



# Low-Viscosity Filtration System Setup and Operating Instructions



Rev D, February 2021



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

61424

Part Number	Description	Maximum Viscosity
36900	Low-Viscosity Filtration Cart with 10 Foot Hose & Quick Connection Fittings	2500 SUS (540 cSt)
36901	Low-Viscosity Filtration Cart with 10 Foot Hose & Quick Connection Fittings – 200V/50Hz	2500 SUS (540 cSt)
36944	Low-Viscosity Portable Hand-Held System – 200V/50Hz	2000 SUS (430 cSt)
36946	Low-Viscosity Filtration Cart with Wands	2500 SUS (540 cSt)
36947	Low-Viscosity Filtration Cart with Wands– 200V/50Hz	2500 SUS (540 cSt)
36994	Low-Viscosity Portable Hand-Held System	2500 SUS (430 cSt)

### TRICO LOW-VISCOCITY FILTRATION SYSTEMS

Trico Low-Viscosity Filtration Systems are designed to transfer and filter hydraulic/lubricating oils with viscosities less than 2000 SUS (430 cSt) for the Portable Hand-Held System or less than 2500 SUS (540 cSt) for the Filtration Cart. 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 Low-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 Low 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.

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.



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## PERFORMANCE DATA

<b>36900, 36901, 36946 &amp; 36947 Low-Viscosity Filtration Cart</b>	
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
Filter 1 Media:	10 Micron absolute Beta>200
Filter 2 Media:	3 Micron absolute Beta>200
Replace Element @:	40 psi differential
Max Viscosity:	2500 SUS (540 cSt)
Max Flow Rate:	7.25 GPM → #36900 & #36946 6.0 GPM → #36901 & #36947
Electric motor:	1-1/2 hp @ 1750 rpm → #36900 & #36946 1 hp @ 1425 rpm → #36901 & #36947
Electric Motor Rating:	115V, 60Hz, 14.5A → #36900 & #36946 220V, 50Hz, 7.0A → #36901 & #36947
Pump Relief	105 psi
Suction / Lift	20 ft
Filter Collapse Rating	80 psi differential
Maximum Filter Operating Pressure	120 psi

<b>36994 &amp; 36944 Low-Viscosity Portable Hand-Held</b>	
Type:	Bronze Internal Helical Gear
Max Temperature:	140°F/60°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:	2000 SUS (430 cSt)
Max Flow Rate:	5.5 GPM → #36994 4.0 GPM → #36944
Electric motor:	1/2 hp @ 1750 rpm → #36994 1/2 hp @ 1425 rpm → #36944
Electric Motor Rating:	115V, 60Hz, 7.2A → #36994 220V, 50Hz, 4.1A → #36944
Suction / Lift	20 ft
Pump Relief	50 psi
Filter Differential Collapse Rating	80 psi
Maximum Filter Operating Pressure	250 psi



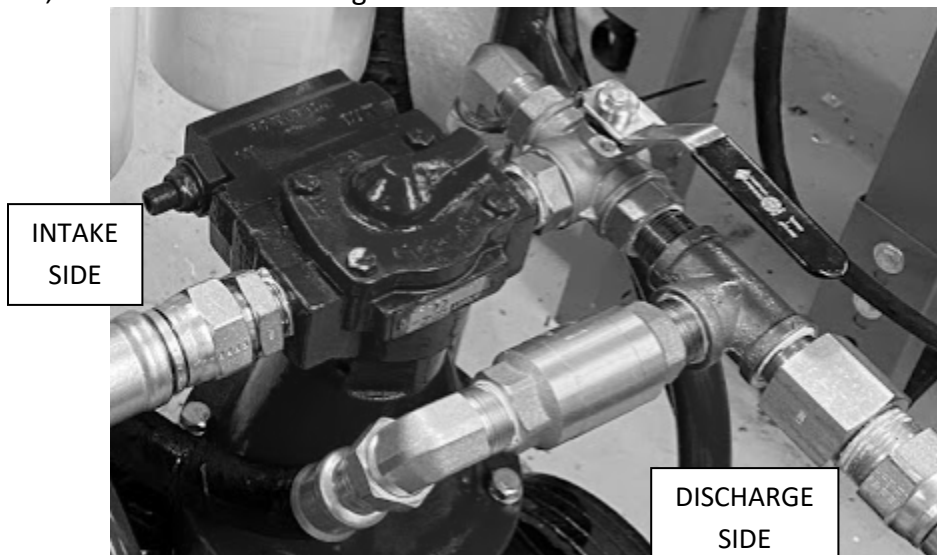
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## CAUTION

