg</td>
<td>107 cm</td>
<td>53 cm</td>
<td>122 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 lb</td>
<td>42 in</td>
<td>21 in</td>
<td>48 in</td>
</tr>
<tr>
<td>BOS 230 Work Platform</td>
<td>ships uncrated</td>
<td>59 kg</td>
<td>183 cm</td>
<td>71 cm</td>
<td>23 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>129 lb</td>
<td>72 in</td>
<td>28 in</td>
<td>9 in</td>
</tr>
</tbody>
</table>
### Equipment crate weights and dimensions (continued)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRATE P/N</th>
<th>WEIGHT(^A)</th>
<th>WIDTH</th>
<th>DEPTH</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPC full (empty)</td>
<td>Built-in crate</td>
<td>150 (50) kg</td>
<td>87 cm</td>
<td>87 cm</td>
<td>105 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>330 (110) lb</td>
<td>34 in</td>
<td>34 in</td>
<td>41 in</td>
</tr>
<tr>
<td>Dust Collector</td>
<td>ships in OEM crate</td>
<td>185 kg</td>
<td>99 cm</td>
<td>97 cm</td>
<td>140 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>408 lb</td>
<td>39 in</td>
<td>38 in</td>
<td>55 in</td>
</tr>
<tr>
<td>Bead Blaster</td>
<td>ships in OEM crate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^A\) Shipping weights are estimates.
**Uncrated Weights and Dimensions**

The table below lists the “bare” (uncrated/empty) dimensions and weights of all required and optional equipment.

### Equipment uncrated weights and dimensions

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>P/N</th>
<th>WEIGHTA</th>
<th>WIDTH</th>
<th>LENGTH (DEPTH)</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>sPro 140 SLS system</td>
<td>101100-00</td>
<td>1480 kg</td>
<td>184 cm</td>
<td>185 cm</td>
<td>234 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3263 lb</td>
<td>72 in</td>
<td>73 in</td>
<td>92 in</td>
</tr>
<tr>
<td>sPro 230 SLS system</td>
<td>104100-00</td>
<td>1730 kg</td>
<td>184 cm</td>
<td>185 cm</td>
<td>257 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3814 lb</td>
<td>72 in</td>
<td>73 in</td>
<td>101 in</td>
</tr>
<tr>
<td>IRS</td>
<td>104265-00</td>
<td>350 kg</td>
<td>133 cm</td>
<td>117 cm</td>
<td>272 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>772 lb</td>
<td>52 in</td>
<td>46 in</td>
<td>107 in</td>
</tr>
<tr>
<td>Chiller, 60 Hz</td>
<td>2600-03879</td>
<td>115 kg</td>
<td>54 cm</td>
<td>74 cm</td>
<td>77 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>254 lb</td>
<td>21 in</td>
<td>29 in</td>
<td>30 in</td>
</tr>
<tr>
<td>Chiller, 50 Hz</td>
<td>2600-03880</td>
<td>115 kg</td>
<td>54 cm</td>
<td>74 cm</td>
<td>77 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>254 lb</td>
<td>21 in</td>
<td>29 in</td>
<td>30 in</td>
</tr>
<tr>
<td>BOS Pro 140</td>
<td>104002-00</td>
<td>481 kg</td>
<td>203 cm</td>
<td>115 cm</td>
<td>246 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1060 lb</td>
<td>80 in</td>
<td>45 in</td>
<td>97 in</td>
</tr>
<tr>
<td>BOS Pro 230</td>
<td>104003-00</td>
<td>519 kg</td>
<td>203 cm</td>
<td>115 cm</td>
<td>269 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1145 lb</td>
<td>80 in</td>
<td>45 in</td>
<td>106 in</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>P/N</td>
<td>WEIGHTA</td>
<td>WIDTH</td>
<td>LENGTH (DEPTH)</td>
<td>HEIGHT</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------------------</td>
<td>------------------------------</td>
<td>-------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>RCM 140</td>
<td>101000-00</td>
<td>260 kg</td>
<td>94 cm</td>
<td>101 cm</td>
<td>112 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>573 lb</td>
<td>37 in</td>
<td>40 in</td>
<td>44 in</td>
</tr>
<tr>
<td>RCM 230</td>
<td>100900-00</td>
<td>360 kg</td>
<td>94 cm</td>
<td>101 cm</td>
<td>135 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>794 lb</td>
<td>37 in</td>
<td>40 in</td>
<td>53 in</td>
</tr>
<tr>
<td>Nitrogen Generator</td>
<td>104011-00</td>
<td>30 kg</td>
<td>55 cm</td>
<td>13 cm⁵</td>
<td>85 cm⁶</td>
</tr>
<tr>
<td></td>
<td></td>
<td>66 lb</td>
<td>22 in</td>
<td>5 in</td>
<td>34 in</td>
</tr>
<tr>
<td>IPC full (empty)</td>
<td>24134-901d</td>
<td>150 (50) kg</td>
<td>87 cm</td>
<td>87 cm</td>
<td>105 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>330 (110) lb</td>
<td>34 in</td>
<td>34 in</td>
<td>41 in</td>
</tr>
<tr>
<td>BOS 230 Work Platform</td>
<td>included with BOS 230</td>
<td>59 kg</td>
<td>71 cm</td>
<td>183 cm</td>
<td>23 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>129 lb</td>
<td>28 in</td>
<td>72 in</td>
<td>9 in</td>
</tr>
<tr>
<td>Dust Collector (208 VAC or 400 VAC)</td>
<td>9201-50243 or 9201-50244</td>
<td>168 kg</td>
<td>61 cm</td>
<td>78 cm</td>
<td>185 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>370 lb</td>
<td>24 in</td>
<td>31 in</td>
<td>62 in</td>
</tr>
<tr>
<td>Non-ignition vacuum cleaner</td>
<td>4100-03730</td>
<td>32 kg</td>
<td>53 cm</td>
<td>53 cm</td>
<td>94 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 lb</td>
<td>21 in</td>
<td>21 in</td>
<td>37 in</td>
</tr>
<tr>
<td>Bead Blaster</td>
<td>26107-101-00</td>
<td>160 cm</td>
<td>97 cm</td>
<td>183 cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>63 in</td>
<td>38 in</td>
<td>72 in</td>
<td></td>
</tr>
</tbody>
</table>

a. Weights are estimates.
b. Add 2.5 cm (1 in) to Nitrogen Generator depth for wall-mount bracket.
c. Add 10 cm (4 in) to Nitrogen Generator height for nozzles at top and bottom of enclosure. The nozzles protrude 5 cm (2 in) from the top and 5 cm (2 in) from the bottom.
d. This IPC part number, and the full weight listed for it, are for DuraForm PA only.
General Lifting and Moving Safety

When moving the SLS process equipment, observe the general lifting and moving safety guidelines below. Then, follow the separate moving instructions for each machine later in this section.

- Before you move and place your equipment, be sure your layout provides sufficient clearance in front of facility electrical supply panels to meet local electrical code.

Lifting Safety Guidelines

Always follow standard lifting practices, one person per 23 kg (50 lb), when moving any equipment or material container. If you are not accustomed to lifting this much weight, or if you have back problems, do any or all of the following to protect yourself:

- Use additional people to lift the items
- Remove mass to reduce weight
- Use mechanical assistance such as a jack, crane, or lift cart

- Never try to lift more than weight than you are accustomed to. Get assistance!

EQUIPMENT-SPECIFIC MANUAL LIFTING SAFETY GUIDELINES

- The IPC is designed to lifted and moved with a pallet jack. Do not try to lift or move it manually, especially when it is full. The IPC weighs 25 kg (54 lb) empty and 125 kg (276 lb) full.
- Have an assistant help you if you choose to remove the Nitrogen Generator, IRS bin tops, or sPro 230 SLS system frame risers from their shipping crates for inspection before installation.
- Do not attempt to mount the Nitrogen Generator, IRS bin tops, sPro 230 SLS system frame risers, or stacklights yourself. These must only be mounted by your 3D CSE.
Moving Safety Guidelines

If you do not unpack your equipment immediately after you receive it, be sure it’s stored in dry indoor area away from any sources of extreme heat or cold.

- Use a pallet jack or forklift with a load capacity of **at least 2268 kg (5000 lb)**.
- Use a forklift with forks that are at least **1.8 m (6 ft) long**.
- When moving crated equipment, **only** lift crates with forks parallel to crate skids and fully inserted in channels between skids.
- When moving uncrated equipment, insert forklift or pallet jack forks at lifting points labeled on the equipment frame.

**Only** insert forks and lift equipment at labeled lifting points on equipment frame. Inserting forks and lifting at other locations can damage equipment and cause fatal injuries if the equipment tips or falls.
Moving the sPro SLS System

Before moving the SLS system, read General Lifting and Moving Safety on page 110 and follow all the guidelines in that section.

