



**Explosive
gases**

Pumping fluids in Hazardous environments

For over 15 years, Verder has manufactured and distributed air-operated diaphragm pumps, during which time it has looked for ways of improving the design. Today Verder manufactures its own best-in-class diaphragm pump, explains Wim Rochtus, product manager for Verderair pumps at Verder International.

Explosive areas



Industry Sectors

- Chemicals transfer
- Pharmaceutical
- Solar power
- Electronics plating
- Refineries
- Flour processing
- Atex rated environments

The Verderair Pure range

Over three years of development have been devoted to the design of the Verderair Pure air-operated diaphragm pump, which was launched in June 2012 at the Achema exhibition in Frankfurt.

The design scope was focused on producing a double diaphragm pump for heavy-duty applications using only pure Polyethylene (PE) and polytetrafluoroethylene (PTFE) polymers. PE is suitable for handling abrasive material while PTFE is chemically inert.

This new design has produced a flow up to 25 percent better than comparable pumps, and significant energy savings from reduced friction loss. Verderair Pure double diaphragm pumps are available in six sizes and four different material types.

Improvements in liquid and air flow have been combined with an enhanced air valve in a cartridge design for superior efficiency, by reducing tolerances to a minimum.

Both PE and PTFE materials can also

be provided in conductive options for use in explosive areas as set out by the ATEX requirements.

The brand 'Verderair Pure' was coined because only virgin PTFE that is free from impurities is used throughout. This benefits the chemical resistance of the pump.

Diaphragms come in a choice of materials such as PTFE or ethylene propylene diene monomer (EPDM) rubber – the Verderair Pure diaphragms are therefore both chemically compatible with aggressive fluids and highly durable.

Verderair Pure is milled, drilled and machined from a solid block of PE or PTFE polymer - because these materials cannot be moulded or extruded in a liquid phase. This requires capital investment in very expensive machinery with the capability to work to low tolerances in microns to maintain quality. For instance, the five-axis milling machines used are so sophisticated that they are used in only the most demanding of product designs.

Critical applications

The advantage of machining instead of moulding in pre-formed moulds is that it avoids the formation of mechanical stress lines which make the material brittle and weaken the pump. Cheaper pumps made from moulded parts are available but not suitable for critical applications.

For hazardous area and explosive environments, Verderair Pure offers ATEX-compliant conductive pumps using a PE and PTFE with a surface resistivity of $\leq 10^4 \Omega$. This conductivity allows for grounding of the pumps in explosive environments.

After running computer simulations of flow streams, the first prototype pump was produced using 3D printing. Producing 3D printed prototypes allowed refinements to be made for optimum physical liquid and air flow before the final version went into manufacture.

This process allowed Verder to investigate different internal diameters and the use of different materials for wet-side components and to optimise tolerances.



An explosion at the Fort Worth Texas Chemical Plant, highlighting the crucial role of minimising risks with plant equipment, training and processes

