QUATTROFLOW™
Fluid Systems

# Expert Solutions for Biopharma Applications

BIOPHARMA
Pumps

Where Innovation Flows

MULTIPLE-USE QUATERNARY DIAPHRAGM PUMPS
SINGLE-USE QUATERNARY DIAPHRAGM PUMPS

PSG®
a DOVER company

quattroflow.com

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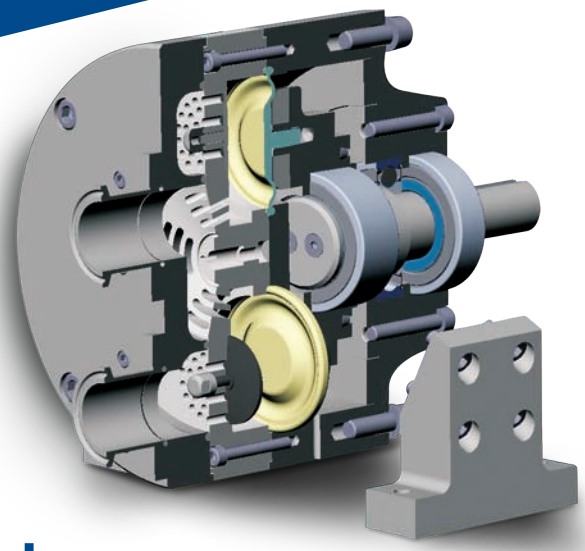
Fluid Systems



# The Idea:
## Pump Follows Evolution

How does a pump have to be designed to convey extremely delicate biologically active molecules? The solution is in nature itself!

Millions of years of evolution developed the perfect device to pump blood that contains albumin, gamma globulins, clotting factors and cells. It is the heart!

The Quattroflow displacement pump is based on this principle. The 4-piston (quaternary) diaphragm technology enables a gentle pumping through soft "heartbeats". Each stroke of the four diaphragms is generated by an eccentric shaft, which is connected to the electric motor.

The method of operation of Quattroflow pumps allows them to gently, safely and securely convey aqueous solutions and biologic products that are sensitive to shear force with minimal impact. 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.

# MARKETS SERVED

## BIOPHARMACEUTICAL:

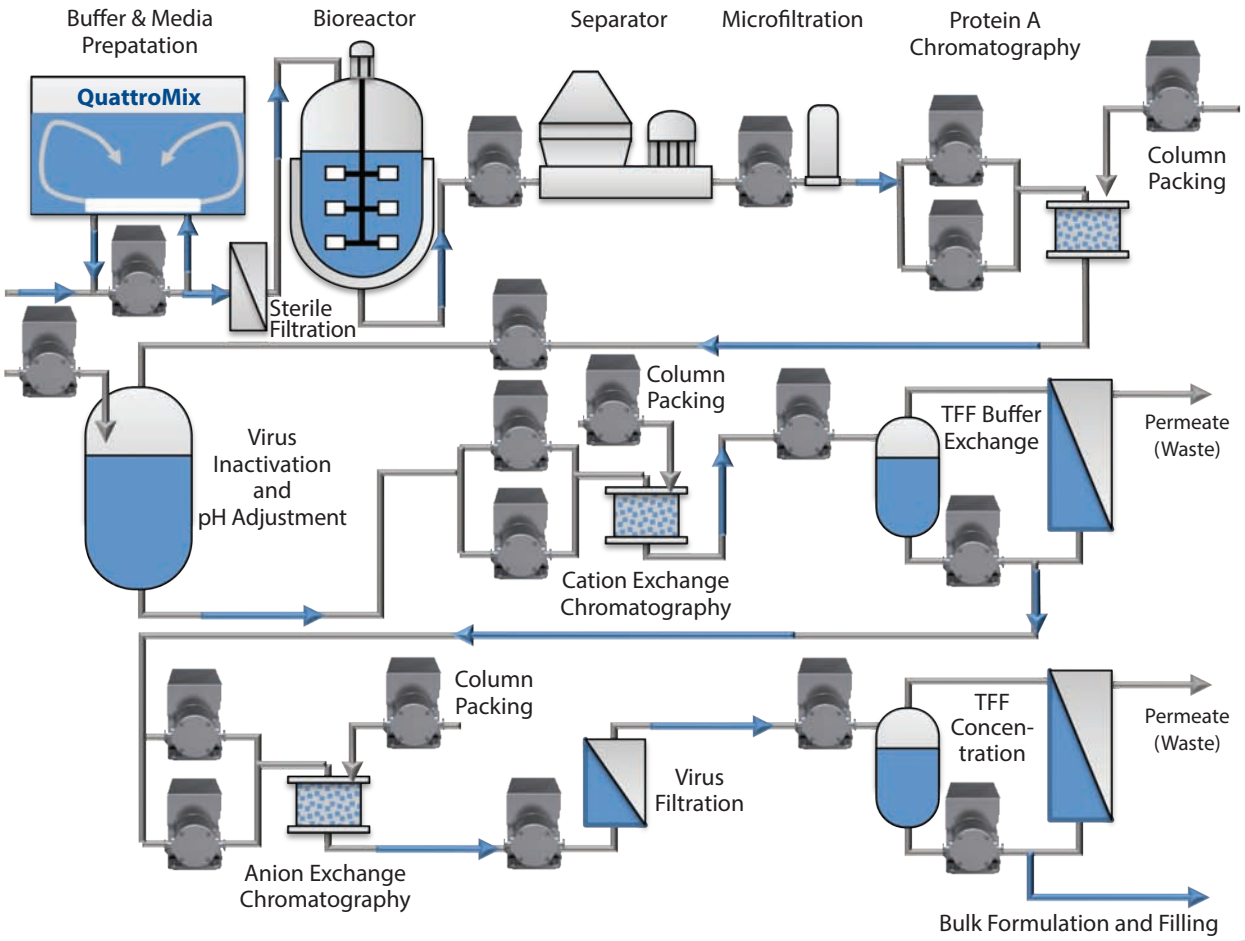
Quattroflow™ develops and manufactures single-use and multiple-use Quaternary (Four-Piston) Diaphragm Pumps for critical applications in the biopharmaceutical industry. This technology is CIP/SIP capable and offers disposable solutions that increase flexibility, reduce down-time, eliminate costs of cleaning validation, and risks of cross-contamination.

Quattroflow pumps can be found in all areas of biologic manufacturing such as cross-flow filtration systems, chromatography, and centrifuges. Quattroflow ensures safety, efficiency and reliability for handling biologics such as plasma products, therapeutic proteins, monoclonal antibodies, vaccines, and other high value products.

**Typical Applications and Products Handled:**

- Chromatography systems
- Cross-flow systems, TFF
- Centrifuges
- Homogenizers
- Direct flow filters
- Reaction dosing
- Virus or sterile filtration
- Depth filtration
- Buffer mixing systems
- Blood plasma fractionation
- Virus cultures
- Bacterial and viral vaccines
- Cell cultures
- Cell cultures supernatants
- Enzyme solutions
- Antibodies
- Virus inactivation

**Quattroflow Pumps in the Up- and Downstream Processing of Monoclonal Antibodies**



QUATTROFLOW™
Fluid Systems

# Multiple-Use Pumps

## Pump Development for Special Applications

Biopharmaceutical processes require the highest level of purity, containment and cleanability. Quattroflow pumps meet these requirements as they are specially designed for such applications. Quattroflow provides the most versatile and efficient stainless-steel multiple-use pumps for worldwide applications in laboratories, pilot plants and production plants.

QF4400S
Multiple-Use Quaternary
Diaphragm Pump

## QF-Series Multiple-Use Biopharma Pumps

The QF150S, QF1200S, QF4400S, QF5050S and QF20k Series quaternary diaphragm positive displacement pumps do not utilize mechanical shaft seals or wetted rotating parts, ensuring total product containment without abrasion and minimum particle creation. Moreover, the pumping principle of the Quattroflow pumps allows risk-free dry running.

# Single-Use Pumps

## The Single-Use Advantage

Quattroflow single-use pumps have a disposable product wetted chamber constructed of solid polypropylene (PP) or injection-molded polyethylene (PE) that can be replaced as a complete unit. The simple disposability of the pump chamber saves time and money by eliminating cleaning validation, sterilization and product cross-contamination. Single-use pumps are critical to reduce equipment turnaround times in the development biosimilar processes. In general, multi-product facilities is the typical field of application of the single-use pumps (e.g. process development, production of clinical reference samples, contract manufacturing).

## QF150SU, QF1200SU, QF4400SU and QF5050SU

### Single-Use Quaternary Diaphragm Pumps

The Quattroflow single-use pumps are self-priming and can be run dry. Inside the pump chamber, there are no rotating parts that are subject to friction that might cause particle generation and/or product modification/degradation due to heat generation. A single-use pump chamber can be replaced and ready for a new batch in a few minutes. Its simple design requires only one tool. An exchange kit is available to retrofit a multi-use pump into a single-use pump.

