Prodigy® HDLV® Pump

Customer Product Manual
Part 1053244A02

Issued 1/07

For parts and technical support, call the Industrial Coating Systems Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

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NORDSON CORPORATION • AMHERST, OHIO • USA

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Contact Us

Nordson Corporation welcomes requests for information, comments, and inquiries about its products. General information about Nordson can be found on the Internet using the following address: http://www.nordson.com.

Address all correspondence to:

Nordson Corporation
Attn: Customer Service
555 Jackson Street
Amherst, OH 44001

Prodigy HDLV Pump

Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to all persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

All phases of equipment installation must comply with all federal, state, and local codes.

Personal Safety

To prevent injury follow these instructions.

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing any moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Relieve (bleed off) hydraulic and pneumatic pressure before adjusting or servicing pressurized systems or components. Disconnect, lock out, and tag switches before servicing electrical equipment.

- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.

Fire Safety

To avoid a fire or explosion, follow these instructions.

- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Provide adequate ventilation to prevent dangerous concentrations of volatile materials or vapors. Refer to local codes or your material MSDS for guidance.
- Do not disconnect live electrical circuits while working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. If a fire starts in a spray booth, immediately shut off the spray system and exhaust fans.
- Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation.
- Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice.

Grounding

WARNING: Operating faulty electrostatic equipment is hazardous and can cause electrocution, fire, or explosion. Make resistance checks part of your periodic maintenance program. If you receive even a slight electrical shock or notice static sparking or arcing, shut down all electrical or electrostatic equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

Grounding inside and around the booth openings must comply with NFPA requirements for Class II, Division 1 or 2 Hazardous Locations. Refer to NFPA 33, NFPA 70 (NEC articles 500, 502, and 516), and NFPA 77, latest conditions.

- All electrically conductive objects in the spray areas shall be electrically connected to ground with a resistance of not more than 1 megohm as measured with an instrument that applies at least 500 volts to the circuit being evaluated.
- Equipment to be grounded includes, but is not limited to, the floor of the spray area, operator platforms, hoppers, photoeye supports, and blow-off nozzles. Personnel working in the spray area must be grounded.
- There is a possible ignition potential from the charged human body. Personnel standing on a painted surface, such as an operator platform, or wearing non-conductive shoes, are not grounded. Personnel must wear shoes with conductive soles or use a ground strap to maintain a connection to ground when working with or around electrostatic equipment.
- Operators must maintain skin-to-handle contact between their hand and the gun handle to prevent shocks while operating manual electrostatic spray guns. If gloves must be worn, cut away the palm or fingers, wear electrically conductive gloves, or wear a grounding strap connected to the gun handle or other true earth ground.
- Shut off electrostatic power supplies and ground gun electrodes before making adjustments or cleaning powder spray guns.
- Connect all disconnected equipment, ground cables, and wires after servicing equipment.

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

- Disconnect and lock out electrical power. Close pneumatic shutoff valves and relieve pressures.
- Identify the reason for the malfunction and correct it before restarting the equipment.

Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

Description

See Figure 1. The Prodigy HDLV (High-Density powder, Low-Volume air) powder feed pump transports precise amounts of powder from a feed source to a powder spray gun.

The design of the pump and the small diameter powder tubing used allow powder to be purged quickly and thoroughly for fast color changes.

The pump is more efficient than traditional venturi-style pumps in that very little of the air that is used to operate the pump is delivered to the spray gun. The only air in the powder stream to the spray gun is that which is used to move the powder out of the pump.

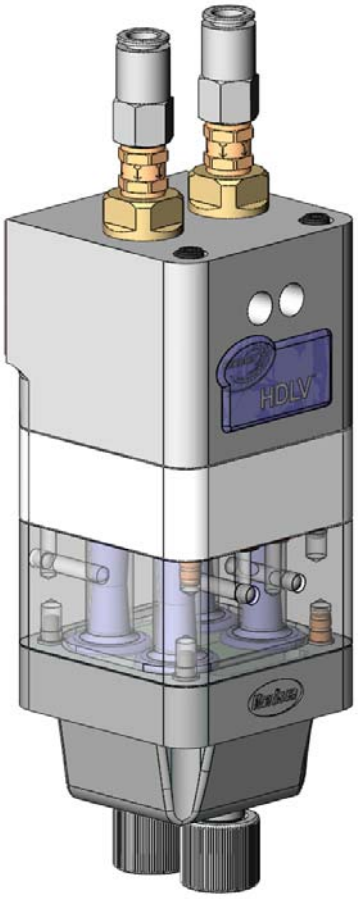


Figure 1 Prodigy HDLV Pump

HDLV Pump Components

See Figure 2.

Item	Description	Function
1	Purge Air Fittings	Send line air pressure through the pump during the purge process.
2	Fluidizing Tubes	Porous cylinders that alternately draw powder in and dispense powder out.
3	Upper Y-Manifold	Interface between the pinch valves and the porous tubes; consists of two Y-shaped passages that join the inlet and outlet branches of either half of the pump.
4	Lower Manifold/Wear Blocks	Connect the inlet and outlet fittings to the pinch valves on either half of the pump.
5	Inlet Fitting	Connects to the tubing leading from the powder source.
6	Outlet Fitting	Connects to the tubing leading to the powder spray gun.
7	Pinch Valves	Open and close to allow powder to be drawn in or dispensed out of the fluidizing tubes.

