PiSys Flex™ User Manual

Version: 06 Feb 2023

Closed Loop Grit Blasting

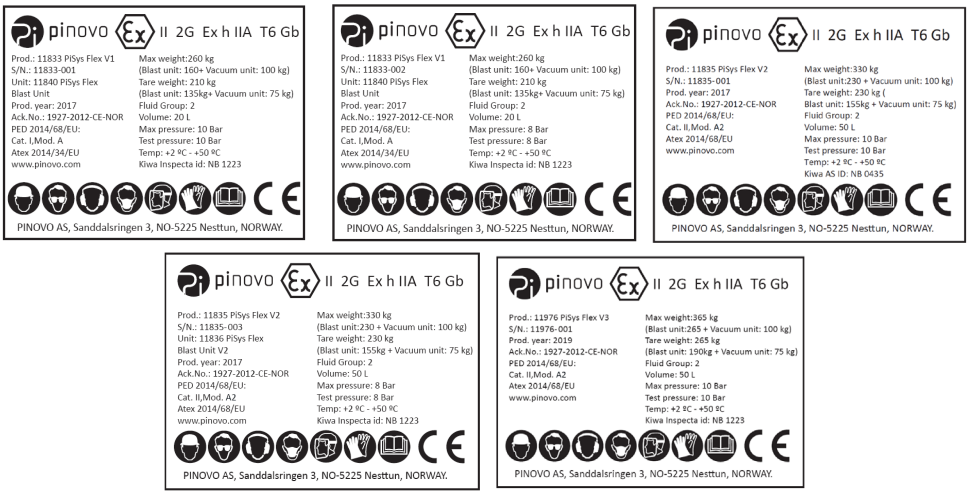
pinovo

Any person intending to operate this equipment or any person intending to be in the vicinity during its operation must receive proper training.

Do not operate this equipment before reading and completely understanding all the warnings, cautions, operating procedures, and instructions contained in this manual. Do also read and understand the manuals of the Pinovo® tools used with this equipment.

This manual is valid for:

- 11833 PiSys Flex V1 8 and 10 bar version
- 11835 PiSys Flex V2 8 and 10 bar version
- 11976 PiSys Flex V3 10 bar version
- 12019 PiSys Flex V4



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1 INTRODUCTION

The PiSys Flex is a closed loop, dust-free vacuum blasting unit. It is 100% pneumatically operated and all components are grounded. Therefore, the system is usable in most environments, such as EX gas zone 1. The PiSys Flex is developed to be used with the Pinovo handheld tools PiPoint, PiConnect, Piwalk, PiHab and Pico Pipe. The instructions in this manual are also valid for Pinovo's vacuum blasting unit Pisys 100.

The surface is blast cleaned by using fused brown alumina as blasting medium. "White Metal" surface cleanliness according to SA 3 (ISO 8501-1) and SSPC-SP5 can be easily achieved in addition to an anchoring profile up to 120 µm. Furthermore, the Pinovo® closed loop grit blasting method inherently delivers feathered edges ideally suited to spot blasting and high-quality coating repair.

Another advantage of Pinovo® grit blasting tools is the closed loop circulation system covering the entire treatment process. The result is complete elimination of discharges related to the work, as well as excellent utilization of the blasting medium. Brown fused aluminum oxide circulates in the system and may be re-used up to 20 times reducing media consumption and waste generation up to 80 % compared to conventional dry abrasive blasting technologies. In addition, the operators are never in direct contact with the actual blasting and waste material, which is collected automatically in the integrated waste management system.

No significant clean-up or further work is required after the Pinovo® preparation process, the surface is ready for painting or other post-treatment. The low noise and dust free Pinovo® surface preparation process minimizes the impact on surrounding installations and equipment.

2 SAFETY INSTRUCTIONS

The products described in this manual are intended for knowledgeable, experienced users of abrasive blasting equipment. It is the responsibility of the user to ensure that proper training has been completed and to have the relevant certificates from the Pinovo training program.

It is the responsibility of the users to familiarize themselves with the appropriate laws, regulations and safe practices that apply to these products and materials that may be used with these products, and that a safe work environment is provided.

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Any use outside the sphere of application specified by Pinovo is not approved. Such use, any failure to comply with the instructions given herein, or any modification of the product without the written consent of Pinovo will invalidate the warranty, and Pinovo refuses to accept liability.

In addition to information on installation and operation, this instruction manual may contain **WARNINGS** and **CAUTIONS** related to user safety. A **WARNING** indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury. A **CAUTION** indicates a potentially hazardous situation, which, if not avoided, may result in minor or major injury.

