Pneumatic High-Viscosity Filtration System Instruction Manual

P/N: 61512 – 08/24 REV E

1235 Hickory Street; Pewaukee, WI 53072
For Customer Support: 800-558-7008

Part Number	Description	Maximum Viscosity
36933	Pneumatic High-Viscosity Filtration Cart with 6ft Hoses and Wands	7500 SUS (1600 cSt)
36933-QC	Pneumatic High-Viscosity Filtration Cart with 6ft Hoses and Hydraulic Couplers	7500 SUS (1600 cSt)
36933-W-10	Pneumatic High-Viscosity Filtration Cart with 10ft Hoses and Wands	7500 SUS (1600 cSt)
36933-QC-10	Pneumatic High-Viscosity Filtration Cart with 10ft Hoses and Hydraulic Couplers	7500 SUS (1600 cSt)
36934	Pneumatic High-Viscosity Portable Hand-Held System with 3/4" MNPT 6ft Hoses	7500 SUS (1600 cSt)
36934-QC	Pneumatic High-Viscosity Portable Hand-Held System with 6ft Hoses and Hydraulic Couplers	7500 SUS (1600 cSt)
36934-OP-10	Pneumatic High-Viscosity Portable Hand-Held System with 3/4" MNPT 10ft Hoses	7500 SUS (1600 cSt)
36934-QC-10	Pneumatic High-Viscosity Portable Hand-Held System with 10ft Hoses and Hydraulic Couplers	7500 SUS (1600 cSt)

Trico Pneumatic High-Viscosity Filtration Systems Introduction

Thank- you for purchasing one of our Pneumatic Flirtation Systems. Attempting to filter high viscosity oil with a lower viscosity systems result in low viscosity units operating primarily in bypass mode where little if any of the high-viscosity oil is filtered. These types of units are not designed to work with higher pressures required to push high viscosity fluids through the system.

Trico's Pneumatic High-Viscosity Gear and Lube Oil Filtration Systems are specifically designed for high viscosity fluids associated mainly with gear oils and can filter up to 7500 SUS @ 100°F. (1600cSt @40°C) To ensure that equipment receives the cleanest possible oil to increase life expectancy, Trico's filtration systems provide two-stage filtration. Oil flows through the primary particulate filters first before continuing to the second set filter elements where additional particulate and water is removed. Filter media is designed to be used with *hydrocarbon-based fluids* and **should NOT be used with potentially flammable fluids** such as diesel fuel or alcohols. Before operating this equipment, the operator should thoroughly read all instructions before proceeding.

NOTE: The Trico High-Viscosity Filtration Systems are self-priming units. Lubrication is not provided to the pump gears at the factory before the units are shipped. After assembly and before operating for the first time, it is recommended to place a small amount of oil that is intended to be pumped into the suction line and allow the fluid to enter the pump gears by elevating the suction line higher than the pump head. This should also be done whenever the units have been stationary for over a month or has been cleaned or serviced. ***Running the pump gears dry will cause premature wear and shorten the life of your filtration system.***

WARNING

Always use safety around electrical equipment, follow instructions to prevent electrical shock. Electrical shock may cause death or other serious bodily harm. Although the High-Viscosity Filtration Systems are designed with Totally Enclosed, Fan-Cooled (TEFC) motors they cannot be submersed into liquids. Use precaution when operating in wet environments and do not allow excess fluids to come in contact with electrical components. If fluid does come in contact with electrical components immediately disconnect the power by removing the electrical plug at the outlet or turn the power off at the breaker.

Do not use with flammable liquids or in areas where there is presence of large amounts of flammable fumes. Failure to comply may cause an explosion. Always take precautions when working around open fuel sources.

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Due to the rate of flow of oils across different materials there is always a potential to build up a static charge. Static discharge can cause an explosion if near, or around, open flammable fluids. Bonding and ground safety procedures must be used when operating in hazardous duty environments or when there is a danger of static discharge. See National Fire Protection Code 77 for proper grounding and bonding procedures. It is the responsibility of the operator to properly inspect and ground equipment before use.

