VILTER®
Since 1867

Oil Program For Refrigeration Service

Compressor Types:	Applicable Model No's:
Single Screw Compressors	VSS, VSR & VSM
Reciprocating Compressors	450XL, 440, 350ES And 320
Twin Screw Compressors	VRS

Authorized Distributor Manual

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VILTER®

Since 1867

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Issue Date: July, 1999
Revision No: 0
Revision Date: Initial Release

Storage Guidelines for Vilter B & FL Type Lubricants

Background

Vilter Type B and FL lubricants are an ester-based fluid and are hygroscopic by nature. This means that they absorb water moisture from the surrounding environment. Compared to mineral based lubricants which are typically saturated with water at less than 100 PPM, ester based lubricants become saturated with water at approximately 2,500 PPM.

High water moisture levels cannot be tolerated in the refrigeration systems where ester based lubricants are utilized and require specific handling and storage guidelines, in addition to the normal precautions for system dehydration prior to system start-up.

All Vilter lubricants are manufactured to meet strict requirements to ensure minimal water moisture content as shipped. The following guidelines are provided for the end-user of the equipment as a means to minimize the water moisture content of lubricants in storage.

Guidelines

- Use a suitable dehydration process for the complete refrigeration system to ensure that the system as a whole is completely dry and water free. This can be accomplished by the use of vacuum pumps and checked by a vacuum gauge to ensure that a suitable micron value has been reached, and maintained.

- Store all lubricant containers in a dry environment. Do not expose the lubricant to the atmosphere by opening the container until the compressor sump or separator is ready to be charged.

- Keep the lubricant in its original container. Some plastic containers allow water moisture to pass through the container itself.

- If possible, use container sizes appropriate to the compressor charge to avoid leaving partially filled containers for long period of times. Vilter B Type lubricant is available in 5 and 55 gallon containers.

- Refrigeration systems using ester based lubricants will require suitable high capacity moisture filter/driers to maintain low total moisture content in the refrigerant and lubricant.

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Compatibility & Misc.

- Vilter Type B lubricant has been extensively tested with many of the components in a refrigeration system. Elastomers, driers, etc. for use with HFCs have demonstrated no adverse effects when tested for hardness, swelling and brittleness.

- Vilter Type B lubricant cannot be used in conjunction with a mineral based oil. CFC and HCFC refrigerants typically have used mineral oil; however, mineral oils are not miscible with HFCs. The performance of a refrigeration system is optimized when the lubricant is allowed to be miscible with the refrigerant to aid in the oil return to the compressor. If the oil used in an HFC refrigeration system does not provide oil return capability, the oil will tend to accumulate in the evaporator reducing the overall system capacity.

- CFC and HCFC refrigerants should not be used with Vilter Type B lubricant since these types of refrigerants greatly reduce the viscosity of ester based lubricants, resulting in inadequate compressor lubrication.

Glossary of Terms
for Oil Lubrication Systems

Dew Point Temperature
The temperature at which the gas will start to condense. Typically it is desired to have the gas temperature at least 15-20 ° F higher than the dew point temperature of the refrigerant, at the given operating pressure to prevent vapor condensation.

Dilution
The amount of refrigerant mixed with the oil expressed as a percentage, to that of the same volume of oil at a given temperature /pressure condition.

Flash Point Temperature
The flash point of the oil is the temperature to which the oil must be heated for sufficient vapor formation above the surface, of the oil, which will momentarily flash or burn when brought into contact with a very small flame or ignition source.

Floc Point Temperature
A measure of the temperature point where wax in a refrigerant / oil mixture will begin to form wax crystals. At or below the crystal formation temperature the wax agglomerates into larger plastic solids, that can restrict refrigerant flows through strainers and orifices.–

Miscibility
The ability of the liquid refrigerant to mix with the lubricant. If the lubricant will form a single phase with the refrigerant, it is miscible. If the lubricant will not form a single homogenous mixture with the refrigerant, then it is immiscible and two phase.

Miscibility Temperature
Above this temperature the oil will be completely miscible with the refrigerant. Below this temperature the oil will separate into two liquid phases, depending upon the mixture composition.

Pour Point Temperature
The lowest temperature at which oil will flow of its own accord without being disturbed. The pour point of the oil should be less than the lowest expected operating temperature to provide sufficient oil fluidity and viscosity. Oil pour points higher than the refrigerant evaporating temperature will tend to coat the evaporator heat transfer surface and reduce the overall heat transfer coefficient.

Solubility
The ability of refrigerant vapor to dissolve in the lubricant. An oil with a high solubility potential will have the effect of reducing the oil viscosity due to the refrigerant dilution.

SSU (Seconds Saybolt Universal)
The time in seconds for a specified quantity of oil to flow through a calibrated orifice. The oil quantity is fixed, however the time interval increases or decreases based on the oil viscosity.

Viscosity
The amount of fluid friction exhibited by the oil in motion, or in other terms, viscosity may be regarded as the resistance an oil offers to motion (flow). Viscosity is usually expressed in centipoise, SSU (see above), or kinematic viscosity (see viscosity kinematic).

Viscosity Index
A method of indicating the rate of change in oil viscosity with changes in the oil temperature. An oil which is assigned low viscosity index numbers will display large viscosity changes with a change in temperature. Conversely, a high viscosity index will represent low viscosity changes

with a change in temperature. The viscosity index applies only to the oil viscosity and does not reflect other changes in the oil properties.

Viscosity, Kinematic
Derived by (viscosity in centipoise) divided by (the oil density at the same tempertature) = centistokes.

Miscible Regions for Oil & Refrigerant Mixtures

Vilter Lubricant	**Ammonia R-717**	**R-22**	**R-134a**	**R-410a**	**R-404a**	**R-407c**	**Propylene R-1270**	**Propane R-290**
717	Immis.	-	-	-	-	-	-	-
F-68	-	60 to -30°C[1]	-	-	-	-	-	-
FL-100	-	60 to <-60°C[1]	-	-	-	-	-	-
FL-150	-	60 to <-60°C[1]	-	-	-	-	-	-
B-120	-	-	60 to -20°C[1]	60 to 35°C[2]	60 to -45°C[2]	40 to -60°C[3]	-	-
B-68	-	-	60 to -10°C[1]	60 to -60°C[3]	60 to -60°C[3]	60 to -60°C[3]	-	-
HCL-68	Immis.	-	-	-	-	-	60 to <-60°C[1]	-
HCL-100	-	-	-	-	-	-	60 to <-60°C[1]	-
HC-68	-	-	-	-	-	-	-	60 to <-40°C[1]
HC-100	-	-	-	-	-	-	-	60 to <-40°C[1]
D	Immis.	60 to+30°C[1]	-	-	-	-	-	-
Oil Location When Immiscbile[5]	Bottom	Top	Top	> 45°C Bottom < 44°C Top[4]	> 40°C Bottom < 39°C Top[4]	> 40°C Bottom < 39°C Top[4]	Bottom	Bottom

[1] 10% oil by weight in refrigerant
[2] 8% oil by weight in refrigerant
[3] 5% oil by weight in refrigerant
[4] Concentration dependent –contact Vilter
[5] **Bottom** notation means oil phase will fall below refrigerant liquid phase. **Top** notation means oil phase will rise above the refrigerant liquid phase. Temperature ranges given in table for specific refrigerant and oil selections are the miscible regions where the two fluids (liquid refrigerant & oil) are mixed as one homogenous fluid. This issue is particularly important for oil recovery requirements for flooded shell & tube chillers as the operating pressure can change the relative location of the "immiscible phase" for refrigerants R410a, R-404a, & R-407c. See note 4 above.

Direct expansion shell & tube chillers will also be dependent on the solubility of the oil and refrigerant vapor for oil return to the compressor. Traditional schemes of controlling the return vapor velocity vs. allowable pressure loss will apply, i.e.. last pass velocity and suction line velocity to return the liquid oil phase where it exists.

