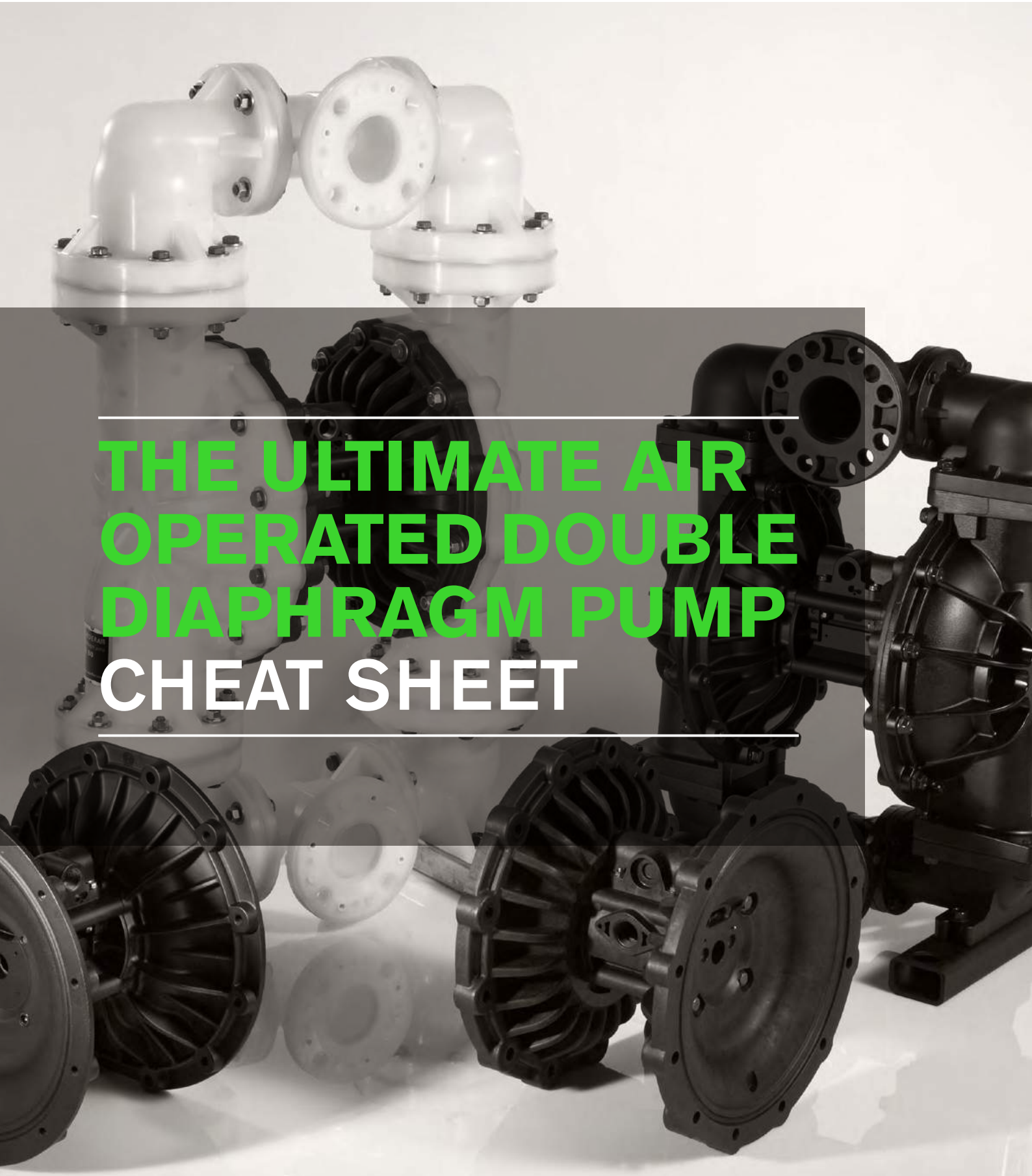
Global Pumps



THE ULTIMATE AIR OPERATED DOUBLE DIAPHRAGM PUMP CHEAT SHEET

INTRODUCTION

The Air Operated Double Diaphragm Pump (AODD) is the most commonly used portable pump in mining, chemical and general applications. It belongs to the family of positive displacement pumps, which is driven by compressed air rather than electricity. The working principle revolves around a combination of reciprocating actions by different components, such as the diaphragm, valve seats and valve balls (or flap valves) working together to pump the liquid.