Design Information:

36933 Pneumatic High-Viscosity Filtration Cart System	
Type:	Industrial Grade Gear Pump
Max Temperature:	200°F/93°C
Suction/ Discharge line:	1” Synthetic Rubber Hydraulic Hose
Filter Type:	Spin-on
Filter Head By-Pass Pressure:	43 psi differential
Upper Filters Media:	10 Micron absolute Beta>200
Lower Filters Media:	10 Micron Nominal Water
Replace Element @:	40 psi differential
Max Viscosity:	7500 SUS (1600 cSt)
Max Flow Rate:	3.0 GPM
Max Pneumatic Motor Speed:	3000 rpm
Max Supply Air Pressure:	120psi
Pump Relief:	105 psi
Suction / Lift:	20 ft
Filter Collapse Rating:	80 psi differential
Maximum Filter Operating Pressure:	120 psi

36934 Pneumatic High-Viscosity Portable Hand-Held System	
Type:	Industrial Grade Gear Pump
Max Temperature:	200°F/93°C
Suction line:	3/4” Synthetic Rubber Hydraulic Hose
Discharge line:	1” Synthetic Rubber Hydraulic Hose
Filter Type:	Spin-on
Filter Head By-Pass Pressure:	43 psi differential
Filter 1 Media:	10 Micron absolute Beta>200
Filter 2 Media:	10 Micron Nominal Water
Replace Element @:	40 psi differential
Max Viscosity:	7500 SUS (1600 cSt)
Max Flow Rate:	1.0 GPM
Max Pneumatic Motor Speed:	3000 rpm
Max Supply Air Pressure:	120psi
Suction / Lift:	20 ft
Pump Relief:	85 psi
Filter Differential Collapse Rating:	80 psi
Maximum Filter Operating Pressure:	250 psi

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Pneumatic Motor Operation and Maintenance:

Pneumatic motors are beneficial because they can operate in hot, corrosive, and wet environments without damage, and are unaffected by continuous stalling or overload. Compressed air offers special advantages that make pneumatic motors quite desirable: it's readily available in many plants, it's clean, and it can be connected with simple low-pressure air line. Pneumatic motors are operated by compressed air, the expansion of which creates a cooling effect. As a result, the temperature of the pneumatic motor will not exceed the temperatures of the surrounding atmosphere or the air delivered at the inlet.

A pneumatic motor slows down when load increases. Its torque increases at the same time until it matches the load. Therefore, the Trico High Viscosity Pneumatic Filtration system continues to provide increased torque until it stalls due to fluid viscosity within the pump, then maintains the stalled condition and can remain there for indefinite periods without harming the motor. By contrast, a stalled electric motor without overload protection soon burns out, and hydraulic motors will overheat.

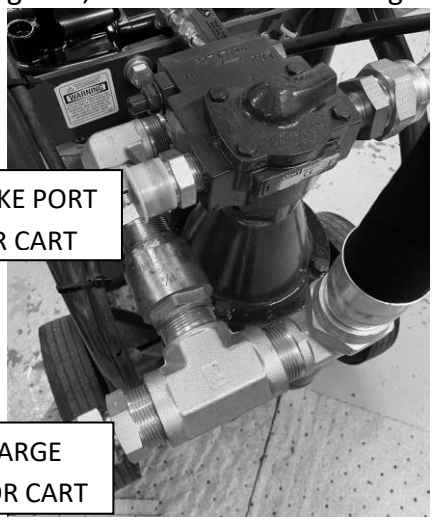
During a stall, Trico High Viscosity Pneumatic Filtration system continues to applying torque and resumes rotation only when the stall is overcome by reducing the load. Pneumatic Filtration system motor usually wears out slowly over time, producing less power as they wear. Because of this, maintenance can be planned well in advance.

