3DSYSTEMS

ProX DMP320

Production Printer

ProX DMP 320

User Guide

Original Instructions

CONTENTS

1 INTRODUCTION

The ProX® DMP320 is a high quality direct metal printing (DMP) machine. It brings reliability and repeatability to production-level direct metal printing. The ProX DMP320 is designed to meet industrial market demands of reliable, high material quality and low maintenance 3D printing machines.

With direct metal printing, parts are built up layer by layer. Using this technique, the most complex parts can be made. Loose metal powder particles are melted together by a high-precision laser. The laser is directed to the powder particles in order to selectively build up thin subsequent horizontal layers. Connecting each new layer to the previous one, it brings a high quality alternative to the traditional manufacturing processes. Since no tools are used and no material is removed, waste is reduced significantly. Parts aren't built by removing material in different steps, but by adding material. Other advantages are the quick set up times and the ability to produce very complex assemblies as a single part.

The ProX DMP320 has a build platform of 275 x 275 x 420mm (including printing plate) which can produce big and high quality parts in a variety of metals. The machine features easy cleaning and rapid material switching.

2 SAFETY GUIDELINES AND INSTRUCTIONS

GENERAL GUIDELINES

Before using your Direct Metal Printing (DMP) equipment, your company should have a safety program in place. The safety program should:

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

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

TRAINING AND INSTRUCTIONS

Follow these general safety guidelines when operating any DMP equipment:

- Do not operate any DMP equipment before receiving proper training.
- Read and follow all operating instructions.
- Follow all safety rules in this section and heed all hazard warnings in this guide.
- Do not try to perform any equipment maintenance procedures you were not trained to do.
    - **Operators** are trained to operate the system and perform all the necessary tasks to print a part.
    - **Certified service personnel** are those who have completed the 3D Systems service training package and are certified to perform service tasks. Certification may occur at various levels, and servicers should only perform tasks they are authorized and certified to complete.

MACHINE HANDLING

- Do not try to access, service, or adjust any components inside any DMP equipment enclosure.
- Do not try to open any panel or door while a machine is running.
- Do not access any area of the machine near the print chamber during printing.
- Take note of all warning labels on the machine.
- Secure electrical cables and coolant hoses to prevent tripping.
- Make a daily inspection of the machine before starting work.
- Never wear a tie, scarf or loose-fitting clothing when operating the machine.
- Make it a rule that only one trained and qualified operator uses the machine at any given moment.
- Make sure that the building module is cleared of any obstacles before powering up the machine.
- Laser printing operations are performed on 3D Systems certified metal powders only.
- Never place any reflective materials (such as glass, lenses, mirrors, etc.) inside the process chamber.

MATERIAL HANDLING

- Do not use any material without first reading the Safety Data Sheet (SDS) for that specific material.
- To prevent injury and equipment damage, be sure to follow all handling guidelines detailed in the appropriate material guide

LASER

- **Do not** try to access, service, or adjust the laser system in any way.
- **Do not** enter any area displaying posted warning signs during open beam operations. Open beam operations refer to the laser, and they **only** occur during service procedures performed by 3D Systems certified service personnel.

ALARMS AND WARNINGS

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

SAFETY SYMBOLS AND DEFINITIONS

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

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

LASER RADIATION HAZARD: Invisible laser radiation is accessible in the vicinity of this sign or behind the access panel. Direct and scattered radiation can cause severe burns and blindness. Access panels are for service only and should be opened only by certified service personnel.

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

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

CRUSH HAZARD: Injury or death from crushing weight.

NOTCHED BELT ENTANGLEMENT: Injury or death from entanglement in notched pulley drive belt.

FIRE HAZARD: indicates potential fire can occur that could cause damage to equipment or personal injury.

EXPLOSION HAZARD: indicates potential explosion can occur due to combustible particles inside of unit that could cause damage to equipment or personal injury.

PINCH POINT HAZARD: Keep hands clear.

STATIC HAZARD: indicates electro-static discharge that can cause damage to the equipment or personal injury.

DUST HAZARD: indicates dust particles are in the air and a suitable dust mask is required.

Safety glasses and/or full face shield required.

Disposable nitrile gloves should be used when handling powder. Heat-resistant gloves such as welding gloves should be used in conjunction with other fire-retardant clothing when there is a potential for fire, such as when doing a filter change in the re-circulating unit.

Disposable dust mask rated N99 (FFP3) or equivalent level protection required.

When working in areas where reactive metal condensates are present, use fire retardant special fabric, rendered conductive, trousers without turn-ups, closed pockets.

Harmful Irritant Warning: Indicates that eyes and skin irritation could result while exposed to chemical composition.

FIRST AID SECTION – WHAT TO DO

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

Burns

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

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

Reporting Laser Radiation Exposure

If the injury was determined to be the result of laser radiation overexposure, please send a report to:

> Attention: Laser Safety Officer
> 3D Systems, Inc.
> 333 Three D Systems Circle
> Rock Hill, South Carolina, 29730
> USA

Include the following information in your report:

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

Please send this information to 3D Systems within a day of the accident.

Electrocution

The DMP system contains equipment energized at 400 volts. Do not attempt to remove protective panels. There are no user serviceable parts inside.

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

Material Inhalation

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

Powder ingestion

Quickly wipe material from mouth and rinse with water. Do not induce vomiting. Seek medical attention if symptoms occur or when unsure.

Powder skin contact

Powder contamination of the skin may cause soft tissue irritation and/or an allergic reaction. Remove contaminated clothing and dispose of or properly launder. Brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms persist.

Powder eye contact

Even non toxic powders may cause soft tissue irritation and/or an allergic reaction. If someone gets powder in his/her eyes immediately rinse eyes gently but thoroughly with lukewarm water. Also rinse under upper and lower eyelids, for at least 10 to 20 minutes. Seek medical attention when symptoms persist. Eye wash station must be present in the vicinity of all powder operations.

✍️ **NOTE: For more specific information regarding first aid in relations to powder, see the applicable SDS sheet.**

DMP EQUIPMENT SAFETY FEATURES

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

⚠️ **WARNING: IF ANY DMP EQUIPMENT SAFETY FEATURES FAIL, YOUR ACTIONS MAY BE ALL THAT WILL PREVENT POTENTIALLY HAZARDOUS OPERATING CONDITIONS.**

Safety Interlocks

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

- Software in the DMP system automatically initiates immediate equipment shutdown if certain unsafe conditions are detected during operation.
- Ground fault interrupter and over-current circuit-breaker
- **Lock-out/tag out on the main power switch:** When the main power switch is locked in the OFF position, the machine cannot be switched on.
- Electrical cabinet cannot be opened while the main power switch is in the "On" position.

⚠️ **WARNING: NEVER TRY TO DISABLE OR OVERRIDE ANY SAFETY INTERLOCK DEVICE ON ANY DMP EQUIPMENT. OPERATING EQUIPMENT WITHOUT ALL SAFETY INTERLOCKS ENABLED CAN CAUSE EQUIPMENT DAMAGE, INJURY, OR DEATH. IF YOU SUSPECT A SAFETY INTERLOCK DEVICE IS NOT WORKING PROPERLY, DO NOT OPERATE YOUR DMP EQUIPMENT. RATHER, DISCONNECT POWER FROM THE EQUIPMENT AND CONTACT 3D SYSTEMS CUSTOMER SUPPORT FOR ASSISTANCE.**

DMP System Response if an Interlock Fails

Safety interlock devices mounted on the DMP system sense the hazardous operating conditions below. The DMP system takes the actions listed when an interlock fails.

SAFETY INTERLOCKED CONDITION	IF THIS INTERLOCK FAILS...
Process chamber door open	• Laser is disabled • Print will not start • Valves are closed • Argon/ Pressurized air supply are closed
Oxygen in process chamber too high	• Laser is disabled (except when service switch is turned on) • Print will not start • Warning message appears on DMP system display
Pressure in process chamber too low	• Laser is disabled (except when service switch is turned on) • Print will not start • Warning message appears on DMP system display
E-stop pressed-in	• Laser is disabled • Print will not start • Warning message appears on DMP system display • Valves are closed • Argon/ Pressurized air supply are closed • Print module movements are disabled • Vacuum pump/blower are disabled • Red stack light blinks on/off

Limited Access and Barrier Shielding

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

Service areas

- Such as cabinets and enclosures for electrical power and automation controls. This prevents accidental exposure to electrical shock hazards.

Material areas, such as material overflow bins. This prevents:

- burn hazards by minimizing exposure to heated material
- slip hazards by keeping material from dropping on the floor
- fire hazards by minimizing airborne dust cloud formation and potential ignition.
- See SDS for complete material hazard details.

Laser beam optics and scanning areas

- Including the fully-enclosed print head—where the laser beam originates—and the interior of the print chamber, into which the beam projects. The print head and print chamber are designed to minimize hazards such as burns, eye injury, and fire in the following ways:
- The print head optics and laser beam duct (at the top of the print chamber, below the removable Laser Window) prevents the laser beam from being aimed outside the print chamber.
- The fully enclosed print chamber blocks laser radiation from escaping to the outside.
- The material of the print chamber window, which conforms to CE EN207, also blocks laser radiation so you can safely observe the part bed during a print. Do not stare at the laser when using the PowerBurn option.

Other Active Safety Features

- The power coater is equipped with a slip clutch which disengages if the powder coater movement is hindered.
- Software in the DMP system automatically initiates immediate equipment shutdown if certain unsafe conditions are detected during operation.
- Ground fault interrupter and over-current circuit-breaker.
- Lock-out/tag out on the main power switch: When the main power switch is locked in the OFF position, the machine cannot be switched on.

ELECTRICAL SAFETY

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

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

ELECTRICAL HAZARD: Verify your facility's electrical service ratings before connecting power to any DMP equipment. Power must only be connected by a certified electrician.

ELECTRICAL HAZARD: Do not open the panel behind disconnect switch! Live voltage present. This should only be opened by qualified personnel after power is disconnected from the facility's power circuit/breaker panel.

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

When operating any DMP equipment, keep the following electrical safety points in mind:

- Only 3D Systems certified service personnel should operate DMP equipment with access panels or service doors open.
- Heed high voltage warning signs and labels.
- Take common-sense safety precautions when operating any electrical equipment.
- After any change to the electrical wiring, make sure the equipment is properly grounded.

PERSONAL PROTECTIVE EQUIPMENT

Gloves

Wear disposable nitrile gloves when handling powders. Dispose of the gloves when the powder handling operation is complete. Do not operate switches or use door handles or other fixtures while still wearing the gloves in order to prevent cross contamination.

Clothing

When working in areas where reactive metal condensates are present, use fire-retardant special fabric, rendered conductive, trousers without turn-ups, closed pockets.

Safety Masks

Wear disposable dust mask that is rated N99 (FFP3) or equivalent level protection.

Safety Goggles

Wear close fitting safety goggles or a full face mask when handling powder. In case of emergency, use an eye shower to remove any particles from the eye(s).

Safety Shoes

The use of safety shoes is mandatory in any area where heavy items are handled. This includes powder vessels, building plates and the build module. In any area where powder is handled safety shoes with antistatic soles are recommended.

Hygiene

It is advised to wash your hands, even when wearing gloves, after handling powder. It is also recommended to shower and wash your hair after removing the protective clothing at the end of a day's work.

HAND TOOLS

You must acquire non-sparking, non-magnetic hand tools that are safe for Ex zones where hazardous, flammable or combustible vapors, liquids, dusts or residues may be present. Hand tools such as trowels, screwdrivers, dustpans, should be composed of:

- Aluminum
- Aluminum-Bronze (AlBr)
- Copper-Beryllium (CuBe2) alloys

You must also acquire and use natural fiber or ESD safe brushes and brooms. Work benches must be grounded.

GROUNDING

Grounding personnel and equipment when working with powder is highly recommended. The DMP building chamber is grounded as a safety feature. When no other option is available, personnel can be grounded to this chamber using an antistatic bracelet. Similarly, all auxiliary equipment (including explosion proof), can be grounded by attaching the provided grounding leads to the DMP chamber **(A)**. However to ensure easy, uncomplicated operation, the following is recommended:

- Dedicated grounding points in each process room
- Antistatic flooring or Antistatic floor mats

In addition it is recommended to check the grounding itself on a regular basis in accordance to local regulations.
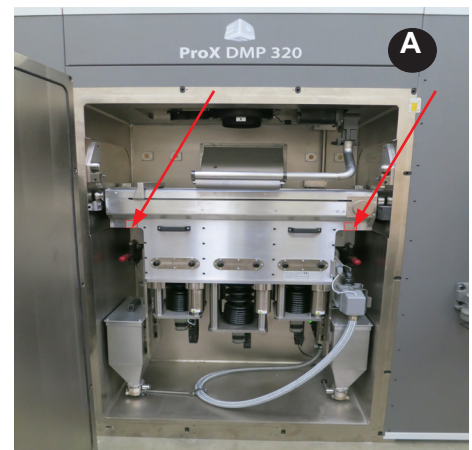
VACUUM CLEANERS

Installations must have a wet separator, explosion proof vacuum cleaner. The RUWAC, NA35-110 explosion proof vacuum is recommended. Certain metal powders will react with water forming hydrogen gas, this process is sped up when the powder to water ratio is higher. It is therefore necessary to refill or replace the liquid of the wet separator regularly as indicated in the vacuum cleaner manual.

FIRE AND EXPLOSION PREVENTION

In no case are smoking, open flames, heat sources or spark sources to be allowed in the vicinity of powders or in rooms where powders are handled. This includes all electronic devices as well as non-ATEX or EX certified equipment. Use non-sparking tools, when working with powder. Likewise activities which generate heat or sparks, such as grinding or welding, should not be performed near combustible powder or in rooms where such powder is manipulated.

The grounding of all personnel is highly recommended. This is especially true for any location where combustible powders are used. As fine powder can remain static in the air for hours after dispersion, it is recommended that all rooms where powder manipulations occur are equipped with grounded conductive or antistatic flooring. Furthermore the personnel entering those rooms must wear safety shoes with antistatic or conductive soles and antistatic or conductive outer garments. If grounding through conductive flooring is impossible, the use of antistatic bracelets, combined with grounding to a work bench or the equipment itself is recommended. Likewise the use of carts or other devices with non-conducting or non-static wheels is prohibited.

ROOM VENTILATION

A room ventilation system is required in order to:

- Prevent Argon accumulation and
- Remove suspended fine powder particles.

Argon may be released into the room as a result of opening the machine or from using other sieving station. Even though Argon is an inert gas, it still poses a suffocation danger when it is allowed to accumulate. Argon is heavier than air and will "pool" on the floor and in any low points. Therefore the room must be equipped with a system which continuously exchanges the air in the room a minimum of four times per hour.

A room ventilation system is also required to prevent the presence of fine powder particles suspended in the air. This presents both a health and an explosion hazard. Because powder fines can accumulate in filters, the system must either:

- Be a filter free system.

   -- or --

- The system must be equipped with immersion filtration

Ventilation

If available, use point ventilation at your work station when handling powder. Set it to the correct strength to ensure maximal removal of air suspended powder, while preventing the ventilation itself from causing agitation of static powder

MATERIAL SAFETY

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

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

Refer to the SDS's and to 3D Systems material guides for information on specific materials.

> ⚠️ **WARNING: USING MATERIALS THAT HAVE NOT BEEN CERTIFIED FOR USE IN THE DMP EQUIPMENT MAY CAUSE HEALTH OR SAFETY HAZARDS AND MAY DAMAGE THE EQUIPMENT AND VOID THE WARRANTY.**

Material Ignition Information

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

Use only Class D extinguishing agents. Never use water, carbon dioxide, Halon or non-class D foam or powder on fires involving reactive metal powders.

3D SYSTEMS, INC**.**

⚠️ **WARNING: THE OPERATOR MUST USE AN APPROVED VACUUM CLEANER TO CLEAN UP EXCESS MATERIAL. 3D SYSTEMS RECOMMENDS AN EXPLOSION-PROOF MODEL. CONTACT 3D SYSTEMS CUSTOMER SERVICE FOR PURCHASING OPTIONS.**

Finding Material Safety Information

Use the Material Safety Information table to locate references and contacts for information on important material safety topics. Read the SDS of the material used for the specific precautions to be observed.

Material Safety Information

TOPIC	REFERENCE / CONTACT		
Standard industrial ventilation practices	**US**: American Conference of Governmental Hygienists, Committee on Industrial Ventilation		
	Europe: Maximale Arbeitsplatz Konzentration, January 1990		
Housecleaning and prevention of accumulation of explosive dust concentrations	**US:** NFPA 484-2012: standard for combustible metals		
	Europe: directive 99/92/EC risk from explosive atmospheres and directive 2014/34/EU: equipment and protective systems intended for use in potentially explosive atmospheres.		
Material exposure	**US**: Code of Federal Regulations, 29 CFR, section 1900.1000, available from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402		
	Europe: directive 99/92/EC risk from explosive atmospheres and directive 2014/34/EU: equipment and protective systems intended for use in potentially explosive atmospheres.		
Specific materials	Safety Data Sheets (SDS) from 3D Systems, Inc.		
	US/Canada:		Europe:
	Mfgr. Contact:	3D Systems Corporation 333 Three D Systems Circle Rock Hill, SC 29730 USA	3D Systems GmbH Guerickeweg 9 D-64291 Darmstadt, Germany
	Information	Phone: 803.326.3900 or Toll-free: 800.739.3669	Phone: (+49) 6151 357-0
	Emergency	1.800.262.8200 - Chemtrec	1.703.741.5500 - Chemtrec (U.S.)

POTENTIALLY HAZARDOUS METAL POWDERS

The risks concerning powder handling can be roughly divided into two large classes: health hazards and combustion and explosion risk. Each specific risk requires suitable precautions when handling powder. Furthermore some powders pose a risk in both classes.

As for health risks, the following metals are known to cause health problems upon prolonged or short term extensive exposure:

- CoCr and other cobalt containing alloys
- Nickel & Nickel alloys

Cobalt and some other metals are known to cause poisoning. Nickel is considered to be allergenic, leading to intolerance after extensive exposure. Other powders, even when they are considered to be non-hazardous or to pose no health risk, should still be handled with care. Even biocompatible powders, such as titanium alloys, are harmful after inhalation or contact with soft tissues, causing irritation of lung tissue and those soft tissues. Furthermore even if no health risks are attributed to a specific powder as to date, there is no guarantee that none will be discovered in the future.

Concerning fire and explosion hazards, the following powders are known to be combustible:

- Titanium and Titanium alloys
- Aluminum and Aluminum alloys
- Magnesium and Magnesium alloys
- Pure non-noble metals

Accumulations of combustible powder can ignite due to elevated temperatures, open flames, sparks or electrostatic discharge. When dispersed finely into the air, they are susceptible to dust explosions. Furthermore fine fractions and condensates of these materials (as you will find in the exhaust filter), are to be considered extremely flammable.

In addition to combustible powders, some materials can react with moisture, generating heat and/or hydrogen gas. Typical examples include pure aluminum, magnesium and magnesium alloys. The combination means that these powder form an immediate fire and explosion risk when exposed to moisture.

The end user is required to review the Safety Data Sheet for each material in your facility. Always assume that any material is both a health and fire hazard.

REACTIVE METAL POWDER STORAGE

To store reactive metal powders in your facility:

- Use closed containers. Closed containers will prevent accidental dust generation and contamination.
- Always use conductive containers or containers lined with conductive material. Containers made from a conductive materials will help dissipate electrostatic charges.
- Store containers on a grounded conductive surface.
- Store separately from other chemicals such as, but not limited to, oxidizers and fuels.
- Store in a fireproof cabinet that is certified for the storage of combustible materials (class 4.1).
- Make certain you have small containers for small quantities of powder. Do not store small quantities of powder in large vessels.
- In the ideal case, large quantities of powders are stored in a suitable separate building, away from the production environment.

Storage in closed containers will prevent accidental dust generation and contamination, while a conductive material will help dissipate electrostatic charges.

It is also recommended to store large quantities of combustible powders in fire retarding cabinets or a specifically designed room. While this will not prevent fire itself, it will prevent powder from igniting immediately by a fire in the vicinity of the powder storage. This will give your personnel additional time to evacuate and will provide emergency services the opportunity to extinguish the external fire before the powder stock ignites. In the ideal case, store large quantities of powders in a suitable separate building, away from the production environment.

You must make certain there is no automatic sprinkler system installed where aluminum, magnesium or magnesium alloys are stored. These materials will react with water to produce hydrogen which will create an explosion hazard.

Material Handling Precautions

Always wear all PPE as specified in the section, "Personal Protective Equipment".

Read the SDS of the material used for the specific precautions you should observe. Use the following table of precautions as a general guide

Safe Material Handling Guidelines

CATEGORY	PRECAUTION
FIRE/HEAT	• Never smoke or ignite anything around powdered materials. • Store flammable liquids away from materials. • After removing a part from the print chamber, allow it to cool to room temperature in a well-ventilated area. • Use anti-static mats in front of DMP equipment.
INHALATION	• Avoid breathing powdered materials Always wear dust mask rated N99 (FFP3) or equivalent level protection.. • Always provide adequate ventilation.
SHOP SAFETY	• Train operators in DMP system procedures. • Wear safety glasses. • Use extreme care with all heated materials. • Make sure that the room is well ventilated.
AVOIDING SPILLS	• Keep containers closed when not in use. • Have a fully-grounded internal non-ignition vacuum cleaner ready to use. • Have any equipment specified in the SDS ready to use.
SDS	• Give operators access to the SDS's that apply to materials they will be handling and ensure that they read them. If necessary, translate them. • File SDS's in an easily accessible location for immediate reference. • Strictly follow all the conditions in each SDS.

ARGON SAFETY

The DMP system uses Argon as a cover gas to create an inert atmosphere in the print chamber. The cover gas inhibits any potential rapid combustion of particulate matter during the DMP process.

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

3D Systems recommends that you have an oxygen monitor installed in the room containing the DMP system. This monitor will alert you if the oxygen level drops below a designated point. It must be wired to trigger an immediate shutdown of the DMP system and any inert gas flow.

⚠️ **WARNING: BECAUSE ARGON IS HEAVIER THAN AIR, 3D SYSTEMS RECOMMENDS INSTALLING THE OXYGEN MONITOR CLOSE TO THE FLOOR TO DETECT ARGON POOLING.**

⚠️ **WARNING: EXPOSURE TO AN ATMOSPHERE CONTAINING 12 PERCENT OR LESS OXYGEN CAUSES UNCONSCIOUSNESS WITHOUT ANY WARNING SYMPTOMS. THIS HAPPENS SO QUICKLY THAT YOU CANNOT HELP OR PROTECT YOURSELF.**

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

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

- If, at any time, you feel you are experiencing symptoms of oxygen deprivation, leave the area immediately.
- You have received oxygen safety training.
- The room is well-ventilated; at least 4 air exchanges per hour.
- Self-contained breathing apparatus is available and easily accessible.
- The room oxygen alarm monitor is functioning and audible.
- Leave the DMP system room/area immediately when you hear the oxygen alarm.

Oxygen Deprivation Effects and Symptoms

OXYGEN CONTENT (% BY VOLUME)	EFFECTS AND SYMPTOMS AT ATMOSPHERIC PRESSURE[a]
15 – 19 %	Decreased ability to work strenuously. May impair your coordination or may induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12 – 14 %	Increases respiration during exertion. Pulse rate goes up. May 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. Nausea and vomiting may occur.
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.

a. From Safety Bulletin SB-2 - 1983—"1983 by the Compressed Gas Association, Inc. 1235 Jefferson Davis Highway, Arlington, VA 22202

RISK RELATING TO GAS BOTTLES

Whenever necessary, compressed gas bottles are to be stored outside the buildings in an enclosed and ventilated shelter. The bottles must be placed vertically in the racks attached to the walls.

Any gas bottles that cannot be attached and that have to be used close to the equipment, must be placed on a suitable support that makes it impossible for them to tip over.

Remember that there is a risk of asphyxia in small, poorly ventilated, rooms.

Furthermore, an excess-flow shut-off valve must be fitted to the regulator output, upstream of the gas pipe. This valve starts to operate when the flow exceeds flow value under normal operation conditions with approximately 10% .

RISK RELATING TO LIQUID ARGON GAS CONTAINERS

Ensure that the complete gas system is regularly checked for leaks before use. Containers should be stored in a vertical position and properly secured to prevent them from falling over. Containers should be stored in a well ventilated environment that will not encourage corrosion. In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.

CHEMICAL RISK

These risks can have several sources:

Laser – material interaction: in this case, the emission, to a greater or lesser extent, is caused by the vaporization and decomposition of materials during a laser procedure (emission of fumes, aerosols and dust, some of which may be carcinogenic),

Use of gas to control the building atmosphere. Argon Ar – inert gas: anoxia.

LASER SAFETY

The DMP system contains an IPG fiber laser. The laser itself is designated Class IV. Very brief exposure to a direct—or specularly or diffusely reflected—laser beam can cause significant burns or eye damage. It can also be a fire hazard.

