

Fristam Sanitary Design Pump

Mfg: Fristam

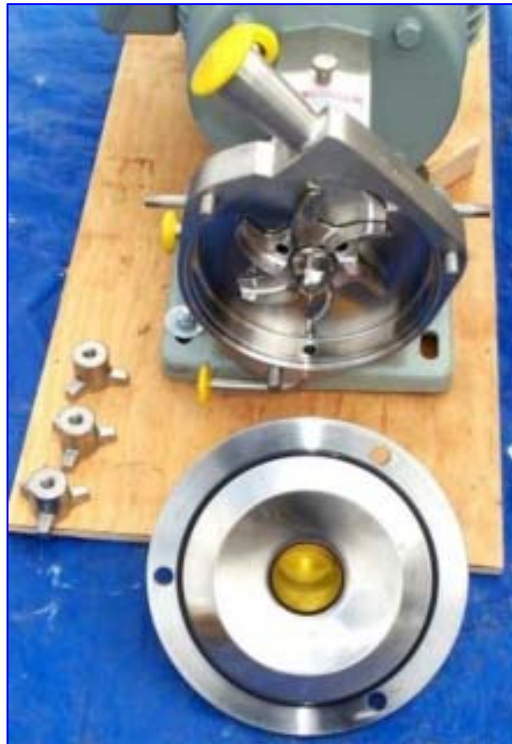
Model: FP-722-125

Stock No. 11a.MFBB395.6

Serial No. 22175096

Fristam Pump

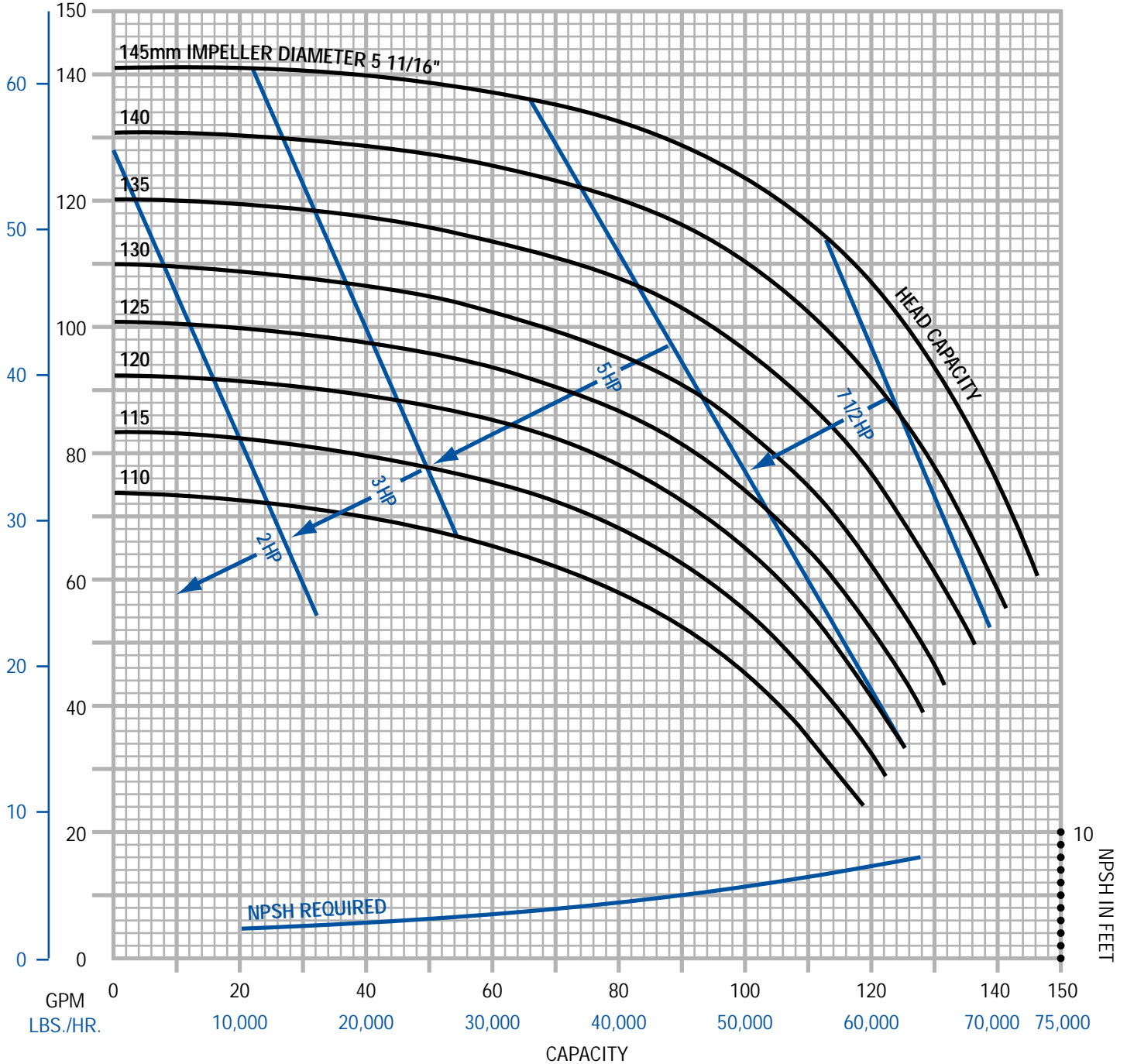
- Model FP-722-125,
- S/N 22175096, 7-½ TE hp, 230/460V 3,525 rpm, 1-½ in. outlet, 2 in. inlet, 29 in. L x 15 in. W x 12 in. H
- Product: WFI (Water for injection, double safe seal system)
- Pump Position: 107-P-01B
- Shaft Number: 52500588
- Seal Number: 66503001
- Impeller Number: 55504169
- Impeller Description: 722/125/18
- Impeller Nut Number: 53501488
- Cover Gasket Number: 65500049
- Cover Number: 59504151
- In Fitting: 2 in. CLAMP
- Housing Number: 57504147
- Out Fitting: 1.5 in. CLAMP
- Notes: 8% FERRITE CONTENT MAX. 25Ra INTERNAL POLISH
- PIPING TO CONNECT TO #22175095-SEE ORIGINAL ORDER
- TOP 45 DEGREE LEFT DISCHARGE ½ in. ELBOW DRAIN TO LEFT





FP/FPX 722 3500 RPM Inlet 2"-Outlet 1 1/2"

Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.



Sanitary Centrifugal Pumps



FP and FPX Series

Fristam Pumps...
Performance You've Come To Expect

Fristam
PUMPS

Industry Benchmarks: Fristam FP and FPX Series Pumps

Fristam Pumps

Fristam is an international manufacturer of sanitary centrifugal and positive displacement pumps respected for performance, reliability and technical superiority. The FP and FPX Series serve as industry benchmarks for quiet, efficient, low maintenance operations.

FP and FPX: Different Series for Different Needs

The FP Series is the original Fristam pump which established the standards for high performance centrifugals. The success of the FP led satisfied customers to request a Fristam pump for less severe applications. The result was the FPX, a pump combining the same pump head with a modified mounting flange and shaft. Since its introduction, the FPX has become an industry standard for most general applications. Whether it's FP or FPX, both series offer the perfect combination of the following outstanding features and benefits.

Internal Mechanical Seal

Seal life is critical to pump performance. Fristam's unique internal seal uses the cooling and lubrication of the product to provide longer seal life. The Fristam design also maintains constant pressure between the faces to prevent potential contamination. Even under extreme conditions, Fristam's seal life is often measured in years.

Low Maintenance

Fristam's reputation is built on proven performance, reliability and minimal downtime. Contributing to our reputation are heavy cast construction, superior seal design, heavy shafts, close tolerances and an ability to withstand hydraulic shock and cavitation.

Low NPSH (Net Positive Suction Head) Requirements

Insufficient NPSH* is the cause of the majority of pump process problems. Close internal tolerances, advanced impeller design and the availability of both volute and non-volute housings allow Fristam pumps to perform with the lowest NPSH requirements of any standard pump. Due to low NPSH requirements, evaporator manufacturers and others with vacuum applications have turned to Fristam as the industry leader for years.

* NPSH = The total pressure at the suction nozzle necessary for the pump to operate properly.

An Alternative to Positive Pumps

For applications with shear sensitive products and those having viscosities lower than 1200 cps, Fristam centrifugal pumps have replaced positive displacement pumps. Close internal tolerances and superior impeller design allow Fristam centrifugals to successfully pump cream, eggs and cell cultures.

Less Noise

Close tolerances, heavy-duty construction and dynamically balanced impellers contribute to building Fristam's reputation for quiet performance.

High Efficiency

As the originator of the high efficiency sanitary centrifugal, Fristam continues to set the standard. The industry's broadest range of pump head and impeller combinations allow you to better match pumps to specific duties for optimum efficiency.

3-A, GMP, U.S.D.A., F.D.A. and ISO 9001:2000

Fristam complies with and supports regulatory standards. FP and FPX pumps meet all applicable industry standards for performance, cleanliness and design. As a registered ISO 9001:2000 company, Fristam is committed to consistent quality products.



Select the Right Pump for Your Process

The Right Pump for Your Needs - The FP or FPX

The FP is designated for heavy-duty applications, while the FPX is designed for general purpose applications. The right pump for you depends on your process. The following guidelines will assist us in serving you better.



FP SERIES

- Product viscosity up to 1200 cps
- Process temperature up to 400°F
- Maximum inlet pressure 150 PSI
- Products being withdrawn from a vacuum
- Abrasive products
- Single or double seal available
- Seal flush
- Internal seal product flush
- Flange support (pedestal) is standard. Bearing block style support also available.
- All wetted metal components are 316L stainless steel, standard
- Horsepower range up to 150 HP
- John Crane seals available
- Capable of pumping up to 2,000 gallons per minute

Specialty Applications:

- Water for Injection
- Vacuum Withdrawal
- Aseptic Processing
- Abrasive Products

FPX SERIES

- Product viscosity up to 600 cps
- Process temperature up to 400°F
- Maximum inlet pressure 150 PSI
- Single seal only
- Internal seal product flush
- Water cascade available
- Mounted to C-face motor
- All wetted metal components are 316L stainless steel, standard
- Horsepower range up to 50 HP

Applications For FP and FPX

- Bottling
- Cleaning Applications/CIP
- De-alcoholization
- Distillation
- Emulsifying
- Evaporation
- Mechanical Separation
- Reverse Osmosis
- In-Line Mixing
- Water Conditioning
- Transfer Filtration
- Extraction
- Dosing
- Dialysis
- De-gassing
- Carbonizing
- Homogenizing
- Fermentation



Specialty Pumps



Water for Injection

The Fristam WFI pump is a precision adaptation of our famous heavy-duty FP Series pump. Fristam pioneered the “Double Safe Seal System” to ensure product sterility. Our low pressure, low flush design protects product sterility and saves valuable product.



Aseptic Centrifugal

Aseptic processing requires equipment which assures both product dependability and sterility. The Fristam FP double-seal pump offers a perfect “fit” for aseptic processing. With sterile barriers at all seal points, including the cover gasket, your product is protected from contamination.



Jacketed Pump Housing

Fristam’s jacketed pump housing is compatible with most FP and FPX models. The jacketed pump housing is designed for products that require temperature control. This includes applications that require solids to stay in solution, such as chocolate, or for applications that require a cold product, such as brewing.



The Fisa Award

Fristam is proud to be a *three-time* fisa award winner. This award is based on the manufacturer’s contributions in the areas of commitment to distributors, quality of support, competitiveness and innovation.

Seals at a Glance

Seals

The industry's best seals are found in Fristam pumps. Even under extreme duties the seal life on a Fristam pump is often measured in years.

Fristam's Standard Seal (Internal)

A single seal is available on the FP and FPX Series pumps. A double seal is standard on the FP pump only.

Materials:

- Chrome Oxide/Carbon - Standard
- Silicon Carbide/Carbon
- Silicon Carbide/Silicon Carbide
- Chrome Oxide/Silicon Carbide

Fristam's External Seal

Available on both the FP and FPX Series pumps. In addition to our single and double mechanical internal seals, our customers have the option of an external seal. Our external seal offers various benefits to the customer.

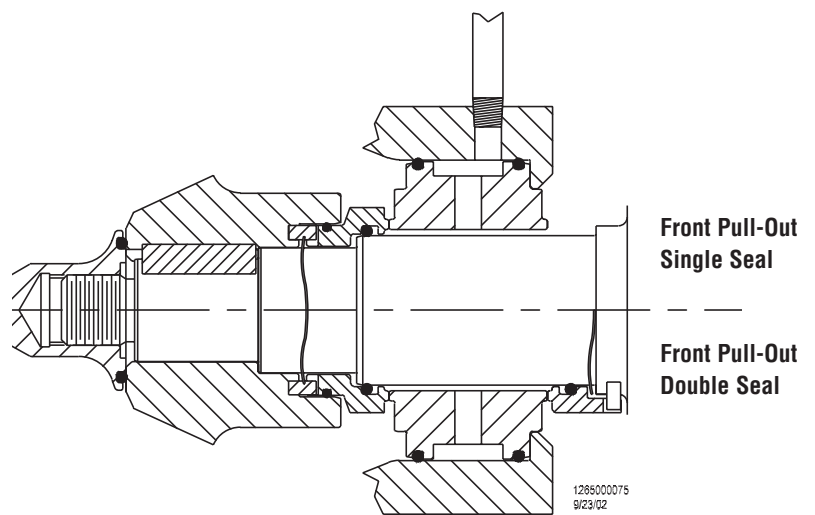
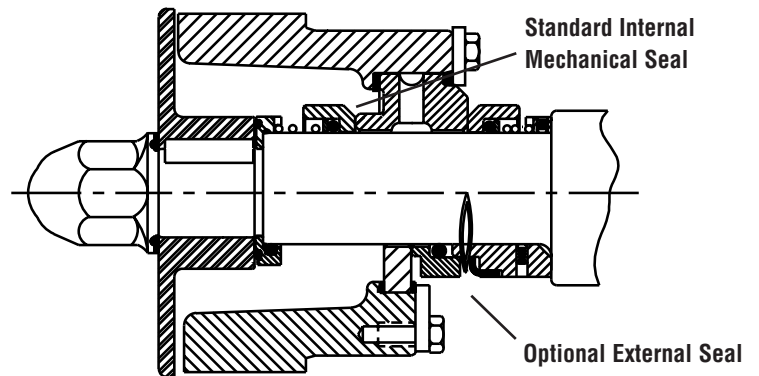
- Balanced external design
- Replaceable wear surfaces
- Easy assembly without tension adjustments
- Silicon Carbide/Carbon seal face material

Fristam's New Front Pull-Out Seal (Internal)

This new seal design is only available on our new FP 4000 model. Designed to simplify maintenance on this large pump series. Both a single and double seal are available.

Materials:

- Chrome Oxide/Carbon - Standard
- Chrome Oxide/Silicon Carbide
- Silicon Carbide/Silicon Carbide



Components at a Glance

FP
SINGLE FLANGE

Heavy Cast Pedestal
Reduces noise and vibration and helps dissipate heat.

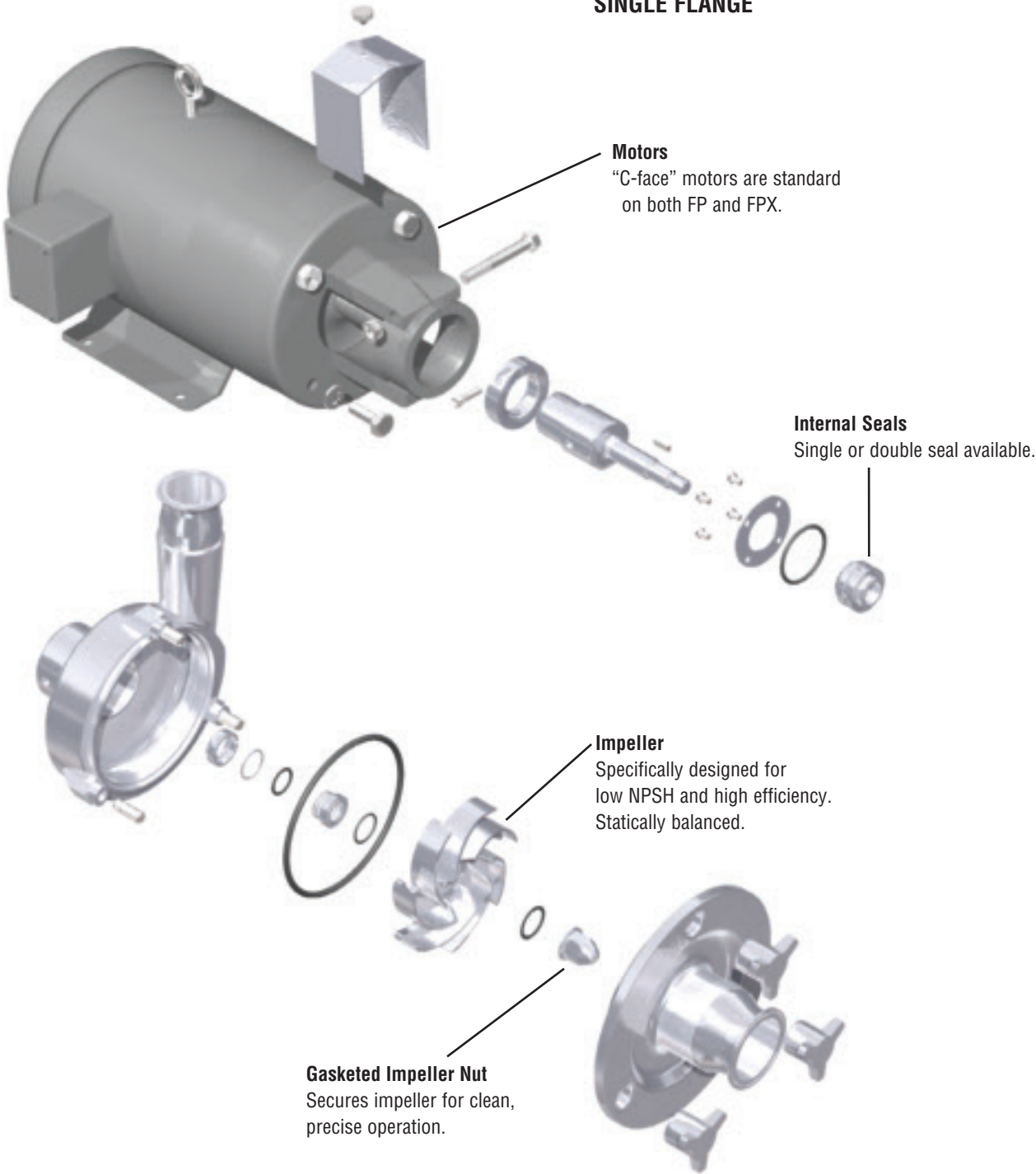
Shaft Clamp Design
For simple, accurate mounting.

Spring Assembly
Loads seal accurately.

Volute or Non-Volute Housings
Designed to match your specific applications.

FPX

SINGLE FLANGE

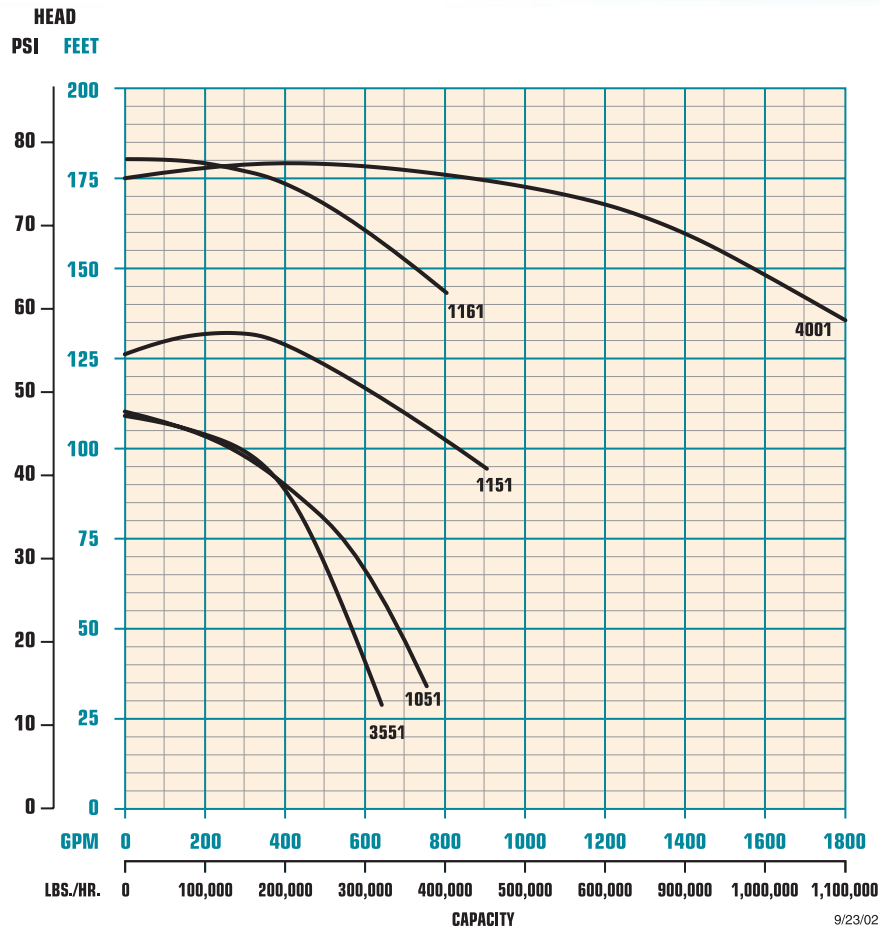


Motors
"C-face" motors are standard on both FP and FPX.

Internal Seals
Single or double seal available.

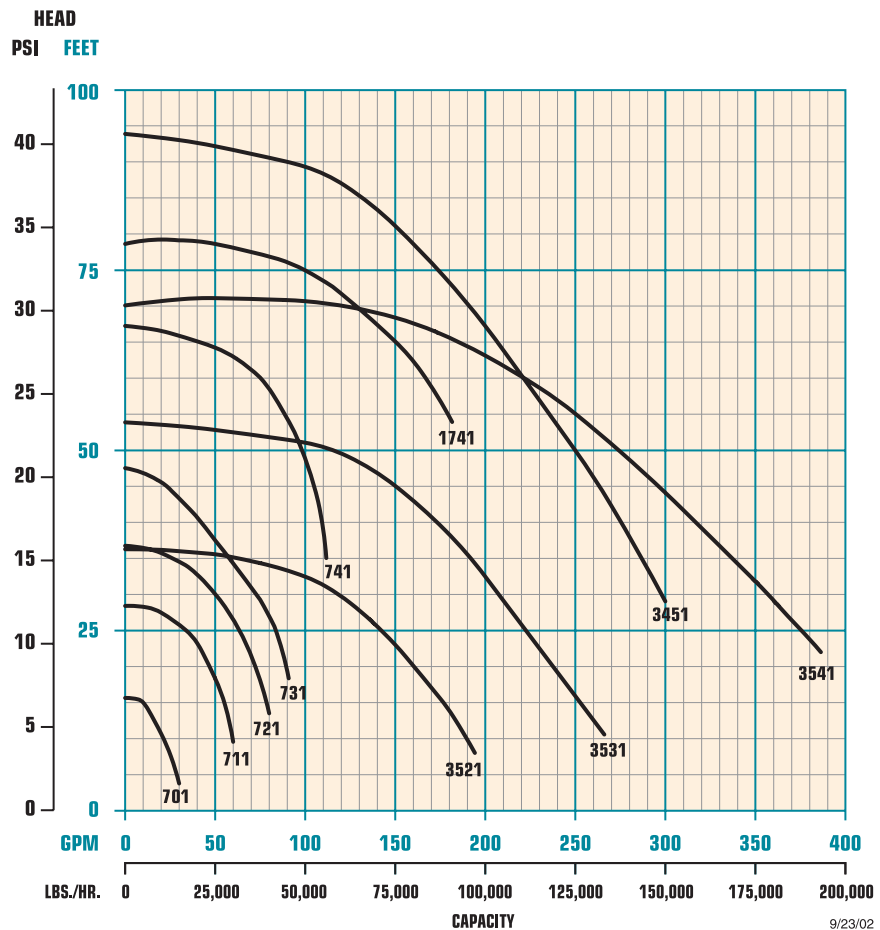
Impeller
Specifically designed for low NPSH and high efficiency. Statically balanced.

