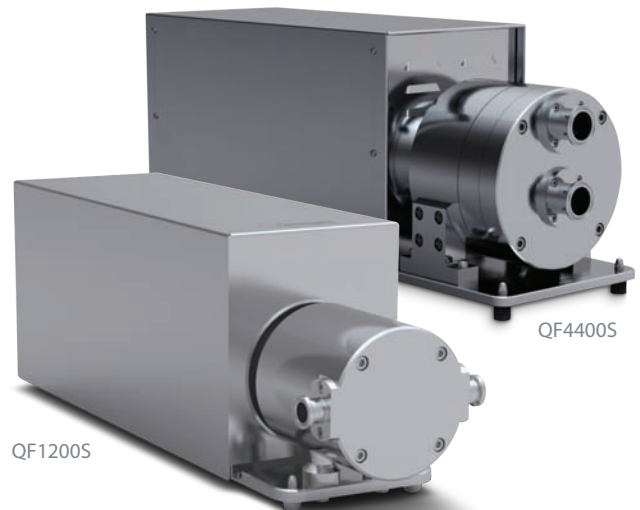


Concerned about your Lobe Pump Performance?

Quattroflow™ pumps and lobe pumps compared:

Lobe Pump Shortcomings <i>(And Shortcomings of Gear and PD Pumps)</i>	Quattroflow Pump Benefits
Can't satisfy all duty needs or scalability requirements	High turn-down allows for multiple flow duties and scaleup
Unable to handle both product and CIP flow duties with the same pump	High turn-down allows for consistent completion of both duties
Can't self-prime, limited suction-lift capabilities	Self-priming (even dry), wider range of suction-lift capabilities
Mechanical seals do not permit dry running	Risk-free dry running
Leakage problems with mechanical seals	Seal-less technology
High maintenance costs due to expensive mechanical seals	Seal-less design helps ensure low maintenance costs
Shock during pump shipment may lead to damaged mechanical leads	No special risks during transport
Highly skilled staff required for replacement of mechanical seals	Easy replacement of wear parts
Compromised polished fluid path because of incidental metal-to-metal contact resulting in high re-polish costs <i>(see figure 1)</i>	No metal-to-metal parts moving in proximity, so no loss of internal polish finish
Damage by rigid particles of undissolved salts	Less prone to damage
Large clearance required for SIP temperatures	SIP and CIP capable with no influence on performance
Low efficiency for low-viscosity products	Specially developed for low-viscosity products
Shear produced, unacceptable for shear-sensitive products	Optimized flow path for shear-sensitive products
Pump efficiency affected by component wear with time	Consistent efficiency along the pump curve independent of time
Particle generation caused by internal pump wear and mechanical seal wear can lead to product contamination	The quaternary (four-piston) technology does not require a mechanical seal or wetted rotating parts, ensuring total product containment with minimum particle generation
High power required to compensate for slip results in greater heat and shear generation for pumped products	Just 0.37 kW needed for a QF1200 pump size
Pulsation due to the high and irregular slip during rotation	Low pulsation due to quaternary diaphragm pump principle
Not suitable for single-use biopharma applications	Convertible to cleanable Multiple-Use and disposable Single-Use pump chambers