*PALL Allegro™ Single-Use Tangential Flow Filtration System" using a Quattroflow QF1200SU as recirculation pump.*

*PALL Allegro™ MVP Single-Use System" also with a Quattroflow QF1200SU pump, for different applications like virus filtration, sterile filtration, membrane chromatography, etc.*

*Images supplied courtesy of Pall Corporation*

QUATTROFLOW™
Fluid Systems

QF150S
Multiple-Use Quaternary
Diaphragm Pump

QF1200SU
Single-Use Quaternary
Diaphragm Pump

TECHNOLOGY: 4-PISTON DIAPHRAGM

# Multiple-Use and Single-Use

## Quaternary Diaphragm Pumps

Quattroflow multiple-use pumps have a vast array of options and flow rates to accommodate many biopharmaceutical applications. Whether your requirement is 1 lph (0.017 lpm) or 20,000 lph (333 lpm) Quattroflow has your application covered with high purity, easily cleanable, multiple use units. From OEM's and small scale automated systems, to large laboratories and crossflow systems, the QF Series provides the purity needed for the most demanding pharmaceutical and bio-technology applications.

Quattroflow single-use combines convenience with the ability to save time and money by eliminating the cost of cleaning and decontamination. Gamma-irradiated upon request, these pumps ensure the integrity of your process and production output by providing the safe, clean and reliable transfer of your high purity process fluids.

### Applications and Products

- Chromatography systems
- Cross-flow systems, TFF
- Centrifuges
- Homogenizers
- Direct flow filters
- Reaction dosing
- Virus or sterile filtration
- Depth filtration
- Buffer mixing systems
- Blood plasma fractionation
- Virus cultures
- Bacterial and viral vaccines
- Cell cultures
- Cell cultures supernatants
- Enzyme solutions
- Antibodies
- Virus inactivation
- DF/MF/UF filters

### Features and Benefits

- Minimal maintenance
- Minimal downtime
- Low pulsation
- Superior containment
- Variable wide flow
- Capable of dry run
- Self-priming
- Cleanable outer surface
- Linear turndown
- Compact design
- Low heat input
- High purity
- Minimum particle shedding
- Quiet operation
- Lower life cycle cost
- Ease of use
- Quick start-up
- Scaleable
- No cell damage
- Low shear

### Technical Data

- Stainless steel materials of construction
- Single-use pump chamber: Solid polypropylene or injection-molded polyethylene
- Valves: EPDM
- Diaphragm: TPE (EPDM/PP)

### Performance Data

- Flow range: 1 lph - 20,000 lph (0.017 - 333 lpm)
- Max. discharge pressure: 6 bar (87 psi)
- Max. temperature: 130°C (266°F)

### Certifications & Associations

FDA USP CLASS VI Ex CE

# PUMP SELECTION GUIDE

## Multiple-Use Pumps

| | | | | | | |
|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| **Pump Size** | QF150S | QF1200S | QF1200S-CV | QF4400S | QF5050S | QF20k |
| **Flow Range** | 1 – 180 lph<br>0.017 - 3 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 150 – 5,000 lph<br>2.5 - 83 lpm | 50 – 5,000 lph<br>0.83 - 83 lpm | 1,000 – 20,000 lph<br>16.7 - 333 lpm |
| **More Data On Page** | 8 | 9 | 10 | 11 | 12 | 13 |

## Single-Use Pumps

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |
| **Pump Size** | QF150SU | QF1200SU | QF1200SU-M | QF1200SU-XAQ | QF1200SU-CV | QF4400SU | QF5050SU |
| **Flow Range** | 1 – 180 lph<br>0.017 - 3 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 10 – 1,200 lph<br>0.167 - 20 lpm | 150 – 5,000 lph<br>2.5 - 83 lpm | 50 – 5,000 lph<br>0.83 - 83 lpm |
| **More Data On Page** | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

For Accessories please see page 21.

All Quattroflow pump sizes are available with different options, such as controller, housing, ports and motor. Consider the standard versions of all sizes for the technical data presented on the following pages.

# QF150S

## Quaternary Diaphragm Pumps Multiple-Use

- Integrated controller
- Digital key pad for manual operation
- Small and portable format
- Ideal for R&D and process development

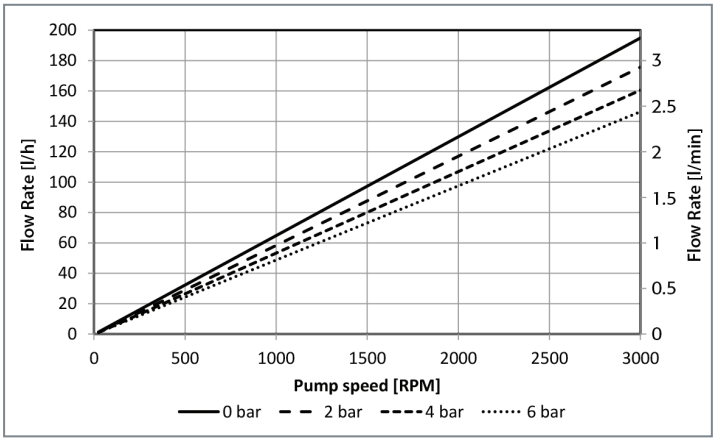
## Technical Data

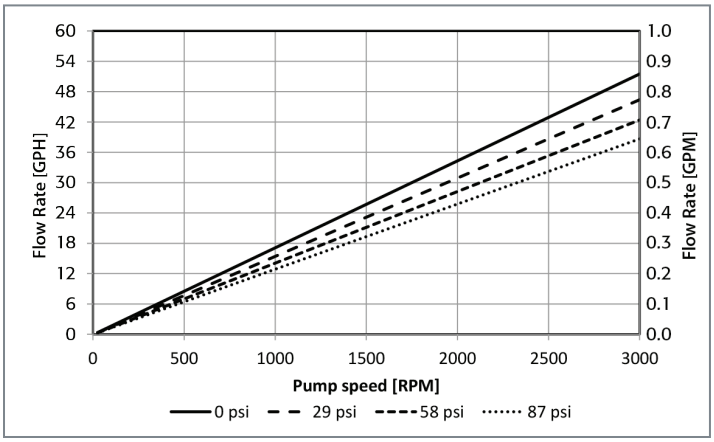
| QF150S Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 5° | 180 lph (3 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 5° | 1 lph (0.017 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130° C (266° F) |
| | Autoclave | 130° C (266° F) |
| Suction Lift Dry at 3000 rpm: | Eccentric Shaft 5° | 2 - 3 m (6.6 - 9.8 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 1.2 ml |
| | Filling Volume Without Connectors | 15 ml |
| Connection Specification (Standard): | Connectors | 1/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Housing | SS316L |
| | Valve Plate | SS316L |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor (Standard): | Rated speed | 3000 min-1 |
| | Voltage | 230 V (110 V as option) |
| | Power | 0.05 KW |
| Pump Dimension with Motor and Housing: | Length | 280.5 mm (11.04") |
| | Width | 115 mm (4.53") |
| | Height | 184 mm (7.24") |
| Pump Weight with Motor and Housing: | | 8.4 kg (19 lb.) |

Other connection specifications, materials and motors available on request.

