



## USER'S GUIDE



### for InVision Finisher models

	Voltage	Heater Power	Current	Frequency	Phase
<b>InVision Finisher 1-A</b>	120 VAC	1200 W	11.6 A	60 Hz	1
<b>InVision Finisher 1-B</b>	240 VAC	1200 W	5.8 A	50 Hz	1

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23400-M03-00, Rev. A



**NOTICE – Users of this equipment must comply with operating procedures and training of operation personnel as required by the Occupational Safety and Health Act (OSHA) of 1970, Section 6 and relevant safety standards, as well as other safety rules and regulations of state and local governments. Refer to the relevant safety standards in OSHA and National Fire Protection Association (NFPA), section 86 of 1990.**



**Setup and maintenance of the equipment should be performed by qualified personnel who are experienced in handling all facets of this type of system. Improper setup and operation of this equipment could cause an explosion that may result in equipment damage or severe injury.**



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# Preface

This *User's Guide* helps you get started using your 3D Systems' InVision™ Finisher safely and quickly. It tells you what you need to know before you start, such as facility requirements, descriptions of Finisher functions, and safety guidelines. Then, when you're ready to begin, it gives you step-by-step instructions for operating and troubleshooting the Finisher.



**For your own safety and the safety of others, you need to understand how the Finisher works. Read the “Introduction” and “How the Finisher Works” before you install it. Then, as you learn to use the Finisher, read the guide carefully and follow the safety warnings and guidelines. Failure to heed the safety warnings in this guide or labeled on the InVision Finisher could cause equipment damage or severe injury.**

## About This Guide

This guide will help you:

- Prepare your facility for InVision Finisher installation
- Understand how the InVision Finisher works
- Properly unpack and set up your Finisher
- Learn how to operate and properly maintain the Finisher
- Learn the part finishing methods you can perform with the Finisher
- Troubleshoot your Finisher if any problems arise

For best results, read this guide along with the **VisiJet Material Handling Guide** (p/n 23080-M01-00), and follow the step-by-step operating instructions in the **InVision 3-D Printer System User's Guide** (p/n 23400-M10-00). If you are new user, you should read all three guides before you start printing VisiJet parts on your InVision printer.



**For InVision 3-D printer system installation and operating safety instructions, see your **InVision 3-D Printer Facility Requirements Guide** (p/n 23400-M05-00) and **InVision 3-D Printer System User's Guide** (p/n 23400-M10-00).**

## Other Useful Documentation

This comprehensive **InVision Finisher User's Guide** and the quick-reference **InVision Finisher Operator's Guide** booklet are part of the InVision 3-D printer system documentation set. The complete set is available in electronic format in the \Documentation folder of your InVision 3-D Printer Software CD (except for the InVision Client online Help, which you access through the InVision Client software).

### VisiJet material documentation

**VisiJet Material Handling Guide** - The **Material Handling Guide** (p/n 23080-M01-00) provides the information you need to safely manage your inventory of VisiJet material for the InVision 3-D printer. It also provides valuable application and printer operating tips, part finishing instructions, and troubleshooting information to help you build robust and aesthetically pleasing parts with VisiJet material.

**Accura VisiJet Material Safety Data Sheets (MSDS's)** – These are online copies of the printed **VisiJet model material MSDS** and **VisiJet support material MSDS** that ship with VisiJet materials. Make sure everyone in your facility who handles VisiJet materials reads these MSDS's and follows the safety guidelines in them. To order extra copies of these MSDS's, request 3D Systems document part numbers 23080-S01-01 (VisiJet M-100) or 23126-S01-02 (VisiJet S-100).

**VisiJet material part finishing movie clips** – four .mpg movies (clip 1, 2, 3, and 4) that demonstrate part breakout and finishing techniques. See the part finishing section of the **InVision 3-D Printer User's Guide** for instructions related to these clips.

### InVision Printer and InVision Client software guides

**InVision 3-D Printer Facility Requirements Guide** – You received this guide before your InVision printer was installed. A pdf copy is also on your InVision 3-D Printer Software CD for reference.

**InVision 3-D Printer System User's Guide** - The **User's Guide** provides the instructions you need to create finished parts made of VisiJet materials using the InVision 3-D printer system. See the **User's Guide** for complete information on InVision printer safety, setup, operation, maintenance, and troubleshooting. You will also find some VisiJet material information detailed in this guide mentioned in the **User's Guide** when it affects how you use your InVision printer.

**InVision 3-D Printer Operator's Guide** - This pocket-size booklet is included in your InVision 3-D printer accessory kit. Use the velcro tape in your kit to mount this booklet on or near your InVision printer for quick reference to basic part printing procedures. To order extra copies of this booklet, request 3D Systems document part number 23400-M01-00.

**InVision Client online Help** – Run the InVision Client software, then select **Help > Help Topics** in the 3-D Printers window or the 3-D Print Preview window to launch the InVision Client online Help. The online Help provides detailed instructions on how to use the InVision Client software to setup, run, and manage print jobs.

## Getting Help

If you have any questions or problems regarding your InVision Finisher, VisiJet materials, or your InVision 3-D printer, please contact our Customer Support Hotline at:

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

## Contacting 3D Systems

At 3D Systems, we work to continually improve our solid imaging systems, materials, and services. Evaluating and acting on your feedback is a critical part of our effort.

We encourage you to contact us with any suggestions for improvement, corrections, or general comments you might have regarding this guide, the InVision Finisher, VisiJet material, or your InVision 3-D printer system.

You can reach us worldwide in any of the following ways:

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# Introduction

The InVision Finisher models 1-A and 1-B have the most effective heat distribution and fastest processing time of any lab ovens their size. Heated air is forced through ducts on both sides of the oven, circulates throughout the chamber, then returns through the heater cover.

## Special Features

Sturdy construction and high-grade insulation contribute to the Finisher's excellent high-temperature performance. Other special features include:

- Digital temperature controller ("TEMP CONTROL") to control temperature fluctuations
- Digital high-temperature limit controller ("HI LIMIT control") with manual reset to protect VisiJet parts in the chamber, as well as the Finisher itself
- Unique chamber design that forces circulated air through side ducts for the ultimate in temperature performance
- Welded double wall construction and fiberglass insulation to reduce heat loss
- Silicone rubber gaskets to further minimize heat leakage
- Rapid response heater
- Scratch-resistant baked enamel exterior and stainless steel interior for easy cleaning
- Space-saving design

