



Empowering you to work smarter

PRO
SERIES

Vacuum Pump
NP7DP2
User Manual



Failure to follow warnings could
result in death or serious injury.

**SAVE THIS MANUAL
FOR FUTURE REFERENCE**

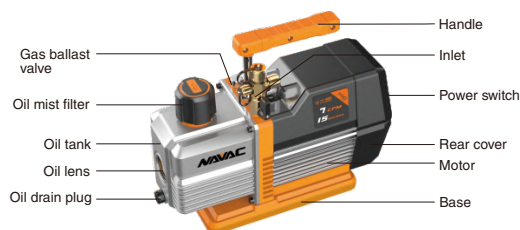
NAVAC Inc.
www.NavacGlobal.com
Tel/Fax: +1 877 MY-NAVAC
877 696 2822
MADE IN PRC

TABLE OF CONTENTS

INTRODUCTION AND TECHNICAL INFORMATION	01
AC MOTOR DRIVEN VACUUM PUMPS	01
APPLICATION	01
SPECIAL FEATURES	01
PREPARATION PRIOR TO USING VACUUM PUMP	02
SAFETY WARNINGS	02
USE GUIDE	03
MAINTENANCE	04
REQUIREMENT FOR WARRANTY COVERAGE	04
TROUBLESHOOTING	05
EXPLODED VIEW	06
REPAIR PARTS LIST	07
DIMENSION	08

INTRODUCTION AND TECHNICAL INFORMATION

In order to make it easier to understand the components of the vacuum pump, please see the picture below.



AC MOTOR DRIVEN VACUUM PUMPS

Model	NP7DP2
Power Supply	115V/60Hz
Flow Rate (CFM)	7 CFM
Ultimate Vacuum	15 Micron
Pump Design	Dual-Stage, AC Motor
Motor Power (HP)	3/4
Oil Capacity (oz)	15
Dimensions (in)	14"x5"x11.3"
Weight (lbs)	26
Inlet Port	1/4", 3/8", 1/2" Flare

APPLICATION

NAVAC dual-stage rotary vane vacuum pumps are used to remove air, moisture, and other non-condensables from sealed HVACR systems. The products can be used for evacuation of HVACR repair and new installations, specially designed for A2L refrigerants such as, R-32, 1234yf, R-600a, R-452B. It can also be used as other common refrigerants such as, R-12, R-22, R-410A, R-404A, R-134A, etc.



SPECIAL FEATURES

- Integrated pump structure, high precision, for deep ultimate vacuum level.
- Forced oil lubrication ensures vane sealing, cooling and high reliability.
- Large and easy to see oil-level window design help prevent oil supply shortage.

PREPARATION PRIOR TO USING VACUUM PUMP

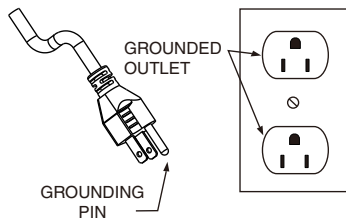
GROUNDING INSTRUCTIONS

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING:

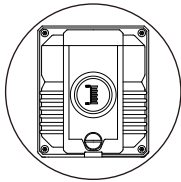
Improper installation of the grounding plug is able to result in a risk of electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.



1. Verify the power supply being used to match the voltage on the nameplate.
2. Ensure that the pump is switched off prior to connecting to the power source.
3. Check for proper oil level, or change if needed.
4. Remove the oil fill cap, filling oil to the level in between the two oil sight glass lines, as shown in the drawing below. For specific pump oil volume, please see the technical specification table.

Note: In order to prevent pump oil from spilling out, please add oil slowly.



Switch on the power and the pump will begin to operate. After running for approximately one minute, check the oil level. If the oil level is too low, switch off the machine and add the required extra oil. Reinstall the oil fill cap.

Note: While the pump is operating, the oil level should be in between the two oil position lines. If the oil level is too low, it will reduce the performance and could damage the pump vanes. If the oil level is too high, it could cause oil to discharge through the pump exhaust.