## Performance Charts

### Eccentric Shaft: 5°

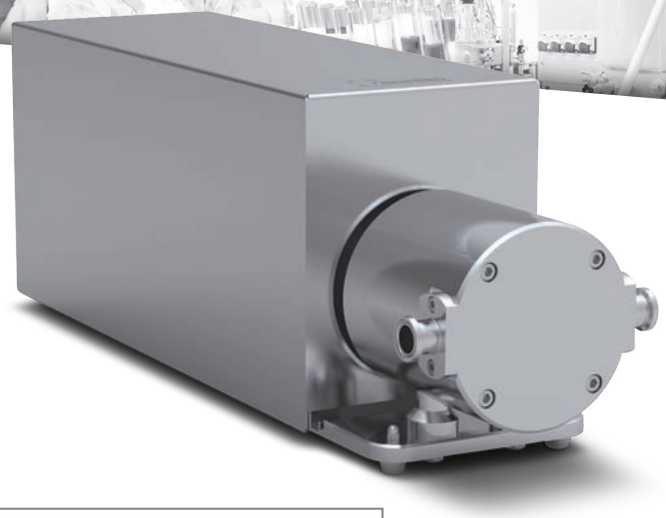


# QF1200S

## Quaternary Diaphragm Pumps Multiple-Use

- Separate control box for manual operation available
- ATEX version available

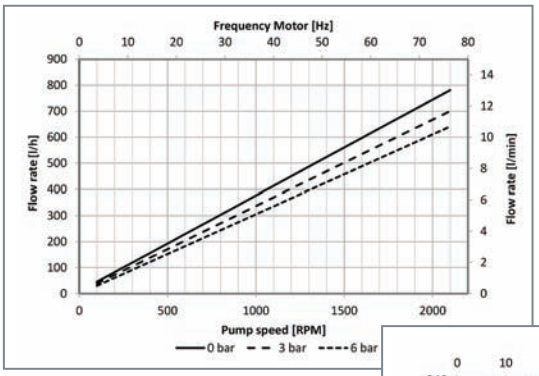


## Technical Data

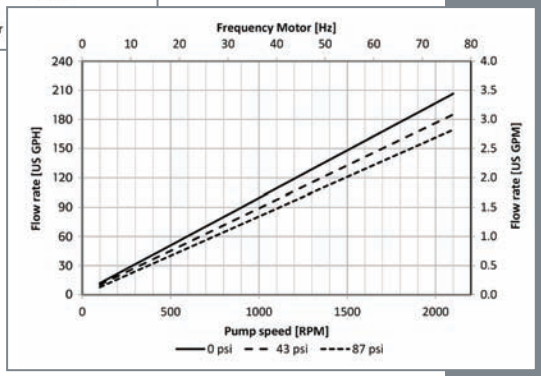
| QF1200S Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 3° | 800 lph (13.3 lpm) |
| | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum*: | Eccentric Shaft 3° | 10 lph (0.167 lpm) |
| | Eccentric Shaft 5° | 20 lph (0.333 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130° C (266° F) |
| | Autoclave | 130° C (266° F) |
| Pump Speed Range: | rpm | 30 - 2,400 |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 3° | 2.5 - 3 m (8.2-9.8 ft) |
| | Eccentric Shaft 5° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 9.6 ml (5°) 5.8 ml (3°) |
| | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | 3/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Housing | SS316L |
| | Valve Plate | SS316L |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/ Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/ TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor (Standard): | Rated speed | 1375 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 0.37 KW |
| Pump Dimension with Motor and Housing: | Length | 487 mm (19.17") |
| | Width | 159 mm (6.26") |
| | Height | 210 mm (8.27") |
| Pump Weight with Motor and Housing: | | 24 kg (53 lb.) |

Other connection specifications, materials and motors available on request.
* When using pump with control box: 20 lph (0.333 lpm) and 40 lph (0.667 lpm)

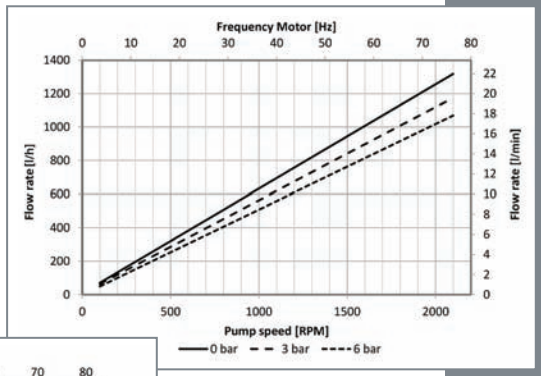
## Performance Charts

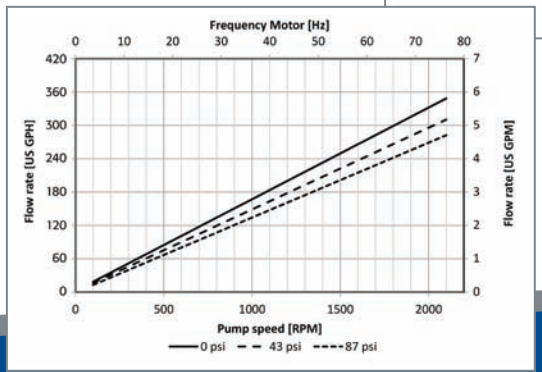



Eccentric Shaft: 3°




*Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.*




Eccentric Shaft: 5°

# QF1200S-CV

## Quaternary Diaphragm Pumps Multiple-Use

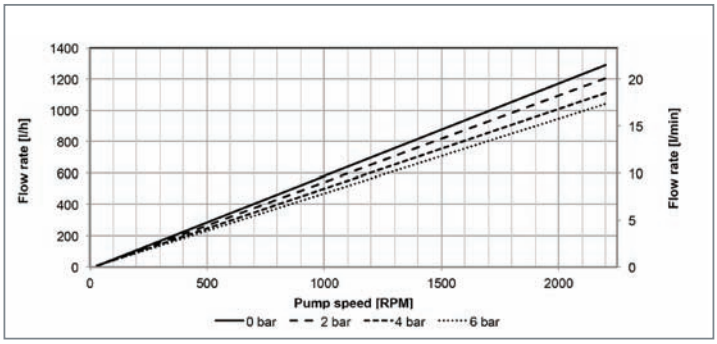
- Integrated controller
- Digital key pad for manual operation
- Compact size
- 230V motor

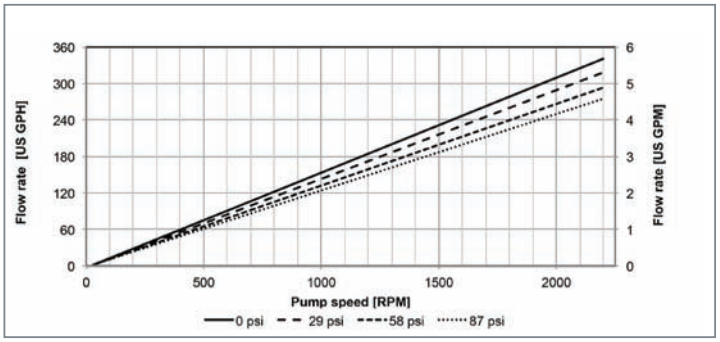
## Technical Data

| QF1200S-CV Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 5° | 10 lph (0.167 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130° C (266° F) |
| | Autoclave | 130° C (266° F) |
| Pump Speed Range: | rpm | 10 - 2200 |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 5° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | 3/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Chamber | SS316L |
| | Valve Plate | SS316L |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor: | Rated speed | 2200 min-1 |
| | Voltage | 230 V |
| | Power | 0.75 kW |
| Pump Dimension with Motor and Housing: | Length | 487 mm (19.17") |
| | Width | 200 mm (7.87") |
| | Height | 210 mm (8.27") |
| Pump Weight with Motor and Housing: | | 25 kg (55 lb.) |

## Performance Charts

### Eccentric Shaft: 5°



# QF4400S

## Quaternary Diaphragm Pumps Multiple-Use

- Separate control box for manual operation available
- ATEX version available

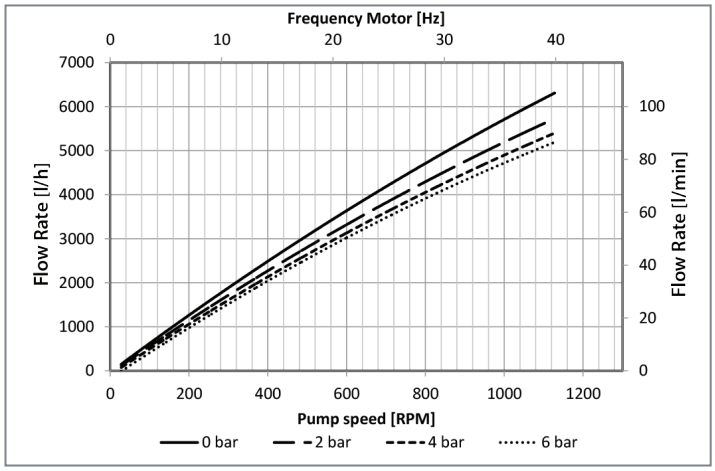
## Technical Data

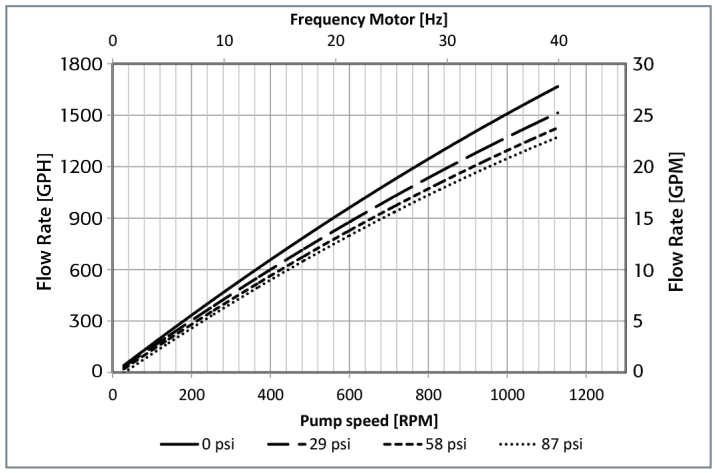
| QF4400S Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 6° | 5000 lph (83 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 6° | 150 lph (2.5 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130°C (266° F)* |
| | Autoclave | 130°C (266° F)* |
| Suction Lift Dry at 1200 rpm: | Eccentric Shaft 6° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 95 ml |
| | Filling Volume Without Connectors | 820 ml |
| Connection Specification (Standard): | Connectors | 1.5" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Housing | SS316L |
| | Valve Plate | SS316L or PP |
| | Diaphragms | TPE |
| | Valves | EPDM/SS316L |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor (Standard): | Rated speed | 1410 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 2.2 KW |
| Pump Dimension with Motor and Housing: | Length | 776.4 mm (30.57") |
| | Width | 256 mm (10.08") |
| | Height | 330 mm (12.99") |
| Pump Weight with Motor and Housing: | | 96 kg (212 lb.) |

