

# **Hydra·Cell<sup>®</sup>**

**METERING SOLUTIONS™**

**Metering Pumps with “Pulse-Free” Linear Flow**

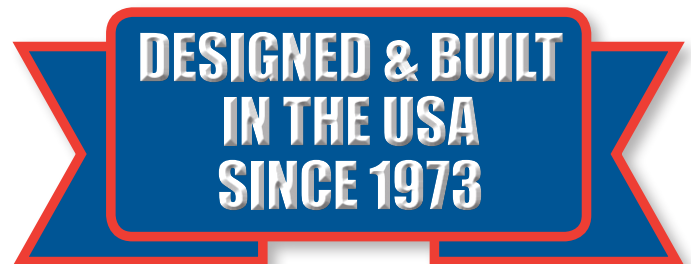


**Wanner Engineering, Inc.**



## Hydra-Cell® Metering Solutions

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“If the owner of a plant wants cost-effective pumps...he will buy pumps with the lowest Life Cycle Cost. Hydra-Cell is simple in construction, less elaborate in design and physically smaller for equivalent flow/pressure performance. These differences can substantially affect both purchase and operating costs.”

Ing Friedrich-Wilhelm Hennecke, Ph.D.  
*Chemical Engineering World*

*Dr. Hennecke served on the Faculty of Chemical Engineering, Karlsruhe, and as a plant engineer, specifying pumps at BASF AG for 30 years.*

*Due to the Wanner Engineering Continuous Improvement Program, specifications and other data in this catalog are subject to change.*

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# Hydra-Cell® Is Not a Conventional Metering Pump



**Hydra-Cell**  
METERING SOLUTIONS™

The technology used to produce metering pumps has barely changed in over a generation. As a result, conventional metering pumps have operational limitations and greater cost consequences.

Hydra-Cell is not a conventional metering pump. Hydra-Cell Metering Solutions pumps enable you to meet and, in most cases, exceed API 675 performance standards with virtually pulse-less, linear flow while providing many other operational benefits.

Taking advantage of the most current technologies, Hydra-Cell P Series metering pumps achieve superior levels of accuracy, repeatability and linearity, while delivering precise, constant flow. This revolution in metering employs the latest available means of electronic flow control to replace antiquated, inaccurate stroke adjusters.

To maintain accuracy in a hydraulically-actuated metering pump, the volume of oil on the non-process side of the diaphragm must remain constant. Conventional metering pumps rely on vacuum sensing or mechanical activation to compensate for leakage past the plunger. They may not compensate on every pump stroke.

Hydra-Cell pumps incorporate a replenishment valve in every piston assembly. This ensures optimum actuating oil

volume on every diaphragm stroke to provide superior accuracy that exceeds the performance demands of API 675.

In addition, the modern design features of the Hydra-Cell pump lower your acquisition costs when compared to conventional metering pumps, and its inherently simple yet elegant engineering keeps your maintenance and replacement costs down. Rugged construction and long-lasting durability will provide economy and value over the lifetime of your Hydra-Cell metering system.

Used in place of conventional metering pumps to provide superior performance at a lower cost, Hydra-Cell is an extraordinary metering pump built to handle your precise metering and dosing applications.

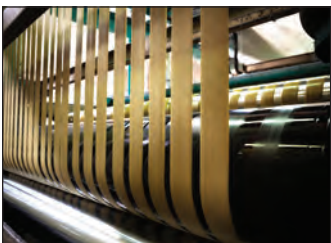
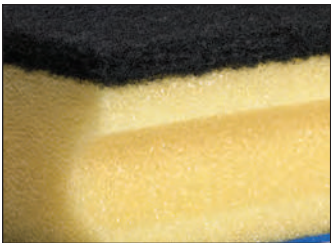
*The IChemE Awards recognize innovation and excellence in making outstanding contributions to safety, the environment, and sustainable development in the chemical and bioprocess industries.*



# Hydra-Cell® Applications and Markets Served

## Primary Pumping Applications

- Adding
- Blending
- Coating
- Dosing
- Filling
- Filtering
- Injecting
- Metering
- Mixing
- Spraying
- Transferring



## Fluid Handling Capability



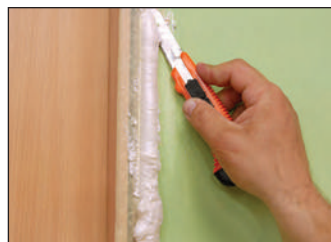
Propane/ Butane    Freon    Ammonia    Polymers    Fuels/ Additives    D.I. Water    Glycols    Chlorine    Acids/ Caustics    Glues/ Adhesives    Inks/ Paints    Resins    Slurries

From drinking water to highly viscous resins, Hydra-Cell Metering Solutions pumps can handle the full spectrum of process fluids while maintaining high-efficiency operation. This includes non-lubricating fluids as well as difficult fluids with

abrasives that can damage or destroy other types of pumps. This makes Hydra-Cell an ideal choice in a wide range of industries and when serving multiple applications in one facility.

## Markets and Industries Served

- Agricultural
- Automotive
- Biodiesel
- Biotechnical
- Ceramics
- Chemical & Petrochemical
- Chip Board Manufacturing
- Construction
- Electronics
- Emissions & Environmental Control
- Energy & Power Generation
- Flue Gas Emission Control
- Food & Beverage Processing
- General Industrial & Manufacturing
- Glass & Clay
- Landscaping & Lawn Care
- Marine
- Mining, Quarrying & Tunneling
- Offshore Drilling & Processing
- Oil, Gas & Petrochemical
- Paints, Coatings, Sealants & Adhesives
- Personal Care
- Pharmaceutical
- Polyurethane
- Propellant Packaging
- Pulp & Paper
- Reverse Osmosis & Filtration
- Rubber & Plastic
- Spray Drying
- Steam Generation
- Steel
- Textiles
- Water & Wastewater Treatment



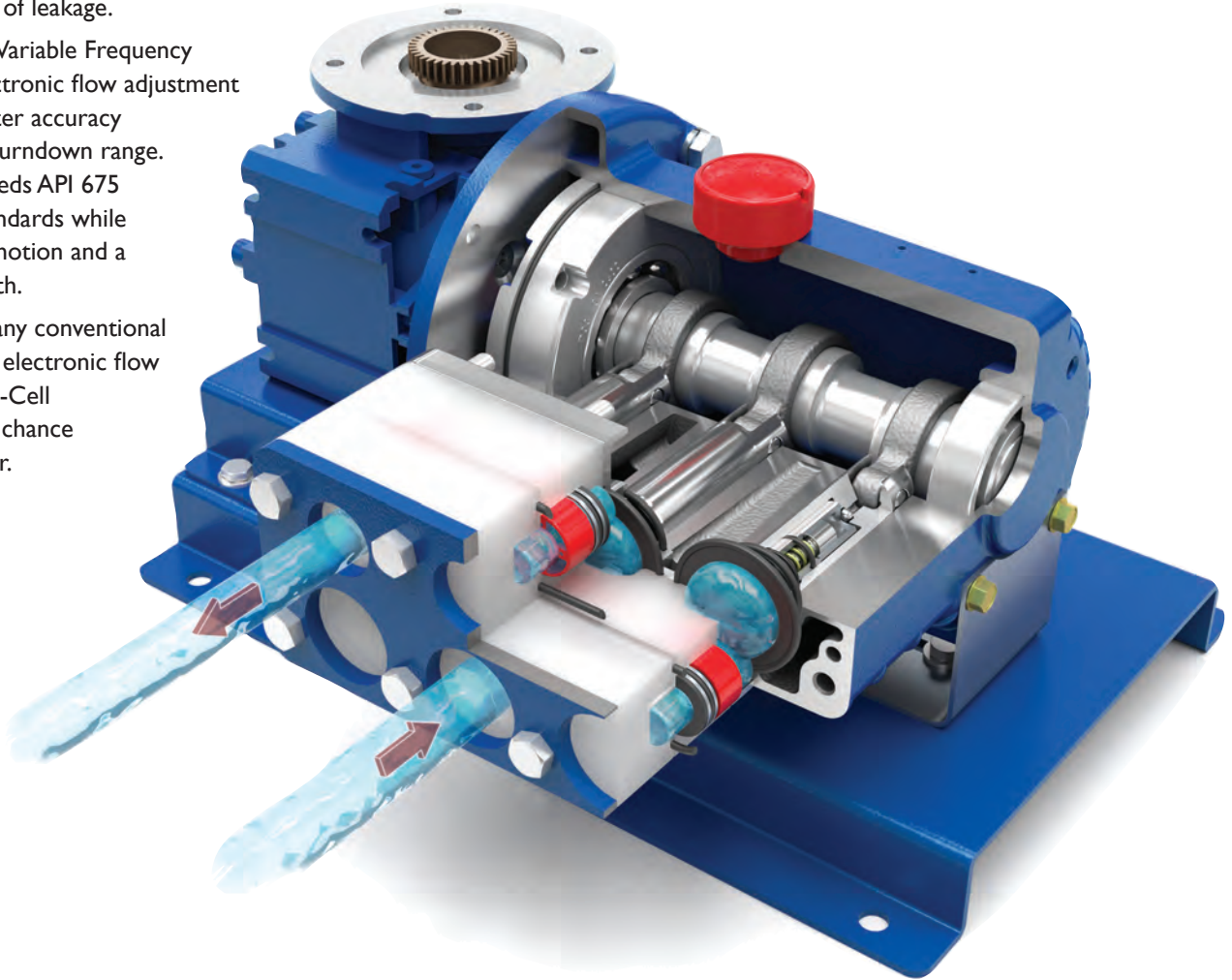
# Hydra-Cell® Operational and Cost Advantages

## Electronic Flow Control Is More Accurate and Reliable

Conventional metering pumps rely on manual stroke adjustment or expensive actuators to change flow. This can result in pumping inaccuracies, lost motion, operator error, and a greater chance of leakage.

Hydra-Cell uses Variable Frequency Drive (VFD) electronic flow adjustment to maintain greater accuracy throughout the turndown range. It meets or exceeds API 675 performance standards while eliminating lost motion and a potential leak path.

Compared to many conventional metering pumps, electronic flow control of Hydra-Cell also reduces the chance of operator error.



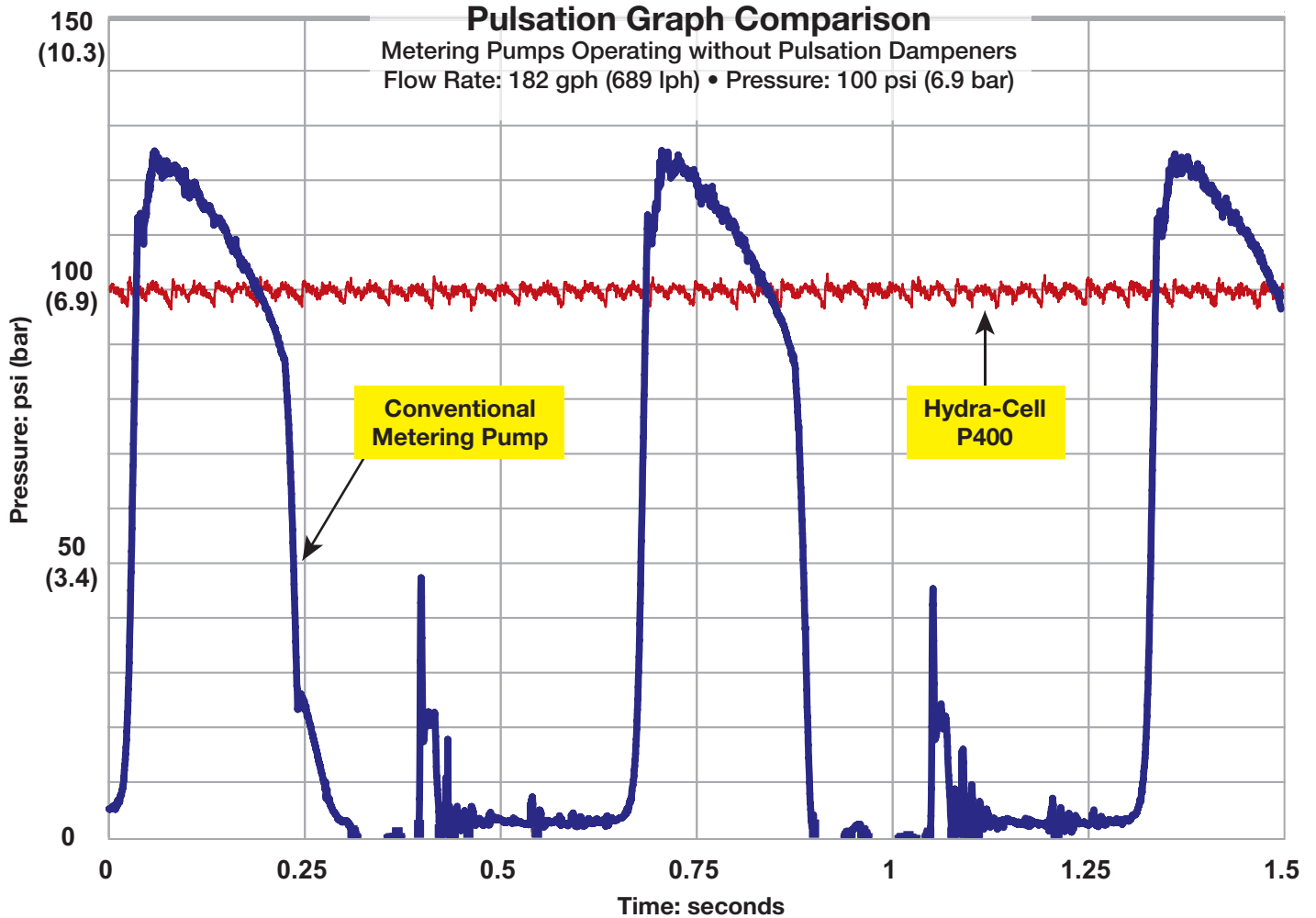
<b>Hydra-Cell with Electronic Flow Control</b>	<b>Other Pumps with Manual Stroke Adjusters/Actuators</b>
Solid-state electronics (SCR, VFD, or solenoid pulser) are unlikely to fail	Stepper motors or linear actuators driving against pressure are subject to wear and tear
Metering is linear over the entire range	Losses in repeatability below 30% stroke length and losses through check valves
Volume per every stroke is constant and a known value	Unknown with manual stroke adjustment and may not be proportional to the output
Easy calibration of the desired feed rate	Nearly impossible to calibrate unless a variable stroke rate or span-able controller is used
Rate of change is virtually instantaneous (0 to maximum rpm in 0.3 seconds)	Up to one (1) second per 1% of the stroke length

# Hydra-Cell® Operational and Cost Advantages

## Accurate Metering with Virtually Pulse-free Flow

Conventional metering pumps produce pulsing, surging flow and require large pulsation dampeners that add cost and complexity to a metering system. This inherent problem with conventional metering pumps creates greater strain on the system and more wear and tear on the pump.

Hydra-Cell Metering Solutions pumps (except P100) feature a multiple-diaphragm design that minimizes pulsations, producing smooth, linear, virtually pulse-free flow without the need for expensive pulsation dampeners.



Compared to conventional metering pumps operating under the same conditions at the same flow and pressure, Hydra-Cell metering pumps provide smooth, almost pulse-less performance.

This allows for the design of a safer, less expensive metering pump system that can be used in more accurate applications, such as spraying which cannot tolerate pulsing flow.

## Reduced Pulsations Improve Operation

- Reduces pipe strain
- Enhances operating safety
- Minimizes maintenance
- Reduces friction and acceleration losses
- Eliminates the need for pulsation dampeners
- Lowers system acquisition costs
- Provides accurate metering and injecting with linear, constant flow and eliminates the “slugs” common to conventional metering pumps

# Hydra-Cell® Operational and Cost Advantages

## Greater Choice of Materials Enhances Capability

A choice of diaphragm, check valve, and liquid end materials enables Hydra-Cell Metering Solutions pumps to operate over a wider range of processing applications than conventional metering pumps. In addition, special materials such as PVDF

and Hastelloy C are available in standard Hydra-Cell packages. Hydra-Cell is lower in cost compared to conventional metering pumps that have substantial price adders for exotic liquid end materials.

### Manifolds



Manifolds for Hydra-Cell Metering Solutions pumps are available in metallic and non-metallic materials to suit your process application. They are easy to replace and interchangeable to accommodate different fluids processed by the same pump. Special manifolds with a 2:1 dosing ratio are also available. (Consult factory.)

### Valves



Hydra-Cell Metering Solutions valve assemblies (seats, valves, springs, and retainers) are available in a variety of materials to suit your process application.

### Diaphragms and O-rings



Conventional metering pumps typically offer only PTFE diaphragms. When subjected to flex stresses, PTFE diaphragms do not have a “memory” like elastomeric diaphragms and will require more frequent and costly replacement due to stresses on the material. In addition, if fluid and process temperatures are low, and the PTFE diaphragm is cold, it can stiffen and cause irregularities in the output, and cause a drop in flow.

Hydra-Cell offers PTFE diaphragms as well as the following cost-effective elastomeric materials:

- Aflas
- EPDM
- FKM
- Neoprene
- Buna-N

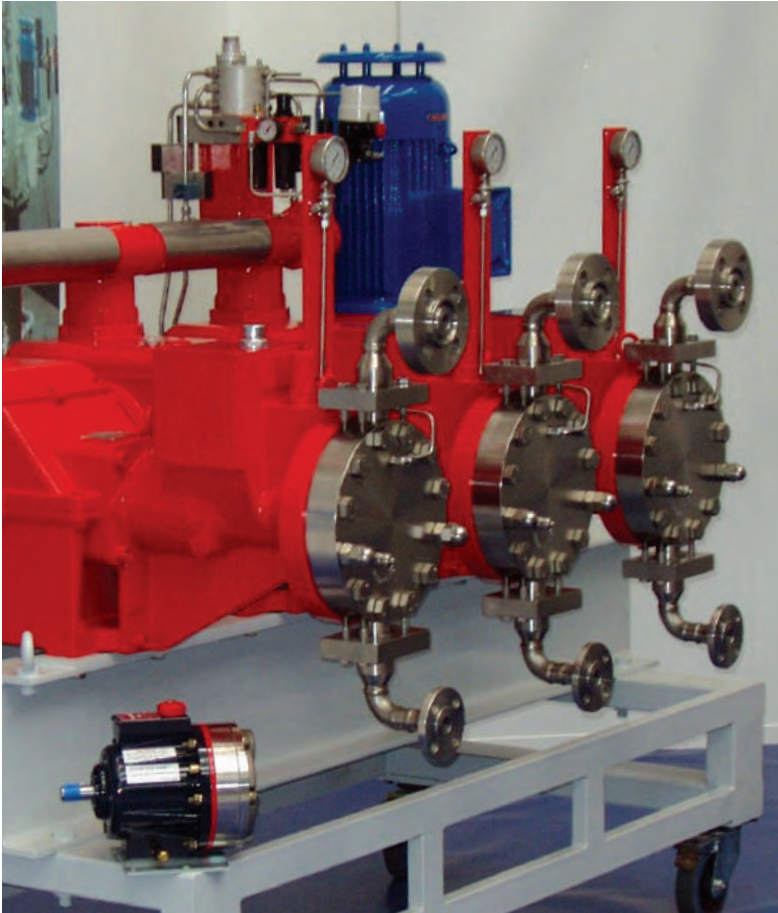
#### Registered trademarks of materials:

Aflas®	Asahi Glass Co., Ltd.
Buna®-N (Nitrile)	E.I. Du Pont de Nemours and Company, Inc.
Hastelloy® C	Haynes International, Inc.
Neoprene®	E.I. Du Pont de Nemours and Company, Inc.
Teflon® (PTFE)	E.I. Du Pont de Nemours and Company, Inc.
Viton® (FKM)	DuPont Performance Elastomers, LLC



# Hydra-Cell® Operational and Cost Advantages

## Achieve Economy through Technology



Both the Hydra-Cell pump and triplex metering pump shown have the same flow capacity and pressure rating. Hydra-Cell has a much smaller footprint, however, saving valuable floor space in your facility. Conventional metering pumps can become over-sized and overpriced as flow and pressure requirements increase.

