Sinterstation® sPro™ 60 SLS® Center

Site Preparation Guide (Preliminary)

DCN 9209-31000-00
sPro 60 SLS Center

3® SYSTEMS

How to Prepare for Installation

Use this guide to prepare your facility for the installation of:

- 3D Systems Corporation's sPro 60 SLS Center.
- Auxiliary equipment for finishing parts made with 3D Systems' Selective Laser Sintering (SLS) process

Also refer to the *sPro 60 SLS Center Facility Requirements* drawing (DCN 8001-20020) as you work through the requirements.

Before Scheduling Installation

Before 3D Systems Field Service can install the sPro 60 at your site, you must do the following:

- ❑ Complete the facility requirements listed in each "Requirements" section of this guide.

- ❑ Complete and submit the "Facility Information Form" (page 19) and the "Facility Requirements Checklist" (page 23) to 3D Systems Customer Support via fax, mail, or e-mail.

The "Facility Requirements Checklist" must be completed before 3D Systems Field Service can install the sPro 60 at your site.

> **NOTE** If you plan to use 3D Systems' LaserForm ST-100 metal material, you must also complete and submit the "Facility Requirements Checklist" for the LaserForm Oven found in the "Facility Requirements" section of the *LaserForm Oven Guide* (DCN 8002-20031).

When You are Ready for Installation

Once your facility is ready and you've scheduled an installation date with 3D Systems Customer Support, read "Receiving and Moving the System" starting on page 43. This will show you how to properly unpack the sPro 60 system and move it into place.

Also, before using the sPro 60, please read the "Safety" chapter starting on page 67 to find out the how to safely handle the SLS materials and various system components.

What Your System Includes

This section lists all required and optional components of a 3D Systems sPro 60 SLS Center. These include:

- An sPro 60 process station for building the SLS parts
- Equipment for breaking out and finishing SLS parts
- Maintenance and safety equipment for cleaning the process station and protecting operators and service personnel
- Items consumed during part builds (“consumables”) such as powder, nitrogen, and filters

> **NOTE** The sPro 60 SLS Center builds many types of parts out of several types of SLS materials. Each application has some unique requirements. Your system will, most likely, not include every component and material listed in this section. Just focus on the components and materials included in your order.

It is especially important that you prepare your facilities for all non-3D Systems-supplied components in your order. These are listed as “customer-supplied and installed” in this section. **The facilities for these non-3D Systems-supplied components—and in some cases the components themselves—must be in place before the sPro 60 SLS Center can be installed.**

Required System Components

Your sPro 60 SLS Center must include the components described below. Most of these components are 3D Systems-supplied and installed; others can be one of the following:

- Customer supplied and supplier-installed, or,
- Customer supplied and 3D Systems-installed

When a required system component can be customer-supplied, the source (or sources) for the component are listed, along with purchasing information.[1]

All required system components are listed below. Each component is detailed separately in the sections that follow.

1. Purchasing information is current at the time of printing, however, it is subject to change. Contact 3D Systems Customer Support if you need help contacting a supplier.

Process Station

Supplied by: 3D Systems

Installed by: 3D Systems

The process station requires a 3-phase, 240 VAC, 50/60 Hz, 12.5 kVA power source and a separate chiller with its own single-phase power source.

Ceiling drop lines for nitrogen supply and exhaust are required, and the floor below the process station must be flat and vibration-free. The room must be air-conditioned, with no vents directly above the machine. Clearance around the process station is required so hinged access panels can be fully opened.

sPro 60 SLS Center Process Station

Chiller

3D Systems chiller

Supplied by: 3D Systems

Installed by: 3D Systems

Source:
- Neslab

The 3D Systems-supplied chiller ships with the system. It requires a separate, single-phase power source and a coolant hose kit. (The 3D Systems-supplied hose kit must be purchased separately.)

See “Chiller Requirements” on page 35 for chiller electrical and clearance requirements.
Use the chiller specifications and purchasing information in this section if you choose to purchase your chiller from a supplier other than 3D Systems.

NOTE The chiller requires coolant to run. Be sure to have sufficient coolant (distilled water and glycol) on hand when 3D Systems comes to install the system. See “Chiller Coolant Requirements” on page 35.

Nitrogen Supply

Supplied by: Customer

Installed by: Customer (prior to sPro 60 SLS Center installation)

Source: Local nitrogen supplier

The nitrogen supply can be any one of the following:

- Two or more nitrogen dewars connected with an auto-switching manifold (as shown)
- Bulk nitrogen tank (as shown)
- A nitrogen generator with or without a compressor and surge tank

The nitrogen supply you choose depends on your projected consumption and the materials you plan to run. If you choose to use a nitrogen generator, you must decide whether or not you will need a compressor and surge tank.

Nitrogen dewars for low-to-medium volume operations

Bulk nitrogen tank for high volume operations

Facility nitrogen supply examples

NOTE If a LaserForm Oven will share the nitrogen supply, you **must** use liquid or bottled nitrogen. The nitrogen generator does not produce sufficiently pure nitrogen for the oven.

NOTE 3D Systems does not install, service, or support nitrogen generators.

See “Nitrogen Requirements” on page 37 for nitrogen supply equipment specifications and purchasing information.

Breakout Station (BOS)

Supplied by: 3D Systems

Installed by: 3D Systems

The BOS assembly includes the following:

- Part cleaning table
- Air handler
- Standard-volume under-table sifter
- High-volume sifter (optional)

The BOS needs to be in a part finishing room separate from the process station. (Part breakout is a dusty operation.)

- The air handler requires single-phase 208/240 VAC 50/60 Hz power.
- The sifter requires single-phase 220/240 VAC 50/60 Hz power.

BOS components:
1 Part cleaning table
2 Air handler
3 Under-table (standard volume) sifter

If you have a high volume operation, 3D Systems recommends using a commercial-grade, metal-drum cement mixer (as shown in photo) for powder mixing.

See “Part Finishing Area Facilities Requirements” on page 55 for BOS component specifications and purchasing information.

Non-ignition Vacuum Cleaner

Non-ignition vacuum cleaner

Supplied by: 3D Systems or customer

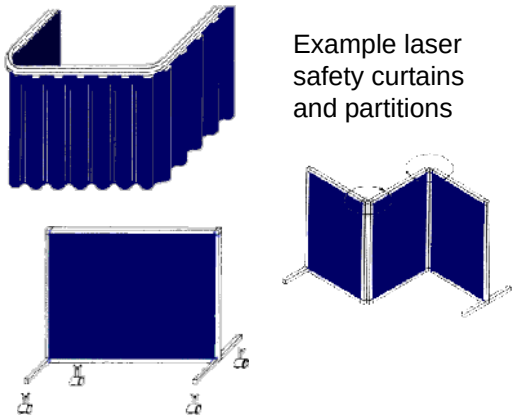
Installed by: Supplier (3D Systems or customer)

Source:
- American Vacuum Company (U.S. and Asia Pacific)
- Nilfisk Advance AG (Europe)

The vacuum is used to clean the process station between builds. A “non-ignition” model is required due to the potential combustibility of airborne powder.

See “Optional Safety Equipment” on page 83 for vacuum safety guidelines, specifications, and purchasing information.

Laser Safety Curtains or Partitions



Example laser safety curtains and partitions

Supplied by: Customer

Installed by: Customer

Source: KENTEK Corporation

Laser safety curtains or partitions are required if the sPro 60 SLS Center room cannot be secured during laser calibration.

NOTE Laser safety curtains or partitions must be in place before 3D Systems performs laser maintenance.

See “Optional Safety Equipment” on page 83 for further details.

LaserForm Oven

Supplied by: 3D Systems

Installed by: 3D Systems

NOTE Required for LaserForm ST-100 metal material only.

See the separate *LaserForm Oven Guide* (DCN 8002-20031) for a complete discussion of the facility requirements for LaserForm ST-100 metals applications.

3D Systems LaserForm Oven for LaserForm ST-100

SandForm/CastForm Forced Convection Oven

Supplied by: 3D Systems or customer

Installed by: 3D Systems or supplier

Source:
- Lindberg / Blue M – division of Cole-Parmer Instrument Co. (U.S. and Asia Pacific only)
- Kendro (Europe)

Forced convection oven for SandForm and CastForm materials

3D Systems recommends this oven for curing SandForm parts and infiltrating CastForm parts. See “Part Finishing Area Facilities Requirements” on page 55 for oven specifications and purchasing information.

NOTE The Lindberg/Blue M model shown is for U.S. and Asia Pacific facilities only. It is **not** CE approved.

sPro 60 SLS Center Transformer

Supplied by: 3D Systems or customer

Installed by: Supplier (prior to sPro 60 SLS Center installation)

Source:
- Nova Magnetics (recommended; U.S. and Asia Pacific)
- Isoltra Transformatorenbau GmBH (recommended; Europe)

A customer-supplied step-up or step-down transformer is required if the facility does not have 240 VAC, 3-phase, 50/60 Hz, 12.5 kVA power. A CE-approved version of the transformer is available for European installations through 3D Systems-Europe.

See “Electrical Requirements” on page 31 for descriptions of each of the four types of transformers 3D Systems stocks.

NOTE The LaserForm Oven might also require a transformer if facility power does not match its power requirements. See the “Facility Requirements” section of the separate *LaserForm Oven Guide* (DCN 8002-20031) for further information.

Recommended Optional Equipment

Your sPro 60 SLS Center can optionally include the components listed below. These are described in the sections that follow.

- Room Area Oxygen Monitor (page 12)
- Bead Blaster (page 13)
- Powder Mixer (page 14)
- 1.5 m (5 ft) platform ladder (page 14)
- Storage cabinet (page 14)
- Anti-static floor mats (page 14)

All the items above are customer-supplied and installed except for the Bead Blaster, which 3D Systems supplies and installs. 3D Systems can also assist your oxygen monitor supplier with installation.

Room Area Oxygen Monitor

Supplied by: 3D Systems

Installed by: 3D Systems

Source: 3D Systems

For safety when working with nitrogen, 3D Systems recommends you install a room area oxygen monitor on the wall of your Sinsterstation room.