SAFETY WARNINGS

WARNING:

This machine should only be used for evacuation of refrigerant systems after refrigerant has been removed from the system and the system has been opened to atmosphere. This machine is not to be used as a transfer pump for liquids or any other media; doing so can damage the product.

Note: In order to avoid personal injury, please carefully read and follow the instructions in this user manual and the user guide of the pump.

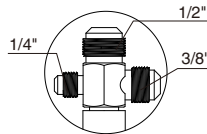
NAVAC VACUUM PUMPS ARE NOT ALLOWED TO BE USED FOR A3 OR FLAMMABLE REFRIGERANTS.

1. NEVER CONNECT A VACUUM PUMP TO A PRESSURIZED SYSTEM. Always check to make sure that system and piping pressure is NOT ABOVE ATMOSPHERIC PRESSURE.
2. When handling refrigerants, please wear an eye-protection such as safety glasses or goggles.
3. Avoid direct physical contact with refrigerants, you will get burned.
4. When connecting the power source, all equipments must be grounded in order to prevent electrical hazards.
5. When the pump is in operation, the enclosure surfaces will be hot. Do not touch the oil box or the motor case. Allow adequate ventilation space for heat dissipation.
6. Not applicable for flammable refrigerants in A2 and A3 classes.
7. Keep pump dry and away from water, mud, and dirt at all times.
8. Operating pump with intake fittings open to the atmosphere must not exceed 3 minutes.
9. Ambient temperature range for pump use is 30 to 104°F (-1°C~40°C). The pump can be used in lower ambient conditions, if warmed up inside first and run for no more than 1 minute to warm the oil prior to system evacuation.
10. The power outlet must be grounded.
11. Prior to connecting the vacuum pump to an A/C-R system, please use proper methods to remove refrigerant from a pressurized system. Note that pumping refrigerants under high-pressure conditions will damage the pump, and refrigerant must be removed using a recovery machine designed for that purpose.

USE GUIDE

CAUTION

-To reduce the risk of electric shock, do not expose to rain.
Store indoors.



EXTENSION CORDS

If an extension cord must be used, be sure it is:

1. A 3-wire extension cord that has a 3-blade grounding plug, and a 3-slot receptacle that will accept the plug on the product
2. In good condition
3. No longer than 50' (15.2m)
4. 16 gauge (AWG) or larger. (Wire size increases as gauge number decreases. 14 AWG and 12AWG may also be used. DO NOT USE 18 AWG)

NOTICE: Risk of Property Damage. The use of an undersized extension cord will cause voltage to drop resulting in power loss to the motor and overheating.

1. When using the vacuum pump, remove the inlet protection cap from the desired (1/4", 3/8", or 1/2") connecting port, as shown in the diagram above, and connect the pump to the system or piping to be evacuated. Use shortest hoses possible for faster and more thorough evacuation.
2. Inspect the hose inlet connection, as well as all connecting hoses for proper seal. There must be no leakage or it will be impossible to draw the required deep vacuum level.
3. At the beginning of the evacuation process, open the GAS BALLAST, and once the vacuum gauge reaches 2000 microns, retighten to achieve desired vacuum level.
4. After evacuation is completed, shut down the pump and close the system access valves.
5. Turn off the power switch on the pump and disconnect power.
6. Remove the evacuation hoses.
7. Close the air entry cap and the air exhaust cap tightly (with the exception of models without air exhaust cap), to prevent dirt or particulates from entering the pump.

Note:

1. Always evacuate systems in conjunction with a micron vacuum gauge, such as the NAVAC NMV1, giving you a comprehensive view of the sealed system internal evacuation condition.
2. Please pay attention to any changes in the oil level during pump operation. If the oil level falls below the center line, immediately add more vacuum pump oil to avoid damage to the pump.
3. Vacuum pump and oil must be above 30° F.

MAINTENANCE

1. Vacuum pump oil has three major functions: pump lubricant, pump cooling, and pump sealant. During the evacuation process, the pump oil will absorb moisture being pulled from the system, causing it to be less effective as a lubricant and pump vane seal, extending evacuation time and possibly allowing the pump to overheat. We recommend that the oil be changed just before evacuating each A/C-R system to insure the pump oil is in a clean condition as this is the key factor in determining if the pump can achieve the required vacuum levels. In order to maintain the optimum operation of the pump, we recommend that you use NAVAC vacuum pump oil. This oil is made using a unique process and can maintain proper viscosity during normal operation and temperatures, and it's also helpful for cold starts. Should the NAVAC oil not be available, reputable brands of special-purpose vacuum pump oil may be used.