Tools and equipment required

- **Pallet jack or forklift**
  - Forklift required if equipment cannot be moved from truck to installation room with pallet jack alone. A pallet jack is required if the forklift cannot maneuver equipment through the passageways, door, or in the SLS process room.)
- **Hex nut driver with M10 and M8 sockets** - (power drive recommended)
- **Philips head screwdriver** (power drive recommended)
- **Utility knife**
- **Tape measure**
- **Protective gloves**

SLS system moving sequence

1. Remove the SLS 140/230 large crate (p/n 103862-00) from the truck and place it on the loading dock floor for unpacking. Turn the front of the crate to face the unloading direction.

2. Remove the crate front panel and banding straps securing the frame to the crate.

   - Use the power nut driver with an M10 socket to remove the crate front panel, and a utility knife to cut the banding straps.
3 Use the forklift to remove the SLS system from the crate, then set it on the floor.

To prevent the SLS system from tipping and damage, use 1.8 m (6 ft) long forks (minimum) to remove it from the crate. **Do not attempt to remove the SLS system from its crate using standard-length forks or a pallet jack.**

4 Insert the pallet jack forks at the labeled lifting points, then lift the SLS system. Stop lifting as soon as the foot pads are off the floor.

**Do not move or lift the SLS system from the sides or rear.** Verify that pallet jack forks are in the labeled fork locations shown on page 112 before lifting or moving.

5 Move the SLS system to its final position.

6 Remove the shipping brace from the front of the main frame.

**sPro SLS system placement**

Your 3D CSE can advise you on sPro SLS system placement before installation. Be sure to provide the sufficient clearance around the SLS system to open the front RCM bay door and maneuver the RCM, open side enclosure access doors, and enable service access in the back.

Local regulations may require more clearance around the SLS system than 3D Systems recommends in the Equipment Clearance Requirements on page 61. See your SLS Process Facility Layout (p/n 23348-101-00) and Equipment Clearance Requirements on page 61 for equipment layout and clearance requirements.
Moving the IRS

Before moving the IRS, read General Lifting and Moving Safety on page 110 and follow all the guidelines in that section.

Tools and equipment required
- Pallet jack or forklift
  - Forklift required if equipment cannot be moved from truck to installation room with pallet jack alone. A pallet jack is required if the forklift cannot maneuver equipment through the passageways, door, or in the SLS process room.
- Hex nut driver with M10 and M8 sockets (power drive recommended)
- Philips head screwdriver (power drive recommended)
- Utility knife
- Tape measure
- Protective gloves

IRS moving sequence
1. Remove the IRS large crate (p/n 103868-00) from the truck and place it on the loading dock floor for unpacking. Turn the narrow (right or left) side of the crate to face the unloading direction.

   Forks
   1.8 m (6 ft) long (minimum)

2. Remove the crate side panel.

   Use the power nut driver with an M10 socket to remove the crate front panel, and a utility knife to cut the banding straps.
3. Use the forklift to remove the IRS from the crate, then set it on the floor. To prevent the IRS from tipping and damage, use 1.8 m (6 ft) long forks to remove it from the crate. Do not attempt to remove the IRS from its crate using standard-length forks or a pallet jack.

4. Insert the pallet jack forks at the labeled lifting points, then lift the IRS. Stop lifting as soon as the foot pads are off the floor. Do not move or lift the IRS from the front or rear. Verify that the pallet jack forks are in the labeled fork locations shown on page 114 before lifting/moving.

5. Move the IRS bottom frame to its final position.

6. If a 3D Systems Certified Customer Support Engineer or Authorized Service Provider is on site, have them unpack and install the IRS bin tops in the IRS Small Crate (crate p/n 103867-00). Otherwise, leave the IRS bin tops crated until installation.

IRS placement
Your 3D CSE can advise you on IRS placement before installation. Be sure to provide the sufficient clearance around the IRS to open side enclosure access doors and enable service access in the back.

Also take into account the position of the IPC that connects to the IRS umbilical. Typically, the IPC is placed at the right front of the IRS as shown on the Facility Layout.

Local regulations may require more clearance around the IRS than 3D Systems recommends in the Equipment Clearance Requirements on page 61.
Moving the BOS

Before moving the BOS, read General Lifting and Moving Safety on page 110 and follow all the guidelines in that section.

Tools and equipment required
- Pallet jack or forklift
  - Forklift required if equipment cannot be moved from truck to installation room with pallet jack alone. A pallet jack is required if the forklift cannot maneuver equipment through the passageways, door, or in the SLS process room.
- Hex nut driver with M10 and M8 sockets (power drive recommended)
- Philips head screwdriver (power drive recommended)
- Utility knife
- Tape measure
- Protective gloves

BOS moving sequence
1. Remove the BOS 140/230 crate (p/n 103868-00) from the truck and place it on the loading dock floor for unpacking. Turn the wide (front) side of the crate to face the unloading direction.
2. Remove the crate front panel.
  - Use the power nut driver with an M10 socket to remove the crate front panel, and a utility knife to cut the banding straps.
3. Use the forklift to remove the BOS from the crate, then set it on the floor. **To prevent the BOS from tipping and damage, use 1.8 m (6 ft) long forks to remove it from the crate. Do not attempt to remove the BOS from its crate using standard-length forks or a pallet jack.**

4. Insert the pallet jack forks at the labeled lifting points, then lift the BOS. Stop lifting as soon as the foot pads are off the floor. **Do not move or lift the BOS from the sides or rear.** Verify that the pallet jack forks are in the labeled fork locations shown on page 116 before lifting/moving.

5. Move the BOS to its final position.

6. If a 3D Systems Certified Customer Support Engineer or Authorized Service Provider is on site, have them unpack and install the BOS powder transporter shipped in a separate box inside the BOS crate. Otherwise, leave the transporter boxed until installation.

**BOS placement**

Your 3D CSE can advise you on BOS placement before installation. Be sure to provide the sufficient clearance around the BOS to maneuver the RCM, open the right side service access door, and enable service access in the back.

Also take into account the position of the Dust Collector that connects to the BOS Pro. Typically, the Dust Collector is placed at the right rear of the BOS Pro as shown on the Facility Layout.

Local regulations may require more clearance around the SLS system than 3D Systems recommends in the Equipment Clearance Requirements on page 61.
Installation Verifications

After all the equipment is in place, your 3D CSE will make the required power, compressed air, nitrogen, powder, and coolant hook-ups and connections. Your CSE will also level the SLS system, IRS, and BOS, then perform the following verification procedures:

✓ Complete equipment functional tests and software installation/updates
✓ Verify functionality of safety interlocks
✓ Verify calibration of SLS system laser and IR sensor blackbody
✓ Verify calibration of IRS bin load cells
✓ Verify Powder Management System network
✓ Build an acceptance test part
SAFETY

Following the safety recommendations and guidelines in this section when preparing your facility for SLS equipment and auxiliary machine installation.

- General Operator Safety Information . 120
- Environmental Venting Information ... 120
- Noise Level Information .............. 121
- Laser Safety .......................... 122
- Reporting Laser Radiation Exposure ... 122
- Laser Safety Labels on the SLS system... 123
- General Laser Safety Rules .......... 127
- Laser Service and Maintenance .... 128
- Laser Service Guidelines .......... 128
- Powder Safety ....................... 130
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- Finding Powder Safety Information ... 130
- Powder Handling Precautions .... 132
- Breakout Station (BOS) Ventilation ... 134
- Powder Storage ........................ 134
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- Non-ignition Vacuum Cleaner .... 138
- Laser Safety Curtains or Partitions ... 140
General Operator Safety Information

Before using the SLS equipment or auxiliary machines, your company should have a safety program in place. The safety program should do the following:

- Label and point out hazardous equipment, materials, and procedures.
- Explain what to do in an emergency situation.
- Provide information about the hazards of equipment and materials in the form of warning labels, signs, and Material Safety Data Sheets (MSDS). 3D Systems provides the MSDS’s for the powdered materials used with the SLS equipment.
- Include the installation of a room area oxygen sensor with audible and visible alarms—with optional connections to the process station’s nitrogen system safety interlocks.

Environmental Venting Information

Environmental venting is required where the SLS system operates for three reasons:

1. To control waste heat created by SLS operations
2. To prevent nitrogen from displacing oxygen in the work area
3. To prevent excessive concentrations of airborne SLS material and SLS combustion off-gasses from accumulating in the work area

WASTE HEAT VENTING

Waste heat venting is required for the normal operation of the SLS equipment in a room that meets or exceeds the recommended room specifications. See SLS Process Room Atmosphere Requirements on page 64.

NITROGEN VENTING

Nitrogen must be vented from the process station by a 0.750-14 male NPT pipe fitting with an exhaust pressure of less 0.0025 bar (1.0 in H2O). See Nitrogen Supply and Exhaust Lines on page 86 for more information.
SLS MATERIAL COMBUSTION OFF-GAS AND AIRBORNE DUST CONTROL

All SLS materials and operations have been evaluated for environmental exposure safety by a certified industrial hygienist\(^1\). The “Industrial Hygiene Surveys” and Material Safety Data Sheets (MSDS’s) for 3D Systems SLS materials are excellent sources of occupational health information and exposure control recommendations.