Immi. = Immiscible

Single Screw Compressors Only

Cross Reference Index

Vilter Part No.	CPI Number	Vilter Lube Type	Oil Type	Lube Oil Base Stock	Container Size	Used w/ Refrig. Type
	CP-1009-68	717		Semi-synthetic	55 gallon drum	R-717
	CP-1009-68	717		"	5 gallon pail	R-717
	CP-4600-68	717LT		Synthetic	55 gallon drum	R-717
	CP-4600-68	717LT		"	5 gallon pail	R-717
	CP-Lenoil-68	F-68		Semi-synthetic	55 gallon drum	R-22
	CP-Lenoil-68	F-68		"	5 gallon pail	R-22
	CP-4214-100	FL-100		Synthetic	55 gallon drum	R-22
	CP-4214-100	FL-100		"	5 gallon pail	R-22
	Solest-68	B-100	POE	Ester	55 gallon drum	Blends
	Solest-68	B-100	POE	"	5 gallon pail	Blends
	CP-1516-68	HC-68		Synthetic	55 gallon drum	R-290
	CP-1516-68	HC-68		"	5 gallon pail	R-290
	CP-4600-68	HCL-68		Synthetic	55 gallon drum	R-1270
	CP-4600-68	HCL-68		"	5 gallon pail	R-1270
	CP-200-SR	Vilter D		Paraffinic	55 gallon drum	R-717 & R-22
	CP-200-SR	Vilter D		Paraffinic	5 gallon pail	R-717 & R-22

All Twin Screw & Reciprocating Compressors Only

Cross Reference Index

Vilter Part No.	CPI Number	Vilter Lube Type	Oil Type	Lube Oil Base Stock	Container Size	Used w/ Refrig. Type
	CP-1009-68	717		Semi-synthetic	55 gallon drum	R-717
	CP-1009-68	717		"	5 gallon pail	R-717
	CP-4600-68	717LT		Synthetic	55 gallon drum	R-717
	CP-4600-68	717LT		"	5 gallon pail	R-717
	CP-Lenoil-68	F-68		Semi-synthetic	55 gallon drum	R-22
	CP-Lenoil-68	F-68		"	5 gallon pail	R-22
	CP-4214-150	FL-150		Synthetic	55 gallon drum	R-22
	CP-4214-150	FL-150		"	5 gallon pail	R-22
	Solest-120	B-120	POE	Ester	55 gallon drum	Blends
	Solest-120	B-120	POE	"	5 gallon pail	Blends
	CP-1516-100	HC-100		Synthetic	55 gallon drum	R-290
	CP-1516-100	HC-100		"	5 gallon pail	R-290
	CP-4600-100	HCL-100		Synthetic	55 gallon drum	R-1270
	CP-4600-100	HCL-100		"	5 gallon pail	R-1270
	CP-200-SR	Vilter D		Paraffinic	55 gallon drum	R-717 & R-22
	CP-200-SR	Vilter D		Paraffinic	5 gallon pail	R-717 & R-22

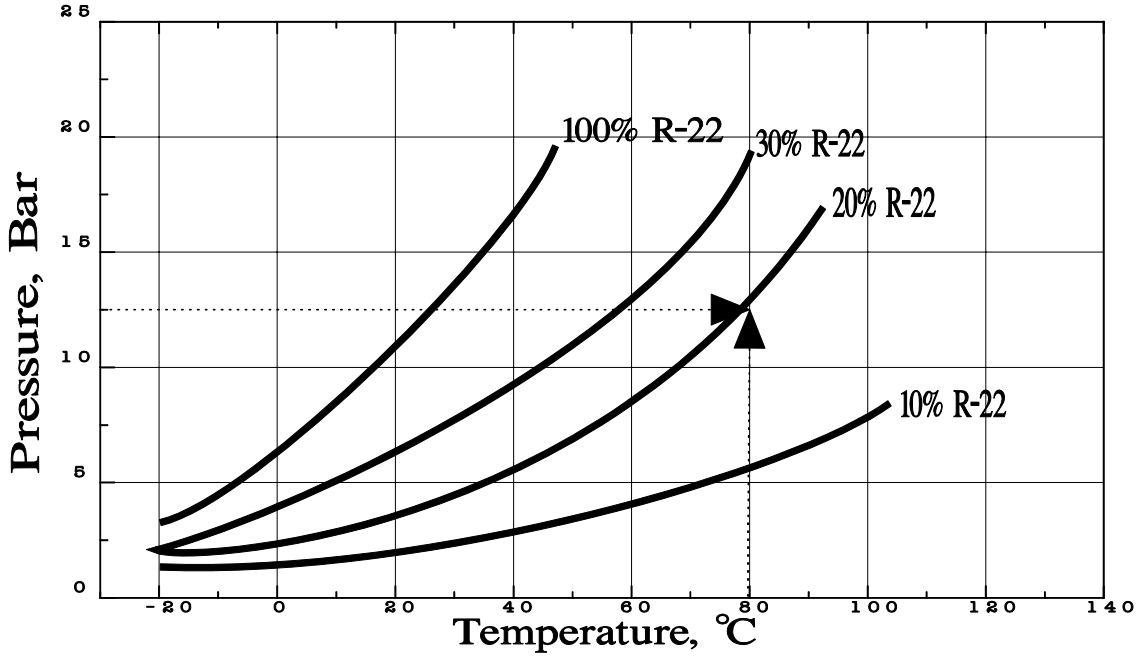
The effect of dilution on lube oil viscosity

The following example illustrates how to determine dilution and diluted viscosity using a Pressure –Viscosity –Temperature (PVT) chart. The example given below is for R-22 using Vilter oil type FL-150.

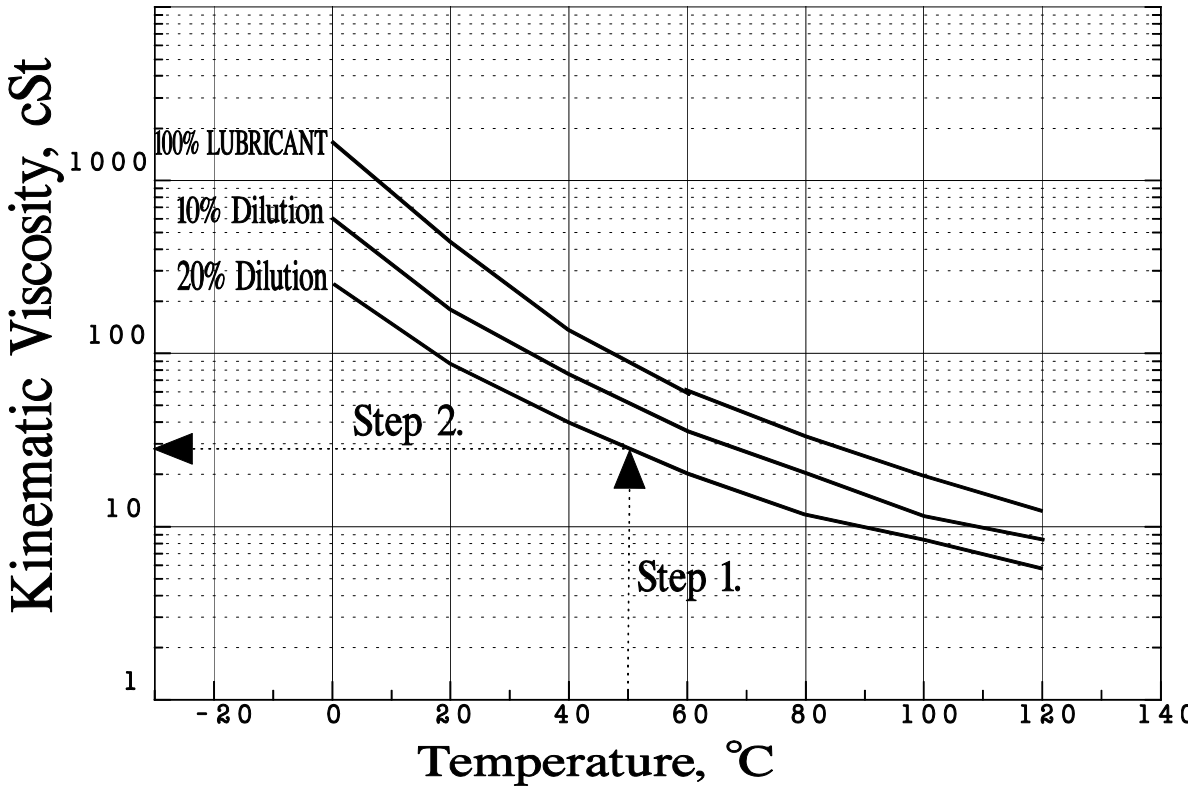
Charts are given for each specific refrigerant and lube oil combination. Please review the specific application operating conditions carefully. For operating conditions outside of the chart values, please consult Vilter.

