

Hydra-Cell®

Seal-less Pumps



Hydra-Cell F/M/D/H Series Seal-less Pumps



Hydra-Cell T80 Series Seal-less Pumps



Hydra-Cell P Series Seal-less Metering Pumps



Hydra-Cell® Seal-less Pumps



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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.”

Dr. Ing Friedrich Wilhelm Hennecke
Chemical Engineering World



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

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Kel-Cell® is a registered trademark of Wanner Engineering, Inc.

Hydra-Cell® Seal-less Design Advantages

Hydra-Cell positive displacement pumps feature a seal-less pumping chamber so there are no seals, packing or cups to leak or replace. The seal-less design and check valves enable Hydra-Cell to handle abrasives and particulates that would damage other types of pumps. In addition, Hydra-Cell can run dry indefinitely without damage to the pump. The multiple-diaphragm design of Hydra-Cell provides virtually pulse-less, linear flow without the need for expensive pulsation dampeners.

Economical

- Can save approximately 30% to 50% on initial costs because Hydra-Cell uses lower horsepower motors to achieve the same flow rates and pressures as other pumps.
- Compact design with smaller footprint provides more efficient use of floor space.
- Operates at 85-90% energy efficiency to reduce operating costs.
- Seal-less design reduces maintenance and repair expenditures and minimizes the cost of spare parts compared to other types of pumps.

Versatile

- Variety of styles and models to pump a wide range of flow capacities and pressure ratings.
- Hydraulically-balanced diaphragms can pump low-to-high-viscosity liquids throughout the entire pressure range of the pump.
- Available in a variety of construction materials to meet a wide range of applications and ensure optimum pumping life even when handling aggressive fluids.
- Can be fitted with SAE, ANSI or DIN flanges as well as IEC or NEMA motor mounts.
- Can be provided with ATEX certification or other certification to adapt to specific applications or meet international standards.
- Design allows for easy interchangeability of pump head materials and can accommodate mixing different materials with one pump head.





Capable

- Tolerates abrasive solids and particulate matter up to 800 microns (depending on pump model) and 9 hardness (Mohs) without the need for fine filtration.
- Multiple diaphragms provide virtually pulse-less flow that exceeds API 675 standards for accuracy, linearity, and repeatability.
- Low-shear pumping action ensures integrity of long-chain structures.

Reliable

- Can run dry without damage to the pump.
- Robust design tolerates non-ideal operating conditions.
- No seals, packing or cups to leak or replace.
- Typically runs up to 6,000 hours between lubricating oil changes.
- Can pump acids, slurries and liquids containing up to 40% of non-dissolved solids.
- Does not rely on the fluid being pumped for lubrication.
- No tight tolerances susceptible to corrosion or solid particles.

Environmental

- Liquids are 100% sealed from the atmosphere.
- No leak path for toxic vapors or harmful gasses.
- No seals to leak any Volatile Organic Compounds (VOC).
- Lower energy costs to operate pump.



Hydra-Cell® Application Versatility

Hydra-Cell pumps operate reliably and efficiently in commercial, institutional, industrial, and municipal facilities throughout the world. The breadth of the product line offers a wide range of flow capacities and pressure ratings to meet

many different requirements. The further capability to provide precise metering and dosing is ideal for many specialized applications. Hydra-Cell pumps can also be fitted with SAE, ANSI, DIN, or other flange connections.



Markets and Industries Served

- Agricultural
- Automotive
- Biodiesel
- Biotechnical
- Car/Vehicle Washing
- Ceramics
- Chemical & Petrochemical
- Chip Board Manufacturing
- Cleaning & Washing
- Construction
- Electronics
- Emissions & Environmental Control
- Energy & Power Generation
- Flue Gas Emission Control
- Food & Beverage Processing
- General Industrial & Manufacturing
- Glass & Clay
- Landscaping & Lawn Care
- Marine
- Machine Tool Coolant
- 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
- Tote, Tank & Barrel Washing
- Water & Wastewater Treatment



Hydra-Cell® Primary Pumping Applications

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



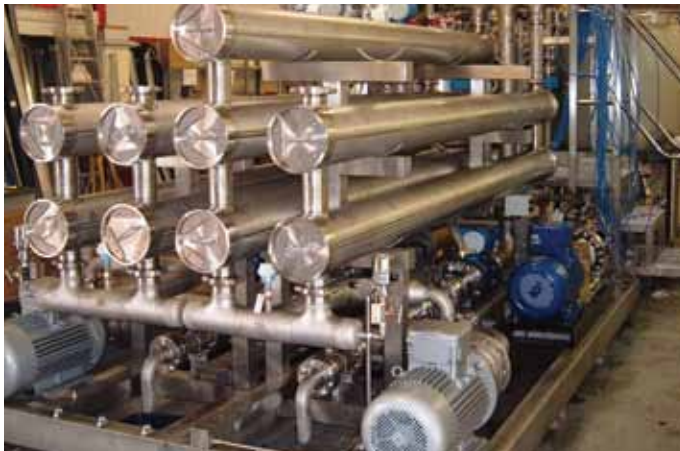
Hydra-Cell pumps deliver high-pressure, controlled flow of machine tool coolant without the need for fine filtration.



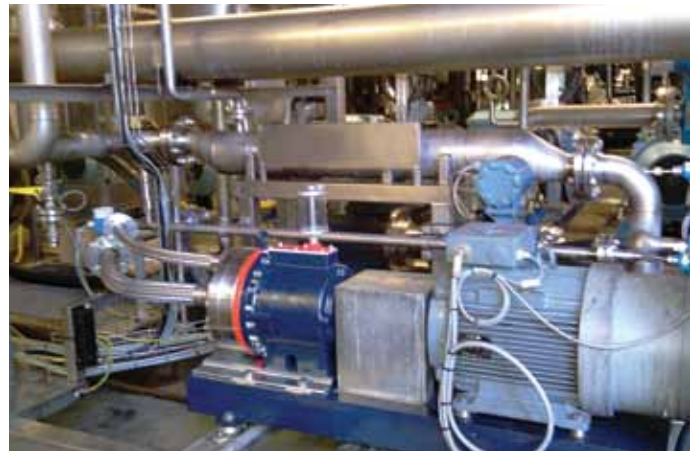
High-precision injecting at low flow rates can be achieved for specialized applications in polyurethane processing.



Hydra-Cell pumping shear-sensitive polymers for enhanced oil recovery.



Pumping for waste stream reduction and salt solution concentration at a pharmaceutical chemical plant.



Hydra-Cell pumps used for ultra-filtration by a food additive manufacturer.

Hydra-Cell® Fluid Handling Capability

◀ **Non-Lubricating**

Viscous Abrasives ▶

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

Handles Abrasives and Low-to-High Viscosity Fluids

From drinking water to highly viscous cutting fluids, Hydra-Cell pumps 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.



Pumping ceramic slurry in a spray drying application can be a problem for other types of pumps, but not Hydra-Cell.



Several operational features of Hydra-Cell pumps are showcased when processing volatile crude oil.



Wastewater treatment is a difficult pumping application that Hydra-Cell routinely handles.

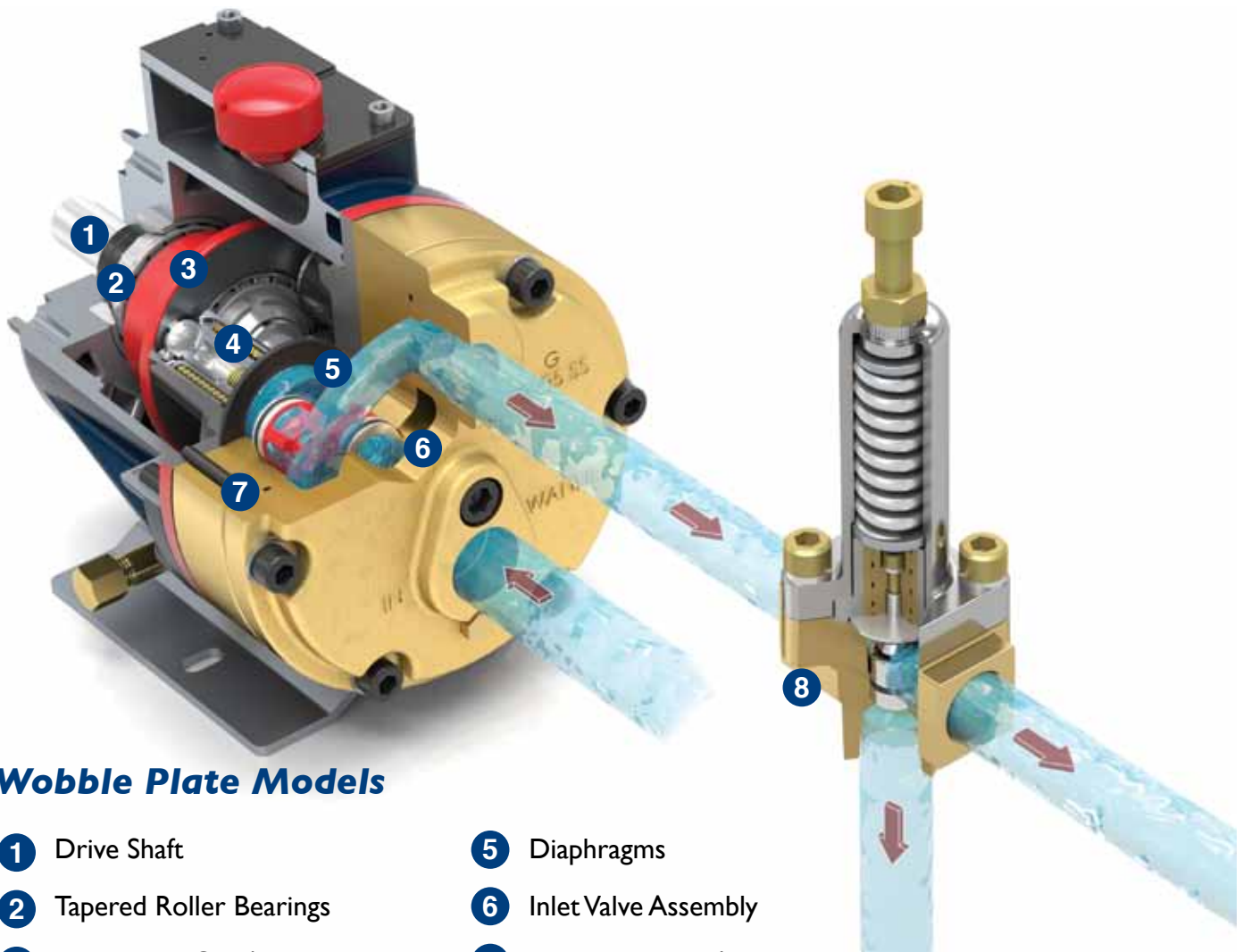


Hydra-Cell pumping ethanol-based fluid for making jet fuel.



Pumping dirty and recycled water at a commercial car wash is an everyday function for Hydra-Cell pumps.

Hydra-Cell® Principles of Operation



Wobble Plate Models

- | | |
|--------------------------------|---------------------------------|
| 1 Drive Shaft | 5 Diaphragms |
| 2 Tapered Roller Bearings | 6 Inlet Valve Assembly |
| 3 Fixed-angle Cam/Wobble Plate | 7 Discharge Valve Assembly |
| 4 Hydraulic Cells (Patented) | 8 C62 Pressure Regulating Valve |

Reliable, Efficient Pumping Action

The drive shaft (1) is rigidly held in the pump housing by a large tapered roller bearing (2) at the rear of the shaft and a smaller bearing at the front of the shaft. Set between another pair of large bearings is a fixed-angle cam or wobble plate (3). As the drive shaft turns, the wobble plate nutates, oscillating forward and back (converting axial motion into linear motion). The complete pumping mechanism is submerged in a lubricating oil bath.

The hydraulic cell (4) is moved sequentially by the wobble plate and filled with oil on its rearward stroke. A ball check valve in the bottom of the piston ensures that the cell remains full of oil on its forward stroke.

The oil held in the Hydra-Cell balances the back side of the diaphragms (5) and causes the diaphragms to flex forward and back as the wobble plate moves. This provides the pumping action.

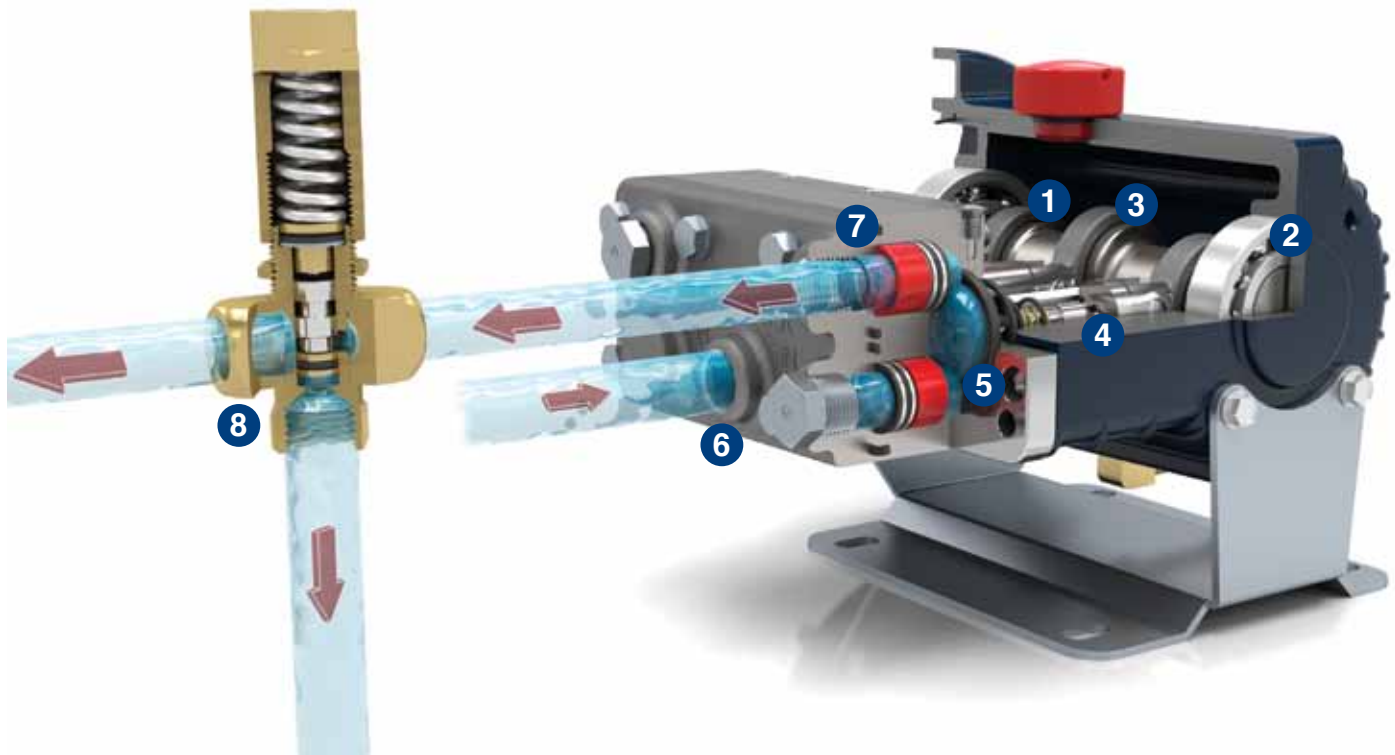
To provide long trouble-free diaphragm life, Hydra-Cell

hydraulically balances the diaphragm over the complete pressure range of the pump. The diaphragm faces only a 3 psi (0.21 bar) pressure differential regardless of the pressure at which fluid is being delivered - up to 2500 psi (172 bar) on standard Hydra-Cell models and Hydra-Cell metering pumps.

Hydra-Cell wobble plate pumps can have up to five diaphragms, and each diaphragm has its own pumping chamber that contains an inlet and discharge self-aligning horizontal disk check valve assembly (6). As the diaphragms move back, fluid enters the pump through a common inlet and passes through one of the inlet check valves. On the forward stroke, the diaphragm forces the fluid out the discharge check valve (7) and through the manifold common outlet. Equally spaced from one another, the diaphragms operate sequentially to provide consistent, low-pulse flow.

A Hydra-Cell C62 pressure regulating valve (8) is typically installed on the discharge side of the pump to regulate the pressure of downstream process or equipment.

Hydra-Cell® Principles of Operation



Crank-shaft Models

- | | |
|------------------------------|---|
| 1 Drive Shaft | 5 Diaphragms |
| 2 Precision Ball Bearings | 6 Inlet Valve Assembly |
| 3 Connecting Rods | 7 Discharge Valve Assembly |
| 4 Hydraulic Cells (Patented) | 8 C46 Pressure Regulating Valve (In-line) |

Reliable, Efficient Pumping Action

The drive shaft (1) is supported in position by two precision ball bearings (2) positioned at either end of the shaft. Located between these bearings are either one or three cam shaft lobes with connecting rods (3) that are hardened, precision ground, and polished. Maintaining a high level of quality on the cam lobes and connecting rod surfaces ensures proper lubrication and reduced operating temperatures in the hydraulic end of the pump.

As the drive shaft turns, each cam actuates the attached connecting rod that is pinned into position at the end of each hydraulic piston. This action moves the piston forward and backward, converting the axial motion into linear pumping motion. The complete pumping mechanism is submerged in a lubricating oil bath.

Each piston contains a patented hydraulic cell (4) that is moved sequentially by the crank-shaft. The innovative and proprietary Hydra-Cell maintains the precise balance of oil behind the diaphragm (5) regardless of the operating conditions of the pump. The oil in Hydra-Cell is pressurized on the forward stroke of the piston causing the diaphragm to flex, which drives

the pumping action. The oil held in the Hydra-Cell balances the diaphragm against the fluid being pumped, maintaining no more than a 3 psi (0.21 bar) differential regardless of the pressure at which the fluid is being delivered - up to 2500 psi (172 bar) on standard Hydra-Cell models and Hydra-Cell metering pumps.

Hydra-Cell crank-shaft pumps can have up to three diaphragms, and each diaphragm has its own pumping chamber that contains an inlet and discharge self-aligning horizontal disk check valve assembly (6). As the diaphragms move back, fluid enters the pump through a common inlet and passes through one of the inlet check valves. On the forward stroke, the diaphragm forces the fluid out of the discharge check valve (7) and through the manifold common outlet. Equally spaced from one another, the diaphragms operate sequentially to provide consistent, low-pulse flow.

A Hydra-Cell C46 pressure regulating valve (8) is typically installed on the discharge side of the pump to regulate the pressure of downstream process or equipment.

Hydra-Cell® Patented Kel-Cell® Diaphragm Protection

Diaphragm Position Control (DPC) Technology

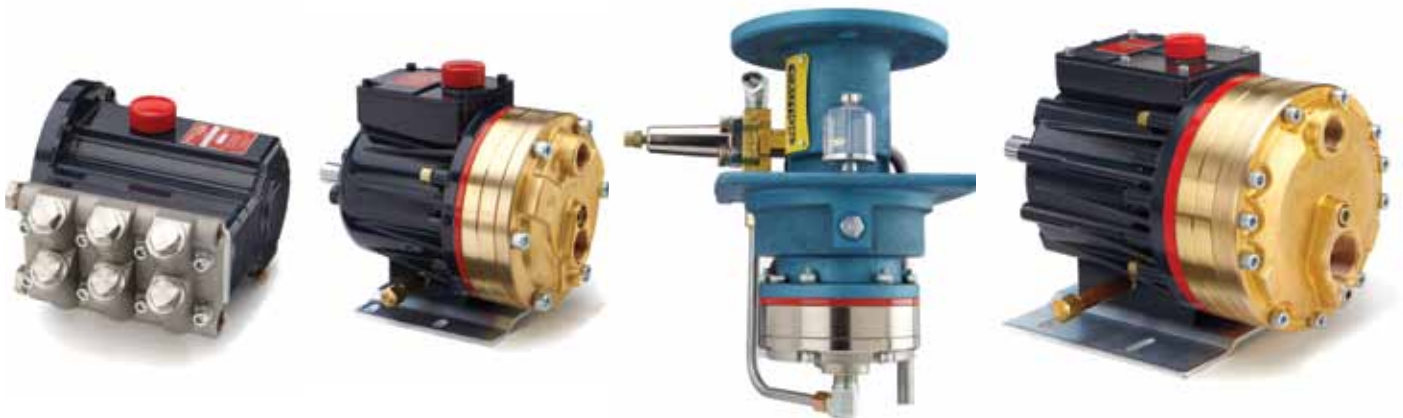


Available on many Hydra-Cell models that use the fixed-angle cam/wobble plate operating principle, Kel-Cell DPC protects Hydra-Cell pumps by safeguarding the diaphragms against abnormal or adverse conditions such as:

- Partially or completely blocked inlet pipe or inlet filter
- Partly or completely closed inlet shut-off valve
- Inadequate liquid supply
- Excessively viscous fluids
- Inadequate discharge pressure
- Other conditions that result in excessive vacuum formed at the inlet of the pump

These conditions can result from system problems, poor system design, faulty installation, an unplanned operational incident, or other situations that would cause the diaphragms to operate out of hydraulic balance and ultimately deform and rupture.

The Kel-Cell positioning system enhances Hydra-Cell pump performance. It is designed to stabilize the diaphragms in all such conditions and virtually eliminate the possibility of an incidental diaphragm failure caused by adverse system conditions.



Kel-Cell is available with Hydra-Cell models M03/D03, M03/D03 Mono-Block, D10, D12, H25, and D35.

Hydra-Cell® Patents and Industry Recognition

USA Patents Held by Wanner Engineering

Patent Number	Title
5,667,143	Spray gun for spraying two fluids
5,707,219	Diaphragm pump
6,019,124	Valve assembly for use with high-pressure pumps
6,164,560	Lawn applicator module and control system therefor
6,536,466	Pressure regulator apparatus
6,568,559	Termite control system with multi-fluid proportion metering and batch signal metering
6,899,530	Diaphragm pump with a transfer chamber vent with a longitudinal notch on the piston cylinder
7,101,158	Hydraulic balancing, magnetically-driven centrifugal pump
6,941,853	Pump diaphragm rupture detection
7,467,582	Pump diaphragm rupture detection
7,090,474	Diaphragm pump with overflow limiter
7,425,120	Diaphragm position control for hydraulically driven pumps
7,665,974	Diaphragm pump position control with offset valve axis

Awards for Hydra-Cell

Presented by the Institution of Chemical Engineers, the IChemE Awards recognize innovation and excellence in making outstanding contributions to safety, the environment, and sustainable development in the chemical and bioprocess industries. Introduced in 2006, Hydra-Cell Metering Solutions pumps earned Honourable Mention in the category for new products.



Selected by the editors and advisory board of *Pumps & Systems* magazine, the Hydra-Cell model T8030 earned recognition as a finalist in the publisher's 2010 "Product Innovation" awards. As noted by the trade journal, Hydra-Cell T8030 has a patented valve system that maintains the correct volume of hydraulic fluid in the pumping chamber behind the diaphragm.



Hydra-Cell T80 Series pumps received a "Spotlight on New Technology" award at the 2010 Offshore Technology Conference in recognition of the latest and most advanced technologies that are leading the industry into the future. Winners are selected for being new, innovative, proven (in application or prototype), of broad interest to the industry, and of significant impact, including environmental benefits.



Hydra-Cell® Design and Manufacturing Standards



Hydra-Cell seal-less pumps are designed, built, and tested in the Wanner Engineering 80,000 square foot facility in Minneapolis, Minnesota. We have more than 40 years of experience serving manufacturers, processors, and commercial or institutional organizations, including many major global companies.



Hydra-Cell pumps are performance-proved for efficiently pumping the widest range of corrosive, high-temperature, abrasive, viscous, non-lubricating, and recycled fluids, as well as liquids containing solids. Every pump is assembled with the proper materials of construction to meet the application.



Our capability is the result of a strategic emphasis on adopting sound management principles throughout the plant combined with attention to detail for every task and procedure.

Continuous Improvement

- High-precision machining equipment and lean production practices throughout an extensively automated manufacturing facility.
- All pumps are designed, built, and tested in the USA.
- Design engineering services available for assistance with your application.
- Extensive inventory and reliable supply chain.
- Stringent quality control systems for component-to-component and unit-to-unit quality and consistency.
- Every pump is tested (15-minute to 2-hour run cycles) for full flow at rated pressure, temperature, noise, and vibration.



Mass Customization Means Maximum Flexibility

Every order is a priority at Wanner Engineering. Every pump is built to order. Our “Mass Customization” philosophy leverages the modular design of Hydra-Cell with sophisticated operational methods to:

1. Provide you with the properly configured pump for your process application;
2. At a competitive price;
3. Delivered with minimal lead time.

We can help you match your flow/pressure requirements to select the best model and materials of construction based on your process fluid and industry application. We maintain optimum inventory levels of parts and components that translate into cost efficiencies and faster turnaround time for customers.

An expert staff and attentive customer service practices enable us to achieve the goals of providing the Hydra-Cell pump engineered and configured to your specifications.

- A wide selection of metallic and non-metallic pump head materials plus diaphragm, valve and o-ring materials enable easy configuration to meet your specific needs from in-stock components.
- Base plates, couplings and coupling guards are available in several inline and parallel mounting configurations to suit your facility and operating environment.
- Custom pump head and body castings are available, as well as matching OEM paint and private labeling.
- Comprehensive assortment of accessories include regulator valves, oil coolers and filtration, oil level monitoring, couplings, guards, connectors, and tool kits.
- Options to enhance performance such as gear boxes, controllers, pulsation dampeners, and an assortment of drives.



Hydra-Cell® Materials of Construction

As part of our “Mass Customization” philosophy, every Hydra-Cell pump is built with manifolds, elastomeric materials, and valve assemblies using construction materials specified by the customer. Hydra-Cell distributors and factory representatives are readily available to assist customers in selecting the materials best suited to the process application. (The range of material choices depends on each pump model – for example, models designed to operate at higher pressures are available with metallic pump heads only.)

Manifolds



Manifolds for Hydra-Cell pumps are available in a variety of 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.)

Metallic Pump Heads

Metallic pump heads can handle higher operating pressures. Hastelloy C or Stainless Steel is also selected for corrosion resistance and other properties.

- Brass
- Bronze
- Cast Iron (Nickel-plated)
- Hastelloy C
- Duplex Alloy 2205 Stainless Steel
- 304 Stainless Steel
- 316L Stainless Steel

Non-metallic Pump Heads

Non-metallic pump heads are often used when a corrosive or aggressive fluid is being processed at lower pressures.

- Polypropylene
- PVDF

Diaphragms and O-rings



Diaphragms and corresponding o-rings are available in several elastomeric materials. For diaphragm start-up temperatures and material markings, see page 147.

- Aflas diaphragm (used with PTFE o-ring)
- Buna-N
- EPDM (requires EPDM-compatible oil)
- Neoprene
- PTFE
- FKM



Valve Materials



Hydra-Cell valve assemblies (seats, valves, springs, and retainers) are available in a variety of materials to suit your process application. For reference to identify metallic materials used for valves and valve seats, see page 146. For fluid temperature ranges of valve spring retainers, and reference to identify non-metallic valve spring retainers, see page 147.

Valve Seats

- Ceramic
- Hastelloy C
- Nitronic 50*
- Tungsten Carbide
- 17-4 Stainless Steel
- 316L Stainless Steel

Valves

- Ceramic
- Hastelloy C
- Nitronic 50*
- Tungsten Carbide
- 17-4 Stainless Steel

Valve Springs

- Elgiloy*
- Hastelloy C
- 17-7 Stainless Steel
- 316L Stainless Steel

Valve Spring Retainers

- Celcon*
- Hastelloy C
- Nylon
- PVDF
- Polypropylene
- 17-7 Stainless Steel

* For properties and characteristics of these materials to aid in pump selection, see pages 147.)

Registered trademarks of materials:

Aflas®	Seal Eastern, Inc.
Buna®-N (Nitrile)	E.I. Du Pont de Nemours and Company, Inc.
Celcon®	Celanese Company
Elgiloy®	Elgiloy Limited Partnership
Hastelloy® C	Haynes International, Inc.
Kynar® (PVDF)	Arkema, Inc.
Mesamoll®	Lanxess Deutschland GmbH
Neoprene®	E.I. Du Pont de Nemours and Company, Inc.
Nitronic® 50	AK Steel Corporation
Teflon® (PTFE)	E.I. Du Pont de Nemours and Company, Inc.
Viton® (FKM)	DuPont Performance Elastomers, LLC
Zytel® (Nylon)	E.I. Du Pont de Nemours and Company, Inc.

Hydra-Cell® F/M/D/H Series Seal-less Pumps Selection



F20
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M03
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M03 Mono-Block
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D04
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D10
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D12
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DI5 & DI7
Page 58



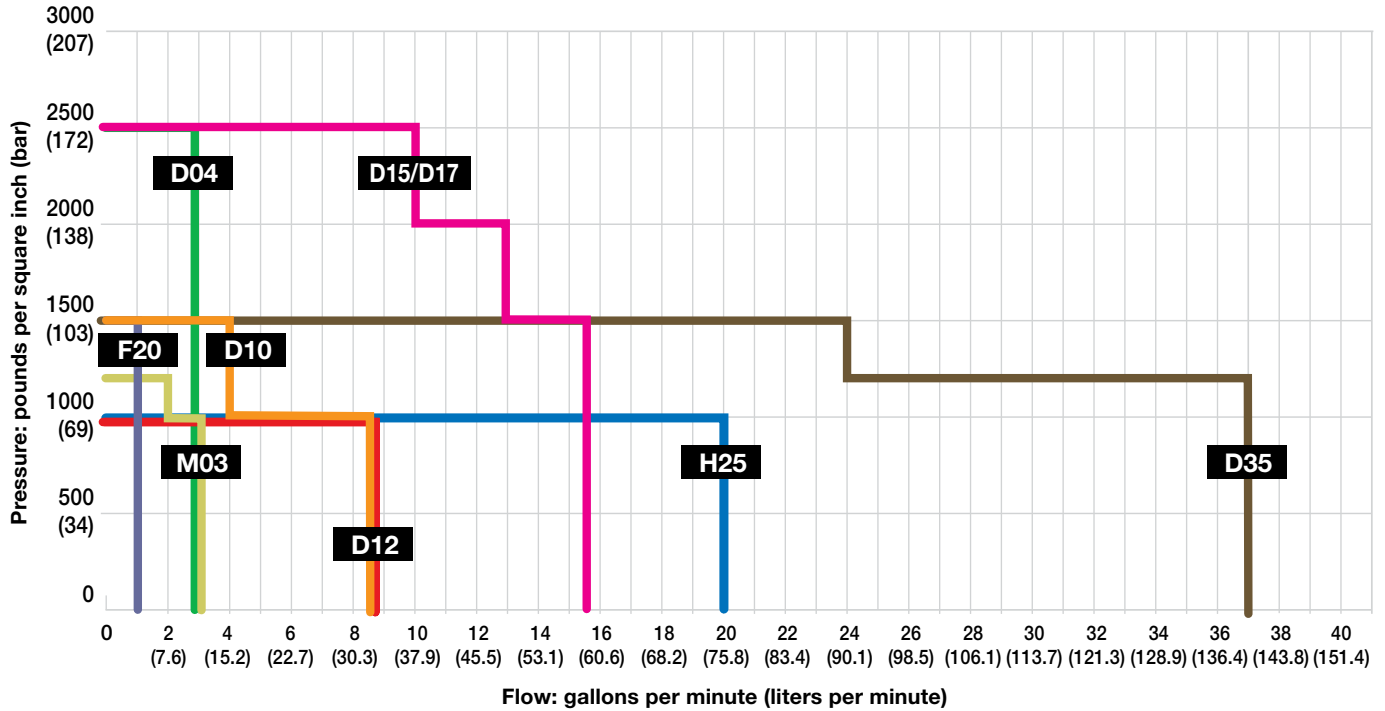
H25
Page 64



D35
Page 70

Hydra-Cell® Flow Capacities and Pressure Ratings

F/M/D/H Series Seal-less Pumps



The graph above displays the maximum flow capacity at a given pressure for each model series. The table below lists the maximum flow capacity and maximum pressure capability of each model series.

Please Note: Some models do not achieve maximum flow at maximum pressure. Refer to the individual model specifications in this section for precise flow and pressure capabilities by specific pump configuration.

Model	Maximum Capacity gpm (l/min)	Maximum Discharge Pressure psi (bar)		Maximum Operating Temperature F (C) ²		Maximum Inlet Pressure psi (bar)
		Non-metallic ¹	Metallic	Non-metallic	Metallic	
F20	1.0 (3.8)	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)
M03	3.1 (11.7)	350 (24)	1200 (83)	140° (60°)	250° (121°)	250 (17)
D04	2.9 (11.2)	N/A	2500 (172)	N/A	250° (121°)	500 (34)
D10	8.8 (33.4)	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)
D12	8.8 (33.4)	N/A	1000 (69)	N/A	250° (121°)	250 (17)
D15 & D17	15.5 (58.7)	N/A	2500 (172)	N/A	250° (121°)	500 (34)
H25	20.0 (75.9)	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)
D35	36.5 (138)	N/A	1500 (103)	N/A	250° (121°)	500 (34)

¹ 350 psi (24 bar) maximum with PVDF liquid end; 250 psi (17 bar) maximum with Polypropylene liquid end.

² Consult factory for correct component selection for temperatures from 160°F (71°C) to 250°F (121°C).

F20 Series

Maximum Flow Rate: 1.0 gpm (3.8 l/min)

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



F20 Close-coupled for 56C frame motors with Brass pump head



F21 Shaft-driven with Polypropylene pump head



F22 Flexible-coupled to 56C, I43TC and I45TC frame motors with Stainless Steel pump head

F20 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
F20-X	1750	1.01	3.82
F20-E	1750	0.71	2.69
F20-S	1750	0.56	2.12
F20-B	1750	0.31	1.17
F20-G	1750	0.20	0.76

Pressure

Maximum Inlet Pressure
250 psi (17 bar)

Maximum Discharge Pressure

Metallic Pump Heads:

F20 to 1000 psi (69 bar)

F21 to 1500 psi (103 bar)

F22 to 1500 psi (103 bar)

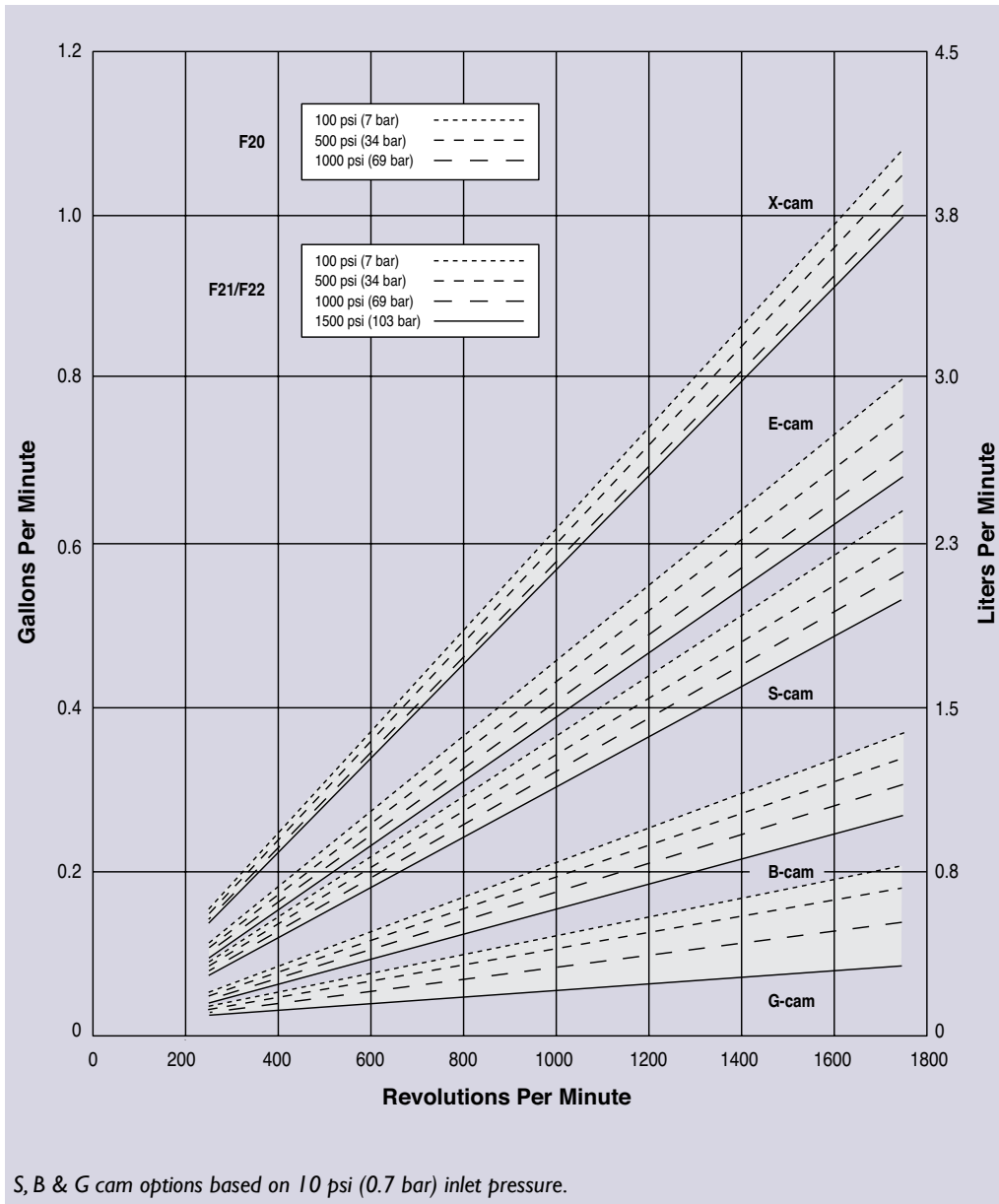
Non-metallic Pump Heads:

250 psi (17 bar) Polypropylene

350 psi (24 bar) PVDF

Performance and specification ratings apply to F20, F21 and F22 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



F20 Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
F20-X	1750	1.01	3.82
F20-E	1750	0.71	2.69
F20-S	1750	0.56	2.12
F20-B	1750	0.31	1.17
F20-G	1750	0.20	0.76

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
F20-X	0.0006	0.0022
F20-E	0.0004	0.0015
F20-S	0.0003	0.0012
F20-B	0.0002	0.0007
F20-G	0.0001	0.0004

Maximum Discharge Pressure

Metallic Heads:	F20 to 1000 psi (69 bar)
	F21 to 1500 psi (103 bar)
	F22 to 1500 psi (103 bar)
Non-metallic Heads:	250 psi (17 bar) Polypropylene
	350 psi (24 bar) PVDF

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads:	250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).
Non-metallic Heads:	140 °F (60 °C)

Maximum Solids Size 200 microns

Inlet Port 1/2 inch NPT

Discharge Port 3/8 inch NPT

Shaft Diameter F20: 5/8 inch (15.9 mm) hollow shaft F21 & F22: 5/8 inch (15.9 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Precision ball bearings

Oil Capacity 0.125 US quart (0.12 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads:	12 lbs. (5.5 kg)
Non-metallic Heads:	9 lbs. (4.1 kg)

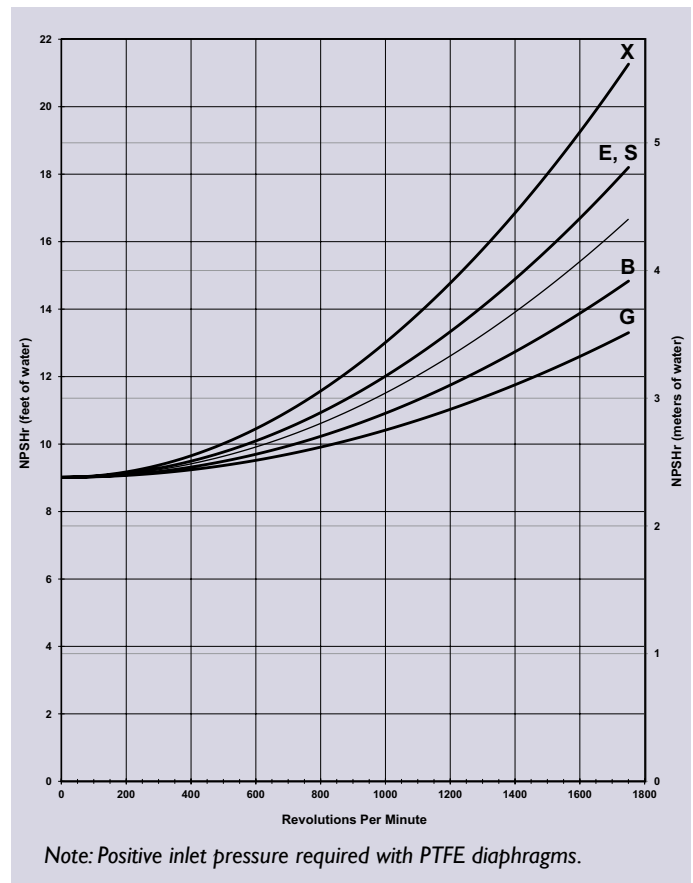
Calculating Required Power

$$\frac{\text{rpm} + 1000}{7000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{\text{rpm} + 1000}{9383} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



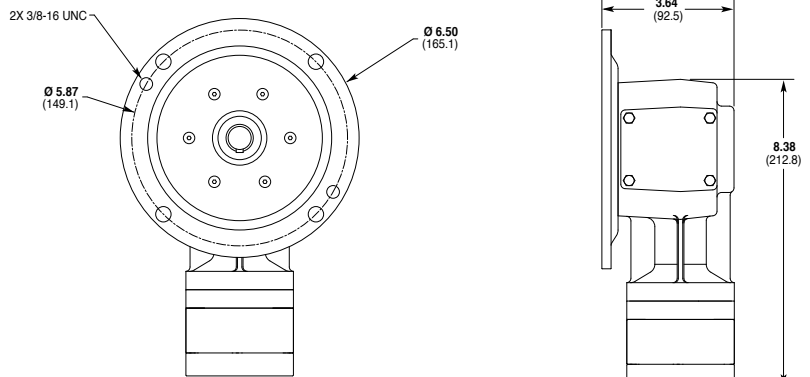
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

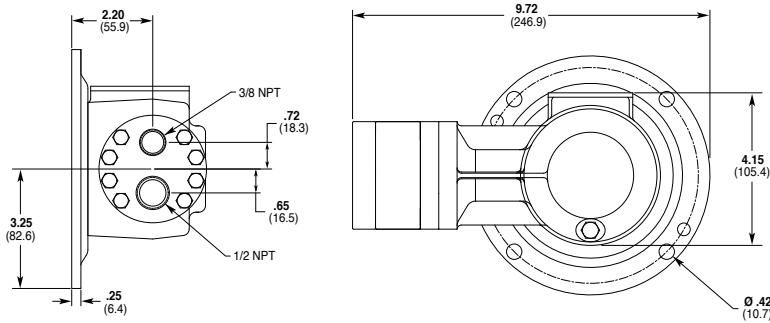
For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

F20 Series Representative Drawings

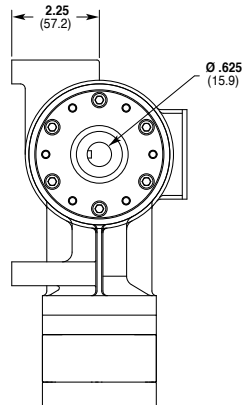
F20 Models with Metallic Pump Head Inches (mm)



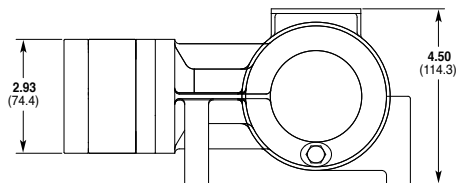
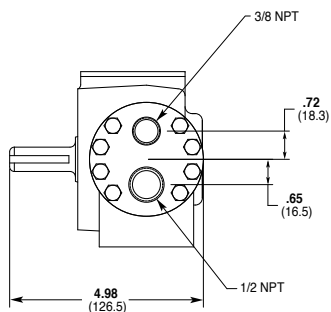
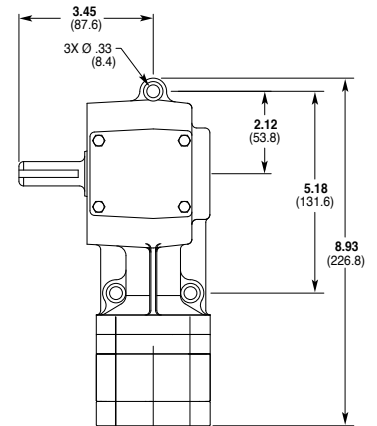
* Add 0.25" (6.35mm) where shown for manifold cover plate on non-metallic models.



F21 Models with Metallic Pump Head Inches (mm)



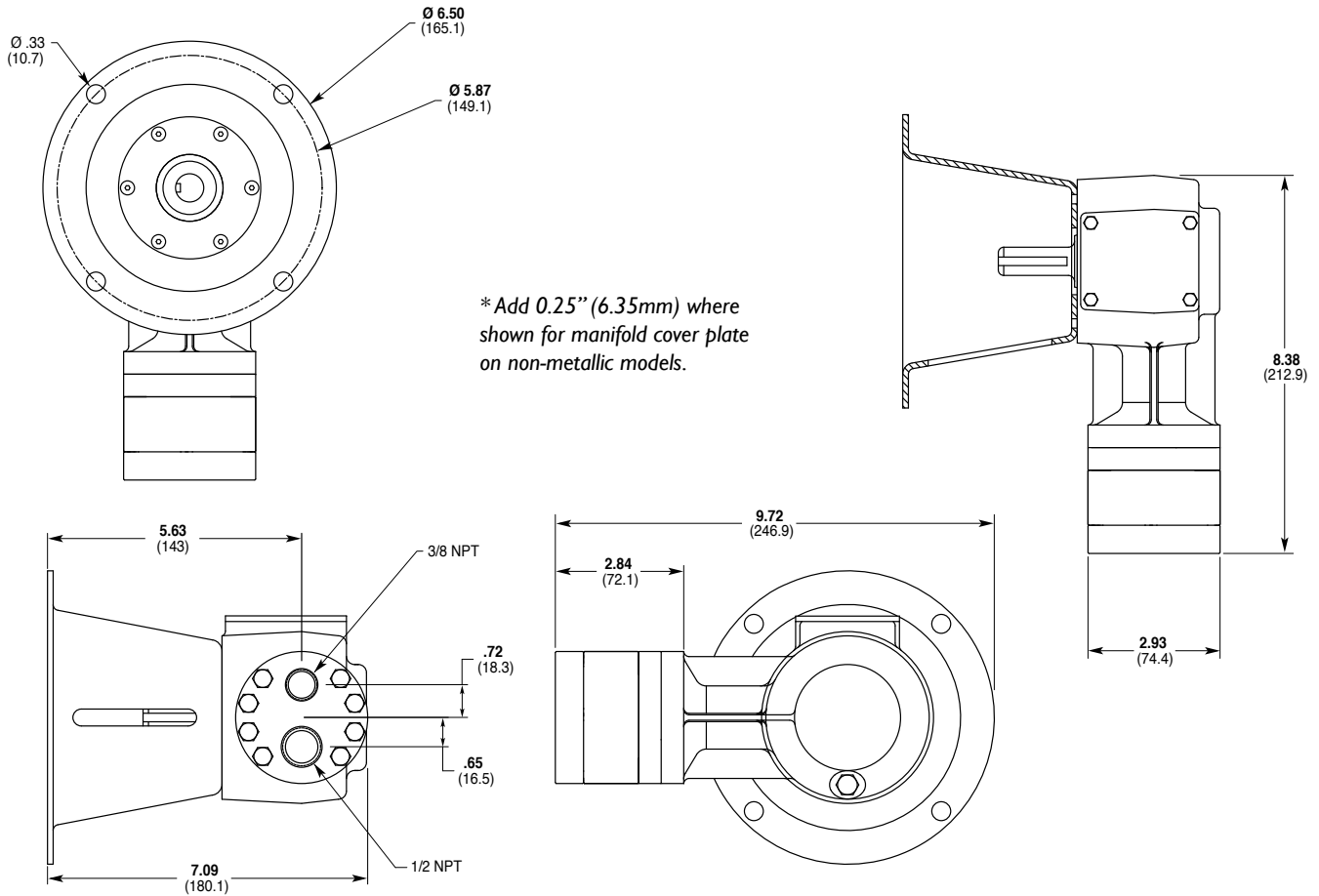
* Add 0.25" (6.35mm) where shown for manifold cover plate on non-metallic models.



Note: Contact factory for additional drawings of specific models and configurations.

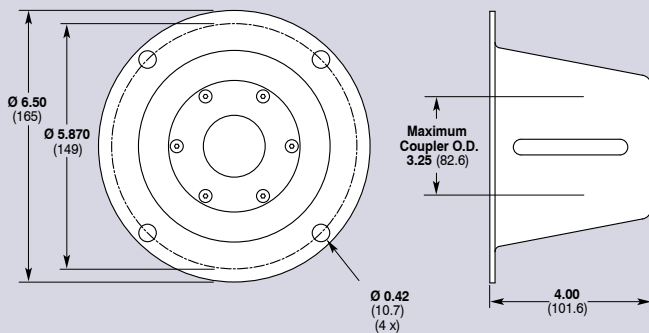
F20 Series Representative Drawings

F22 Models with Metallic Pump Head Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

Pump/Motor Adapter Inches (mm)



Part Number: A04-005-1200

Must be ordered separately for F22 models for use with 56C, I43TC, and I45TC frame motors.

Metric adapter available - consult factory.

Valve Selection

A Hydra-Cell F20, F21 or F22 pumping system uses a C46 Pressure Regulating Valve.

See page 80 for more information.



F20 Series How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete F20 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: F20GAPGHFECCG.