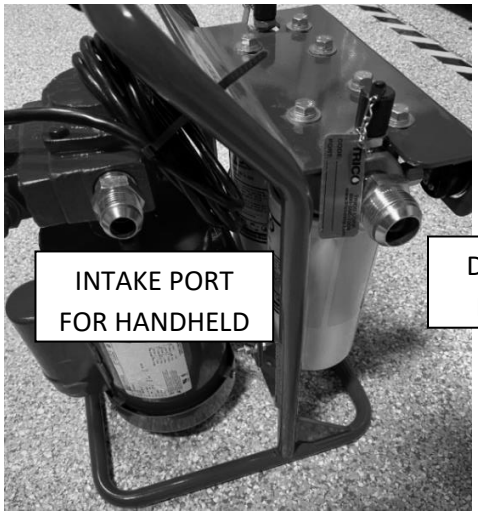
Maintenance and repairs are generally fairly simple as is testing and checking. Air entering the FRL must be clean and dry for efficient operation of the pneumatic motor as well as to prevent motor damage. Lubrication is critical for efficient operation and long life of the pneumatic motor. Lubrication also prevents corrosion of a motor's interior, since moisture is often present in plant air lines.

Symptoms of a malfunctioning rotary motor are slow operation or low torque capability, or both. Problems can stem from one or more of our sources: dirt or foreign materials in the motor, corrosion, and improper lubrication. Please consult troubleshooting at the end of this manual for any other issues.

Operating Instructions:

1. Connect one wand/hose to suction side of pump using the JIC fitting and tighten, this will be the intake side.
2. Connect one wand/hose after filtration which is after filtration, with the JIC fitting and tighten, this will be the discharge side.





3. Spin-on filters are hand tightened during assembly at the Trico factory, tighten filters with filter/strap wrench, at the top of the filter where they are the strongest, to form a proper seal with the gasket around the filter and filter head.
4. For initial startup of the unit, place a small amount of fluid into the suction wand/hose and allow the fluid to enter the pump head by raising the wand/hose above the pump. This will help lubricant the internal gears of the pump and prevent dry running that can cause gear wear. Once gears are lubricated this step is not necessary to repeat unless the unit has been in storage for over a month or has been cleaned during maintenance.
5. Place suction wand/hose into the container, or machinery, to be emptied and/or filtered. Ensure that the suction wand/hose does not become impeded/blocked by internal components within the machinery or container.
6. Place the discharge wand/hose into another opening in the machinery, container, or desired clean container if transferring fluids.
7. Fill the Filter, Regulator, Lubricator (FRL) reservoir located on the back of the cart to the proper level with SAE 10W (ISO VG32) oil.
8. Adjust lubricator to feed 1 drop of oil for every 50 CFM of air while the unit is running, or 1 drop of oil per continuous minute of run time for high speed or continuous duty usage. Do not over oil or exhaust air may become contaminated.
9. Connect the air supply to the filter cart FRL. Check the oil level daily.
10. Clean the compressed air connection with low pressure air to remove any dirt from the line before connecting to the FRL.

WARNING: The maximum surface temperature of the air motor should not exceed 266ºF/130ºC. Do not continue to operate the motor if the measured surface temperature exceeds temperature stated.

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11. Check air motor intake and exhaust filters after first 500 hours of operation. Clean filters and determine how frequently filters should be checked during future operation. This one procedure will help assure the motor's performance and service life.
12. Verify air supply is maintained at 100psi or below by reading the pressure gage located on the FRL unit. Regulators are NOT preset at the factory, and can be adjusted. DO NOT EXCEED 100psi.
13. It is helpful to install an inline ball valve before the connection to the FRL to quickly turn the air supply to the motor on and off. Different fluid viscosities will apply different resistance to the pump and motor assembly in turn motor speed will fluctuate.
    Note: Motor will gradually increase in speed at startup until maximum torque is applied at operating flow. Motor RPM will increase and decrease with the increase or decrease of suction and lift head.
14. The condition of the filter elements should be monitored by the pressure gages located on the filter head or on the gage panel. When the differential pressure between these gauges equals 40 psi differential the filter element needs to be changed out. If filter elements are not changed before the specified pressure, the system pressure will continue to increase until the built-in pressure relief valve opens. The filter heads go into bypass at 43 psi differential and at this point oil is bypassing the filter media and is no longer being filtered. The pump has a built-in pressure relief at 105psi at the inlet, at this point the pump will run in bypass relieving the built-up pressure.