Other connection specifications, materials and motors available on request.
*With SS316L valve plate only

## Performance Charts

### Eccentric Shaft: 6°



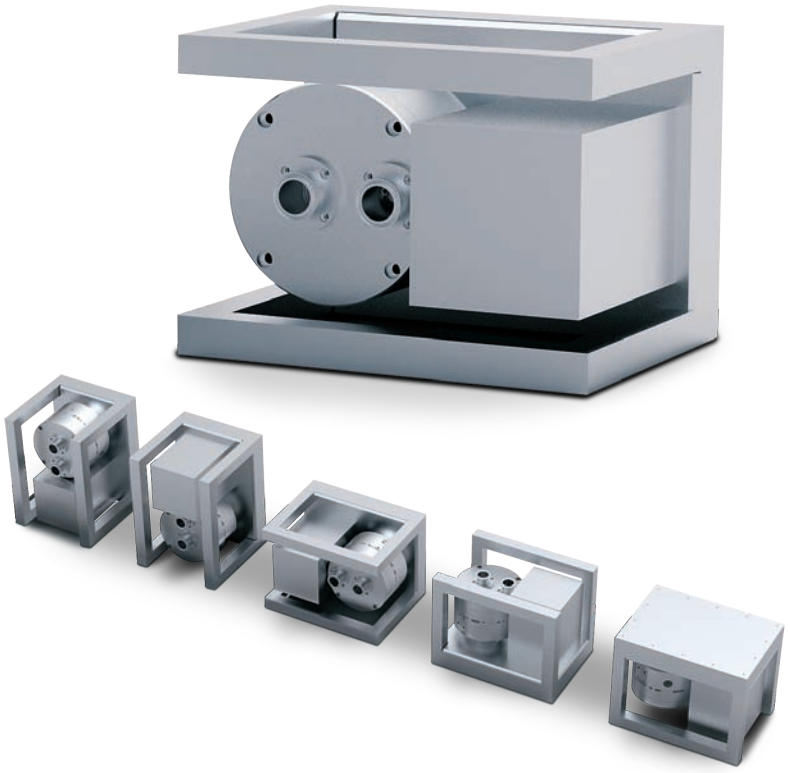




*Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# QF5050S

## Quaternary Diaphragm Pumps Multiple-Use

- Compact footprint
- High turn-down ratio
- Multi-option installation flexibility
- Separate control box for manual operation available



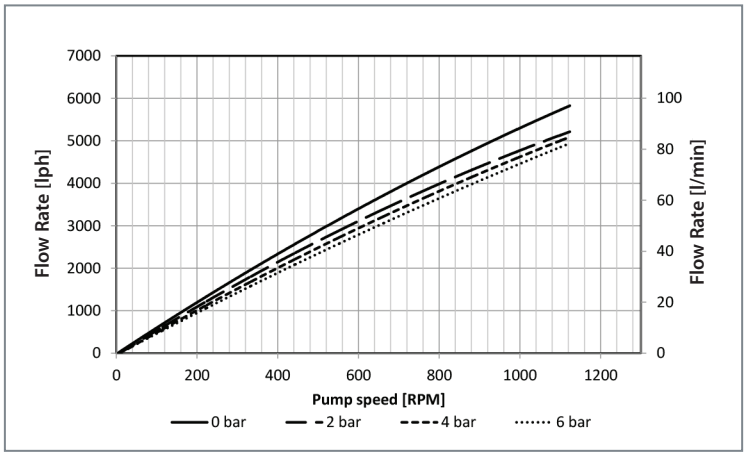
## Technical Data

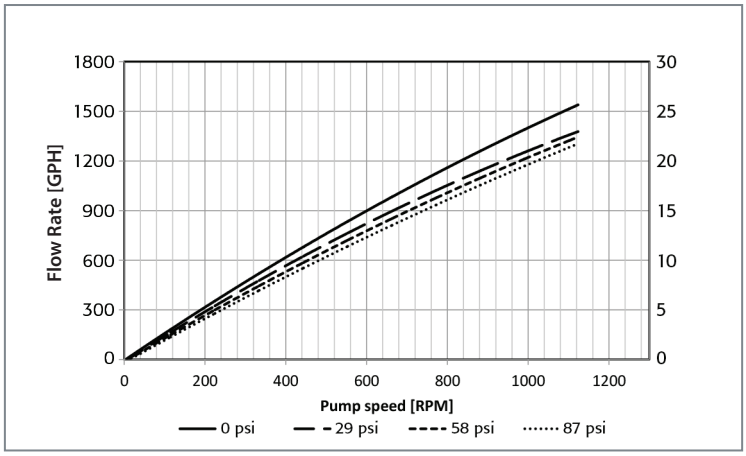
| QF5050S Servo Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 6° | 5000 lph (83 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 6° | 50 lph (0.83.lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130°C (266° F)* |
| | Autoclave | 130°C (266° F)* |
| Suction Lift Dry at 1200 rpm: | Eccentric Shaft 6° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 95 ml |
| | Filling Volume Without Connectors | 820 ml |
| Connection Specification (Standard): | Connectors | 1.5" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Housing | SS316L |
| | Valve Plate | SS316L or PP |
| | Diaphragms | TPE |
| | Valves | EPDM/SS316L |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor (Standard): | Rated speed | 3000 min -1 (2.66:1 reduction) |
| | Voltage | 400 V |
| | Power | 3 KW |
| Pump Dimension with Motor and Housing: | Length | 440 mm (17.32") |
| | Width | 325 mm (12.80") |
| | Height | 320 mm (12.60") |
| Pump Weight with Motor and Housing: | | 66 kg (146 lb.) |

Other connection specifications, materials and motors available on request.
*With SS316L valve plate only

## Performance Charts

### Eccentric Shaft: 6°




*Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# QF20k

## Quaternary Diaphragm Pumps Multiple-Use

- Separate control box for manual operation available
- ATEX version available

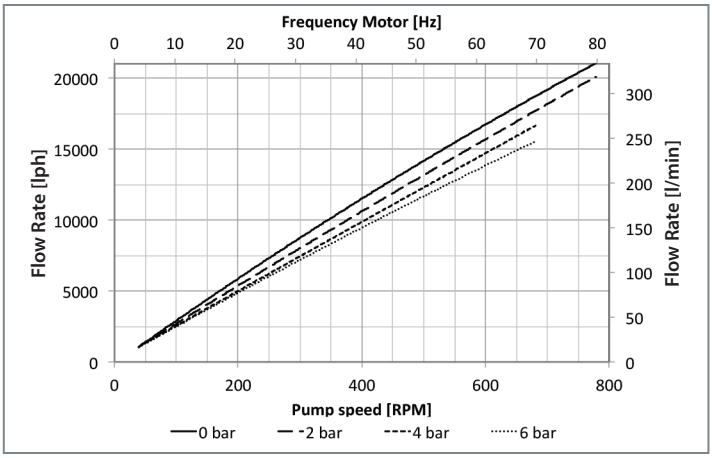
## Technical Data

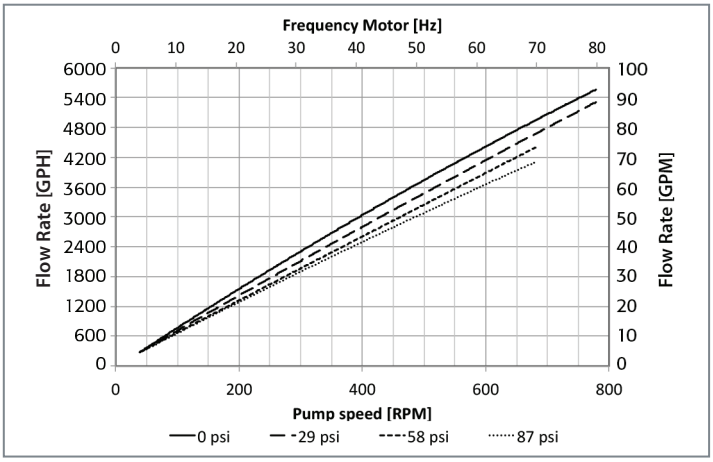
| QF20k Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 7° | 20000 lph (333 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 7° | 1000 lph (16.7 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 6 bar (87 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 80° C (176° F) |
| | CIP | 90° C (194° F) |
| | SIP | 130° C (266° F) |
| | Autoclave | 130° C (266° F) |
| Suction Lift Dry at 330 rpm: | Eccentric Shaft 7° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 470 ml |
| | Filling Volume Without Connectors | 2950 ml |
| Connection Specification (Standard): | Connectors | 2" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Housing | SS316L |
| | Valve Plate | SS316L |
| | Diaphragms | TPE |
| | Valves | EPDM/SS316L |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| | Stainless Steel Parts (product wetted) | 3.1; Surface Roughness; Ferrite Content |
| Motor (Standard): | Rated speed | 1460/474 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 4 KW |
| Pump Dimension with Motor and Housing: | Length | 1152.5 mm (45.37") |
| | Width | 400 mm (15.75") |
| | Height | 416 mm (16.38") |
| Pump Weight with Motor and Housing: | | 217 kg (478 lb.) |

Other connection specifications, materials and motors available on request.