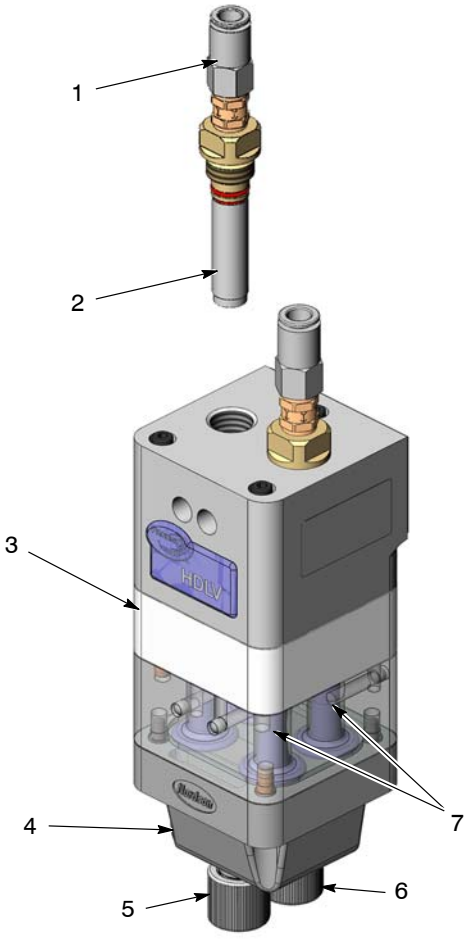


Figure 2 HDLV Pump Components

Theory of Operation

Pumping

The Prodigy HDLV pump consists of two halves that function identically. The halves alternately draw powder in and dispense powder out of the pump; while one half is drawing powder in, the other half is dispensing powder out.

Left Half Drawing Powder In
See Figure 3. The left suction pinch valve is open, while the left delivery pinch valve is closed. Negative air pressure is applied to the left porous fluidizing tube, which draws powder in the inlet fitting, up the left side of the inlet manifold wear block, through the left suction pinch valve, and into the left fluidizing tube. After the negative air pressure has been on for the specified time, the fluidizing tube's negative air pressure shuts off and the left suction pinch valve closes.
Right Half Dispensing Powder Out
See Figure 3. The right suction pinch valve is closed, while the right delivery pinch valve is open. Positive air pressure is applied to the right porous fluidizing tube, which dispenses the powder out of the fluidizing tube, down the right delivery pinch valve, down the right side of the outlet manifold wear block, out the delivery fitting, and out to the tubing that leads to the powder spray gun.

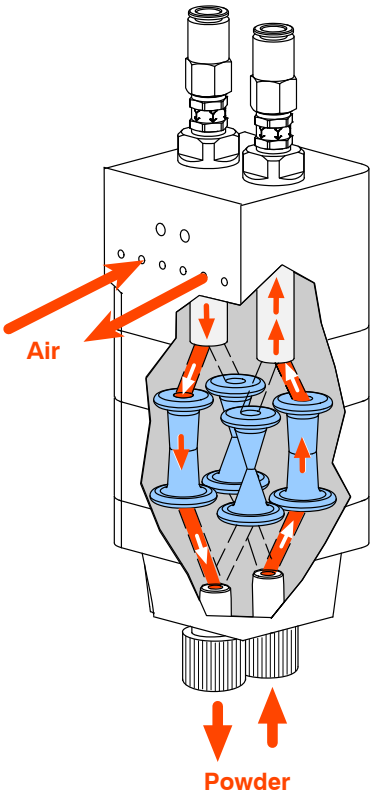


Figure 3 Left Side Drawing In, Right Side Dispensing

Note: Rear, left view of pump.

See Figure 4.

As the sides complete these processes, they alternate. In the example explained above, the left half would now dispense powder out while the right half would draw powder in.

As each half dispenses powder out, the powder in the tubing blends together, resulting in a consistent flow of powder from the spray gun.

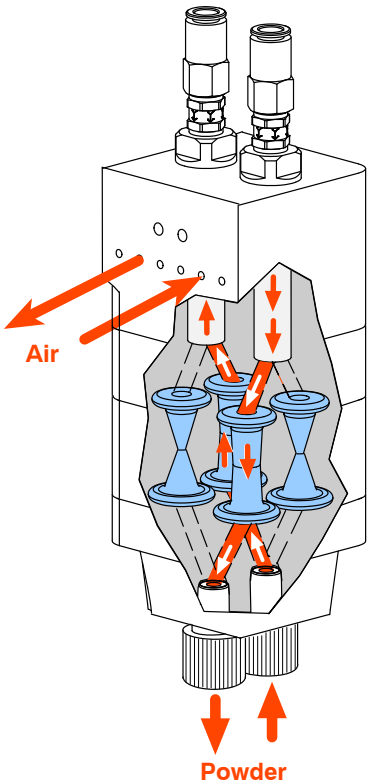


Figure 4 Left Side Dispensing, Right Side Drawing In

Purging

See Figure 5. When the operator initiates a color change, the pump goes through a three-stage purge process.

Stage 1: Soft Purge to Spray Gun

The suction pinch valves close, while the delivery pinch valves remain open. Pump assist air pressure turns on, starting at a low pressure and building up to maximum pump assist pressure. The air dispenses powder out of both fluidizing tubes, through the powder delivery tubing and spray gun and out into the booth.