Gasketed Impeller Nut
Secures impeller for clean, precise operation.



1750 RPM Composite* Performance Curve

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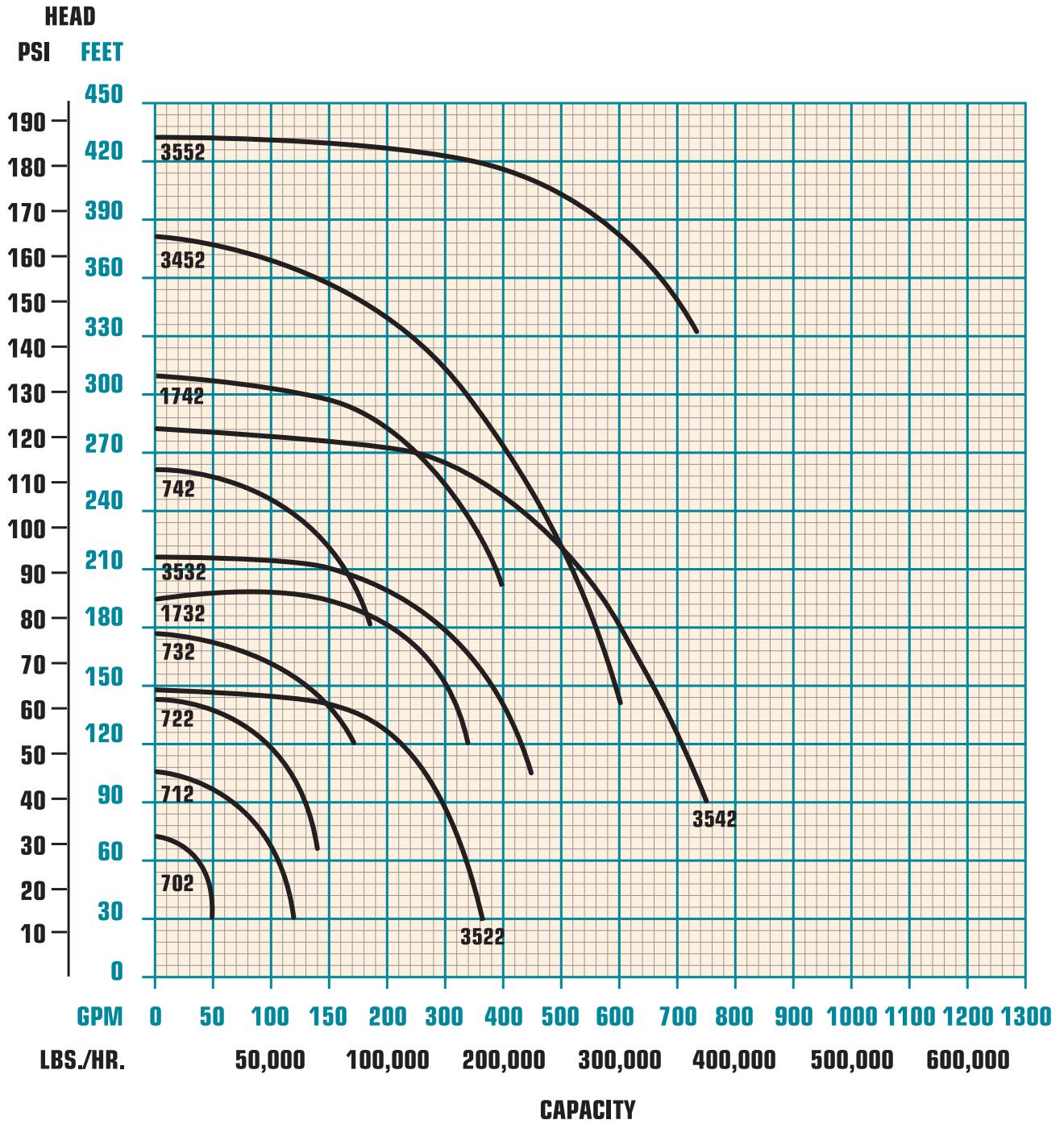


1750 RPM Composite* Performance Curve

*See the Fristam FP/FPX Curve book for *individual* pump performance curves.

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1265000074

3500 RPM Composite* Performance Curve



*See the Fristam FP/FPX Curve book for *individual* pump performance curves.

Options



Fittings

Fristam pumps can be supplied with most types of sanitary or industrial fittings. Some alternate inlet sizes are also available. Non-sanitary fittings cannot be used on pumps that are required to meet 3-A standards.

Motor Options

Standard motors provided are “Inverter Ready”, TEFC with a locked front bearing. The following options are available:

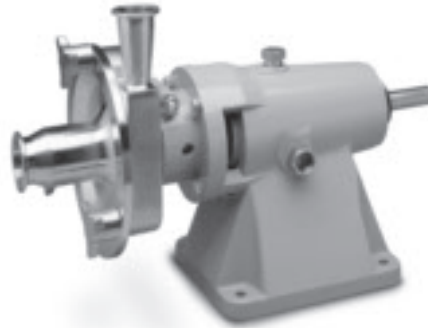
- Washdown
- Premium Efficiency
- Explosion-Proof
- IEC
- Chemical Duty

Surface Finish

Standard surface finish is 32 Ra. Finer finishes up to 15 Ra and electropolished are available.

Tungsten Carbide Coatings

For extremely abrasive products, internal components can be coated with tungsten carbide to prevent erosion.



Bearing Blocks

Fristam pumps are available with a bearing block style mounting which can accommodate motors up to 100 HP. The base plate is stainless steel.



Adjustable Base

Fristam pumps’ adjustable bases use solid stainless steel components with adjustable legs.

Stainless Steel Motors/Adapters

Pumps can be provided with S.S. motors and adapters for protection against corrosive environments and a clean appearance.

Portable Cart

Most Fristam pumps can be mounted on a stainless steel cart, depending on motor size.



Worldwide commitment to customer satisfaction

Fristam is represented worldwide through an international sales and service network. Fristam has been manufacturing pumps in the United States since 1983.

Fristam's Commitment

Fristam Pumps manufactures the sturdiest pumps in the industry. Our design reduces repair/replacement costs, downtime and energy consumption. Fristam is one of the most accessible pump companies in the world. Fristam's dedication and quality service do not end with your initial purchase. An international network of manufacturing facilities, sales offices and distribution supports Fristam's commitment to customer satisfaction.

Mission Statement

To be the leader in achieving total customer satisfaction by providing the highest value pumps and "whatever-it-takes" customer service.



Worldwide Contact Details

USA/CANADA/MEXICO/ SOUTH AMERICA

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1-800-841-5001
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Austria

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Vienna

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Fristam N.V.
Aartselaar

France

Pompes Fristam S.A.
Noisy-le-Sec

Germany

Fristam Pumpen F. StampKG
(GmbH & Co)
Hamburg

Great Britain

Fristam Pumps (UK) Ltd.
Hailsham

India

Fristam Pumps (I) Pvt. Ltd.
Pune

Italy

Fristam Italia S.r.l.
Borgo Ticino (NO)

Japan

Stamp Pumps of Japan Ltd.
Tokyo

Netherlands

Fristam B.V.
De Meern

New Zealand

Fristam Pumps Ltd.
Cambridge

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Fristam Polska sp.z.o.o.
Warsaw

Russian Federation

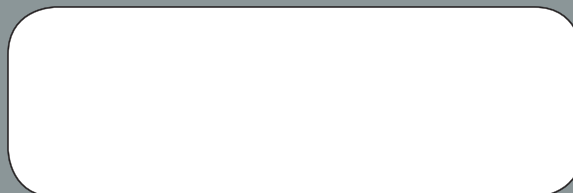
Fristam Pumpen R.A.
Moscow

Scandinavia

Fristam Pumper A/S
Saeby

S.E. Asia

Fristam Pumpen A.R.
Singapore



Fristam
PUMPS

Sanitary Centrifugal Pumps



FP and FPX Series

Fristam Pumps...
Performance You've Come To Expect



Pump Basics: Background Information

Pump Series – FP or FPX

Both the FP and FPX Series pumps are manufactured of 316L stainless steel and use the same pump head. The FP incorporates a heavy-duty pedestal flange between the motor and pump head. The FPX is a motor mounted pump used for standard duties. Double seals are only available in the FP. The FP is used for vacuum withdrawal, high temperature, high viscosity, aseptic processes and other demanding applications.

Pump Model/Housing Size

Fristam offers both volute and non-volute (circular) housings in many sizes to best match different process needs. The 700 and 1700 models are non-volute pumps designed for lower capacities. Their shorter, steeper curves provide better efficiencies on low flows and superior accuracy when used with control devices. The 3400, 3500 and 4000 models are volute high capacity pumps. Their long, flat curves provide greater capacity and an ability to provide steady discharge pressure over a wide flow range.

Speed

Pumps are sized using two standard speeds, 1750 and 3500 rpm. Speed selection is made when selecting a housing. The last digit of the Fristam model number indicates the speed. All models ending in 1 are 1750 rpm. All models ending in 2 are 3500 rpm.

Efficiency

The efficiency of centrifugal pumps varies over the individual curve. The most efficient point of two curves is illustrated in Figure 1. When sizing, it is helpful to select a pump whose curve puts the duty point as close to this bend in the curve as possible.

Impeller Size

Within a given housing, the impeller diameter will determine the flow and pressure produced. Pressure results from the velocity achieved within the pump. The highest velocity occurs at the tip of the impeller and is directly proportional to the square of the impeller diameter. At a given speed, a larger diameter impeller will impart more velocity and produce more pressure.

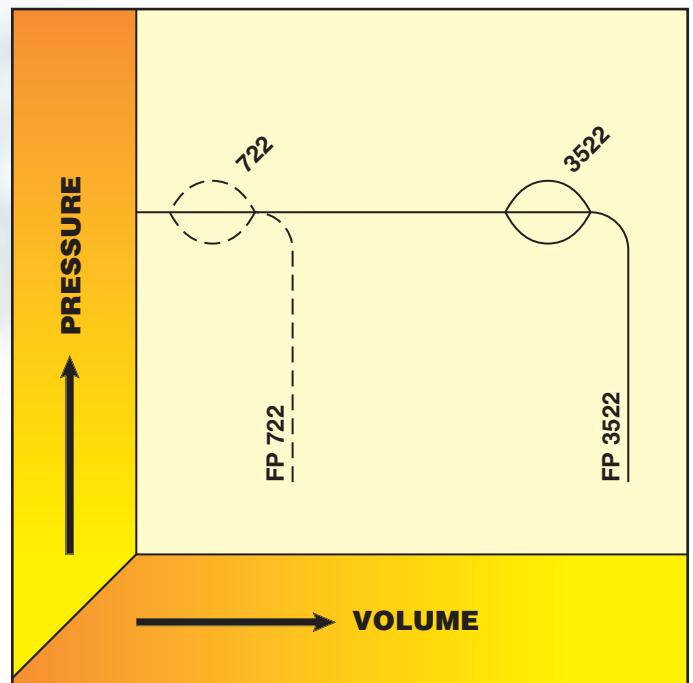


Figure 1

Horsepower

Horsepower must be matched to a given duty or duties. The requirements are determined by individual curves. Enough horsepower must be supplied to handle the most demanding duty, often the duty requiring the most flow, pressure or the pumping of the heaviest product.

Net Positive Suction Head (NPSH)

Product must be forced into a centrifugal pump for it to function properly. This force is called NPSH. Your process must have sufficient NPSH available to meet or exceed the NPSH required.

Seals

Fristam offers a wide selection of seals. Most processes require a standard single seal of chrome oxide faced stainless on carbon. More difficult applications will require harder seal materials such as silicon carbide or tungsten carbide. Double seals are used where a flush is required, where abrasion or stickiness is a problem, for vacuum withdrawal or where a sterile barrier is required between the process and atmosphere.

Selecting A Fristam Pump: A Step by Step Guide

Special Considerations

All curves are based on 70°F water. If your process involves products under vacuum, with high viscosity, high specific gravity, high temperatures, un-dissolved solids or entrained air there are special considerations which affect pump selection. In such cases, please consult Fristam Pumps, Inc. or your local Fristam distributor.

Choosing the FP or FPX

In general, FPX will be suitable for your application unless the following apply:

- A double seal is desired
- Viscosity is greater than 600 cps
- Vacuum of more than 12" Hg exists at the inlet
- Product temperature of 400°F or more
- Horsepower requirement exceeds 50 HP
- Aseptic conditions exist
- A John Crane seal is desired

If any of these conditions exist, the FP will be the proper selection.

Selecting a pump model from the composite curves

Composite curves appear on pages 4-6. To select the correct pump model from the composite curves, find the desired flow rate along the bottom scale and the desired pressure on the left-hand vertical scale. Find the point where the vertical line from the flow rate and a horizontal line from the pressure intersect. The curves immediately above this point will be most suitable.

Example

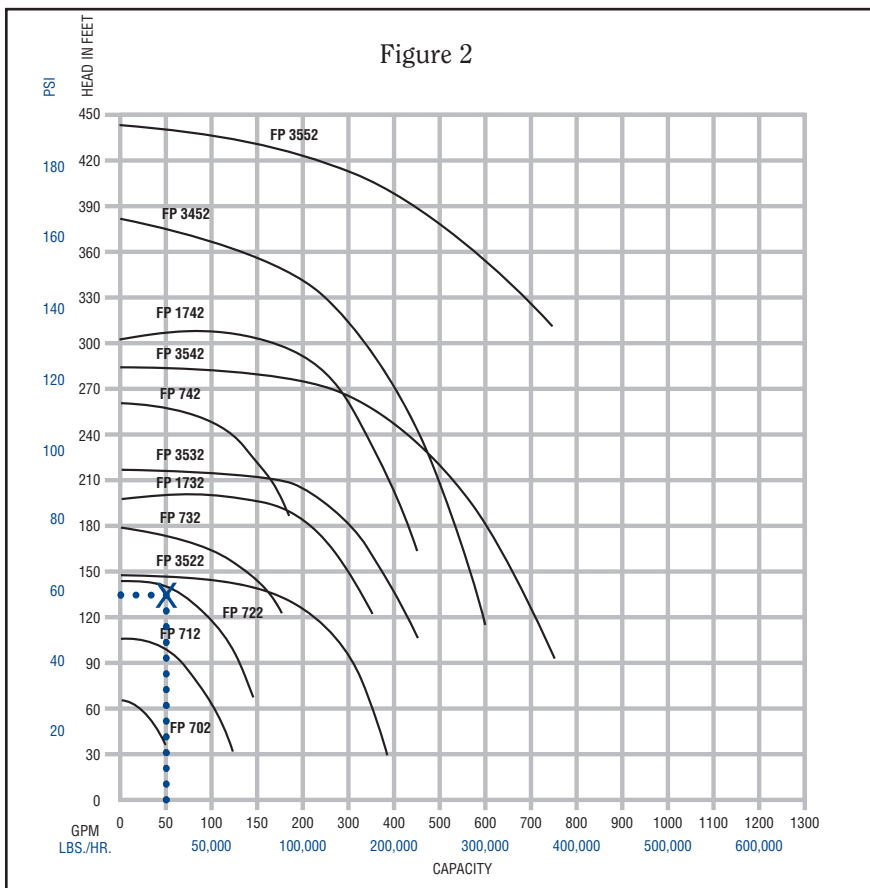
As an example, size a pump to pump 50 gallons per minute and generate 135 feet of head. In the composite shown in Figure 2, find the intersection point of 50 GPM on the bottom of the graph and 135 feet on the side. The pump curve directly above the duty point is the 722. In this example, model 3522 might also be considered. A quick review of the duty point on their individual curves (pages 24-25) reveals the 722 will be more efficient than the 3522.

Considering Speed and Efficiency

If both pumps are the same speed, consider which will be more efficient based on the information discussed in Figure 1. If both a high and low speed pump can handle the duty, the high speed will generally be more economical, but the low speed model may have a lower NPSH requirement.

Choosing impeller size and horsepower

Having chosen a pump model based on the first two steps, find the specific curve for the pump model chosen on pages 7 through 33. To determine the impeller diameter and horsepower move vertically from the flow and horizontally from the pressure or head desired. Find the intersecting point.



The next higher curve indicates the correct impeller diameter. The blue line immediately to the right of the intersection identifies the motor horsepower required.

Example

Using our previous example of 50 gallons per minute and 135 feet of head, we can determine from Figure 3 that the impeller diameter should be 145 millimeters (5.7 inches). The motor required is 5 horsepower.

Checking NPSH (Net Positive Suction Head)

To assure there is sufficient product pressure at the inlet of the pump the suction conditions need to be checked. The NPSH required can be determined by finding the point on the individual pump curve where the vertical line from the desired flow rate intersects the NPSH curve. From this point, a horizontal line to the right will intersect the NPSH scale at the net positive suction head required.*

The procedure for determining the NPSH available is described on page 45. When the NPSH available is determined, it must meet or exceed the NPSH required for the pump to function properly. If the NPSH available is insufficient, a change to the inlet conditions, an enlarged inlet or another pump selection may be required.

Example

A 722 pumping 50 GPM against 135 feet of head will require 3 feet or more of NPSH. The installation must provide 3 feet or more when the calculations described on page 45 are made.

*Please note that the NPSH values shown are for full size impellers. Smaller impellers may require somewhat greater NPSH.

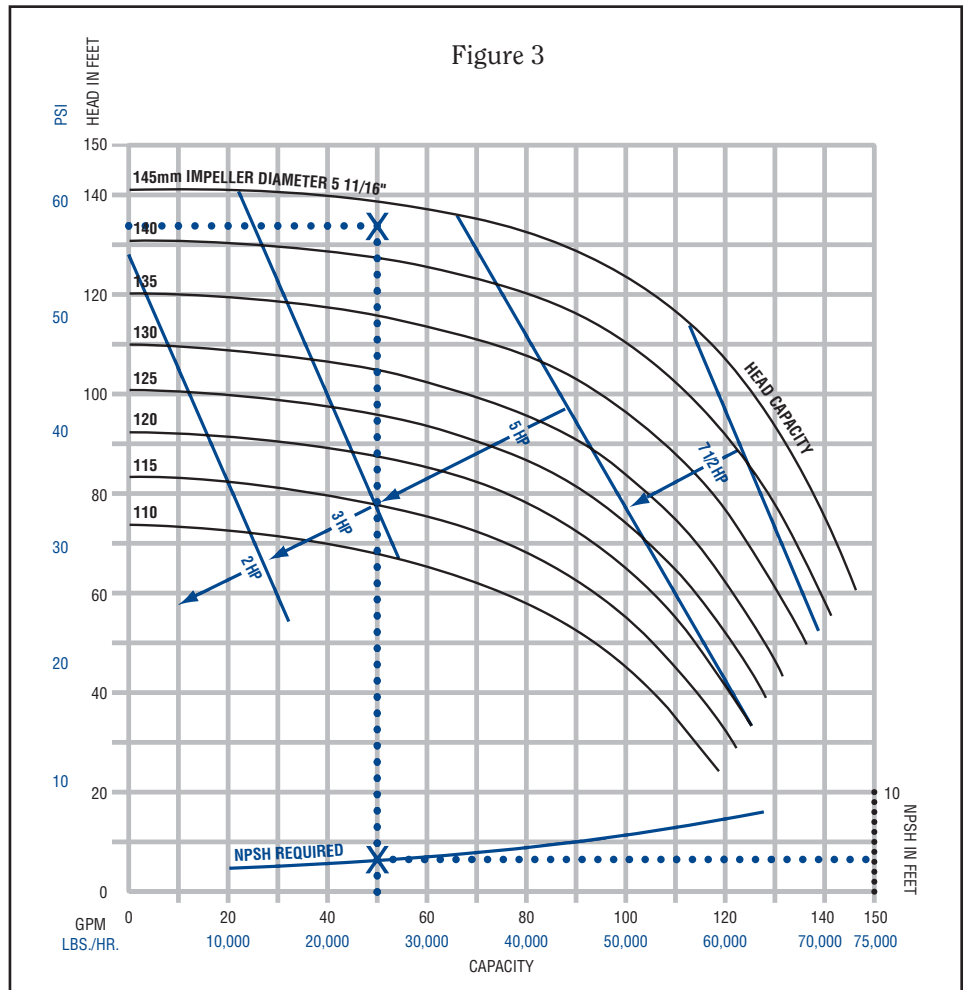
Seal Selection

Generally choosing an FP or FPX series pump determines whether the seal is single or double. The primary remaining decision is whether the standard seal materials are appropriate. The standard seal materials are: chrome oxide vs. carbon. To review other seal options, see Fristam's Seal Options Guide.

Applications involving abrasive products or other special conditions may require other combinations. Please consult Fristam Pumps, Inc. or your local distributor in such cases.