## Performance Charts

### Eccentric Shaft: 7°




*Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# QF150SU

## Quaternary Diaphragm Pumps Single-Use

- Disposable wetted product chamber
- Integrated controller
- Digital key pad for manual operation
- Small and portable format
- Ideal for R&D and process development

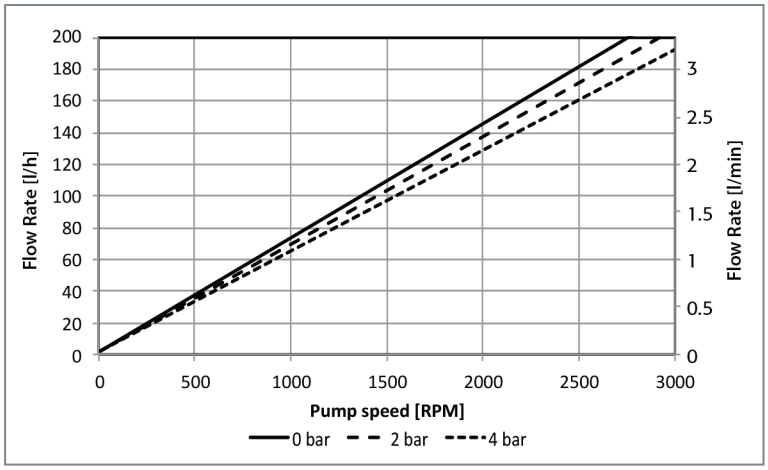
## Technical Data

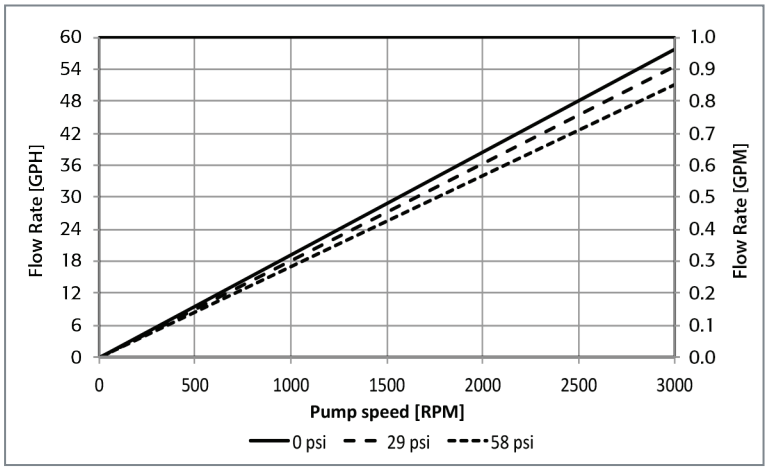
| QF150SU Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 5° | 180 lph (3 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 5° | 1 lph (0.017 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 60° C (140° F) |
| | Autoclave* | 130° C (266° F) |
| Suction Lift Dry at 3000 rpm: | Eccentric Shaft 5° | 2 - 3 m (6.6 - 9.8 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 1.2 ml |
| | Filling Volume Without Connectors | 15 ml |
| Connection Specification (Standard): | Connectors | 1/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Chamber | PP |
| | Valve Plate | PP |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor (Standard): | Rated speed | 3000 min-1 |
| | Voltage | 230 V (110 V as option) |
| | Power | 0.05 KW |
| Pump Dimension with Motor and Housing: | Length | 285 mm (11.22") |
| | Width | 115 mm (4.53") |
| | Height | 184 mm (7.24") |
| Pump Weight with Motor and Housing: | | 7 kg (15.8 lb.) |

Other connection specifications, materials and motors available on request.

## Performance Charts

### Eccentric Shaft: 5°

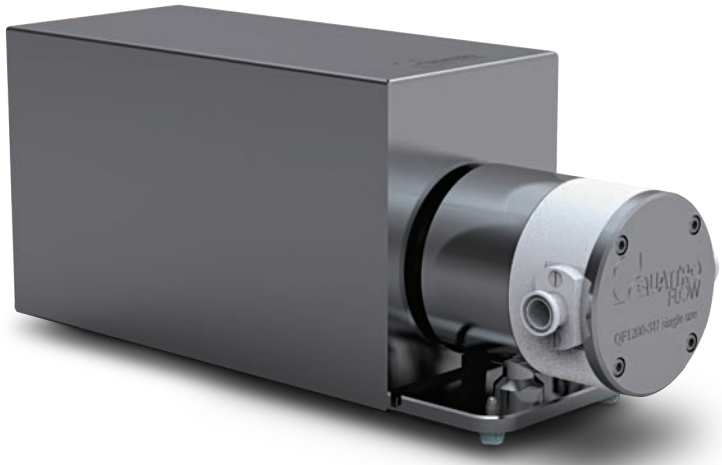


# QF1200SU

## Quaternary Diaphragm Pumps Single-Use

- Disposable wetted product chamber
- Pump chamber made of solid polypropylene
- Separate control box for manual operation available
- ATEX version available

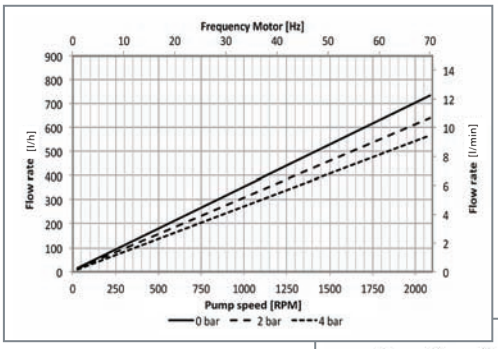


## Technical Data

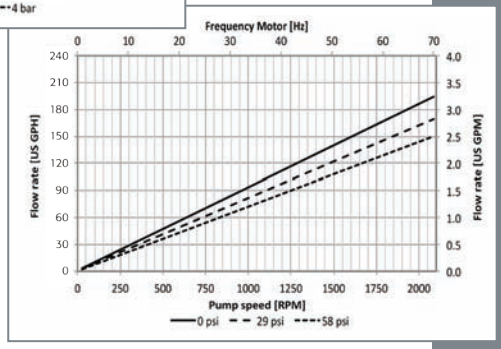
| QF1200SU Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 3° | 800 lph (13.3 lpm) |
| | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum*: | Eccentric Shaft 3° | 10 lph (0.167 lpm) |
| | Eccentric Shaft 5° | 20 lph (0.333 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 60° C (140° F) |
| | Autoclave | 130° C (266° F) |
| Pump Speed Range: | rpm | 30 - 2,400 |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 3° | 2.5 - 3 m (8.2-9.8 ft) |
| | Eccentric Shaft 5° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 9.6 ml (5°)<br>5.8 ml (3°) |
| | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | 3/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Chamber | PP |
| | Valve Plate | PP |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor (Standard): | Rated speed | 1375 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 0.37 KW |
| Pump Dimension with Motor and Housing: | Length | 497 mm (19.56") |
| | Width | 159 mm (6.26") |
| | Height | 210 mm (8.27") |
| Pump Weight with Motor and Housing: | | 21 kg (46 lb.) |

Other connection specifications, materials and motors available on request.
* When using pump with control box: 20 lph (0.333 lpm) and 40 lph (0.667 lpm)

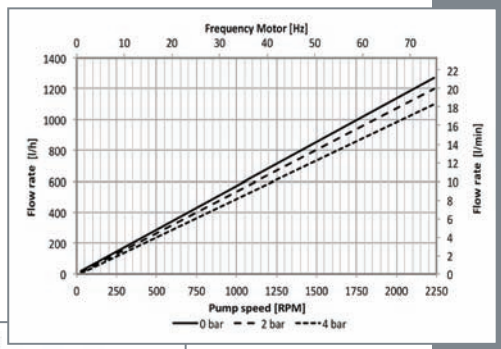
## Performance Charts

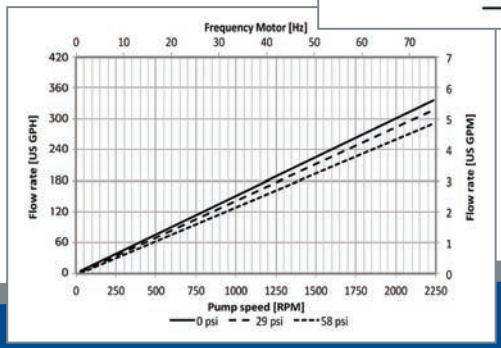



### Eccentric Shaft: 3°




### Eccentric Shaft: 5°




*Depending on the selected motor/ frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# QF1200SU-M