Digit	Order Code	Description
1-3		Pump Configuration
	F20	Close-coupled to NEMA 56C footed motor (NPT Ports)
	F21	Shaft-driven (NPT Ports)*
	F22	For use with pump/motor adapter (NPT Ports)* *Pump/motor adapters ordered separately. See previous page.
4		Hydraulic End Cam
	X	Max 1.01 gpm (3.8 l/min) @ 1750 rpm
	E	Max 0.71 gpm (2.7 l/min) @ 1750 rpm
	S	Max 0.56 gpm (2.1 l/min) @ 1750 rpm
	B	Max 0.31 gpm (1.2 l/min) @ 1750 rpm
	G	Max 0.20 gpm (0.8 l/min) @ 1750 rpm
5		Pump Head Version
	A	NPT Ports (for all F20, F21 & F22 pumps)
6		Pump Head Material
	B	Brass
	M	PVDF
	P	Polypropylene
	S	316L Stainless Steel
	T	Hastelloy C
7		Diaphragm & O-ring Material
	E	EPDM (requires EPDM-compatible oil - Digit 12 oil code J)
	G	FKM
	J	PTFE (available with X and E cams only)
	P	Neoprene
	T	Buna-N
8		Valve Seat Material
	C	Ceramic
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	S	316L Stainless Steel
	T	Hastelloy C

Digit	Order Code	Description
9		Valve Material
	C	Ceramic
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C
10		Valve Springs
	E	Elgiloy
	T	Hastelloy C
11		Valve Spring Retainers
	C	Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	T	Hastelloy C
	Y	Nylon
12		Hydra-Oil
	G	5W30 cold-temp severe-duty synthetic oil
	J	EPDM-compatible oil
	K	Food-contact oil

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

M03 Series

Maximum Flow Rate: 3.1 gpm (11.7 l/min)

Maximum Pressure: 1200 psi (83 bar) for Metallic Pump Heads
350 psi (24 bar) for Non-metallic Pump Heads



M03 Close-coupled with Brass pump head



M03 Close-coupled with Polypropylene pump head



D03 Shaft-driven with Stainless Steel pump head

M03 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
M03-X	1750	3.1	11.7
M03-E	1750	2.2	8.3
M03-S	1750	1.7	6.4
M03-B	1750	1.0	3.6
M03-G	1750	0.6	2.3
@ 1200 psi (83 bar)			
M03-E	1750	2.1	8.1
M03-S	1750	1.6	6.3
M03-B	1750	0.9	3.5
M03-G	1750	0.6	2.2

Pressure

Maximum Inlet Pressure
250 psi (17 bar)

Maximum Discharge Pressure

Metallic Pump Heads:

M03-X to 1000 psi (69 bar)

M03-S, E, B, G to 1200 psi (83 bar)

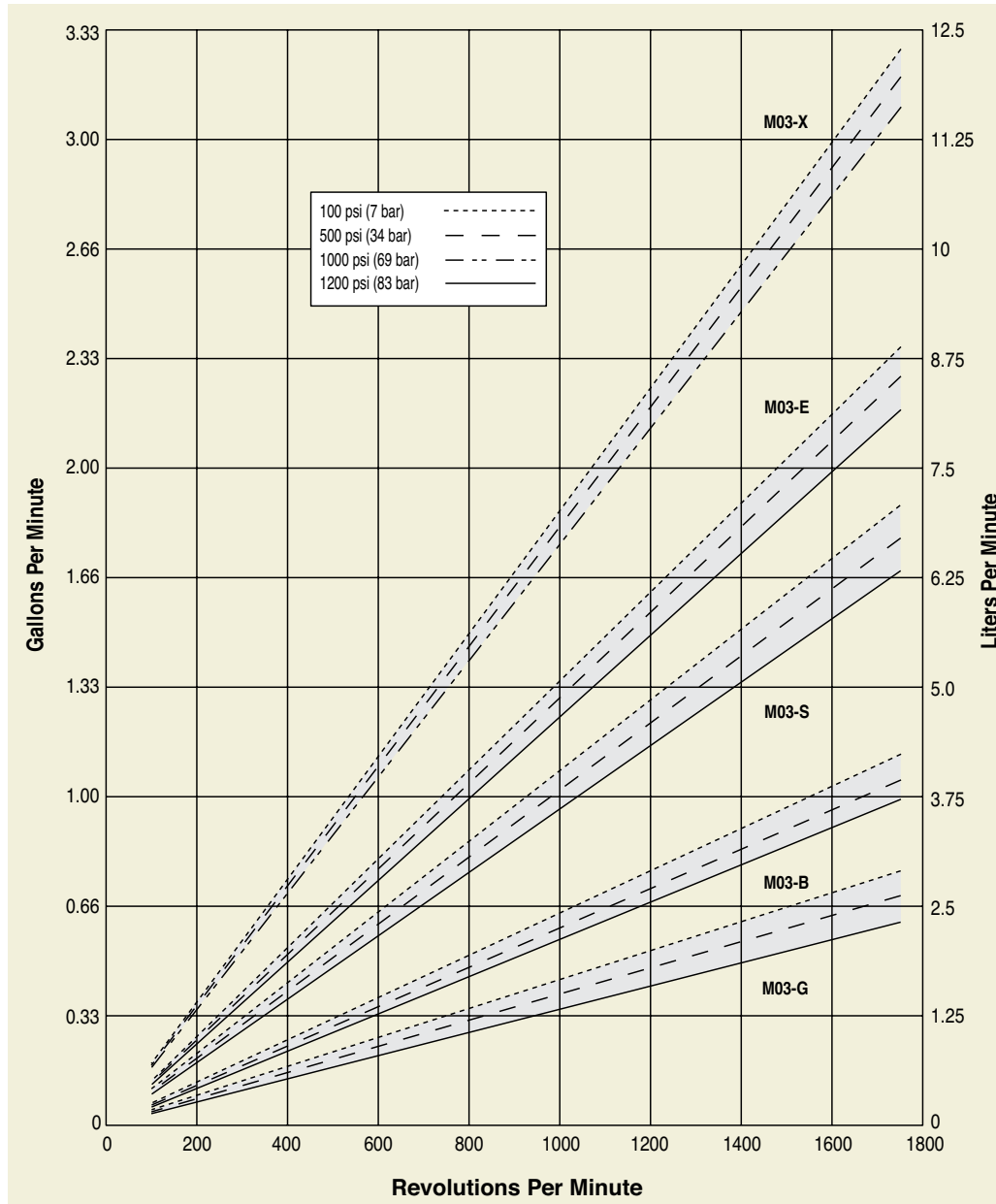
Non-metallic Pump Heads:

250 psi (17 bar) Polypropylene

350 psi (24 bar) PVDF

Performance and specification ratings apply to M03 Kel-Cell and D03 Shaft-driven configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



M03 Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
M03-X	1750	3.10	11.73
M03-E	1750	2.18	8.25
M03-S	1750	1.69	6.40
M03-B	1750	0.96	3.63
M03-G	1750	0.62	2.35

Delivery @1200 psi (83 bar)

Model	gal/rev	liters/rev
M03-E	0.0012	0.0046
M03-S	0.0009	0.0036
M03-B	0.0005	0.0020
M03-G	0.0003	0.0013

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
M03-X	0.0018	0.0067
M03-E	0.0013	0.0047
M03-S	0.0010	0.0037
M03-B	0.0005	0.0021
M03-G	0.0004	0.0013

Maximum Discharge Pressure

Metallic Heads:	M03-X to 1000 psi (69 bar)
	M03-S, E, B to 1200 psi (83 bar)
Non-metallic Heads:	250 psi (17 bar) Polypropylene
	350 psi (24 bar) PVDF

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads:	250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).
Non-metallic Heads:	140 °F (60 °C)

Maximum Solids Size 200 microns

Inlet Port 1/2 inch NPT

Discharge Port 3/8 inch NPT

Shaft Diameter M03: 5/8 inch (15.9 mm) hollow shaft D03: 7/8 inch (22.2 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Precision ball bearings

Oil Capacity 1.0 US quart (0.95 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads:	28 lbs. (17.7 kg)
Non-metallic Heads:	19 lbs. (8.6 kg)

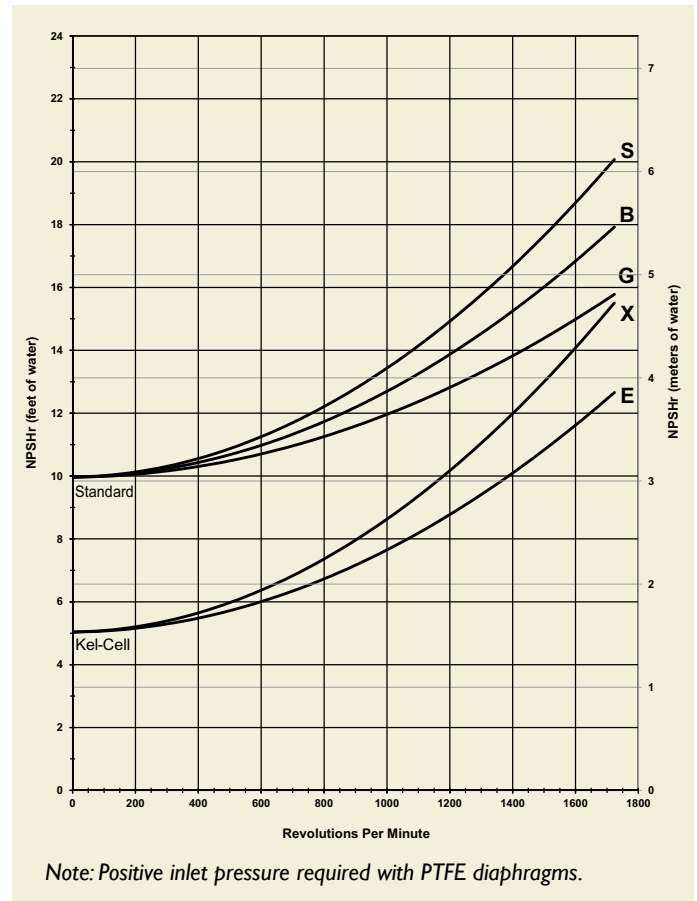
Calculating Required Power

$$\frac{6 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{6 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



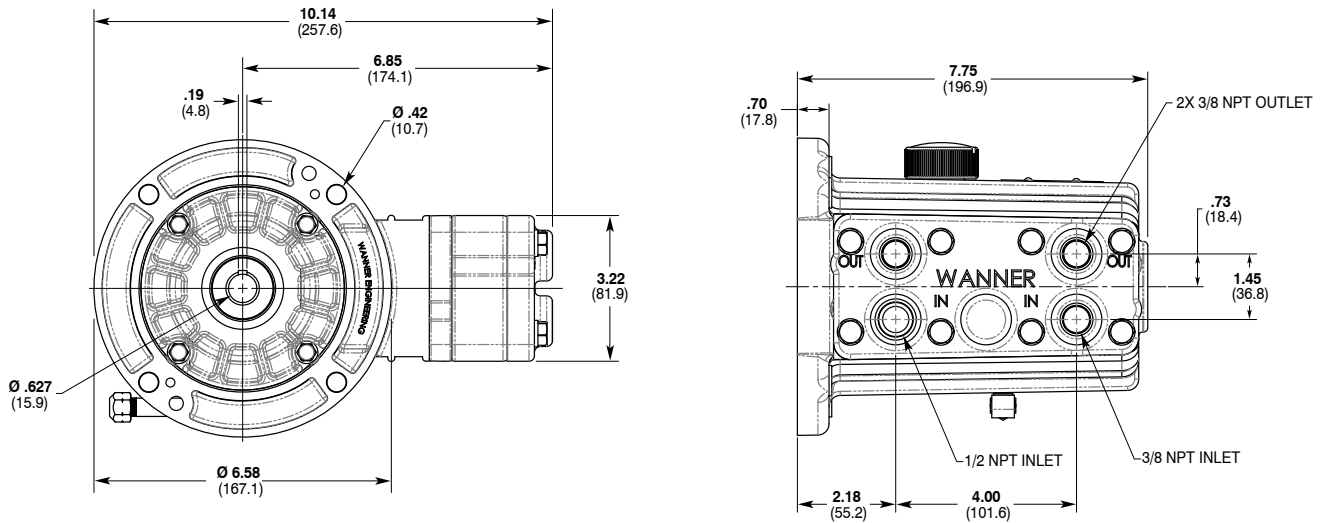
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

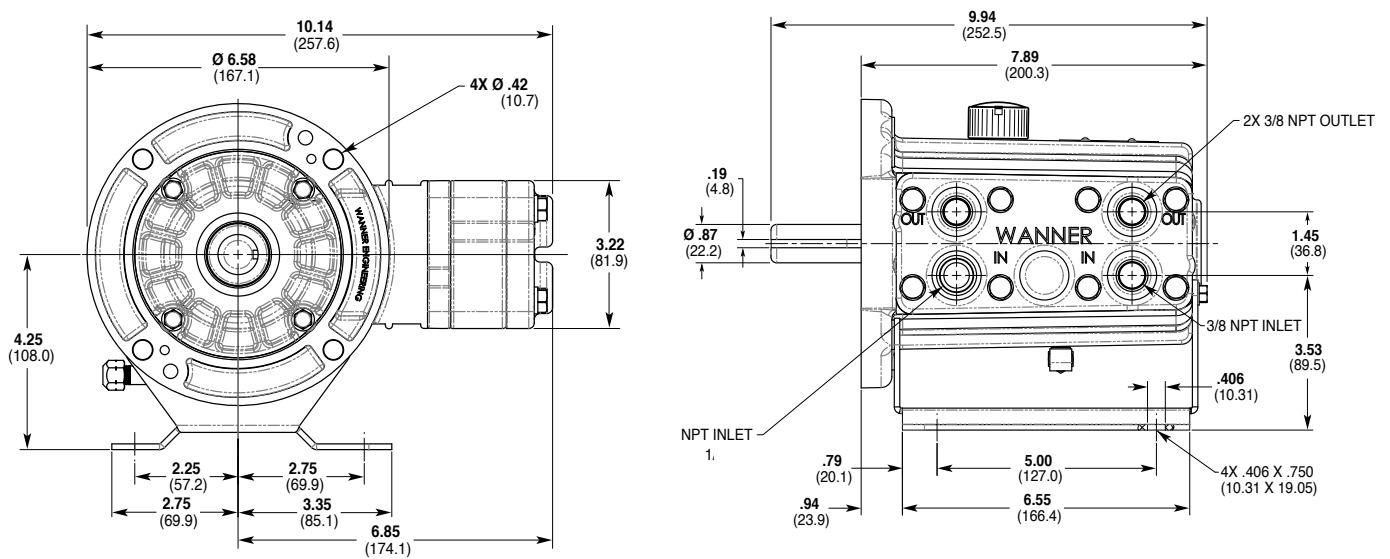
M03 Series Representative Drawings

M03 Models with Metallic Pump Head Inches (mm)



* Add 0.38" (9.65mm) overall length where shown for manifold cover plate on non-metallic models and 0.20" (5.08mm) for bolt heads attaching the plate.

D03 Models with Metallic Pump Head Inches (mm)



* Add 0.38" (9.65mm) overall length where shown for manifold cover plate on non-metallic models and 0.20" (5.08mm) for bolt heads attaching the plate.

Note: Contact factory for additional drawings of specific models and configurations.

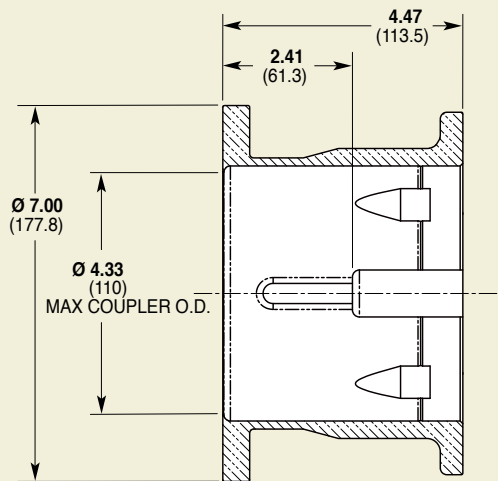
M03 Series Representative Drawings

Pump/Motor Adapter Inches (mm)

Part Number: A04-001-1202

Must be ordered separately for D03 models for use with 56C, I43TC, and I45TC frame motors.

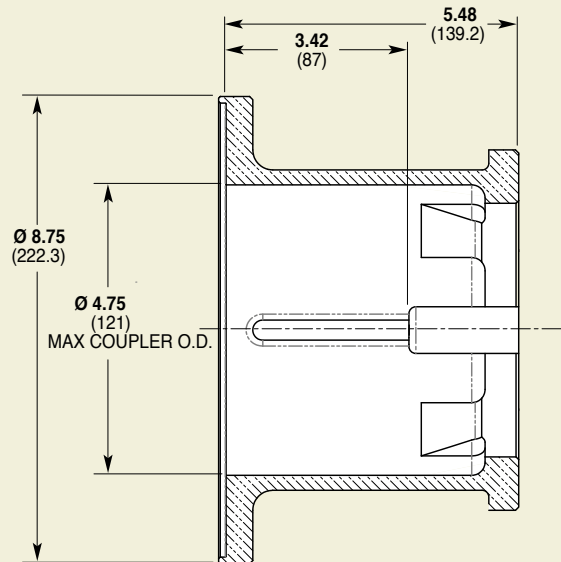
Metric adapter available - consult factory.



Part Number: A04-002-1202

Must be ordered separately for D03 models for use with I82C, I84TC, and 2I3TC and 2I5TC frame motors.

Metric adapter available - consult factory.



Valve Selection

A Hydra-Cell M03/D03 pumping system uses a C46 Pressure Regulating Valve.

See page 80 for more information.



M03 Series **How to Order**

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
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A complete M03 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: M03XKSTHFECA.

Digit	Order Code	Description
1-3	D03	Pump Configuration Shaft-driven (NPT Ports)*
	M03	Close-coupled to NEMA 56C footed motor (NPT Ports) *Pump/motor adapters ordered separately. See previous page.
4	X	Hydraulic End Cam Max 3.1 gpm (11.7 l/min) @ 1750 rpm
	E	Max 2.2 gpm (8.3 l/min) @ 1750 rpm
	S	Max 1.7 gpm (6.4 l/min) @ 1750 rpm
	B	Max 1.0 gpm (3.6 l/min) @ 1750 rpm
	G	Max 0.6 gpm (2.3 l/min) @ 1750 rpm
5	A	Pump Head Version Standard NPT Ports (S, B & G cams)
	K	Kel-Cell NPT Ports (X & E cams)
6	B	Pump Head Material Brass
	M	PVDF
	P	Polypropylene
	S	316 Stainless Steel
	T	Hastelloy CW12MW
7	E	Diaphragm & O-ring Material EPDM (requires EPDM-compatible oil - Digit 12 oil code J)
	G	FKM
	J	PTFE (available with X and E cams and standard A version only; cannot be used with Kel-Cell pumps)
	P	Neoprene
	T	Buna-N
8	C	Valve Seat Material Ceramic
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	S	316L Stainless Steel
	T	Hastelloy C

Digit	Order Code	Description
9	C	Valve Material Ceramic
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
10	T	Hastelloy C
	E	Valve Springs Elgiloy
	S	316L Stainless Steel
11	T	Hastelloy C
	C	Valve Spring Retainers Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	T	Hastelloy C
12	Y	Nylon
	A	Hydra-Oil 10W30 standard-duty oil
	G	5W30 cold-temp severe-duty synthetic oil
	J	EPDM-compatible oil
K	Food-contact oil	

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

M03 Mono-Block Series

Maximum Flow Rate: 3.1 gpm (11.7 l/min)

Maximum Pressure: 1000 psi (69 bar) - Metallic Pump Heads Only



Mono-Block (M03) Close-coupled with Stainless Steel pump head



Mono-Block (M03) Shaft-driven with Brass pump head



The Mono-Block pump head combines the valve plate and manifold into one component for servicing without disassembly or removal of plumbing.

M03 Mono-Block Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
M03-X	1750	3.1	11.7
M03-E	1750	2.2	8.3

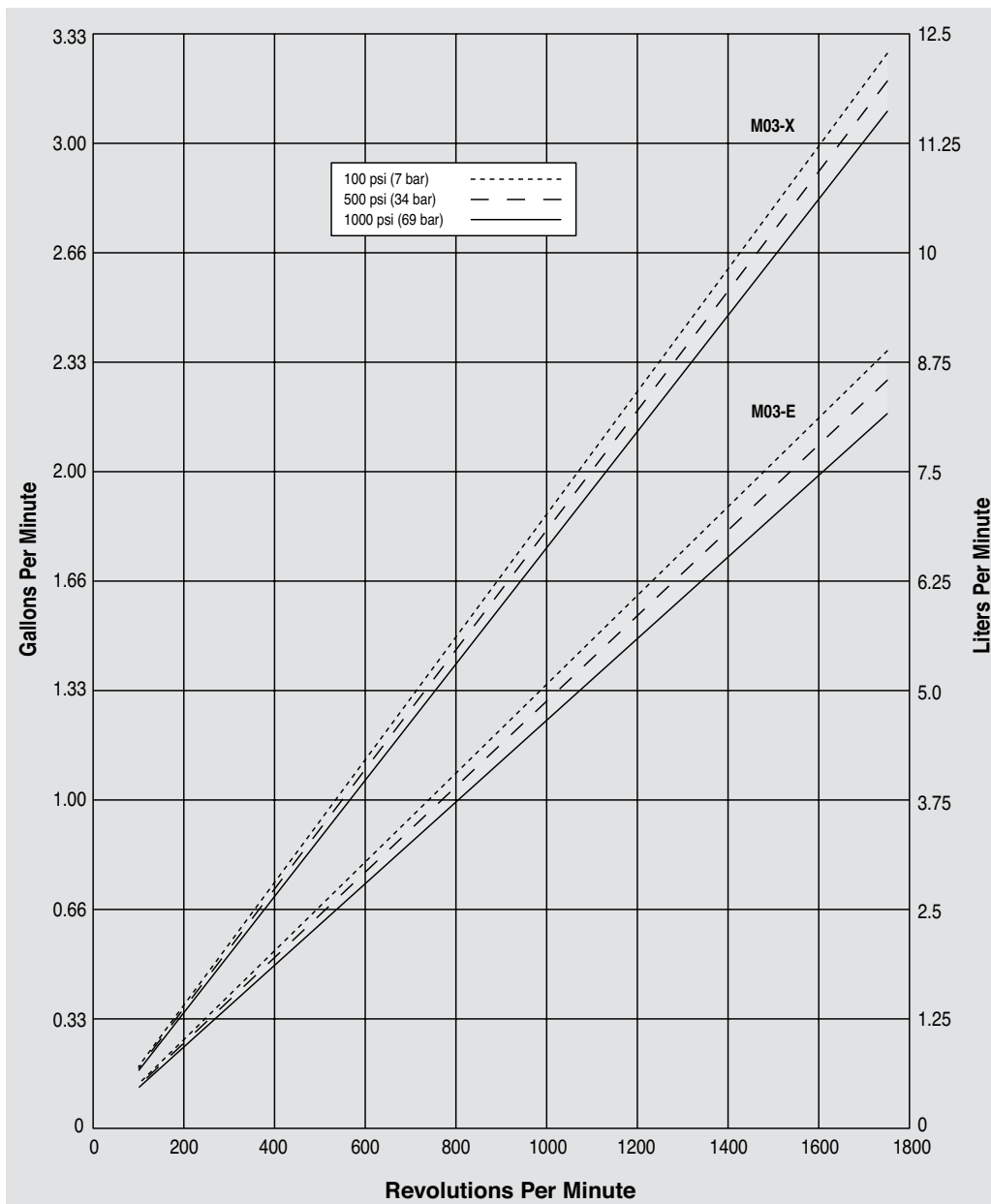
Pressure

Maximum Inlet Pressure
250 psi (17 bar)

Maximum Discharge Pressure
1000 psi (69 bar)

Performance and specification ratings apply to M03 and D03 Mono-Block configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



M03 Mono-Block Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
M03-X	1750	3.10	11.73
M03-E	1750	2.18	8.25

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
M03-X	0.0018	0.0067
M03-E	0.0013	0.0047

Maximum Discharge Pressure

Metallic Heads: M/D03-X, E to 1000 psi (69 bar)

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads: 250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

Maximum Solids Size 200 microns

Inlet Port 1/2 inch NPT

Discharge Port 1/2 inch NPT

Shaft Diameter M03: 5/8 inch (15.9 mm) hollow shaft D03: 7/8 inch (22.2 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Precision ball bearings

Oil Capacity 1.0 US quart (0.95 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads: 28 lbs. (12.7 kg)

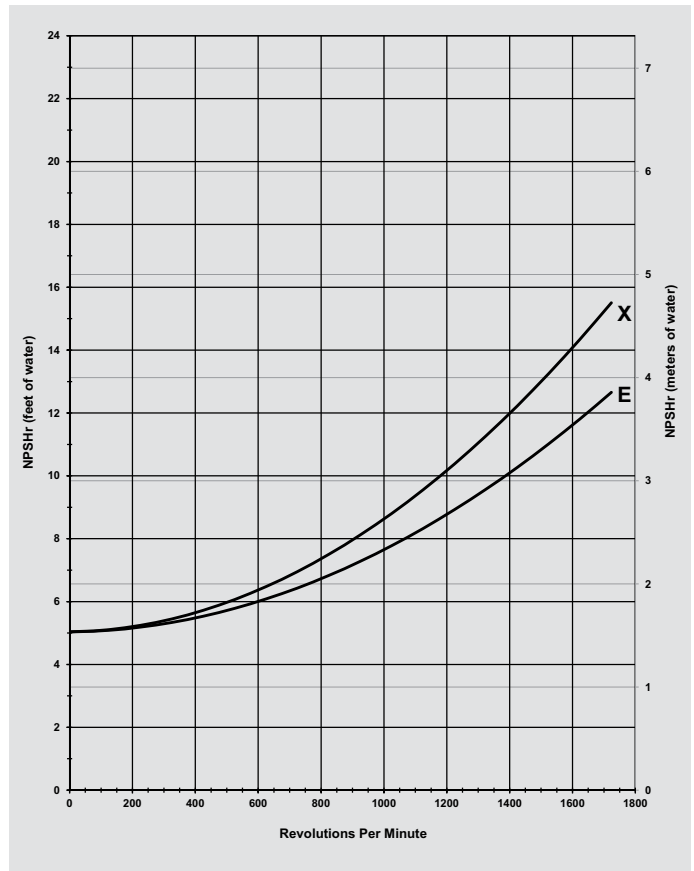
Calculating Required Power

$$\frac{6 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{6 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



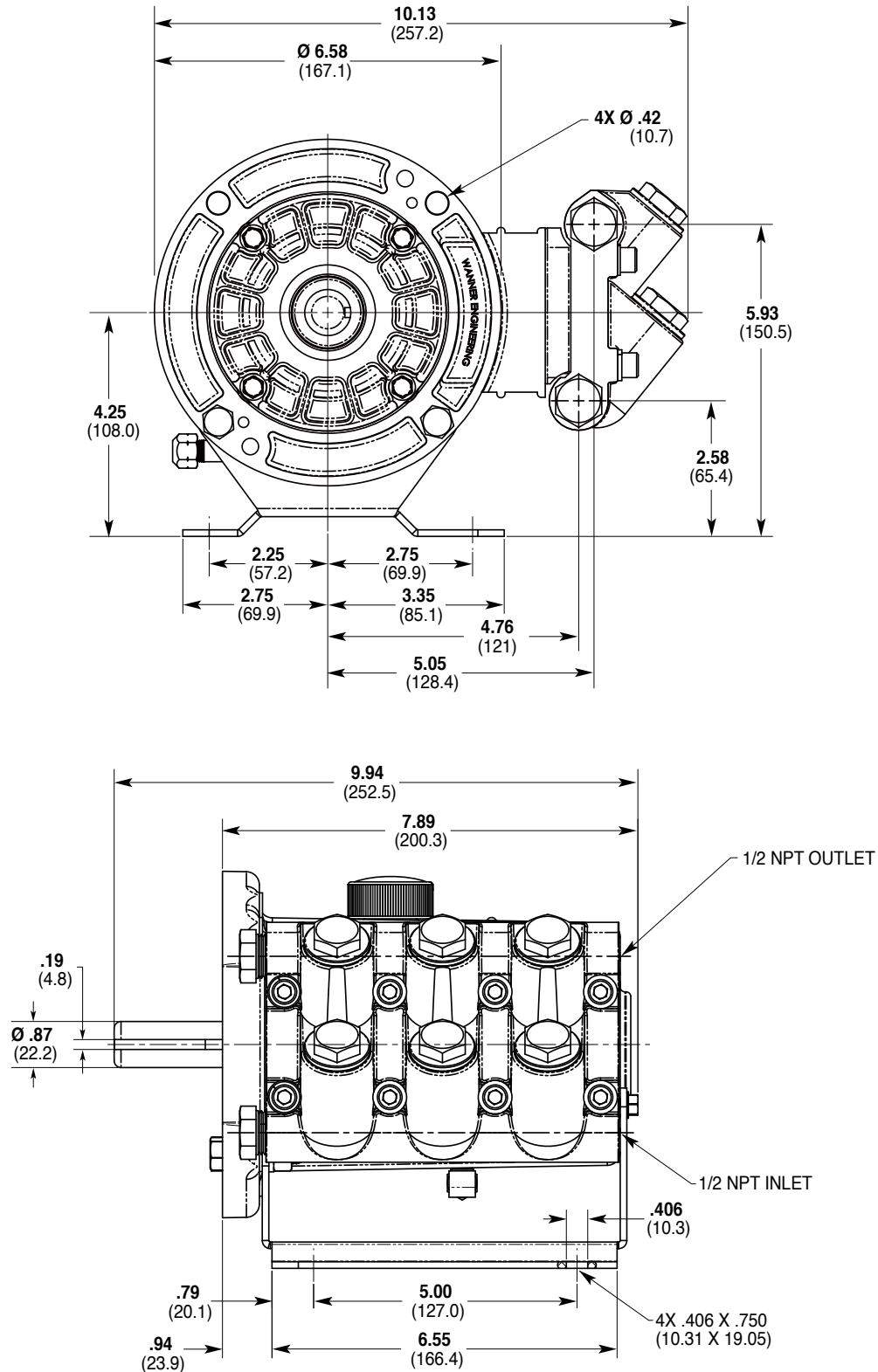
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

M03 Mono-Block Series Representative Drawings

M03 Models with Metallic Pump Head Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

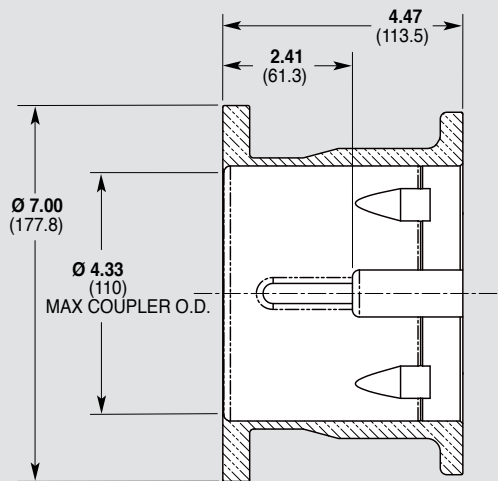
M03 Mono-Block Series Representative Drawings

Pump/Motor Adapter Inches (mm)

Part Number: A04-001-1202

Must be ordered separately for M03 Mono-Block models for use with 56C, 143TC, and 145TC frame motors.

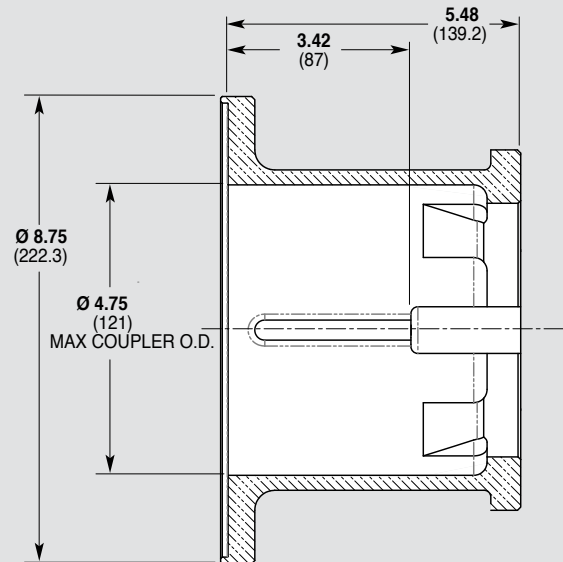
Metric adapter available - consult factory.



Part Number: A04-002-1202

Must be ordered separately for M03 Mono-Block models for use with 182C, 184TC, and 213TC and 215TC frame motors.

Metric adapter available - consult factory.



Valve Selection

A Hydra-Cell M03 Mono-Block Series pumping system uses a C46 Pressure Regulating Valve.

See page 80 for more information.



M03 Mono-Block Series How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete M03 Mono-Block Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: M03EMBPSFEPG.

Digit	Order Code	Description
1-3		Pump Configuration
	D03	Shaft-driven (NPT Ports)*
	M03	Close-coupled to NEMA 56C footed motor (NPT Ports) *Pump/motor adapters ordered separately. See previous page.
4	X	Hydraulic End Cam Max 3.1 gpm (11.7 l/min) @ 1750 rpm
	E	Max 2.2 gpm (8.3 l/min) @ 1750 rpm
5	M	Pump Head Version Mono-Block, Kel-Cell NPT Ports
6	B	Pump Head Material Brass
	S	316L Stainless Steel
7	E	Diaphragm & O-ring Material EPDM (requires EPDM-compatible oil - Digit 12 oil code J)
	G	FKM
	P	Neoprene
	T	Buna-N
8	H	Valve Seat Material 17-4 Stainless Steel
	S	316L Stainless Steel
9	F	Valve Material 17-4 Stainless Steel
	N	Nitronic 50
10	E	Valve Springs Elgiloy
	S	316L Stainless Steel
11	M	Valve Spring Retainers PVDF
	P	Polypropylene

Digit	Order Code	Description
12	A	Hydra-Oil 10W30 standard-duty oil
	G	5W30 cold-temp severe-duty synthetic oil
	J	EPDM-compatible oil
	K	Food-contact oil

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

D04 Series

Maximum Flow Rate: 2.9 gpm (11.2 l/min)

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



D04 Shaft-driven with Stainless Steel pump head



D04 Shaft-driven with Brass pump head

D04 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 2500 psi (172 bar)	
		gpm	l/min
D04-X	1750	2.9	11.2
D04-E	1750	2.0	7.7
D04-S	1750	1.6	6.2

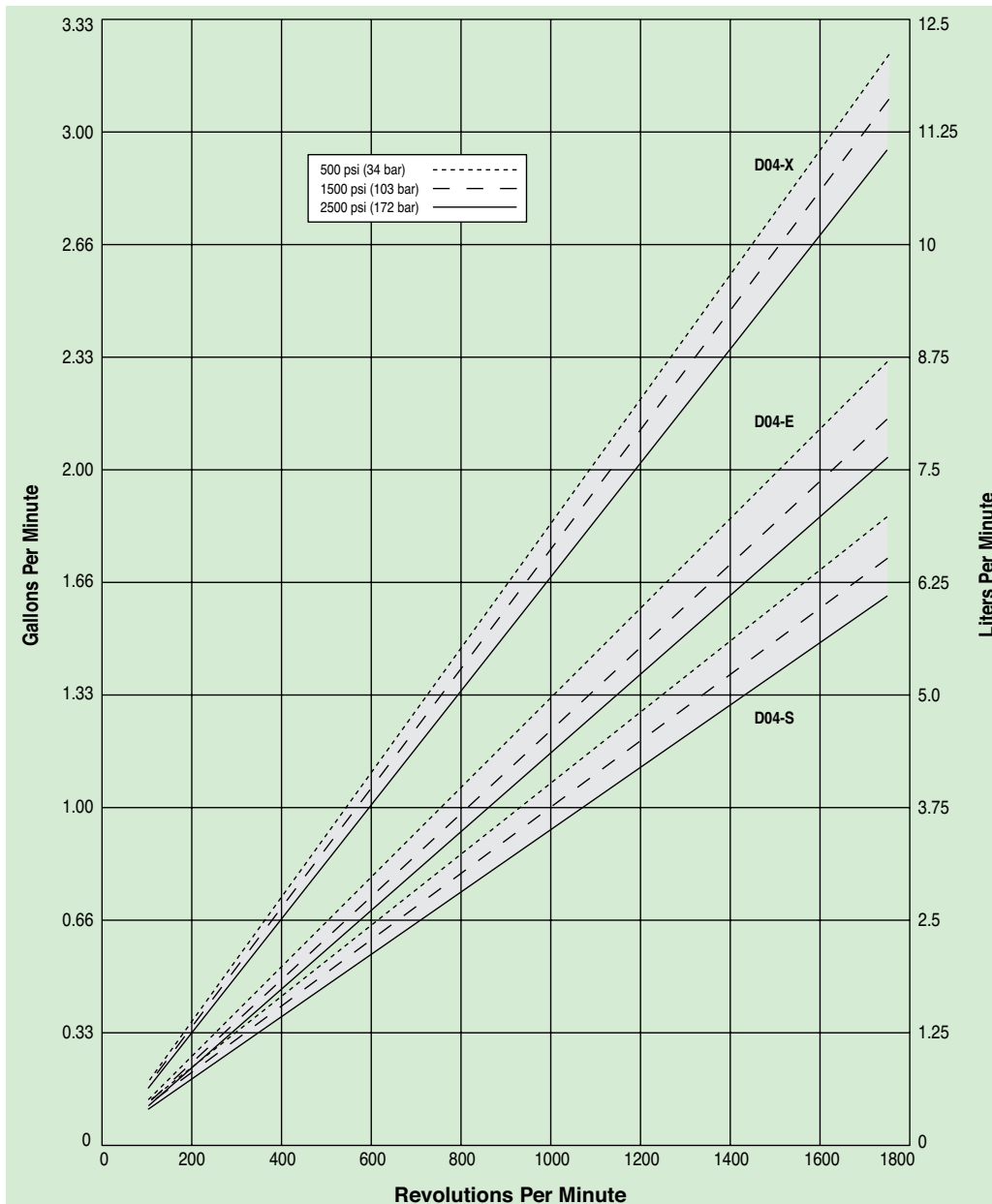
Pressure

Maximum Inlet Pressure
500 psi (34 bar)

Maximum Discharge Pressure
2500 psi (172 bar)

Performance and specification ratings apply to D04 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



D04 Series Specifications

Flow Capacities @2500 psi (172 bar)

Model	rpm	gpm	l/min
D04-X	1750	2.95	11.16
D04-E	1750	2.04	7.71
D04-S	1750	1.63	6.19

Delivery

Model	gal/rev		
	@500 psi (34 bar)	@1500 psi (103 bar)	@2500 psi (172 bar)
D04-X	0.0019	0.0018	0.0017
D04-E	0.0013	0.0012	0.0012
D04-S	0.0011	0.0010	0.0009

Model	liters/rev		
	@500 psi (34 bar)	@1500 psi (103 bar)	@2500 psi (172 bar)
D04-X	0.0070	0.0067	0.0064
D04-E	0.0050	0.0047	0.0044
D04-S	0.0041	0.0039	0.0035

Maximum Discharge Pressure

Metallic Heads: 2500 psi (172 bar)

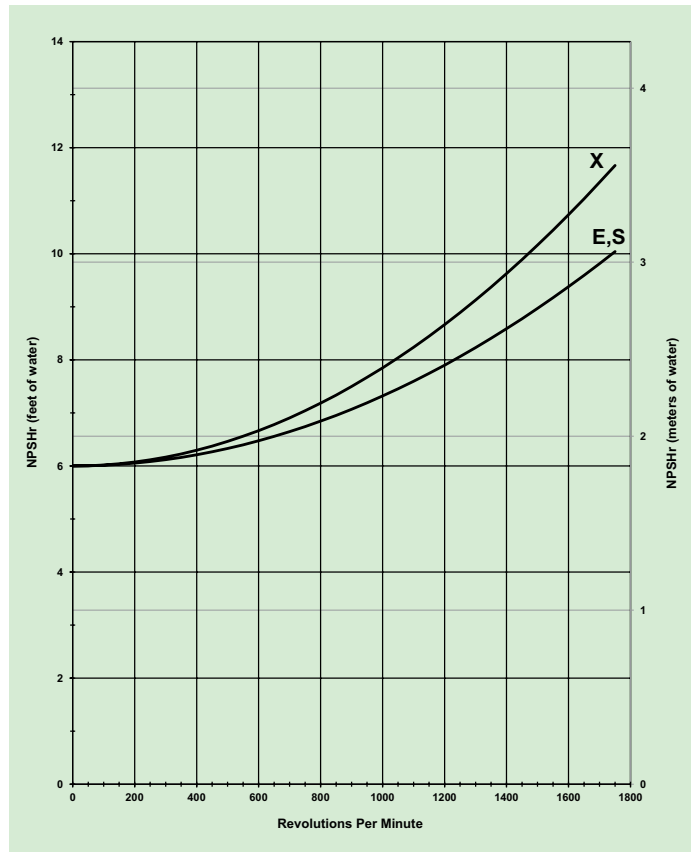
Maximum Inlet Pressure 500 psi (34 bar)

Maximum Operating Temperature

Metallic Heads: 250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

Maximum Solids Size	200 microns
Inlet Port	1/2 inch NPT
Discharge Port	1/2 inch NPT
Shaft Diameter	7/8 inch (22.2 mm)
Shaft Rotation	Reverse (bi-directional)
Bearings	Precision ball bearings
Oil Capacity	1.1 US quarts (1.05 liters) - See pages 94 and 95 for oil selection and specification.
Weight	37 lbs. (16.8 kg)

Net Positive Suction Head (NPSHr)



Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

Calculating Required Power

$$\frac{6 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

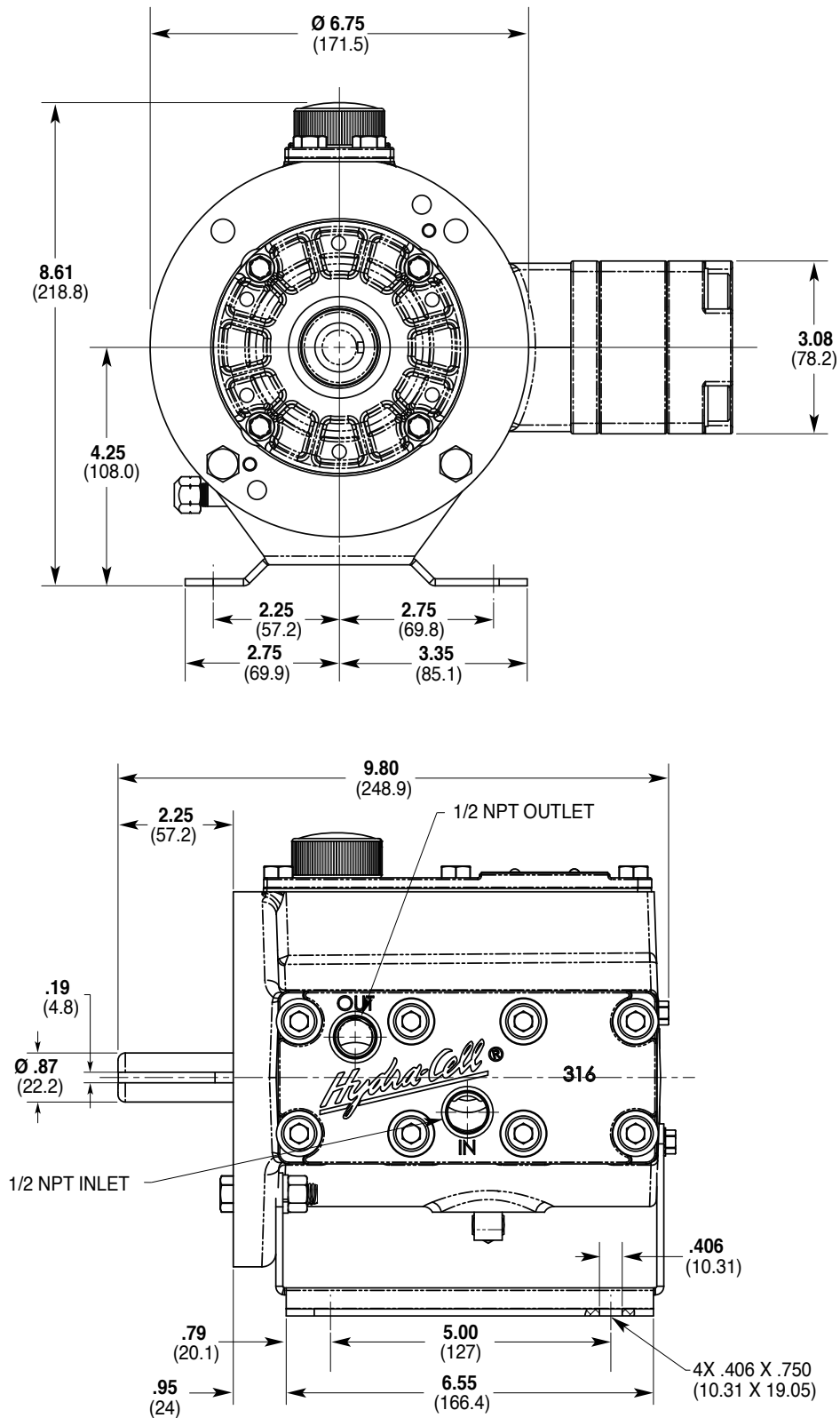
$$\frac{6 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

D04 Series Representative Drawings

D04 Models with Metallic Pump Head Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

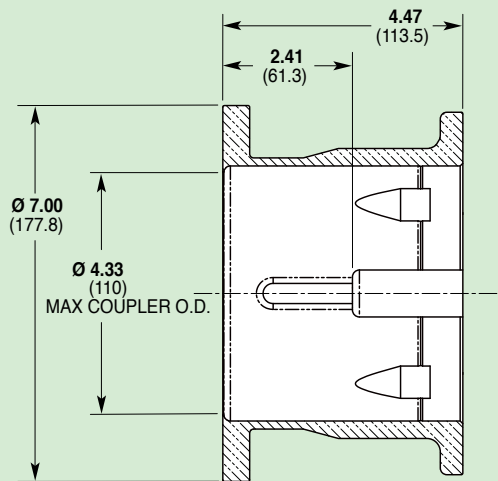
D04 Series Representative Drawings

Pump/Motor Adapter Inches (mm)

Part Number: A04-001-1202

Must be ordered separately for D04 models for use with 56C, I43TC, and I45TC frame motors.

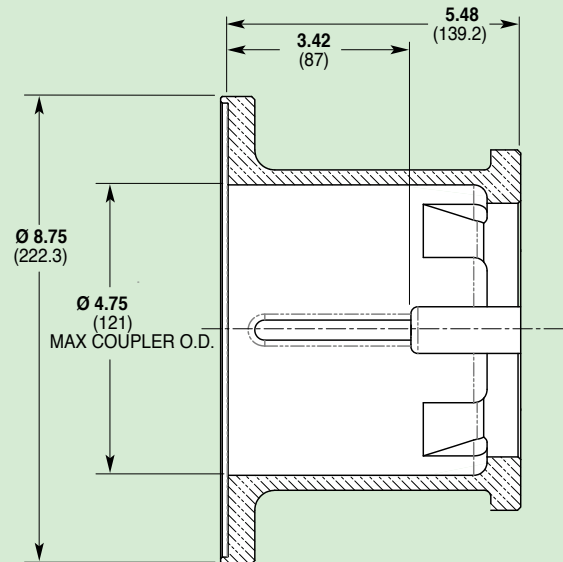
Metric adapter available - consult factory.



Part Number: A04-002-1202

Must be ordered separately for D04 models for use with I82C, I84TC, and 2I3TC and 2I5TC frame motors.

Metric adapter available - consult factory.



Valve Selection

A seal-less C62 Pressure Regulating Valve is recommended for Hydra-Cell D04 pumping systems, especially for high-pressure requirements or when handling dirty fluids. See page 82 for more information.



D04 Series **How to Order**

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete D04 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: D04SABTHFECCG.

Digit	Order Code	Description
1-3	D04	Pump Configuration Shaft-driven (NPT Ports)* *Pump/motor adapters ordered separately. See previous page.
4	X	Hydraulic End Cam Max 2.9 gpm (11.2 l/min) @ 1750 rpm
	E	Max 2.0 gpm (7.7 l/min) @ 1750 rpm
	S	Max 1.6 gpm (6.2 l/min) @ 1750 rpm
5	A	Pump Head Version NPT Ports
6	B	Pump Head Material Brass
	R	304 Stainless Steel
	S	316L Stainless Steel
7	E	Diaphragm & O-ring Material EPDM (requires EPDM-compatible oil - Digit 12 oil code J)
	G	FKM
	P	Neoprene
	T	Buna-N
8	D	Valve Seat Material Tungsten Carbide
	H	17-4 Stainless Steel
	S	316L Stainless Steel
9	D	Valve Material Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
10	E	Valve Springs Elgiloy
	S	316L Stainless Steel

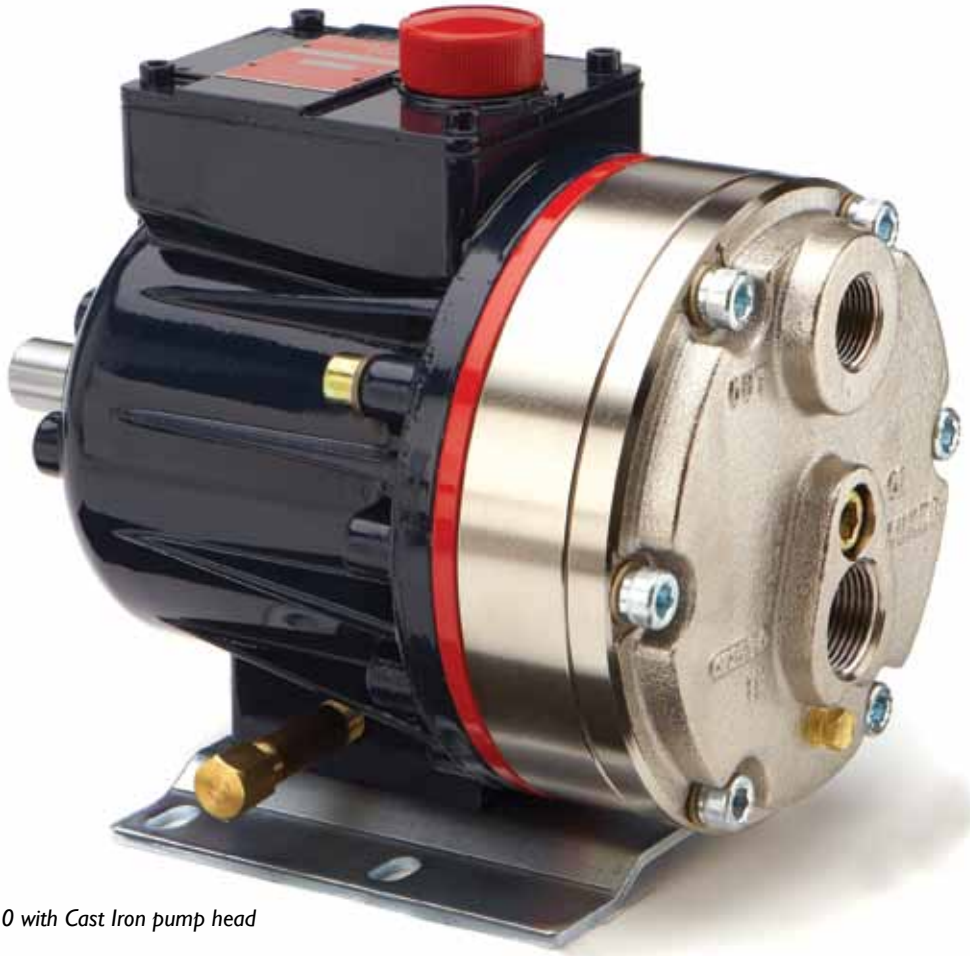
Digit	Order Code	Description
11	C	Valve Spring Retainers Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	Y	Nylon
12	G	Hydra-Oil 5W30 cold-temp severe-duty synthetic oil
	J	EPDM-compatible oil
	K	Food-contact oil

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

D10 Series

Maximum Flow Rate: 8.8 gpm (33.4 l/min)

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



D10 with Cast Iron pump head



D10 with Brass pump head



D10 with Polypropylene pump head



D10 with Stainless Steel pump head and ANSI flanges

D10 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
D10-X	1450	8.1	30.6
D10-E	1750	8.8	33.4
D10-S	1750	6.0	22.7
D10-I	1750	4.0	15.0

@ 1500 psi (103 bar)			
D10-X	790	4.26	15.1
D10-E	790	3.87	14.7

Pressure

Maximum Inlet Pressure

250 psi (17 bar)

Maximum Discharge Pressure

Metallic Pump Heads:

D10-X, E, S, I to 1000 psi (69 bar)

D10-X to 1500 psi (103 bar) @ 790 rpm max.