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

LASER SAFETY CLASSIFICATIONS

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

BIOLOGICAL RISK

The main risk is to the eyes. The laser beam presents a danger in two ways:

Direct radiation, where the eyes are in the beam axis.

Do not look directly into laser during power burn.

Reflected radiation, where the beam hits a surface that does not fully absorb it, results in partial reflection of the emitted beam.

Specular reflections (due to reflective objects) present exactly the same risk as direct radiation, as not only are they insidious, but they also contain up to 90% or more of the initial energy content.

Effects due to laser radiation depend on the wavelength; in the near infrared range (700 to 1400 nm), the cornea and lens are highly transparent to laser radiation, which thus reaches the retina. If the eye receives a significant energy density, the laser beam may cause small, irreversible lesions with extremely variable consequences depending on the location of the affected area. This can result in the formation of a hole in the retina with no adverse effect on vision, or in a blind area (or black spot) due to damage to the macula or even in almost total loss of vision when the fovea is affected.

The laser safety window conforms to standard CE EN207 allowing operators to observe interaction of laser and material while avoiding the risk of burns and loss of visual acuity.

SAFETY LABELS ON THE DMP SYSTEM

Voltage, Compliance and Id Labels
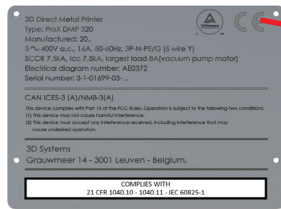
supply conductor and machine overcurrent protection provided at machine supply terminals

Laser Certification / Identification

COMPLIES WITH FDA PERFORMANCE
STANDARDS FOR LASER PRODUCTS EXCEPT
FOR DEVIATIONS PURSUANT TO LASER NOTICE
No. 50,
DATED JUN 24, 2007

Max. AVERAGE OUTPUT POWER: 1000W CW
WAVELENGTH RANGE: 900-1200nm
VISIBLE AND/OR INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR
SCATTERED RADIATION CLASS 4 LASER
PRODUCT

PER IEC 60825-1:2007-03;21 CFR 1040: 10(g)

Tip Over Warning Label - Process Chamber Door

WARNING

Tip over hazard.

Do not open door before chamber is bolted to the floor.

Burn Hazard Label - Back of Process Chamber. Adjacent to Oxygen Sensor.

WARNING

Burn hazard.
Hot surface inside.
Allow to cool before servicing.

Pinch point label –build module

Laser Safety Labels - Located on Scanner. Left and Right Side of Lens Cover

CAUTION – class 4 invisible laser

Invisible laser radiation when door is open and interlocks defeated.
Avoid eye or skin exposure to direct or scattered radiation

Laser Safety Labels - Located on Door

CAUTION – class 4 invisible laser

Invisible laser radiation when door is open and interlocks defeated.
Avoid eye or skin exposure to direct or scattered radiation
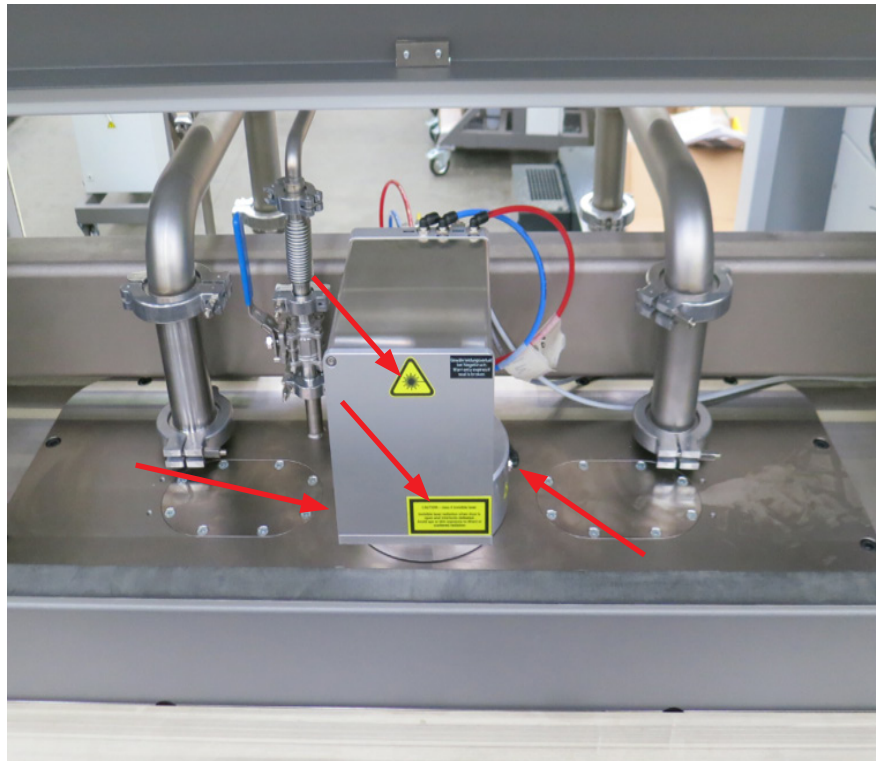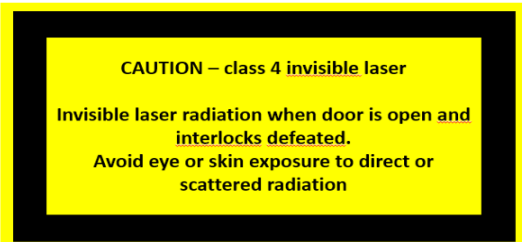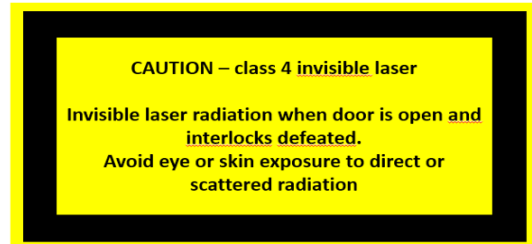
EUROPEAN DIRECTIVES

European directive 89/686/CE in Europe

For Personal Protective Equipment (PPE), the employer is required to:

- Provide the appropriate PPE,
- Check the correct choice of PPE has been made in relation to the risks involved,
- Ensure that PPE is used effectively,
- Check their conformity,
- Notify the people responsible for their implementation (workshop manager, etc.),
- Make sure that any PPE are in proper working order and are correctly maintained,
- Notify users against which risks the PPE protects them and
- Train the users.

Conforming PPE (self-certified or certified by an accredited body) shall be marked both visibly and indelibly with (CE marking for Europe):

- The manufacturer's name and logo,
- PPE trade name or reference,
- Expiry date, where appropriate.

PPE must be delivered with a notice as well as a declaration of conformity to applicable regulations (to the main requirements of European directive 89/686/CE in Europe).

Operator safety

Components approved in accordance with standards EN 60204-1 (safety of machinery):

- Emergency stop (as per IEC 947-5-1): the emergency stop is located on the control display; it activates immediate shutdown of the following components: oven, laser, motors, turbine, as well as the pneumatic drives,
- Emergency shutdown (as per IEC 947-3): this involves a circuit-breaker located on the network upstream of the machine. It can be used to cut off the power supply to the machine in a single operation,
- Disconnection from electricity grid: this involves the main isolating switch located on the machine's connection panel. When the machine is off this device isolates the machine from the network and enables electrical isolation (subject to shut off the Uninterrupt-able Power Supply),
- Safety switches (as per EN 1088): these devices isolate the laser when opening one of the main doors or the galvanometric head. They make it possible to lock and unlock the main doors, and
- Laser safety window (as per EN 207): this device is located on the front face of the machine and enables the operator to look inside the chamber while being protected from laser reflections. There is, therefore, no need to wear laser eye protectors when the system is in normal operating mode.

3 SYSTEM SPECIFICATIONS

THE PROX DMP 320 SYSTEM

This section lists all of the equipment that is provided as a part of the ProX DMP 320. For more detail on product specification, please refer to the ProX DMP 320 Facility Guide.

- Process Chamber/Electrical Cabinet
- Vacuum Pump
- Blower
- Filter
- Chiller
- Transport Cart
- Sieving Station **(optional)**

PROX DMP320 SYSTEM COMPONENTS
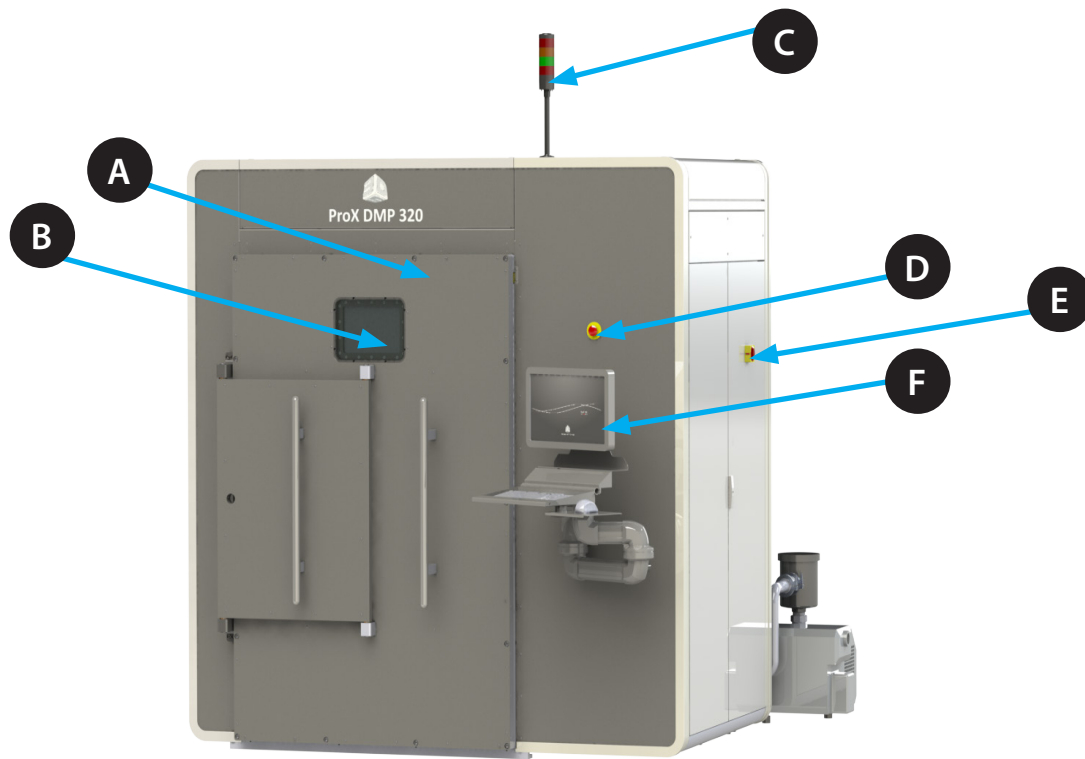
A   **Process Chamber Door**

The door makes an airtight seal with the process chamber and protects the operator from the laser.

B   **Process Chamber Window**

This enable the operator to look inside the process chamber while being protected from the laser.

C   **Stack Light**

The stack light consists of four lights that indicate the state of the machine at all times.

- Red - Machine Error
- Orange - Job is running / Laser on
- Green - The machine can be controlled from the operator panel, DMP deposition is running.
- Red Flashing - Emergency stop

D   **Emergency Stop**

When this button is pressed, all movement stops, the laser is switched off and the argon and compressed air supply are both switched off. This places the machine in a safe state.

E   **Main Power Switch**

The Main Power Switch is used to switch the main 400V power to the printer on and off.

F   **Operator Panel**

The DMP 320 is controlled this computer.
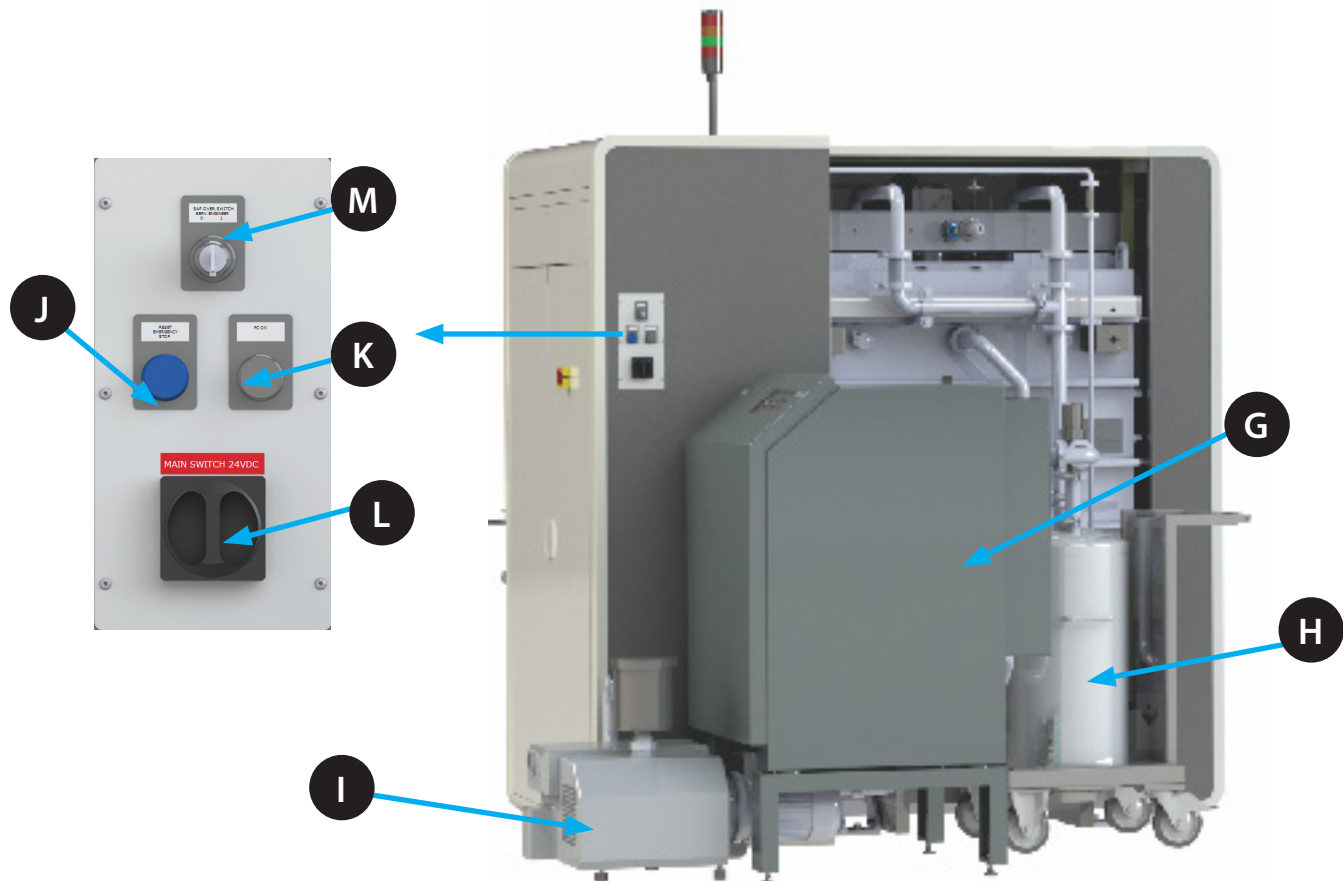
G **Blower**

The blower continuously circulates the argon over the printbed to extract all fumes and carry them to the filter

H **Filter**

All fumes and debris extracted from the process chamber are filtered out by the filter before the argon atmosphere is reintroduced into the process chamber.

I **Vacuum Pump**

Before starting a printjob, the atmosphere inside the chamber needs to be oxygen free. The vacuum pump removes all air from the process chamber creating a vacuum in the process chamber. This allows the process chamber to be filled with argon gas to create inert atmosphere with oxygen levels lower than 100 parts per million (ppm).

J **RESET EMERGENCY STOP**

Returns the system to normal operation after the E-Stop key has been pressed and disengaged again.

K **PC ON**

The PC On Switch is used to switch the machine PC ON and OFF.

L **MAIN SWITCH 24VDC**

The power switch for all parts that run on 24V DC.

M **SAFETY OVERRIDE SWITCH**

When this switch is turned on with the key the laser can be turned on even when the pressure or oxygen levels are not at the required level. Note: the laser will still be turned off by opening the door. This should only be used by 3D Systems certified maintenance personnel to calibrate the laser system.
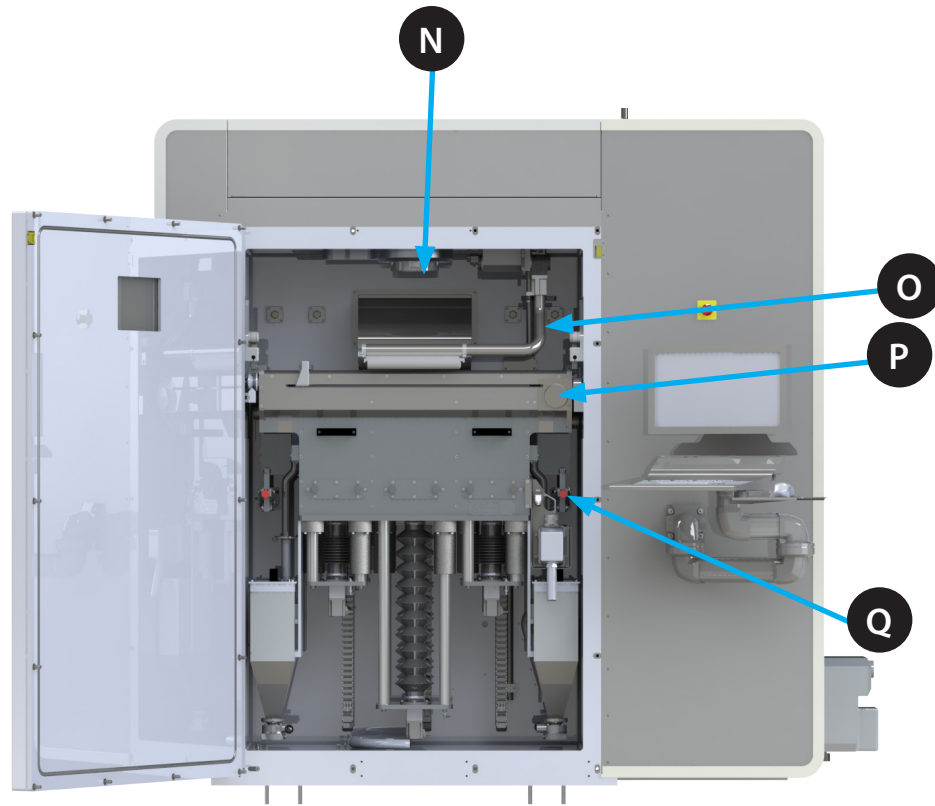
N **Laser Window**

Laser is focused onto the build platform through the laser window.

O **Air Flow Nozzle**

The argon atmosphere is circulated through the process chamber through the air flow nozzle.

P **Build Module**

The build module contains the metal powder and the build platforms. It can be pulled outwards to have better access to the building module. It can be removed and "swapped-out" for another build module which contains a different metal powder.

Q **Locking Pins**

The locking pins lock the build module into place and maintain it in the correct position. These must be unlocked to pull the module in its outward position or to remove it.
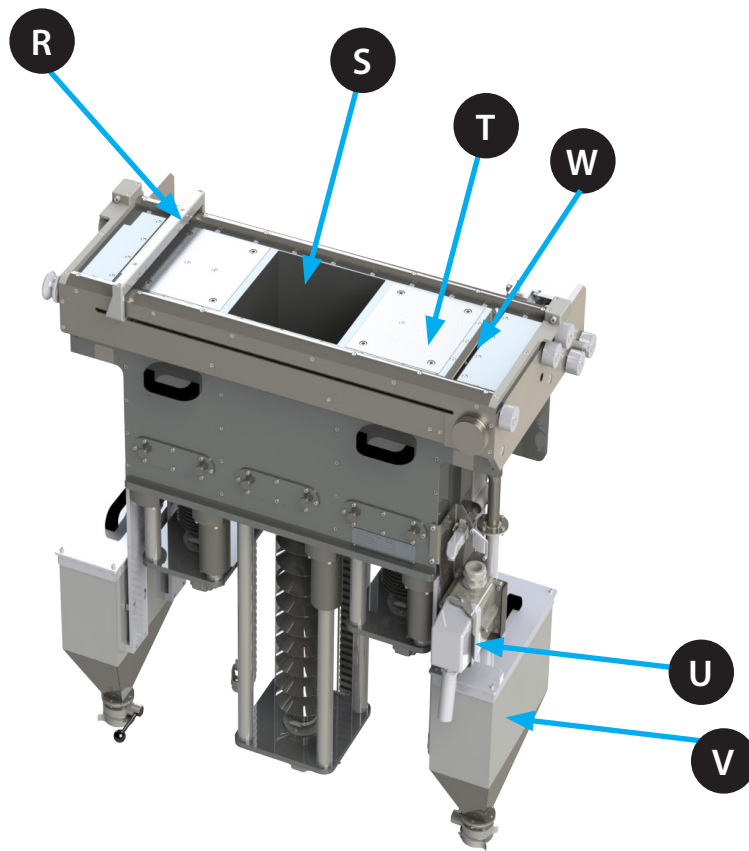
R **Deposition System**

A soft coater moves the powder from the feeds onto the build platform.

S **Build Chute (with build platform)**

The parts are printed on a printing plate which is bolted to the build platform. During the print process, the build platform indexes down to allow subsequent layers of the part to be printed.

T **Feed Chute (with feed platform)**

The feed chute (with feed platform) contains the new metal power. The platform lifts the powder to the correct height to supply the coater with the right amount of metal powder.

U **Electrical Connector**

Carries all power and signal connections from the process chamber to the build module.

V **Overflow Container**

Holds the excess powder until it can be extracted and sieved for re-use.

W **Overflow Chute**

Powder deposited in here is lead to the overflow containers.

X   **Module Transportation Cart**

Used to remove the build module out of the printer and to store a build module if you have multiple build modules.

Y   **Chiller**

The chiller cools and circulates cooling liquid used to keep the laser parts at a set temperature. The cooling liquid is composed of a mixture of 50% tap water and 50% distilled water. Optishield is added to this mixture to prevent corrosion. For more information, please refer to the Chiller User Guide.

Z   **Sieving Station (optional):**

The sieving station allows the user to electronically sift and separate material from the overflow bins and separate it into the waste and the usable material that can be fed into the feeds to build parts.

SOFTWARE OVERVIEW

The ProX DMP 320 comes with a number of programs.

Program name	Installed on: Machine PC	DMP Server	User PC	Used for
DMP Deposition	X			Printer control
DMP Control	X	X	X	Printer control File preparation
DMP Explorer		X	X	File preparation
DMP Machine Server	X			Background program
DMP Remoting Server		X		Background program
DMP Worker		X	X	Background program
DMP Slicer		X	X	Background program
DMP hatchwise 2		X	X	Background program

File preparation is typically performed in the following sequence.

| stl model software | .stl Slice files | DMP Explorer | .lmj | DMP Control | .lmj | Machine PC |

→ Prepare 3D model
→ Fix the stl file
→ Support generation

→ Create part file

→ Create job file
→ Manipulate the parts
→ Change parameters
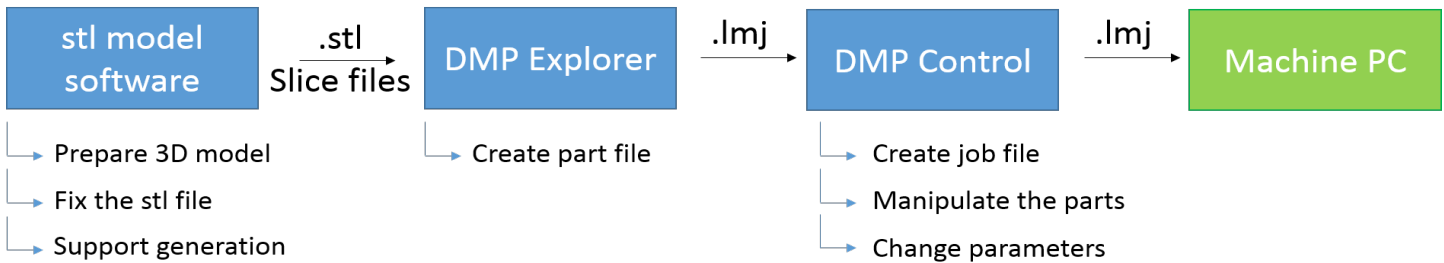
File preparation is typically performed from a user PC although the DMP server can also be used to do file preparation if needed.