Elastomers

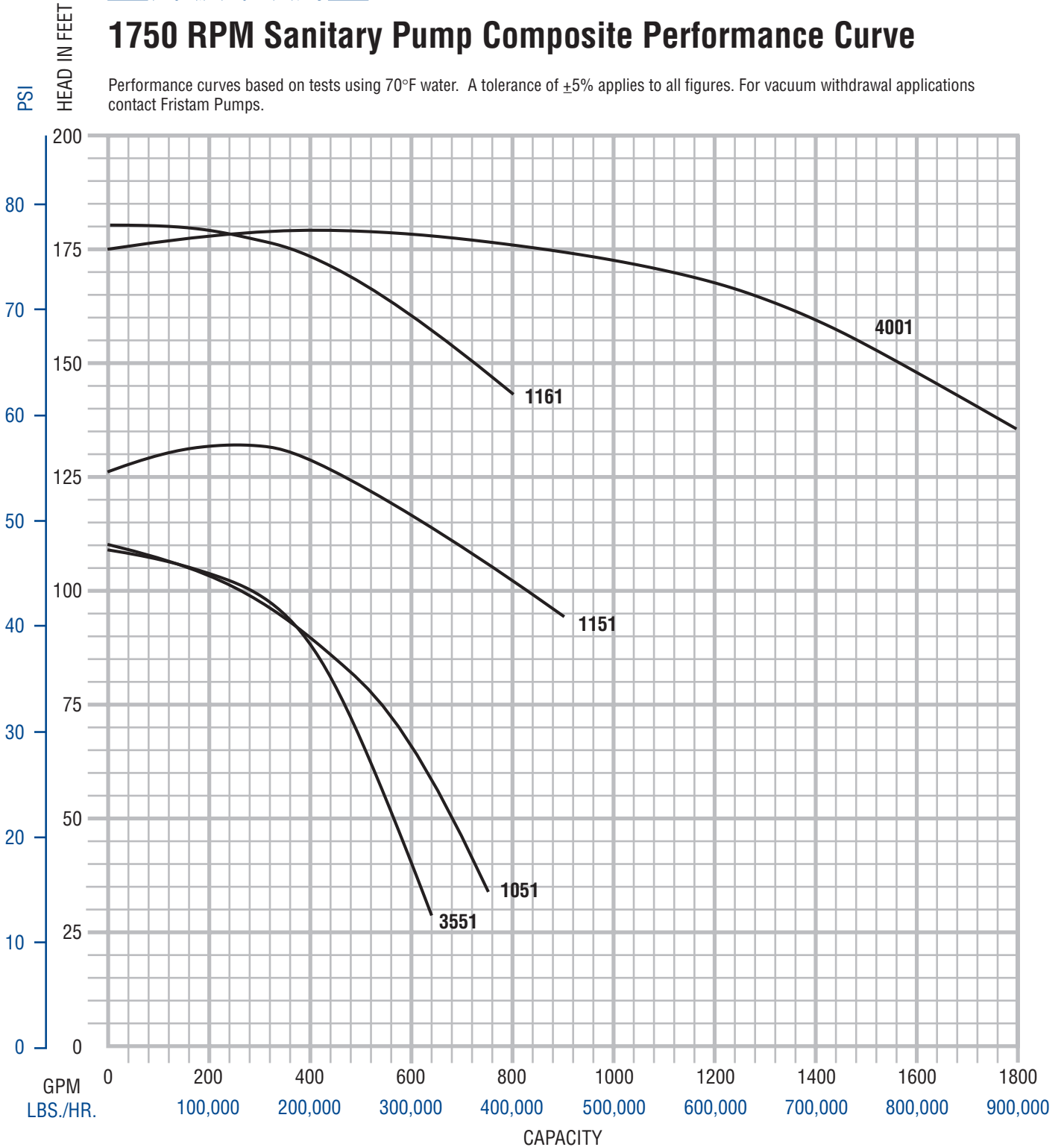
Viton is the standard seal elastomer and BUNA is standard for the cover gasket. Other materials and combinations are available to meet your application or process needs.





1750 RPM Sanitary Pump Composite Performance Curve

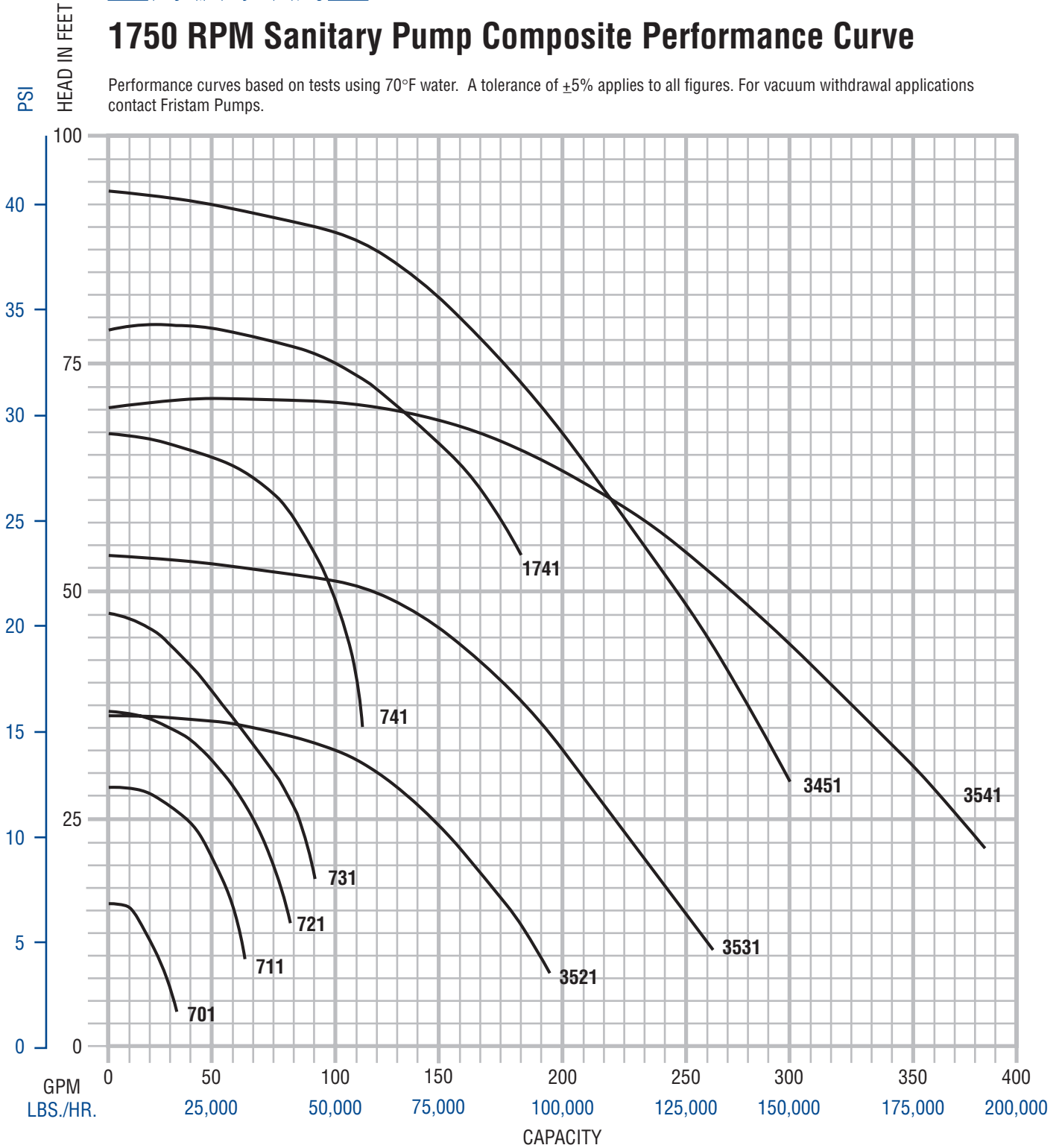
Performance curves based on tests using 70°F water. A tolerance of ±5% applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





1750 RPM Sanitary Pump Composite Performance Curve

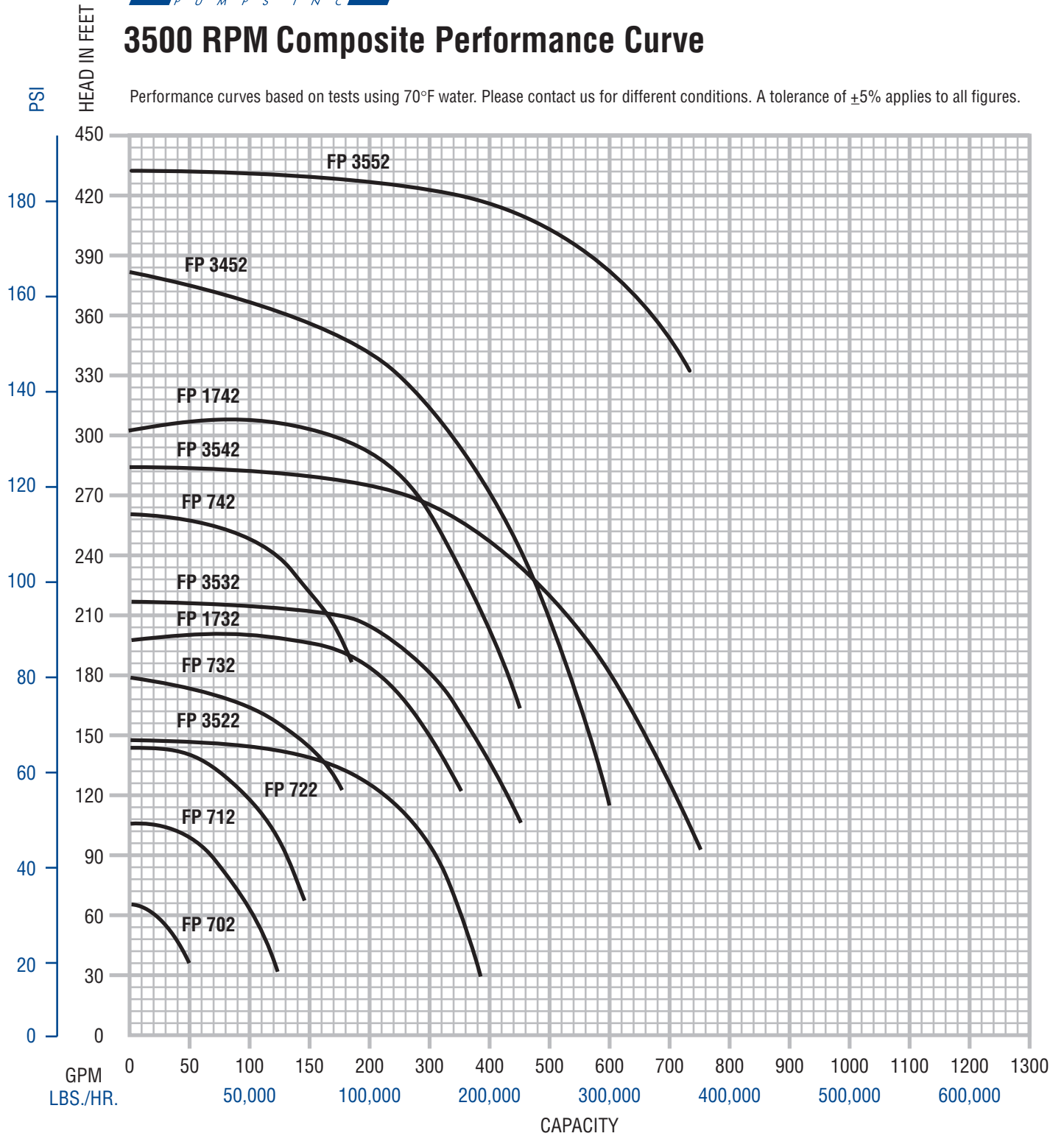
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





3500 RPM Composite Performance Curve

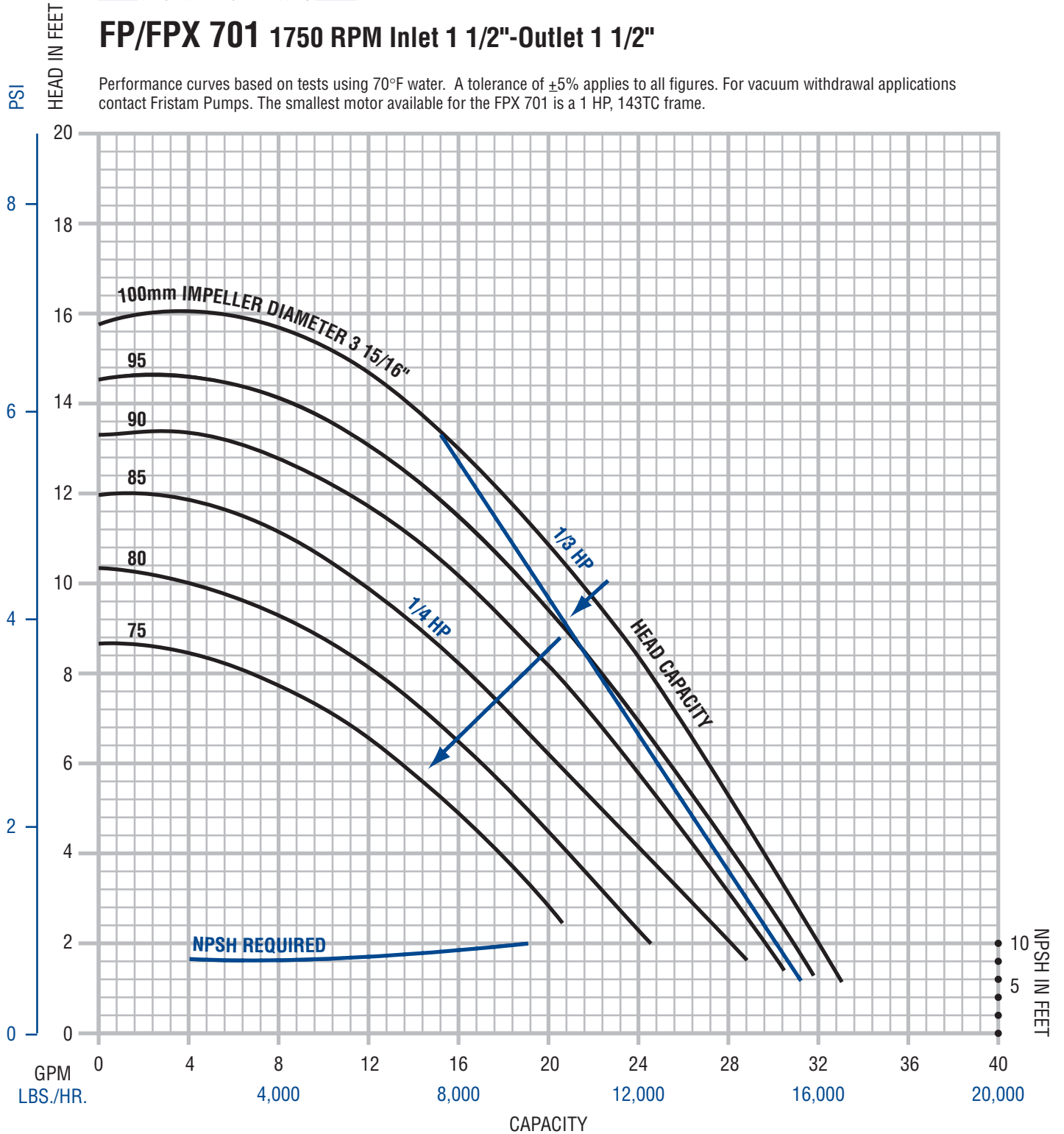
Performance curves based on tests using 70°F water. Please contact us for different conditions. A tolerance of $\pm 5\%$ applies to all figures.





FP/FPX 701 1750 RPM Inlet 1 1/2"-Outlet 1 1/2"

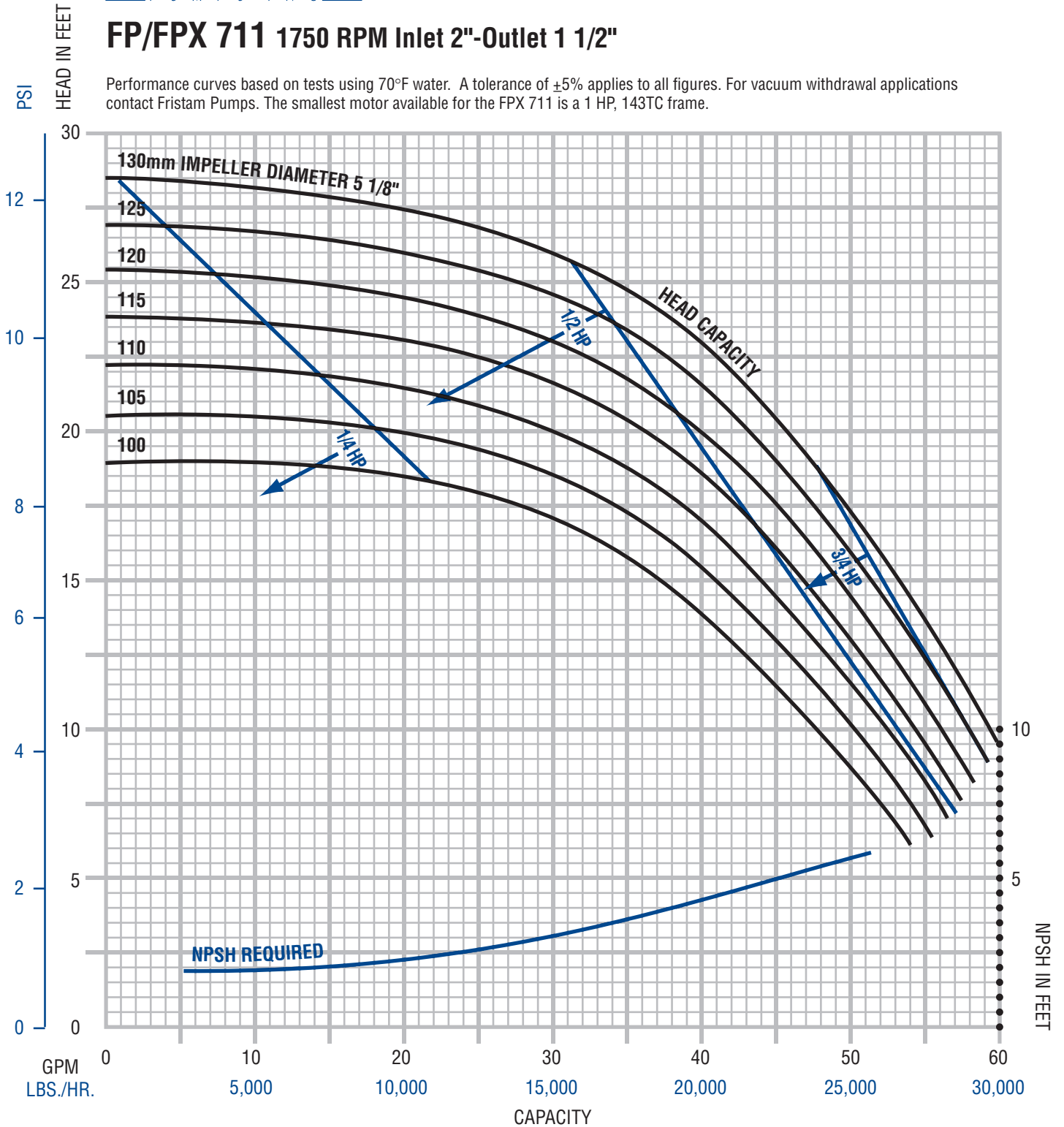
Performance curves based on tests using 70°F water. A tolerance of ±5% applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 701 is a 1 HP, 143TC frame.





FP/FPX 711 1750 RPM Inlet 2"-Outlet 1 1/2"

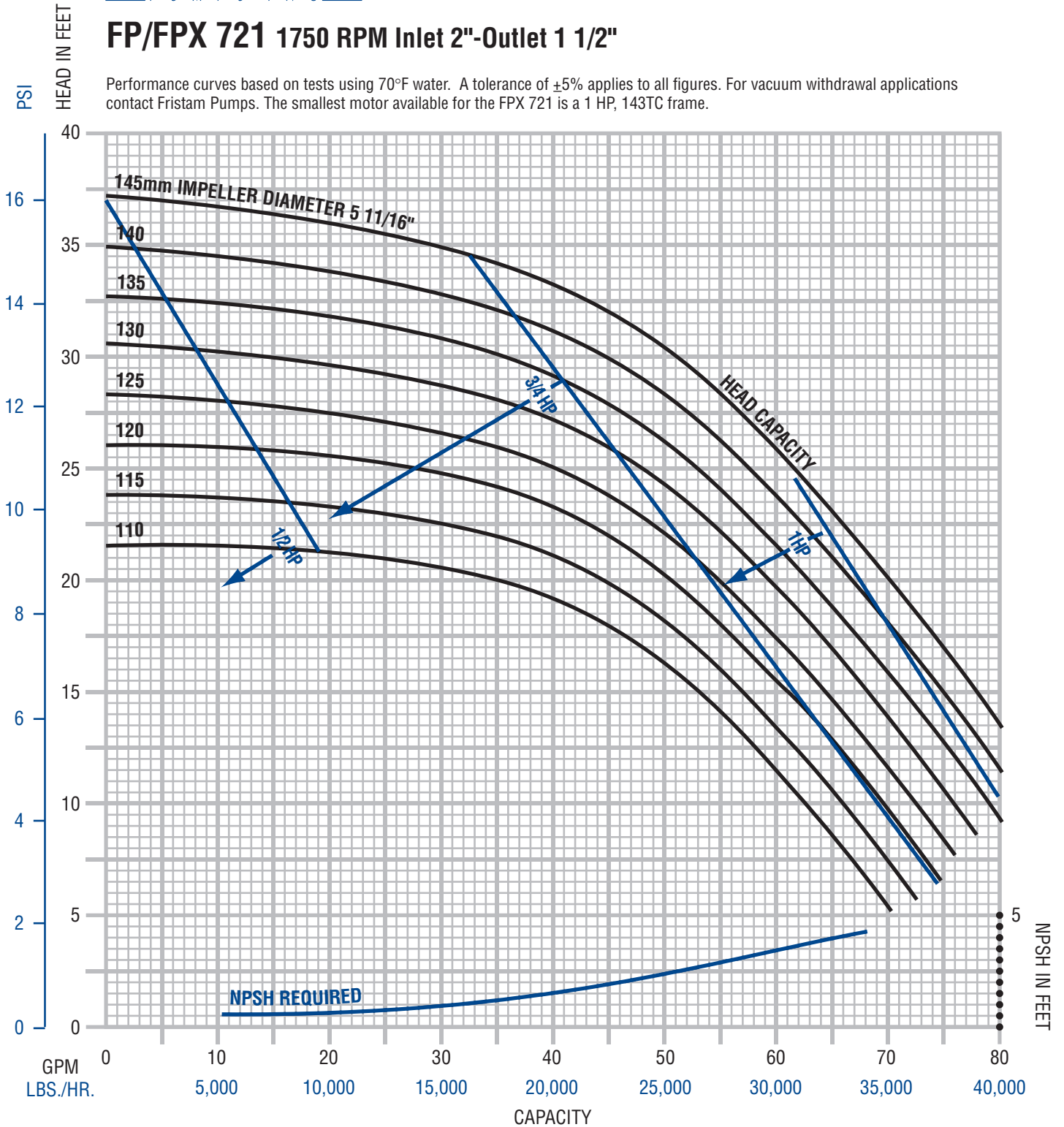
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 711 is a 1 HP, 143TC frame.