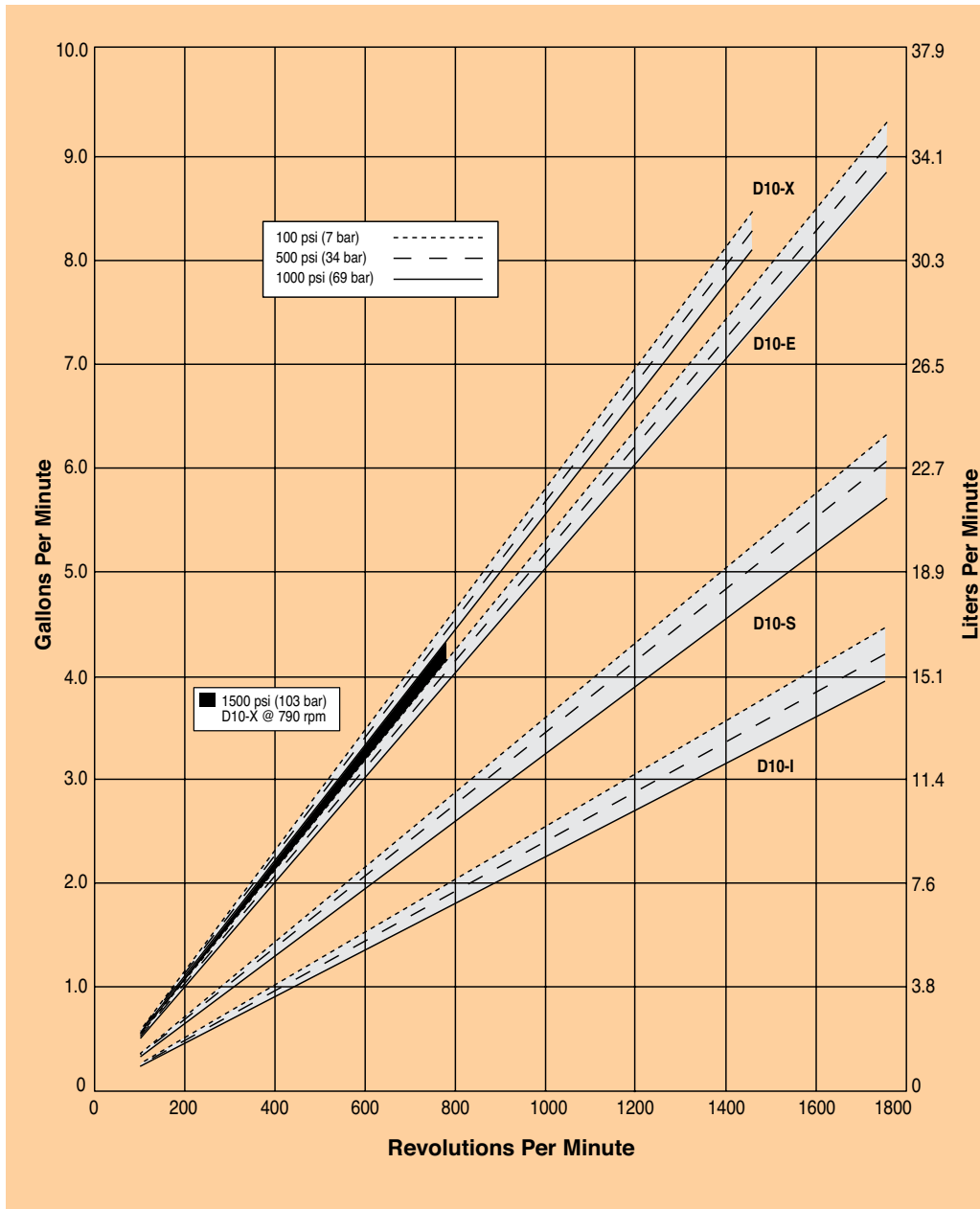
Non-metallic Pump Heads:

250 psi (17 bar) Polypropylene

350 psi (24 bar) PVDF

Performance and specification ratings apply to D10 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



D10 Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
D10-X	1450	8.10	30.6
D10-E	1750	8.83	33.4
D10-S	1750	6.00	22.7
D10-I	1750	3.96	15.0

Delivery @1500 psi (103 bar)

Model	gal/rev	liters/rev
D10-X	0.0054	0.0205
D10-E	0.0049	0.0186

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
D10-X	0.0056	0.0211
D10-E	0.0051	0.0191
D10-S	0.0034	0.0130
D10-I	0.0023	0.0086

Maximum Discharge Pressure

Metallic Heads:	1000 psi (69 bar) @1450 rpm (D10-X)
	1000 psi (69 bar) @1750 rpm (D10-E, S, I)
	1500 psi (103 bar) @790 rpm (D10-X)
Non-metallic Heads:	250 psi (17 bar) Polypropylene
	350 psi (24 bar) PVDF

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads:	250° F (121° C) - Consult factory for correct component selection for temperatures from 160° F (71° C) to 250° F (121° C).
Non-metallic Heads:	140° F (60° C)

Maximum Solids Size 500 microns

Inlet Port 1 inch NPT

Discharge Port 3/4 inch NPT

Shaft Diameter 7/8 inch (22.2 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Tapered roller bearings

Oil Capacity 1.1 US quarts (1.05 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads:	48 lbs. (21.8 kg)
Non-metallic Heads:	35 lbs. (15.9 kg)

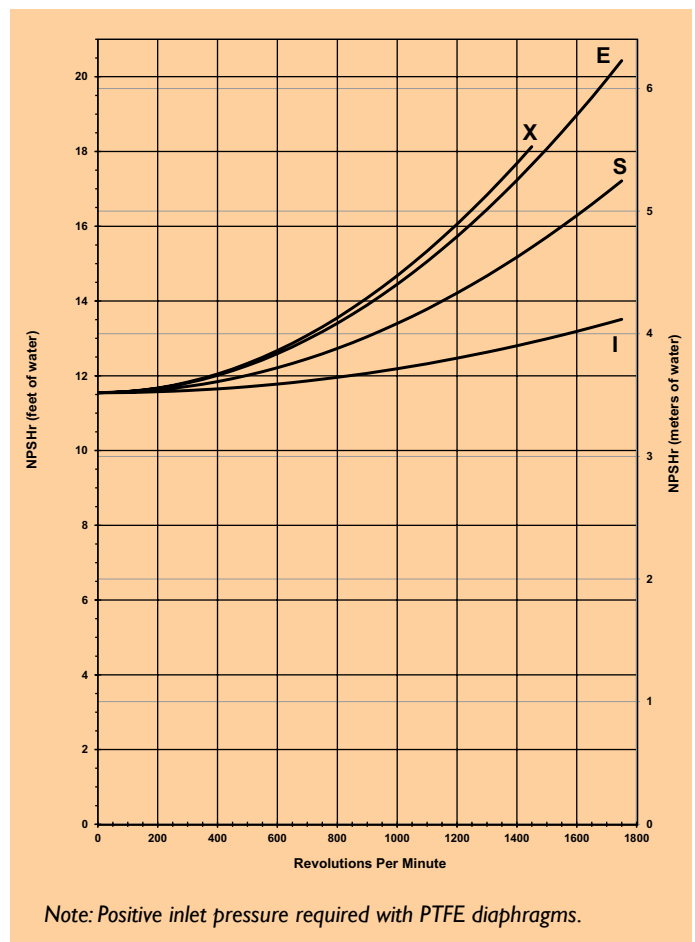
Calculating Required Power

$$\frac{15 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{15 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



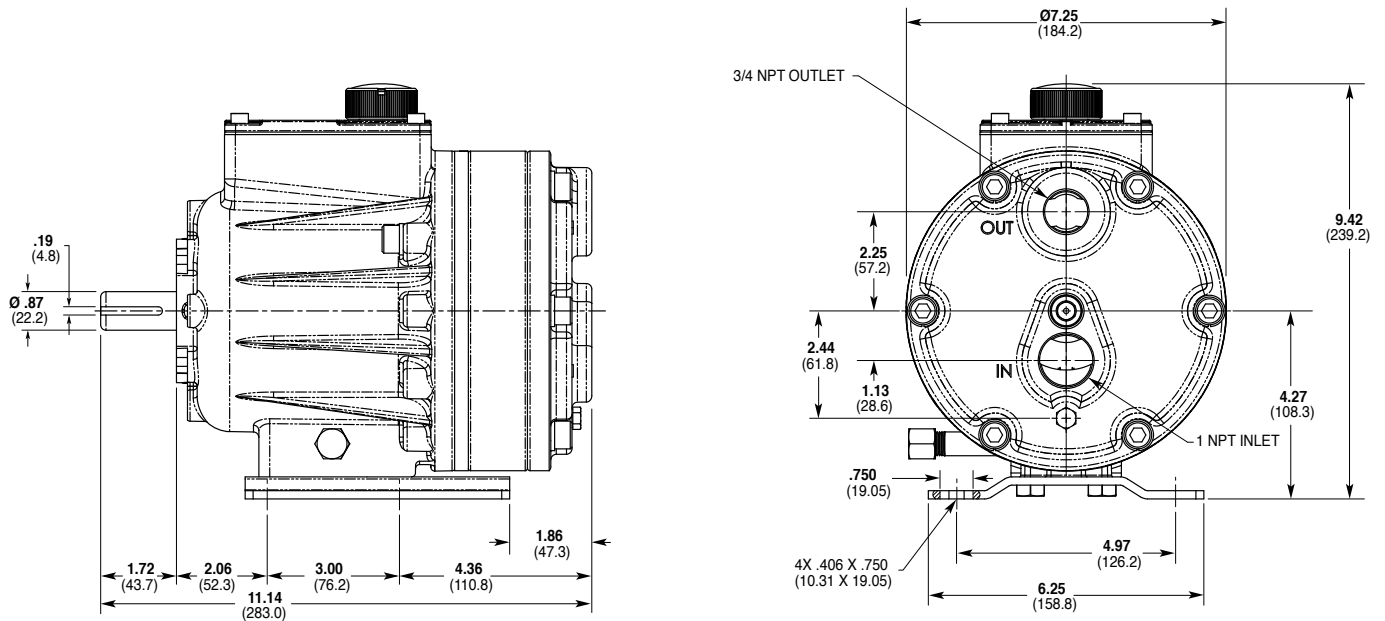
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

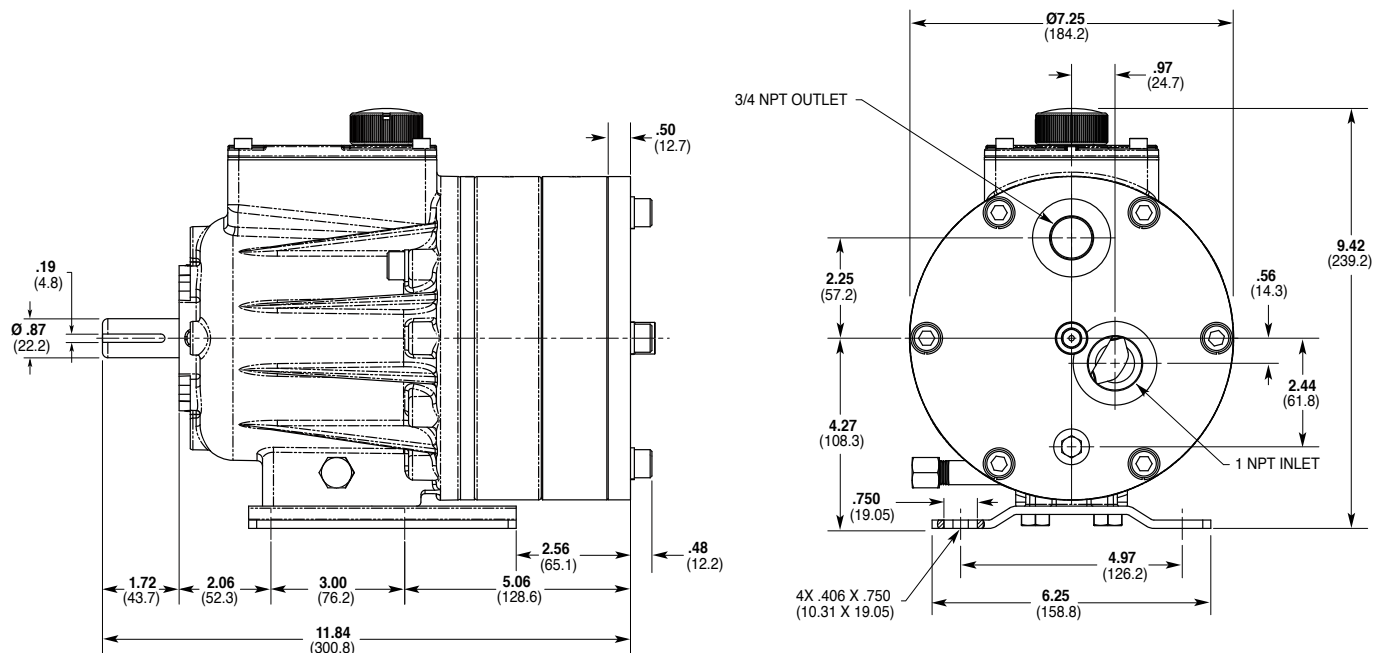
For technical assistance in pump selection, see *Frequently Asked Questions* on page 142, *Design Considerations* on page 143, and *Installation Guidelines* on pages 144-145.

D10 Series Representative Drawings

D10 Models with Metallic Pump Head Inches (mm)



D10 Models with Non-metallic Pump Head Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

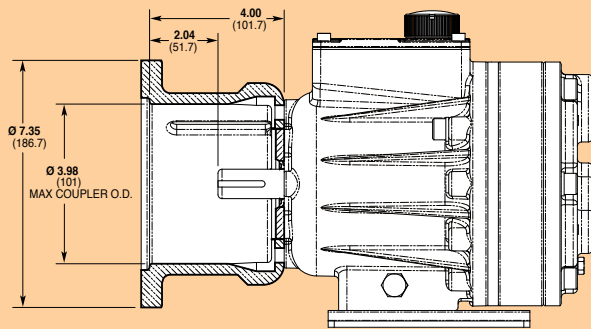
D10 Series Representative Drawings

Pump/Motor Adapter Inches (mm)

Part Number: A04-001-1200

For: 56C, 143TC & 145TC frame motors.

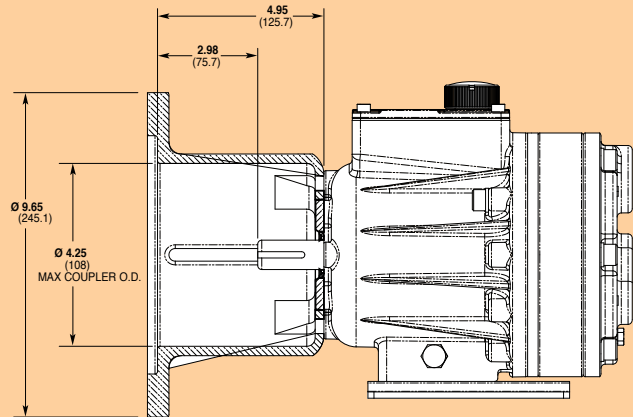
Metric adapter available - consult factory.



Part Number: A04-002-1200

For: 182TC, 184TC, 213TC & 215TC frame motors.

Metric adapter available - consult factory.



Valve Selection

A seal-less C62 Pressure Regulating Valve is recommended for Hydra-Cell D10 pumping systems, especially for high-pressure requirements or when handling dirty fluids. See page 82 for more information.

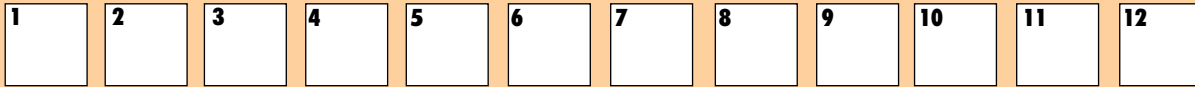


A C22 Pressure Regulating Valve provides a capable, lower-cost alternative to C62 valves for Hydra-Cell D10 pumping systems. See page 78 for more information.



D10 Series **How to Order**

Ordering Information



A complete D10 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: D10XKBTHFECA.

Digit	Order Code	Description
1-3	D10	Pump Configuration Shaft-driven (NPT Ports or ANSI Flanges)* *Pump/motor adapters ordered separately. See previous page.
4	X	Hydraulic End Cam Max 8.1 gpm (30.6 l/min) @ 1450 rpm
	E	Max 8.8 gpm (33.4 l/min) @ 1750 rpm
	S	Max 6.0 gpm (22.7 l/min) @ 1750 rpm
	I	Max 4.0 gpm (15.0 l/min) @ 1750 rpm
5	K	Pump Head Version Kel-Cell NPT Ports
6	B	Pump Head Material Brass
	C	Cast Iron (Nickel-plated)
	G	Duplex Alloy 2205 (with Hastelloy C followers & follower screws)
	M	PVDF (with Hastelloy C followers & follower screws)
	N	Polypropylene (with Hastelloy C followers & follower screws)
	P	Polypropylene (with 316 Stainless Steel followers & follower screws)
	R	316L Stainless Steel ANSI flange weldment
	S	316L Stainless Steel
	T	Hastelloy CW12MW
7	A	Diaphragm & O-ring Material Aflas diaphragm / PTFE o-ring
	E	EPDM (requires EPDM-compatible oil - Digit 12 oil code C)
	G	FKM
	J	PTFE (available with E and S cams only; 1200 rpm max.)
	P	Neoprene
	T	Buna-N
8	C	Valve Seat Material Ceramic
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	S	316L Stainless Steel
	T	Hastelloy C

Digit	Order Code	Description
9	C	Valve Material Ceramic
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C
10	E	Valve Springs Elgiloy
	H	17-7 Stainless Steel
	T	Hastelloy C
11	C	Valve Spring Retainers Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	T	Hastelloy C
	Y	Nylon (Zytel)
12	A	Hydra-Oil 10W30 standard-duty oil
	B	40-wt for continuous-duty oil (use with 316L SST or Hastelloy CW12MW pump head - standard)
	C	EPDM-compatible oil
	E	Food-contact oil
	G	5W30 cold-temp severe-duty synthetic oil

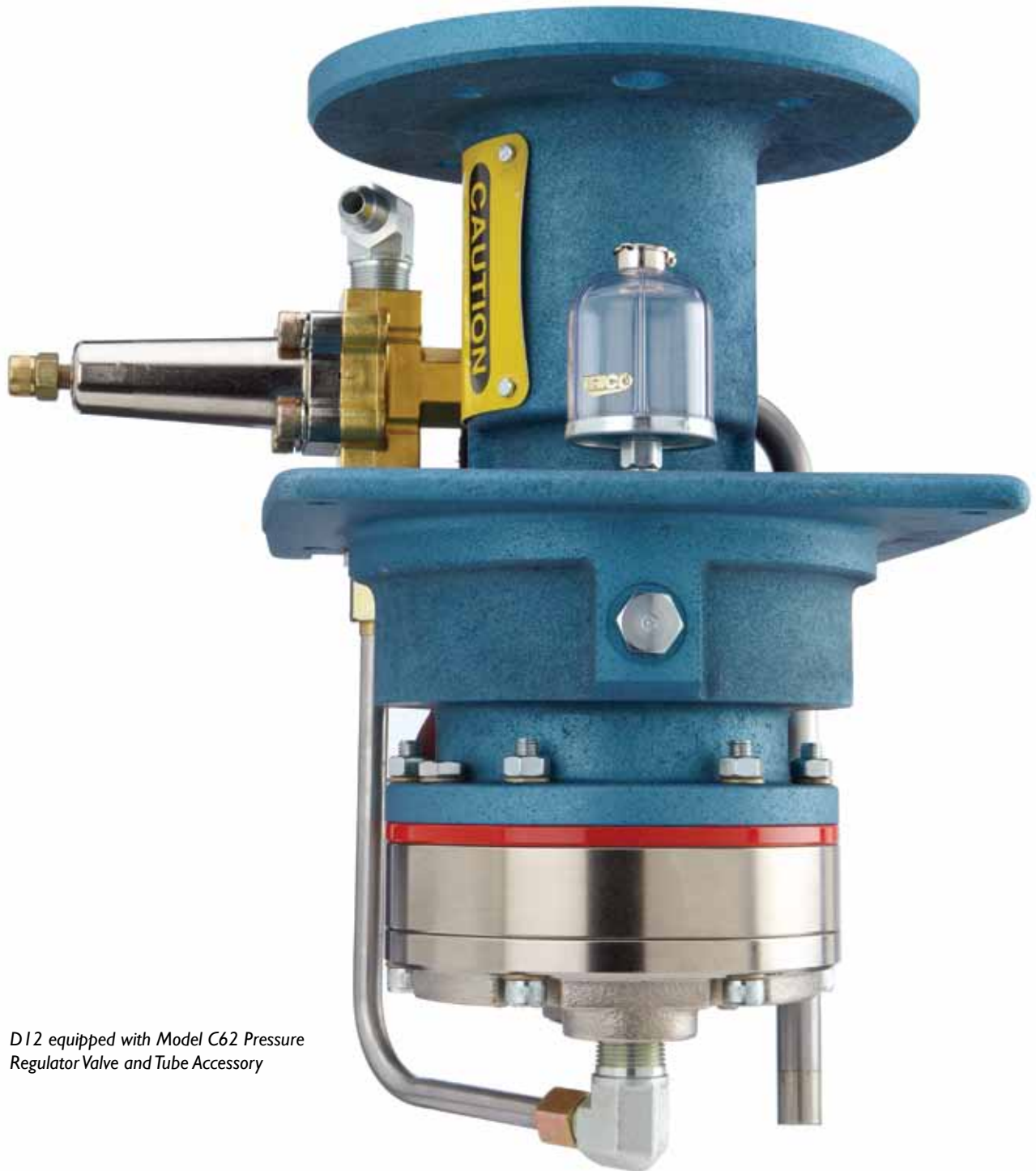
D10 Pump Housing is standard as Cast Aluminum. Upgrade to Ductile Iron available.

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

D12 Series

Maximum Flow Rate: 8.8 gpm (33.4 l/min)

Maximum Pressure: 1000 psi (69 bar) for Metallic Pump Heads



D12 equipped with Model C62 Pressure Regulator Valve and Tube Accessory

D12 Series Performance

Capacities

Flow

model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
D12-X	1450	8.1	30.6
D12-E	1750	8.8	33.4
D12-S	1750	6.0	22.7
D12-I	1750	4.0	15.0

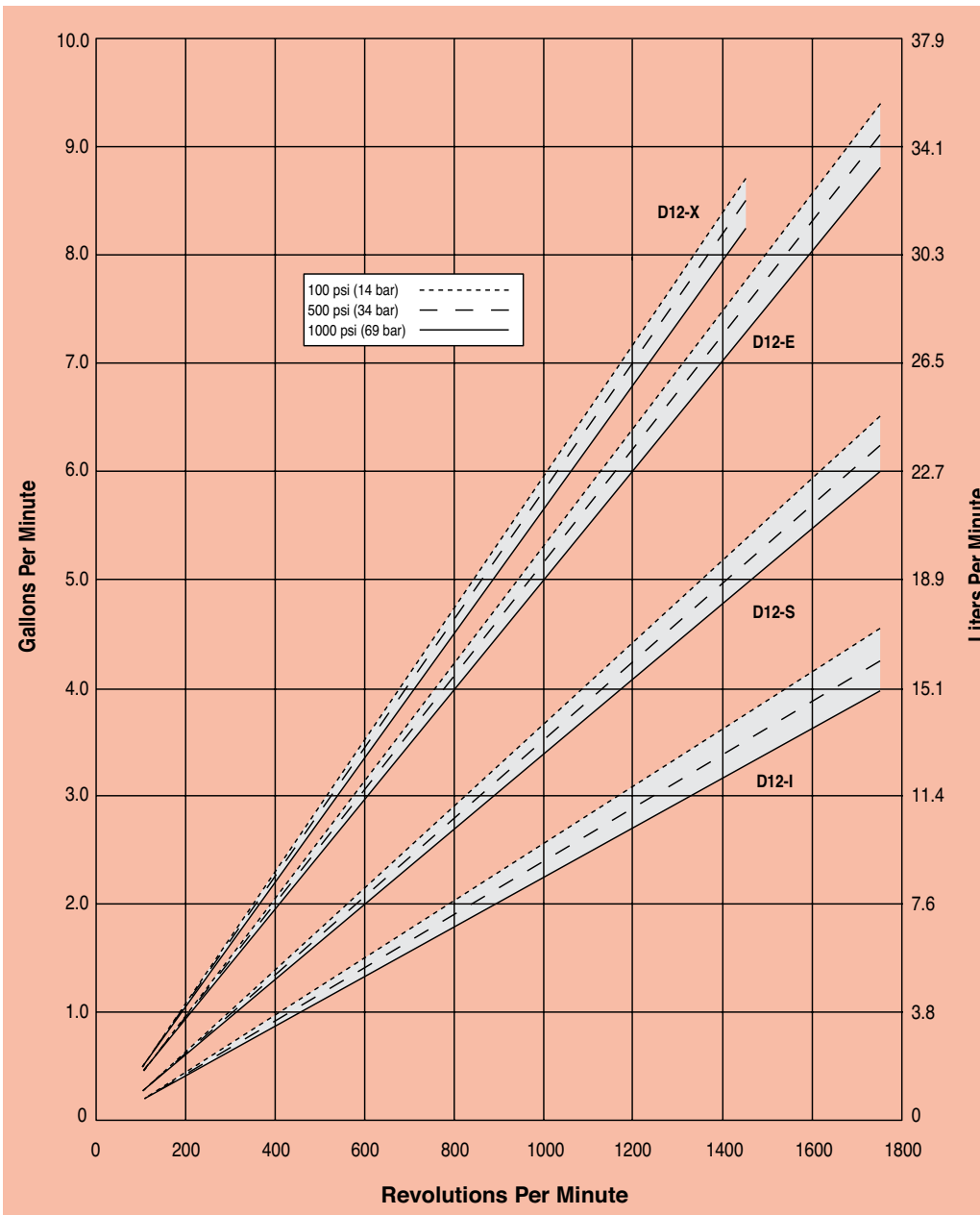
Pressure

Maximum Inlet Pressure
250 psi (17 bar)

Maximum Discharge Pressure
1000 psi (69 bar)

Performance and specification ratings apply to D12 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



D12 Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
D12-X	1450	8.10	30.6
D12-E	1750	8.83	33.4
D12-S	1750	6.00	22.7
D12-I	1750	3.96	15.0

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
D12-X	0.0056	0.0211
D12-E	0.0051	0.0191
D12-S	0.0034	0.0130
D12-I	0.0023	0.0086

Maximum Discharge Pressure

Metallic Heads: 1000 psi (69 bar)

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads: 250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

Maximum Solids Size 500 microns

Inlet Port 1 inch NPT

Discharge Port 3/4 inch NPT

Shaft Diameter 7/8 inch (22.2 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Tapered roller bearings

Oil Capacity 1.5 US quarts (1.4 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads: 63 lbs. (28.6 kg)

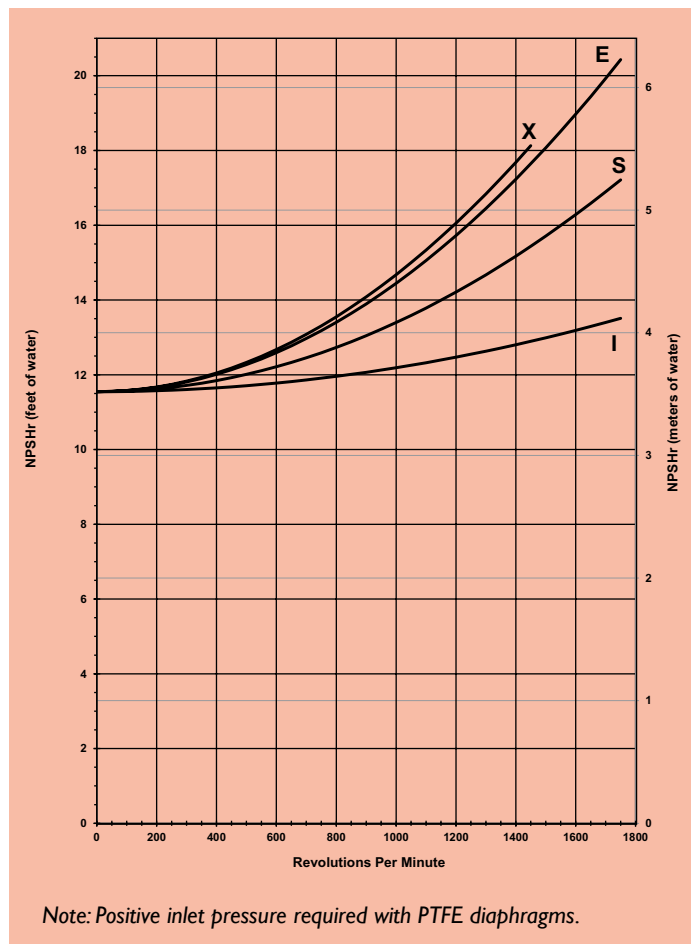
Calculating Required Power

$$\frac{15 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{15 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



Self-priming:

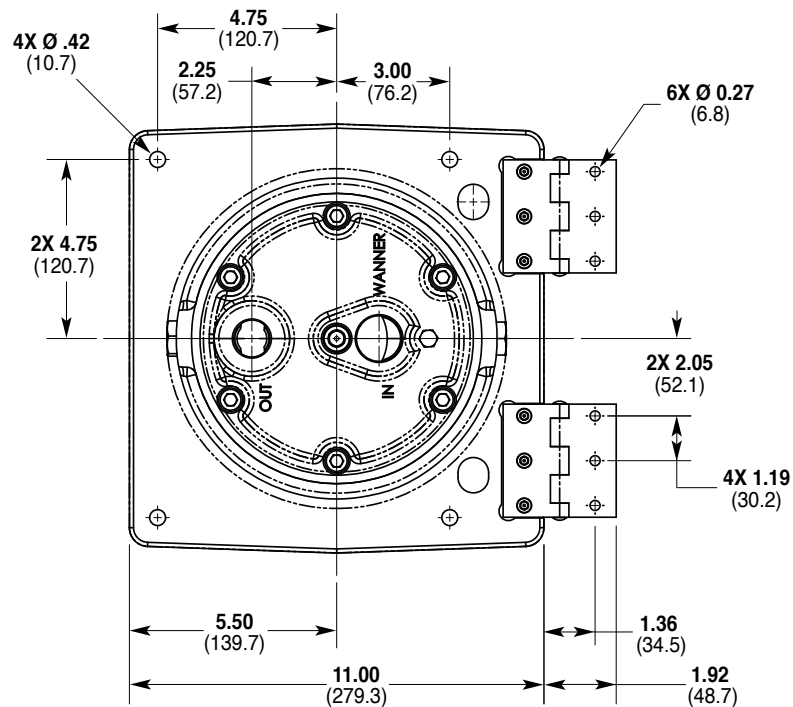
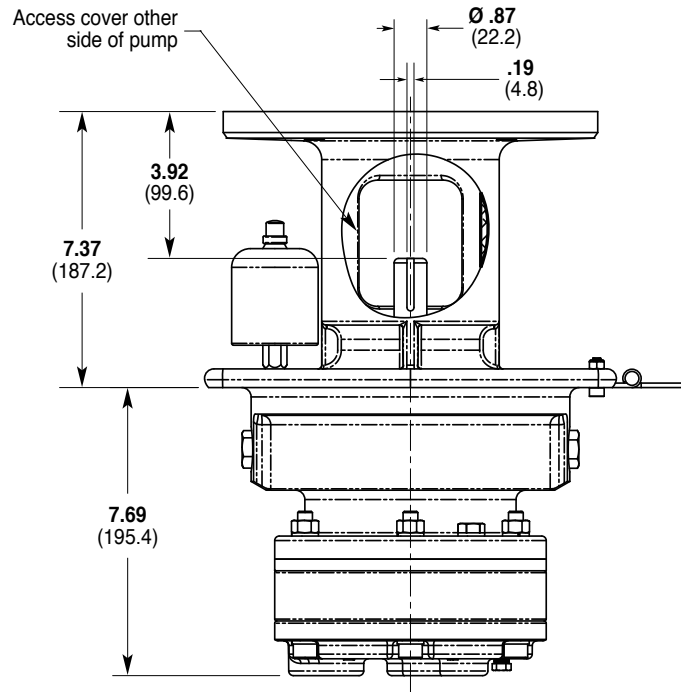
Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

D12 Series Representative Drawings

D12 Standard Configuration (Metallic Pump Heads)

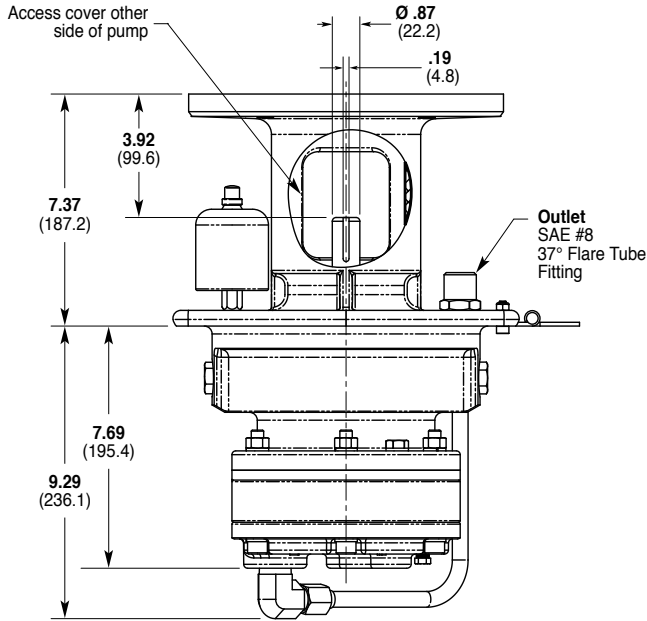
Inches (mm)



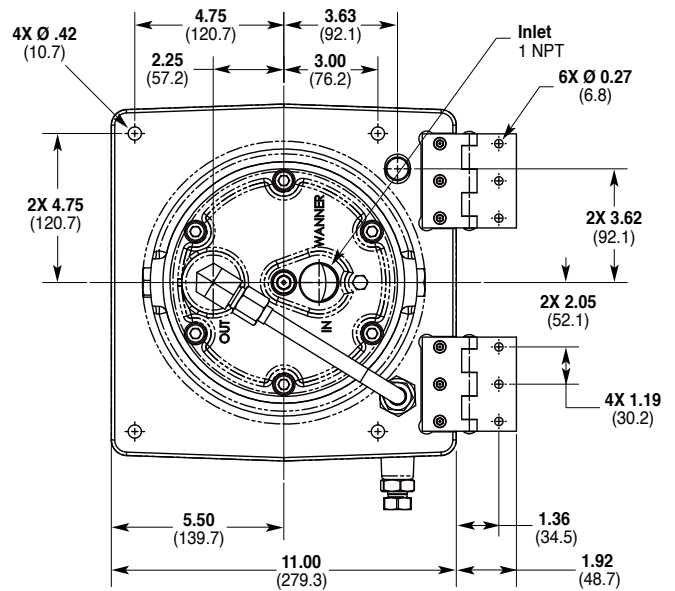
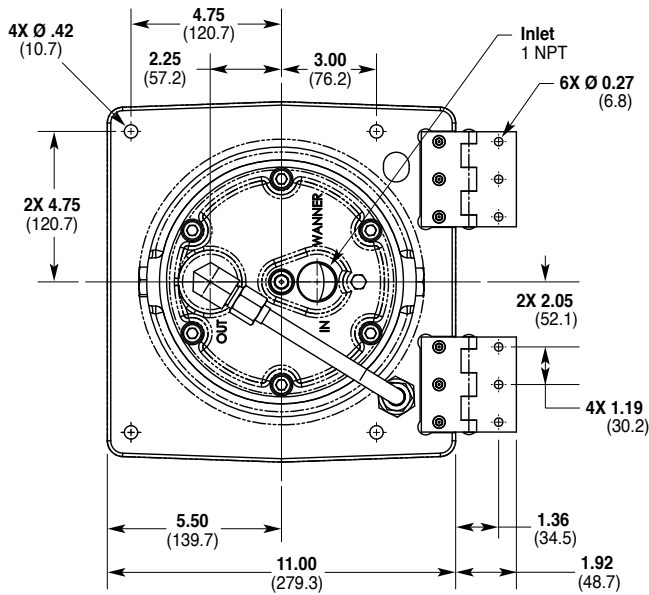
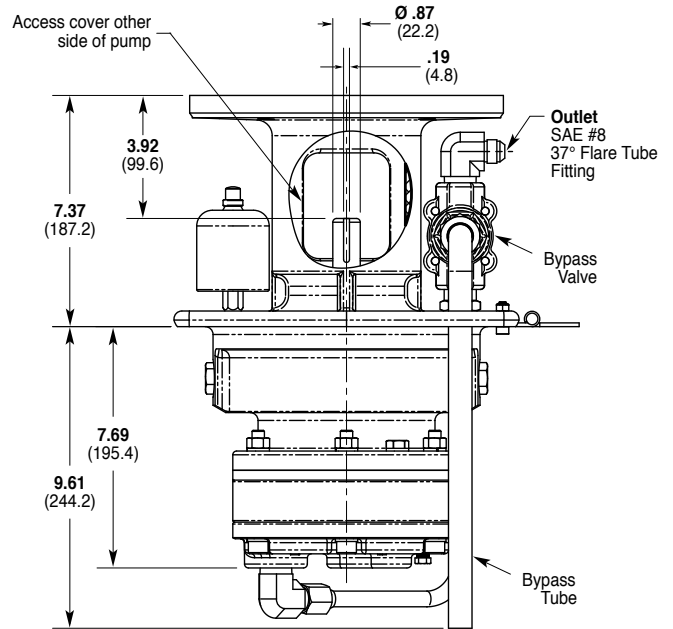
Note: Contact factory for additional drawings of specific models and configurations.

D12 Series Representative Drawings

D12 with Tube Accessory Inches (mm)



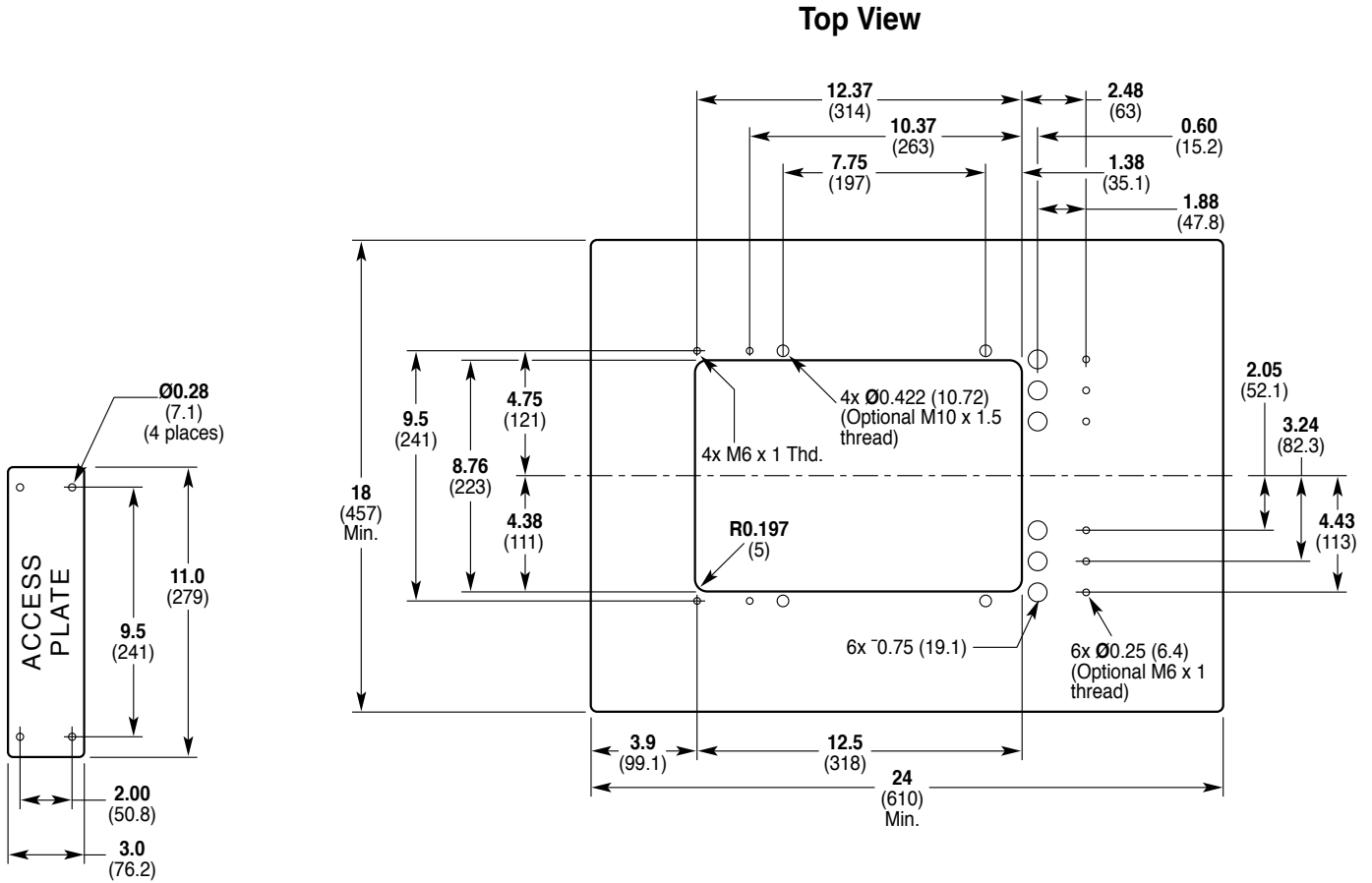
D12 with Valve/Tube Accessory Inches (mm)



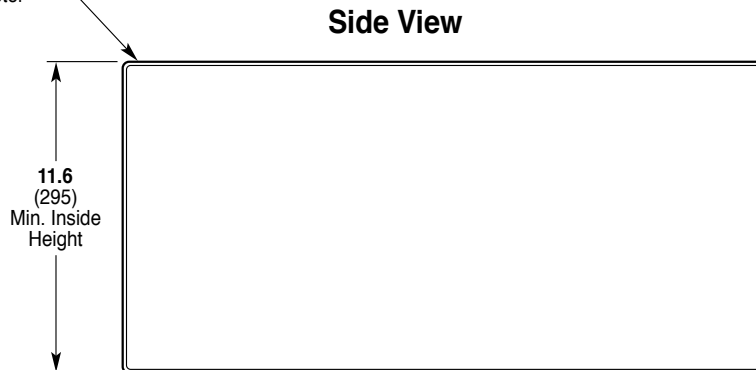
Note: Contact factory for additional drawings of specific models and configurations.

D12 Series Representative Drawings

D12 Models with Minimum Tank Size and Critical Installation Dimensions Inches (mm)



Top of tank must support weight of 200 pounds for pump/motor



Note: Contact factory for additional drawings of specific models and configurations.

D12 Series Valve/Tube Accessories

The Hydra-Cell D12 Tube and Valve/Tube Accessories provide a pre-fabricated plumbing package for simplified installation. (See page 54 for dimensions.)

Ordering Information

Tube Accessory Part Number: A04-007-1200

Valve/Tube Accessory Part Number: A04-008-1200



Valve Selection

A seal-less C62 Pressure Regulating Valve is recommended for Hydra-Cell D12 pumping systems, especially for high-pressure requirements or when handling dirty fluids. See page 82 for more information.



A C22 Pressure Regulating Valve provides a capable, lower-cost alternative to C62 valves for Hydra-Cell D12 pumping systems. See page 78 for more information.



D12 Series **How to Order**

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete D12 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: D12XKCGHFCA.

Digit	Order Code	Description
1-3	D12	Pump Configuration Flanged for NEMA 182/184TC, 213/215TC (NPT Ports)* *Tube Accessory Kits ordered separately. See previous page.
4	X	Hydraulic End Cam Max 8.1 gpm (30.6 l/min) @ 1450 rpm
	E	Max 8.8 gpm (33.4 l/min) @ 1750 rpm
	S	Max 6.0 gpm (22.7 l/min) @ 1750 rpm
	I	Max 4.0 gpm (15.0 l/min) @ 1750 rpm
5	K	Pump Head Version Kel-Cell NPT Ports
6	B	Pump Head Material Brass
	C	Cast Iron (Nickel-plated)
	S	316L Stainless Steel
7	E	Diaphragm & O-ring Material EPDM (requires EPDM-compatible oil - Digit 12 oil code C)
	G	FKM
	J	PTFE (available with E and S cams only; 1200 rpm max.)
	P	Neoprene
	T	Buna-N
8	C	Valve Seat Material Ceramic
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	S	316L Stainless Steel
9	C	Valve Material Ceramic
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
10	E	Valve Springs Elgiloy

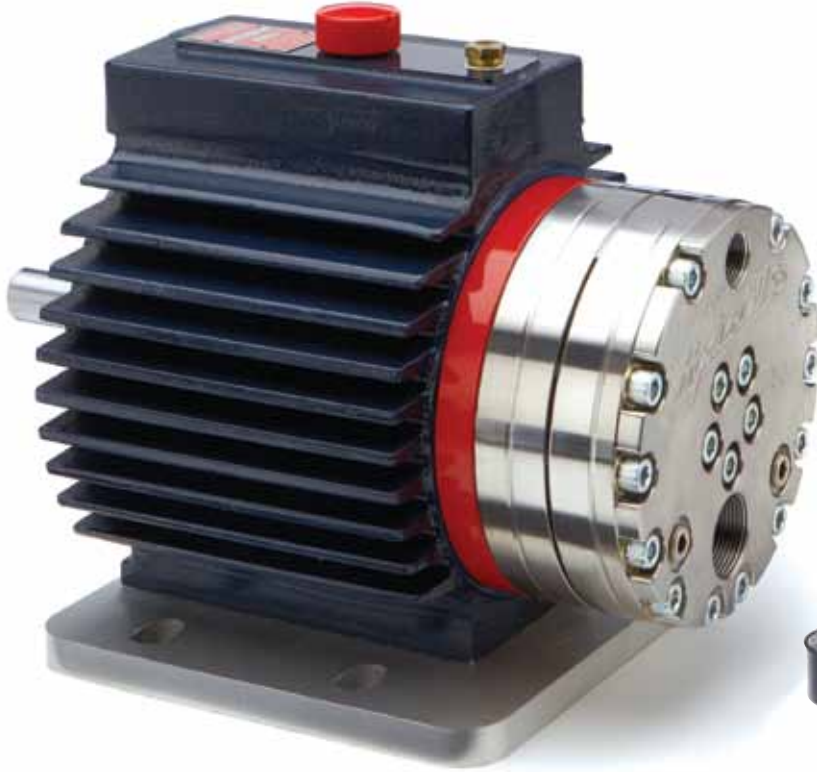
Digit	Order Code	Description
11	C	Valve Spring Retainers Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	Y	Nylon (Zytel)
12	A	Hydra-Oil 10W30 standard-duty oil
	B	40-wt for continuous-duty (use with 316 SST pump head - standard)
	C	EPDM-compatible oil
	E	Food-contact oil
	G	5W30 cold-temp severe-duty synthetic oil

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

DI5/DI7 Series

Maximum Flow Rate: 15.5 gpm (58.7 l/min)

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



DI5 for horizontal installations shown with Stainless Steel pump head.



DI7 for vertical mounting (including motor adapter, base plate and oil reservoir) shown with Brass pump head.

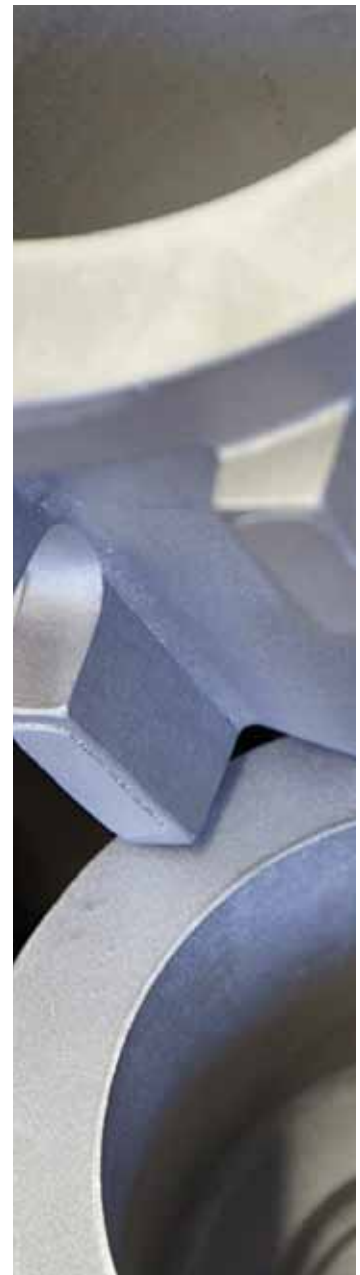
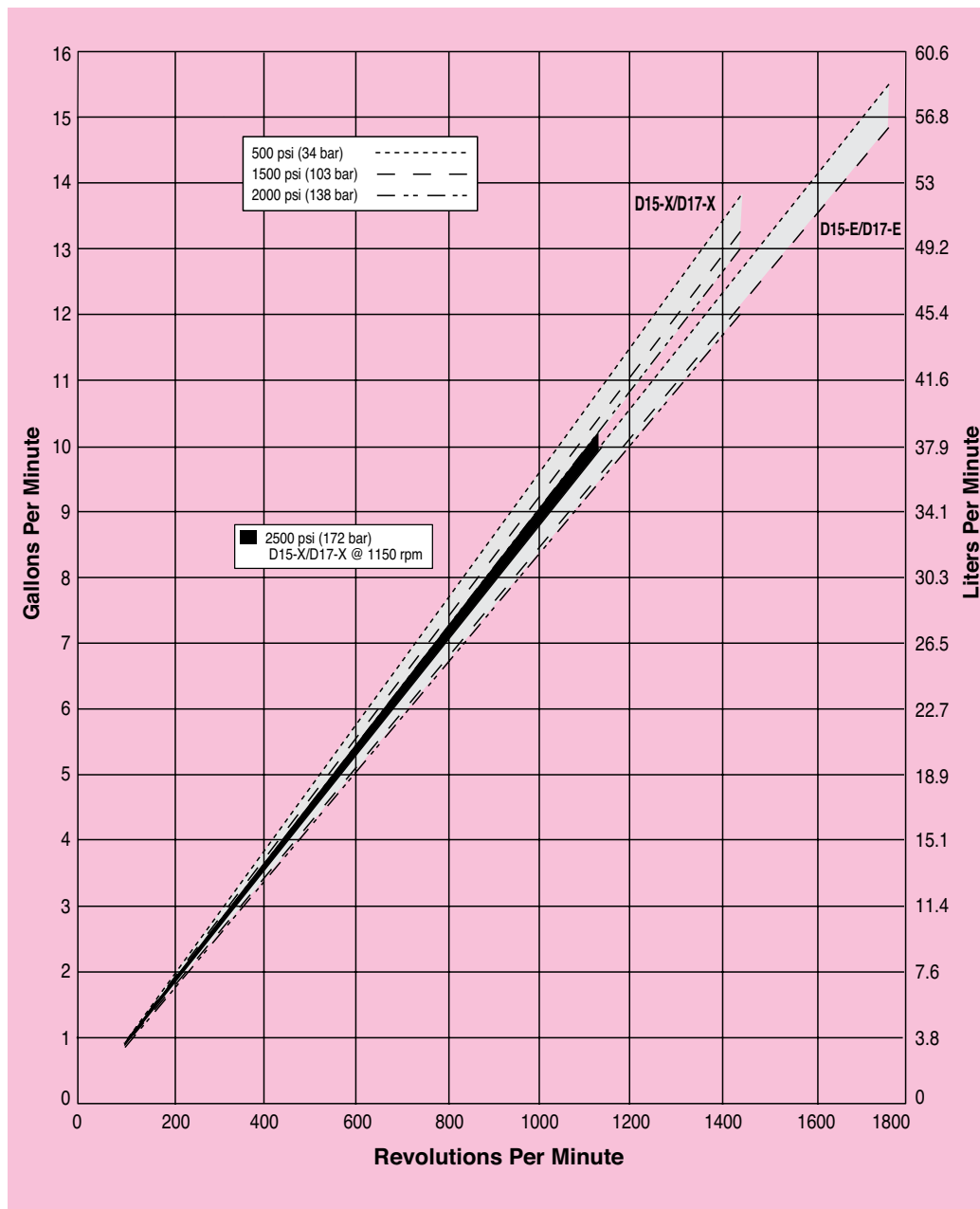
DI5/DI7 Series Performance

Capacities

Model	Max. Input rpm	Flow		Pressure	
		gpm	l/min	Max. Inlet Pressure	Max. Discharge Pressure
DI5-X/DI7-X	1450	13.8	52.3	500 psi (34 bar)	500 psi (34 bar)
	1450	13.3	50.2	500 psi (34 bar)	1500 psi (103 bar)
	1450	13.0	49.2	500 psi (34 bar)	2000 psi (138 bar)
	1150	10.1	38.1	500 psi (34 bar)	2500 psi (172 bar)
DI5-E/DI7-E	1750	15.5	58.7	500 psi (34 bar)	500 psi (34 bar)
	1750	14.8	56.2	500 psi (34 bar)	1500 psi (103 bar)
	1450	12.0	45.5	500 psi (34 bar)	2000 psi (138 bar)

Performance and specification ratings apply to DI5/DI7 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



DI5/DI7 Series Specifications

Flow Capacities

Model	@ max rpm	psi	bar	gpm	l/min
D15-X/D17-X	1450	500	34	13.8	52.3
	1450	1500	103	13.3	50.2
	1450	2000	138	13.0	49.2
	1150	2500	172	10.1	38.1
D15-E/D17-E	1750	500	34	15.5	58.7
	1750	1500	103	14.8	56.2
	1450	2000	138	12.0	45.5

Delivery

Model	psi	bar	gal/rev	liters/rev
D15-X/D17-X	500	34	0.0095	0.0360
	1500	103	0.0092	0.0346
	2000	138	0.0090	0.0339
	2500	172	0.0088	0.0331
D15-E/D17-E	500	34	0.0089	0.0335
	1500	103	0.0085	0.0321
	2000	138	0.0083	0.0314

Maximum Discharge Pressure

Metallic Heads: 1500 psi (103 bar) @1750 rpm
(D15-E & D17-E only)
2000 psi (138 bar) @1450 rpm
2500 psi (172 bar) @1150 rpm

Maximum Inlet Pressure

500 psi (34 bar)

Maximum Operating Temperature

Metallic Heads: 250° F (121 °C) - Consult factory for correct component selection for temperatures from 160° F (71 °C) to 250° F (121 °C).