Note: Should the pump oil become opaque, dirty, or full of moisture, promptly change oil. This will greatly speed up evacuation, especially when there is a lot of moisture in system piping from having been left open to the atmosphere for an extended period of time.

Oil change procedure:

1. To ensure that the pump and oil are warm, run pump for approximately one minute prior to changing oil. Do not run longer than this, as it may be possible to damage the pump.
2. While the pump is running, open one inlet port and allow oil to drain out of the pump. After turning off pump, open the oil drain plug, and drain used oil into an appropriate vessel and dispose of properly.
3. As oil stops draining, tip the pump to drain any remaining oil in the bottom of the pump.
4. Close oil drain valve.
5. Remove oil fill cap, pour in new oil until the oil is at the proper level in the sight glass (the same procedure prior to using the pump above).

REQUIREMENTS FOR WARRANTY COVERAGE

Product warranty is provided for product quality problems for one years from date of sale. For warranty to be valid, the following conditions must be met:

1. Products issues due to manufacturing defects confirmed by qualified agents.
2. Products which have not been maintained or dismantled by unauthorized parties.
3. Products that have been used in accordance with the User Manual. All maintenance services shall be performed during the warranty period.

Statement: Other than repairing the product defective, the manufacturer of this product will not be liable for any other costs, such as time spent in fixing the issue, refrigerant consumption, refrigerant disposal costs, as well as unauthorized transportation and labor costs.