The industrial hygiene survey reports conclude that occupational exposures to SLS materials and combustion off-gasses during SLS operations are well below allowable OSHA\(^2\) and ACGIH\(^3\) limits. These reports assume that the SLS system has been installed correctly and that the facility meets all the requirements in this guide. Contact 3D Systems Customer Support at:

- U.S.A. 800.793.3669
- Asia-Pacific + 852 2923 5077
- Europe + 49 (0) 6151 357-357

if you wish to obtain copies of the Industrial Hygiene Surveys and MSDSs for the SLS materials you use.

---

1. All SLS material industrial hygiene surveys were performed by Southwest Research Institute, P.O. Drawer 28510, 6220 Culebra Road, San Antonio, Texas 78228-0510 U.S.A.
2. Occupational Safety and Health Administration
3. American Conference of Governmental Industrial Hygienists, Inc.

### Noise Level Information

In accordance with ISO 4871, the following table shows the declared single-number noise emission values for the SLS system, BOS, Dust Collector, and IRS. These values assume that the input power levels for the SLS system and Dust Collector are both within specifications.

Declared single-number noise emission values are the sum of measured values and the associated uncertainty. They represent upper boundaries of the range of likely measurements.

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>NOISE LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLS System</td>
<td>&lt;85 dBA @ operator standpoint</td>
</tr>
<tr>
<td>BOS and Dust Collector</td>
<td>&lt;85 dBA @ operator standpoint</td>
</tr>
<tr>
<td>BOS only</td>
<td></td>
</tr>
<tr>
<td>Dust Collector only</td>
<td></td>
</tr>
<tr>
<td>Dust Collector self-cleaning cycle</td>
<td></td>
</tr>
<tr>
<td>IRS idle</td>
<td>&lt;85 dBA @ operator standpoint</td>
</tr>
<tr>
<td>IRS transporting powder</td>
<td></td>
</tr>
<tr>
<td>IRS blending powder</td>
<td></td>
</tr>
</tbody>
</table>
Laser Safety

The SLS system contains a 70-watt continuous wave CO₂ laser that operates at a 10.6 μm wavelength (beam divergence < 5 mrad). The laser itself is a Class IV laser. Even a very brief exposure to a direct—or specularly or diffusely reflected—laser beam can cause significant burns or eye damage. It can also be a fire hazard.

During normal operations of the SLS system, the laser beam path is wholly contained within the machine. This makes the entire machine a Class I Laser System. That means the SLS system does not produce damaging emissions under normal operations.

Class I and Class IV are designations established by the U. S. Department of Health and Human Services, Public Health Service, Food and Drug Administration, Center for Devices and Radiological Health (CDRH), and by IEC 60825 (the International Electrotechnical Commission's Radiation Safety of Laser Products, Equipment Classification Requirements, and User's Guide). You can also read about these designations in ANSI Z136.1-1993 (the American National Standards Institute standard for the safe use of lasers). This laser classification also complies with DIN VDE 0837/02.86+A1/07.90.

Reporting Laser Radiation Exposure

If anyone at your site is exposed to laser radiation from the SLS system, report the following information to 3D Systems, Inc.:

- Nature of the accident and circumstances surrounding it
- Where the accident occurred
- Model and serial number of the machine
- Number of people involved
- Any other pertinent information

Please send this information to 3D Systems within a day of the accident. The information can be sent by regular mail to 3D Systems marked “Attention: Laser Safety Officer” or by e-mail to LaserSafetyOfficer@3DSystems.com.
Laser Safety Labels on the SLS system

The SLS system has the two types of laser safety labels below. Laser safety label locations on the SLS system are shown in the figures that follow the table:

<table>
<thead>
<tr>
<th>LASER SAFETY LABEL</th>
<th>WHAT IT MEANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LASER RADIATION HAZARD</td>
<td>Invisible laser radiation is accessible in the vicinity of this sign or behind the access panel. Direct and scattered radiation can cause severe burns and eye injury, or start a fire. Access panels are for service only and should only be opened by certified service personnel. See Laser Safety on page 122.</td>
</tr>
<tr>
<td>DEFEATABLY INTERLOCKED PROTECTIVE HOUSING</td>
<td>If you defeat the SLS system laser safety interlocks, then open this housing (panel or door), you can be exposed to hazardous direct and scattered Class 4 invisible laser radiation which can cause severe burns and eye injury, or start a fire. Interlocked SLS system panels and doors are for service only and should only be opened only by certified service personnel. See Laser Safety on page 122.</td>
</tr>
<tr>
<td>LASER CERTIFICATION/IDENTIFICATION</td>
<td>Identifies laser system Class and shows CDRH Statement of Compliance.</td>
</tr>
</tbody>
</table>
LASER RADIATION HAZARD LABEL LOCATIONS

- Behind the process chamber cover
- Behind raised laser window access door
- On process chamber rear interior and exterior wall
- On IPM top access panel
- On process chamber left and right exterior wall (right side not shown)
DEFEATABLY INTERLOCKED PROTECTIVE HOUSING LASER LABEL LOCATIONS

CAUTION
CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

At top of SLS system; on IPM access panel

On back panel of IPM

On front face of IPM; behind raised laser window access door

(Internal) on IPM base plate; visible after removing the IPM access panel
LASER CERTIFICATION (AND MACHINE IDENTIFICATION) LABEL LOCATION

<table>
<thead>
<tr>
<th>MODEL:</th>
<th>SERIAL NO:</th>
<th>MFG DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ELECTRICAL:**
208 VAC 3-phase WYE, 50/60 Hz, 48 A/ph

**MASS (KG):**

**SHORT CIRCUIT INTERRUPTING CURRENT:**
50A

**ELECTRICAL DIAGRAM NUMBER:**

Covered by one or more of the following patents: U.S. Patent Nos. 4,863,538; 4,938,816; 4,944,817; 5,017,753; 5,132,143; 5,155,321; 5,252,264; 5,316,580; 5,397,589; 5,646,370; 6,085,122; 6,151,345; 6,677,554; 6,694,207 and 6,815,836. Other patents pending.

**CLASS 1 LASER PRODUCT**

**STATEMENT OF CDRH COMPLIANCE**
This product conforms to the applicable requirements of 21 CFR 1040.10 and 1040.11.

**STATEMENT OF FCC COMPLIANCE**
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interferences that may cause undesired operation.

Machine ID label at left rear of SLS system, on AC chassis door

Laser certification on machine ID label
General Laser Safety Rules

- Use of controls or adjustments, or performance of procedures other than those specified herein, may result in hazardous radiation exposure.
- Failure to follow laser safety rules can also result in exposure to hazardous radiation. Radiation can cause burns on the skin and cornea, which can temporarily or permanently damage your vision.

You should always comply with the following rules when working with laser equipment.

- Operators must attend a training class for SLS system procedures.
- Operate the SLS system only with the RCM properly loaded and all process chamber covers in place. The SLS system laser is enclosed in a protective housing to prevent exposure to radiation. The protective housing has tool-access locks to prevent access to the laser during normal SLS system operation. However, if someone tampers with or defeats the interlocks and opens the protective housing, the potential for exposure exists.
- Do not enter any area displaying posted warning signs during open beam operations. Open beam operations occur only during service procedures and with a warning sign posted.
- Do not operate the SLS system with a broken or missing window. The process chamber window is part of a the laser safety enclosure. Contact 3D Systems for service or replacement.
- Operate the SLS system in accordance with all local regulations. If your state or national government does not provide guidelines for operation of Class I laser systems, refer to ANSI Z136.1-1993 (American National Standards Institute standard for the safe use of lasers).
- Only certified service personnel specifically trained in laser safety should perform laser service procedures.
- Do not look directly into a laser beam or even at diffuse reflections of a beam.
Laser Service and Maintenance

**WARNING!** SLS system laser service and maintenance procedures must only be performed by 3D Systems-certified service technicians. Attempts by non-3D Systems-certified personnel to perform laser service or maintenance procedures could result in serious injury. All SLS system users must observe the guidelines and warnings in the “Laser Safety” section of this guide.

The SLS system conforms to applicable requirements of 21 CFR Subchapter J at date of manufacture. It is designated a Class 1 Laser Device by the Center for Devices and Radiological Health (CDRH). In normal operation, the laser beam is completely confined and the viewing windows in the process chamber block infrared radiation. However, if the laser cover is removed for any reason, the unit becomes a dangerous Class IV laser device. Direct or reflected laser power from a Class IV laser device can cause severe burns and eye damage. It can also be a fire hazard. See Laser Safety on page 122 for more information.

Laser Service Guidelines

On occasion, certified service personnel must perform alignment or focus adjustments on the SLS laser or beam delivery system. When this occurs, certified service personnel at your site should follow the special laser safety precautions described in the following list:

- **Certified service personnel should secure the room containing the SLS system; it is called the Nominal Hazard Zone (NHZ).** The room must have locks on the door(s) that limit entry but do not restrict exit. If the SLS system is in an area that cannot be secured by door locks, your company must provide laser safety curtains or alternative safety precautions.