### Ratings

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Flow: 396 gph (1500 lph)

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Pressure: 1160 psi (80 bar)

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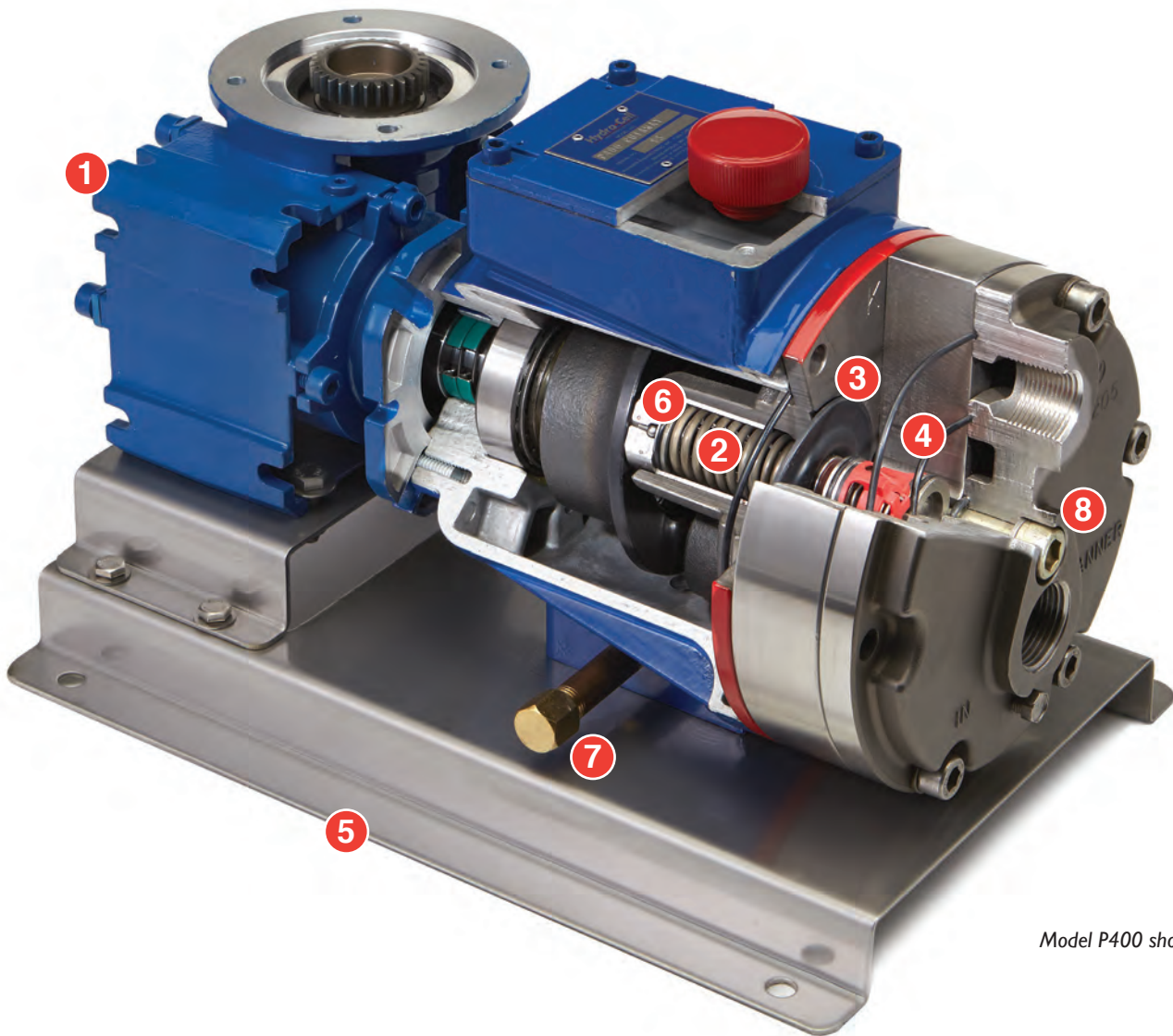
### Pumps Shown to Scale

Conventional metering pumps use technology in existence or unimproved upon for many years. This poses limitations such as inaccurate stroke adjusters, pulsation problems, restricted choice of materials, narrow adjustable flow ranges, and different plunger and diaphragm sizes. In addition, large footprints may be needed to handle high flows and pressures. Other pumps can also have difficulty handling slurries and suspended solids. Conventional metering pumps result in higher costs of acquisition, maintenance, and replacement.

Hydra-Cell combines simple, elegant engineering with rugged construction to offer greater versatility while lowering life cycle costs. Design advantages include:

- Seal-less design means no mechanical or dynamic seals, cups, or packing to leak or replace.
- Smaller footprint that offers the same capability as larger, typically higher-priced pumps.
- Each model covers an extensive range of pressures and flows, whereas ordinary metering pumps may need different plunger and liquid end sizes to accommodate increases.
- The inherent simplicity of the Hydra-Cell design allows versatile application compared to complex metering pumps that require expensive construction changes to meet specific needs.
- Simplicity also means lower parts and maintenance costs.
- A separate gearbox allows greater versatility in changing applications and prevents cross-contamination of actuating oil - integral gearing on other pumps is difficult and expensive to change.
- A replenishment valve in every piston assembly ensures optimum actuating oil on every stroke for continuous accuracy - other metering pumps can leak oil past the plunger and may not be able to compensate on every stroke.

# Hydra-Cell® Design Features and Benefits

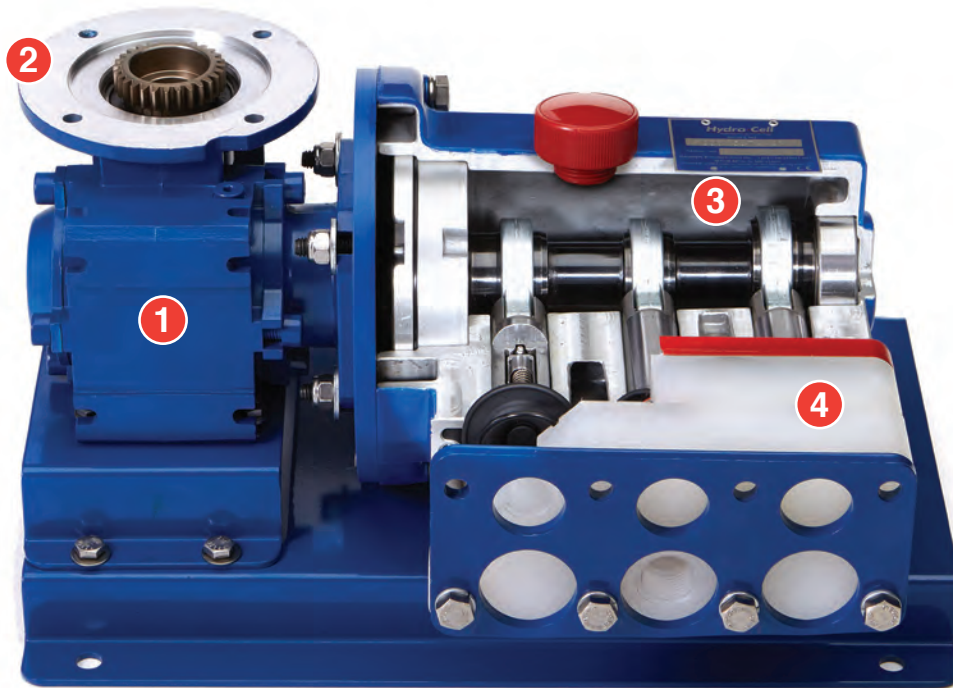


Model P400 shown

- 1 More Accurate**  
No manual stroke adjustment to cause inaccuracies, potential leakage and operator error.
- 2 Optimal Precision**  
Full stroke - every stroke.
- 3 Linear Flow**  
Multiple diaphragms reduce pulsations and acceleration losses.
- 4 Variety of Flows & Pressures**  
Same plunger, liquid end and diaphragm size.
- 5 Space-Saving**  
Significantly smaller footprint than comparably-rated metering pumps.
- 6 Greater Repeatability**  
Replenishment valve in piston assembly ensures optimum actuating oil on every stroke for continuous accuracy.
- 7 Easy Maintenance**  
Simple, neat drain plug for oil changes.
- 8 Less Chance of Entrapped Air**  
Porting is larger than normal to eliminate common out-gassing metering problems.

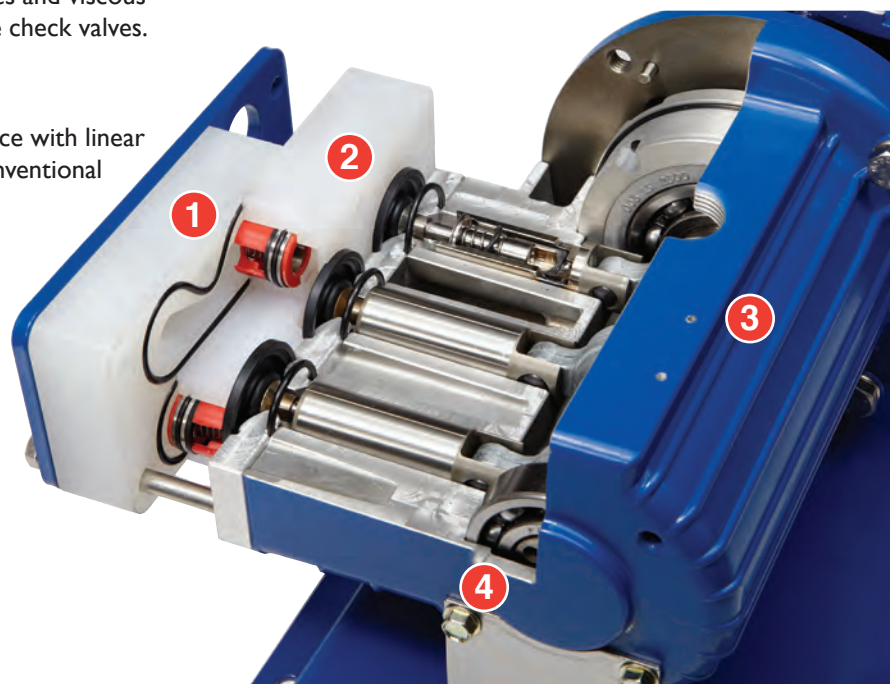
- 1 Separate Gearbox**  
Enables versatility in changing applications and prevents cross-contamination of actuating hydraulic oil.
- 2 Versatile Motor Adapter**  
Makes it easier to install or replace motors. (Variety of NEMA & IEC motor frames available.)

- 3 Inherent Simplicity**  
Lowers acquisition costs, reduces maintenance costs, and minimizes labor costs.
- 4 Extensive Choice of Materials**  
Choice of diaphragm, check valve, and liquid end materials allows pumps to operate in a wider range of applications.



Model P200 shown

- 1 Spring-Loaded, Horizontal Disk Check Valves**  
Designed for superior handling of particulates and viscous fluids compared to floating, vertical ball-style check valves.
- 2 Multiple Diaphragms**  
Provide smooth, almost pulseless performance with linear flow, compared to the “slugs” created by conventional metering pumps.
- 3 Robust Construction**  
Delivers long-lasting, durable operation in the toughest industrial and processing environments.
- 4 Lubricated Ball Bearings**  
Ensure optimal pump life.



# Hydra-Cell® Metering Performance Standards

## P Series Pumps Exceed API 675 Performance Standards

In 1994, the American Petroleum Institute (API) adapted its Standard 675 to stipulate performance characteristics for controlled-volume, positive displacement pumps. Although revised in 2010, and again in 2012, API 675 primarily defined metering pumps using mechanical stroke adjustment.

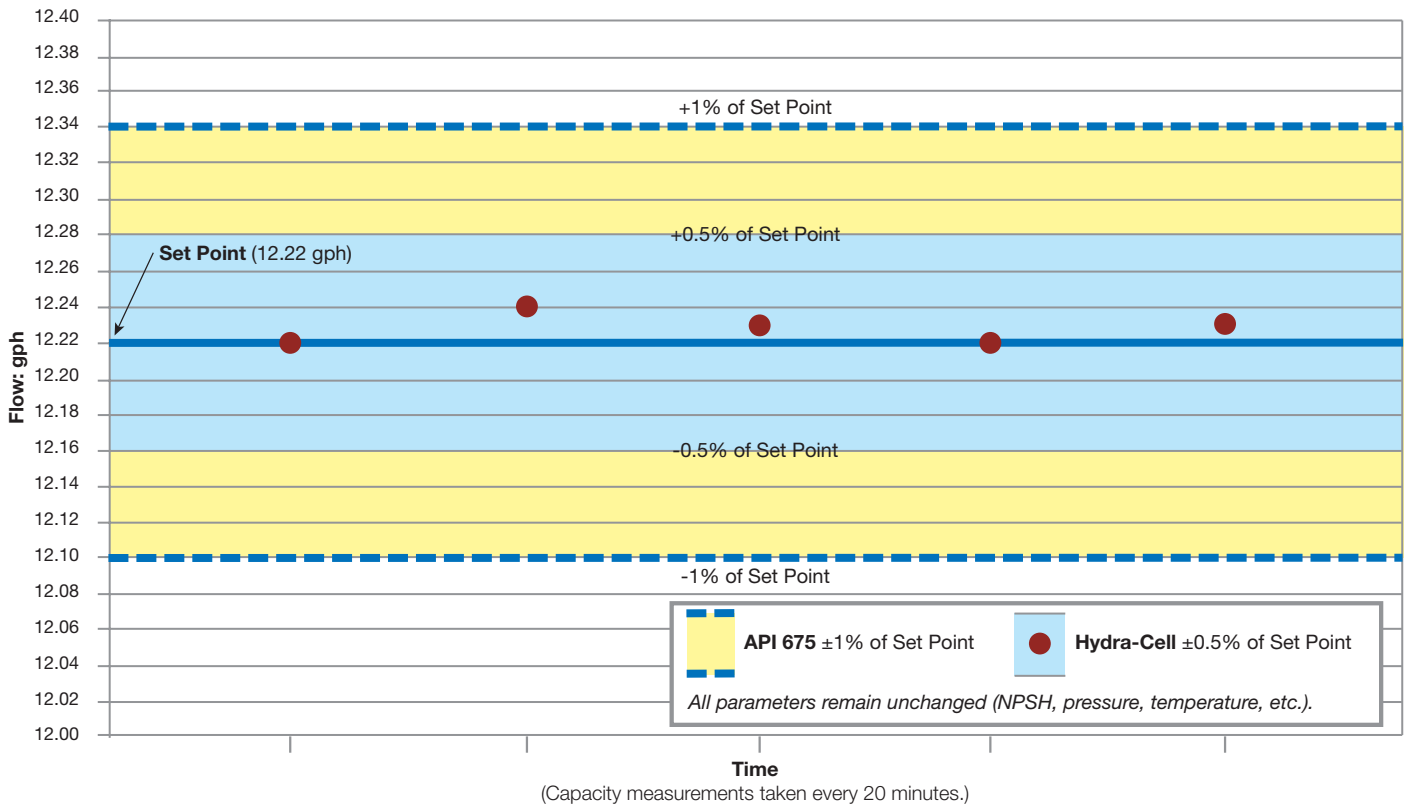
Hydra-Cell Metering Solutions meet or exceed API 675 performance standards by using electronic flow control to improve accuracy and a multiple-diaphragm design to reduce pulsations. A replenishment valve in every piston assembly ensures optimal actuating oil for continuous accuracy and greater repeatability. Used in precise metering, dosing, injection, and mixing applications, Hydra-Cell pumps provide an economical alternative to conventional metering pumps.

## Operational Data for Testing

Pump Configuration:	P300NRGSS015S
Reducer:	15:1
Pressure:	1500 psi
Actuating Oil:	10W-30 Hydra-Oil
Ambient Temperature:	71.5°F
Pumped Fluid:	Water @72°F
Gravity Feed:	1-to-3 Feet Positive Head
Franklin IMDS Motor:	240-2400 rpm 1 hp

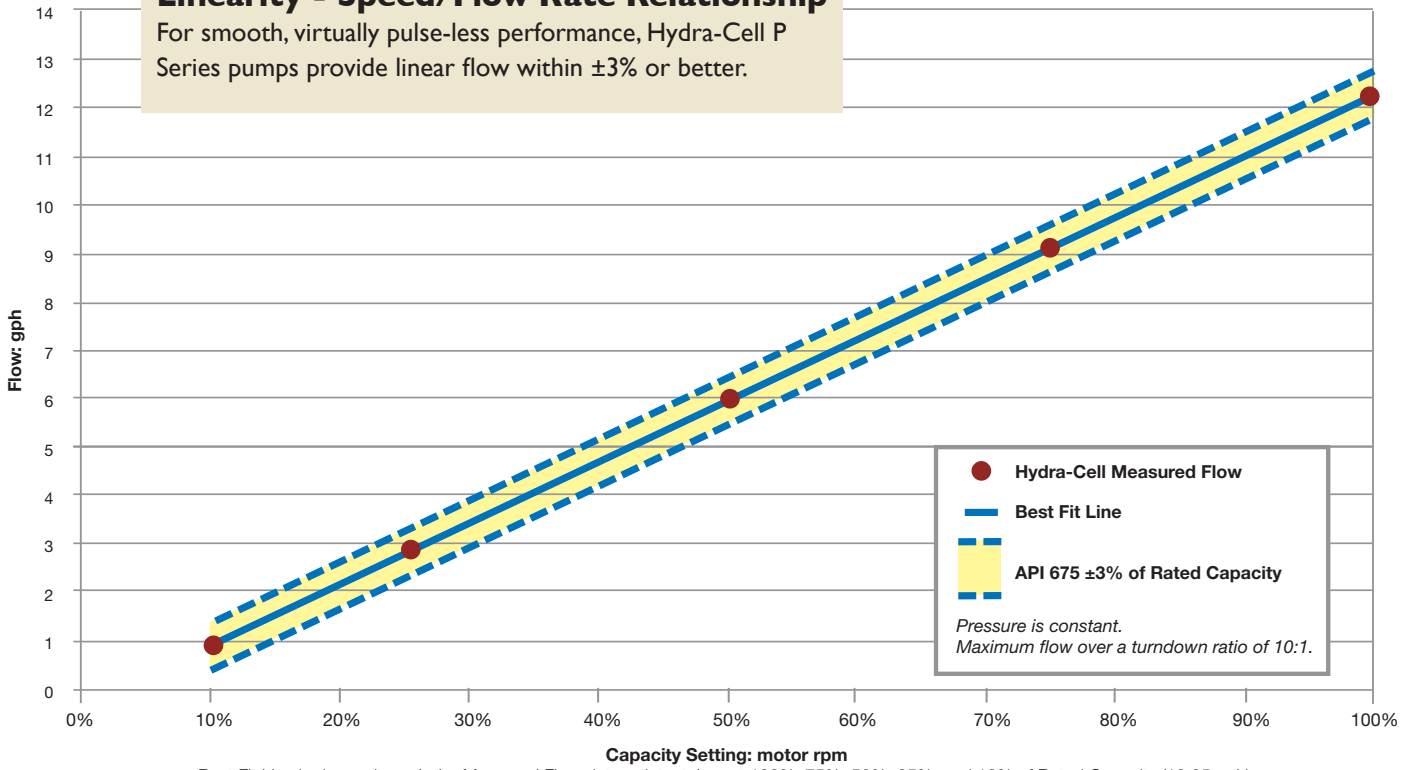
### Accuracy - Performance at a Set Point

For continuous metering applications, Hydra-Cell P Series pumps provide precise steady-state accuracy of  $\pm 1\%$  or better.