1. Lubricant must be soluble with the refrigerant – Unlike mineral oil or Polyalphaolefins with ammonia.
2. Dilution is determined at compressor operating conditions to determine if the mixture going to the bearings is adequate for lubrication and does not contain excessive amounts of refrigerant. ***For screw compressors***, dilution is measured from the discharge temperature and pressure. The resulting viscosity, that supplies the bearings, is then found by using the oil supply temperature at the given dilution level. Acceptable viscosities for bearings are produced by compressor OEMs and can vary by designs.

   For example, FL-150 is utilized with R-22. A screw compressor has a discharge temperature and pressure of 176°F (80°C) and 12.5 bar absolute, the amount (dilution) of R-22 in the lubricant will be about 20%.



3. In order to determine the viscosity of the mixture, the 20% dilution is paired with the oil supply temperature to obtain the mixture viscosity. For example, if the oil supply temperature was 122°F (50°C), the dilution is 20% from above, the resulting mixture viscosity would be approximately 28-29 cSt. The chart on the following page outlines the process:



4. In order to determine if the mixture viscosity will adequately lubricate, consult Vilter Manufacturing Corporation. In general, screw compressors require at least 10 cSt at discharge conditions to adequately lubricate the bearings.

5. ***For reciprocating compressors***, the crankcase temperature and pressure are used to determine dilution instead of discharge temperature and pressure. The procedure, however, is the similar to the above.

SECTION 2

Service Intervals for Warranty Coverage

VSS, VSM and VSR SINGLE SCREW COMPRESSORS
SERVICE INTERVAL REQUIREMENTS
FOR VILTER EXTENDED WARRANTY

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in VSS, VSM and VSR Single Screw Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
OIL CIRCUIT															
	Oil Change (1)		R		R		R		R		R		R		R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filters (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Strainer	I	I	I	I	I	I	I	I	I	I	I	I	I	I
PACKAGE															
	Coalescing Elements					R			R			R			R
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Inspect Compressor		I		I		I		I		I		I		I
	Bearings														I

Key I Inspect.
R Replace.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter(s) on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter(s) must be changed if the oil filter differential exceeds 12 psi or oil analysis requires it.

300 AND 400 SERIES VMC RECIPROCATING COMPRESSORS
SERVICE INTERVAL REQUIREMENTS

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in 300 and 400 Series VMC Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	**5,000**	**10,000**	**20,000**	**30,000**	**40,000**	**50,000**	**60,000**	**70,000**	**80,000**	**90,000**	**100,000**	**110,000**	**120,000**
UNIT															
	Suction Screen	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	Coupling Alignment and Integrity	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	V-Belt Drive Alignment and Integrity	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	Water Line Strainers	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	Liquid Line Strainers	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
***CONTROL* CALIBRATION**															
	Electro-Mechanical Pressure Controls	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	Transducers	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
	RTD's	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
COMPRESSOR															
	Oil Change (1)		**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
	Flush Oil Circuit				**R**		**R**		**R**		**R**		**R**		**R**
	Oil Analysis (2)		**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	Oil Filter (3)	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
	Inspect Compressor (4)		**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**

Key I Inspect.
R Replace or Service.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter must be changed if the oil filter differential exceeds 25 psi or oil analysis requires it.
(4) To prevent possible breakdowns, the compressor should be opened and the condition of the valves, valve seats, liners and connecting rod bearings should be checked and excessively worn parts be replaced. At the same time the crankshaft bearing float should also be checked.

VRS TWIN SCREW COMPRESSORS
SERVICE INTERVAL REQUIREMENTS

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in VRS Twin Screw Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
OIL CIRCUIT															
	Oil Change (1)		R		R		R		R		R		R		R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filters (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Strainer	I	I	I	I	I	I	I	I	I	I	I	I	I	I
PACKAGE															
	Coalescing Elements					R			R			R			R
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Inspect Compressor		I	I	I	I	I	I	I	I	I	I	I	I	I
	Bearings		I	I	I	I	I	I	I	I	I	I	I	I	I

Key I Inspect.
R Replace.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter(s) on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter(s) must be changed if the oil filter differential exceeds 12 psi or oil analysis requires it.

VSS, VSM and VSR SINGLE SCREW COMPRESSORS
SERVICE INTERVAL REQUIREMENTS
Based on WF-68 Refrigeration Oil Usage

The following service intervals are based on the usage of WF-68 refrigeration oil in VSS, VSM and VSR Single Screw Compressor units that meets specifications in the Vilter Manufacturing Corp. Single Screw Operation Manual.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
OIL CIRCUIT															
	Oil Change (1)		R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filters (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Strainer	I	I	I	I	I	I	I	I	I	I	I	I	I	I
PACKAGE															
	Coalescing Elements			I	R	I	R	I	R	I	R	I	R	I	R
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Inspect Compressor		I	I	I	I	I	I	I	I	I	I	I	I	I
	Bearings		I		I		I		I		I		I		I

Key I Inspect.
R Replace.
S Sample.

Notes: (1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at 6-month intervals if using WF-68 refrigeration oil.
(3) The oil filter(s) on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter(s) must be changed if the oil filter differential exceeds 12 psi or oil analysis requires it.

300 AND 400 SERIES VMC RECIPROCATING COMPRESSORS
SERVICE INTERVAL REQUIREMENTS
Based on WF-68 Refrigeration Oil Usage

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in 300 and 400 Series VMC Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
UNIT															
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	V-Belt Drive Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Water Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Electro-Mechanical Pressure Controls	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Oil Change (1)		R	R	R	R	R	R	R	R	R	R	R	R	R
	Flush Oil Circuit				R		R		R		R		R		R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filter (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Inspect Compressor (4)		I	I	I	I	I	I	I	I	I	I	I	I	I

Key I Inspect.
R Replace or Service.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter must be changed if the oil filter differential exceeds 25 psi or oil analysis requires it.
(4) To prevent possible breakdowns, the compressor should be opened and the condition of the valves, valve seats, liners and connecting rod bearings should be checked and excessively worn parts be replaced. At the same time the crankshaft bearing float should also be checked.

300 AND 400 SERIES VMC RECIPROCATING COMPRESSORS
SERVICE INTERVAL REQUIREMENTS
Based on WF-68 Refrigeration Oil Usage

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in 300 and 400 Series VMC Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
UNIT															
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	V-Belt Drive Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Water Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Electro-Mechanical Pressure Controls	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Oil Change (1)		R	R	R	R	R	R	R	R	R	R	R	R	R
	Flush Oil Circuit				R		R		R		R		R		R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filter (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Inspect Compressor (4)		I	I	I	I	I	I	I	I	I	I	I	I	I

Key I Inspect.
R Replace or Service.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter must be changed if the oil filter differential exceeds 25 psi or oil analysis requires it.
(4) To prevent possible breakdowns, the compressor should be opened and the condition of the valves, valve seats, liners and connecting rod bearings should be checked and excessively worn parts be replaced. At the same time the crankshaft bearing float should also be checked.

VRS TWIN SCREW COMPRESSORS
SERVICE INTERVAL REQUIREMENTS
Based on WF-68 Refrigeration Oil Usage

The following service intervals are based on the usage of Vilter Manufacturing Corporation Premium Grade refrigeration oil in VRS Twin Screw Compressor units.

GROUP	*INSPECTION OR MAINTENANCE ITEM*	*SERVICE INTERVAL (HOURS)*													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
OIL CIRCUIT															
	Oil Change (1)		R		R		R		R		R		R		R
	Oil Analysis (2)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filters (3)	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Strainer	I	I	I	I	I	I	I	I	I	I	I	I	I	I
PACKAGE															
	Coalescing Elements					R			R			R			R
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Liquid Line Strainers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
***CONTROL* CALIBRATION**															
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR															
	Inspect Compressor		I	I	I	I	I	I	I	I	I	I	I	I	I
	Bearings		I	I	I	I	I	I	I	I	I	I	I	I	I

Key I Inspect.
R Replace.
S Sample.