- Certified service personnel should post Exposed Non-Visible Laser in Operation signs at each entrance to the room containing the SLS system.
Certified service personnel should notify and instruct everyone in the area to wear safety glasses (ANSI Z136.1-1993 section 4.6.2 and ANSI Z87.1; DIN 58215/01.86 and DIN 58219/02.86). The CO2 laser wavelength cannot travel through glass. It will create a visible indication on polycarbonate. *Your company* must provide industrial safety glasses of either glass or polycarbonate for adequate eye protection.

If your company requires any precautions beyond these, such as a flashing red light to be in operation during the process, *your company* must provide the equipment. Certified service personnel should comply with all of your safety requirements.
Powder Safety

All powders certified by 3D Systems are safe during normal operation. However, you should be aware of the following issues:

- Any powder, powder-like substance, or airborne cloud of powder has a remote chance of rapid combustion.
- Breathing some powders may cause certain people to experience respiratory irritation.
- Powder safety hazards are minimized by good industrial housekeeping and ventilation practices.
- Spilled powder can cause the floor to become very slippery.
- Powder should be sifted in a well-ventilated room.

Refer to the MSDS’s and to 3D Systems material guides for information on specific powders.

Powder Ignition Information

Powdered materials can be flammable and can be ignited by static electricity in a non-inert environment. Refer to each powder's MSDS for specific information.

⚠️ Use only a safety agency-approved vacuum rated for explosive environments to clean up powder. Contact 3D Systems Customer Support for vacuum supplier recommendations.

Finding Powder Safety Information

Use the Powder Safety Information table on page 131 to locate references and contacts for information on important powder safety topics. Also check the MSDS of the material used for the specific precautions to be observed.

⚠️ Using materials that have not been certified for use in the SLS process equipment may cause health or safety hazards and may damage to the equipment and void the warranty.
## Powder Safety Information

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>REFERENCE / CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard industrial ventilation practices</td>
<td><strong>US:</strong> American Conference of Governmental Hygienists, Committee on Industrial Ventilation&lt;br&gt;&lt;br&gt;<strong>Europe:</strong> Maximale Arbeitsplatz Konzentration, January 1990</td>
</tr>
<tr>
<td>Housecleaning and prevention of accumulation of explosive dust</td>
<td><strong>US:</strong> NFPA 654: Standard for the Prevention of Dust Explosions in the Plastics Industry; National Fire Protection Association, Volume 5 of the National Fire Codes&lt;br&gt;&lt;br&gt;<strong>Europe:</strong> Maximale Arbeitsplatz Konzentration, January 1990</td>
</tr>
<tr>
<td>Specific powdered materials</td>
<td>Material Safety Data Sheets (MSDS) from 3D Systems, Inc.:&lt;br&gt;&lt;br&gt;<strong>US/Canada:</strong> 3D Systems Corporation 333 Three D Systems Circle Rock Hill, SC 29730 USA&lt;br&gt;&lt;br&gt;<strong>Europe:</strong> 3D Systems GmbH Guerickeweg 9 D-64291 Darmstadt, Germany&lt;br&gt;&lt;br&gt;<strong>Information</strong>&lt;br&gt;Phone: 803.326.4080 or Toll-free: 800.889.2964&lt;br&gt;Phone: +49 6151 357 0&lt;br&gt;Fax: +49 6151 357 111&lt;br&gt;&lt;br&gt;<strong>Emergency</strong>&lt;br&gt;800.424.9300 - Chemtrec&lt;br&gt;703.527.3887 - Chemtrec (U.S.)</td>
</tr>
</tbody>
</table>
Powder Handling Precautions

During normal operation of the SLS process equipment using 3D Systems’ DuraForm materials, you are not required to wear a dust mask or special personal protection equipment unless specifically designated. Check the MSDS of the material used for the specific precautions you should observe. Use the following table of precautions as a general guide:

**Safe Powder Handling Guidelines**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PRECAUTION</th>
</tr>
</thead>
</table>
| Fire/Heat    | • Never smoke or ignite any materials around powder.  
• Maintain proper clearance from powders when using portable heating devices.  
• Store flammable liquids away from powder.  
• After removing a part from the process chamber, allow it to cool to room temperature in a well-ventilated area.  
• Use anti-static mats in front of SLS process equipment.  
• Connect the ground wire on the IRS powder umbilical to the IPC band clamp before unloading virgin powder. |
| Inhalation   | • Avoid breathing powdered materials; when exposure to dust or fumes is likely, wear a NIOSH approved respirator appropriate to the airborne concentration.  
• Always provide adequate ventilation.                                                                                                                   |
| Shop Safety  | • Train operators in SLS system procedures.  
• Wear safety glasses.  
• Use extreme care with all heated powders.  
• Make sure that the room is well ventilated.                                                                                                           |
## Safe Powder Handling Guidelines (continued)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PRECAUTION</th>
</tr>
</thead>
</table>
| Avoiding spills | • Keep containers closed when not in use.  
• Have a fully-grounded internal non-ignition vacuum cleaner ready to use.  
• Have any equipment specified in the MSDS ready to use. |
| MSDS           | • Give operators access to the MSDS’s that apply to materials they will be handling and ensure that they read them. If necessary, translate them.  
• File MSDS’s in an easily accessible location for immediate reference.  
• Strictly follow all the conditions in each MSDS. |
Breakout Station (BOS) Ventilation

When using the BOS, follow standard industrial ventilation practices such as those recommended by the American Conference of Governmental Hygienists, Committee on Industrial Ventilation.

**Powder Storage**

Protect 3D Systems SLS powder materials from open flames and sparks and keep portable heating devices a safe distance away. Store flammable liquids away from all powdered materials.

For additional powder safety information, refer to:

- DIN EN 26184 Teil 1/06.91

**SLS Powder Storage Requirements**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>%RH</th>
<th>TEMP.</th>
<th>LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuraForm PA</td>
<td>&lt;70%</td>
<td>(20–25) °C</td>
<td>1 yr</td>
</tr>
</tbody>
</table>
**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.

 ✓ Only 3D Systems certified service personnel should operate SLS equipment or auxiliary machines with access panels or service doors open.

 ✓ Heed high voltage warning signs and labels.

 ✓ Take common-sense safety precautions when operating any electrical equipment.

 ✓ After any change to the electrical wiring, make sure the equipment is properly grounded.

Hazardous voltage exists inside the enclosures of all SLS equipment and auxiliary machines. 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.

Verify your facility’s electrical service ratings **before** connecting power to any equipment. Power must only be connected by certified electrician.

All SLS process equipment was designed to minimize operator exposure to electrical hazards during normal operations. All exposed electrical circuits are inside limited-access cabinets. This is to separate the operator from service and maintenance areas.

When operating any equipment, keep the following electrical safety points in mind:
Nitrogen/Oxygen Safety

The SLS system uses nitrogen to create an inert atmosphere in the process chamber. The nitrogen inhibits any potential rapid combustion of particulate matter during the selective laser sintering process.

The oxygen content of air is approximately 21 percent. Displacement of the normal atmosphere with an inert gas, such as nitrogen, can reduce the oxygen content in a room. In the remote chance that nitrogen leaks into the room during the sintering process, the situation can be hazardous.

Your site must have an oxygen monitor with alarm (e.g., 3D Systems Room Oxygen Monitor) installed in the room containing the SLS system. This monitor will alert you if the oxygen level drops below a designated point. It must be wired to trigger an immediate shutdown of the SLS system and nitrogen generator (if in use).

The table of Oxygen Deprivation Effects and Symptoms on page 137 explains the potential effects and symptoms that can occur at different concentrations of oxygen in the atmosphere.

When you work in an environment that may become oxygen-deficient, make sure you comply with the following items:

- You have received oxygen/nitrogen safety training.
- The room is well-ventilated; at least 4 air exchanges per hour.
- Self-contained breathing apparatus is available and easily accessible.
- The room oxygen alarm monitor is functioning and audible
- Leave the SLS system room/area immediately when you hear the oxygen alarm.

Exposure to an atmosphere containing 12 percent or less oxygen causes unconsciousness without any warning symptoms. This happens so quickly that you cannot help or protect yourself.
## Oxygen Deprivation Effects and Symptoms

<table>
<thead>
<tr>
<th>OXYGEN CONTENT (% BY VOLUME)</th>
<th>EFFECTS AND SYMPTOMS AT ATMOSPHERIC PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 – 19 %</td>
<td>Decreased ability to work strenuously. May impair your coordination or may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.</td>
</tr>
<tr>
<td>12 – 14 %</td>
<td>Increases respiration during exertion. Pulse rate goes up. May experience impaired coordination, perception, and judgment.</td>
</tr>
<tr>
<td>10 – 12 %</td>
<td>Respiration continues to increase in rate and depth. Lips become blue. May lose consciousness at this point.</td>
</tr>
<tr>
<td>8 – 10 %</td>
<td>Mental failure. Fainting and unconsciousness. Face becomes ashen, lips become blue. Nausea and vomiting may occur.</td>
</tr>
<tr>
<td>6 – 8 %</td>
<td>100% fatal after 8 minutes of exposure. 50% fatal within 6 minutes. Recovery with treatment within 4 to 5 minutes.</td>
</tr>
<tr>
<td>4 – 6 %</td>
<td>Coma within 40 seconds; convulsions, respiration ceases, death occurs.</td>
</tr>
</tbody>
</table>

---

Optional Safety Equipment

In addition to the optional Room Oxygen Monitor, 3D Systems recommends you use the following optional safety equipment with the SLS equipment and auxiliary machines:

- Non-ignition vacuum cleaner (p.138)
- Laser safety curtains (p.140)
- 1.5 m (5 ft) platform ladder for installation and service
- Anti-static mats for the floor around the SLS system, IRS, and BOS.