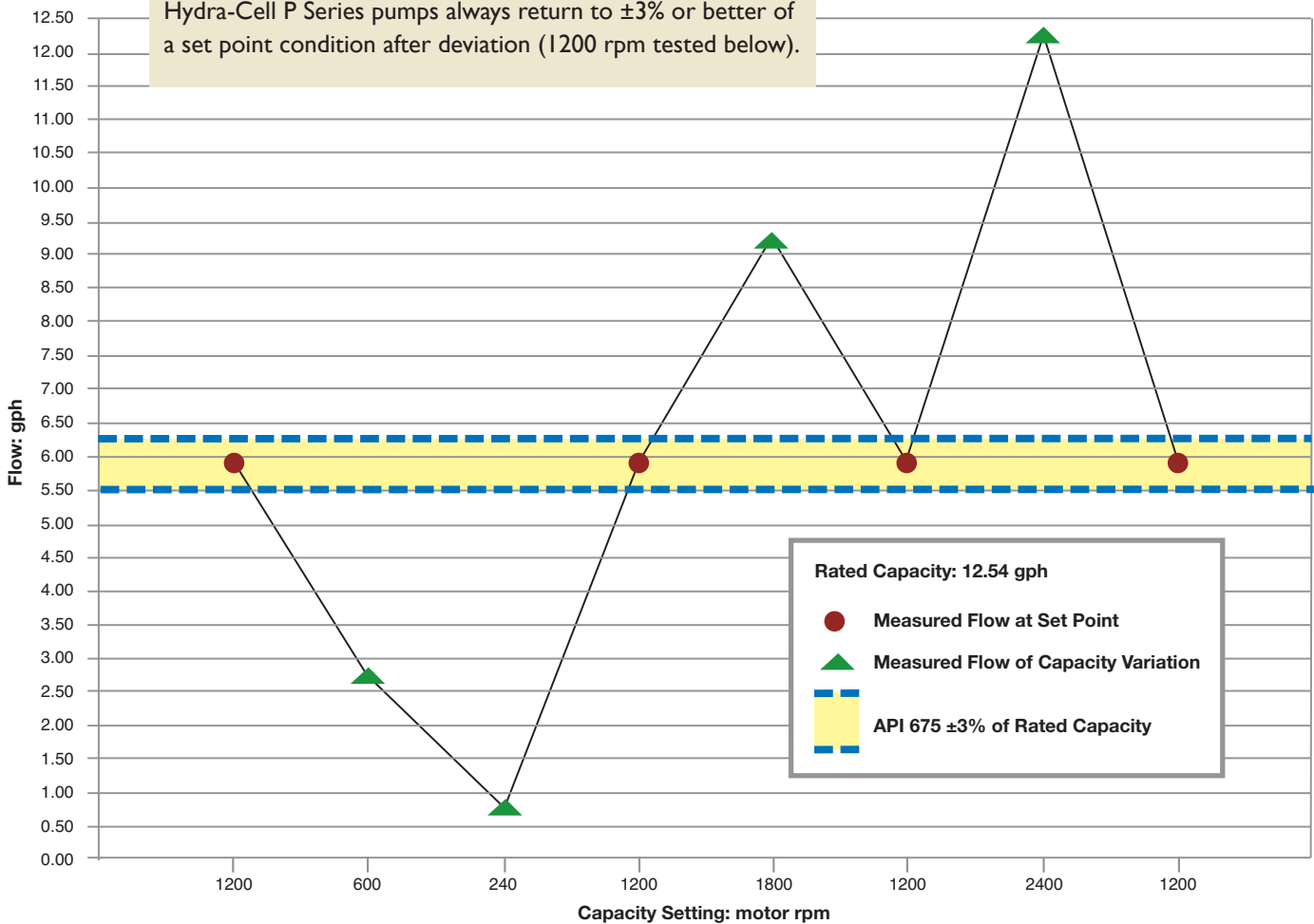
### Linearity - Speed/Flow Rate Relationship

For smooth, virtually pulse-less performance, Hydra-Cell P Series pumps provide linear flow within  $\pm 3\%$  or better.



### Repeatability - Return to Set Conditions

Hydra-Cell P Series pumps always return to  $\pm 3\%$  or better of a set point condition after deviation (1200 rpm tested below).



# Hydra-Cell® P Series Metering Pump Selection

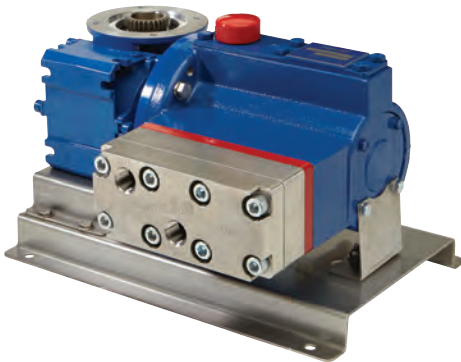
**Hydra-Cell**<sup>®</sup>  
METERING SOLUTIONS™



**P100**  
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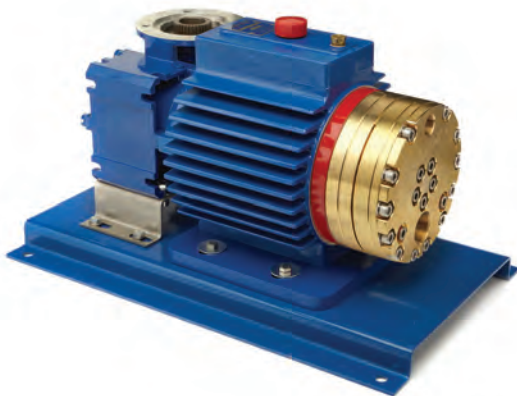
**P200**  
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**P300**  
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**P400**  
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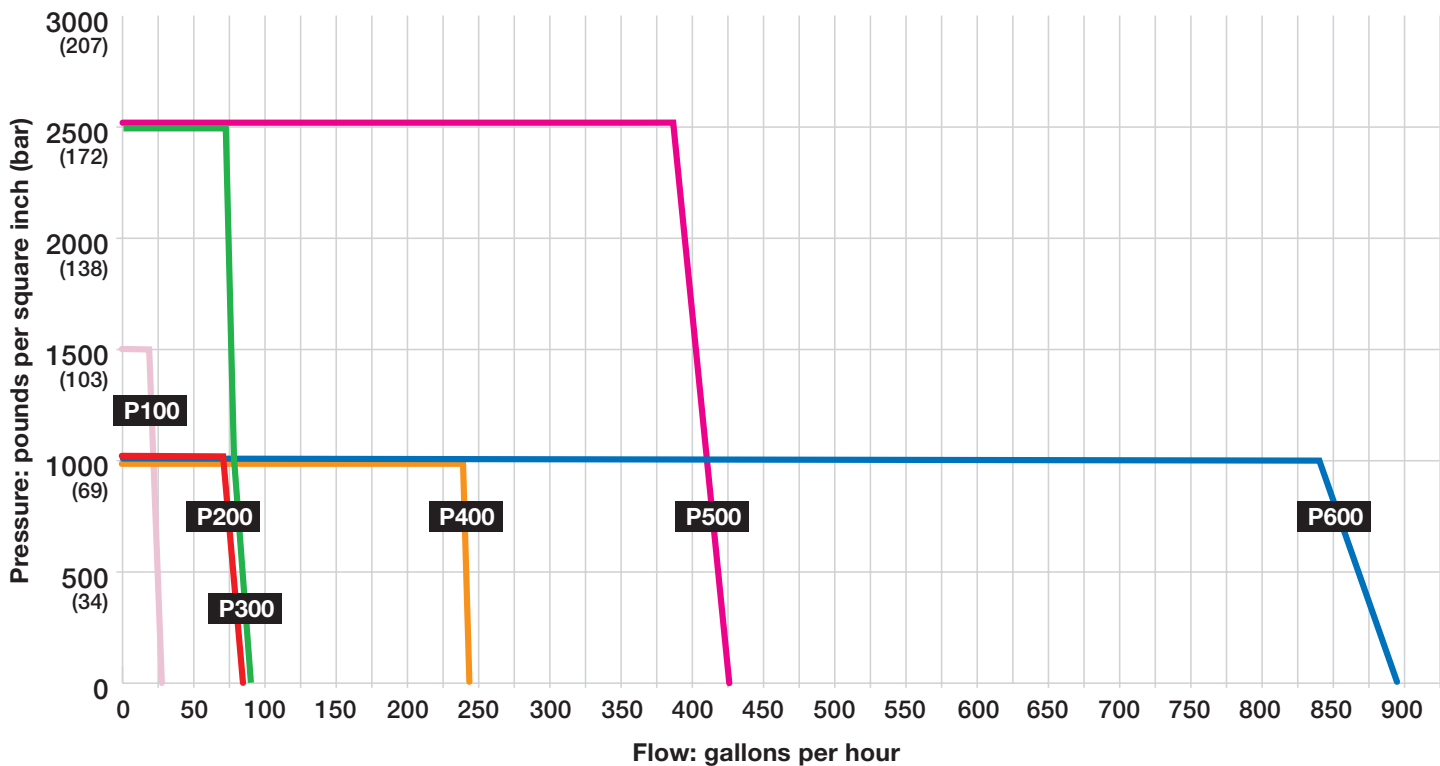
**P500**  
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**P600**  
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# Hydra-Cell® Flow Capacities and Pressure Ratings

## P Series Electronic Precision Metering Pumps



Model <sup>1</sup>	Maximum Capacity gph	Maximum Discharge Pressure psi (bar)		Maximum Operating Temperature F (C) <sup>3</sup>		Maximum Inlet Pressure psi (bar)
		Non-metallic <sup>2</sup>	Metallic	Non-metallic <sup>2</sup>	Metallic	
<b>P100</b>	27.0	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)
<b>P200</b>	81.0	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)
<b>P300</b>	81.4	N/A	2500 (172)	N/A	250° (121°)	500 (34)
<b>P400</b>	242.8	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)
<b>P500</b>	425.9	N/A	2500 (172)	N/A	250° (121°)	500 (34)
<b>P600</b>	890.3	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)

<sup>1</sup> Ratings are for X-cam design.

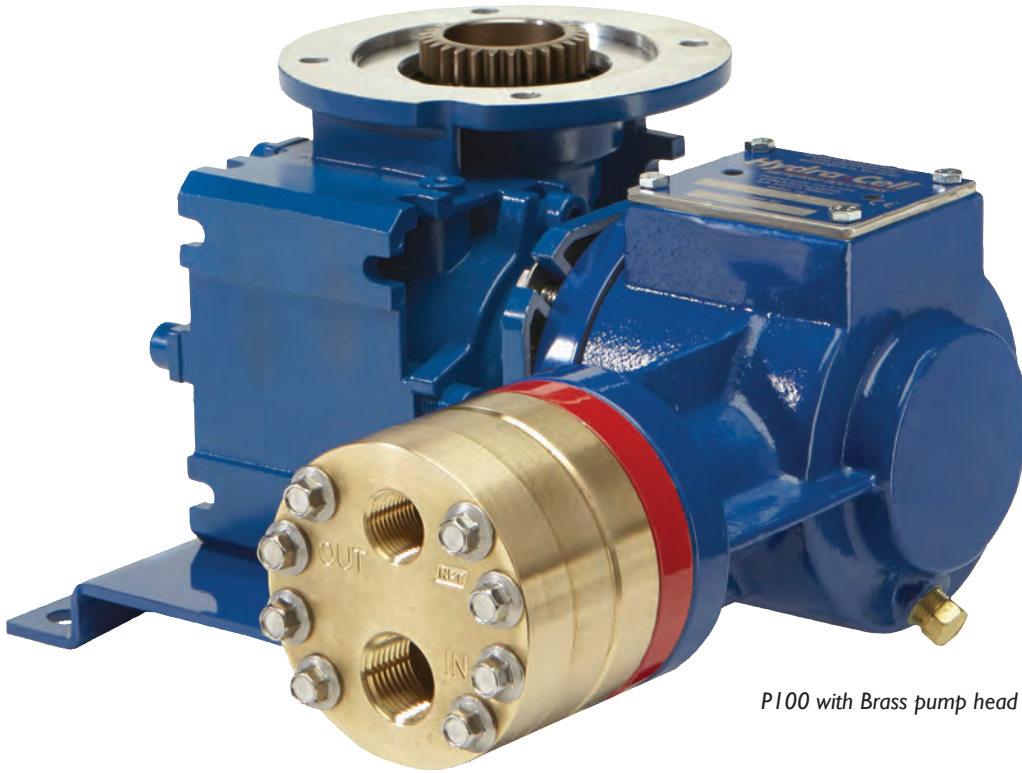
<sup>2</sup> 350 psi (24 bar) maximum with PVDF liquid end; 250 psi (17 bar) maximum with Polypropylene liquid end.

<sup>3</sup> Consult factory for correct component selection for temperatures from 160°F (71°C) to 250°F (121°C).

# PI00 Series

Maximum Flow Rate: 27.0 gph

Maximum Pressure: 1500 psi (103 bar) for Metallic Pump Heads  
350 psi (24 bar) for Non-metallic Pump Heads



PI00 with Brass pump head

## Performance\* Maximum Flow at Designated Pressure

All Pumps (gph)		Metallic Pump Heads Only (gph)			Pump rpm	Gear Ratio	Motor rpm
100 psi	250 psi	500 psi	1000 psi	1500 psi			
1.086	1.077	1.058	1.015	0.981	30	60:1	1800
1.316	1.300	1.273	1.220	1.184	36	50:1	
1.630	1.628	1.607	1.535	1.492	45	40:1	
2.192	2.182	2.148	2.056	2.000	60	30:1	
2.643	2.626	2.582	2.473	2.405	72	25:1	
3.318	3.291	3.232	3.099	3.014	90	20:1	
4.444	4.400	4.316	4.141	4.028	120	15:1	
6.695	6.618	6.483	6.226	6.057	180	10:1	
8.947	8.836	8.651	8.311	8.085	240	7.5:1	
13.45	13.27	12.99	12.48	12.14	360	5:1	
17.95	17.71	17.32	16.65	16.20	480	7.5:1	3600
26.96	26.58	25.99	24.99	24.31	720	5:1	

\* Capacity data is shown for pumps with elastomeric diaphragms. Consult factory for performance characteristics of pumps with PTFE diaphragms.

## Required Motor hp

1/2	3/4	1
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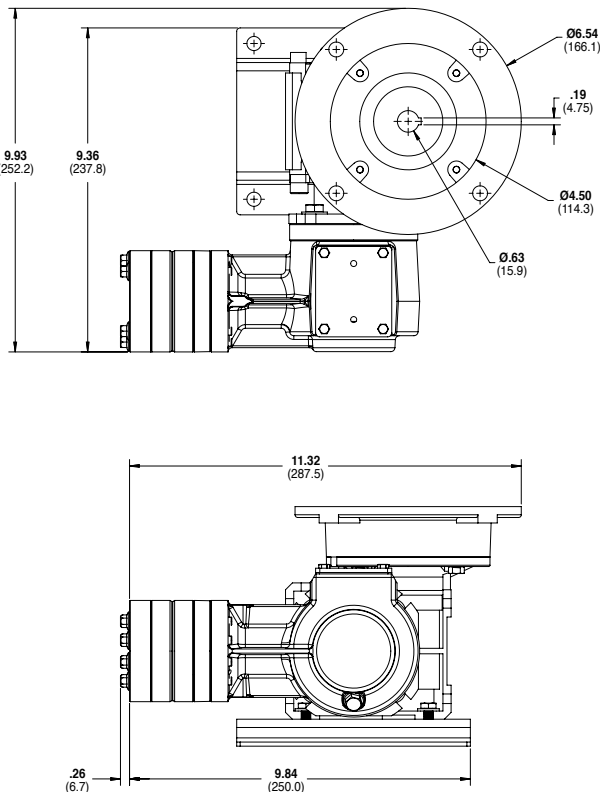


## Pump Data

Diaphragms per Liquid End	1
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	1500 psi (103 bar)
Non-metallic Heads:	PVDF- 350 psi (24 bar) Polypropylene- 250 psi (17 bar)
Maximum Inlet Pressure	250 psi (17 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Non-metallic Heads:	140 °F (60 °C)
Inlet Port	1/2 inch NPT or BSPT
Discharge Port	3/8 inch NPT or BSPT
Weight (less motor)	
Metallic Heads:	21.3 lbs (9.7 kg)
Non-metallic Heads:	19.2 lbs (8.7 kg)
Dimensions (less motor)	
Metallic Heads:	9.93" W x 11.58" D x 6.92" H (252.2 mm W x 297.1 mm D x 175.8 mm H)
Non-metallic Heads:	9.93" W x 11.87" D x 6.92" H (252.2 mm W x 301.5 mm D x 175.8 mm H)

\* Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

## Representative Drawings Inches (mm)



### Metallic Pump Heads

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.