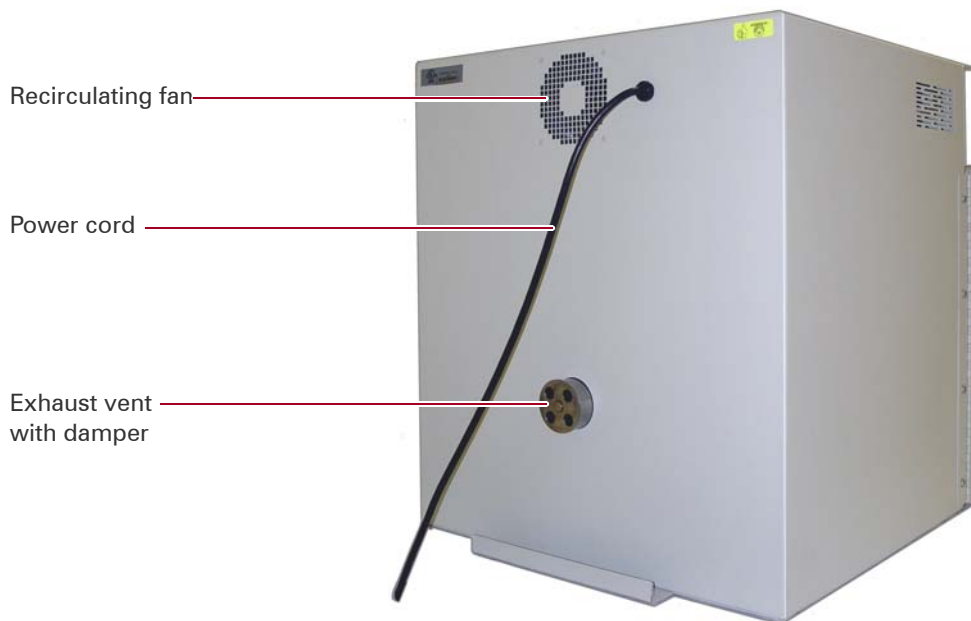
## InVision Finisher Quick Tour



InVision Finisher – front exterior



**InVision Finisher – interior chamber**



**InVision Finisher – rear exterior**





# Facility Requirements

Use the information in this section to prepare your facility for the InVision Finisher.

**i** InVision Finisher models 1-A and 1-B have different electrical specifications, but their dimensions, capacities, and temperature specifications are the same.

## Dimensions

	Width	Depth	Height	Weight
<b>Crated (U.S.A.)<sup>1</sup></b>	86 cm (34 in)	91 cm (36 in)	118 cm (46.5 in)	93 kg (205 lb)
<b>Crated (international)<sup>1</sup></b>	84 cm (33 in)	81 cm (32 in)	86 cm (34 in)	118 kg (260 lb)
<b>Uncrated</b>	61 cm (24 in)	62 cm (24.5 in)	66 cm (26 in)	63 kg (140 lb)

1. Approximate nominal values and subject to change without notice. Includes shipping pallet.

<b>Chamber</b>	46 cm (18 in)	46 cm (18 in)	30 cm (12 in)
<b>Shelf</b>	38 cm (15 in)	36 cm (14 in)	
<b>Shelf (usable area)</b>	28 cm (11 in)	30 cm (12 in)	
<b>Tray</b>	34 cm (13.5 in)	32 cm (12.75 in)	10 cm (4 in)

## Capacities

<b>Chamber volume</b>	65 L (2.3 ft <sup>3</sup> )
<b>Usable height above shelf</b>	19 cm (7.5 in)
<b>Shelf load</b>	9 kg (20 lb)
<b>Tray load, full<sup>1</sup></b>	10 kg (22 lb)
<b>Tray load, max.<sup>2</sup></b>	7 kg (16 lb)
<b>Exhaust flow</b>	0.62 m <sup>3</sup> /min (22 CFM)
<b>Fan flow</b>	4.25 m <sup>3</sup> /min (150 CFM)

1. Tray filled to the rim with VisiJet support material and/or dip-finishing wax.
2. Tray filled to the recommended maximum depth; approximately  $\frac{3}{4}$  full.

## Electrical Specifications

### Electrical ratings

The InVision Finisher is UL and C-UL rated for shipments in the United States and Canada. It is also CE-compliant for shipments within the European Union.

### Power requirements



**Line voltages can vary by location. If your line voltage is lower than the Finisher's nameplate voltage rating, warm up time will be longer and motors may overload or run hot. If your line voltage is higher than the nameplate rating, the motor may run hot and draw excessive current. Also If your line voltage varies more than 10% from the Finisher's nameplate rating, electrical components such as relays and temperature controls may operate erratically.**

Model	Voltage	Current	Freq.	Phase	Heater Power	Cord and Plug
1-A	120 VAC	11.6 A	60 Hz	1	1200 W	Included; 15 A
1-B	240 VAC	5.8 A	50 Hz	1	1200 W	Included; 10 A

The 240-volt InVision Finisher model 1-B will operate satisfactorily on a minimum of 208 V, but with a 25% reduction in heater power. If you have a model 1-B and your line voltage is lower than 208 V, contact [3D Systems Customer Support](#).

## Temperature Specifications



Temperature specifications that exceed what is required for VisiJet support material removal are included here for reference only.

Specification	Temperature Range		Time
	°C	°F	
Time to temperature <sup>1</sup>	25 °C to <b>(70 - 75) °C</b>	77 °F to (158 - 167) °F	7 min
	25 °C to 100 °C	77 °F to 212 °F	12 min
	25 °C to 150 °C	77 °F to 302 °F	20 min
	25 °C to 204 °C	77 °F to 399 °F	35 min
Recovery time <sup>1</sup> (door open 1 min)	<b>(70 - 75) °C</b>	(158 - 167) °F	45 seconds
	100 °C	212 °F	2 min
	150 °C	302 °F	4 min
	204 °C	399 °F	6 min
<b>Operating range (for VisiJet support material removal)</b>	<b>70 °C to 75 °C</b> at 20 °C ambient	<b>158 °F to 167 °F</b> at 68 °F ambient	
Operating range (maximum)	30 °C to 204 °C at 20 °C ambient	86 °F to 399 °F at 68 °F ambient	
Temperature control stability	± 0.5 °C	± 0.9 °F	

1. Time to temperature and recovery times are based on 240 VAC, 60 Hz operation with an empty chamber. Actual results may vary slightly depending on model, chamber load, and operating conditions.

## Accessory Kit Contents

Each InVision Finisher ships with an accessory kit that includes the following items:

- One pair of insulated PVC-coated gloves
- One pair cushion-tip 23.5 cm (9.25 in) stainless steel tongs
- One 90-count box of paper wipes (Kimberly-Clark Kaydry EX-L or equivalent)
- One 20-count package of 30 cm x 30 cm (12 in x 12 in) absorbent drip pads
- One 34 cm (13.5 in) x 32 cm (12.75 in) x 10 cm (4 in) stainless steel tray for **dip-finishing**
- One 38 cm (15 in) x 36 cm (14 in) shelf (sits on top of tray) for **dry finishing**
- *InVision Finisher User's Guide*
- *InVision Finisher Operator's Guide* (multi-language quick-reference booklet)

InVision Finishers shipped outside the U.S. also include a country-specific power cord.

## Pre-Installation Checklist

✓ **Read this *User's Guide***

Read this guide carefully. Make use of its instructions and explanations. Safe, continuous, satisfactory, trouble-free operation depends primarily on how well you understand and maintain the Finisher.