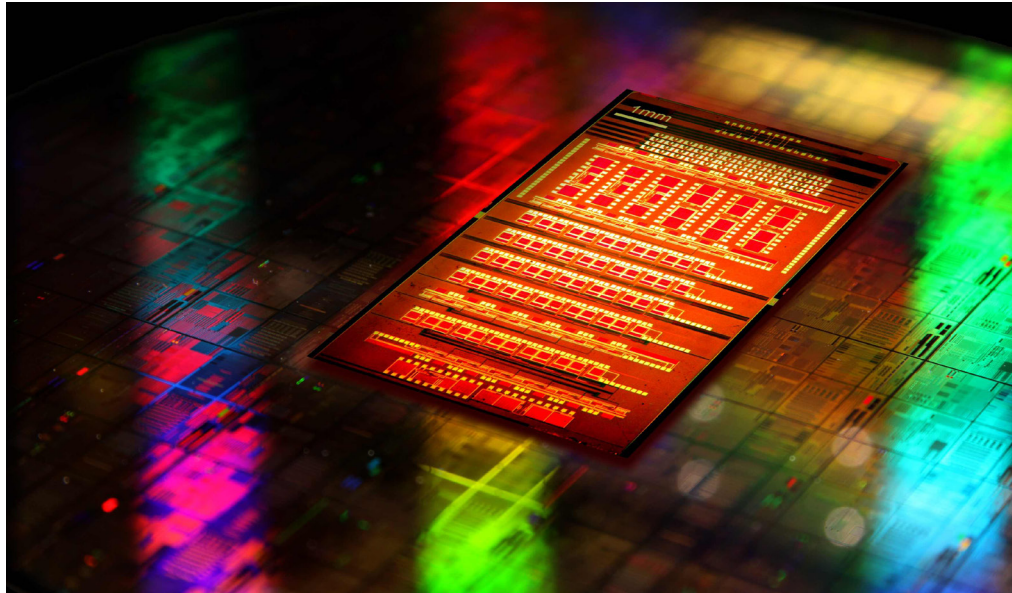
Applications

The Verderair Pure is designed for heavy operation such as those found in many manufacturing processes such as where highly corrosive and explosive fluids and atmospheres are present.

Critical applications include recirculation of cutting agents, silicon ingots made from slurry of glycol with powdered silicon carbide, recirculation of polishing slurry for silicon wafers, pumping of anti-reflecting coating for silicon using a coating made of titanium dioxide and silicon oxide, pumping chemical fluids and ceramic glaze supply.

In the chemical and pharmaceutical industry, Verderair Pure pumps are suitable for transferring corrosive, hazardous, toxic or explosive media like acids, bases, solvents and mixtures. In the ceramic industry they are suitable for transferring abrasive sludge and glazes, and in the solar or photovoltaic industry for cooling water and wafer treatment chemicals when cutting silicon wafers.

In the surface treatment of metals it is used for transferring different kind of acids and abrasive slurries in cleaning of the baths. In the paper industry in find uses for transferring glues and starches in the waste water industry for taking samples and neutralising fluids in dosing.



- Solvents and explosive fluids
- Varnish cleaning baths
- Resins
- Titanium dioxide slurry
- Electroplating baths
- Etching acids
- Carrier-fluids for ultra-sonic washing
- Recirculation of cutting agents for silicon ingots
- Polishing slurry for silicon wafers
- Ceramic glaze supply
- Flour milling sites
- Refineries
- Electronics manufacturing
- Semi-conductors
- Up to ATEX Zone 2 112G



Switching time

At the end of a stroke, if the air valve takes too long to switch over, it is easy to keep filling the air chamber with air that is no longer needed. The switching time is measured in microseconds but is long enough to let air escape.

A 15mm pump for example will easily run at 150 strokes per minute and, in this respect, Verderair Pure is on average 25% more efficient than comparable diaphragm pumps.

A Verderair Pure is easy to operate and one of the advantages of using compressed air as a power supply comes from the fact that it is possible to block off the discharge without damaging the pump. The pressure builds up until it equals the air supply pressure and the pump then stops until the discharge air pressure falls and it is restarted again.

An example application is ceramic glazing of wash basins that can be produced by compressing abrasive China clay, which is viscous when heated, into moulds using a Verderair pump made from PE. The pressure is then maintained until the clay solidifies.

The Verderair Pure is designed for heavy-duty operation, harsh liquids and severe process conditions, such as photovoltaic solar panel manufacturing, where a PE pump may be used for the water containing the abrasive material for cutting the silicon, followed by a PTFE pump for chemical treatment.

In addition, the Verderair Pure pumps handle a huge diversity of fluids, whether they are high or low viscosity, abrasive or thixotropic, hazardous or toxic, including sludge, acids, alkalis, solvents, slurries, emulsions, mixtures of liquids and solids, resins and powders.



Refineries require an extremely high standard of working plant equipment. The pumps must be able to operate in a strict, hazardous ATEX rated zones

Easy maintenance

The seats and valves of the Verderair Pure double diaphragm pump can be removed and exchanged without the need to dismantle the pump. This is a significant advantage in comparison to other double diaphragm pumps, because the valve plug can be simply removed for access or inspection.