1	2	3	4	5	6	7	8	9	10	11	12	13
P	1	0	0									

### Pump Model Size (Digits 1-4)

**P100** For all P100 Pumps (Non Kel-Cell)

### Pump Version (Digit 5)

**N** NPT Ports (NEMA motors only)

**M** BSPT Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C

**M** PVDF / PVDF

**P** Polypropylene / Polypropylene

**S** 316L Stainless Steel / Hastelloy C

**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)▲

**A** Aflas / PTFE O-rings (Synthetic oil)

**E** EPDM (EPDM-compatible oil)

**X** FKM (Synthetic oil)

**J** PTFE (Food-contact oil)

**P** Neoprene (Synthetic oil)

**T** Buna-N (Synthetic oil)

▲ See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / 316L SST / Nitronic 50

**TT** Hastelloy C / Hastelloy C / Hastelloy C

**SC** Elgiloy / Ceramic / Ceramic

**TC** Hastelloy C / Ceramic / Ceramic

### Gearbox Ratio (Digits 10-12) NEMA Motors

**060** 60:1 (56C Motor Frame)

**050** 50:1 (56C Motor Frame)

**040** 40:1 (56C Motor Frame)

**030** 30:1 (56C Motor Frame)

**025** 25:1 (56C Motor Frame)

**020** 20:1 (56C Motor Frame)

**015** 15:1 (56C Motor Frame)

**010** 10:1 (56C Motor Frame)

**007** 7.5:1 (56C Motor Frame)

**005** 5:1 (56C Motor Frame)

### Base Plate (Digit 13)

**C** Carbon Steel (Epoxy painted)

**S** 316L Stainless Steel

# P200 Series

Maximum Flow Rate: 81.0 gph

Maximum Pressure: 1000 psi (69 bar) for Metallic Pump Heads  
350 psi (24 bar) for Non-metallic Pump Heads



P200 with Polypropylene pump head

## Performance Maximum Flow at Designated Pressure

All Pumps (gph)		Metallic Pump Heads Only (gph)		Pump rpm	Gear Ratio	Motor rpm
100 psi	250 psi	500 psi	1000 psi			
3.378	3.321	3.249	3.128	30	60:1	1800
4.059	3.994	3.911	3.776	36	50:1	
5.072	5.015	4.908	4.748	45	40:1	
6.758	6.686	6.555	6.353	60	30:1	
8.107	8.022	7.873	7.637	72	25:1	
10.130	10.027	9.849	9.563	90	20:1	
13.503	13.369	13.14	12.77	120	15:1	
20.248	20.052	19.73	19.19	180	10:1	
26.993	26.735	26.32	25.62	240	7.5:1	
40.483	40.101	39.49	38.46	360	5:1	
53.97	53.47	52.66	51.30	480	7.5:1	3600
80.95	80.20	79.01	76.98	720	5:1	

## Required Motor hp

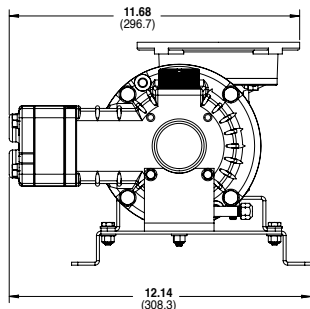
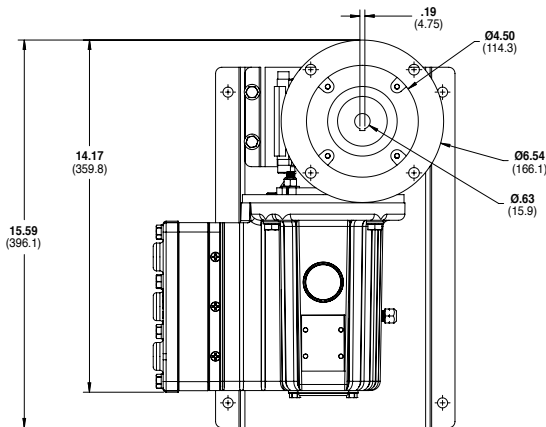
1/4	1/2	3/4	1	1-1/2
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## Pump Data

Diaphragms per Liquid End	3
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	1000 psi (69 bar)
Non-metallic Heads:	PVDF- 350 psi (24 bar) Polypropylene- 250 psi (17 bar)
Maximum Inlet Pressure	250 psi (17 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Non-metallic Heads:	140 °F (60 °C)
Inlet Port	1/2 inch NPT or BSPT
Discharge Port	3/8 inch NPT or BSPT
Weight (less motor)	
Metallic Heads:	41.8 lbs (19.0 kg)
Non-metallic Heads:	32.8 lbs (14.9 kg)
Dimensions (less motor)	
Metallic Heads:	15.59" W x 11.68" D x 8.97" H (396.1 mm W x 296.7 mm D x 227.8 mm H)
Non-metallic Heads:	15.59" W x 12.06" D x 8.97" H (396.1 mm W x 306.3 mm D x 227.8 mm H)

\* Consult factory for correct component selection for temperatures from 160°F (71 °C) to 250°F (121 °C).

## Representative Drawings Inches (mm)



### Metallic Pump Heads

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.

1	2	3	4	5	6	7	8	9	10	11	12	13
P	2	0	0									

### Pump Model Size (Digits 1-4)

**P200** For all P200 Pumps (Non Kel-Cell)

### Pump Version (Digit 5)

**N** NPT Ports (NEMA motors only)  
**M** BSPT Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C  
**M** PVDF / PVDF  
**P** Polypropylene / Polypropylene  
**S** 316L Stainless Steel / Hastelloy C  
**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)<sup>▲</sup>

**A** Aflas / PTFE O-rings (Synthetic oil)  
**M** Aflas / PTFE O-rings & FKM drive case elastomers (Mesamoll oil)  
**E** EPDM (EPDM-compatible oil)  
**X** FKM (Synthetic oil)  
**J** PTFE (Food-contact oil)  
**P** Neoprene (Synthetic oil)  
**T** Buna-N (Synthetic oil)

<sup>▲</sup> See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / 316L SST / Nitronic 50  
**TT** Hastelloy C / Hastelloy C / Hastelloy C  
**SC** Elgiloy / Ceramic / Ceramic  
**TC** Hastelloy C / Ceramic / Ceramic

### Gearbox Ratio (Digits 10-12) NEMA Motors

**060** 60:1 (56C Motor Frame)  
**050** 50:1 (56C Motor Frame)  
**040** 40:1 (56C Motor Frame)  
**030** 30:1 (56C Motor Frame)  
**025** 25:1 (56C Motor Frame)  
**020** 20:1 (56C Motor Frame)  
**015** 15:1 (56C Motor Frame)  
**010** 10:1 (56C Motor Frame)  
**007** 7.5:1 (56C Motor Frame)  
**005** 5:1 (56C Motor Frame)

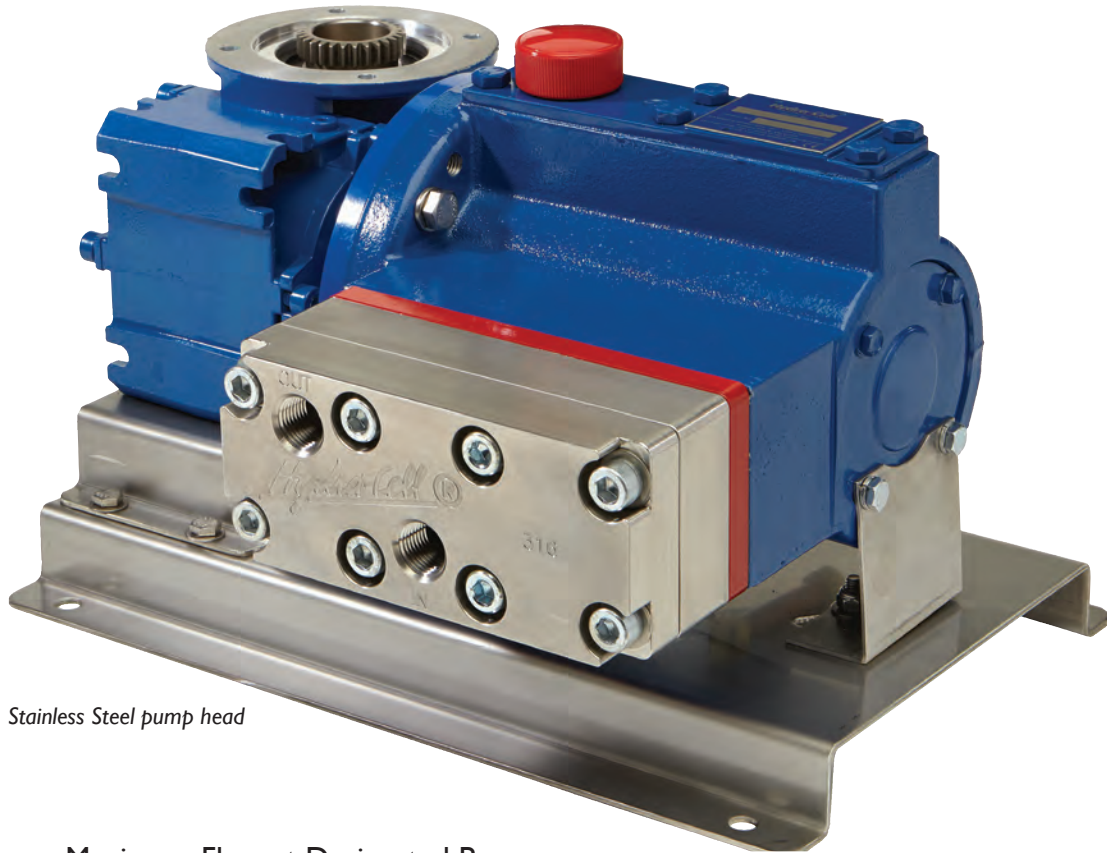
### Base Plate (Digit 13)

**C** Carbon Steel (Epoxy painted)  
**S** 316L Stainless Steel

# P300 Series

Maximum Flow Rate: 81.4 gph

Maximum Pressure: 2500 psi (172 bar) for Metallic Pump Heads



P300 with Stainless Steel pump head

## Performance Maximum Flow at Designated Pressure

100 psi	Metallic Pump Heads Only (gph)			Pump rpm	Gear Ratio	Motor rpm
	500 psi	1500 psi	2500 psi			
3.221	3.183	3.014	2.741	30	60:1	1800
3.895	3.849	3.655	3.350	36	50:1	
4.939	4.882	4.607	4.272	45	40:1	
6.639	6.548	6.194	5.786	60	30:1	
7.999	7.881	7.463	6.998	72	25:1	
10.04	9.880	9.368	8.815	90	20:1	
13.44	13.21	12.54	11.84	120	15:1	
20.24	19.88	18.89	17.90	180	10:1	
27.03	26.54	25.24	23.96	240	7.5:1	
40.63	39.87	37.93	36.08	360	5:1	
54.23	53.20	50.63	48.19	480	7.5:1	3600
81.42	79.85	76.02	72.43	720	5:1	

## Required Motor hp

1/4	1/2	3/4	1	1-1/2	2	3
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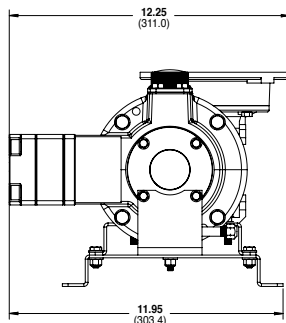
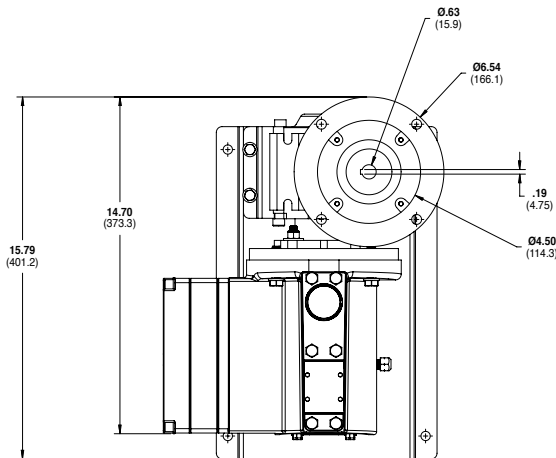
## Pump Data

Diaphragms per Liquid End	3
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	2500 psi (172 bar)
Maximum Inlet Pressure	500 psi (34 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Inlet Port	1/2 inch NPT or BSPT
Discharge Port	1/2 inch NPT or BSPT
Weight (less motor)**	
Metallic Heads:	54.5 lbs (24.7 kg)
Dimensions (less motor)**	
Metallic Heads:	15.79" W x 12.25" D x 9.46" H (401.2 mm W x 311.0 mm D x 240.2 mm H)

\* Consult factory for correct component selection for temperatures from 160°F (71 °C) to 250°F (121 °C).

\*\* For 56C motor frame only. Consult factory for other motor frame sizes.

## Representative Drawings Inches (mm)



### Metallic Pump Heads

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.

1	2	3	4	5	6	7	8	9	10	11	12	13
P	3	0	0									

### Pump Model Size (Digits 1-4)

**P300** For all P300 Pumps (Non Kel-Cell)

### Pump Version (Digit 5)

**N** NPT Ports (NEMA motors only)  
**M** BSPT Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C  
**R** 304 Stainless Steel / Hastelloy C  
**S** 316L Stainless Steel / Hastelloy C  
**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)▲

**E** EPDM (EPDM-compatible oil)  
**X** FKM (Synthetic oil)  
**J** PTFE (Food-contact oil)  
**T** Buna-N (Synthetic oil)

▲ See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / Nitronic 50 / Nitronic 50  
**TT** Hastelloy C / Hastelloy C / Hastelloy C  
**SD** Elgiloy / Tungsten Carbide / Tungsten Carbide  
**TD** Hastelloy C / Tungsten Carbide / Tungsten Carbide

### Gearbox Ratio (Digits 10-12) NEMA Motors

**060** 60:1 (56C Motor Frame)  
**050** 50:1 (56C Motor Frame)  
**040** 40:1 (56C Motor Frame)  
**030** 30:1 (56C Motor Frame)  
**025** 25:1 (56C Motor Frame)  
**020** 20:1 (56C Motor Frame)  
**015** 15:1 (56C Motor Frame)  
**010** 10:1 (56C Motor Frame)  
**007** 7.5:1 (56C Motor Frame)  
**A07** 7.5:1 (143/145TC Motor Frame)  
**005** 5:1 (56C Motor Frame)  
**A05** 5:1 (143/145TC Motor Frame)

### Base Plate (Digit 13)

**C** Carbon Steel (Epoxy painted)  
**S** 316L Stainless Steel

# P400 Series

Maximum Flow Rate: 242.8 gph

Maximum Pressure: 1000 psi (69 bar) for Metallic Pump Heads  
350 psi (24 bar) for Non-metallic Pump Heads



P400 with Polypropylene pump head

## Performance\* Maximum Flow at Designated Pressure

All Pumps (gph)		Metallic Pump Heads Only (gph)		Pump rpm	Gear Ratio	Motor rpm	
100 psi	250 psi	500 psi	1000 psi				
9.637	9.280	8.491	6.464	30	60:1	1800	
11.652	11.283	10.452	8.269	36	50:1		
14.66	14.30	13.37	11.21	45	40:1		
19.73	19.31	18.30	15.96	60	30:1		
23.79	23.32	22.24	19.75	72	25:1		
29.87	29.34	28.15	25.45	90	20:1		
40.011	39.375	38.00	34.94	120	15:1		
60.290	59.438	57.70	53.92	180	10:1		
80.569	79.501	77.41	72.90	240	7.5:1		
121.1	119.6	116.8	110.9	360	5:1		
161.69	159.75	156.22	148.84	480	7.5:1		3600
242.80	240.01	235.03	224.77	720	5:1		

\* Capacity data is shown for pumps with elastomeric diaphragms. Consult factory for performance characteristics of pumps with PTFE diaphragms.

## Required Motor hp

1/4	1/2	3/4	1	1-1/2	2	3	5
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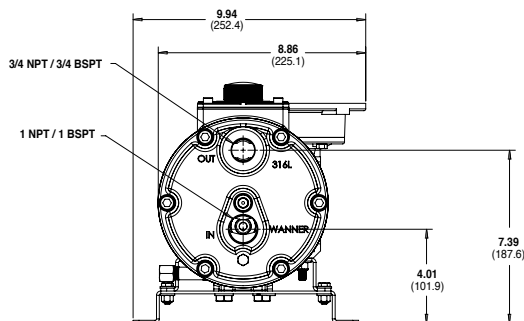
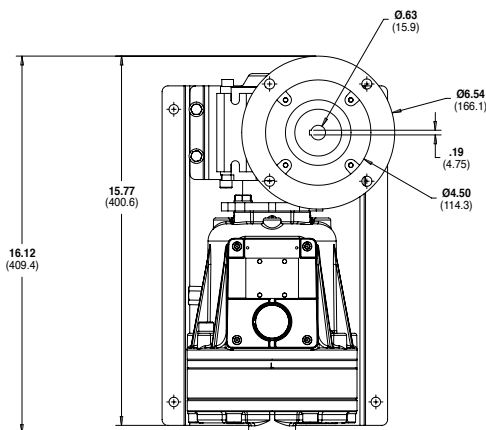
## Pump Data

Diaphragms per Liquid End	3
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	1000 psi (69 bar)
Non-metallic Heads:	PVDF- 350 psi (24 bar) Polypropylene- 250 psi (17 bar)
Maximum Inlet Pressure	250 psi (17 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Non-metallic Heads:	140 °F (60 °C)
Inlet Port	1 inch NPT or BSPT
Discharge Port	3/4 inch NPT or BSPT
Weight (less motor)**	
Metallic Heads:	65.5 lbs (29.7 kg)
Non-metallic Heads:	52.5 lbs (23.8 kg)
Dimensions (less motor)**	
Metallic Heads:	9.94" W x 16.12" D x 10.29" H (252.4 mm W x 409.4 mm D x 261.3 mm H)
Non-metallic Heads:	9.94" W x 17.29" D x 10.29" H (252.4 mm W x 439.2 mm D x 261.3 mm H)

\* Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

\*\* For 56C motor frame only. Consult factory for other motor frame sizes.

## Representative Drawings Inches (mm)

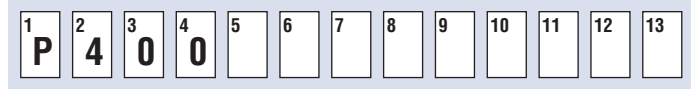


**Metallic Pump Heads**

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.