✓ **Verify line voltage**

Your facility's line voltage must correspond to the voltage shown on the Finisher's nameplate. See **Power requirements** on page 6.

✓ **Verify clearance**

You need at least 8 cm (3 in) of clearance at the Finisher's sides, and 5 cm (2 in) clearance at the rear of the Finisher to ensure adequate air circulation, component cooling, and effective temperature control. Take special care to not block the openings on the sides and rear of the Finisher.

✓ **Verify Finisher stand or bench load stability and capacity**

The table, bench, or stand you place the Finisher on must be stable, level, and able to support 78 kg (172 lb), the weight of the Finisher plus a full tray of VisiJet support material and 9 kg (20 lb) of VisiJet parts on the shelf.





# How the Finisher Works

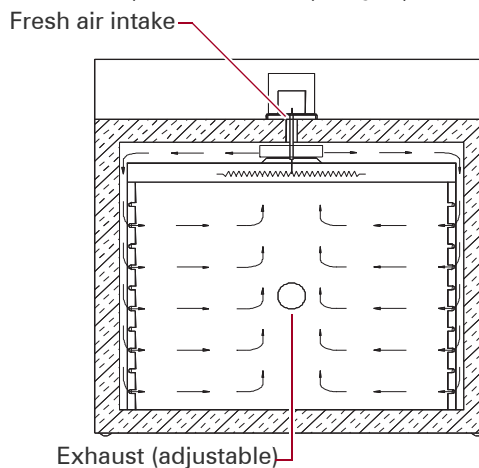
The InVision Finisher makes removing bulk support material from VisiJet parts efficient and easy. Forced airflow and precision temperature control deliver faster, shorter, and more predictable VisiJet part finishing times.

## Temperature stability

The InVision Finisher design moves convected heat through stainless steel ducts on each side of the oven chamber. A high-volume fan circulates air. The temperature in the Finisher chamber is always within  $\pm 0.5^{\circ}\text{C}$  ( $\pm 0.9^{\circ}\text{F}$ ) of the control setpoint shown on the TEMP CONTROL display given a normal chamber load with sufficient air flow.

## Adjustable exhaust damper

A damper on the back of the Finisher also helps keep the chamber temperature constant in the operating range required for VisiJet part finishing. Open the damper fully to maintain constant temperature in this  $70^{\circ}\text{C}$  to  $75^{\circ}\text{C}$  ( $158^{\circ}\text{F}$  to  $167^{\circ}\text{F}$ ) range. (The fresh air intake is not adjustable.)



**Forced circulating airflow in the InVision Finisher**

## How the TEMP CONTROL Works

The job of the Finisher's TEMP CONTROL is mainly to...

- Run the heater at full power during warmup
- Cycle the heater on and off as the temperature nears the control setpoint to minimize thermal fluctuation

Use the TEMP CONTROL panel (shown below) to do the following:

- View the actual temperature inside the chamber. The actual temperature is displayed when all LEDs on the TEMP CONTROL panel are off.
- View and change the Finisher's TEMP CONTROL setpoint. The setpoint is displayed when the **SP** LED on the TEMP CONTROL panel is on. (See [TEMP CONTROL panel features and functions](#) on page 11.)

**i** 3D Systems recommends a TEMP CONTROL setpoint between 70 °C and 75 °C (158 °F and 167 °F).

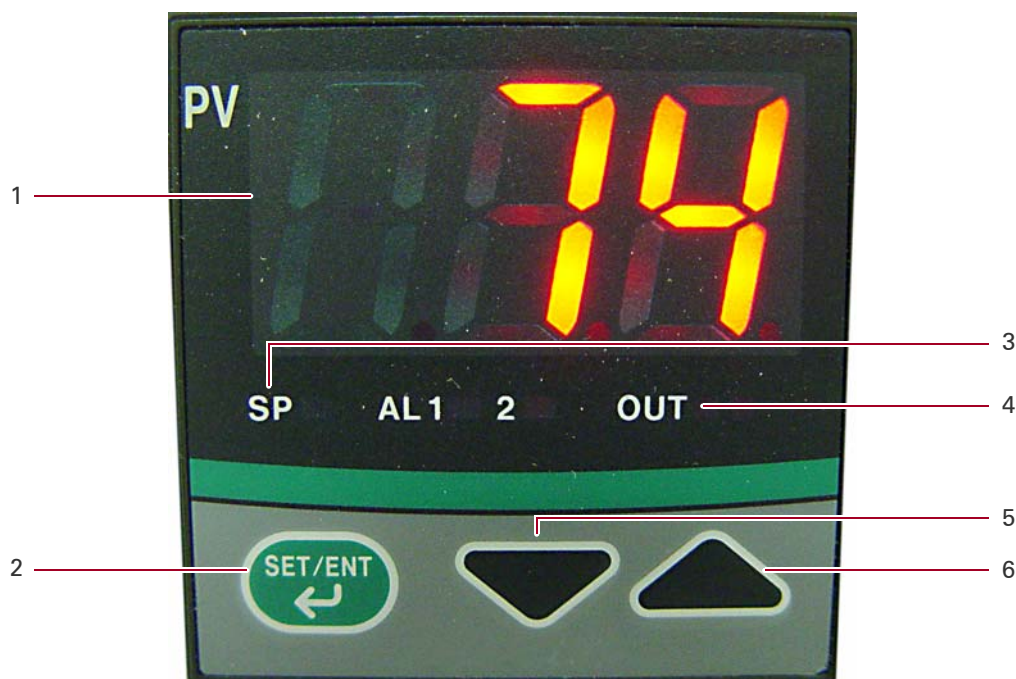
To ensure good support material liquid flow, this setpoint is above the VisiJet support material melting point of 55 °C to 65 °C (131 °F to 149 °F). However, it is not hot enough to deform the part or cause it to shrink excessively when it cools.

- Monitor when the TEMP CONTROL is switching the heater on or off.

TEMP CONTROL panel



TEMP CONTROL on the Finisher control panel



### TEMP CONTROL panel features and functions

Feature		Function
1	Display	Shows either the actual chamber temperature or the TEMP CONTROL setpoint (when you press <b>SET/ENT</b> ). <b>❗ The actual temperature display will fluctuate a few degrees around the TEMP CONTROL setpoint though the overall chamber temperature is stable. This is because the display is showing temperature fluctuations at the temperature sensor location, not the overall chamber temperature.</b>
2	<b>SET/ENT</b> key	Switches the display between actual temperature and setpoint ( <b>SP</b> LED on). You can change the setpoint by pressing <b>▲</b> or <b>▼</b> , then save it by pressing <b>SET/ENT</b> .
3	<b>SP</b> LED	Lights when the TEMP CONTROL setpoint is displayed
4	<b>OUT</b> LED	Lights when the TEMP CONTROL is calling for heat
5	<b>▼</b> key	Decreases the setpoint when <b>SP</b> LED is lit
6	<b>▲</b> key	Increases the setpoint when <b>SP</b> LED is lit

## How the HI LIMIT Control Works

The Finisher's HI LIMIT control switches the heater off automatically if the chamber exceeds the HI LIMIT setpoint. You can view and change the HI LIMIT setpoint on the HI LIMIT control panel when the **HSP1** LED is lit.