Stage 2: Soft Purge to Feed Source

The suction pinch valves are open, while the delivery pinch valves close. Pump assist air pressure turns on, starting at a low pressure and building up to maximum pump assist pressure. The air dispenses powder out of both fluidizing tubes, through the powder suction tubing, and back into the powder feed source.

Stages 3 and 4: Hard Purge to Spray Gun and Feed Source

The delivery pinch valves open. Pump assist air pressure turns on at maximum pressure, while pulses of line air pressure are sent down the purge air fittings at the tops of the fluidizing tubes. The pulses of air remove any powder that remains in the pump, spray gun, and suction and delivery tubing.

After the delivery side is purged, the delivery pinch valves close and the suction pinch valves open. The suction side is purged in the same way as the delivery side.

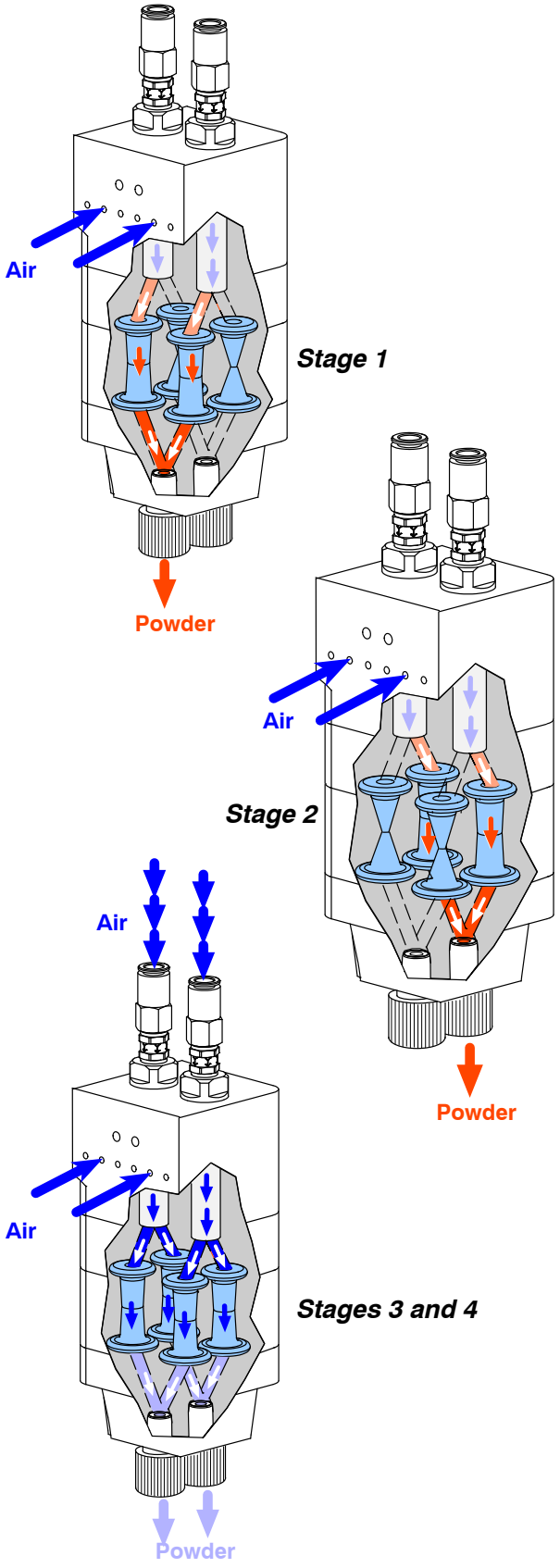


Figure 5 Purging Operation

Specifications

Output (Maximum)	
27 kg (60 lb) per hour	
Air Consumption	
Conveying Air	21–35 l/min (0.75–1.25 scfm)
Gun Pattern Air	6–57 l/min (0.2–2.0 scfm)
Total Consumption	85–170 l/min (3–6 scfm)
Operating Air Pressures	
Pinch Valves	2.4–2.75 bar (35–40 psi)
Flow Control (to pattern air/pump assist)	5.9 bar (85 psi)
Vacuum Generator	3.5 bar (50 psi)
Powder Tubing	
Size	8 mm OD x 6 mm ID
Length	Output: 4.5–23 m (15–75 ft) Input: 1–3 m (3.5–12 ft)
Dimensions	
See Figure 6	

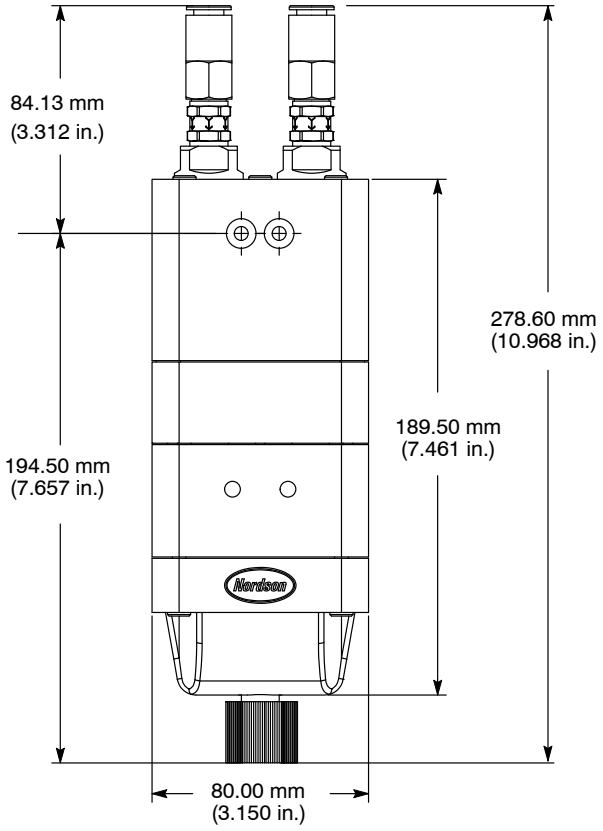


Figure 6 Pump Dimensions

Powder Tubing Installation

NOTE: Cut the powder tubing with a tubing cutter. Powder cross-contamination may result if the powder tubing is cut unevenly.

