VARNA Products

Engineered | Innovation

ML-2 & 4 Lube Pump

Compact, Heavy Duty, Industrial, Quality

100% Duty Cycle 3 Phase Motor

Flow rate up to 4 GPM or 15 LPM

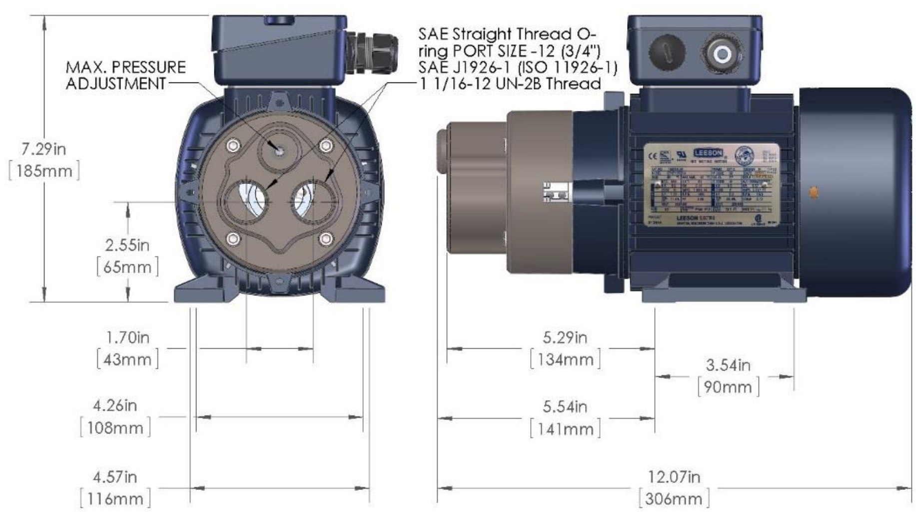
Integrated Pressure bypass

Direct Shaft Coupling, Simple, Long Life

Specifications and Features Comparison		ML-2	ML-4
Operating AC Voltage		60Hz 230/460 - 50Hz 200/400	
Maximum Flow Rate	60Hz	2.6 GPM / 9.8 LPM	4.0 GPM / 15.1 LPM
	50Hz	2.2 GPM / 8.3 LPM	3.4 GPM / 12.9 LPM
Attainable Pressure		>80psi / 5.5bar	
Pressure Bypass Setting Range		30-80psi / 2.0 - 5.5 bar	
Whisper-Vane Positive Displacement Technology, Self Priming		>3ft / 1m	
Port Size, SAE straight thread O-ring **(Not compatible with Pipe Thread)**		3/4" (-12)	
Maximum Oil temperature		250°f / 120°c	
Oil Viscosity Range		30 - 2000 cSt	20 - 2000 cSt

Wetted Materials:

- Phosphate Carbon Steel
- Stainless Steel
- Anodized Aluminum
- Viton Rubber



VARNA Products

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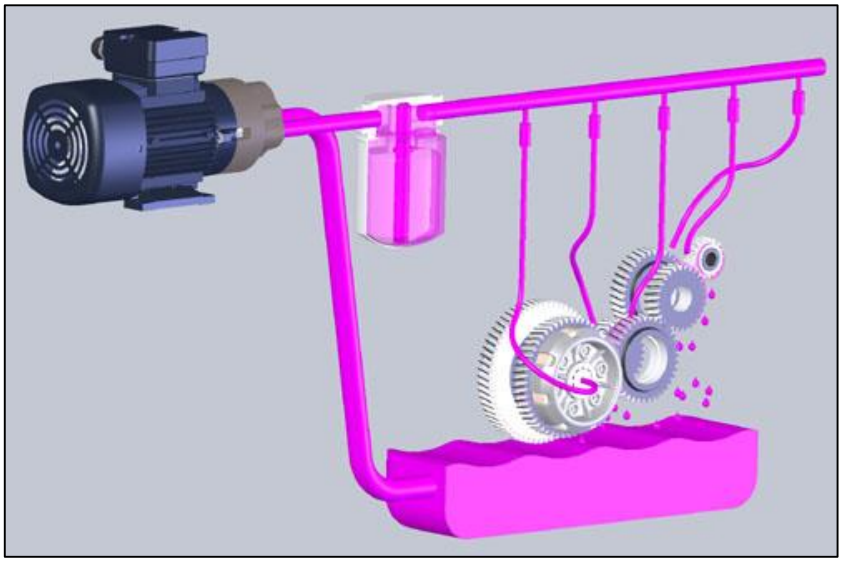
General

The ML series lube pumps are designed for pumping lubricating oils. With two models to choose from, producing either a maximum of 4.0 or 2.6 gallons per minute, they are a great fit for a range of industrial applications. They are self-priming and quiet-running vane pump that can produce over 80 psi (5.5 bar) pressure.