WARNING: Failure to monitor the system and change filter elements may cause filter media to collapse at 80psi differential which may produce further contamination by inducing filter media into reservoir or container at fluid exit point. Maintain monitoring of the High Viscosity Pneumatic Filtration system while in operation. Continued running of the pump in pump bypass due to pressure will cause excess heat generation and/or cavitation, reducing the life of the filtration unit.

15. Trico High Viscosity Pneumatic Filtration systems are equipped with sample ports. For most accurate results, do not sample into an open bottle. Use a vacuum bottle sampler with plunger removed.
16. The filter cart (36933) is equipped with a bypass valve and piping. This valve should be kept in the fully closed position when using the filters. Use the bypass for removal of old/used oil only. Turn Handle until it is parallel with the cart frame for filtration mode. Turn handle until it is fully perpendicular to the cart frame for by-pass mode.
17. When finished filtering/transferring fluid, turn the air off and disconnect the air supply connection. Wipe any excess oil from the unit that might have spilled during the filtering/transferring process.
18. Remove the suction and discharge wands/hoses and place one into each ring located on the side of the cart. Place the wand/hose tip into the tray to catch any remaining fluid. An absorbent pad can be placed into the tray to absorb any fluid remaining in the wands/hoses. Otherwise disconnect the wands/hoses and store.

Filter Selection and Run Time

Filter selection is determined by what cleanliness level is recommended for your oil. The selection of the appropriate cleanliness level should be based on the operational and environmental conditions as well as recommended manufacture specifications. Consult your equipment manufacture whenever possible. A guideline of gear oil cleanliness is included in the next section.

Start with a larger filter and work your way down. A common mistake is over-filtering contaminated oils. The finer the filter, the more frequent the replacement of the element will be required. Generally speaking as the oil viscosity increases the filter size should get larger because cleanliness levels are less.

Run time is determined when the filtration unit is used in a kidney loop filtration and works best when oil is filtered six to ten turns of the reservoir volume. To calculate the minimum hours of operation use the following formula:

Minimum minutes = Reservoir Gallons x 6 (Divide by 3 for Cart)
*Multiply this number by 3 for hand held Min Hours

Maximum minutes = Minimum minutes x 2

In rare cases, or extremely dirty oil, additional run time may be needed.

Filter Element Technical Data

Filter element life varies with the true dirt holding capacity of the element under dynamic flow conditions and the amount of contamination introduced into the Filtration System. Choosing the right media for the correct application is determined by the rate of ingestion with the desired ISO cleanliness level. The amount of dirt can vary from day to day and hour to hour, making it difficult to predict when an element will become fully loaded. Increasing the rate of fluid flow increases the ability of the filter to trap particles. The effectiveness of the filter elements should be determined by contamination monitoring. Our oil analysis laboratory has a wide range of oil analysis capabilities to help determine and trend fluid conditions.

High Water Content Fluids

High water content fluids consist of either water and soluble mineral based oil, or water and soluble synthetic oil. The oil proportion is usually 5% but may vary from 2% to 10%. All Trico particulate filter medias are compatible with these types of fluids and should be used in leu of the Trico water removal filters. However, the high specific gravity and low vapor pressure of these fluids can create a potential for severe cavitation; therefore, monitoring of the Filtration System with the use of these fluids is highly recommended. Failure to identify cavitation will lead to destruction of the pump valves and filter media.

Inverted Emulsions

Inverted Emulsions consist of a mixture of petroleum-based oil and water. Typically, the proportions are 60% oil and 40% water. All Trico particulate filter medias are compatible with these types of fluids and should be used in lieu of the Trico water removal filters. Filters should be sized conservatively for water emulsions since they are non-Newtonian and their viscosities are a function of shear. Potentials do exist for cavitation similar to high water-based fluids; therefore, monitoring of the Filtration System with the use of these fluids is highly recommended. Failure to identify cavitation will lead to destruction of the pump valves and filter media.