Amperage draw from electric motor varies due to load at normal operating conditions. Full load amperage for the Low-Viscosity Filtration Cart is 14.5A and a 20 Amp circuit is recommended. Full load amperage for the Low-Viscosity Portable Hand-Held is 8.8A and a 15 Amp circuit is recommended. Failure to use the appropriate circuit type may cause overloading of the circuit and trip the breaker. Repeated attempts to use equipment on the same tripped circuit will cause electrical fire. Ensure to consult an electrician to identify proper outlets before using equipment.

## LOW-VICOSITY FILTRATION CART OPERATION (36900, 36901, 36946 & 36947)

1. Connect one wand/hose to suction side of pump using the #16 JIC fitting and tighten, this will be the intake side.
2. Connect one wand/hose after filtration and after bypass valve, with the #16 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.



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7. Before plugging the unit into an electrical outlet, ensure the receptacle is rated for 20 Amps. As resistance increases, due to filtration, amperage draw increases in the electric motor.
8. Check to make sure motor switch is in the "Off" position, and the three-way valve is positioned correctly for either filtration or bypass/non-filtration.
9. Plug the electrical cord into the outlet and turn the Low-Viscosity Filtration Cart to the "On" position. Fluid will begin to be drawn through the suction wand/hose, into the pump, through the filters, pass the check valve and into the discharge hose/wand.
10. The check valve has two purposes in the Low-Viscosity Filtration Cart. First, it closes the flow of fluid from the filter elements in by-pass mode. Second, it prevents fluid backflow when pumping fluid vertically if reservoirs are higher than the pump or base container.
11. As filter elements become clogged the pressure differential between the gauges 1 and 2, 2 and 3 increases. 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 100psi 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 Filter Cart 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.

12. The Low-Viscosity Filtration Cart is also equipped with two sample ports located before and after filtration. Fluid samples may be extracted at these points to monitor fluid conditioning.
13. When finished filtering/transferring fluid, turn the power switch to the "Off" position, unplug the cord and wrap around handle for storage. Wipe any excess oil from the unit that might have spilled during the filtering/transferring process.
14. 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.