See “Nitrogen/Oxygen Safety” on page 74 and “Optional Safety Equipment” on page 83 for more oxygen monitor information.

Bead Blaster

Supplied by: 3D Systems

Installed by: 3D Systems

Source:
- 3D Systems

If you plan to run DuraForm, 3D Systems recommends you install a pneumatic abrasive blast cabinet (“bead blaster”) in the part finishing area separate from the sPro 60 SLS Center process station room.

A glass bead blaster is very useful for cleaning sintered DuraForm parts. It requires an 5.5 bar (80 psi) compressed air line and a 110 VAC/60 Hz power source (U.S. and Asia Pacific version) or a 240 VAC/50 Hz power source (European version).

See “Bead Blaster” on page 62 in the “Part Finishing Area Facilities Requirements” section for more information.

Pneumatic abrasive blast cabinet (“bead blaster”)

Powder Mixer

Supplied by: Customer

Source: Imer Inc. (www.imerusa.com)

The powder mixer is a standard, low-capacity cement mixer for blending virgin and recycled powder. A drum lid is required to keep powder in the drum while mixing.

The recommended model's specifications are as follows:

Capacity	0.14 m^3 (5 ft^3)
Motor	0.5 hp
Facility Power	110 VAC, single phase, 60 Hz, 3.0 A, 0.37 kW
Overall Dimensions (W x H x D)	76 cm x 145 cm x 127 cm (30 in x 57 in x 50 in)
Drum Capacity	125 kg (275 lb)
Weight	66 kg (145 lb)

Powder mixer with metal drum

The mixer drum must be metal. Mixing plastic powder in a plastic drum builds up static charge which can lead to damaging electrostatic discharge.

Miscellaneous Service and Maintenance Equipment

Supplied by: Customer

Source: Local hardware store or home center

You should also have the following equipment on site prior to sPro 60 SLS Center installation to facilitate service and maintenance:

- 1.5 m (5 ft) platform ladder – for installation and service
- Storage cabinet – for maintenance parts
- Anti-static floor mats – to protect process station and BOS from damaging static discharge

1.5 m (5 ft) platform ladder for service access

Consumables

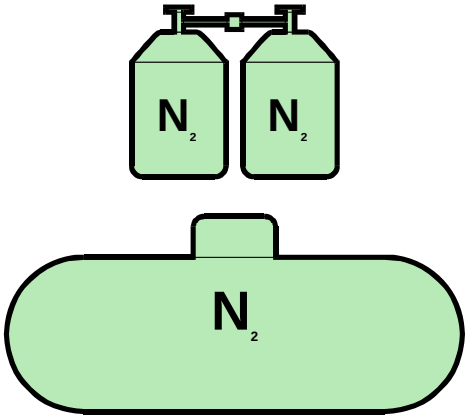
The following items are consumed at varying rates during the SLS process:

- Nitrogen
- SLS Materials (powders, waxes, sprays, etc.)
- Filters
- Coolant

These items are described separately in the sections that follow.

- Contact 3D Systems to purchase replacement SLS materials and filters.
- See your nitrogen and coolant supplier to replenish stocks of these items.

Nitrogen Consumption



NOTE Your site's actual nitrogen consumption may vary from the nitrogen consumption estimate below.

One sPro 60 SLS Center will consume approximately 120 cubic meters (4240 cubic feet) of nitrogen gas per week. This estimate assumes seven days of continuous operation (24 hours/day) with seven purge cycles (one per day).

NOTE This volume estimate is for **gaseous** nitrogen—not liquid nitrogen. Be sure to ask your supplier for the proper liquid-to-gas volume conversion ratio so you can properly size your tanks.

SLS Materials

The SLS process consumes SLS materials when making parts. The materials listed below are available for purchase from 3D Systems. Each comes with its own 3D Systems *Material Guide* to help you use it successfully.

- DuraForm™ PA
- DuraForm™ GF
- DuraForm™ Flex
- DuraForm™ AF
- DuraForm™ EX Black
- DuraForm™ EX Natural
- DuraForm™ HS-10 General Purpose
- DuraForm™ HS-10 Stiff
- Bronze Infiltrant
- Alumina Powder
- CastForm™ PS
- LaserForm ST-100™
- LaserForm A6

See “Electrical Safety” on page 74 to help you determine your SLS material storage needs.

Replaceable Filters

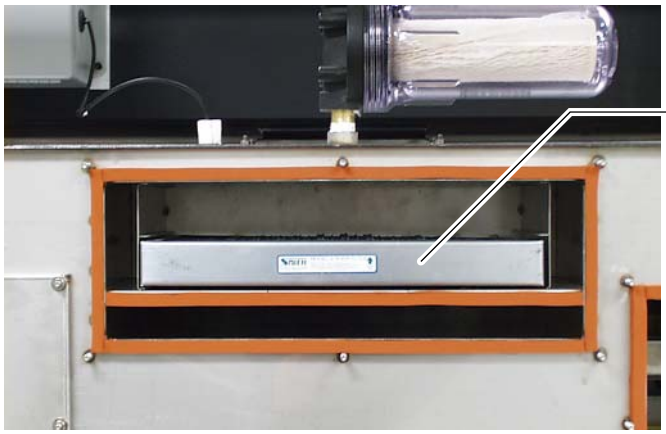
The process station and chiller have customer-replaceable filters. 3D Systems recommends you keep a supply of these filters on hand and replace them when necessary to ensure part quality and trouble-free operation.

These filters include:

- Process chamber filter (particulate)
- Process chamber duct filter (charcoal)
- Nitrogen system exhaust filter (cellulose)
- IR block coolant filter
- Chiller air filter (if chiller is purchased from 3D Systems)
- Chiller coolant filter (if chiller is purchased from 3D Systems)

See the *sPro 60 SLS Centers Reference Guide* (DCN 8002-00002) for filter replacement information.

NOTE Filters are also replaced as necessary by your 3D Systems Field Service Representative during scheduled preventive maintenance visits.



Process chamber duct filter at rear of process station

Coolant

The 3D Systems-standard Neslab chiller requires 30 liters (8 gallons) of coolant to operate. The coolant mix for this chiller model is 2 parts distilled water to 1 part pure (100%) ethylene glycol or 3M® Corporation's DowFrost®.

NOTE Sufficient coolant must be available on site for 3D Systems to install your sPro 60 SLS Center. To keep delays and costs to a minimum, verify that you have sufficient quantities of distilled water and ethylene glycol (or DowFrost) on hand before installation.

CAUTION! Ethylene glycol is toxic. Follow the toxic chemical handling laws and guidelines in your area.

CAUTION! **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 glycol cooling fluid can contaminate the cooling system and void the laser system warranty.

See "Chiller Coolant Requirements" on page 35 for details.

Facility Information Form

As soon as you receive this guide, complete the “sPro 60 SLS Systems Facility Information Form” on page 21.

Fax your completed form to 3D Systems Customer Support at one of the following numbers:

+1 512 339-0634 (North & South America; Asia Pacific)

+49 6151 357 355 (Europe)

3D Systems must acknowledge receipt of your completed “sPro 60 SLS Systems Facility Information Form” **before** Customer Support can schedule a trip to your facility to install the sPro 60 SLS System.

How 3D Systems Uses Facility Information

3D Systems Customer Support keeps track of machine configurations and maintenance histories in a database. The information in this database is updated based on the content of the “Facility Information Form” you submit.

If you call 3D Systems to schedule maintenance on your machine or get technical assistance, 3D Systems Customer Support uses this database to help you get the results you need. Therefore, it is very important that the information you provide on the “sPro 60 SLS Systems Facility Information Form” is complete and accurate.

NOTE 3D Systems only uses the information you submit to better support and service your machine. 3D Systems does not sell or otherwise disclose private customer information to third parties without permission.

Facility Information Form Instructions

Use these instructions to help you complete and submit the “sPro 60 SLS Systems Facility Information Form” on the next page.

Line No.	Instructions
1	Enter the installation address of the building where the sPro 60 SLS System(s) will be installed. (If you have a large facility, be specific; for example, include building and room numbers.) Enter the shipping address and billing address if they are different than the installation address.
2	Enter contact information for all persons who will be using and maintaining the sPro 60 SLS System. Specify each user’s level of expertise; e.g., “engineer,” “operator,” “expert,” or “novice.”
3	Check all the materials that you intend to use in your sPro 60 SLS System.
4	Check all the applications that you intend to run on your sPro 60 SLS System.
5	Enter the contact information for the person or persons at your facility responsible for handling accounts payable to 3D Systems.
6	Enter the date you submitted this form to 3D Systems Customer Support. If you had to submit this form more than once, enter the most recent submission date.

Fax, mail, or email the completed form to one of the 3D Systems Customer Support sites below.

	North & South America; Asia Pacific	**Europe**
Fax	**+1 512-339-0634** attn: SLS Customer Support	**+49 6151 357 355** attn: SLS Customer Support
Mail	3D Systems Corporation 333 Three D Systems Circle Rock Hill, SC 29730 attn: SLS Customer Support	3D Systems GmbH Rontgenstrasse 41 D-64291 Darmstadt, Germany attn: SLS Customer Support
Email	support@3D Systems3D Systems-corp.com	support@3D Systems3D Systems-corp.com

If you want to speak to a 3D Systems Customer Support representative about your facility, call **+1-800-999-5553** (U.S.), **+49 6151 357 452** (Europe), or **+65 430-6681** (Asia Pacific).