Maximum Solids Size

500 microns

Inlet Port

1-1/4 inch NPT

Discharge Port

3/4 inch NPT

Shaft Diameter

1-1/8 inch (28.58 mm)

Shaft Rotation

Reverse (bi-directional)

Bearings

Tapered roller bearings

Oil Capacity

2.2 US quarts (2.1 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads: 145 lbs. (66 kg)

Calculating Required Power

$$\frac{80 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460 - \left(\frac{\text{psi} - 500}{20}\right)} = \text{electric motor hp}$$

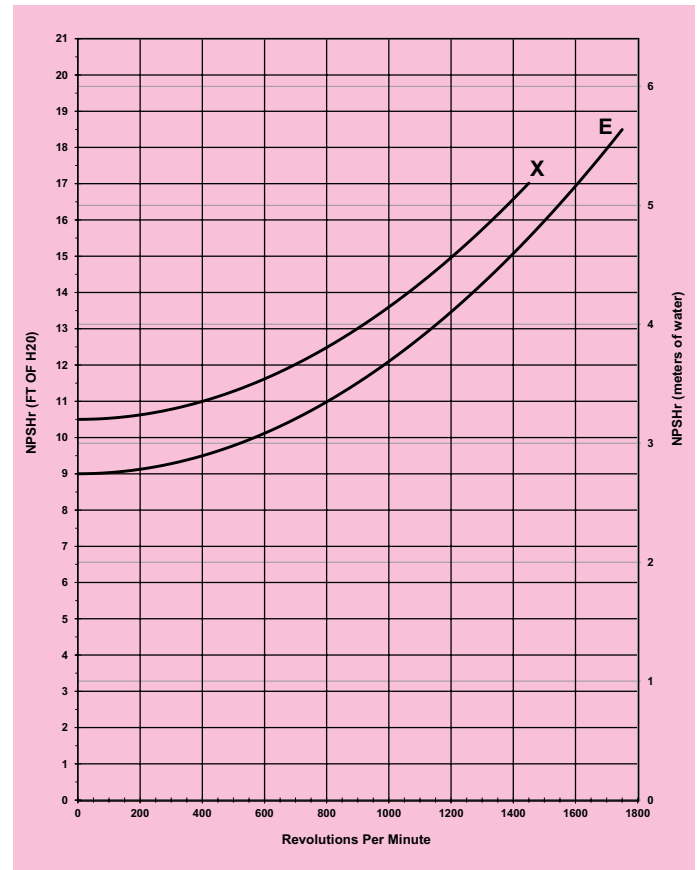
$$\frac{80 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511 - \left(\frac{\text{bar} - 35}{4}\right)} = \text{electric motor kW}$$

Calculating Pulley Size

$$\frac{\text{motor pulley OD}}{\text{pump rpm}} = \frac{\text{pump pulley OD}}{\text{motor rpm}}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



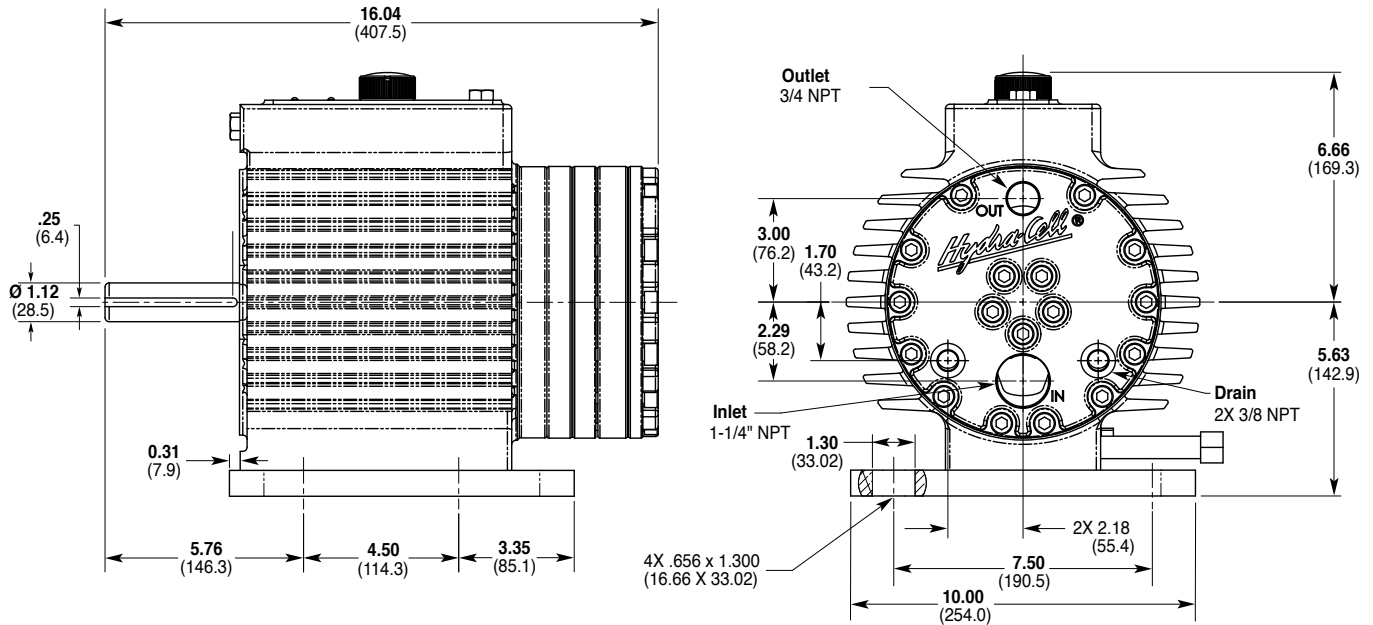
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

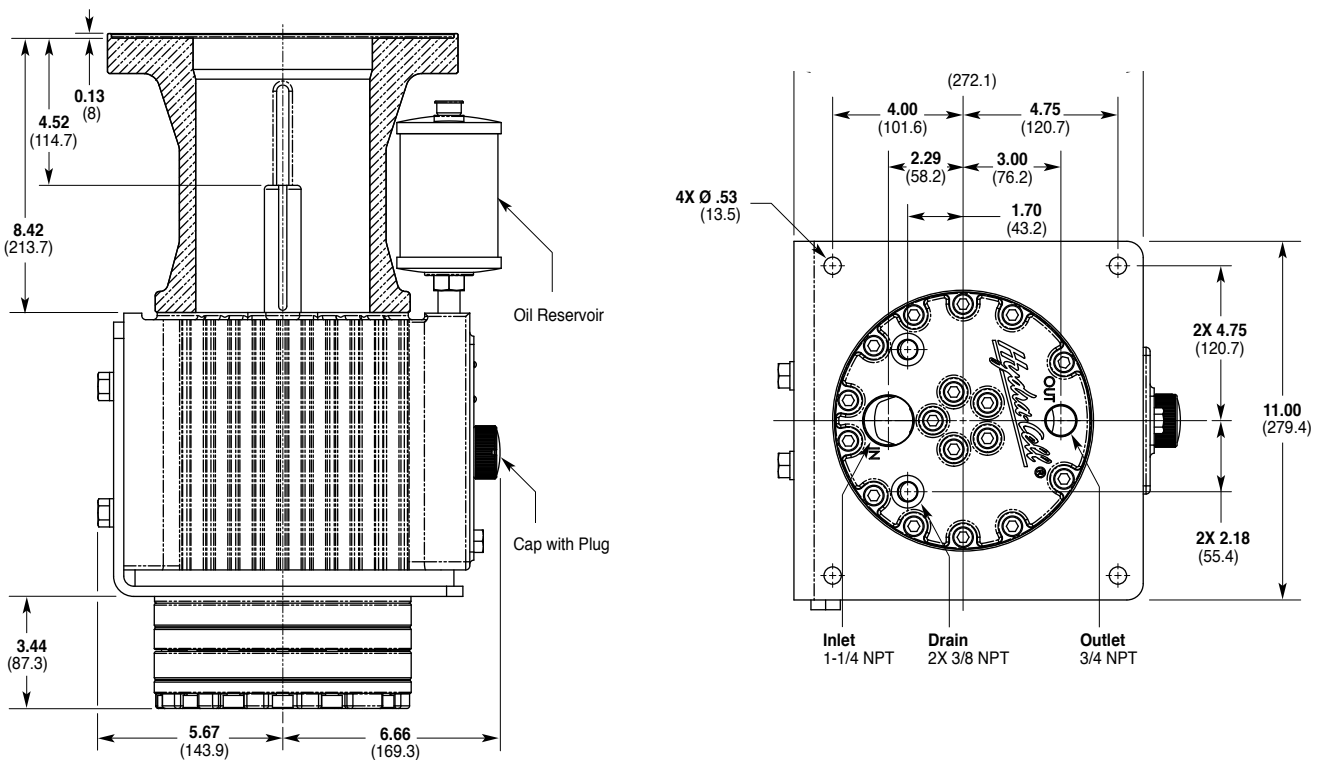
For technical assistance in pump selection, see *Frequently Asked Questions* on page 142, *Design Considerations* on page 143, and *Installation Guidelines* on pages 144-145.

DI5/DI7 Series Representative Drawings

DI5 Models for Horizontal Mounting Inches (mm)



DI7 Models for Vertical Mounting Inches (mm)

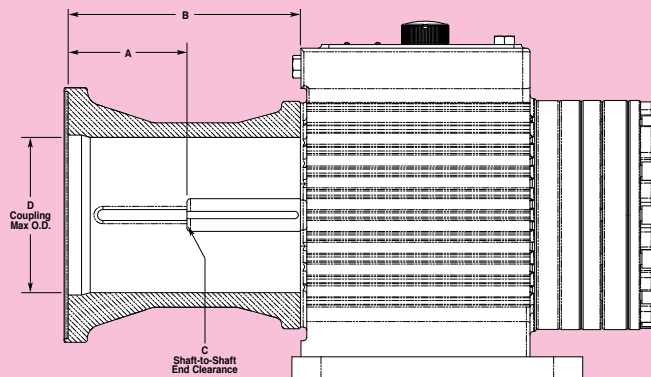


Note: Contact factory for additional drawings of specific models and configurations.

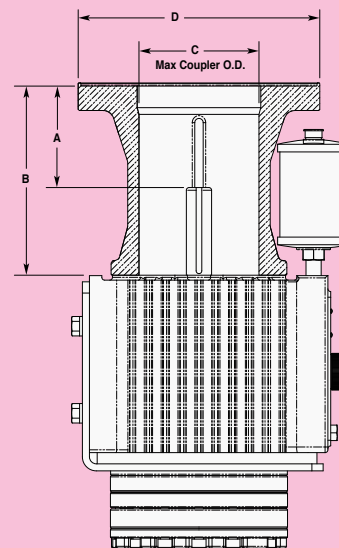
DI5/DI7 Series Representative Drawings

Pump/Motor Adapter Kits Inches (mm)

Pump/Motor Adapter Kits are designed to fit several NEMA frame sizes. Kits are ordered separately for all DI5 and DI7 models. Each kit includes the adapter flange and all necessary mounting hardware.



DI5 (Horizontal)



DI7 (Vertical)

Dimensions in Inches (mm)

Adapter Kit Motor Size	Kit Part Number	A	B	C	D
DI5/DI7 NEMA 182TC - 256TC	A04-041-1200	4.1 (103.8)	8.0 (202.8)	4.75 (120.7)	8.75 (222.3)
DI5/DI7 NEMA 284TC - 286TC	A04-041-1202	4.5 (114.7)	8.4 (213.7)	4.75 (120.7)	10.75 (273.1)

Valve Selection

A Hydra-Cell DI5/DI7 Series pumping system uses a C62 Pressure Regulating Valve.

See page 82 for more information.



D15/D17 Series How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete D15/D17 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: D15XABTHFEGG.

Digit	Order Code	Description
1-3		Pump Configuration
	D15	Horizontal shaft-driven (NPT Ports)
	D17	Vertical shaft-driven (NPT Ports) *Pump/motor adapters ordered separately. See previous page.
4		Hydraulic End Cam
	X	Max 13.8 gpm (52.3 l/min) @ 1450 rpm
	E	Max 15.5 gpm (58.7 l/min) @ 1750 rpm
5		Pump Head Version
	A	NPT Ports
6		Pump Head Material
	B	Brass
	S	316L Stainless Steel
7		Diaphragm & O-ring Material
	G	FKM
	T	Buna-N
8		Valve Seat Material
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	N	Nitronic 50
9		Valve Material
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
10		Valve Springs
	E	Elgiloy
	H	17-7 Stainless Steel
	T	Hastelloy C
11		Valve Spring Retainers
	C	Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	Y	Nylon (Zytel)

Digit	Order Code	Description
12		Hydra-Oil
	A	10W30 standard-duty oil
	B	40-wt for continuous-duty (use with 316 SST pump head - standard)
	E	Food-contact oil
	G	5W30 cold-temp severe-duty synthetic oil
	H	15W50 high-temp severe-duty synthetic oil

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

H25 Series

Maximum Flow Rate: 20.0 gpm (75.9 l/min)
Maximum Pressure: 1000 psi (69 bar) for Metallic Pump Heads
350 psi (24 bar) for Non-metallic Pump Heads



H25 with Cast Iron pump head



H25 with Brass pump head



H25 with Polypropylene pump head



H25 with Stainless Steel pump head and ANSI flanges

H25 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 1000 psi (69 bar)	
		gpm	l/min
H25-X	1050	20.0	75.7
H25-E	1150	20.0	75.9
H25-S	1150	16.2	61.5
H25-I	1150	11.8	44.7

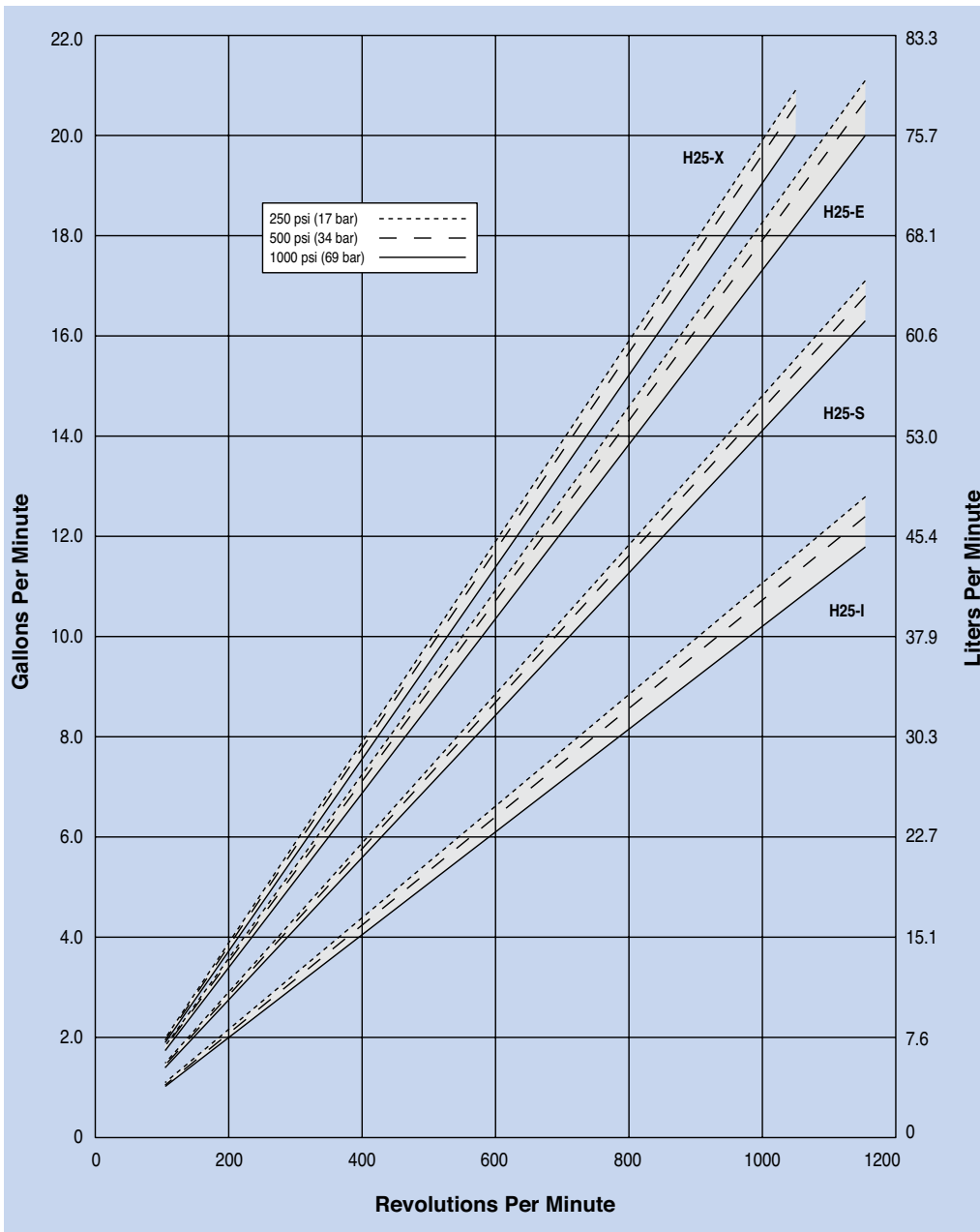
Pressure

Maximum Inlet Pressure
250 psi (17 bar)

Maximum Discharge Pressure
Metallic Pump Heads:
1000 psi (69 bar)
Non-metallic Pump Heads:
250 psi (17 bar) Polypropylene
350 psi (24 bar) PVDF

Performance and specification ratings apply to H25 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



H25 Series Specifications

Flow Capacities @1000 psi (69 bar)

Model	rpm	gpm	l/min
H25-X	1050	20.0	75.7
H25-E	1150	20.0	75.9
H25-S	1150	16.2	61.5
H25-I	1150	11.8	44.7

Delivery @1000 psi (69 bar)

Model	gal/rev	liters/rev
H25-X	0.0190	0.0721
H25-E	0.0174	0.0660
H25-S	0.0141	0.0535
H25-I	0.0103	0.0389

Maximum Discharge Pressure

Metallic Heads:	1000 psi (69 bar)
Non-metallic Heads:	250 psi (17 bar) Polypropylene 350 psi (24 bar) PVDF

Maximum Inlet Pressure 250 psi (17 bar)

Maximum Operating Temperature

Metallic Heads:	250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).
Non-metallic Heads:	140 °F (60 °C)

Maximum Solids Size 800 microns

Inlet Port 1-1/2 inch NPT

Discharge Port 1 inch NPT

Shaft Diameter 1-1/8 inch (28.6 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Tapered roller bearings

Oil Capacity 2.5 US quarts (2.4 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads:	125 lbs. (56.8 kg)
Non-metallic Heads:	90 lbs. (40.9 kg)

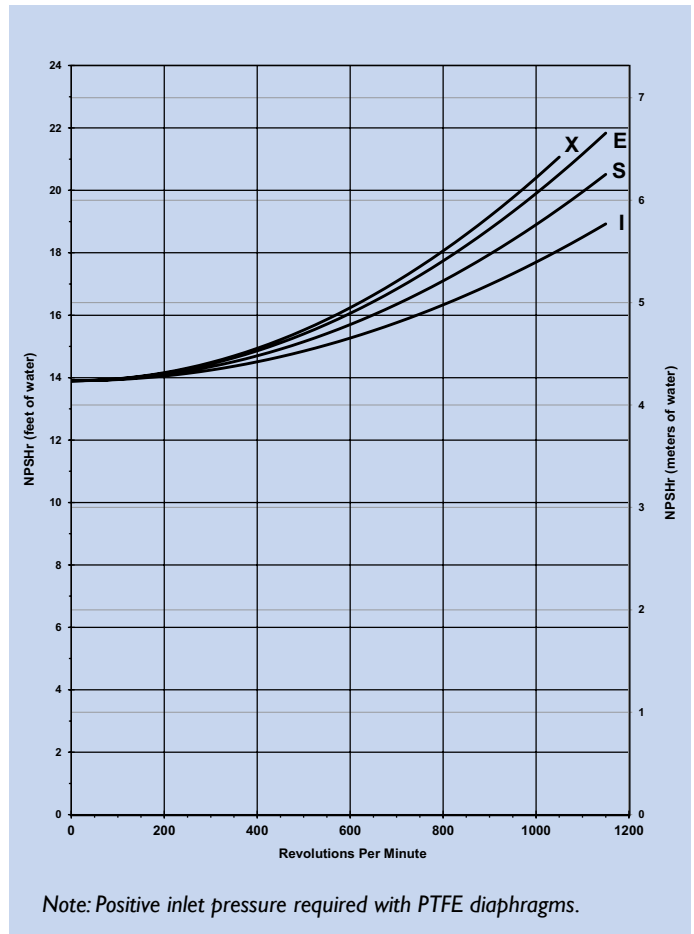
Calculating Required Power

$$\frac{50 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{50 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



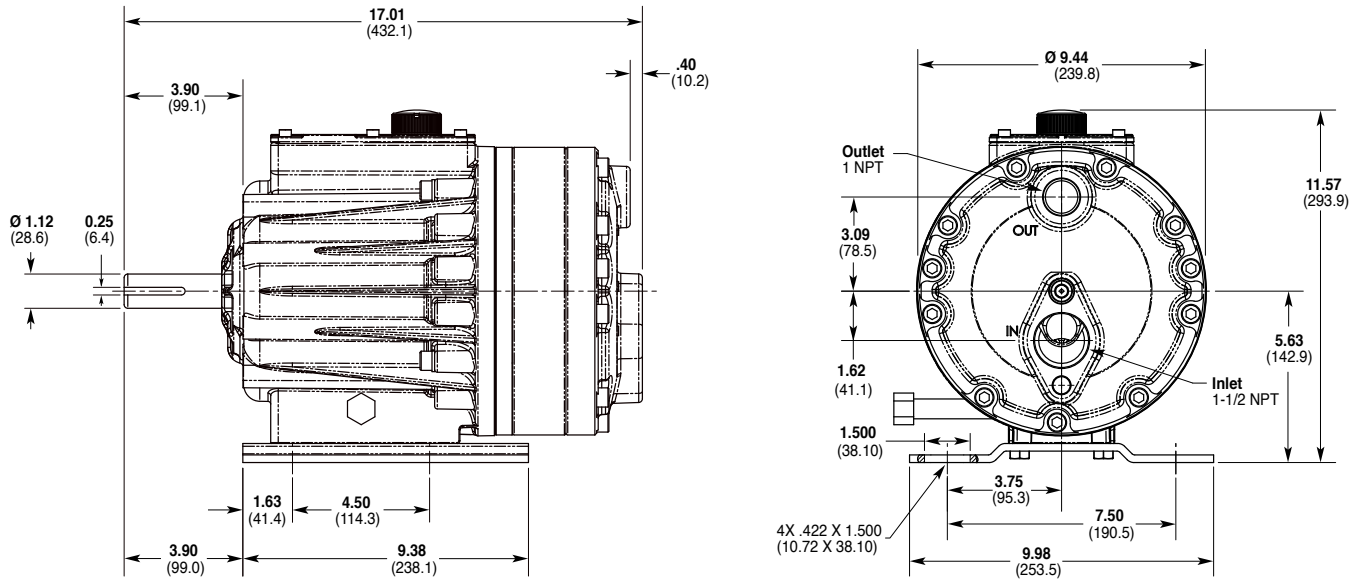
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

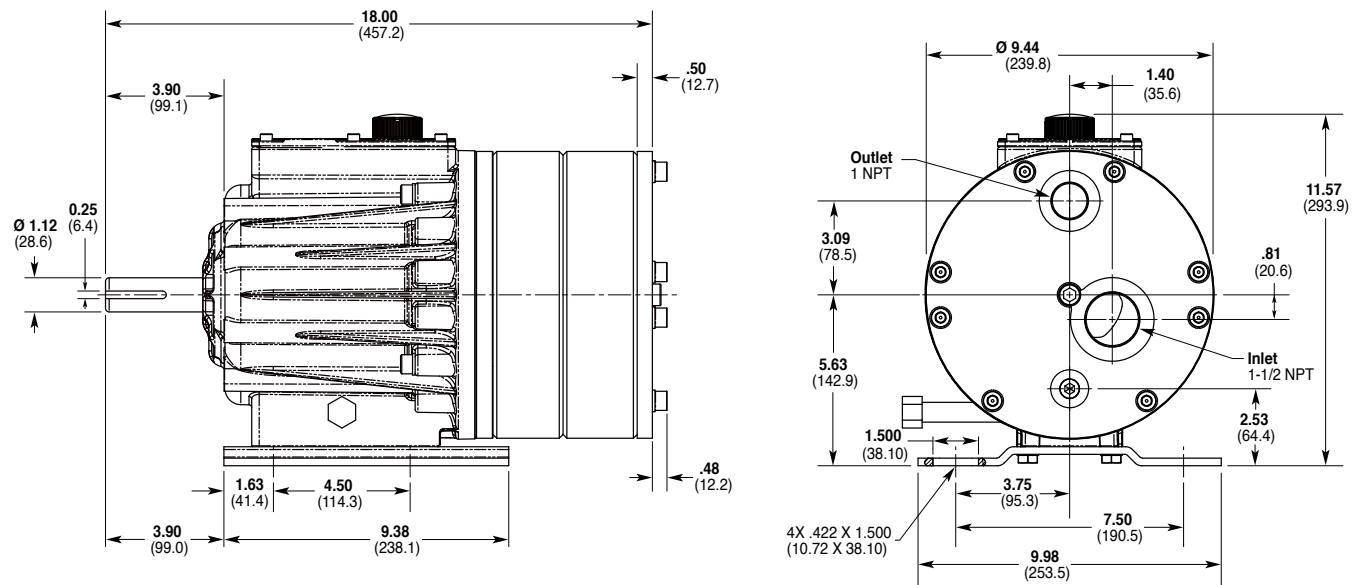
For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

H25 Series Representative Drawings

H25 Models with Metallic Pump Head Inches (mm)



H25 Models with Non-metallic Pump Head Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

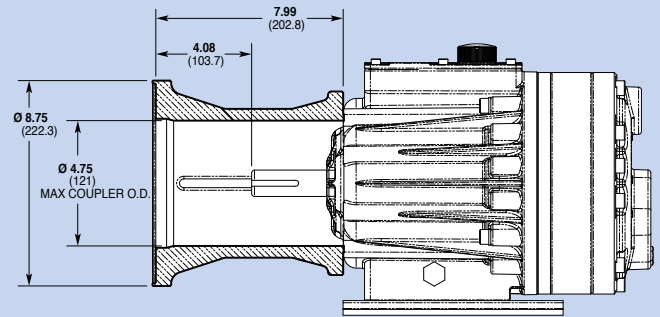
H25 Series Representative Drawings

Pump/Motor Adapter Inches (mm)

Part Number: A04-041-I200

For: 182TC–184TC, 213–215TC & 254–256TC frame motors.

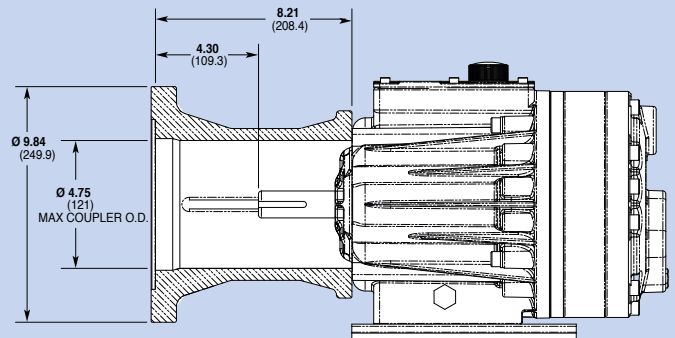
Metric adapter available - consult factory.



Part Number: A04-042-I200

For: 284TC–286TC frame motors.

Metric adapter available - consult factory.



Valve Selection

A seal-less C63 Pressure Regulating Valve is recommended for Hydra-Cell H25 pumping systems, especially for high-pressure requirements or when handling dirty fluids. See page 82 for more information.



A C23 Pressure Regulating Valve provides a capable, lower-cost alternative to C63 valves for Hydra-Cell H25 pumping systems. See page 78 for more information.



H25 Series How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
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A complete H25 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: H25XKCGNNECA.

Digit	Order Code	Description
1-3	H25	Pump Configuration Shaft-driven (NPT Ports or ANSI Flanges)
4	X	Hydraulic End Cam Max 20.0 gpm (75.7 l/min) @ 1050 rpm
	E	Max 20.0 gpm (75.9 l/min) @ 1150 rpm
	S	Max 16.2 gpm (61.5 l/min) @ 1150 rpm
	I	Max 11.8 gpm (44.7 l/min) @ 1150 rpm
5	K	Pump Head Version Kel-Cell NPT Ports
	M	Machined housing to accept C-face adapter/gearbox
6	B	Pump Head Material Brass
	C	Cast Iron (Nickel-plated)
	G	Duplex Alloy 2205 (with Hastelloy C followers & follower screws)
	M	PVDF (with Hastelloy C followers & follower screws)
	N	Polypropylene (with Hastelloy C followers & follower screws)
	P	Polypropylene (with 316L Stainless Steel followers & follower screws)
	R	316L Stainless Steel ANSI flange weldment
	S	316L Stainless Steel
	T	Hastelloy CW12MW
7	A	Diaphragm & O-ring Material Atlas diaphragm / PTFE o-ring
	E	EPDM (requires EPDM-compatible oil - Digit 12 oil code C)
	G	FKM
	J	PTFE (available with E and S cams only; 1050 rpm max.)
	P	Neoprene
	T	Buna-N
8	C	Valve Seat Material Ceramic
	D	Tungsten Carbide
	H	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C

Digit	Order Code	Description
9	C	Valve Material Ceramic
	D	Tungsten Carbide
	F	17-4 Stainless Steel
	N	Nitronic 50
	T	Hastelloy C
10	E	Valve Springs Elgiloy
	H	17-7 Stainless Steel
	T	Hastelloy C
11	C	Valve Spring Retainers Celcon
	H	17-7 Stainless Steel
	M	PVDF
	P	Polypropylene
	T	Hastelloy C
	Y	Nylon (Zytel)
12	A	Hydra-Oil 10W30 standard-duty oil
	B	40-wt for continuous-duty oil (use with 316L SST or Hastelloy CW12MW pump head - standard)
	C	EPDM-compatible oil
	E	Food-contact oil
	G	5W30 cold-temp severe-duty synthetic oil
	H	15W50 high-temp severe-duty synthetic oil

H25 Pump Housing is standard as Cast Aluminum. Upgrade to Ductile Iron available.

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

D35 Series

Maximum Flow Rate: 36.5 gpm (138 l/min)

Maximum Pressure: 1500 psi (103 bar) for Metallic Pump Heads Only



*D35 with Stainless Steel pump head
and SAE flanges*



D35 with Brass pump head



D35 with Cast Iron pump head



*D35 with Stainless Steel pump head and
ANSI flanges*

D35 Series Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow	
		@ 1200 psi (83 bar) gpm	l/min
D35-X	1050	36.5	138
D35-E	1150	34.0	129

@ 1500 psi (103 bar)			
D35-X	700	23.1	87.5

Pressure

Maximum Inlet Pressure

250 psi (17 bar) with 1500 psi (103 bar) maximum discharge pressure

500 psi (34 bar) with 1200 psi (83 bar) maximum discharge pressure

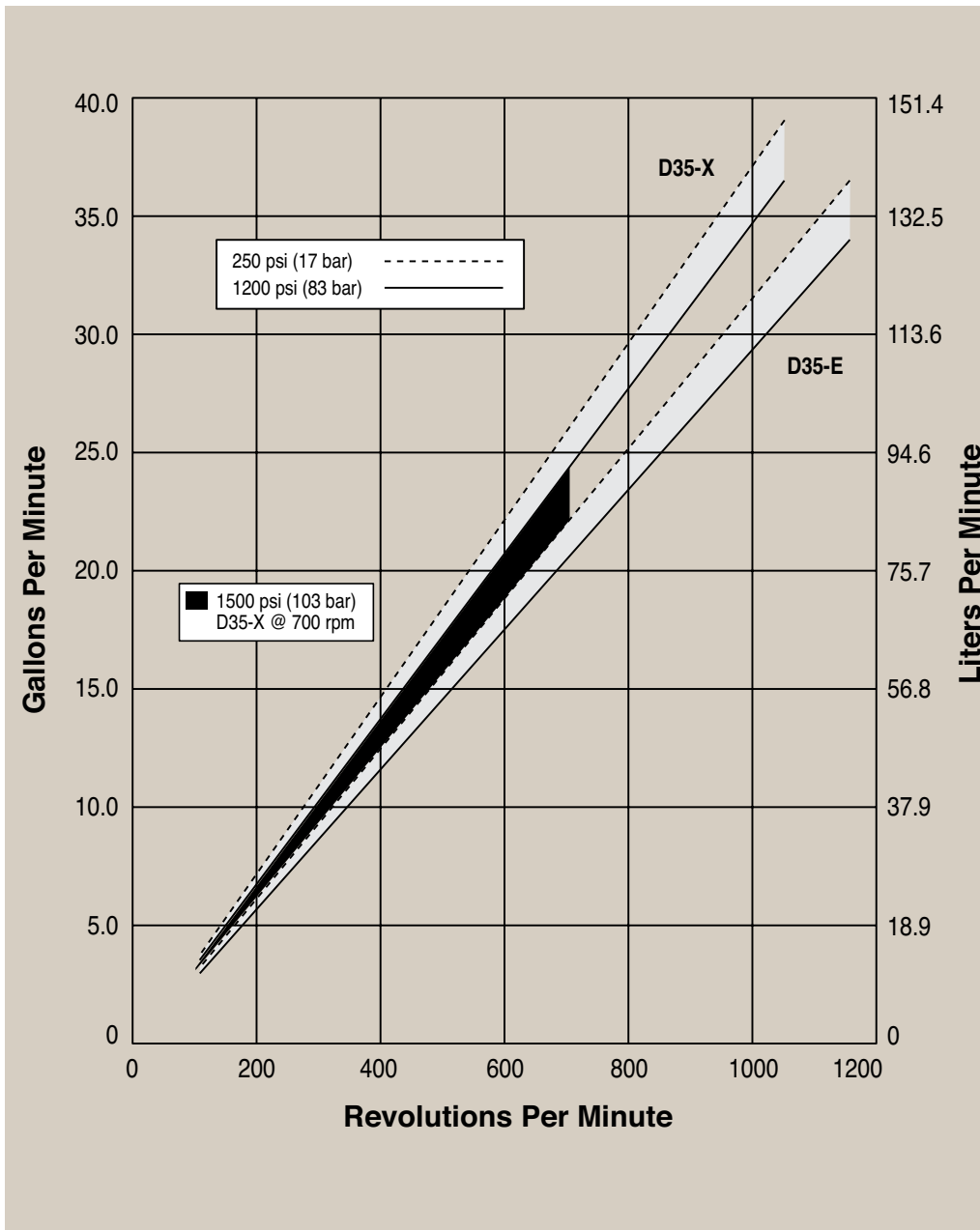
Maximum Discharge Pressure

1200 psi (83 bar) @ 1150 rpm max.

1500 psi (103 bar) @ 700 rpm max.

Performance and specification ratings apply to D35 configurations unless specifically noted otherwise.

Maximum Flow at Designated Pressure



D35 Series Specifications

Flow Capacities @1200 psi (83 bar)

Model	rpm	gpm	l/min
D35-X	1050	36.5	138
D35-E	1150	34.0	129

Delivery @1200 psi (83 bar)

Model	gal/rev	liters/rev
D35-X	0.0347	0.1314
D35-E	0.0296	0.1120

Delivery @1500 psi (103 bar)

Model	gal/rev	liters/rev
D35-X	0.0330	0.1250

Maximum Discharge Pressure

Metallic Heads: 1500 psi (103 bar) @ 700 rpm

Maximum Inlet Pressure 250 psi (17 bar) with 1500 psi (103 bar) maximum discharge pressure
500 psi (34 bar) with 1200 psi (83 bar) maximum discharge pressure

Maximum Operating Temperature

Metallic Heads: 250 °F (121 °C) - Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

Maximum Solids Size 800 microns

Inlet Port 2-1/2 inch NPT or 3 inch SAE flange

Discharge Port 1-1/4 inch NPT or 1-1/4 inch SAE flange

Shaft Diameter 2 inch (50.8 mm)

Shaft Rotation Reverse (bi-directional)

Bearings Tapered roller bearings

Oil Capacity 5.0 US quarts (4.7 liters) - See pages 94 and 95 for oil selection and specification.

Weight

Metallic Heads: 240 lbs. (109 kg)

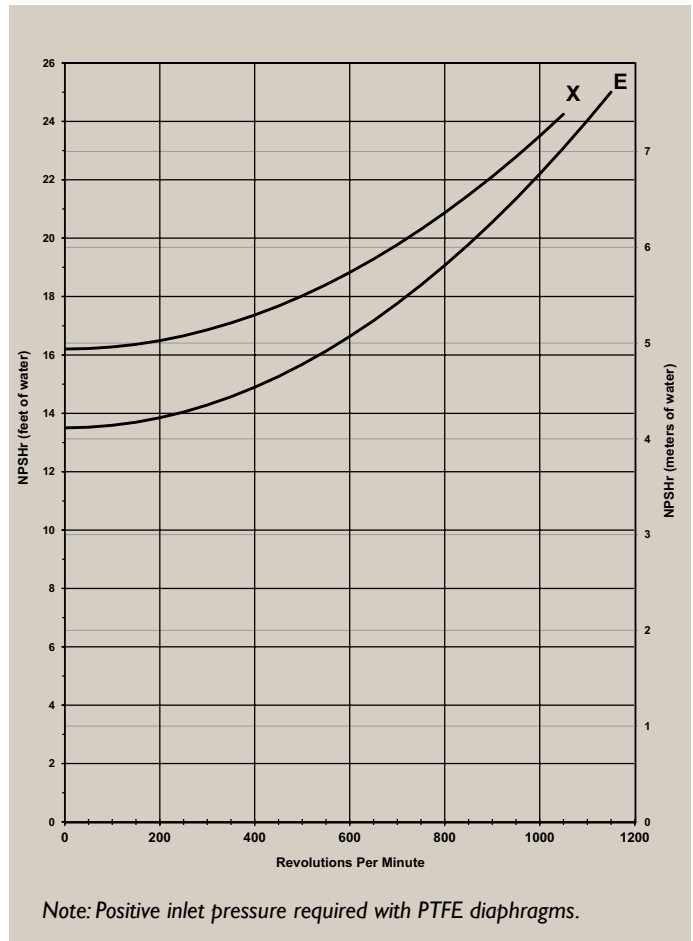
Calculating Required Power

$$\frac{100 \times \text{rpm}}{63,000} + \frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}$$

$$\frac{100 \times \text{rpm}}{84,428} + \frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}$$

When using a variable frequency controller (VFD) calculate the hp or kW at minimum and maximum pump speed to ensure the correct hp or kW motor is selected. Note that motor manufacturers typically de-rate the service factor to 1.0 when operating with a VFD.

Net Positive Suction Head (NPSHr)



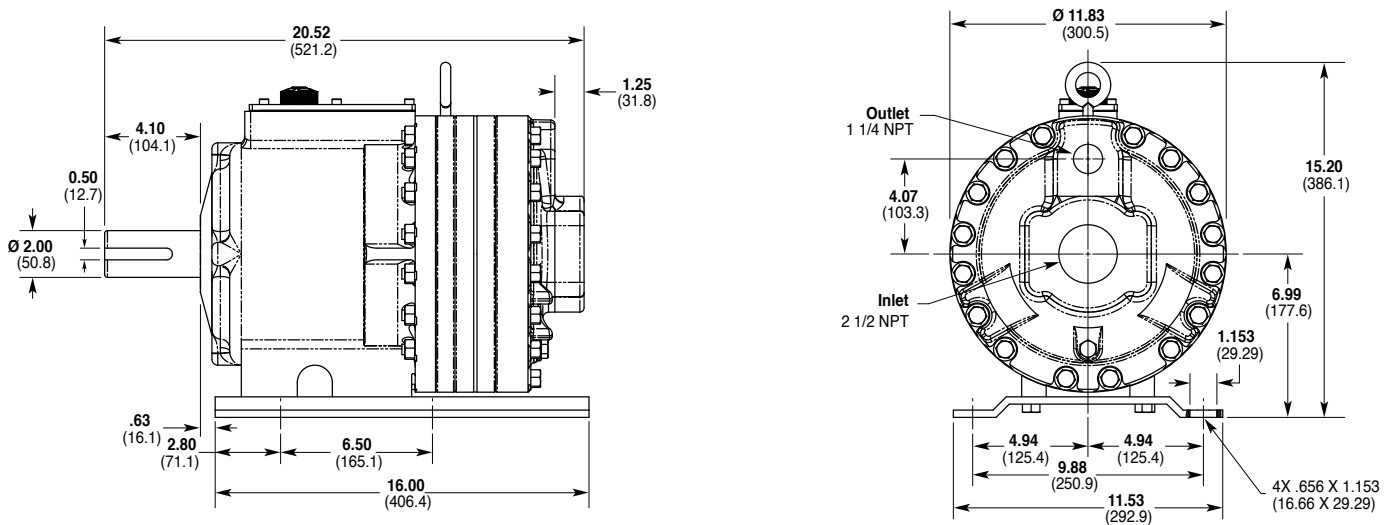
Self-priming:

Each Hydra-Cell pump has different lift capability depending on model size, cam angle, speed, and fluid characteristics. To ensure that your specific lift characteristics are met, refer to the inlet calculations regarding friction, and acceleration head losses in your Hydra-Cell Installation & Service Manual. Compare those calculations to the NPSHr curves above.

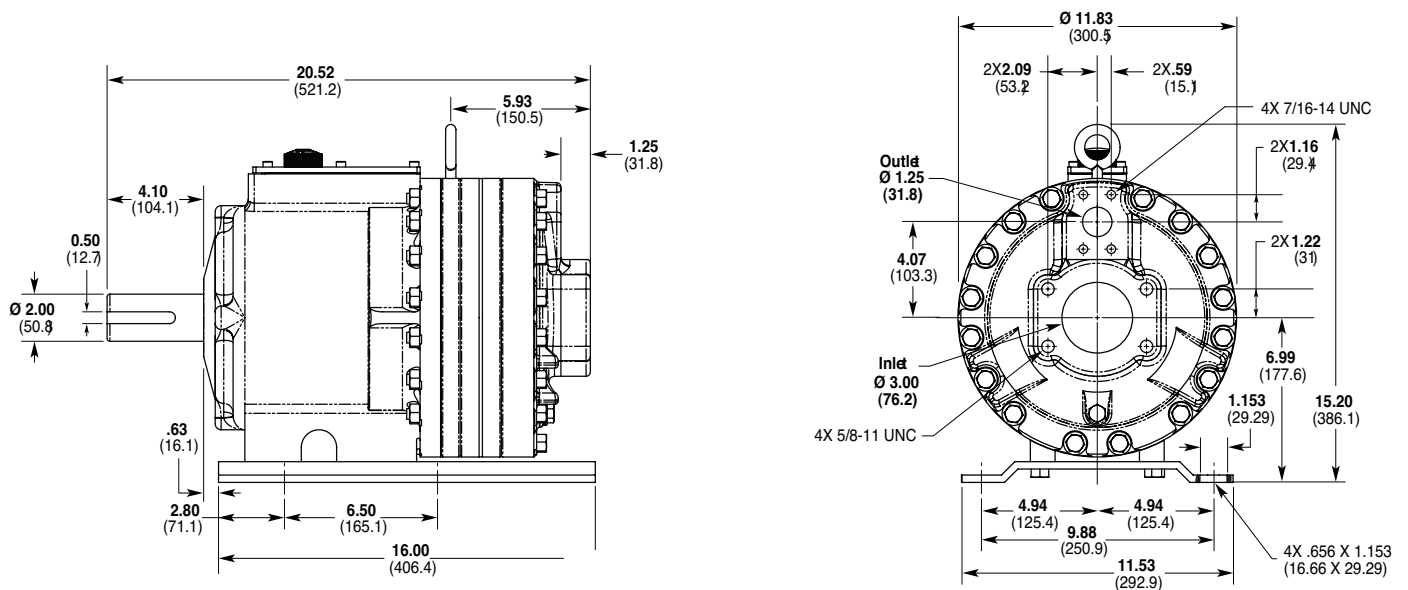
For technical assistance in pump selection, see Frequently Asked Questions on page 142, Design Considerations on page 143, and Installation Guidelines on pages 144-145.

D35 Series Representative Drawings

D35 Models with NPT Inlet/Outlet Ports Inches (mm)



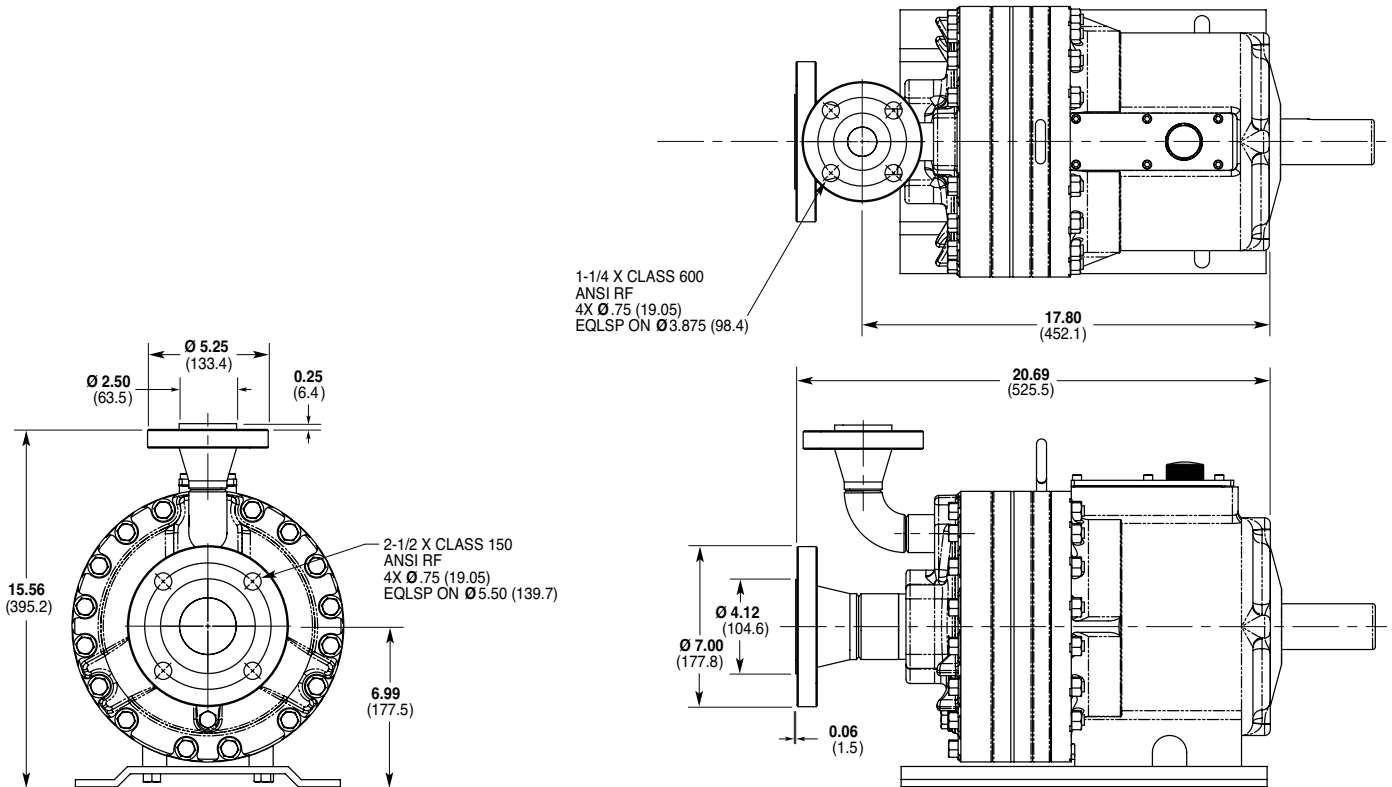
D35 Models with SAE Flange Inlet/Outlet Ports Inches (mm)



Note: Contact factory for additional drawings of specific models and configurations.

D35 Series Representative Drawings

D35 Models with ANSI Flange Inlet/Outlet Ports Inches (mm)



Valve Selection

A seal-less C64 Pressure Regulating Valve is recommended for Hydra-Cell D35 pumping systems, especially for high-pressure requirements or when handling dirty fluids. See page 82 for more information.



A C24 Pressure Regulating Valve provides a capable, lower-cost alternative to C63 valves for Hydra-Cell D35 pumping systems. See page 78 for more information.



D35 Series How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete D35 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: D35XKBTHFECA.

Digit	Order Code	Description
1-3	D35	Pump Configuration Shaft-driven (NPT Ports or SAE or ANSI Flanges)
4	X E	Hydraulic End Cam Max 36.5 gpm (138 l/min) @ 1050 rpm Max 34.0 gpm (129 l/min) @ 1150 rpm
5	K E	Pump Head Version Kel-Cell NPT Ports or ANSI Flanges Kel-Cell SAE Flanges
6	B C G Q R S T	Pump Head Material Brass Cast Iron (Nickel-plated) Duplex Alloy 2205 (with Hastelloy C followers & follower screws) 316L Stainless Steel ANSI flange class 600 x 1500 316L Stainless Steel ANSI flange class 150 x 600 316L Stainless Steel - threaded or SAE ports Hastelloy CW12MW
7	A E G J P T	Diaphragm & O-ring Material Atlas diaphragm / PTFE o-ring EPDM (requires EPDM-compatible oil - Digit 12 oil code D) FKM PTFE (available with E cam only; 1050 rpm max.) Neoprene Buna-N
8	C D H N T	Valve Seat Material Ceramic Tungsten Carbide 17-4 Stainless Steel Nitronic 50 Hastelloy C
9	C D F N T	Valve Material Ceramic Tungsten Carbide 17-4 Stainless Steel Nitronic 50 Hastelloy C

Digit	Order Code	Description
10	E H T	Valve Springs Elgiloy 17-7 Stainless Steel Hastelloy C
11	C H M P T Y	Valve Spring Retainers Celcon 17-7 Stainless Steel PVDF Polypropylene Hastelloy C Nylon (Zytel)
12	A B D E G H	Hydra-Oil 10W30 standard-duty oil 40-wt for continuous-duty oil (use with 316L SST or Hastelloy CW12MW pump head - standard) EPDM-compatible oil Food-contact oil 5W30 cold-temp severe-duty synthetic oil 15W50 high-temp severe-duty synthetic oil

D35 Pump Housing is standard as Cast Aluminum. Upgrade to Ductile Iron available.

Note: For motors, bases, couplings and other pump accessories, refer to the Accessories section beginning on page 86.

C Series Valves Selection Guide

Pressure Regulating Valves



C20 Series
Page 78



C46 Series
Page 80



C60 Series
(Seal-less Valves)
Page 82

Air Bleed Priming Valves



C80 Series
Page 84

C Series Pressure Regulating Valves

Versatile Application for Positive Displacement Pumps

Designed for use with any positive displacement pump, Hydra-Cell C Series pressure regulating valves bypass system fluid to prevent excess system pressure. They can also be used as pressure relief valves.

When a system discharge is completely closed (e.g. closed spray gun, closed valve, plugged nozzle) the Hydra-Cell valve bypasses the total system fluid flow. The valves also balance system pressure for multiple-gun operations.

Seal-less Diaphragm



C60 Series valves feature a seal-less diaphragm with a tapered plunger, making the valves ideal for high-pressure requirements and handling dirty fluids.

Design Advantages



Tapered design of the C20 Series valves plunger.

The valve design is based on using a simple tapered plunger with a valve seat. When excess pressure overcomes the adjustable spring pressure on the plunger, the plunger lifts off the seat, allowing fluid to bypass and reduce system pressure.

When the valve is mounted in the discharge line, its modified flow-through design reduces wear on the plunger and seat. Baffles on either side of the plunger and seat extend valve life by directing flow around these critical components.

Performance Advantages

- Accurate and repeatable
- Adjustable
- Immediate response
- Smooth, chatter-free bypass
- No external springs or moving parts
- Flow-through design with minimal pressure surge
- Heavy-duty construction

Easy to Service

Hydra-Cell C Series valves can be serviced in place without removing any fittings or plumbing. Simply remove the top of the body and replace any worn internal components.



The model C62 seal-less valve is the most frequently specified pressure regulating valve in a Hydra-Cell pumping system.

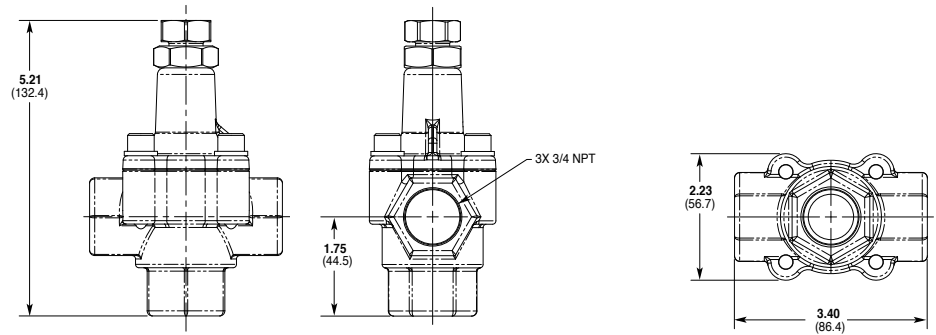
C20 Series Valves

Dimensions

C22 with 3/4" NPT Ports Inches (mm)



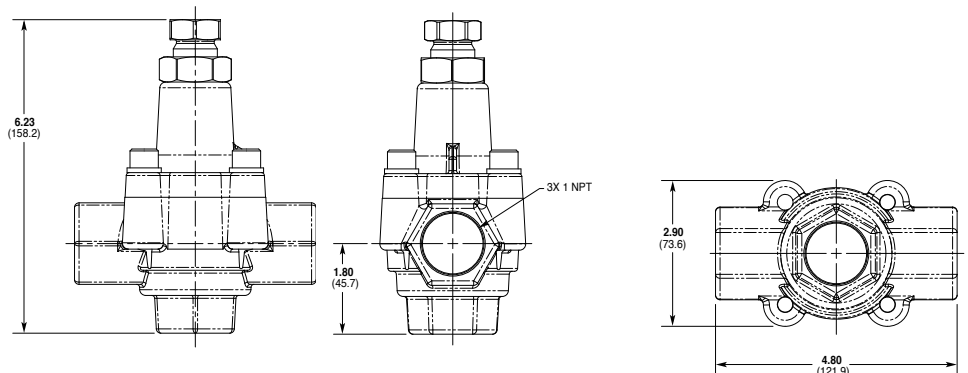
C22 valve with Brass body



C23 with 1" NPT Ports Inches (mm)



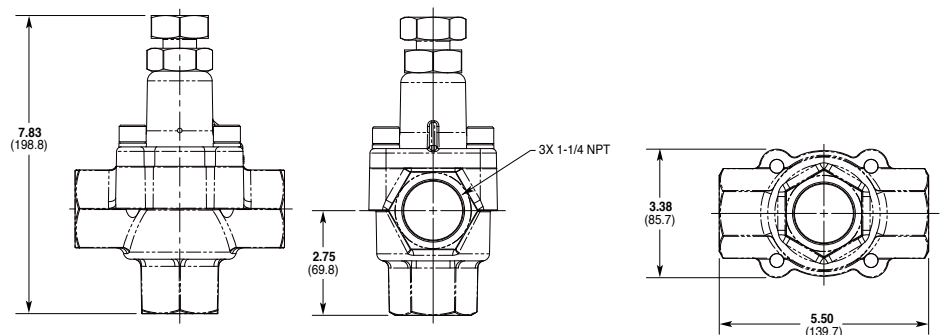
C23 valve with Stainless Steel body



C24 with 1-1/4" NPT Ports Inches (mm)



C24 valve with Brass body



C20 Series Valves How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11
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A complete C22, C23 or C24 Model Number contains 11 digits of customer-specified design options, for example: C22AABNSSEF.