DMP Explorer

This application guides the user through the process that converts 3D .stl files to printable .lmj job files. This conversion entails slicing and hatching the parts among other things. The workload is splitted so it can be sent to different cores of the server PC and other high performance stations that run DMP worker. The different packages are intelligently divided among all the running DMP workers on the network.
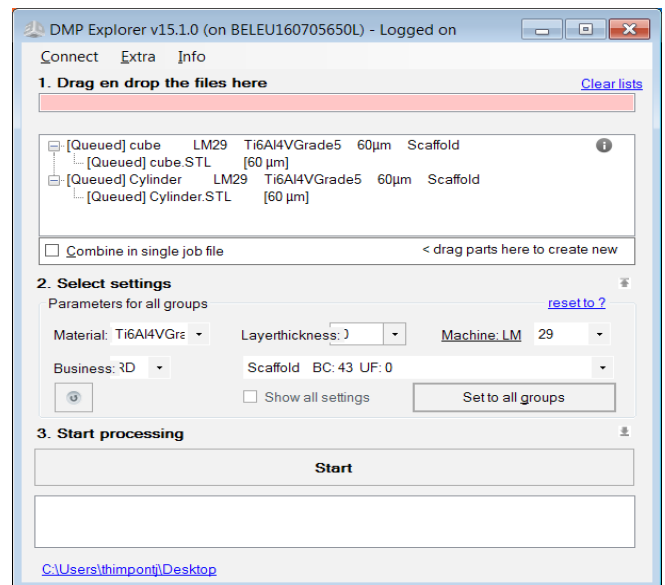
File processing is performed in 3 steps

1. Input file

Drag and drop .stl and .cli files in the red field. Files will be grouped and non-process

able files will be filtered out automatically. Groups can still be changed by dragging files and renamed by double clicking and writing the new name. Parts or groups can be removed again by selecting the line and pressing the delete key.
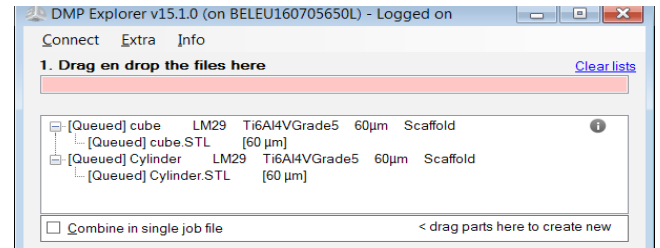
2. Select settings

The settings for all the groups can be changed in this section. First fill in all the applicable fields and then press "Set to all groups" to change the settings for all groups.
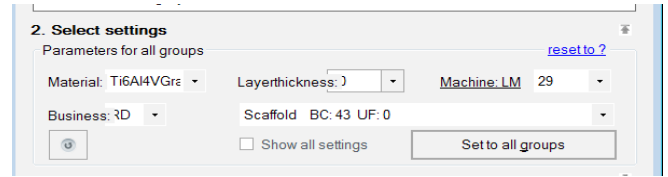
Layer parameters and layer thickness of each part individually can be changed by right clicking the line in the input file field and selecting "Set parameters" or "Set layer thickness" accordingly.

NOTE: Be carefull when changing parameters for each part individually as all profiles (even if they are not possible) will be shown. In the general parameter selection only the possible profiles will be shown.
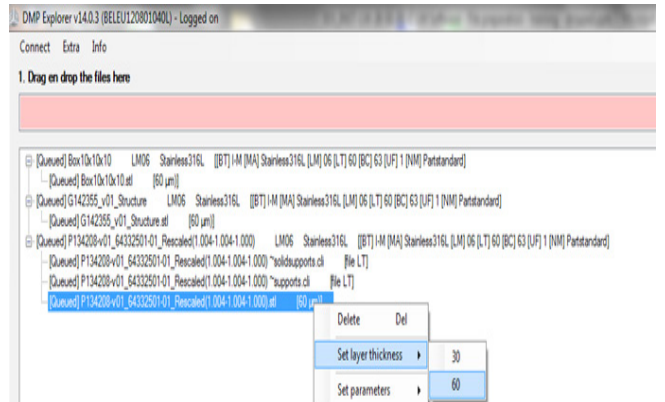
3. Start processing

When the start button is pressed the processing starts. The progression will be visible in the input file field.'

The field below the start button will show the conversion log, errors that come up while processing will also be shown here.
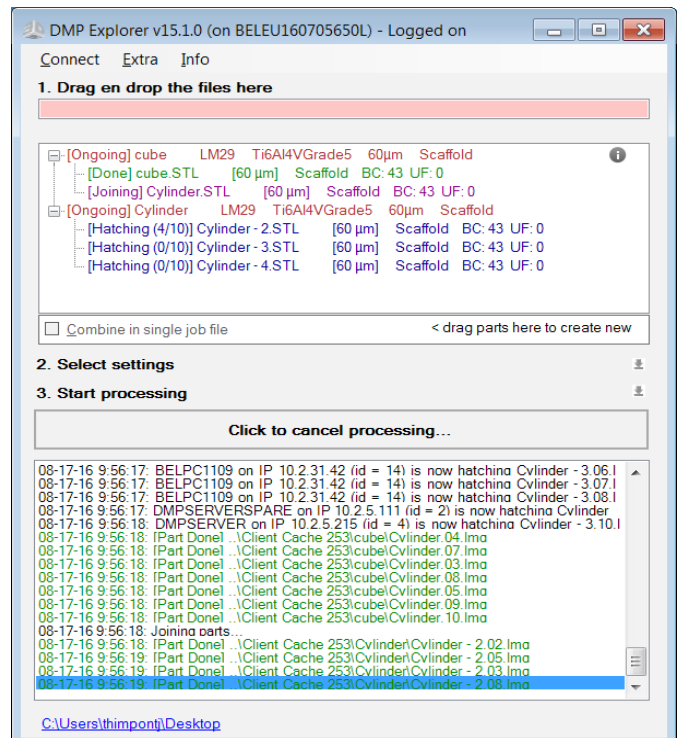
When finished the output will be placed on the location of the original .stl file. You can also find a link to this location on the bottom left corner of the screen.

DMP Control

This program is used to prepare the printjob. For example bringing parts in to print, laying out the parts on the print platform, changing parameters,… This program will also be used to start the actual printjob when the printer has been prepared with DMP deposition.

While it needs to be running on the machine pc to control the laser and scanner during printing, it can be run separately from a user pc to prepare the printjob remotely and send it to a printer.
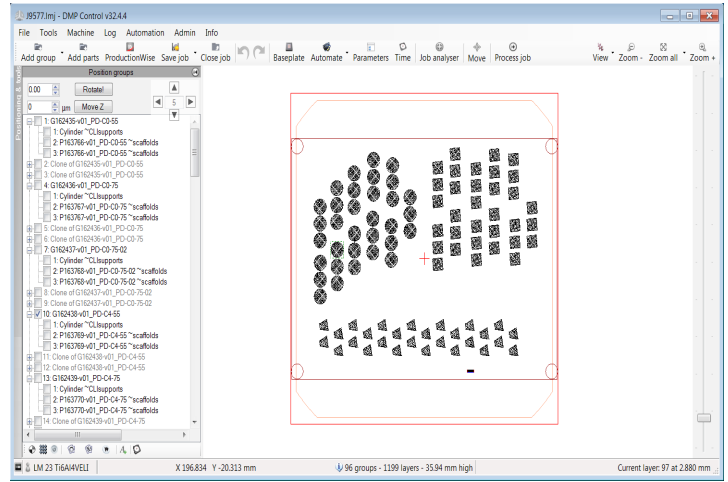
The program is build up out of the following components:

The Menu bar

- Add group: Add a group of parts
- Add parts: Add one part at a time
- ProductionWise:

  The optional Production-Wise module allows user to:

  - Start your serial manufacturing job in < 1 minute.
  - Includes automatic individual ID tagging and serial number generation.
  - Centrally manage your serial manufacturing jobs.
  - All with Traceability and Version Control

- SaveJob: Saves the job as a .lmj file
- CloseJob: closes the job
- Base plate: Lets the user change the printing plate size
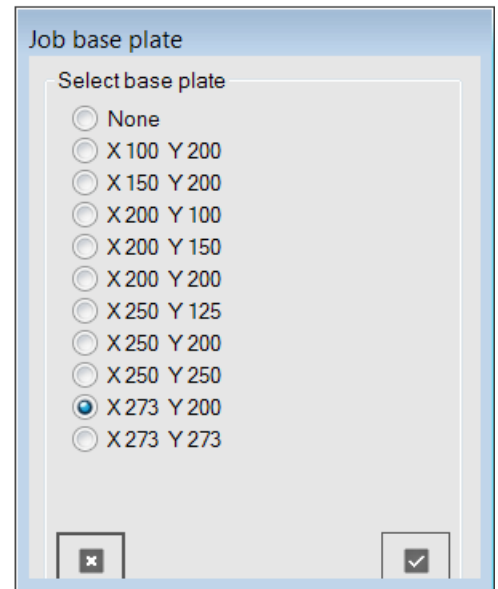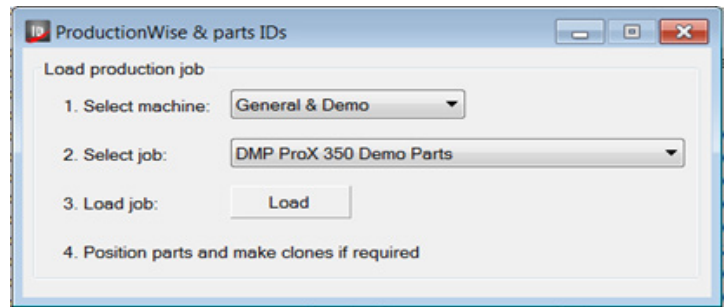
- Automate: Automatically apply parameters to the complete job or to selected groups

- Parameters: Manually allocate job and part parameters

- Time: Estimate job time

- Job analyser:
    - Analyzes the job file for potential mistakes
    - Over 25 potential issues are checked
    - Includes (automatic) fixing for some issues
    - 3 different levels
        - error (red): must be fixed otherwise job can't be started
        - warning (yellow): carefully read and see if it alligns with your intentions or not
        - information (white): informative message

- Move (toggle button): Turn move group mode on/off If it is turned on, you can drag your groups manually to the desired position.

- Process Job: Start printing the job, this will only be enabled on the machine pc.
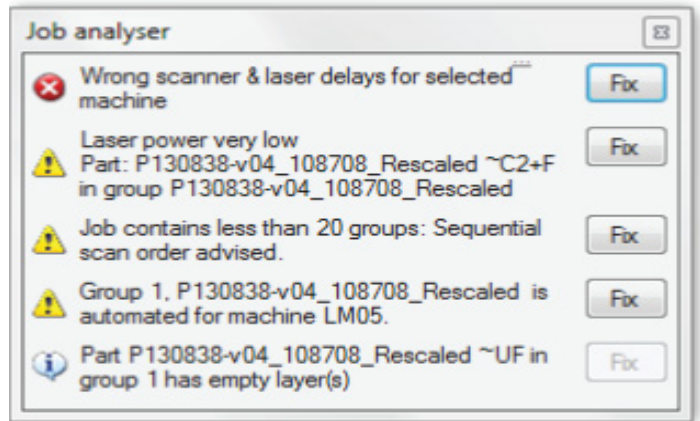
Preview screen

- Shows a preview of the current selected layer for each part
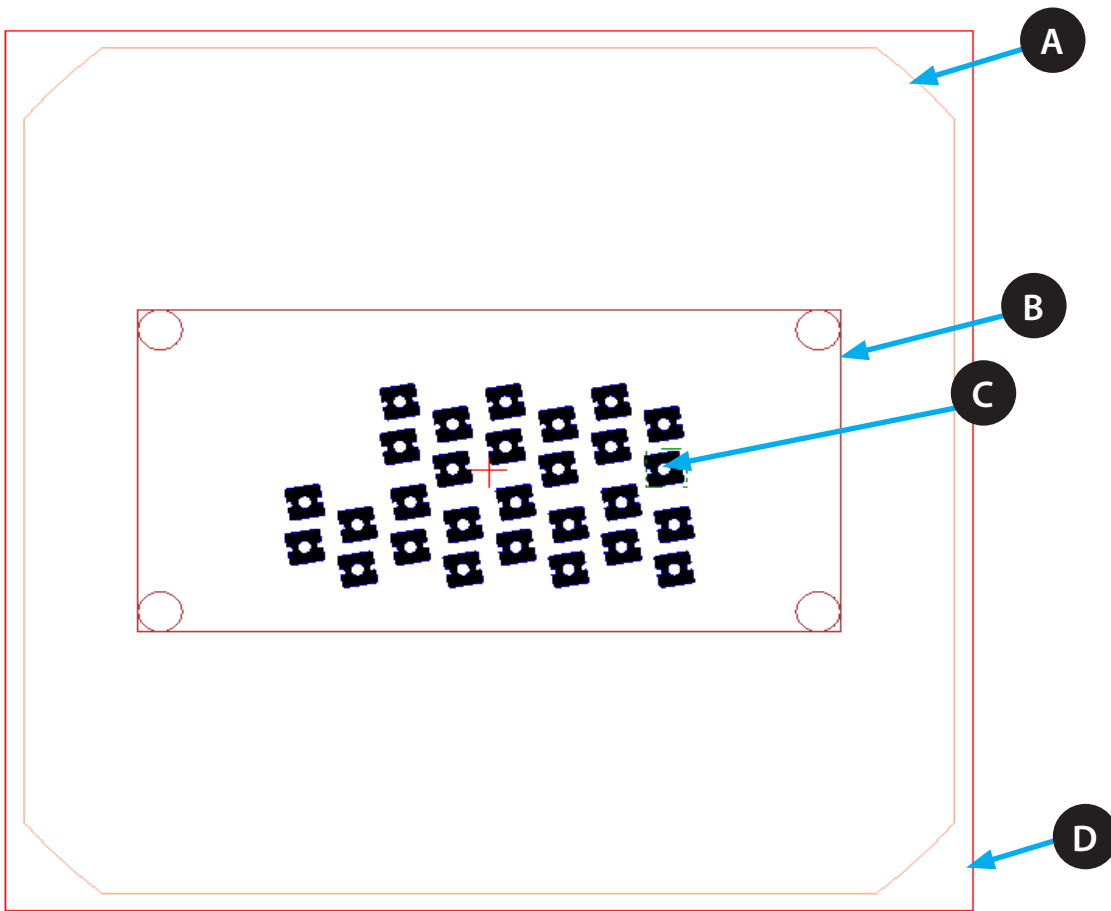
A Calibrated scan area

B. Printing plate

C. Selected layer of part to be printed

D. Build platform

Tools Panel

Two panels can be shown here:

- The "positioning & tools" panel: Lets the user position, rotate, clone, certain parts or groups.
- The "properties" panel: Lets the user change parameters of the job, group or part.
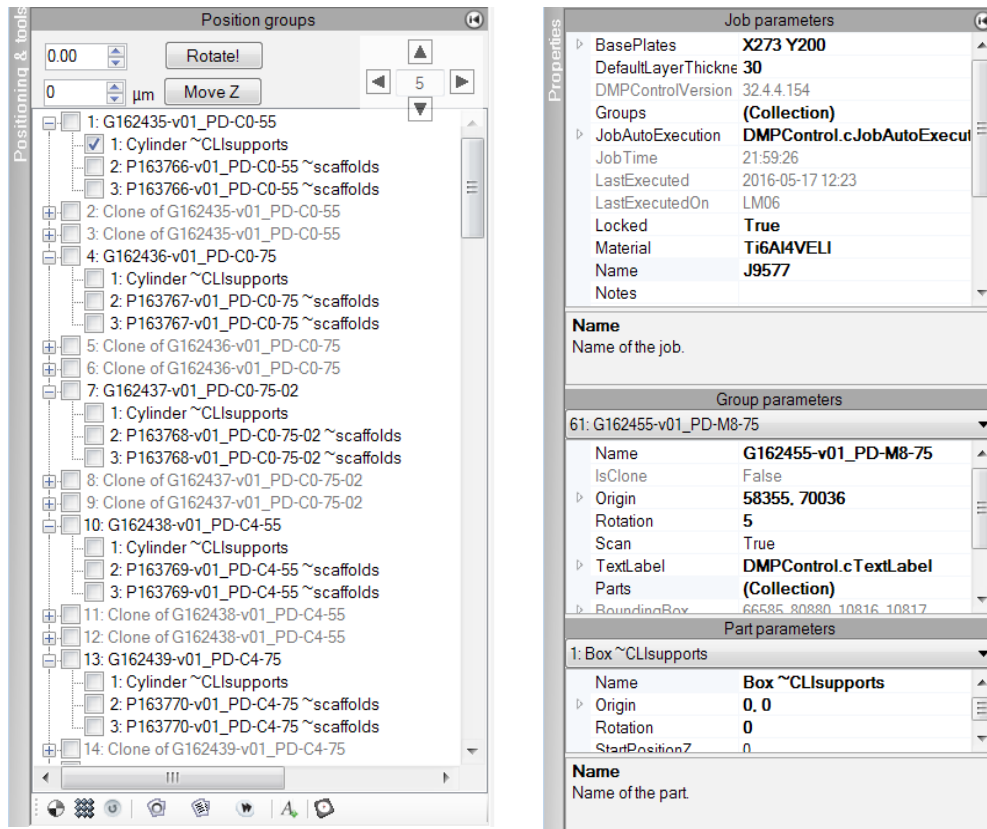
Layers sliderbar

Let's you scroll through the layers in the preview window.

By clicking in the bottom right corner you can specify which layer to show.
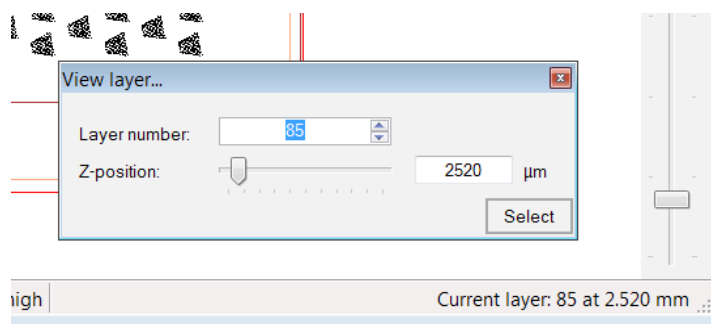
The layers can also be scrolled trough by using the up / down arrow keys

Move/copy groups

via this window you can accurately place parts and by clicking one of the buttons while holding CTRL you create new clones of the selected groups at the new location. Units is millimeters

Update Scanner Calibration File

A scanner correction file contains the geometrical calibration of your scanner which is used to improve the accuracy of the laser scanning. When a scanner calibration is performed and a new scanner correction file is generated, you have to manually configure the machine to use the new scanner correction file.

1. Get the latest calibration file for your machine from Teamplatform, (see the ProX 320 Knowledge Base).
2. Navigate to the Calibrations folder and to your serial machine serial number
3. Download the latest version of the calibration file, e.g. D2_1224_LM45_v04.ct5
4. Copy this file to your machine and copy it into the folder C:\3D Systems\Config\Machines\LM45
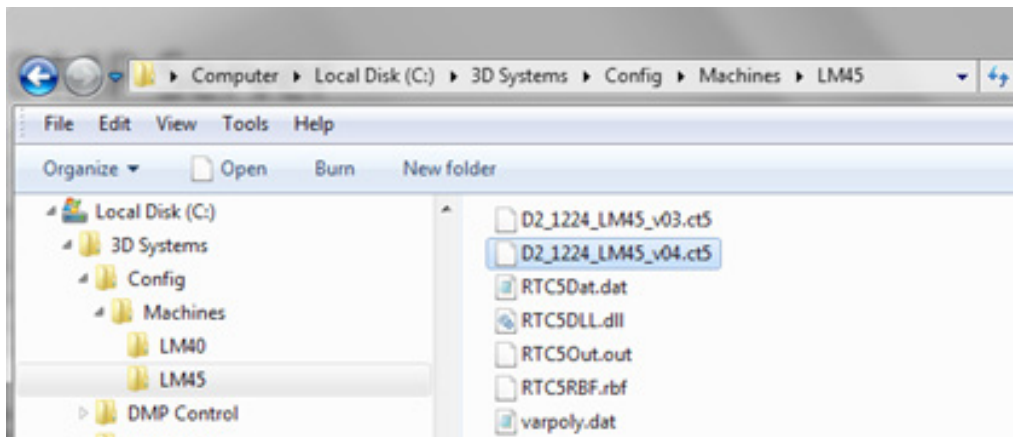
5. Make you place the file in the correct sub folder, (LMxx where xx is your machine serial number).
6. If this folder does not exists, you are still running old software. You need to upgrade your software.
7. To finalize the configuration, start DMP Control.
8. Select Admin > Configurations > Machine configuration.
9. Enter the name of your new correction file.
10. Click the Save button.
11. Restart DMP Control
12. The new scanner correction file is used from this point on.
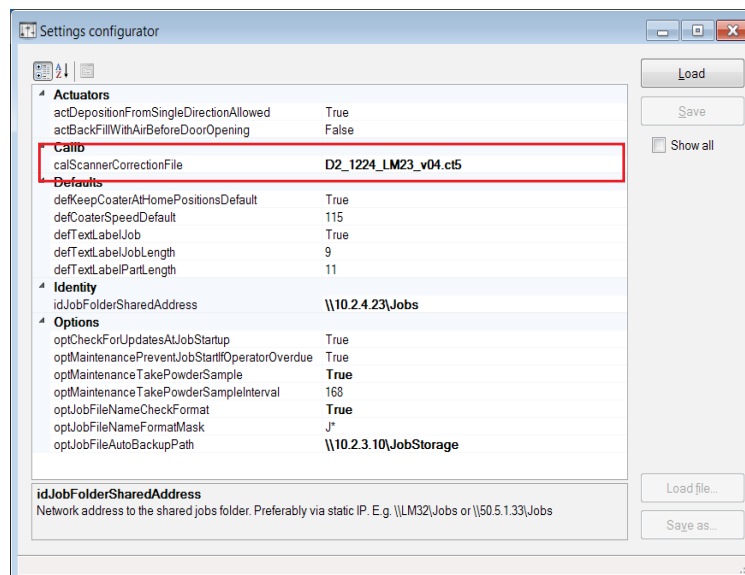
Traceability of Slicing/Hatching Parameters

Once you have a job file, one can always trace back what actual hatching parameters were used. To find this information:

1. Open the job in DMP Control.
2. Click on the far left bar to switch to the properties windows.
3. Select group.
4. Select part.
5. In the part property window locate the field 'SliceSettings'.
6. This will list the slice settings used to generate this part.
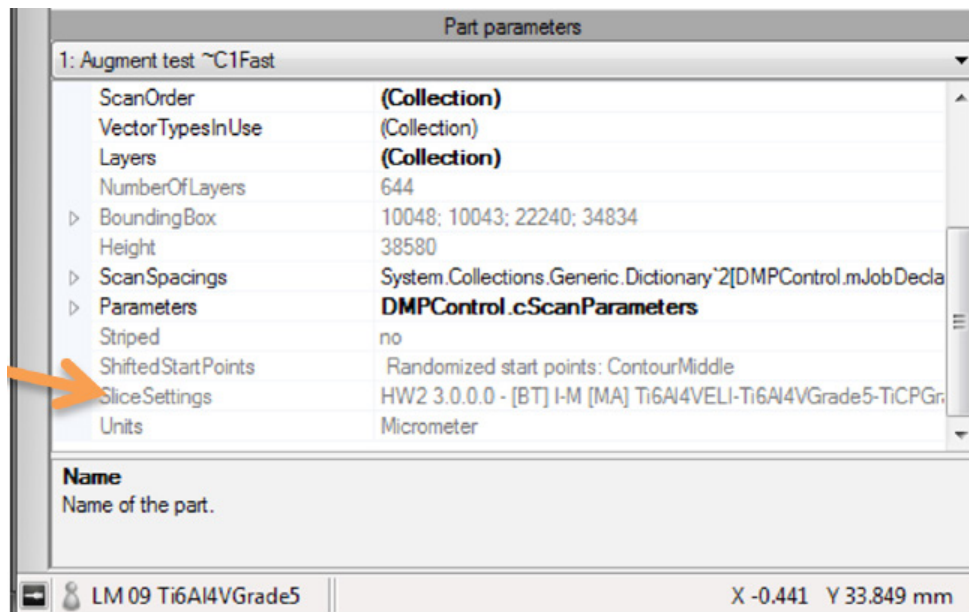
Building Very Close to the Platform Borders

DMP control shows the preferred calibrated building area with the light colored contour. Attempting to print outside of this area will have a significant influence on the aConfccuracy. Optically, you will not damage the machine or the part as long as you stay away from the 4 corners.
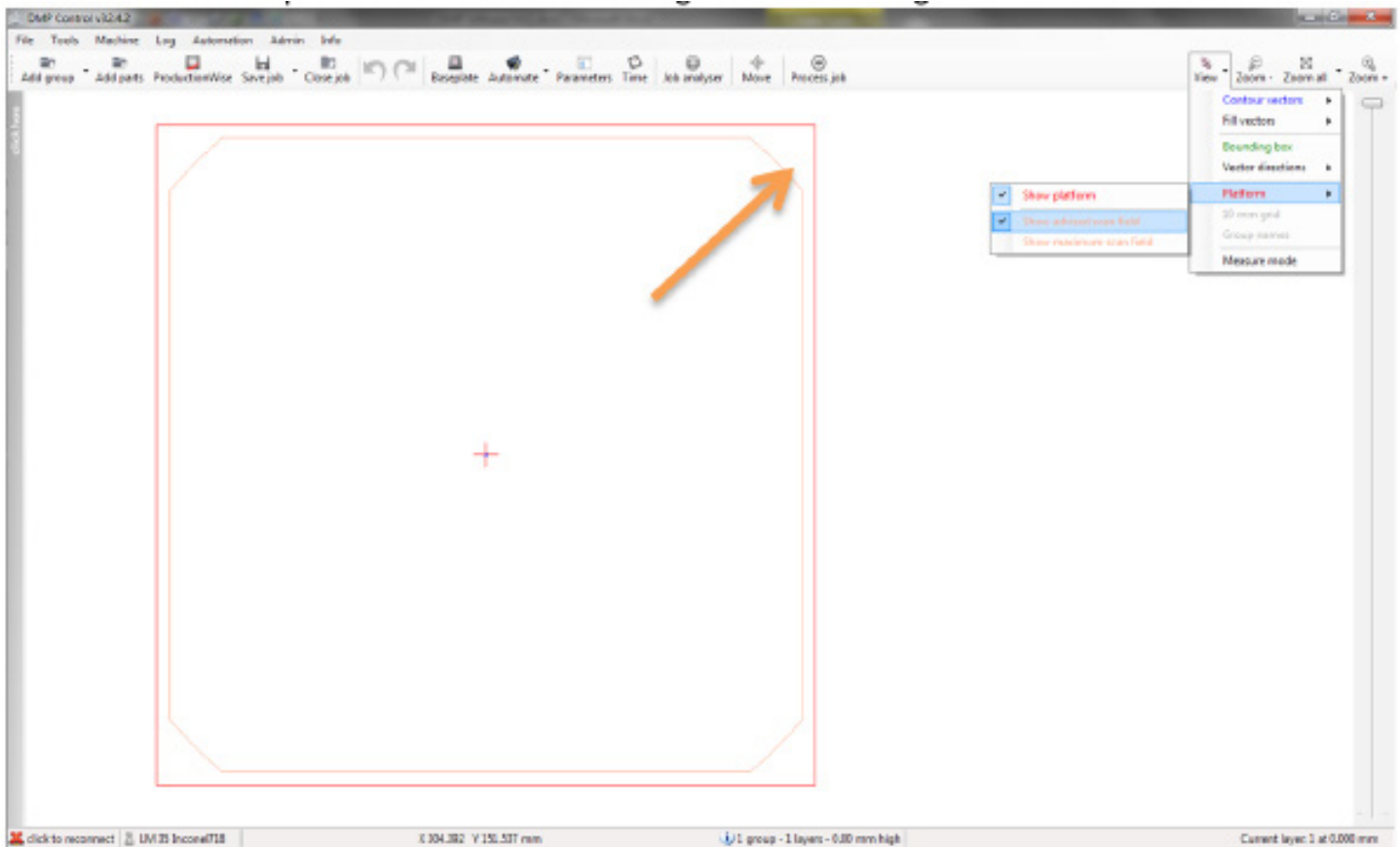
⚠️ **Caution: Do not scan on the print module. The scanner zero point is not always exactly in the center of the build platform.**

To verify if your part is not outside of the platform, you can 'test' the location by manually pointing the scanner to the test location.