Diaphragm pumps have several characteristics that are generally not available in most other types of pumps.

1. These pumps have self-priming capabilities up to 7 meters suction lift
2. They can run dry without damage
3. They are capable of handling highly viscous, highly volatile and dangerous liquids

As these pumps have such a wide range of attributes and can be used in a variety of pumping applications, Global Pumps has put together this ultimate cheat sheet to give you an understanding of the basics of air operated diaphragm pumps, allowing you to put this knowledge into practice.

Non-metallic

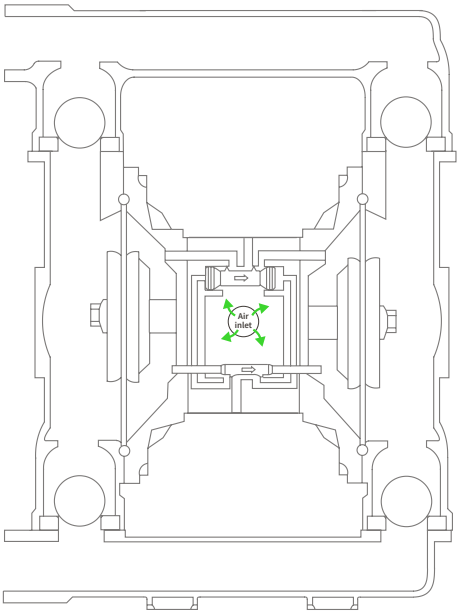
Metallic

Hygienic

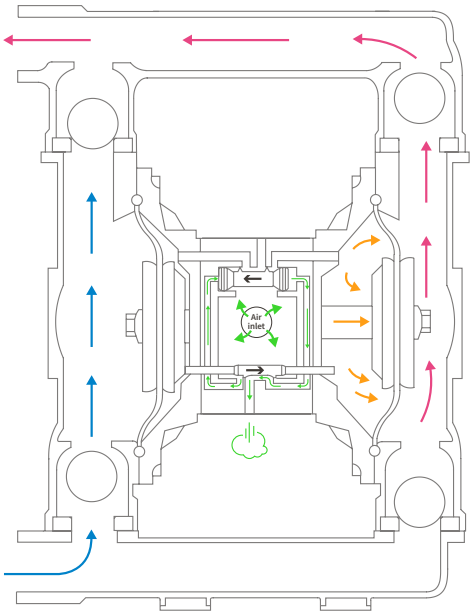
AIR OPERATED DIAPHRAGM PUMPS' OPERATION AND WORKING PRINCIPAL

THE PUMP'S CONTROL MECHANISM

The pumping action of AODD pumps is performed by means of an air valve (sometimes referred to as the air motor), which, when connected to compressed air, causes the pump shaft to reciprocate back and forth. The pump shaft is connected to a diaphragm on each side, which pumps the liquid through the pump.



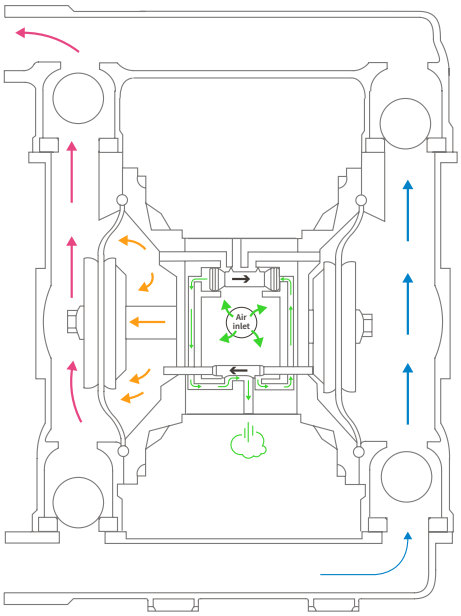
Pump stopped with the air supply off



With air turned on, piston pushes to one side to start

Drawing in the liquid

Pushing the liquid out



Then alternating back

Drawing in the liquid

Pushing the liquid out

AIR OPERATED DIAPHRAGM PUMPS' OPERATION AND WORKING PRINCIPAL

RECOMMENDED AIR PRESSURE LEVEL

When installing the air line to the pump, ensure that it is large enough to supply the volume of air necessary to achieve the desired pumping rate. Most AODD pumps can operate at any air pressure, typically up to a maximum of 8.6 bar or 125 psi. However, if the actual supply of air flow is hindered, the pump will lose its effectiveness. We suggest you use the correct air pressure depending on pumping performance to optimise pump life (we will go over how to obtain this shortly).