Digit	Order Code	Description
1-4	Valve Configuration & Capacities	
	C22A	3-10 gpm (11.3-37.8 l/min) NPT Ports
	C23A	3-20 gpm (11.3-75.7 l/min) NPT Ports
	C24A	5-40 gpm (18.9-151.4 l/min) NPT Ports
5	Pressure Range (Spring Selection)	
	A	75-500 psi (5-34 bar)
	B	500-1000 psi (34-69 bar)
	C	1000-1500 psi (69-103 bar)
6	Body/Top Material	
	B	Brass/Plated Steel
	H	Hastelloy C/Plated Steel
	S	316L Stainless Steel/Plated Steel
	Seals/Back-up Seals	
7	A	Urethane/UHMW Polyethylene
	B	FKM/UHMW Polyethylene
	E	EPDM/PTFE
	N	Buna-N/Buna-N
	V	FKM/PTFE
8	Valve Seats	
	H	Hastelloy C
	R	316L Stainless Steel
	S	17-4 Stainless Steel
	T	Tungsten Carbide
9	Plungers	
	H	Hastelloy C
	R	316L Stainless Steel
	S	17-4 Stainless Steel
	T	Tungsten Carbide
10	Seat Size	
	E	For C22 Models
	J	For C23 Models
	N	For C24 Models
11	Port Size	
	E	For C22 Models (3/4")
	G	For C23 Models (1")
	H	For C24 Models (1-1/4")

For reference on identifying metallic components of C20 Series plungers and plunger valve seats, see page 146.

Ratings and Specifications

Flow Capacity Model	Maximum		Minimum	
	gpm	l/min	gpm	l/min
C22	10.0	37.8	3.0	11.3
C23	20.0	75.7	3.0	11.3
C24	40.0	151.4	5.0	18.9

Pressure Range (All Models)	Model Configuration		
	AA	AB	AC
psi	75-500	500-1000	1000-1500
bar	5-34	34-69	69-103

Max. Temperature	200 °F (93 °C)
------------------	----------------

Inlet & Outlet Ports	
C22	3/4" NPT
C23	1" NPT
C24	1-1/4" NPT

Weight	
C22	3 lbs. (1.3 kg)
C23	6 lbs. (2.7 kg)
C24	10 lbs. (4.5 kg)

C20 Series valves can be used as a lower-cost alternative to C60 Series seal-less valves when higher discharge pressures are not required.

C22 valves are used with Hydra-Cell models D10 and D12.

C23 valves are used with Hydra-Cell model H25.

C24 valves are used with Hydra-Cell model D35.

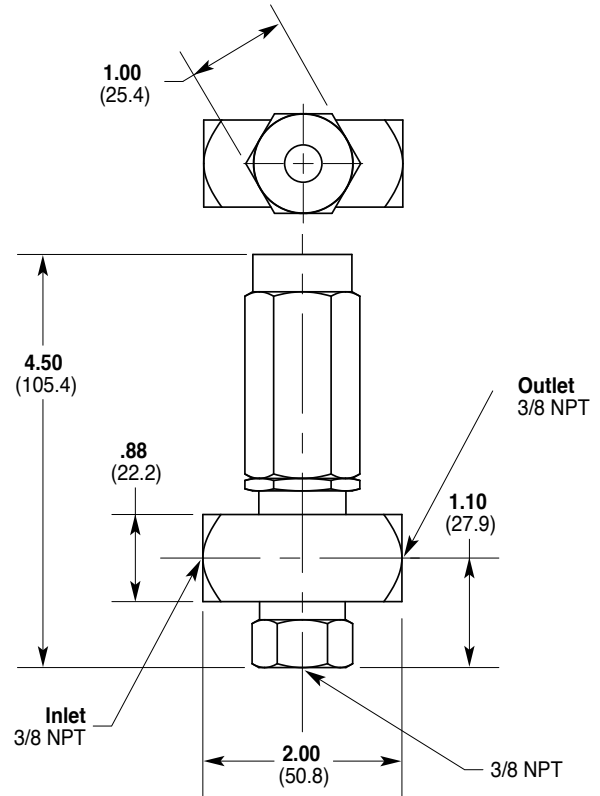
C46 Series Valves

Dimensions



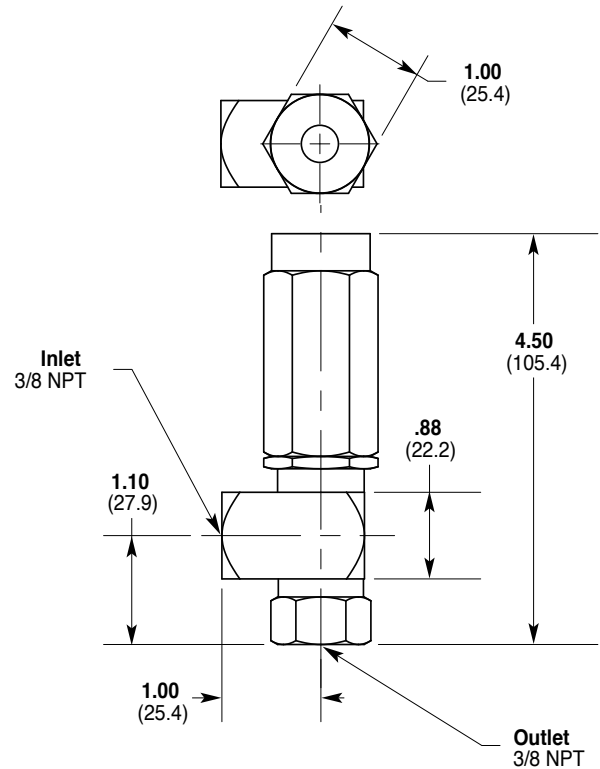
C46 In-line with Brass body

C46 for In-Line Mount with 3/8" NPT Ports Inches (mm)



C46 Off-line with Stainless Steel body

C46 for Off-Line Mount with 3/8" NPT Ports Inches (mm)



C46 Off-line with Brass body

C46 Series Valves How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11
---	---	---	---	---	---	---	---	---	----	----

A complete C46 Model Number contains 11 digits of customer-specified design options, for example: C46AABESSEE.

Digit	Order Code	Description
1-3		Valve Configuration & Capacities
	C46	0.2-10 gpm (1-37.8 l/min) NPT Ports
4		Mounting Design
	A	In-line (Brass only)
	B	Off-line (Brass or Stainless Steel)
5		Pressure Range (Spring Selection)
	A	Low Spring: 50-500 psi (3-34 bar)
	B	Medium Spring: 100-900 psi (7-62 bar)
	C	Standard Spring: 200-1500 psi (13-103 bar)
6		Body Material
	B	Brass
	S	316L Stainless Steel (Off-line models only)
7		O-rings
	E	EPDM
	N	Buna-N
	V	FKM
8		Piston
	S	316L Stainless Steel
9		Seat
	S	316L Stainless Steel
10		Seat Size
	E	For C46 Models
11		Port Size
	E	For C46 Models (3/8" NPT)

Ratings and Specifications

Flow Capacity Model	Maximum		Minimum	
	gpm	l/min	gpm	l/min
C46 In-line	7.0	26.5	0.2	1.0
C46 Off-line	10.0	37.8	0.2	1.0
Pressure Range				
Low Spring	50-500 psi (3-34 bar)			
Medium Spring	100-900 psi (7-62 bar)			
Standard Spring	200-1500 psi (13-103 bar)			
Max. Temperature	200° F (93° C)			
Inlet & Outlet Ports	3/8" NPT			
Weight	12 oz. (0.33 kg)			

C46 Series valves are used with Hydra-Cell models F20, F21, F22, M03, D03, and M03 Mono-Block.

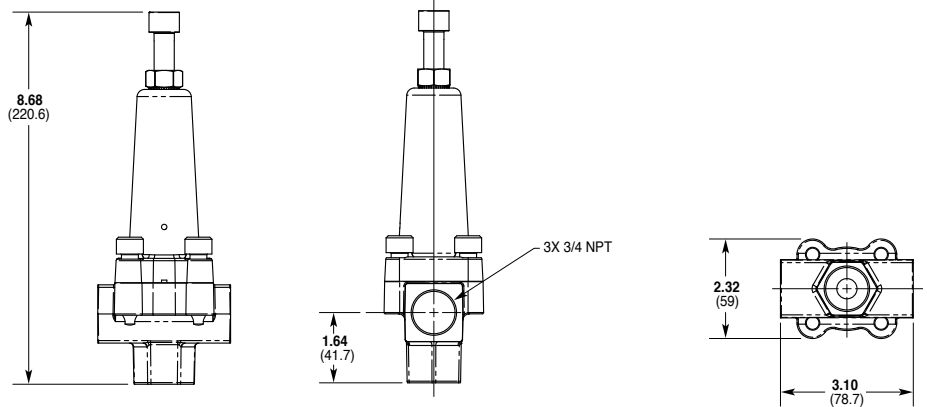
C60 Series Valves

Dimensions



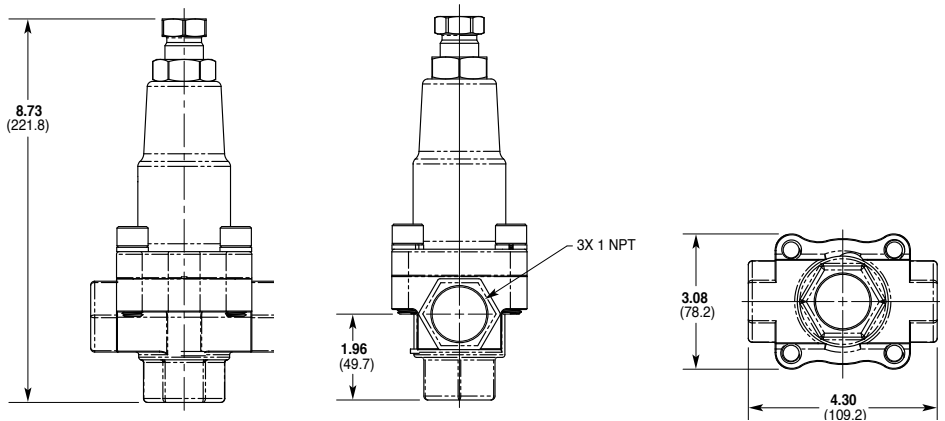
C62 valve with Stainless Steel body

C62 with 3/4" NPT Ports Inches (mm)



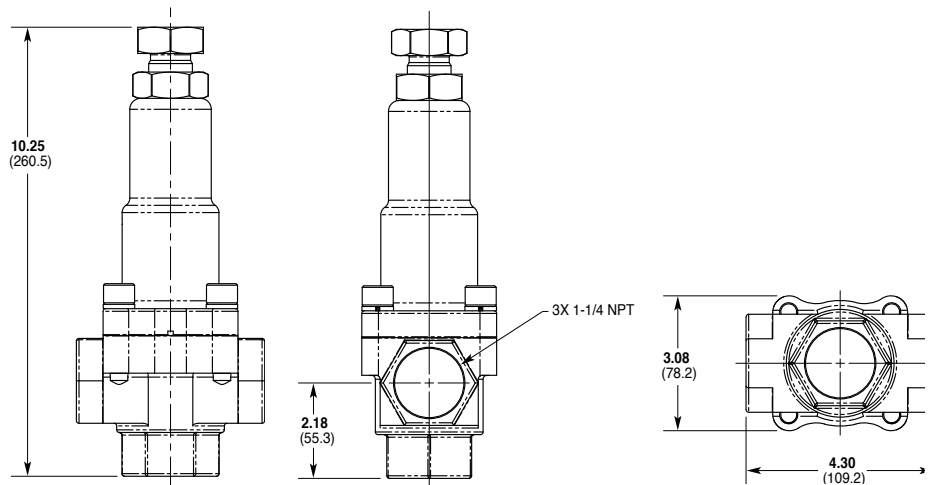
C63 valve with Brass body

C63 with 1" NPT Ports Inches (mm)



C64 valve with Stainless Steel body

C64 with 1-1/4" NPT Ports Inches (mm)



C60 Series Valves How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11
---	---	---	---	---	---	---	---	---	----	----

A complete C62, C63 or C64 Model Number contains 11 digits of customer-specified design options, for example: C62ABBVSSEF.

Digit	Order Code	Description
1-3		Valve Configuration & Capacities
	C62	1-14 gpm (3-53.0 l/min) NPT Ports
	C63	1-25 gpm (3-94.6 l/min) NPT Ports
	C64	1-40 gpm (3-151.4 l/min) NPT Ports
4		Inlet/Outlet Ports
	A	NPT Threaded Ports
5		Pressure Range (Spring Selection)
	A	C62: 75-500 psi (5-34 bar) C63: 75-1000 psi (5-69 bar) C64: 75-1000 psi (5-69 bar)
	B	C62: 500-2500 psi (34-172 bar) C63: 1000-2500 psi (69-172 bar) C64: 1000-2500 psi (69-172 bar)
6		Body/Top Material
	B	Brass/Plated Steel
	H	Hastelloy C/Plated Steel
	S	316L Stainless Steel/Plated Steel
7		O-rings/Diaphragm
	J	PTFE/PTFE
	V	FKM/PTFE
8		Valve Seats
	H	Hastelloy C
	R	316L Stainless Steel
	S	17-4 Stainless Steel
	T	Tungsten Carbide
9		Plungers
	H	Hastelloy C
	R	316L Stainless Steel
	S	17-4 Stainless Steel
	T	Tungsten Carbide
10		Seat Size
	E	For C62 Models
	J	For C63 Models
	N	For C64 Models
11		Port Size
	F	For C62 Models (3/4")
	G	For C63 Models (1")
	H	For C64 Models (1-1/4")

Ratings and Specifications

Flow Capacity Model	Maximum		Minimum	
	gpm	l/min	gpm	l/min
C62	14.0	53.0	1.0	3.8
C63	25.0	94.6	1.0	3.8
C64	40.0	151.4	1.0	3.8

Pressure Range	Model Configuration		
	psi	AA	AB
C62	75-500	500-2500	
C63	75-1000	1000-2500	
C64	75-1000	1000-2500	

Max. Temperature 200 °F (93 °C)

Inlet & Outlet Ports	
C62	3/4" NPT
C63	1" NPT
C64	1-1/4" NPT

Weight	
C62	4.0 lbs. (1.8 kg)
C63	6.2 lbs. (2.8 kg)
C64	7.2 lbs. (3.3 kg)

C62 valves are recommended for Hydra-Cell models D04, D10, D12, and D15/D17.

C63 valves are recommended for Hydra-Cell model H25.

C64 valves are recommended for Hydra-Cell model D35.

Notes:

C62 valves fitted with Tungsten Carbide rated to 1800 psi (124 bar) maximum.

Hastelloy C Body and Tungsten Carbide Plunger/Seat options available only for C62 models.

C80 Series Valves

Air Bleed Priming Valves

C80 Series valves provide an effective air/vapor release mechanism for diaphragm pump systems.

The valve automatically creates an open port to atmosphere for the pumping system. This allows the pump to clear air or vapors from the pump head and discharge plumbing rather than compressing the gas and reducing flow. The valve then closes to develop full system pressure immediately.

- Design is simple and reliable
- Easy to install and maintain
- Mounts vertically or horizontally
- Heavy-duty construction
- Available in a choice of materials and flow ranges to suit your application



C80 with Brass body



C80 with Stainless Steel body

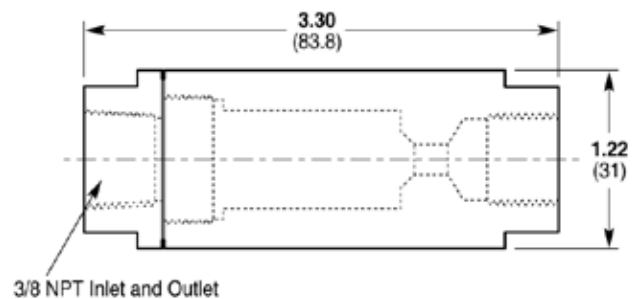


C80 with PVDF body



Detail of valve components. The C80 Series Air Bleed valves are used with Hydra-Cell models F20, M03, D04, D10 and D12.

Dimensions Inches (mm)



C80 Series Valves How to Order

Ordering Information



A complete C80 Series Model Number contains 9 digits of customer-specified design options, for example: C80AAHBEB.

Digit	Order Code	Description
1-3		Valve Configuration & Capacities
	C80	1.4-10 gpm (5.3-37.8 l/min) NPT Ports
4		Mounting Design
	A	3/8" NPT
5-6		Flow Range (Spring Selection)
	A-H	1.4-3 gpm (5.3-11.4 l/min) / Hastelloy spring
	B-H	2.4-5 gpm (9.1-18.3 l/min) / Hastelloy spring
	C-H	4.6-7 gpm (17.4-26.5 l/min) / Hastelloy spring
	D-H	6.5-10 gpm (24.6-37.8 l/min) / Hastelloy spring
	D-E	6.5-10 gpm (24.6-37.8 l/min) / Elgiloy spring
7		Body Material
	B	Brass
	H	Hastelloy C
	M	PVDF (250 psi; 17 bar maximum pressure)
	S	316L Stainless Steel
8		O-rings
	E	EPDM
	N	Buna-N
	P	Neoprene
	V	FKM
9		Poppet
	B	Brass
	H	Hastelloy C276
	S	17-4 Stainless Steel

Ratings and Specifications

Flow Capacity Configuration	Maximum		Minimum	
	gpm	l/min	gpm	l/min
A-H	3.0	11.4	1.4	5.3
B-H	5.0	18.3	2.4	9.1
C-H	7.0	26.5	4.6	17.4
D-H	10.0	37.8	6.5	24.6
D-E	10.0	37.8	6.5	24.6

Pressure Range

Metallic Units	75-2500 psi	(5-172 bar)
Non-metallic Units	75-250 psi	(5-17 bar)

Max. Discharge

Pressure Required 75 psi (5 bar)

Max. Temperature 200° F (93° C)

Inlet & Outlet Ports 3/8" NPT

Weight

Brass	1.0 lbs.	(0.45 kg)
Stainless Steel	1.0 lbs.	(0.45 kg)
PVDF	0.3 lbs.	(0.14 kg)

Hydra-Cell® Pumps Accessories and Options



As part of our “Mass Customization” approach, Hydra-Cell pumps are available with a variety of in-stock accessories and options to provide a pumping system ideally suited to your installation and application.

Note: Accessories in this section apply to Hydra-Cell F Series, M Series, D Series, and H Series pumps as well as Hydra-Cell P Series metering pumps. Additional information about metering pump accessories can be found on page 140.

Accessory/Option	Page
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Couplings



Couplings with sleeves are available in a wide range of motor sizes for Hydra-Cell pumping systems.

Coupling Selection Guide

When selecting a coupling, note that horsepower (hp) values are for reference only under normal pump operation within rated specification. Please consult factory for critical performance or harsh-duty applications.

Coupling Series	Bore Ø (in.)	Maximum hp @ Designated Speed (rpm)		Part Number
		1750	1150	
M24	5/8 x 5/8	4.0	2.6	A04-024-1201
	5/8 x 7/8			A04-024-1202
	5/8 x 24 mm			A04-024-1203
	7/8 x 24 mm			A04-024-1204
	7/8 x 7/8			A04-024-1205
M28	5/8 x 5/8	9.1	5.8	A04-028-1201
	5/8 x 7/8			A04-028-1202
	5/8 x 1-1/8			A04-028-1203
	7/8 x 7/8			A04-028-1204
	7/8 x 1-1/8			A04-028-1205
	7/8 x 24 mm			A04-028-1206
	7/8 x 28 mm			A04-028-1208
M38	7/8 x 1-1/8	16.1	10.4	A04-038-1202
	7/8 x 1-3/8			A04-038-1203
	1-1/8 x 1-1/8			A04-038-1204
	1-1/8 x 1-3/8			A04-038-1205
M42	1-1/8 x 1-1/8	20.4	13.3	A04-042-1201
	1-1/8 x 1-3/8			A04-042-1202
	1-1/8 x 1-5/8			A04-042-1203
M48	1-1/8 x 1-1/8	28.3	20.2	A04-048-1201
	1-1/8 x 1-3/8			A04-048-1202
	1-1/8 x 1-5/8			A04-048-1203
	1-1/8 x 1-7/8			A04-048-1204
M65	1-1/8 x 2-1/8	84.5	50	A04-065-1201
	1-5/8 x 2			A04-065-1202
	1-7/8 x 2			A04-065-1203
	2 x 2-1/8			A04-065-1204
	1-3/8 x 2			A04-065-1205

Pump & Motor Size Reference

Pump Model	Pump Shaft Ø (in.)
F20	5/8
F21	5/8
F22	5/8
M03/D03*	7/8
D04	7/8
D10	7/8
D12	7/8
D15	1-1/8
D17	1-1/8
H25	1-1/8
D35	2

* Includes Mono-Block

Nominal Motor hp at Designated Speed (rpm)	Motor Frame Size	Motor Shaft Ø (in.)
1/4 to 1	56C	5/8
1-1/2	143T	7/8
2	145T	7/8
3	182T	1-1/8
5	184T	1-1/8
7-1/2	213T	1-3/8
10	215T	1-3/8
15	254T	1-5/8
20	256T	1-5/8
25	284T	1-7/8
30	286T	1-7/8
-	324T	2-1/8
-	326T	2-1/8

Motors

Motors provide the rotary action that engages the shaft of a Hydra-Cell pump or operates the gear reducer on a Hydra-Cell Metering Solutions pump. A motor for a specific pump is selected based on the horsepower (hp), revolutions per minute (rpm), and turndown ratio required for the application (performance criteria) in gallons per minute (gpm) or liters per minute (l/min).

Selection Process

1. On the pump model (e.g. M03, D10, H25) "Performance" page for your pump, locate the Maximum Flow at Designated Pressure (gpm or l/min) for your application.
2. On the pump model "Specifications" page for your pump, locate the formula for Calculating Required Power (hp or kW) and plug in the rpm, gpm (or l/min) and psi (or bar).
3. Using the motor selection charts in this section (based on required hp and corresponding motor frame for your model) match the required rpm (1200 or 1800) with the correct turndown ratio for your pump.



Model M03 with TEFC motor



Model H25 with C-face motor and direct-drive adapter

Motors, NEMA 56C Frame, Footed, 1 Phase

HP	RPM	Frame	Part Number	Enclosure	Voltage/Hz	Shipping Weight (lbs.)
1/2	1800	56C	M50TE18F1P56CLO	TEFC	115-230/60	23
3/4	1800	56C	M75TE18F1P56CLO	TEFC	115-230/60	30
1	1800	56HC	M100TE18F1P56CLO	TEFC	115-230/60	31
1-1/2	1800	56HC	M150TE18F1P56CLO	TEFC	115-230/60	40

Motors, NEMA 56C Frame, Footed, 3 Phase

HP	RPM	Frame	Part Number	Turndown Ratio (CT)	Enclosure	Voltage/Hz	Shipping Weight (lbs.)
1/2	1800	56C	M50TE18F3P56CA3	10:1	TEFC	230-460/60	35
	1800	56C	M50TN18F3P56CA5	1000:1	TENV	230-460/60	24
	1200	56C	M50TE12F3P56CA3	10:1	TEFC	230-460/60	42
3/4	1800	56C	M75TE18F3P56CA3	10:1	TEFC	230-460/60	35
	1200	56C	M75TE12F3P56CA3	10:1	TEFC	230-460/60	42
1	1800	56C	M100TE18-3P56C	0	TEFC	230-460/60	28
	1800	56C	M100TE18F3P56CA3	10:1	TEFC	230-460/60	29
	1800	56C	M100TN18F3P56CA5	1000:1	TENV	230-460/60	41
	1200	56C	M100TE12-3P56C	10:1	TEFC	230-460/60	42
1-1/2	1800	56C	M150TE18F3P56CA3	10:1	TEFC	230-460/60	48
	1800	56C	M150WD18F3P56CA5	1000:1	TENV	230-460/60	34
2	1800	56C	M200TE18F3P56CA2	4:1	TEFC	230-460/60	45
	1800	56C	M200TE18F3P56CA3	10:1	TEFC	230-460/60	49

Note: Contact factory for hazardous-location motors.

Motors

Motors, C-Face, Footed, 3 Phase

- Totally enclosed fan-cooled (TEFC), continuous-duty, 230/460 V, 60 Hz, 3-phase, 1.15 S.F.
- Cast Iron construction
- 10:1 rated motors are NEMA Premium Efficiency
- Class “F” insulation
- 50 Hz Data on Nameplate - 190/380V at 1.0 S.F.
- UL Recognized with CE mark on label.

HP	RPM	Frame	Part Number	Turndown Ratio (CT)	Shipping Weight (lbs.)
1	1800	143TC	M100TE18F3P143TCA3	10:1	50
	1200	145TC	M100TE12F3P145TCA3	10:1	92
1-1/2	1800	145TC	M150TE18F3P145TCA3	10:1	80
	1200	182TC	M150TE12F3P182TCA3	10:1	122
2	1800	145TC	M200TE18F3P145TCA3	10:1	85
	1200	184TC	M200TE12F3P184TCA3	10:1	134
3	1800	182TC	M300TE18F3P182TCA3	10:1	137
	1200	213TC	M300TE12F3P213TCA3	10:1	166
5	1800	184TC	M500TE18F3P184TCA3	10:1	135
	1200	215TC	M500TE12F3P215TCA3	10:1	212
7-1/2	1800	213TC	M750TE18F3P213TCA3	10:1	202
	1200	254TC	M750TE12F3P254TCA3	10:1	317
10	1800	215TC	M1000TE18F3P215TCA3	10:1	221
	1200	256TC	M1000TE12F3P256TCA3	10:1	342
15	1800	254TC	M1500TE18F3P254TCA3	10:1	318
	1200	284TC	M1500TE12F3P284TCA3	10:1	532
20	1800	256TC	M2000TE18F3P256TCA3	10:1	397
	1200	286TC	M2000TE12F3P286TCA3	10:1	522
25	1800	284TC	M2500TE18F3P284TCA3	10:1	512
	1200	324TC	M2500TE12F3P324TCA3	10:1	747
30	1800	286TC	M3000TE18F3P286TCA3	10:1	547
	1200	326TC	M3000TE12F3P326TCA3	10:1	777

Motors, Footed, 3 Phase

- Totally enclosed fan-cooled (TEFC), continuous-duty, 230/460 V, 60 Hz, 3 phase, 1.15 S.F.
- Cast Iron construction
- 10:1 rated motors are NEMA Premium Efficiency
- Class “F” insulation
- 50 Hz Data on Nameplate - 190/380V at 1.0 S.F.
- UL Recognized with CE mark on label.

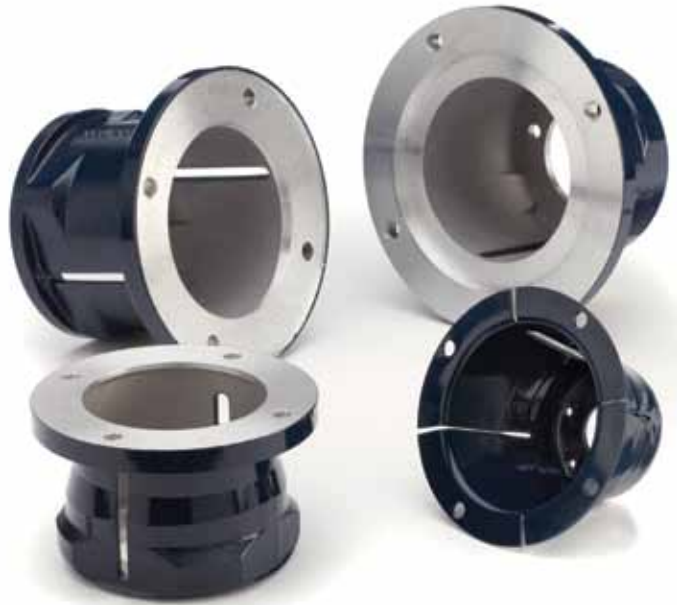
HP	RPM	Frame	Part Number	Turndown Ratio (CT)	Shipping Weight (lbs.)
1	1800	143T	M100TE18F3P143TA3	10:1	48
	1200	145T	M100TE12F3P145TA3	10:1	90
1-1/2	1800	145T	M150TE18F3P145TA3	10:1	78
	1200	182T	M150TE12F3P182TA3	10:1	120
2	1800	145T	M200TE18F3P145TA3	10:1	90
	1200	184T	M200TE12F3P184TA3	10:1	132
3	1800	182T	M300TE18F3P182TA3	10:1	135
	1200	213T	M300TE12F3P213TA3	10:1	164
5	1800	184T	M500TE18F3P184TA3	10:1	133
	1200	215T	M500TE12F3P215TA3	10:1	210
7-1/2	1800	213T	M750TE18F3P213TA3	10:1	200
	1200	254T	M750TE12F3P254TA3	10:1	315
10	1800	215T	M1000TE18F3P215TA3	10:1	219
	1200	256T	M1000TE12F3P256TA3	10:1	340
15	1800	254T	M1500TE18F3P254TA3	10:1	316
	1200	284T	M1500TE12F3P284TA3	10:1	530
20	1800	256T	M2000TE18F3P256TA3	10:1	395
	1200	286T	M2000TE12F3P286TA3	10:1	520
25	1800	284T	M2500TE18F3P284TA3	10:1	510
	1200	324T	M2500TE12F3P324TA3	10:1	745
30	1800	286T	M3000TE18F3P286TA3	10:1	545
	1200	326T	M3000TE12F3P326TA3	10:1	775

Pump Motor Adapters

Pump/Motor Adapter Kits, NEMA

Part Number	Pump Model	Motor Size
A04-005-1200	F21 & F22	56C-145TC
A04-001-1202	D03 & D04	56C-145TC
A04-002-1202	D03 & D04	182TC-215TC
A04-001-1200	D10	56C-143/145TC
A04-002-1200	D10	182/184TC-213/215TC
A04-041-1200	D15/D17 & H25	182TC-256TC
A04-041-1202	D15/D17 & H25	284TC-286TC

Note: Dimensional drawings are shown in each pump model section.



Pump Motor Baseplates and Guards

- Feature heavy-gauge construction
- Ready to assemble - all mounting holes are fully threaded
- Complete package includes all mounting hardware, guards, and shims
- Available for size 56 through 326 NEMA motor frames
- Choice of blue epoxy-powder-coated steel or Grade 304 Stainless Steel baseplates
- Pump, motor, adjustable motor base (for HBD Series), coupling, flange adapter, pulleys, and belt ordered separately
- Customized versions available

HDD Series

Horizontal Direct Drive with Orange Coupling Guard



Designed for Hydra-Cell models D10, D15, H25 and D35. (D10 shown)

HFD Series

Horizontal Direct Drive with Flanged Adapter



Designed for Hydra-Cell models D10, D15 and H25. (D10 shown)

HBD Series

Horizontal Belt Drive with Belt Pulley Guard



Designed for Hydra-Cell models D10, D15, H25 and D35. (D35 shown)

Pump Motor Baseplates and Guards



Required Motor Information		HDD Series Horizontal Direct Drive			HFD Series Horizontal Flanged Adapter Drive			HBD Series Horizontal Belt Drive		
Frame Size	Motor Shaft (in.)	Order Number		Dimensions L x W x H (in.)	Order Number		Dimensions L x W x H (in.)	Order Number		Dimensions L x W x H (in.)
		Steel	SST		Steel	SST		Steel	SST	
D10 Pump Shaft Ø: 7/8" Bases and guards are contour-formed for maximum strength and safety. Steel thickness from 10 to 7 gauge.										
56C	5/8	104-050	104-051	21x11x11	104-052	104-053	21x11x11	104-150	104-151	23x14x12
143T	7/8	104-050	104-051	21x11x11	104-052	104-053	21x11x11	104-150	104-151	23x14x12
145T	7/8	104-050	104-051	21x11x11	104-052	104-053	21x11x11	104-150	104-151	23x14x12
182T	1-1/8	104-000	104-001	22x13x10	104-002	104-003	22x13x12	104-100	104-101	29x16x14
184T	1-1/8	104-000	104-001	22x13x10	104-002	104-003	22x13x12	104-100	104-101	29x16x14
213T	1-3/8	104-030	104-031	25x14x13	104-032	104-033	25x14x13	104-100	104-101	29x16x14
215T	1-3/8	104-030	104-031	25x14x13	104-032	104-033	25x14x13	104-100	104-101	29x16x14
D15 Pump Shaft Ø: 1-1/8" Heavy-duty contour-formed and welded reinforced design. All steel plates 3/16" thick.										
182T	1-1/8	104-830	104-831	30x15x14	104-870	104-871	30x15x14	-	-	-
184T	1-1/8	104-830	104-831	30x15x14	104-870	104-871	30x15x14	-	-	-
213T	1-3/8	104-820	104-821	30x15x14	104-860	104-861	30x15x14	104-890	104-891	39x24x17
215T	1-3/8	104-820	104-821	30x15x14	104-860	104-861	30x15x14	104-890	104-891	39x24x17
254T	1-5/8	104-810	104-811	39x18x18	104-850	104-851	39x18x19	104-880	104-881	39x24x17
256T	1-5/8	104-810	104-811	39x18x18	104-850	104-851	39x18x19	104-880	104-881	39x24x17
284T	1-7/8	104-800	104-801	39x18x20	104-840	104-841	39x18x19	-	-	-
286T	1-7/8	104-800	104-801	39x18x20	104-840	104-841	39x18x19	-	-	-
H25 Pump Shaft Ø: 1-1/8" Heavy-duty contour-formed and welded reinforced design. All steel plates 3/16" thick.										
143T	7/8	-	-	-	-	-	-	104-480	104-481	31x18x17
145T	7/8	-	-	-	-	-	-	104-480	104-481	31x18x17
182T	1-1/8	104-350	104-351	30x15x15	104-380	104-381	30x15x15	104-450	104-451	31x18x17
184T	1-1/8	104-350	104-351	30x15x15	104-380	104-381	30x15x15	104-450	104-451	31x18x17
213T	1-3/8	104-375	104-376	30x15x15	104-380	104-381	30x15x15	104-440	104-441	39x24x17
215T	1-3/8	104-375	104-376	30x15x15	104-380	104-381	30x15x15	104-440	104-441	39x24x17
254T	1-5/8	104-330	104-331	39x18x15	104-304	104-309	39x18x15	104-400	104-401	39x24x17
256T	1-5/8	104-330	104-331	39x18x15	104-304	104-309	39x18x15	104-400	104-401	39x24x17
284T	1-7/8	104-300	104-301	39x18x15	104-304	104-309	39x18x15	-	-	-
286T	1-7/8	104-300	104-301	39x18x15	104-304	104-309	39x18x15	-	-	-
D35 Pump Shaft Ø: 2" Heavy-duty contour-formed and welded reinforced design. All steel plates 1/4" thick.										
182T	1-1/8	-	-	-	-	-	-	104-750	104-751	40x28x19
184T	1-1/8	-	-	-	-	-	-	104-750	104-751	40x28x19
213T	1-3/8	104-660	104-661	48x20x18	-	-	-	104-740	104-741	40x28x19
215T	1-3/8	104-660	104-661	48x20x18	-	-	-	104-740	104-741	40x28x19
254T	1-5/8	104-650	104-651	48x20x18	-	-	-	104-730	104-731	40x28x19
256T	1-5/8	104-650	104-651	48x20x18	-	-	-	104-730	104-731	40x28x19
284T	1-7/8	104-640	104-641	48x20x18	-	-	-	104-700	104-701	40x28x19
286T	1-7/8	104-640	104-641	48x20x18	-	-	-	104-700	104-701	40x28x19
324T	2-1/8	104-600	104-601	48x20x18	-	-	-	-	-	-
326T	2-1/8	104-600	104-601	48x20x18	-	-	-	-	-	-

Controllers

Controllers regulate the motor speed and strokes per minute, providing a flow that is proportional to the motor speed.

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

3 Phase

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

Touch-screen Metering Controller

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

- Features 1/2-hp Variable Frequency Drive (VFD) - larger horsepower drives optionally available
- 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 enclosure (other enclosures available as option) - easy to operate and visible in low-light areas
- Safety features for emergency stop, loss of power, fault monitoring, and optional pump oil temperature probe
- 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
- Includes real-time clock
- Option available to control multiple pumps with one Hydra-Cell “Smart Control”
- Versatile - enables programming for flow rate or totalization



The “Control Freak” provides optimum motor speed based on the user’s desired flow and pressure ratings. Its versatility enables it to be programmed for flow rate or totalization.

Hydra-Oil Lubricants

Hydra-Oil is specially formulated to maximize performance of Hydra-Cell pumps.

- Reduce wear
- Withstand extreme temperature changes
- Improve pump performance
- Extend pump life
- Maintain consistent viscosity
- Withstand extreme pressures

Standard Grades

10W30-weight (Order Code A)

For lower temperatures and lighter loads; maintains viscosity over a wide temperature range and with repeated startups.

40-weight (Order Code B)

For continuous use at higher loads and temperatures; provides exceptional wear resistance and film thickness.

Synthetic Grades

Hydra-Oil synthetic grades are a blend of synthesized hydrocarbon fluids that provide pure chemicals and a heavier, more protective oil film for bearings and pistons.

5W30 (Order Code G)

For stable protection in cold temperatures or severe duty.

15W50 (Order Code H)

For stable protection in high temperatures or severe duty.

Food-contact Grade

The Hydra-Oil food contact grade is specially formulated for food service industry applications. Hydra-Oil SFGO grade 100 is USDA H-1 authorized, certified OU Kosher, and complies with the requirements of FDA 21 CFR 178.3570 and FDA 21 CFR 172.882. This lubricant is a polyalphaolephin based synthetic (PAO) and is suggested for use on equipment in which there may be incidental contact with an edible product.

EPDM-compatible Grades

Hydra-Oil EPDM-compatible grades must be used in all Hydra-Cell pumps containing EPDM diaphragms. These CP-100/150 F lubricants are a custom blend of polyalkylene glycols with additives for oxidation stability, corrosion protection, and high-viscosity index. Low solubility with many different hydrocarbons provides for excellent lubricity. Hydra-Oil EPDM-compatible grades are available in 20-weight (Order Code J) and 30/40-weight (Order Code C or D) and comply with FDA 21 CFR 178.3510 (Lubricants with Incidental Food Contact).



Hydra-Oil Characteristics	Standard Grade		Synthetic Grade		Food Grade	EPDM Compatible
	10W30	40W	5W30	15W50	SFGO-100	20W
Order Code Letter	A	B	G	H	E/F or K	J/C/D
Gravity, API @60°F (16°C)	31.1	28.7	30.4	30.2	36.9	N/A
Flash Point °F (°C)	400 (204)	430 (221)	445 (229)	470 (243)	450 (232)	500 (260)
Fire Point °F (°C)	440 (227)	470 (243)	N/A	N/A	500 (260)	530 (277)
Pour Point °F (°C)	-30 (-34)	10 (-12)	-65 (-54)	-55 (-48)	-45 (-43)	-40 (-40)
Viscosity: SUS @ 100°F (38°C)	360	811	265	556	570	464
	SUS @ 210°F	63	85	60	90	71
Viscosity Index (99°)	148	107	165	170	120	223
Specific Gravity	0.88	0.89	N/A	N/A	N/A	0.992

Hydra-Oil Selection Guide

How to Order with Pump Selection

Hydra-Cell pumps are shipped with the oil reservoir filled with the appropriate Hydra-Oil selected by the customer.

1. Use the Hydra-Cell Characteristics chart on page 94 to select the Hydra-Oil best suited to your application requirements.
2. Use the chart below to select the appropriate oil letter code which corresponds to the 12th digit of the pump model ordering number. (Refer to the How to Order page in the appropriate pump product section.)
3. NOTE: All pumps equipped with EPDM diaphragms must use EPDM-compatible oil.

Oil Recommendation

Pump Model	F20 ¹	M03 ²	D04	D10	D12	D15/D17	H25	D35
Oil Reservoir Capacity								
US Quarts	0.125	1.00	1.10	1.10	1.5	2.2	2.5	5.0
Liters	0.120	0.95	1.05	1.05	1.4	2.1	2.4	4.7
Metallic Pump Head Material								
Standard-duty	G	A	G	A	A	A	A	A
Continuous-duty	G	G	G	B	B	B	B	B
Cold-temperature/Severe-duty	G	G	G	G	G	G	G	G
High-temperature/Severe-duty	G	G	G	G	G	H	H	H
Food-contact	K	K	K	E	E	E	E	F
EPDM-compatible	J	J	J	C	C	-	C	D
Non-metallic Pump Head Material								
Standard-duty	G	A	-	A	-	-	A	-
Continuous-duty	G	G	-	B	-	-	B	-
Cold-temperature/Severe-duty	G	G	-	G	-	-	G	-
High-temperature/Severe-duty	G	G	-	G	-	-	G	-
Food-contact	K	K	-	E	-	-	E	-
EPDM-compatible	J	J	-	C	-	-	C	-

¹ Includes all F20, F21 and F22 models

² Includes all D03, M03, and M03 Mono-Block models

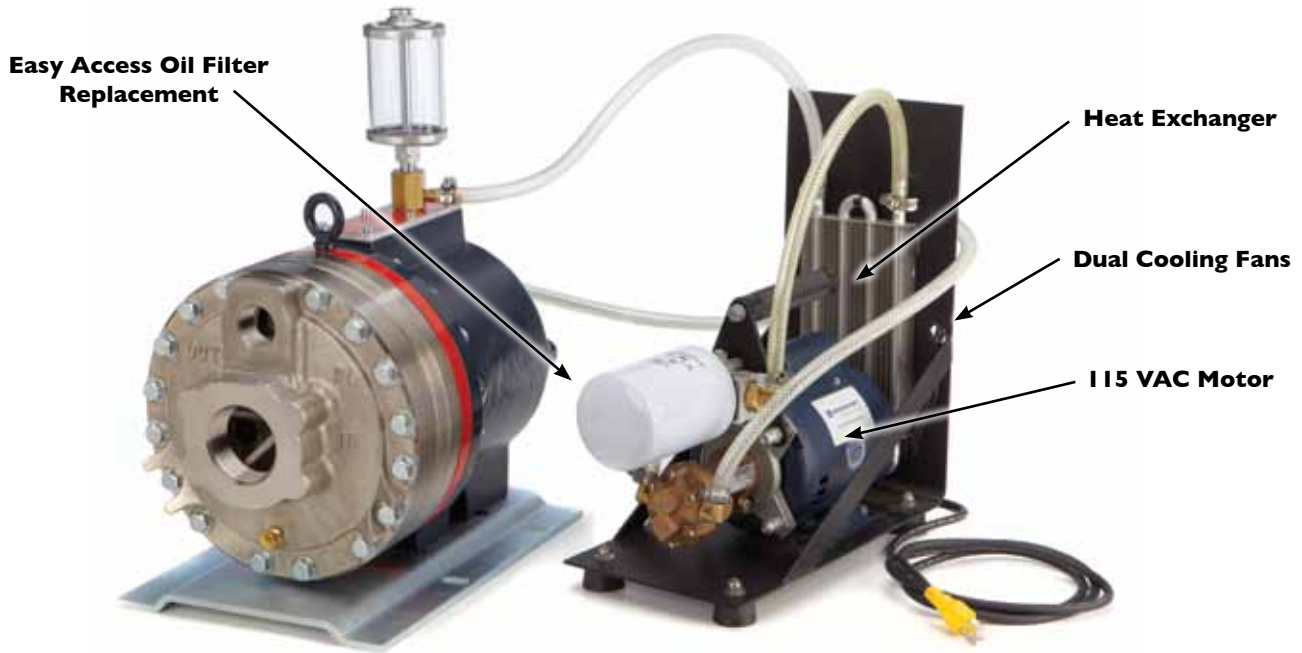
How to Order Separately

Replacement Hydra-Oil is available in quart and 2-1/2 gallon packages.

1. Consult your Hydra-Cell Pump Installation/Service Manual for oil change interval specifications.
2. Use the part numbers in the chart below.

Code Letter	Oil Description	Quart		2-1/2 Gallon	
		Single	6-Pack	Single	Twin-Pack
A	10W30 for standard-duty	A01-114-3430	A01-114-3431	A01-114-3432	A01-114-3433
B	40-wt for continuous-duty	A01-114-3440	A01-114-3441	A01-114-3442	A01-114-3443
C	EPDM-compatible oil	A01-114-3407	-	A01-114-3408	-
D	EPDM-compatible oil	A01-114-3407	-	A01-114-3408	-
E	Food-contact oil	A01-114-3410	-	A01-114-3411	-
F	Food-contact oil	A01-114-3410	-	A01-114-3411	-
G	5W30 cold-temperature severe-duty synthetic oil	A01-114-3415	-	A01-114-3420	-
H	15W50 high-temp severe-duty synthetic oil	A01-114-3416	-	A01-114-3421	-
J	EPDM-compatible oil	A01-114-3407	-	A01-114-3408	-
K	Food-contact oil	A01-114-3410	-	A01-114-3411	-

Oil Cooler and Filter System



Hydra-Cell Oil Cooler and Filter Systems enable Hydra-Cell pumps to operate cooler in order to extend oil life and reduce bearing wear. This helps maximize performance and reliability in some of the toughest industrial and process applications. They are easy to install and available with all Hydra-Cell models except the F20, P100, and T80 Series models. (D35 shown)

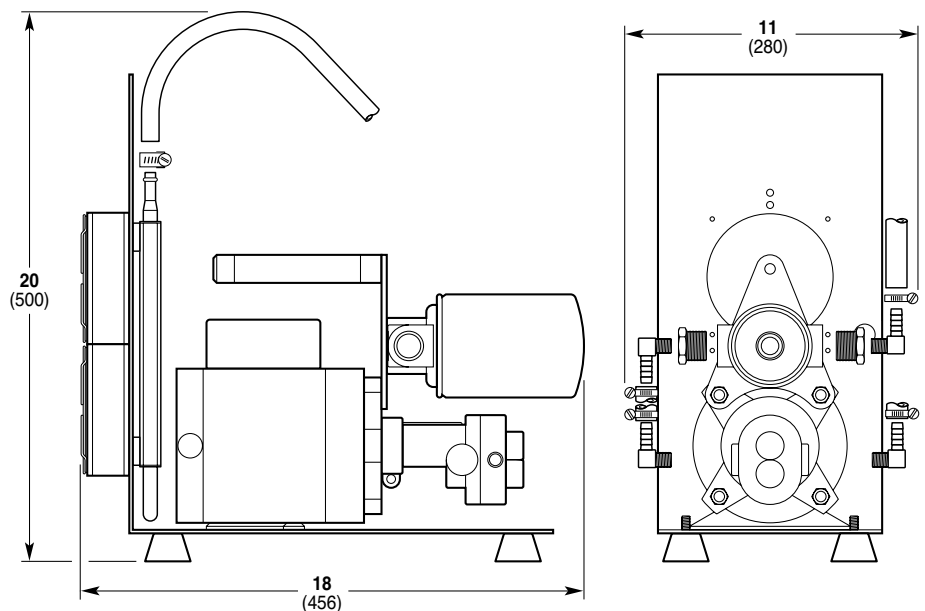
- Reduces the typical oil operating temperature by up to 30°F (16°C)
- Lessens the impact of pumping high-temperature fluids
- Offers greater longevity for pump components when combined with a filtration system built into the cooling loop
- Extends oil life, reducing the need for oil changes
- Packaged system includes all necessary fittings, hoses, adapters, hardware and mounting materials for installation

Oil Cooler & Filter System

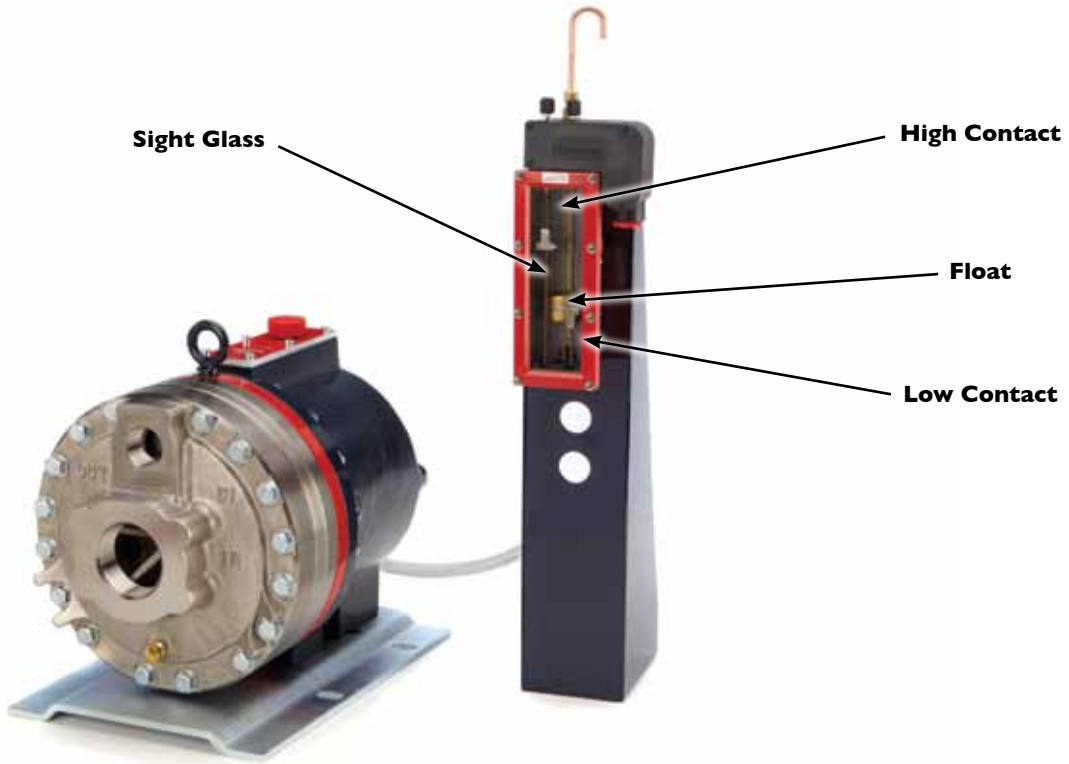
Power	Part Number
60 Hz, 115 VAC	103-100
50 Hz, 230 VAC	103-150

Specify pump when ordering.

Dimensions Inches (mm)



Oil Level Monitoring Mounting Kits



The Hydra-Cell Oil Level Monitoring Kit uses a Murphy SWICHGAGE Model L129CK1, which is field-proven to detect the crank case oil levels and is well-suited to detect oil levels for Hydra-Cell pumps except the F20, P100, and T80 Series models. (D35 shown)

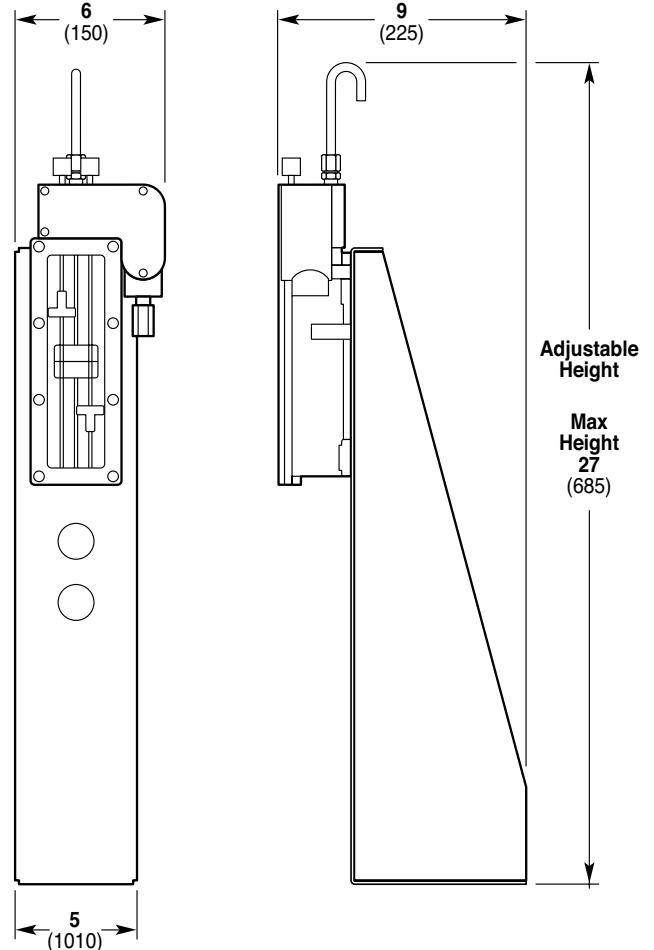
- Detects changes to the oil level in the pump to minimize costly interruptions in the process and avoid potential pump damage
- Ideal for remote or critical industrial applications, such as oil fields, paper mills and automotive plants
- Compact, rugged, and ready to use when supplied with a Murphy SWICHGAGE (ordered separately)
- Adjustable height to accommodate installation options

Oil Level Monitoring Mounting Kit

Description	Part Number
Mounting Kit	103-000
Murphy SWICHGAGE®	103-010

SWICHGAGE® is a registered trademark of Frank W. Murphy MFR.