1.   Switch on the red laser diode/pointer to see the location of the spot:

2.   Select Machine > Laser > check 'Show laser diode'

3.   From DMP Control, select Machine > Scanner > Direct scanner control.

4.   Move the scanner to the requested 'test' location and verify it is inside the printing plate.

5.   If the spot is not inside the printing plate, shift your part in DMP Control to match the real position.

Configure Automatic Job File Backup

Note: this paragraph is only applicable if you have purchased and installed this option.

In order to have this function working correctly, always place the job files in a subfolder of the C:\Data\Jobs folder on your machine. For example.

- C:\Data\Jobs\Job 01
- C:\Data\Jobs\Job 02
- C:\Data\Jobs\J20151201
- C:\Data\Jobs\Test job for customer X

Never place a job file directly under the C:\Data\Jobs folder or in another folder on the computer.

When a job completes, you can have the machine automatically move your job file to a storage location (e.g. on the network). After a couple of days, the job is automatically deleted from the machine workstation, keeping it clean.

To enable this option (perform on each machine):

1. Start DMP Control.
2. Select Admin > Configurations > Machine configuration.
3. Set the path to the (network) storage folder. Preferably use an IP based address. Examples
   - X:\Backups\Jobs
   - \\10.2.100.3\BuildFiles
   - \\PC1234\Job backup)
4. The machine will automatically create a subfolder based on its serial number, e.g. …\LM 25\
5. The job folders will be placed in this directory.
6. Click Save and restart DMP Control and DMP Deposition.
7. You can test access to the job storage folder (after software restart) via:

DMP Control > menu Admin > Open job storage network folder…
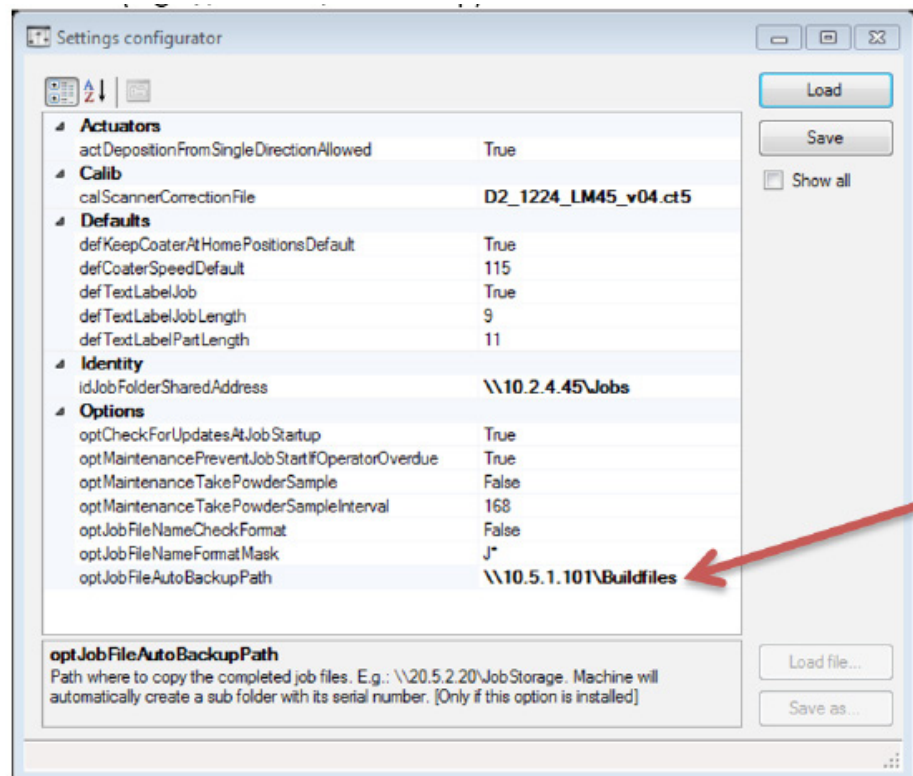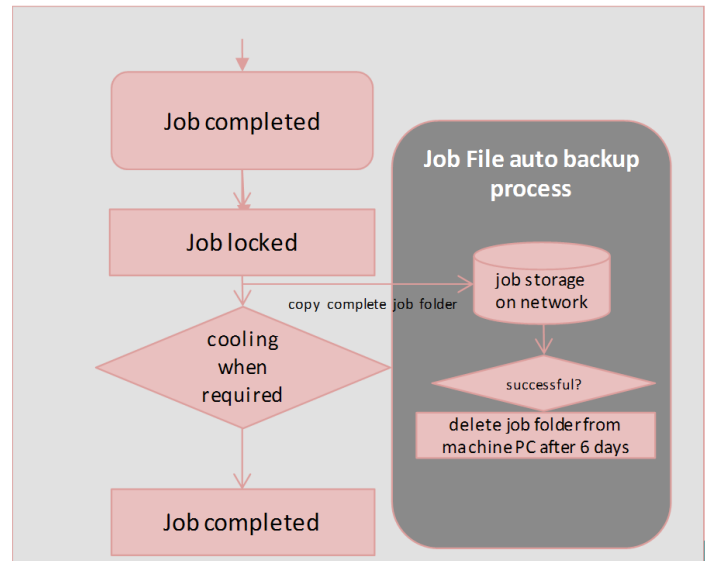
Options for the MaterialBatchNumberFormatMask Setting

In the settings configurator (Select Admin > Configurations > Machine configuration) there is the property "optJobFileNameFormatMask."

This property is used to define the input format for the Material batch text. If you want the user entering the batch number in a specific format then create a matching mask to accomplish this.

Users can navigate through the mask by using the left and right arrow keys or the mouse cursor, and can skip optional positions in the mask by entering a space.

Mask Setting	Examples	Description
None	Batch2012563 123Powder 5 2 5 Titanium	Anything can be entered. No limitation in length or type of text.
PB-0000	PX_ PB-1234 PB-0002 PB-0510	Fixed letters "PX", followed by underscore_ then 0 up to 4 digits.
PX_9999	PX_ PX_1 PX_1 5 PX_1234	Fixed letters "JOB", followed by space, then 0 up to 3 digits
\A-LL	A-_ A-kR A-kr A-KR	Fixed letter "A" (because A has a special function, you must precede it with \A to obtain the letter A itself). Followed by a dash -, then 2 letters required (upper or lower case).
\LW->AA-########	LW-_-_____ LW-TI-20151005 LW-XY-12345678	Fixed letters "LW", followed by dash -, then 2 letters (that are converted to capitals automatically via the '>' option, then dash -, then 8 digits (not more, not less).

Detailed Information:

Mask must be a string composed of one or more of the masking elements, as shown in the following table.

Masking Element	Description
0	Digit, required. This element will accept any single digit between 0 and 9.
9	Digit or space, optional.
#	Digit or space, optional. If this position is blank in the mask, it will be rendered as a space. Plus (+) and minus (-) signs are allowed.
L	Letter, required. Restricts input to the ASCII letters a-z and A-Z.
?	Letter, required. Restricts input to the ASCII letters a-z and A-Z.
&	Reserved character, don't use. If you need to use this character, use \& (see end of table: \)
C	Reserved character, don't use. If you need to use this character, use \C (see end of table: \)
A	Alphanumeric, required. It will accept the ASCII letters a-z and A-Z. This mask element behaves like the "a" element.
a	Alphanumeric, optional. It will accept the ASCII letters a-z and A-Z. This mask element behaves like the "A" element.
.	Decimal placeholder.
,	Thousands placeholder.
:	Time separator.
/	Date separator.
$	Currency symbol. The actual character displayed will be depending on your local currency symbol defined in Windows.
<	Shift down. Converts all characters that follow to lowercase.
>	Shift up. Converts all characters that follow to uppercase.
|	Disable a previous shift up or shift down.
\	Escape. Escapes a mask character, turning it into a literal. For example: \\ is the escape sequence for a backslash. \L is the escape sequence for the letter L (if you just put L, it will be interpreted as mentioned above, like a placeholder for any letter A-Z.
All other characters	Literals. All non-mask elements will appear as themselves. Literals always occupy a static position in the mask, and cannot be moved or deleted by the user.

The decimal (.), thousandths (,), time (:), date (/), and currency ($) symbols default to displaying those symbols as defined by the application's culture or Windows local settings for these symbols.

Mask	Behavior
00/00/0000	A date (day, numeric month, year) in international date format. The "/" character is a logical date separator, and will appear to the user as the date separator appropriate to the application's current culture.
00->L<LL-0000	A date (day, month abbreviation, and year) in United States format in which the three-letter month abbreviation is displayed with an initial uppercase letter followed by two lowercase letters.
(999)-000-0000	United States phone number, area code optional. If users do not want to enter the optional characters, they can either enter spaces or place the mouse pointer directly at the position in the mask represented by the first 0.
$999,999.00	A currency value in the range of 0 to 999999. The currency, thousandth, and decimal characters will be replaced at run time with their culture-specific equivalents.

Configure E-mail Notifications

This paragraph is only applicable if you have purchased and installed this option. When this option is installed, the machine will send e-mails when the job is

- Paused
- Aborted
- Completed

1. To configure the e-mail server and recipients, you need to set up the configuration. Ensure your computer can connect to the DMP Server and the internet.

2. Start DMP Control > Admin > Configurations > E-mail notifications.

3. For the "From address" (in the e-mail addresses field), you could use ProX320.%@mycompany.com. The % character will be replaced automatically by the machine serial number when the machine sends mail.

4. Use the Send test e-mail button to test your configuration

5. Click Save configuration to permanently save it on the DMP Server, making it available for all machines in your facility.

6. Make sure you add the sender addresses to your safe senders list in your e-mail program and check the SPAM folder in the beginning.

DMP Deposition

DMP deposition is used for preparing the printer before a print job, checking sensors/actuators and doing maintenance. While printing, this program controls all movements, sensors and vacuum cycle.
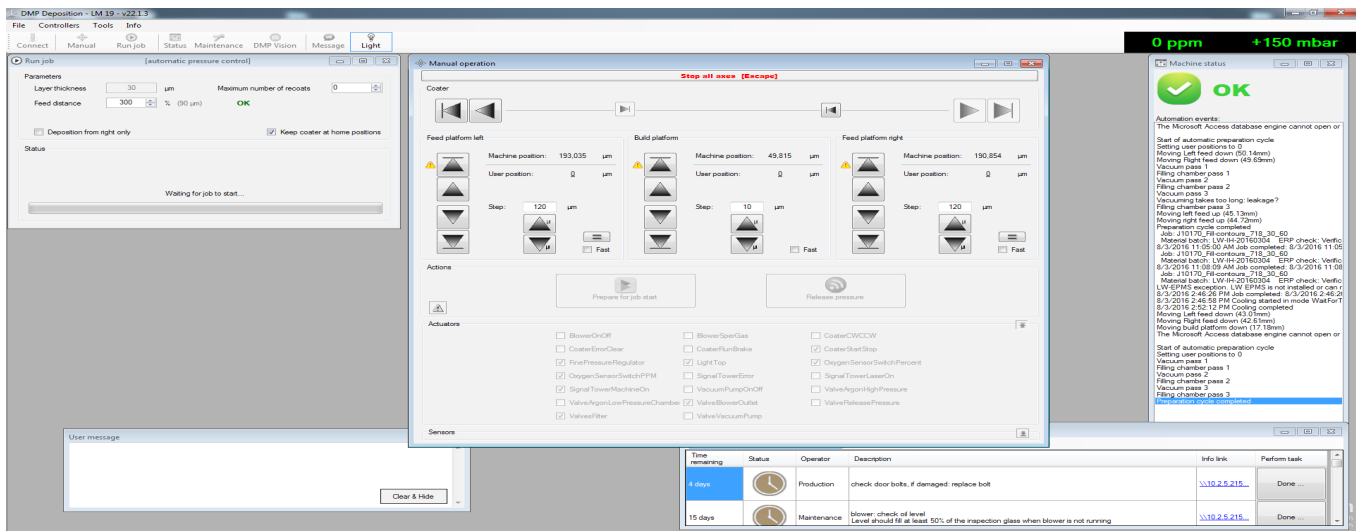
DMP Deposition is build up out of the following parts:

The Menu Bar
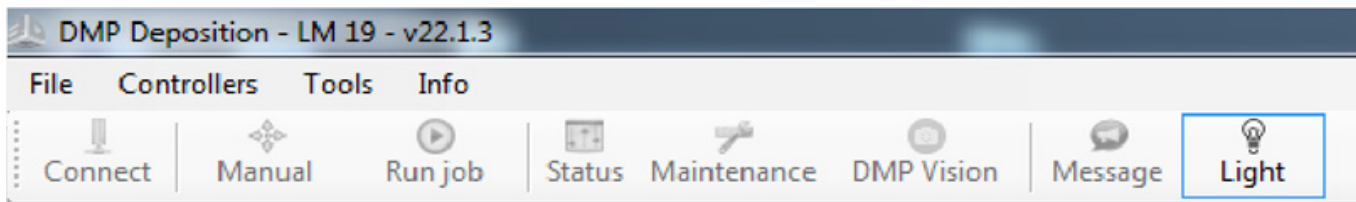
From here all different sub-modules can be accessed

- Connect – Connect to the machine
- Manual – manually control the machine and perform actions
- Run Job – Window that will be shown during printing
- Status – Opens up the Machine status screen
- Maintenance – Opens up the Maintenance tasks module
- DMP Vision – Separately purchasable module that visually checks the coaterbed
- Message – Opens up the User Message screen
- Light – Turns on/off the process chamber light
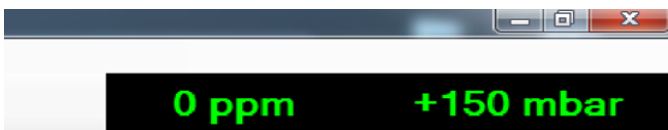
- On the right side of the menu bar the current oxygen level in the process chamber is shown. The displayed unit will be in % while the chamber is at high oxygen content and will switch to ppm (parts per million) when the oxygen content gets lower. This will be shown as soon as the printer starts preparing to print. Next to that is the relative pressure in the process chamber (in millibar). A negative number means there is underpressure, a positive number overpressure

Manual Operation

- This module lets the user perform manual movements and check the actuators and sensors. Note: the keyboard escape key acts as a stop button for all movements
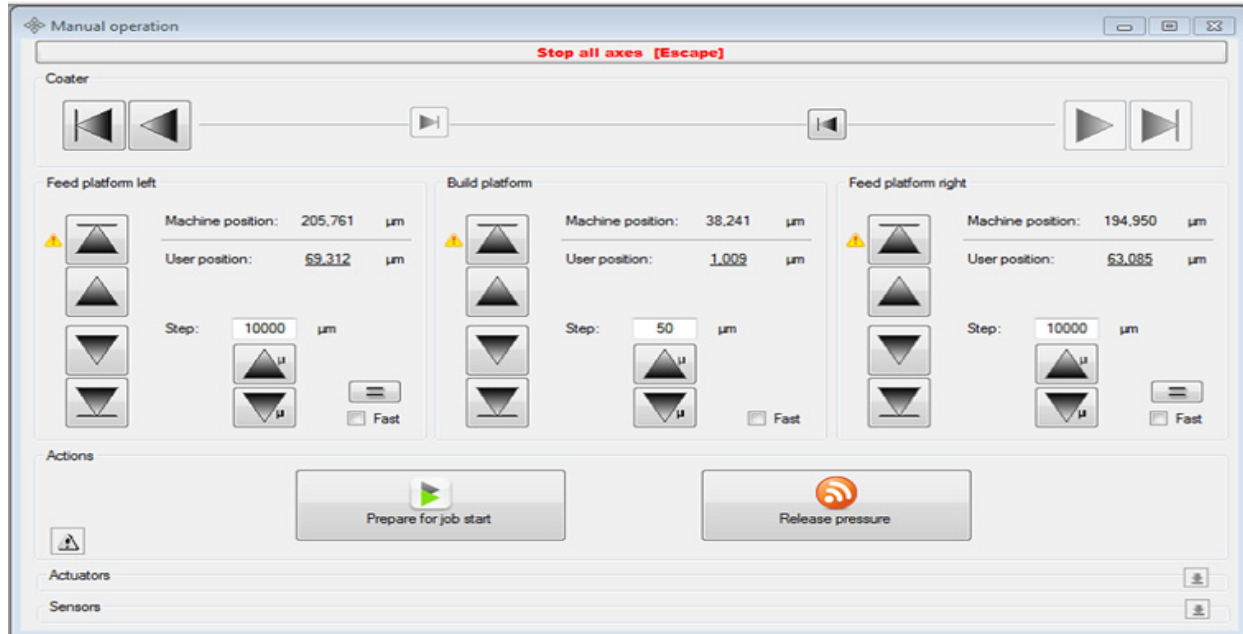
Coater Movements:
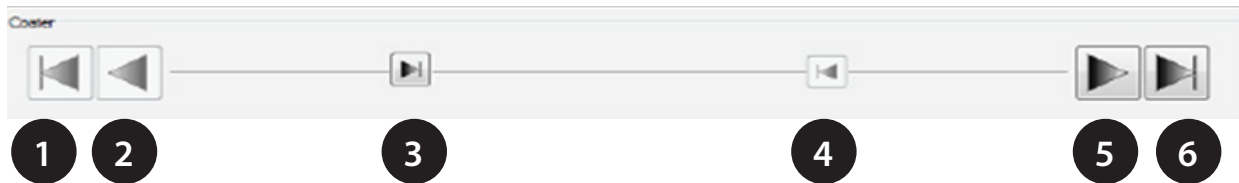
1. move coater to left end position
2. move coater left until button is released
3. move coater between left feed and build platform
4. move coater between right feed and build platform
5. move coater right until button is released
6. move coater to right end position

Feed/build Platform Movements
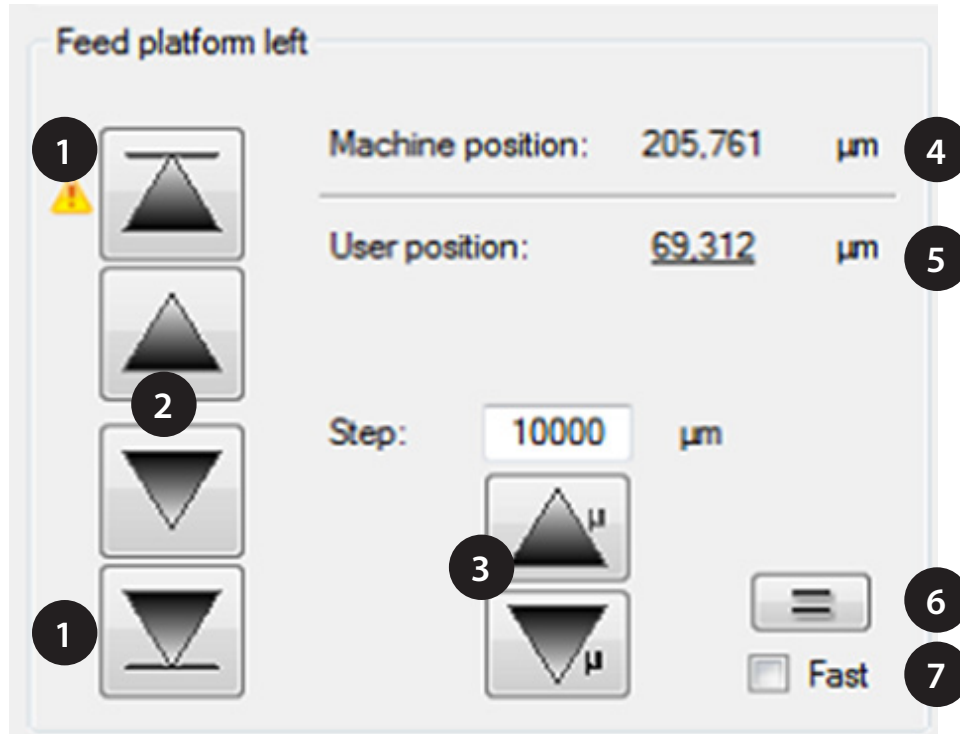
1. Move platform up/down to the end position (home).

   ✏️ **Note: it is required to home the platforms from time to time to ensure accurate position display. When a long time has passed since the last homing a warning symbol will remind you to perform a homing again.**

   ⚠️ **CAUTION: when the feed or build module is moved fully up while still containing powder, this powder will be spilled inside the process chamber. To stop automatic movement, press the escape button on the keyboard.**

2. Move platform up/down until button is released.
3. Move platform up/down with a set amount of μm as can be filled in in the textbox above.
4. Machine position gives the current position of the platform with the top position as 0 μm.
5. User position is the platform position that can be zeroed at any location by the user by clicking on it.
6. When this button is pressed, the applicable feed platform will move to the same machine position as the other feed platform.
7. When this option is marked, the platform will move up/down at a faster rate. (while printing, this option is disregarded).

Tip: When the shift button is held while pressing one of the buttons of a feed platform, both feed platforms will perform the same action.

<u>Actions</u>
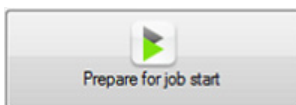
  Prepares the printer to start printing.

  Releases the pressure from the process chamber, This allows the user to open the door and unload the build.