Do not attempt to operate this tool until you have read and understood all safety precautions and instructions listed in this manual. **INCORRECT OPERATION OF THIS UNIT CAN CAUSE SERIOUS INJURY.**

3 WARNINGS & CAUTIONS

⚠WARNING	**Enclosed blasting equipment may cause serious injury – protect hands, feet, eyes and hearing.**
⚠WARNING	**Show outmost care when connecting and operating the system. ALWAYS THINK SAFETY FIRST!**
⚠WARNING	**Wear PPE at all times when operating the PiSys Flex™. The type of respiratory protection should be considered depending on material being removed, e.g. lead-based coatings.**
⚠WARNING	**Do not use closed loop grit blasting tools on surfaces of unknown thickness or temperatures above 70°C without proper risk assessment.**
⚠WARNING	**Check all hoses for damage before starting the system.**
⚠WARNING	**Maintenance/repair on the system should only be carried out when the system is depressurized**
⚠WARNING	**Do not repair or replace any portion of Pinovo equipment using components that are not original Pinovo replacement parts or components that are not approved by Pinovo.**
⚠WARNING	**Do not cut, obstruct, restrict or pinch pneumatic control lines. Doing so could prevent the proper activation and deactivation of the remote control system, resulting in the release of high speed media and compressed air.**
⚠WARNING	**The use of this product for any purpose other than originally intended or altered from its original design is prohibited.**
⚠WARNING	**Never aim the blast head at anybody, not even when blasting is not done. Never look into the blast head when connected to the system.**

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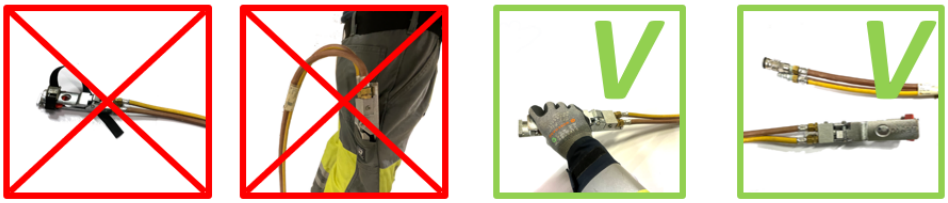
⚠WARNING	**If left in a fixed position, the Pinovo pipe tool can blast a hole in a 4,5 mm thick pipe in less than 7 minutes.** **NEVER LEAVE the tool on a live pipe!** 

⚠ CAUTION	**Never install, remove, or perform any maintenance on the PiSys Flex machine when the system is pressurized.**
⚠ CAUTION	**Only use Brown Fused Aluminum Oxide in the appropriate size, normally F16 (max F12, min F46)**
⚠ CAUTION	**Blasting of oil contaminated parts may result in contaminated surfaces, clogged abrasive, and/or malfunctioning of the equipment.**
⚠ CAUTION	**Valves must be opened slowly to allow seal to function correctly and to give a safe operation.**
⚠ CAUTION	**Never operate the Pisys Flex while wearing loose hanging chains, hanging ID/Security badges or garments.**
⚠ CAUTION	**Never start the Pisys Flex before its hoses are properly secured and safely located.**
⚠ CAUTION	**The Pisys Flex should be properly maintained and stored when not in use to avoid damage to parts.**
⚠ CAUTION	**Always consider the workplace, access and risk factor prior to installation.**
⚠ CAUTION	**Always connect the hoses with safety line to fixed structure if working above 2 meters free fall.**
⚠ CAUTION	**Always use the dead-man's handle to start and stop the Pisys-system.** **The handle must never be locked a way that restricts the safety function.** **The control-tubes must be correctly assembled for the safety function to work (male to port 1 is correct).** 

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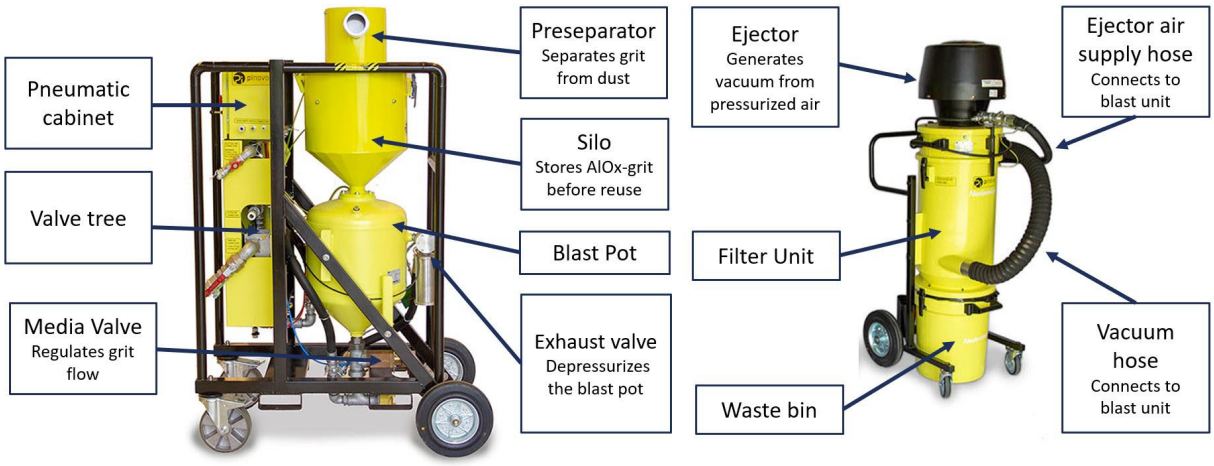
4 SYSTEM DESCRIPTION