### Pump Model Size (Digits 1-4)

**P400** For all P400 Pumps (Kel-Cell)

### Pump Version (Digit 5)

**N** NPT or ANSI Ports (NEMA motors only)  
**M** BSPT or ANSI Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C  
**C** Cast Iron / Hastelloy C  
**M** PVDF / PVDF  
**P** Polypropylene / Polypropylene  
**R** 316L Stainless Steel (ANSI flange weldment) / Hastelloy C  
**S** 316L Stainless Steel (NPT or BSPT) / Hastelloy C  
**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)▲

**A** Aflas / PTFE O-rings (Synthetic oil)  
**E** EPDM (EPDM-compatible oil)  
**X** FKM (Synthetic oil)  
**J** PTFE (Food-contact oil)  
**P** Neoprene (Synthetic oil)  
**T** Buna-N (Synthetic oil)

▲ See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / 316L SST / Nitronic 50  
**TT** Hastelloy C / Hastelloy C / Hastelloy C  
**SC** Elgiloy / Ceramic / Ceramic  
**TC** Hastelloy C / Ceramic / Ceramic  
**SD** Elgiloy / Tungsten Carbide / Tungsten Carbide  
**TD** Hastelloy C / Tungsten Carbide / Tungsten Carbide

### Gearbox Ratio (Digits 10-12) NEMA Motors

**060** 60:1 (56C Motor Frame)  
**050** 50:1 (56C Motor Frame)  
**040** 40:1 (56C Motor Frame)  
**030** 30:1 (56C Motor Frame)  
**025** 25:1 (56C Motor Frame)  
**020** 20:1 (56C Motor Frame)  
**015** 15:1 (56C Motor Frame)  
**010** 10:1 (56C Motor Frame)  
**007** 7.5:1 (56C Motor Frame)  
**A07** 7.5:1 (143/145TC Motor Frame)  
**005** 5:1 (56C Motor Frame)  
**A05** 5:1 (143/145TC Motor Frame)

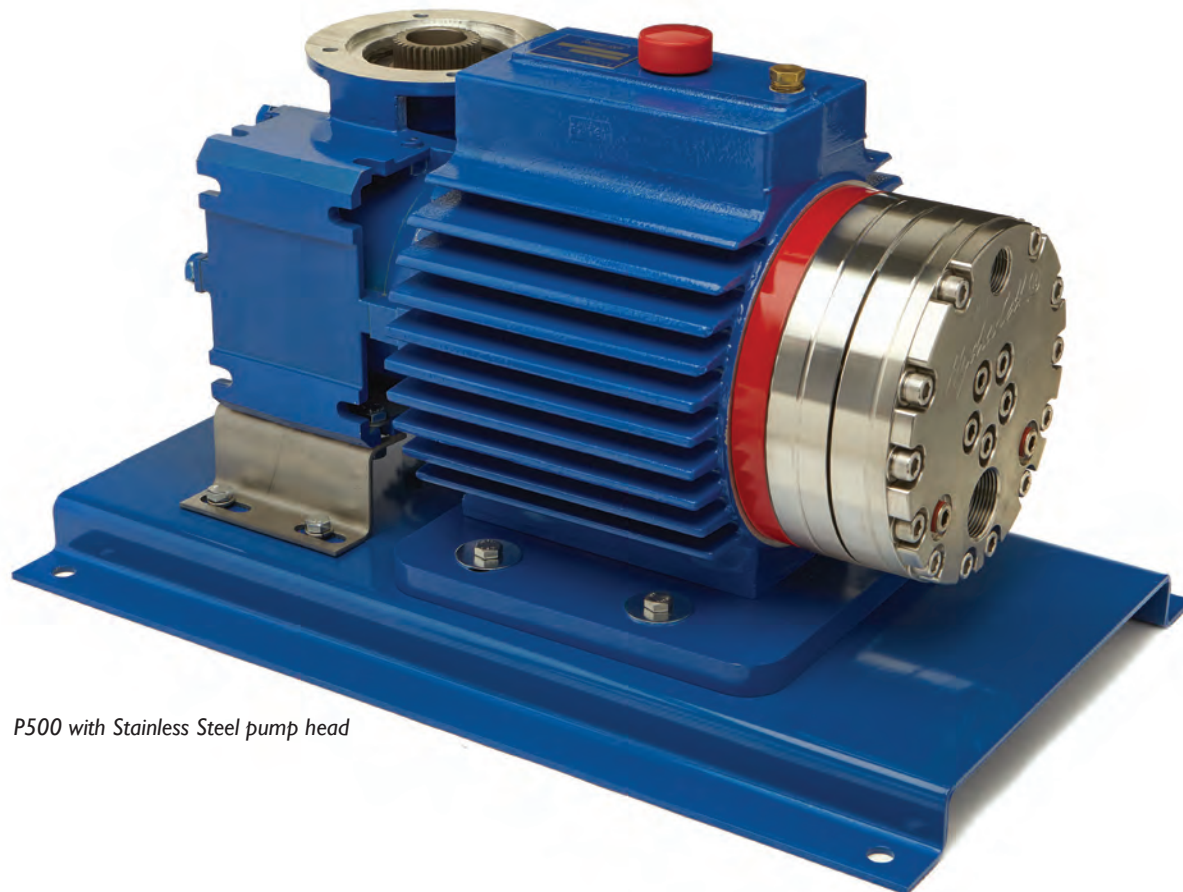
### Base Plate (Digit 13)

**C** Carbon Steel (Epoxy painted)  
**S** 316L Stainless Steel

# P500 Series

Maximum Flow Rate: 425.9 gph

Maximum Pressure: 2500 psi (172 bar) for Metallic Pump Heads



P500 with Stainless Steel pump head

## Performance Maximum Flow at Designated Pressure

100 psi	Metallic Pump Heads Only (gph)			Pump rpm	Gear Ratio	Motor rpm
	500 psi	1500 psi	2500 psi			
17.48	16.96	15.74	14.47	30	60:1	1800
20.97	20.43	19.11	17.71	36	50:1	
26.39	25.73	24.20	22.67	45	40:1	
35.27	34.47	32.63	30.80	60	30:1	
42.37	41.47	39.37	37.31	72	25:1	
53.03	51.97	49.49	47.07	90	20:1	
70.78	69.46	66.35	63.34	120	15:1	
106.3	104.4	100.1	95.88	180	10:1	
141.8	139.4	133.8	128.4	240	7.5:1	
212.8	209.4	201.2	193.5	360	5:1	
283.9	279.4	268.7	258.6	480	7.5:1	3600
425.9	419.3	403.6	388.7	720	5:1	

## Required Motor hp

1/4	1/2	3/4	1	1-1/2	2	3	5	7-1/2	10	15	20
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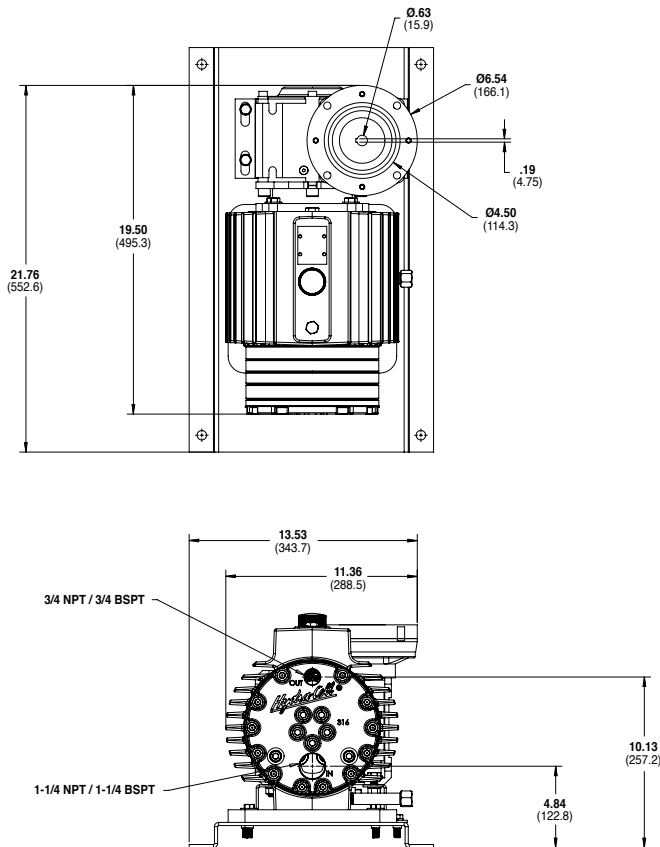
## Pump Data

Diaphragms per Liquid End	5
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	2500 psi (172 bar)
Maximum Inlet Pressure	500 psi (34 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Inlet Port	1-1/4 inch NPT or BSPT
Discharge Port	3/4 inch NPT or BSPT
Weight (less motor)**	
Metallic Heads:	192.1 lbs (88.5 kg)
Dimensions (less motor)**	
Metallic Heads:	14.5" W x 24.0" D x 13.9" H (368.3 mm W x 609.6 mm D x 353.1 mm H)

\* Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

\*\* For 56C motor frame only. Consult factory for other motor frame sizes.

## Representative Drawings Inches (mm)



**Metallic Pump Heads**

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.

1	2	3	4	5	6	7	8	9	10	11	12	13
P	5	0	0									

### Pump Model Size (Digits 1-4)

**P500** For all P500 Pumps (Non Kel-Cell)

### Pump Version (Digit 5)

**N** NPT Ports (NEMA motors only)

**M** BSPT Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C

**S** 316L Stainless Steel / Hastelloy C

**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)<sup>^</sup>

**A** Aflas / PTFE O-rings (Synthetic oil)

**X** FKM (Synthetic oil)

**T** Buna-N (Synthetic oil)

<sup>^</sup> See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / Nitronic 50 / Nitronic 50

**TT** Hastelloy C / Hastelloy C / Hastelloy C

**SD** Elgiloy / Tungsten Carbide / Tungsten Carbide

**TD** Hastelloy C / Tungsten Carbide / Tungsten Carbide

### Gearbox Ratio (Digits 10-12) NEMA Motors

<b>060</b>	60:1	(56C Motor Frame)
<b>050</b>	50:1	(56C Motor Frame)
<b>040</b>	40:1	(56C Motor Frame)
<b>A40</b>	40:1	(143/145TC Motor Frame)
<b>030</b>	30:1	(56C Motor Frame)
<b>A30</b>	30:1	(143/145TC Motor Frame)
<b>025</b>	25:1	(56C Motor Frame)
<b>A25</b>	25:1	(143/145TC Motor Frame)
<b>020</b>	20:1	(56C Motor Frame)
<b>A20</b>	20:1	(143/145TC Motor Frame)
<b>015</b>	15:1	(56C Motor Frame)
<b>A15</b>	15:1	(143/145TC Motor Frame)
<b>B15</b>	15:1	(182/184TC Motor Frame)
<b>010</b>	10:1	(56C Motor Frame)
<b>A10</b>	10:1	(143/145TC Motor Frame)
<b>B10</b>	10:1	(182/184TC Motor Frame)
<b>007</b>	7.5:1	(56C Motor Frame)
<b>A07</b>	7.5:1	(143/145TC Motor Frame)
<b>B07</b>	7.5:1	(182/184TC Motor Frame)
<b>C07</b>	7.5:1	(213/215TC Motor Frame)
<b>005</b>	5:1	(56C Motor Frame)
<b>A05</b>	5:1	(143/145TC Motor Frame)
<b>B05</b>	5:1	(182/184TC Motor Frame)
<b>C05</b>	5:1	(213/215TC Motor Frame)
<b>D05</b>	5:1	(254/256TC Motor Frame)

### Base Plate (Digit 13)

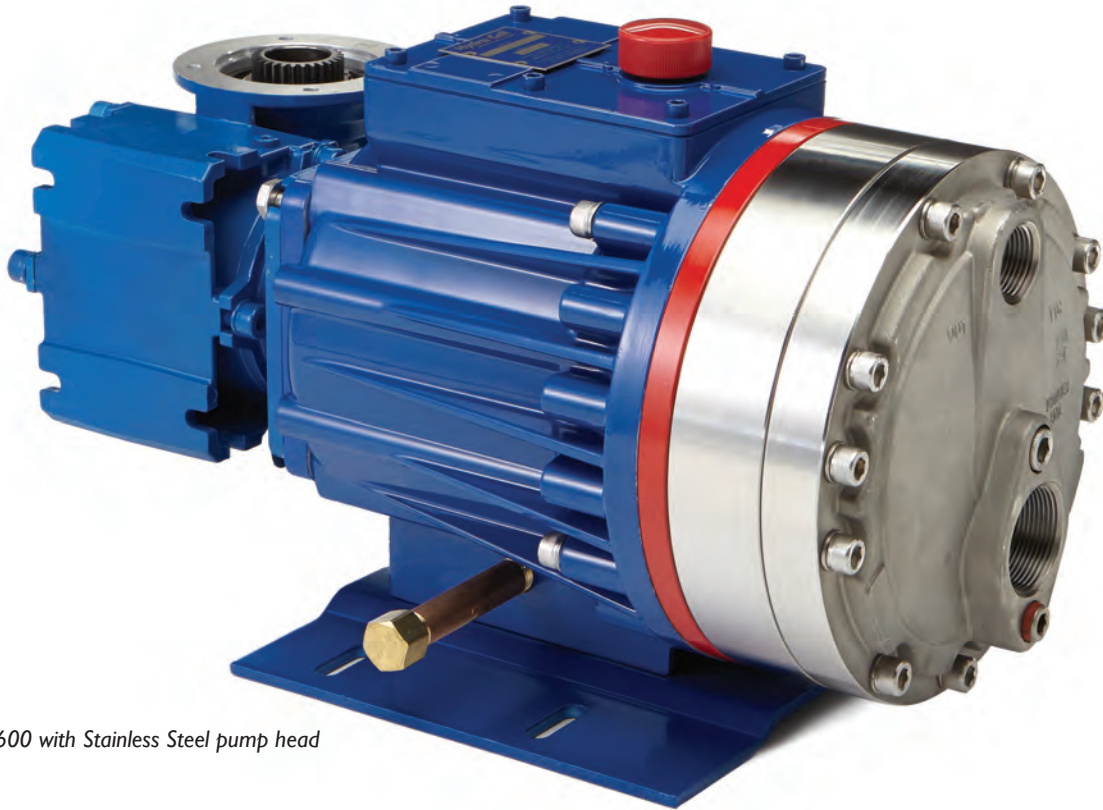
**H** Carbon Steel (Epoxy painted) for O, A & B reducers, size 75

**G** Carbon Steel (Epoxy painted) for C & D reducers, in-line horizontal

# P600 Series

Maximum Flow Rate: 890.3 gph

Maximum Pressure: 1000 psi (69 bar) for Metallic Pump Heads  
350 psi (24 bar) for Non-metallic Pump Heads



P600 with Stainless Steel pump head

## Performance\* Maximum Flow at Designated Pressure

All Pumps (gph)		Metallic Pump Heads Only (gph)		Pump rpm	Gear Ratio	Motor rpm
100 psi	250 psi	500 psi	1000 psi			
36.49	36.12	35.21	33.25	30	60:1	1800
43.90	43.48	42.49	40.35	36	50:1	
55.00	54.53	53.39	51.17	45	40:1	
73.56	72.97	71.58	68.75	60	30:1	
88.41	87.71	86.12	82.81	72	25:1	
110.7	109.8	107.9	103.9	90	20:1	
147.8	146.7	144.3	139.1	120	15:1	
222.1	220.4	217.0	209.4	180	10:1	
296.3	294.1	289.8	279.7	240	7.5:1	
444.8	441.6	435.2	420.3	360	5:1	
593.3	589.0	580.7	560.9	480	7.5:1	3600
890.3	883.9	871.6	842.1	720	5:1	

\* Capacity data is shown for pumps with elastomeric diaphragms. Consult factory for performance characteristics of pumps with PTFE diaphragms.

## Required Motor hp

1/2	3/4	1	1-1/2	2	3	5	7-1/2	10	15
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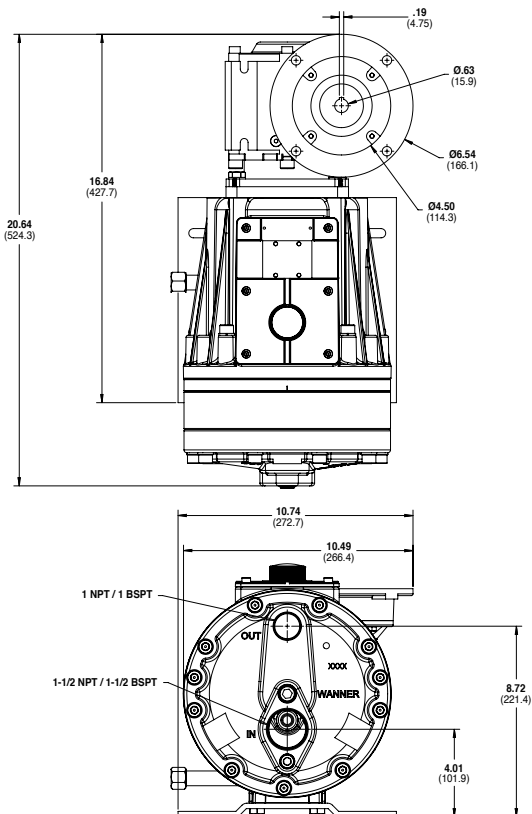
## Pump Data

Diaphragms per Liquid End	3
Flow Control	Electronic variable speed drive
Maximum Discharge Pressure	
Metallic Heads:	1000 psi (69 bar)
Non-metallic Heads:	PVDF- 350 psi (24 bar) Polypropylene- 250 psi (17 bar)
Maximum Inlet Pressure	250 psi (17 bar)
Maximum Operating Temperature	
Metallic Heads:	250 °F (121 °C)*
Non-metallic Heads:	140 °F (60 °C)
Inlet Port	1-1/2 inch NPT or BSPT
Discharge Port	1 inch NPT or BSPT
Weight (less motor)**	
Metallic Heads:	146.0 lbs (66.2 kg)
Non-metallic Heads:	111.0 lbs (50.3 kg)
Dimensions (less motor)**	
Metallic Heads:	10.74" W x 20.64" D x 11.57" H (272.7 mm W x 524.3 mm D x 293.9 mm H)
Non-metallic Heads:	10.74" W x 21.56" D x 11.57" H (272.7 mm W x 547.6 mm D x 293.9 mm H)

\* Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

\*\* For 56C motor frame only. Consult factory for other motor frame sizes.

## Representative Drawings Inches (mm)



**Metallic Pump Heads**

For a system installation example, accessories, and options, see pages 30-45.

## How to Order

A complete pump order number contains 13 digits based on the specified pump materials listed below.

1	2	3	4	5	6	7	8	9	10	11	12	13
P	6	0	0									

### Pump Model Size (Digits 1-4)

**P600** For all P600 Pumps (Kel-Cell)

### Pump Version (Digit 5)

**N** NPT or ANSI Ports (NEMA motors only)  
**M** BSPT or ANSI Ports (IEC motors only)

### Pump Head / Retainer Material (Digit 6)

**B** Brass / Hastelloy C  
**C** Cast Iron / Hastelloy C  
**M** PVDF / PVDF  
**P** Polypropylene / Polypropylene  
**R** 316L Stainless Steel (ANSI flange weldment) / Hastelloy C  
**S** 316L Stainless Steel (NPT or BSPT) / Hastelloy C  
**T** Hastelloy C / Hastelloy C

### Diaphragm & O-ring Material / Oil (Digit 7)▲

**A** Aflas / PTFE O-rings (Synthetic oil)  
**E** EPDM (EPDM-compatible oil)  
**X** FKM (Synthetic oil)  
**J** PTFE (Food-contact oil)  
**P** Neoprene (Synthetic oil)  
**T** Buna-N (Synthetic oil)

▲ See price list for different actuating oils available with these materials.

### Check Valve Material (Digits 8-9)

#### (Valve Spring / Valve Seat / Valve)

**SS** Elgiloy / Nitronic 50 / Nitronic 50  
**TT** Hastelloy C / Hastelloy C / Hastelloy C  
**SC** Elgiloy / Ceramic / Ceramic  
**TC** Hastelloy C / Ceramic / Ceramic

### Gearbox Ratio (Digits 10-12) NEMA Motors

<b>060</b>	60:1	(56C Motor Frame)
<b>050</b>	50:1	(56C Motor Frame)
<b>040</b>	40:1	(56C Motor Frame)
<b>A40</b>	40:1	(143/145TC Motor Frame)
<b>030</b>	30:1	(56C Motor Frame)
<b>A30</b>	30:1	(143/145TC Motor Frame)
<b>025</b>	25:1	(56C Motor Frame)
<b>A25</b>	25:1	(143/145TC Motor Frame)
<b>020</b>	20:1	(56C Motor Frame)
<b>A20</b>	20:1	(143/145TC Motor Frame)
<b>015</b>	15:1	(56C Motor Frame)
<b>A15</b>	15:1	(143/145TC Motor Frame)
<b>010</b>	10:1	(56C Motor Frame)
<b>A10</b>	10:1	(143/145TC Motor Frame)
<b>B10</b>	10:1	(182/184TC Motor Frame)
<b>007</b>	7.5:1	(56C Motor Frame)
<b>A07</b>	7.5:1	(143/145TC Motor Frame)
<b>B07</b>	7.5:1	(182/184TC Motor Frame)
<b>C07</b>	7.5:1	(213/215TC Motor Frame)
<b>D07</b>	7.5:1	(254/256TC Motor Frame)
<b>005</b>	5:1	(56C Motor Frame)
<b>A05</b>	5:1	(143/145TC Motor Frame)
<b>B05</b>	5:1	(182/184TC Motor Frame)
<b>C05</b>	5:1	(213/215TC Motor Frame)
<b>D05</b>	5:1	(254/256TC Motor Frame)

### Base Plate (Digit 13)

**C** Carbon Steel (Epoxy painted) for 0 reducers, size 63  
**H** Carbon Steel (Epoxy painted) for A & B reducers, size 75  
**G** Carbon Steel (Epoxy painted) for C reducers, in-line horizontal

# Hydra-Cell® Bare Shaft Pumps for Metering



In certain less critical metering and injecting applications, Hydra-Cell Seal-less Pumps (without gearbox reducers) provide an alternative to Hydra-Cell Metering Solutions Pumps. They meet API 675 performance standards for accuracy, linearity, and repeatability – a must for metering pumps.