One seat fits both ball and cylinder valves, so irrespective of which of the two the pump is equipped with, the seat remains the same. Furthermore, if at any time later in the process the pump needs to be refitted with the alternative type of valve, the process

is simple.

The Verderair Pure series offers spares kits for parts that are exposed to normal wear, as well as a range of accessories such as pulsation dampers, barrier chambers, diaphragm monitoring, stroke counters and drain down systems.

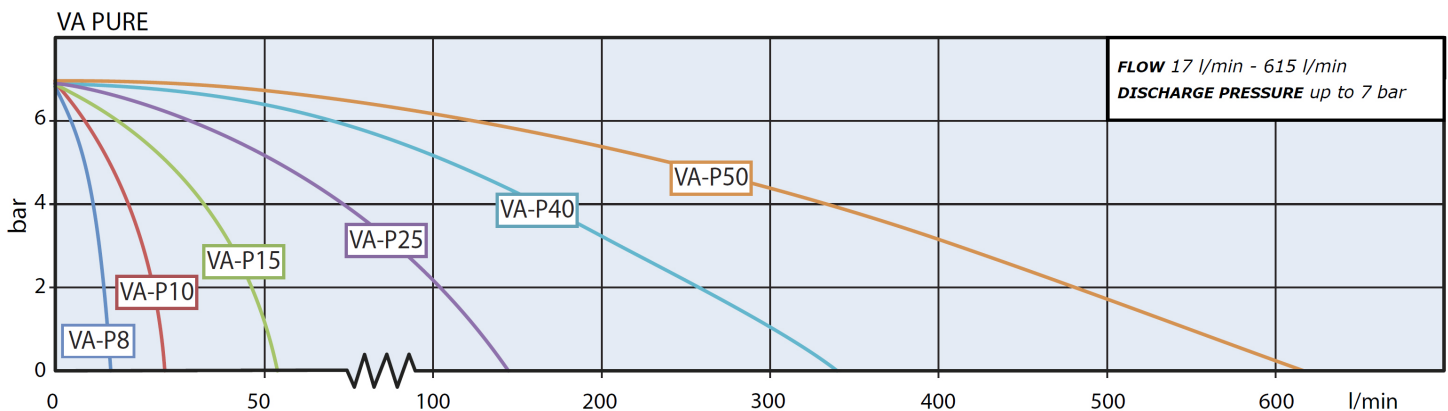
In summary, Verderair Pure is a robust series of double diaphragm pumps, produced from one-piece solid and pure PE or PTFE, which is also available in conductive versions for use in ATEX environments.

VERDERAIR PURE

Air-operated double diaphragm pump



- One piece of solid pure material
- For harsh liquids and severe process conditions
- New generation of air valve technology
- Up to 25% higher flow rate for the same air consumption
- Solid design for pressure tolerances and limited vibration
- No metal wetted or external parts
- Possible to build pulsation dampener on top as integrated unit
- Access to valve seat and ball valves without disassembling



Duties

- Flow: Up to 615 l/min
- Connections: 8mm - 50mm
- Discharge pressure: Up to 7 bar