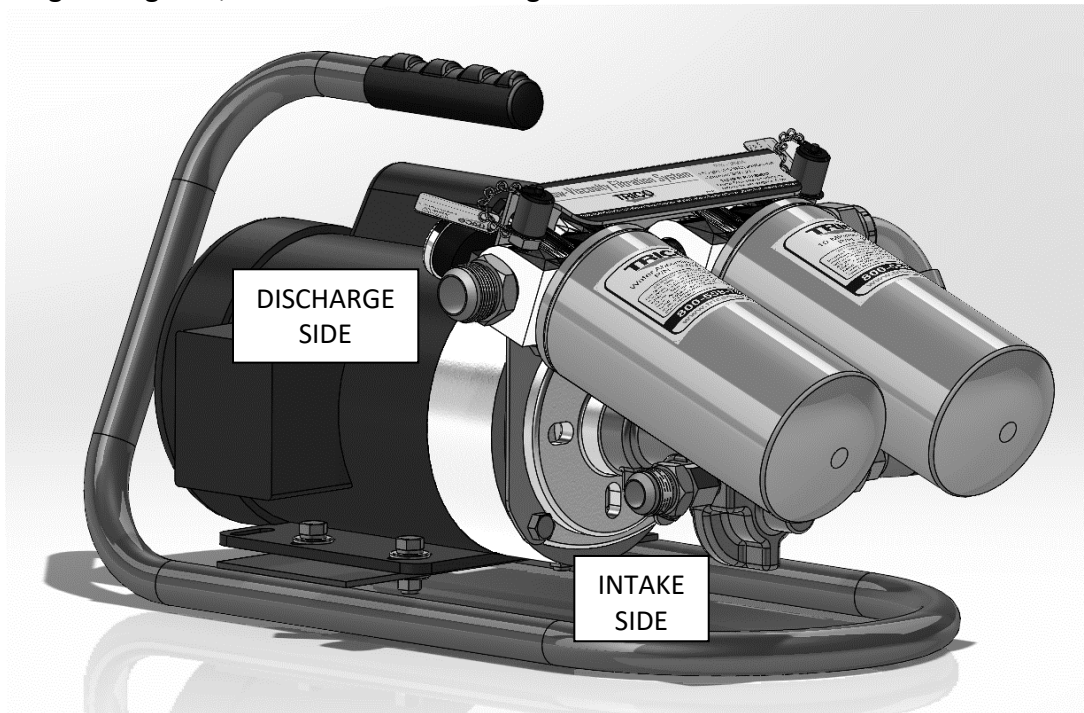


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## LOW-VISCOSITY PORTABLE HAND-HELD SYSTEM OPERATION (36994 & 36944)

1. Connect the 3/4" ID hose before pump, below filters, to suction side of pump using the #12 JIC fitting and tighten, this will be the intake side
2. Connect the 1" ID hose after filtration, to the end of the filter head assembly, with #16 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 hose and allow the fluid to enter the pump head by raising the hose above the pump. This will help lubricate the internal gears of the pump and prevent dry running that can cause gear wear. Once gears are lubricated this step is not necessary unless the unit has been in storage for over a month or has been cleaned during maintenance.
5. The suction hose has a 3/4" male NPT fitting on the end of the hose not connected to the Low-Viscosity Portable Hand-Held System. Connect this end to either the machine directly, an adapter, or a fitting, and then into the container selected to be emptied and/or filtered. Ensure the suction hose does not become impeded/blocked by internal components within the machinery or container.
6. The discharge hose has a 3/4" male NPT fitting on the end of the hose not connected to the Low-Viscosity Portable Hand-Held System. Connect this end to either the machine directly, an adapter, or fitting, and then into another opening in the machinery, container, or desired clean container if transferring fluid.



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7. Before plugging the unit into an electrical outlet, ensure that the receptacle is rated for 15 Amp draw. As resistance increases, due to filtration, amperage draw will increase in the electric motor. Full Load amperage is 8.8 Amps.
8. Check to make sure the power switch, located on the cord, is in the "Off" position.
9. Plug the electrical cord into the outlet and switch the Low-Viscosity Portable Hand-Held System to the "On" position. Fluid will begin to be drawn through the suction hose, into the pump, through the filters, and into the discharge hose.
10. As filter elements become clogged, the pressure differential between the gauges 1 and 2, 2 and 3 increases. When the differential pressure between these gages equals 40 psi differential, the element needs to be changed out. If 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 50psi at the inlet, at this point the pump will run in bypass relieving the built-up pressure.

**CAUTION:** Continued running of the pump in bypass will cause excess heat generation and or cavitation reducing the life of the filtration unit.

11. The Low-Viscosity Portable Hand-Held System is also equipped with two sample ports located before and after filtration. Fluid samples may be extracted at these points to monitor fluid conditioning.
12. When finished filtering/transferring fluid, turn the power switch to the "Off" position, unplug the cord and wrap around handle for unit. Wipe any excess oil from the unit that might have spilled during the filtering/transferring process.



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## **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 lieu 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.



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## WHEN TO CHANGE THE FILTER AND PROCEDURE

The filter head is outfitted with three pressure gauges. The first gauge nearest to the pump indicates the pressure being produced by the pump. The second gauge between the filter heads indicate the pressure between the two filters. The third gauge near the discharge wand/hose indicates the pressure after the second filter element. To determine when each filter element 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 single 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)

### To change the filter:

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 filter gasket, tighten the filter another 1/4 turn with the strap wrench and repeat the procedure to check for leaks.

<b>Replacement LARGE Filters for 36946 &amp; 36947 Low-Viscosity Filtration Cart</b>	<b>Part Number</b>
Particulate Filter - 3 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36972
Particulate Filter - 10 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36973
Particulate Filter - 20 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36974
Water Filter - 10 Micron Nominal Spin On	36975

<b>Replacement SMALL Filters for 36994 &amp; 36944 Low-Viscosity Portable Hand-Held</b>	<b>Part Number</b>
Particulate Filter - 3 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36976
Particulate Filter - 10 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36977
Water Filter - 10 Micron Nominal Spin On	36978