Water Glycols

Water glycols consist of a mixture of water, glycol, and various additives. All Trico particulate filter medias are compatible with these types of fluids and should be used in lieu of the Trico water removal filters. Potentials do exist for cavitation similar to high water-based fluids; therefore, monitoring of the Filtration System with the use of these fluids is highly recommended. Failure to identify cavitation will lead to destruction of the pump valves and filter media

Phosphate Esters

Phosphate Esters are classified as synthetic fluids. All Trico particulate and water removal filter medias are compatible with these types of fluids.

When to Change the Filter and Procedure

The filter head is outfitted with three pressure gauges. The first gauge nearest to the pump output indicates the pressure being produced by the pump. The second gauge between the filter heads indicate the pressure between the two filters, or set of filters on the Filtration Cart. The third gauge near the discharge wand/hose indicates the pressure after the second filter element or set. To determine when each filter element, or set, is at its maximum holding capacity, calculate the differential pressure by subtracting the higher pressure from the lower pressure to get the total differential pressure across the filter head. Differential pressure is used to determine filter usage. Filters should be changed at ***40 psi*** differential.

Example:
P1 (Pressure Produced by Pump)= 43 psi P2 (Between Filters)= 35 psi
Differential Pressure= P1-P2 = 43psi - 35psi = 8psi (filter still has remaining life)

<u>To change the filter:</u>

1. Place an oil catch pan beneath the filter to catch remaining oil in the filter and head that will come out during the filter change.
2. Using a strap wrench at the top of the filter, turn the filter counterclockwise and unthread the filter from the head.
3. Dispose of remaining oil in the filter and the used filter in accordance with local environmental laws and practices.
4. Remove the old gasket from the filter head and wipe excess oil residue from the head.

5. Remove the new filter from its packaging and insert the new gasket provided with the filter into the gasket groove of the head.
6. Thread the new filter onto the head turning it counterclockwise and hand tighten.
7. Using the strap wrench, place the strap near the top of the filter, to prevent collapsing, and turn the filter 1/4 turn to tighten.
8. Turn on, dispense fluid, and observe the filter gasket checking for leaks.
9. If leaking is noticed around the filer gasket, tighten the filter another 1/4 turn with the strap wrench and repeat the procedure to check for leaks.

Note: Change BOTH filters in the upper/lower filter head assembly sets on the High-Viscosity Filtration Cart when the differential pressure is 40psi.

Replacement LARGE Filters for 36933 High-Viscosity Filtration Cart	Part Number
Particulate Filter - 3 Micron Microglass Spin On Beta ≥ 200 Absolute	36972
Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	36973
Particulate Filter - 20 Micron Microglass Spin On Beta ≥ 200 Absolute	36974
Water Filter - 10 Micron Nominal Spin On	36975

Replacement SMALL Filters for 36934 High-Viscosity Portable Hand-Held	Part Number
Particulate Filter - 3 Micron Microglass Spin On Beta ≥ 200 Absolute	36976
Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	36977
Water Filter - 10 Micron Nominal Spin On	36978

Grounding and Binding

The Trico High-Viscosity Filtration Systems are not rated for a hazardous duty environment due to possible static discharge, use proper bonding and grounding per National Fire Protection Code 77. A ***Bonding*** system connects various pieces of conductive equipment together to keep them at the same potential. Static sparking cannot take place between objects that are the same potential. ***Grounding*** is a special form of bonding in which conductive equipment is connected to an earthing electrode, or to the building grounding system, to prevent sparking between conductive equipment and grounded structures.

Grounding is an electrical connection between a metal vessel, pump, motor and a constant ground; i.e. a metal rod driven into the earth. Failure to bond and ground properly can cause a discharge of static electricity resulting in fire, injury, or death. If in doubt, do not start the pump! Be sure bonding and grounding wires are secure before starting operation. (Ground and bond wires ***must have less than one-ohm resistance*** for safe usage. Check continuity before starting.) Always check with a safety engineer when any question arises and periodically check safety procedures with a safety engineer.