Dimensions Inches (mm)



Oil Reservoir Sight Bottles

Oil reservoir assemblies screw in easily where the oil fill cap is located on all Hydra-Cell pump models (except for the F20 Series).

Hydra-Cell pumps equipped with an oil reservoir provide additional volume for oil expansion and allow for quick visual monitoring of the oil level and its condition.

Three different bottles are available, including a 12-oz bottle with a low-level float switch that outputs a low voltage signal if the oil level in the pump housing drops.

Bottle Assemblies

Description	Part Number
12-oz (474 ml) volume sight bottle	A01-116-3400
12-oz (474 ml) volume sight bottle with low-level float switch	A01-116-3410
4-oz (119 ml) volume sight bottle	A01-116-3500



Vacuum Priming Kit

The Hydra-Cell Vacuum Priming Kit provides for a quick and easy way to prime the hydraulic pistons after diaphragm replacement. The tool assembly is attached to the hydraulic end housing through the oil cap and pulls a vacuum, removing air from behind the diaphragms. Priming can be accomplished while the pump remains in place.

Description	Part Number
Vacuum Priming Kit	A03-130-1200



Priming Plugs

PVC priming plugs are used to assist in priming the hydraulic cells in Hydra-Cell pumps equipped with Kel-Cell technology. They are available in a variety of sizes with and without air valves.

Description	Part Number
NPT, solid 3/4"	A03-100-0000
NPT, solid 1"	A03-100-0001
NPT, solid 1-1/4"	A03-100-0002
NPT, solid 1-1/2"	A03-100-0003
NPT, solid 2-1/2"	A03-100-0004
NPT, solid 3/4", with air valve	A03-100-0040
NPT, solid 1", with air valve	A03-100-0041
NPT, solid 1-1/4", with air valve	A03-100-0042
NPT, solid 1-1/2", with air valve	A03-100-0043
NPT, solid 2-1/2", with air valve	A03-100-0044
BSPT, solid 2-1/2", with air valve	A03-100-0144



Tool Kits



Complete Tool Kits

Customized for your specific pump model, Hydra-Cell Tool Kits provide specialty tools to facilitate maintenance and servicing of your Hydra-Cell pump. Each kit is packaged in a durable plastic case and includes a shaft rotator, valve seat remover, plunger guide lifter, plunger holder, protector seal, seal inserter, and assembly studs.

Pump Model	Tool Kit Part Number
Master Tool Kit for all Pump Models	A03-175-1107
F20, F21, F22	A03-175-1105
M03, D03, D04	A03-175-1106
D10, D12	A03-175-1101
D15/D17	A03-175-1103
H25	A03-175-1102
D35	A03-200-1100

Note: Since Mono-Block pumps feature the valve plate and manifold combined into one component for servicing, consult factory regarding tool kit needs.

Specialty Tools

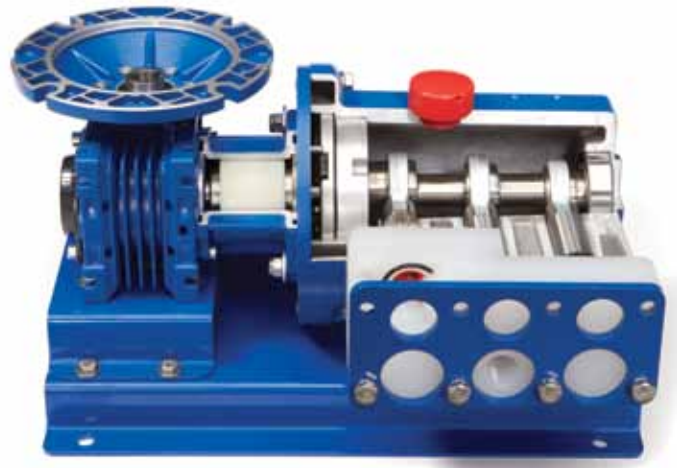
For your convenience individual specialty tools are available for all Hydra-Cell pumps.

Ref #	Part Number	Description
1	A03-126-1500	Toolbox
2	A03-159-1200	Inserter/Rotator (D10)
	A03-160-1200	Inserter/Rotator (D15/D17, H25)
	A03-185-1200	Inserter/Rotator (D35)
3	A03-124-1200	Lever Assembly
4	A03-117-1000	Seat Puller (M03, D03, D04)
	A03-118-1000	Seat Puller (D10, D12)
	A03-119-1000	Seat Puller (H25, D35)
5	A03-157-1000	Seal Protector (D10, D12)
	A03-158-1002	Seal Protector (D15/D17)
	A03-158-1001	Seal Protector (H25)
6	A03-125-1020	Plunger Holder (F20, M03, D03, D04)
	A03-125-1010	Plunger Holder (D10, D12, D15/D17)
	A03-125-1000	Plunger Holder (H25, D35)
7	A03-195-1200	Shaft Rotator (F20, M03, D03, D04)
8	A03-196-1000	Plunger Guide Lifter (F20, M03, D03, D04)
9	A03-162-1200	Plunger Guide Lifter (D10, D12)
	A03-162-1201	Plunger Guide Lifter (H25, D35)
10	A03-156-1200	Assembly Studs (D10, D12, D15/D17, H25, D35)

Demonstration (Cutaway) Units



D10 models demonstrate the wobble plate principle of operation.



P200 models demonstrate the crank-shaft principle of operation.

Demonstration units of Hydra-Cell D10 and P200 (metering) pumps are available with or without a rolling carry case (furnished with the appropriate sticker). The units are “cut away” to show both the wobble plate (D10) and crank-shaft (P200) operating principles as well as other features including the multiple diaphragm design that provides virtually pulse-free flow, and spring-loaded, horizontal check valves which, combined with the seal-less design, enable Hydra-Cell to handle abrasives and particulates that would damage other types of pumps.

Part Number	Description
CUTAWAY-D10WCASE	D10 Cutaway Demo with Rolling Carry Case
CUTAWAY-D10	D10 Cutaway Demo without Case
CUTAWAY-P200WCASE	P200 Cutaway Demo with Rolling Carry Case
CUTAWAY-P200	P200 Cutaway Demo without Case
CUTAWAY-CASE	Cutaway Demo Rolling Case Only (for D10 or P200)

Testing

Wanner Engineering has a fully-equipped testing facility to perform a variety of witnessed and non-witnessed tests with certification for Hydra-Cell pumps.



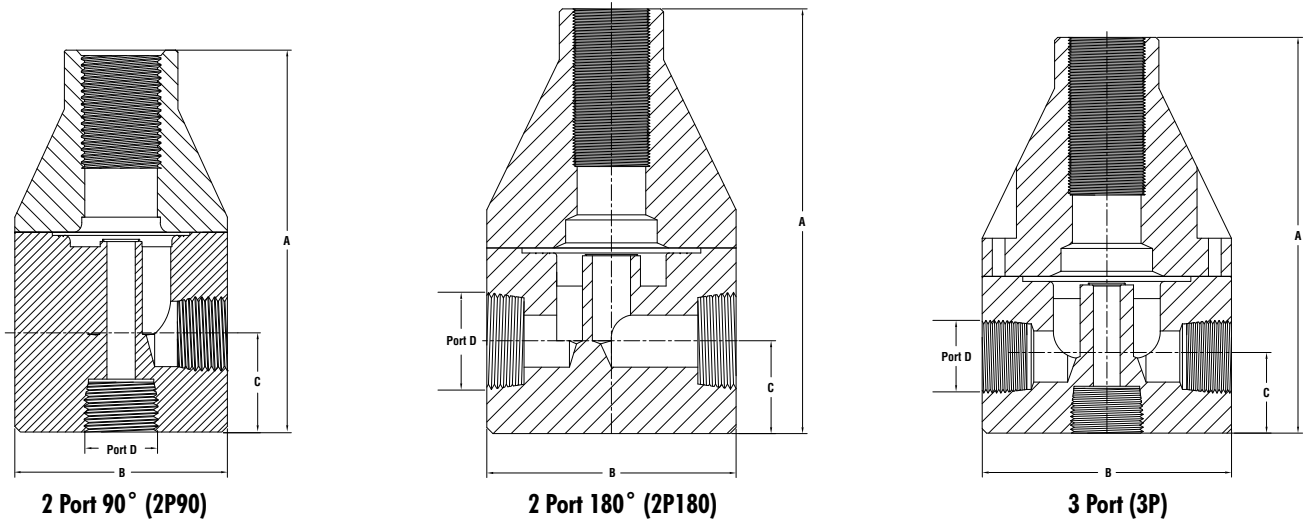
Part Number	Description	Notes
TEST-STDPROD	Standard Production Tests	Rated Flow, Rated Pressure, & Steady State Accuracy
TEST-STDPRODWIT	Witnessed Standard Production Tests	Rated Flow, Rated Pressure, & Steady State Accuracy
TEST-HYDRO	Hydrostatic Test & Certificate	Includes Standard Production Tests
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

Back Pressure and Pressure Relief Valves

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



Dimensions and Port Configurations



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

Back Pressure Valves

Selection Process

1. Use the chart immediately below to determine the valve port size with the appropriate maximum flow (gallons per minute or hour; liters per minute or hour) to match the Hydra-Cell pump selected.
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.

Valve Port Size “D”

	3/8"	1/2"	StdFlo 3/4"	HiFlo 3/4"	StdFlo 1"	HiFlo 1"	2"	High Pressure 1/4"-3/8"-1/2"	1"
Maximum Flow									
gpm	3.3	5.0	5.0	10.0	8.0	17.5	39.0	11.7	20.0
gph	200	300	300	600	480	1050	2350	700	1200
l/min	12.6	18.9	18.9	37.8	30.3	66.2	147.6	44.3	75.7
lph	75.6	1134	1134	2268	1818	3942	8856	2658	4542

Port “D”	Wetted Materials*	Pressure Adjustment Range		Maximum Temperature		Port Configuration	Model Number	
		psi	bar	F	C		NPT Ports	BSPT Ports
3/8"	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"	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"	Polypropylene	10 - 150	0.7 - 10.3	140	60	2P180	111-341	111-341-B
	PVDF	10 - 150	0.7 - 10.3	140	60	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
	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" StdFlo	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	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
	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
2"	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	Model Number	
		psi	bar	F	C		NPT Ports	BSPT Ports
1/4" High Pressure	316 SST	350 - 2000	24 - 138	300	149	2P90	111-800	111-800-B
	Hastelloy C	350 - 2000	24 - 138	300	149	2P90	111-804	111-804-B
3/8"	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	316 SST	350 - 2000	24 - 138	300	149	2P90	111-706	111-706-B
	Hastelloy C	350 - 2000	24 - 138	300	149	2P90	111-710	111-710-B
1/2"	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	316 SST	350 - 2000	24 - 138	300	149	2P90	111-726	111-726-B
	Hastelloy C	350 - 2000	24 - 138	300	149	2P90	111-730	111-730-B
3/4" StdFlo	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	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	316 SST	350 - 2000	24 - 138	300	149	2P90	111-746	111-746-B
	Hastelloy C	350 - 2000	24 - 138	300	149	2P90	111-750	111-750-B
1" StdFlo	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	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	316 SST	350 - 2000	24 - 138	300	149	2P180	111-766	111-766-B
	Hastelloy C	350 - 2000	24 - 138	300	149	2P90	111-770	111-770-B
2"	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.

They control pulsations by allowing fluid to enter a wetted chamber of the dampener during the discharge stroke. This displaces a flexible bladder, which compresses gas in an air chamber, thus absorbing the shock. During the inlet stroke, liquid pressure decreases as the dampener gas expands, allowing fluid to re-enter the process line.

Bladders are available in Neoprene, Buna-N, EPDM, FKM, and PTFE (except where noted) to match Hydra-Cell pump diaphragm materials.

- Produces steady fluid flow up to 99% pulsation- and vibration-free
- Protects pipes, valves, fittings, meters, and in-line instrumentation from destructive pulsations, cavitation, and water hammer
- Creates steady and continuous flow when dosing, blending, or proportioning additives
- Ensures accuracy, longevity, and repeatability of in-line meters
- Enables uniform application of material in spraying and coating systems
- Reduces product agitation, foaming, splashing, and degradation of product

Pulsation Dampeners

Selection Process

1. Determine discharge pulsation (<1000 psi or > 1000 psi).
2. Determine inlet stabilization: high inlet pressure (>30 psi) or low inlet pressure (suction lift/ <30 psi positive pressure).
3. Select dampener size based on cubic inches (volume).
4. Consult price list or selection guide for specific model based on choice of wetted end and diaphragm materials.

Air Control Pump Model	Application			
	Discharge Pulsation		Inlet Stabilization	
	Chargeable <1000 psi	Chargeable >1000 psi	Chargeable >30 psi	"J" Style <30 psi
F20 (P100)	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
D03 (P200)	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
D04 (P300)	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
D10 (P400)	4 cu. in.	12 cu. in.	4 cu. in.	10 cu. in.
D12	4 cu. in.	N/A	4 cu. in.	10 cu. in.
D15 (P500)	4 cu. in.	12 cu. in.	10 cu. in.	10 cu. in.
D17	4 cu. in.	12 cu. in.	10 cu. in.	10 cu. in.
P600	10 cu. in.	N/A	10 cu. in.	10 cu. in.
H25	36 cu. in.	N/A	36 cu. in.	85 cu. in.
D35	36 cu. in.	12 cu. in.	36 cu. in.	85 cu. in.

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

Since Hydra-Cell multiple-diaphragm model pumps provide smooth, virtually pulse-less linear flow, pulsation dampeners are recommended for F20 and P100 models, but are optional for all other models.

Description	Part Number
Pulse Dampener, Charging Kit	110-900

4 Cubic Inch Dampeners

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1/2" NPT	SST	Buna-N	4	1000	110-060
1/2" NPT	SST	Neoprene	4	1000	110-062
1/2" NPT	SST	EPDM	4	1000	110-063
1/2" NPT	SST	FKM	4	1000	110-065
1/2" NPT	SST	PTFE	4	600	110-068
1/2" NPT	Hastelloy C	Buna-N	4	1000	110-090
1/2" NPT	Hastelloy C	Neoprene	4	1000	110-092
1/2" NPT	Hastelloy C	EPDM	4	1000	110-093
1/2" NPT	Hastelloy C	FKM	4	1000	110-095
1/2" NPT	Hastelloy C	PTFE	4	600	110-098
1/2" NPT	Polypropylene	Buna-N	4	150	110-000
1/2" NPT	Polypropylene	Neoprene	4	150	110-002
1/2" NPT	Polypropylene	EPDM	4	150	110-003
1/2" NPT	Polypropylene	FKM	4	150	110-005
1/2" NPT	Polypropylene	PTFE	4	150	110-008
1/2" NPT	PVDF	Buna-N	4	150	110-020
1/2" NPT	PVDF	Neoprene	4	150	110-022
1/2" NPT	PVDF	EPDM	4	150	110-023
1/2" NPT	PVDF	FKM	4	150	110-025
1/2" NPT	PVDF	PTFE	4	150	110-028

Pulsation Dampeners

10 Cubic Inch Dampeners

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1/2" NPT	SST	Buna-N	10	1000	110-260
1/2" NPT	SST	Neoprene	10	1000	110-262
1/2" NPT	SST	EPDM	10	1000	110-263
1/2" NPT	SST	FKM	10	1000	110-265
1/2" NPT	SST	PTFE	10	150	110-268
1/2" NPT	Hastelloy C	Buna-N	10	1000	110-290
1/2" NPT	Hastelloy C	Neoprene	10	1000	110-292
1/2" NPT	Hastelloy C	EPDM	10	1000	110-293
1/2" NPT	Hastelloy C	FKM	10	1000	110-295
1/2" NPT	Hastelloy C	PTFE	10	150	110-298
1/2" NPT	Polypropylene	Buna-N	10	150	110-200
1/2" NPT	Polypropylene	Neoprene	10	150	110-202
1/2" NPT	Polypropylene	EPDM	10	150	110-203
1/2" NPT	Polypropylene	FKM	10	150	110-205
1/2" NPT	Polypropylene	PTFE	10	150	110-208
1/2" NPT	PVDF	Buna-N	10	150	110-220
1/2" NPT	PVDF	Neoprene	10	150	110-222
1/2" NPT	PVDF	EPDM	10	150	110-223
1/2" NPT	PVDF	FKM	10	150	110-225
1/2" NPT	PVDF	PTFE	10	150	110-228

10 Cubic Inch Inlet Stabilizers with J-Style Control

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1/2" NPT	PVC	Buna-N	10	30	110-210-J
1/2" NPT	PVC	Neoprene	10	30	110-212-J
1/2" NPT	PVC	EPDM	10	30	110-213-J
1/2" NPT	PVC	FKM	10	30	110-215-J
1/2" NPT	PVC	PTFE	10	30	110-218-J

12 Cubic Inch Dampeners

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1/2" NPT	SST	Buna-N	12	4000	110-360
1/2" NPT	SST	EPDM	12	4000	110-363
1/2" NPT	SST	FKM	12	4000	110-365
1/2" NPT	SST	PTFE	12	2000	110-368

Pulsation Dampeners

36 Cubic Inch Dampeners

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1" NPT	SST	Buna-N	36	1000	110-660
1" NPT	SST	Neoprene	36	1000	110-662
1" NPT	SST	EPDM	36	1000	110-663
1" NPT	SST	FKM	36	1000	110-665
1" NPT	SST	PTFE	36	600	110-668
1" NPT	CS	Buna-N	36	1000	110-640
1" NPT	CS	Neoprene	36	1000	110-642
1" NPT	CS	EPDM	36	1000	110-643
1" NPT	CS	FKM	36	1000	110-645
1" NPT	CS	PTFE	36	600	110-648
1" NPT	Hastelloy C	Buna-N	36	1000	110-690
1" NPT	Hastelloy C	Neoprene	36	1000	110-692
1" NPT	Hastelloy C	EPDM	36	1000	110-693
1" NPT	Hastelloy C	FKM	36	1000	110-695
1" NPT	Hastelloy C	PTFE	36	600	110-698
1" NPT	Polypropylene	Buna-N	36	150	110-600
1" NPT	Polypropylene	Neoprene	36	150	110-602
1" NPT	Polypropylene	EPDM	36	150	110-603
1" NPT	Polypropylene	FKM	36	150	110-605
1" NPT	Polypropylene	PTFE	36	150	110-608
1" NPT	PVDF	Buna-N	36	150	110-620
1" NPT	PVDF	Neoprene	36	150	110-622
1" NPT	PVDF	EPDM	36	150	110-623
1" NPT	PVDF	FKM	36	150	110-625
1" NPT	PVDF	PTFE	36	150	110-628

85 Cubic Inch Dampeners with J-Style Control

Inlet (female)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
1" NPT	PVC	Buna-N	10	30	110-710-J
1" NPT	PVC	Neoprene	10	30	110-712-J
1" NPT	PVC	EPDM	10	30	110-713-J
1" NPT	PVC	FKM	10	30	110-715-J
1" NPT	PVC	PTFE	10	30	110-718-J

275 Cubic Inch Dampeners

Inlet (2500 lbs. ANSI flange)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
2.5"	CS	Buna-N	275	3045	110-275-B
2.5"	CS	FKM	275	3045	110-275-V

1155 Cubic Inch Dampeners (5 gallon)

Inlet (150 lbs. ANSI flange)	Wetted	Bladder	Volume (Inch ³)	Max psi	Part Number
3.0"	CS	Buna-N	1155	30	110-1155-B
3.0"	CS	FKM	1155	30	110-1155-V

Calibration Cylinders

Calibration cylinders verify the flow rate of a Hydra-Cell P Series metering pump, providing a visual indicator that the system is operating within the required parameters of performance and accuracy.

(Note: Can be used with corresponding Hydra-Cell pump models shown in parentheses below as long as rpm are the same.)

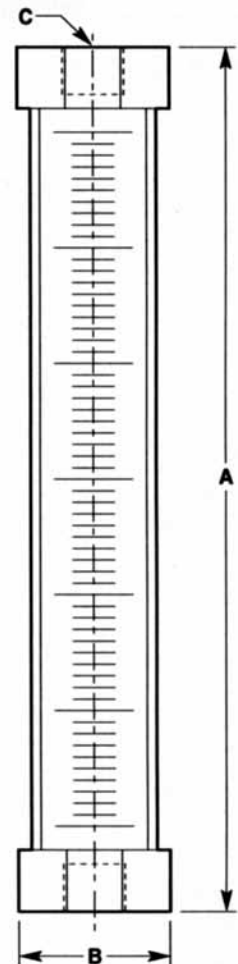
Selection Process

1. Size the appropriate P Series pump to the application.
(Refer to the metering pump section starting on page 122 for more 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 (lph)	0.95 (3.6)	6.4 (24)	32 (120)	64 (240)	320 (1200)
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)



Replacement Parts Kits

Convenient replacement part kits for all models of Hydra-Cell pumps are prepackaged with all necessary components to make pump service quick and easy.

Three types of kits are available depending on the level of replacement service required:

- Diaphragm Kit
- Valve Kit
- Complete Fluid-end Kit

Every kit has the correct components matching your specific pump configuration and materials (based on your original model number designed in Order Code Digits 7, 8, 9, 10 & 11). Contact us or your Hydra-Cell distributor to select your correct kit.



Replacement Hydraulic Ends

Complete hydraulic end assemblies are available as replacement items. The hydraulic end contains all drive end components from the drive shaft up to and including the diaphragms. All hydraulic ends are factory-tested and shipped with oil. To order a replacement hydraulic end, refer to the appropriate pump ordering page and specify the desired cam, diaphragm and o-ring material, and Hydra-Oil.



Hydra-Cell® T80 Series Seal-less Pump Selection

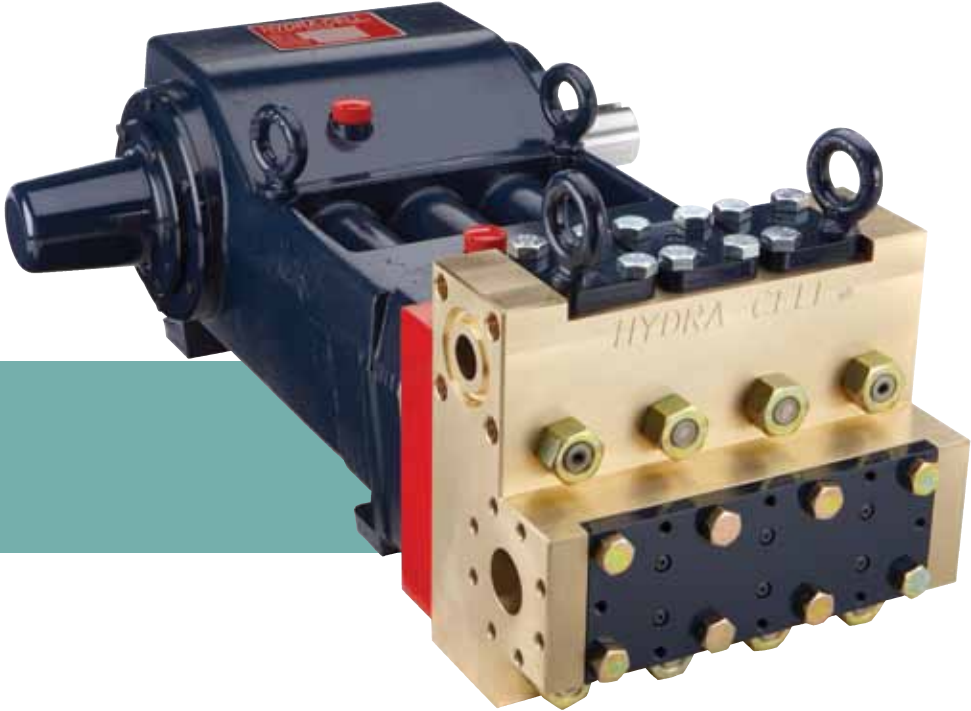
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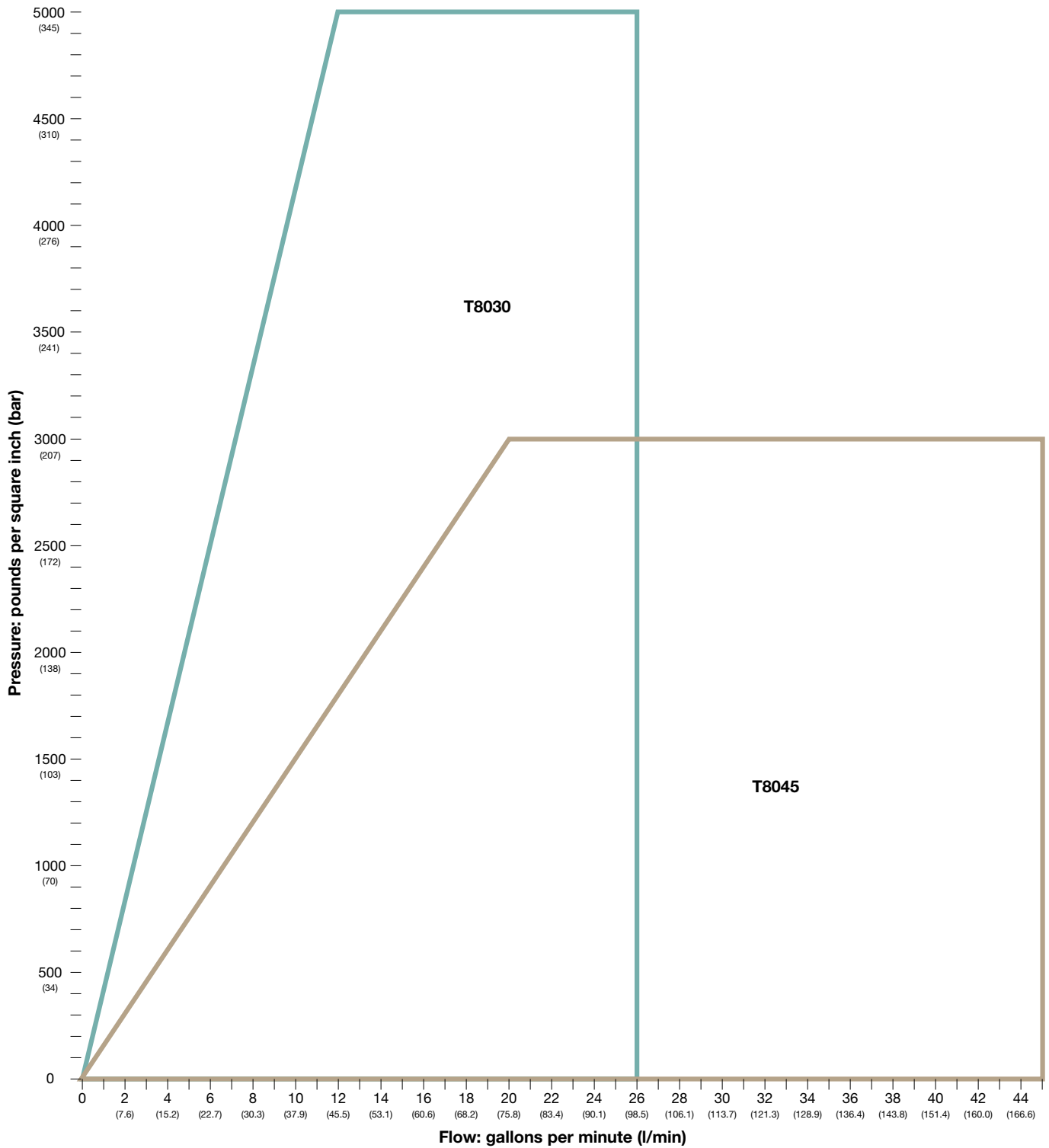
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Hydra-Cell® Flow Capacities and Pressure Ratings

T80 Series Seal-less Pumps



Model	Maximum Capacity		Maximum Discharge Pressure		Maximum Inlet Pressure		Maximum Operating Temperature	
	(gpm)	(l/min)	(psi)	(bar)	(psi)	(bar)	(F)*	(C)*
T8045	45.0	170.4	3000	207	500	34	180°	82°
T8030	26.0	98.4	5000	345	500	34	180°	82°

* Consult factory for correct component selection for temperatures above 180°F (82°C) or below 40°F (4°C)

Hydra-Cell® T80 Series Pumps Design Advantages

An Economical and Environmental Choice

Hydra-Cell is a positive displacement, multiple-diaphragm pump featuring a seal-less design that provides full containment of the pumping chamber.

This means there are no VOC emissions when operating Hydra-Cell and no need for expensive “vapor-less” options to control VOC emissions as there are with other pump designs.

In addition there are no packing or seals that pose environmental issues from leakage, which contributes to costly downtime, maintenance, and wear.



Ideal for a Variety of Applications

- Jet Lift
- Produced Water / Brine Transfer or Disposal
- Crude Oil Transfer
- Methanol & Glycol Injection
- Natural Gas Liquids (NGL)
- Chemical Metering
- Amine Injection
- Boiler Feed Condensate



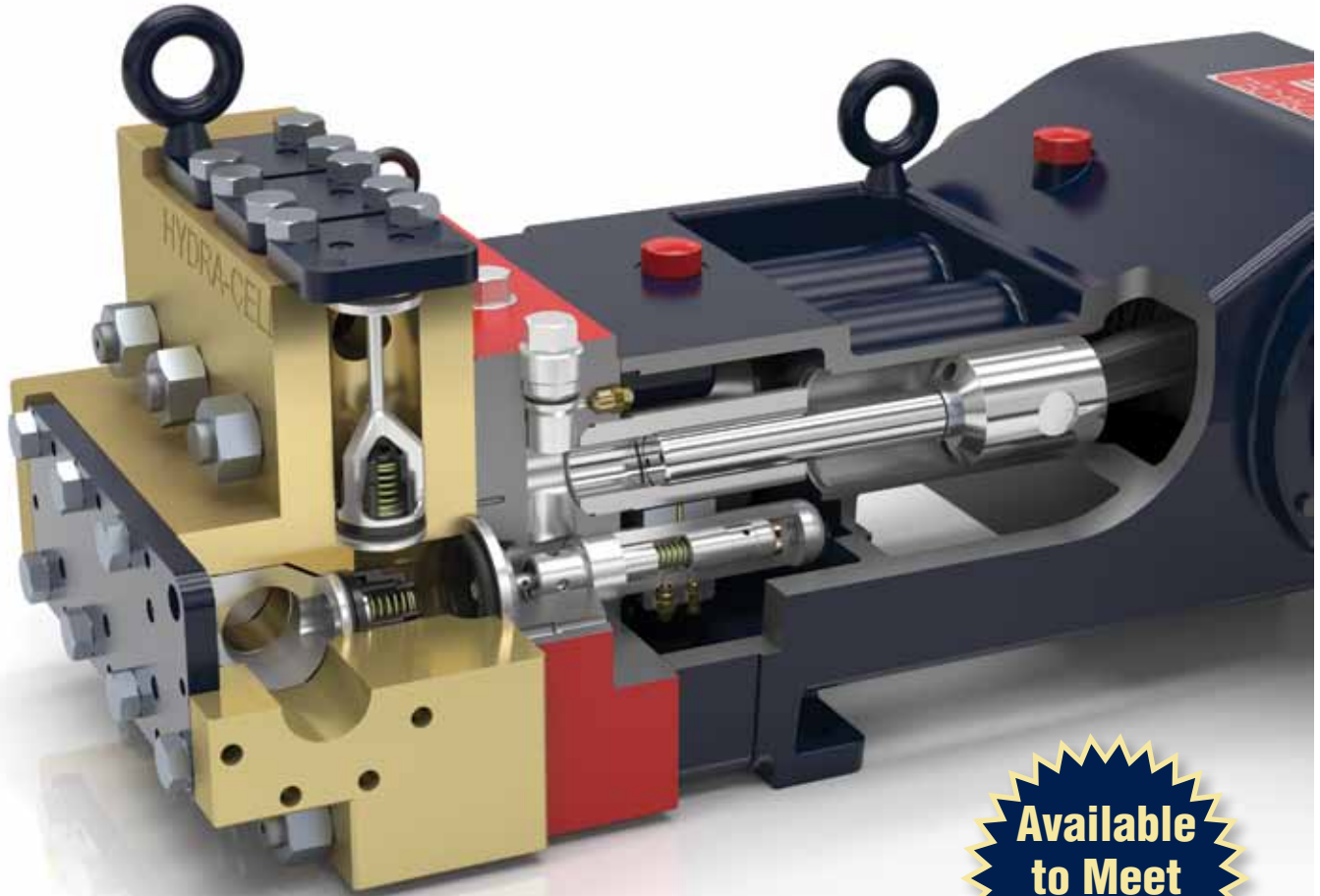
Designed for higher pressures, T80 Series pumps provide reliable, low-maintenance service in a variety of field production and transport applications.



T80 Series pumps feature the Hydra-Cell seal-less design, eliminating clean-up costs from leaking seals or packing and protecting operators from dangerous fluids such as those containing hydrogen sulfide.

Hydra-Cell® T80 Series Pumps Design Advantages

Exclusive Seal-less Diaphragm Design



**Available
to Meet
API 674!**

- Seal-less design separates the power end from the process fluid end, eliminating leaks, hazards, and the expense associated with seals and packing
- Low NPSH requirements allow for operation with a vacuum condition on the suction - positive inlet pressure is not necessary
- Can operate with a closed or blocked suction line and run dry indefinitely without damage, eliminating downtime and repair costs
- Unique diaphragm design handles more abrasives with less wear than gear, screw or plunger pumps
- Hydraulically balanced diaphragms to handle high pressures with low stress
- Provides low-pulse, linear flow due to its multiple diaphragm design
- Lower energy costs than centrifugal pumps and other pump technologies
- Rugged construction for long life with minimal maintenance
- Compact design and double-ended shaft provides a variety of installation options
- Hydra-Cell T80 Series pumps can be configured to meet API 674 standards – consult factory for details



Hydra-Cell model T8030 was a finalist in the Pumps & Systems “Product Innovation” awards, and the T80 Series earned a “Spotlight on New Technology” from the Offshore Technology Conference.

T80 Series Model T8045 Performance

Capacities

Flow

Model	Max. Input rpm	Max. Flow @ 3000 psi (207 bar)	
		gpm	l/min
T8045	450	45.0	170.4

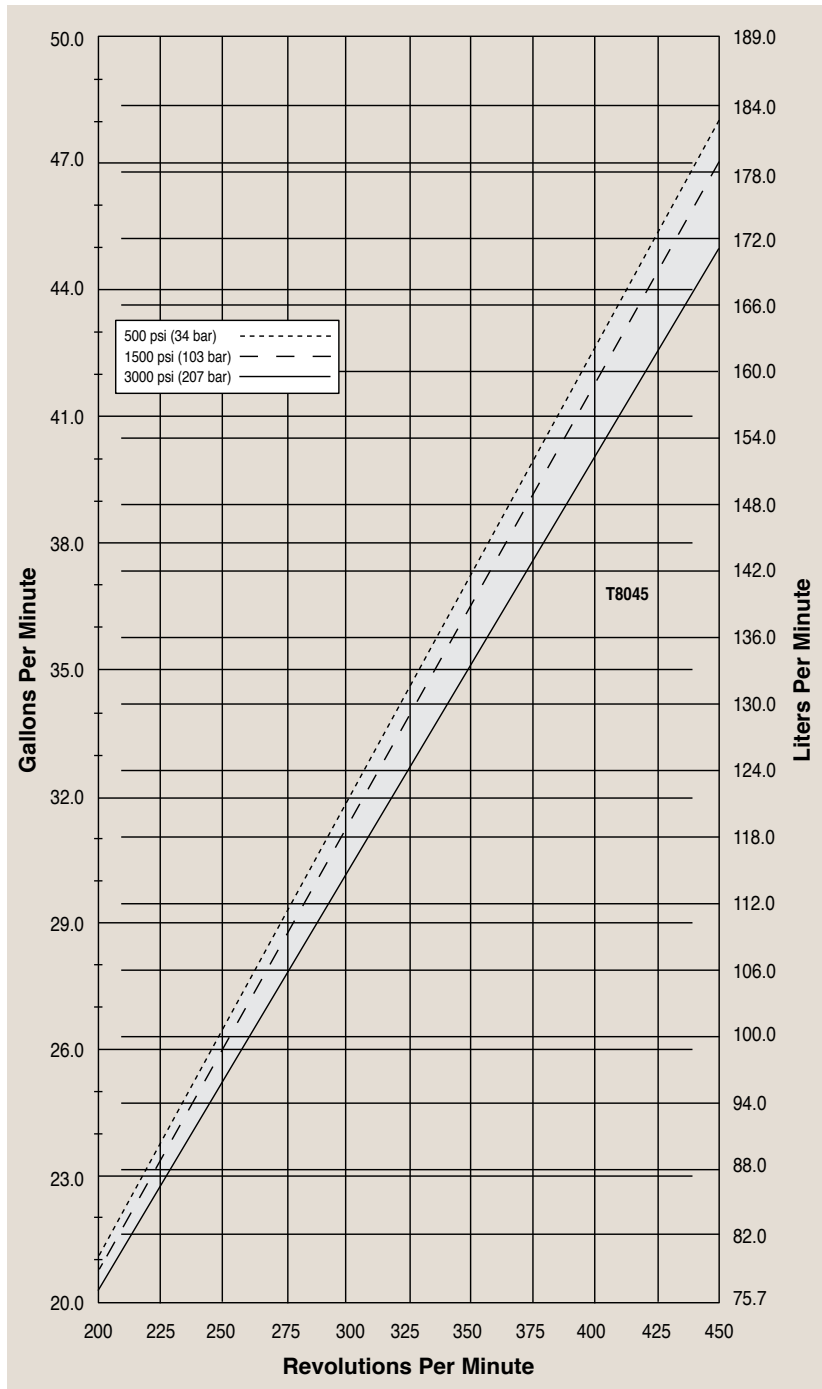
Consult factory when operating below 20 gpm (75.7 l/min).

Pressure

Maximum Inlet Pressure
500 psi (34 bar)

Maximum Discharge Pressure
3000 psi (207 bar)

Maximum Flow at Designated Pressure



T8045 medium-pressure shown with Nickel Aluminum Bronze (NAB) manifold. (Also available with Stainless Steel manifold.)

T80 Series Model T8045 Specifications

Flow Capacities @3000 psi (207 bar)

Model	rpm	gpm	l/min
T8045	450	45.0	170.4

Delivery

Pressure psi (bar)	gal/rev	liters/rev
500 (34)	0.107	0.406
1500 (103)	0.105	0.397
3000 (207)	0.101	0.384

rpm

Maximum:	450
Minimum:	200 Consult factory for speeds less than 200 rpm

Maximum Discharge Pressure

Metallic Heads:	3000 psi (207 bar)
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Maximum Inlet Pressure 500 psi (34 bar)

Operating Temperature

Maximum:	180 °F (82.2 °C)
Minimum:	40 °F (4.4 °C)

Consult factory for temperatures outside this range

Maximum Solids Size 800 microns

Input Shaft Left or Right Side

Inlet Ports 3-1/2 inch Class 300 RF ANSI Flange or 2-1/2 inch NPT

Discharge Ports 1-1/2 inch Class 2500 RJ ANSI Flange or 1-1/2 inch NPT

Shaft Diameter 3 inch (76.2 mm)

Shaft Rotation Reverse (bi-directional)

Oil Capacity 18 US quarts (17 liters) 10W30 standard-duty oil

Weight

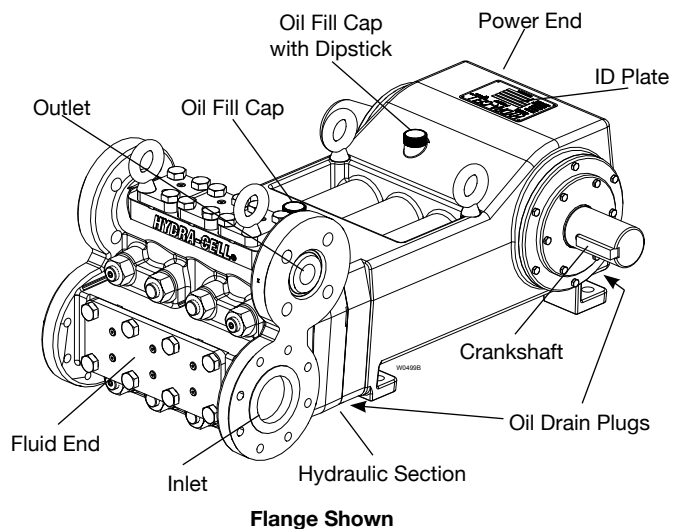
Metallic Heads:	1100 lbs. (499 kg)
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Fluid End Materials

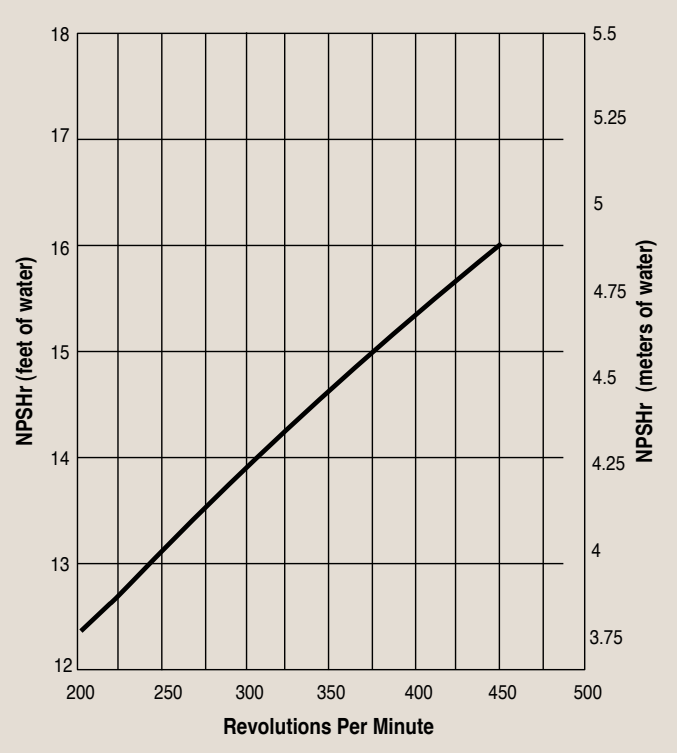
Manifold:	Nickel Aluminum Bronze (NAB) 316L Stainless Steel
Diaphragm/Elastomers:	FKM Buna-N
Diaphragm Follower Screw:	316 Stainless Steel
Valve Spring Retainer:	Polypropylene
Check Valve Spring:	Elgiloy
Valve Disc/Seat:	Tungsten Carbide 17-4 Stainless Steel Hastelloy C
Outlet Valve Retainer:	316 Stainless Steel
Plug-Outlet Valve Port:	316 / 316 Stainless Steel
Inlet Valve Retainer:	316 Stainless Steel

Power End Materials

Crankshaft:	Forged Q&T Alloy Steel
Connecting Rods:	Ductile Iron
Crossheads:	12L14 Steel
Crankcase:	Ductile Iron
Bearings:	Spherical Roller/Journal (main) Steel Backed Babbitt (crankpin) Bronze (wristpin)



Net Positive Suction Head (NPSHr)



Calculating Required Power (kW)*

$$\frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}^*$$

$$\frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}^*$$

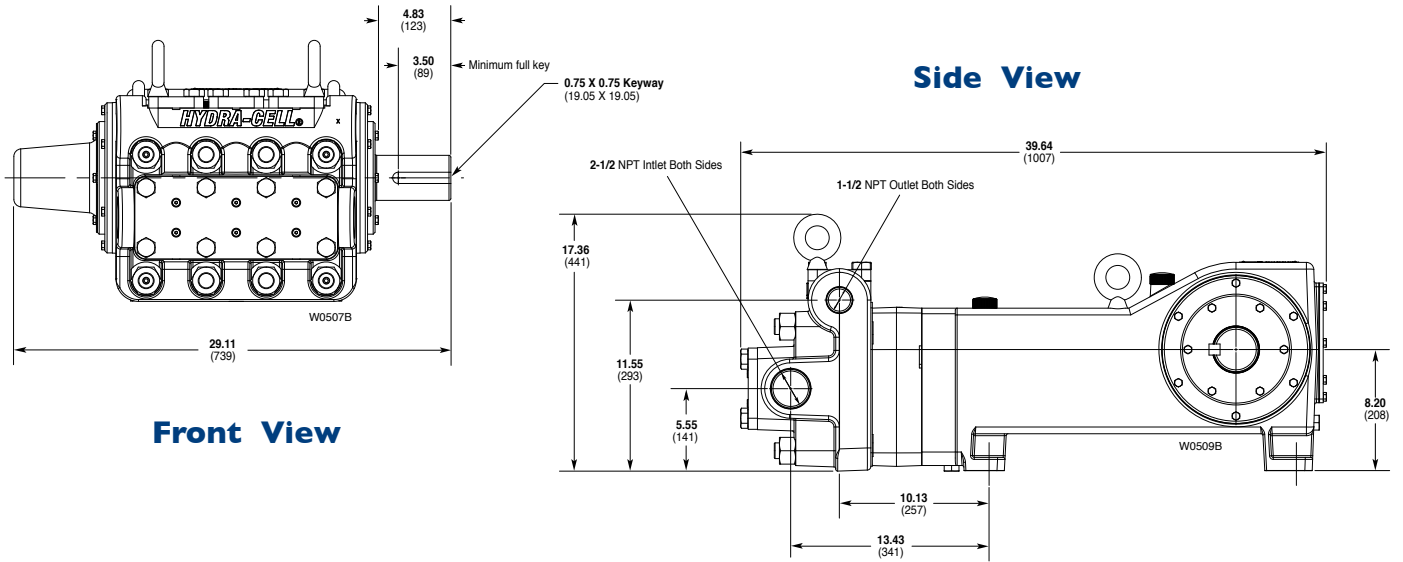
* hp (kW) is required application power.

Attention!

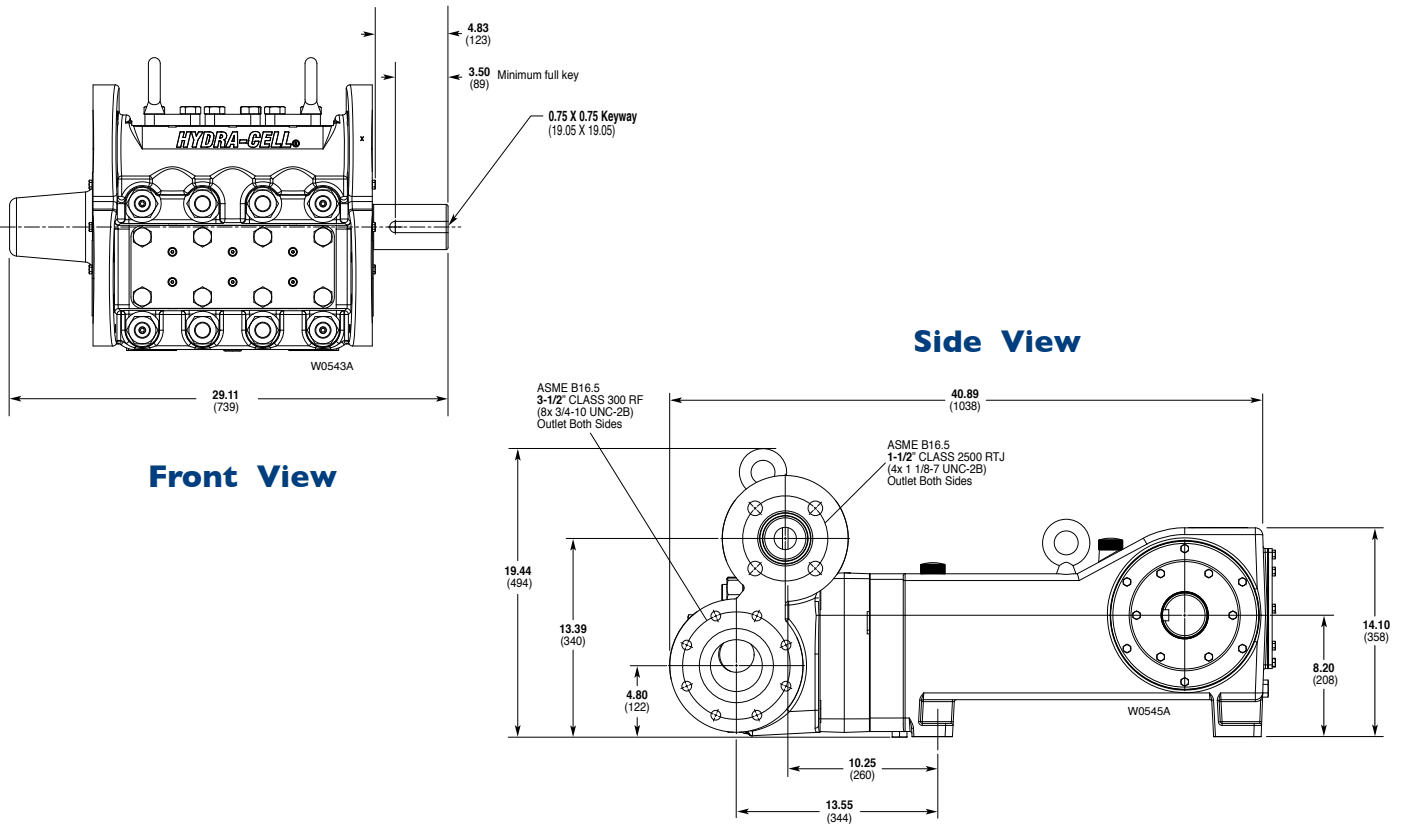
When sizing motors with variable speed drives (VFD): It is very important to select a motor and a VFD rated for constant torque inverter duty service and that the motor is rated to meet the torque requirements of the pump throughout desired speed range.

T80 Series Model T8045 Representative Drawings

Model T8045 Threaded Version inches (mm)



Model T8045 Flanged Version inches (mm)



T80 Series Model T8045 How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete T8045 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: T80KADGGDDEPA.

Medium Pressure (T8045)

Digit	Order Code	Description
1-3		Pump Configuration
	T80	Shaft-driven
4		Performance
	K	Max 45 gpm (170 l/min) @ 3000 psi (207 bar)
5		Pump Head Version
	A	NPT Ports (for NAB only)
	R	ANSI Flange Ports
6		Pump Head Material
	D	Nickel Aluminum Bronze (NAB)
	S	316L Stainless Steel
7		Diaphragm & O-ring Material
	G	FKM
	T	Buna-N
8		Valve Seat Material
	D	Tungsten Carbide*
	H	17-4 Stainless Steel
	T	Hastelloy C
9		Valve Material
	D	Tungsten Carbide*
	F	17-4 Stainless Steel
	T	Hastelloy C
10		Valve Springs
	E	Elgiloy
11		Valve Spring Retainers
	P	Polypropylene
12		Hydra-Oil
	A	10W30 standard-duty oil

*Tungsten Carbide valve seat and disc are a matched set and must be purchased together.

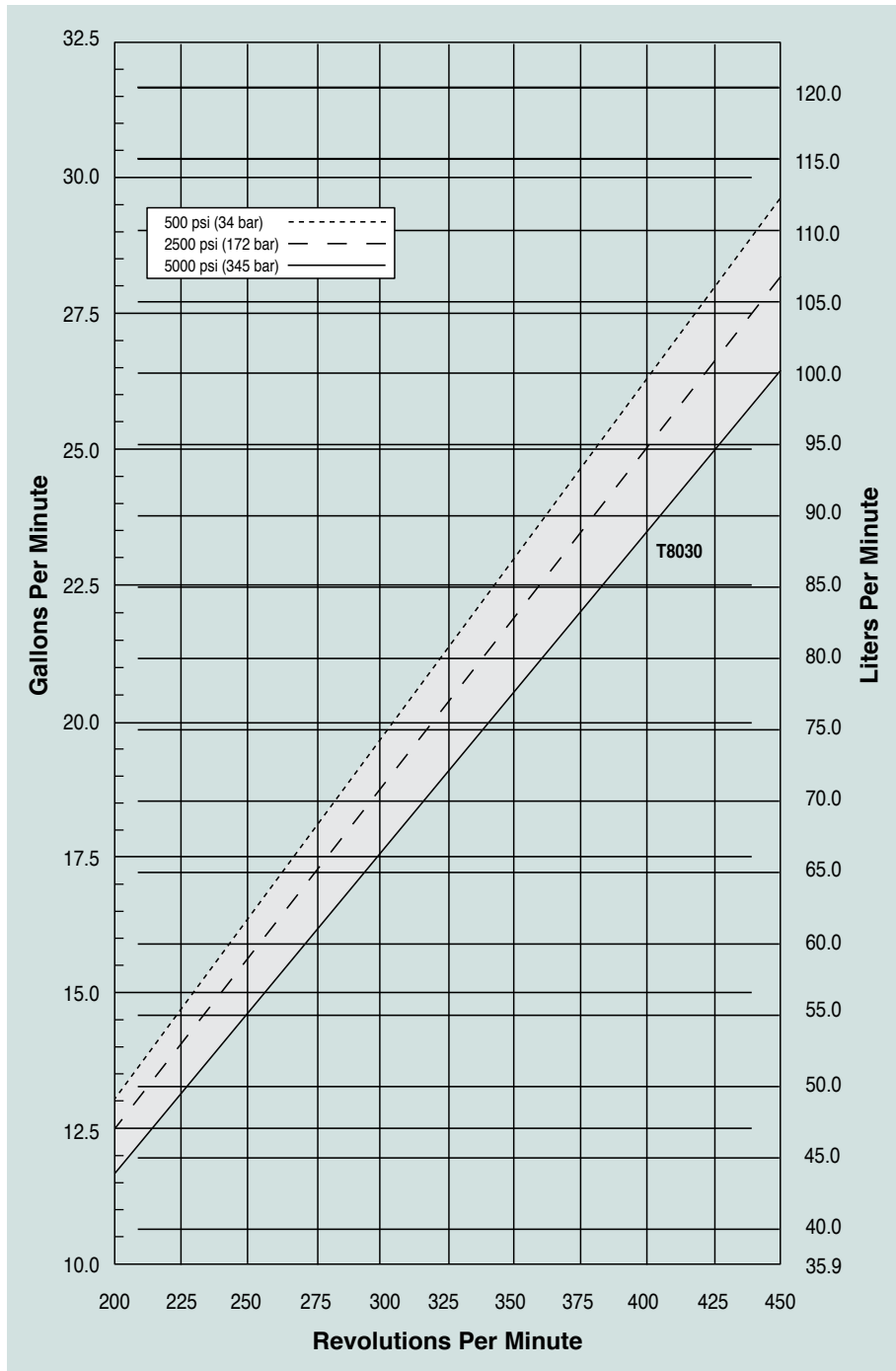
T80 Series Model T8030 Performance

Capacities

<i>Flow</i>				<i>Pressure</i>	
Model	Max. Input rpm	Max. Flow @ 5000 psi (345 bar)		Maximum Inlet Pressure	Maximum Discharge Pressure
		gpm	l/min		
T8030	450	26.0	98.4	500 psi (34 bar)	5000 psi (345 bar)

Consult factory when operating below 12 gpm (45.4 l/min).