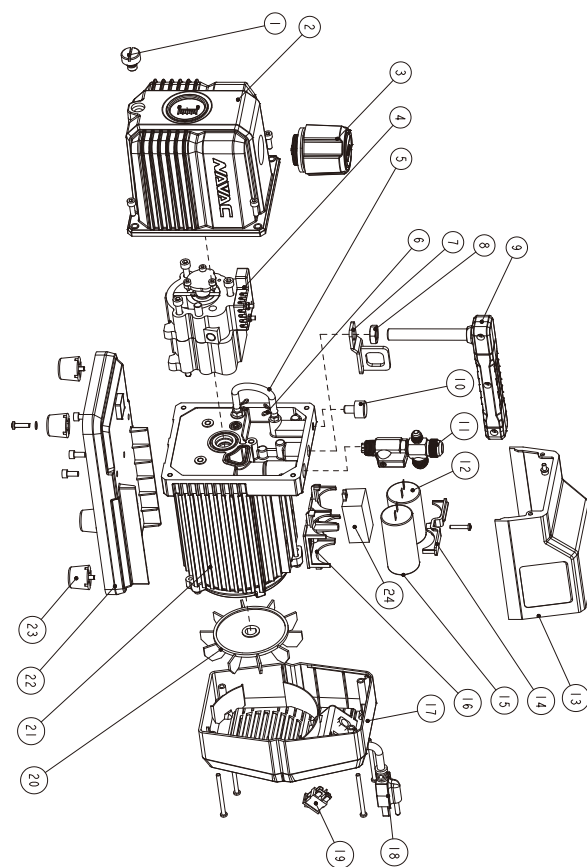
TROUBLESHOOTING

Malfunction	Possible Cause	Remedy
Low Vacuum	1. Secondary air inlet connection cap loose on the air inlet port.	Tighten the cap.
	2. Damaged rubber ring inside the secondary air inlet connection cap.	Replace the rubber ring.
	3. The volume of oil is insufficient.	Add oil to the center line of the oil display.
	4. Pump oil becomes opaque or absorbed too many impurities.	Replace with new oil.
	5. The pump's oil entry hole is clogged or the oil supply is insufficient.	Clean the oil entry hole, clean the oil filter.
	6. The pump connecting hoses, manifold or system has a leak.	Inspect the connecting hose gaskets and system, repair leaks.
	7. The pump selection is wrong.	Check the size of the container to be evacuated, recalculate and select an appropriate pump model.
	8. The pump has been used for too long, damage and wear to components caused increased gaps between parts.	Inspect and repair, or replace the pump.
Oil leak	1. Damaged oil seal.	Replace the oil seal.
	2. Loose or damaged oil box connections.	Tighten the connecting screws, replace O-rings.
Oil spray	1. Excessive oil volume.	Remove oil until the oil position line is reached.
	2. Inlet port pressure is excessively high for a long period.	Select an appropriate pump, increase the pumping speed.
Start-up problems	1. Oil temperature is too low.	Place the vacuum pump in an over 77°F ambient environment for an hour, or replace in the 77°F oil.
	2. Motor, power source or circuit board malfunctions.	Inspect and repair.
	3. Foreign objects entered the pump.	Inspect and remove.
	4. Voltage supply is excessively low or high.	Inspect the power source voltage.
	5. Overload trips.	After overload trip occurs, turn off the switch. Remove the power plug. Examine and solve the issue.

Notes:

1. The pump has over-current / overload protection, please troubleshoot after overload resets.
2. If the above methods cannot resolve your problems, please contact your nearest distributor or take the pump to a repair center. We will do our best to provide you with a quick turnaround to keep you working.

EXPLODED VIEW



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REPAIR PARTS LIST

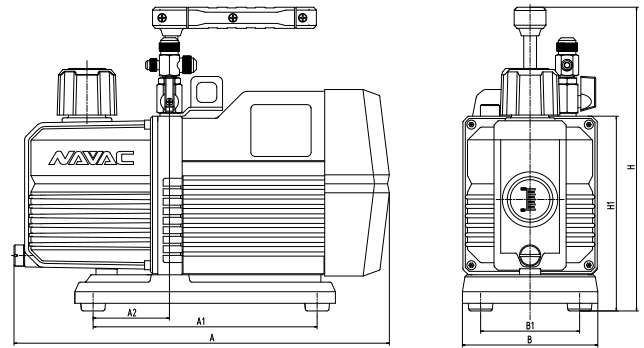
Ref No.	Part No.	Part Name
1	P040001	Oil Drain
2	P040002	Oil Housing
3	P040003	Exhaust Filter and Noise Reducer
4	P040004	Pump Body
5	P040005	Rubber Tube
6	P040006	Jump Ring
7	P040007	Hook
8	P040008	Nut
9	P040009	Handle
10	P040010	Gas Ballast
11	P040011	Inlet Port
12	P040012	Running Capacitor
13	P040013	Top Cover
14	P040014	Plate
15	P040015	Start Capacitor
16	P040016	Pedestal
17	P040017	Rear Cover
18	P040018	Power Cord
19	P040019	Switch
20	P040020	Fan
21	P040021	Motor
22	P040022	Plate
23	P040023	Rubber Feet
24	P040024	Electronic Starter

08

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DIMENSION



Unit: inch

Model	A	A1	A2	B	B1	H	H1
NP7DP2	14	8.3	2.8	5	3.7	11.3	7.2

09



ACCUTOOLS®



TruBlu Evacuation Tools

Steps to a Proper Evacuation

How to get the most out of the TruBlu Evacuation rig, quickly and safely achieve deep, dry and tight systems. This manual subject to change without notice.

TruBlu Quick Start and User Instructions

TABLE OF CONTENTS

Safety	2
Introduction	2
How Does TruBlu Work?	3
The Science and the Math (+%#-++/%??)	3
Getting Started with TruBlu	5
Cautions/Safety	5
Product Use	5
Steps to Assure a Fast Evacuation	7
Checking Your TruBlu Hose Rig for Leaks	8
Test the Pump	8
Attach the TruBlu Vacuum Rig	8
Degas and & Dehydrate	8
Performance Test	8
Performance Expectations	8

Safety

Caution: TruBlu hoses and hose assemblies are only intended and designed for sealed system evacuation. TruBlu hoses are not intended (or rated) to be used for pressure or refrigerant transport. The O-rings used for the vacuum seal will dislodge under positive pressure and may expose the operator to refrigerant liquid or vapor, if present in the hose. Refrigerant can cause burns or eye damage/loss. Always wear gloves and goggles when working on or around refrigerants.