Quattroflow™
Multiple-Use Quaternary
Diaphragm Pumps



QF1200S

QF4400S



QF5050S

QF20k

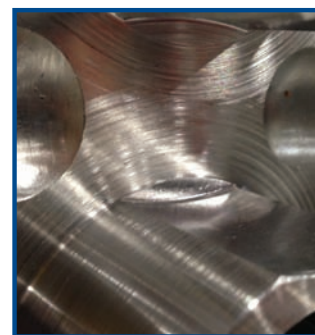
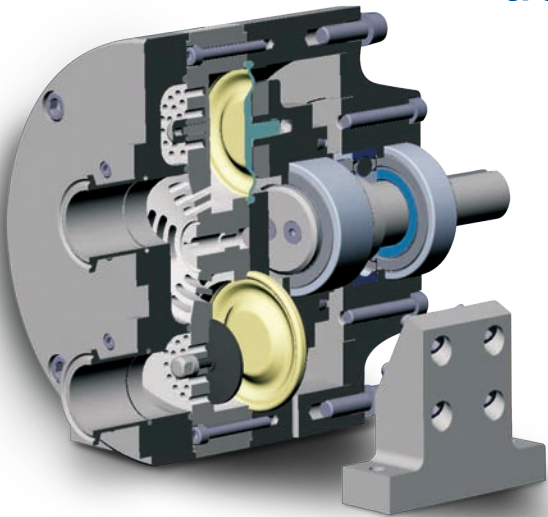
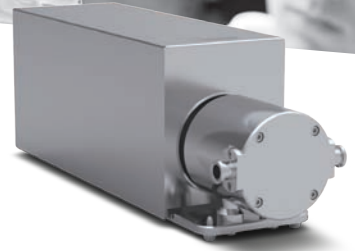


Figure 1

Quattroflow™ Pumps

A better alternative for traditional lobe pump applications



The operation of the positive displacement Quattroflow™ quaternary diaphragm pump is based on the same operational principle as the human heart. The four-piston (quaternary) diaphragm technology enables a gentle pumping action through soft “heartbeats.” Each stroke of the four diaphragms is generated by an eccentric shaft, which is connected to the electric motor.

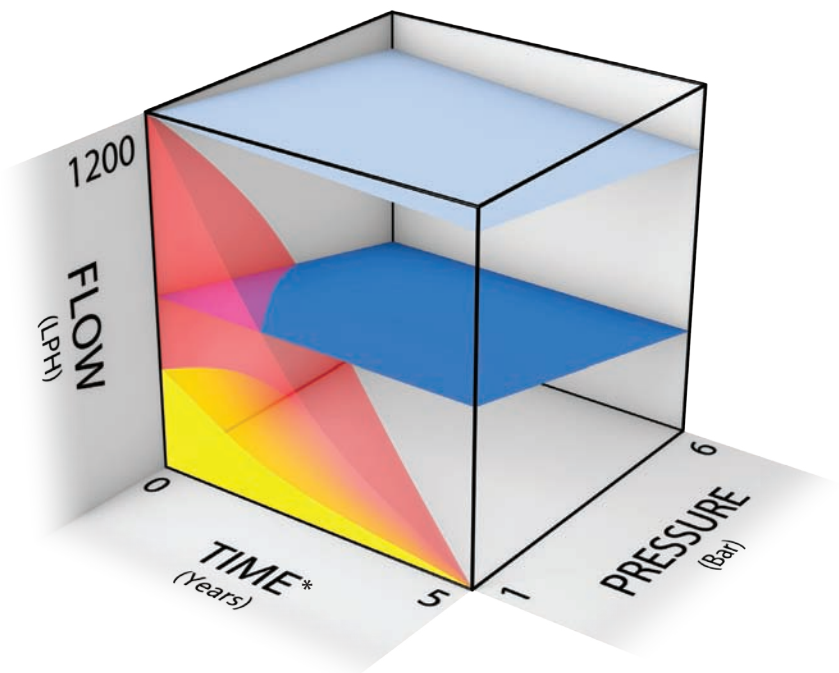
This method of operation for Quattroflow pumps allows them to gently, safely and securely convey aqueous solutions and biologic products that are sensitive to shear forces. The four-piston design does not require a mechanical seal or wetted rotating parts, ensuring total product containment without abrasion and minimum particle generation. Additionally, the four-piston pumping principle enables risk-free dry-running, low pulsation, self-priming and a high turn-down ratio.

Performance of Quattroflow™ Pumps and Lobe Pumps Compared

Fixed Speed Curves

- **Quattroflow pump at maximum speed.**
Pump is only slightly influenced by pressure and wear over time.
- **The same Quattroflow pump at half speed.**
Pump is only slightly influenced by pressure and wear over time. Pump is able to match a lobe pump that slips at maximum speed.
- **Larger traditional lobe pump slips and needs to be oversized.**
- **Smaller traditional lobe pump does not have needed flow range (turn-down) to meet flow.**

* For applications that experience loss of performance from pump wear.



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