Notes:
(1) The oil should be changed at these intervals, unless oil analysis results exceed the allowable limits. The frequency of changes will depend on the system cleanliness.
(2) Oil analysis should be done at these intervals as a minimum; the frequency of analysis will depend on system cleanliness.
(3) The oil filter(s) on a minimum must be changed at these intervals or annually if not run continuously. However, the oil filter(s) must be changed if the oil filter differential exceeds 12 psi or oil analysis requires it.

VILTER®

Since 1867

Oil Recommendations for Warranty Coverage

SECTION 3

Issue : July,1999
Revision : 0
Revised: Initial Release

Vilter Manufacturing Corporation
Oil Recommendations for Warranty Coverage
Single Screw Compressors Only

Vilter Code	***717***	***HCL-68***	***F-68***	***FL-100***	***B-68***	***HCL-68***	***HC-68***	***D***
ISO Grade	68	68	68	100	68	68	68	68
@ 100 °F (cST)	77	75.7	65.67	649	71	75.7	67.2	68.5
Viscosity Index	100	140	79	115	114	140	168	65
Spec. Gravity	0.867	0.835	0.876	0.96	0.957	0.835	0.989	0.905
Density lbm/gal, 60 °F	7.4	6.96	7.30	8.26	8.02	6.96	8.25	7.52
Flash Point-°F	440	480	295	558	266	480	425	400
Fire Point-°F	475	530	315	633	296	530	465	420
Pour Point-°F	-38.2	-60	-31			-60	-55	-40
Floc Point-°F	-25	NA	-75	NA	NA	NA	NA	-35
Max. Disc. Press.-psia	286	291	274	274	***	291	242	286
Max. Disc. Temp.-°F	212	212	212	212	212	212	212	212
Max. Oil Injection-°F	140	140	140	140	140	140	140	140
Min. Evap. Temp.-°F	-38.2	-60	-31	-50	-60	-60	-60	-40
Min. Evap. Press.-psia	10.97	12.5	19.09	11.6	**	12.5	9.69	10.41
Refrigerant Type	**R-717**	**R-717**	**R-22**	**R-22**	**R-134a R-507 R-404A R-407C R-410A**	**R-1270**	**R-290**	**R-717**

Cross Reference Index

Vilter Part No.	Vilter Lube Type	Oil Type	Lube Oil Base Stock	Container Size	Used w/ Refrig. Type
2939A	717		Semi-synthetic	5 gallon pail	R-717
2939B	717		"	55 gallon drum	R-717
3103A	HCL-68		Synthetic	5 gallon pail	R-717
3103B	HCL-68		"	55 gallon drum	R-717
3105A	F-68		Semi-synthetic	5 gallon pail	R-22
3105B	F-68		"	55 gallon drum	R-22
3101A	FL-100		Synthetic	5 gallon pail	R-22
3101B	FL-100		"	55 gallon drum	R-22
3106A	B-68	POE	Ester	5 gallon pail	Blends
3106B	B-68	POE	"	55 gallon drum	Blends
3098A	HC-68		Synthetic	5 gallon pail	R-290
3098B	HC-68		"	55 gallon drum	R-290
3103A	HCL-68		Synthetic	5 gallon pail	R-1270
3103B	HCL-68		"	55 gallon drum	R-1270
3100A	Vilter D		Paraffinic	5 gallon pail	R-717 & R-22
3100B	Vilter D		Paraffinic	55 gallon drum	R-717 & R-22

Note: ** See saturation property table for specific refrigerant
*** Based on maximum condensing temperature of 120 °F

Vilter Manufacturing Corporation
Oil Recommendations for Warranty Coverage
All Twin Screw & Reciprocating Compressors Only

Vilter Code	***717***	***HCL-68***	***HCL-68***	***F-68***	***FL-150***	***B-120***	***HCL-100***	***HC-100***	***D***
ISO Grade	68	68	68	68	150	120	100	100	68
@ 100 °F (cST)	77	75.7	75.7	65.67	830	40.6	111.4	100.3	68.5
Viscosity Index	100	140	140	79	150	106	138	112	65
Spec. Gravity	0.867	0.835	0.835	0.876	1.01	0.940	0.839	0.992	0.905
Density lbm/gal, 60 °F	7.4	6.96	6.96	7.30	8.41	7.83	6.99	8.27	7.52
Flash Point-°F	440	480	480	295	555	505	510	500	400
Fire Point-°F	475	530	530	315	630	555	560	530	420
Pour Point-°F	-38.2	-60	-60	-31			-55	-40	-40
Floc Point-°F	-25	NA	NA	-75	NA	NA	NA	NA	-35
Max. Disc. Press.-psia	286	291	286	274	274	***	291	242	286
Max. Disc. Temp.-°F	212	212	212	212	190	212	212	212	212
Max. Oil Injection-°F	140	140	140	140	140	140	140	140	140
Min. Evap. Temp.-°F	-38.2	-60	-60	-31	-50	-16.6	-55	-40	-40
Min. Evap. Press.-psia	10.97	12.5	5.55	19.09	11.6	**	14.27	16.09	10.41
Refrigerant Type	**R-717**	**R-717**	**R-717**	**R-22**	**R-22**	**R-134a R-507 R-404A R-407C R-410A**	**R-1270**	**R-290**	**R-717**

Cross Reference Index

Vilter Part No.	Vilter Lube Type	Oil Type	Lube Oil Base Stock	Container Size	Used w/ Refrig. Type
2939A	717		Semi-synthetic	5 gallon pail	R-717
2939B	717		"	55 gallon drum	R-717
3103A	HCL-68		Synthetic	5 gallon pail	R-717
3103B	HCL-68		"	55 gallon drum	R-717
3105A	F-68		Semi-synthetic	5 gallon pail	R-22
3105B	F-68		"	55 gallon drum	R-22
3102A	FL-150		Synthetic	5 gallon pail	R-22
3102B	FL-150		"	55 gallon drum	R-22
3107A	B-120	POE	Ester	5 gallon pail	Blends
3107B	B-120	POE	"	55 gallon drum	Blends
3099A	HC-100		Synthetic	5 gallon pail	R-290
3099B	HC-100		"	55 gallon drum	R-290
3104A	HCL-100		Synthetic	5 gallon pail	R-1270
3104B	HCL-100		"	55 gallon drum	R-1270
3100A	Vilter D		Paraffinic	5 gallon pail	R-717 & R-22
3100B	Vilter D		Paraffinic	55 gallon drum	R-717 & R-22

Note: ** See saturation property table for specific refrigerant
*** Based on maximum condensing temperature of 120 °F

Vilter Single Screw Compressors

Vilter 5/15 warranty is valid for the above lube oil selections only, WITH THE EXCEPTION OF THE “D” TYPE OIL (WARRANTY EXCLUSION).

The standard Vilter 2-year warranty is applicable if the “D” type oil is utilized.

Vilter Reciprocating Compressors

The standard Vilter 2-year warranty is applicable to all lube oil selections above.

Vilter Twin Screw Compressors

The standard Vilter 2-year warranty is applicable to all lube oil selections above.

General: Oil analysis per service schedule interval is required to maintain warranty coverage.

These recommendations are based on a minimum oil supply temperature of 100 °F for start-up conditions. For applications installed outdoors or in a climate where the oil sump and supply temperature can fall below this minimum temperature requirement additional precautions will be necessary. Installations intended for outdoor duty or any ambient temperature less than 85 °F can experience start-up problems due to low oil injection temperature, oil dilution, foaming, high filter pressure drop, etc..

To prevent these situations from occurring the use of external heat tracing and insulation on all lube oil lines and oil coolers will be required to provide a sufficient injection supply temperature. Additionally, with screw compressor packages the oil separator provides a large amount of surface area for heat loss to the ambient air. To maintain the oil separator temperature in these environments a supplemental heat source (additional sump heaters) and separator insulation may be required.

As a minimum requirement the oil sump and injection temperature should be maintained at 100 °F, or 15 °F greater than the surrounding ambient, whichever is greater to prevent potential start-up conflicts related to cold, thick lube oil.