FAX **1 page**

Date

To ❑ **3D Systems Customer Support (U.S.)** **Fax No. +1 512-339-0634**

❑ **3D Systems Customer Support (Europe)** **Fax No. +49 6151 357 355**

From **Fax No.**

sPro 60 SLS Systems
Facility Information Form

1	**Facility address**	**Installation**	**Ship To**	**Bill To**
2	**User name (1)**			
	Expertise level			
	Phone & fax			
	Email address			
	User name (2)			
	Expertise level			
	Phone & fax			
	Email address			
3	**SLS material(s)**	❑ Duraform PA	❑ CastForm PS	❑ DuPont Somos 201
		❑ Duraform GF	❑ SandForm Zr	
		❑ LaserForm ST-100	❑ SandForm Si	
4	**SLS application(s)**	❑ Rapid plastic prototypes	❑ Rapid metal prototypes	❑ Direct plastic part manufacturing
		❑ Metal tooling for plastic parts	❑ Metal tooling for die cast parts	❑ Casting patterns for metal parts
5	**Billing contact**			
	Phone & fax			
	Email address			
6	**Date submitted**			

Facility Requirements Checklist

In the “Requirements” sections that follow, you will find all the requirements your facility must meet before your sPro 60 SLS Center can be installed. After your facility meets all these requirements, complete and sign the “Facility Requirements Checklist” on page 25 and submit it to 3D Systems Customer Support for review.

When Customer Support receives your completed checklist, a 3D Systems representative will contact you to verify your facility’s readiness. When the representative is confident that all facility requirements are met, he or she will schedule a trip to your site to install the sPro 60 SLS Center.

> **NOTE** All facility requirements must be met **before** 3D Systems Customer Support can schedule a trip to your facility to install the sPro 60 SLS Center.

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 *sPro 60 SLS Centers Facility Requirements* drawing (DCN 8002-0020); for example, when you lay out the room 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 Requirements Checklist.
- If you have any questions regarding facility requirements, contact your 3D Systems Sales representative or 3D Systems Customer Support.

How to Submit Your Completed Facilities Checklist

Submit your completed Facility Requirements Checklist by fax, mail, or email to one of the 3D Systems Customer Support sites below. This notifies them that your facility is fully prepared for installation.

	North & South America; Asia Pacific	**Europe**
Fax	**+1 512-339-0634** attn: SLS Customer Support	**+49 6151 357 355** attn: SLS Customer Support
Mail	3D Systems Corporation 333 Three D Systems Circle Rock Hill, SC 29730 attn: SLS Customer Support	3D Systems GmbH Rontgenstrasse 41 D-64291 Darmstadt, Germany attn: SLS Customer Support
Email	support@3D Systems-corp.com	support@3D Systems-corp.com

Be sure to include the date you submitted your completed checklist so installation can be scheduled as quickly as possible.

If you need to speak to a 3D Systems Customer Support representative about your facility requirements, call:

- **+1-800-999-5553** (U.S.)
- **+49 6151 357 452** (Europe)
- **+65 430-6681** (Asia Pacific).

NOTE If you plan to use 3D's LaserForm ST-100 metal material, you must also complete and submit the "Facility Requirements Checklist" for the LaserForm Oven. This checklist is in the "Facility Requirements" section of the separate *LaserForm Oven Guide* (DCN 8002-20031). You receive this guide when you order a LaserForm Oven.

FAX **1 page**

Date

To ❑ **3D Systems Customer Support (U.S.)** **Fax No. +1-512-339-0634**

❑ **3D Systems Customer Support (Europe)** **Fax No. +49 6151 357 355**

From **Fax No.**

Facility Requirements 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.

Contact name			
Phone & fax	**Phone (1)**	**Phone (2)**	**Fax**
Email address			
Facility address			
Date submitted			
❑	**Room Requirements** (page 27) **completed**		
❑	**Atmosphere Requirements** (page 29) **completed**		
❑	**Electrical Requirements** (page 31) **completed** Measured facility power: _____ VAC, _____ Hz		
❑	**Chiller Requirements** (page 35) **completed**		
❑	**Nitrogen Requirements** (page 37) **completed**		
❑	**Computer and Network Requirements** (page 45) **completed**		
Signature			

Room Requirements

See the *sPro 60 SLS Center Facility Requirements* drawing (DCN 8002-20020) for room dimensions and forklift requirements.

Clearance Requirements

Minimum Clearance	Width	Depth	Height
Room	457 cm (15 ft)	366 cm (12 ft)	305 cm (10 ft)
Access door[1]	213 cm (7 ft)	–	244 cm (8 ft)

1. Though the process station is only 198 cm (6.5 ft) tall, you need extra height clearance if it is on the pallet.

Floor Requirements

Vibration-free	**Required**
First floor installation	Preferred
Uncarpeted	
Level and flatness	within 25.4 mm (1 in) below process station
Distributed load-bearing capacity	0.024 bar (50 psf) on seven 100 mm (4 in) diameter pads

Atmosphere Requirements

The atmosphere in the sPro 60 SLS Center room must meet the following specifications:

Room temperature controls	Heating and air conditioning installed A/C not blowing on top of process station
Temperature	Operating range: (16 to 27) °C; (60 to 80) °F
	Setpoint range: (18 to 24) °C; (65 to 75) °F
	Stability: ± 2 °C (± 5 °F)
Non-condensing relative humidity	No higher than 70%
Room air changes	4 per hour minimum
Heat dissipation	Maximum: 3516 W (12000 Btu/h) Average: 2110 W (7200 Btu/h)
Atmospheric corrosives	None

Electrical Requirements

Refer to the *sPro 60 SLS Center Facility Requirements* drawing for more electrical information. Also see “Chiller Electrical Requirements” on page 35 for information on the **separate single-phase chiller electrical service** required in the sPro 60 SLS Center process station room.

Process Station Power Requirements

Process station input voltage[1]	(240 ± 5%) VAC, 3-phase, 50/60 Hz, 12.5 kVA
Normal operating current	(20 to 25) A
Peak operating current	30 A
On/Off breaker rating	40 A
Power cable (for 3-phase power)	4-conductor Wire size according to local electrical code Cable drop from ceiling over right side of process station
Power cable circuit breaker wiring	phase 1 to FD1-L1 phase 2 to FD1-L2 phase 3 to FD1-L3

1. The process station also supplies power to the computer cabinet (but not the chiller).

- The 3-phase power cable and cable gland (cord grip) are customer supplied and installed. The cable feeds through the gland on the top of the process station.
- Connect the power cable ground wire to the ground bus bar in the process station's power distribution enclosure.
- Connect the process station to a dedicated power circuit.
- The electrical systems in the sPro 60 SLS Center process station and computer cabinet 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 process station.

sPro 60 SLS Center Transformer Requirements

If the facility does not have 240 VAC, 3-phase, 50/60 Hz, 12.5 kVA power, a customer-supplied step-up or step-down transformer is required.

3D Systems stocks the following four transformers:

Transformer Type	3D Systems Part No.	Output
Step-up	5600-03538	208 to 240 VAC; 3-phase; 60 Hz
Step-down	5600-03539	400 to 240 VAC; 3 phase; 50 Hz
Step-down (CE approved)	5600-03539-EUR	400 to 240 VAC; 3 phase; 50 Hz
Step-down	5600-03768	480 to 240 VAC; 3 phase; 60 Hz

- If you purchase a transformer from a supplier other than 3D Systems, specify a “delta-to-wye” or “wye-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 process station ground.

Transformer Purchasing Information

Transformer, Step Up, 208/240V, 3-phase, 60 Hz	
3D Systems Part Number	5600-03538
3D Systems Stocked Item	Yes
Dimensions (W x H x D)	(56 x 41 x 23) cm (22 x 16 x 9) in
Weight	104 kg (230 lb)
Voltage	208/240 VAC, 3-phase, 60 Hz, 12.5 kVA
3D Systems Warranty Information	One year from installation date
Notes	Must be purchased through 3D Systems

Transformer, Step Down, 400/240V, 3-phase, 50 Hz	
3D Systems Part Number	5600-03539
3D Systems Stocked Item	Yes
Dimensions (W x H x D)	(56 x 41 x 23) cm (22 x 16 x 9) in
Weight	127 kg (280 lb)
Voltage	400/240 VAC, 3-phase, 60 Hz, 12.5 kVA
3D Systems Warranty Information	One year from installation date
Notes	Must be purchased through 3D Systems

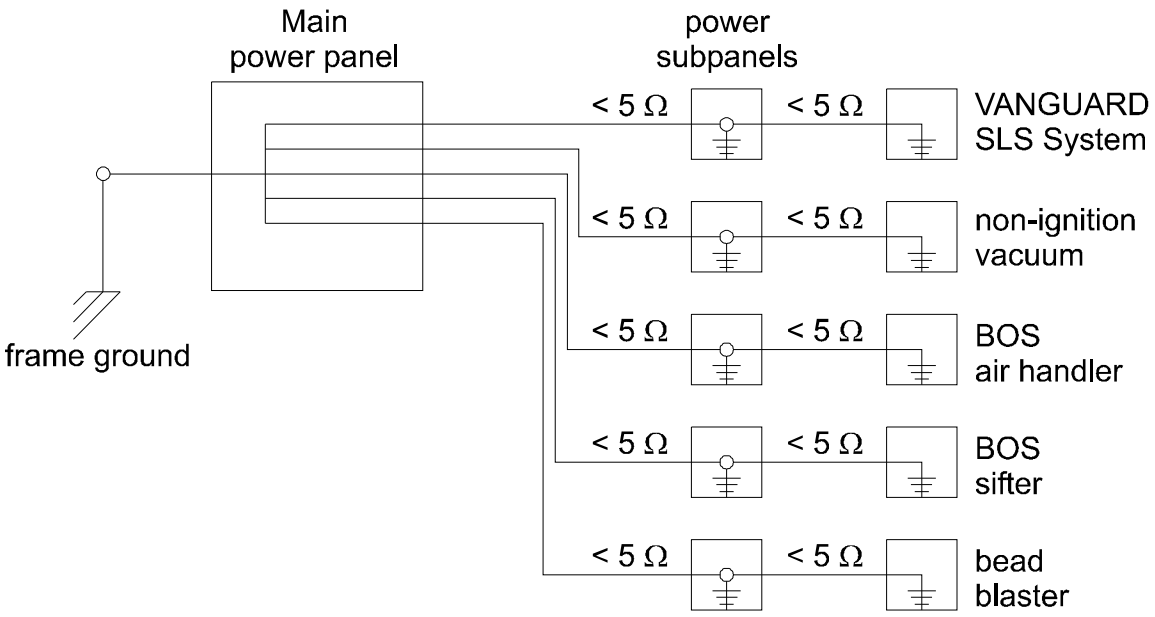
Transformer, Step Down, 400/240V, 3-phase, 50 Hz, CE approved	
3D Systems Part Number	5600-03539-EUR
3D Systems Stocked Item	Yes
Dimensions (W x H x D)	(80 x 60 x 75) cm (packed in box) (32 x 24 x 30) in (packed in box)
Weight	127 kg (280 lb)
Voltage	400/240V, 3-phase, 50 Hz, 12.5 KVA
3D Systems Warranty Information	One year from installation date (on parts)
Notes	Must be purchased through 3D Systems

Transformer, Step Down, 480/240V, 3-phase, 60 Hz	
3D Systems Part Number	5600-03768
3D Systems Stocked Item	Yes
Dimensions (W x H x D)	(56 x 41 x 23) cm (22 x 16 x 9) in
Weight	127 kg (280 lb)
Voltage	480/240 VAC, 3-phase, 60 Hz, 12.5 kVA
3D Systems Warranty Information	One year from installation date
Notes	Must be purchased through 3D Systems

Grounding Requirements

These grounding requirements apply to the sPro 60 SLS Center and the optional part finishing equipment.