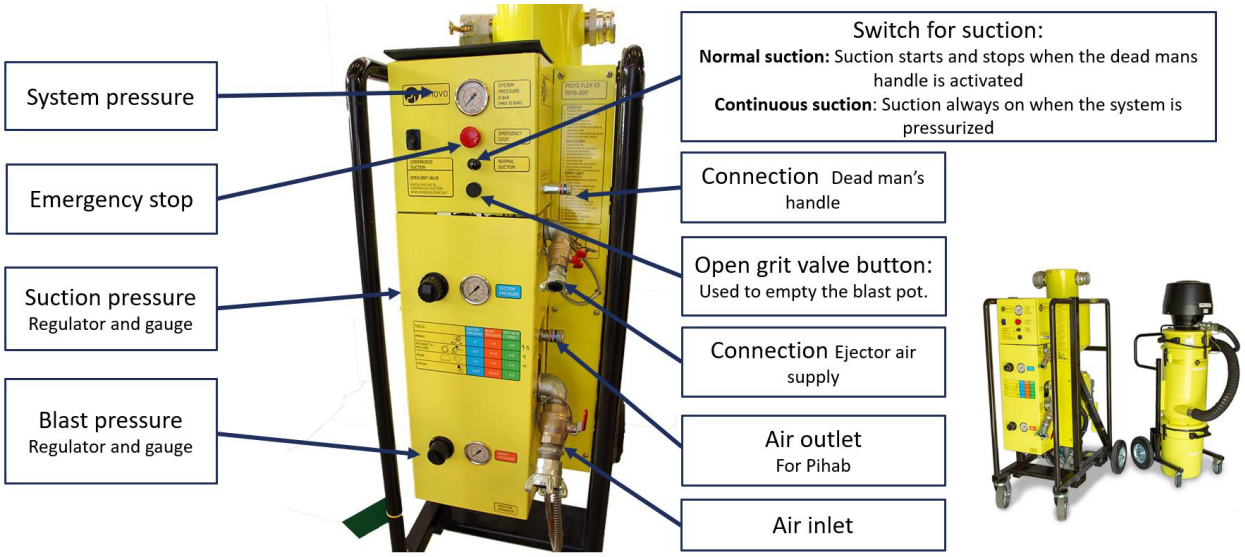
4.1 MAIN COMPONENTS

The Pisys Flex consists of:

- A blast unit with a pre-separator on top, and several valves and regulators for controlling the system.
- A vacuum unit with a pneumatic ejector, a filter system and waste bin.

The system requires 8 bar and 10 m^3/min to function. Use 2 inch supply hoses from the air source/compressor to the unit to avoid high pressure loss .





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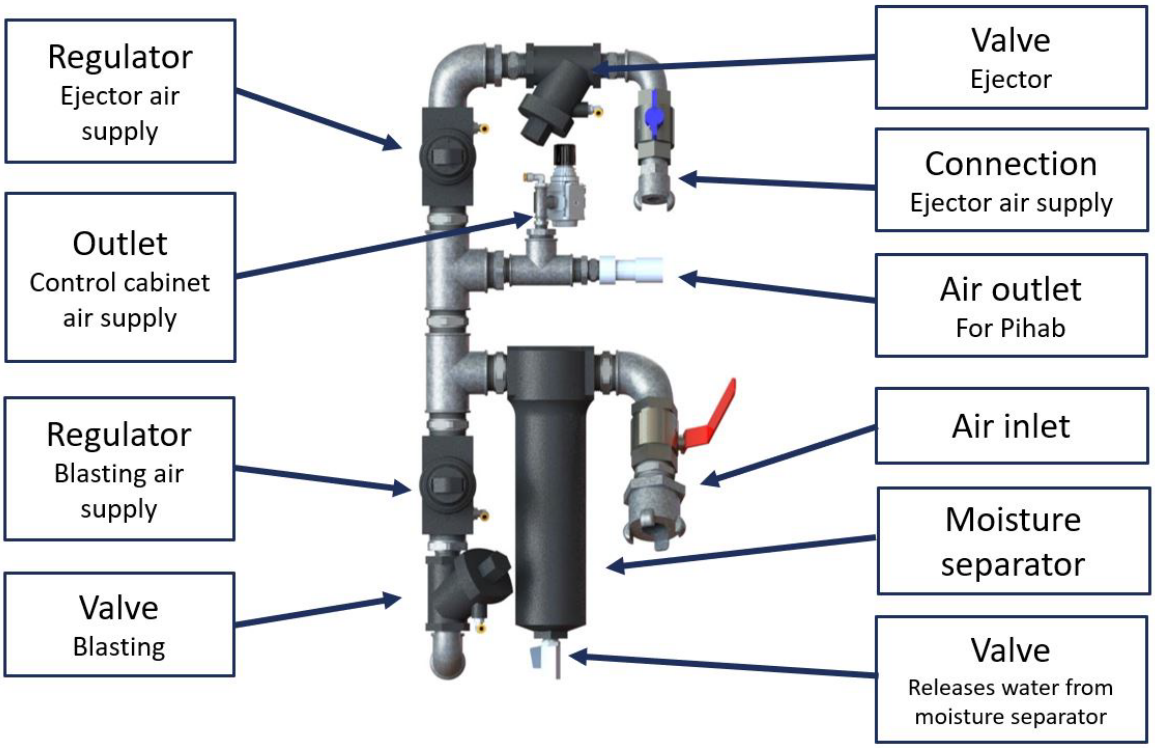
4.2 PRESSURE SYSTEM