The HI LIMIT setpoint should be **10 °C to 14 °C (18 °F to 25 °F)** higher than the TEMP CONTROL setpoint (**SP**). Since the recommended TEMP CONTROL setpoint for VisiJet parts is between **70 °C and 75 °C (158 °F and 167 °F)**, the HI LIMIT setpoint you enter should be between **80 °C and 89 °C (176 °F and 192 °F)**.

If the Finisher overheats and the HI LIMIT control switches the heater off, let the chamber cool down at least 2 degrees below the HI LIMIT setpoint, then press **RESET** on the HI LIMIT panel. When the **OUT** LED on the TEMP CONTROL panel lights, the heater will switch on again automatically. (For more details, [How to change the HI LIMIT setpoint and reset heater](#) on page 29.)

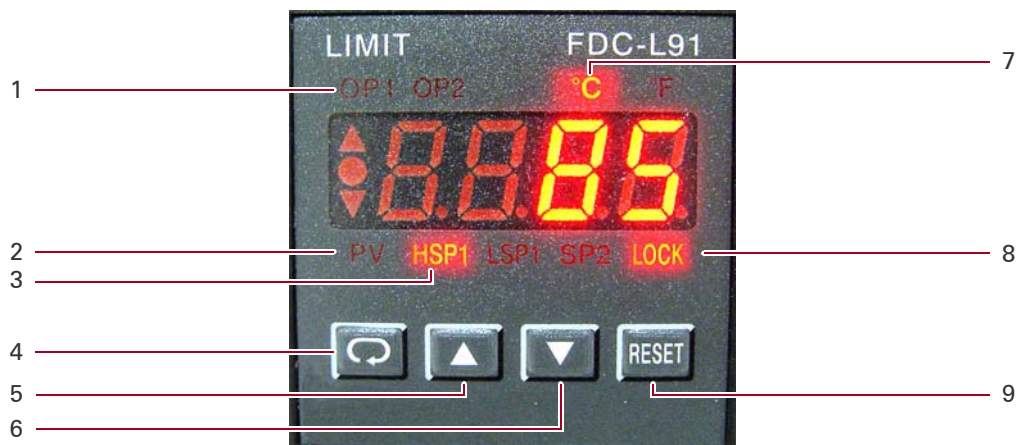
 If the heater frequently shuts down, make sure your HI LIMIT setpoint is at least 10 °C (18 °F) above the TEMP CONTROL setpoint. If it is, contact **3D Systems Customer Support**.



**Do not set the HI LIMIT setpoint above 204 °C (399 °F). If you do, you will damage the Finisher and void the warranty.**



HI LIMIT panel with heater RESET button on the Finisher control panel



### HI LIMIT control panel features and functions

Feature	Function
1 <b>OP1</b>	Output 1 status value LED. If <b>OP1</b> LED is on, the HI LIMIT setpoint was exceeded and the heater was automatically switched off. You must reset the heater. See <a href="#">How to change the HI LIMIT setpoint and reset heater</a> on page 31 for instructions.
2 <b>PV</b>	Process Value LED. When the <b>PV</b> LED is on, the display shows the actual temperature inside the chamber.
3 <b>HSP1</b>	HI LIMIT setpoint LED. When the <b>HSP1</b> LED is on, the display shows the HI LIMIT setpoint temperature. The heater shuts off automatically when chamber reaches this temperature. See <a href="#">How to change the HI LIMIT setpoint and reset heater</a> on page 29.
4  key	Selects display mode. Press to switch display between actual chamber temperature <b>PV</b> and HI LIMIT setpoint <b>HSP1</b>
5  key	Increases the HI LIMIT setpoint when <b>HSP1</b> is lit
6  key	Decreases the HI LIMIT setpoint when <b>HSP1</b> is lit
7 <b>°C / °F</b>	Temperature units indicator LEDs
8 <b>LOCK</b>	Lock status indicator
9 <b>RESET</b>	Resets the HI LIMIT control after automatic heater shutoff, then returns HI LIMIT control display to normal. Can also be used to save new HI LIMIT setpoint. See <a href="#">How to change the HI LIMIT setpoint and reset heater</a> on page 29.





# Setup

This section describes how to unpack and install your InVision Finisher.

## Unpacking and Inspection

Remove all packing materials and thoroughly inspect the Finisher for shipping damage.

- Check the carton and plastic cover sheet inside carton.
- Look for scratches and dents on all the Finisher's outer surfaces and corners.
- Check the Finisher controls and indicators for normal movement, bent shafts, cracks, chips or missing parts such as knobs and lenses.
- Check the door and latch for smooth operation.

If there is damage, and it could have happened during shipment, follow these instructions.

- 1** Contact the shipper immediately and file a written damage claim.
- 2** Contact **3D Systems Customer Support** to report the damage and order replacement parts for those that were damaged.
- 3** Please send a copy of your filed damage claims to **3D Systems Customer Support**.

Next, check to make sure you have received all the required materials. Your shipment should include:

- InVision Finisher
- Finisher accessories kit
- *InVision Finisher User's Guide* (in accessories kit)
- *InVision Finisher Operator's Guide* multi-language, quick-reference booklet (in accessories kit)
- Finisher tray (in accessories kit), tray bracket, and shelf (in accessories kit)
- Country-specific power cord (as required)

If any of these items are missing from the packaged contents, contact **3D Systems Customer Support** to have the appropriate materials forwarded to you.

## Installing the Finisher

- 1 Place Finisher on a bench top.

The Finisher must have a minimum of 5 cm (2 in) clearance in the rear to provide proper ventilation. It can be placed next to another cabinet, or next to another oven, with 8 cm (3 in) clearance (the doors will still open).

Make sure Finisher is level. This will assure proper heat distribution and operation of all mechanical components.

- 2 Identify correct line voltage indicated on the nameplate.



**All grounding and safety equipment must be in compliance with applicable codes, ordinances and accepted safe practices**

- 3 Connect Finisher power cord to the electric supply.

- For InVision Finisher model 1-A: plug power cord into electric supply
- For InVision Finisher model 1-B: plug power cord into the back of the Finisher, then into electric supply



**Your Finisher shipment included a country-specific power cord if required in your country.**





# Finishing Parts

This section describes how to use the InVision Finisher to help you finish (“remove support material from”) VisiJet parts. Specifically, how to:

- Choose which part finishing method to use; “dry finishing” or “dip finishing.” (See [Choosing a Finishing Method](#) on page 18.)
- Run a Finisher cycle for either dry or dip finishing
- View and change setpoints or temperature units on the Finisher’s TEMP CONTROL and HI LIMIT control.