All connections between powered equipment and the power panel must be grounded as shown in the diagram below.



Chiller Requirements

NOTE If you plan to install a chiller other than the 3D Systems-supplied model, the model you choose must meet the "Third Party Chiller Requirements" on page 36.

Chiller Electrical Requirements

Facility power[1]	230 VAC, 60 Hz, single phase, 10 A
	200 VAC, 50 Hz, single phase, 10 A
	240 VAC, 50 Hz, single phase, 10 A
Step-up or step-down transformer	May be required to modulate power
Wiring	Ground wire cannot be used for neutral (return)

1. The single-phase chiller power source **must** be separate from the 3-phase process station power source.

Chiller Coolant Requirements

Distilled water	2 parts	**See Caution below**
Glycol	1 part	100% pure ethylene glycol (preferred) or DowFrost® propylene glycol
Coolant capacity		30 L (8 gal)

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 glycol cooling fluid can contaminate the cooling system and void the laser system warranty.

- Coolant is customer-supplied and must be available at installation.
- 100 percent pure ethylene glycol is available through McMaster-Carr in 1- and 5-gallon containers. Request part no. 3190K246 (5-gal size—recommended). To order, call +1-404-346-7000 (U.S. only) or see www.mcmaster.com
- If local toxic chemical regulations do not permit use of ethylene glycol in the HiQ SLS System facility, use DowFrost® propylene glycol manufactured by The Dow Chemical Company.

Third Party Chiller Requirements

If you plan to purchase a chiller from third party, it must meet these requirements:

Cooling capacity	3.1 kW at 20 °C (68 °F)
Stability	± 0.5 °C (± 0.9 °F)
Pump capacity (measured at the process station)	8.7 lpm minimum at 4.1 bar (2.3 gpm minimum at 60 psi)
Reservoir capacity	30 L (8 gal)
Water filter pore size	10 μ
Controls	Adjustable temperature control; coolant shutoff release
Alarms/indicators	Coolant temperature high/low; coolant level low
CE approved	Yes (Europe only)

- Requires purchase of separate chiller plumbing kit from 3D Systems (part number 9204-20112). All plumbing connections are ½-inch FPT.
- 45 cm (18 in) of clearance is required on all vented sides for adequate ventilation.
- Chiller should installed in clean environment where ambient temperatures are (13 to 35) °C ((55 to 95) °F).

Nitrogen Requirements

A properly functioning nitrogen supply system that meets the “Nitrogen Supply Requirements” below **must** be in place before sPro 60 SLS System installation.

Nitrogen Supply Requirements

Purity	99.998%
Nitrogen line fittings	Inlet: ¼ in NPT male; Exhaust: ¾ in NPT male
Continuous flow	9 lpm (19 scfh) for length of build
Purge flow	Continuous flow of 9 lpm (19 scfh) plus 165 lpm (350 scfh) maintaining 1.03 bar (15 psi) for 25 min
Exhaust	Must exhaust to outside at pressure 0.0025 bar (1.0 in H_2O)
Weekly consumption	120 m^3 (4240 ft^3) of N_2 gas based on 24 h/day operation with 7 purge cycles

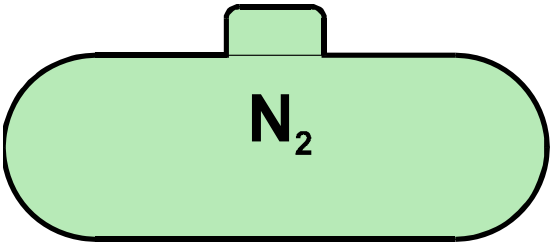
NOTE If you plan to use the process station’s nitrogen system to supply a LaserForm Oven in your facility, **use liquid or bottled nitrogen only. Do not use a nitrogen generator.** The nitrogen produced by a nitrogen generator is not pure enough for LaserForm applications. However, it is pure enough for all other SLS materials.

Nitrogen Supply Options

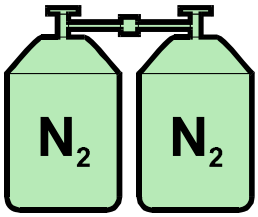
Use one of the following nitrogen supply methods to meet the “Nitrogen Supply Requirements” on page 37:

- Liquid or bottled (gaseous) nitrogen with auto-switching manifold
- Nitrogen generator[1]
- Bulk nitrogen tank

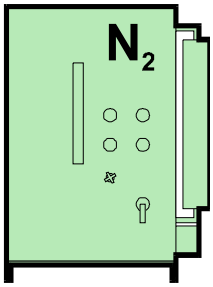
NOTE Nitrogen supply systems are customer supplied and installed. **3D Systems does not service nitrogen supply equipment except for 3D Systems’ Nitrogen generator.**



Bulk nitrogen tank



Liquid or bottled (gaseous) nitrogen with auto-switching manifold



Nitrogen generator

1. Do not use a nitrogen generator for LaserFom applications. The nitrogen produced is not pure enough.

Liquid or Bottled (Gaseous) Nitrogen

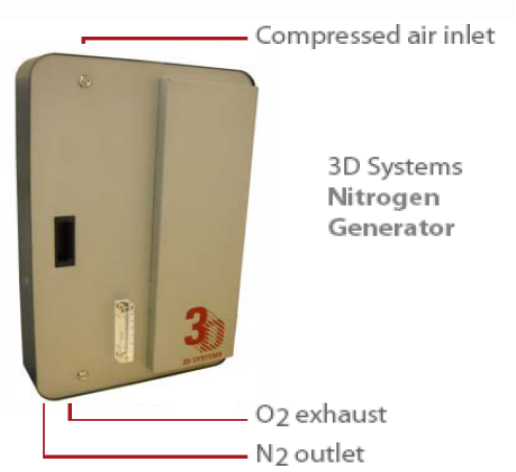
- **Nitrogen dewars:** If you plan to run only one machine, portable liquid or bottled nitrogen tanks (dewars) will probably be sufficient. Install at least two dewars and connect them with an auto-switching manifold. The manifold will ensure a constant nitrogen supply during builds.
- **Bulk nitrogen tank:** If you plan to run two or more machines, consider a fixed bulk liquid nitrogen tank.

Nitrogen dewars with auto-switching manifold

Bulk liquid nitrogen tanks

Nitrogen Generator

High Performance Nitrogen Generator -- Part Number 104011-01.



N_2 Generator O_2 Exhaust

The nitrogen generator separates nitrogen from ambient air, creating two air streams; N_2 supply and O_2 waste. Both exit at the bottom of the generator.

The N2 supply stream is greater than 98% nitrogen. the O2 waste stream is less than 40% oxygen. If the SLS process room meets the air exchange requirements, it is safe to vent the Os waste stream into the room. The waste stream flow rate is low.

Compressed Air Supply

A facility compressed air connection near the nitrogen generator mounting location is required. The nitrogen generator compressed air supply must meet the requirements shown in the table below.

Compressed Airr	
Quality	CDA (Clean Dry Air)
Air Inlet	Industrial interchange male coupling plug: 1/4 inch coupling size, air inlet at top of nitrogen generator
Inlet Pressure	620-690 kPa (90-100 psi)
Inlet Flow Rate	250 L/min (9 scfm)

Nitrogen Supply and Exhaust Lines

Nitrogen supply and exhaust lines **must** be in place before sPro 60 SLS System installation. Follow these guidelines for nitrogen supply and exhaust lines:

- Route nitrogen supply lines through the ceiling.
- Locate the drops over the left side of the process station (viewed from the front).
- Use a ¼ inch female NPT female fitting on the nitrogen inlet line.
- Use a ¾ inch female NPT fitting on the nitrogen exhaust line.
- Do not use a fan on the nitrogen exhaust line.

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

Receiving and Moving the System

This chapter tells you what you will receive in your sPro 60 SLS Center shipment and how to unload and unpack the various system components. It also tells you how to properly move the system to prevent damage.

Before you move the sPro 60 SLS Center, verify the following:

- ❑ Room is large enough to allow specified clearance around all sides of the process station, chiller, and computer cabinet.
- ❑ Floor below sPro 60 SLS Center meets the “Floor Requirements” on page 27.
- ❑ Process station on pallet jack or forklift will fit through all doorways leading to the installation room.

> **NOTE** Refer to the *sPro 60 SLS Center Facility Requirements* drawing (DCN 8002-20020) for illustrated dimension and clearance information.

What Your Shipment Includes

All possible components of a 3D Systems rapid prototyping system are listed below. They include a sPro 60 SLS Center for building the parts, peripheral equipment for part finishing, and items consumed during part builds such as powder and filters.