Non-ignition Vacuum Cleaner

3D Systems strongly recommends you use a non-ignition vacuum cleaner to clean powder from the SLS equipment, auxiliary machines, and the surrounding area. A “non-ignition” model is required due to the potential combustibility of airborne powder.

To avoid shock, the vacuum cleaner should be an internally and externally non-ignition unit with conductive housing, hose, and filter. It should be connected to the same earth ground point as the SLS system.
### Non-ignition Vacuum Specifications

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part No.</td>
<td>4100-03730 (U.S. and Asia Pacific only)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Height: 91 cm (36 in)</td>
</tr>
<tr>
<td></td>
<td>Diameter: 51 cm (20 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>32 kg (70 lb)</td>
</tr>
<tr>
<td>Facility power</td>
<td>115 VAC, single phase, 60 Hz, 1550 W</td>
</tr>
<tr>
<td>Tank size</td>
<td>57 L (15 gal)</td>
</tr>
<tr>
<td>Air flow</td>
<td>3.3 m³/min (115 cfm)</td>
</tr>
<tr>
<td>Attachments</td>
<td>38 mm × 254 mm (1.5 in × 10 in) grounded plastic hose</td>
</tr>
<tr>
<td></td>
<td>38 mm × 432 mm (1.5 in × 17 in) machinery cleaning nozzle</td>
</tr>
<tr>
<td>Supplies</td>
<td>Filter protectors (package of 12)</td>
</tr>
<tr>
<td></td>
<td>Vacuum bags (package of 10)</td>
</tr>
</tbody>
</table>

### VACUUM SAFETY

Observe the following vacuum safety guidelines:

- Hard-wire the vacuum to the power source (no plug).
- Connect the vacuum to the correct power source. For the standard model, 4100-03730, the source must be 115 VAC, single phase, 60 Hz.
Laser Safety Curtains or Partitions

Example laser safety curtains and partitions

Laser safety curtains or partitions (fixed or on rollers) help prevent accidental exposure to radiation when servicing the process station.

If the SLS system is in an area that cannot be secured during laser calibration, install laser safety curtains or partitions.

If the area cannot be secured, laser safety curtains or partitions must be in place before 3D Systems performs laser maintenance.

Laser Safety Curtains
Purchasing Information

<table>
<thead>
<tr>
<th>Supplier</th>
<th>KENTEK Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone</td>
<td>1-800-432-2323 (U.S.)</td>
</tr>
<tr>
<td></td>
<td>+1-603-435-5580 (outside U.S.)</td>
</tr>
<tr>
<td>Fax</td>
<td>+1-603-435-7441</td>
</tr>
<tr>
<td>Address</td>
<td>19 Depot Street, Pittsfield, NH 03263, USA</td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.kentek-laser.com">www.kentek-laser.com</a></td>
</tr>
</tbody>
</table>
CONTACTING 3D SYSTEMS

If you have questions about your SLS equipment, auxiliary machines, or DuraForm materials—or to request service—please contact 3D Systems at the appropriate number or address below.

Sales and Service

3D SYSTEMS CORPORATION  
333 Three D Systems Circle  
Rock Hill, SC 29730 USA  
tel 803.326.4080  
fax 803.324.4311  
email moreinfo@3dsystems.com  
web www.3dsystems.com  
NASDAQ TDSC

<table>
<thead>
<tr>
<th>Country</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRANCE</td>
<td>tel +33 1 69 35 17 17</td>
</tr>
<tr>
<td>GERMANY</td>
<td>tel +49 6151 357 0</td>
</tr>
<tr>
<td>HONG KONG</td>
<td>tel +852 2923 5077</td>
</tr>
<tr>
<td>ITALY</td>
<td>tel +39 39 68 904 00</td>
</tr>
<tr>
<td>JAPAN</td>
<td>tel +81 3 5451 1690</td>
</tr>
<tr>
<td>UK</td>
<td>tel +44 1442 28260</td>
</tr>
</tbody>
</table>

Customer Support Hotline

Toll free in U.S.A. 800.889.2964
Outside U.S.A. 803.326.4080
Asia-Pacific + 852 2923 5077
Europe + 49 6151 357 0

About 3D Systems

Founded in 1986, 3D Systems provides solid imaging products and solutions that help reduce the time and cost of designing products and facilitate direct and indirect manufacturing. Its systems utilize patented technologies that create physical objects from digital input. 3D Systems also offers the InVision® 3-D printer, SLA® systems (stereolithography), as well as related material, software and application solutions.
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GLOSSARY

A

**AC box**  Electrical AC power cabinet on the lower left side of the SLS® system MSM. The AC box contains facility electrical power terminals, wiring, circuit breakers, and fuses. The SLS® system’s main power switch is on the AC box door.

**Add Powder Layer sequence**  The steps an SLS® system performs to add one layer of powder to the part bed. Depending on your build geometry and your current build stage, a layer might or might not be scanned. For example, at the start of a build, several unscanned layers are added as a thermal barrier for the parts in a part cake. During an Add Powder Layer sequence, the SLS® system does the following: spreads a powder wave and heats it to feed temperature; feeds powder to a new layer, heats powder on the part bed to process temperature, and then holds the part bed temperature constant while the layer is scanned.

**advisory**  A type of Sinter application message (color code yellow). You must acknowledge an advisory. It can turn into an alarm if the cause it is not corrected.

**airslide**  Air-assisted gravity powder conveying chute on the BOS. The BOS has two airslides; one conveys powder from the work table to the auger, the other conveys powder from the sifter to the recycled powder transporter. A permeable membrane separates the airslide’s upper and lower channels. Pressurized air in the lower channel “fluidizes” powder in the upper channel, enabling it to flow down the chute at much shallower angle that it would without air assist.

See also message, warning, alarm, and the Message List Window topic in Sinter Help.
alarm  A type of Sinter application message (color code red). You must acknowledge an alarm when the alarm dialog box that pops up then correct the cause. An alarm shuts down your current operation, motion, heating, and scanning in the SLS® system.

Batch  One unit of blended virgin powder and used powder stored in the IRS Blender bin. A batch has a specific Percent Virgin and weight (e.g., 5 kg for DuraForm PA). The IRS blends one batch at a time.

Beam  See laser beam.

Beam Delivery System  All the optical components of the SLS® system, including the laser, mirrors, lenses, galvanometers, and power modulators.

Beam Shaft  The channel at the top of the process chamber, below the laser window and above the part bed heaters, through which the laser beam travels. The beam shaft is centered over the part bed.

Beam Width  The smallest diameter of the focused laser beam; ideally located in the part bed image plane.

APMU  (Application Powder Management Unit) Database management application that logs powder transfer data it receives from the IRS. APMU resides on a PowderNet client SLS® system computer and helps ensure powder supply integrity in the SLS process.

Auger  Screw mechanism at the bottom of the powder transport hopper under the middle grate on the BOS work table. The auger grinds part cake powder to be recycled before it dropping it into the BOS sifter.
blackbody  A temperature reference device mounted on a hinged panel beside the infrared sensor on the right wall of the process chamber in sPro SLS® systems. The IR sensor measures the blackbody temperature during IR sensor calibration.

blackbody heater  The device that heats the blackbody to its reference temperature setpoint.

blend  n. A mix of used powder and virgin powder in the IRS Blender bin with a specific Percent Virgin.

v. To make a batch of powder in the IRS Blender bin.

Blender bin  (On IRS top right front corner) receives and blends used powder (from the Used bin) and virgin powder (from the Virgin bin) in proportions specified by the Percent Virgin. It stores the powder blend until the SLS® system requests a refill.

BOS Breakout Station. The machine used for breakout in the SLS process. The BOS can be set to recycle or dispose of used powder after breakout. When set to RECYCLE, the BOS sifts used powder, then sends it to the Used bin on the IRS. When set to DISPOSAL, the BOS sends used powder to the waste powder container.

bounding box  In the Build Setup application, an imaginary box that defines the 3-dimensional space in which the part fits.

.bpf  build packet file: the file name extension for build packet files.

.bpz  build packet (zipped) archive: the file name extension for compressed build packet archive files.

breakout  Removing parts from the part cake, typically (and most easily) done in the BOS. Breakout is the last step of the SLS process.

Breakout Station mode  The BOS mode in which air flow is on and powder transfers are enabled. (Similar to Ready mode mode in IRS.)
**build** 1. The three stages of part fabrication on an SLS® system. The three stages are (in order) Warmup stage, Build stage, and Cooldown stage. 2. One or more parts set up to be built in the same part cylinder.