Operating conditions should be verified to ensure that the discharge gas superheat is greater than 25 °F. Discharge gas superheat is defined as the actual discharge gas temperature minus the refrigerant saturated temperature at discharge pressure.

The following fluid properties , pages 4 to 7, are based on pure lube oil only. Some lube oils will experience dilution with certain refrigerants, please see the miscibility and solubility curves in Section 2 for property correction to a specific operating condition.

717 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.5100	53.860	0.8631	71.340	0.08000
110	0.5120	53.614	0.8592	61.186	0.07960
120	0.5140	53.368	0.8553	51.032	0.07920
130	0.5160	53.122	0.8513	40.878	0.07880
140	0.5180	52.876	0.8474	30.724	0.07840
150	0.5200	52.630	0.8434	20.570	0.07800
160	0.5240	52.278	0.8378	18.238	0.07740
170	0.5280	51.926	0.8321	15.906	0.07680
180	0.5320	51.574	0.8265	13.574	0.07620
190	0.5360	51.222	0.8209	11.242	0.07560
200	0.5400	50.870	0.8152	8.910	0.07500

F-68 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4500	54.610	0.8752	55.570	0.07330
110	0.4530	54.310	0.8704	47.758	0.07304
120	0.4560	54.010	0.8655	39.946	0.07278
130	0.4590	53.710	0.8607	32.134	0.07252
140	0.4620	53.410	0.8559	24.322	0.07226
150	0.4650	53.110	0.8511	16.510	0.07200
160	0.4696	52.812	0.8463	14.586	0.07176
170	0.4742	52.514	0.8416	12.662	0.07152
180	0.4788	52.216	0.8368	10.738	0.07128
190	0.4834	51.918	0.8320	8.814	0.07104
200	0.4880	51.620	0.8272	6.890	0.07080

FL-100 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4250	60.400	0.9679	126.880	0.07000
110	0.4290	59.892	0.9598	112.296	0.06980
120	0.4330	59.384	0.9517	97.712	0.06960
130	0.4370	58.876	0.9435	83.128	0.06940
140	0.4410	58.368	0.9354	68.544	0.06920
150	0.4450	57.860	0.9272	53.960	0.06900
160	0.4480	57.330	0.9188	46.116	0.06900
170	0.4510	56.800	0.9103	38.272	0.06900
180	0.4540	56.270	0.9018	30.428	0.06900
190	0.4570	55.740	0.8933	22.584	0.06900
200	0.4600	55.210	0.8848	14.740	0.06900

FL-150 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4100	60.640	0.9718	166.600	0.07200
110	0.4130	60.124	0.9635	143.160	0.07190
120	0.4160	59.608	0.9553	119.720	0.07180
130	0.4190	59.092	0.9470	96.280	0.07170
140	0.4220	58.576	0.9387	72.840	0.07160
150	0.4250	58.060	0.9304	49.400	0.07150
160	0.4290	57.532	0.9220	43.776	0.07140
170	0.4330	57.004	0.9135	38.152	0.07130
180	0.4370	56.476	0.9051	32.528	0.07120
190	0.4410	55.948	0.8966	26.904	0.07110
200	0.4450	55.420	0.8881	21.280	0.07100

B-68 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4280	58.410	0.9361	66.080	0.07300
110	0.4318	58.022	0.9298	57.114	0.07280
120	0.4356	57.634	0.9236	48.148	0.07260
130	0.4394	57.246	0.9174	39.182	0.07240
140	0.4432	56.858	0.9112	30.216	0.07220
150	0.4470	56.470	0.9050	21.250	0.07200
160	0.4506	56.010	0.8976	18.898	0.07180
170	0.4542	55.550	0.8902	16.546	0.07160
180	0.4578	55.090	0.8829	14.194	0.07140
190	0.4614	54.630	0.8755	11.842	0.07120
200	0.4650	54.170	0.8681	9.490	0.07100

B-120 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4040	58.170	0.9322	133.480	0.08400
110	0.4078	57.782	0.9260	113.960	0.08300
120	0.4116	57.394	0.9198	94.440	0.08200
130	0.4154	57.006	0.9136	74.920	0.08100
140	0.4192	56.618	0.9073	55.400	0.08000
150	0.4230	56.230	0.9011	35.880	0.07900
160	0.4266	55.890	0.8957	31.616	0.07780
170	0.4302	55.550	0.8902	27.352	0.07660
180	0.4338	55.210	0.8848	23.088	0.07540
190	0.4374	54.870	0.8793	18.824	0.07420
200	0.4410	54.530	0.8739	14.560	0.07300

HC-68 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4900	60.590	0.9710	68.530	0.08500
110	0.4920	60.142	0.9638	59.594	0.08500
120	0.4940	59.694	0.9566	50.658	0.08500
130	0.4960	59.246	0.9495	41.722	0.08500
140	0.4980	58.798	0.9423	32.786	0.08500
150	0.5000	58.350	0.9351	23.850	0.08500
160	0.5040	58.050	0.9303	21.358	0.08480
170	0.5080	57.750	0.9255	18.866	0.08460
180	0.5120	57.450	0.9207	16.374	0.08440
190	0.5160	57.150	0.9159	13.882	0.08420
200	0.5200	56.850	0.9111	11.390	0.08400

HC-100 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.4700	60.590	0.9710	112.580	0.08700
110	0.4740	60.292	0.9662	98.768	0.08680
120	0.4780	59.994	0.9614	84.956	0.08660
130	0.4820	59.696	0.9567	71.144	0.08640
140	0.4860	59.398	0.9519	57.332	0.08620
150	0.4900	59.100	0.9471	43.520	0.08600
160	0.4940	58.800	0.9423	38.852	0.08580
170	0.4980	58.500	0.9375	34.184	0.08560
180	0.5020	58.200	0.9327	29.516	0.08540
190	0.5060	57.900	0.9279	24.848	0.08520
200	0.5100	57.600	0.9231	20.180	0.08500

HCL-68 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity BTU/h-ft^2 - °F/ft
100	0.5200	51.620	0.8272	62.550	0.09400
110	0.5240	51.470	0.8248	54.366	0.09380
120	0.5280	51.320	0.8224	46.182	0.09360
130	0.5320	51.170	0.8200	37.998	0.09340
140	0.5360	51.020	0.8176	29.814	0.09320
150	0.5400	50.870	0.8152	21.630	0.09300
160	0.5460	50.570	0.8104	19.282	0.09280
170	0.5520	50.270	0.8056	16.934	0.09260
180	0.5580	49.970	0.8008	14.586	0.09240
190	0.5640	49.670	0.7960	12.238	0.09220
200	0.5700	49.370	0.7912	9.890	0.09200

HCL-100 Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity $BTU/h\text{-}ft^2$ - °F/ft
100	0.5100	52.360	0.8391	101.520	0.09200
110	0.5140	52.062	0.8343	87.206	0.09180
120	0.5180	51.764	0.8296	72.892	0.09160
130	0.5220	51.466	0.8248	58.578	0.09140
140	0.5260	51.168	0.8200	44.264	0.09120
150	0.5300	50.870	0.8152	29.950	0.09100
160	0.5360	49.224	0.7888	26.556	0.09080
170	0.5420	47.578	0.7625	23.162	0.09060
180	0.5480	45.932	0.7361	19.768	0.09040
190	0.5540	44.286	0.7097	16.374	0.09020
200	0.5600	42.640	0.6833	12.980	0.09000

D Thermophysical Oil Properties for Pure Fluid

Temp °F	Specific heat BTU/lbm - °F	Density Lbm/ft^3	Specific Gravity	Viscosity CP	Conductivity $BTU/h\text{-}ft^2$ - °F/ft
100	0.4500	54.610	0.8752	61.740	0.07330
110	0.4520	54.310	0.8704	52.782	0.07302
120	0.4540	54.010	0.8655	43.824	0.07274
130	0.4560	53.710	0.8607	34.866	0.07246
140	0.4580	53.410	0.8559	25.908	0.07218
150	0.4600	53.110	0.8511	16.950	0.07190
160	0.4640	52.812	0.8463	14.972	0.07168
170	0.4680	52.514	0.8416	12.994	0.07146
180	0.4720	52.216	0.8368	11.016	0.07124
190	0.4760	51.918	0.8320	9.038	0.07102
200	0.4800	51.620	0.8272	7.060	0.07080