Required and Optional System Components

Required sPro 60 SLS Center Components		
Component	**Supplier**	**Comment**
Process station	3D Systems	Requires a 3-phase power source and a separate chiller with its own single phase power source.
User Interface	3D Systems	Shipped in separate boxes Includes monitor, keyboard, and mouse
Chiller	3D Systems or third party	3D Systems stocks a recommended chiller and ships it with the system.
Nitrogen supply	3D Systems or third party	Can use nitrogen tank(s) or a nitrogen generator depending on consumption/ application.
Non-ignition vacuum cleaner	3D Systems or third party	For cleaning the process station between builds.
LaserForm Oven (optional)	3D Systems	See the “Facility Requirements” section in the separate *LaserForm Oven Guide* (DCN 8002-20031)
Convection Oven (optional)	3D Systems or third party	Required for SandForm material only

Optional, Recommended sPro 60 SLS Center Components		
Component	**Supplier**	**Comment**
Breakout Station (BOS)	3D Systems	Includes table, air handler and under-table sifter. 3D stocks the BOS and ships it with the system. Recommended for DuraForm part finishing.
Pneumatic blast cabinet (“bead blaster”)	3D Systems or third party	3D stocks two bead blaster models and ships the chosen model with the system. A bead blaster is recommended for DuraForm part finishing. It requires a 5.5 bar (80 psi) compressed air source.
Powder mixer	third party	Cement mixer used for blending virgin and recycled powder.
Room oxygen monitor	3D Systems or third party	Audible and visible low O_2 alarm
Laser safety curtains	third party	Required if room cannot be secured during laser calibration.
1.5 m (5 ft) platform ladder	third party[1]	For installation and service
Storage cabinet	third party	For SLS tools and maintenance parts
Anti-static floor mats	third party	To protect sPro 60 SLS Center and BOS from damaging static discharge

1. Must be on site before your 3D Systems Field Service Representative arrives to install the sPro 60 SLS Center.

SLS Materials and Filters

The materials and filters you receive in your sPro 60 SLS Center shipment depend on your SLS application. All available materials and filters are listed below.

SLS materials	DuraForm™ PA DuraForm™ GF DuraForm™ Flex DuraForm™ AF DuraForm™ EX Black DuraForm™ EX Natural DuraForm™ HS-10 General Purpose DuraForm™ HS-10 Stiff Bronze Infiltrant Alumina Powder CastForm™ PS LaserForm ST-100™ LaserForm A6
Filters	Process chamber filter (fiberglass) Process chamber duct filter (charcoal) Nitrogen exhaust filter (cellulose) IR block coolant filter Chiller filter (if chiller is purchased from 3D Systems) LaserForm Oven electrical box intake fan filter (if LaserForm Oven is purchased)

Shipping Weights and Dimensions

sPro 60 SLS Center shipments consist of several numbered pallets or crates of equipment and one crate of accessories. Check the count labels on the pallets and crates to verify that your shipment is complete.

The weights and dimensions in the domestic shipment example below include the equipment plus the pallet or crate. Shipping configurations may vary from this example.

NOTE For "bare" equipment weights and dimensions (without pallets and crates included), see "System Component Weights and Dimensions" on page 50.

sPro 60 SLS Center Component Shipping Weights and Dimensions (Domestic Example)					
No.	**Pallet or Crate Contents**	**Weight[1]**	**Width**	**Depth/Length**	**Height**
1	Process station	2000 kg	246 cm	173 cm	249 cm
		4400 lb	97 in	68 in	98 in
2	User Interface	260 kg	76 cm	117 cm	89 cm
		570 lb	30 in	40 in	35 in
3	Chiller[2]	195 kg	76 cm	104 cm	122 cm
		430 lb	30 in	41 in	48 in
4	BOS table[3]	122 kg	122 cm	122 cm	145 cm
		270 lb	48 in	48 in	57 in
5	Standard volume sifter[3]	113 kg	122 cm	122 cm	183 cm
		250 lb	48 in	48 in	72 in
6	Air handler [3]	168 kg	122 cm	122 cm	150 cm
		370 lb	48 in	48 in	59 in
7	Bead blaster[2]	91 kg	91 cm	61 cm	165 cm
		200 lb	36 in	24 in	65 in
8	Accessories	272 kg	198 cm	122 cm	74 cm
		600 lb	78 in	48 in	29 in
9	Nitrogen Generator	136 kg	76 cm	117 cm	74 cm
		300 lb	30 in	46 in	29 in
LaserForm Oven[4] (3 crates)		See "LaserForm Oven Shipping Crates" on page 49.			

1. Shipping weights are estimates.
2. If ordered from 3D Systems

3. BOS, sifter, and air handler are not used in LaserForm applications.
4. LaserForm ST-100 applications only

Accessories Crate

One “Accessories crate” containing the items listed below ships with the sPro 60 SLS Center.

sPro 60 SLS Center Accessories Crate Contents with Shipping Weights and Dimensions				
Accessories Crate Item	**Weight[1]**	**Width**	**Depth/ Length**	**Height**
“Ship Group” box (contents listed below)	272 kg	198 cm	122 cm	74 cm
	600 lb	78 in	48 in	29 in

1. Shipping weights are estimates.

NOTE If you ordered extra SLS materials or equipment, your shipment will also include one or two extra crates or pallets. (Crates for air shipments; pallets for ground shipments.)

Ship Group Box

The “Ship Group” box in the “Accessories” crate contains the following items:

sPro 60 SLS Center Ship Group Box Contents	
Qty	**Description**
1	sPro 60 SLS Center Application Software CD-ROM
1	sPro 60 SLS Center Application Software release notes
1	Magics RP software CD-ROM
1	Material Safety Data Sheet (MSDS) for every 3D-supplied material in shipment
2	Replacement process chamber halogen lamps
12	Replacement fiberglass process chamber filters
3	Replacement charcoal process chamber duct filter pads
2	Replacement cellulose nitrogen exhaust sediment filters
1	Part transfer container
1	Feed transfer container
1	Part transfer tray

sPro 60 SLS Center Ship Group Box Contents (continued)	
Qty	**Description**
1	Feed transfer tray
1	Laser window plug
1	Powder scoop
1	Dust cloth
2	Foam swabs
2	Boxes of lens cleaning tissue
1	Metric hex wrench
1	Bottle of ethanol
1	Nylon bristle paint brush

LaserForm Oven Shipping Crates

If you order a LaserForm Oven, it arrives in three additional crates with the following weights and sizes. (See the “Facility Requirements” section of the *LaserForm Oven Guide* (DCN 8002-20031) for more information.)

LaserForm Oven Shipping Weights and Dimensions			
Crate 1	Oven Frame	(165 x 160 x 234) cm (65 x 63 x 92) in	399 kg (880 lb)
Crate 2	Oven Retort	(137 x 137 x 150) cm (54 x 54 x 59) in	127 kg (280 lb)
Crate 3	Oven Kiln	(114 x 114 x 132) cm (45 x 45 x 52) in	209 kg (460 lb)

System Component Weights and Dimensions

This table lists the “bare” (unpacked) dimensions and weights of all required and optional sPro 60 SLS Center and part finishing equipment.

sPro 60 SLS Center Component Weights and Dimensions				
Component	**Weight[2]**	**Width**	**Depth**	**Height**
Process station[1]	1700 kg	213 cm	147 cm	224 cm
	3700 lb	84 in	58 in	88 in
User Interface	118 kg	102 cm	69 cm	56 cm
	260 lb	40 in	27 in	22 in
3D Systems-supplied chiller (U.S. and Asia Pacific)	113 kg	56 cm	91 cm	81 cm
	249 lb	22 in	36 in	32 in
3D-supplied chiller (Europe)	64 kg	54 cm	71 cm	93 cm
	141 lb	21 in	28 in	37 in
Transformer – step down (400 to 240) VAC, 3-phase, 50/60 Hz, 12.5 kVA	127 kg	56 cm	23 cm	41 cm
	280 lb	22 in	9 in	16 in
Transformer – step up (208 to 240) VAC, 3-phase, 50/60 Hz, 12.5 kVA	104 kg	56 cm	23 cm	41 cm
	230 lb	22 in	9 in	16 in
Transformer – step down (400 to 240) VAC, 3-phase, 50/60 Hz, 12.5 kVA; -EUR version; CE approved	127 kg	56 cm	23 cm	41 cm
	280 lb	22 in	9 in	16 in
Transformer – step down (480 to 240) VAC, 3-phase, 60 Hz, 12.5 kVA	127 kg	56 cm	23 cm	41 cm
	280 lb	22 in	9 in	16 in
Breakout Station (BOS) table	95 kg	112 cm	71 cm	113 cm
	210 lb	44 in	28 in	45 in
Air handler	50 kg	66 cm	71 cm	91 cm
	110 lb	26 in	28 in	36 in
Standard volume sifter	34 kg	53 cm	58 cm	86 cm
	75 lb	24 in	40 in	34 in

sPro 60 SLS Center Component Weights and Dimensions (continued)				
Component	**Weight[2]**	**Width**	**Depth**	**Height**
High volume sifter	136 kg	53 cm	53 cm	122 cm
	300 lb	21 in	21 in	48 in
Bead blaster (U.S. and Asia Pacific only)	68 kg	66 cm	102 cm	160 cm
	150 lb	26 in	40 in	63 in
Nitrogen generator	113 kg	25 cm	56 cm	97 cm
	250 lb	10 in	22 in	38 in
Non-ignition vacuum cleaner	32 kg	53 cm	53 cm	94 cm
	70 lb	21 in	21 in	37 in
Forced convection oven single phase; 110 VAC, 60 Hz or 240 VAC 50/60 Hz (U.S. and Asia Pacific only)	133 kg	91 cm	58 cm	122 cm
	294 lb	36 in	23 in	48 in
LaserForm Oven (assembled)	630 kg	137 cm	142 cm	208 cm
	1390 lb	54 in	56 in	82 in