## Quaternary Diaphragm Pumps Single-Use

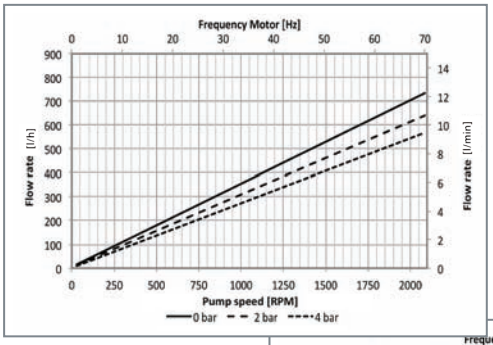
- Disposable wetted product chamber
- Pump chamber made of injection-molded polyethylene
- Separate control box for manual operation available
- ATEX version available
- Front side connections

## Technical Data

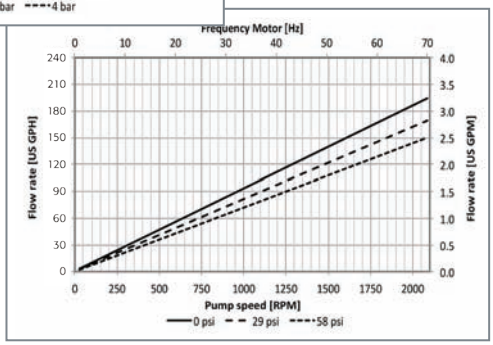
| QF1200SU-M Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 3° | 800 lph (13.3 lpm) |
| | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum*: | Eccentric Shaft 3° | 10 lph (0.167 lpm) |
| | Eccentric Shaft 5° | 20 lph (0.333 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 50° C (122° F) |
| Pump Speed Range: | rpm | 30 - 2,400 |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 3° | 2-2.5 m (6.6-8.2 ft) |
| | Eccentric Shaft 5° | 3-3.5 m (9.8-11.5 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 9.6 ml (5°) 5.8 ml (3°) |
| | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | 3/4" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Chamber | PE injection molded** |
| | Valve Plate | PE injection molded |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor (Standard): | Rated speed | 1375 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 0.37 KW |
| Pump Dimension with Motor and Housing: | Length | 503 mm (19.8") |
| | Width | 159 mm (6.26") |
| | Height | 210 mm (8.27") |
| Pump Weight with Motor and Housing: | | 20 kg (44 lb.) |

Other connection specifications, materials and motors available on request.
* When using pump with control box: 20 lph (0.333 lpm) and 40 lph (0.667 lpm)
** Connectors PP

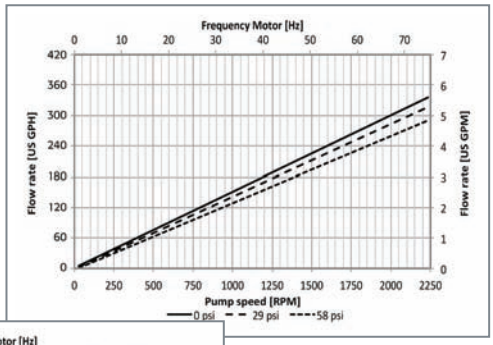
## Performance Charts

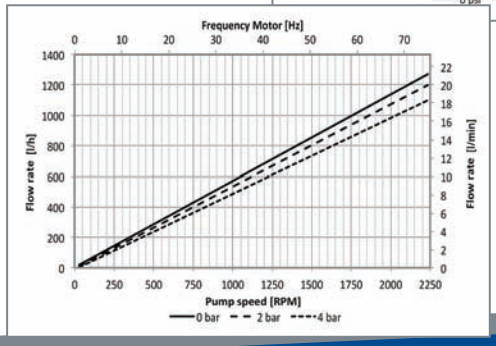



### Eccentric Shaft: 3°




### Eccentric Shaft: 5°




*Depending on the selected motor/ frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# QF1200SU-XAQ

## Pre-Gamma-Irradiated Single-Use Pump Chamber with CPC™ AseptiQuik® Connector

The use of aseptic connectors of CPC enables simple and flexible aseptic integration of gamma irradiated Quattroflow single-use pump chambers in biopharmaceutical processes. Depending on the process tubing requirements it allows users to flexibly and aseptically connect the pump chambers with bags, tubing and filters, which are also equipped with matching aseptic connectors.

- Disposable wetted product chamber
- Pre-gamma-irradiated
- Fast & easy aseptic integration
- Easy replacement

### **Technical Data** with Standard Drive (QF1200SU Pump)

| QF1200SU-XAQ Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 3° | 800 lph (13.3 lpm) |
| | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum*: | Eccentric Shaft 3° | 10 lph (0.167 lpm) |
| | Eccentric Shaft 5° | 20 lph (0.333 lpm) |
| Pressure: | Temperature of Fluid ≤ 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 40° C (104° F) |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 3° | 2.5 - 3 m (8.2 - 9.8 ft) |
| | Eccentric Shaft 5° | 4 - 4.5 m (13.1 - 14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 5.8 ml (3°)<br>9.6 ml (5°) |
| | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | AseptiQuik® G |
| | Sanitary Clamp | Sanisure® 3/4" |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Chamber / Valve Plate | PP |
| | Pump Diaphragms | TPE |
| | Pump Valves | EPDM |
| | Valves / O-rings | EPDM |
| | Connector Seals / TC Gasket | Platinum-Cured Silicone |
| | Connector Main Components | Polycarbonate |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe |
| Gamma Irradiation: | Gamma dose | 25 kGy |
| | Certificate | Included |
| | Comment | Double bagged package |

Other connection specifications, materials and motors available on request.

* When using pump with control box: 20 lph (0.333 lpm) and 40 lph (0.667 lpm)

For the performance charts, please refer to the QF1200SU pump specifications on page 15.

# QF1200SU-CV

## Quaternary Diaphragm Pumps Single-Use

- Disposable wetted product chamber
- Integrated controller
- Digital key pad for manual operation
- Compact size

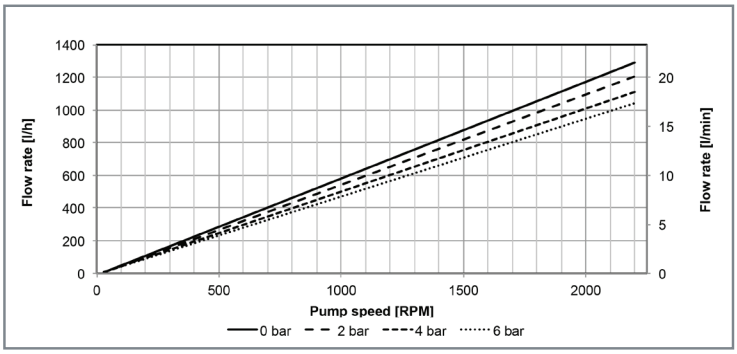
## Technical Data

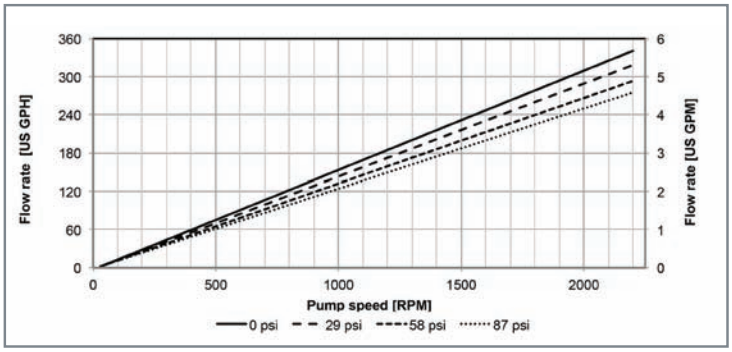
| QF1200SU-CV | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 5° | 1200 lph (20 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 5° | 10 lph (0.167 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 60° C (140° F) |
| | Autoclave | 130° C (266° F) |
| Pump Speed Range: | rpm | 10 - 2200 |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 5° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 9.6 ml |
| | Filling Volume Without Connectors | 75 ml |
| Connection Specification (Standard): | Connectors | 3/4" TC |
| | Position of Connectors | Inline |
| | Number of Flow Directions | 4 |
| Product Wetted Materials (Standard): | Pump Chamber | PP |
| | Valve Plate | PP |
| | Diaphragms | TPE |
| | Valves | EPDM |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor: | Rated speed | 2200 min-1 |
| | Voltage | 230 V |
| | Power | 0.75 kW |
| Pump Dimension with Motor and Housing: | Length | 497 mm (19.56") |
| | Width | 200 mm (7.87") |
| | Height | 210 mm (8.27") |
| Pump Weight with Motor and Housing: | | 21 kg (46 lb.) |

Technical data for the QF1200SU-CV-M (pump chamber made of injection-molded PE) available on request.