FP/FPX 721 1750 RPM Inlet 2"-Outlet 1 1/2"

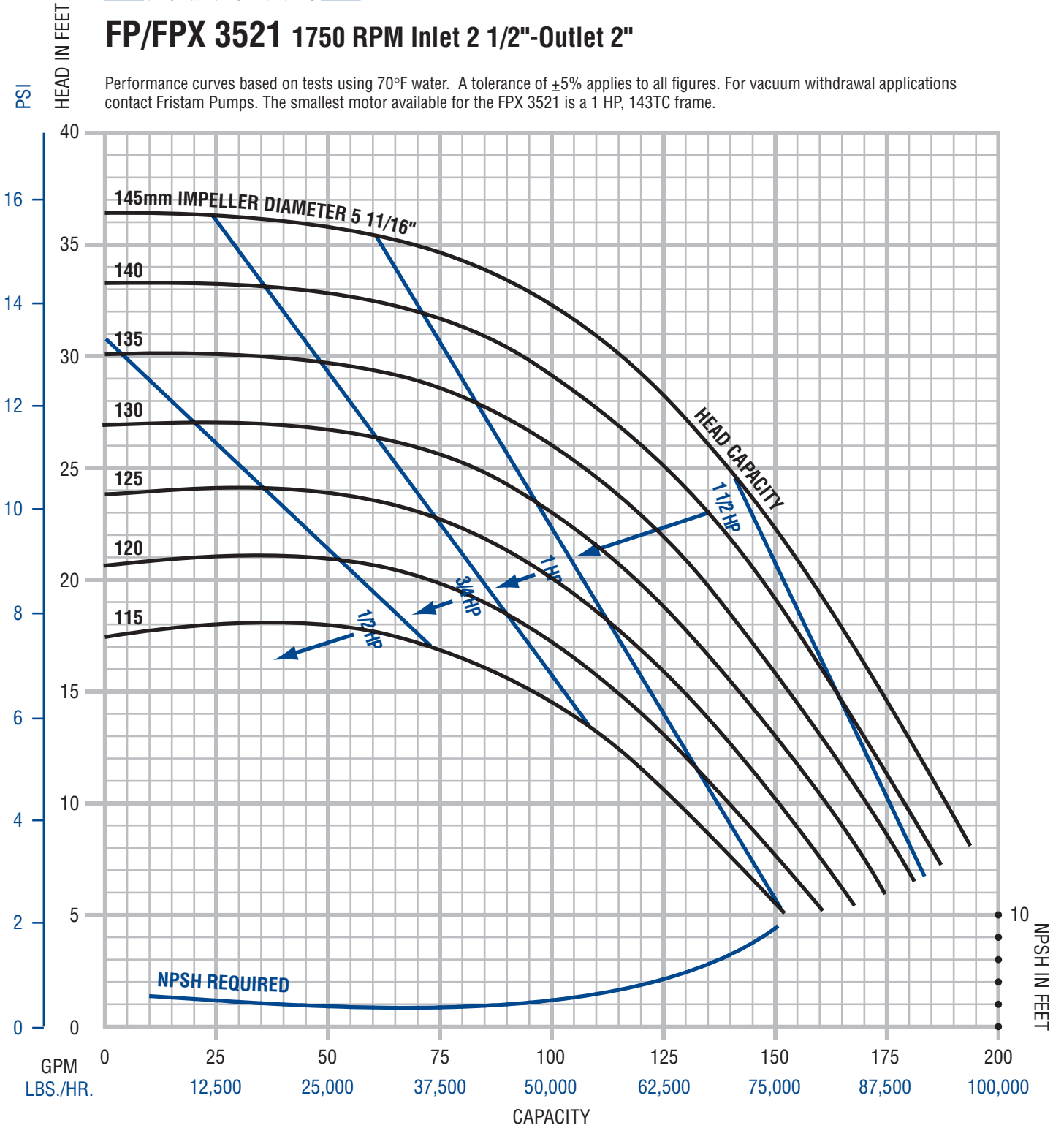
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 721 is a 1 HP, 143TC frame.





FP/FPX 3521 1750 RPM Inlet 2 1/2"-Outlet 2"

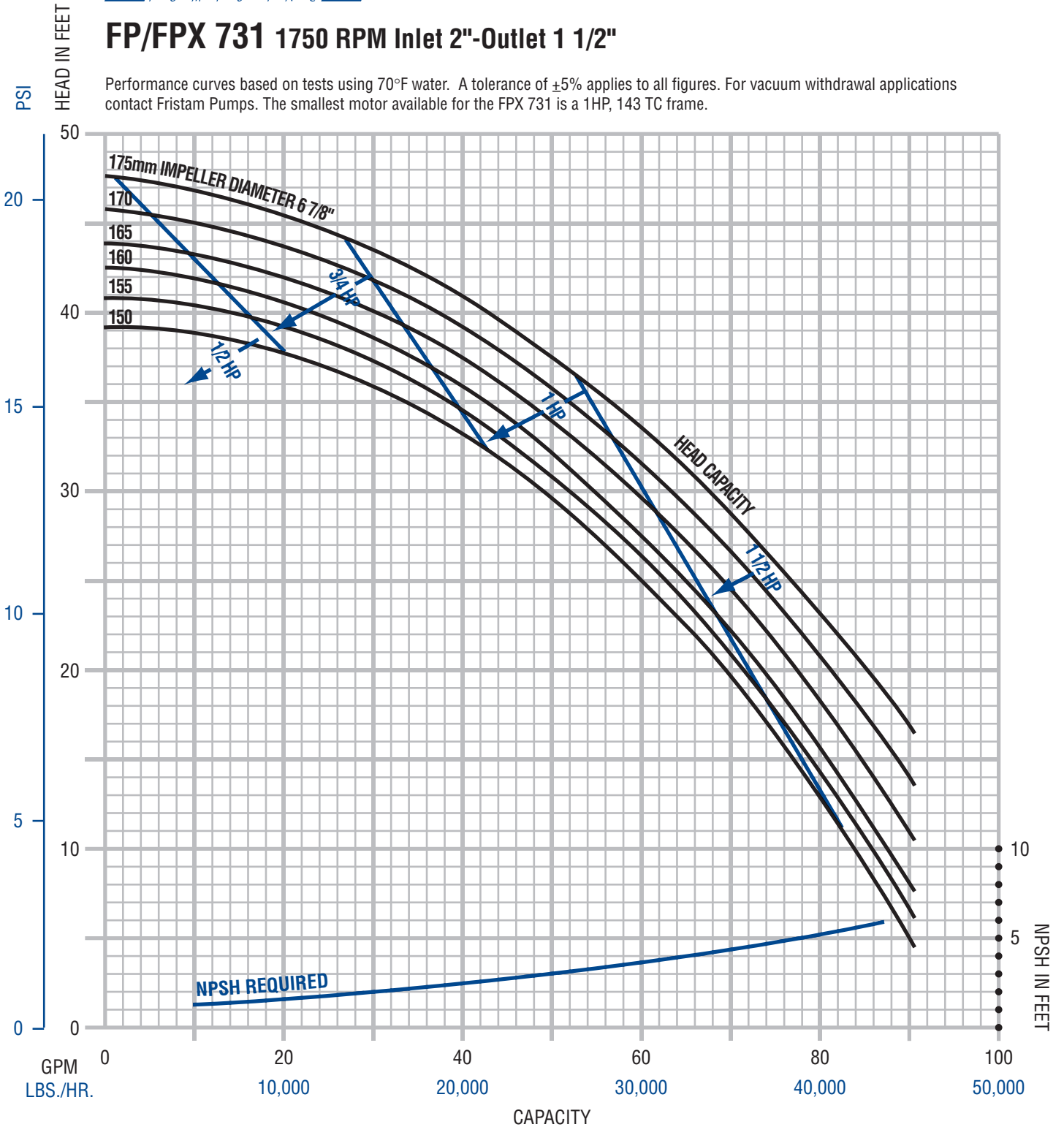
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 3521 is a 1 HP, 143TC frame.





FP/FPX 731 1750 RPM Inlet 2"-Outlet 1 1/2"

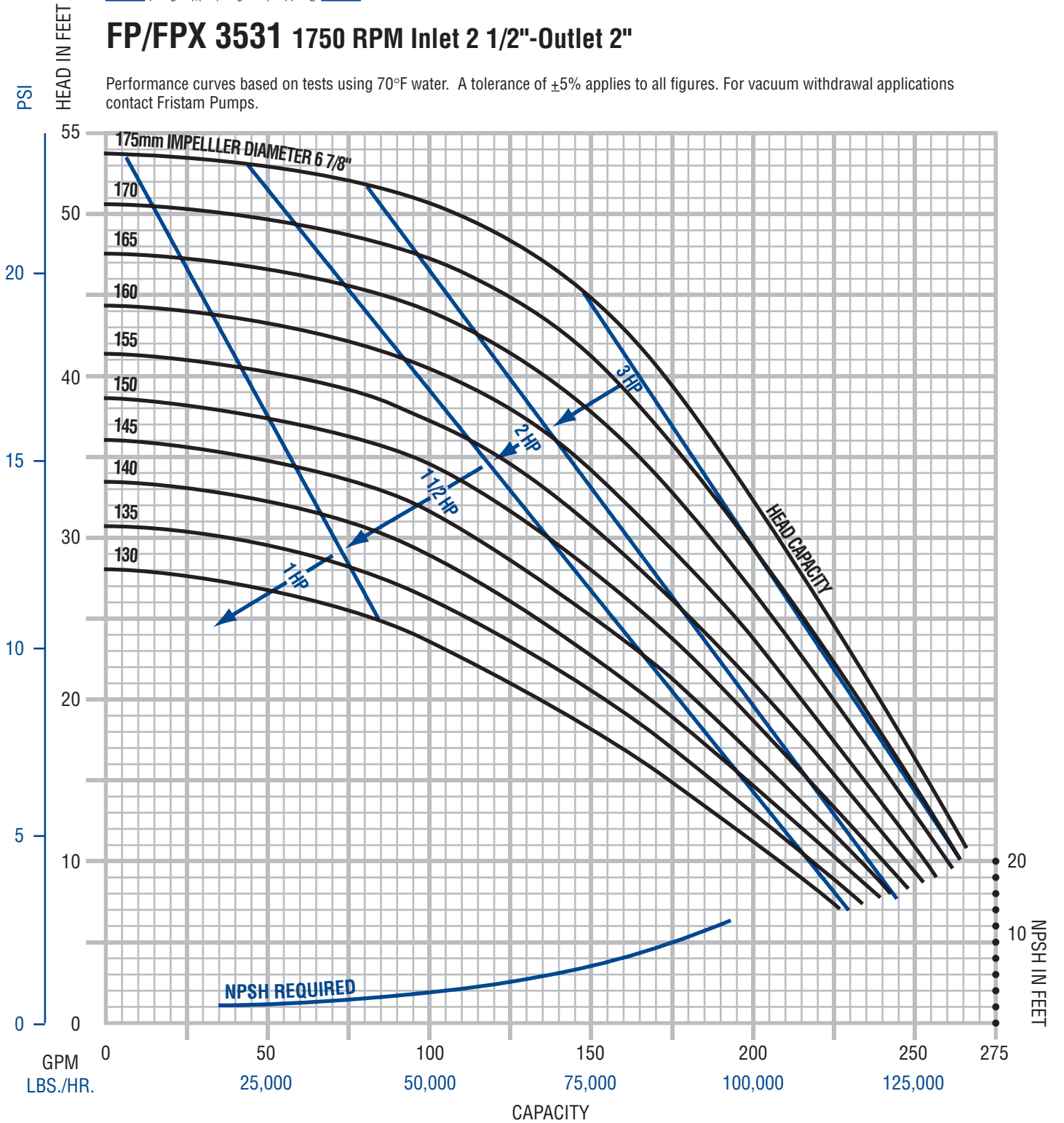
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 731 is a 1HP, 143 TC frame.





FP/FPX 3531 1750 RPM Inlet 2 1/2"-Outlet 2"

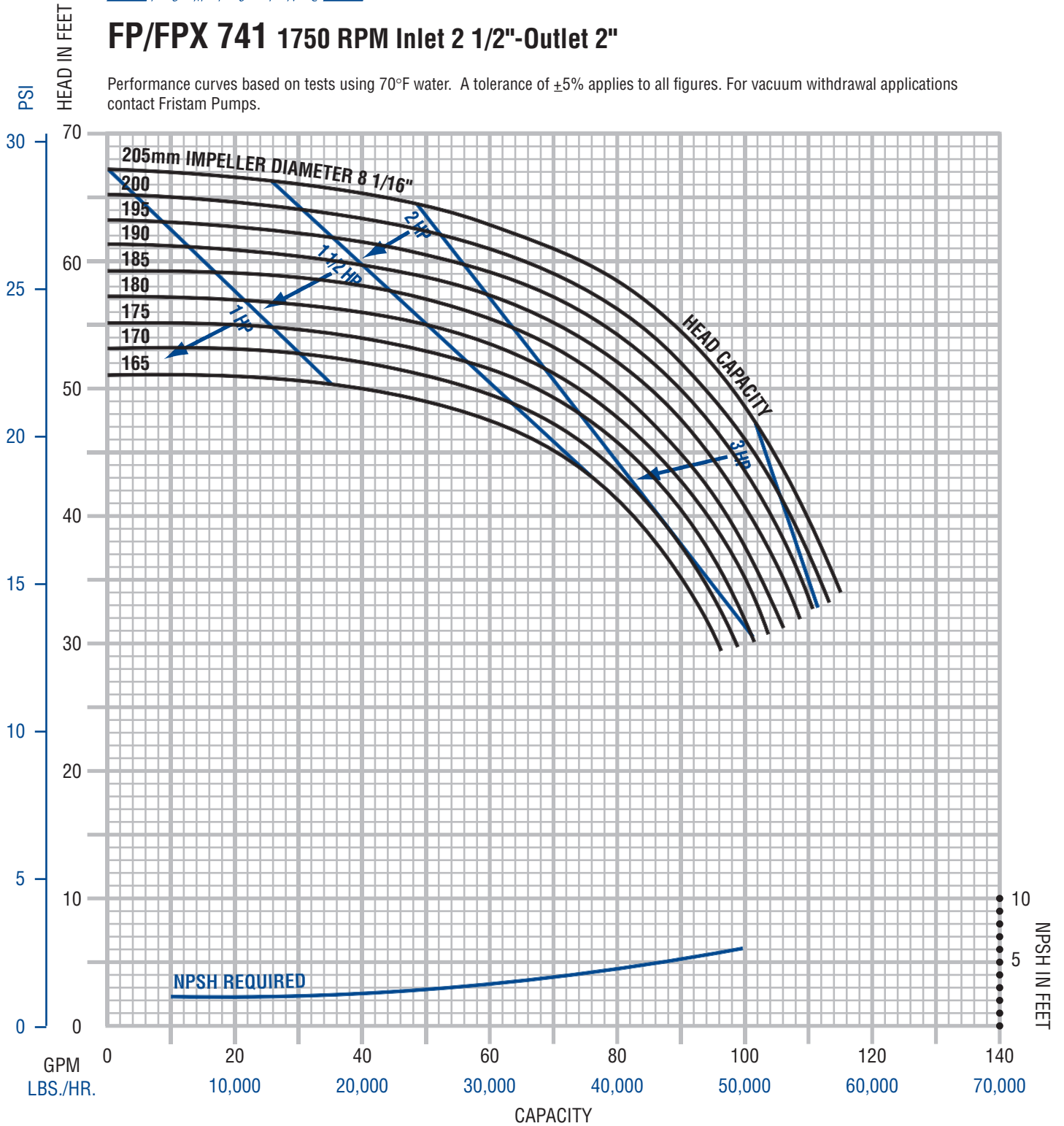
Performance curves based on tests using 70°F water. A tolerance of ±5% applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 741 1750 RPM Inlet 2 1/2"-Outlet 2"

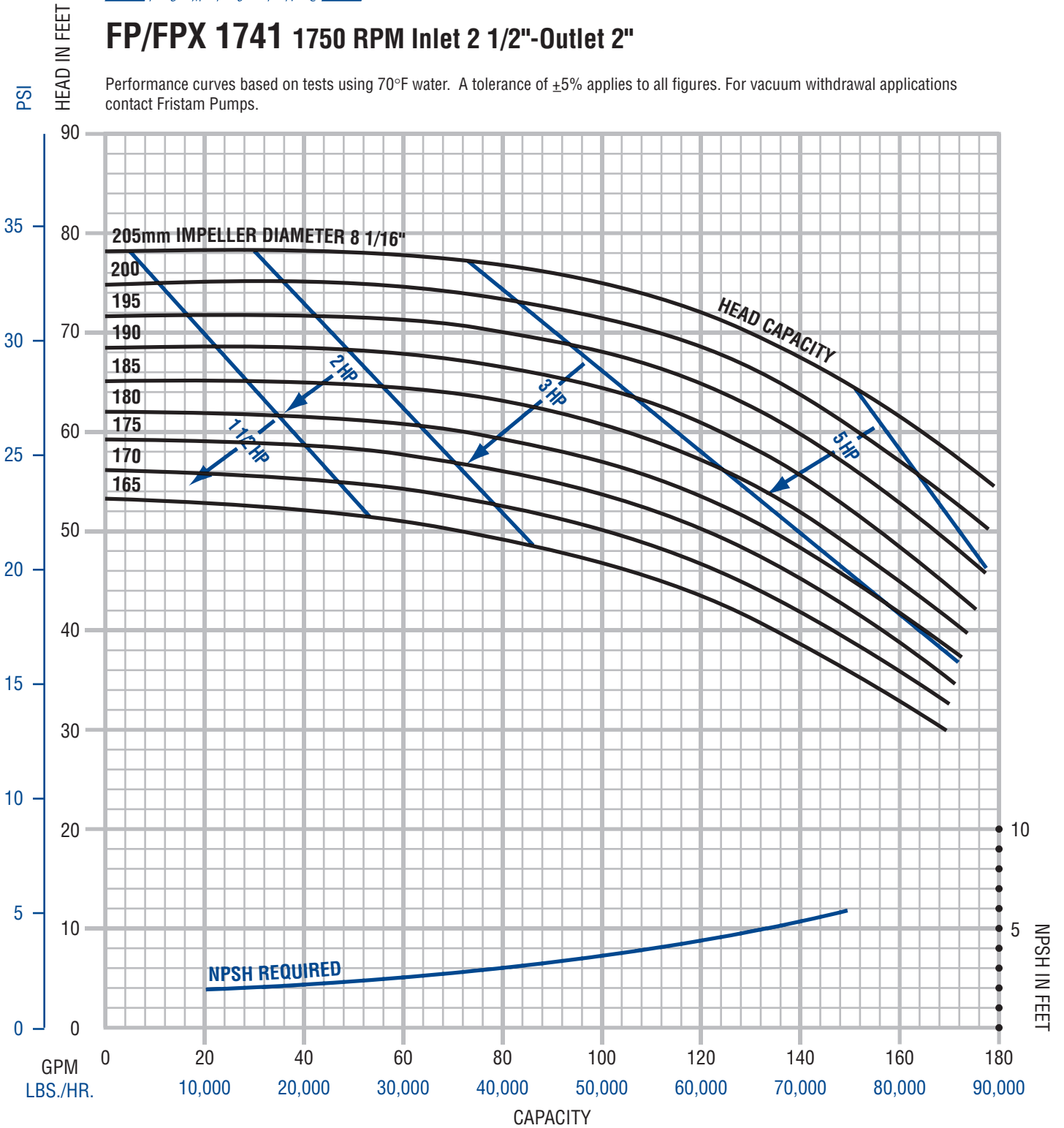
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 1741 1750 RPM Inlet 2 1/2"-Outlet 2"

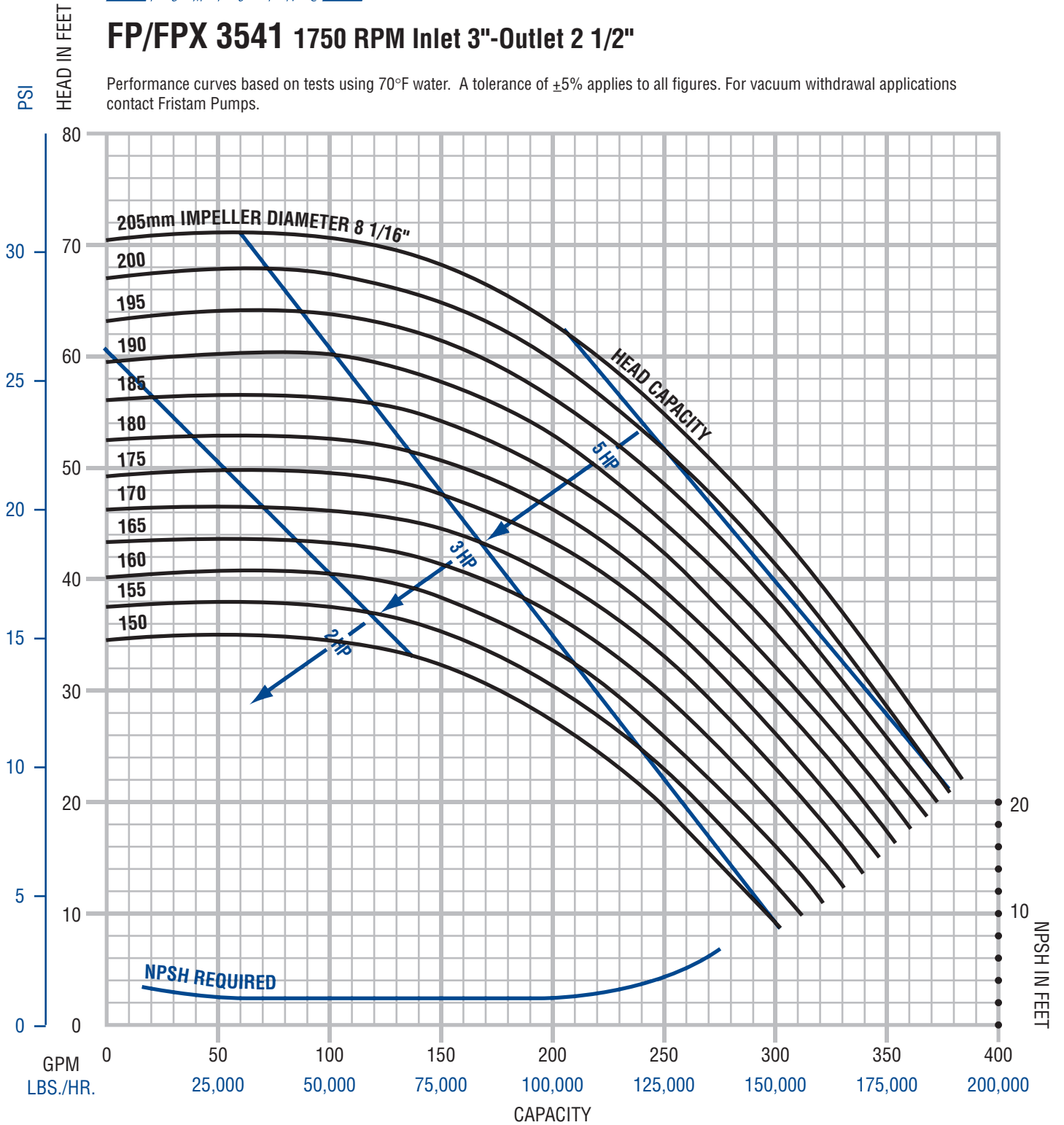
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3541 1750 RPM Inlet 3"-Outlet 2 1/2"