The system is remotely controlled with a **dead man's handle/switch**. When the dead man handle is activated, the **Valve for Blasting**, the **Valve for Ejector,** and the **Grit valve** (media valve) are opened, while the **Exhaust valve** on the blast pot is closed. The **Valve for Blasting** supplies air to pressurize the **blast pot** and to the **Grit valve** to drive the grit through the blast hose. Inside the blast pot there is a **Pop-up valve**, that is activated by the air flow from the **Valve for Blasting**, which closes the opening on the top of the blast pot. Grit flows from the blast pot through the media valve and into the blast hose. The **Valve for Ejector** supplies air to the vacuum ejector to start the suction.

When the dead man handle is released, the **Valve for Blasting** and the **Grit valve** close, and the **Exhaust valve** opens. The blast pot is then depressurized and the flow of grit through the blast hose stops. The **Pop up valve** opens, and recycled grit can flow from the silo and into the blast pot. After a set delay, the **Valve for Ejector** also closes, and the suction stops.

The **Valve for Ejector** can also be opened by flipping the valve on the control cabinet from **Normal suction** to **Continuous suction**.

The **Grit valve** can also be opened by pressing the **Open grit valve** button.

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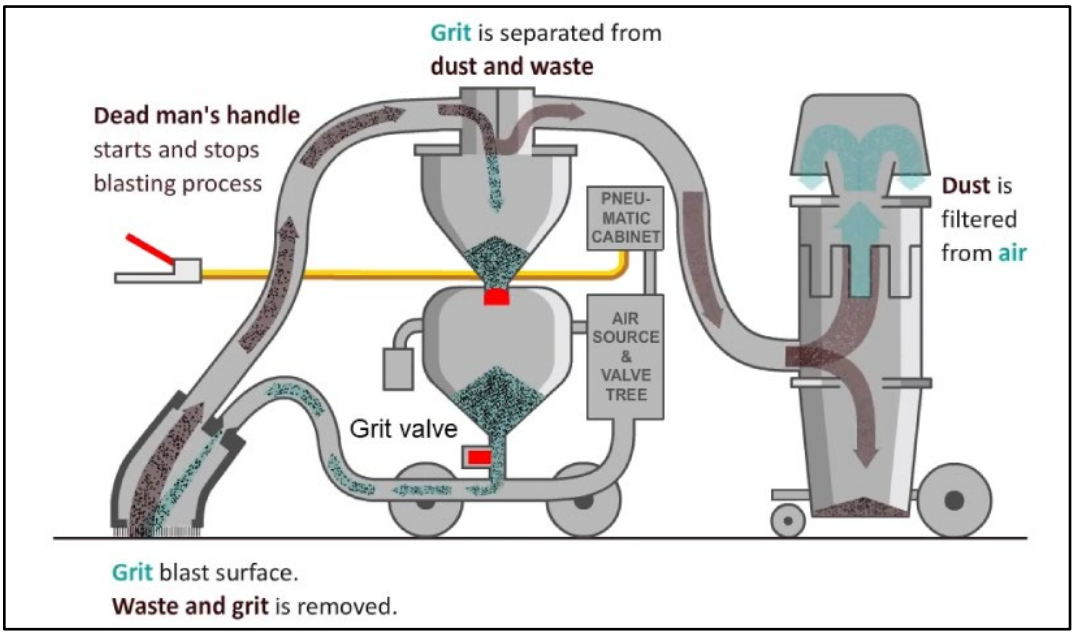
4.3 GRIT FLOW



The grit is filled into the **Silo** below the **Pre-Separator** and falls into the **Blast Pot**. From the **Blast Pot,** it is fed through the **Grit Valve** and brought to the tool through the blast hose. In the tool, the grit is sucked back to the system via the suction hose. In the **Pre-Separator,** the dust and small particles are separated from the grit. The dust goes into the **Waste bin**, while the grit falls into the silo and is recycled.

4.3.1 The manual valves on the PiSys system

- The **ejector air supply valve** opens/closes the air supply to the ejector and shall always be open when running the system and closed when ejector air supply hose is not connected.
- The **main air inlet valve** is positioned after the main air supply connector. It is used to close the system from the main air supply.
- The **moisture bleed valve** is located under the moisture separator. It should always be slightly open to drain away moisture from the compressed air. When depressurizing the system, the valve shall be fully open to empty the system of all pressure.

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4.4 THE VACUUM DELAY TIMER

- Delay timer: adjusts the time the system continues the vacuum after the dead man's handle/switch has been released.
- Purpose: to empty all hoses and get all grit and dust back into the system.
- Inside the control box you see a timer knob marked with zero and the letters A-F.
- Standard setting is B
- Close the control box properly to keep moisture away from the components inside!