## Performance Charts

### Eccentric Shaft: 5°



# QF4400SU

## Quaternary Diaphragm Pumps Single-Use

- Disposable wetted product chamber
- Separate control box for manual operation available
- ATEX version available

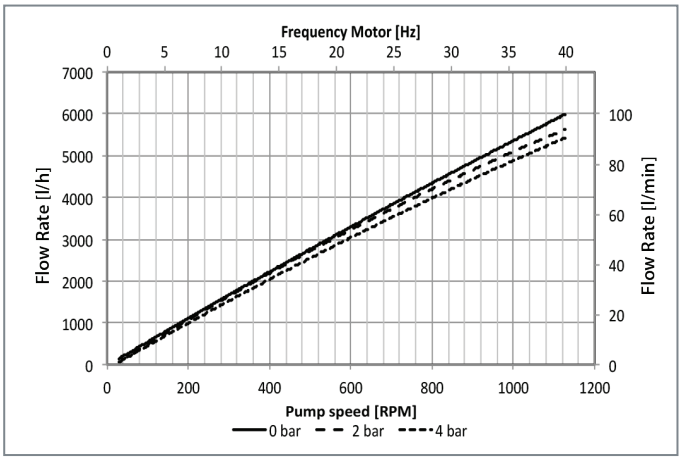
## Technical Data

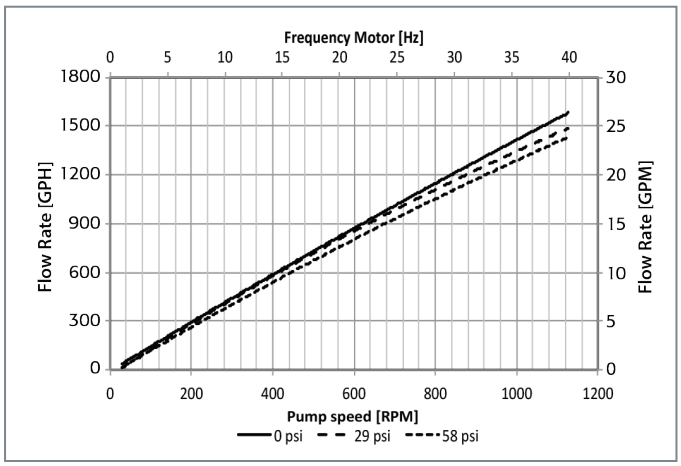
| QF4400SU Standard Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 6° | 5000 lph (83 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 6° | 150 lph (2.5 lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 60° C (140° F) |
| | Autoclave | 130° C (266° F) |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 6° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 95 ml |
| | Filling Volume Without Connectors | 820 ml |
| Connection Specification (Standard): | Connectors | 1.5" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Chamber | PP |
| | Valve Plate | PP |
| | Diaphragms | TPE |
| | Valves | EPDM / SS316L |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor: | Rated speed | 1410 min-1 (50 Hz) |
| | Voltage | 230/400 V |
| | Power | 2.2 KW |
| Pump Dimension with Motor and Housing: | Length | 776.4 mm (30.57") |
| | Width | 256 mm (10.08") |
| | Height | 330 mm (12.99") |
| Pump Weight with Motor and Housing: | | 81 kg (178 lb.) |

Other connection specifications, materials and motors available on request.

## Performance Charts

### Eccentric Shaft: 6°



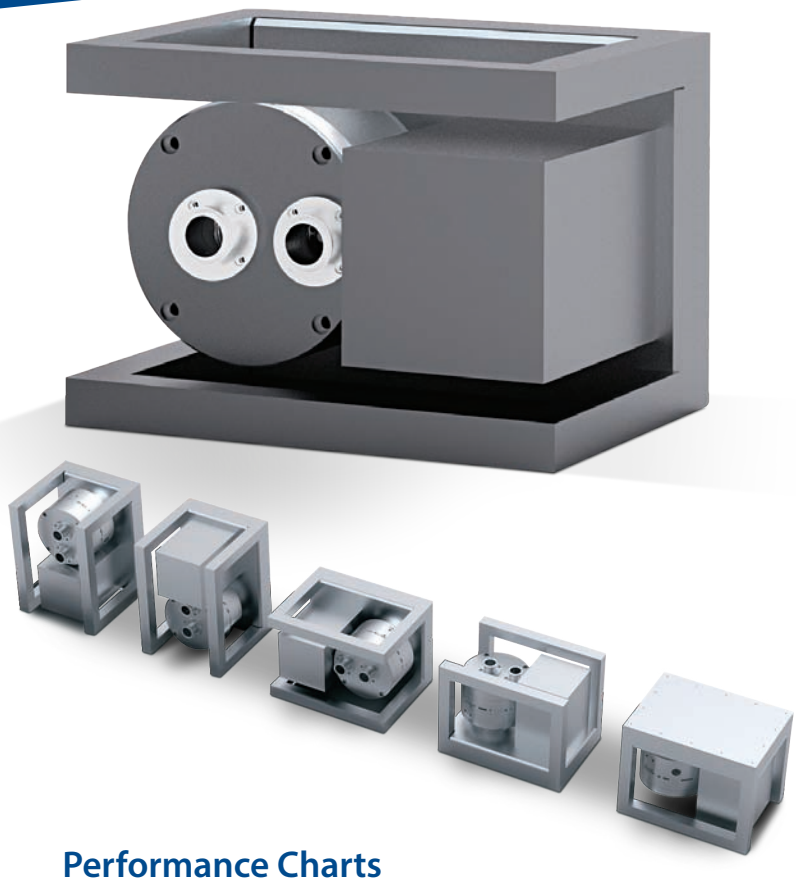




Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.

# QF5050SU

## Quaternary Diaphragm Pumps Single-Use

- Disposable wetted product chamber
- Compact footprint
- High turn-down ratio
- Multi-option installation flexibility
- Separate control box for manual operation available



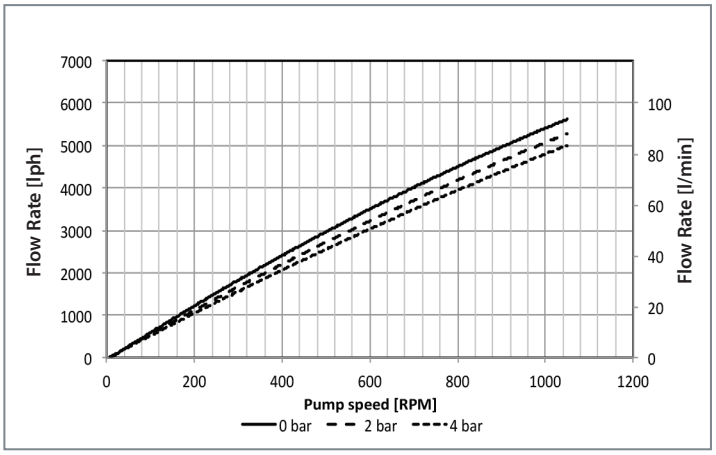
## Technical Data

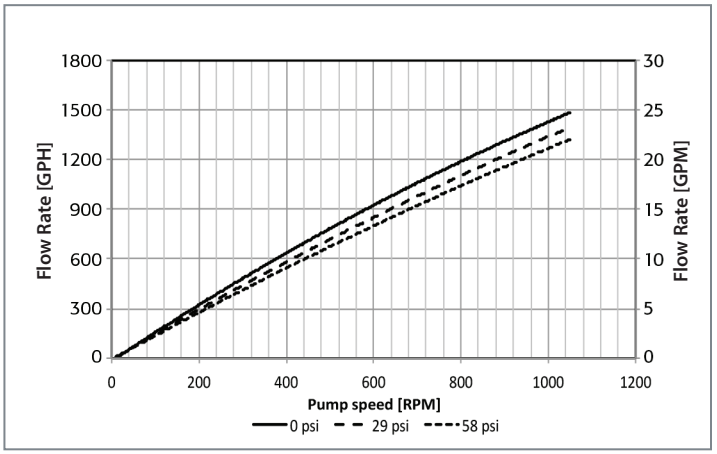
| QF5050SU Servo Motor | | |
|---|---|---|
| Flow Rate Maximum: | Eccentric Shaft 6° | 5000 lph (83 lpm) |
| Flow Rate Minimum: | Eccentric Shaft 6° | 50 lph (0.83.lpm) |
| Pressure: | Temperature of Fluid < 40° C (104° F) | 4 bar (58 psi) |
| | Temperature of Fluid > 40° C (104° F) | 4 bar (58 psi) |
| Maximum Temperature: | Fluid | 60° C (140° F) |
| | Autoclave | 130° C (266° F) |
| Suction Lift Dry at 1800 rpm: | Eccentric Shaft 6° | 4 - 4.5 m (13.1-14.7 ft) |
| Volume Specifications: | Approximated Volume per Revolution at Free Output | 95 ml |
| | Filling Volume Without Connectors | 820 ml |
| Connection Specification (Standard): | Connectors | 1.5" TC |
| | Position of Connectors | Front |
| Product Wetted Materials (Standard): | Pump Chamber | PP |
| | Valve Plate | PP |
| | Diaphragms | TPE |
| | Valves | EPDM / SS316L |
| | O-rings | EPDM |
| Certificates/Proofs (Optional): | Elastomere (product wetted) | USP <88> Cl. VI; FDA21CFR177; BSE/TSE Safe; USP 87/381/661 |
| Motor: | Rated speed | 3000 min -1 (2.66:1reduction) |
| | Voltage | 400 V |
| | Power | 3 KW |
| Pump Dimension with Motor and Housing: | Length | 440 mm (17.32") |
| | Width | 325 mm (12.80") |
| | Height | 320 mm (12.60") |
| Pump Weight with Motor and Housing: | | 51 kg (112 lb.) |