Actuators

By pressing the button on the right this screen opens up and shows all currently engaged actuators
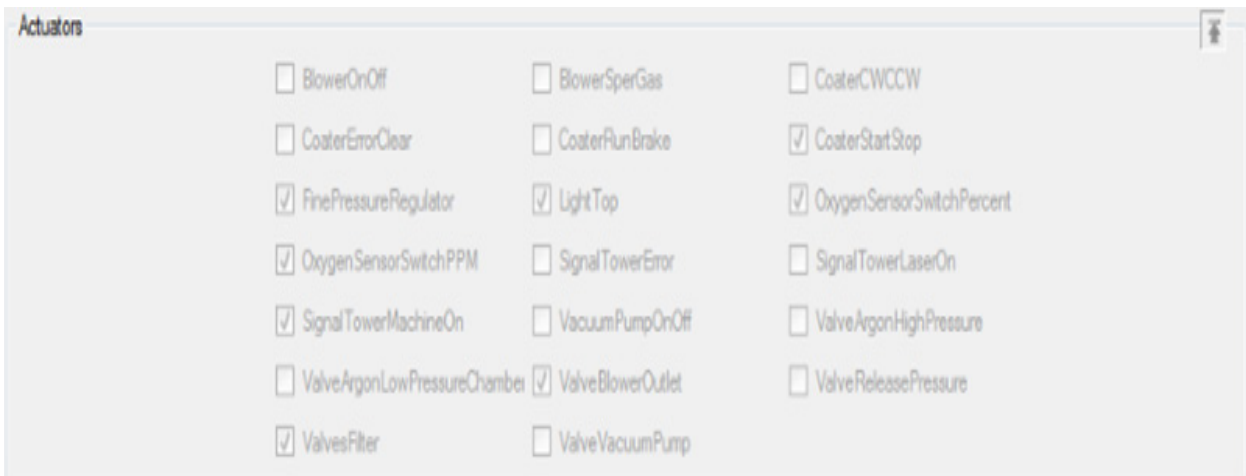
Sensors

By pressing the button on the right this screen opens up and shows all current sensor data
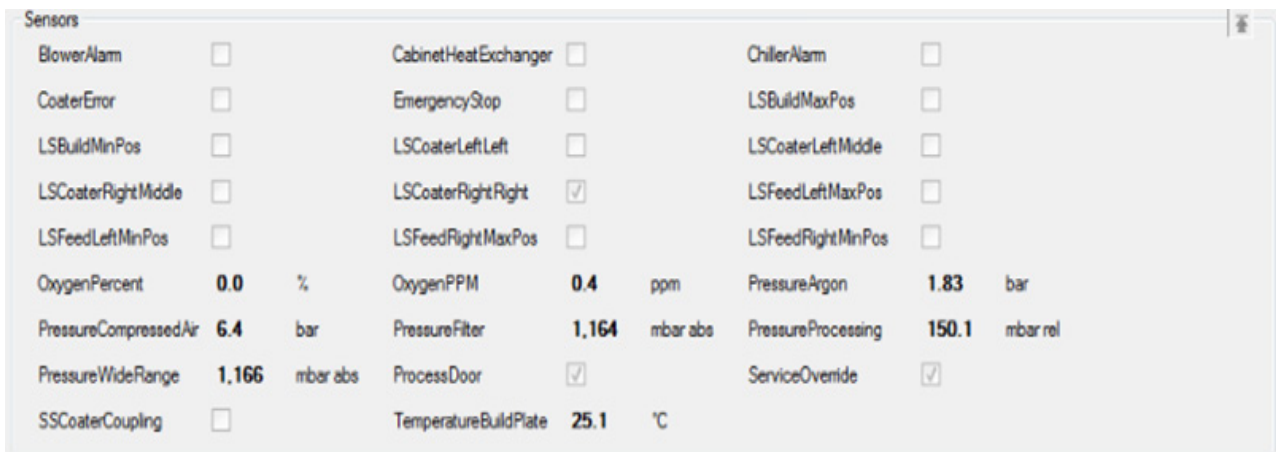
Machine preparation checklist

When you press the "prepare for job start" button the following checklist pop's up:
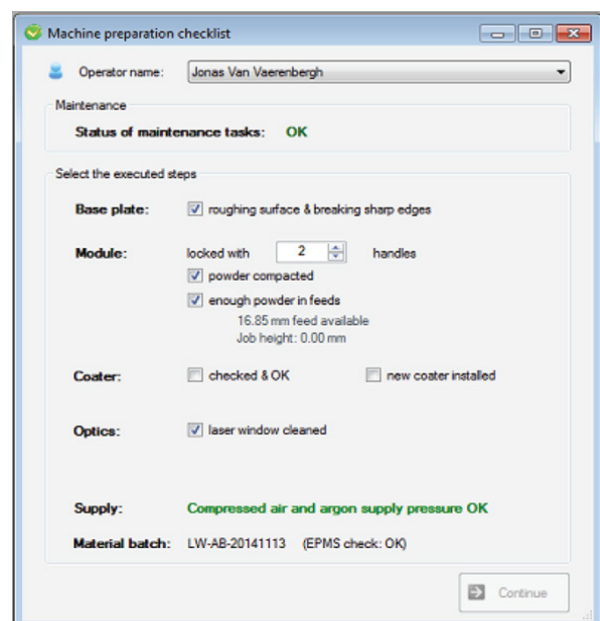
This list helps you check that all preparation steps have been fulfilled before starting the print.

Fill out the checklist and press on the continue button to start inerting the printer. After this the printer will be ready to print. The actual printing command will be given from within DMP control. This checklist will be stored in the Deposition.log file.

Run job

This gives the current status of print job (what action is being performed and what is the current layer).

It allows you to change some parameters. This windows opens after the machine has gone through the preparation cycle. This screen must be active if you want to start a job. If DMP deposition is closed for some reason after the preparation cycle, the program will automatically ask whether you have inerted the machine. If you inerted the machine correctly, press yes. To start a job now, open the run job screen manually.
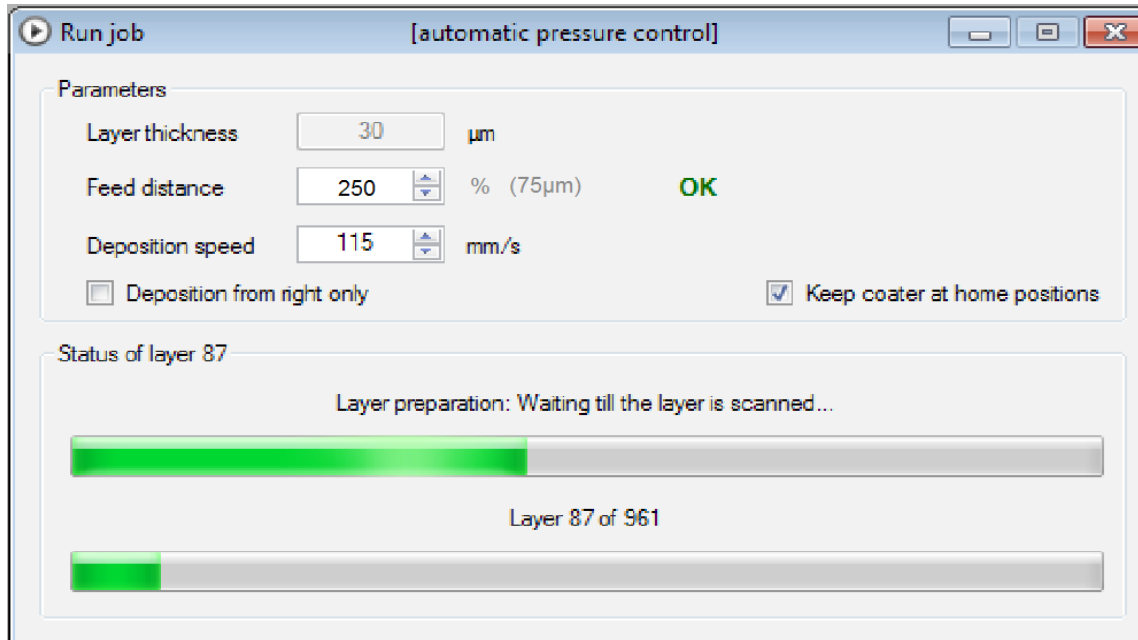
- Feed distance: How much the feed platforms will go up each time to provide the coater with enough powder. (in percent of layer thickness), making this number higher will reduce short feed occurrences but will use up more powder.
- Deposition speed: How fast the coater will move while depositing new powder on the build bed.
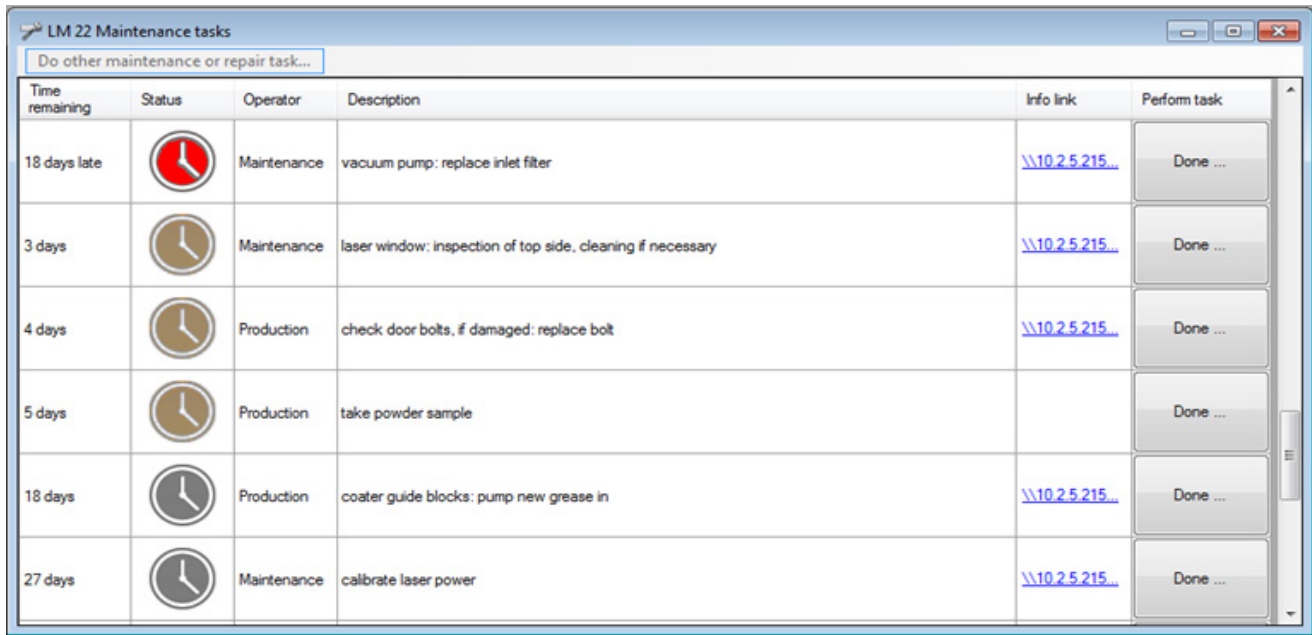
⚠️ **CAUTION: changing this parameter can change part properties (mechanical properties, surface roughness, etc.)**

- Deposition from the right only: Used if you have a limited supply of powder and only want to fill one of the two feeds. Only powder from the right feed will be deposited on the building platform this will increase the overall deposition time of the job.
- Keep coater at home positions: With this option set the coater will go to its endposition and wait there after each powder deposition. When this option is not set, the coater will go the end position after deposition and then go back to between the building platform and the feed to wait for the next deposition cycle.

Status

This window gives an overview of the Machine status reports

Maintenance Tasks

Time remaining: How much time until the maintenance task is due.

Status:

Overdue maintenance tasks

Maintenance tasks in the near future

Maintenance tasks in the further future

Operator:

Maintenance   ->   Must be performed by 3d Systems certified maintenance personnel

Production   ->   Must be performed by production operator

Description: Short description about the maintenance task

Info link: Opens up the applicable work instruction for the maintenance task.

Perform task:

Press button when maintenance task has been completed.

Message:

Is a simple notepad-like tool that can be used for noting down reminders or communicating remarks to other operators of the same printer. This messages will be stored even when DMP deposition is closed.

Background Programs

Next to this there are a number of background programs that the user will not need to interact with directly.

DMP Machine Server

- This program enables communication between DMP control and DMP deposition.
- Starts automatically when you start one of the programs above on the Macine PC.

DMP Remoting Server

- This program will divide the workload requested by DMP explorer between the DMP worker instances on the network.
- It needs to run before you start DMP Explorer or DMP Worker. DMP Server is normally configured to start this program automatically, once signed in into Windows.

DMP Worker

- This program runs in the system tray. If installed on several PC's in the network, it significantly increases the computation power to do the file preparation faster. This will also manage DMP software updates
- Must be manually run when starting up the DMP Server/user PC.

DMP Slicer

- Performs splicing for DMP explorer

DMP HatchWise 2

- Performs hatching for DMP explorer

DMP SERVER

The DMP Server communicates between all DMP printers and any user PC's in the network.

Backup DMP Server

All your important machine and material parameters can be backed up easily.

Make certain the complete C:\D

MP folder is backed up automatically. The easiest way to do this is by using Windows Backup:

Windows Start > Control Panel > Backup and restore
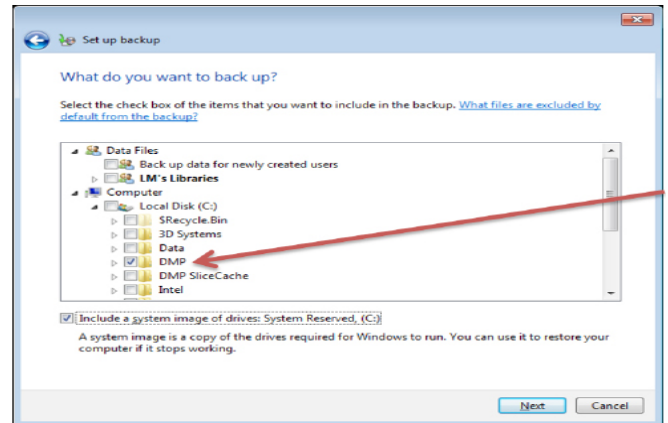
Bringing the DMP Server to a Domain

The DMP server is configured to communicate with your machine(s) when it is delivered. Joining it to a domain will require to repeat the configuration of the server and may lead to unwanted effects (like automatic updates, computer restarting, software not working anymore, etc.).

If your company requires the DMPserver joining the company domain take into account that:

- This might require you to set up the DMP Server configuration again, especially if you will log on as a different user .
- Make sure all client PC's (e.g. for job file preparation) can access the DMPserver.
- Preferably configure as a fixed IP machine.
- Make sure the local user "LM" is always logged on.
- The DMP Server may become invisible to the machines, so the machine will not work properly anymore.
- Never bring the ProX DMP 320 machines into a domain.

If the machines and the DMP Server are in a different domain or VLAN, your IT administrator needs to ensure both machines can access each other.

Powering Up ProX DMP 320

1. Make sure printer is plugged in to the facility power.
2. Turn on the main power switch.
3. Turn on the main power switch, 24VDC.
4. Make sure the emergency stop located on the front of the machine is not engaged
5. Press the "reset emergency stop."
6. Press the "pc on" button to turn the pc on.
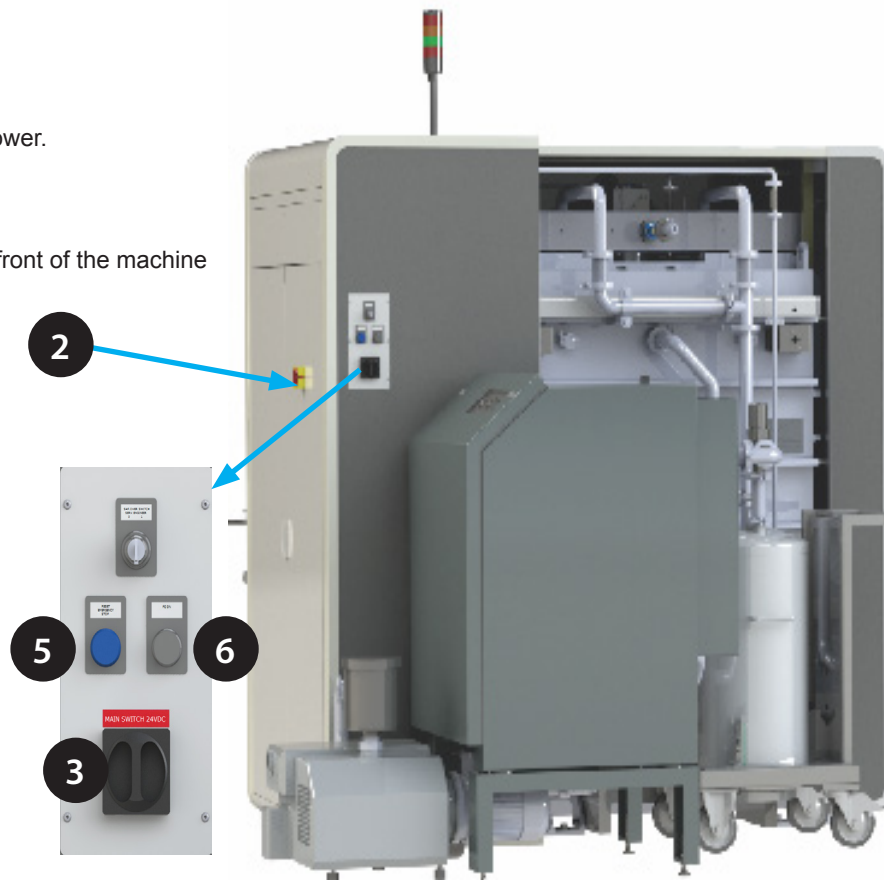
7. Start DMP Deposition (7) and DMP Control (8).
8. The printer is now ready to be used.
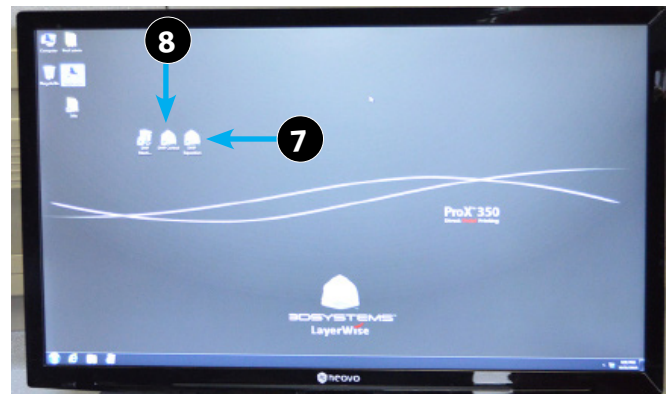
Shutting Printer Down

Anytime the Build Module is removed from the printer, the printer should be shut down first. Follow these steps to shut down printer:

1. Close DMP Control and DMP Deposition by clicking the boxes for all two windows in the upper right corner (1).
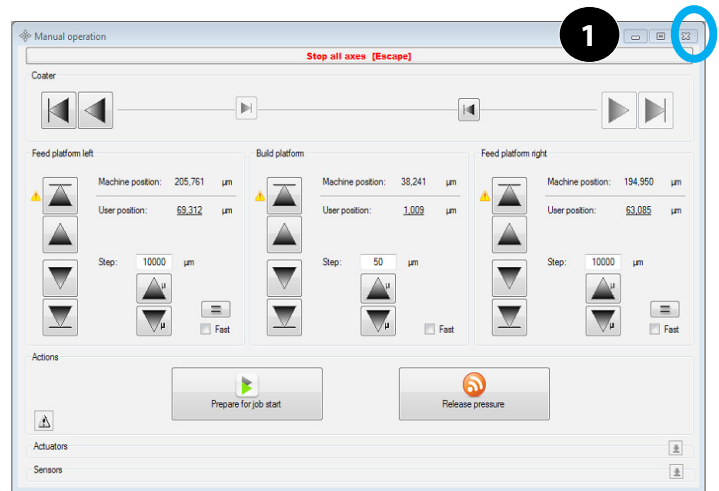
2. Shut down the PC the same way any PC is shut down, select Shut Down (2) under Start.
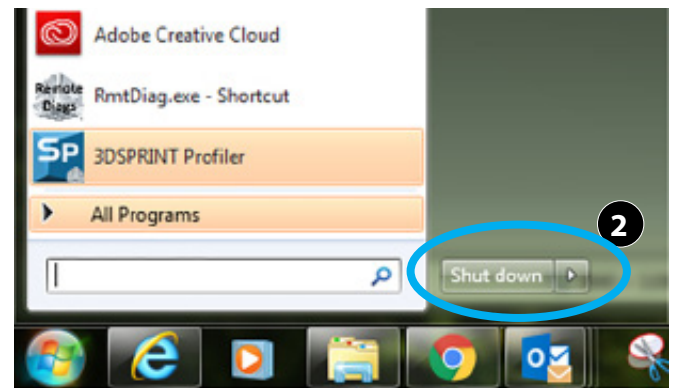
3. Turn off the 24 Volts (3).
4. Turn off the Main Power (4).

CAUTION: Do not turn off the 24 Volts before shutting down DMP deposition.

CAUTION: Do not turn off the main power before shutting down the computer.
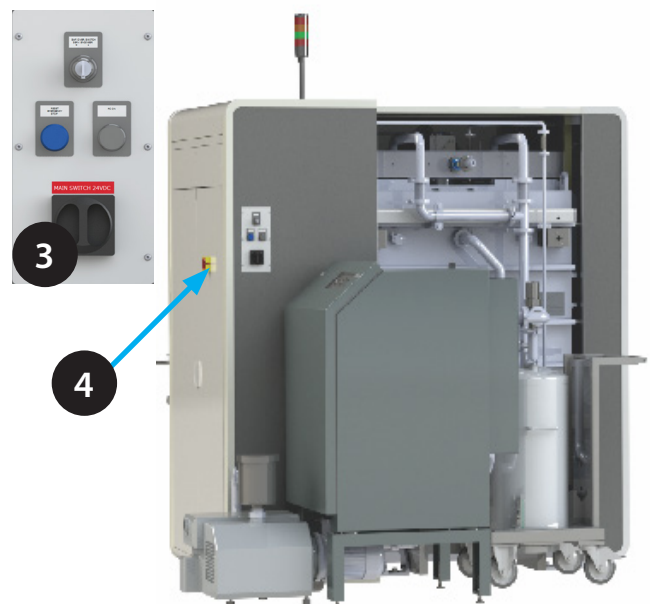
Preparing ProX DMP 320

Always use appropriate safety equipment when operating the ProX DMP320. The feeds can be adjusted in DMP Deposition.

Fill the feeds with the material. Add about 100mm of powder then thrust a stainless steel trowel in the powder a few times to compact the powder. Continue with adding and compacting until the needed amount is added to the feeds. Make sure that the feeds are equally filled and there is enough material to complete the job. Multiply the job height by 1.25 to get the amount of material needed to have a successful build. Example: If the job height is 100mm then each feed has to have 125mm of material installed.

Because the feed have to move down while inerting you can only fill up the feed bins for 320mm. If more powder is needed for a build, fill the build shute with 140mm of extra powder and, after inerting, move this powder to the feed bins with the coater.
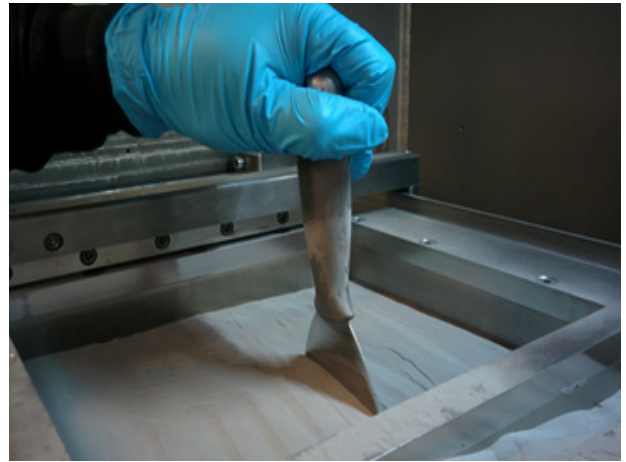
WARNING: Any time powder material is handled (i.e., refilling, sifting, changing, etc.) make sure you are either standing on an anti-static mat, or you are wearing a grounding strap that is attached to the module so that you are grounded to the machine. Always pour or scoop slowly from as close to surface as possible to avoid producing dust from material. It is also advised that the vacuum dust extractor be over top of the bin.

CAUTION: The print plate must be compatible with the print material.

1. Use a finishing sander, grit size 100, to remove any irregularities on the printing plate and to roughen the surface.

2. Clean the printing plate using 91% isopropyl alcohol before installing it into the printer.
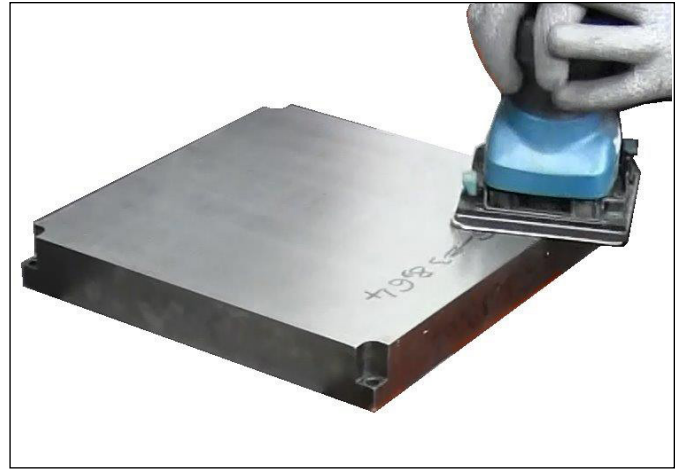
3. Place the printing plate into position and secure each corner of the printing plate with an M6 bolt.