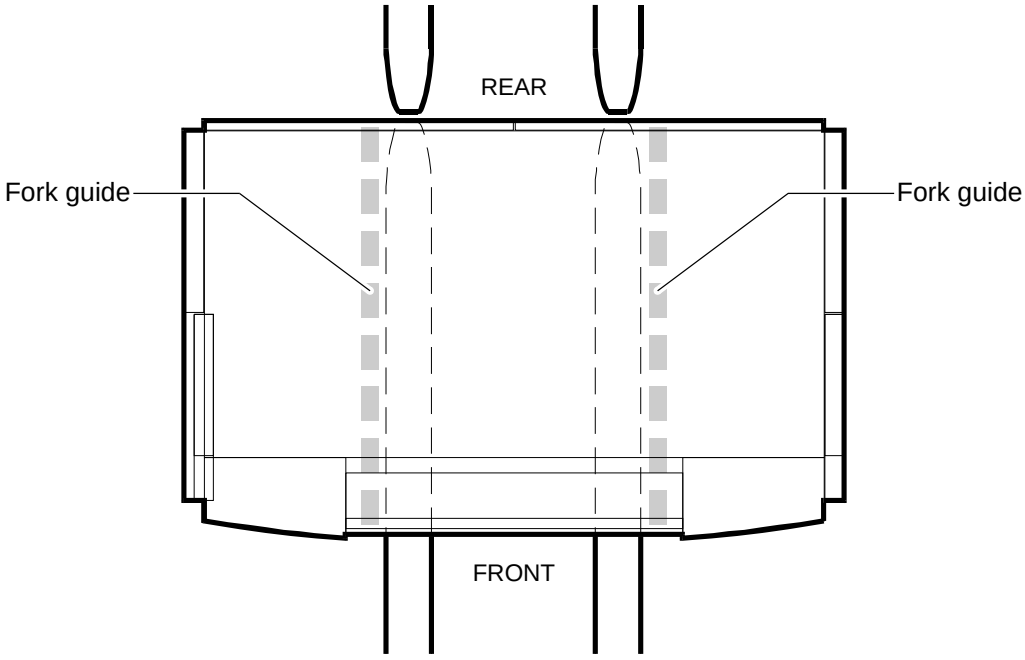
1. Process station dimensions and weight include panels
2. estimated

Moving the sPro 60 SLS Center

When moving the process station, observe the following:

- 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 the process station is on the pallet, use a forklift to move it. Wood blocks around the bottom of the process station pallet prevent the unit from tipping when it is on the forks. (However, the thick forks on most pallet jacks will not fit into the pallet's forklift holes.)
- When the process station is on the pallet, you can lift it from any side using the extended forks.
- When the process station is off the pallet, you must lift it from the front or back following the fork guides at the bottom of the frame.

When the process station is off its pallet, lift it from the front or rear only with the forks fully inserted. Lifting it from the side, or lifting it with the forks partially inserted, might cause it to tip.



Top view of process station showing fork position when unit is off the pallet.

Moving Sequence

Use the pallet jack to remove the chiller and computer cabinet from the truck.

1. Use the forklift to remove the process station from the truck.

Do not use a forklift with standard-length forks to move the process station; use 1.8 m (6 ft) long forks. (The front of the process station is much heavier than the back and it can tip.)

2. Use the forklift to lift the components off their pallets or crate bottoms.

3. Use the pallet jack to move the process station into place.

Make sure the pallet jack forks are between the fork guides before lifting/moving.

Do not move or lift the process station from its sides.

4. Unlock the front wheels on the chiller and computer cabinet and roll them into place.

Place the computer cabinet on the right side of the process station and the chiller on the left.

sPro 60 SLS Center Placement

3D Systems Customer Support can advise you on sPro 60 SLS Center equipment placement before installation. Also refer to the *sPro 60 SLS Centers Facilities Requirements* drawing (DCN 8002-20020). Be sure to meet the “Clearance Requirements” on page 27 so there will be sufficient room for air circulation and service/operator access.

Installation Verifications (performed by 3D Systems)

Once all the sPro 60 SLS Center equipment is in place, your 3D Systems Field Service Representative will make the required nitrogen, power, and coolant hook-ups and connections. He will also level the process station, then perform the following verification procedures:

- Complete machine module functional tests
- Verify functionality of safety interlocks
- Verify calibration of components
- Build an acceptance test part to ensure system function

Part Finishing Area Facilities Requirements

This section describes the facility requirements and 3D Systems-recommended third party equipment for your part finishing area. If you have questions about third party maintenance and part finishing equipment, contact 3D Systems for additional product information.

Part Finishing and Maintenance Equipment List

- BOS Air Handler
- Vibratory Sifter
- A 1.5-m (5-ft) platform ladder for installation and service
- A glass bead blaster to clean sintered parts (requires a source of compressed air of at least 5.5 bar (80 psi))
- A storage cabinet for maintenance parts
- Anti-static mats for the floor around the sPro 60 SLS Center and the BOS.

Electrical Requirements for Part Finishing Equipment

This section lists the electrical power and grounding facilities you must have in order to operate the part finishing and maintenance equipment.

Part Finishing Equipment Facility Power Requirements

		Voltage	Frequency	Phase	Operating Current	Breaker Rating
BOS air handler	U.S., Europe	220/230 VAC	50/60 Hz	1	5.9 A	15 A[1]
Vacuum cleaner	U.S.	115 VAC	60 Hz	1	10 A	15 A
	U.S., Europe	220 VAC	50/60 Hz	1	6 A	15 A
BOS sifter	U.S., Europe	220/240 VAC	50/60 Hz	1	3.25 A	15 A
Bead blaster	U.S.	110 VAC	60 Hz	1	6 A	15 A
	Europe	220 VAC	50 Hz	1	2 A	10 A

1. Motor rated breaker

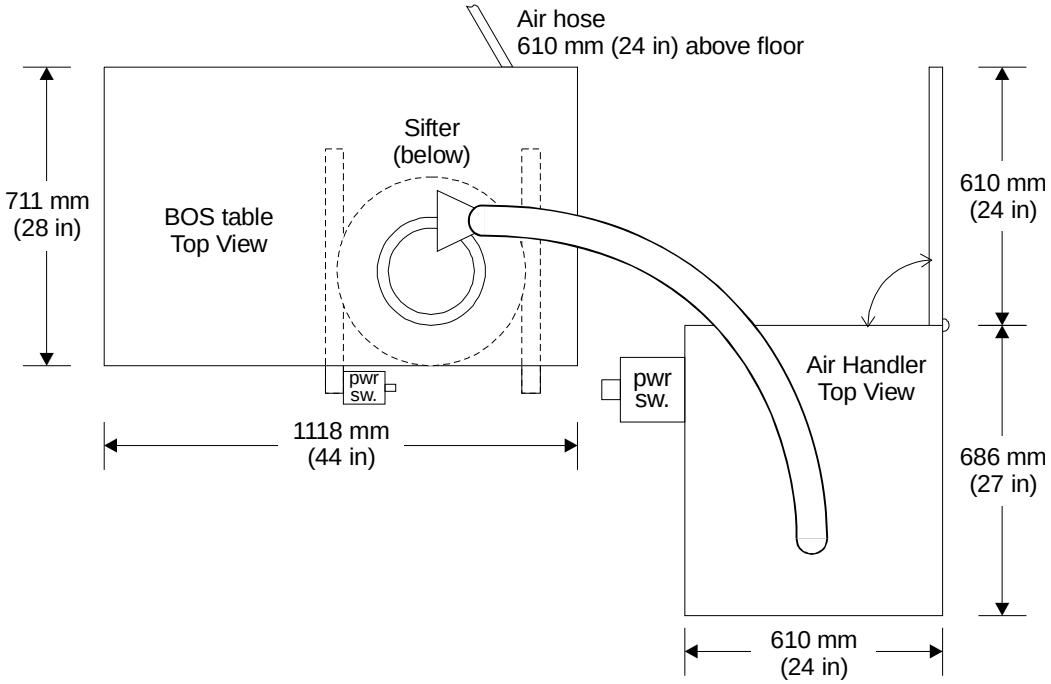
Grounding Requirements

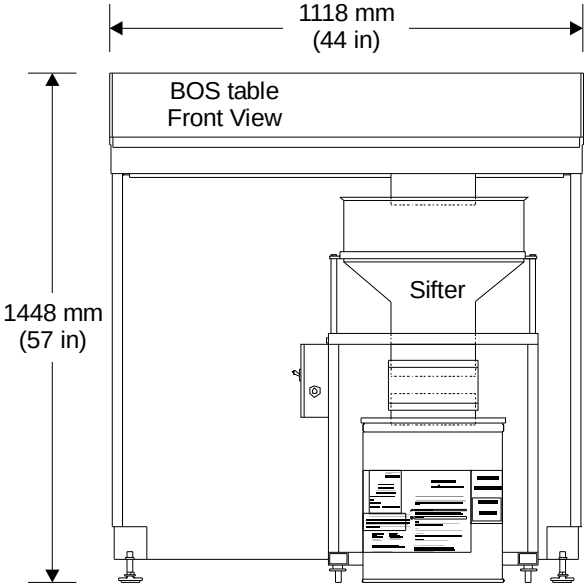
See“Grounding Requirements” on page 34

Part Finishing Equipment Dimensions and Weights

See“System Component Weights and Dimensions” on page 50.

BOS, Sifter, and Air Handler Dimensions





Front view of BOS table showing sifter under the BOS table.
(Air handler also shown on the right side of the photo below.)

BOS Component Purchasing Information

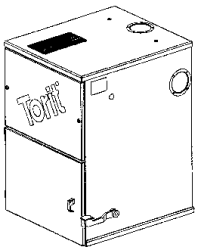
This section provides purchasing information for the following third-party 3D Systems BOS components:

- Standard volume sifter
- High volume sifter (optional)
- Air handler

3D Systems supplies the BOS table (part number 9201-20681).

Standard volume sifter

High volume sifter



Air handler

Standard Volume Sifter Purchasing Information

Standard Volume Sifter (U.S. and Asia Pacific)		
3D Systems Part Number	9201-20683	
3D Systems Stocked Item	Yes	
Specifications/ Requirements	Dimensions (W x D x H)	(61 x 102 x 86) cm (24 x 40 x 34) in
	Weight	34 kg (75 lb)
	Sifting rate	> 2.9 kg (6.5 lb)/min (Duraform PA)
	Screens	One 70 TBC and one 94 TBC
	Facility power	220/240 VAC, single phase, 50/60 Hz, 1.4 A (15% reduction at 50 Hz)
Features	Four casters Power switch and 3 m (10 ft) power cord without plug	
Warranty Information	One year	
Notes	This sifter fits under the 3D Systems BOS table. Contact 3D Systems for replacement screens.	