Maximum Flow at Designated Pressure



T8030 high-pressure model shown with Nickel Aluminum Bronze (NAB) manifold.

T80 Series Model T8030 Specifications

Flow Capacities @5000 psi (345 bar)

Model	rpm	gpm	l/min
T8030	450	26.0	98.4

Delivery

Pressure psi (bar)	gal/rev	liters/rev
500 (34)	0.066	0.249
2500 (172)	0.063	0.237
5000 (343)	0.059	0.222

rpm

Maximum:	450
Minimum:	200 Consult factory for speeds less than 200 rpm

Maximum Discharge Pressure

Metallic Heads:	5000 psi (345 bar)
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Maximum Inlet Pressure 500 psi (34 bar)

Operating Temperature

Maximum:	180° F (82.2° C)
Minimum:	40° F (4.4° C)

Consult factory for temperatures outside this range

Maximum Solids Size	800 microns
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Input Shaft	Left or Right Side
--------------------	--------------------

Inlet Ports	2 inch Class 300 FF ANSI Flange
--------------------	---------------------------------

Discharge Ports	1-1/4 inch Class 2500 RJ ANSI Flange
------------------------	--------------------------------------

Shaft Diameter	3 inch (76.2 mm)
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Shaft Rotation	Reverse (bi-directional)
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Oil Capacity	18 US quarts (17 liters)
	10W30 standard-duty oil

Weight

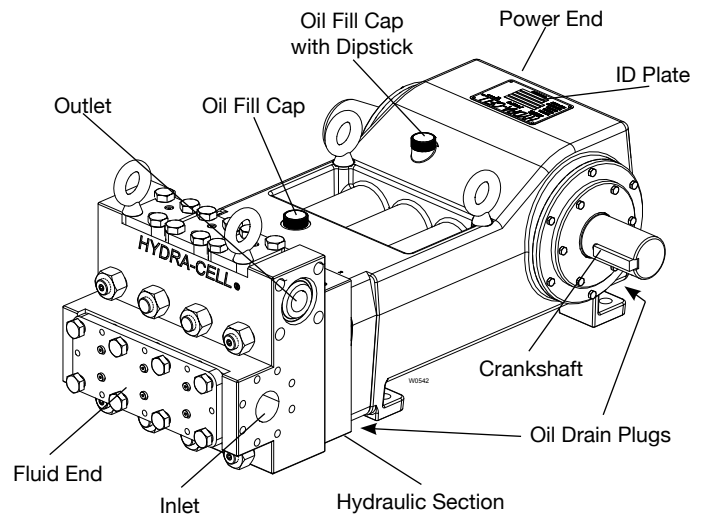
Metallic Heads:	1100 lbs. (499 kg)
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Fluid End Materials

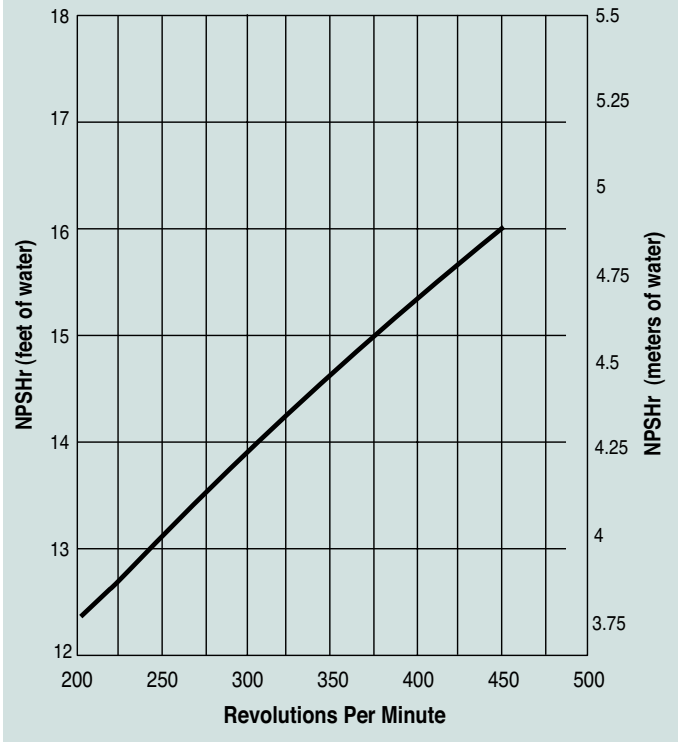
Manifold:	Nickel Aluminum Bronze (NAB)
Diaphragm/Elastomers:	FKM Buna-N
Diaphragm Follower Screw:	316 Stainless Steel
Valve Spring Retainer:	Polypropylene
Check Valve Spring:	Elgiloy
Valve Disc/Seat:	17-4 Stainless Steel Hastelloy C
Outlet Valve Retainer:	316 Stainless Steel
Plug-Outlet Valve Port:	316 / 316 Stainless Steel
Inlet Valve Retainer:	316 Stainless Steel

Power End Materials

Crankshaft:	Forged Q&T Alloy Steel
Connecting Rods:	Ductile Iron
Crossheads:	12L14 Steel
Crankcase:	Ductile Iron
Bearings:	Spherical Roller/Journal (main) Steel Backed Babbit (crankpin) Bronze (wristpin)



Net Positive Suction Head (NPSHr)



Calculating Required Power (kW)*

$$\frac{\text{gpm} \times \text{psi}}{1,460} = \text{electric motor hp}^*$$

$$\frac{\text{l/min} \times \text{bar}}{511} = \text{electric motor kW}^*$$

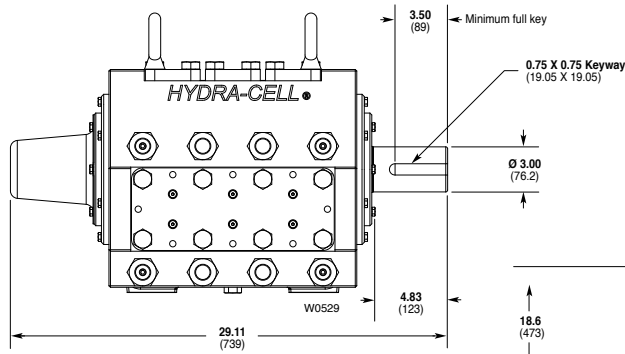
* hp (kW) is required application power.

Attention!

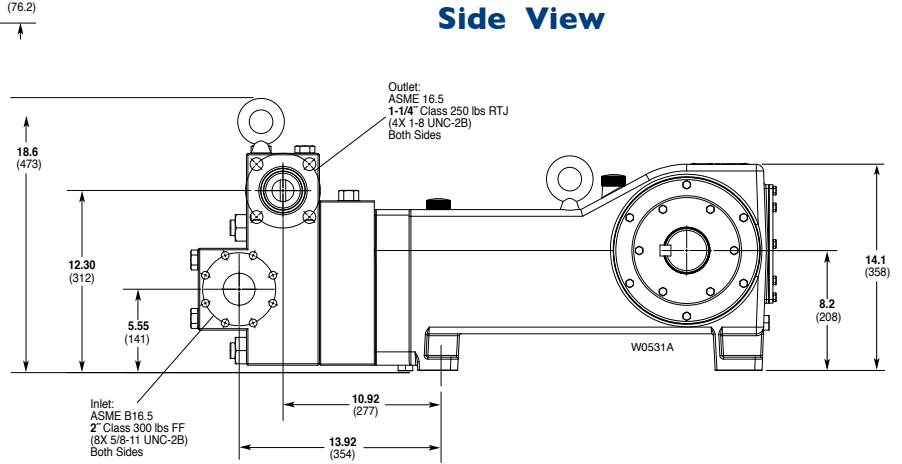
When sizing motors with variable speed drives (VFD): It is very important to select a motor and a VFD rated for constant torque inverter duty service and that the motor is rated to meet the torque requirements of the pump throughout desired speed range.

T80 Series Model T8030 Representative Drawings

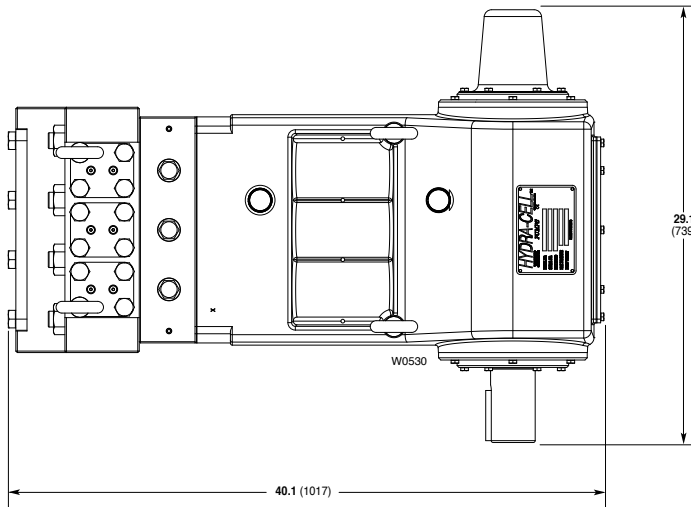
Model T8030 Threaded Version inches (mm)



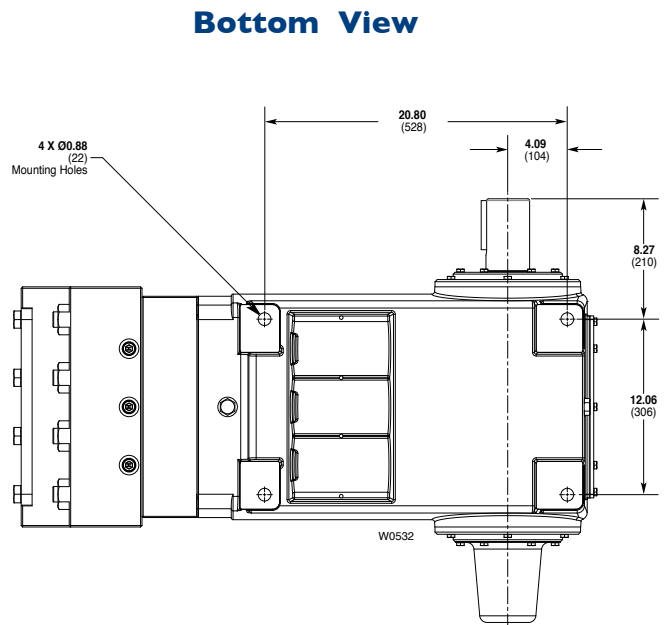
Front View



Side View



Top View



Bottom View

T80 Series Model T8030 How to Order

Ordering Information

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

A complete T8030 Series Model Number contains 12 digits including 9 customer-specified design and materials options, for example: T80SRDTHFEPA.

High Pressure (T8030)

Digit	Order Code	Description
1-3	T80	Pump Configuration Shaft-driven
4	S	Performance Max 26 gpm (98 l/min) @ 5000 psi (345 bar)
5	R	Pump Head Version ANSI Flange Ports
6	D	Pump Head Material Nickel Aluminum Bronze (NAB)
7	G T	Diaphragm & O-ring Material FKM Buna-N
8	H T	Valve Seat Material 17-4 Stainless Steel Hastelloy C
9	F T	Valve Material 17-4 Stainless Steel Hastelloy C
10	E	Valve Springs Elgiloy
11	P	Valve Spring Retainers Polypropylene
12	A	Hydra-Oil 10W30 standard-duty oil

Hydra-Cell® P Series Metering Pump Selection



P100
Page 128



P200
Page 130



P300
Page 132



P400
Page 134



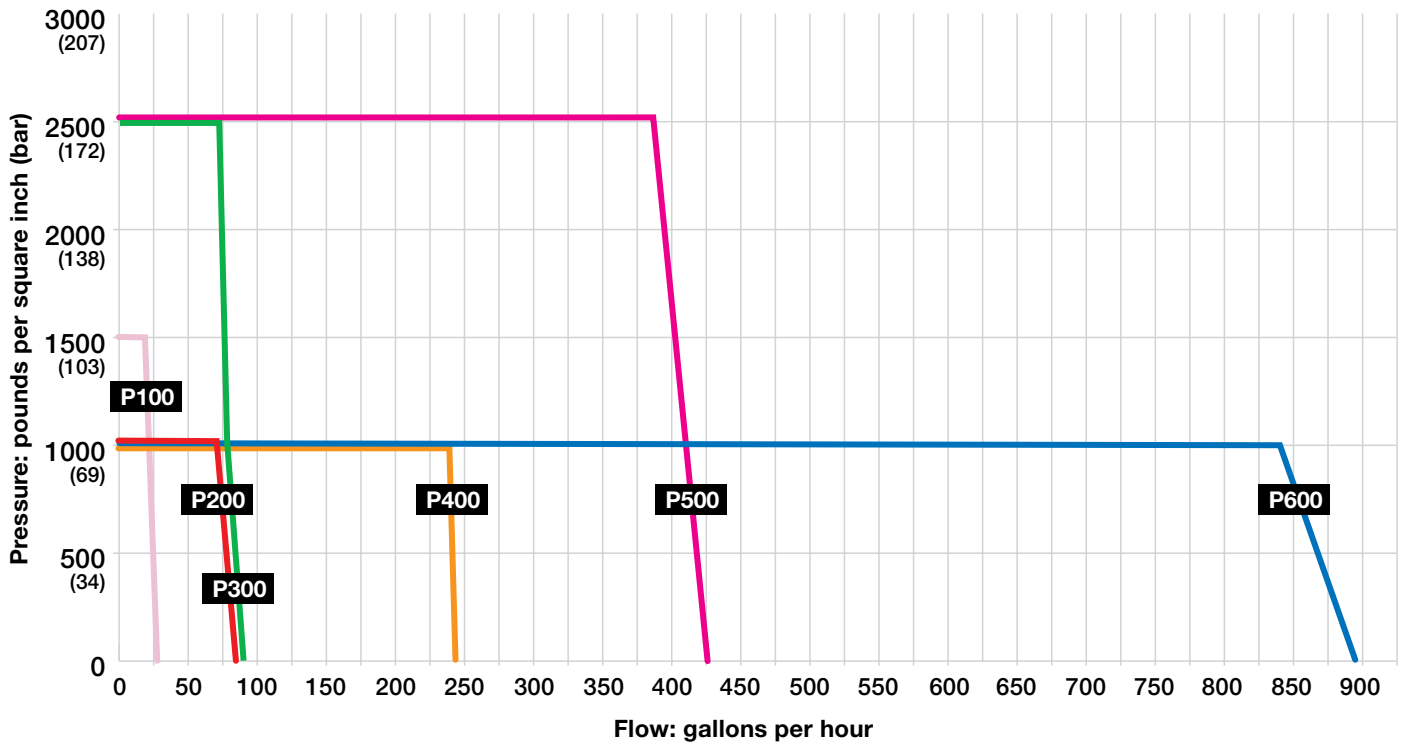
P500
Page 136



P600
Page 138

Hydra-Cell® Flow Capacities and Pressure Ratings

P Series Electronic Precision Metering Pumps



Model ¹	Maximum Capacity gph	Maximum Discharge Pressure psi (bar)		Maximum Operating Temperature F (C) ³		Maximum Inlet Pressure psi (bar)
		Non-metallic ²	Metallic	Non-metallic ²	Metallic	
P100	26.5	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)
P200	80.8	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)
P300	82.3	N/A	2500 (172)	N/A	250° (121°)	500 (34)
P400	243.0	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)
P500	426.0	N/A	2500 (172)	N/A	250° (121°)	250 (17)
P600	894.6	350 (24)	1000 (69)	140° (60°)	250° (121°)	500 (34)

¹ Ratings are for X-cam design.

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

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

Hydra-Cell® Metering Pumps Design Advantages

Accurate, Reliable Electronic Flow Control

Unlike metering pumps that use manual stroke adjusters, Hydra-Cell P Series metering pumps use Variable Frequency Drive (VFD) electronic flow adjustment to maintain greater accuracy over the entire turndown range. This reduces the possibility of operator error, pumping inaccuracies, lost motion, and chance of leakage.

- Solid-state electronics are unlikely to fail
- Metering is linear over the entire range
- Volume per stroke is constant and a known value
- Easy calibration of the desired feed rate
- Rate of change is virtually instantaneous (0 to maximum rpm in 0.3 seconds) with AC motor



Greater Choice of Materials Enhances Capability



Some metering pump manufacturers offer only PTFE diaphragms, which require more frequent and costly replacement due to stress and low processing temperatures. Hydra-Cell metering pumps can be equipped with a variety of diaphragm materials (FKM, Buna-N, EPDM, Neoprene, Aflas, and PTFE). This enables Hydra-Cell metering pumps to operate over a wider range of processing applications.

In addition, several Hydra-Cell metering pump packages are available with special materials such as Hastelloy C and PVDF. Other metering pumps apply substantial price adders for exotic liquid end materials.

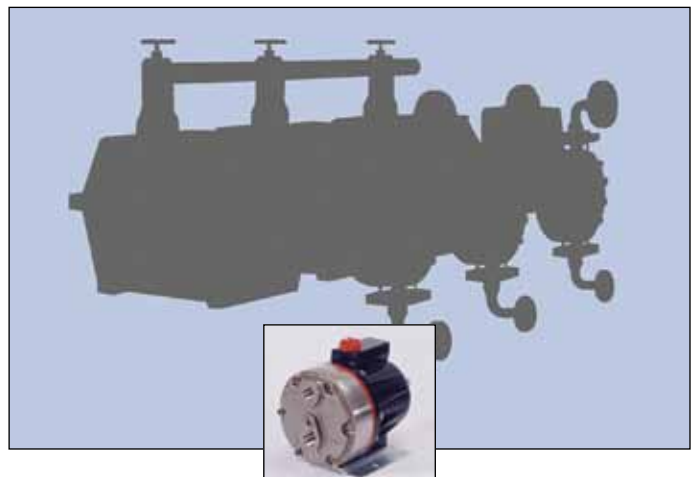
Mesamoll Oil

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. For information about ordering Hydra-Cell pumps with Mesamoll Oil, contact the factory.

Achieve Economy through Technology

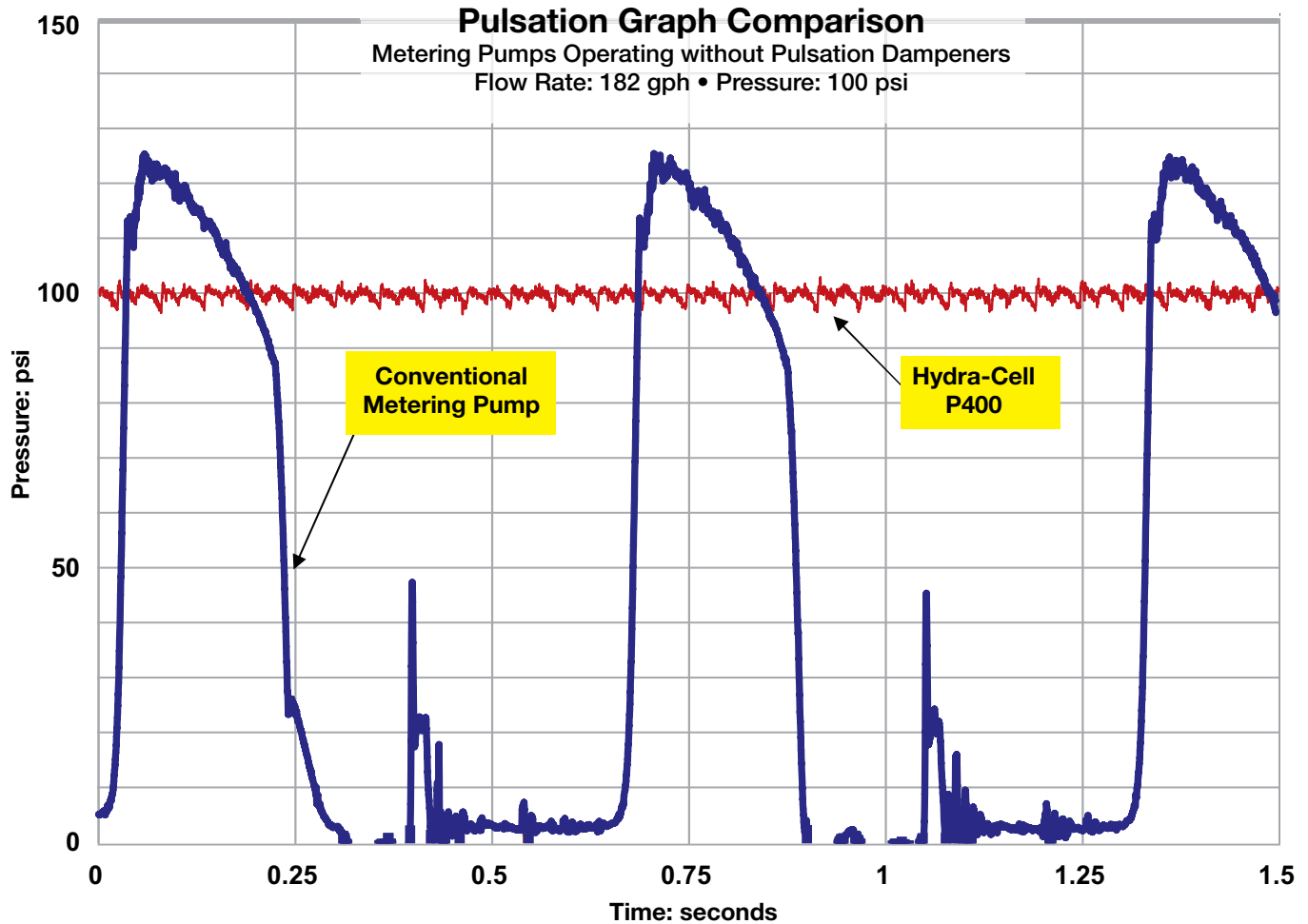
Hydra-Cell metering pumps combine simple, elegant engineering with rugged construction to offer greater versatility while lowering overall costs.

- Smaller footprint with the same capability as larger pumps lowers acquisition costs and saves valuable space in the facility
- Each model covers an extensive range of pressures and flows - no need for different plunger and liquid end sizes to accommodate increases
- Inherent simplicity of the Hydra-Cell design allows versatile application compared to complex metering pumps that may require expensive construction changes to meet specific needs
- Lower parts and maintenance costs
- Separate gearbox makes it easy to change applications while preventing cross-contamination of actuating oil
- Multiplexing capability enables mixing ratios of multiple fluids in flexible, economical ways



Hydra-Cell® Metering Pumps Design Advantages

Accurate Metering and Dosing with Virtually Pulse-less Flow



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 and for use in more accurate applications, such as spraying which cannot tolerate pulsing flow.

Reduced Pulsations Improve Operation

Pulsing, surging flow from traditional metering pumps can produce greater strain on the system and more wear and tear on the pump. Hydra-Cell features a multiple-diaphragm design (except model P100) that practically eliminates pulsations.

- Reduces pipe strain
- Enhances operating safety
- Minimizes maintenance
- Reduces friction and acceleration losses in the suction line
- Eliminates the need for pulsation dampeners
- Provides accurate metering with linear, constant flow
- Lowers system acquisition costs



The multiple-diaphragm design of Hydra-Cell metering pumps provides virtually pulse-less, linear flow without the need for expensive pulsation dampeners.

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.

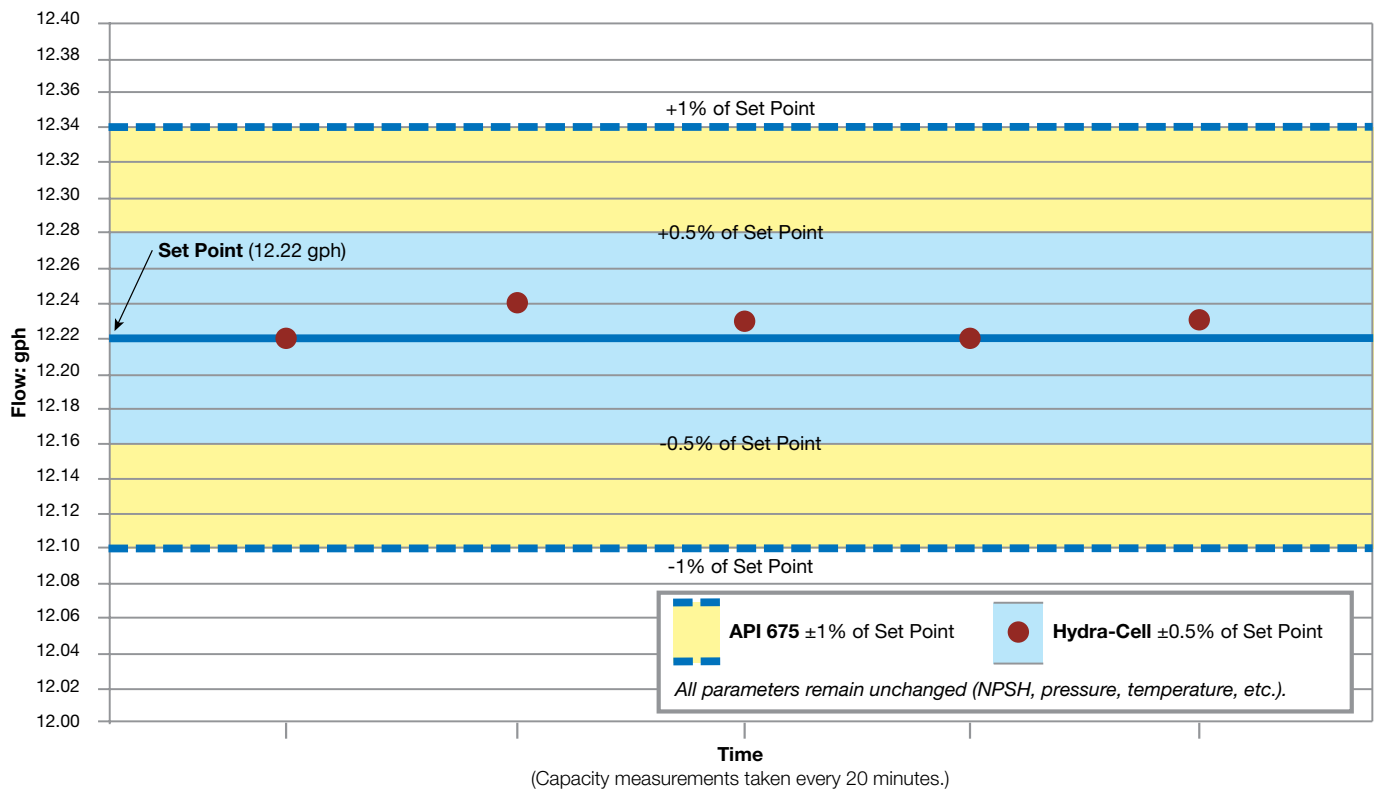
Hydra-Cell Metering Solutions meet or exceed API 675 performance standards by using electronic flow control to improve accuracy and a multiple-diaphragm design to reduce pulsations. Used in precise metering, dosing, injection, and mixing applications, Hydra-Cell pumps provide an economical alternative to conventional metering pumps.

Operational Data for Testing

Pump Configuration:	P300NRGSS020S
Reducer:	20:1
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

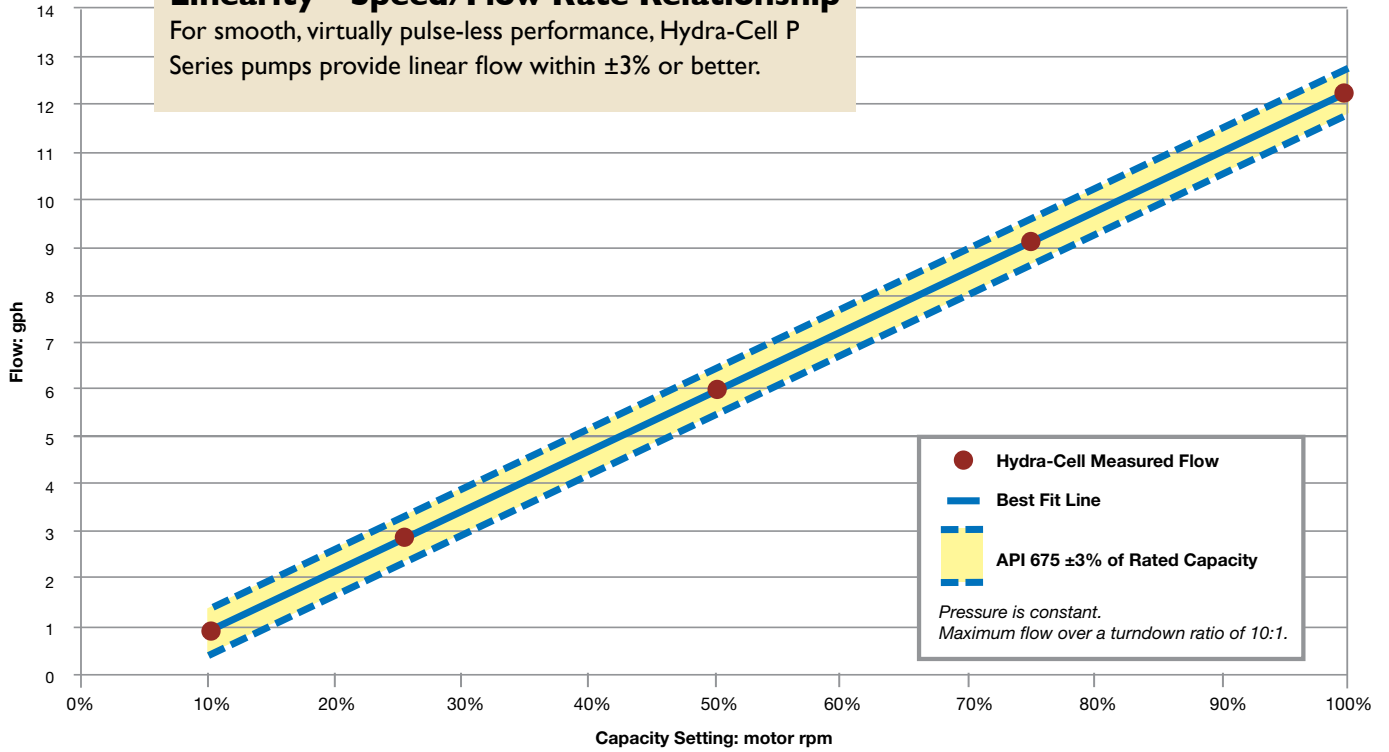
Accuracy - Performance at a Set Point

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



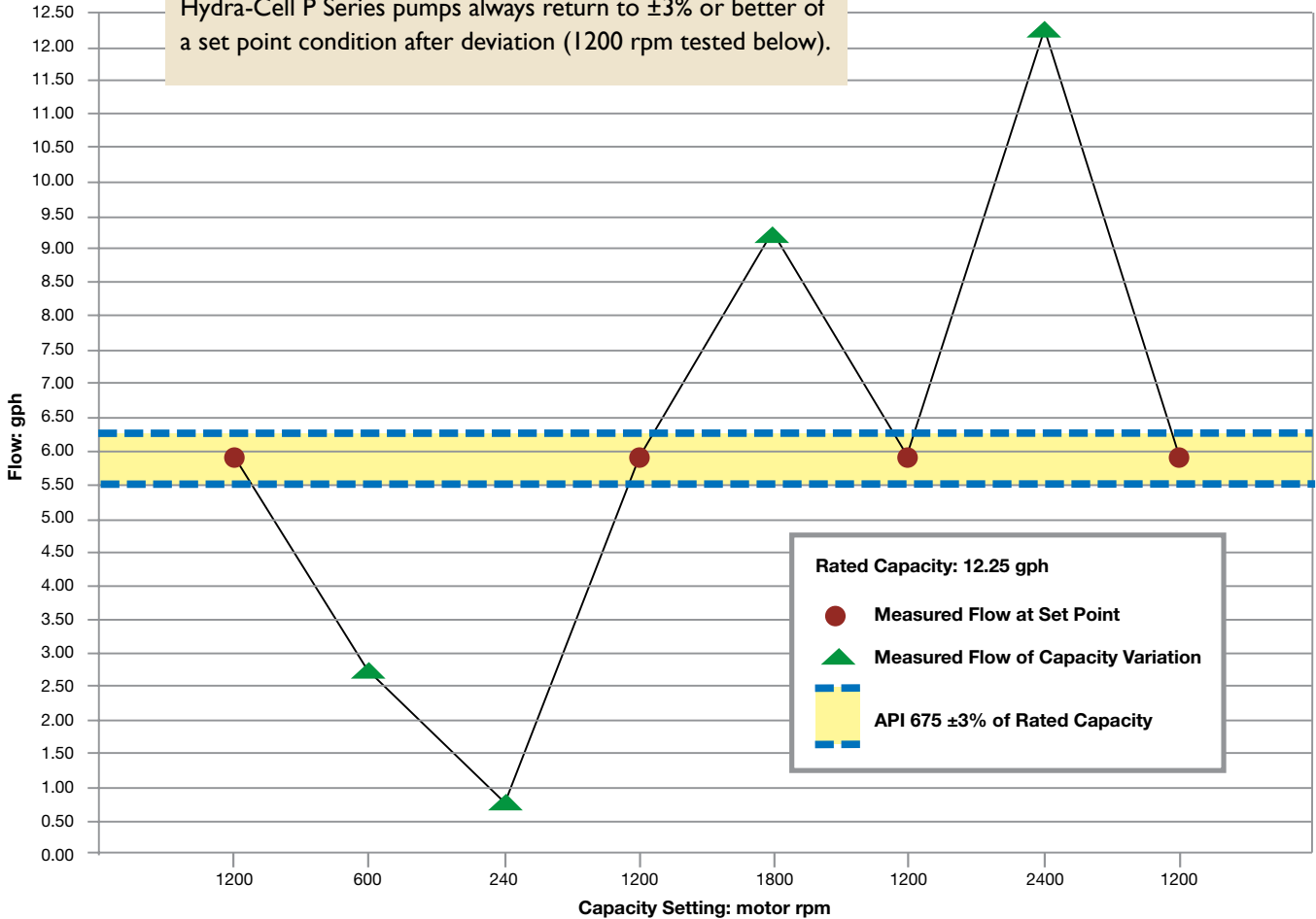
Linearity - Speed/Flow Rate Relationship

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).



PI00 Series

Maximum Flow Rate: 26.5 gph

Maximum Pressure: 1500 psi for Metallic Pump Heads
350 psi for Non-metallic Pump Heads



PI00 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	1500 psi				
0.66	0.57	0.51	0.32	-	18	100:1	1800	
0.82	0.73	0.67	0.48	-	22.5	80:1		
1.10	1.01	0.93	0.73	-	30	60:1		
1.32	1.22	1.14	0.94	-	36	50:1		
1.65	1.55	1.46	1.25	0.35	45	40:1		
2.20	2.10	2.00	1.76	0.85	60	30:1		
2.64	2.53	2.42	2.17	1.26	72	25:1		
3.31	3.18	3.06	2.79	1.86	90	20:1		
4.41	4.27	4.13	3.82	2.87	120	15:1		
6.62	6.45	6.26	5.87	4.88	180	10:1		
8.83	8.63	8.39	7.93	6.89	240	7.5:1		
13.20	12.98	12.64	12.04	10.92	360	5:1		
17.66	17.33	16.90	16.16	14.94	480	7.5:1		3600
26.50	26.04	25.42	24.38	22.99	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

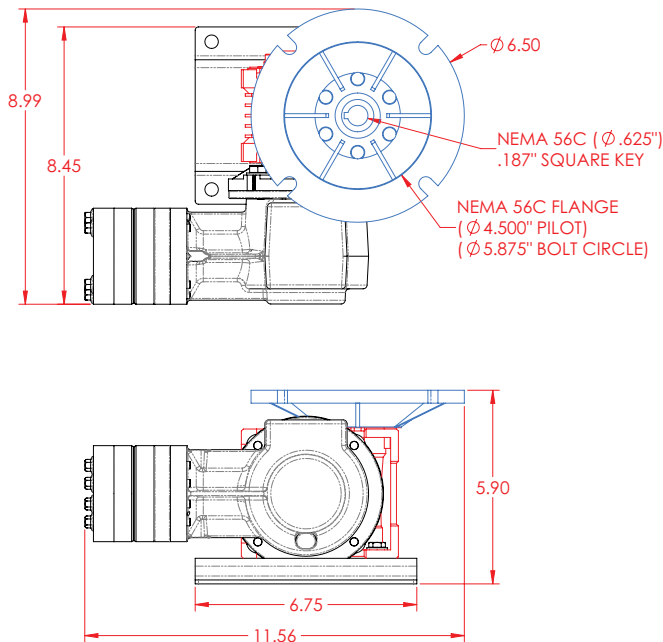
1/4	1/2	3/4
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Pump Data

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:	18.5 lbs (8.4 kg)
Non-metallic Heads:	16.4 lbs (7.4 kg)
Dimensions (less motor)	
Metallic Heads:	9.07" W x 11.57" D x 5.9" H (230 mm W x 294 mm D x 150 mm H)
Non-metallic Heads:	9.07" W x 11.82" D x 5.9" H (230 mm W x 300 mm D x 150 mm H)

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

Representative Dimensional Drawings (Inches)



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

Pump Version (Digit 5)

N NPT Ports
M BSPT Ports

Pump Head Material (Digit 6)

M PVDF
P Polypropylene
S 316L Stainless Steel
T Hastelloy C

Diaphragm & O-ring Material (Digit 7)[▲]

E EPDM ▲ See price list for different actuating oils available with these materials.
G FKM
J PTFE
P Neoprene
T Buna-N

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST
TT Hastelloy C / Hastelloy C
SC 316L SST / Ceramic
TC Hastelloy C / Ceramic

Gearbox Ratio (Digits 10-12)

100 100:1 (56C Motor Frame)
080 80:1 (56C Motor Frame)
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)

For accessories, options, and a system installation example, see page 140.

P200 Series

Maximum Flow Rate: 80.8 gph

Maximum Pressure: 1000 psi for Metallic Pump Heads
350 psi for Non-metallic Pump Heads



P200 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				
1.70	1.60	1.40	0.90	18	100:1	1800	
2.21	2.10	1.90	1.38	22.5	80:1		
3.05	2.94	2.73	2.18	30	60:1		
3.73	3.62	3.39	2.81	36	50:1		
4.74	4.62	4.39	3.77	45	40:1		
6.43	6.30	6.05	5.36	60	30:1		
7.78	7.65	7.38	6.64	72	25:1		
9.81	9.67	9.37	8.55	90	20:1		
13.18	13.03	12.69	11.74	120	15:1		
19.94	19.75	19.34	18.12	180	10:1		
26.69	26.47	25.98	24.50	240	7.5:1		
40.20	39.92	39.26	37.25	360	5:1		
53.71	53.36	52.55	50.00	480	7.5:1		3600
80.72	80.25	79.11	75.51	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

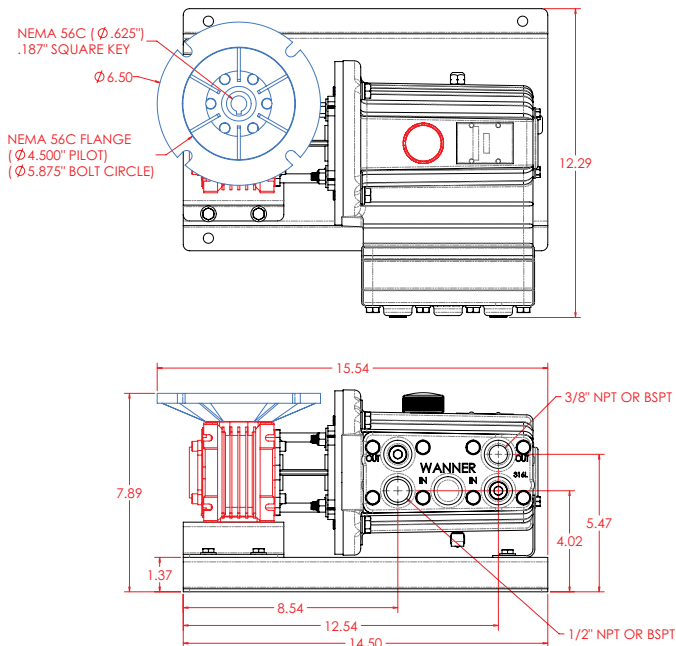
1/4	1/2	3/4	1
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Pump Data

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:	39 lbs (17.7 kg)
Non-metallic Heads:	30 lbs (13.6 kg)
Dimensions (less motor)	
Metallic Heads:	15.56" W x 12.23" D x 8.06" H (395 mm W x 311 mm D x 205 mm H)
Non-metallic Heads:	15.56" W x 12.61" D x 8.06" H (395 mm W x 320 mm D x 205 mm H)

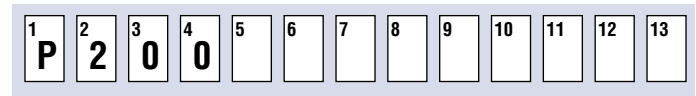
* Consult factory for correct component selection for temperatures from 160 °F (71 °C) to 250 °F (121 °C).

Representative Dimensional Drawings (Inches)



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)

P200 For all P200 Pumps

Pump Version (Digit 5)

N NPT Ports
M BSPT Ports

Pump Head Material (Digit 6)

M PVDF
P Polypropylene
S 316L Stainless Steel
T Hastelloy CW12MW

Diaphragm & O-ring Material (Digit 7)▲

A Aflas (with PTFE o-rings)
M Aflas (with PTFE o-rings, FKM drive case elastomers and Mesamoll oil)
E EPDM
G FKM
J PTFE
P Neoprene
T Buna-N

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

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST
TT Hastelloy C / Hastelloy C
SC 316L SST / Ceramic
TC Hastelloy C / Ceramic

Gearbox Ratio (Digits 10-12)

100 100:1 (56C Motor Frame)
080 80:1 (56C Motor Frame)
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)

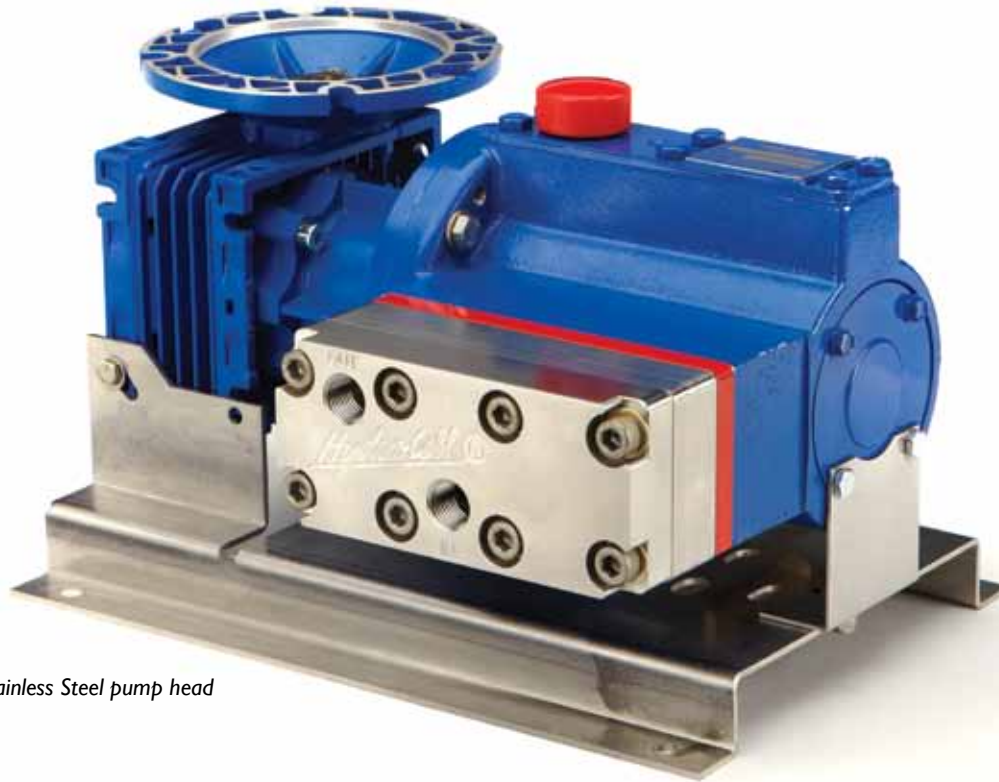
C Carbon Steel (Epoxy painted)
S Stainless Steel

For accessories, options, and a system installation example, see page 140.

P300 Series

Maximum Flow Rate: 82.3 gph

Maximum Pressure: 2500 psi for Metallic Pump Heads



P300 with Stainless Steel pump head

Performance Maximum Flow at Designated Pressure

Metallic Pump Heads Only (gph)				Pump rpm	Gear Ratio	Motor rpm	
100 psi	500 psi	1500 psi	2500 psi				
2.00	1.85	1.50	1.15	18	100:1	1800	
2.51	2.36	1.98	1.60	22.5	80:1		
3.37	3.21	2.79	2.36	30	60:1		
4.06	3.88	3.43	2.97	36	50:1		
5.09	4.89	4.40	3.88	45	40:1		
6.80	6.58	6.01	5.39	60	30:1		
8.17	7.94	7.30	6.60	72	25:1		
10.23	9.62	9.23	8.41	90	20:1		
13.66	13.34	12.46	11.44	120	15:1		
20.52	20.10	18.90	17.50	180	10:1		
27.38	26.86	25.35	23.55	240	7.5:1		
41.10	40.37	38.24	35.67	360	5:1		
54.82	53.89	51.13	47.78	480	7.5:1		3600
82.26	80.91	76.91	72.00	720	5:1		

Required Motor hp

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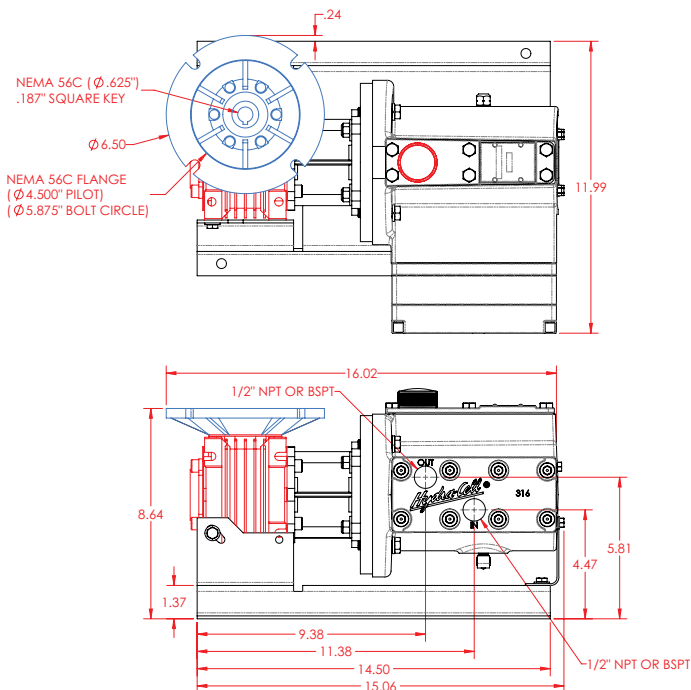
Pump Data

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:	51 lbs (23.2 kg)
Dimensions (less motor)**	
Metallic Heads:	16.02" W x 12.23" D x 9.60" (407 mm W x 311 mm D x 244 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 Dimensional Drawings (Inches)



For accessories, options, and a system installation example, see page 140.

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

Pump Version (Digit 5)

N NPT Ports
M BSPT Ports

Pump Head Material (Digit 6)

R 304 Stainless Steel
S 316L Stainless Steel

Diaphragm & O-ring Material (Digit 7)[▲]

E EPDM ^{▲ See price list for different actuating oils available with these materials.}
G FKM
T Buna-N

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST

Gearbox Ratio (Digits 10-12)

100	100:1	(56C Motor Frame)
080	80:1	(56C Motor Frame)
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 Stainless Steel

P400 Series

Maximum Flow Rate: 243.0 gph

Maximum Pressure: 1000 psi for Metallic Pump Heads
350 psi 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				
5.45	5.40	5.35	5.19	18	100:1	1800	
6.97	6.92	6.86	6.68	22.5	80:1		
9.51	9.45	9.38	9.16	30	60:1		
11.54	11.48	11.40	11.15	36	50:1		
14.59	14.52	14.43	14.13	45	40:1		
19.66	19.59	19.47	19.10	60	30:1		
23.72	23.64	23.51	23.07	72	25:1		
29.81	29.72	29.56	29.04	90	20:1		
39.96	39.85	39.65	38.97	120	15:1		
60.27	60.12	59.83	58.84	180	10:1		
80.57	80.38	80.00	78.71	240	7.5:1		
121.2	120.9	120.4	118.5	360	5:1		
161.8	161.4	160.7	158.2	480	7.5:1		3600
243.0	242.5	241.4	237.7	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
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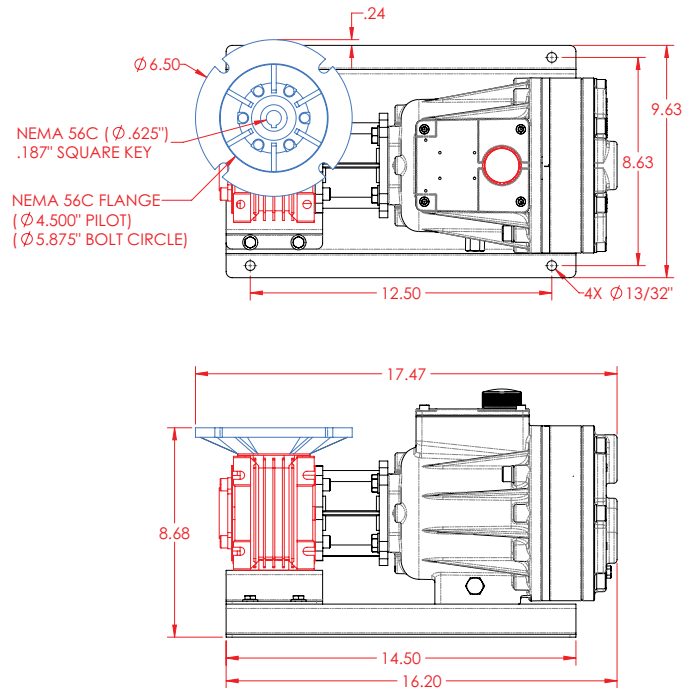
Pump Data

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:	62 lbs (28.1 kg)
Non-metallic Heads:	49 lbs (22.2 kg)
Dimensions (less motor)**	
Metallic Heads:	17.59" W x 9.87" D x 10.34" H (447 mm W x 251 mm D x 263 mm H)
Non-metallic Heads:	18.19" W x 9.87" D x 10.34" H (462 mm W x 251 mm D x 263 mm H)

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

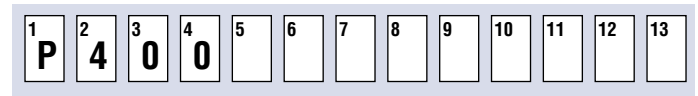
** For 56C motor frame only. Consult factory for other motor frame sizes.

Representative Dimensional Drawings (Inches)



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

Pump Version (Digit 5)

N NPT Ports
M BSPT Ports

Pump Head Material (Digit 6)

C Cast Iron
M PVDF
P Polypropylene
R 316L Stainless Steel (ANSI flange weldment)
S 316L Stainless Steel (NPT or BSPT)
T Hastelloy CW12MW

Diaphragm & O-ring Material (Digit 7)[▲]

E EPDM
G FKM
J PTFE
P Neoprene
T Buna-N

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

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST
TT Hastelloy C / Hastelloy C
SC 316L SST / Ceramic
TC Hastelloy C / Ceramic

Gearbox Ratio (Digits 10-12)

100	100:1	(56C Motor Frame)
080	80:1	(56C Motor Frame)
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 Stainless Steel

For accessories, options, and a system installation example, see page 140.