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## TROUBLE SHOOTING

Symptom	Possible Cause(s)	Corrective Action
Pump system does not prime	Suction wand/hose above liquid	Ensure open end of suction wand/hose remains completely below surface of liquid
	Clogged suction/discharge wand/hose line and/or filter	Clean suction/discharge wand/hose line and/or replace filter
	Suction line too long	Reduce length in suction line to reduce pressure
Insufficient flow	Clogged filter	Check differential pressure between gauges, if 40 psi or greater, change filter element
	Clogged/ kinked discharge wand/hose line or nozzle	Remove and flush discharge wand/hose line and nozzle, inspect for damage
	Fluid viscosity exceeds recommended viscosity for motor	Check viscosity of fluid at temperature. See SUS vs. Temp. chart or contact fluid supplier. If viscosity exceeds maximum cSt, fluid must be warmed to reduce viscosity
Fluid Leaking from filter area	Loose filter and or connections	Check tightness of filter element to ensure proper seal, check hose/fitting connections
Electric motor does not function/ or stops working while filtering	Power On/Off switch not fully switched	Check On/Off switch
	No power to receptacle	Check outlet for power and breaker
	Unit has overheated tripping internal overload breaker	Turn unit power to the "0" position, allow motor to cool, turn back to "on" position and resume filtering
	Unit generates excessive heat	Fluid viscosity exceeds maximum recommended viscosity



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## GROUNDING AND BINDING

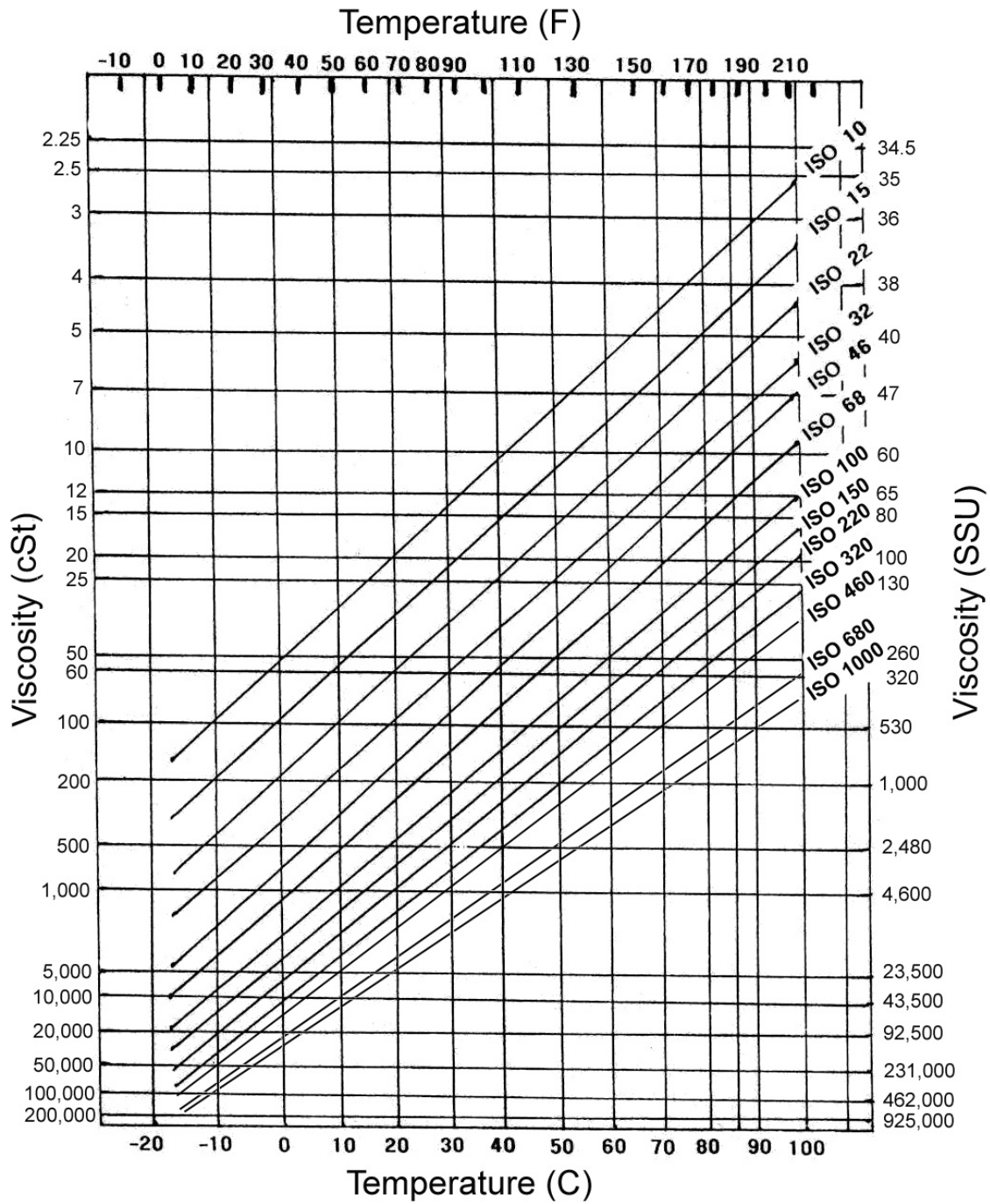
The Trico Low-Viscosity Filtration Systems are not rated for a hazardous duty environment due to possible static discharge, use proper bonding and grounding per National Fire Protection Code 77. A **Bonding** system connects various pieces of conductive equipment together to keep them at the same potential. 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.