The ML pumps also feature an integrated bypass valve to set pressure within the system. The bypass setting can be externally set to limit pressure to 30-80 psi with a simple 3/16” allen wrench. On the fly adjustment allows the lube system to be tuned in real time, while it is running for optimal performance.

Basics of Lube Oil Distribution

An effective lubrication oil system needs to provide a consistent flow of oil to each distribution point. While that may seem straightforward, changes in lube oil viscosity can introduce drastic deviations in flow within a system that is not configured correctly. In the worst cases, it may even result in no flow at some lube points.

Long lube lines and differences in elevation between points can add up to the potential problems as the temperature changes.

Long Lines and Elevation

When using a single pump to lubricate a large machine, lube points of different elevations or with differing tube lengths can see significant variability in flow as oil viscosity changes in response to temperature.

It takes about 0.5 psi per foot elevation gain to push the oil to a higher lubrication point. As the oil temperature rises, the oil viscosity drops, and elevation differences as small as a foot could cause the oil flow to an upper lubrication point to stop altogether.

Viscosity & Pressure Example

Water flowing through a 5ft length of 1/4in ID tubing has a Reynolds number of 13,400 at room temperature. The flow is turbulent. The pressure to push the water through the tube is 1.7 psi.

The same tube with the same fluid flow rate and temperature (1.75 gpm and 72°F) but this time with SAE 20 engine oil rather than water has a Reynolds Number of 140. The flow is now laminar. The pressure to push the oil through the tube this time is 87 psi!

Raise the oil temperature to 180°F, the Reynolds number increases to 1,650. Flow is still laminar but the pressure to push the oil through the tube drops to 8 psi.

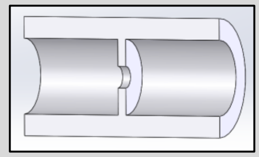
Similarly, when oil flow is laminar, as is the case with most lube oil in tubing, each length of tube has a cumulative effect on pressure drop. This means that a tube leading to a lube point near the pump and one leading to the far side of a machine could end up with radically different flow rates as a result of the longer tubes greater pressure drop when the oil is cold. These pressure loss and elevation differences result in a variability in flow as temperature changes effect oil viscosity.

Flow Restrictive Orifices

The solution to this viscosity-induced variability is to place orifice flow restrictors in each lubrication line to set the desired flow for each lubrication point. Orifices have the beneficial property of creating a pressure restriction that is largely independent of oil viscosity and therefore independent of changes in the oil temperature. In order to capture the benefit, the orifice needs to have a substantially greater pressure restriction than the tube itself. As a rule, the tube diameter and any fittings should have an inside diameter of at least 5 times the orifice diameter.

As an example, a system where the length of the tubing would have a pressure drop of 5psi with the coldest oil combined with an orifice that would produce maybe 40 psi would result in flow that remains effectively constant as the oil viscosity changes with temperature. A valve such as a needle valve can also be used to approximate an orifice.

Pressure drop through an orifice



$$\text{Pressure Drop} = \frac{0.001 \cdot (\text{GPM})^2}{(\text{Orifice Diameter in inches})^4}$$

$$\text{Pressure Drop} = \frac{2.0 \cdot (\text{LPM})^2}{(\text{Orifice Diameter in mm})^4}$$

For oil flowing through an orifice, the pressure required can be approximated within about 5% with these formulas.

If valves are used rather that orifices, consult the valve data sheets for the correct valve for the desired oil flow.

Constant Flow or Constant Pressure

There are two ways to set up a multiple point lubrication system that will use the property of an orifice to ensure substantially constant flow at multiple lube points. They are constant flow, and constant pressure. Either system can work but constant pressure is decidedly easer to set up and more versatile.