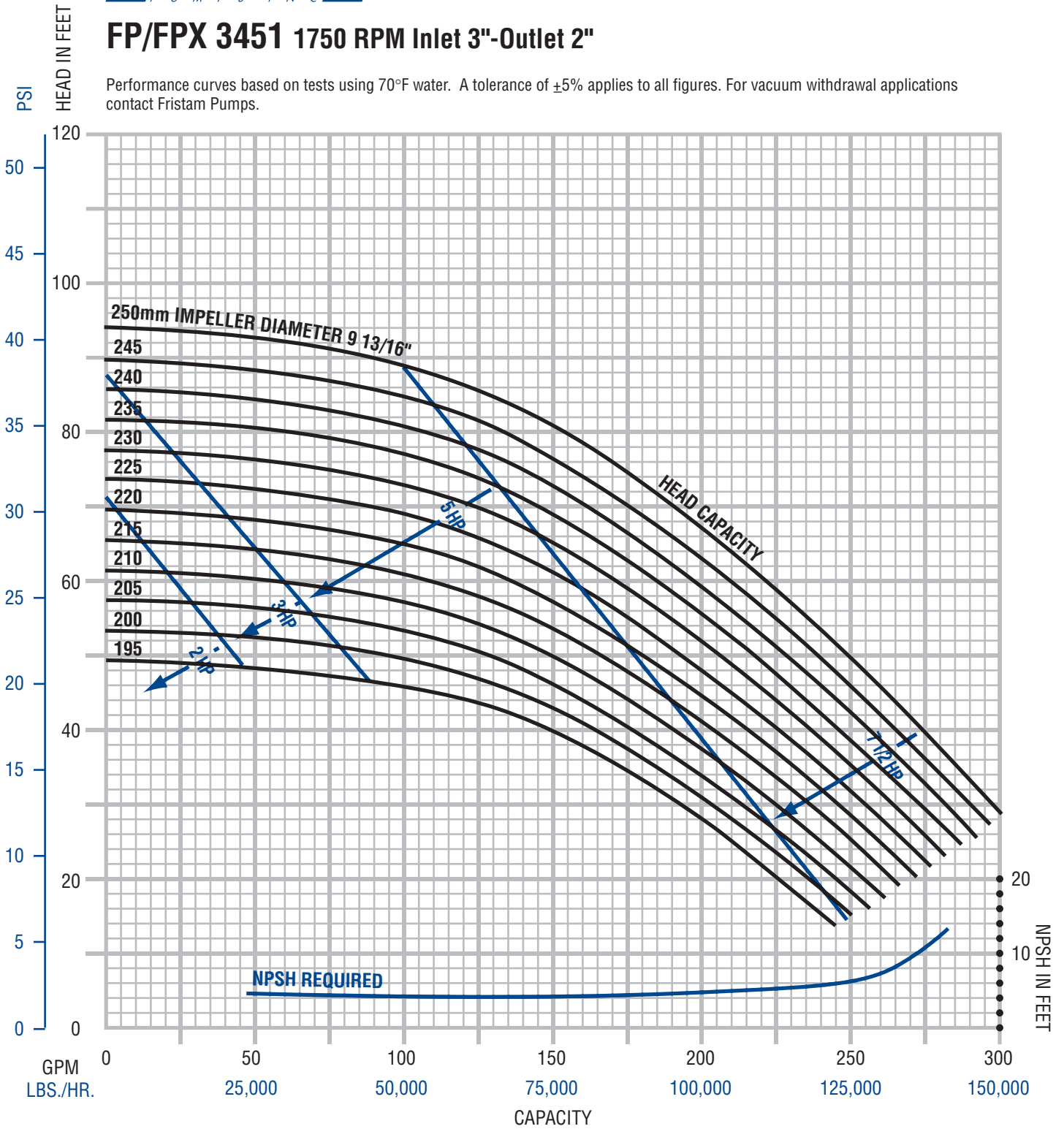
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3451 1750 RPM Inlet 3"-Outlet 2"

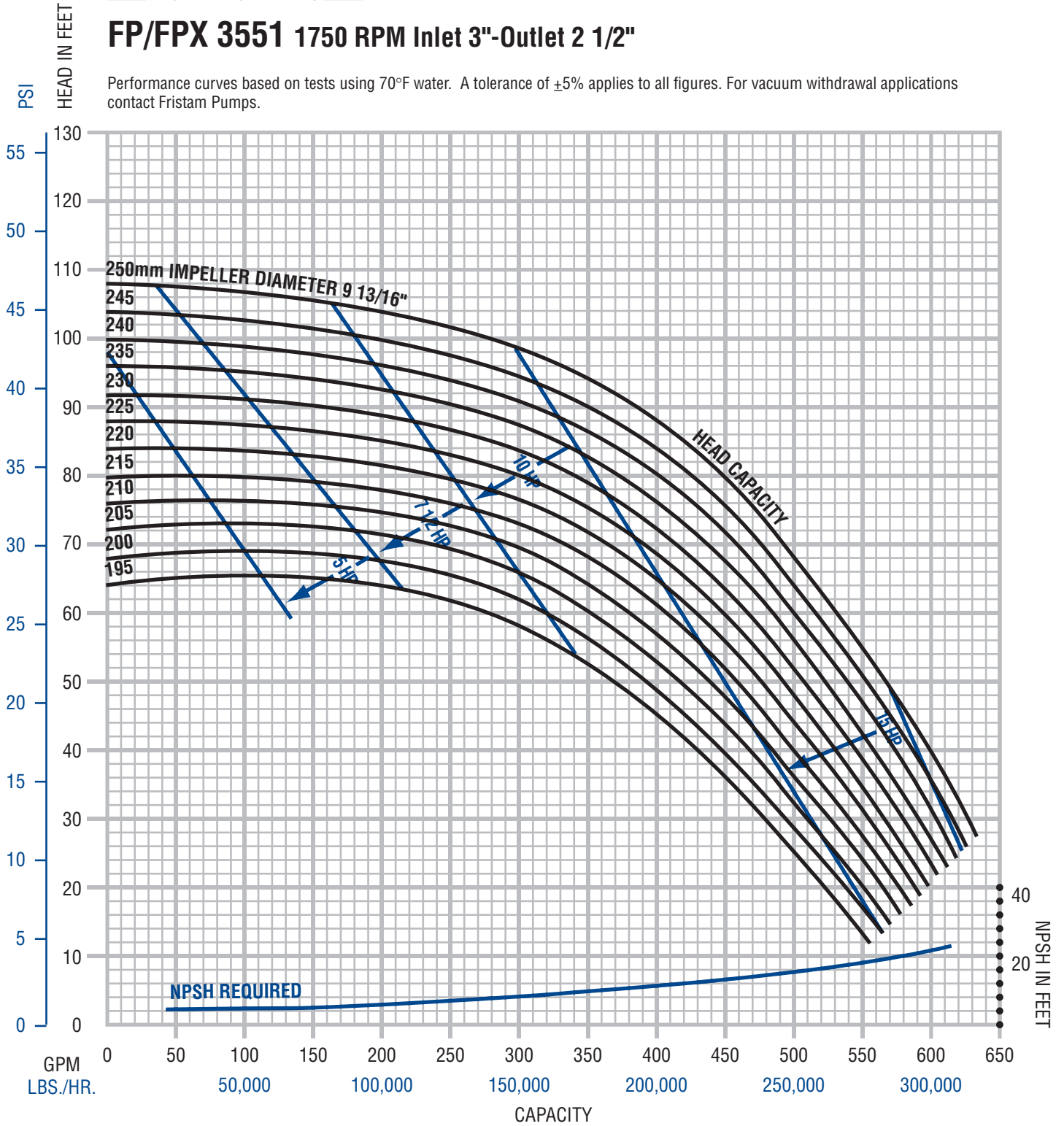
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3551 1750 RPM Inlet 3"-Outlet 2 1/2"

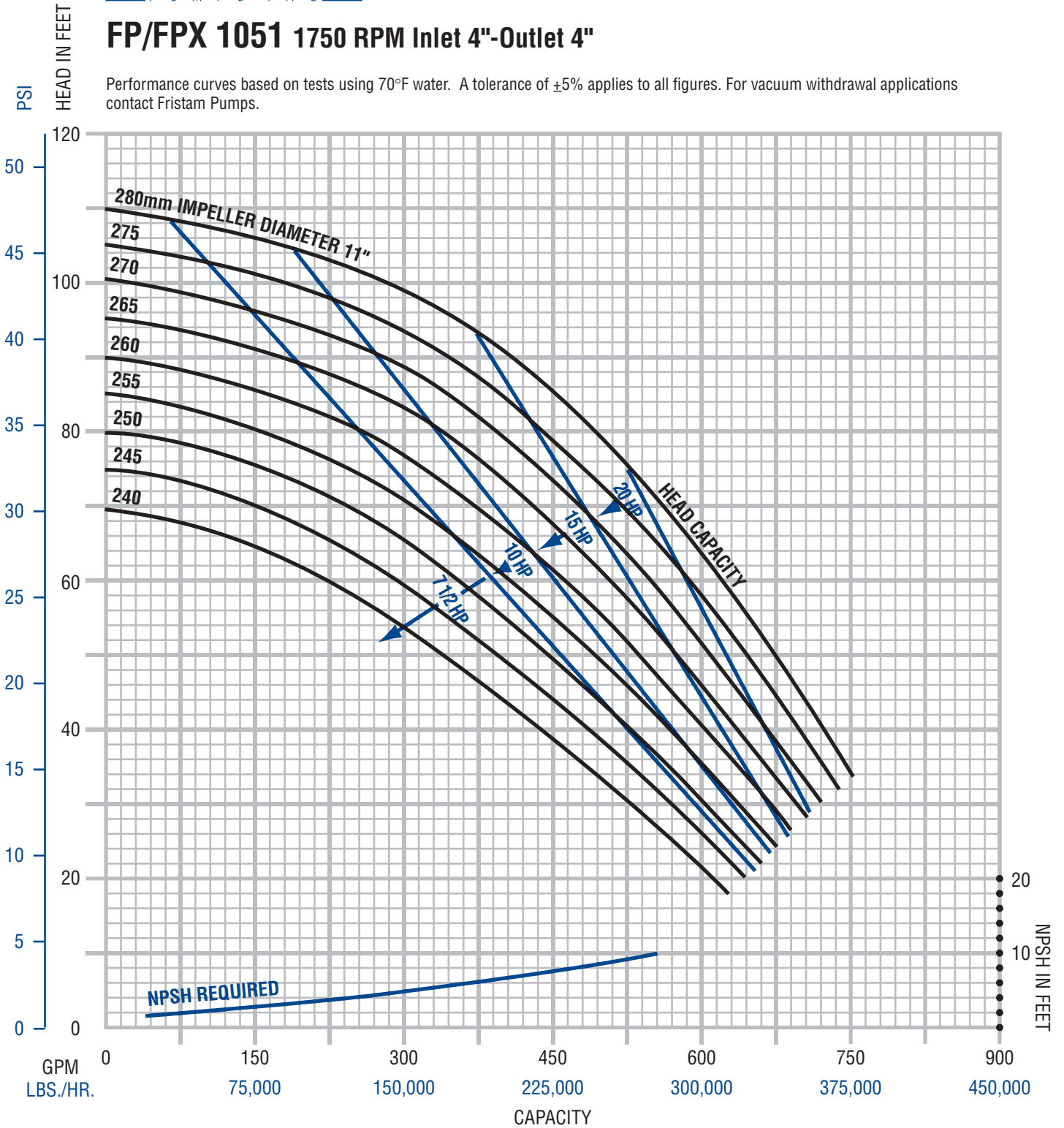
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 1051 1750 RPM Inlet 4"-Outlet 4"

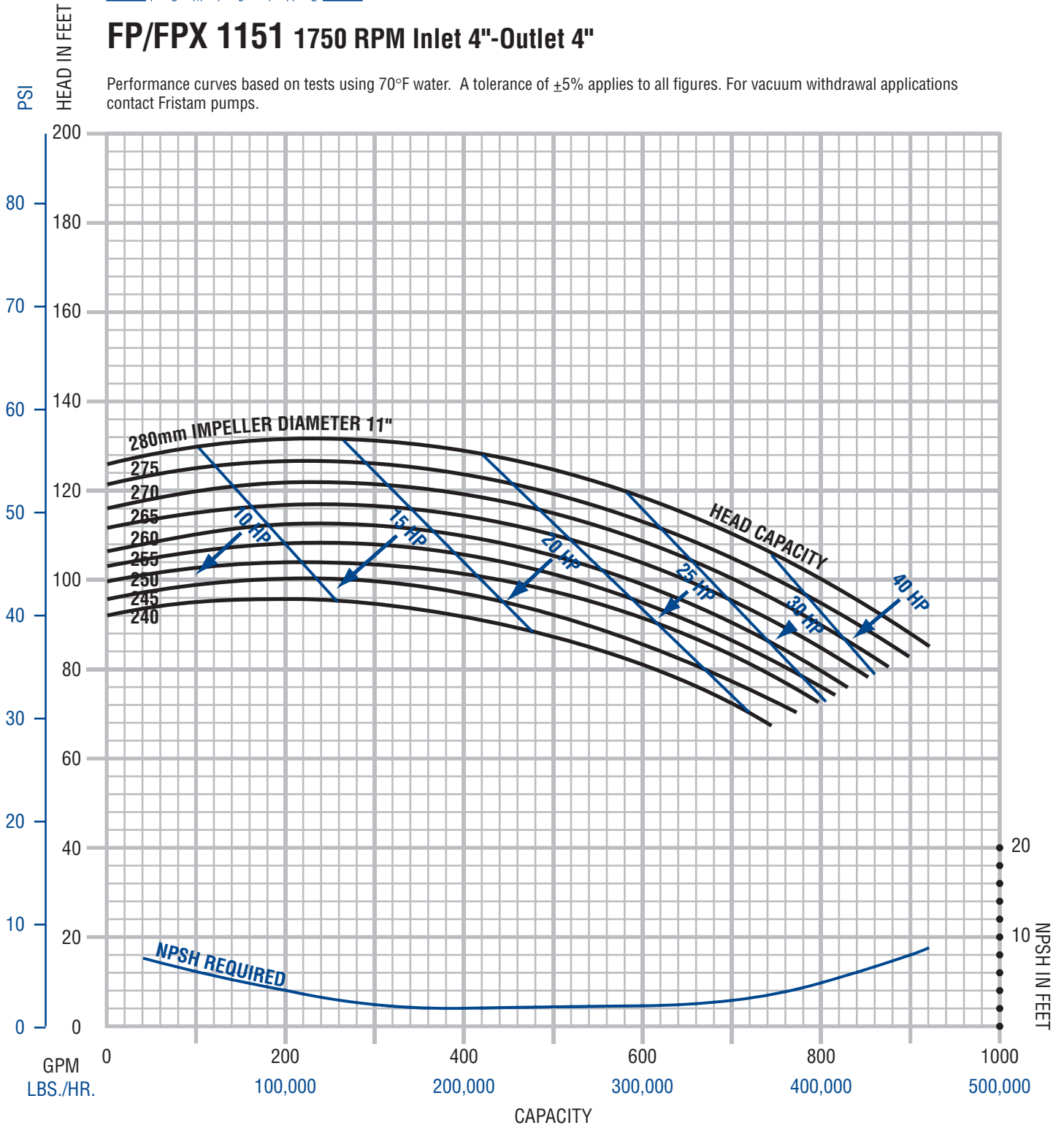
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 1151 1750 RPM Inlet 4"-Outlet 4"

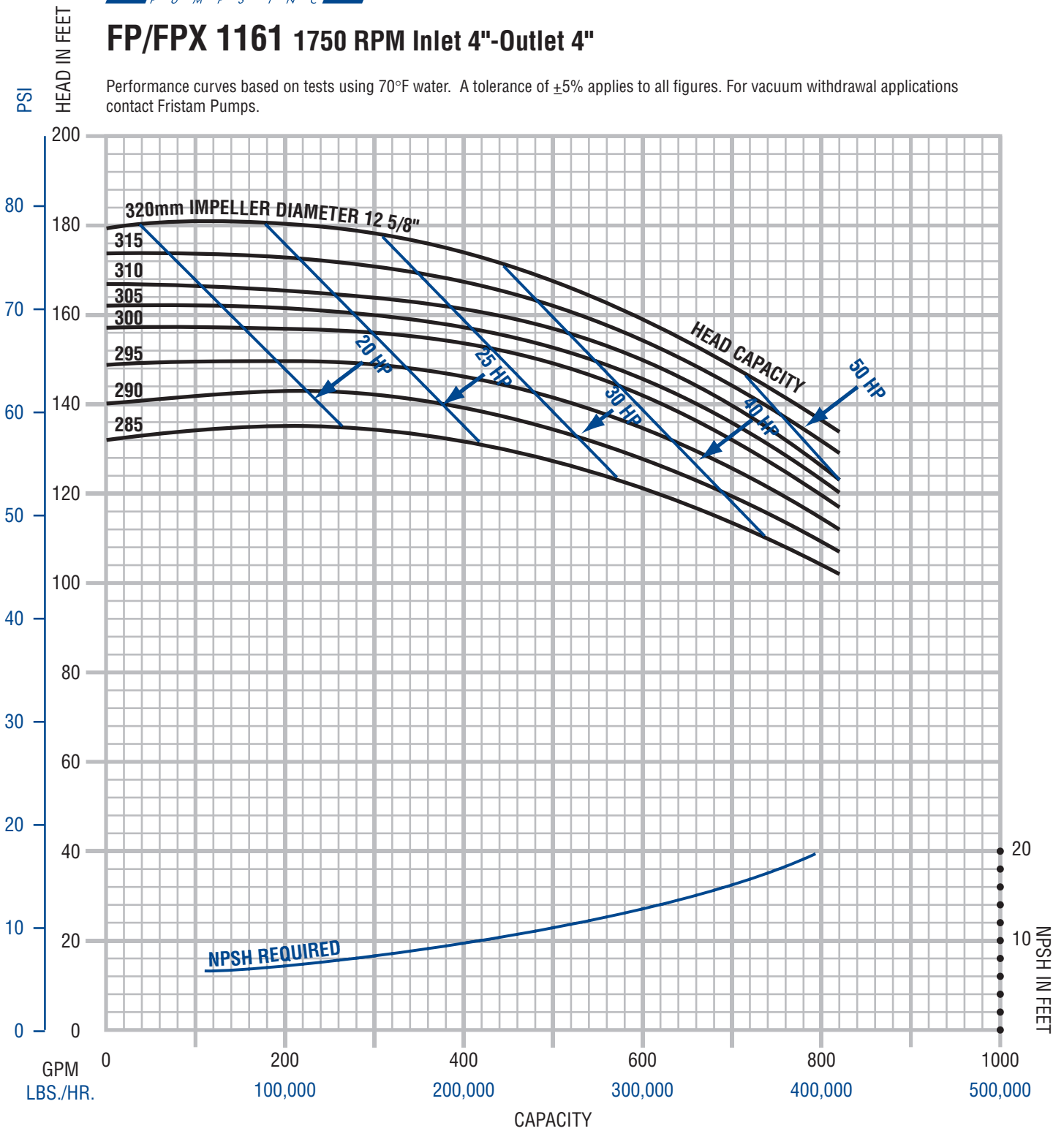
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam pumps.





FP/FPX 1161 1750 RPM Inlet 4"-Outlet 4"

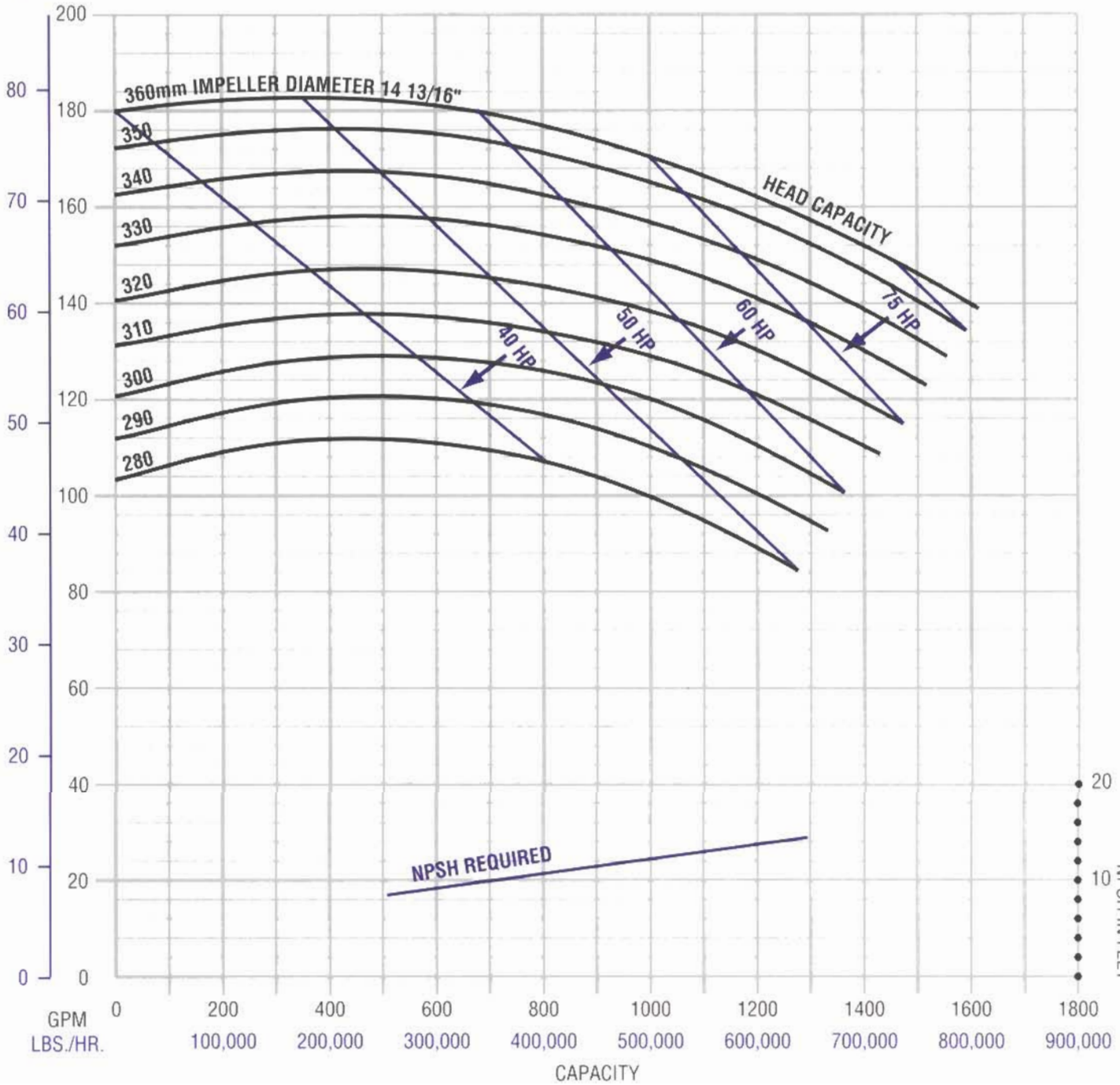
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 4001 1750 RPM Inlet 6"-Outlet 4"