4.5 WORKING PRESSURE

To meet customer specific demands, some systems are certified to 10 bar system pressure. The Pisys Flex systems are designed to function good at 8 bar system pressure, and the system pressure should therefore always be limited to max 8 bar.

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5 OPERATING INSTRUCTIONS

5.1 PISYS FLEX START UP PROCEDURE

5.1.1 Grounding

1. Start with connecting the grounding cable to a location with good metallic connection to your worksite.
2. Remember that the connection spot must be bare metal for good connection.

5.1.2 Connect the vacuum connection hose and ejector air supply hose between the vacuum unit and the blast unit. (On Pisys 100 these hoses are always connected). Remember: Whip checks and safety pins!

5.1.3 Connect main air, blast hoses, suction hoses and dead man's switch

1. Close main air valve
2. Connect the 2 inch main air supply hose.
   Remember: Whip checks and safety pins on all hose couplings
3. Connect the blast hose
   Blast hoses: 1" for Piwalk and Pibox. ¾" for other tools. Max length: 40 m
   Remember: Whip checks and 2 x built in safety pins
4. Connect the suction hose
   Max length vacuum hoses: 3 x 12m
   Remember: Whip checks and safety pins
5. Connect the hose for the deadman's handle at the side (Pisys Flex) or under (Pisys 100) the control box.

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5.1.4 Attach tool

1. Attach Suction hose transition
2. Check the wear rubber and brushes
3. Attach tool
4. Remember: Whip checks and safety pins
5. Do a visual overview of the system and check all hoses, whip checks and safety pins. The main valve shall be closed.

Piwalk, Pibox and Pihab Pipe: Use • Suction Hose Transition 2”- 3”	
PiConnect, PiPoint, Pico Pipe and Pihab Flat: Use both • Suction Hose Transition 2” - 3” • Suction Hose Transition 1 ½” – 2”	 

Fill blasting grit

The blast media used for the PiSys systems is Pinovo® Blasting Grit, a brown fused aluminum oxide. The standard grading is F16. Other gradings can be supplied on demand. When filling blasting grit there are 2 options:

1. Open lid on top of pre-separator, and gently pour blasting grit. The sieve in the pre-separator might slip out of position if adding blasting grit too fast. The system shall be de-pressurized.
2. Pour blasting grit into a clean and dry container or bucket. Remove any tool that might be connected to the adapter, pressurize the system, and set the lever for vacuum-mode to manual. Use the hose with adapter to gently suck the blasting grit into the system. When finished set the lever for vacuum-mode back to auto.

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5.1.5 Pressurize system. Adjust suction pressure, blast pressure and grit valve

1. Check that the lever for changing vacuum mode located on the right side of the control box is set to auto.
2. Gently open main air inlet to pressurize the system.

A smart routine when pressurizing any air hose is to open the lever 1/3, wait 3 seconds and if everything looks normal then slowly push the lever to fully open position.

Requirements for compressed air:

- 10 m^3/min
- 8 bar
- Dry

3. Open the valve under the moisture separator ca 1/4 so condensation from the main air hose is drained away from the system.
4. Check the service pressure for the pneumatic cabinet. It should not exceed 7 bar
5. Adjust the metering valve
6. Check that the emergency button is not in activated (not pushed in). Note that the emergency button is for emergency only and is never to be used as a shortcut to the procedures for depressurizing the system.
7. Adjust the blast and suction pressure.
8. Recommended settings:

Tools	Suction Pressure (bar)	Blast Pressure (bar)	Grit valve (turns)
PiWalk	**8, open regulator fully**	**4-5**	**4-5**
PiConnect & Pico Pipe	**6-7**	**3-4,5**	**4**
PiHab	**3-4**	**3-5**	**4**
PiPoint	**5-6,5**	**2,5 -3,5**	**2-3**

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5.1.6 Check system. Ready to blast

1. The system is now ready for use. Perform an extra check of the system and make sure that everything looks OK.
2. Start blasting
3. When the blast pot is empty, you should stop for a couple of minutes to let the recycled blasting grit from the pre-separator back into the blast pot.
4. Monitor and empty the waste bin regularly.

5.1.7 Empty waste bin

1. Always wear minimum a dust particle mask when performing this operation. If you are working with potential hazardous materials, you should use a gas mask with particle filter or a fresh air mask.
2. Depressurize the system
3. Disconnect the upper coupling on the pressure equalization hose. (Pisys 100 only)
4. Open the hinged latches on both sides of the waste bin and release the bin. Remember that the waste bin might be heavy if it has not been monitored and emptied regularly.
5. Seal the waste bag with a plastic strip. Remove the bag from the bin and replace it with a new plastic bag. Fold the bag neatly over the bins edge and then reposition the waste bin.
6. Make sure the holes in the bag are inside the waste bin's edge.
7. Remember to reattach the pressure equalization hose. (Pisys 100 only)

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5.2 BREAKS AND DAILY SHUTDOWN

5.2.1 Depressurize Pisys:

1. Close main air inlet valve
1. Set lever to continuous (PiSys Flex) / manual (PiSys 100) suction and open moisture separator valve
2. Let system depressurize
3. Set lever to normal suction. Close moisture separator valve.
4. Close the valve on the air supply (valve on the compressor)

The valve for the suction is a "normally closed valve" and closes before all the pressure in the system is released. Therefore, the moisture separator valve must also be opened to release all air from the system

5.2.2 Depressurize system and hoses:

1. Open main air inlet valve gently
2. Set lever to continuous (PiSys Flex) / manual (PiSys 100) suction and open moisture separator valve
3. Let system depressurize
4. Set lever to normal (PiSys Flex) / auto (PiSys 100) normal suction. Close moisture separator valve.
5. Close main air inlet valve
6. Check that air supply hose is depressurized

The system and all connected hoses are now depressurized, and you may disconnect the components in the reverse order from which you attached them. The grounding-cable is the last thing to be removed. Remember to take care of all safety pins and whip-checks for later use.