4. Lower the build platform until the top of the printing plate matches the exact height of the module, use a block to check the height.
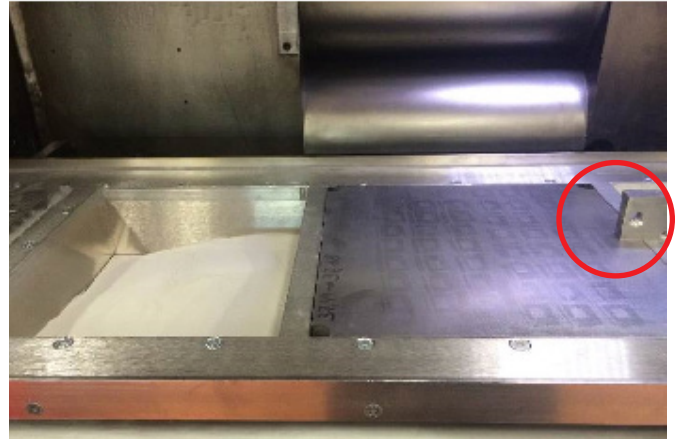
5. To adjust build platform use the arrows in the Manual operation screen.
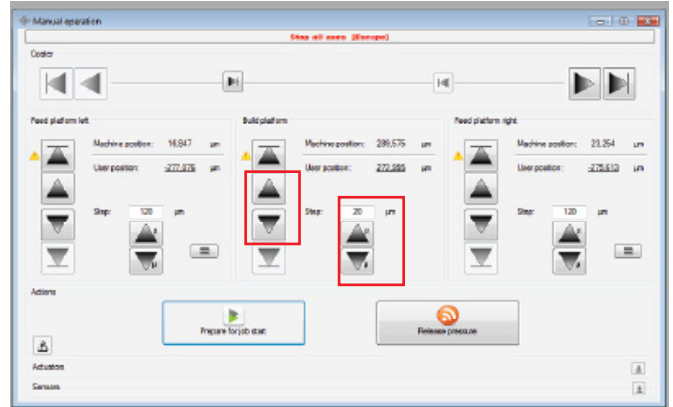
6. Remove the recoater housing from the recoater bridge by releasing 2 bolts.
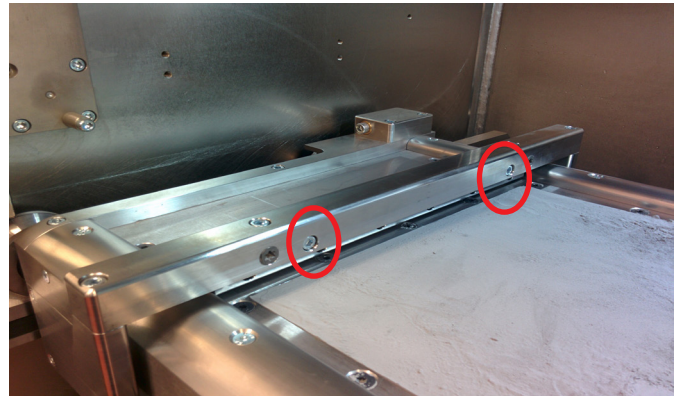
7. Place new silicone strip in the recoater housing. Tighten all the bolt and ensure the silicone strip is fixed.

8. Place the recoater housing in the lower part of the coater cutting tool. Place the upper part of the coater cutting tool on top.
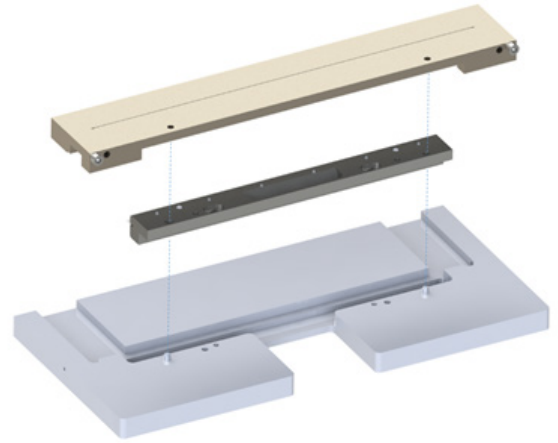
9. Use a sharp utility knife to cut the recoater in one smooth motion.

⚠️ **WARNING: BE CAREFUL WHEN CUTTING THE RECOATER THIS PRESENTS A CUTTING DANGER.**
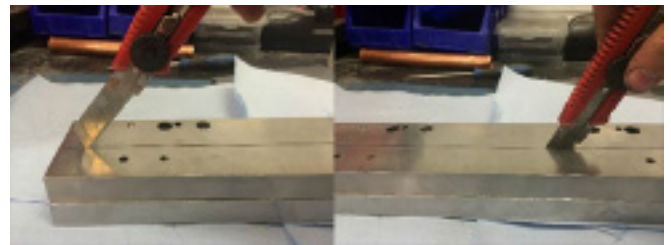
10. Leave the recoater housing in the upper part of the coater cutting tool and cut the ends of the silicone strip where they stick out of the recoater housing. Cut the corners at a 45° edge. Check if the silicone strip is smooth with no irregularities. If the recoater is not smooth, use a new silicon strip and cut it again, repeating Steps 7-9.

11. Re-attach recoater housing to recoater bridge.

12. Move the coater to one of the far sides (1) and move the powder feed from that side up (2) until the powder is above the module level by a few millimetres
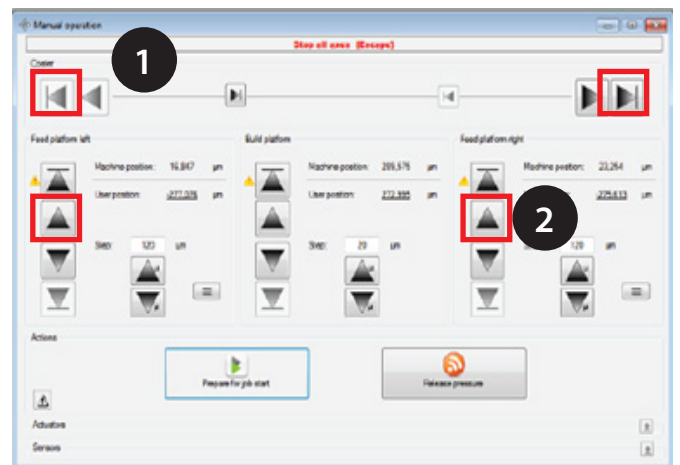
13. Deposit a very thin layer of powder onto the printing plate by moving the coater to the other far side of the module. Check the layer thickness on the section of the build module between the build shute and the feed shute, If the powder thickness is not constant from the front to the back.The recoater must be aligned, otherwise continue from step 16.

14. To align the coater, loosen the bolts on top and side (1) & (3) of the coater bridge turn the excenter (2) on the side where the powder layer was too thin or to thick to move the coater up and down. Tighten the bolts on top and side again and deposit another powder layer. Iterate these steps until the powder layer height is constant from the front to the back.
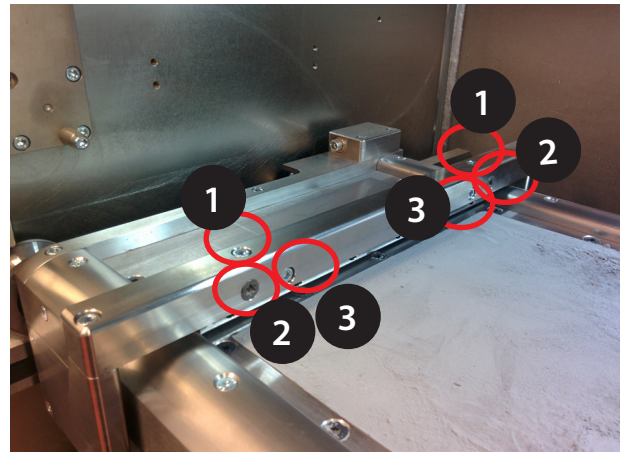
15. Check the powderlayer thickness on the printing plate. There should be a thin layer (less than a mm) on the complete printing plate. You should still be able to see the printing plate trough the powder

    To change the layer thickness move the build platform up a few 10's of micrometers at a time. Try to not go to far up because when the recoater scrapes on the build platform, the silicone strip will get damaged and needs to be replaced.
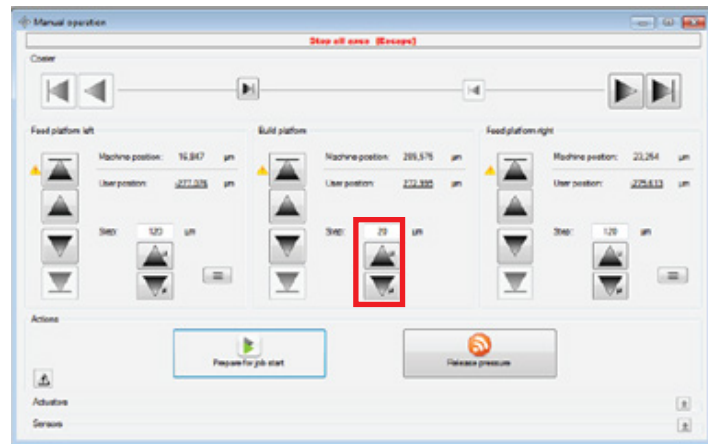
16. Pictured here are examples of what's good (2) and what's considered not good (3).
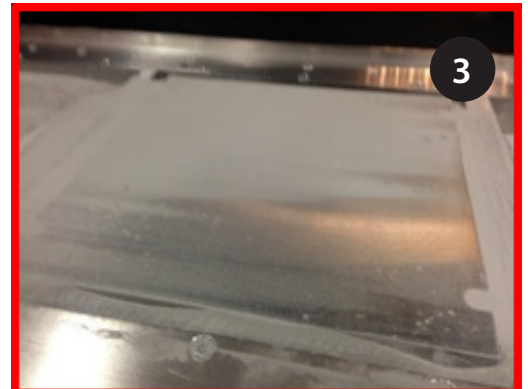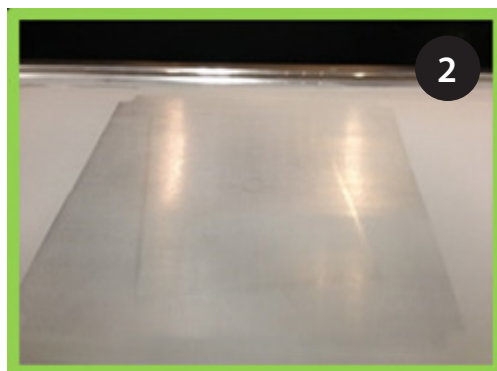
17. Clean laser window using optical tissues and optical cleaning fluid provided. For more information, please see maintenance instructions on how to clean the laser window.

18. Make sure the build module is locked in place using the locking pins.

19. Close the door and fasten the door bolts to 30Nm torque setting.

20. Click on Prepare for Job Start. (4)

21. A checklist will appear, fill in everything appropriately to ensure the machine is prepared in a proper way.

22. Press continue on the Machine preparation checklist. The machine will start removing the air from the process chamber.

23. When the pressure drops below -800mbar it is recommended to recheck the 30Nm torque on the door bolts and tighten additionally when needed.

24. The process chamber will go trough 3 interting cycles.An inerting cycle consists out of vacating the air out of the process chamber and filling it with argon. This is performed 3 times to achieve oxygen levels of only 100 ppm. When the three inerting cycles are finished, the ProX DMP 320 is ready for building.
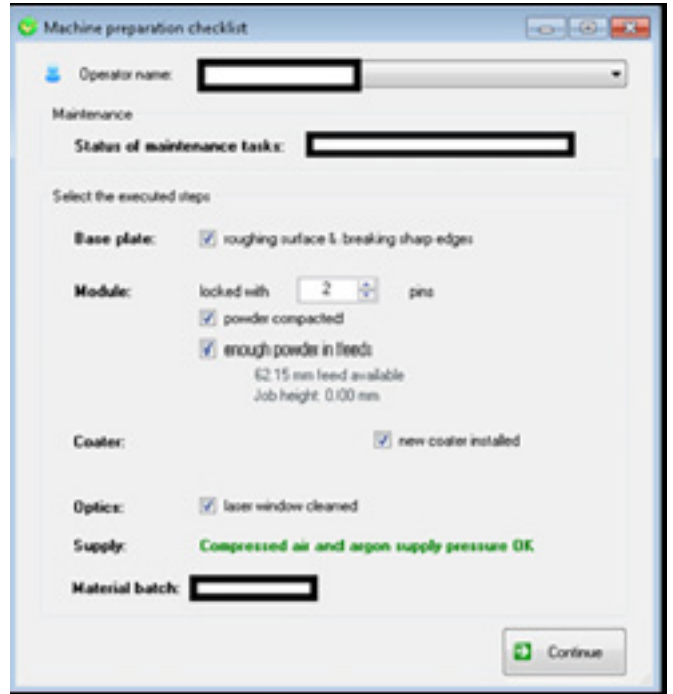
25. During the removal of oxygen, the powder in the feeds will have become unflat. Use manual operation to move the powder surface of the feeds to just above the module top. Make sure you do not move the build platform. Use the recoater to make a flat equal powder bed. (5)
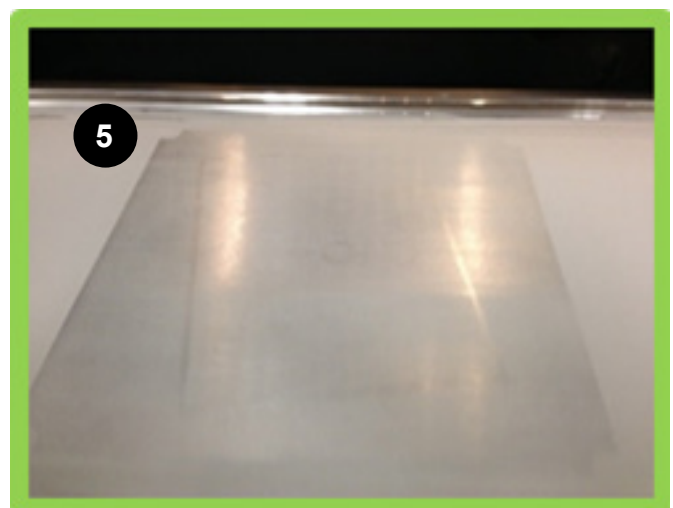
26. In DMP deposition, the run job screen is shown. In this screen the feed can be changed during the job. At the start of a job, the feed needs to be very high 300-350%. The reason for this is that powder density at top of the feed is not so high due to the vacuum preparation cycle: when the machine is vacuuming the quick escape from air from the powder creates loose powder at the top of the powder feed platforms, the powder at the top is not compacted as much as at the bottom of the feed. After 10 – 50 layers you can start lowering the feed. A feed of approximately 250% (depending on the product volume) is recommended. Higher volume parts need more powder, e.g. up to 320% .
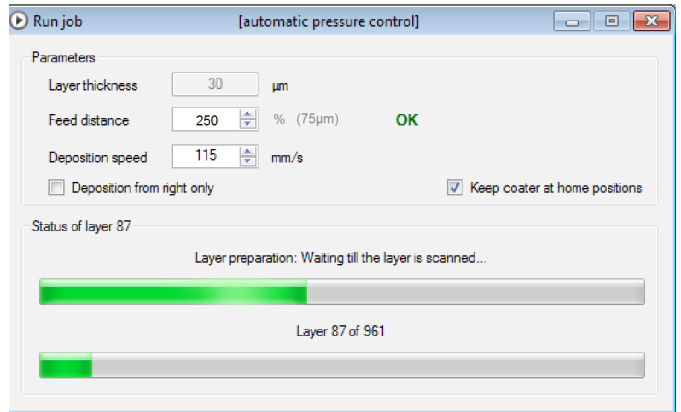
27. Open the job you want to process by double-clicking on DMP control (6) on the desktop.
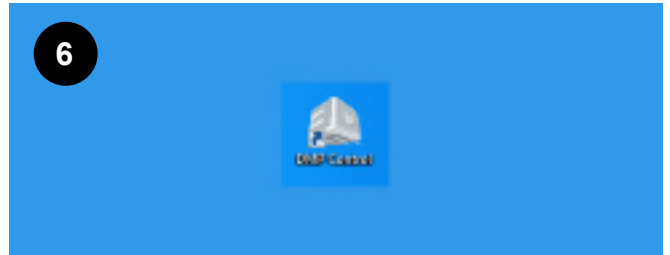
28. Open the applicable job (7).

29. Click on job analyzer.
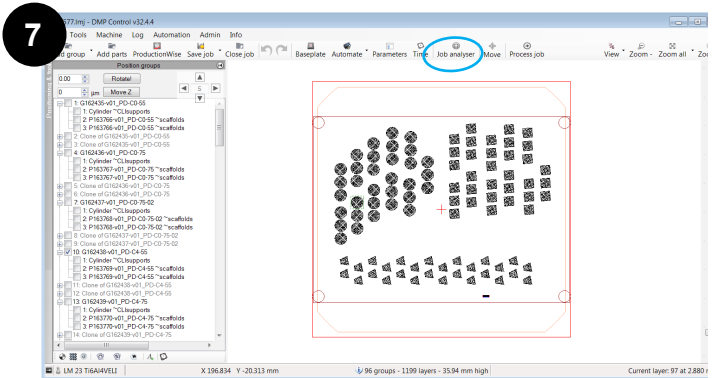
30. Click on Single Layer (9) and Power Burn (10).

31. Click on Start Job (11).

32. The printer will scan the first layer to the plate, make sure all the parts are on the printing plate.
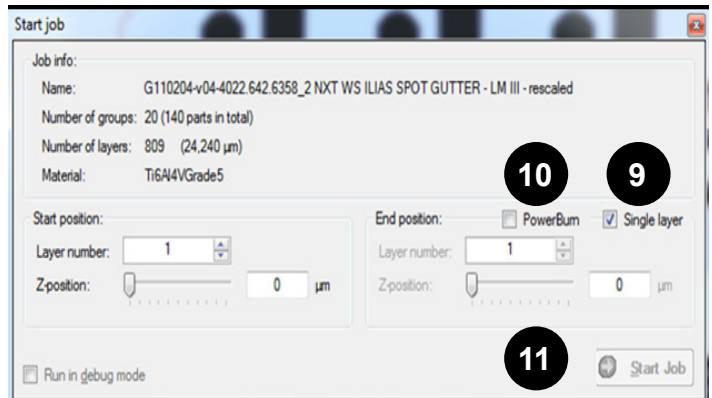
33. Use DMP Deposition to lower the printing plate 20µm and use the coater to deposit a new powder layer over the part. (12)
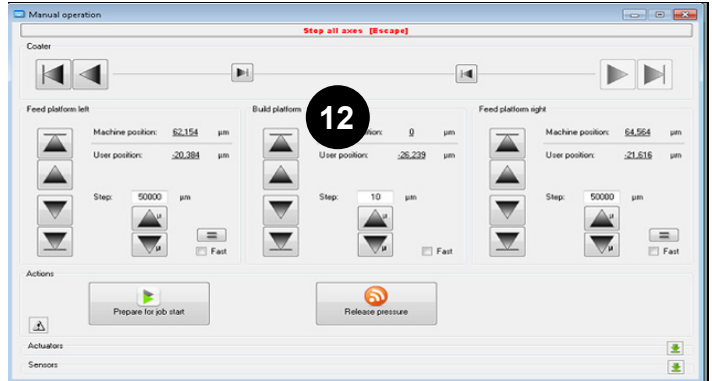
34. Make sure Single Layer and PowerBurn (13) are no longer on. You can now start the job from layer 1 and the printer will start with the direct metal printing.

Removing Printing Parts from Printer

When the parts are finished printing they need to be removed from the printer and processed for use. Follow these steps to remove the printed parts from the printer.

1. When job has finished printing, push the **Release Pressure** (1) button.
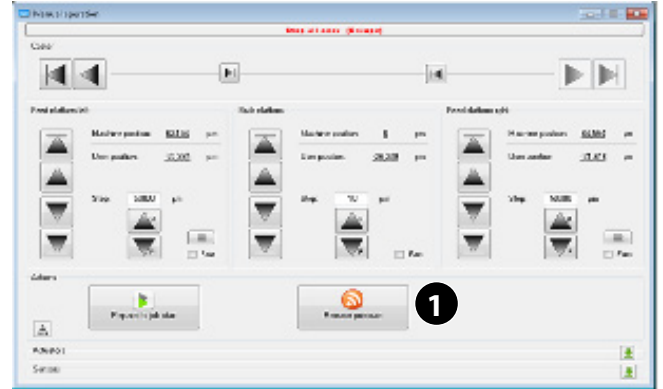
2. Once the pressure is released, start un-bolting the door.

3. Start at one bolt and turn one time, go to the next one and turn that one, continue one by one until you have loosened every bolt one turn (all 19).
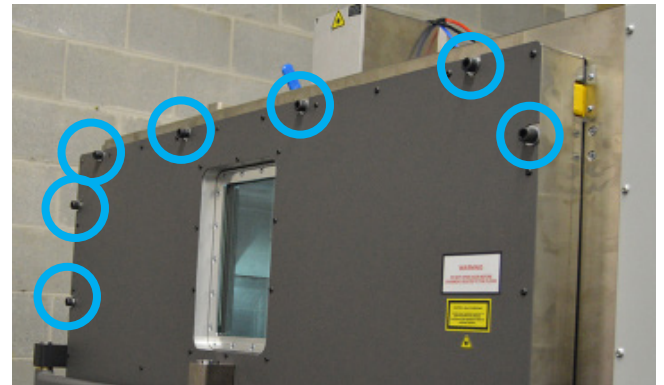
4. Continue going from bolt to bolt, loosening a little more each time you make the round, once all bolts are loosened, you can open the door.

5. Move the two feeds until the powder is at the height of the top of module. Set the User position of the 2 feeds to 0 by clicking on "User position" and setting it to 0. This will mark till where the unused powder goes.
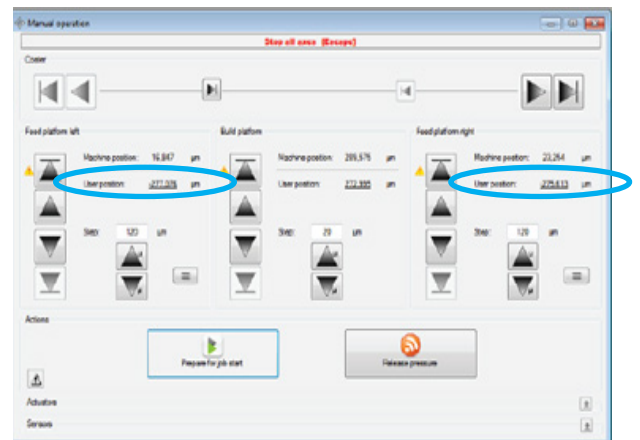
6. Move the feeds down by about 10mm.
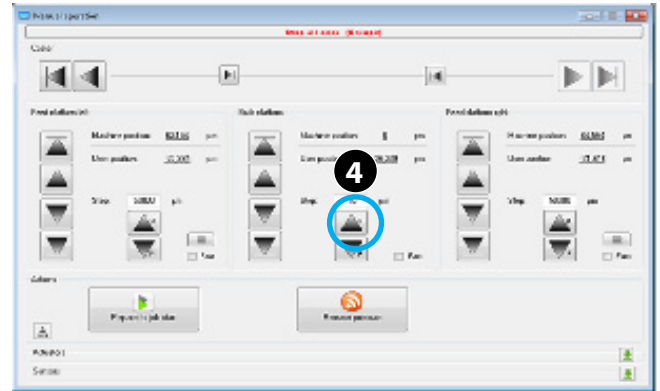
7. Move the build platform up by about 20 mm.
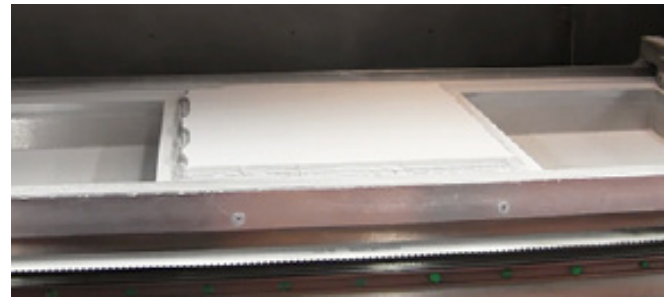
8. Gradually brush the excess powder off into the bins.

⚠️ **WARNING: Any time powder material is handled (i.e., refilling, sifting, changing, etc.) make sure you are either standing on an anti-static mat, or you are wearing a grounding strap that is attached to the module so that you are grounded to the machine. Always pour or scoop slowly from as close to surface as possible to avoid producing dust from material. It is also advised that the vacuum dust extractor be over top of the bin.**

9. Continue moving the build platform up 20 mm at a time, lowering the feeds with steps of 100 mm when needed and brushing away the powder until you have most of the visible powder removed as shown.