Connections

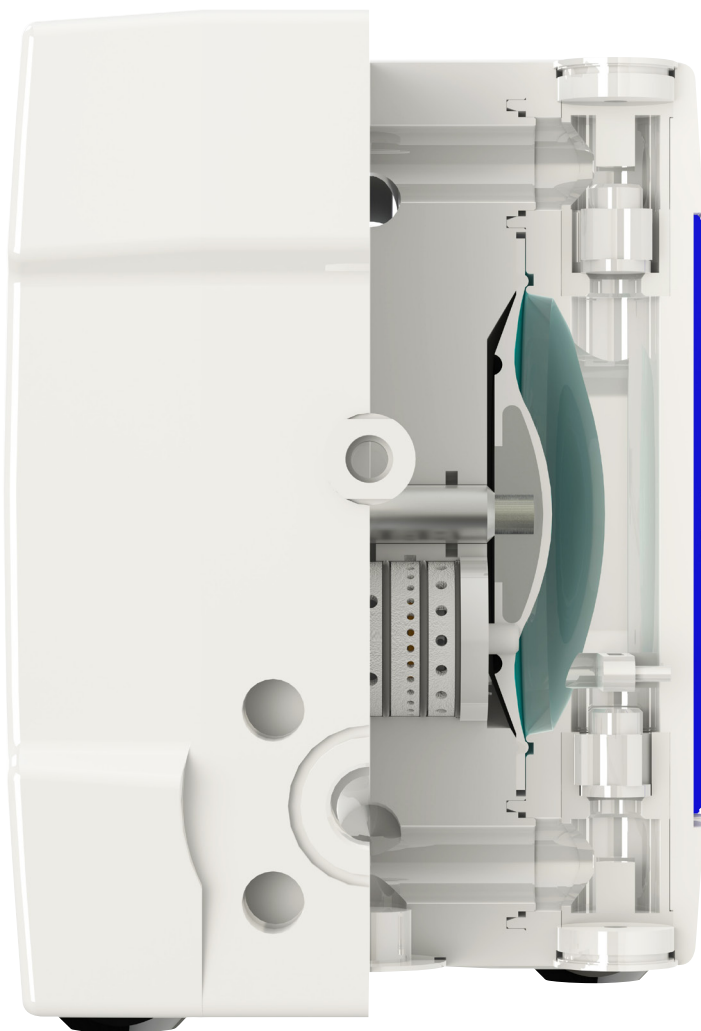
- 8mm, 10mm, 15mm, 25mm, 40mm, 50mm

Materials

- Polyethylene (PE)
- Teflon (PTFE)
- Conductive Polyethylene for ATEX
- Conductive Teflon for ATEX

VERDERAIR PURE

Air valve technology



Verderair has proven to be the most efficient double diaphragm pump, mainly because of the engineered designs of the air valves of both series.

The Verderair Pure pump is especially designed for working in severe environments.

The air valve of this series is mounted in the inner of the pump. Therefore the pump efficiency is not influenced by atmospheric circumstances.

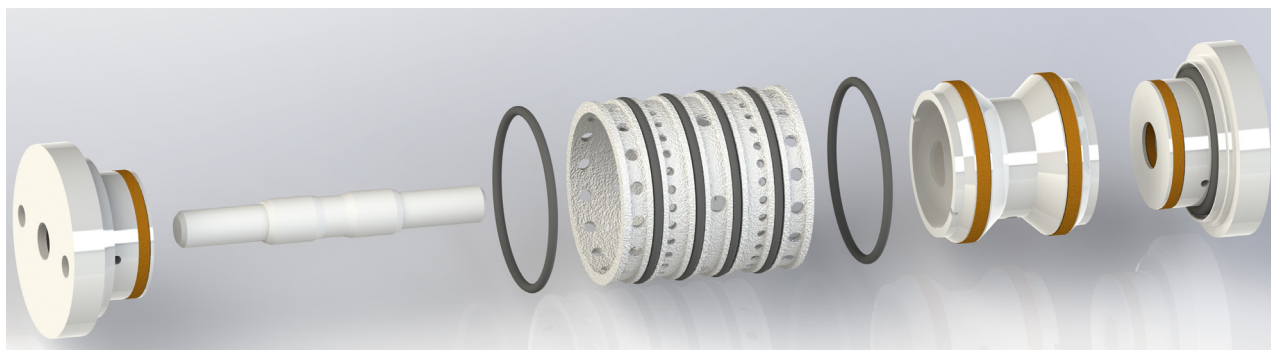
Features

- Cartridge design
- Quick action & Non-stalling
- Easy to replace

Benefits

- Increased productivity with a fast acting valve
- Reduced cost - Less air is used
- Improved working environment - Less noise

The Verderair pure pump is a plastic solid-block pump. At the heart of the pump is the new generation of air valve technology increasing the volume of fluid pumped by up to 25% for the same air consumption.



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VERDER
passion for pumps