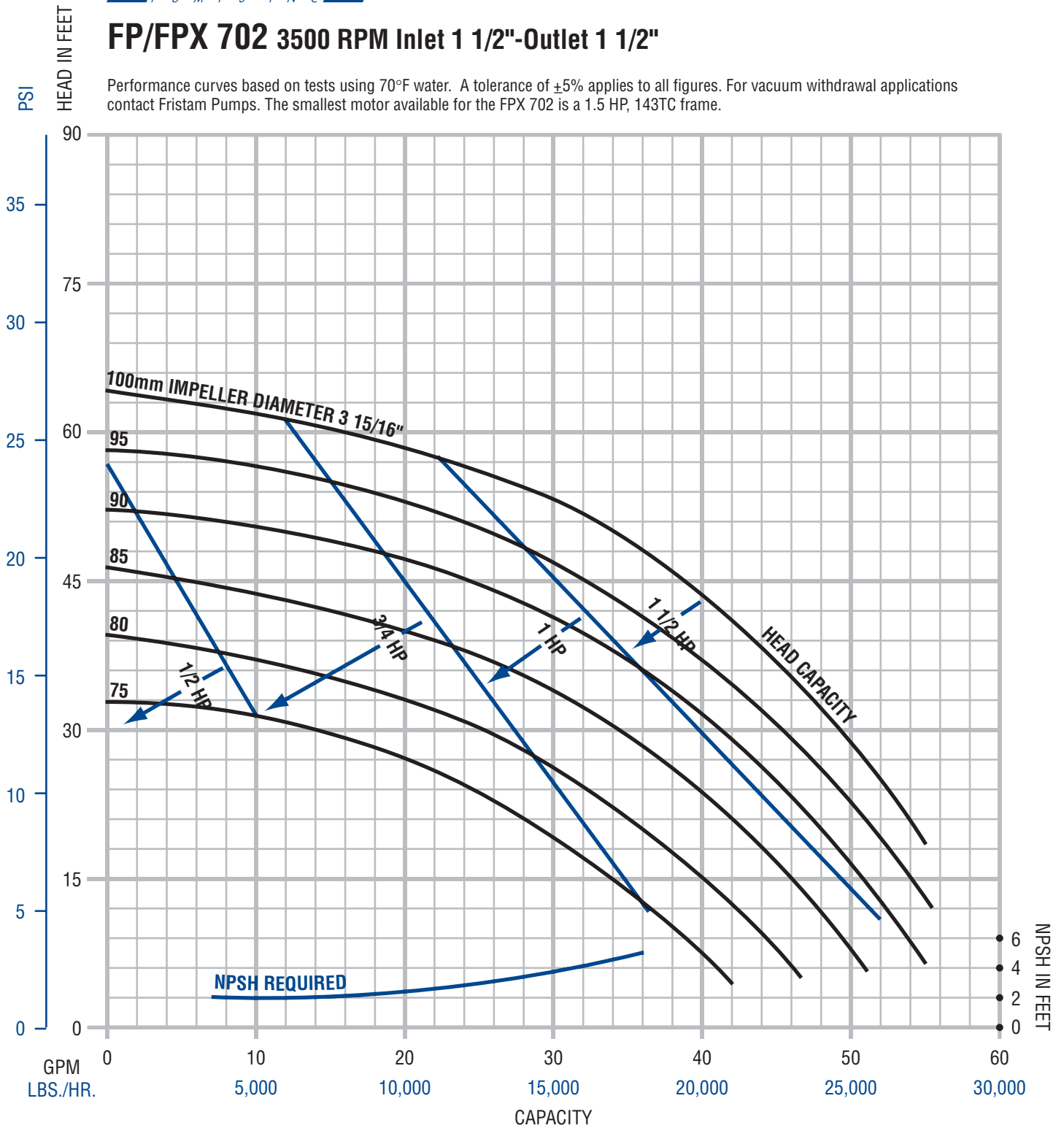
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 702 3500 RPM Inlet 1 1/2"-Outlet 1 1/2"

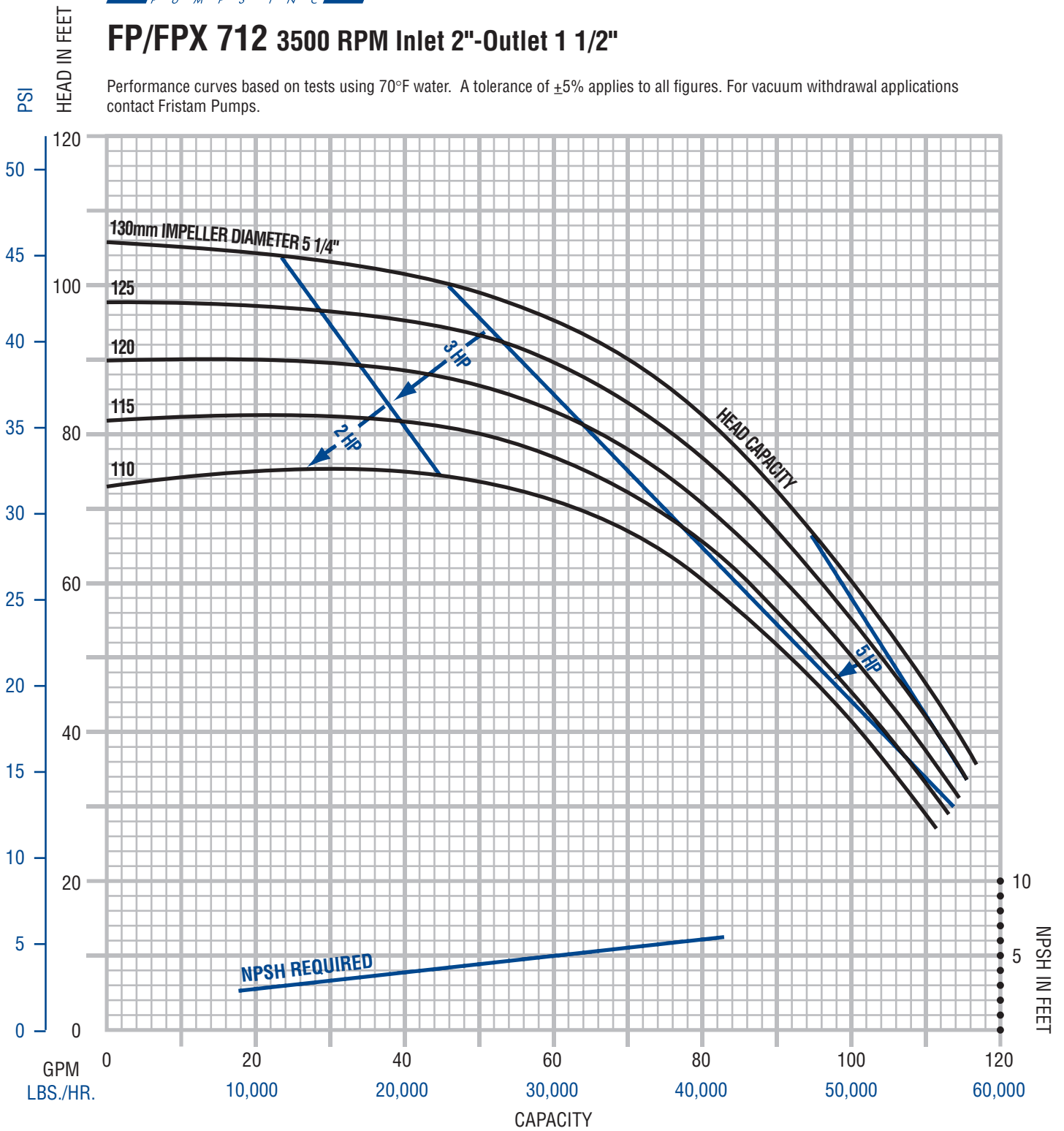
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps. The smallest motor available for the FPX 702 is a 1.5 HP, 143TC frame.





FP/FPX 712 3500 RPM Inlet 2"-Outlet 1 1/2"

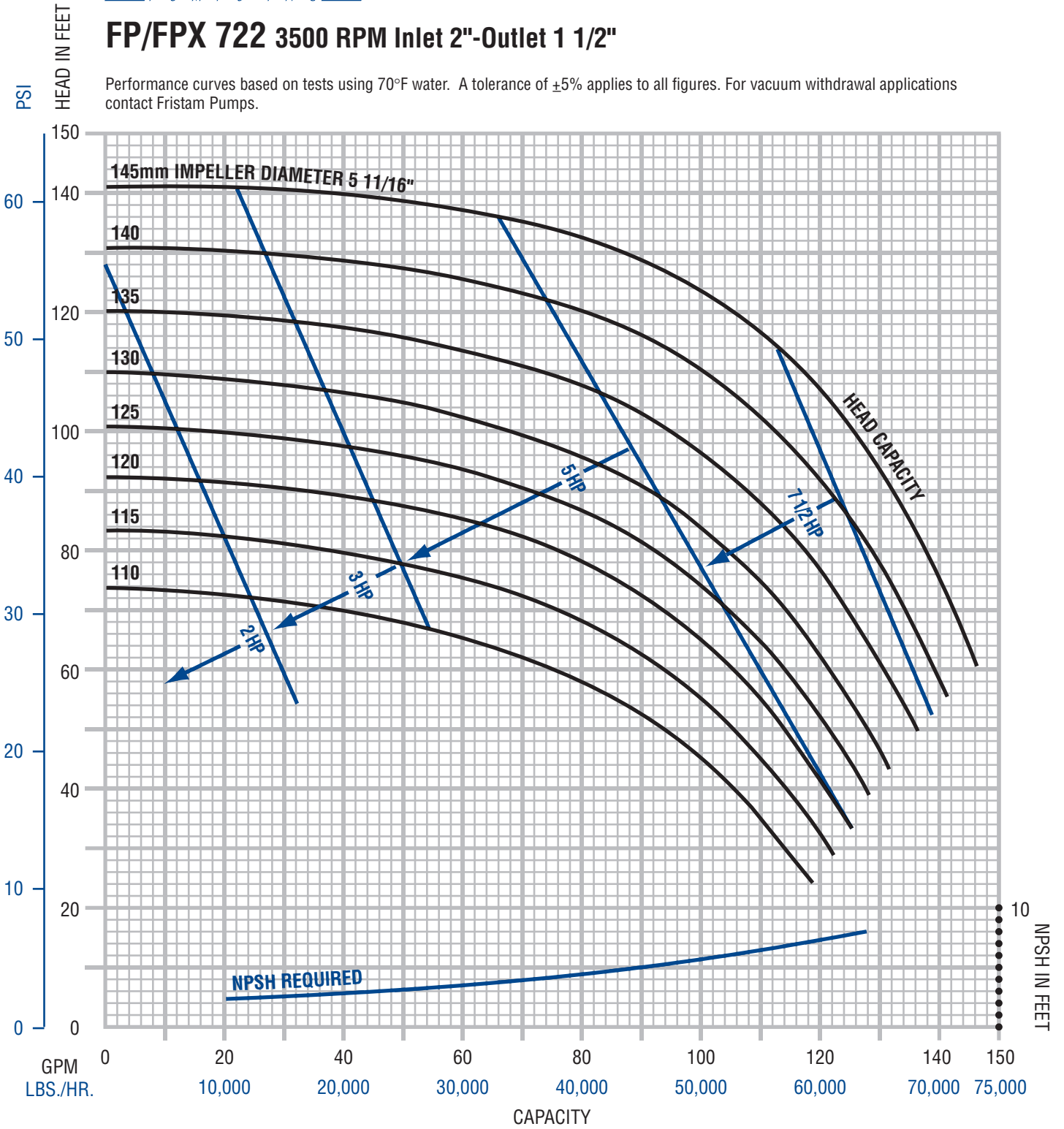
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 722 3500 RPM Inlet 2"-Outlet 1 1/2"

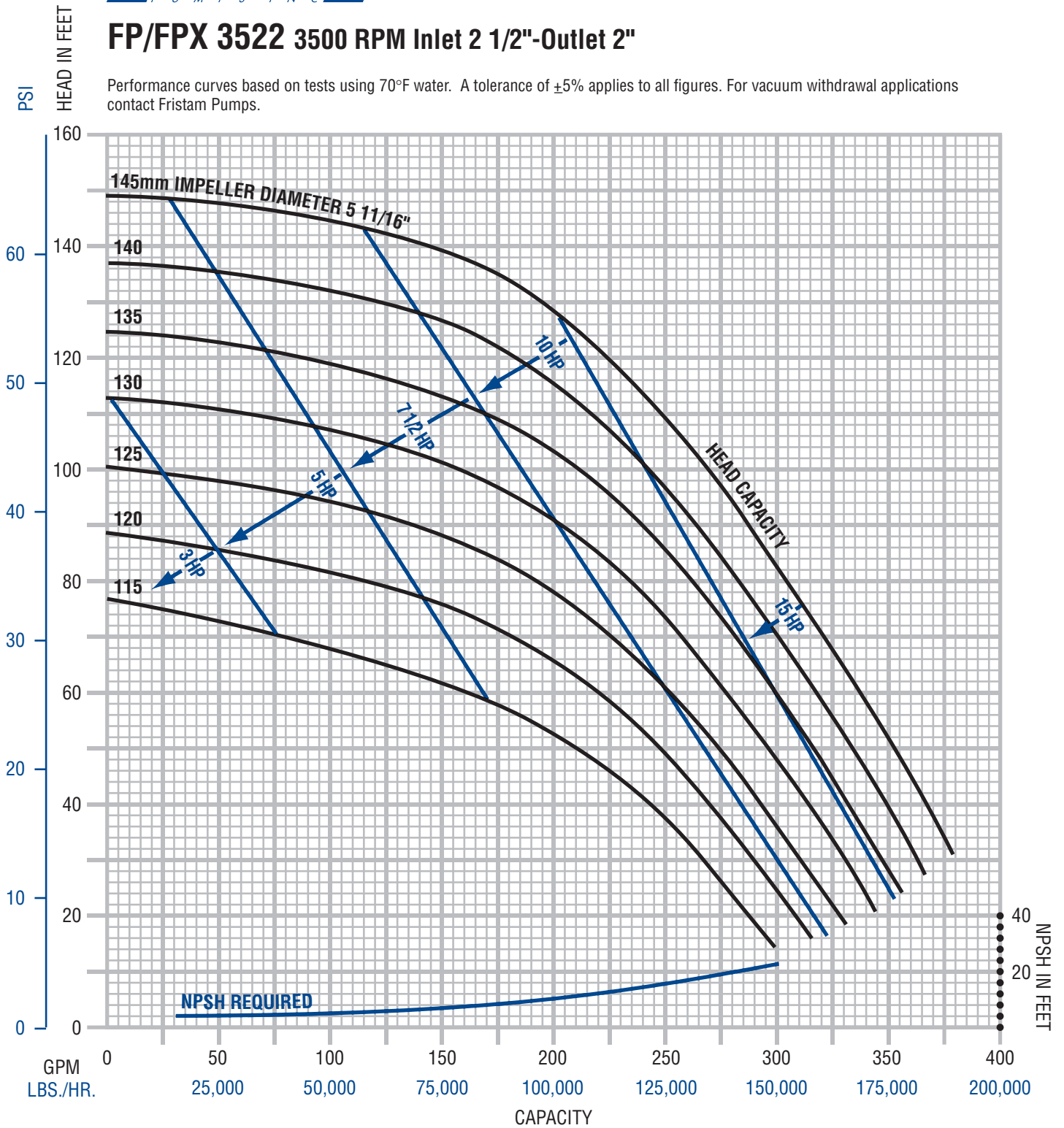
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3522 3500 RPM Inlet 2 1/2"-Outlet 2"

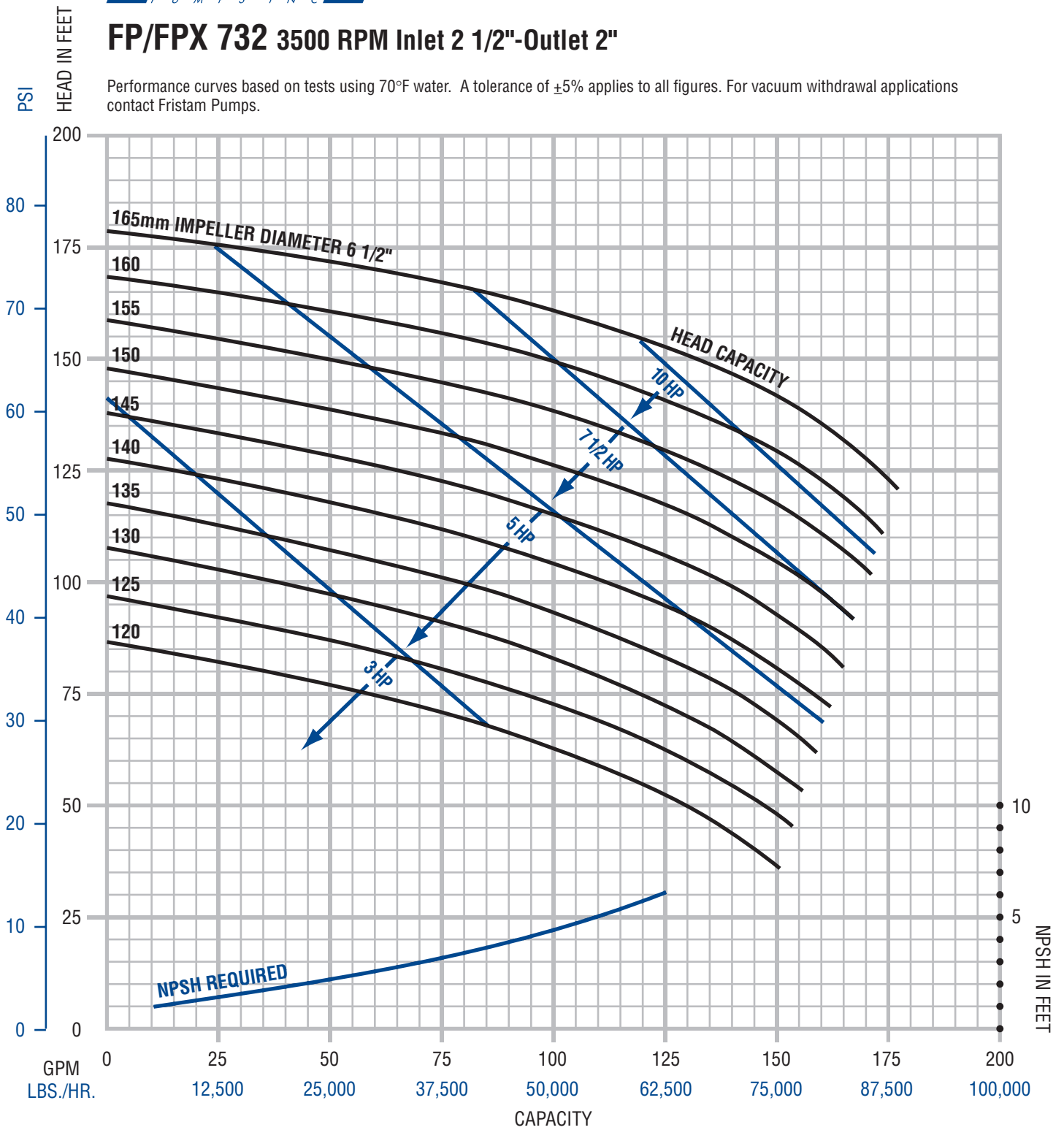
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 732 3500 RPM Inlet 2 1/2"-Outlet 2"

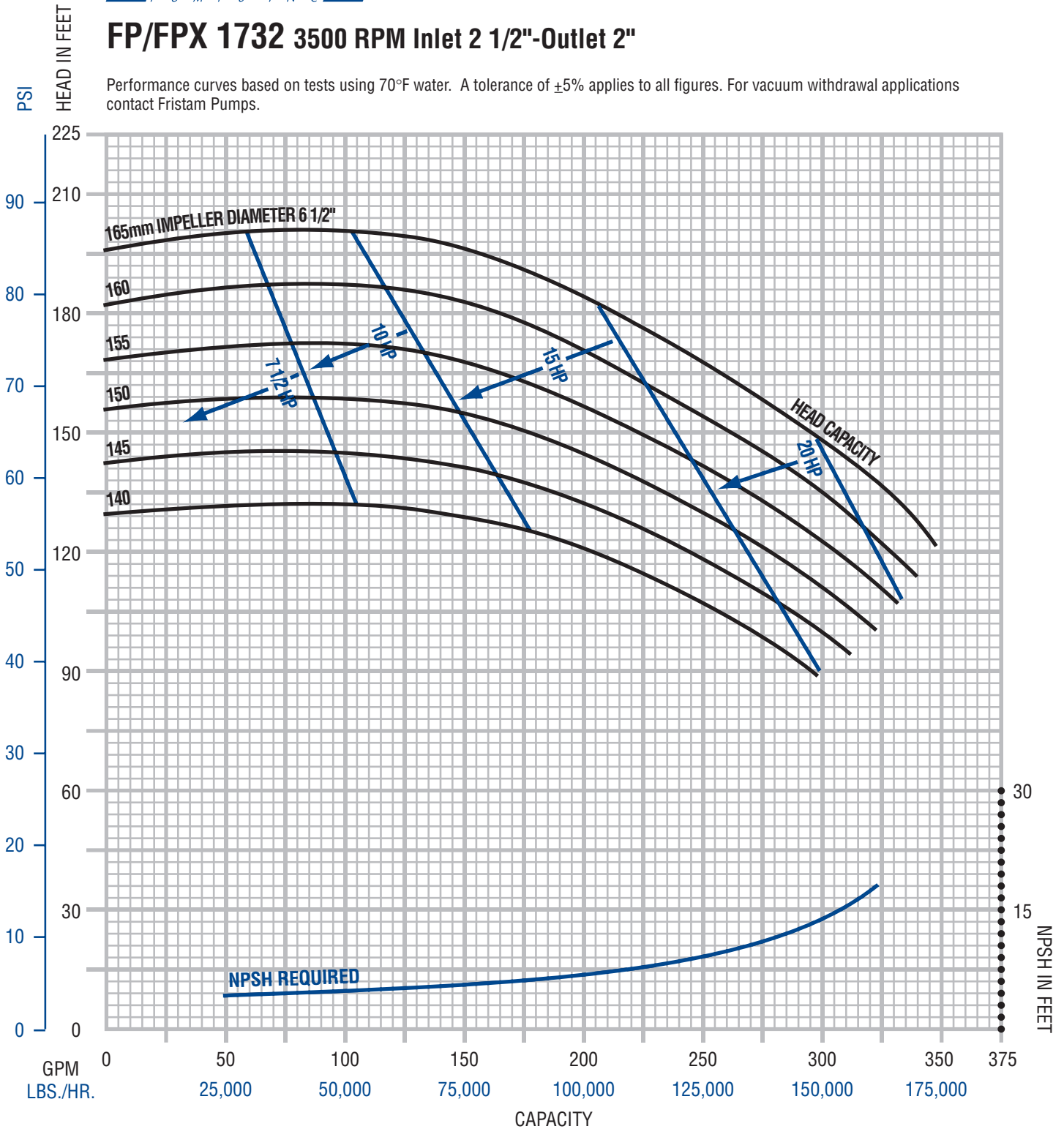
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 1732 3500 RPM Inlet 2 1/2"-Outlet 2"