1. See Figure 7. Remove a tube retaining nut (1) and O-ring (3) from the pump.
2. Slide the retaining nut over the 8-mm OD, clear powder tubing (2).
3. Install the O-ring onto the powder tubing, sliding it down approximately 50 mm (2 in.) from the end.
4. Push the powder tubing into the wear block (4) until it bottoms out.
5. Slide the O-ring up the powder tubing until it stops against the wear block threads.
6. Thread the tube retaining nut onto the wear block threads finger tight.

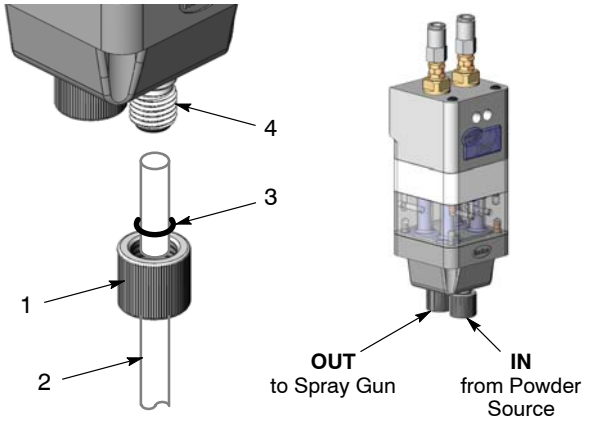


Figure 7 Powder Tubing Installation

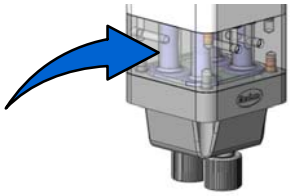
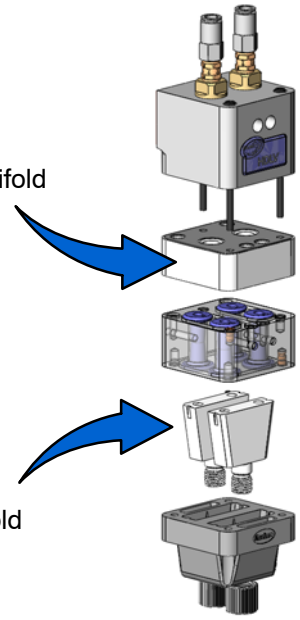
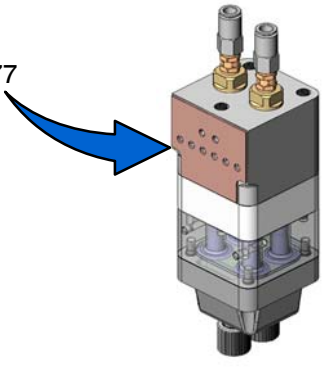
1. Tube retaining nut
2. 8-mm OD, clear powder tubing
3. O-ring
4. Wear block

Maintenance

Perform these maintenance procedures to keep your pump operating at peak efficiency.

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

NOTE: You may have to perform these procedures more or less frequently, depending on factors such as operator experience and type of powder used.

Frequency	Part	Procedure
Daily	Pinch Valves Kit 1057257 	Inspect the pinch valve body for signs of powder leakage. If you see powder in the pinch valve body or stress cracks in the pinch valves, replace the pinch valves and filter discs.
Every Six Months **or** **Each Time You Disassemble the Pump**	Upper Y-Manifold Kit 1057262 Lower Manifold Wear Blocks Kit 1057260 	**NOTE:** To reduce downtime, keep a spare upper manifold and set of lower wear blocks in stock to install while you are cleaning the other set. Disassemble the pump and inspect the lower manifold wear blocks and upper Y-manifold for signs of wear or impact fusion. Clean these parts in an ultrasonic cleaner if necessary. **NOTE:** If you clean the upper Y-manifold in an ultrasonic cleaner, you must replace its gasket. Remove as much of the gasket as possible, then use isopropyl alcohol to clean the adhesive from the manifold.
	Gasket Part 1053277 	Inspect the gasket for damage. Replace if necessary.

Troubleshooting

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

These troubleshooting procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, call the Nordson Finishing Customer Support Center at (800) 433-9319 or contact your local Nordson representative for help.