P500 Series

Maximum Flow Rate: 426.0 gph

Maximum Pressure: 2500 psi for Metallic Pump Heads



P500 with Stainless Steel pump head

Performance Maximum Flow at Designated Pressure

Metallic Pump Heads Only (gph)				Pump rpm	Gear Ratio	Motor rpm
100 psi	500 psi	1500 psi	2500 psi			
11.74	11.26	10.25	9.47	18	100:1	1800
14.39	13.89	12.79	11.89	22.5	80:1	
18.82	18.27	17.02	15.92	30	60:1	
22.36	21.78	20.41	19.15	36	50:1	
27.67	27.03	25.49	23.99	45	40:1	
36.52	35.80	33.95	32.06	60	30:1	
43.60	42.81	40.73	38.52	72	25:1	
54.22	53.32	50.89	48.20	90	20:1	
71.93	70.84	67.82	64.34	120	15:1	
107.3	105.9	101.7	96.62	180	10:1	
142.7	140.9	135.5	128.9	240	7.5:1	
213.6	211.0	203.3	193.5	360	5:1	
284.4	281.1	271.0	258.0	480	7.5:1	3600
426.0	421.3	406.5	387.1	720	5:1	

Required Motor hp

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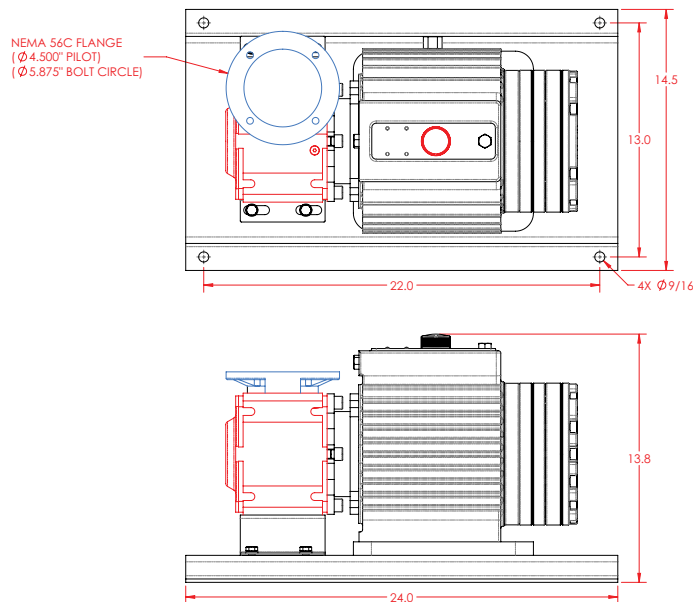
Pump Data

Diaphragms per Liquid End	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:	160 lbs (23.2 kg)
Dimensions (less motor)**	
Metallic Heads:	19.2" W x 10.7" D x 12.4" H (488 mm W x 272 mm D x 315 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 Dimensional Drawings (Inches)



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

Pump Version (Digit 5)

N NPT Ports
M BSPT Ports

Pump Head Material (Digit 6)

S 316L Stainless Steel

Diaphragm & O-ring Material (Digit 7)[▲]

G FKM ▲ See price list for different actuating oils available with these materials.
T Buna-N

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST

Gearbox Ratio (Digits 10-12)

100	100:1	(56C Motor Frame)
080	80:1	(56C Motor Frame)
060	60:1	(56C Motor Frame)
050	50:1	(56C Motor Frame)
040	40:1	(56C Motor Frame)
A40	40:1	(143/145TC Motor Frame)
030	30:1	(56C Motor Frame)
A30	30:1	(143/145TC Motor Frame)
025	25:1	(56C Motor Frame)
A25	25:1	(143/145TC Motor Frame)
020	20:1	(56C Motor Frame)
A20	20:1	(143/145TC Motor Frame)
015	15:1	(56C Motor Frame)
A15	15:1	(143/145TC Motor Frame)
B15	15:1	(182/184TC Motor Frame)
010	10:1	(56C Motor Frame)
A10	10:1	(143/145TC Motor Frame)
B10	10:1	(182/184TC Motor Frame)
007	7.5:1	(56C Motor Frame)
A07	7.5:1	(143/145TC Motor Frame)
B07	7.5:1	(182/184TC Motor Frame)
C07	7.5:1	(213/215TC Motor Frame)
005	5:1	(56C Motor Frame)
A05	5:1	(143/145TC Motor Frame)
B05	5:1	(182/184TC Motor Frame)
C05	5:1	(213/215TC Motor Frame)
D05	5:1	(254/256TC Motor Frame)

Base Plate (Digit 13)

A Aluminum (Epoxy painted)
H Carbon Steel (Epoxy painted) for B, C and D reducers

For accessories, options, and a system installation example, see page 140.

P600 Series

Maximum Flow Rate: 894.6 gph

Maximum Pressure: 1000 psi for Metallic Pump Heads
350 psi 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				
22.43	22.27	21.89	20.77	18	100:1	1800	
28.03	27.79	27.31	26.05	22.5	80:1		
37.34	36.99	36.34	34.84	30	60:1		
44.80	44.35	43.57	41.87	36	50:1		
55.98	55.39	54.40	52.42	45	40:1		
74.62	73.79	72.46	70.01	60	30:1		
89.52	88.51	86.91	84.07	72	25:1		
111.9	110.6	108.6	105.2	90	20:1		
149.2	147.4	144.7	140.3	120	15:1		
223.7	221.0	216.9	210.7	180	10:1		
298.2	294.6	289.2	281.0	240	7.5:1		
447.3	441.8	433.7	421.7	360	5:1		
596.4	589.0	578.1	562.4	480	7.5:1		3600
894.6	883.4	867.1	843.7	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	7-1/2	10
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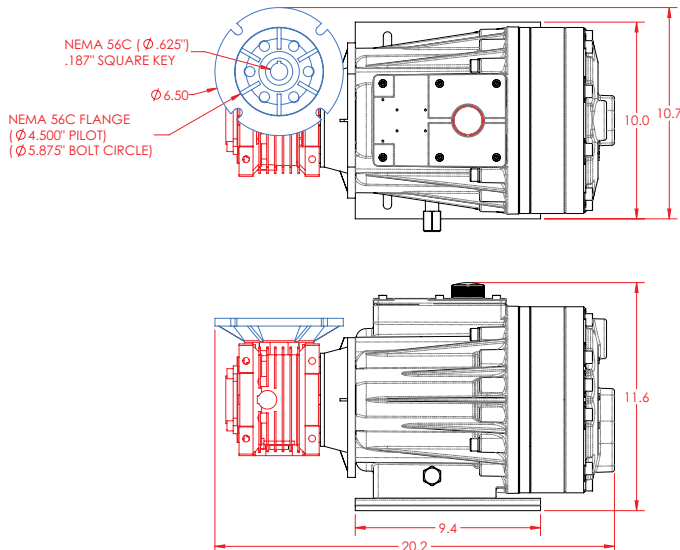
Pump Data

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:	141 lbs (64 kg)
Non-metallic Heads:	106 lbs (48 kg)
Dimensions (less motor)**	
Metallic Heads:	21.0" W x 10.7" D x 11.2" H (533 mm W x 272 mm D x 285 mm H)
Non-metallic Heads:	21.8" W x 10.7" D x 11.2" H (554 mm W x 272 mm D x 285 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 Dimensional Drawings (Inches)



For accessories, options, and a system installation example, see page 140.

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

Pump Version (Digit 5)

N NPT Ports or ANSI Flanges

M BSPT Ports

Pump Head Material (Digit 6)

C Cast Iron

M PVDF

P Polypropylene

R 316L Stainless Steel (ANSI flange weldment)

S 316L Stainless Steel (NPT or BSPT)

T Hastelloy CW12MW

Diaphragm & O-ring Material (Digit 7)▲

E EPDM

G FKM

J PTFE

P Neoprene

T Buna-N

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

Check Valve Material (Digits 8-9)

(Valve Spring / Valve & Seat)

SS 316L SST / 316L SST

TT Hastelloy C / Hastelloy C

SC 316L SST / Ceramic

TC Hastelloy C / Ceramic

Gearbox Ratio (Digits 10-12)

100	100:1	(56C Motor Frame)
080	80:1	(56C Motor Frame)
060	60:1	(56C Motor Frame)
050	50:1	(56C Motor Frame)
040	40:1	(56C Motor Frame)
A40	40:1	(143/145TC Motor Frame)
030	30:1	(56C Motor Frame)
A30	30:1	(143/145TC Motor Frame)
025	25:1	(56C Motor Frame)
A25	25:1	(143/145TC Motor Frame)
020	20:1	(56C Motor Frame)
A20	20:1	(143/145TC Motor Frame)
015	15:1	(56C Motor Frame)
A15	15:1	(143/145TC Motor Frame)
010	10:1	(56C Motor Frame)
A10	10:1	(143/145TC Motor Frame)
B10	10:1	(182/184TC Motor Frame)
007	7.5:1	(56C Motor Frame)
A07	7.5:1	(143/145TC Motor Frame)
B07	7.5:1	(182/184TC Motor Frame)
C07	7.5:1	(213/215TC Motor Frame)
005	5:1	(56C Motor Frame)
A05	5:1	(143/145TC Motor Frame)
B05	5:1	(182/184TC Motor Frame)
C05	5:1	(213/215TC Motor Frame)

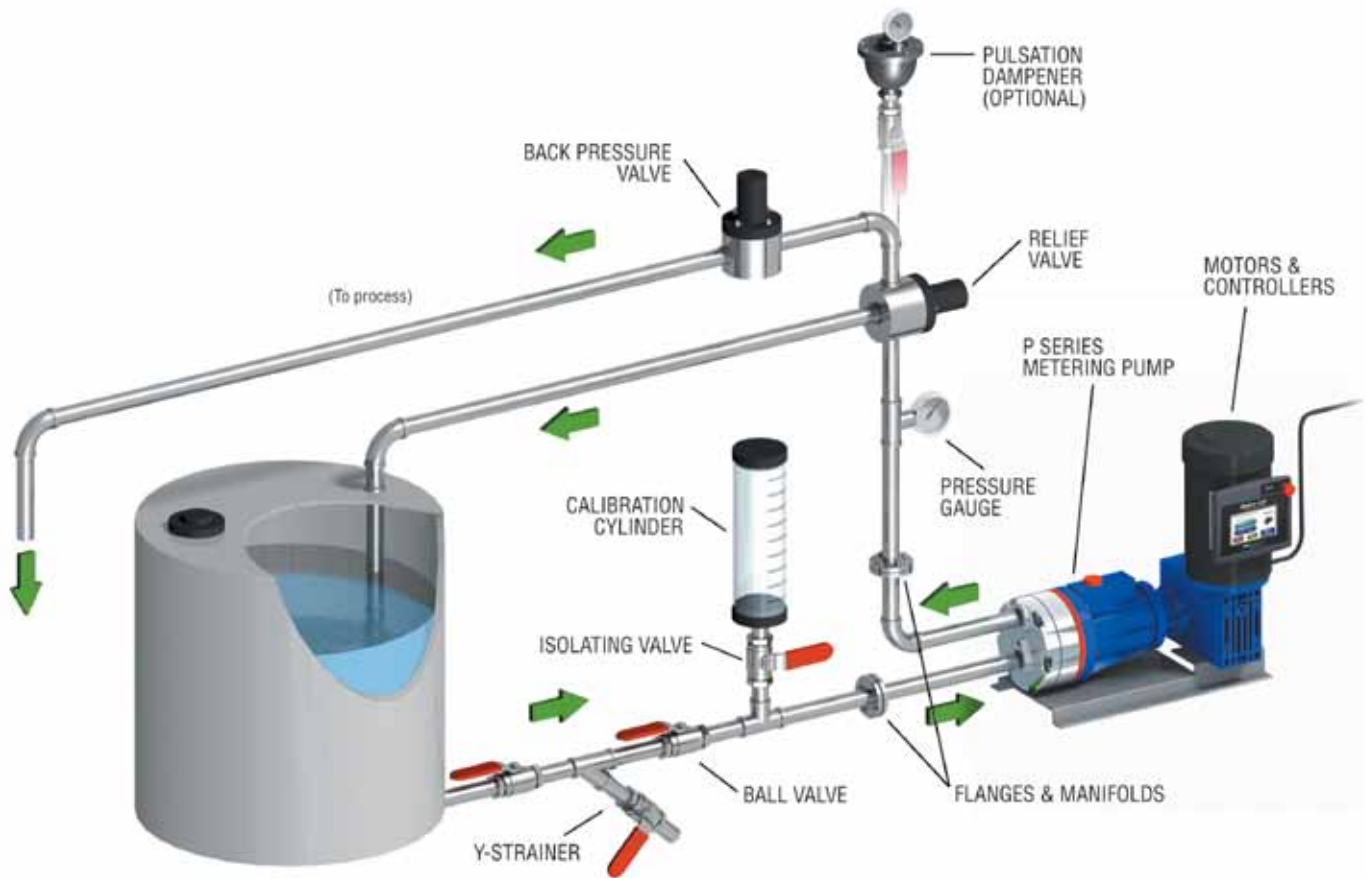
Base Plate (Digit 13)

C Carbon Steel (Epoxy painted)

H Carbon Steel (Epoxy painted) for B and C reducers

Hydra-Cell® P Series Accessories and Options

Metering System Installation Example



Hydra-Cell metering pumps are just one facet of a complete Hydra-Cell “Metering Solutions” system. We can furnish all components in your pumping system, individually tailored to your specific processing needs.

- Calibration cylinders
- Back pressure valves
- Pressure relief valves
- Pulsation dampeners
- Motors and motor adapters
- Motor controllers
- Variable frequency drives (VFD)
- Diaphragm materials
- Liquid end and check valve materials
- Gearbox ratios
- Manifolds and flanges
- Strainers
- Suction accumulators
- Actuating oils
- Witnessed and non-witnessed testing
- Drawing packages
- OEM paint and nameplate customization

See the Accessories section of this catalog, beginning on page 86 for more detailed information about the selection and specific part numbers.

Hydra-Cell® Bare Shaft Pumps for Metering

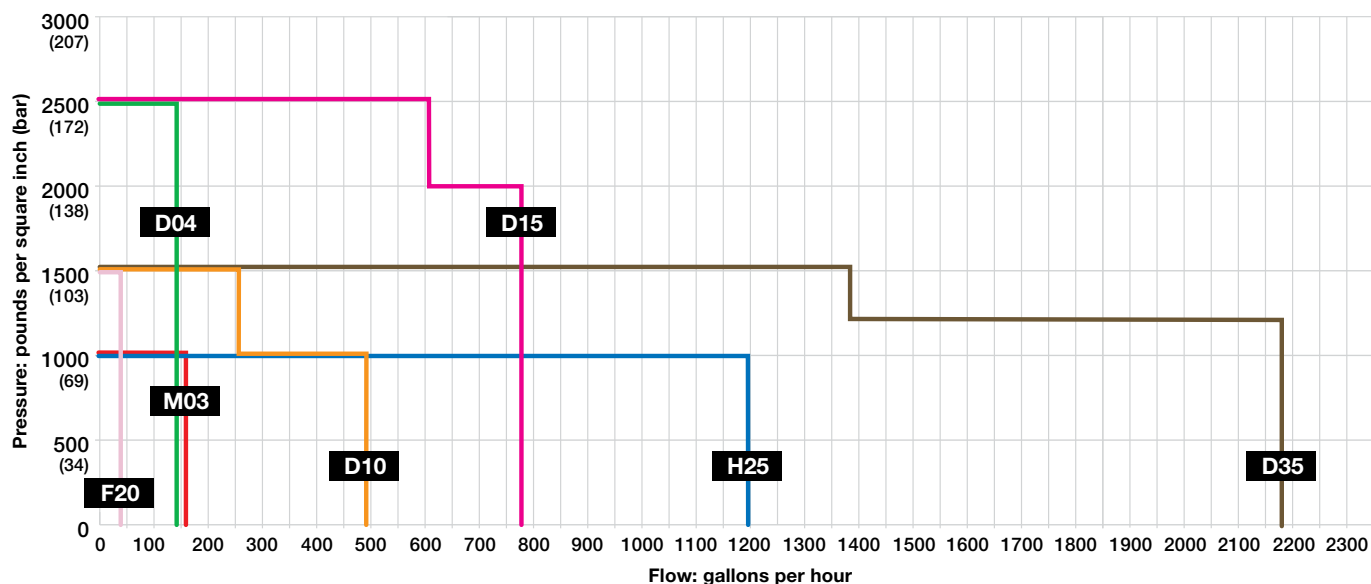
In certain less critical metering and injecting applications, Hydra-Cell pumps without the gear reducers (bare shaft pumps) provide an alternative to P Series metering pumps as they meet API 675 performance standards at the rated maximum rpm shown in the table below.

Hydra-Cell bare shaft pumps should be considered instead of a Hydra-Cell Metering Solutions system when any of the following conditions apply:

- Flow capacities required exceed those of Hydra-Cell Metering Solutions pumps (see page 123)
- Space or application parameters dictate the use of direct or belt drives
- Acquisition cost is the primary consideration



Capacities and Ratings



Model ¹	Maximum Capacity gph	Maximum Discharge Pressure psi (bar)		Maximum Operating Temperature F (C) ³		Maximum Inlet Pressure psi (bar)	Rated rpm for Metering
		Non-metallic ²	Metallic	Non-metallic	Metallic		
F20	36.6	350 (24)	1500 (103)	140° (60°)	250° (121°)	250 (17)	1050
M03	155.5	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1440
D04	146.9	N/A	2500 (172)	N/A	250° (121°)	500 (34)	1440
D10	256.0	N/A	1500 (103)	N/A	250° (121°)	250 (17)	790
D10	483.8	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1440
D15	607.2	N/A	2500 (172)	N/A	250° (121°)	500 (34)	1150
D15	777.6	N/A	2000 (138)	N/A	250° (121°)	500 (34)	1440
H25	1197.0	350 (24)	1000 (69)	140° (60°)	250° (121°)	250 (17)	1050
D35	1386.0	N/A	1500 (103)	N/A	250° (121°)	250 (17)	700
D35	2186.1	N/A	1200 (83)	N/A	250° (121°)	500 (34)	1050

¹ Ratings are for X-cam design.

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

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

Hydra-Cell® Frequently Asked Questions

What type of oil should be used with Hydra-Cell pumps?

The pump lubricant in Hydra-Cell pumps performs two functions: (1) it provides flooded oil lubrication to the bearings; (2) it provides hydraulically-balanced displacement to the diaphragms.

Critical to the hydraulic system within each piston, the oil must flow smoothly under high pressures.

Hydra-Oil is available in a variety of standard-duty motor oils, synthetic, EPDM-compatible, and food-grade lubricants to meet these requirements.

Which way do I rotate the shaft when setting up the drive for my Hydra-Cell pump?

Either way.

The smooth, positive displacement delivery of a Hydra-Cell pump can be achieved when rotating the shaft in either direction.

What happens if the Hydra-Cell pump runs dry?

“Nothing.”

The unique, seal-less design of Hydra-Cell means that the pump does not require lubrication from the process fluid. In the event of your tank or product source running dry, and air being pulled through the pump, no damage will occur. As fluid again is available, the Hydra-Cell pump will resume pumping.

What is the maximum particle size that can pass through a Hydra-Cell pump?

Up to 800 microns depending on pump model.

Round particles up to 200 microns can pass through Hydra-Cell models F20, M03, D03, and D04. 500-micron particles can pass through models D10, D12, and D15/D17. 800-micron particles can pass through the H25 and D35 model pumps. Critical to the successful pumping of particulates is ensuring that all particles are fully suspended in the fluid to avoid any settling of the solids. Key factors include fluid velocity (pump speed) and particle mass. With intermittent duty, care must be taken to avoid excessive settling in the inlet and discharge plumbing.

What is the maximum hardness number on the Mohs Mineral Hardness Scale that Hydra-Cell pumps can handle?

9 Mohs.

Is a pressure relief valve necessary when using the Hydra-Cell pump?

Yes.

The positive displacement performance of the Hydra-Cell pump requires that each application has a pressure regulating valve in the discharge line to allow fluid to divert in the event that excessive pressure builds in the system. Hydra-Cell C Series valves provide this protection for your high-pressure system.

How long can I expect the diaphragms to last?

Indefinitely

When installed properly and no adverse stresses are applied to our elastomeric diaphragms (e.g. excessive vacuum, foreign matter, etc.) the hydraulically-balanced diaphragm will not be a wear component.

Due to their poor elastomeric memory, PTFE diaphragms will eventually wear. Maximum life can be achieved with reduced stroke cams and/or by limiting pump speed.

Are Hydra-Cell pumps easy to service?

Yes.

Hydra-Cell pumps are engineered to be easy and inexpensive to service. With regular oil changes, most wear is restricted to the check valve components in the fluid end pump head. All wear items are available in repair kits that include service and parts manuals to allow for fast and easy repairs in the field.

All repair manuals are available on our website (www.Hydra-Cell.com). Online videos are also available – contact us for details.

What determines an application duty cycle?

A continuous-duty cycle is typically defined as a pump running more than 8 hours per day, 5-to-7 days a week. Continuous applications running at or near maximum pressure may benefit and achieve a longer pump life by sizing the application with the next larger pump model.

Running a pump for shorter periods (intermittent-duty cycle) than a continuous-duty cycle under high temperatures or heavy loads may also affect pump duty selection. In addition, for excessive heat applications (greater than 180°F/82°C) using an oil cooler is recommended.

How can the right flow be produced for a pump application?

Hydra-Cell pumps use positive displacement performance to produce a steady, dependable flow at pressures from 50 to 2500 psi (3.4 to 172 bar). The output of the pump is entirely dependent on the shaft rpm. Once the required flow rate is known, there are many ways to drive the pump. Shaft coupling directly to a motor with a motor adapter is the most popular drive arrangement.

All our pump models utilize different output crankshafts or cams to produce different flow rates at common electric motor speeds (e.g., 1150, 1450, 1750 rpm with 60 Hz power, etc.). In addition, pumps and motors can be mounted side-by-side and pulley driven with V-belts or cog style belts (see calculating pulley size formulation on page 144). Other drive configurations include hydraulic motors, air motors, gas engines, PTO or any other means to drive the shaft.

Hydra-Cell® Design Considerations

Technical Pump Selection

To properly specify a pump to meet a specific application requirement, use a copy of the application worksheet found on page 153. Please feel free to contact us or your local Hydra-Cell distributor for assistance in calculating the appropriate pump for your application.

Chemical Compatibility

Chemical compatibility of the pump materials of construction with the pumped fluid is a critical design consideration. Factors that must be reviewed as part of chemical compatibility include:

- Temperature
- Concentration
- Presence of other chemicals

Temperature

Temperature factors that must be reviewed as part of this evaluation include:

- Stability of fluid
- Fluid end components
- Hydraulic end lubricity
- Vapor pressure

Inlet Pressure

Inlet pressure to the pump is determined by the design of the pump system: flooded (gravity fed); suction lift; or pressure fed. Do not exceed vacuum and pressure limits as designated in the pump IOM Manual.

NPSH (Net Positive Suction Head)

Two NPSH values are involved in pump selection: NPSHr (required head) and NPSHa (available head). NPSHa must be greater than NPSHr. If not, the pressure in the pump inlet will be lower than the vapor pressure of the fluid, and cavitation will occur. Use the following calculations as a guideline only.

Calculating NPSHa

Use the following formula to calculate NPSHa:

$$\text{NPSHa} = P_t + H_z - H_f - H_a - P_{vp}$$

where:

- P_t = Atmospheric pressure (use Atmospheric Pressure chart in next column)
- H_z = Vertical distance from the liquid surface to the pump centerline (if liquid is below pump centerline, H_z is a negative value)
- H_f = Friction losses in suction piping
- H_a = Acceleration head at pump suction (see Calculating Acceleration Head at right)
- P_{vp} = Absolute vapor pressure of liquid at pumping temperature

Atmospheric Pressure at Various Altitudes

Altitude (ft.)	Pressure (ft. of H ₂ O)
0	33.9
500	33.3
1,000	32.8
1,500	32.1
2,000	31.5
5,000	28.2

Calculating Acceleration Head (H_a)

Use the following formula to calculate H_a losses. Subtract this figure from the NPSHa and compare the result to the NPSHr of the appropriate Hydra-Cell pump (NPSHr curves in pump specification section).

$$H_a = \frac{L \times V \times N \times C}{K \times G}$$

where:

- H_a = Acceleration head (ft. of liquid)
- L = Actual length of suction line (ft.) – not equivalent length
- V = Velocity of liquid in suction line (ft./sec);
[V = gpm × (0.408 ÷ pipe I.D.²)]
- N = rpm of crank shaft
- C = Constant determined by type of pump/Hydra-Cell: (consult your Hydra-Cell Installation & Service Manual).
- K = Constant of compensate for compressibility of the fluid – use:
 - 1.4 for de-aerated or hot water
 - 1.5 for most liquids
 - 2.5 for hydrocarbons with high compressibility
- G = Gravitational constant (32.2 ft./sec²)

Minimizing Acceleration Head

- Keep inlet lines less than 6 ft. (1.8 m) long
- Use appropriate size I.D. inlet hose
- Use flexible hose (low-pressure hose, non-collapsing) for inlet lines
- Minimize fittings (elbows, valves, tees, etc.)
- Use suction stabilizer on the inlet

Hydra-Cell® Installation Guidelines

General Installation

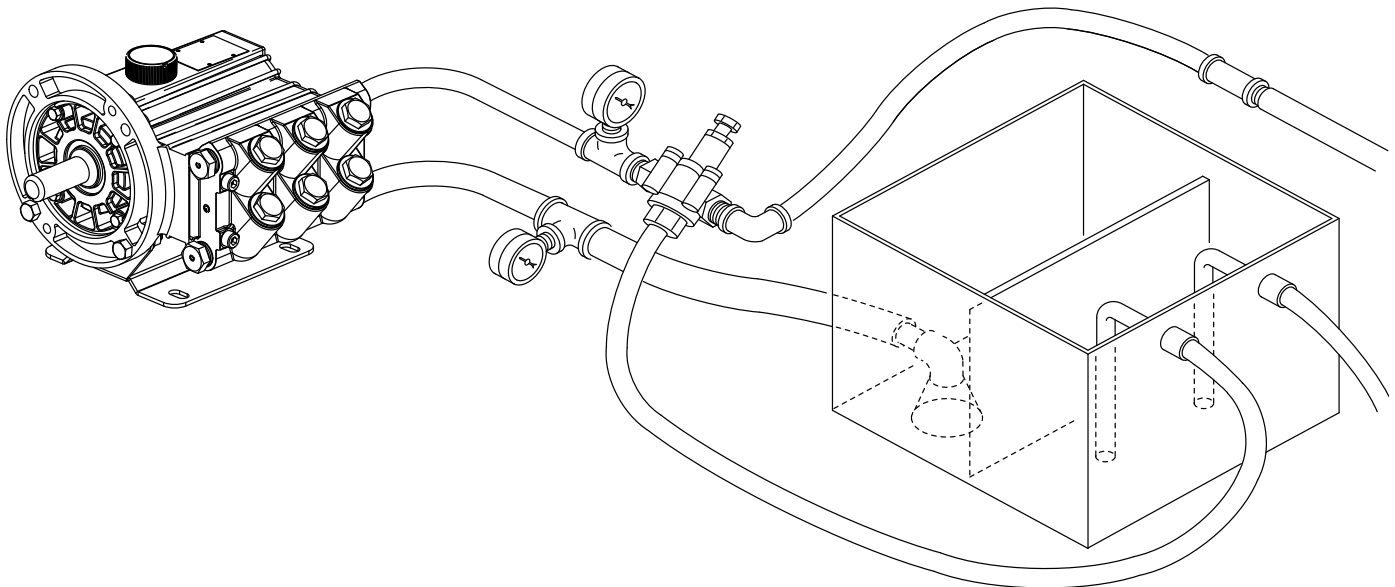
1. Read and follow all instructions and safety warnings in the Hydra-Cell IOM Manual.
2. Do not exceed the manufacturer's recommended maximum rpm or pressure.
3. Follow all codes and regulations regarding installation and operation of the pumping system.
4. For safety and easier servicing, provide adequate work space around the pump. Allow room for checking the oil level, changing the oil, and removing the valve plate and manifold.
5. To prevent vibration, mount the pump and motor securely to a rigid, level base.
6. Be sure the inlet system provides NPSHa that exceeds the sum of NPSHr of the pump, all friction losses and acceleration head.
7. Do not exceed the manufacturer's recommended maximum inlet pressure. Install an inlet pressure regulator if necessary.
8. On a belt-drive system, align the belts and pulleys accurately, and follow the manufacturer's specifications for belt tension.
9. On a direct-drive system, align shafts properly.
10. Install adequate safety guards on all belts and couplings.
11. Install drains in all low points of the system to allow draining in freezing conditions.

Supply Tank Guidelines

1. Use a supply tank that is large enough to provide time for any entrapped air in the fluid to escape.
2. Isolate the pump and motor stand from the supply tank and support them separately.
3. Where possible, install a separate inlet line from the supply tank to each pump. Alternatively, target 1 ft/sec manifold velocity.
4. Install the inlet and bypass lines so that they empty into the supply tank below the lowest water level, on the opposite side of the baffle from the pump inlet line.
5. If a line strainer is used in the system, install it in the inlet line to the supply tank.
6. Install a completely-submerged baffle plate in the supply tank to separate the incoming and outgoing liquid so as to reduce aeration and turbulence.
7. Install a vortex breaker in the supply tank over the outlet port to the pump.
8. Place a cover on the supply tank to prevent foreign objects from falling into it.

Calculating Pulley Size

$$\frac{\text{motor pulley OD}}{\text{pump rpm}} = \frac{\text{pump pulley OD}}{\text{motor rpm}}$$



Hydra-Cell® Installation Guidelines

Inlet Piping Guidelines

1. Size the suction line so that the velocity will not exceed 1 to 3 ft/sec. $\text{Velocity} = 0.408 \times \text{gpm}/\text{Pipe I.D.}^2$. Multiple-pump installations require 1 ft/sec.
2. Keep the suction line as short and straight as possible, without any obstructions (e.g., valves, elbows, tees) within 10 pipe diameters of the pump inlet.
3. Use flexible, non-collapsible suction hose and/or expansion joints to absorb vibrations, expansions and contractions.
4. If possible, keep suction line level. Have no high points to collect vapor unless these high points are vented. Install drain cocks at any low points of the suction line to permit draining in freezing conditions.
5. Provide for permanent or temporary installation of a vacuum gauge to monitor the inlet suction.
6. It is recommended not to supply more than one pump from the same inlet line.
7. To reduce turbulence and resistance, do not use 90° elbows. If turns are necessary in the suction line, use 45° elbows (within 10 pipe diameters of the pump inlet) or arrange sweeping curves in the inlet hose.
8. If a block valve is used, be sure it is full-opening so that the flow to the pump is not restricted. The opening should be at least the same diameter as the inlet plumbing I.D.
9. It is recommended that a line strainer or filter not be used in the suction line unless regular maintenance is assured. If used, it should have a free-flow area at least three times the free-flow area of the inlet.
10. Install piping supports where necessary to relieve strain on the inlet line and to minimize vibration.

Discharge Line Guidelines

1. Size the discharge line so that the velocity will not exceed 8 to 10 ft/sec.
2. Use flexible hose between the pump and hard piping to absorb vibrations, expansions or contractions.
3. Install a pressure gauge between the pump and the pressure regulator, and as close as possible to the pump outlet.
4. Install a pressure regulator, unloader valve, or another safety relief valve in the discharge line.
5. Never install a shut-off valve in the discharge line between the pump and the regulator, or in the bypass line.

Pressure Regulator (Relief Valve) Guidelines

1. Size the pressure regulator valve so that when fully open, it will be large enough to relieve the full capacity of the pump without excessive over-pressurizing of the system.
2. Locate the valve as close to the pump as possible and ahead of any other valves.
3. Adjust the pressure regulating valve to no more than 10% over the maximum working pressure of the system. Do not exceed the manufacturer's pressure rating for the pump and/or regulator.

Hydra-Cell® Materials of Construction Reference

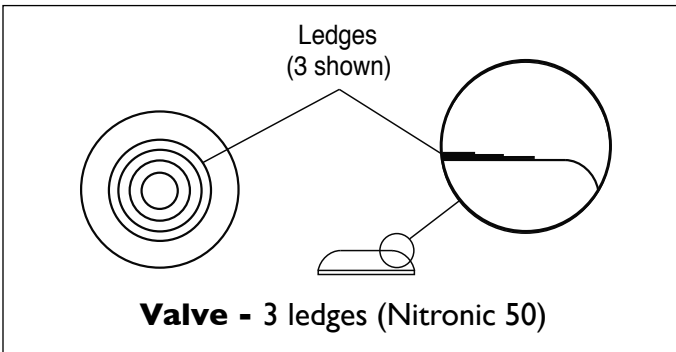
Identifying Metallic Components

Since it is often difficult to distinguish between metallic materials used, identification marks have been added to several machined metallic components of Hydra-Cell pumps and valves.

Valve (Pumps)

Identified by 0.003-inch (0.08mm) ledges (or no ledges) on one face.

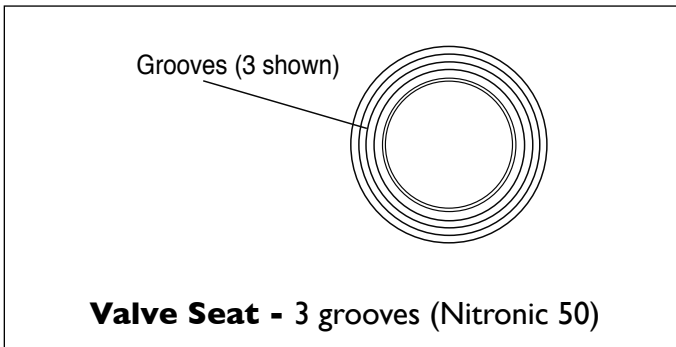
Nitronic 50	3 ledges
17-4 SST	2 ledges
316L SST	1 ledge
Hastelloy C	No ledges



Valve Seat (Pumps)

Identified by circular V-shaped grooves (or no grooves) on one face.

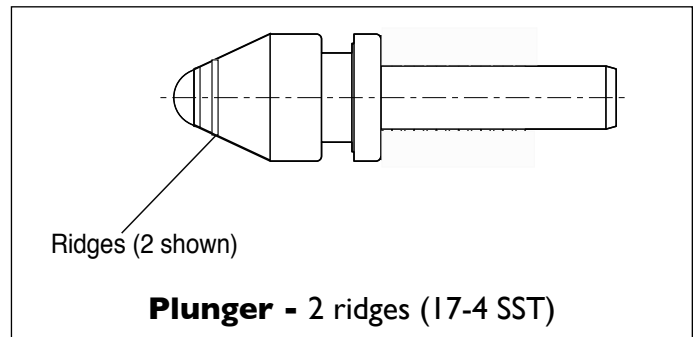
Nitronic 50	3 grooves
17-4 SST	2 grooves
316L SST	1 groove
Hastelloy C	No groove



Plunger (C22/C23/C24 Valves)

Identified by ridges (or no ridges) around the tapered end.

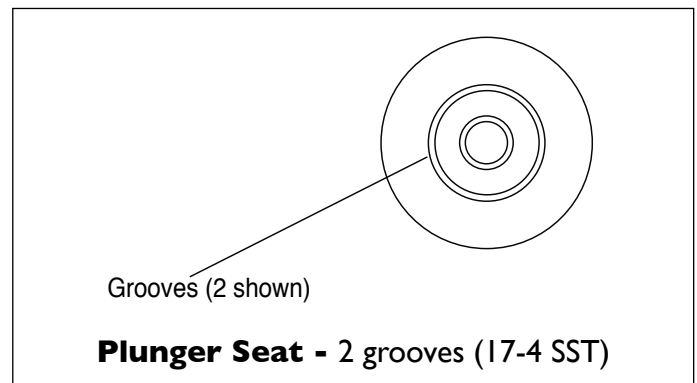
17-4 SST	2 ridges
316L SST	1 ridge
Hastelloy C	No ridges



Plunger Seat (C22/C23/C24 Valves)

Identified by circular V-shaped grooves (or no grooves) on one face.

17-4 SST	2 grooves
316L SST	1 groove
Hastelloy C	No groove



Hydra-Cell® Materials of Construction Reference

Celcon Valve Spring Retainers

Also known as Polyoxymethylene, Celcon is a thermoplastic characterized by high strength, hardness, and rigidity. It is a highly abrasion-resistant and heat-resistant material with a low coefficient of friction.

Elgiloy Valve Springs

A Cobalt-Nickel spring alloy, Elgiloy is highly recommended to reduce valve spring problems as it tested and proved to exceed Stainless Steel for many applications.

- Corrosion Resistance:** Far superior to Stainless Steel
- Greater Spring Efficiency:** Increased power with decreased size
- Fatigue Resistance:** Operates significantly longer without breaking
- Set Resistance:** Maintains constant reactive force
- Temperature Resistance:** Maintains spring characteristics up to 600°F (316°C)

Nitronic 50 Valve Seats and Valves

Nitronic 50 is an austenitic stainless steel that has greater corrosion resistance than 316, 316L, 317, and 317L Stainless Steel. It has very good mechanical properties at both elevated and sub-zero temperatures and a yield strength of three-times to four-times greater than 316 Stainless Steel.

Diaphragm Start-up Temperatures and Material Markings

The back side of diaphragms for Hydra-Cell pumps have a letter marking to identify the material from which the diaphragm is made. (There may be additional markings, such as those to indicate mold numbers.)

Diaphragm Material	Pump Start-up Temperature Range	Fluid Temperature ¹	Marking
Aflas	100-250 °F (100-121.1 °C)	80 °F (26.7 °C)	A
Buna N	30-250 °F (1.1-121.1 °C)	15 °F (9.4 °C)	NP
Neoprene	50-120 °F (10-48.9 °C)	15 °F (9.4 °C)	NE
EPDM	50-212 °F (10-100 °C)	15 °F (9.4 °C)	E
FKM	40-250 °F (4.4-121.1 °C)	15 °F (9.4 °C)	V
PTFE	60-200 °F (15.6-93.3 °C)	40 °F (4.4 °C)	²

¹ Fluid temperature after pump is warmed to minimum start-up temperature.

² PTFE diaphragms are constructed with a light-blue PTFE material laminated onto a black rubber backing and do not have identification markings.

Valve Spring Retainer Temperatures and Material Markings

Non-metallic valve spring retainers used in Hydra-Cell pumps are color-coded to identify the material from which the retainer is made.

Valve Spring Material	Fluid Temperature	Marking
Celcon (Polyacetal)	20-180 °F (-6.7-82.2 °C)	Black
PVDF	40-180 °F (4.4-82.2 °C)	White
Nylon (Zytel)	40-180 °F (4.4-82.2 °C)	Blue
Polypropylene	50-100 °F (10-37.8 °C)	Red
Metal	Over 200 °F (93.3 °C)	

For fluid temperatures above 180 °F (82.2 °C) use a hydraulic end cooler.

All data based on water.

Hydra-Cell® Glossary of Terms

Absolute Pressure (PSIA): The total force per unit area exerted by a fluid. It is the sum of Atmospheric Pressure and Gauge Pressure.

Accuracy: The degree of precision, usually expressed in terms of error, as a percentage of the specified value, or as a percentage of a range. (See separate definition for Steady-state Accuracy, per API 675 Standard, on the following page.)

API 674 Standard: This standard covers the minimum requirements for reciprocating positive displacement pumps for service in the petroleum, chemical, and gas industries. Both direct-acting and power-frame types are included. There are no test requirements defined within API 674 Standard for Steady-state Accuracy, Flow Repeatability, or Linearity.

API 675 Standard: This standard covers the minimum requirements for controlled volume positive displacement pumps for service in the petroleum, chemical, and gas industries. Both packed-plunger and diaphragm types are included. Diaphragm pumps that use direct mechanical actuation are excluded. Hydra-Cell pumps meet and exceed the performance test requirements of API 675 Standard for Steady-state Accuracy, Flow Repeatability, and Linearity (as defined in section 4.3.3); however, they do not meet all design requirements defined in section 2 of the standard.

Atmospheric Pressure:

The force exerted on a unit area by the weight of the atmosphere; the higher the elevation above sea level, the lower the atmospheric pressure, P_{atm} . (See graph on right.)

Cavitation: Process in which small bubbles are formed and implode violently; occurs instantaneously when $NPSH_a < NPSH_r$.

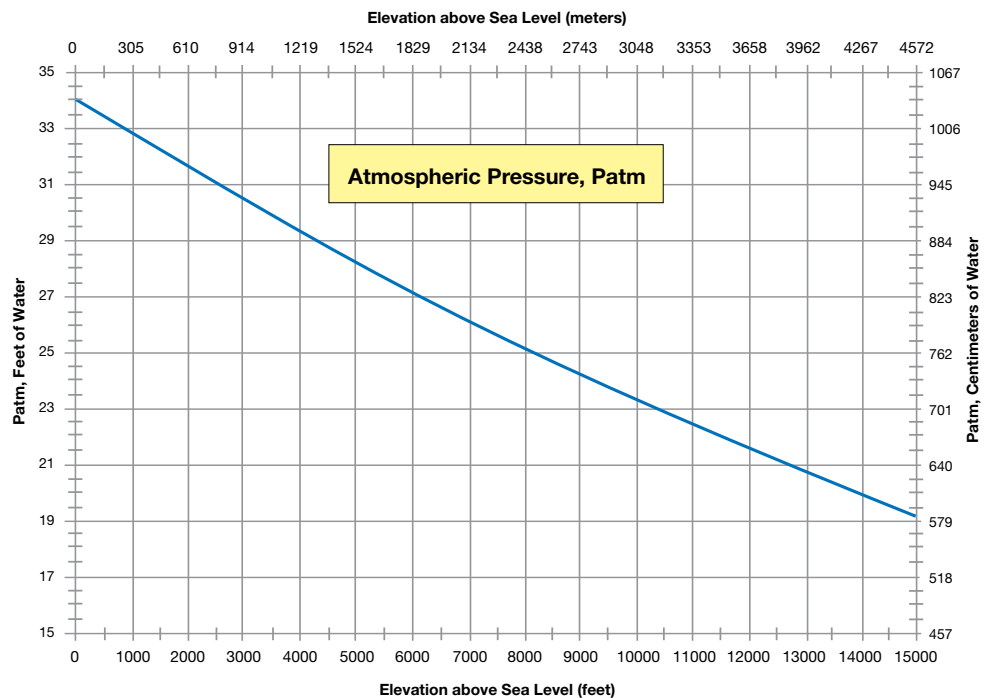
Fluids: Include liquids, gases, and mixtures of liquids, solids and gases. In this catalog, the terms fluid and liquid are both used to mean a pure liquid or a liquid mixed with gases or solids that act essentially like a liquid in pumping applications.

Fluid Slip: Commonly used to describe the migration of liquid around the internal moving parts of a pump. It is the volumetric difference between physical component displacement and liquid throughput of a pump system.

Fluid Slip Loss: Refers to the liquid that passes through the clearance space, ($\sim .00005''$) between the piston and the cylinder wall. The clearance between the piston and cylinder wall must be optimized for the liquid being pumped in order to minimize the loss due to fluid slip.

Head: A measure of pressure expressed in feet of head for centrifugal pumps; indicates the height of a column of water being moved by the pump (without friction losses).

Metering Linearity: The degree to which performance or response approaches the condition of being linear; the maximum deviation from the ideal straight line that can be drawn through plotted calibration test points describing how flow varies with capacity setting. It is expressed as percent (\pm) of the Rated Capacity of the pump. API 675 Standard stipulates that Linearity must remain within $\pm 3\%$. Linearity of $\pm 3\%$ or better can be achieved with Hydra-Cell pumps; it is a function of rated speed, Turndown Ratio, and system operating temperature and pressure ranges.



Hydra-Cell® Glossary of Terms

Metering Repeatability: Describes the reproducibility of pump flow rate under a given set of conditions when the capacity setting is varied and then returned to the set point being tested; expressed as a percent (\pm) of rated capacity. API 675 Standard stipulates that repeatability must remain within $\pm 3\%$. Flow Repeatability of $\pm 3\%$ or better can be achieved with Hydra-Cell pumps; it is a function of rated speed, turndown ratio, and system operating temperature and pressure ranges.

Metering Steady-state Accuracy: Flow variation expressed as a percentage of mean delivered flow under fixed system conditions; applies over the Turndown Ratio. API 675 Standard stipulates that Steady-state Accuracy must remain within $\pm 1\%$. Steady-state Accuracy of $\pm 1\%$ for Hydra-Cell P Series metering pumps reflects continuous run, injection-mode metering.

See pages 127 and 128 for graphs depicting Hydra-Cell performance pertaining to API 675 Standard for Accuracy, Linearity, and Repeatability.

Net Positive Suction Head Available (NPSHa):

The total suction head (in feet absolute) present at the pump suction connection, less the vapor pressure of the pumped liquid (in feet absolute). NPSHa is a function of the system in which the pump operates everything on the suction side of the pump up to the suction port. The formula below is commonly used to determine system NPSHa.

$$\text{NPSHa} = P_t + H_z - H_f - H_a - P_{vp}$$

Pt: Atmospheric Pressure

H_z: Vertical distance from surface liquid to pump centerline (if liquid is below pump centerline, then H_z is negative)

H_f: Friction loss in suction pumping

H_a: Acceleration head at pump suction

P_{vp}: Absolute vapor pressure of liquid at pumping temperature

Note: It is important to correct for the specific gravity of the liquid and to convert all terms to units of “feet absolute” when using this formula.

Net Positive Suction Head Required (NPSHr):

The positive pressure (in feet absolute) required at the pump suction port to overcome pressure losses that occur as the fluid travels from the suction port to the point(s) inside the pump where the pressure starts to increase. NPSHr is a

function of the pump design, size (capacity), and operating speed. It is measured at the suction port of the pump and typically provided by the pump manufacturer in the form of a curve or set of curves.

Note: Testing in water is standard practice; therefore, NPSHr data is generally provided in units of “feet of water.” This must be taken into consideration and converted to “feet of pumped liquid” when comparing to the calculated value of NPSHa.

Prime: Charge of liquid required to begin pumping action when the liquid source is lower than the pump; held in pump by a Foot Valve on the intake line or by a valve or chamber within the pump.

Rated Capacity: The quantity of fluid actually delivered per unit of time at the maximum operating speed. This quantity can be expressed in units of volume or mass; it includes liquid and any dissolved or entrained gases or solids, and is based on suction conditions.

Specific Gravity: The ratio of the weight of a given volume of liquid to pure water. Pumping heavy liquids (specific gravity greater than 1.0) will require more drive horsepower.

Static Discharge Head: Maximum vertical distance (in feet) from pump to point of discharge with no flow.

Total Head: Sum of discharge head, suction lift, and friction loss.

Turndown Ratio: The Rated Capacity divided by the minimum capacity that can be obtained while maintaining specified Steady-state Accuracy, Flow Repeatability, and Linearity. A 10:1 Turndown Ratio capability is industry standard for metering applications. Use of sophisticated motor controls allows speed Turndown Ratios of 1000:1 and greater if required. The mechanical response of the metering pump over these extremely high Turndown Ratios may or may not meet API 675 Standard testing requirements.

Viscosity: The resistance of a fluid to flow when subjected to shear stress (the “thickness” of a liquid). Most liquids decrease in viscosity and flow more easily as they get warmer. Absolute viscosity is measured in centipoises. Kinematic viscosity includes the influence of the specific gravity of the fluid and is measured in centistokes.

Wanner Engineering - Additional Product Lines

Non-metallic ANSI Centrifugal Pumps Featuring Solid PVDF Pump Heads

STAN-COR



Designed to handle difficult process fluids, Stan-Cor pumps offer total dynamic head to 350 feet and flow rate capacities to 700 gpm (2650 l/min).

Designed to Handle Dirty, Abrasive, Corrosive, and Reclaim Process Fluids

Manufactured in the USA by Wanner Engineering, Stan-Cor pumps provide superior handling of difficult process fluids in a cost-effective, rugged, and durable design. They operate with a smooth, full-curve performance and offer exclusive design advantages compared to other centrifugal pumps.

- Solid PVDF pump head for chemical compatibility and excellent abrasion resistance
- Handles high operating temperatures
- Concentric casing design for better flow patterns than other centrifugal pumps - less turbulence, longer seal life, and reduced shaft deflection
- Compact design features including heavy-duty drive shaft, adjustable bearing supports, and large-capacity oil bath ensure low maintenance as well as durable performance for the toughest fluid applications
- Back pull-out design for easy servicing
- Handles solid sizes up to 9/16" maximum

For more information, contact Wanner Engineering or visit www.StanCorPump.com

Wanner Engineering - Additional Product Lines

Peristaltic Pumps that Isolate the Fluid Being Pumped

VECTOR



Designed to handle tough fluid processing applications, Vector pumps provide flow rate capacities to 200 gpm (757 l/min) and pressure ratings to 100 psi (7 bar).

Designed to Handle High-viscosity Fluids, Aggressive and Corrosive Fluids, and High-purity Solutions

Available from Wanner Engineering, Vector pumps can handle pasty, pulp, or thick fluids commonly found in industrial processing applications. They will reliably start, stop, and continuously pump such fluids at a wide range of pressures and flows. The pumping action is powerful, but will not break up delicate emulsions or cause excessive frothing of dissolved gases.

- Dry pump cavity
- Self-priming operation
- Runs dry without damage to the pump

- Complete isolation of the fluid being pumped from contact with mechanical parts for the fluid transport system
- Heavy-duty roller bearings
- Wide range of pump configurations and flow rates
- No cups, packing, or seals to leak or replace or come in direct contact with the pumped fluid
- Low maintenance
- Reversible flow

For more information, contact Wanner Engineering or visit www.VectorPump.com



WANNER

Hydra-Cell® Limited Warranty

Wanner Engineering, Inc. (WEI) warrants that, for a period of one year from the date of delivery, equipment manufactured by WEI shall be free of defects in materials and workmanship under normal use and service, and provided the equipment is installed, operated and maintained in accordance with instructions supplied by WEI.

This limited warranty is WEI's sole and exclusive warranty.

If a defect in WEI's equipment appears within one (1) year from the date of delivery, and Purchaser has given written notice of such defect within thirty (30) days from the discovery thereof, WEI will repair or replace the defective part, at its option.

WEI requires the return to a designated WEI location of the defective part, transportation prepaid, to establish Purchaser's claim. A return goods authorization must be received prior to the return of the defective part. No allowance will be made for repairs undertaken without WEI's written consent or approval.

This limited warranty does not cover normal wear, or wear caused by or related to abrasion, corrosion, abuse, negligence, accident, faulty installation, or tampering which impairs normal operation of the equipment. This limited warranty applies only to equipment manufactured by WEI. Warranties, if any, on equipment manufactured by others including but not limited to electric motors (if applicable), are assigned to the purchaser by WEI (without recourse) at time of delivery.

Any descriptions of the equipment drawings, specifications, and any samples, models, bulletins, or similar material, used in connection with this sale are for the sole purpose of identifying the equipment and are not to be construed as an express warranty that the equipment will conform to such description. Any field advisory or installation support is advisory only.

The foregoing warranties are in lieu of all other warranties.

Whether oral, written, express, implied or statutory, implied warranties of merchantability and fitness for a particular purpose will not apply.

WEI's warranty obligations and purchaser's remedies thereunder are solely and exclusively as stated herein.

The purchaser's sole and exclusive remedy, whether based upon warranty, contract or tort, including negligence, will be to proceed under this warranty. All liability of WEI shall terminate one (1) year from the date of delivery of the equipment.

Hydra-Cell® Application Worksheet



www.Hydra-Cell.com

Let us help you determine the best solution for your pumping application.

Simply provide the information below, tear out the page, and send it to us.

1. Fax to 612-332-6937 or toll-free (USA) at 800-332-6812
2. Scan the page and email it as an attachment to sales@wannereng.com
3. Mail the page - either in an envelope or fold it, and using the other side as a mailing label, tape the page closed, affix postage and mail it
4. Give it to your local Wanner distributor

Fluid Information:

Fluid Name: _____

Solids: Yes No If Yes, size and percentage: _____

Fluid Temperature: Operating _____ Min _____ Max _____

Viscosity: Min _____ Max _____ Specific Gravity: _____

Please provide a brief description of the application and fluid characteristics (e.g. abrasive, shear-sensitive)

Please provide MSDS Sheet if available.

Equipment Information:

Installation: New Existing

If existing, previous equipment installed: _____

Flow Rate: Operating _____ Min _____ Max _____

Discharge Pressure: _____ Inlet (Suction) Pressure: _____

NPSHa: _____

Inlet Pipe Diameter: _____ Inlet Pipe Length: _____

Supply Voltage: Phase _____ Hertz _____

Contact Information:

Name: _____ Date: _____

Title: _____

Company: _____

Address: _____

City: _____ State/Province: _____ Zip/Postal: _____

Phone: _____ Fax: _____

Email: _____

Company Website: _____

Market/Industry: _____

PLACE
POSTAGE
HERE



Wanner Engineering, Inc.
1204 Chestnut Avenue
Minneapolis, MN 55403 USA

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 nearly 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
- ☀ Guangzhou, China
- ☀ São Paulo, Brazil

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

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

Hydra-Cell®

Seal-less Pumps

Wanner Engineering, Inc.

World Headquarters & Manufacturing

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