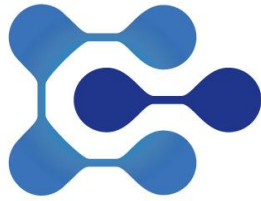




Turn To The Industry Experts



cryoPURE

perfecting purity



PureBLAST 3000 Operator manual

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1. Your new machine

Prior to operating your new PureBLAST 3000 you should check that no damage has occurred during transport. In the event that you do detect physical damage, please document this by taking photos and mail them to us. If transport has been arranged by us then we will take care of the compensation claim. If transport was arranged by you then we recommend that you contact your transport company as quickly as possible.

Please read through this manual carefully before operating the blaster.

It is the responsibility of the owner of the machine to make sure that the operator has been trained in, the use of the equipment and health and safety aspects associated with performing dry ice blasting.

2. Safety and safety equipment

Fresh Air supply

Dry Ice is manufactured by expanding CO_2 which will form dry ice snow. The snow is then compressed and extruded by a pelletizer to create dry ice pellets.

The CO_2 released from the blasting process as the dry ice is turning into gas again increases the levels of CO_2 in the working area.


In most areas and with exterior cleaning this will not cause any problems. But if used indoor or in a confined space a CO_2 monitoring device (most regulations are defining that 5000 ppm is the highest concentration allowed over maximum 8 hours) and fresh air supply mask are needed. Please consult your local supplier of Personal Protection Equipment (PPE).

CO_2 is colourless, tasteless and has no smell. Symptoms of overexposure to CO_2 are:




Under all circumstances it is required to have sufficient ventilation in the areas where you are working.


2.1. Gloves

 <p>Wear gloves</p>	<p>Dry ice is cold (-79°C) and can cause frost burns. Always wear gloves when handling dry ice.</p>
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2.2. Protective clothing

 <p>Wear protective clothing</p>	<p>You should not get in contact with dry ice and mostly you will not. However, it is always recommended to wear protective clothing.</p>
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2.3. Ear Protection

 <p>Wear ear protectors</p>	<p>Depending on the pressure and airflow being used during blasting the noise level will be between 75 dB (A) and 130 dB (A). It is therefore recommended to wear ear protectors at all times. Also do consider that others may be in the vicinity and they should also protect themselves.</p>
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2.4. Face Protection

 <p>Wear face shield</p>	<p>There is a risk of being hit by dry ice pellets bouncing back from the surface you are cleaning. Also debris and other loose particles can get on to your skin and in your eyes. Always wear a fact shield when performing dry ice blasting.</p>
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3. Equipment assembly

3.1. Electrical cable

Connect the electrical cable to a power source as specified on the machine identification plate.

3.2. Blast hose



The blast hose has got two different threaded couplings. One will fit to the

machine and the other to the gun.

No tools are needed to connect the blast hose. A finger tight connection is sufficient. This also makes it easier to detach the blast hose again after use. However, it is required to regularly check to make sure the connections are securely attached.

3.3 Connecting gun

Connecting to the machine: Plug the male connector on the blast hose into the female socket on the front of the blaster by inserting the plug and securing by twisting clockwise.



Connecting to the gun: Plug the male connector on the gun into the female socket on the blast hose, again, by inserting the plug and twisting clockwise.



4. Equipment operation

4.1. Start-up

Follow the previously mentioned instructions on how to connect the electrical cable, compressed air hose and the blast hose. Make sure the emergency stop button is depressed, if it has been pressed in, slightly turn the button clockwise to depress.

When the display has power then the red stop button will be illuminated. Press the green button to start the machine. NOTE. Blasting will not start until the trigger is pressed on the gun.

Before loading the hopper with dry ice, activate the blaster by pressing the handle on the blast gun. This will eliminate any moisture that could be in the hoses, hopper or airlock. You should always carry out this procedure before commencing blasting.

Only load the hopper with dry ice you when you are ready to start blasting and only use the amount you require for the operation. The dry ice hopper can hold 25kgs (55 pounds) and with its special insulation the dry ice will stay fresh for 30 minutes. If dry ice is left in the hopper for longer, there is a risk of humidity which in turn could make the dry ice become slushy which may block the flow of dry ice to the airlock.

We also recommend to always fully close the lid to avoid humidity affecting the dry ice and also to avoid dust and other ambient particles entering and mixing with the dry ice.

4.2. Dry Ice blasting techniques

When blasting always make sure that the blast hose rests over your shoulder. It minimizes the risk of tear and wear of the hose, but it also reduces any drop in pressure and the operator will incur less fatigue.