**Build mode** A state of the Sinter application in which options to start and stop a build are available.

**build packet** A file containing 3-D part build geometry data, build parameter values, and part parameter values. The data in a build packet is required to build a set of parts on an SLS® system. You must set up a build packet in Build Setup before you can run a build. To run a build, run Sinter on an SLS® system, click the Build button to enter Build mode, then click the Start Build button to select a build packet (.bpf) file.

**build packet archive** A compressed (Exported .bpz) file containing a build packet and its associated files. A build packet archive can also contain the sorted facet file and attached notes for a build packet. You must import a build packet archive before you can use the build packet it contains in a build.

**build parameter** A property of a build with a default profile you can change in Build Setup.

**build preparation** Things you do to prepare a set of 3-D CAD parts for a build on an SLS® system. During build preparation you mainly use the Build Setup build preparation application. Build preparation is the first step of the SLS process.

**build profile** The table of build parameters vs. Z height in a build packet. Each build stage has a separate profile. Together, they comprise the build profile.
**Build Setup** The 3D Systems application that creates build files you can run on an SLS® system using the Sinter application. Build Setup is installed when you install your LS software. (You can optionally install it on a separate computer, create a build packet, then transfer the .bpz file to the SLS® system computer for building.)

**Build stage** The second of three SLS® system build stages. Defines the build profile for the layers during an actual build.

**Build Viewer** When running a build in Sinter, displays a top view of the layer that SLS® system is currently scanning. For more information, see “Viewing a Build While In Progress” in your Sinter Help.

**build volume** The maximum X-Y-Z space a build can occupy inside the part cylinder. The build volume is slightly less than the part cake volume. This prevents the laser beam from contacting the part cylinder walls and leaves room for unsintered layers at the top and bottom of the part cake. Unsintered layers form a base for parts in a build and thermally insulate the top and bottom of the part cake.

**CC box** Chamber Controller electrical/electronics cabinet on the upper left side of the SLS® system MSM. The CC box controls motion, sensors, and atmosphere in the PCM.

**certified service personnel** Anyone who has completed the 3D Systems’ field service training and is certified to perform corrective service tasks on the SLS® system.

**Chiller** cools, filters, and recirculates coolant in the SLS® system IPM.

**CO2 laser** The power source for the SLS. The beam is invisible and can cause serious burns.

**cooldown** The ramp-down of part cake temperature after a build. The rampdown can be controlled or uncontrolled. In a controlled cooldown, the RCM heaters remain under active control for a specific time, or until the part cake reaches a final temperature. In an uncontrolled cooldown, all RCM heaters are off and the part cake cools by convection. You can do a controlled cooldown in the SLS® system.
**Cooldown stage**  The third of three SLS® system build stages. The build profile for the unscanned layers added after the last scanned Build stage layer.

**configuration file**  See material configuration file.

**contactor**  An electro-mechanical power relay. The SLS® system machine contains several contactors.

**Cross Fill Scan**  An advanced part profile parameter that alternates the scanning direction between X and Y every layer. You must purchase a Sinterscan license to use this parameter.

**curl**  an SLS part defect; part warping due to uneven heating or cooling. There are two types of curl: “in-build curl” and “post-build curl.” In-build curl happens when the hot laser beam hits a cold (or insufficiently preheated) part bed. Post-build curl happens when different regions of a part cool down at different rates. Controlled cooldown helps prevent post-build curl.

**curling**  See part curling.

**cylinder**  See part cylinder.

**damper**  The hinged metal plate below the laser window at the top of the process chamber beam shaft. When closed, it blocks the laser beam from entering the process chamber, and helps keep powder out of the IPM.

Always close the damper lever on the front of the IPM before you remove the laser window for cleaning—and before you open any door or panel on the SLS® system. Open the damper before you start a build.

**default**  Response or conditions used by a computer unless the user commands it to use something else.

**dependency**  In the SLS® system, a condition that must be met before a command can be executed.

See also Default Values and Dependencies topic in Sinter Help.
**dialog box**  A subordinate window that opens in the LS software. It either presents information or asks you to provide information.

**dspif**  digital signal processor interface: the software and hardware Sinter uses to control SLS® system heaters and motion, and to communicate with the laser scanning system. After you start Sinter, you must wait about 45 seconds for dspif to initialize before you attempt to start a build.

**duty cycle**  For SLS® system heaters, the percent (from 0% to 100%) of maximum available heating power currently being applied. Duty cycle varies to maintain a heater setpoint or temperature parameter profile.

**DuraForm**  (DuraForm® powder material.) Brand name for our family of specially formulated powder materials for building SLS parts in SLS® systems.

**Dust Collector**  Auxiliary machine with a vacuum air duct and removable filter used in the SLS process. The Dust Collector connects to the BOS and removes airborne powder from the area above the BOS work table.

**E-stop button**  (EMERGENCY STOP button) Any one of several large red buttons mounted on the SLS® system. Pressing any E-stop button shuts down the SLS® system immediately. For safety, all energized components are de-energized when E-stop is pressed.

**Export**  (build packet) A Build Setup File menu command that compresses a build packet (.bpf) file and its associated files into a single build packet archive (.bpz) file. You can optionally include the build packet’s sorted facet file in the .bpz file, and any notes attached to the build packet during build setup.

**facets**  Triangular areas in an STL model that represent the exterior and interior surfaces of a part. Three vertices and a normal define a facet. Facets are sorted in Z-axis order in a sorted facet (.sff) file.
**powder heaters** The two pairs of top and bottom heaters on the left and right sides of the process chamber. Feed heaters warm the powder wave before the roller spreads it across the part bed.

**feed hopper** Powder storage dispenser mounted on the left side of the SLS® system process chamber. The feed hopper receives blended powder from the IRS Blender bin and SLS® system overflow modules (OFMs). During a build, at the start of each Add Powder Layer sequence, the feed hopper’s powder dispenser dispenses powder on top of the roller in precise amounts. When the feed hopper is low, it signals the IRS to send more blended powder.

**feed roller** The roller inside the powder dispenser at the bottom of the feed hopper.

**fill** Overlapping parallel vectors that make up the horizontal surface of a slice in a part build.

**Fill Scan Spacing** (also laser scan spacing) On the part bed, the distance between adjacent scan lines.

**galvanometer** A small motor that moves one of the two (X- and Y-axis) scanning mirrors that deflect the laser beam. The motorized scanning mirrors are often referred to as “galvos.”

**galvo** See galvanometer.

**gauge panel** Cluster of gauges, hose fittings, and valves at the right rear of the sPro SLS® system for controlling the supply of nitrogen, compressed air, powder, and coolant.

**growth** See part growth.

**H**

**heaters** See powder heaters, part bed heaters, and part cake heaters.

**HFM** Hopper Feed Module. See feed hopper and powder dispenser.

**home limit** The lowest part piston position—or leftmost roller position—from which other part piston and roller limit positions are measured.
**homing**  
Moving the part piston or roller to its home limit to reestablish the SLS® system’s ability to track the device’s position. You must home the part piston or roller before you can command the SLS® system to move either device. The part piston and roller must be re-homed (a) if the RCM is unloaded for any reason, and (b), if the dspif process is closed. (Exiting the Sinter application does not close the dspif process.)

**inerting**  
Lowering the oxygen level and raising the nitrogen level in the process chamber. Inerting occurs in the Warmup stage of a build. Before the build can advance to the Build stage, the process chamber must be inert. While inerting, the SLS® system delivers maximum nitrogen flow (“purge flow”) to the process chamber until the oxygen concentration inside reaches the inert setpoint.

**interlock**  
A device that makes or breaks a circuit, depending on the condition it should satisfy. In the SLS® system, interlocks serve as safety devices. Unless interlocks are in place, certain operations cannot run.

**infrared sensor**  
See IR sensor.

**IPC**  
Intelligent Powder Cartridge. A factory-refillable powder container that supplies up to 100 kg of virgin powder to the IRS. The IPC is a sealed canvas bag fastened to rugged plastic pallet. The pallet has three nozzles for connecting the powder and compressed air lines in the IRS umbilical. When the IRS’s Virgin bin gets low, the IRS draws virgin powder from the slightly pressurized IPC through the IRS umbilical.
IPM  Image Projection Module. Contains the laser, laser focusing and scanning optics, and removable laser window. The IPM is mounted on top of the SLS® system, above the process chamber.

IR calibration  Iteratively measuring of the blackbody (reference) temperature with the IR sensor, then adjusting the IR sensor output to match the reference temperature. IR calibration can be done automatically every n layers during a build, or manually using the IR CAL button in Man Ops. If you change the type of material in the SLS® system, you must perform a manual (“offline”) IR calibration using the IR CAL button in Man Ops before starting your first build with the new material.

IR sensor  A noncontact part bed temperature measuring device mounted on a hinged panel beside the blackbody on the right wall of the process chamber. The IR sensor detects the emissivity of infrared energy at the part bed and maps it to part bed temperature based on the most recent IR sensor calibration.

IRS  Integrated Recycling Station. Mixes new virgin powder from the IPC with used powder (from a part cake) and transports it to the SLS® system feed hopper on demand.