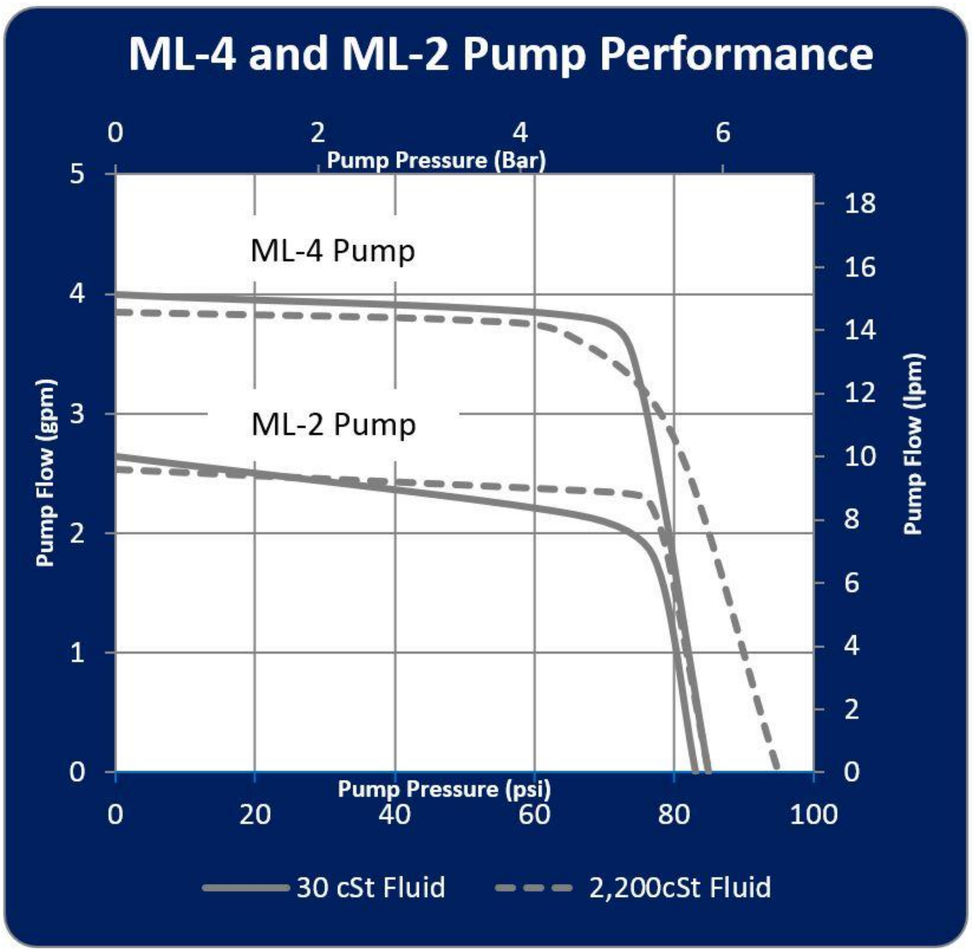
<u>Constant Flow</u> uses a positive displacement pump to generate a fixed flow of oil no matter how restricted the oil tubes are. Each oil line to a particular lubrication point has a valve or orifice that is the primary flow restriction for that line. The sum of the flows in all the lines must remain equal to the fixed flow of the pump. The pressure at the pump outlet is the pressure that will cause the sum of the flows through all the lines to be equal to the pump flow. Changing the restriction in one line will change the flow in all the other lines as well because the grand total of all the lubricant flows must remain unchanged. The flow of one lubrication line therefore cannot be changed independently of the others.

<u>Constant Pressure</u> uses a positive displacement pump such as the ML series that has a pressure bypass that maintains the maximum pump output pressure at a set value. The flow restrictors will all see the same pressure regardless of the settings of the other restrictors.

Unlike in constant flow, the restriction in one lubrication line can be adjusted without affecting the flow in the other lines because the bypass valve takes up the difference. In essence, the pressure bypass valve in the pump is like another orifice in the system except that it changes size on the fly to hold the rest of the orifices at their designed flow.

System Setup

The size of the tubing and the size of orifice in each line must be chosen to work together. As a rule of thumb, the tube size should be at least five times the orifice size. In order for constant pressure to result in constant flow, the pressure loss in the tube and any fittings should be less than 20% of the orifice loss when calculated for the coldest and thickest oil that may be used in the system.



Start by picking a target pressure for the orifice restrictions. Higher pressures need a higher horsepower pump but the diameter of the tubing can be smaller. Lower pressures will require larger diameter tubing but they can use a lower horsepower pump. A good starting pressure might be 30 psi.