Problem	Possible Cause	Corrective Action
1. Reduced powder output (pinch valves are opening and closing)	Blockage in the powder tubing to the spray gun	Check the tubing for blockages. Purge the pump and spray gun.
	Defective pump air flow control valve	Clean the pump air flow control valve.
	Defective check valve	Replace the check valves.
2. Reduced powder output (pinch valves are not opening and closing)	Defective pinch valve	Replace the pinch valves and filter discs.
	Defective pinch solenoid valve	Replace the solenoid valve. Refer to either the pump panel or control manifold manual for more information.
	Defective check valve	Replace the check valves.
3. Reduced powder input (loss of suction from feed source)	Blockage in the powder tubing from the feed source	Check the tubing for blockages. Purge the pump and spray gun.
	Loss of vacuum at the vacuum generator	Check the vacuum generator for contamination.
		Check the pump panel exhaust muffler. If the exhaust muffler appears to be plugged, replace it.
	Defective pump air flow control valve	Clean the pump air flow control valve. Refer to either the pump panel or control manifold manual for more information.

Pump Port Functions

Figure 8 identifies the functions of the ports on the rear face of the pump.

Item	Function
1	Left Side Delivery Pinch Valve
2	Left Side Fluidizing Tube
3	Left Side Suction Pinch Valve
4	Right Side Suction Pinch Valve
5	Right Side Fluidizing Tube
6	Right Side Delivery Pinch Valve

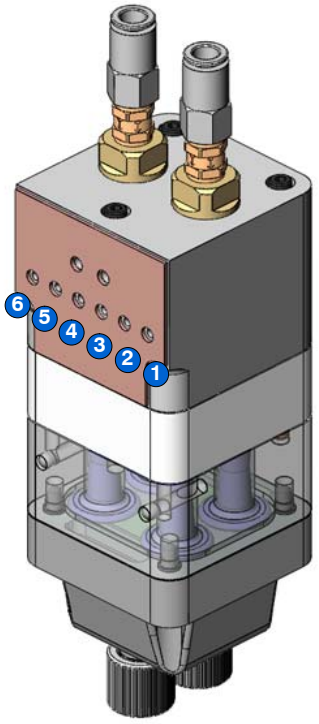


Figure 8 Solenoid and Flow Control Valve Functions

Repair

WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

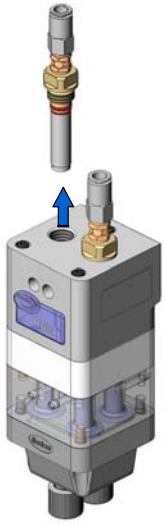
Fluidizing Tube Replacement

WARNING: Shut off and relieve system air pressure before performing the following tasks. Failure to relieve air pressure may result in personal injury.

1

Relieve air pressure and disconnect the purge air tubing.

2



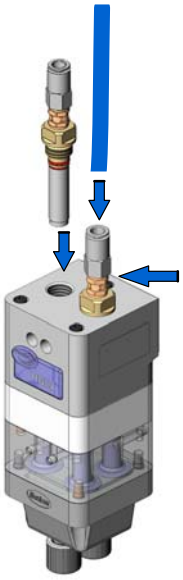
Loosen the fluidizing tube access plug and pull the fluidizing tube assembly straight out of the pump.

3

Pull the fluidizing tube off the access plug.

Seat the new fluidizing tube against the red O-ring.

4



Tighten the fluidizing tube access plugs then connect the purge air tubing.

Pump Disassembly

To reduce downtime, keep a spare pump in stock to replace a pump that is being repaired. Refer to *Pump Parts* on page 18 for ordering information.

WARNING: Shut off and relieve system air pressure before performing the following tasks. Failure to relieve air pressure may result in personal injury.

NOTE: Tag all air and powder tubing before disconnecting from the pump.

1. See Figure 9. Disconnect the purge air lines from the top of the pump.
2. Disconnect the inlet and outlet powder tubing from the bottom of the pump.
3. Remove the two screws securing the pump to the pump panel and take the pump to a clean work surface.
4. See Figure 10. Starting with the fluidizing tubes, disassemble the pump as shown.

NOTE: Refer to *Pinch Valve Replacement* on page 16 for instructions on pulling the pinch valves out of the pinch valve body.