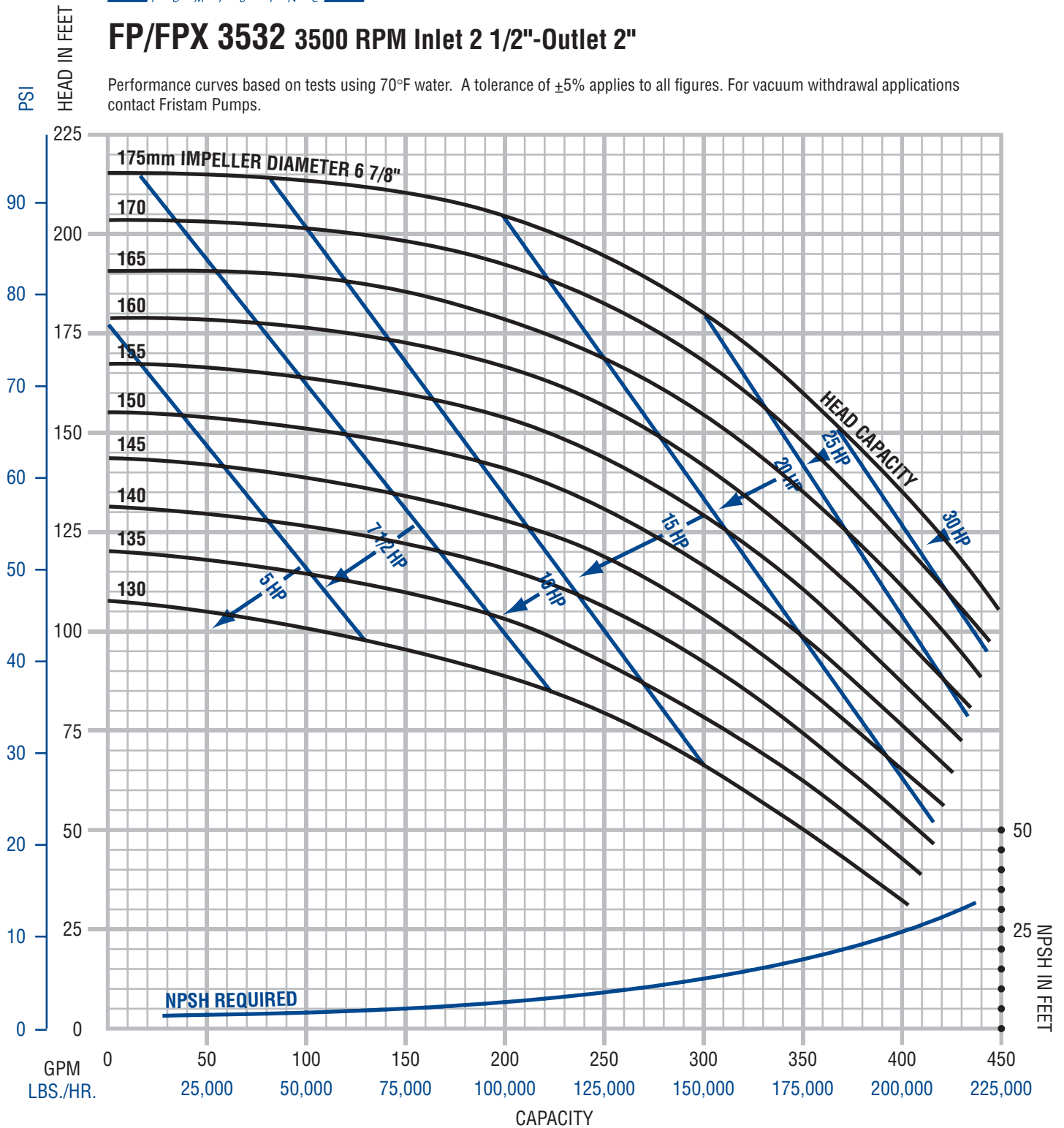
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3532 3500 RPM Inlet 2 1/2"-Outlet 2"

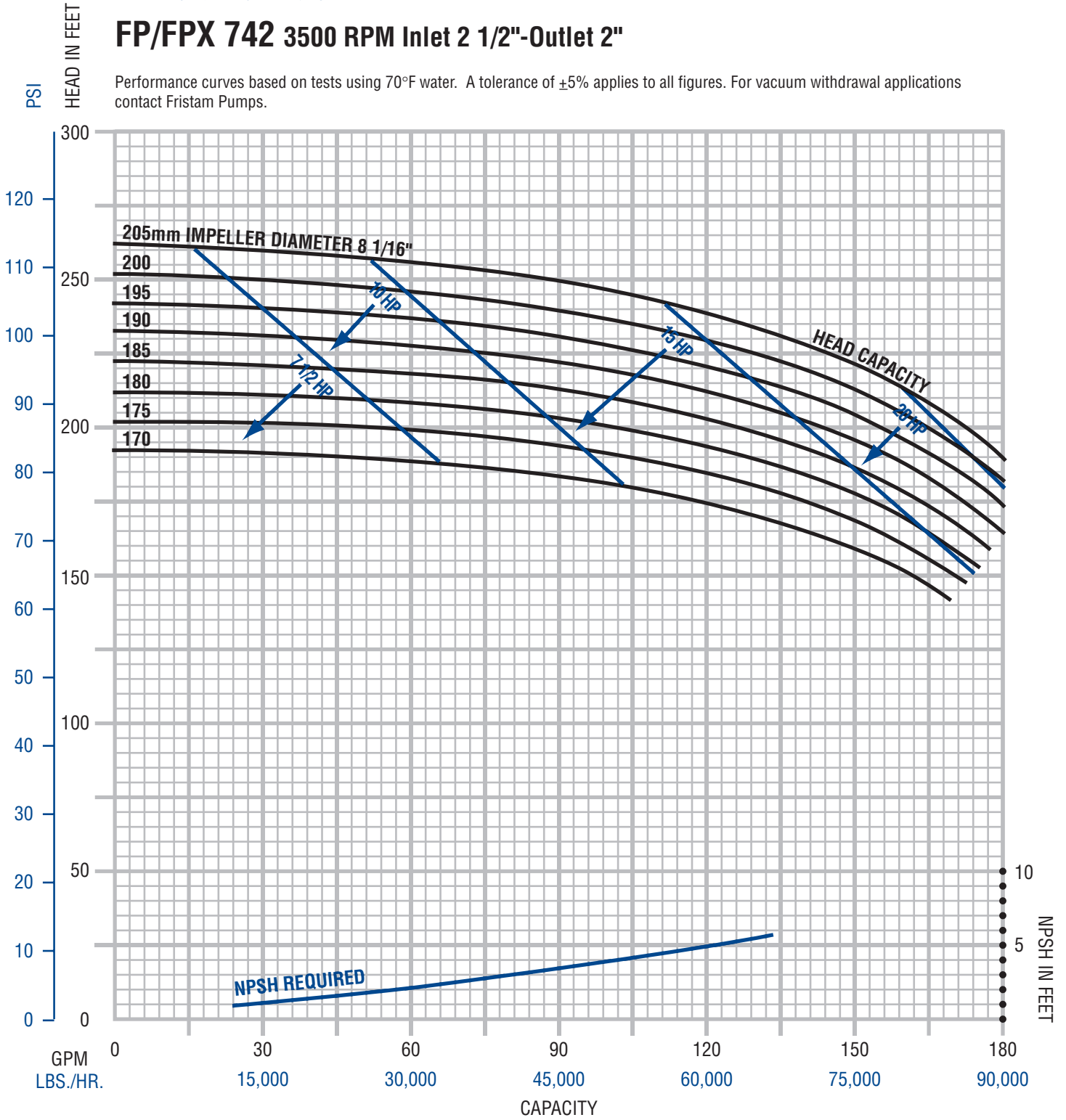
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 742 3500 RPM Inlet 2 1/2"-Outlet 2"

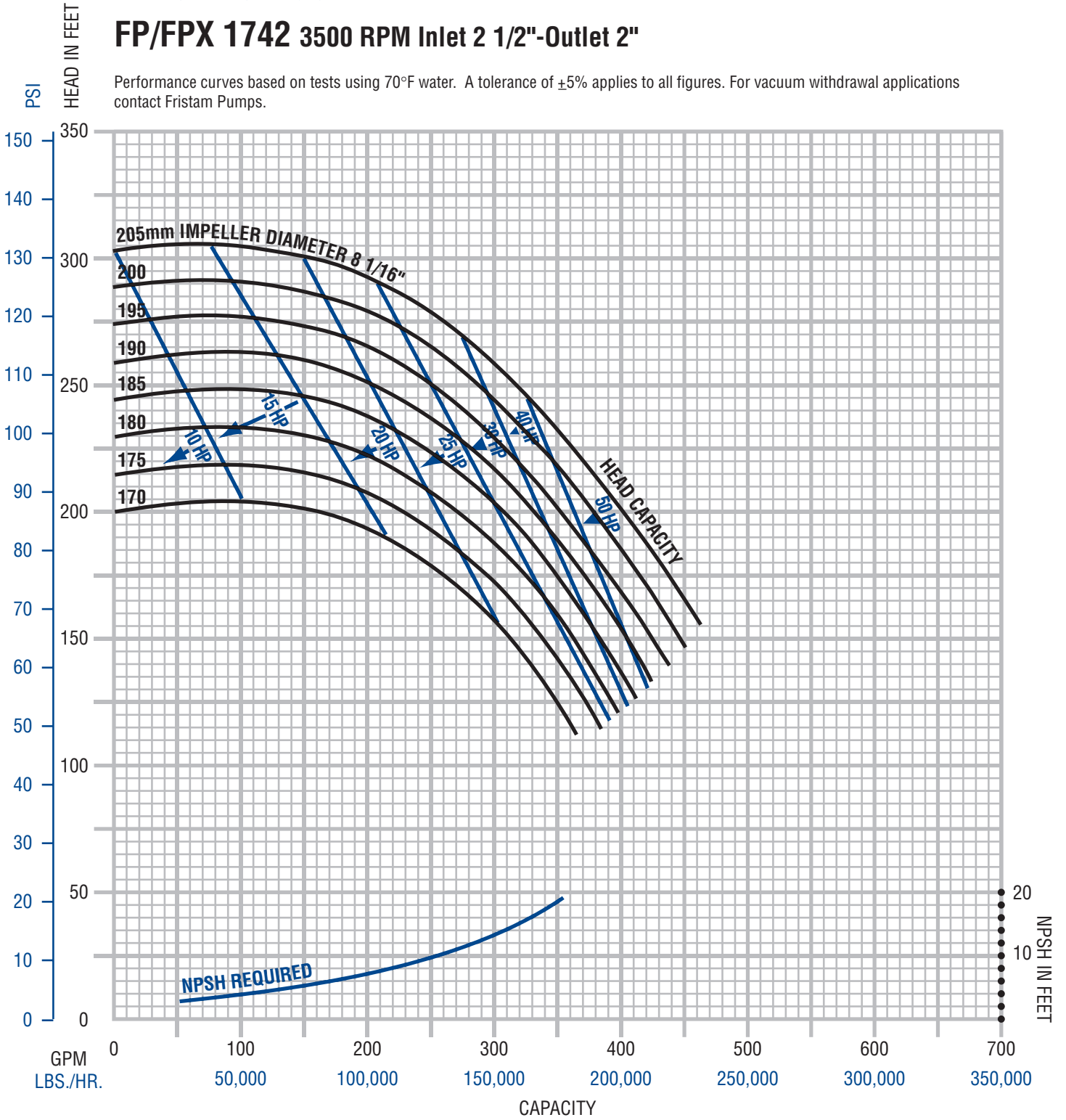
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 1742 3500 RPM Inlet 2 1/2"-Outlet 2"

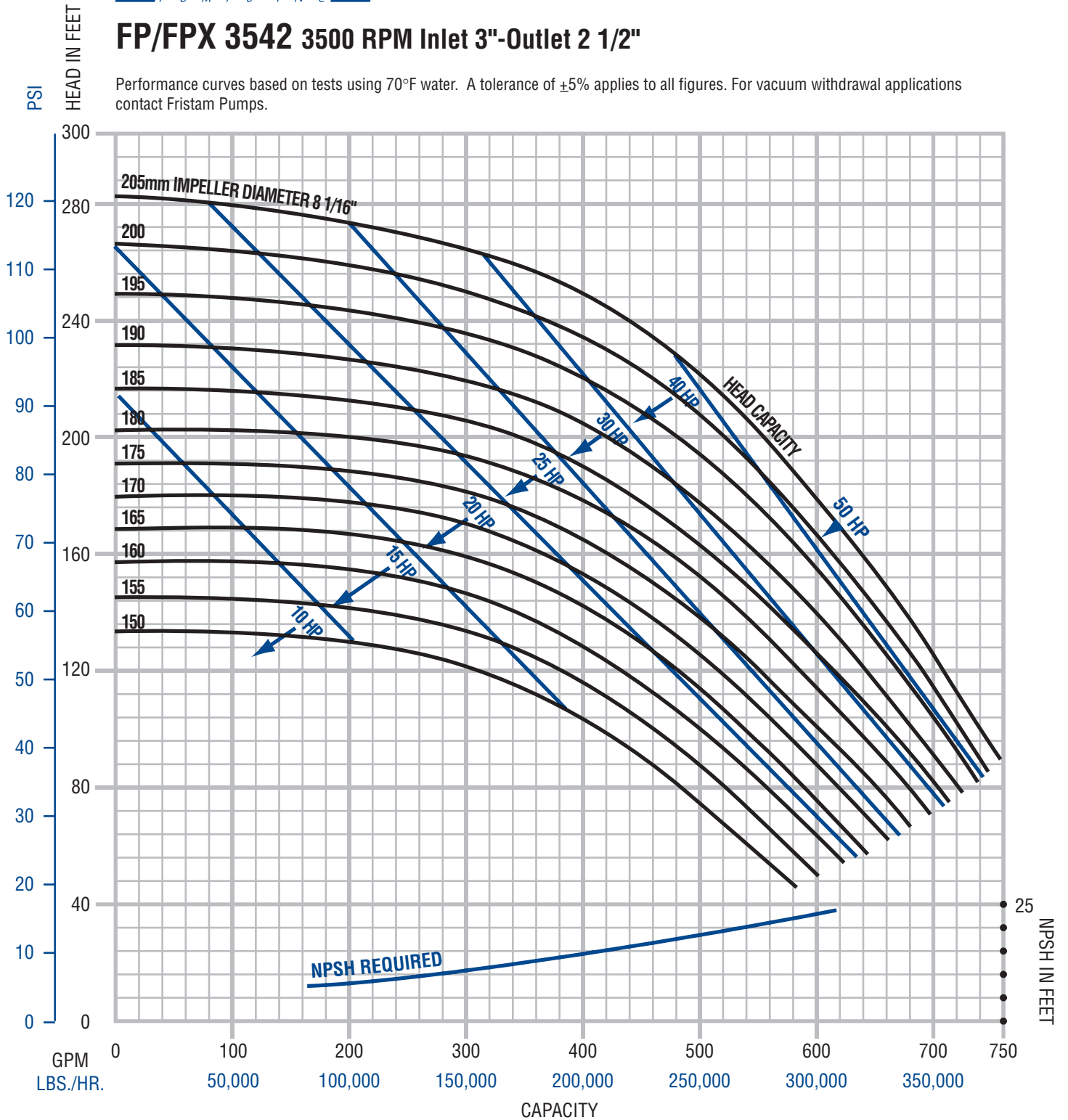
Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.





FP/FPX 3542 3500 RPM Inlet 3"-Outlet 2 1/2"

Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.

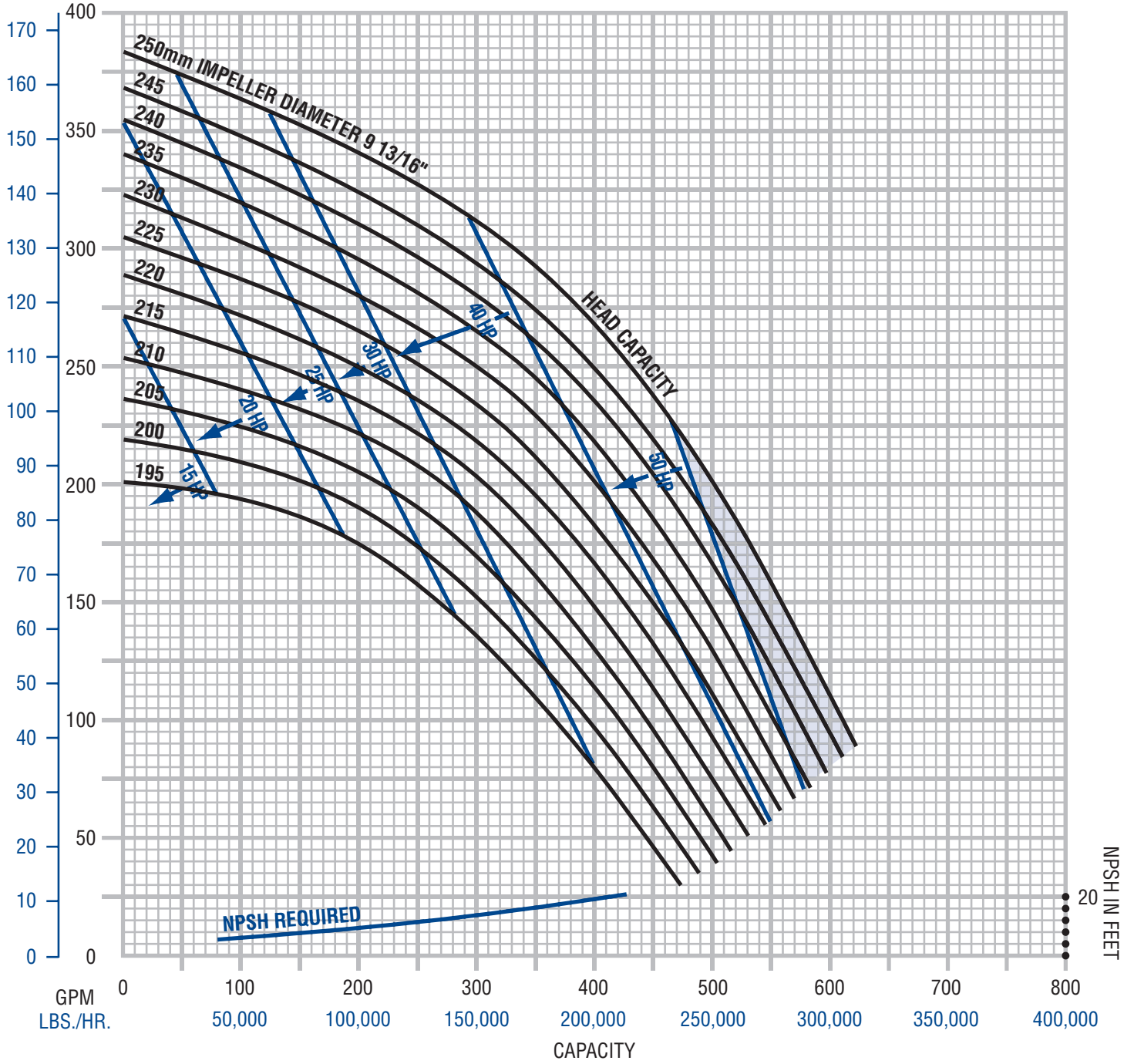




Tinted areas indicate FP Series only

FP/FPX 3452 3500 RPM Inlet 3"-Outlet 2"

Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.

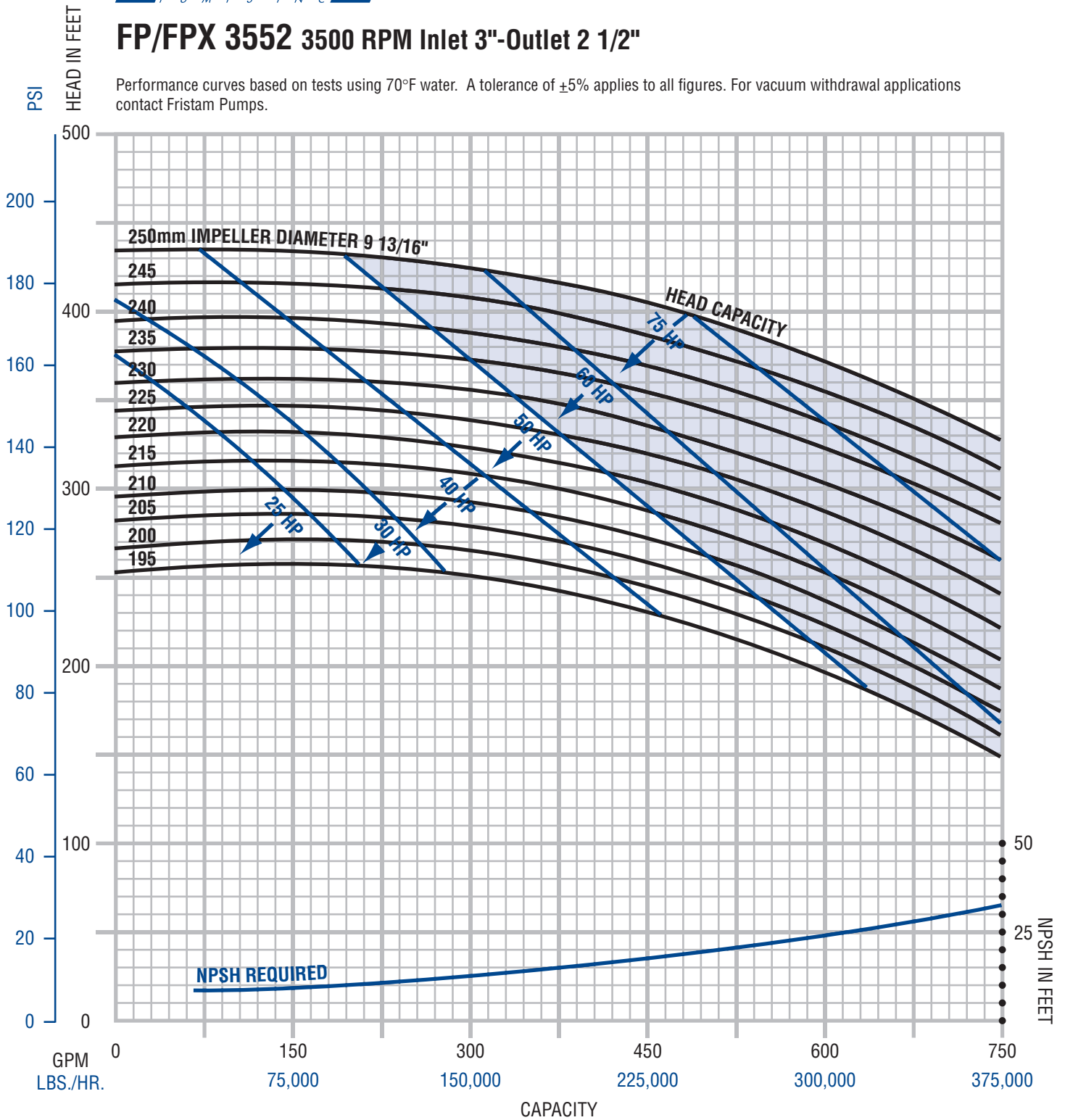




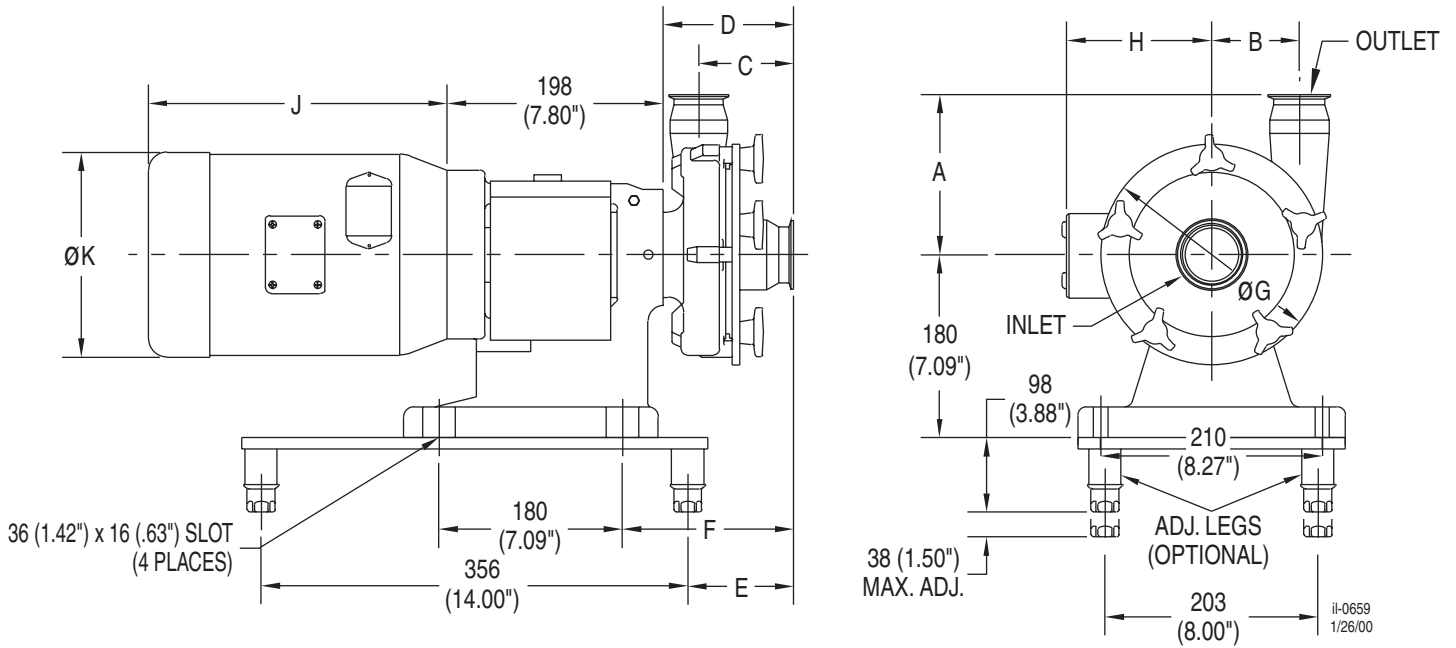
Tinted areas indicate FP Series only

FP/FPX 3552 3500 RPM Inlet 3"-Outlet 2 1/2"

Performance curves based on tests using 70°F water. A tolerance of $\pm 5\%$ applies to all figures. For vacuum withdrawal applications contact Fristam Pumps.