Standard Volume Sifter (Europe)		
3D Systems Part Number	4100-03153	
3D Systems Stocked Item	No	
Specifications/ Requirements	Dimensions (W x D x H)	(45 x 45 x 45) cm (18 x 18 x 18) in
	Weight	12 kg (26 lb)
	Sifting rate	> 2.9 kg (6.5 lb)/min (Duraform PA)
	Screens	One 70 TBC and one 94 TBC
	Facility power	230 VAC, single phase, 50 Hz
Warranty Information	One year	
Notes	This sifter fits under the 3D Systems BOS table, on top of the standard DuraForm PA and DuraForm GF pail Contact 3D Systems for replacement screens.	

High Volume Sifter Purchasing Information

High Volume Sifter		
3D Sys. Part Number	9201-20529	
3D Sys. Stocked Item	No	
Lead Time	42 Days	
Specifications/ Requirements	Dimensions	Height: 122 cm (48 in) Diameter: 53 cm (21 in)
	Weight	136 kg (300 lb)
	Sifting rate	> 7 kg (15.5 lb)/min (Duraform PA)
	Screens	One 70 TBC and one 94 TBC
	Facility power	220/240 VAC, single phase, 50/60 Hz, 7.5 A (15% reduction at 50 Hz)
Features	Brush assembly for screen deblinding Four casters Removable feed lid	

High Volume Sifter (continued)	
Warranty Information	One year
Notes	This is a stand-alone sifter. It does not fit under the 3D Systems BOS table. Order 3D Systems adapter kit 9201-20526 with this sifter for easier powder handling. Contact 3D Systems for replacement screens.

Air Handler Purchasing Information

Air Handler: U.S. and Asia Pacific		
3D Sys. Part Number	4100-03595	
3D Sys. Stocked Item	Yes	
Specifications/ Requirements	Dimensions (W x D x H)	(66 x 71 x 91) cm (26 x 28 x 36) in
	Facility power	220/230 VAC, single phase, 50/60 Hz, 1.4 A (17% power loss with a 30% static pressure drop at 50 Hz)
	Motor	0.75 hp
	Air volume	14.2 m^3/min (500 cfm) per inlet 10 cm (4 in) inlet
Features	Starter switch Snorkel tube Four casters 3 m (10 ft) power cord without plug	
Warranty Information	One year	

Air Handler: Europe		
3D Sys. Part Number	9100-20200-EUR	
3D Sys. Stocked Item	Yes	
Specifications/ Requirements	Dimensions (crated) (W x D x H)	(115 x 115 x 195) cm (45 x 45 x 77) in
	Dimensions (actual) (W x D x H)	(66 x 71 x 91) cm (26 x 28 x 36) in
	Weight	160 kg (353 lb)
	Facility power	400 VAC, single-phase, 50 Hz, 16 A
	Motor	0.75 hp
	Air volume	14.2 m^3/min (500 cfm) per inlet 10 cm (4 in) inlet
Features	Starter switch Snorkel tube Four casters 3 m (10 ft) power cord without plug	
Warranty Information	One year parts and service, except for shipping cost (Europe only)	

Bead Blaster

A glass “bead blaster” (pneumatic abrasive blast cabinet) is very useful for cleaning sintered DuraForm and LaserForm parts. It requires an 5.5 bar (80 psi) compressed air line and a 110 VAC/60 Hz power source (U.S. and Asia Pacific version; shown at right) or 240 VAC/50 Hz power source (European version).

Pneumatic abrasive blast cabinet (“bead blaster”)

Bead Blaster Purchasing Information

Bead Blaster		
3D Sys. Part Number	9201-20695 (U.S. and Asia Pacific)	
3D Sys. Stocked Item	No	
Lead Time	14 days	
Specifications/ Requirements	Overall dimensions (W x D x H)	(66 x 102 x 160) cm (26 x 40 x 63) in
	Weight	68 kg (150 lb)
	Facility power (U.S. and Asia Pacific)	110 VAC, single phase, 60 Hz, 6 A
	Facility power (Europe)	240 VAC, single phase, 50 Hz, 2 A
	Facility compressed air	5.5 bar (80 psi)
	Glass bead media	3D Systems part no. 4100-01380: 23 kg (50 lb) bucket of Potter Industries medium glass beads (Grainger # 2W580), US sieve 70-140
Warranty Information	One year	

LaserForm Oven

See the “Facilities” section in the *LaserForm Oven Guide* (DCN 8002-20031).

CastForm Forced Convection Oven

This section provides specifications and purchasing information for the SandForm/ CastForm Forced Convection Oven manufactured by the Lindberg / Blue M division of Cole-Parmer Instrument Co.

3D Systems recommends this oven for curing SandForm parts and infiltrating CastForm parts. It is available in a 110 VAC 60 Hz or 240 VAC 50/60 Hz model.

Forced convection oven for CastForm materials. (U.S. and Asia Pacific Only)

NOTE The Forced Convection Oven is not CE-approved.

CastForm Forced Convection Oven Purchasing Information

Forced Convection Oven, 110 VAC, single phase, 60 Hz		
3D Systems Part Number	5300-03146	
3D Systems Stocked Item	No	
Lead Time	30 days	
Specifications/ Requirements	Overall dimensions (W x D x H)	(91 x 58 x 123) cm (36 x 23 x 48) in
	Chamber dimensions (W x D x H)	(56 x 41 x 64) cm (22 x 16 x 25) in
	Capacity	0.14 m^3 (5.0 ft^3)
	Weight	133 kg (294 lb)
	Facility power	110 VAC, single phase, 60 Hz, 17.5 A
	Temperature range	(40 to 300) °C (104 to 572) °F
	Uniformity	± 1.0 °C at 200 °C (± 1.8 °F at 392 °F)
Features	Double wall construction Single set point–programmable	
Warranty Information	One year	

Forced Convection Oven, 240 VAC, single phase, 50/60 Hz (with step-down transformer 3D Systems part no. 5600-03670)		
3D Systems Part Number	9201-20711[1]	
3D Systems Stocked Item	No	
Lead Time	30 days	
Specifications/ Requirements	Overall dimensions (W x D x H)	(91 x 58 x 123) cm (36 x 23 x 48) in
	Chamber dimensions (W x D x H)	(56 x 41 x 64) cm (22 x 16 x 25) in
	Capacity	0.14 m^3 (5.0 ft^3)
	Weight	133 kg (294 lb)
	Facility power	240 VAC, single phase, 50/60 Hz, 8.8 A
	Temperature range	(40 to 300) °C (104 to 572) °F
	Uniformity	± 1.0 °C at 200 °C (± 1.8 °F at 392 °F)
Features	Double wall construction Single set point–programmable	
Warranty Information	One year	

1. This assembly must be ordered if your facility requires 240 VAC.

Safety

Following the safety recommendations and guidelines in this chapter when preparing your facility for Sinsterstation installation.

General Operator Safety Information

Before using the sPro 60 SLS Center, 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 sPro 60 SLS Center.
- 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 sPro 60 SLS Center 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 sPro 60 SLS Center in a room that meets or exceeds the recommended room specifications. See "Atmosphere Requirements" on page 29.

Nitrogen Venting

Nitrogen must be vented from the process station by a ¾-inch diameter NPT pipe fitting with an exhaust pressure of less than 25.4 mm H_2O (1.00 inches H_2O). See “Nitrogen Supply and Exhaust Lines” on page 41 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 +1-800-999-5553 if you wish to obtain copies of the Industrial Hygiene Surveys and MSDSs for the SLS materials you use.

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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 sPro 60 SLS Center process station and BOS air handler. These values assume that the input power levels for the process station and air handler are both within specifications.

NOTE 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.

sPro 60 SLS Center Process Station Sound Levels	**Powder loading[1]**	**Building parts[2]**
A-weighted sound power level	< 70 dB	< 70 dB
A-weighted emission sound pressure level at the operator's position	< 70 dB	< 70 dB

1. Two feed pistons and one part piston moving simultaneously
2. Roller movement

BOS Air Handler (Torit Model) Sound Levels	**Operating**
A-weighted sound power level	69 dB

Laser Safety

Using a laser may cause accidental exposure to radiation. This section discusses safety precautions to guard against exposure during sPro 60 SLS Center operation.

Laser Classes

The sPro 60 SLS Center contains a 30W or 70 W CO_2 continuous-wave laser. The sPro 60 SLS Center is a Class 1 laser product that complies with the Federal Laser Product Performance Standard.

Class	Explanation[1]
Class 1	Any laser, or laser system containing a laser, that cannot emit accessible laser radiation levels in excess of the Class Accessible Emissions Limit (AEL) for the maximum possible duration inherent in the design or intended use of the laser or laser system. For the CO_2 laser the AEL is $\leq 9.6 \times 10^{-3}$.
Class 4	Ultraviolet and infrared lasers and laser systems which emit an average accessible radiant power in excess of 0.5 W for periods ≤ 0.25 s or produce a radiant energy > 0.125 J within an exposure time of < 0.25 s.

1. Information taken from the American National Standard Z136.1-2000

Laser Precautions

3D Systems recommends the following laser safety precautions:

- All operators should attend a training class for the sPro 60 SLS Center.
- Only fully qualified and experienced 3D Systems personnel trained in laser safety may perform service procedures.
- Anyone in the controlled area during service must wear the appropriate safety glasses.
- When service is in progress, warning signs must be posted.
- Operators must follow all other safety procedures outlined in the *sPro 60 SLS Centers User's Guide* (DCN 8002-00001).

3D Systems Laser Service Procedures

This section discusses safety precautions that protect you from accidental radiation exposure while servicing the sPro 60 SLS Center.

Laser Service Procedures

When 3D Systems personnel service the laser, they use the following standards and any state and local safety regulations that are appropriate for your facility.