**Do not use the InVision Finisher in wet, corrosive, or explosive atmospheres. InVision Finisher users in the United States must comply with Occupational Safety and Health Act (OSHA) of 1970, Section 5, and all relevant local safety rules and regulations. Refer to the OSHA and National Fire Protection Association (NFPA) safety standards for further information.**



For complete VisiJet part finishing information and instructions, see your **VisiJet Material Handling Guide**. The part finishing process is also summarized in the “Finishing Parts” section of your **InVision 3-D Printer User’s Guide**.

## Before You Start Using the Finisher

### ✓ Read this *User's Guide*

Carefully follow all of its safety, operation, and maintenance instructions.

### ✓ Verify line voltage

It must match to the voltage shown on the nameplate. See [Power requirements](#) on page 6.

### ✓ Verify fan, exhaust, and electrical cabinet openings

Remove any obstructions in or near the fan and exhaust openings to ensure adequate airflow.



The exhaust damper should be fully open when operating the Finisher in the 70 °C to 75 °C (158 °F to 167 °F) temperature range for VisiJet parts.

### ✓ Choose a finishing method

See [Choosing a Finishing Method](#) below to help you decide which one suits your needs.

## Choosing a Finishing Method

You can “dry-finish” or “dip-finish” parts with your InVision Finisher. Both methods are briefly summarized in [About Dry Finishing](#) on page 19 and [About Dip Finishing](#) on page 20. Then, [Running a Finisher Cycle](#) on page 21 gives step-by-step instructions for finishing parts using either method. (See [Dry Finishing Instructions](#) on page 22 and [Dip Finishing Instructions](#) on page 24.)

Both dry- and dip-finished parts meet the cosmetic requirements of most modeling applications. If you want to fine-detail and coat your parts after finishing, see your [VisiJet Material Handling Guide](#) for ideas and instructions.

## About Dry Finishing

With dry finishing, you place parts on the Finisher shelf above the empty tray and heat them at 70 °C to 75 °C (158 °F and 167 °F) to melt VisiJet support material off the part. The hot liquid support material drips down into the tray below the shelf. (An absorbent drip pad placed in the tray makes cleanup easier.) Check the parts frequently, then remove them from the Finisher as soon as all the support material has been removed. Optionally, you may want to wrap the parts in paper wipes and heat them in the Finisher again for a few minutes to wick residual support material off the part.



Dry finishing  
VisiJet parts  
on Finisher  
shelf

Dry finishing...

- Is easier than dip finishing because you do not have to maintain a tray full of hot liquid wax.
- Consumes less energy than dip finishing. You can turn off the Finisher between heating cycles with a minimal increase in cycle time, whereas it takes hours to melt the tray full of wax required for dip finishing—and you must leave the Finisher ON to keep the wax liquid.

See [Dry Finishing Instructions](#) on page 22 to run a dry finishing cycle.

## About Dip Finishing

With dip finishing, you melt approximately 4 kg (8 lb) of dip-finishing wax in the Finisher's tray. Then, use tongs (in your accessory kit) to submerge your VisiJet parts in the tray of hot liquid wax until the support material is removed. After you remove your parts from the bath, you can optionally wrap them in paper wipes and run a short dry finishing cycle to remove residual support material. If you do this, check the parts frequently to avoid over-heating, which can cause distortion and white blotches. (See dip finishing comments below.)



Dip finishing  
VisiJet parts in  
Finisher tray

### Dip finishing...

- Removes support material faster than dry finishing, especially for large parts. For example, a 147 cm<sup>3</sup> (9 in<sup>3</sup>) block of VisiJet support material melts in 45 minutes in a 70 °C (158 °F) hot liquid wax bath. It takes the same block 120 minutes to melt completely at 70 °C (158 °F) when dry-heated on the Finisher shelf.
- Is less sensitive to cycle time than dry finishing. If you air heat a part for too long, wax can leach out from below the part surface after all the support material drips off. The leaching causes white blotches on the part surface. This will not happen with dip finishing. The pressure and temperature equilibrium between the melt bath and part prevents wax from leaching out of the part.

See [Dip Finishing Instructions](#) on page 24 to run a dip finishing cycle.

## Running a Finisher Cycle

Follow the instructions in this section to dry-finish or dip-finish parts in the InVision Finisher.

### About Loading Parts in the Finisher

Follow these guidelines when you load parts in the Finisher.

- ✓ Remove the shelf from the Finisher, place it on an absorbent drip pad, place parts on the shelf, then put the shelf back in the Finisher with the parts on it.
- ✓ Position parts on the shelf away from the tray edges to prevent material from dripping on the chamber floor during the Finisher cycle.



**Verify that no portion of any part overhangs any tray edge before you start the Finisher cycle. Otherwise, hot support material can drip on the chamber floor and possibly damage the Finisher.**

- ✓ Distribute the unfinished VisiJet parts evenly on the shelf so that airflow is not restricted.
- ✓ Do not overfill the chamber. The parts should not take up more than two-thirds of the usable chamber volume above the shelf.

### Finisher Start-up



**Do not use flammable solvent or flammable material in this Finisher. Do not heat closed containers of any substance or liquid in this Finisher because they might explode.**

Perform these steps before running a dry-finishing or dip-finishing cycle.

- 1** Switch Finisher **POWER ON**.
- 2** Verify that the TEMP CONTROL setpoint is between **70 °C and 75 °C (158 °F and 167 °F)** on the **TEMP CONTROL** panel. **70 °C** is the factory setting and the recommended TEMP CONTROL setpoint for finishing VisiJet parts. If you have to change this setpoint, see [How to view and change the TEMP CONTROL setpoint](#) on page 29 for instructions. (The Finisher retains this setpoint when you switch **POWER OFF**. You do not have to re-enter it when you switch **POWER ON**.)
- 3** Verify that the HI LIMIT setpoint is between **80 °C and 89 °C (176 °F and 192 °F)** on the **HI LIMIT** control panel. **85 °C** is the factory setting and the recommended HI LIMIT setpoint for finishing VisiJet parts. If you have to change this setpoint, see [How to change the HI LIMIT setpoint and reset heater](#) on page 31 for instructions. (The Finisher retains this setpoint when you switch **POWER OFF**. You do not have to re-enter it when you switch **POWER ON**.)
- 4** Fully open the Finisher's exhaust damper. 3D Systems recommends running all finishing cycles with the damper fully open. See the picture on [page 3](#) to locate the damper on the back of the Finisher.

## Dry Finishing Instructions

- 1 Perform the steps in **Finisher Start-up** on page 21.
- 2 Remove parts from the InVision 3-D printer platform. See your **InVision 3-D Printer User's Guide** for instructions.
- 3 Open the Finisher chamber door and take the shelf off the tray.



**Never open the chamber door when the Finisher chamber temperature is above 100 °C (212 °F). Wait until it cools to the TEMP CONTROL setpoint or below as shown on the TEMP CONTROL PV display.**

- 4 Empty the tray following the instructions and safety guidelines in **Checking the Tray** on page 28.