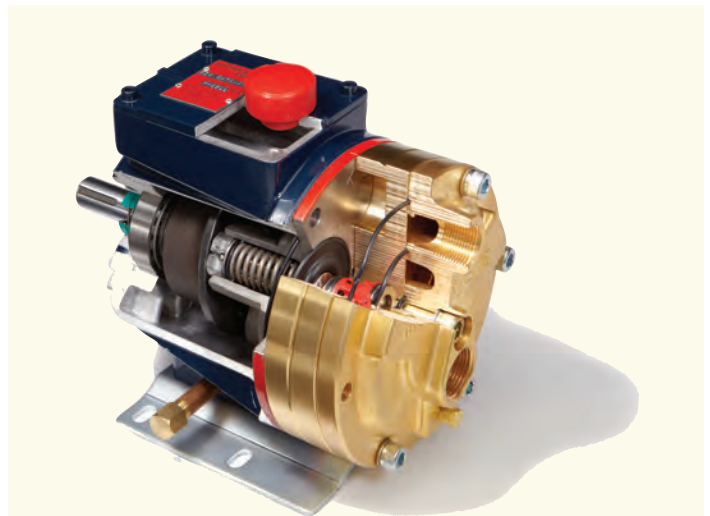
Introduced more than 40 years ago, Hydra-Cell Seal-less Pumps found widespread acceptance for market applications as diverse as industrial cleaning, agricultural spraying, and machine tool coolant delivery.

As the company grew and distribution expanded, customers began using Hydra-Cell Seal-less Pumps for metering purposes. In addition to meeting API 675, they discovered that Hydra-Cell provides virtually pulse-free flow without the use of expensive pulsation dampeners.

To meet more critical metering requirements, such as precise flow control, Hydra-Cell Metering Solutions (P Series) pumps were developed more than 10 years ago. Select models of Hydra-Cell Seal-less Pumps (bare shaft pumps) are still widely used for metering when any of the following conditions apply:

- Flow capacities required exceed those of Hydra-Cell Metering Solutions pumps (see page 29).
- Flow rates for the application do not need to be as precise as what Hydra-Cell Metering Solutions pumps deliver.
- Space limitations or application parameters dictate the use of a direct drive or belt drive.
- Special components designed to resist chemical attack, such as epoxy-coated manifold plates and bases are not needed.
- Metering requirements can be met (including API 675) without using a gearbox reducer (or other components) thus lowering acquisition cost.

*Note: Bare shaft pumps for metering must use X-cams and operate at speeds (rpm) not exceeding those shown in the table on the following page.*



## Hydra-Cell Seal-less Design Advantages

Hydra-Cell positive displacement pumps feature a seal-less pumping chamber so there are no dynamic seals, packing or cups to leak or replace. Other metering pumps are seal-less; however, all Hydra-Cell pumps feature check valves that can handle abrasives and particulates that would damage other types of pumps. In addition, Hydra-Cell can run dry indefinitely without damage to the pump.

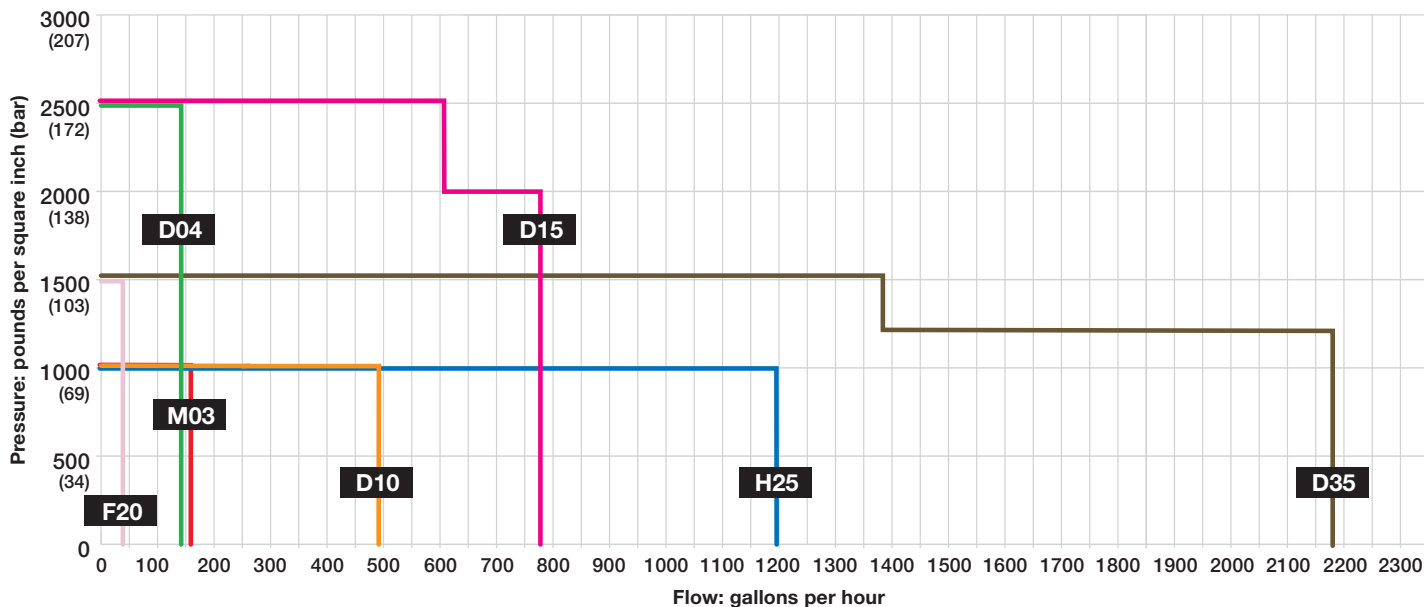
## Patented Kel-Cell® Diaphragm Protection

Kel-Cell Diaphragm Position Control (DPC) technology protects Hydra-Cell pumps by safeguarding the diaphragms against abnormal or adverse conditions (e.g. blocked pipe or filter, inadequate liquid supply or discharge pressure).

The Kel-Cell positioning system stabilizes the diaphragms and virtually eliminates the possibility of incidental diaphragm failure. Kel-Cell is available with Hydra-Cell bare shaft models M03/D03, D10, H25, and D35 and Hydra-Cell Metering Solutions models P400 and P600.

# Hydra-Cell® Flow Capacities & Pressure Ratings

## Bare Shaft Pumps for Metering



Model <sup>1</sup>	Maximum Capacity gph	Maximum Discharge Pressure psi (bar)		Maximum Operating Temperature F (C) <sup>3</sup>		Maximum Inlet Pressure psi (bar)	Rated rpm for Metering
		Non-metallic <sup>2</sup>	Metallic	Non-metallic	Metallic		
<b>F20</b>	36.6	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)	1050
<b>M03</b>	155.5	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1440
<b>D04</b>	146.9	N/A	2500 (172)	N/A	250° (121°)	500 (34)	1440
<b>D10</b>	483.8	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1440
<b>D15</b>	607.2	N/A	2500 (172)	N/A	250° (121°)	500 (34)	1150
<b>D15</b>	777.6	N/A	2000 (138)	N/A	250° (121°)	500 (34)	1440
<b>H25</b>	1197.0	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1050
<b>D35</b>	1386.0	N/A	1500 (103)	N/A	250° (121°)	250 (17)	700
<b>D35</b>	2186.1	N/A	1200 (83)	N/A	250° (121°)	500 (34)	1050

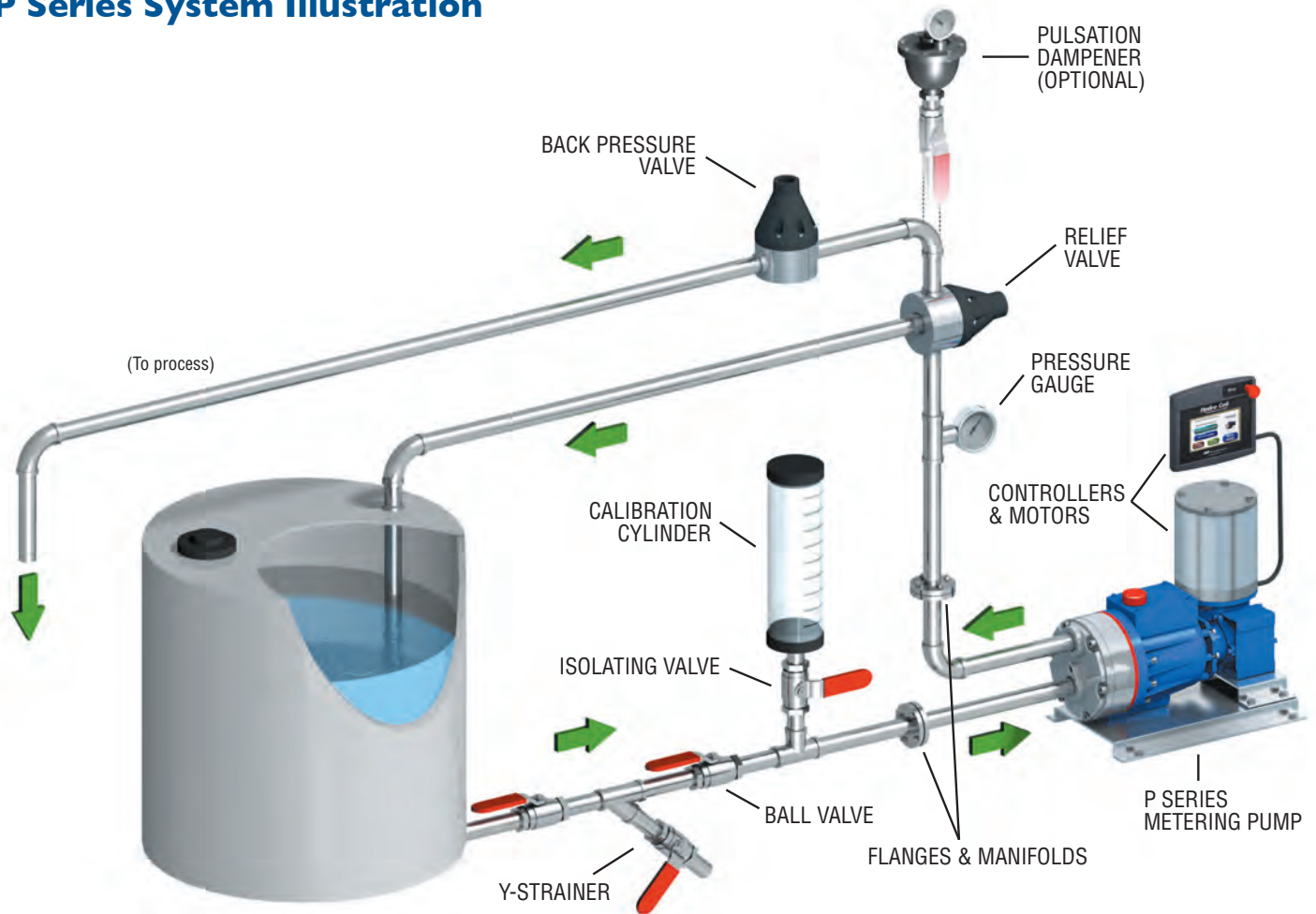
<sup>1</sup> Ratings are for X-cam design.

<sup>2</sup> 350 psi (24 bar) maximum with PVDF liquid end; 250 psi (17 bar) maximum with Polypropylene liquid end.

<sup>3</sup> Consult factory for correct component selection for temperatures from 160°F (71°C) to 250°F (121°C).

# Hydra-Cell® Metering Accessories and Options

## P Series System Illustration



### Accessory/Option

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## Pump Configuration

### Manifolds and Flanges



Pumps can be fitted with interchangeable metallic (Brass, Cast Iron, 316L Stainless Steel, Hastelloy C) or non-metallic (PVDF, Polypropylene) pump heads. ANSI, SAE, and DIN flanges are also available.

### SmartDrive Motor-Controller

Space-saving, integrated motor and variable speed drive. Eliminates remote mounting and provides convenient operation from one location. Available with NEMA or IEC frames. Optional keypad and network interface.



### Multiplexing Capability

Hydra-Cell Metering Solutions enables mixing ratios of multiple fluids in flexible, economical ways. Using only one motor and one gearbox, Hydra-Cell P Series pumps can provide spare, double-flow, side-by-side systems, or pre-mixed ratios. (They need not be the same model Hydra-Cell pumps.)

Up to six different fluids can be metered using different manifold plates. With special manifolds, one P200 or P300 unit can feed up to three systems from one liquid end.



### Gearbox Ratios

Hydra-Cell Metering Solutions P Series pumps are fitted with interchangeable gearboxes with ratios from 60:1 to 5:1.

### Base Plates

Base plates are available in epoxy-painted Carbon Steel and (depending on model) 316L Stainless Steel.



### Oil Systems and Kits

Oil cooler and filter system reduces oil operating temperature, extends oil life, and promotes longevity of pump components.

Oil level monitoring mounting kits detect changes in the oil level to minimize costly interruptions and avoid potential pump damage.

Oil reservoir sight bottles provide additional volume for oil expansion and allow for quick visual inspection of oil.

*For complete details about oil systems and kits, consult the Hydra-Cell Seal-less Pumps master catalog.*

## Actuating Oils

### Hydra-Oil

Hydra-Oil is specially formulated to maximize performance of Hydra-Cell Metering Solutions pumps by reducing wear and maintaining consistent viscosity. Standard grades, synthetic grades, food-contact grades, and EPDM-compatible grades are available to suit the process requirement (e.g. temperature, pressure).

*For complete details about Hydra-Oil, consult the Hydra-Cell Seal-less Pumps master catalog.*

### Mesamoll Oil

Mesamoll oil offers outstanding gelling capacity and high saponification resistance along with good dielectric properties and resistance to weathering and light. It is ideal for use with many types of polymers and in instances where it will come into contact with water or an alkali. Mesamoll Oil is a standard offering for P200 model pumps with Aflas diaphragms, PTFE O-rings, and FKM drive case elastomers.

*Mesamoll® is a registered trademark of Lanxess Deutschland GmbH.*

# Motors and Controllers

## Motors

Motors provide the rotary action that operates the gear reducer on a Hydra-Cell Metering Solutions pump. A motor for a specific P Series pump model is selected based on the horsepower (hp), revolutions-per-minute (rpm) and turndown ratio required for the application (performance criteria).

### Selection Process

1. Locate the Maximum flow at Designated Pressure (gph) for your application in the Performance table of your P Series pump model (P100, P200, etc.) beginning on page 16.
2. This maximum flow rate corresponds to a color-coded rating of your Required Motor hp.
3. Make sure that the hp and rpm match the frame and reducer per the chart at right.
4. Using the charts on pages 33 and 34, for either 1800 rpm or 3600 rpm, select the motor by matching the Required Motor hp with the correct turndown ratio of your pump.

### Motor Horsepower (HP), Pump Speed (RPM) and Frame Guidelines

P100	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 56C	0XX
P200	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 56C	0XX
P300	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 56C	0XX
	1-1/2 or 2	1800	NEMA 56C	0XX
	1-1/2 or 2	1800	NEMA 143/5TC	AXX
	1-1/2 or 2	3600	NEMA 143/5TC	AXX
	3	3600	NEMA 143/5TC	AXX
P400	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 143/5TC	AXX
	1-1/2 or 2	1800	NEMA 56C	0XX
	1-1/2 or 2	1800	NEMA 143/5TC	AXX
	1-1/2 or 2	3600	NEMA 143/5TC	AXX
	3	3600	NEMA 143/5TC	AXX
P500	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 56C	0XX
	1-1/2 or 2	1800	NEMA 143/5TC	AXX
	1-1/2 or 2	3600	NEMA 143/5TC	AXX
	3 or 5	1800	NEMA 182/4TC	BXX
	3 or 5	3600	NEMA 182/4TC	BXX
	7-1/2 or 10	1800	NEMA 213/5TC	CXX
	7-1/2 or 10	3600	NEMA 213/5TC	CXX
	15	3600	NEMA 254/6TC	DXX
P600	HP	RPM	FRAME	REDUCER CODE
	up to 1	1800	NEMA 56C	0XX
	up to 1	3600	NEMA 143/5TC	AXX
	1-1/2 or 2	1800	NEMA 143/5TC	AXX
	1-1/2 or 2	3600	NEMA 143/5TC	AXX
	3 or 5	1800	NEMA 182/4TC	BXX
	3 or 5	3600	NEMA 182/4TC	BXX
	7-1/2 or 10	1800	NEMA 213/5TC	CXX
	7-1/2 or 10	3600	NEMA 213/5TC	CXX
	15	3600	NEMA 254/6TC	DXX



## Motors

### 1800 rpm Inverter Duty - 3 Phase

HP	Voltage	Turndown Ratio	Frame	Enclosure	Drip Cover	Part Number	Weight (lbs.)
1/4	230	1000:1	56C	TENV		M25TE18-3P56C	18
1/2	230/460	1000:1	56C	TENV		M50TE18-3P56C	20
1/2	230/460	1000:1	56C	Washdown/TENV		M50WD18R3P56CA5	25
3/4	230/460	20:1	56C	TEFC		M75TE18-3P56C-P	21
1	230/460	10:1	143TC	TEFC	Yes	M100TE18R3P143TCA3	59
1	230/460	1000:1	56C	Washdown/TENV		M100WD18R3P56CA5	34
1	230/460	1000:1	143TC	TENV*		M100TN18R3P143TCA5	50
1-1/2	230/460	2:1	56C	TEFC		M150TE18-3P56C-P	29
1-1/2	230/460	10:1	145TC	TEFC	Yes	M150TE18R3P145TCA3	38
1-1/2	230/460	1000:1	143TC	TENV*		M150TN18R3P143TCA5	48
2	230/460	4:1	56C	TEFC*		M200TE18R3P56CA2	41
2	230/460	4:1	145TC	TEFC		M200TE18R3P145TCA2	80
2	230/460	10:1	145TC	TEFC	Yes	M200TE18R3P145TCA3	44
2	230/460	20:1	145TC	TEFC		M200TE18R3P145TCA4	51
3	230/460	10:1	182TC	TEFC	Yes	M300TE18R3P182TCA3	125
3	230/460	20:1	182TC	TEFC		M300TE18R3P182TCA4	86
5	230/460	10:1	184TC	TEFC	Yes	M500TE18R3P184TCA3	125
5	230/460	20:1	184TC	TEFC		M500TE18R3P184TCA4	88
7-1/2	230/460	10:1	213TC	TEFC	Yes	M750TE18R3P213TCA3	185
7-1/2	230/460	20:1	213TC	TEFC		M750TE18R3P213TCA4	98
10	230/460	10:1	215TC	TEFC	Yes	M1000TE18R3P215TCA3	185
10	230/460	20:1	215TC	TEFC		M1000TE18R3P215TCA4	125
15	230/460	10:1	254TC	TEFC	Yes	M1500TE18R3P254TCA3	310

\* With Removable Feet

Use washdown or motors with a drip cover for outside installations.