For best results, install an air filter and regulator before the pump as this will ensure the majority of any air line contaminants will be removed and that the correct air inlet pressure is maintained.

AIR OPERATED DIAPHRAGM PUMPS' OPERATION AND WORKING PRINCIPAL

CONSTRUCTION MATERIAL

AODD pumps can come in a variety of different construction materials to match the fluid being pumped, so it is important to find a compromise with service life and compatibility. For example:

CHAMBERS AND MANIFOLDS

The following table illustrates the materials used in the construction of pump body and types of fluids these materials are best suited for *(see page 11 for parts break down).*

MATERIAL	TYPE OF FLUID*
Cast iron and/or aluminium	Water and other non-aggressive liquids
Stainless steel	Chemicals, solvents, food service and slurry
Polypropylene or PVDF	Corrosive chemicals

DIAPHRAGMS, VALVE BALLS AND VALVE SEATS (ALSO KNOWN AS ELASTOMERS)

The following table illustrates the most commonly used materials in elastomers and the types of fluids these materials are best suited for *(see page 11 for parts break down).*

MATERIAL	TYPE OF FLUID*
Nitrile or Geolast	Water, oils and other harmless liquids
Santoprene	Diluted chemicals
Teflon	Chemicals and solvents

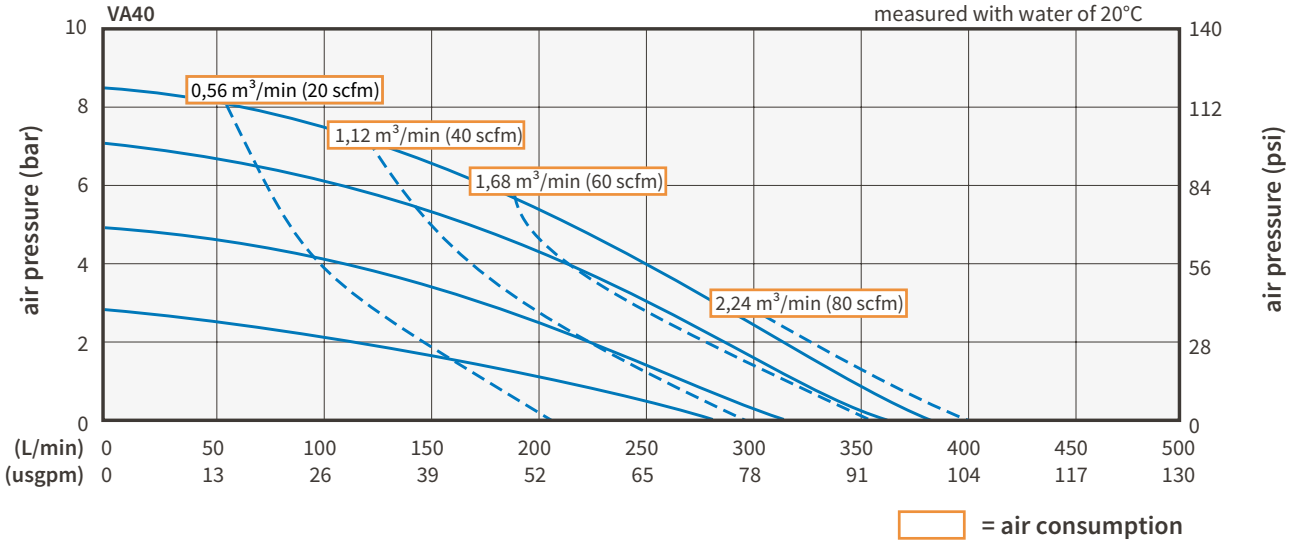
**The above recommendations are a general guide and it is best to check a chemical compatibility chart or consult a pump expert before making a selection*

For some brands of pumps, Teflon material typically uses a shorter shaft that de-rates the pump performance. Take this into consideration if using Teflon as your preferred material.