Introduction

Thank you for buying TruBlu! TruBlu hoses are dedicated evacuation hoses that dramatically improve evacuation times; reducing in many cases what typically takes hours to minutes when compared to 1/4" charging hose. TruBlu uses the same robust technology found in industrial and scientific vacuum applications with components modified to meet the demands of the HVAC/R field use and application. Your TruBlu kit is compatible with most KF-16 fittings. Parts and accessories are available through your distributor.

TruBlu hoses are dedicated evacuation hoses and should never be used as refrigerant transport hoses or for positive pressure application. Oils used in refrigeration applications also have an affinity for moisture. Moreover, oil coating the hose lining significantly impacts the evacuation speed due to desorption of moisture which occurs in vacuum.

Buy a BluVac⁺ Micron Gauge and Use the Free BluVac App!

TruBlu hoses work with most any vacuum gauge, however we strongly recommend the Accutools BluVac⁺ models to take advantage of the free BluVac App. The BluVac App offers guidance, education, reporting, and diagnostics to assist and document the evacuation process.

The BluVac Application supports BluVac⁺ Pro, BluVac⁺ LTE, and the BluVac⁺ Micro.



How Does TruBlu Work?

If you want the short answer, pretty darn good and freaky fast! If you want to know the science, and the math read below. If you hate math and just want to believe us, skip to the Getting Started section following this section.

The Science and the Math (+ % # - + + / + % ??)

The first principle to remember is that evacuation accomplishes two key things; degassing, and dehydration. Degassing is the removal of air and other gasses. Dehydration is the removal of water and water vapor. Degassing happens fairly quickly, while dehydration requires a much deeper vacuum and more time. TruBlu hoses accomplish both in a fraction of the time of typical hoses. What's the secret sauce? TruBlu hoses actually achieve lower evacuation targets than our competitors' hoses. The deeper the evacuation, the faster the job.

To have flow in a line, there has to be a pressure difference. When evacuating atmosphere from a system, the pressures become so small that the flow becomes minute. If the pressure at your vacuum pump inlet for example is 500 microns (.009 psi), and in your system outlet 700 microns (.013 psi) the pressure difference across the hose is .004 psi or 4/1000th of a psi. With pressures so small, the friction created by small lines can have a huge impact on flow.

The friction created by the connecting lines is measured by "Conductance Speed". Conductance is simply the maximum attainable flow through a hose at a stated average pressure. Where in a pressure system we refer to pressure losses as "Pipe Friction Loss" in vacuum we refer to these losses as Pressure Drop. Specifically, we are referring to the pressure drop created by the friction in the connecting hoses. As can be seen by the quote below, Conductance Speed in evacuation is nothing new. As an industry, it is something we simply seem to forget.

The conductance speed of 1/4" OD refrigeration tubing is too small to be useful as a connecting line in a system; so small we will not even discuss it. Never use it if you can avoid it as it is too costly in excessive pump-down time. *Review of Vacuum for Service Engineers*, Saunders and Williams Copyright 1959, Revised 1988, p. 60.

Mathematically it is important to understand that increasing the diameter of a hose does not have a linear effect but rather that to a ratio of its diameter to the third or fourth power. By diameter, we're talking ID not OD.

Comparing 1/4" ID hose to TruBlu 3/4" ID hose shows a Conductance Speed increase of approximately 96 times faster! $(.25^4 = .00331)$ vs. $(.75^4 = .31972)$ or $(.31972/.00331 = 96.5)$