Other connection specifications, materials and motors available on request.

## Performance Charts

### Eccentric Shaft: 6°




*Depending on the selected motor/frequency drive combination, the motor frequency and the resulting pump speed might differ.*

# Accessories

## Control Box

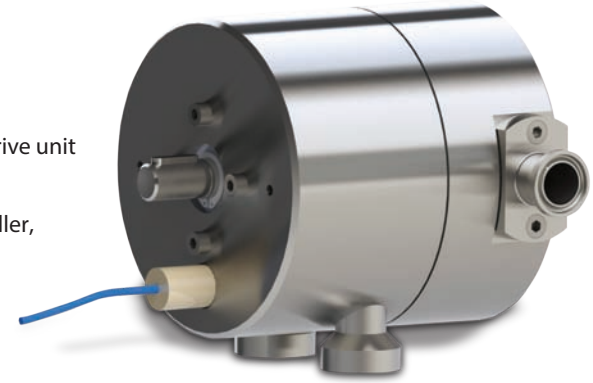
- Variable speed controller with integrated key pad for manual speed control
- Configurable for remote speed control with 4 –20 mA analogue input
- 230V / 50 Hz or 115 V / 60 Hz for model 1200 *(image left)*
- 400V, 3P for models 4400/5050/20k *(image right)*
- Hygienic 1.4301 housing, IP 54
- Easy plug & play installation

## Power Box

- Plug & Play installation
- Protects system and pump from overpressure
- Configurable pressure switch setpoint
- Reset button for pump reset
- To be used with pressure switch (also available)
- For multiple-use models only

## Diaphragm Sensor

- Sensor installed in ring drive unit
- Detection of all liquids
- Signal output to a controller, if diaphragm is ruptured



## PID Pressure Controller

- Ideal for processes, where the Quattroflow pump should be controlled to a defined pressure or flow rate (e.g. for filtration)
- 4 – 20mA input for pressure or flow sensor
- 24VDC voltage supply for sensors
- Autotune function for optimization of PID parameters
- 0 – 5VDC output signal for use with QF150 or QF1200CV (requires optional analogue input)
- Configurable alarm setpoints for automatic shutoff of pump

QUATTROFLOW™
Fluid Systems

# Concerned about Particle Generation?

## Quattroflow™ pumps and peristaltic pumps:

### Particle generation compared

Facts about peristaltic pumps used for biopharmaceutical production processes:

- Particle generation caused by pump design.
- Permanent mechanical stress of the hose may lead to a substantial source of particles entering the fluid stream.
- Possible contamination of the pumped liquid and the pharmaceutical end product.
- Drop-in flow rate over time
- Some are not capable of reaching more than 1 bar

### Do you want to avoid this in your product?

The images on the right show micrographs of filter membranes, which were used to quantify particles created during a pumping process.

- Particles from the peristaltic pump are visible as bright objects obstructing the pores of the membrane *(lower image)*.
- The filter membrane of the Quattroflow test does not show particles just open membrane pores. The gentle working principle of the 4-piston Quattroflow pump minimizes mechanical stress and thus the generation of particles *(upper image)*.

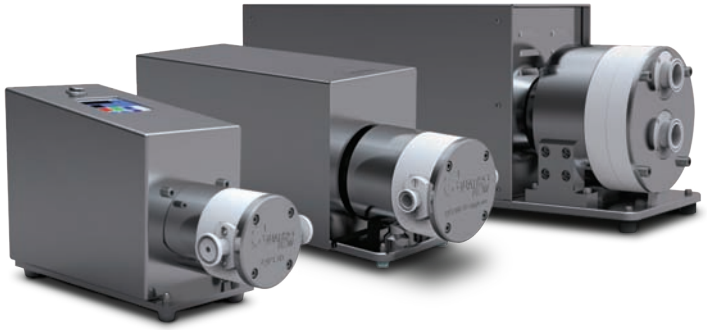
**Test conditions:**

Third party comparison between Quattroflow QF150SU and peristaltic pump using pharma-grade pumping hose. 8h continuous recirculation through 12µm filter filter at approximately 100 lph (1.67 lpm)

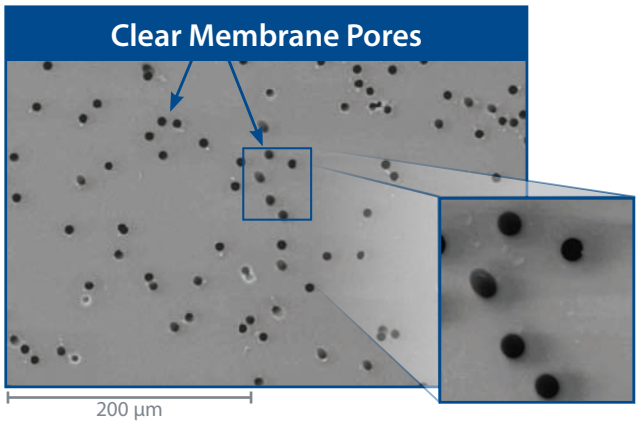
**Result:**

- 2 Mio particles with sizes between 6.1 and 12.7 µm for the peristaltic pump.
- No particles identifiable for the Quattroflow pump.

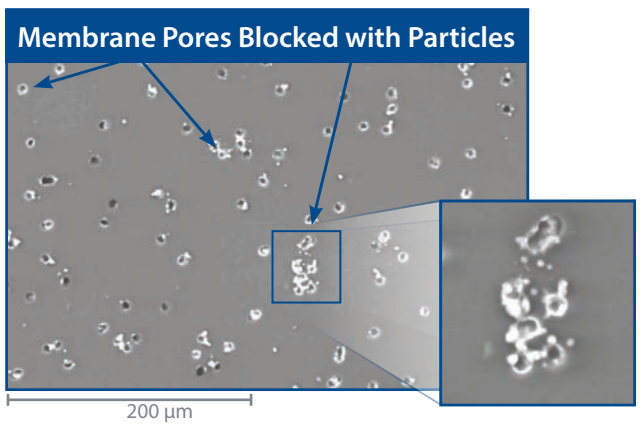
Quattroflow pumps help minimize particle contamination of your product, reduce heat, and are suitable for securing the handling of expensive and/or sensitive liquids.



### Quattroflow




### Peristaltic Pump



# Quattroflow™ Pumps
## make the difference

**Besides the particle generation and product contamination facts mentioned on the first page, peristaltic pumps have some further operational limitations, which can be a disadvantage and risk for your process:**

**Pulsation**
Due to their operational design, peristaltic pumps create a pulsing flow, which can adversely affect the process.

**Tube failure**
High mechanical stress can result in tube rupture, which can lead to a catastrophic failure, costly product loss, downtime and maintenance.

**Flow rate consistency**
With increasing operating time of the tube, mechanical stress changes the hose geometries over time and can lead to an inconsistent flow.

These disadvantages inherent in peristaltic pumps ultimately mean potential threats to the quality of the process and the final product. Spallation, performance loss and rupture are also described in scientific literature (see Bahal and Romansky, *"Spalling and sorption of tubing for peristaltic pumps"*) in Pharmaceutical Development and Technology, 7(3), 317-323 (2002).

Single-use technologies have created improved production opportunities in bio-pharmaceutical production processes. The correct pump technology can make a significant contribution.

**Particle generation outside the hose**
Spallation release may also occur outside the hose. This may compromise the fluid path but also contaminate the external clean room environment.

**Pump technology change**
Limited flow and pressure capabilities of peristaltic pumps means changing pump technologies as processes move from process development to cGMP creating scale up issues.

Where Innovation Flows

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