ISO Cleanliness Rating

Lubricating oils stored in bulk containers may contain contaminates. Ordinarily it has been thought lubricants stored in drums prior to use were contaminant-free; however, it has now been learned it is beneficial to filter lubricants even prior to its use as the original container may impart impurities to the lubricants prior to its first use. Most rotating equipment is manufactured to a class 2 or class 3 fit typical of most industrial operations. Hydraulic components and rotary screw compressors tend to have tighter tolerances in the sliding and rotating elements. Clearances in components are used to establish cleanliness requirements. The best source for cleanliness requirements is from the equipment manufacturer. In general, as the viscosity of the oil increases the cleanliness level decreases. Below is a general guideline for cleanliness levels.

ISO Oil Grade Classification	Cleanliness Code (R4/R6/R14)
32	16/14/11
46	16/14/11
68	17/14/12
100	18/15/13
150	18/15/13
220	19/16/14
320	19/16/14
460	19/16/14
680	20/18/14

Determining the ISO Cleanliness level of equipment requires analysis of the running lubricating oil. Trico's oil analysis laboratories can provide an accurate indication of the ISO Cleanliness level of lubricating oil before and after filtration. Each number in the ISO code represents the micron range of particulate in which the count lies within ($R_{4\ microns}$/ $R_{6\ microns}$/ $R_{14\ microns}$).

Example: 19/16/14, the 19 code shows that count of 4 micron particle lies between 5,000 and 2,500 per ml of fluid.

ISO 320
19/16/14

ISO Number	Particle Count per ml of fluid		
25	160,000	to	320,000
24	80,000	to	160,000
23	40,000	to	80,000
22	20,000	to	40,000
21	10,000	to	20,000
20	5,000	to	10,000
19	2,500	to	5,000
18	1,300	to	2,500
17	640	to	1,300
16	320	to	640
15	160	to	320
14	80	to	160
13	40	to	80
12	20	to	40
11	10	to	20
10	5	to	10
9	2.5	to	5
8	1.3	to	2.5