THE PERFORMANCE CURVE

EXPLAINING THE PERFORMANCE CURVE

The following image shows the performance curves of a Verderair air-operated diaphragm pump (model number VA40). The labelled dimensions and supporting details over the graph help you to interpret your required performance and where it sits in relation to the pump's performance.



VALUES

The above graph shows the pump performance at different air pressures and is plotted between the air pressure and volume of fluid being pumped. The X-axis is displayed in 'litres per minute' or 'US Gallons per minute'. The Y-axis is displayed in 'air pressure' and the discharge pressure for the pumped fluid.

SUPPORTING DETAILS

This curve displays the performance of the air-operated diaphragm pump while pumping water at 20°C. The orange boxes over the performance curve and dotted lines show the air consumption in terms of cubic meters per minute or SCFM (standard cubic feet per minute).

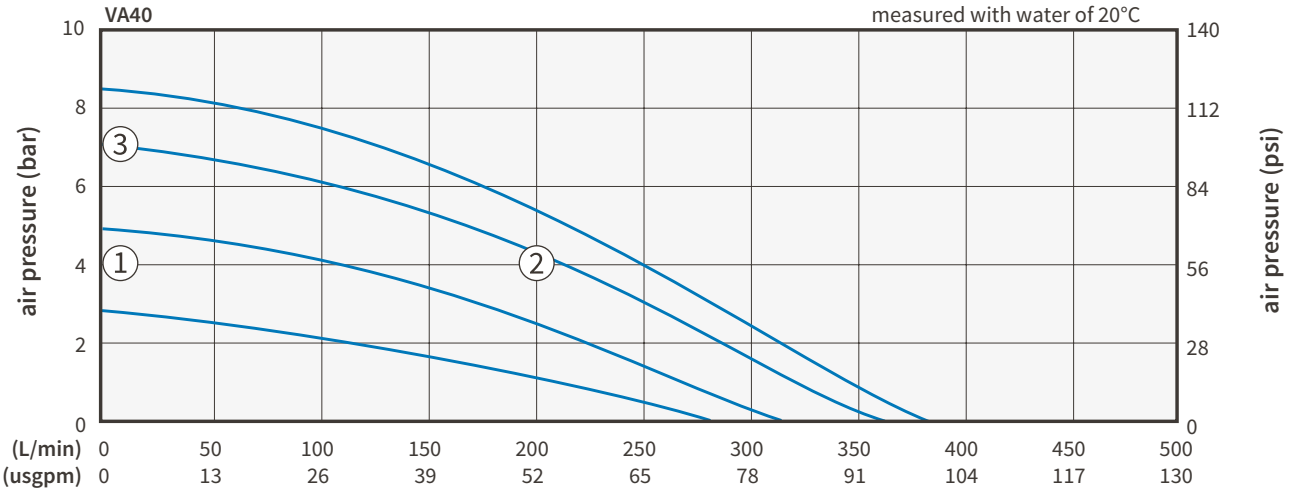
THE PERFORMANCE CURVE

READING

In order to ensure correct reading and interpretation of an AODD pump performance, you must know the following data:

- Required discharge pressure (or head pressure)
- Required flow rate

Once you know this data, reading the curve becomes easy. Let's take a look at how to read the curve.