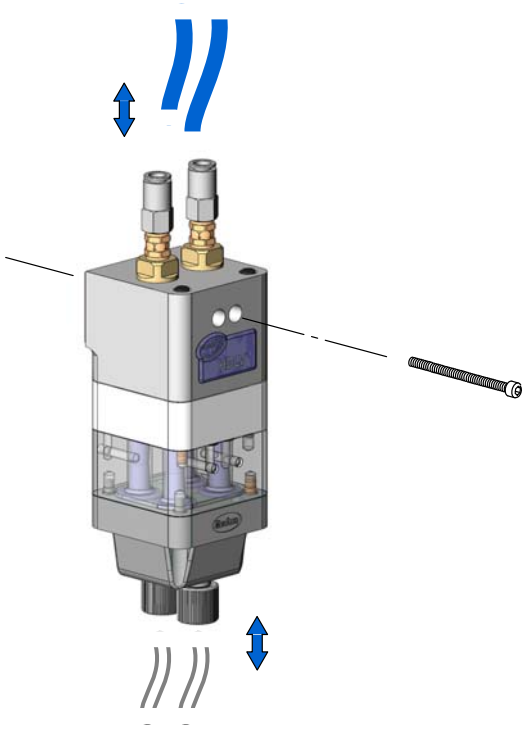


Figure 9 Disassembly Preparation

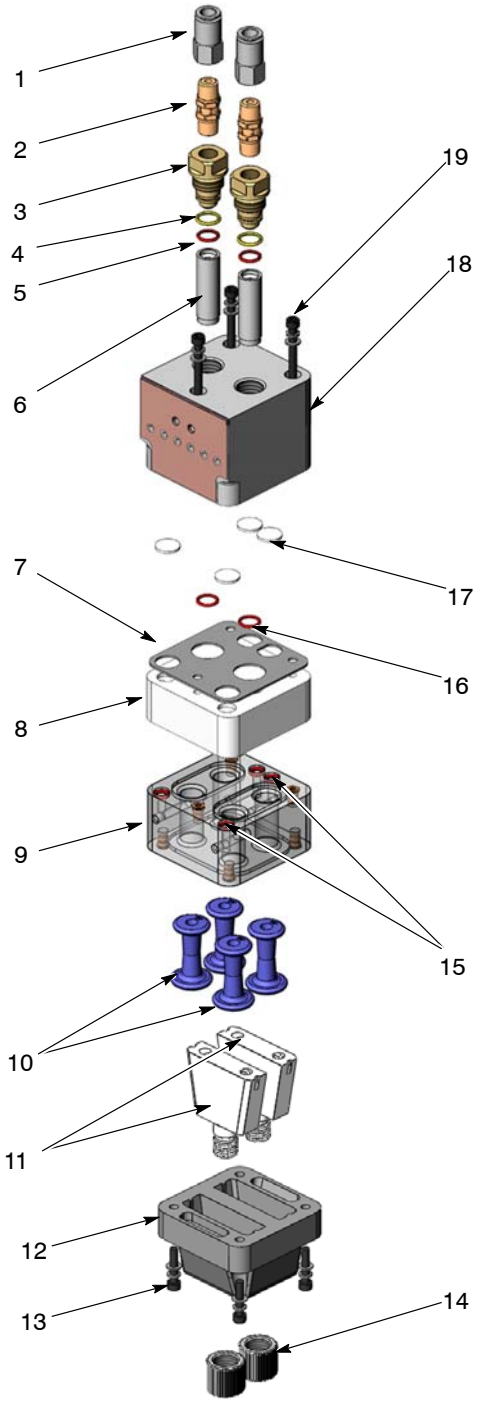


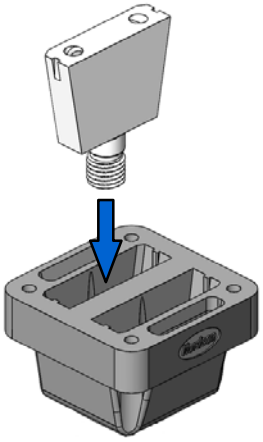
Figure 10 Pump Disassembly

1. 10-mm connectors
2. Check valves
3. Fluidizing tube access plugs
4. O-rings
5. O-rings
6. Fluidizing tubes
7. Gasket
8. Upper Y manifold
9. Pinch valve body
10. Pinch valves
11. Lower manifold wear blocks
12. Lower manifold body
13. Screws, lock washers, and flat washers (4)
14. Tube nuts (2)
15. O-rings (4)
16. O-rings (2)
17. Filter discs
18. Pump body
19. Screws, lock washers, and flat washers (3)

Pump Assembly

CAUTION: Follow the assembly order and specifications shown. Pump damage may occur if you do not carefully follow the assembly instructions.

1



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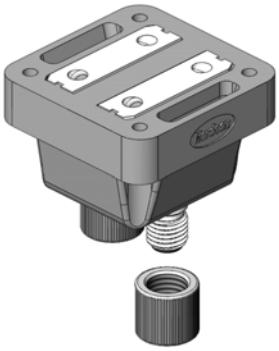

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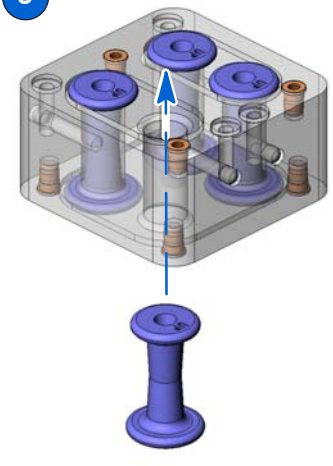

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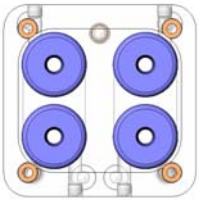
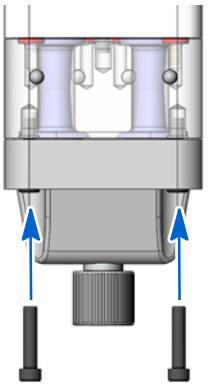


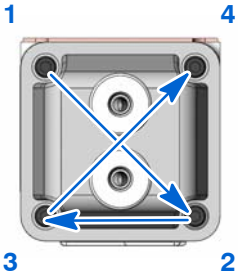
Bottom

Refer to *Pinch Valve Replacement* on page 16 for specific instructions.

4



CAUTION: Stop tightening when the pinch valve body contacts the lower manifold body. The pinch valve body will crack if you use more torque.



Tighten screws two turns at a time to 7–10 in. lb using an alternating pattern.