IRS umbilical  Flexible 5-meter harness of powder tubing, compressed air lines, and electrical cables from the IRS that connects to the IPC when the IRS unloads virgin powder from the IPC.

IRS Ready mode  IRS “run” state in which powder transfers occur. In IRS Ready mode, the IRS can unload an IPC, blend powder, send powder to SLS® system(s), and receive powder from a BOS.

IRS Standby mode  IRS “idle” state in which no powder transfers occur. IRS Standby mode is mainly for IRS setup, diagnostics, utilities, and IPC swapping.

laser  An electronic device that converts electrical energy into a narrowly-focused intense beam of visible or infrared light. In the SLS® system, laser refers to a 30- or 70-watt Chiller.

laser beam  The focused laser light that sinters the powder in the SLS® system.
**laser scan spacing** (also Fill Scan Spacing) On the part bed, the distance between adjacent scan lines.

**laser scan speed** The speed at which the laser travels in a scan line across the part bed. Scan speed is measured in inches per second or millimeters per second.

**laser spot size** See beam width.

**laser window** The removable crystalline window above the process chamber through which the laser beam is directed onto the part bed.

**layer** A single layer of powder that may contain a slice of one or several parts.

**leveling** See powder leveling.

**log files** As you use the SLS® system it automatically creates files in the \dtm\logs folder. These files record events that occur while the Sinter application is operating. Each time you access the Sinter, it records information in these files, continually adding new information as the application runs.

**LPC** Lower Process Chamber; see process chamber.

**LPM** Liters Per Minute; the unit of coolant and nitrogen flow in the SLS® system.

**LS software** Laser Sintering software. Applications (including Build Setup and Sinter), utilities, and data files you install on the SLS® system computer. You use the LS software to setup and build sets of 3-D parts on 3D Systems’ SLS equipment. Some LS software features and utilities are licensed.

**LVDS** Low-Voltage Differential-Signaling. One of two BOS/RCM communications modes set using the BOS RCM Com Mode process parameter.

**M**

**Main mode** The initial state for the Sinter application software. From Main mode, you can switch to Build mode or Manual Operations mode, or start Build Setup.

**manual operations** SLS® system actions you perform in Sinter that are not part of a build, such as lowering the part piston and moving the roller.

See also Using Log Files in Sinter

Manual Operations mode
The Sinter application software state in which you can perform manual operations.

Man Ops See Manual Operations mode.

material The powder used in the SLS process.

material configuration file
In the LS software, a file that specifies the defaults and ranges for the build parameters for a particular material.

material safety data sheets Published information that provides details about safety, usage, and handling for different materials.

MD chassis Mirror Driver electronics enclosure at the top of the SLS® system MSM. The MD box controls laser power and image scanning devices in the SLS® system IPM.

message A brief color-coded text notification that appears in the Sinter application’s Message List window. Messages keep you informed about SLS® system activity. New messages always appear at the top of the list. The message colors are black-information; yellow-advisory or warning; red-alarm.

mode An operating state of the Sinter application software. Sinter has three modes: Main mode, Build mode, and Manual Operations mode. The available commands differ in each mode.

MSDS See material safety data sheets.

MSM Machine Services Module. The enclosed rear portion of the SLS® system that houses the LS software, application computer, and gauge panel.

Nominal Hazard Zone (NHZ) An area (such as a room) with limited access in which potentially hazardous maintenance procedures can be performed.
**Nitrogen Generator** Provides a continuous supply of nitrogen to the SLS® system by removing the oxygen from ambient compressed air input.

**outline** The process of sintering the perimeter of a part before or after sintering the fill of the part on each layer of powder. Outlining increases accuracy in the part's surface finish; but takes more time.

**OFM** (right and left) Overflow Module. Powder overflow chutes with powder transporters below the right and left sides of the process chamber. The OFM overflow chutes catch powder not deposited on the part bed during an Add Powder Layer sequence. The OFM powder transporters below the chutes pump powder back up into the feed hopper. Screens in both OFM overflow chutes catch chunks of powder before they enter the OFM powder transporters.

**overflow chutes** (right and left) Catch-bins with hinged cleanout doors on the right and left side of the process chamber. Overflow chutes catch powder the part bed does not deposit on the part bed during an Add Powder Layer sequence. Screens in both overflow chutes catch chunks of powder before they enter the OFM powder transporters.

**oxygen alarm** See Room Oxygen Monitor

**oxygen monitor** See Room Oxygen Monitor

**oxygen sensor** Detects the percentage of oxygen inside the process chamber.

**open beam operations** When the laser is in an unhoused condition, which occurs only during service procedures.

**operator** A person trained by 3D Systems to operate the SLS® system and all other SLS equipment, and to perform all tasks associated with build preparation, building parts, and breakout. Also called a user.
**parameter** 1. (SLS system) A property of a part or an entire build with a default value you can change. You change part and build parameter values in Build Setup using profile editors. 2. (IRS, BOS) A machine or process setting with a default value you can change through menus on the operator panel display.

**part** The output of the SLS process; a solid object described by an STL file made of sintered SLS powdered material in an SLS® system.

**part bed** The area on process chamber floor, bounded by the edges of the part cylinder, that contains both the powder being sintered and the sintered part(s).

**part bed heaters** The four heaters mounted above the part bed. These heaters raise the temperature of the part bed to just below the powder’s melting point before the laser scans part cross-section(s) on the layer.

**partial batch** A proportionally smaller batch of virgin powder and used powder with the same Percent Virgin as a full batch. For example, if a full batch is 60% virgin, the partial batch is also 60% virgin. The IRS only blends a partial batch when there is insufficient (virgin or used) powder for a full batch. It makes the largest partial batch possible, using all the limiting amount of powder.

**part cake** The block of hot, loose, used powder and parts in the part cylinder after a build. After the part cake cools, parts are removed from it in breakout. The BOS can be set to recycle or dispose of used powder from the part cake after breakout. The RCM-140 part cake measures (550 x 550 x 460) mm. The taller RCM-230 part cake measures (550 x 550 x 750) mm.

**part cylinder heaters** The band heaters wrapped around the part cylinder that heat the sides of the part cake.
**part cylinder** The rectangular steel vessel mounted in the RCM that holds the part cake. The part cake sits on top of the part piston. During a build, the part cake is lowered into the part cylinder by one layer thickness after each Add Powder Layer sequence. After a build, the part cake cools in the part cylinder. During breakout, the part cake is removed from the part cylinder as the BOS raises the part piston.

**part curling** A part deformity caused when the powder becomes too cool during a build. The part bows and is not perfectly flat. If curling becomes a problem, consult your DuraForm Material Guide for ways to resolve it.

**part growth** An defect that occurs when the powder bed is too hot. Unsintered powder may start to adhere to the sintered layers and cause the part to exceed its designed dimensions.

**part parameter** A part scanning property with a default profile you can change in Build Setup’s Part Profile Editor.
Percent Virgin (IRS process parameter) The specified proportion of virgin powder in a batch (or partial batch) in percent.

PMS Powder Management System. See Powder Management System.

powder bed The powder spread across the bottom of the process chamber by the roller.

powder dispenser Mechanism at the bottom of the SLS® system’s feed hopper. The powder dispenser rotates to dispense a quantity of powder on top of the roller at the start of each Add Powder Layer sequence.

powder feed amount The quantity of powder dispensed on top of the roller at the start of the Add Powder Layer sequence. Specifically, the number of revolutions (0 to 500) the powder dispenser makes when dispensing powder.

powder leveling The process by which the roller transports and levels powder from the feed hopper across the powder bed.

Powder Management System (PMS) network and database application that enables powder transfers between SLS equipment, logs data about every transfer, and helps prevent contamination of the SLS® system powder supply.

PowderNet 3D Systems’ proprietary network that interconnects SLS equipment and carries powder transfer messages and data. PowderNet uses the IRS as its server, or hub. All powder transfer messages go through the IRS to client BOS and SLS system(s). The IRS sends powder transfer data over PowderNet to the APMU database in an SLS process for logging.

powder transporter An air-driven powder pump in the IRS, BOS, or SLS® system at the head end of a powder transport tube.

powder transport hopper Chute below the middle grate on the BOS work table for depositing part cake powder to be recycled. The auger is at the bottom of this hopper.
**powder transport tube** Flexible pipe through which powder flows between SLS equipment.

**prime cycle** Adds a layer of powder to the part bed without dropping the part piston. This allows you to compensate for powder short feeds.

**process chamber** The stainless steel chamber inside an SLS® system where part builds occur. The SLS® system performs the Add Powder Layer sequence inside the process chamber. The process chamber contains the powder heaters, part bed heaters, roller, blackbody, IR sensor, powder bed, part bed, and the damper. Before a build, the SLS® system raises the RCM up and seals it against the square part bed hole in the floor of the process chamber. During a build, the atmosphere inside the process chamber is inert and warmed by the heaters. The IPM delivers the laser beam through the laser window, then down to the part bed.