When blasting always aim for a 70-80 degree angle to the surface that is to be cleaned.

The distance to the object for normal blasting should be approximately 5 cm (2 inches). When using micropellets where a softer cleaning is desired then a distance of up to 30 cm (12 inches) could be beneficial.

Move the nozzle slowly over the surface to allow maximum impact of the kinetic effect. Do not "wash/hose down" like normally seen with water blasting.

To avoid damage to the surface or object you are cleaning, start with low pressure and gradually adjust the pressure up to the point where you achieve the maximum speed of cleaning without damage to the surface/object. Start with 50% of the ice flow (40 kgs/hour - 88 pounds/ hour) and try turning it down to the point where you see it has an effect on the cleaning speed. Dry ice is a consumable and correctly minimizing the consumption can increase your profit.

Dry ice blasting can be harmful. Be sure to never point the blast gun at other persons or creatures as serious damage can be caused by being "shot" with dry ice.

Correct working procedures. When blasting there is a risk of cross contamination (particles/debris etc.) being projected from the place you clean to another area, to other machines or surfaces. To eliminate this risk we recommend that an enclosure is constructed around the part to be cleaned and at the same time apply the use of an extraction/filter system to capture the released particles/debris.

Covering flooring and other sensitive areas will reduce the post blasting-cleaning time.

When blasting in closed areas or smaller rooms it is essential to have good ventilation or by using a fresh air supply as the levels of CO₂ can increase to dangerous levels. **We always recommend the use of a CO₂ monitoring device to ensure the safety of the operative in the work area of and to stay within required levels.**

The operative should at all times be wearing facial protection, appropriate gloves and clothing to avoid dry ice or other particles that may rebound from the surface being cleaned.

4.3. Selection of the correct nozzle

It is not always necessary to have maximum cleaning power/speed. One of the most obvious benefits of dry ice is that it also can clean electronics and sensitive surfaces without damage. However, to obtain the fastest cleaning on surfaces where no damage is possible e.g. steel surfaces, then these factors need to be maximized.

4.3.1. Air pressure

The blaster and the hoses are built for pressures up to 16 bar (230 PSI) . Higher pressures enable the removal of deposits that have a greater adherence to the surface.

4.3.2. Air volume

The machine has a true 1 inch flow all the way through the machine, which allows up to 15 m³/min (530 CFM). However, if you can work with lower air flow then you save, not only in diesel/electricity consumption, but also in the investment in larger and more expensive compressors.

4.3.3. Long nozzles

In order to generate the maximum airspeed the air and dry ice needs to accelerate at a specific angle, for this to be achieved most high performing nozzles are set at 3-5 degrees. Calculations and tests have shown that a nozzle in length of 700-900 mm (27 inches - 35 inches) gives best results. A nozzle of this length needs to be as lightweight and be easily handled by the operator as possible whilst offering maximum blast power. The geometrics of such a nozzle widens at the orifice, which for most nozzles would be in the region of 30-40 mm (1.2-1.6 inches) wide.

All other choices are a compromise on the ideal selection for fastest and most aggressive cleaning. But as stated earlier, it is not always a prerequisite to have the most aggressive cleaning in order to achieve the best results.

4.3.4. Wide nozzles

Selection of wider nozzle will make offer a far gentler clean whilst also cleaning a greater area.

4.3.5. Throat diameter.

If you were to work with a nozzle that had a full 1 inch opening the "expanding" air would cause the generated pressure and acceleration to dramatically drop.

In order to choose the right throat diameter you must first check what airflow your compressor can provide.

As a rule, the smaller the compressor the smaller the throat diameter of the nozzle. Having the right size throat diameter allows you to maintain a certain pressure. For example, if the cleaning task required you to set the working pressure at 7 bar (100 PSI), and your compressor only generates 3 m³/min (106 CFM), then choosing a nozzle with a throat diameter of 8 mm, would cause the pressure to drop.

That is why the Cryo Pure Corp supplies a number nozzle inserts from 4 to 10 mm. To be able regulate throat diameters and pressures depending on the available air flow.

The table below indicates which throat diameter (TD) is the right choice for various pressures and airflows.

TD/Bar	2 bar	4 bar	6 bar	7 bar	8 bar	10 bar	12 bar	14 bar	16 bar
3 mm	0,3	0,4	0,6	0,7	0,8	0,9			
4 mm	0,4	0,7	1,0	1,1	1,3	1,6			
5 mm	0,7	1,1	1,6	1,8	2,0	2,5	3,0	3,5	4,0
6 mm	1,0	1,6	2,3	2,6	2,9	3,6	4,4	5,1	5,7
8 mm	1,8	2,9	4,0	4,6	5,2	6,3	7,6	8,8	9,7
10 mm	2,6	4,5	6,3	7,2	8,1	9,9	12,0	13,9	15,4
12 mm	3,9	6,5	9,1	10,4	11,7	14,3			

	Soft cleaning (wood, electronics, textile etc.)
	Normal cleaning (process equip., moulds)
	Aggressive cleaning (paint etc.)