When you empty the tray, you will either:

- Remove absorbent pads on the bottom of the tray (dry finishing), or,
  - Remove the block of solidified wax in the tray (dip finishing).
- 5 Install clean absorbent drip pad(s) in the bottom of the Finisher tray. One pad is usually enough. Use two if you are finishing several parts or a large part.



Place clean  
absorbent pad  
in Finisher tray

- 6 Put the shelf back on the tray and close the chamber door.
- 7 Switch Finisher **HEATER ON**. If the **OUT LED** on the **TEMP CONTROL** panel does not turn ON when you switch **HEATER ON**, try resetting the heater as described in **How to change the HI LIMIT setpoint and reset heater** on page 31.
- 8 Observe the temperature on the **TEMP CONTROL PV** display. It should rise to the TEMP CONTROL setpoint between **70 °C and 75 °C (158 °F and 167 °F)** in approximately 7 minutes, then dwell at the setpoint temperature.

- 9 Heat the VisiJet parts at the TEMP CONTROL setpoint temperature until support material is removed from the part surfaces.



**Check parts frequently to see if all support material has been removed. Heating time will vary depending on part size and the number of parts in the Finisher. When you can no longer see supports on a part, the part is done. Do not heat parts longer than necessary. Prolonged heating can melt wax out of the interior of the part and cause white blotches on the surface. It can also cause distortion such as warping and excessive shrinkage.**

- 10 When the part is done—and with the Finisher still at the TEMP CONTROL setpoint temperature—remove the part and immediately wrap it in paper wipes, making sure wipes are in contact with all surfaces of the part.
- 11 Place the wrapped part back in the Finisher and allow it to heat for a short time (10-15 minutes). (This wicks residual support material off the part.)
- 12 Remove and re-wrap part with fresh paper wipes multiple times if necessary, repeating steps 10 and 11 above.
- 13 Remove and unwrap the part.
- 14 While the part is still warm, use swab sticks to remove support material from small holes and channels on the part surface.
- 15 Switch **POWER** and **HEATER OFF**.



**This energy-conserving step is optional. The Finisher only takes 7 minutes to reach the TEMP CONTROL setpoint when the chamber is empty.**



**Do not switch POWER OFF if the chamber temperature is above 100 °C (212 °F). Leaving POWER ON enables you to view the actual chamber temperature on the TEMP CONTROL PV display, and it keeps the fan running at high temperatures which prolongs the life of Finisher components.**

## Dip Finishing Instructions

- 1 Perform the steps in **Finisher Start-up** on page 21.
- 2 Remove parts from the InVision 3-D printer platform. See your **InVision 3-D Printer User's Guide** for instructions.
- 3 Open the Finisher chamber door and remove the shelf and tray.



**Never open the chamber door when the Finisher chamber temperature is above 100 °C (212 °F). Wait until it cools to the TEMP CONTROL setpoint or below as shown on the TEMP CONTROL PV display. Opening the door when the Finisher is above 100 °C (212 °F) can damage the Finisher, cause severe burns, and start a fire.**

- 4 Create a dip-finishing hot liquid wax bath in the Finisher tray as follows:
  - a Place approximately 4 kg (8 lb) of dip-finishing wax solids in the Finisher tray.

**If you received bag of dip-finishing wax solids with your InVision 3-D printer, you can use that to make a starter hot wax bath. If not, you can use candle wax (available at retail crafts stores) with a melting point between 51 °C and 63 °C (124 °F and 145 °F). Or, use **dry-finishing** to accumulate melted support material in the tray until you have enough liquid for dip-finishing.**
  - b Put the tray with the solid wax in Finisher. (Leave the shelf off.)
  - c Switch Finisher **HEATER** ON. If the **OUT** LED on the **TEMP CONTROL** panel does not turn ON when you switch **HEATER** ON, try resetting the heater as described in **How to change the HI LIMIT setpoint and reset heater** on page 31.
  - d Observe the temperature on the **TEMP CONTROL PV** display. It should rise to the TEMP CONTROL setpoint between **70 °C and 75 °C (158 °F and 167 °F)** in approximately 7 minutes, then dwell at the setpoint temperature.
  - e Heat the solid wax in the Finisher tray at the TEMP CONTROL setpoint temperature until it is completely liquefied. If you choose to raise the temperature to speed melting, do not raise it above 89 °C (192 °F) for safety reasons cited in step 3 above.

**At 70 °C (158 °F), 4 kg (8 lb) of dip-finishing wax takes approximately 5 hours to completely liquefy.**
- 5 When the dip-finishing wax is liquefied, put on the gloves and remove the shelf if necessary and put it aside. (The gloves will not melt at VisiJet part finishing temperatures and they are insulated to prevent burns.)



- 6 With the tray of hot liquid fully inside the Finisher, use one or more clean styrofoam cups to scoop hot liquid wax out of the Finisher tray. (This will prevent overflow when you dip the part(s) in the next step.)



The higher the total volume of the part(s) you plan to dip-finish, the more liquid you should remove. You will replace some or all of it in step 7 on **page 25**.



**Do not tip the tray of hot liquid wax. The liquid can spill and cause burns and damage to the Finisher.**

Set the cup(s) of liquid wax aside temporarily.



Scoop liquid out of tray to prevent overflow when dipping

- 7 Use tongs to immerse the part(s) in the liquid wax bath. (See the picture on **page 20**.) Pour liquid wax from the styrofoam cups (removed in step 6 on **page 25**) back into tray if necessary. You want to submerge as much of your part(s) as possible. However, to prevent overflow, stop pouring when the liquid level is 2.5 cm (1 in) from the top of the tray.

- 8** Leave the part(s) submerged in the tray until all support material is removed.
- 9** Place an absorbent drip pad on the tabletop in front of Finisher (as shown in step **12** on [page 26](#)).
- 10** Put the Finisher shelf on the absorbent pad and put a layer of paper wipes on the shelf.
- 11** After all the support material is removed from the part, use the tongs to lift the part out of bath. Hold it over the bath until it finishes dripping.
- 12** Wrap the part in paper wipes and place on the shelf on the tabletop.



Wrap parts in  
paper wipes  
after removing  
from Finisher  
tray

Place parts on  
Finisher shelf on  
absorbent pad

- 13** Place the shelf with the wrapped parts on top of the Finisher tray and close the chamber door.



Place wrapped parts on shelf in Finisher and heat 10-15 minutes

- 14** Briefly heat the wrapped parts following **Dry Finishing Instructions** steps 10-12 on page 23.
- 15** After dip finishing, check the level of liquid wax in the tray. If it is near the top, scoop out enough liquid to drop the level below 2.5 cm (1 in). (See step 6 on page 25.) Allow the cups of liquid wax to cool and solidify, then dispose of them as regular office waste.
- 16** If you plan to do another dip-finishing cycle soon:
- Leave the Finisher **POWER** and **HEATER ON** and the temperature set to the TEMP CONTROL setpoint.
  - Leave the Finisher tray in the Finisher to keep the wax in the tray from solidifying.