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5.3 EMPTY BLAST POT

The blast pot must be emptied of grit when:

- The AlOx grit is worn out. The abrasive grains are getting smaller with each loop through the system. You will notice that blast speed and roughness declines. This happens after ca 4 hours use, depending on tool and blast pressure.
  → Change grit 1-2 times per day
- The system is going to be stored. If used grit is stored in the Pisys system for longer periods, it might clog the system, especially in moist environments.
- The system is going to be returned to Pinovo. Waste from the vacuum blasting should be properly disposed of by the contractor.

1. **Close the MAIN AIR inlet valve** on the PiSys system and depressurize the system.
2. Attach **EXTRACTION HOSE** between the blast unit and vacuum unit
3. Open **GRIT VALVE** (10 turns)
4. Open **MAIN AIR** valve
5. Set suction to 8 BAR
6. Set suction lever to *continuous* (PiSys Flex) / *manual* (PiSys 100)
7. Push **OPEN GRIT VALVE** (green or black button) for 1 min. The grit valve is now opened without pressurizing the blast pot. The grit flows from the blast pot to the waste bin with help of vacuum.
8. Check and change the **WASTE BAG** in the waste bin regularly, since the blast pot holds more grit than the waste bin can take in one go. Repeat the operation until the blast pot is empty.
9. Clean sieve with the **EXTRACTION HOSE**
10. Close **MAIN AIR** and let the system depressurize
11. Set lever to *normal* (PiSys Flex) / auto (PiSys 100)

Extraction hose

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12. Close the metering valve, remove the hose for emptying the system. Now you can add new blast media to the system and attach all components that you need to continue blasting.

Good practice: Put hearing protection to hose to check if there is grit flow.

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6 BEST PRACTISES AND TROUBLESHOOTING

6.1 BEST PRACTISES

6.1.1 Check the settings

Adjust settings to make the system work optimally:

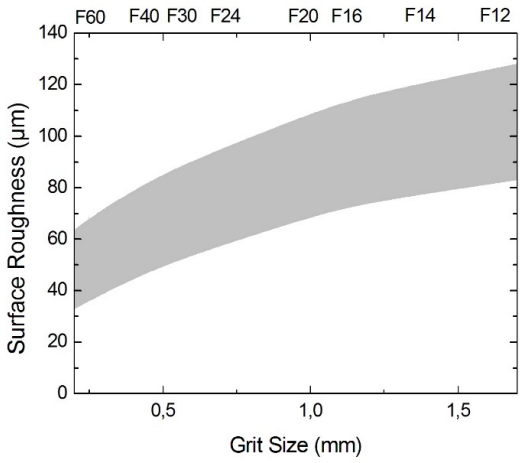
- Longer hoses will require higher blast and suction pressure
- Start with 4 turns on the grit valve, and adjust it until satisfied
  - Too high setting → Dust and grit leakage and lower productivity
  - Too low setting → No grit /low productivity
- Check recommended setting on the Pisys machine or in chapter **5.1.5**

Good practice: When the grit gets worn, it will flow quicker through the grit valve.

To achieve optimal results, turn it ½ turn down after ca 2 hours work.

6.1.2 Grit size and surface profile

- Only use Brown Fused Alumina Grit
- Recommended grit size: F16
- Do not use coarser grit (such as F12) as this will lead to clogging of the nozzles



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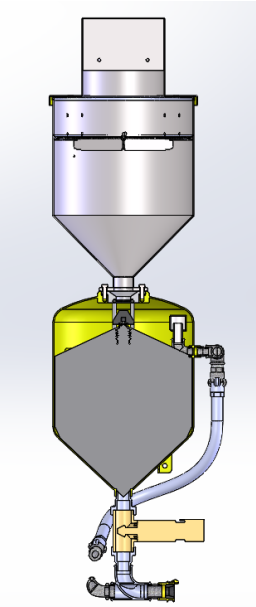
6.1.3 Pisys vacuum delay timer

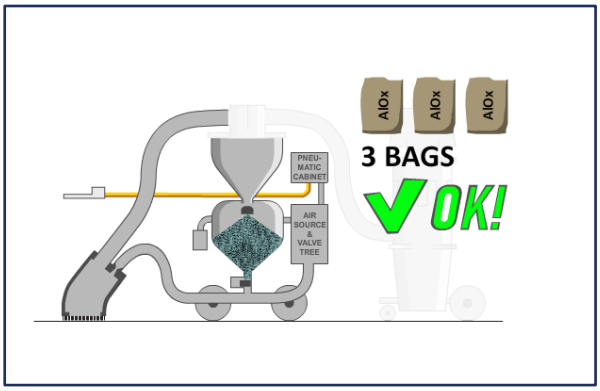
- Delay timer: adjusts the time the system continues the vacuum after the dead man's handle has been released.
- Purpose: to empty all hoses and get all grit and dust back into the system.
- Inside the control box you see a timer knob marked with zero and the letters A-F.
- Standard setting is B
- Close the control box properly to keep moisture away from the components inside!