Another way to see if you have chosen the right nozzle is to test a nozzle with a larger throat diameter and observe whether your air pressure stays at the selected pressure when blasting. If the pressure drops whilst blasting then choose a nozzle with a smaller throat diameter. Continue testing until the correct nozzle has been found. If you work with the same compressor all the time, then this test only needs to be performed once and you then know which will perform best with your compressor.

4.3.6. Short nozzles.

Simple physics make long nozzles more effective, those same physics also reduce the aggressiveness of the clean when using shorter nozzles. But in many cases where accessibility of the area to be cleaned is awkward or difficult to reach then a shorter nozzle is the only solution.

4.4 Cleaning angle

Depending on what needs to be cleaned and how aggressive the cleaning should be the angle of approach can be changed. Aggressive cleaning on hard deposits is usually carried out at an angle from 75-90 degrees. Softer cleaning can be achieved by lowering pressure, using a wide nozzle, using micro pellets, using 2-3 days old dry ice (depending on the insulation of the dry ice container) or by blasting at an angle of less than 75 degrees. Of course a combination of all the options will guide you to obtaining the best result in a given situation.

4.5 Dry ice particle size

At Cryo Pure Corp we have not yet met anybody, who could tell us why the industrial standard sized 3 mm diameter dry ice pellet is the ideal size for blasting. Stories go that since the dry ice manufacturing machine (pelletizer) needs to have a conical extruding plate to make strong pellets, then that was the only size possible to make. It could also be that the early pioneers actually knew that a smaller sized pellet was the ideal size, but that sublimation from few centralized manufacturing plants naturally made them smaller because of time and transport.

Two things are important when understanding the importance of the size of a dry ice pellet. One is the weight (to create maximum force on impact) and the other is number of impacts per cm². The industrial standard 3 mm pellet has a weight that will generate a strong impact. But when consuming between 40-100 kgs/hour (88-220 pounds/hour) it does not generate as many impacts per cm² as micropellets (1,7 mm) would do.

Number of impacts is a very important factor, especially when softer and more gentler cleaning is required. However, when it comes to aggressive cleaning then the micropellet simply is too light and the extra number of impacts cannot make up for the strength of a larger pellet. Finding the right size pellet for the right project is a challenge, but very important.

You could of course also just use our high-flow setting to reach 200 kgs of dry ice per hour. This will with our 1 inch true flow system would offer a great number of impacts, but for most, the cost of the consumable (dry ice), would be too high to justify 15-20% faster cleaning.

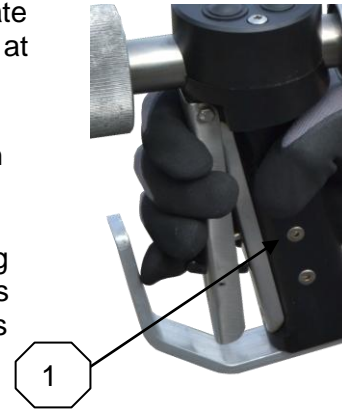
4.6 Crushing dry ice

For delicate cleaning a crusher can be used to split the dry ice into smaller particles. The principle is that the dry ice will pass through a mesh plate. Mesh plates come with different sized holes in order to alter the size of the “crushed” pellet, offering a different levels of force of impact by weight and cleaning aggressiveness.

4.7 Using the dry ice gun

Avoiding loss of cleaning time and achieving the perfect result are key factors behind the specially developed PureBLAST dry ice blasting guns with an integrated control of pressure and airflow. No need to climb out from under a machine to adjust dry ice consumption (to balance the cost) or adjust the pressure (to avoid damage of substrate or maximizing cleaning speed). All this can be achieved at the touch of a button on the gun.

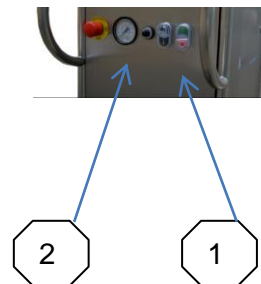
PureBLAST has produced two types of gun, a wired gun and wireless remote controlled. The versatility of dry ice blasting can lead to the gun coming into contact with all types of environments so having the option of not having control cables or plugs eliminates all too frequent repairs or replacement and gives the operator trouble-free focus on the project.