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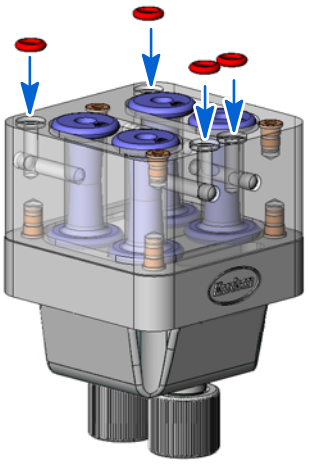

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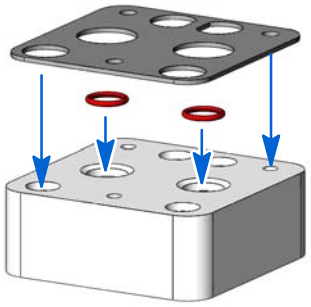

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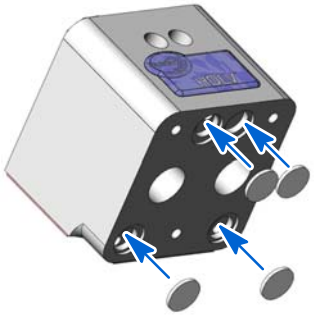

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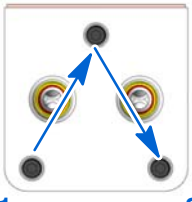
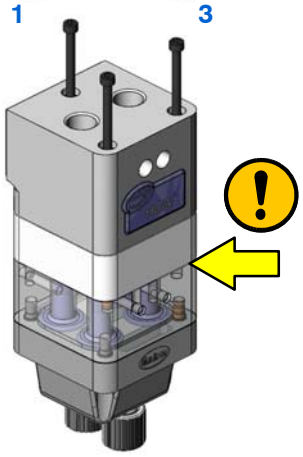


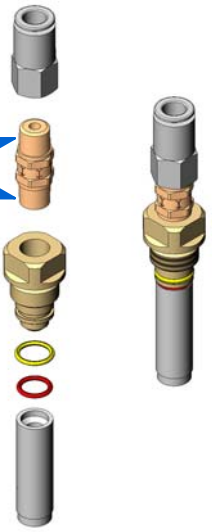
Tighten screws two turns at a time to 7–10 in. lb using an alternating pattern.



CAUTION:
Stop tightening when the pinch valve body contacts the upper Y-manifold. The pinch valve body will crack if you use more torque.

9

Apply 2–3 layers of PTFE tape to the check valve threads.



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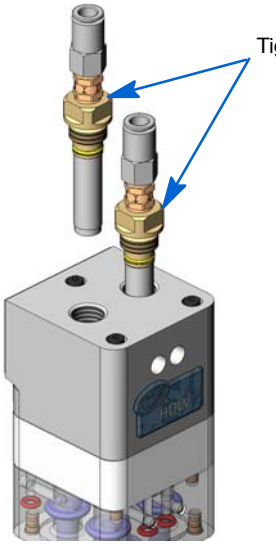


Pinch Valve Replacement

Pinch Valve Removal

WARNING: Wear eye protection while performing this procedure. The pinch valves will quickly snap back to their normal shape when you pull them out of the pinch valve body.

CAUTION: Pad the vise and do not tighten the vise too firmly. Failure to observe this caution may result in damage to the pinch valve body.

NOTE: Replace the filter discs (included in the pinch valve kit) when you replace the pinch valves. Refer to step 7 of the *Pump Assembly* procedure.

1

Place the pinch valve body in a padded vise with the bottom end facing you. Grasp and pull the bottom end of the pinch valve with one hand.

2

Use your other hand to pinch the opposite end of the pinch valve.

3

Pull the pinch valve firmly until it comes out of the pinch valve body.

Pinch Valve Installation

1

Turn the pinch valve body around so that the top end faces you. Insert the pinch valve insertion tool into the pinch valve body.

NOTE: After you put the pinch valve into the insertion tool, pinch the UP end of the valve.

2

Insert the UP end of the pinch valve into the pinch valve insertion tool. Pinch the UP end and feed the small end into the pinch valve body.

3

While pinching the UP end of the pinch valve in the insertion tool, pull the insertion tool.

4

Pull the pinch valve insertion tool firmly until the UP end of the pinch valve and the entire insertion tool come out the top of the pinch valve body.

Parts

To order parts, call the Nordson Finishing Customer Support Center at (800 433-9319 or contact your local Nordson representative.

Pump Parts

See Figure 11.

Item	Part	Description	Quantity	Note
—	1053219	PUMP ASSEMBLY, HDLV	1	
1	1053310	• CONNECTOR, female, 10 mm tube x $^1/_4$ in. RPT	2	
2	1053266	• VALVE, check, $^1/_4$ in. NPTM x $^1/_4$ in. NPTM, 15 psi, brass	2	
3	1053238	• PLUG, fluidizing tube access, HDLV pump	2	
4	940142	• O-RING, silicone, 0.50 x 0.625 x 0.063 in.	2	
5	940137	• O-RING, silicone, 0.437 x 0.562 x 0.063 in.	4	
6	- - - - - -	• TUBE, fluidizing, HDLV pump	2	A
7	1075152	• GASKET, face, HDLV pump	1	
8	- - - - - -	• MANIFOLD, upper Y, HDLV pump	1	A
9	1053234	• • GASKET, HDLV pump	1	
10	1053232	• BODY, pinch valve, HDLV pump	1	
11	- - - - - -	• VALVE, pinch, HDLV pump	4	A
12	- - - - - -	• BLOCK, wear, lower manifold, HDLV pump	2	A
13	- - - - - -	• BODY, lower manifold, HDLV pump	1	
14	982085	• SCREW, socket, M5 x 25, black	4	
15	983401	• WASHER, lock, M, split, M5, steel, zinc	7	
16	983035	• WASHER, flat, M, regular, 5, steel, zinc	7	
17	1062070	• NUT, wear block tube retaining	2	
NS	945115	• O-RING, Viton, 8.00 x 2.00	2	
18	1053292	• O-RING, silicone, 0.219 x 0.406 x 0.094 in.	4	
19	- - - - - -	• DISC, filter, Prodigy HDLV pump	4	A
20	- - - - - -	• MANIFOLD, top, HDLV pump	1	
21	1053293	• SCREW, socket, M5 x 100, black	3	

NOTE A: These parts are available in service kits listed on page 20.