Calculate the losses for each length of tube using the desired flow for that line and the coldest oil present during a cold startup. If the losses in a particular line exceed 20% of the operating pressure, increase the diameter of the plumbing. If tubing diameter is coming out too big to be practical, the target operating pressure can be increased. The ML pumps can be set as high as 80psi.

Once the operating pressure is chosen, the orifice sizes can be chosen. They are usually located within a fitting such as a nipple or coupling and can be placed anywhere in the line.

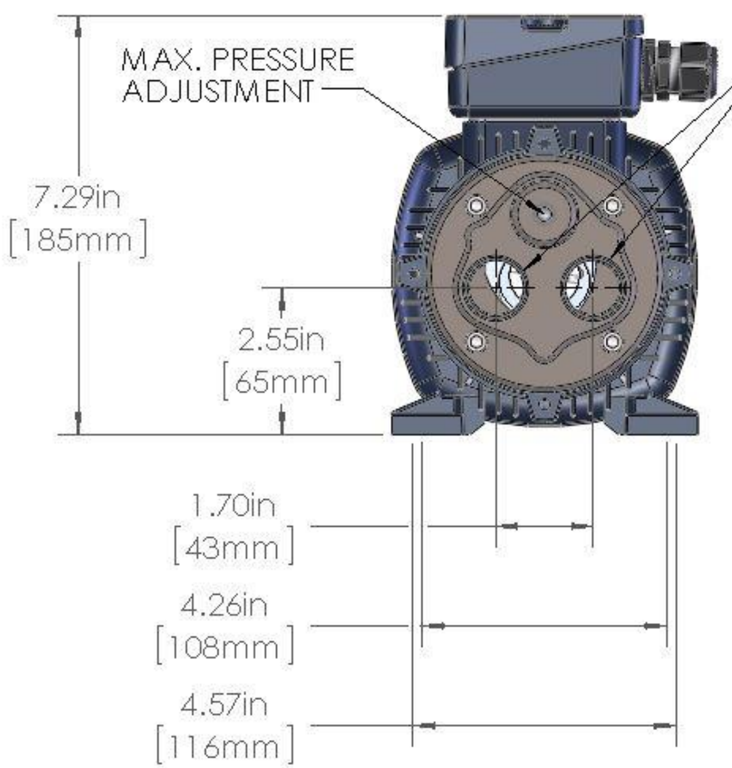
Application Engineering

It is challenging to address every possible installation type. We are always happy to help in choosing an appropriate installation setup. Give us a call for engineering assistance and support. 888-676-7774

Part#	FREQ.	Max. Flow Rate
7520 ML-2	60Hz	2.6 GPM / 9.8 LPM
	50Hz	2.2 GPM / 8.3 LPM
7530 ML-4	60Hz	4.0 GPM / 15.1 LPM
	50Hz	3.4 GPM / 12.9 LPM

REVISIONS			
REV.	DESCRIPTION	DATE	APP'D
☒ ☒		☒	☒

SAE Straight Thread O-ring
PORT SIZE -12 (3/4") SAE
J1926-1 (ISO 11926-1)
1 1/16-12 UN-2B Thread



NOTES:
1. VOLTAGE 230/460 @ 60Hz or 200/400 @ 50Hz
2. MAX. PRES. SETTABLE FROM 30-80 PSI ~ 2.0-5.5Bar
3. CONTINUES DUTY.
4. SELF PRIMING, LIFT IN EXCESS OF 3FT ~ 1m
5. WETTED MATERIALS: TYPII ANODIZED ALUMINUM, MANGANESE PHOSPHATE, STAINLESS & CARBON STEEL, VITON.
6. MAX. TEMP.: 250ºF ~ 120ºC
7. MAX. FLUID VISCOSITY: 2,200cSt
8. WEIGHT: 17.0 Lbs ~ 7.7 Kg

Material: -

Approvals		Date
DWN.	MSA	12/24/15
ECEA #		
SCALE:1:3		

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
X = ± .030
XX = ± .015
XXX = ± .005
ANGLES = ± .5º
FINISHES INDICATED ARE MAXIMUM VALUES

7520 PUMP, ML-2 &
7530 PUMP. ML-4 W/ AC 3P Mtr.

Part No. 7520 & 7530

Rev.