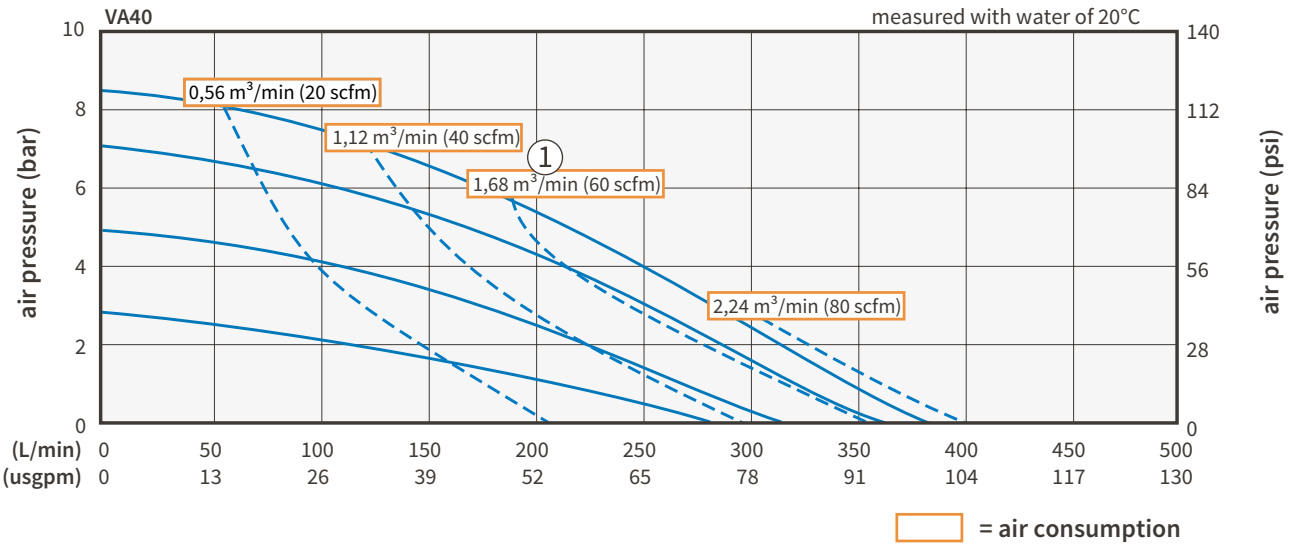
TO FIND THE AIR INLET PRESSURE REQUIRED AT THE DUTY POINT

First, choose the required discharge pressure, i.e. 4 bar or 56 psi *(#1 in the figure)*. Now track the horizontal black line to reach the desired flow rate, i.e. 200 L/min vertical line *(#2 in the figure)*. Now follow the closest solid (curved) blue line where it reaches the mark on the Y-axis. This is the required air inlet pressure, i.e. 7 bar (101 psi) *(#3 in the figure)*.

THE PERFORMANCE CURVE

READING

TO FIND THE AIR CONSUMPTION



This performance graph has curved solid and dotted blue lines that relate to the air consumption. The dotted blue convex lines represent the air consumption at given inlet pressure and discharge capacity. You have to trace the dotted blue line that appears closest to the point of intersection between the previously obtained discharge pressure and flow rate, i.e. 200 L/min at 4 bar. The closest dotted line is just to the right side of the intersection point. Therefore, the required air consumption is 60 SCFM (see point #2) to achieve a flow rate of 200 L/min at 4 bar pressure.

THE PERFORMANCE CURVE

NOTES

- *psi* stands for ‘pounds per square inch’
- *L/min* stands for ‘litres per minute’
- *SCFM* stands for ‘standard cubic feet per minute’
- 1 bar discharge pressure is equal to 10 metres head for water like liquids
- SCFM value for air consumption can also be converted into m^3/h (N). To convert, multiply the SCFM value by 1.7

Now that you understand how to read diaphragm pump curves, it is interesting to compare pump sizes and analyse how sometimes going for the next pump size up requires less air pressure and air consumption for the same flow rate. It is also interesting to compare manufacturers to find out which ones are more efficient.

There is also a viscosity correction chart for when pumping viscous liquids.