10. Remove print platform by loosening the four corner bolts with a 5mm hex key.

11. When all four bolts have been removed, put them somewhere you will remember for later.

12. Lift platform up at an angle and let excess powder fall into bin as shown.

13. Continue removing the excess powder by tapping the back of the print platform with a rubber mallet.

Purging Used Material

1. Using a stainless steel trowel level the material in the material bins until they are leveled flat.

    NOTE: This doesn't have to be exact. As long as they are level to the eye, that is sufficient.
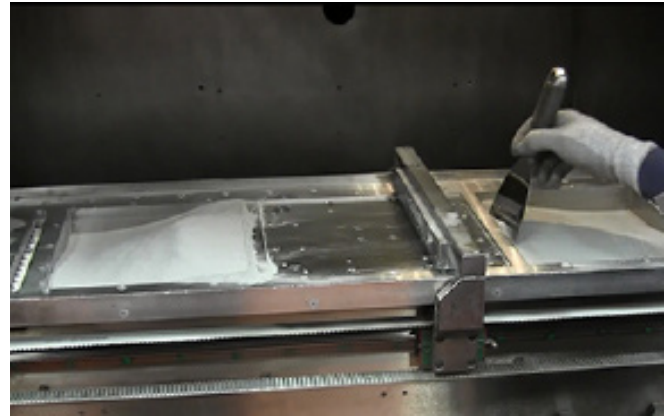
2. Raise the material bins up so they are approximately 25 mm above the print platform as shown. Begin to push excess material into the overflow so it can be removed from printer.

3. Continue purging material until the feed level is about 10000µm higher than the user position set in the previous section. All powder underneath this level has not yet been used and needn't necessarily be purged and sieved.

4. Repeat steps 1-3 for the opposite side.

5. Move the airflow nozzle up and out of the way.

6. Check if the stops are down and operating.
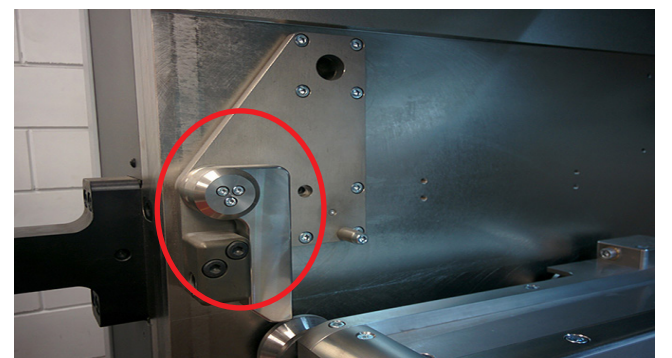
7. Release the build module locking pins.

8. Pull module backwards unto the stops.

9. Place a collection bin underneath the overflow that has the capacity of at least 3L.

10. Flip the handle and let the old material flow into the bin.

11. When material quits, flip the handle to the closed position.

12. Do this for both sides.

13. Use a sieving system to sift the usable material for the next job.

7 SIEVING STATION (OPTIONAL)

The sieving station allows the user to automatically sifts material from the overflow bins and separate it into the waste and the usable material that can be fed into the feeds to new build parts.

Powder intake container (1)

Cyclone sieving chamber (2)

Container with waste powder (3)

Container with re-usable powder (4)

Oxygen sensor (5)

Main power switch (6)

Control panel with emergency switch (7)
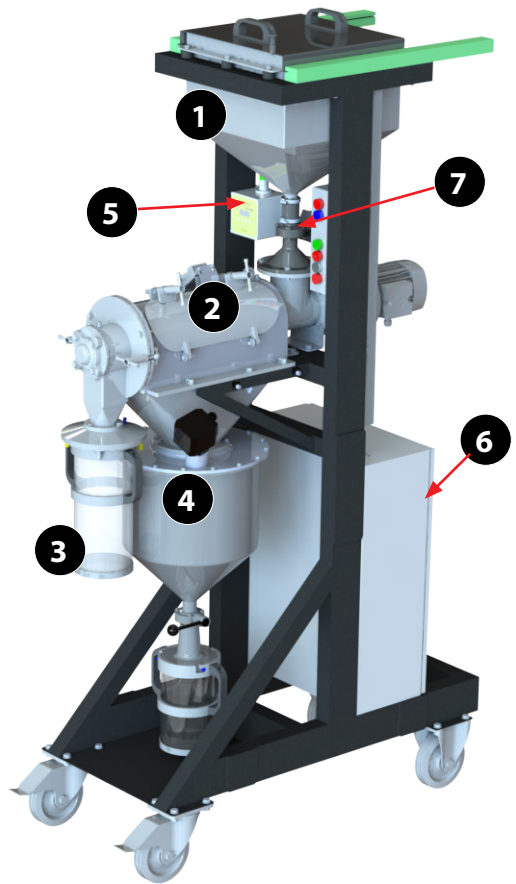
Operation

1. Carefully pour material from the overflow reservoirs into the top of the sieving station (1).

2. Close the lid (2).

3. Make sure the main switch is on, the emergency button is not engaged and the reset button is not lighting up. If the reset button lights up, press it to reset the safety.

4. Press the green start button (3).

5. Set the timer. The timer can be set between 0 and 10 hrs depending on the amount of powder to be sieved.
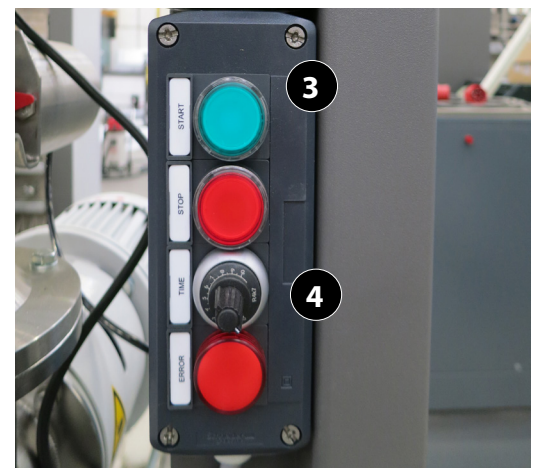
6. The sieving station will start filling with argon. When the oxygen sensor (5) is under 2% the engine will start and sieving will begin.

7. The unusable waste gets fed into the clear container and the usable material is stored in the metal cylinder (7).

8. Dispose of the unusable material out of the clear container according to local regulations.

9. The material in the reusable powder container can be poured into powder bins (6) that attach to the bottom of the container. To attach, align the grooves of the bin to the pins of the powder container move the bin up and turn until it stops, the bin will then move down a little and lock in that position. Now poor the powder in the bin with the handle (7). When the bin is full, push the bin up and turn the other way until you can move the bin completely down and away. The powder in the bin can now be poored in the feeds to be re-used.
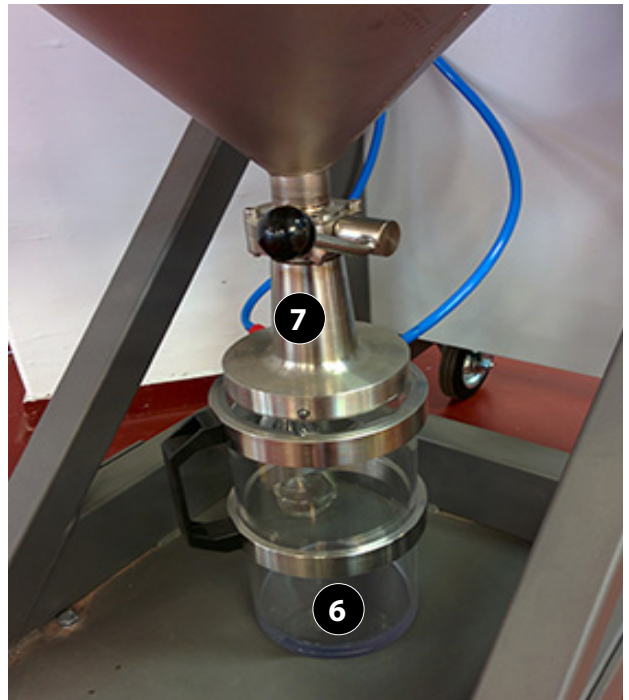
Sieving System Maintenance

Under normal use the cyclone screener that helps filter the material will need to be changed every six months. However periodically inspecting mesh is necessary to ensure there are no tears. If tears are visible the mesh must be replaced immediately.

✐ **NOTE: This procedure was performed on a brand new Sieving System that hasn't had any material in it yet. When replacing cyclone screen or performing any maintenance on the sieving system always wear the personal protection equipment as specified in the Safety section of this manual.**

Replacing Nylon Mesh

1. Loosen the hatch (1) by turning the levers (2) until the latch can be opened.
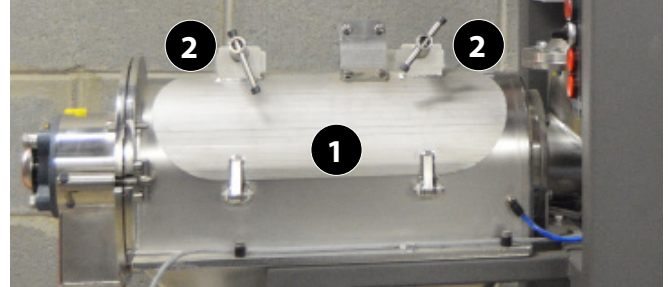
2. Loosen the levers on the end (2) and remove the end (3) as shown.

⚠ **CAUTION: This piece is heavy, handle with care.**
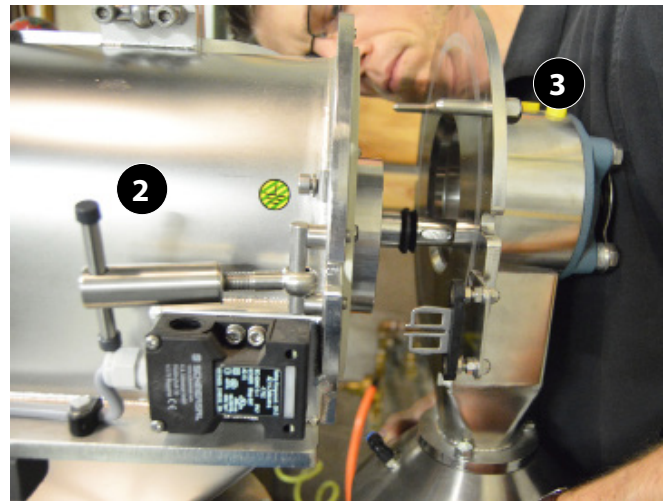
3. Carefully slide out cyclone screener out of receptacle.

4. Remove old screen by loosening clamps holding screen on (4), slide screen off of rings. Dispose of old screen according to local regulations.
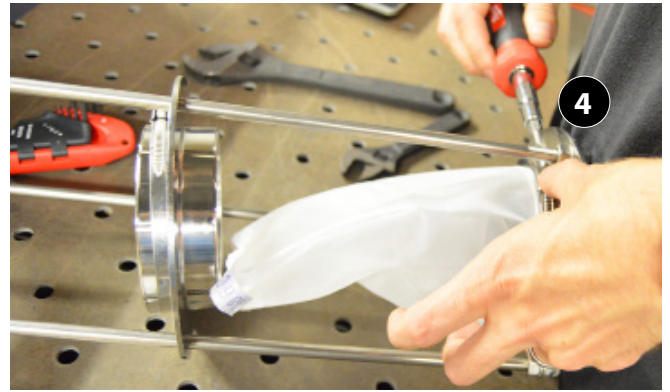

5. Place new screen sleeve over ring (5) and take clamp (6) that was removed and place that over mesh on top of ring. Tighten with a flathead screwdriver. Ensure that you are looking at the arrow on the sieving mesh and replacing mesh in proper direction.

   NOTE: Middle ring will move left and right. Put the first screen piece on so it fits securely but does not have to be tight. This will get tightened down in the last step.
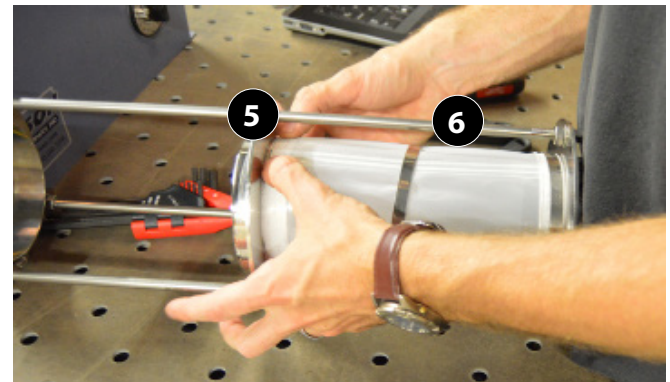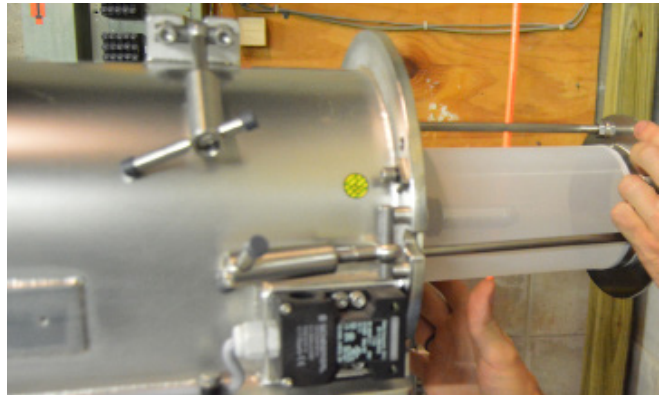

6. Repeat Steps 4 and 5 for the other side.
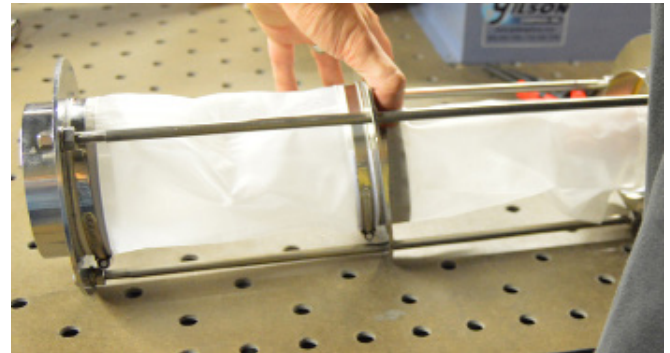
7. Secure screens by tightening up bars on rings with an adjustable wrench.

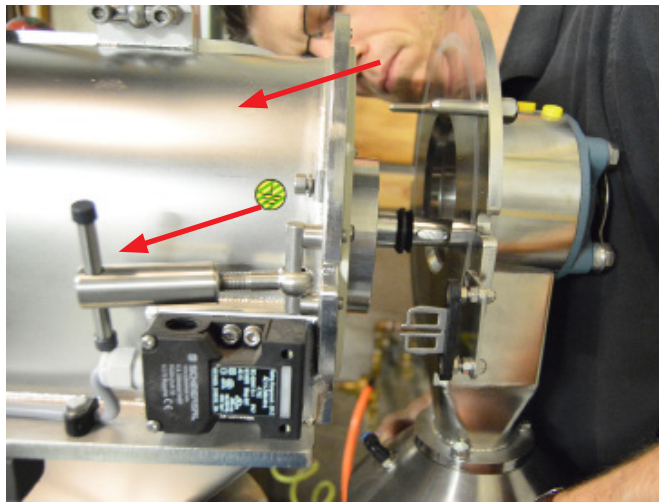8. When screen is fully tight bolts on both ends should be topped out.
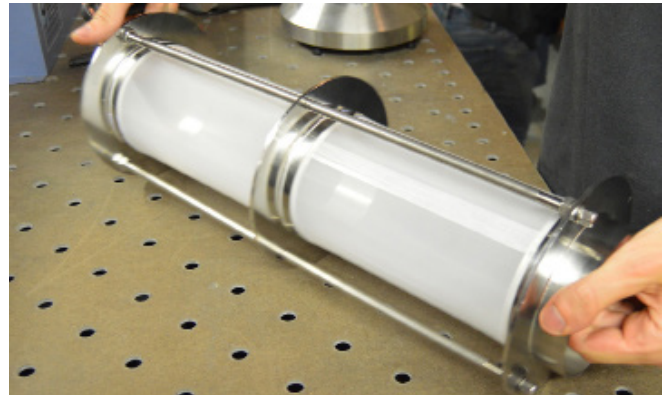
9. Insert cyclone screener back into machine the same way it came out.

10. Fasten the end back on the machine lining it up the same way it was when it was removed.

11. Tighten levers to hold end on machine.

12. Close hatch by tightening levers back up.

13. The water lock filters the air that exits the sieving station. The water contained in the water lock must be replaced on a weekly basis. Unscrew the top of the water lock bottle, remove the water and poor 300ml regular tap water in. Screw the top of the water bottle back on and make sure the glass outlet tube inside the bottle comes to the 100ml mark.
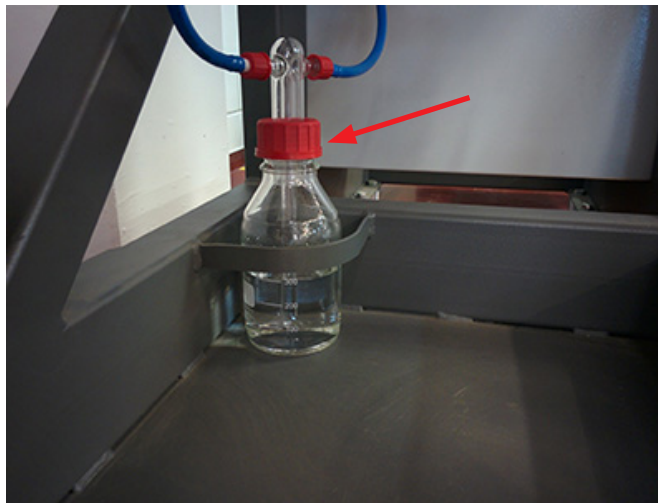
MATERIAL CHANGE: CHANGING POWDER IN A BUILD MODULE

⚠️ **CAUTION: Before changing powder make sure you use appropriate safety equipment.**

This procedure is to be followed if you are operating with one build module and need to change the type of powder that is contained in that module.

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1. Remove all powder from the platform by first brushing all excess powder into the feeds.
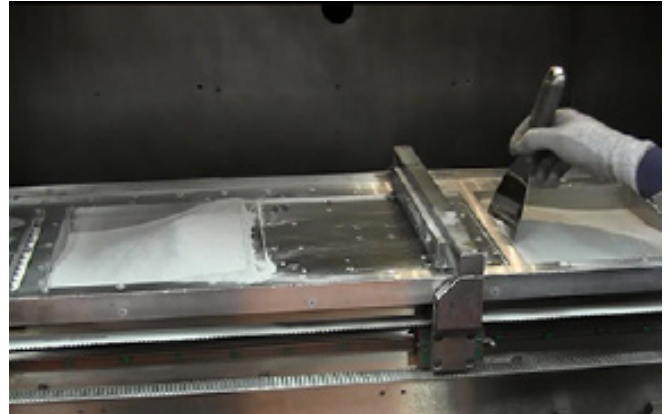
2. Empty feeds into bins, ensuring you don't overflow the bins below the feeds.

   ✑ **NOTE: You may have to do this in steps, as bins get full, empty into sieving station and refill bins until feeds are completely empty.**

3. Clean platform, feeds and all areas you can reach using a wet separator, explosion proof vacuum cleaner and paper towels with isopropyl alcohol.

4. Move the platform completely up and down a couple of times to loosen any powder. When platforms are down, clean power that sticks to the side of the module.

5. Shut down the printer.

6. Remove the module from the process chamber using the module cart.

   a. Locking the module cart to process chamber by turning the wheel clockwise, until the module cart is locked. Now slide the module on the cart and start turning the wheel counter clockwise until the module is fixed on the cart.
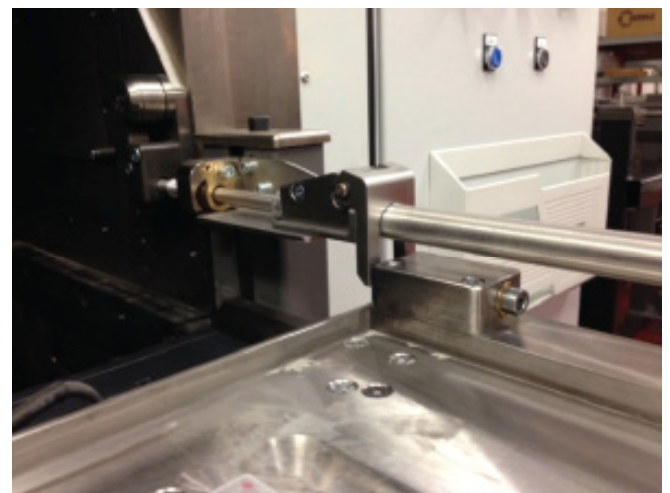
b. Unhook the 24V supply cables, always make sure the 24V supply is shut down first.
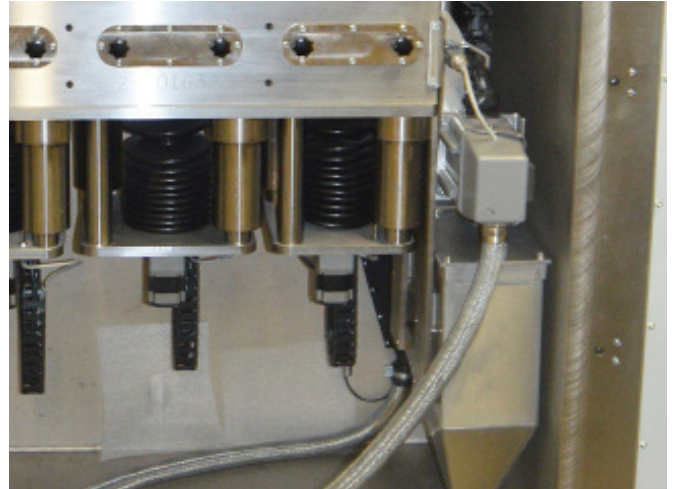
7. Clean the complete inside of the process chamber using paper towels with isopropyl alcohol.

8. Remove overflows and clean the inside of the overflows using paper towels with IPA.

9. Unfasten the 4 bolts on top of the overflow and then remove the lid to clean out the inside.

10. Replace bolts when finished.

11. When all areas have been thoroughly cleaned, install clean module and fill with new powder.
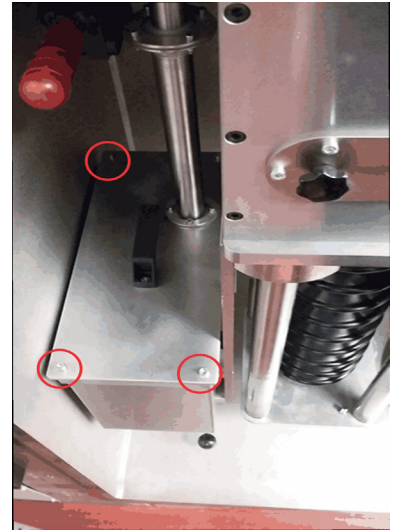
MATERIAL CHANGE BY CHANGING BUILD MODULES

This procedure is to be followed if you have a second build module containing a different material.

1. Remove Build Module 1 from the build chamber.

2. Clean the interior of the build chamber as described in the previous procedure.

3. Install Build Module 2.

7. Home the axis of Build Module 2.

8. Begin your next build.

9. Place a cover over Build Module 1 to protect the material from dust and any other contaminents.

10. If Build Module 1 is to remain unused for an extended period of time, (over one week), remove all of the material from Build Module 1 as described the the previous procedure. Store the material as described in the section, "Material Safety", in this document.

Clean Laser Window

1. Clean the laser window from the bottom with the Dust Off spray can. Keep the can in the upward position and don't spray too hard. This way, most of the dust is already removed.

2. Take a white optics cleaning cloth and form a small ball, as shown.

3. Spray the cloth multiple times with the Optics Cleaning Fluid.

4. Place the ball in the middle of the laser window and gently move from the inside to the outside of the window. Make sure no sharp edges get close to the glass.

✎ **NOTE: Make sure you always turn the same direction, so you don't get the dirt back to the middle.**
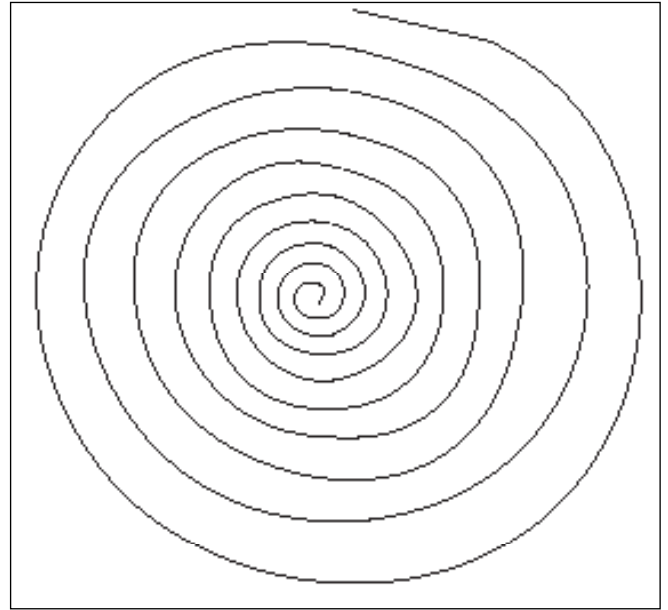
5. Repeat Steps 3 and 4 a couple of times.