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# TEMPERATURE VS. VISCOSITY



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## ISO CLEANLINESS RATING

Lubricating oils stored in bulk containers may contain contaminants. 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<sub>4</sub> microns/ R<sub>6</sub> microns/ R<sub>14</sub> 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.**

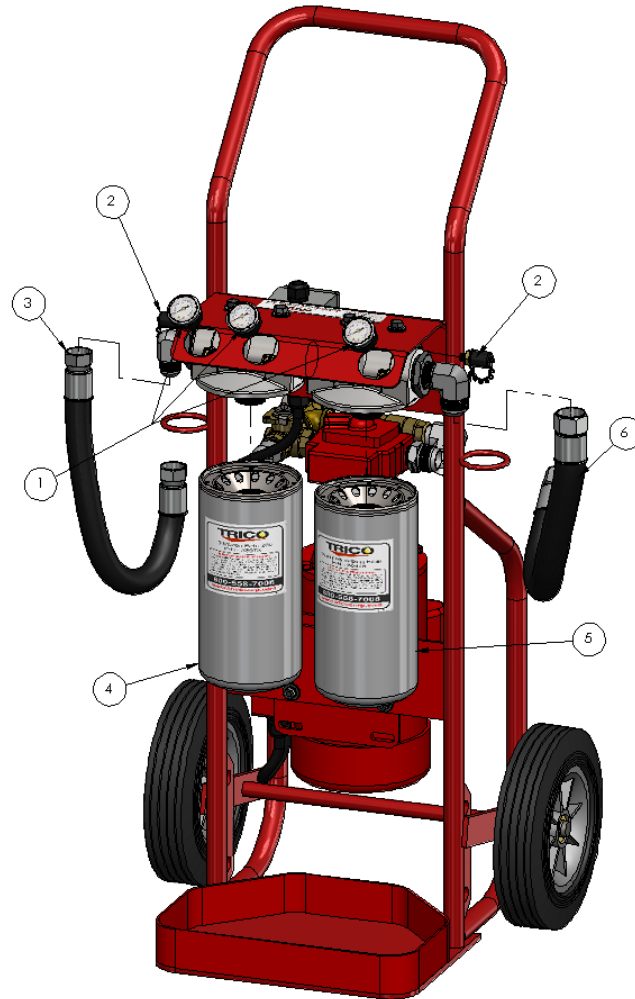
ISO Number	Particle Count per ml of fluid		
25	160,000	to	320,000
24	80,000	to	160,000
23	40,000	to	80,000
22	20,000	to	40,000
21	10,000	to	20,000
20	5,000	to	10,000
19	2,500	to	5,000
18	1,300	to	2,500
17	640	to	1,300
16	320	to	640
15	160	to	320
14	80	to	160
13	40	to	80
12	20	to	40
11	10	to	20
10	5	to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

ISO 320  
19/16/14



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## TRICO LOW-VISCOSITY CART 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 Pump to Filter Head Assembly	1
4	36973	Particulate Filter - 10 Micron Microglass Spin On Beta $\geq$ 200 Absolute	1
5	36975	Water Filter - 10 Micron Nominal Spin On	1
6	21006	1" Hydraulic Hose - From Filter Head Assembly to Check Valve	1