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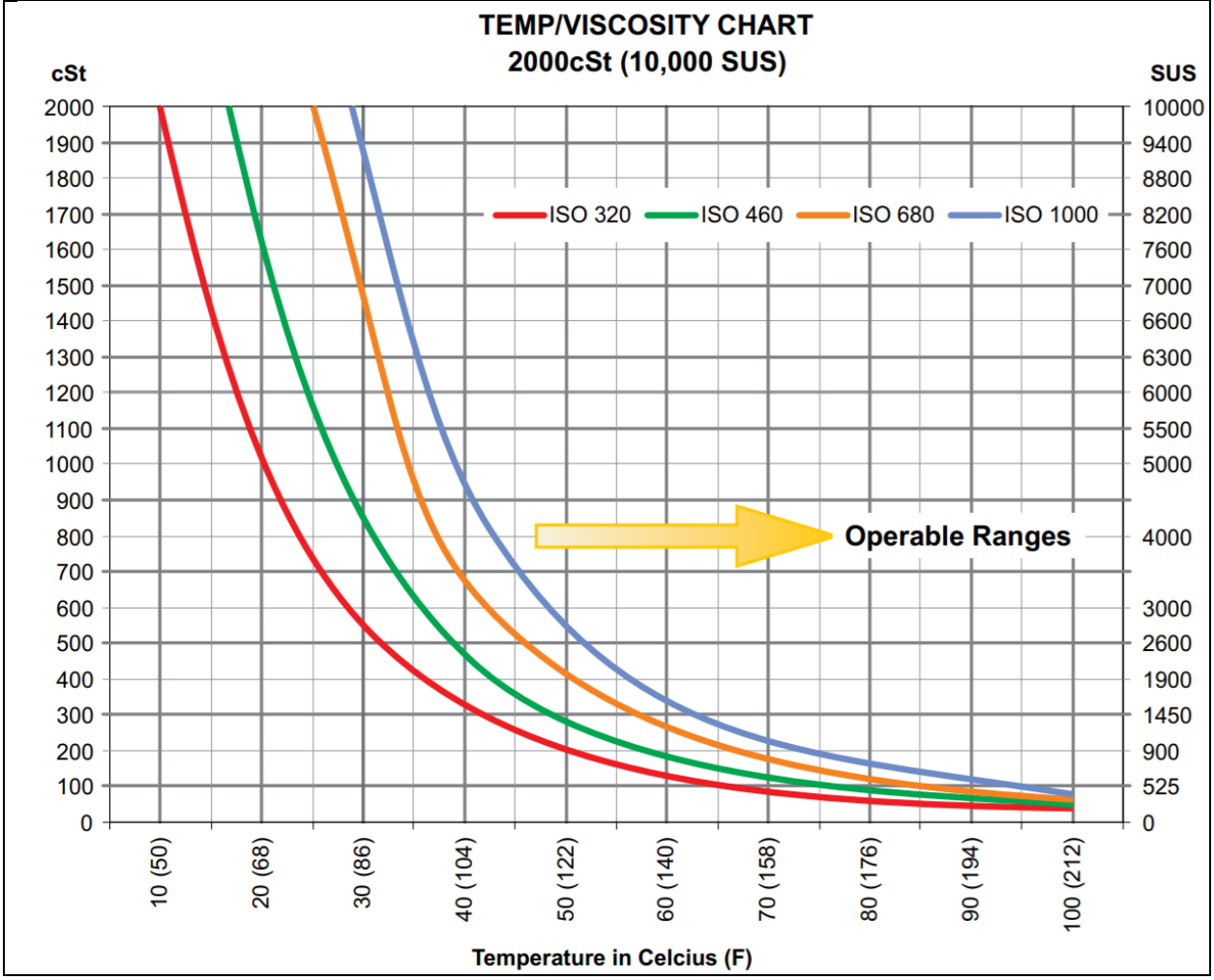
TEMPERATURE VS. VISCOSITY



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Troubleshooting:

Symptom	Possible Cause(s)	Corrective Action
Pump noise	Cavitation or Aeration	Ensure that open end of suction tube remains completely below surface of liquid
		Check hose and fittings for leaks
		Increase suction hose diameter reducing velocity of fluid
No outlet flow	Clogged suction tube/ discharge line	Clean suction tube/ discharge line
	By-Pass valve in between the open and closed position	Check to make sure by-pass valve is fully open or closed
No Air supply to motor	No Air Supply	Check air supply, ensure that is between 100psi and 120psi
	Defective Regulator/ clogged FRL	Remove air line after FRL and check for air flow, clear FRL of obstruction. **Note: Air pressure is preset and locked at 100psi tampering with this locked regulator setting will void the warranty.**
Motor Hesitation	Fluid Viscosity to high or debris build up within motor	Check fluid viscosity Inspect and flush motor with pneumatic flushing solvent.
Motor will not run or runs at low speed	Internal rust or debris build up	Inspect and flush the motor if it is operating slowly or Inefficiently, with pneumatic flushing solvent
	Motor vanes are jammed	Have motor serviced.
Motor runs well then slows down or runs at low speed	Restricted exhaust	Check exhaust for obstruction or damage causing restriction
Motor runs Hot	Bearing failure	Have motor serviced