## Checking the Tray

**Always** check the Finisher tray...

- before you start a finishing cycle, and,
- after you remove parts from the Finisher.

Use a styrofoam cup to adjust the liquid level in the tray if necessary as described in [Dip Finishing Instructions](#), step 6 on [page 25](#).



**Do not allow the liquid level to get closer than 2.5 cm (1 in) from the top rim of the tray. If the tray gets too full, hot liquid could spill out and onto the floor of the chamber and leak out the bottom door seal.**

### Tray cleaning tip for dry finishing:

- If you put an absorbent drip pad in the tray before you do dry finishing, you can simply dispose of the pad in regular office trash when it becomes saturated. This makes cleanup fast and easy. See [Dry Finishing Instructions](#) step 5 on [page 22](#).
- If you do dry finishing without an absorbent pad in the tray, eventually the tray fills up with support material drippings. Empty the tray before the support material gets higher than 2.5 cm (1 in) from the top as described below.

## Emptying the Tray (optional)

You can leave liquid wax material in the Finisher tray indefinitely, adjusting the liquid level as needed. However, if you ever need to empty the tray completely, follow these instructions:

- 1 Switch the Finisher **HEATER** OFF and allow the chamber to cool until all the material in the tray is solidified.
- 2 After all the material in the tray is solid, remove the shelf from the top of the tray, lift the tray up and out of the tray bracket, then remove the tray from the chamber.



**Never attempt to remove the tray if there is hot liquid material in it. Wait until the material in the tray is entirely solid. Hot liquid material can spill out of the tray as you are removing it. If it spills on your skin, it can burn you.**

- 3 Remove the block of solid material from the tray and dispose of it in regular office trash.



**If the block of material is difficult to remove, place the tray in a freezer for several minutes, then try again. You can also try inverting the tray and heating the bottom to loosen the block.**

## TEMP CONTROL Instructions



**Failure to heed warnings in this manual and on the Finisher could result in property damage or severe injury.**

The Finisher has been tested and preset at the factory for normal operating conditions. In most applications, it will not be necessary to alter the Finisher's settings, except for the TEMP CONTROL setpoint. This section provides instructions for viewing and changing the TEMP CONTROL setpoint and changing the displayed temperature units from °C to °F.

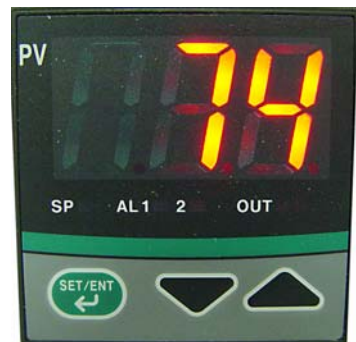
### How to view and change the TEMP CONTROL setpoint



**Never operate Finisher at a temperature in excess of the maximum operating temperature of 204 °C (400 °F).**

To view or change the control setpoint on the TEMP CONTROL panel:


- 1 Press **SET/ENT**. The setpoint (**SP**) LED illuminates and the display shows the current setpoint temperature.
- 2 Use ▲ and ▼ to increase or decrease the setpoint. The right decimal point LED will flash indicating that the setpoint is being changed. This will stop flashing when the new value has been entered.
- 3 Press **SET/ENT** to save the new setpoint.
- 4 Press **SET/ENT** again to display **PV**, the actual chamber temperature.



TEMP CONTROL panel

## Changing TEMP CONTROL display from °C To °F

The TEMP CONTROL can be configured for either °C or °F. Use the following steps to change control from displaying °C to °F.

 To change from °F to °C (instead of °C to °F) perform the steps below using the following values: In = 5; SPH = 204; SPL = 0.

- 1 Press and hold **SET/ENT** for 3 seconds.
- 2 The display will read **CtL** and the **SP** LED will flash, indicating that Operating Parameter mode has been entered.
- 3 Press **SET/ENT** until **LoC** appears on the display. Press ▲ or ▼ to enter the parameter.
- 4 Press ▼ to set the value to **-1**. The **SP** LED will flash rapidly, indicating that the Set-Up Parameter mode has been entered.
- 5 Press **SET/ENT** to enter the value. The display will read **In**. Press ▲ or ▼ to enter the parameter.  
If you are unable to change the setup parameters, go back out and change the **LoC = 0**. Press **SET/ENT** until **LoC** appears again, change **LoC = -1** and press **SET/ENT**.
- 6 Enter a value of **35**. The right decimal point LED will flash indicating that the setpoint is being changed. This will stop flashing when the new value has been entered.
- 7 Press **SET/ENT** to enter the value.
- 8 Press **SET/ENT** until **SPH** is displayed. Press ▲ or ▼ to enter the parameter.
- 9 Enter a value of **400**.
- 10 Press **SET/ENT** to enter the value.
- 11 Repeat steps 12-14 for **SPL**; the value is **32**.
- 12 Press and hold **SET/ENT** for 3 seconds to return to the operation mode. The TEMP CONTROL now reads °F. Enter the desired setpoint.

## HI LIMIT Control Instructions



**Failure to heed warnings in this manual and on the Finisher could property damage or severe injury.**

The Finisher has been tested and the HI LIMIT preset at the factory for normal operating conditions. This section describes how to view and change the HI LIMIT setpoint (**HSP1**) and reset the heater if the HI LIMIT setpoint is exceeded. It also describes how to change the HI LIMIT control's display between °C and °F.

### How to change the HI LIMIT setpoint and reset heater



**Never operate Finisher at a temperature in excess of the maximum operating temperature of 204 °C (400 °F).**



For VisiJet part finishing, enter a HI LIMIT setpoint between **80 °C and 89 °C (176 °F and 192 °F)** on the HI LIMIT control panel.



The HI LIMIT setpoint should be 10 °C to 14 °C (18 °F to 25 °F) higher than the TEMP CONTROL setpoint (SP). Since the recommended TEMP CONTROL setpoint for VisiJet parts is between 70 °C and 75 °C (158 °F and 167 °F), the HI LIMIT setpoint you enter on the HI LIMIT control panel should be between 80 °C and 89 °C (176 °F and 192 °F).



If the heater shuts down, wait for the chamber temperature to drop 2 degrees below the HI LIMIT setpoint, then reset the heater by pushing RESET on the HI LIMIT control panel.




- 1 If the **LOCK** on the HI LIMIT control panel is lit, press and hold **RESET** for 4 seconds to enable ▲ and ▼.
- 2 Press . The **HSP1** LED illuminates and the HI LIMIT control's display shows the current HI LIMIT setpoint temperature.
- 3 Use ▲ and ▼ to change the HI LIMIT setpoint.
- 4 Press **RESET** or  once to save the new setpoint and redisplay the process variable **PV**.
- 5 **Resetting the Heater:** If the HI LIMIT setpoint is exceeded, the heater shuts down automatically. To reset the heater, wait for the chamber temperature to drop 2 degrees below the HI LIMIT setpoint, then press **RESET** on the HI LIMIT control panel.