US and Japan:	ANSI Z136.1-2000 section 4.3.1.1
Germany:	tDIN VDE 0837/02.86 + A1/07.90

During normal operation or maintenance, an operator must not override interlocks and expose the laser beam outside the cover containment. However, certified service personnel will occasionally need to perform alignment or focus adjustments that will put the laser in a Class 4 circumstance. When this occurs, certified service personnel will follow the procedures outlined below:

The area, called the Nominal Hazard Zone (NHZ), must be secured such that entry is limited, and exiting is in no way restricted. If you place the sPro 60 SLS Center in an area that cannot be secured, your company must provide laser safety curtains. (See “Laser Safety Curtains or Partitions” on page 9.)

- Notice signs that say **Laser Service In Progress—Eye Protection Required** are to be placed at each entrance to the room.
- All personnel in the area must be notified that laser service procedures will be performed and instructed to wear safety glasses (ANSI Z87; DIN 58215/01.86 and DIN 58219/02.86).

  The CO_2 laser wavelength does not travel through glass and will create a visible indication on polycarbonate; therefore, industrial safety glasses (either glass or polycarbonate) provide adequate eye protection. Your company must provide safety glasses for personnel.

If your company’s safety requirements are more extensive (for example, a red light turned on during laser servicing), you must provide the additional equipment. Certified service personnel will comply with all customer safety requirements.

Powder Safety

This section discusses procedures you must follow to prevent a safety hazard when using fine powders. All powders provided by 3D Systems are generally safe during normal operations and when used in accordance with the procedures described in the MSDS for each material. 3D Systems supplies the MSDS's with each material ordered. Additional MSDS's are available from 3D Systems Customer Support.

The primary safety concerns with SLS powder materials are the potential for a dust explosion and the inhalation of the powders.

Powder Hazards

- Any airborne dust or fine powder (such as flour or grain dust) can become explosive when ignited under the right conditions.
- The SLS powders are considered nuisance dust and may cause irritation to the respiratory tract.
- Skin contact with the powders can cause irritation to the skin (dermatitis); an allergic reaction, a rash or excessively dry skin.
- Spilled powder can cause the floor to become slippery.

Safe Powder Handling

Read the appropriate MSDS before handling any powder.

When handling powder, you should observe the following general precautions:

1. Avoid the dispersion of dust into the air and dust accumulation to minimize the potential for explosions and inhalation. Follow good industrial hygiene practices and exercise care when dumping bags, sweeping, mixing or doing other task which might create dust.
2. Avoid or remove all ignition sources (flames, electrical and/or static sparks).
3. Work in a well-ventilated area to avoid breathing the powdered materials. In normal operations, dust mask (respirators) are not required when handling SLS powder materials. "Normal operations" mean operations in an environment where the dust and particulates in the air do not exceed accepted standards (refer to the MSDS). For conditions where exposure to dust is apparent, a NIOSH approved respirator (type N95 particulate) should be worn.
4. Avoid contact with eyes, skin, and clothing.

5. Clean up powder spills immediately. Vacuum the dry powder with internally and externally explosion-proof vacuum equipment or wet mop.

Practice good industrial housekeeping and ventilation procedures to minimize powder safety hazards.

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 powders 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:

- *NFPA 654: Standard for the Prevention of Dust Explosions in the Plastics Industry*, published by the National Fire Protection Association (Volume 5 of the National Fire Code). This is available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.
  Tel: +1-202-783-3238.
- DIN EN 26184 Teil 1/06.91

Electrical Safety

Electrical shock is a danger when using or servicing an electric machine. This section explains how to protect yourself from this danger when using or servicing the sPro 60 SLS Center.

During normal operation of the sPro 60 SLS Center, the operator is not exposed to electrical shock hazards.

During some service and maintenance procedures—and during a power loss—the sPro 60 SLS Center can potentially cause an electrical shock even if the high voltage panel is turned off. This danger exists because the sPro 60 SLS Center may contain an optional battery-powered uninterruptible power supply.

To protect yourself from electrical shock, see the safety guidelines in the *sPro 60 SLS Centers User's Guide* (DCN 8002-00001) and follow any local and departmental electrical safety procedures.

Nitrogen/Oxygen Safety

Using nitrogen causes a threat of oxygen displacement. This section explains oxygen displacement and how to ensure that the sPro 60 SLS Center does not pose a hazard.

To eliminate the possibility of powder combustion during the sintering process, the sPro 60 SLS Center uses nitrogen to make the atmosphere of the process chamber inert. Displacement of the oxygen in a room is possible if excessive nitrogen leaks into the room from the process chamber or nitrogen lines.

To address this possibility, an external machine shutdown signal port is located on the sPro 60 SLS Center. This port enables installation of a room oxygen monitor that automatically implements a shutdown sequence when oxygen levels in the room trigger the alarm.

Even at the maximum displacement, oxygen content in a normally vented room (four air changes per hour) should never fall below 18 percent. The following table lists different concentrations of oxygen in the atmosphere and explains the potential effects and symptoms.

Effects & Symptoms of Oxygen-Deficient Atmosphere[1]	
15 - 19%	Decreased ability to work strenuously. May impair coordination or may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12 - 14%	Increases respiration during exertion. Pulse rate goes up. Experience impaired coordination, perception, and judgment.
10 - 12%	Respiration continues to increase in rate and depth. Lips become blue. May lose consciousness at this point.
8 - 10%	Mental failure. Fainting and unconsciousness. Face becomes ashen, lips become blue, accompanied by nausea and vomiting.
6 - 8%	100% fatal after 8 minutes of exposure; 50% fatal within 6 minutes. Recovery with treatment within 4 to 5 minutes.
4 - 6%	Coma within 40 seconds, convulsions, respiration ceases, death occurs.

1. From Safety Bulletin SB-2—1983 ©1983 by the Compressed Gas Association, Inc. 1235 Jefferson Davis Highway, Arlington, VA 22202. (Is this current?)

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

- The room oxygen monitor must be functional and calibrated.
- The room oxygen monitor alarm should be set with the previous effects and symptoms in mind.
- The room oxygen monitor alarm must be audible when in the alarm state.
- All personnel have received nitrogen/oxygen safety training.
- The room must be well ventilated.
- Check with your local fire department regarding applicable fire safety codes.

Optional Safety Equipment

3D Systems recommends you use the following optional safety equipment with the sPro 60 SLS Center:

- Room area oxygen monitor (below)
- Non-ignition vacuum cleaner (page 77)

- Laser safety curtains (page 78)
- 1.5 m (5 ft) platform ladder for installation and service
- Anti-static mats for the floor around the process station and the BOS

Room Area Oxygen Monitor

Because nitrogen is used to create an inert environment in the process station, 3D Systems recommends that you purchase and install an external oxygen monitor with a single channel controller and a sensor module.

- Single channel controller
  Model #4001-11
- Sensor Module
  Model #4101-03

At installation, your 3D Systems CSE can wire your oxygen monitor to the process station's power shutoff safety interlock. The safety interlock will switch off power to the process station if the concentration of oxygen in the room drops below the safe level. (The safety interlock has a contact rating of 10 A.)

Non-ignition Vacuum Cleaner

3D Systems strongly recommends you use a non-ignition vacuum cleaner to clean powder from the sPro 60 SLS Center, part finishing equipment, and the surrounding area. A “non-ignition” model is required due to the potential combustibility of airborne powder.

Non-ignition vacuum cleaner

Non-ignition Vacuum Purchasing Information

3D Sys. Part Number	4100-03730 (U.S. and Asia Pacific only)	
3D Sys. Stocked Item	Yes	
Specifications/ Requirements	Dimensions	Height: 91 cm (36 in) Diameter: 51 cm (20 in)
	Weight	32 kg (70 lb)
	Facility power	115 VAC, single phase, 60 Hz, 1550 W
	Tank size	57 L (15 gal)
	Air flow	3.3 m^3/min (115 cfm)
Features	38 mm x 254 mm (1.5 in x 10 in) grounded plastic hose 38 mm x 432 mm (1.5 in x 17 in) machinery cleaning nozzle Filter protectors (package of 12) Vacuum bags (package of 10)	
Warranty Information	One year	

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, C-83905-01-DTM, the source must be 115 VAC, single phase, 60 Hz.

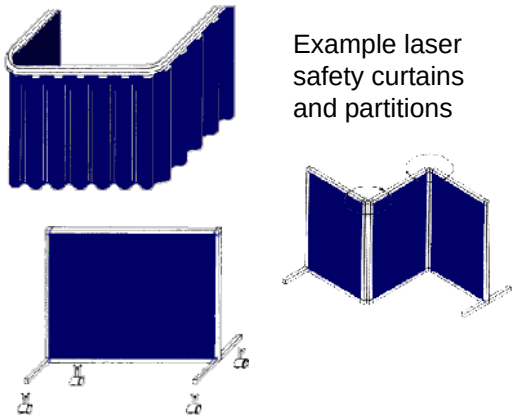
WARNING

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 sPro 60 SLS Center.

Laser Safety Curtains or Partitions

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

If the sPro 60 SLS Center is in an area that cannot be secured during laser calibration, install laser safety curtains or partitions.



Example laser safety curtains and partitions

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

Laser Safety Curtains or Partitions Purchasing Information

3D Systems Stocked Item	No
Supplier	KENTEK Corporation
Phone	1-800-432-2323 (U.S.) +1-603-435-5580 (outside U.S.)
Fax	+1-603-435-7441
Address	19 Depot Street, Pittsfield, NH 03263, USA
Internet Address	www.kentek-laser.com

Contacting 3D Systems

For Customer Support

U.S.: +1 800-999-5553

Europe: +49 6151 357 452

Asia Pacific: +65 430-6681

About this Manual

3D Systems strives to constantly improve the sPro 60 SLS Center and this guide. Your corrections and suggestions concerning this document should be addressed to:

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Revision History

DCN 8002-20001: sPro 60 SLS Centers Site Preparation Guide		
Revision	**Release Date**	**Comments**
000	June 2009	Initial release

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