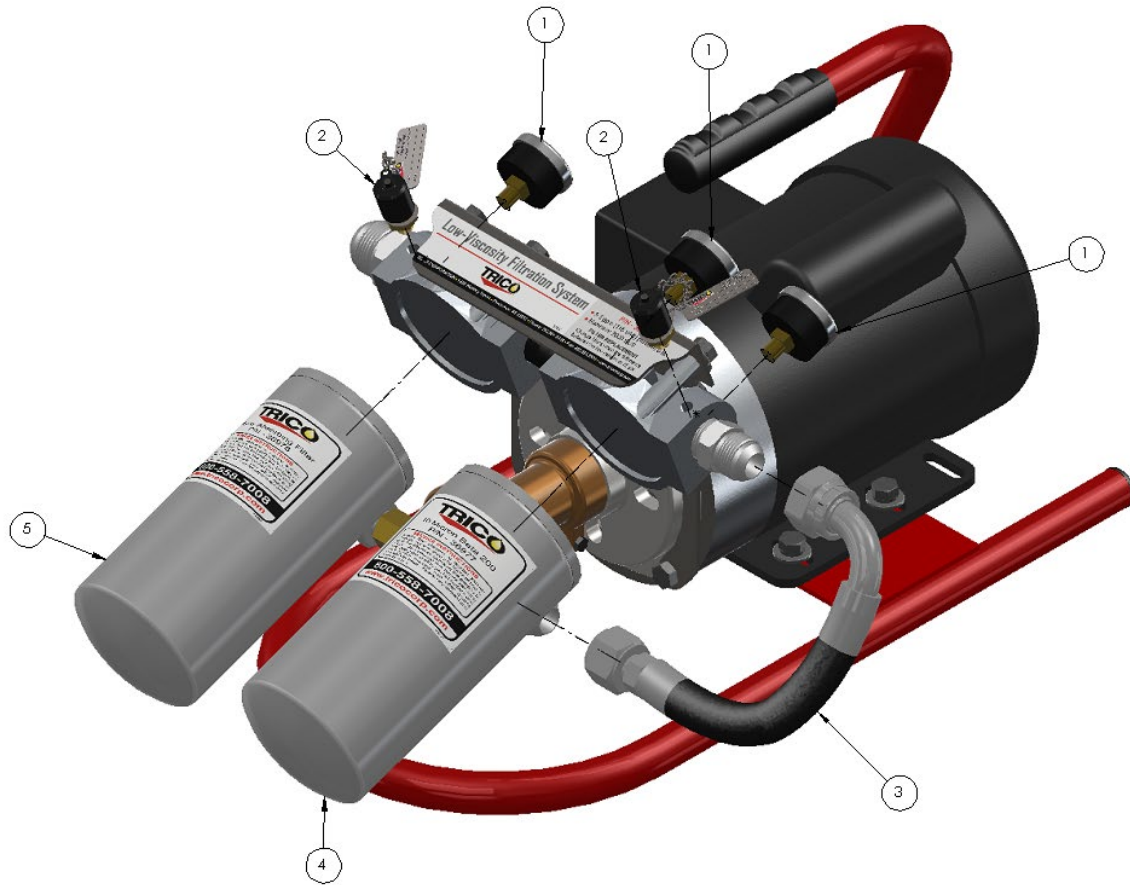
Replacement LARGE Filters for 36946 & 36947 Low-Viscosity Filtration Cart	Part Number
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## TRICO LOW-VISCOSITY PORTABLE HAND-HELD FILTRATION SYSTEM



Item #	Part Number	Description	Qty
1	16183	Filter Gauge, 100 PSI, 1/8" MNPT	3
2	36100	1/8" MNPT Sample Port	2
3	21013	3/4" Hydraulic Hose - From Filter Head Assembly to Pump	1
4	36978	Particulate Filter - 10 Micron Microglass Spin On Beta $\geq$ 200 Absolute	1
5	36977	Water Filter - 10 Micron Nominal Spin On	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 36994 & 36944 Low-Viscosity Portable Hand-Held	Part Number
Particulate Filter - 3 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36976
Particulate Filter - 10 Micron Microglass Spin On Beta $\geq$ 200 Absolute	36977
Water Filter - 10 Micron Nominal Spin On	36978



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