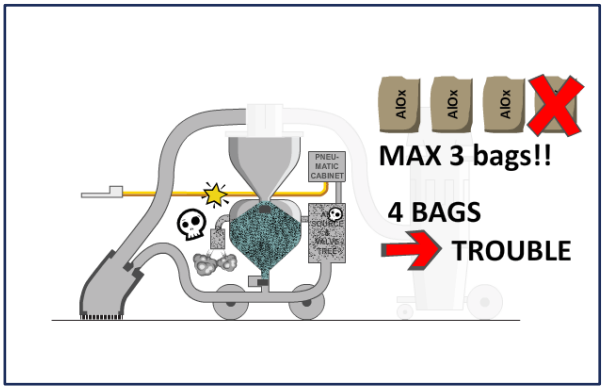
6.2 MALFUNCTION OF REGULATORS AND DUST OR GRIT EMISSIONS FROM THE EXHAUST

This problem is often caused by overfilling the blast pot. Remove the silo to inspect the grit level.



- Too much grit will lead to:
  - Clogging of exhaust valve
  - Malfunction of system
- Max amount of grit: 3 bags / 75 kg
- Empty system of grit before refilling with new grit:
  3 bags of old grit + New grit → TROUBLE
- If the system is overfilled, system must be emptied of grit before refilling with max 3 bags of new grit. (See chapter *Empty Blast Pot)*
- Contact Pinovo if the regulators are malfunctioning





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6.3 SYSTEM IS NOT RESPONDING

- Ensure that emergency stop is de-activated
- Ensure that main valves on PiSys and compressor are open, check that manometers shows that the system is pressurized
- Ensure that dead man switch and twin hoses are properly connected

6.4 BLASTING DOES NOT STOP

- Make sure that system is filled with maximum 3 bags of grit
- Dismantle and check if exhaust is filled with grit
- Dead man’s handle might be broken – Replace it or contact Pinovo

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6.5 LOW OR NO SUCTION

If the suction power drops, the tool will leak grit, and grit and dust will build up in the suction hose.

- Check blast and suction pressure. If they drop during operation, the air supply is probably too low. Requirement: 8 bar, 10 m^3 / min, use 2” supply hoses
- Avoid sharp bends in suction hoses
- Adjust grit feed
- Check suction hoses for damage or if they are filled with grit
- Check that the ejector air supply valve is in fully open position.

6.5.1 Waste bag

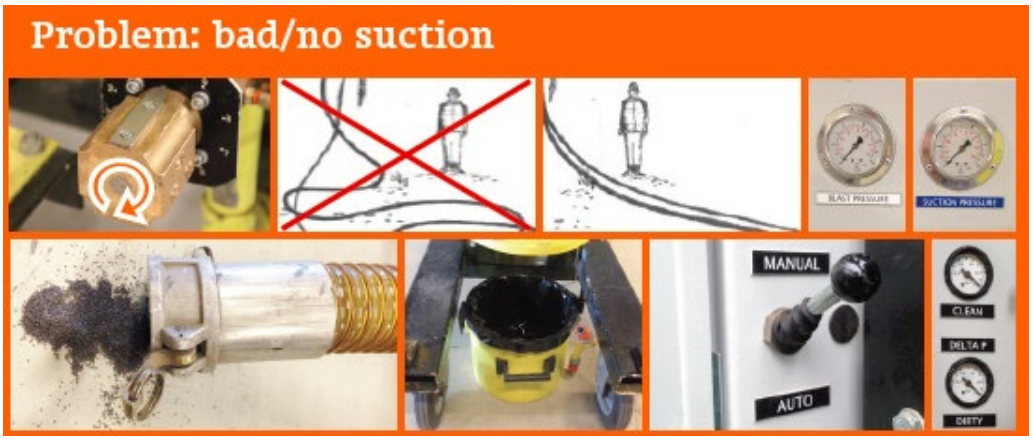
- Check that the waste bag is not sucked up into the filters
- Make sure that the waste bag is properly inserted
- The holes in the bag must be inside the bucket to allow pressure equilibration between the inside and outside of the bag

6.5.2 Filter

Check the condition of the filters in the vacuum unit:

If a manometer is present on the suction unit: Remove the waste bin and set the suction mode to **CONTINUOUS SUCTION**. Check that the manometer on the vacuum unit is close to 0 bar. If not, the filters should be cleaned or replaced.

⚠WARNING When cleaning or replacing the filters, make sure the system you are working on is depressurized. Use proper PPE. Remove the ejector and the filter cleaning unit. Lift out the filter and inspect it. If it is clogged with dust, or very moist, it must be replaced.