## Changing HI LIMIT control display from °C To °F



**Make sure you understand what you are changing before doing so. Changing the setup parameters will alter the functions of the Finisher's HI-LIMIT control.**

Follow the steps below to change the HI LIMIT control display from °C to °F (or °F to °C).

- 1** If the **LOCK** LED on the HI LIMIT control panel is lit, press and hold **RESET** for 4 seconds to enable the ▲ and ▼ keys.
- 2** Press and hold  for 4 seconds to enter setup mode.
- 3** Press  until the **unit** is displayed.
- 4** Press ▲ or ▼ to change the **unit** setting from °C to °F (or °F to °C).
- 5** Press . This saves the **unit** setting and advances to the next parameter.
- 6** Press **RESET** to exit setup mode.
- 7** Enter the desired HI LIMIT setpoint. (See [How to change the HI LIMIT setpoint and reset heater](#) on page 31.)





# Maintenance

This section describes how to maintain your InVision Finisher to help ensure longer life and trouble-free operation.



**Disconnect power to the Finisher before performing any maintenance procedures.**

## Checklist

- ✓ **Keep equipment clean.** Gradual dirt accumulation retards airflow. A dirty Finisher can result in unsatisfactory operation such as unbalanced temperature in the work chamber, reduced heating capacity, reduced production, overheated components, etc. Keep the walls, floor and ceiling of the oven chamber free of dirt and dust. Floating dust or accumulated dirt may produce unsatisfactory work results. Keep all equipment accessible. Do not permit other materials to be stored or piled against it.
- ✓ **Prevent overflows and spills in the oven chamber.** Check the support material liquid level in the tray before and after every finishing cycle. Empty the tray if the liquid level is 2.5 cm (1 in) or less from the top. For instructions, see [Emptying the Tray](#) on page 22.
- ✓ **Protect controls against excessive heat.** This is particularly true of controls, motors or other equipment containing electronic components. Avoid ambient temperatures above 51.5 °C (125 °F).
- ✓ **Establish maintenance and checkup schedules.** Do this promptly and follow the schedules faithfully. Careful operation and maintenance will be more than paid for in continuous, safe and economical operation.
- ✓ **Maintain equipment in good repair.** Make repairs immediately. Delays may be costly in added expense for labor and materials and in prolonged shut down.
- ✓ **Practice safety.** Always know what you are doing before you do it. Make CAUTION, PATIENCE, and GOOD JUDGMENT the safety watchwords for the operation of your Finisher.
- ✓ **Lubrication.** All door latches, hinges, door operating mechanisms, bearing or wear surfaces should be lubricated to ensure easy operation.

## Tests



**Failure to heed warnings in this manual and on the Finisher could result in property damage or severe injury.**



**Disconnect power to the Finisher before performing attempting any repair or adjustment.**

Tests should be performed carefully and regularly. The safety of personnel as well as the condition of equipment may depend upon the proper operation of any one of the functions of these controls. Test the TEMP CONTROL every 40 hours. Check that the TEMP CONTROL **OUT** LED is cycling on and off. Also, verify that the heater is working.

Test the HI LIMIT control every 40 hours as follows: With the Finisher operating at a given temperature, set the HI LIMIT setpoint down to the TEMP CONTROL setpoint. The HI LIMIT control has tripped when **OP1** is lit. Push **RESET** after adjusting the HI LIMIT setpoint back to a higher setting, or letting the chamber temperature drop 2 degrees below the HI LIMIT setpoint.



# Troubleshooting

This section describes possible InVision Finisher problems and suggested solutions. If you are having a problem with your Finisher and need assistance, contact [3D Systems Customer Support](#) at:

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

For more contact information, see [Contacting 3D Systems](#) on page [vii](#).

## FINISHER TROUBLESHOOTING CHART

Problem	Probable Cause	Suggested Remedy
Failure to heat	No power	Check power source and/or Finisher and wall fuses
	Burned-out heater(s)	Replace element.
	TEMP CONTROL malfunction	Replace TEMP CONTROL if <b>OUT</b> LED on panel does not turn on.
	Loose wire connections	Disconnect power and check connections behind Finisher control panel.
Slow heat up	Improperly loaded chamber	Reduce load or redistribute load in chamber.
	Low line voltage	Supply sufficient power and proper connections. Check for circuit overload.
	One or two heating elements burned out	Check heater amperage on the nameplate. Replace burned out element.
	Vent is wide open	Close vent.

**FINISHER TROUBLESHOOTING CHART (CONTINUED)**

<b>Problem</b>	<b>Probable Cause</b>	<b>Suggested Remedy</b>
Frequent heater element burnout	Harmful fumes generated by load	Increase vent opening or discontinue process.
	Splattering of material on heater elements	Disconnect power and clean oven chamber and elements.
	Overheating oven chamber	Check the HI-LIMIT control.
Erratic temperature	TEMP CONTROL malfunction	Check control parameters before replacing the TEMP CONTROL.
Inaccurate temperature	TEMP CONTROL malfunction	Recalibrate TEMP CONTROL.
Excess surface or door temperature	Door seal deterioration	Replace door seal.
	Door closed into top or bottom latch only	See specific difficulty below for this problem.
Improper air flow	Fan motor failure	Replace fan motor
	Unbalanced fan wheel	Replace fan wheel
Excessive vibration	Dirty fan wheel	Clean fan
	Unbalanced fan wheel	Replace fan wheel
Grinding noise	Fan wheel has shifted or fallen	Inspect the fan wheel. It should be 3/16-inch lower than the top of the fan housing.
	Unbalanced fan wheel	Replace fan wheel
Finisher will not control at setpoint	HI LIMIT setpoint is too low	Increase the HI LIMIT setpoint on the HI LIMIT control.
	TEMP CONTROL malfunction	Check control parameters before replacing TEMP CONTROL.
	Air friction of recirculation fan	Open exhaust air vent. Unit will not control at minimum operating temperature with vent(s) closed.
Heater does not shutdown until temperature reaches the HI LIMIT setpoint.	TEMP CONTROL malfunction	Contact <b>3D Systems Customer Support</b>
	Solid-state relay (SSR) malfunction	

**FINISHER TROUBLESHOOTING CHART (CONTINUED)**

<b>Problem</b>	<b>Probable Cause</b>	<b>Suggested Remedy</b>
Door closes into top or bottom latch only.	Uneven latch tension adjustment	Ensure that latch strike is contacting center of latch. Adjust mounting angle as required. Adjust door for even top and bottom latch tension by turning screws on ends of latch. Clockwise increases tension on latch. Counterclockwise decreases tension.
Door will not stay closed.	Inadequate latch tension	Ensure that latch strike is contacting center of latch. Adjust mounting angle to center as required. Increase latch tension by turning screws on end of latch clockwise. Adjust in even increments on all four screws to keep door pull even.





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