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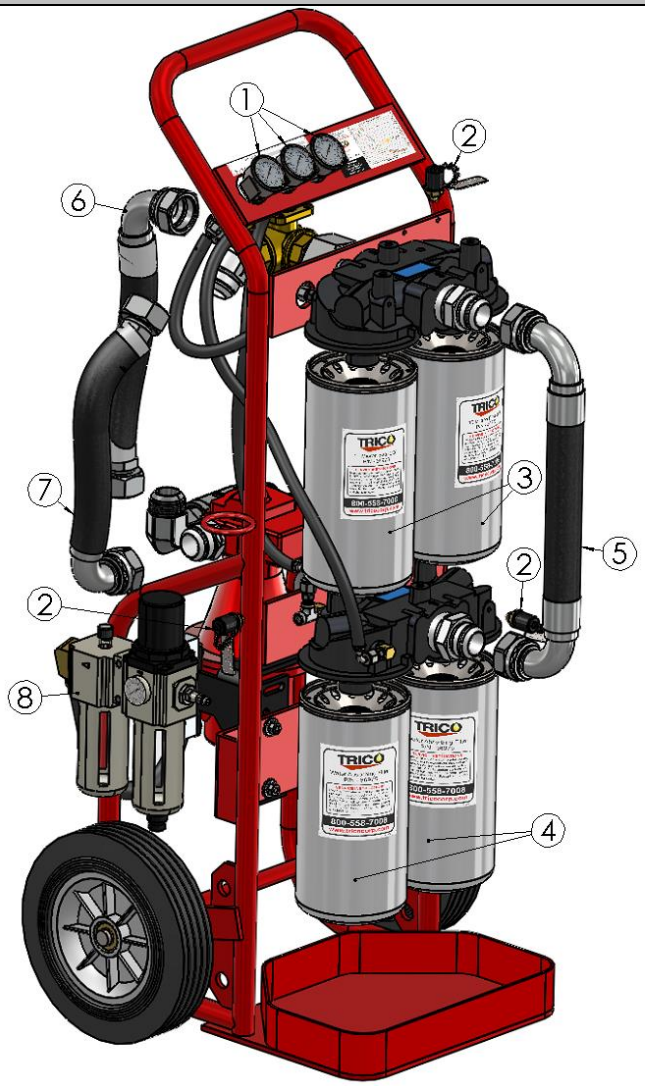
TRICO HIGH-VICOSITY CART FILTRATION SYSTEM



Item #	Part Number	Description	Qty
1	10786	Filter Gauge, 160 PSI, U-Clamp, 1/8” MNPT	3
2	36100	1/8” MNPT Sample Port	3
3	36973	Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	1
4	36975	Water Filter - 10 Micron Nominal Spin On	1
5	21001	1-1/4” Hydraulic Hose - Front Filter Head Assembly Connection	1
6	21002	1-1/4” Hydraulic Hose – From Bypass Valve to Tee Fitting	1
7	21017	1-1/4” Hydraulic Hose – From Pump to Bypass Valve	1
8	20221	1/2" Pneumatic Regulator Assembly for High Viscoscity Filter Carts	1
Not Shown	22489	1” Hydraulic Hose – Set of 2 Stainless Steel Wands	1

Replacement LARGE Filters for 36933 High-Viscosity Filtration Cart	Part Number
Particulate Filter - 3 Micron Microglass Spin On Beta ≥ 200 Absolute	36972
Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	36973
Particulate Filter - 20 Micron Microglass Spin On Beta ≥ 200 Absolute	36974
Water Filter - 10 Micron Nominal Spin On	36975

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TRICO HIGH-VICOSITY PORTABLE HAND-HELD FILTRATION SYSTEM

Item #	Part Number	Description	Qty
1	16183	Filter Gauge, 100 PSI, 1/8” MNPT	3
2	36100	1/8” MNPT Sample Port	2
3	21007	3/4” Hydraulic Hose - From Filter Head Assembly to Pump	1
4	36978	Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	1
5	36977	Water Filter - 10 Micron Nominal Spin On	1
6	20220	3/8” Pneumatic Regulator Assembly for High Viscoscity Filter Carts	1
Not Shown	21008	3/4” ID Hydraulic Hose – Intake Side 72” Length	1
Not Shown	21004	1” ID Hydraulic Hose – Discharge Side 72” Length	1

Replacement SMALL Filters for 36934 High-Viscosity Portable Hand-Held	Part Number
Particulate Filter - 3 Micron Microglass Spin On Beta ≥ 200 Absolute	36976
Particulate Filter - 10 Micron Microglass Spin On Beta ≥ 200 Absolute	36977
Water Filter - 10 Micron Nominal Spin On	36978

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