NS: Not Shown

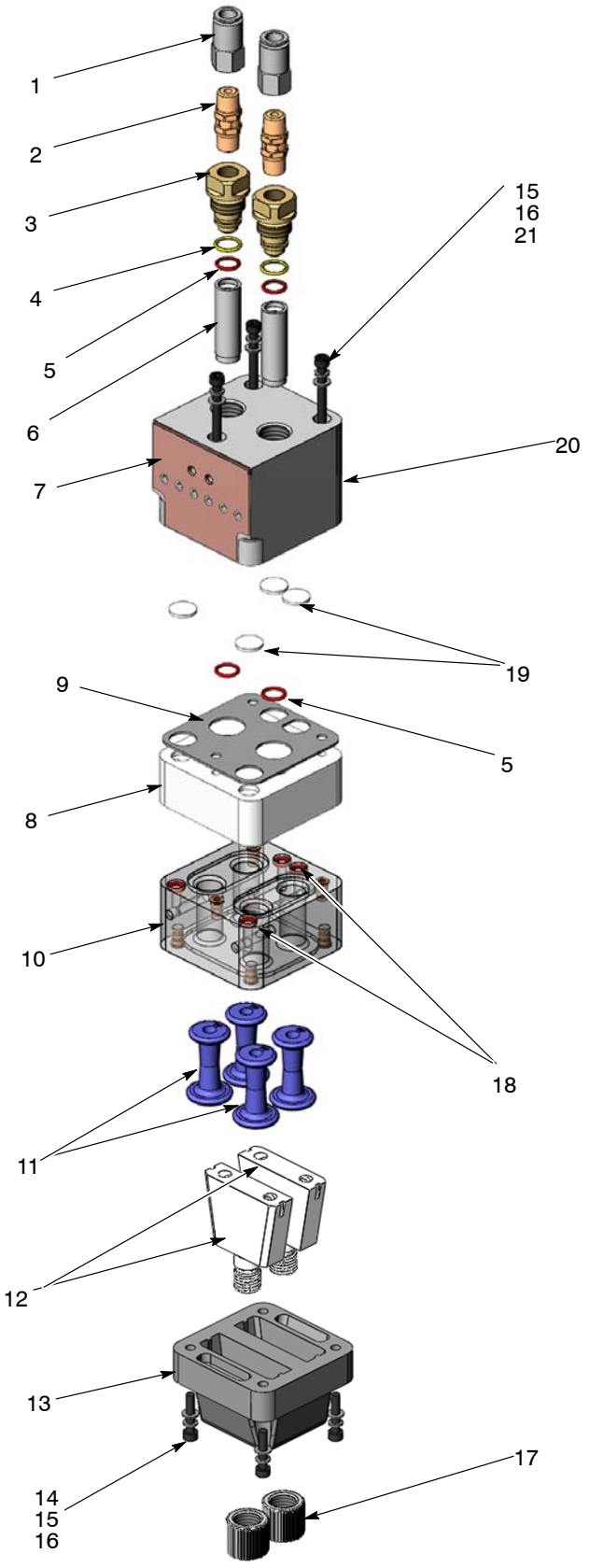
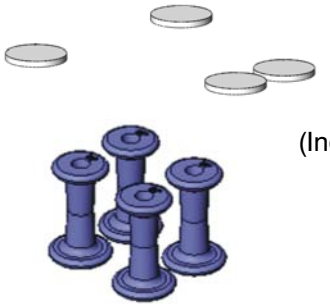


Figure 11 Pump Parts

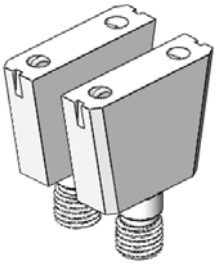
Spare Parts

Keep one of each of these assemblies in stock for each pump in your system.



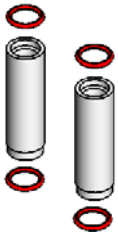
Pinch Valves
Kit 1057257
(Includes 8 pinch valves,
1 insertion tool,
and 8 filter discs)

Instructions on page 16



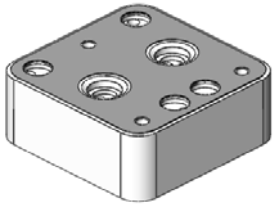
Lower Manifold Wear Blocks
Kit 1057260
(Includes 2 wear blocks
and 2 O-rings)

Instructions on page 12



Fluidizing Tubes
Kit 1057258
(Includes 4 tubes
and 8 O-rings)

Instructions on page 11



Upper Y-Manifold
Part 1057262
(Includes manifold
and gasket)

Instructions on page 12

Check Valve
Part 1053266
(Quantity of 1)