### 3600 rpm Inverter Duty - 3 Phase

HP	Voltage	Turndown Ratio	Frame	Enclosure	Drip Cover	Part Number	Weight (lbs.)
1	230/460	10:1	56C	TEFC		M100TE36R3P56CA3	34
1	230/460	1000:1	56C	Washdown/TENV		M100WD36R3P56CA5	34
1	230/460	10:1	143TC	TEFC	Yes	M100TE36R3P143TCA3	59
1-1/2	230/460	10:1	143TC	TEFC	Yes	M150TE36R3P143TCA3	59
2	230/460	10:1	145TC	TEFC	Yes	M200TE36R3P145TCA3	65
3	230/460	4:1	145TC	TEFC		M300TE36R3P145TCA3	48
3	230/460	10:1	182TC	TEFC	Yes	M300TE36R3P182TCA3	100
5	230/460	10:1	184TC	TEFC	Yes	M500TE36R3P184TCA3	120
7-1/2	230/460	10:1	213TC	TEFC	Yes	M750TE36R3P213TCA3	175
10	230/460	10:1	215TC	TEFC	Yes	M1000TE36R3P215TCA3	198
15	230/460	10:1	254TC	TEFC	Yes	M1500TE36F3P254TCA3	310

Use washdown or motors with a drip cover for outside installations.

## Explosion-proof Motors

Consult the National Electric Code and your local regulations for proper selection of motors in hazardous locations.

### Hazardous Duty Location, NEMA 56C, Footed, 3 Phase

HP	RPM	Frame	Part Number	Turndown Ratio (CT)	Enclosure	Voltage/Hz	Weight (lbs.)
1/4	1800	56C	M25EX18F3P56CA5	1000:1	TENV	230-460/60	26
1/2	1800	56C	M50EX18F3P56CA5	1000:1	TENV	230-460/60	31
3/4	1800	56C	M75EX18F3P56CA5	1000:1	TENV	230-460/60	38
1	1800	56C	M100EX18F3P56CA5	1000:1	TENV	230-460/60	43

#### Standard Features:

- Class I and II, Groups C, D, F & G
- CSA certified
- UL listed
- Continuous duty at 104°F (40°C) ambient

### Hazardous Duty Location, NEMA, No Feet, 3 Phase

HP	RPM	Frame	Part Number	Turndown Ratio (CT) <sup>(1)</sup>	Shipping Weight (lbs.)
1	1800	143TC	M100EX18R3P143TCA2	4:1	68
2	3600	145TC	M200EX36R3P145TCA2	4:1	110
2	1800	145TC	M200EX18R3P145TCA2	4:1	110
3	3600	182TC	M300EX36R3P182TCA2	4:1	150
3	1800	182TC	M300EX18R3P182TCA2	4:1	150
5	3600	184TC	M500EX36R3P184TCA2	4:1	170
5	1800	184TC	M500EX18R3P184TCA2	4:1	160
7.5	3600	213TC	M750EX36R3P213TCA2	4:1	230
7.5	1800	213TC	M750EX18R3P213TCA2	4:1	250
10	3600	215TC	M1000EX36R3P215TCA2	4:1	285
10	1800	215TC	M1000EX18R3P215TCA2	4:1	325

Contact factory if higher turndown ratios are required.

Contact factory if operating above 3300-ft. elevation.

#### Standard Features:

- Totally enclosed fan cooled - explosion proof (IP55), continuous-duty, 230/460V, 60 Hz, 3 phase, 1.15 S.F.
- UL and CSA listed for Class I, Division I, Group C & D and Class II, Groups E, F, G: Temp Code T3B
- Cast-iron construction, premium efficiency
- UL listed for inverter duty (motor service factor 1.0 when operated with VFD)
- Class "F" insulation with Class "B" rise

## Variable Frequency Drives (VFD) and Controllers

Hydra-Cell Metering Solutions pumps feature VFD electronic controllers to regulate the motor speed and strokes-per-minute, providing a flow that is proportional to the motor speed. They are selected based on the motor hp and whether single-phase or three-phase voltage is required.

### Selection Process

1. Ensure that the phase and enclosure match your application.
2. Using the appropriate chart below, select the controller hp based on the hp of your motor.
3. Match the output voltage to the output voltage of your motor.
4. Match the input voltage to your electrical source.



### 1 Phase

HP	Type	Voltage (input/output)	Enclosure	Part Number	Weight (lbs.)
1/2	Sensorless Vector	230 volt / 230 volt	NEMA 1	C50N1-1P3P-230	2.2
1	Micro AC Inverter	115 volt / 230 volt	IP-20	C100IP-1P3P-115	2.0
1	Micro AC Inverter	115 volt / 230 volt	NEMA 4	C100N4-1P3P-115	8.0
1	Sensorless Vector	230 volt / 230 volt	NEMA 1	C100N1-1P3P-230	2.2
1	Micro AC Inverter	230 volt / 230 volt	NEMA 4	C100N4-1P3P-230	8.0
2	Sensorless Vector	230 volt / 230 volt	NEMA 1	C200N1-1P3P-230	4.4
3	Sensorless Vector	230 volt / 230 volt	NEMA 1	C300N1-1P3P-230	4.4

### 3 Phase

HP	Type	Voltage (input/output)	Enclosure	Part Number	Weight (lbs.)
1/2	Sensorless Vector	230 volt / 230 volt	NEMA 1	C50N1-3P3P-230	2.2
1	Sensorless Vector	230 volt / 230 volt	NEMA 1	C100N1-3P3P-230	2.2
2	Sensorless Vector	230 volt / 230 volt	NEMA 1	C200N1-3P3P-230	4.4
2	Micro AC Inverter	230 volt / 230 volt	NEMA 4	C200N4-3P3P-230	14.0
3	Sensorless Vector	230 volt / 230 volt	NEMA 1	C300N1-3P3P-230	4.4
5	Sensorless Vector	230 volt / 230 volt	NEMA 1	C500N1-3P3P-230	5.0
7-1/2	Sensorless Vector	230 volt / 230 volt	NEMA 1	C750N1-3P3P-230	13.0
10	Sensorless Vector	230volt / 230 volt	NEMA 1	C1000N1-3P3P-230	13.0
1	Sensorless Vector	460 volt / 460 volt	NEMA 1	C100N1-3P3P-460	2.2
1	Micro AC Inverter	460 volt / 460 volt	NEMA 4	C100N4-3P3P-460	13.0
2	Sensorless Vector	460 volt / 460 volt	NEMA 1	C200N1-3P3P-460	2.2
2	Micro AC Inverter	460 volt / 460 volt	NEMA 4	C200N4-3P3P-460	14.0
3	Sensorless Vector	460 volt / 460 volt	NEMA 1	C300N1-3P3P-460	4.4
5	Sensorless Vector	460 volt / 460 volt	NEMA 1	C500N1-3P3P-460	4.4
7-1/2	Sensorless Vector	460 volt / 460 volt	NEMA 1	C750N1-3P3P-460	14.0
10	Sensorless Vector	460 volt / 460 volt	NEMA 1	C1000N1-3P3P-460	14.0
15	Sensorless Vector	460 volt / 460 volt	NEMA 1	C1500N1-3P3P-460	14.0
20	Sensorless Vector	460 volt / 460 volt	NEMA 1	C2000N1-3P3P-460	28.0
30	Sensorless Vector	460 volt / 460 volt	NEMA 1	C3000N1-3P3P-460	30.0

# Control Freak™ Touch-screen Metering Controller



Start-up menu options.

“Control Freak” is an exclusive new electronic controller that provides motor speed control for Hydra-Cell Metering Solutions pumps (or select Hydra-Cell bare shaft pumps) with an easy-to use touch-screen display and built-in programming.

The user can enter the desired flow rate or volume in gallons or liters and system pressure in psi or bar; and the controller automatically runs the pump manually at desired flow rate or volume total/time, or in pre-set batches.

The versatile Control Freak enables programming for the flow rate or for totalization of the recent process application as well as the life of the pump.



Opening screen - touch to activate.



Sample menu for batch operation.

## Performance Features

- Features a Variable Frequency Drive (VFD) available in different hp (or kW) ratings
- Pre-set (with password protection) for Hydra-Cell pump performance algorithms - can also be field-calibrated for greater accuracy
- 7” color graphic touch-screen user interface in a NEMA-4X (or IP) enclosure - easy to operate and visible in low-light areas
- Safety features for emergency stop, loss of power and fault monitoring
- Pump-drive information screen
- Four configurable on-off relays
- Ten separate batch set-up screens
- Two user-configurable analog input displays
- Analog and digital I/O for interfacing with external devices
- One analog input dedicated to a pre-programmed closed loop feedback
- Includes real-time clock
- Versatile - enables programming for flow rate or totalization
- Can control up to six (6) pumps with one Hydra-Cell Control Freak screen - requires additional VFDs and I/O modules

## Options

- Ball-mount assembly for touch screen
- VFD enclosure
- Additional cables
- Oil temperature probe kit

## Control Freak Selection Process

Control Freak enables control of up to six pumps from one touch-screen. A complete Control Freak unit is comprised of Touch-screen Kit (Number 150-150) plus one or more VFD kits.

### Touch-screen Kit (required)

Kit Number	Contents
150-150	7" Touch-screen Assembly Cable, CAT5e, 7-ft.

### VFD Kits (order one VFD kit for each pump operated by the Control Freak)

Kit Number	Power	Voltage	Phase
150-250	1/2 hp (0.37 kW)	115V	1 Phase VFD
150-251	1/2 hp (0.37 kW)	230V	1 Phase VFD
150-252	1 hp (0.75 kW)	115V	1 Phase VFD
150-253	1 hp (0.75 kW)	230V	1 Phase VFD
150-254	2 hp (1.5 kW)	230V	1 Phase VFD
150-255	3 hp (2.2 kW)	230V	1 Phase VFD
150-256	1/2 hp (0.37 kW)	230V	3 Phase VFD
150-257	1 hp (0.75 kW)	230V	3 Phase VFD
150-258	2 hp (1.5 kW)	230V	3 Phase VFD
150-259	3 hp (2.2 kW)	230V	3 Phase VFD
150-264	1 hp (0.75 kW)	460V	3 Phase VFD
150-265	2 hp (1.5 kW)	460V	3 Phase VFD
150-266	3 hp (2.2 kW)	460V	3 Phase VFD

*For higher hp or kW, please consult factory.*

### Control Freak Accessories

Accessory	Description	Part Number
Enclosure (1)	VFD Enclosure for up to 1 hp (0.75 kW)	150-005
Probe Kit	Oil Temperature Sensor Probe with Oil Cap	150-006
Ball Mount Assembly	Bracket Ball, Ball Mount Hinge, Screw, Nut	150-030
Cabling	1-ft. CAT5e Cable	150-401
Cabling	3-ft. CAT5e Cable	150-403
Cabling	7-ft. CAT5e Cable	150-407
Cabling	10-ft. CAT5e Cable	150-410
Cabling	30-ft. CAT5e Cable	150-430

*(1) Consult Factory for larger VFDs and for pricing on equipment mounting in enclosure.*



#### Each VFD kit includes:

- Appropriate VFD model in chart to left
- I/O Module, Single Pump
- Wiring, I/O Module
- Wiring, Motor, 22 ga., 1-ft., Red
- Wiring, Motor, 22 ga., 1-ft., White
- Cable, CAT5e, 1-ft.



# Calibration Cylinders

The calibration cylinder verifies the flow rate of your Hydra-Cell metering pump, providing a visual indicator that your system is operating within the required parameters for performance and accuracy.

Available in PVC and glass, calibration cylinders are selected based on cylinder capacity needed (gph or lph) as determined by the maximum shaft rpm of your pump. Models are available for both NPT and BSPT ports.

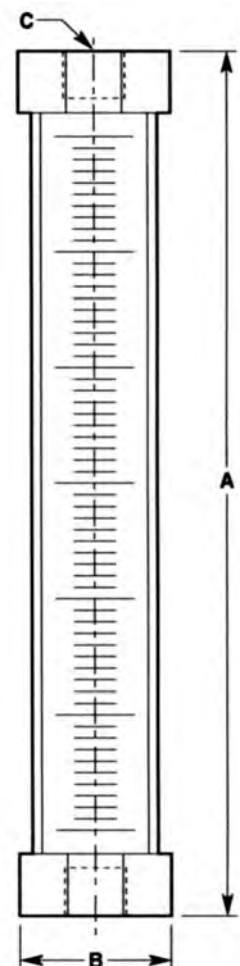
## Selection Process

1. Size the appropriate P Series pump to the application (refer to pump specifications for complete information).
2. Use the application rpm to select the appropriate cylinder from the chart below.



Cylinder Size					
mL	30	200	1000	2000	10000
Capacity					
gph	0.95	6.4	32	64	320
lph	3.6	24	120	240	1200
Pump Model	Maximum Pump Shaft (rpm)				
P100 (F20)	36	200	1000	1750	-
P200 (M03)	-	75	300	600	1750
P300 (D04)	-	75	300	600	1750
P400 (D10)	-	30	110	210	1000
P500 (D15/D17)	-	-	60	115	600
P600 (H25)	-	-	30	60	275

Port C	Cylinder Size (mL)	Part Number		Dimensions - in (mm)	
		NPT Ports	BSPT Ports	A	B
PVC Cylinders					
1/2"	200	111-001	111-001-B	19.0 (482.6)	1.5 (38.1)
3/4"	1000	111-003	111-003-B	22.0 (558.8)	2.5 (63.5)
1"	2000	111-004	111-004-B	20.0 (508.0)	3.7 (94.0)
2"	10000	111-006	111-006-B	25.0 (635.0)	6.95 (176.5)
Glass Cylinders					
1/4"	30	111-010	111-010-B	14.0 (355.6)	1.4 (35.6)
1/2"	200	111-011	111-011-B	21.0 (533.4)	2.5 (63.5)
3/4"	1000	111-013	111-013-B	27.0 (685.8)	3.5 (88.9)
1"	2000	111-014	111-014-B	27.0 (685.8)	5.0 (127.0)



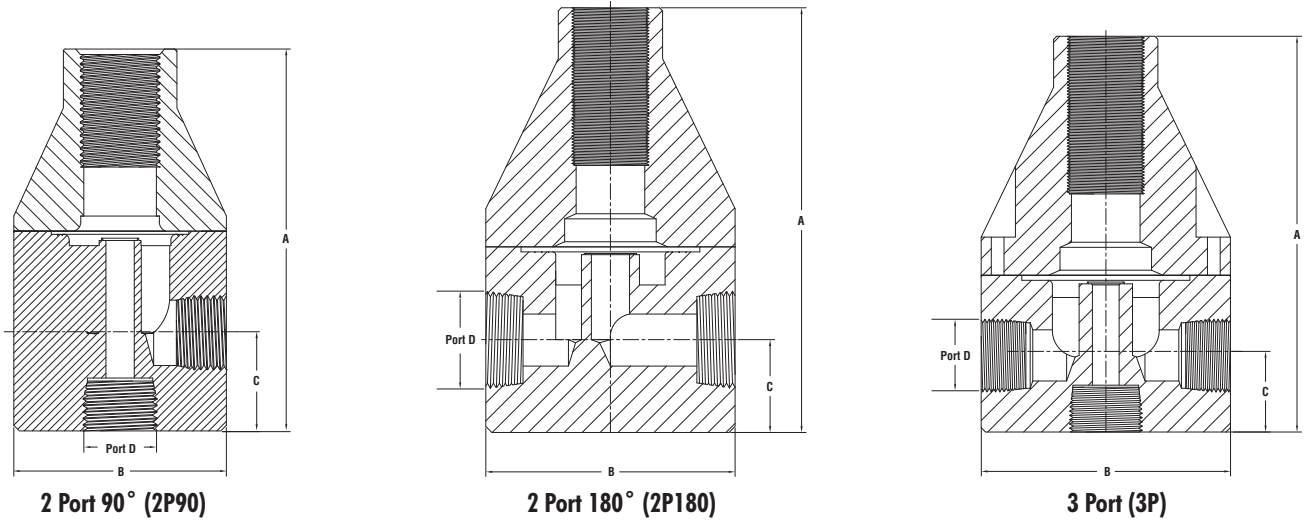
# Back Pressure and Pressure Relief Valves

Back pressure valves help ensure that your Hydra-Cell metering pump provides accurate and predictable flow. Pressure relief valves protect your pump and system from over-pressurized situations.

Available in a choice of wetted materials with PTFE diaphragms, pressure valves are selected according to the valve port size needed for the appropriate maximum flow (gph or lph) of your Hydra-Cell metering pump. Models are available for both NPT and BSPT ports.



## Dimensions and Port Configurations



Material	Port D	A		B		C	
		in	mm	in	mm	in	mm
Polypropylene/PVDF	3/8" (DN 10)	3.55	90.2	2.35	59.7	0.75	19.1
	1/2" (DN 15)	4.25	108.0	2.35	59.7	1.10	27.9
	3/4" (DN 20)	5.56	141.2	3.50	88.9	1.125	28.6
	1" StdFlo (DN 25)	5.86	148.8	3.50	88.9	1.25	31.8
	1" HiFlo (DN 25)	7.25	184.2	4.90	124.5	1.25	31.8
	2" (DN 50)	8.90	226.1	4.90	124.5	2.15	54.6
316 SST	1/4" High Pressure (DN 8)	4.25	108.0	2.35	59.7	1.10	27.9
	3/8" (DN 10)	3.55	90.2	2.35	59.7	0.75	19.1
	3/8" High Pressure (DN 10)	4.25	108.0	2.35	59.7	1.10	27.9
	1/2" (DN 15)	4.25	108.0	2.35	59.7	1.10	27.9
	1/2" High Pressure (DN 15)	4.25	108.0	2.35	59.7	1.10	27.9
	3/4" (DN 20)	5.56	141.2	3.50	149.9	1.125	28.6
	1" StdFlo (DN 25)	5.86	148.8	3.50	88.9	1.25	31.8
	1" HiFlo (DN 25)	7.25	184.2	4.90	124.5	1.25	31.8
	1" High Pressure (DN 25)	5.90	149.9	3.50	88.9	1.25	31.8
	2" (DN 50)	8.90	226.1	4.90	124.5	2.15	54.6
Hastelloy C	1/4" High Pressure (DN 8)	4.25	108.0	2.35	59.7	1.10	27.9
	3/8" (DN 10)	3.55	90.2	2.35	59.7	0.75	19.1
	3/8" High Pressure (DN 10)	4.25	108.0	2.35	59.7	1.10	27.9
	1/2" (DN 15)	4.25	108.0	2.35	59.7	1.10	27.9
	1/2" High Pressure (DN 15)	4.25	108.0	2.35	59.7	1.10	27.9
	3/4" (DN 20)	5.56	141.2	3.50	88.9	1.125	28.6
	1" StdFlo (DN 25)	5.86	148.8	3.50	88.9	1.25	31.8
	1" HiFlo (DN 25)	7.25	184.2	4.90	124.5	1.25	31.8
	1" High Pressure (DN 25)	5.90	149.9	3.50	88.9	1.25	31.8
	2" (DN 50)	8.90	226.1	4.90	124.5	2.15	54.6

# Back Pressure Valves

## Selection Process

1. Use the Valve Port Size “D” chart below to determine the valve port size with the appropriate maximum flow rate to match the Hydra-Cell pump selected: gpm and l/min are Continuous Flow; gph and lph are Pulsating Flow.