**profile** The set of values assigned to a parameter based on Z height or X, Y, Z location. A build packet contains profiles for part parameters, build parameters, and scale parameters. Profiles can be saved to disk for reuse in multiple builds.

**purge** See inerting.

**RCM** Rapid Change Module. Heavy-duty wheeled cart with heated part piston and part cylinder that holds the part cake. With multiple RCMs, you can remove a part cake from an SLS® system, then immediately load an empty RCM. The RCM connects to the BOS for breakout. The RCM is currently available in two models/sizes: RCM-140 with a (550 x 550 x 460) mm part cylinder, and the taller RCM-230 with a (550 x 550 x 750) mm part cylinder.

See Using the Profile Editors and How Parameters Work in Build Setup Help. Also see part profile, build profile, and scale profile.
**RCM Com Mode** (Service use only.) BOS process parameter that defines how the BOS communicates with the RCM; in LVDT mode or SPI mode.

**RCM Type** BOS process parameter that defines what type of RCM is connected to the BOS; RCM model 140 or 230.

**Ready mode** The IRS mode in which air flow is on and powder transfers are enabled. (Similar to Breakout Station mode in BOS.)

**resizing** In SLS, changing the desired final part dimensions.

**RFID tag** (Radio Frequency IDentification tag) Small wireless data storage device in the IPC that is continually read and written to by a magnetic reader in the IRS umbilical bulkhead connector. The IPC RFID tag contains encrypted Powder Management System data such as IPC serial number, expiration date, IRS machine ID, current IPC weight, etc.

**roller** The device in the process chamber that spreads and levels powder across the powder bed and part bed. In each Add Powder Layer sequence, the powder dispenser dispenses powder on top of the roller cover. The roller moves under a scraper, which scrapes powder off the cover and deposits it between the powder heaters. It then spreads the heated powder across the part bed.

**Room Oxygen Monitor** Detects the percentage of oxygen in the SLS process room. If the room oxygen concentration drops to an unsafe level, the Room Oxygen Monitor sounds and alarm and shuts down the SLS® system and the nitrogen supply to it.

**scale profile** A set of scale parameters that vary based on the X, Y, and Z location of parts.

**scale parameter** A part scaling property with a default value you can change in Build Setup’s Scale and Offset editor.
scaling  In SLS, adjusting for part shrinkage during a build. (Scaling does not change the desired final part dimensions.)

scan line  The path where the laser sinters a line of powder across the part bed.

scanner  The components in the IPM that work together to deflect the laser beam onto the target.

scanner correction table  A table of values the scanner uses to compensate for laser beam targeting error. The scanner correction table enables the scanner to accurately target the laser beam anywhere on the part bed. Each SLS® system has a unique scanner correction table.

scanner parameters  The parameters that control the laser beam.

scanner timeout  The length of time the LS software gives the scanner to complete one scan of a part layer.

scanning  The process by which the laser beam is deflected onto the part plane in order to sinter a part.

scanning mirrors  Mirrors, moved by the galvanometers, that direct the CO₂ laser beam during selective laser sintering (SLS).

scrapers  Blades that clean the powder from the roller as it travels across the part bed.

selective laser sintering  See SLS.

setpoint  A value for a particular parameter established by a configuration file or by the user and which the SLS® system attempts to achieve. For example, a feed heater setpoint is the temperature that the system attempts to achieve for the feed heater. The actual temperature may fluctuate around the setpoint value as the SLS® system attempts to stabilize the temperature at the setpoint.

Sinter  3D Systems’ licensed application software that creates a set of 3-D parts starting with a build packet file created in 3D Systems’ Build Setup application.

sintering  Physical process in which particulates form a solid mass through the application of external energy.

sinter  See sintering.
**Sinterscan** 3D Systems-licensed software feature that enables you use the Cross Fill Scan advanced part profile parameter.

**Sinterstation® Pro** The SLS® system machine that builds parts in 3D Systems’ SLS process. Rebranded as the sPro SLS center. sPro 140 has a maximum part cake volume of 140 liters; (550 x 550 x 460) mm. sPro 230 has a maximum part cake volume of 230 liters; (550 x 550 x 750) mm.

**slice** See part slice.

**slicing** Software process in Build Setup that generates part cross-section data for one or more parts in a build.

**SLS® system** Selective Laser Sintering system. Machine for building parts using 3D Systems’ SLS technology. The two latest SLS® system models are the sPro® 140 and sPro® 230.

**SLS** Selective Laser Sintering: A thermodynamic process in which directed laser energy heats particulates in a defined pattern, fusing them into a solid mass. SLS is one of several 3D Systems’ rapid manufacturing and prototyping technologies. SLS is and integral part of 3D Systems’ SLS process that creates solid parts from 3-D CAD files. It makes parts by rolling a thin layer of powdered material across a part bed, heating the part bed to just below melting, then scanning a cross-section of the parts with a high-power (up to 100-watt) infrared laser. The scanned cross-section “sinters” (partially melts, then solidifies), adhering to the scanned cross-section on the layer below it. Unscanned areas remain loose, solid powder. After a layer is scanned, the part bed drops one layer thickness and the cycle repeats until the part build is complete. At the end of the build, the loose powder is removed from the layered part cake.
**SLS process** (SLS™ process) 3D System’s process for creating 3-D models and end-use parts from powdered materials starting with a 3-D CAD file. The SLS process proceeds in three steps: build preparation, build, and breakout. The following 3D Systems SLS equipment play major roles in the SLS process: IRS, IPC, RCM, SLS® system, Nitrogen Generator, and BOS. Auxiliary machines include: Chiller, Room Oxygen Monitor, Dust Collector, Bead Blaster, and Non-ignition Vacuum Cleaner.

**sort** To arrange facets in an STL file in ascending Z order.

**sorted facet file** A file that contains the facets in the STL file sorted in ascending Z order. The software creates the sorted facet file when you verify parts in the Build Setup application. You can display sorted facet files in Build Setup. A build requires a sorted facet file.

**SPI** Serial Peripheral Interface. One of two BOS/RCM communications modes set using the BOS RCM Com Mode process parameter.

**stage** One of three separate, consecutive states of a build. Each stage has a separate build profile.

**Standby mode** The mode (in both the IRS and BOS) in which air flow is shut off and powder transfers are disabled. All other functions, such as setup and diagnostics, are available in Standby.

**STL file** A file produced by a CAD system. The SLS® system computer uses this file to generate a build. It is composed of triangles connected at vertices that represent exterior and interior surfaces. It can be either ASCII or binary. Users can read ASCII files, but in general, binary files provide better space conservation and system performance.

**Stop** See E-stop button

**stray vectors** A build defect where unintentional scan lines distort the part shape.

**SYSTEM SECURE light** When this green UI console light is on, all SLS® system safety interlocks are satisfied.
**SYSTEM ENABLE light**  When this green UI console light is on, you can load an RCM, then use the heaters, laser, part piston, and roller. The **SYSTEM ENABLE** light turns on automatically after you run Sinter and the dspif program initializes.

**terminate build**  To stop a build in progress. Terminating a build turns off the heaters and does not maintain an inert state. Depending on the material and the elapsed time, you can restart a terminated build.

**used powder**  Powder that has been through a build. Used powder is recycled or disposed of after a build. Used powder surrounds parts in the part cake. During breakout, the BOS sifts used powder, then (in **RECYCLE** mode), sends it to the IRS’s **Used bin**, or (in **DISPOSAL** mode) sends it to the waste powder drum. Used powder cannot be recycled indefinitely. See your DuraForm Material Guide for material-specific recycling instructions.

**user**  See operator.

**Used bin**  (On IRS top left rear corner) receives used powder from the BOS when the BOS is in **RECYCLE** mode, and stores it for blending with virgin powder. The IRS transfers used powder from the Used bin to the Blender bin one batch at a time. The Percent Virgin process parameter determines how much used powder is withdrawn from the Used bin each batch.

**UPC**  Upper Process Chamber - part bed heaters and IR sensor w/blackbody; O2 sensor
**Virgin bin** (On IRS top right rear corner) receives virgin powder when the IRS unloads an IPC, and stores it for blending with used powder. The IRS transfers virgin powder from the Virgin bin to the Blender bin one batch at a time. The Percent Virgin process parameter determines how much virgin powder is withdrawn from the Virgin bin each batch.

**Virgin powder** New powder that has never been used in a build. Virgin powder is shipped and stored in an IPC. The IRS unloads virgin powder from the IPC and stores it in the Virgin bin until it is ready to blend it with used powder in Blender bin.

**Warning** A type of Sinter application message (color code yellow). You must acknowledge a warning. An warning can turn into an alarm if the condition that caused it is not corrected. For more information, see the Messages and the Message List Window topic in Sinter Help. See also message, advisory, and alarm.

**X**

**X-axis** The left-right fill scanning direction on the SLS® system part bed.

**Y**

**Y-axis** The front-to-back fill scanning direction on the SLS® system part bed.

**Z**

**Z height** The part piston position during a build. The values of profiled part parameter and build parameter change at specified Z heights. The Z heights in part profiles can be part-relative or build-relative. The Z heights in build profiles are relative to stage heights.
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