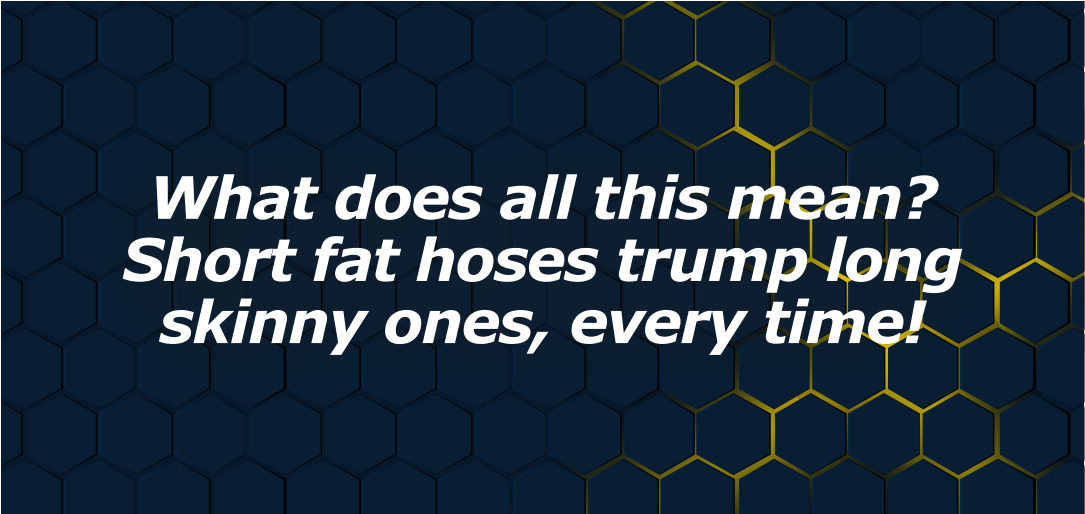
In addition to higher conductance, we need to consider the type of flow. In vacuum there are three types of flow to consider: viscous, laminar, and molecular. Viscous flow means we have a steady stream of molecules flowing through the pipe. As we get to laminar and molecular flow things really slow down, so staying in the viscous flow region is critical for quick evacuation times (and hence, our focus!).

Viscous flow ends where the microns are approximately 100/d" or 100/internal diameter of the tubing in inches. When comparing viscous flow in various diameters, again you can see that 3/4" tubing has a huge advantage. Viscous flow stops in 1/4" tubing at 400 microns $(100/.25" = 400 \text{ Microns})$ where 3/4" viscous flow continues to 133 microns $(100/.75" = 133 \text{ microns})$. This is important because with a larger diameter we get a 3X deeper vacuum in the viscous flow region $(400/133 = 3.00)$. A deeper vacuum means faster degassing and much better dehydration. Dehydration is critical more than ever for systems contaminated with POE oils since moisture breaks-down the oil forming sludge and acids.

So how much faster is a 5 foot, 3/4" ID hose than 1/4" ID at 500 microns? Approximately 80 times faster.

The conductance for air at 68°F is expressed as $520 \times d^4 \times P/L$ where P is the pressure in mm Hg Absolute and length is expressed in feet of hose.

Where 500 microns = .5 mm Hg abs
 $(520 \times .25^4 \times .500)/5' = .2 \text{ CFM}$
 $(520 \times .75^4 \times .500)/5' = 16 \text{ CFM}$
 $16 \text{ CFM} / .2 \text{ CFM} = 80 \text{ CFM faster at 500 microns of Hg}$



***What does all this mean?
Short fat hoses trump long
skinny ones, every time!***

Getting Started with TruBlu

Cautions/Safety

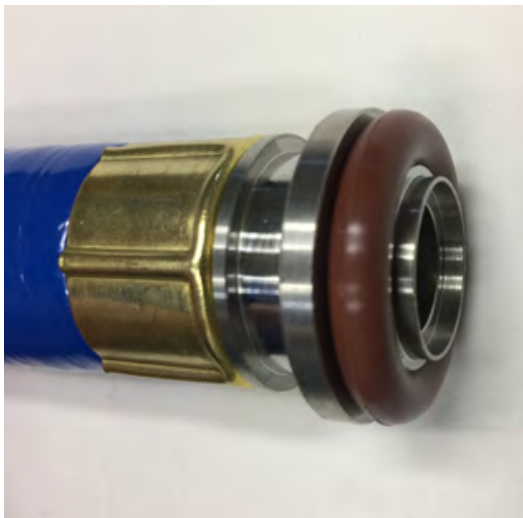
TruBlu hoses are intended for use by professionally trained HVAC technicians. TruBlu hoses are not intended for pressure. They are designed for vacuum only the same as your vacuum pump. Pressurizing a vacuum hose could cause displacement of the O-ring seal which leads to pressure loss, refrigerant loss, and could cause bodily injury.