6. Check to see if the window is clean. To check if window is clean take an LED flashlight and move the light into different angles to see of there are any streaks and/or dust left on the window.
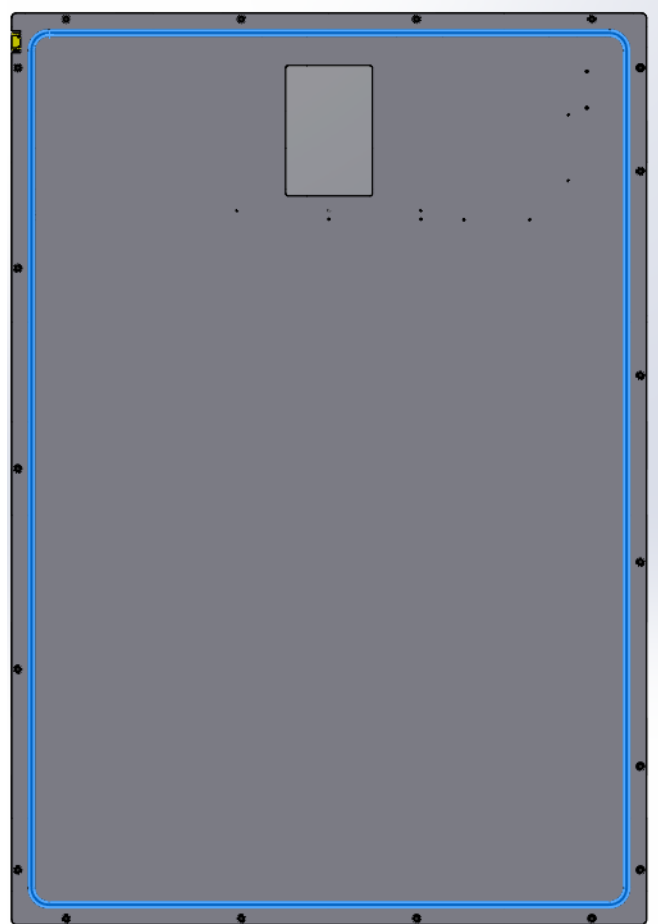
Door Seal

Door seals may get damaged over time from opening and closing.

Periodically inspect door seals and if door seals are damaged, follow this procedure to replace them.
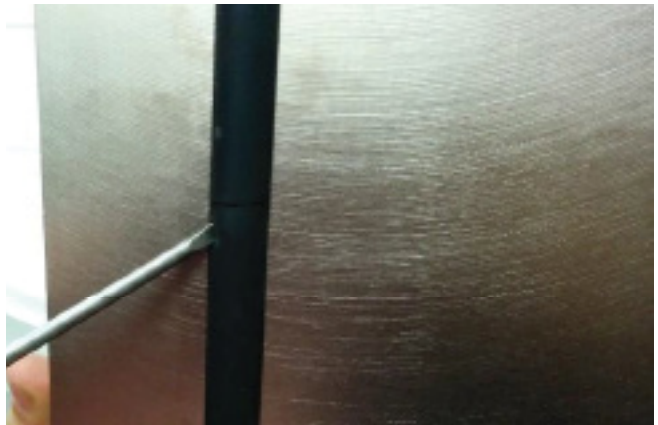
Door Seal Removal and Replace

Tools:

- Sharp knife
- Super glue
- Rubber hammer
- Small flat screwdriver
- Rubber seal 12mm

1. Remove the old seal from the door using the flat screwdriver to remove it easily.

2. Feed a new seal in the groove. You may need to gently tap with a rubber hammer to force it in place.


3. Cut the ends of the seal straight and glue together with super glue. Be careful not to use too much glue, this will make the rubber hard.

Clean Overpressure Valve

1. Remove the clamp by loosening the thumbscrew. Clean the overpressure valve with ethanol and a lint free cloth.

2. Use 8 bar (116 psi) compressed air towards the valve to ensure the valve does not stick.

3. Replace clamp, tighten thumbscrew.
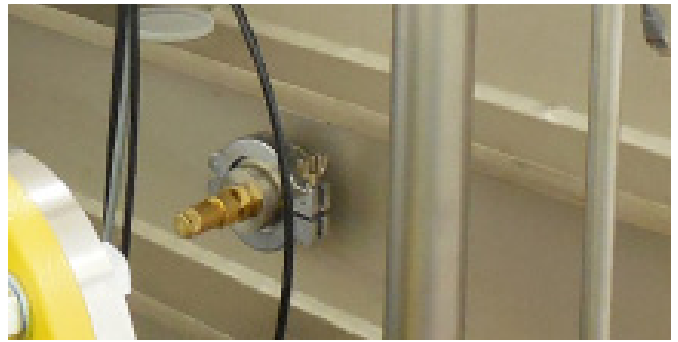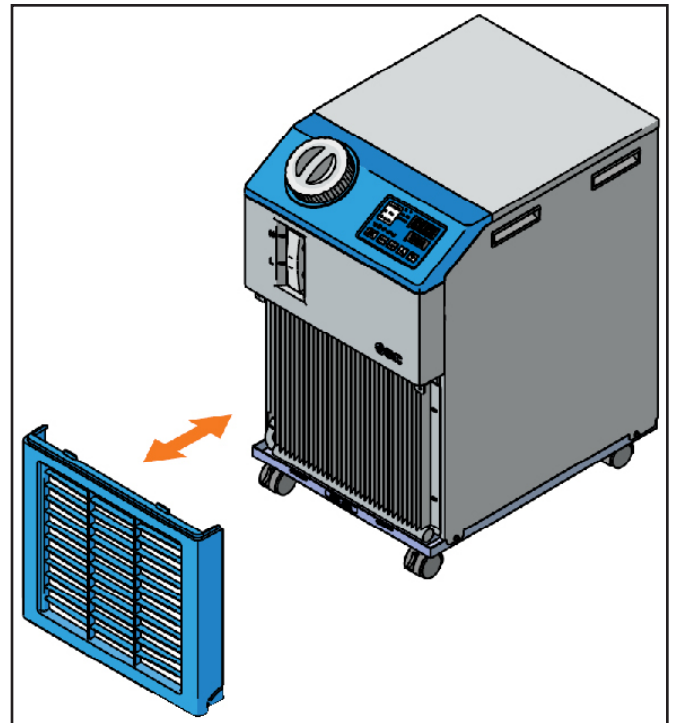
Chiller Fluid Replacement

1. Clean the tank, circulating fluid circuit, and change the circulating fluid (1) in the tank if any problems are found during a regular check.

2. It is necessary to change the fluid once every 3 months in case evaporation of the fluid causes concentration of impurities.

3. The chiller has a fluid capacity of 5 liters (1.3 gallons). It requires a mixture of one pint of OptiShield (p/n 110362-00) to one gallon of distilled water (p/n 9208-30021).
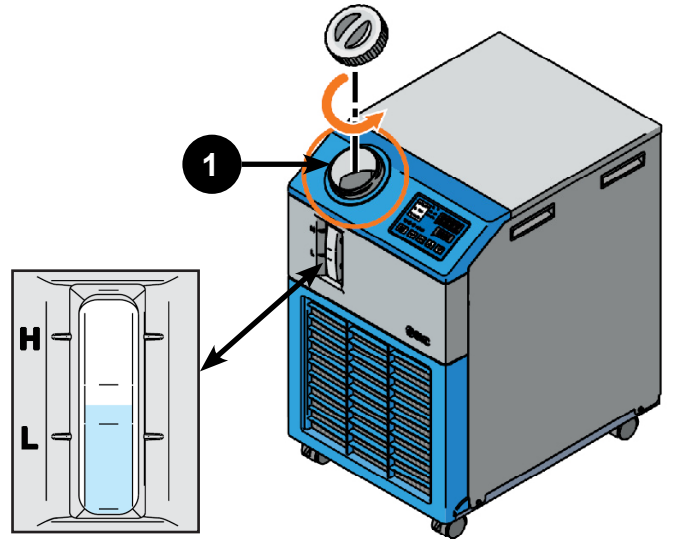
## Cleaning the Chiller Air Vent and Changing the Air Vent Filter

If the fins of the air-condenser become clogged with dust or debris, heat radiation performance reduces. This results in the reduction of cooling performance, and may stop the operation because the safety device is triggered.

1. Shut off the power supply of the product when performing cleaning, maintenance or inspection to avoid electric shock, injury or burn, etc.

2. Use a long bristled brush or air gun to clean the condenser to prevent the fins from being deformed or damaged.

3. To replace the filter, remove the filter panel and replace with "SMC Filter Element AF/AW30 (Scott Equipment #AF30P-060S)" (p/n 132576-00).

4. Refer to the OEM documentation for detailed instructions.

Drain Filter Replacement

When the chiller is free of fluids, open the drain filter housing at the rear of the chiller and uninstall/reinstall a Pentek CW-F Polypropylene Wound Filter (Scott Equipment #155186-43).
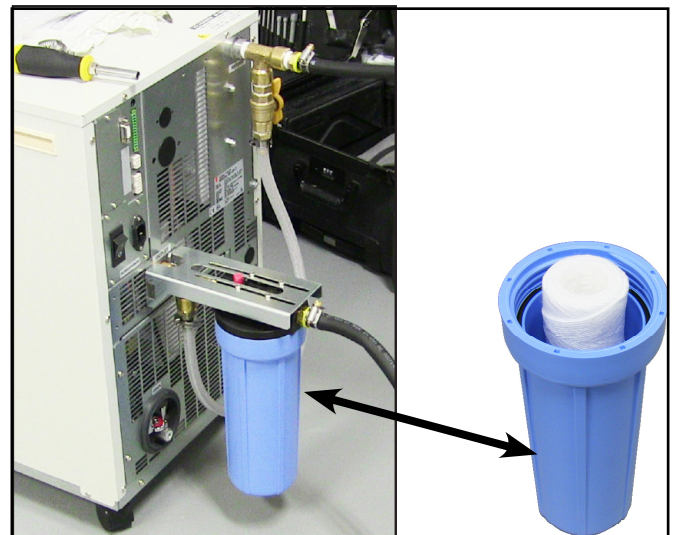
9 TROUBLESHOOTING

Client software (DMP Control, DMP Explorer,…) Does Not Work

Make certain your computer can access the DMP Server by checking the following address in Windows Explorer:

- \\DMPserver\
- \\ip address of the server\

If you cannot access the DMP Server, no DMP software program will work correctly. Contact your local IT administrator to set up the correct access, The default DMPserver login details are:

- User name: LM
- Password: DMPuser

Reinstall or Restore a Broken DMP Server Computer

Make sure you have set up an automatic backup procedure for the C:\DMP folder on the DMP Server in order to be able to restore at a later time. See Backup DMP Server.

1. IP address and computer name.
   - If the DMP Server was set to fix IP address before re set the fix IP address.
   - Set the computer name to DMPSERVER.

2. Create the following 2 folders.
   - C:\DMP
   - C:\DMP SliceCache

3. Make sure the two folders are shared so other users and ProX machines can access these.

4. Restore the content of folder C:\DMP from your backup location. It should contain the following:

   📁 Config
   📁 Machines
   📁 ProcessWise
   📁 ProductionWise
   📁 Remoting config
   📁 Software
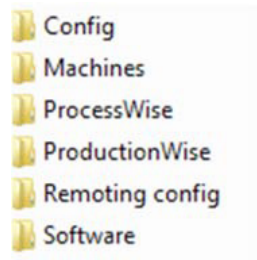
5. Optionally: Update your software folder content with the newest files from TeamPlatform.

6. Folder C:\DMP SliceCache is empty

7. Install the DMP software on that computer. Run the installers from C:\DMP\Software\
   - DMP Software prerequisites.exe
   - DMP Software client setup.exe

To have the DMP Worker and DMP Remoting Server programs started automatically when you log on to Windows; you can copy/drag these shortcuts from desktop into the Windows Startup folder:

      Windows Start > All Programs > Startup

DMP EXPLORER

## Solid Supports are Failing to Process

Export the Solidsupports as an stL, never as a slice file (.cli) because the slice export often contains errors in the file.

Processing Fails with "Errors during hatching"

Symptoms:

Processing a part fails at a random step during the hatching process, e.g. Hatching (15/61).

The message logging shows part failed, …. (during hatching with HatchWise: Errors during hatching).
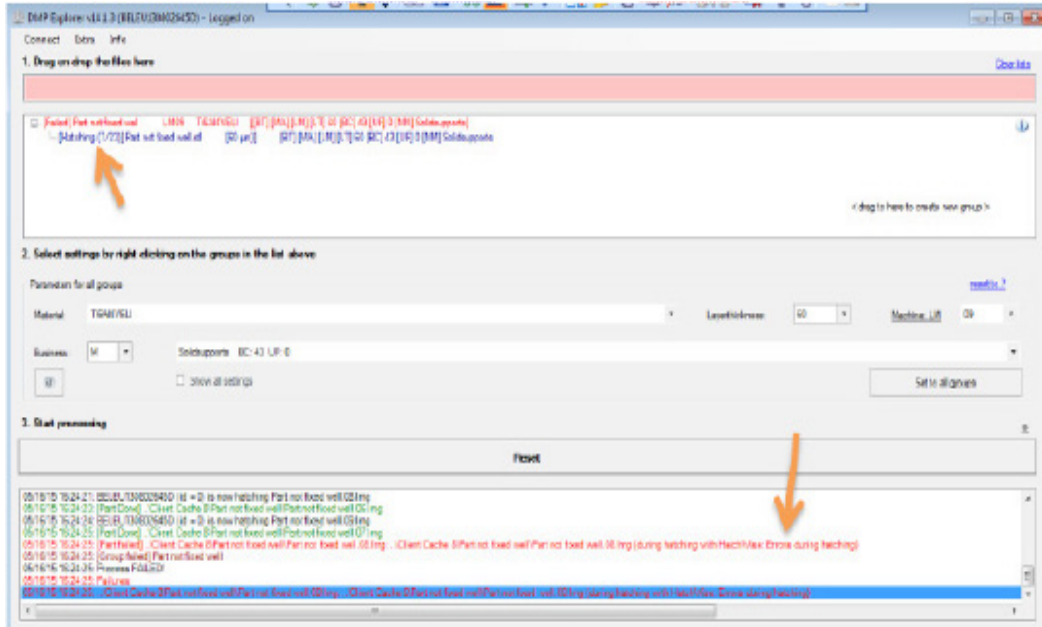
Cause

This error is due to slice data handling by the hatching program (HatchWise), that is incapable of interpreting contours that are intersecting each other. A more robust hatching data handling algorithm is under developed.

1. Solutions

    Solid Supports. See "Solid Supports are Failing to Process", at the top of the page.

2. Try with other DMP Slicer parameter set:

    • Expand the "processing options" in DMP Explorer, by clicking the arrow button.

    • Then select "DMP Slicer set" = 0 [no filtering] or 3 [lower accuracy]'.
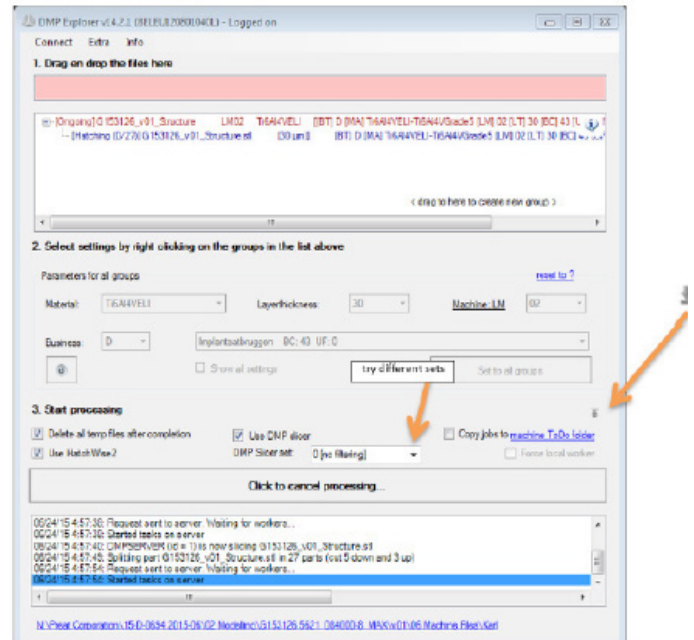
- Restart the process
- If the process keeps failing, select another DMP Slicer set

3. In case previous steps keep failing, you can try to slice the part first with modified slicing parameters. To do this:
   - Start DMP Slicer (C:\3D Systems\DMP Slicer\DMP Slicer.exe)
   - Set the correct layer thickness and modify the slicer parameters
   - Drag the resulting slice file (*.sli) into DMP Explorer instead of the stl file
   - DMP Explorer will then process the – already sliced – file.

4. Fix the stl file OR re-triangulate the stl file and try again. Re-triangulating will slightly move the triangle points and as such can prevent the slicing from crashing.

5. If it still fails, try the a shrinkwrap function to recreate all triangles of the stl file.

Slicing and Hatching a Large and Complex Part Takes More than Two Days and Crashes

Symptoms:

File takes a very long time to process (more than two days) and crashes although your stl file is clean.

Crash isn't at the same location every time.

Cause:

The file is too complicated to do all the calculations.

This can happen when you have a lot of small holes in your part (more than 1000) or you have a very fine grid structure. The number of contours that need to be calculated is enormous and takes a lot of time. These difficult calculations can cause a crash.

Solutions:

Split the geometry/stl file into different parts and process them separately. There are two possibilities to prevent voids in the part, but you will always see the seams.

When you split the part it can be interesting to make the cuts in the middle and keep an outer contour part. The advantage of this strategy is that the outer contour will be a single part without seams. But in the middle you are still stuck with the visible section lines.

Option 1:

Provide a small overlap of a 100 micrometers between the sections. To do this you have to offset the surfaces that are next to each other by 50 micrometers each as you can see in the figure below.

Make certain to keep the sections at the original positions so they are automatically positioned correctly in DMP Control afterwards.
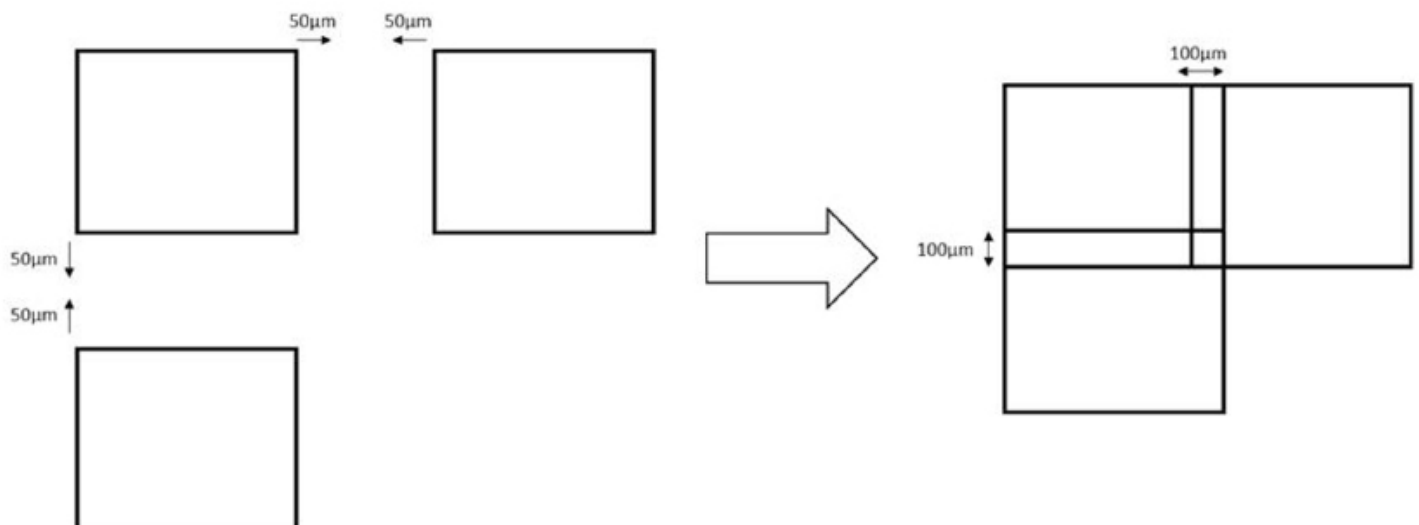
Option 2:

1. Move the different parts slightly towards each other in DMP Control so that outer contours are as close as a scan space apart.

2. For both options it is advised to put the job ScanOrder to "randomized" to have the best result. You can do this in DMP Control:
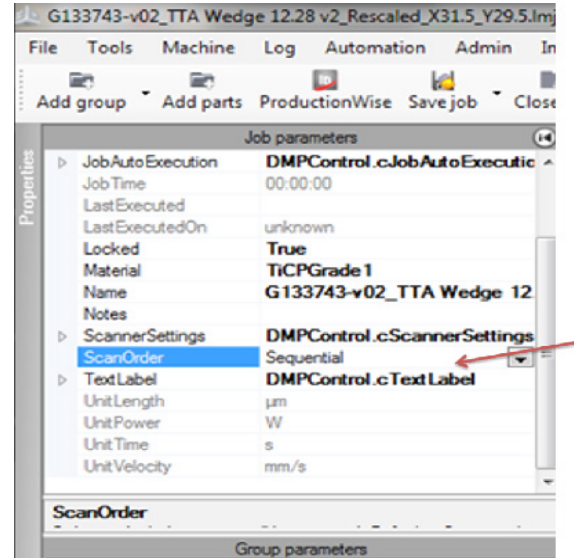
Processing of block supports fails

Cause

DMP software needs mm units as input. If the units of the layer thickness are in inches, HatchWise will not be able to find the first layer.

Speed up the Slicing, Hatching and Processing of Multiple Parts

1. To increase the processing speed, the number of DMP Workers (each one running on a computer) is very important. The more DMP Workers running, the quicker all calculations will be finished.

2. You can start as many DMP Workers (one Worker per PC), on as many computers as you want.

3. If you want to process multiple parts at the same time, you can drag/drop them all in one instance of DMP Explorer. However it is preferrable to start multiple instances (can be on the same computer) of DMP Explorer and process only a few parts per DMP Explorer. You can start multiple instances of DMP Explorer on multiple computers as well.

4. The order of processing that the server will apply is random and cannot be prioritized. This means that if you really need a particular group to be finished first, process that one alone before starting all other DMP Explorer processes.

My Computer is Slow When DMP Worker is Enabled

By default DMP Worker can automatically take approximately 80% of your computing power to use for processing. If you want to limit this you can set it to use less processor core.

1. Right click on the DMP Worker icon in the system tray.

2. Click Set Max Processes and set to a lower value

3. The new setting will take effect the next time DMP Worker is started.
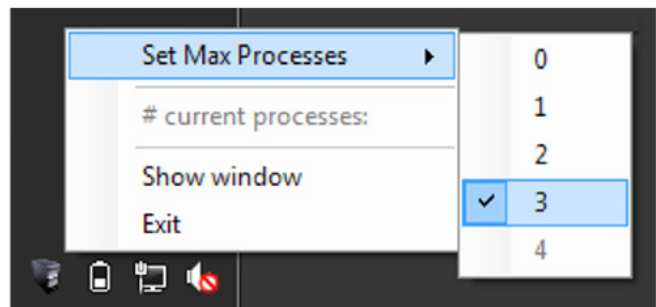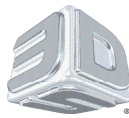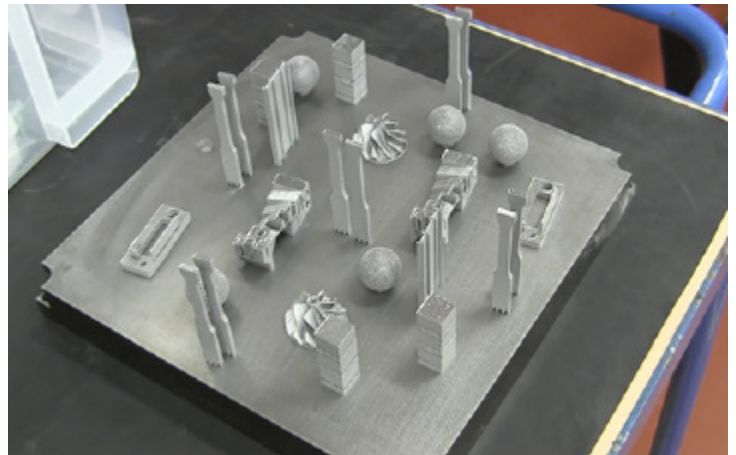
DMP DEPOSITION

Fix 'Unsafe filter pressure' message.

An automatic solution is available in DMP Deposition software from version v21.0.0 onwards.

Detecting of Job Processing Capability Failed after Restart of DMP Deposition.

Available in DMP Deposition software from version v21.0.20 onwards.

1. When the DMP Deposition program starts, it verifies if the right machine conditions are met to allow for a job start. If the machine conditions are met, the 'Run job' button can be pressed.

2. If this detection failed during program start, go to menu Controllers > Verify if ready for processing. This will repeat the evaluation. After successful verification, you can press the 'Run job' button again.