Material Safety Data Sheets (MSDS)

SECTION 4

Vilter 717

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	61 - 75	55-61 & 75-78	<55 & >78
Antioxidant Level	% Remaining	Liquid Chromatography	100	15	<5
Acid Number	mg KOH/g	ASTM D-974	0.06	0.8	1.0
Pour Point		ASTM D-97	-36°C	-36°C	>-36°C
Phosphorus	PPM	Plasma Emission	0	1 – 20	>20
Zinc	PPM	Plasma Emission	0	1 – 20	>20
Calcium	PPM	Plasma Emission	0	1 – 20	>20
Barium	PPM	Plasma Emission	0	1 – 20	>20
Iron	PPM	Plasma Emission	0	5-10	>15
Copper	PPM	Plasma Emission	0	5-10	>10
Lead	PPM	Plasma Emission	0	5-10	>10
Tin	PPM	Plasma Emission	0	5-10	>10
Aluminum	PPM	Plasma Emission	0	5-10	>10
Silicon	PPM	Plasma Emission	0	10-15	>15
Molybdenum	PPM	Plasma Emission	0	1-20	>20
Water Content	PPM	Karl Fischer	<75	100	>100
Particle Count	Micron	Hiac Royco	ISO CODE 14/10	ISO CODE XX/19	ISO CODE XX/>19

XX Any Number

B-68

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	61-68	50-60 & 69-75	<50 & >75
Antioxidant Level	% Remaining	Liquid Chromatography	NA	NA	NA
Acid Number	mg KOH/g	ASTM D-974	0.1	0.3 - 0.5	>0.5
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	10	>10
Copper	PPM	Plasma Emission	0	10	>10
Lead	PPM	Plasma Emission	0	10	>10
Tin	PPM	Plasma Emission	0	10	>10
Aluminum	PPM	Plasma Emission	0	10	>10
Silicon	PPM	Plasma Emission	0	15	>15
Molybdenum	PPM	Plasma Emission	0	20	>20
Water Content	PPM	Karl Fischer	<100	100-200	>200
Particle Count	Micron	Hiac Royco	ISO CODE 17/14	ISO CODE XX/19	ISO CODE XX/>19

* This Parameter is not relevant to the Condition of the oil.
XX Any Number
Parameters used for lubricant analysis only. Not to be used for QC or specification purposes.

B-120

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	115-135	68-115 & 135-150	<68 & >150
Antioxidant Level	% Remaining	Liquid Chromatography	NA	NA	NA
Acid Number	mg KOH/g	ASTM D-974	0.1	0.3 - 0.5	>0.5
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	10	>10
Copper	PPM	Plasma Emission	0	10	>10
Lead	PPM	Plasma Emission	0	10	>10
Tin	PPM	Plasma Emission	0	10	>10
Aluminum	PPM	Plasma Emission	0	10	>10
Silicon	PPM	Plasma Emission	0	15	>15
Molybdenum	PPM	Plasma Emission	0	20	>20
Water Content	PPM	Karl Fischer	<100	100-200	>200
Particle Count	Micron	Hiac Royco	ISO CODE 17/14	ISO CODE XX/19	ISO CODE XX/>19

XX Any Number

F-68

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	52-60	42-52 & 60-66	<42 & >66
Antioxidant Level	% Remaining	Liquid Chromatography	NA	NA	NA
Acid Number	mg KOH/g	ASTM D-974	<0.1	0.4 - 0.5	>0.5
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	0 - 10	>10
Copper	PPM	Plasma Emission	0	0 - 10	>10
Lead	PPM	Plasma Emission	0	0 - 10	>10
Tin	PPM	Plasma Emission	0	0 - 10	>10
Aluminum	PPM	Plasma Emission	0	0 - 10	>10
Silicon	PPM	Plasma Emission	<50	0 - 15	>15
Molybdenum	PPM	Plasma Emission	0	0 - 20	>20
Water Content	PPM	Karl Fischer	<75	100-200	>200
Particle Count	Micron	Hiac Royco	ISO CODE 15/13	ISO CODE XX/19	ISO CODE XX/>19

XX Any Number
Parameters used only for lubricant analysis only. Not for QC or specification purposes

FL-100

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	90-110	50-90 & 110-120	<50 & >120
Antioxidant Level	% Remaining	Liquid Chromatography	*	*	*
Acid Number	mg KOH/g	ASTM D-974	0.2	0.5	>0.5
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	5-10	>10
Copper	PPM	Plasma Emission	0	5-10	>10
Lead	PPM	Plasma Emission	0	5-10	>10
Tin	PPM	Plasma Emission	0	5-10	>10
Aluminum	PPM	Plasma Emission	0	5-10	>10
Silicon	PPM	Plasma Emission	0	5-15	>15
Molybdenum	PPM	Plasma Emission	0	0-20	>20
Water Content	PPM	Karl Fischer	<100	100-200	>200
Particle Count	Micron	Hiac Royco	ISO CODE 15/13	ISO CODE XX/19	ISO CODE XX/>19

* This Parameter is not relevant to the Condition of the oil.
XX Any Number

FL-150

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	135-165	75-134 & 166-180	<75 & >180
Antioxidant Level	% Remaining	Liquid Chromatography	NA	NA	NA
Acid Number	mg KOH/g	ASTM D-974	0.2	0.5	>0.5
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	5-10	>10
Copper	PPM	Plasma Emission	0	5-10	>10
Lead	PPM	Plasma Emission	0	5-10	>10
Tin	PPM	Plasma Emission	0	5-10	>10
Aluminum	PPM	Plasma Emission	0	5-10	>10
Silicon	PPM	Plasma Emission	0	5-15	>15
Molybdenum	PPM	Plasma Emission	0	0-20	>20
Water Content	PPM	Karl Fischer	<100	100-200	>200
Particle Count	Micron	Hiac Royco	ISO CODE 15/13	ISO CODE XX/19	ISO CODE XX/>19

XX Any Number

HC-68

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	CSt	ASTM D-445	61 - 75	32 - 61 & 75 - 88	<32 & >88
Antioxidant Level	% Remaining	Liquid Chromatography	100	10	<10
Acid Number	mg KOH/g	ASTM D-974	*	*	*
Phosphorus	PPM	Plasma Emission	20	<5	0
Zinc	PPM	Plasma Emission	0	40	>40
Calcium	PPM	Plasma Emission	0	40	>40
Barium	PPM	Plasma Emission	0	40	>40
Iron	PPM	Plasma Emission	0	10	>10
Copper	PPM	Plasma Emission	0	10	>10
Lead	PPM	Plasma Emission	0	10	>10
Tin	PPM	Plasma Emission	0	10	>10
Aluminum	PPM	Plasma Emission	0	10	>10
Silicon	PPM	Plasma Emission	0	15	>15
Molybdenum	PPM	Plasma Emission	0	40	>40
Water Content	PPM	Karl Fischer	500	1%	>1%
Particle Count** N/A	Micron N/A	Hiac Royco N/A	ISO CODE 14/16	ISO CODE XX/19	ISO CODE XX/>19

* This Parameter is not relevant to the Condition of the oil.
XX Any Number
** This product is water-soluble. We are unable to use water as a solvent for the particle count.

HC-100

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	95 - 110	48-60 & 115-120	<48 & >120
Antioxidant Level	% Remaining	Liquid Chromatography	100	10	<10
Acid Number	mg KOH/g	ASTM D-974	*	*	*
Phosphorus	PPM	Plasma Emission	20	<5	0
Zinc	PPM	Plasma Emission	0	40	>40
Calcium	PPM	Plasma Emission	0	40	>40
Barium	PPM	Plasma Emission	0	40	>40
Iron	PPM	Plasma Emission	0	10	>10
Copper	PPM	Plasma Emission	0	10	>10
Lead	PPM	Plasma Emission	0	10	>10
Tin	PPM	Plasma Emission	0	10	>10
Aluminum	PPM	Plasma Emission	0	10	>10
Silicon	PPM	Plasma Emission	0	15	>15
Molybdenum	PPM	Plasma Emission	0	40	>40
Water Content	PPM	Karl Fischer	500	1%	>1%
Particle Count ** N/A	Micron N/A	Hiac Royco N/A	ISO CODE 14/16	ISO CODE XX/19	ISO CODE XX/>19

* This Parameter is not relevant to the Condition of the oil in this application; however it may show acidity of the gas stream.
XX Any Number
** This product is water-soluble. We are unable to use water as a solvent for particle count.