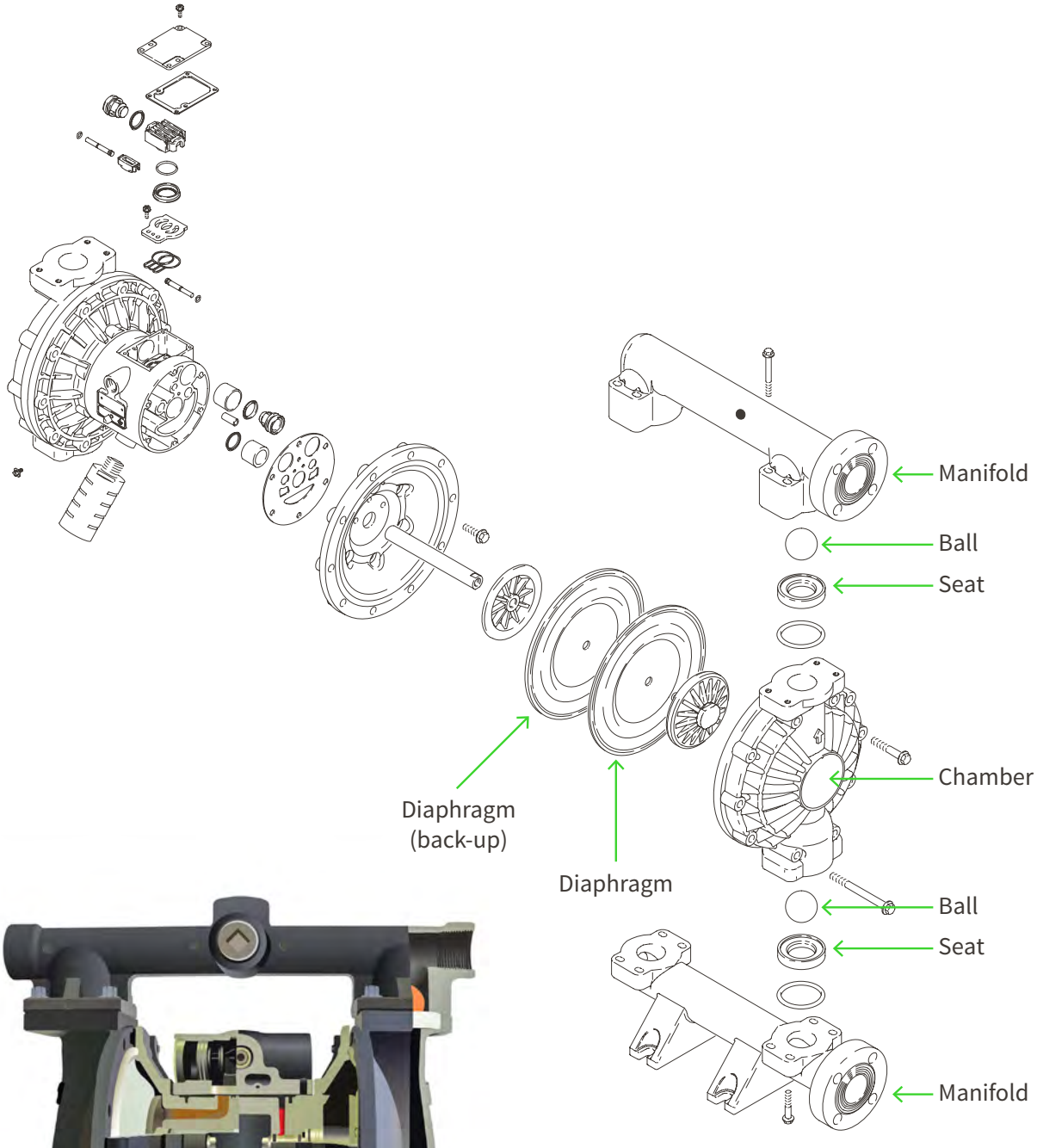
WHAT ARE THE MAIN FEATURES OF VERDERAIR AIR OPERATED DIAPHRAGM PUMPS?

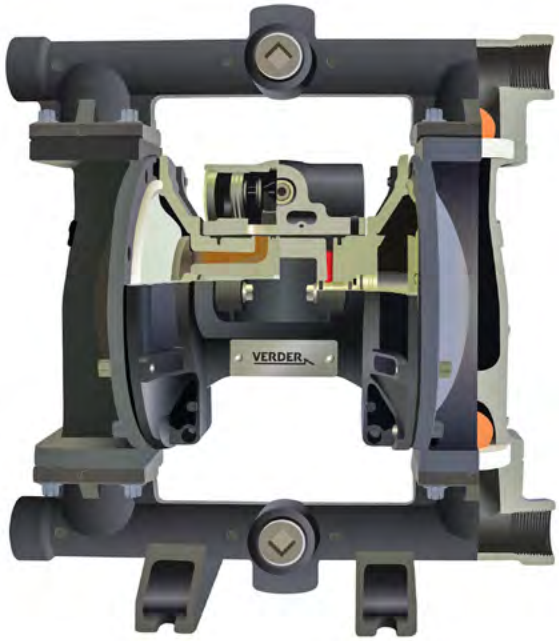
- They are self priming
- They can run dry without damage
- They are available in many different materials for pumping many different liquids and chemicals
- These diaphragm pumps are anti-freezing, meaning they are non-stalling and are lube free
- Highly efficient, meaning they require less air to pump the same volume as compared to the competition