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6.6 NO GRIT FLOW OR BAD BLASTING

Check blast pressure and the adjustment of the grit feed. Requirement: 8 bar, 10 m^3 / min, use 2” supply hoses. Other causes for this problem can be:

6.6.1 Wrong grit size

Use max F12 on tools with 6 mm venturi nozzle and max F16 on tools with 9, 5 mm fan nozzle.

6.6.2 Moisture in blast media

The PiSys systems are more vulnerable to moisture than a conventional blast kit since the same media runs through the system several times. If you have problem with moist grit, you should empty the blast pot and apply new, dry grit to the system.

6.6.3 Blocked hoses or nozzles

The nozzle used with the Pinovo tools is usually a 6,4 mm venturi nozzle or a 9 mm fan nozzle. If large particles access the system, the nozzles can be blocked.

If the grit valve has been adjusted too high, the grit may build up inside the hose and then finally block it. If this happens, you must disconnect the hose and empty it manually.

6.6.4 The pop-up valve is malfunctioning

The pop-up valve opens/closes the opening on the top of the blast pot and is positioned inside the blast pot. When open, it allows the grit to flow from the silo and into the blast pot. When closed, it allows the blast pot to be pressurized. To check that the valve is has proper function:

Remove the pre-separator (on top of silo) and remove the sieve (metal plate with holes). Use personal protection and a pocket light and check that the valve closes when the system starts and opens when the system is shut down. There is a delay when the system shuts down, so that the blast pot is depressurized through the exhaust and not through the vacuum system.

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6.6.5 Blocked Grit Valve

The grit valve can also be blocked by debris from the blasting process, for instance larger paint or rust flakes. To fix this:

- Set the grit valve to fully open (10 turns) position
- Connect the extraction hose
- Set the suction to “Manual”
- Push transfer button for 5 sec

If still no grit appears you must either:

- Remove the whole grit-valve-unit and empty the blast-pot of debris
  or
- Dismantle the grit valve and then remove any obstacle that prevents the grit flow to the grit valve (see next chapter)

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6.6.6 Dismantling the grit valve









- Remove control hose/dead man's handle to avoid unintentional activation of the system
- Remove the 6 mm plastic hose that controls the grit valve:
    - There is a plastic ring where the hose enters the coupling, press this ring against the coupling and pull out the plastic hose.
- Use a wrench to remove the two bolts that connect the grit valve to its pipe.
- The grit will now flow out of the blast pot. Use waste bags to collect the grit.
- Use a metal string to remove any objects that are blocking the channel. Make a small hook in the end of the string to grab obstacles inside the channel. In most cases this will remove the object that blocks the grit, and the grit will now flow until the blast pot is empty.
- Make sure the grit valve is in fully open position (10 turns open) and then reattach it. **The pneumatic control-tube must be reattached and the black button on the control panel must be pressed to open the valve!** Otherwise, the rod on the grit-valve cylinder can get damaged.
- Put the bolts in position and tighten them with a wrench.
- Remember to set the grit valve to an appropriate number of turns before adding new grit.

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7 MAINTENANCE

Maintenance shall be performed periodically. Refer to *C1.36 PiSys Flex Maintenance Manual* for more details.

7.1 DAILY CHECK

To ensure proper functioning of PiSys Flex units engaged in projects, it is recommended that daily checks are conducted on site, by the customer. Daily checks should include:

- Visual check of system, including hoses, couplings, tools, and dead man's handle,
- Visual check of grounding connections
- Check of waste bin – empty if necessary
- Check for debris in pre-separator – clean if necessary.

7.2 WEEKLY CHECK

To ensure proper functioning of PiSys Flex units engaged in projects, it is recommended that weekly checks are conducted on site, by the customer. Weekly checks should include:

- Check filter in vacuum unit. If dirty, clean filter or if its leaking, replace filter with a new one.
- Check sealing in top of cyclone/ silo.
- Check gasket on grit outlet (where blast hose is connected)

7.3 6 MONTHS CHECK

To ensure proper functioning of PiSys Flex units engaged in longer term projects, it is recommended to conduct status checks on site. The status check can be executed by Pinovo service personnel or by competent and trained customer personnel. It is suggested to perform the status check according to the following checklists and to file these checklists.

- S1.58 Pisys Flex Checklist
- S1.59 Pisys Flex ATEX Checklist

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8 STORAGE AND TRANSPORT

- The system should always be stored in a dry space
- Always empty blast pot before transport.
- To avoid transportation damages everything should be properly strapped and secured
- If possible, transport the Pisys Flex in vertical position

9 TECHNICAL DATA

Size L x W x H:	Blast units: 116 x 74 x 172 cm Suction unit: 80 x 60 x 170 cm
Weight, excluding hoses :	V1: Tare weight approx. 210 kg V2: Tare weight approx. 230 kg V3: Tare weight approx. 265 kg Max weight: add approx. 100 kg grit
Air requirements	8 bar, 10 Nm^3 / min dry air
ATEX conformity	CE Ex II 2G IIA T6 Gb

10 CONTACT

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