Vilter D

PROPERTY	UNITS	TEST-METHOD	NEW OIL	MARGINAL	UNACCEPTABLE
Viscosity @ 40C	cSt	ASTM D-445	57-68	50-57 & 68-75	<50 & >75
Antioxidant Level	% Remaining	Liquid Chromatography	*	*	*
Acid Number	mg KOH/g	ASTM D-974	<0.2	0.8 - 1.0	>1.0
Phosphorus	PPM	Plasma Emission	0	0 - 20	>20
Zinc	PPM	Plasma Emission	0	0 - 20	>20
Calcium	PPM	Plasma Emission	0	0 - 20	>20
Barium	PPM	Plasma Emission	0	0 - 20	>20
Iron	PPM	Plasma Emission	0	0 - 10	>10
Copper	PPM	Plasma Emission	0	0 - 10	>10
Lead	PPM	Plasma Emission	0	0 - 10	>10
Tin	PPM	Plasma Emission	0	0 - 10	>10
Aluminum	PPM	Plasma Emission	0	0 - 10	>10
Silicon	PPM	Plasma Emission	0	0 - 15	>15
Molybdenum	PPM	Plasma Emission	0	0 - 20	>20
Water Content	PPM	Karl Fischer	<55	200-300	>300
Particle Count	Micron	Hiac Royco	ISO CODE 17/15	ISO CODE XX/19	ISO CODE XX/>19

XX Any Number
Parameters used only for lubricant analysis only. Not for QC or specification purposes

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter 717
Chemical Name: Semi-synthetic Hydrocarbon
Chemical Family: Mineral Oil
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 191 0.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 **Physical Data**

Appearance: Colorless liquid
Boiling Point: >500°F
Vapor Pressure: <0.1 mmHg ~20°C
Specific Gravity (water = 1): 0.86-0.87
Volatiles, Percent by Volume: 0%
Odor: slight
Solubility in Water: insoluble
Evaporation Rate (butyl acetate~1): nil

Section 5 **Fire and Explosion Hazards**

Flash Point (by Cleveland Open Cup): 216-232°C (420-450°F)
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Dry chemical; CO_2 foam

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water carefully to cool fire-exposed containers. Spraying water directly on hot or burning liquid may cause frothing or splashing.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong Oxidizers
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: 5mg/m^3 for oil mist
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

- Ingestion: DO NOT INDUCE VOMITING. Consult physician at once. DO NOT give anything by mouth if the person is unconscious or having convulsions.
- Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.
- Contact: Prolonged exposure may irritate the skin. Wash exposed skin with soap and water.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for long term exposure
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, or commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all who use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter HCL-68
Chemical Name: Polyalphaolefin
Chemical Family: Synthetic Hydrocarbon
Formula: $C_{1n}H_{20n}+_2$
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 Physical Data

Appearance: Clear liquid, yellow to light brown tint
Boiling Point: >300°F
Vapor Pressure: <0.01mmHg @ 20°C
Specific Gravity (water = 1): 0.79-0.85
Volatiles, Percent by Volume: 0%
Odor: None
Solubility in Water: Insoluble
Evaporation Rate (butyl acetate=1): Nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): 425°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Dry chemical; CO_2 foam; water spray (fog)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water to cool fire-exposed containers. Use water carefully near exposed liquid to avoid frothing and splashing of hot liquid.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide carbon dioxide and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: 5mg/m^3 ACGIH
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. DO NOT INDUCE VOMITING. May cause nausea and diarrhea.

Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicity of this product has not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for prolonged exposure.
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter F-68
Chemical Name: Semi-synthetic hydrocarbon blend
Chemical Family: Petroleum hydrocarbon/ alkylate
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 **Physical Data**

Appearance: colorless to light amber
Boiling Point: >315°F
Vapor Pressure: <0.5 mmHg @20°C
Specific Gravity (water = 1): 0.815 - 0.876
Volatiles, Percent by Volume: 0%
Odor: slight
Solubility in Water: insoluble
Evaporation Rate (butyl acetate =1): nil

Section 5 **Fire and Explosion** Hazards

Flash Point (by Cleveland Open Cup): 275 - 295°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0
Personal Protection:	B

NFPA Ratings in air: not established

Extinguishing Media: Dry chemical; CO_2 foam, water fog

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water carefully to cool fire-exposed containers. Spraying water directly on hot or burning liquid may cause frothing or splashing.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong Oxidizers
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: 5mg/m^3 for oil mist
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

- Ingestion: DO NOT INDUCE VOMITING. Consult physician at once. DO NOT give anything by mouth if the person is unconscious or having convulsions.
- Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.
- Contact: Prolonged exposure may irritate the skin. Wash exposed skin with soap and water.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for long term exposure
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, or commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter FL-100
Chemical Name: Ester
Chemical Family: PolyoI Ester
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use. Product will absorb moisture from the air. Storage under nitrogen highly recommended.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 **Physical Data**

Appearance: Clear liquid, yellow to light brown tint
Boiling Point: 650°F
Vapor Pressure: <0.01mmHg @ 20°C
Specific Gravity (water = 1): 0.99 - 1.03
Volatiles, Percent by Volume: 0%
Odor: Mild, distinct
Solubility in Water: Insoluble
Evaporation Rate (Butyl Acetate = 1): Nil

Section 5 **Fire and Explosion Hazards**

Flash Point (by Cleveland Open Cup): >530°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Dry chemical: CO_2 foam

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water carefully to cool fire-exposed containers. Water spray may cause frothing or splashing of hot material.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers, caustic or acidic solutions
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. May cause nausea and diarrhea.
Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicity of this product has not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection:	Use in well-ventilated area
Ventilation:	Local exhaust
Protective:	Gloves: Not required, but recommended, especially for prolonged exposure.
Eye/Face Protection:	Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter FL-150
Chemical Name: Ester
Chemical Family: Polyol Ester
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use. Product will absorb moisture from the air. Storage under nitrogen highly recommended.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 **Physical Data**

Appearance: Clear liquid, yellow to light brown tint
Boiling Point: 650°F
Vapor Pressure: <0.01mmHg @ 20°C
Specific Gravity (water = 1): 0.99 - 1.03
Volatiles, Percent by Volume: 0%
Odor: Mild, distinct
Solubility in Water: Insoluble
Evaporation Rate (butyl acetate = 1): Nil

Section 5 **Fire and Explosion Hazards**

Flash Point (by Cleveland Open Cup): >530°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Dry chemical; CO_2 foam

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water carefully to cool fire-exposed containers. Water spray may cause frothing or splashing of hot material.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers, caustic or acidic solutions
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. May cause nausea and diarrhea.
Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicity of this product has not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for prolonged exposure.
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid(i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter B-68
Chemical Name: Ester
Chemical Family: Polyol Ester
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use. Product is Hygroscopic. Storage under nitrogen highly recommended.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 **Physical Data**

Appearance: Clear liquid, gray to yellow or light brown tint
Boiling Point: > 650°F
Vapor Pressure: < 0.01 mmHg @ 20°C
Specific Gravity (water = 1): 0.94 - 0.97
Volatiles, Percent by Volume: 0%
Odor: Mild, distinct
Solubility in Water: Negligible
Evaporation Rate (butyl acetate = 1): Nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): 230 - 300°C
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

Extinguishing Media: Dry chemical; CO_2 foam; water fog (see below)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water fog to cool fire-exposed containers. USE WATER CAREFULLY NEAR EXPOSED/BURNING LIQUIDS. May cause frothing and splashing of hot material.

Section 6 **Reactivity Data**

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers, caustic or acidic solutions
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide and other unidentified fragments when burned. See Section 5.

This product may degrade some paints and rubber materials.

Section 7 **Health Hazard Data**

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. May cause nausea and diarrhea.
Inhalation: Product is not toxic by inhalation, If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 **Personal Protection Information**

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Strongly recommended, especially for prolonged exposure.
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter B-120
Chemical Name: Ester
Chemical Family: Polyol Ester
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 191 0.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use. Product is Hygroscopic. Storage under nitrogen highly recommended.