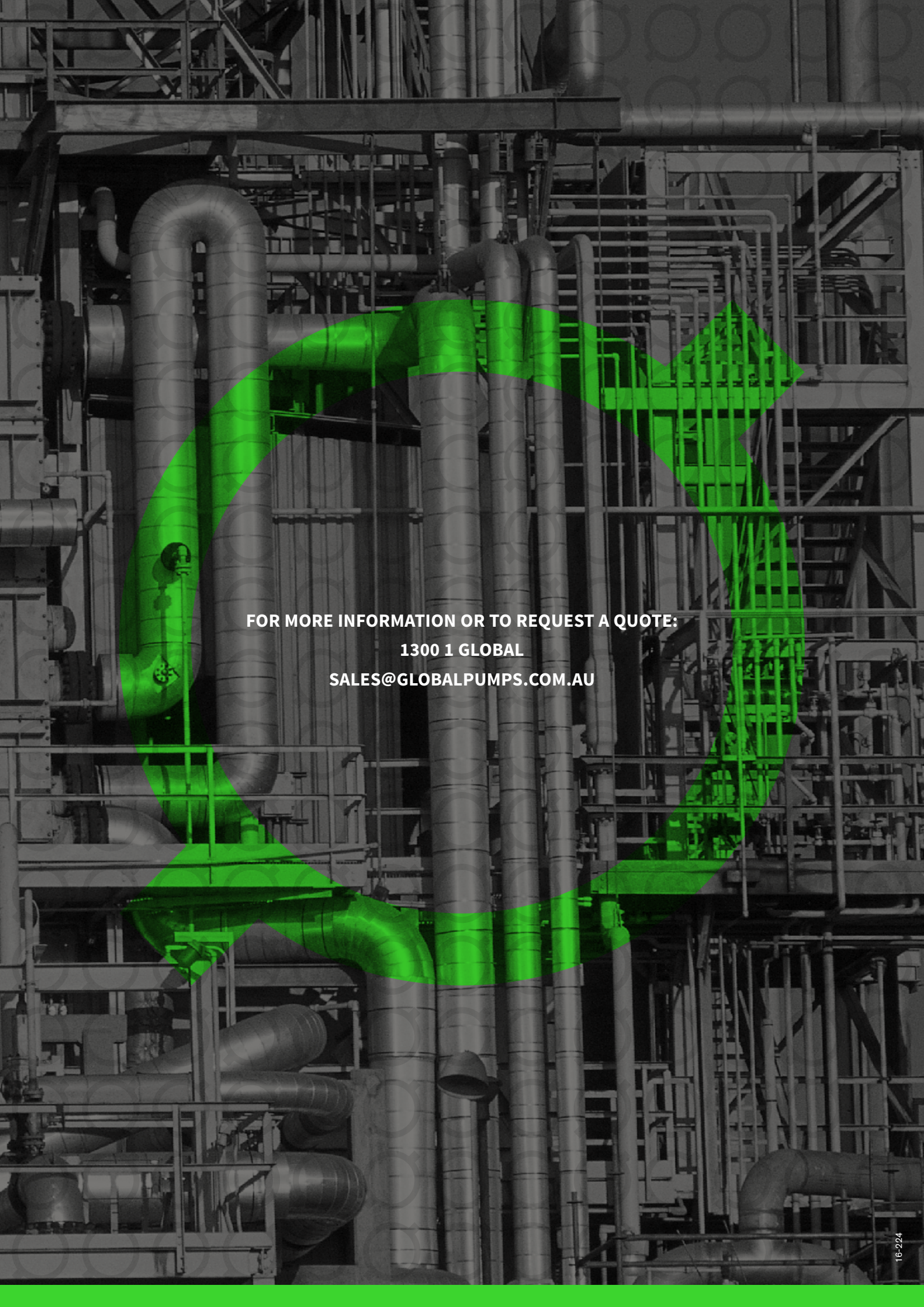
SIZES AVAILABLE

¼", ⅜", ½", ¾", 1", 1.5", 2" and 3"

TYPICAL PARTS VIEW OF AIR OPERATED DIAPHRAGM PUMP: VERDERAIR VA40 NON-METALLIC







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