The blast gun has for safety been equipped with a safety pin (1) at the trigger. In order to activate blasting the lever must be pushed down, which in turn allows the trigger to be pressed.

4.8 Adjusting pressure and dry ice consumption

On the rear of the machine you will be able to adjust pressure up/down (1) and regulate dry ice flow (2)



5 Avoiding humidity

There are 3 different possible sources for increased humidity when dry ice blasting that can therefore create a risk when cleaning sensitive parts.

Compressor:

Only dry ice blast when using compressors that have an after cooler and water separator. In some cases it may be necessary to have an electrical freeze dryer to make sure that water is not condensing on the surface to be cleaned.

Dry Ice:

Dry ice is cold and will attract humidity. That can happen at the production site or at the cleaning project site. Check before accepting delivery that the dry ice is fresh and has not been affected by long exposure to open air. Apart from when filling it is important to make sure that both the dry ice container and the lid on the blaster are both firmly closed at all times.

Condensation:

Condensation is another situation that happens when a substrate is being cooled down which then attracts water/condensation. If the condensation is not stemming from one of above and thus drawing water from the ambient air, then manual wiping or mechanical heating of the parts is the only solution to solve the condensation.

6 Handling the blast hose

If you have chose the blaster with the wireless blast gun then typically the most sensitive part of most dry ice blasting systems has been made less so due to not having any plugs or cables going from the blaster to the blast gun. This now makes the blast hose the part that is subjected to most tear and wear. PureBLAST hoses are made of PU (rated 20 bar) with strong threaded connectors. All of this is to ensure a long life for the blast hose.

Most damage to the blast hose is not from the actual blast operation, but from improper transport and storage.

When blasting always try and have the hose as straight as possible. A 360 degree curve can reduce the cleaning effect by more than 10%.

Hold the blast hose over your shoulder when cleaning. Besides given a better working position it will also give a softer curve on the blast hose.

It is recommended to protect the hose with a disposal plastic liner. This will keep your blast hose clean at all times, which is important when you bring your machine on to a customer's site.

7 Changing nozzles

Nozzles and the inserts are easily changed without the use of tools. Point the nozzle downwards to make sure that the insert doesnot obstruct the disconnection of the nozzle and then just turn the outer nut until the nozzle slides out sideways.

8 Equipment shut down and transportation

8.1 Depressurizing the machine

Whenever there is a long pause in the cleaning or if the equipment needs to be moved, then it is advised to depressurize the equipment. First shut off the air supply at the source, then either depressurize the machine and hose by pulling the trigger on the gun or if electricity has been cut t open the right side door and turn the release valve at the rear end of the supply string (located just before the pressure regulator).

9 Equipment maintenance

9.1 Daily

Check all external connections. Clean or replace if necessary

Electrical plug
Blast hose connections
Connections at blast gun

9.2 100 hours

Inspect all connections internally. Make sure all are well connected and that no leaks or damage are observed.

Inspect rotor plate and air plates for damage by following these steps.

IMPORTANT:(MAKE SURE THAT THE MACHINE HAS BEEN DEPRESSURIZED AND THAT THE ELECTRICAL POWER CORD HAS BEEN REMOVED FROM THE ELECTRICAL SUPPLY SOCKET)

1. Remove the side panels
2. Remove the air connection string by unscrewing the 4 bolts on the airlock and the union at the pressure regulator
3. Remove the 4 bolts holding the top airlock plate.
4. Inspect the airplate that is embedded in the top airlock plate. It is normally this inexpensive airplate that will absorb almost all wear and tear. It is a good idea to replace it on a regular basis to insure a long life of the machine.
5. Remove the rotorplate and inspect for damage (replace if needed). Please do not use screwdrivers or other tools to remove the rotorplate. It should slide up just by hand.
6. Inspect the air plate embedded in the lower airlock plate. Again replace if needed.

9.3 500 hours

Same as for the 100 hours service but it is recommended that this be performed at a qualified PureBLAST service facility.

10 Warranty

Cryo Pure Corp provides a 2 year warranty on all none wear and tear parts if the machinery is used as intended under normal circumstances and only if stated service intervals have been observed. The cost of replacement is limited to the cost of the part only and does not cover labour, transport or any other cost. Replacement and repair on the machinery has to be performed by an appointed service technician or other approved and trained personnel. A warranty claim will first be accepted when the default part has been returned to Cryo Pure Corp and evaluated as damaged.

Wear and tear parts are identified as; rotorplate, airplates, electrical wires/connections, blast hose including couplings.