Section 4 Physical Data

Appearance: Clear liquid, gray to yellow or light brown tint
Boiling Point: > 650°F
Vapor Pressure: < 0.01 mmHg @ 20°C
Specific Gravity (water = 1): 0.94 - 0.97
Volatiles, Percent by Volume: 0%
Odor: Mild, distinct
Solubility in Water: Negligible
Evaporation Rate (butyl acetate = 1): Nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): 230 - 300°C
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

Extinguishing Media: Dry chemical; CO_2 foam; water fog (see below)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water fog to cool fire-exposed containers. USE WATER CAREFULLY NEAR EXPOSED/BURNING LIQUIDS. May cause frothing and splashing of hot material.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers, caustic or acidic solutions
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

This product may degrade some paints and rubber materials.

Section 7 Health Hazard Data

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. May cause nausea and diarrhea.
Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Strongly recommended, especially for prolonged exposure.
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid(i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter HCL-100
Chemical Name: Polyalphaolefin
Chemical Family: Synthetic Hydrocarbon
Formula: $C_{10n}H_{20n}+_2$
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 191 0.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 Physical Data

Appearance: Clear liquid, yellow to light brown tint
Boiling Point: >300°F
Vapor Pressure: <0.01 mmHg ~ 20°C
Specific Gravity (water = 1): 0.79-0.85
Volatiles, Percent by Volume: 0%
Odor: None
Solubility in Water: Insoluble
Evaporation Rate (butyl acetate = 1): Nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): 425°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Dry chemical; CO_2 foam; water spray (fog)

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water to cool fire-exposed containers. Use water carefully near exposed liquid to avoid frothing and splashing of hot liquid.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: 5mg/m^3 ACGIH
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: Consult physician at once. DO NOT INDUCE VOMITING. May cause nausea and diarrhea.
Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

To the best of our knowledge, the toxicity of this product has not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for prolonged exposure.
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter HC-68
Chemical Name: Polyalkylene Glycol
Chemical Family: Polyglycol
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 191 0.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 Physical Data

Appearance: Clear liquid; gray to brown tint
Boiling Point: >400°F
Vapor Pressure: <0.01 mmHg ~ 20°C
Specific Gravity (water = 1): 0.99 - 1.01
Volatiles, Percent by Volume: 0%
Odor: slight
Solubility in Water: <1%
Evaporation Rate (butyl acetate = 1): nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): >218°C
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Water spray; Dry chemical; CO_2 foam
Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Do not spray water directly on fire. This may cause splashing and frothing of hot liquid.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers and materials incompatible with alcohols
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: DO NOT INDUCE VOMITING. Consult physician at once. DO NOT give anything by mouth if the person is unconscious or having convulsions.

Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

Contact: Wash exposed skin with soap and water. Flush eyes with large quantities of water and consult physician immediately.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Mechanical exhaust needed at elevated temperatures
Protective Gloves: Not required, but recommended, especially for long term exposure
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter HC-100
Chemical Name: Polyalkylene Glycol
Chemical Family: Polyglycol
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is **non-hazardous.** The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 Physical Data

Appearance: Clear liquid; gray to brown tint
Boiling Point: >400°F
Vapor Pressure: <0.01 mmHg @ 20°C
Specific Gravity (water = 1): 0.99 - 1.01
Volatiles, Percent by Volume: 0%
Odor: slight
Solubility in Water: <1%
Evaporation Rate (butyl acetate = 1): nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): >21 8°C
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

NFPA Ratings: not established

Extinguishing Media: Water spray; Dry chemical; CO_2 foam

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes.
Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus.
Do not spray water directly on fire. This may cause splashing and frothing of hot liquid.

Section 6 Reactivity Data

Stability: **Stable**
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong oxidizers and materials incompatible with alcohols
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide, and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: not established
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

Ingestion: DO NOT INDUCE VOMITING. Consult physician at once. DO NOT give anything by mouth if the person is unconscious or having convulsions.

Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.

Contact: Wash exposed skin with soap and water. Flush eyes with large quantities of water and consult physician immediately.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Mechanical exhaust needed at elevated temperatures
Protective Gloves: Not required, but recommended, especially for long term exposure
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, and commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Emergency Number: (517) 496-3780

Section 1 Product Name and Information

Product (Trade Name and Synonyms): Vilter D
Chemical Name: Semi-synthetic Hydrocarbon
Chemical Family: Petroleum Hydrocarbon
Formula: Proprietary
CAS#: Proprietary

Section 2 Components and Hazard Statement

This product is non-hazardous. The product contains no known carcinogens. No special warning labels are required under OSHA 29 CFR 1910.1200.

Section 3 Safe Handling and Storage

Handling. Do not take internally. Avoid contact with skin, eyes, and clothing. Upon contact with skin, wash with soap and water. Flush eyes with water for 15 minutes and consult physician. Wash contaminated clothing before reuse.

Storage. Keep container tightly sealed when not in use.

Vilter Manufacturing Corporation
5555 South Packard Avenue ▼ P.O. Box 8904 ▼ Cudahy, Wisconsin 53110-8904
(414) 744-0111 ▼ FAX (414) 744-3483

Section 4 Physical Data

Appearance: Colorless liquid
Boiling Point: >350°F
Vapor Pressure: <0.5 mmHg @20°C
Specific Gravity (water = 1): 0.89 - 0.905
Volatiles, Percent by Volume: 0%
Odor: slight
Solubility in Water: insoluble
Evaporation Rate (butyl acetate = 1): nil

Section 5 Fire and Explosion Hazards

Flash Point (by Cleveland Open Cup): 330 - 345°F
Flammable Limits: not established
Autoignition Temperature: no data
HMIS Ratings:

Health:	0
Flammability:	1
Reactivity:	0

Personal Protection: B NFPA Ratings in air: not established

Extinguishing Media: Dry chemical; CO_2 foam, water fog

Unusual Fire and Explosion Hazards: None

Special Fire Fighting Techniques: Burning fluid may evolve irritating/noxious fumes. Firefighters should use NIOSH/MNSA-approved self-contained breathing apparatus. Use water carefully to cool fire-exposed containers. Spraying water directly on hot or burning liquid may cause frothing or splashing.

Section 6 Reactivity Data

Stability: Stable
Hazardous Polymerization: Will not occur
Incompatible Materials: Strong Oxidizers
Conditions to Avoid: Excessive heat
Hazardous Decomposition Products: Analogous compounds evolve carbon monoxide, carbon dioxide and other unidentified fragments when burned. See Section 5.

Section 7 Health Hazard Data

Threshold Limit Value: 5mg/m^3 for oil mist
Situations to Avoid: Avoid breathing oil mists
First Aid Procedures:

- Ingestion: DO NOT INDUCE VOMITING. Consult physician at once. DO NOT give anything by mouth if the person is unconscious or having convulsions.
- Inhalation: Product is not toxic by inhalation. If oil mist is inhaled, remove to fresh air and consult physician.
- Contact: Prolonged exposure may irritate the skin. Wash exposed skin with soap and water.

To the best of our knowledge, the toxicological properties of these compounds have not been fully investigated. Analogous compounds are considered essentially non-toxic.

Section 8 Personal Protection Information

Respiratory Protection: Use in well-ventilated area
Ventilation: Local exhaust
Protective Gloves: Not required, but recommended, especially for long term exposure
Eye/Face Protection: Goggles

Section 9 Spill or Leak Procedures

In Case of Spill: Wear suitable protective equipment, especially goggles. Stop source of spill. Dike spill area. Use absorbent materials to soak up fluid (i.e. sand, sawdust, or commercially available materials). Wash spill area with large amounts of water. Properly dispose of all materials.

Section 10 Waste Disposal Methods

Incinerate this product and all associated wastes in a licensed facility in accordance with Federal, state, and local regulations.

The information in this material safety data sheet should be provided to all that use, handle, store, transport, or are otherwise exposed to this product. We believe the information in this document to be reliable and up to date as of the date of publication, but makes no guarantee that it is.

Issue Date: July, 1999
Revision No: 0
Revision Date: Initial Release

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