2. For Back Pressure Valves, use the chart on this page to select the appropriate valve. For Pressure Relief Valves, use the chart on the following page.

(Note: The maximum flow rates are guidelines. Consult factory for specific recommendations.)

## Valve Port Size “D”

		LoFlo		StdFlo			HiFlo		High Pressure	
		3/8"	1/2"	3/4"	1"	2"	3/4"	1"	1/4"-3/8"-1/2"	1"
Maximum Flow		(DN 10)	(DN 15)	(DN 20)	(DN 25)	(DN 50)	(DN 20)	(DN 25)	(DN 8 - DN 10 - DN 15)	(DN 25)
Pulsating	gph	200	260	300	500	2350	600	1000	700	1200
	lph	757	984	1135	1890	8892	2271	3785	2650	4542
Continuous	gpm	10	15	21	26	120	30	54	35	60
	l/min	37	57	80	98	454	114	204	132	227

Port “D”	Wetted Materials*	Pressure Adjustment Range		Maximum Temperature		Port Configuration	Part Number	
		psi	bar	°F	°C		NPT Ports	BSPT Ports
3/8" (DN 10)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-101	111-101-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-103	111-103-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-106	111-106-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-110	111-110-B
	316 SST	50 - 350	3.5 - 24	300	149	2P180	111-107	111-107-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-111	111-111-B
1/2" (DN 15)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-121	111-121-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-123	111-123-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-126	111-126-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-130	111-130-B
	316 SST	50 - 350	3.5 - 24	300	149	2P180	111-127	111-127-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-131	111-131-B
3/4" (DN 20)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-341	111-341-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-343	111-343-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-346	111-346-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-350	111-350-B
1" StdFlo (DN 25)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-261	111-261-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-263	111-263-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-266	111-266-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-270	111-270-B
	316 SST	50 - 350	3.5 - 24	300	149	2P180	111-267	111-267-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-271	111-271-B
1" HiFlo (DN 25)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-361	111-361-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-363	111-363-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-366	111-366-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-370	111-370-B
2" (DN 50)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-281	111-281-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-283	111-283-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-286	111-286-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-290	111-290-B
	316 SST	50 - 350	3.5 - 24	300	149	2P180	111-287	111-287-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-291	111-291-B

\* Diaphragm material is PTFE on all models. Other materials available on request.



## Pressure Relief Valves

Port "D"	Wetted Materials*	Pressure Adjustment Range		Maximum Temperature		Port Configuration	Part Number	
		psi	bar	°F	°C		NPT Ports	BSPT Ports
1/4" High Pressure (DN 8)	316 SST	350 - 2500	24 - 172	300	149	2P90	111-800	111-800-B
	Hastelloy C	350 - 2500	24 - 172	300	149	2P90	111-804	111-804-B
3/8" (DN 10)	Polypropylene	10 - 150	0.7 - 10.3	195	90	3P	111-401	111-401-B
	PVDF	10 - 150	0.7 - 10.3	195	90	3P	111-403	111-403-B
	316 SST	10 - 150	0.7 - 10.3	300	149	3P	111-406	111-406-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	3P	111-410	111-410-B
	316 SST	50 - 350	3.5 - 24	300	149	3P	111-407	111-407-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	3P	111-411	111-411-B
3/8" High Pressure (DN 10)	316 SST	350 - 2500	24 - 172	300	149	2P90	111-706	111-706-B
	Hastelloy C	350 - 2500	24 - 172	300	149	2P90	111-710	111-710-B
1/2" (DN 15)	Polypropylene	10 - 150	0.7 - 10.3	195	90	3P	111-421	111-421-B
	PVDF	10 - 150	0.7 - 10.3	195	90	3P	111-423	111-423-B
	316 SST	10 - 150	0.7 - 10.3	300	149	3P	111-426	111-426-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	3P	111-430	111-430-B
	316 SST	50 - 350	3.5 - 24	300	149	3P	111-427	111-427-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	3P	111-431	111-431-B
1/2" High Pressure (DN 15)	316 SST	350 - 2500	24 - 172	300	149	2P90	111-726	111-726-B
	Hastelloy C	350 - 2500	24 - 172	300	149	2P90	111-730	111-730-B
3/4" StdFlo (DN 20)	Polypropylene	10 - 150	0.7 - 10.3	195	90	3P	111-541	111-541-B
	PVDF	10 - 150	0.7 - 10.3	195	90	3P	111-543	111-543-B
	316 SST	10 - 150	0.7 - 10.3	300	149	3P	111-546	111-546-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-550	111-550-B
3/4" HiFlo (DN 20)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-641	111-641-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-643	111-643-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-646	111-646-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-650	111-650-B
3/4" High Pressure (DN 20)	316 SST	350 - 2500	24 - 172	300	149	2P90	111-746	111-746-B
	Hastelloy C	350 - 2500	24 - 172	300	149	2P90	111-750	111-750-B
1" StdFlo (DN 25)	Polypropylene	10 - 150	0.7 - 10.3	195	90	3P	111-561	111-561-B
	PVDF	10 - 150	0.7 - 10.3	195	90	3P	111-563	111-563-B
	316 SST	10 - 150	0.7 - 10.3	300	149	3P	111-566	111-566-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-570	111-570-B
	316 SST	50 - 350	3.5 - 24	300	149	3P	111-567	111-567-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-571	111-571-B
1" HiFlo (DN 25)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P180	111-661	111-661-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-663	111-663-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-666	111-666-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-670	111-670-B
1" High Pressure (DN 25)	316 SST	350 - 2500	24 - 172	300	149	2P180	111-766	111-766-B
	Hastelloy C	350 - 2500	24 - 172	300	149	2P90	111-770	111-770-B
2" (DN 50)	Polypropylene	10 - 150	0.7 - 10.3	195	90	2P90	111-581	111-581-B
	PVDF	10 - 150	0.7 - 10.3	195	90	2P180	111-583	111-583-B
	316 SST	10 - 150	0.7 - 10.3	300	149	2P180	111-586	111-586-B
	Hastelloy C	10 - 150	0.7 - 10.3	300	149	2P180	111-590	111-590-B
	316 SST	50 - 350	3.5 - 24	300	149	2P180	111-587	111-587-B
	Hastelloy C	50 - 350	3.5 - 24	300	149	2P180	111-591	111-591-B

\* Diaphragm material is PTFE on all models. Other materials available on request.

# Pulsation Dampeners

Pulsation dampeners protect your pumping system and its components by removing virtually all hydraulic shock and vibration resulting from the reciprocating stroking action of a positive displacement pump.

Available in a variety of housing construction and bladder materials to cover different applications, pulsation dampeners are selected based on the size dampener (in cubic inches) needed to match your Hydra-Cell P Series pump model and discharge pulsation.

(Note: Since Hydra-Cell multiple-diaphragm model pumps provide smooth, virtually pulse-less linear flow, pulsation dampeners are recommended for P100 models, but are optional for all other models.)



## Selection Process

### Determine application

- Discharge pulsation (< 1000 psi or > 1000 psi)
- Inlet stabilization
  - High inlet pressure (>30 psi); or
  - Low inlet pressure (suction lift / <30 psi positive pressure)

### Select dampener size (cu. in. volume)

Based on the P Series pump model and application, select the appropriate cubic inch size from the chart at right.

### Select dampener model

Use the appropriate dampener size chart on pages 43 and 44 to select the specific model with the desired housing materials, bladder material, and pressure and temperature performance. (Contact Wanner Engineering for special order units with other construction materials and temperature limits.)

Air Control Pump Model	Application			
	Discharge Pulsation		Inlet Stabilization	
	Chargeable <1000 psi	Chargeable >1000 psi	Chargeable >30 psi	"J" Style <30 psi
<b>P100 (F20)</b>	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
<b>P200 (M03)</b>	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
<b>P300 (D04)</b>	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
<b>P400 (D10)</b>	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
<b>P500 (D15/D17)</b>	4 cu. in.	12 cu. in.	10 cu. in.	10 cu. in.
<b>P600 (H25)</b>	10 cu. in.	N/A	10 cu. in.	10 cu. in.

**Note:** These are minimum size recommendations. A larger size can always be used.

## Bladder Options

Bladder Material	Application Recommendations
Buna-N	Good flex life; use with petroleum, solvents, and oil-based fluids
Neoprene	Good abrasion resistance and flex; use with moderate chemicals
EPDM	Good for extreme cold; good chemical resistance with ketones, caustics
FKM	Good for hot and aggressive fluids; use with aromatics, solvents, acids, and oils
PTFE	Bellows design, excellent flex life; use with highly aggressive fluids

#### 4 Cubic Inch Dampeners: Inlet 1/2" (female)

Wetted	Bladder	Volume (Inch <sup>3</sup> )	Max Pressure		Part Number	
			psi	bar	NPT Ports	BSPT Ports
SST	Buna-N	4	1000	69	110-060	110-060-B
SST	Neoprene	4	1000	69	110-062	110-062-B
SST	EPDM	4	1000	69	110-063	110-063-B
SST	FKM	4	1000	69	110-065	110-065-B
SST	PTFE	4	1000	69	110-068	110-068-B
Hastelloy C	Buna-N	4	1000	69	110-090	110-090-B
Hastelloy C	Neoprene	4	600	41.4	110-092	110-092-B
Hastelloy C	EPDM	4	1000	69	110-093	110-093-B
Hastelloy C	FKM	4	600	41.4	110-095	110-095-B
Hastelloy C	PTFE	4	600	41.4	110-098	110-098-B
Polypropylene	Buna-N	4	150	10.3	110-999	110-999-B
Polypropylene	Neoprene	4	150	10.3	110-101	110-101-B
Polypropylene	EPDM	4	150	10.3	110-104	110-104-B
Polypropylene	FKM	4	150	10.3	110-106	110-106-B
Polypropylene	PTFE	4	150	10.3	110-109	110-109-B
PVDF	Buna-N	4	150	10.3	110-020	110-020-B
PVDF	Neoprene	4	150	10.3	110-022	110-022-B
PVDF	EPDM	4	150	10.3	110-023	110-023-B
PVDF	FKM	4	150	10.3	110-026	110-026-B
PVDF	PTFE	4	150	10.3	110-028	110-028-B

#### 10 Cubic Inch Dampeners: Inlet 1/2" (female)

Wetted	Bladder	Volume (Inch <sup>3</sup> )	Max Pressure		Part Number	
			psi	bar	NPT Ports	BSPT Ports
SST	Buna-N	10	1000	69	110-260	110-260-B
SST	Neoprene	10	1000	69	110-262	110-262-B
SST	EPDM	10	1000	69	110-263	110-263-B
SST	FKM	10	1000	69	110-265	110-265-B
SST	PTFE	10	150	10.3	110-268	110-268-B
Hastelloy C	Buna-N	10	1000	69	110-290	110-290-B
Hastelloy C	Neoprene	10	1000	69	110-292	110-292-B
Hastelloy C	EPDM	10	1000	69	110-293	110-293-B
Hastelloy C	FKM	10	1000	69	110-295	110-295-B
Hastelloy C	PTFE	10	150	10.3	110-298	110-298-B
Polypropylene	Buna-N	10	150	10.3	110-100	110-100-B
Polypropylene	Neoprene	10	150	10.3	110-232	110-232-B
Polypropylene	EPDM	10	150	10.3	110-233	110-233-B
Polypropylene	FKM	10	150	10.3	110-105	110-105-B
Polypropylene	PTFE	10	150	10.3	110-108	110-108-B
PVDF	Buna-N	10	150	10.3	110-220	110-220-B
PVDF	Neoprene	10	150	10.3	110-222	110-222-B
PVDF	EPDM	10	150	10.3	110-223	110-223-B
PVDF	FKM	10	150	10.3	110-225	110-225-B
PVDF	PTFE	10	150	10.3	110-228	110-228-B

## 10 Cubic Inch Inlet Stabilizers with J-Style Control: Inlet 1/2" (female)

Wetted	Bladder	Volume (Inch <sup>3</sup> )	Max Pressure		Part Number	
			psi	bar	NPT Ports	BSPT Ports
CPVC	Buna-N	10	30	2	110-210-J	110-210-J-B
CPVC	Neoprene	10	30	2	110-212-J	110-212-J-B
CPVC	EPDM	10	30	2	110-213-J	110-213-J-B
CPVC	FKM	10	30	2	110-215-J	110-215-J-B
CPVC	PTFE	10	30	2	110-218-J	110-218-J-B

## 12 Cubic Inch Dampeners: Inlet 1/2" (female)

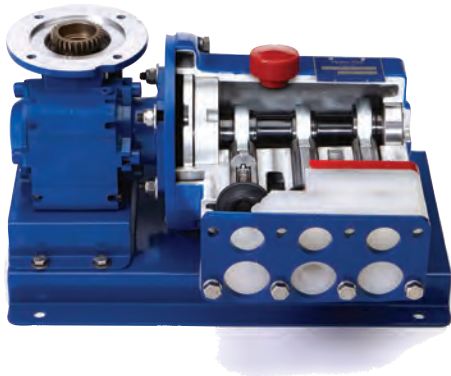
Wetted	Bladder	Volume (Inch <sup>3</sup> )	Max Pressure		Part Number	
			psi	bar	NPT Ports	BSPT Ports
SST	Buna-N	12	4000	276	110-370	110-370-B
SST	EPDM	12	4000	276	110-373	110-373-B
SST	FKM	12	4000	276	110-375	110-375-B
SST	PTFE	12	2000	138	110-368	110-368-B

## Pulsation Dampener Charging Kits

Part Number	Description
110-900	Pulsation Dampener Charging Kit to 999 psi (68.9 bar)
110-901	Pulsation Dampener Charging Kit 1000 to 5000 psi (69 to 345 bar)

# Other Services and Support

## Demonstration (Cutaway) Units



Description	Part Number
P200 Cutaway Demo with Rolling Carry Case	CUTAWAY-P200WCASE
P200 Cutaway Demo without Case	CUTAWAY-P200
Cutaway Demo Rolling Case Only	CUTAWAY-CASE

## Testing

Part Number	Description	Notes
TEST-STDPROD	Standard Production Tests	Rated Flow, Rated Pressure, & Steady State Accuracy
TEST-STDPRODWIT	Witnessed Standard Production Tests	Rated Flow, Rated Pressure, & Steady State Accuracy
TEST-HYDRO	Hydrostatic Test & Certificate	Includes Standard Production Tests
TEST-HYDROWIT	Witnessed Hydrostatic Test & Certificate	Includes Standard Production Tests
TEST-STDLIN	API Linearity Test (5-point curve)	Includes Standard Production Tests
TEST-STDLINWIT	Witnessed API Linearity Test (5-point curve)	Includes Standard Production Tests
TEST-STDLINREP	API Repeatability Test (10-point curve)	Includes Standard Production Tests & API Linearity Test
TEST-STDLINREPWIT	Witnessed API Repeatability Test (10-point curve)	Includes Standard Production Tests & API Linearity Test
TEST-STDHYDAPI	API Test Package	Standard Production Tests, Linearity, Repeatability, & Hydrostatic
TEST-STDHYDAPIWIT	Witnessed API Test Package	Standard Production Tests, Linearity, Repeatability, & Hydrostatic

## System Components

If needed, we can also deliver your Hydra-Cell Metering Solutions pumping system with all necessary strainers, suction accumulators, gauges, and other components.

## Priming Kits and Plugs

A vacuum priming kit is available for use after diaphragm replacement, and PVC priming plugs are used for priming the hydraulic cells in Hydra-Cell pumps equipped with patented Kel-Cell Diaphragm Position Control technology (models P400 and P600).

## Replacement Parts Kits and Tool Kits

Replacement Parts Kits are available for each P Series metering pump model and Hydra-Cell bare shaft pumps for metering. Complete tool kits are also available customized to the specific pump model.

## Factory Services

OEM paint and nameplate customization, drawing packages, and other special services are available.

## Other Wanner Engineering Pumps

### **Hydra-Cell**<sup>®</sup> METERING SOLUTIONS™

MT8 triplex metering pump with a maximum flow rate of 8.0 gph and maximum discharge pressure of 3500 psi.

15 S Series solenoid-driven metering pumps with maximum flow rates ranging from 30 ml/min to 200 ml/min and 12 additional models available with relief valves (and flow rates from 30 to 100ml/min) depending on pump model.



### **Hydra-Cell**<sup>®</sup> Seal-less Pumps

Nine seal-less pump models with maximum flow rates from 1.0 gpm to 68.5 gpm and discharge pressures from 700 psi to 2500 psi depending on pump model.

Three high-horsepower pump models with maximum flow rates from 26 gpm to 96 gpm and discharge pressures from 1500 psi to 5000 psi depending on pump model.

Two quintuplex pump models with maximum flow rates from 67 gpm to 157 gpm and discharge pressures from 1500 psi to 3500 psi depending on pump model.



### **STAN-COR**

Non-metallic, solid PVDF ANSI centrifugal pumps with total dynamic head to 350 feet and flow capacities to 700 gpm.



### **VECTOR**

Peristaltic pumps to move high-viscosity fluids. Ten 2000 and 3000 Series models with maximum flow rates from 0.3 gpm to 211 gpm and discharge pressures from 30 psig to 116 psig depending on pump model. Seven 4000 Series models with maximum flow rates from 0.79 gpm to 154.1 gpm and discharge pressures of 110 psig or 218 psig depending on pump model.



# Hydra-Cell® Worldwide Sales and Service



Hydra-Cell pumps are sold and serviced worldwide by a comprehensive network of factory-trained pump distributors. As specialists in pump technologies, our distributor organizations offer you a vital local resource for technical expertise, product training, sales and service.

Hydra-Cell distributors are located in more than 70 countries worldwide. In North America specifically, there are more than 100 Hydra-Cell distributor locations to provide local availability for every major commercial, institutional, industrial, and municipal marketplace.

## World Headquarters & Manufacturing

★ Minneapolis, Minnesota, USA

## Business Units

- ★ Wichita Falls, Texas, USA
- ★ Hampshire, United Kingdom
- ★ Kowloon, Hong Kong
- ★ Shanghai, China
- ★ São Paulo, Brazil

## Contact us for the name and location of the authorized Hydra-Cell distributor nearest you:

Algeria	Colombia	Hungary	Mexico	Qatar	Thailand
Argentina	Costa Rica	India	Mongolia	Romania	Tunisia
Australia	Czech Republic	Indonesia	Morocco	Russia	Turkey
Austria	Denmark	Ireland	Netherlands	Saudi Arabia	Ukraine
Belarus	Ecuador	Israel	New Zealand	Singapore	United Arab Emirates
Belgium	Egypt	Italy	Norway	Slovakia	United Kingdom
Bolivia	Estonia	Japan	Oman	South Africa	United States
Brazil	Finland	Kazakhstan	Panama	South Korea	Uruguay
Bulgaria	France	Kuwait	Peru	Spain	Venezuela
Canada	Germany	Latvia	Poland	Sweden	Viet-Nam
Chile	Greece	Lithuania	Portugal	Switzerland	Yemen
China	Hong Kong	Malaysia	Puerto Rico	Taiwan	

# Hydra·Cell<sup>®</sup>

## METERING SOLUTIONS™



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