Always wear gloves and goggles and other required PPE when working on or around refrigerants.

Product Use

TruBlu hoses use KF or Quick Flange fittings. KF fittings allow for one hose to be used in multiple applications with a variety of end configurations. The hose can also be connected to a tee 'T' or wye 'Y' fitting to further expand the system flexibility. KF fittings use a taper lock flange and clamp connection that is sealed with an O-ring. Unlike typical KF fittings used in industrial vacuum service, TruBlu hoses have the centering ring built into the flange to prevent the centering O-ring from falling on the ground when end changing fittings in the field (patent pending).

Once an end fitting is installed on a hose there is no need to remove it unless you want to change the hose configuration. Leaving the fittings on the hoses prevents damage to the O-rings and protects the flanges from damage. A plastic cap is included with each end connection, and it is advised that end connections that are not in use the flange is capped. This will prevent the sealing surface from getting scratched, nicked, or marred. The flat surface is the sealing surface, and care should be taken that it is not damaged.



KF Fitting with Integrated O-Ring



Hose-end Flange Face

There are two types of clamps provided in your kit, a stainless low-profile type (p. 6 left) and a larger aluminum clamp (p.6 right). These are standard KF style clamps. Clamp wing nuts only need to be finger tight. The connection is actually self-sealing under vacuum. The low-profile clamp is intended to be used on the hose end that connects to the Schrader core removal tool and intern the equipment, the larger clamps are intended to be used where space is not limited.



Low Profile Stainless Clamp (left)
Standard Aluminum (right)



Clamp Assembly

When connecting the TruBlu hoses to the equipment, ensure that you relieve all the pressure on the system. Removing the Schrader cores provide the fastest evacuation. The 1/4" hose-end is to be connected directly to the back of the AccuTools Schrader Core Removal Tool. *If the cores cannot be removed, connect the AccuTools Schrader Core Depressor to the service valve, and depress the core with the thumb screw to fully open the Schrader port. Removing the cores significantly decreases the evacuation time, and the core tool can be used to reinsert the core even after the system refrigerant charge has been released and the system is under pressure.



Vacuum and Pressure Rated Valve
Core Removal Tool



Vacuum and Pressure Rated
Schrader Core Depressor



Core Tool with Vacuum Gauge
Installed on Side Port

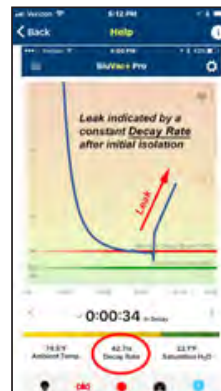


Core Tool with Vacuum Gauge Installed on Side
Port and Schrader Core Depressor/Angle Valve

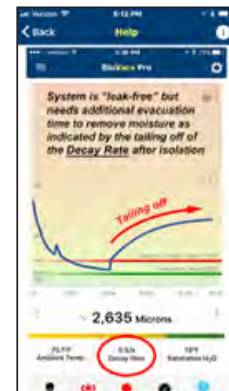
Steps to Assure a Fast Evacuation

An accessory tee fitting is included in the Pro and Standard Kits to permit an additional hose to be connected. This is sometimes helpful to get from the vacuum pump to the service ports. Reducing the two ports to a single port will not significantly affect the evacuation times as each hose is rated at 16 CFM conductance speed at 1,000 microns.

1. Always purge the system with dry nitrogen while assembling the tubing.
2. Sweep the system with dry nitrogen by purging from the suction to the liquid side of the system to carry out any moisture or particulates.
3. After a nitrogen sweep, pressurize the system with nitrogen and allow it to stand at the manufacture's recommend test pressure for at least the minimum recommend time to assure a leak free system.
4. Vent the nitrogen and remove the Schrader cores form the system.
5. Whenever practical, it is always advisable to evacuate from both sides of the system using two of the 1-meter lengths of hose connected directly to the system and the vacuum pump. Pulling from both sides assures a fast evacuation as you are not pulling through the metering device which can have rather small porting. Pulling from both sides also aids in faster and better dehydration as a deeper vacuum is often achievable.
6. Start the vacuum pump with the gas ballast open and shut the ballast at 10,000 to 12,000 microns. The system may drop very quickly, so pay close attention to the vacuum readings. A vacuum pump cannot typically achieve full vacuum with the ballast open.
7. Close the gas ballast and evacuate to the target pressure. The target pressure is typically 200 to 300 microns below the maximum allowable decay pressure. For adequate system dehydration, leave the vacuum pump running below the target for 1 to 60 minutes.
8. Isolate the system from the vacuum pump by SLOWLY closing the core tools to remove any gas trapped in the ball valve and watch the rate of system rise. This is called a decay or leak test. The below graphs are available free from the AccuTools BluVac Application.
9. A slight rise followed by slowing of the leak rate assures that the system is dry and tight. If the vacuum rise rate does not slow it indicates a potential leak in the system. If the systems rises and levels off near 2,000 to 3,000 microns the system is likely tight but still wet and needs further evacuation time.
10. With core tools closed, release the refrigerant charge into the system and reinstall the valve cores after attaching the valve core to the stem, attaching it loosely to the back of the core tool and venting the air from the core compartment to prevent any air from being introduced into the system.



Rapid rise indicates a leak that needs to be repaired and pressure tested before continuing evacuation.



Rise with curving tail indicates tight but wet system that needs further evacuation.

Checking Your TruBlu Hose Rig for Leaks

Let's start with the statement, "everything leaks!" What concerns us is the leak rate. The pump and vacuum rig have to overcome the leaks in the hoses or connections, so a low leak rate is critical for good evacuations. TruBlu hoses have a very low leak rate and low water adhesion properties. This means that TruBlu hoses effectively move all the work that your vacuum pump is doing at the pump inlet to the end of your hose where it should be.

To check your rig for significant leaks it is first prudent to check the vacuum pump. Vacuum pumps used for HVAC work should be capable of pulling at least 50 microns, ideally below 20 microns of mercury. To test the ultimate pull of your pump, start with fresh clean high-quality vacuum pump oil, cap the hose ports and attach a micron gauge directly to the 1/4" port on the pump with a brass coupling.

Test the Pump

Start the pump, close the gas ballast, and allow the pump to run for at least 10 minutes. The vacuum may slightly decrease over time as the pump oil warms and the vapor pressure of the oil decreases – this is normal. Record the vacuum level after 10 minutes. We recommend that you jot the level down on a piece of tape and attach it to the pump for future reference. If your pump will not pull below 50 microns, you may need to service the pump or replace it.

Attach the TruBlu Vacuum Rig

Now test the vacuum rig. Attach your vacuum rig or a vacuum and core tools to a (user supplied) brass tee fitting and in turn to your micron gauge at the end of the rig forming a continuous loop.

Degas and Dehydrate

Start the pump and allow it to run for at least 10 minutes to degas and dehydrate the hoses. Brand new hoses may require more time to degas, perhaps as much as 10 minutes the first time use.

Performance Test

After 10 minutes, isolate the pump by closing the blocking valve or shutting off the vacuum pump. Break the vacuum by loosening a connection on the rig. The hoses should be dry. Retighten the connection and immediately restart the vacuum pump and evacuation. Let the pump run an additional 5 minutes and confirm that you can pull below 100 microns at the far end of the rig. This is a dynamic test meaning the we are testing the pump, vacuum rig, to assure that we can achieve the desired vacuum at the system inlet.

Note: After 5 minutes your vacuum rig should be able to achieve 100 microns or less. TruBlu will typically achieve near the following results.

Performance Expectations

Pump ultimate pulldown = 50 microns ----- TruBlu Rig 100 microns or lower

Pump ultimate pulldown = 25 microns ----- TruBlu Rig 50 microns or lower

8 Pump ultimate pulldown = 10 microns ----- TruBlu Rig 30 microns or lower