FP Single Flange Dimensions

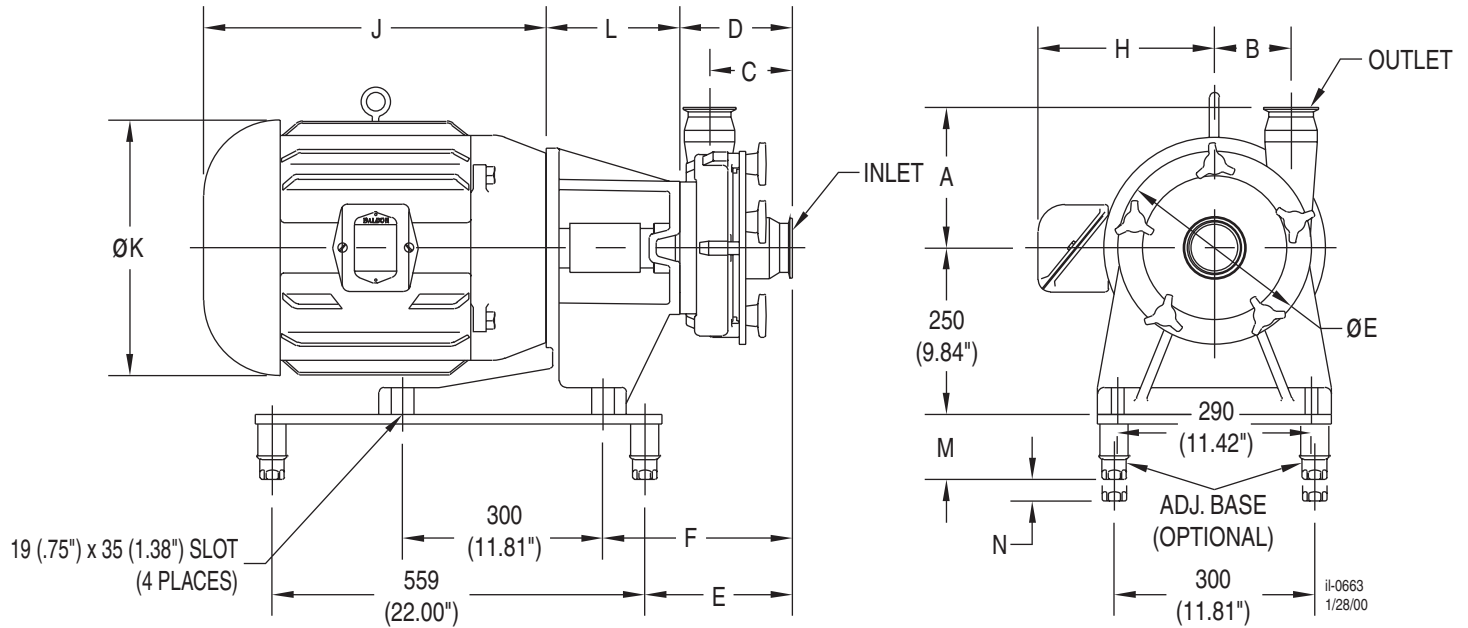


- NOTE:
- (1) Motor dimensions may vary depending on manufacturer requested.
 - (2) Pump dimensions are based on clamp fittings.
 - (3) All dimensions are in Millimeters (Inches).

PUMP MODEL	INLET	OUTLET	DIMENSIONS IN MILLIMETERS (INCHES)						ØG
			A	B	C	D	E	F	
FP 701/702	1.5"	1.5"	108 (4.25")	44.5 (1.75")	108.5 (4.27")	146.5 (5.77")	154.5 (6.08")	186.5 (7.34")	150 (5.90")
FP 711/712	2"	1.5"	144 (5.67")	58 (2.28")	113 (4.45")	150 (5.90")	158 (6.22")	190 (7.48")	185 (7.28")
FP 721/731/722	2"	1.5"	170 (6.69")	79 (3.11")	113 (4.45")	150 (5.90")	158 (6.22")	190 (7.48")	230 (9.06")
FP 741/732/742	2.5"	2"	195 (7.68")	96 (3.78")	101 (3.98")	141 (5.55")	149 (5.87")	181 (7.13")	270 (10.63")
FP 1741/1732/1742	2.5"	2"	200 (7.87")	91 (3.58")	104 (4.09")	150.5 (5.93")	158.5 (6.24")	190.5 (7.50")	270 (10.63")
FP 3521/3522	2.5"	2"	190 (7.48")	80 (3.15")	118 (4.64")	162 (6.38")	170 (6.69")	202 (7.95")	230 (9.06")
FP 3531/3532	2.5"	2"	191 (7.52")	95 (3.74")	115.5 (4.55")	162 (6.38")	170 (6.69")	202 (7.95")	260 (10.24")
FP 3541/3542	3"	2.5"	211 (8.31")	115 (4.53")	118 (4.64")	162 (6.38")	170 (6.69")	202 (7.95")	290 (11.42")
FP 3451/3452	3"	2"	211 (8.31")	140 (5.51")	114 (4.49")	158 (6.22")	166 (6.54")	198 (7.80")	350 (13.78")
FP 3551	3"	2.5"	231 (9.09")	140 (5.51")	119 (4.69")	168 (6.61")	176 (6.93")	208 (8.19")	350 (13.78")

MOTOR HP		MOTOR FRAME	DIMENSIONS IN MILLIMETERS (INCHES)		
1750 RPM	3500 RPM		H	J	ØK
	0.5 HP	56C	115 (4.53")	236 (9.29")	157 (6.19")
0.75 HP	0.75 HP	56C	115 (4.53")	236 (9.29")	157 (6.19")
	1 HP	56C	115 (4.53")	236 (9.29")	157 (6.19")
1 HP	1.5 HP	143TC	115 (4.53")	252 (9.94")	157 (6.19")
1.5 HP		145TC	133 (5.22")	259 (10.19")	183 (7.19")
2 HP	2 HP	145TC	133 (5.22")	284 (11.19")	183 (7.19")
	3 HP	145TC	133 (5.22")	284 (11.19")	183 (7.19")
3 HP		182TC	133 (5.23")	313 (12.31")	216 (8.50")
5 HP	5 HP	184TC	152 (6.00")	348 (13.68")	216 (8.50")
	7.5 HP	184TC	152 (6.00")	386 (15.18")	216 (8.50")
7.5 HP	7.5 HP	213TC	189 (7.46")	388 (15.27")	263 (10.34")
	10 HP	215TC	189 (7.46")	388 (15.27")	263 (10.34")
10 HP	15 HP	215TC	189 (7.46")	416 (16.40")	263 (10.34")

FP Double Flange Dimensions



NOTE:

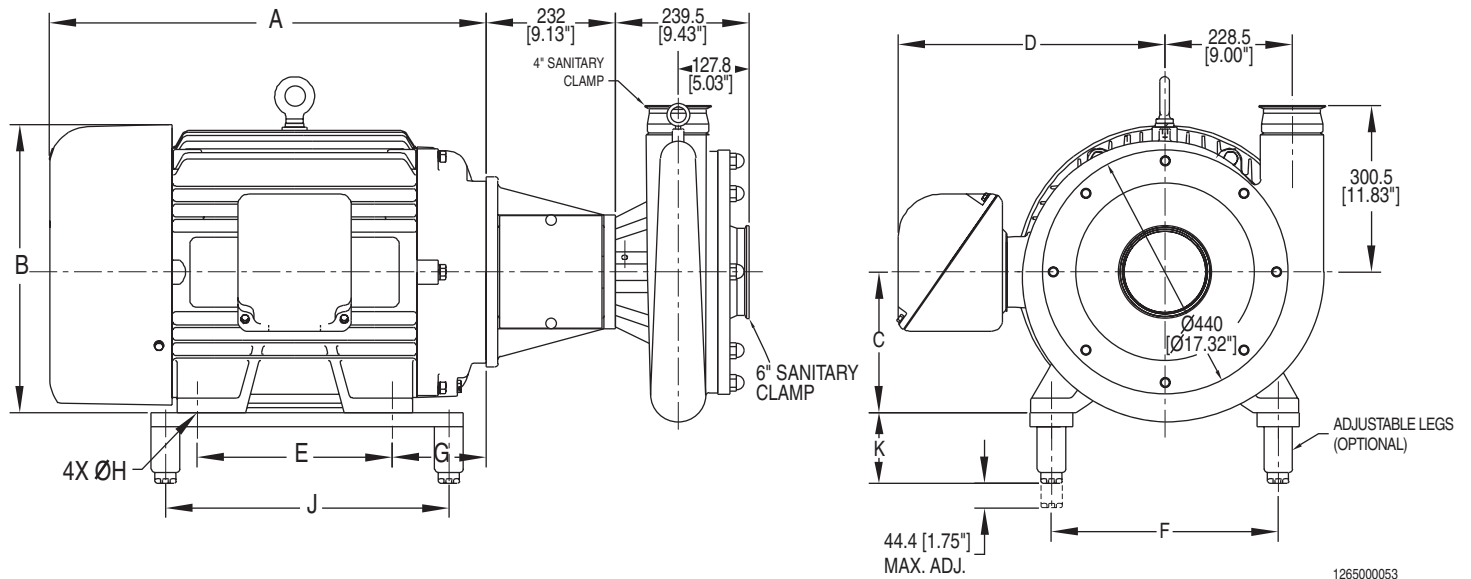
- (1) Motor dimensions may vary depending on manufacturer requested.
- (2) Pump dimensions are based on clamp fittings.
- (3) All dimensions are in Millimeters (Inches).

PUMP MODEL	INLET	OUTLET	DIMENSIONS IN MILLIMETERS (INCHES)						
			A	B	C	D	E	F	ØG
FP 1051	4"	4"	250 (9.84")	170 (6.69")	167 (6.57")	202.5 (7.97")	254 (10.00")	317.5 (12.50")	406 (15.98")
FP 1151	4"	4"	250 (9.84")	170 (6.69")	110.5 (4.35")	146 (5.75")	197.5 (7.78")	261 (10.28")	406 (15.98")
FP 1161	4"	4"	250 (9.84")	170 (6.69")	110.5 (4.35")	146 (5.75")	197.5 (7.78")	261 (10.28")	406 (15.98")
FP 1161	6"	4"	250 (9.84")	170 (6.69")	111 (4.37")	146 (5.75")	197.5 (7.78")	261 (10.28")	406 (15.98")
FP 742	2.5"	2"	195 (7.68")	96 (3.78")	101 (3.98")	143.5 (5.65")	195 (7.68")	258.5 (10.18")	270 (10.63")
FP 1732/1742	2.5"	2"	200 (7.87")	91 (3.58")	104 (4.09")	153 (6.02")	204.5 (8.05")	268 (10.55")	270 (10.63")
FP 3532	2.5"	2"	191 (7.52")	95 (3.74")	115.5 (4.55")	164.5 (6.48")	216 (8.50")	279.5 (11.00")	260 (10.24")
FP 3542	3"	2.5"	211 (8.31")	115 (4.53")	118 (4.64")	164.5 (6.48")	216 (8.50")	279.5 (11.00")	290 (11.42")
FP 3452	3"	2"	211 (8.31")	140 (5.51")	114 (4.49")	160.5 (6.32")	212 (8.35")	275.5 (10.85")	350 (13.78")
FP 3551/3552	3"	2.5"	231 (9.09")	140 (5.51")	119 (4.68")	170.5 (6.71")	222 (8.74")	285.5 (11.24")	350 (13.78")

MOTOR HP	MOTOR FRAME	DIMENSIONS IN MILLIMETERS (INCHES)						
		H	J	ØK	L	M	N	
*7.5 HP	213TC	189 (7.46")	388 (15.27")	263 (10.34")	200 (7.87")	117 (4.62")	44.5 (1.75")	
*10 HP	215TC	189 (7.46")	416 (16.40")	263 (10.34")	200 (7.87")	117 (4.62")	44.5 (1.75")	
15 HP	254TC	220 (8.67")	415 (16.33")	263 (10.34")	200 (7.87")	98** (3.88")	38*** (1.50")	
20 HP	256TC	239 (9.42")	499 (19.66")	326 (13.25")	200 (7.87")	98** (3.88")	38*** (1.50")	
20 HP	256TC	225 (8.88")	491 (19.34")	263 (10.34")	200 (7.87")	98 (3.88")	38 (1.50")	
25 HP	284TC	333 (13.12")	588 (23.13")	395 (15.56")	200 (7.87")	117 (4.62")	44.5 (1.75")	
25 HP	284TSC	333 (13.12")	588 (23.13")	395 (15.56")	200 (7.87")	98 (3.88")	38 (1.50")	
30 HP	286TC	333 (13.12")	588 (23.13")	395 (15.56")	200 (7.87")	117 (4.62")	44.5 (1.75")	
30 HP	286TSC	333 (13.12")	588 (23.13")	395 (15.56")	200 (7.87")	98 (3.88")	38 (1.50")	
40 HP	324TSD	333 (13.12")	588 (23.13")	395 (15.56")	220 (8.66")	117 (4.62")	44.5 (1.75")	
40 HP	324TSD	333 (13.12")	588 (23.13")	395 (15.56")	220 (8.66")	117 (4.62")	44.5 (1.75")	
50 HP	326TSD	333 (13.12")	588 (23.13")	395 (15.56")	220 (8.66")	117 (4.62")	44.5 (1.75")	
50 HP	326TSD	333 (13.12")	588 (23.13")	395 (15.56")	220 (8.66")	117 (4.62")	44.5 (1.75")	

* 1051 AND 1151 ONLY
 ** 117 (4.62") FOR 1051, 1151, AND 1161
 *** 44.5 (1.75") FOR 1051, 1151, AND 1161

FP 4000 Double Flange Dimensions

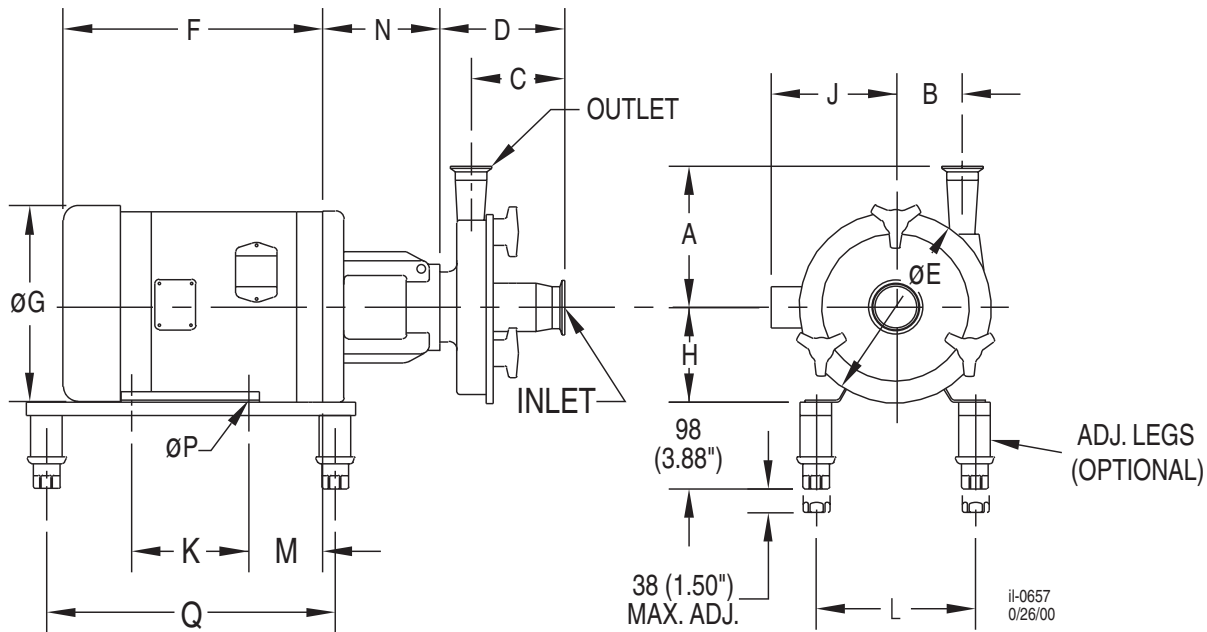


- NOTE:
- (1) Motor dimensions may vary depending on manufacturer requested.
 - (2) Pump dimensions are based on clamp fittings.
 - (3) All dimensions are in Millimeters (Inches).

MOTOR HP	MOTOR FRAME	DIMENSIONS IN MILLIMETERS (INCHES)									
		A	B	C	D	E	F	G	ØH	J	K
40 HP	324TC	636 (25.05")	418 (16.44")	203 (8.00")	371 (14.62")	267 (10.50")	317 (12.50")	133 (5.25")	16.7 (21/23")	470 (18.50")	117 (4.63")
50 HP	326TC	636 (25.05")	418 (16.44")	203 (8.00")	371 (14.62")	305 (12.00")	317 (12.50")	133 (5.25")	16.7 (21/32")	470 (18.50")	117 (4.63")
60 HP	364TC	684 (26.94")	470 (18.50")	229 (9.00")	380 (14.95")	286 (11.25")	355 (14.00")	149 (5.88")	16.7 (21/23")	508 (20.00")	127 (5.00")
75 HP	365TC	684 (26.94")	470 (18.50")	229 (9.00")	380 (14.95")	311 (12.25")	355 (14.00")	149 (5.88")	16.7 (21/32")	508 (20.00")	127 (5.00")
100 HP	405TC	782 (30.80")	520 (20.48")	254 (10.00")	477 (18.78")	349 (13.75")	406 (16.00")	168 (6.62")	20.6 (13/16")	508 (20.00")	127 (5.00")

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FPX Single Flange Dimensions

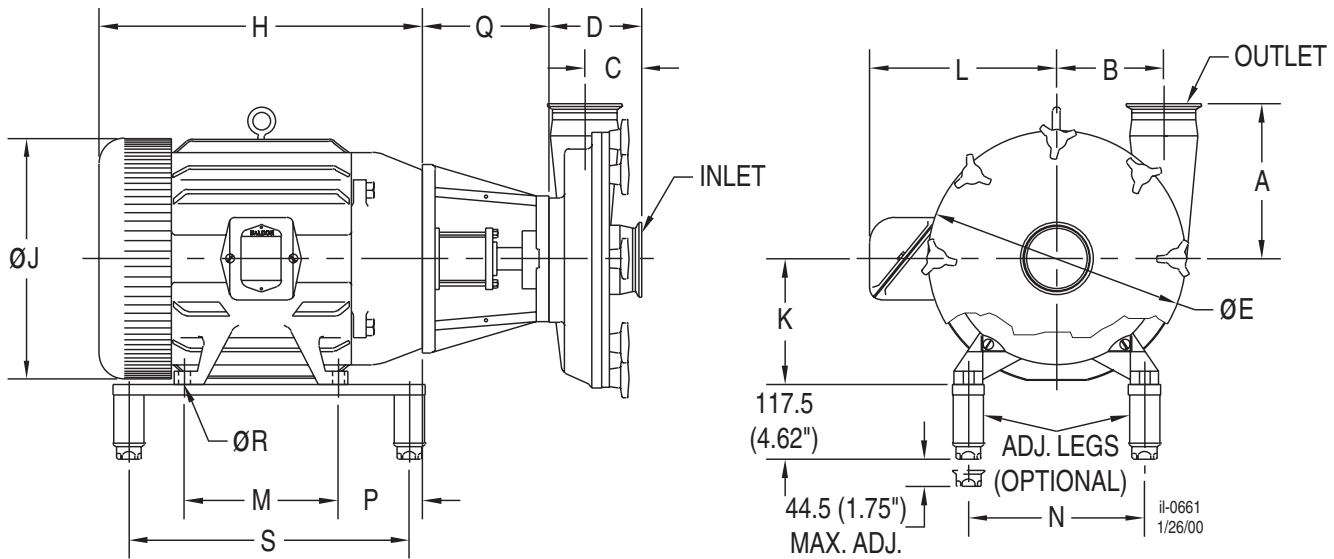


NOTE:

- (1) Motor dimensions may vary depending on manufacturer requested.
- (2) Pump dimensions are based on clamp fittings.
- (3) All dimensions are in Millimeters (Inches).

PUMP MODEL	INLET	OUTLET	DIMENSIONS IN MILLIMETERS (INCHES)					MOTOR HP		MOTOR FRAME	DIMENSIONS IN MILLIMETERS (INCHES)									
			A	B	C	D	ØE	1750 RPM	3500 RPM		F	ØG	H	J	K	L	M	N	ØP	Q
FPX 701/702	1.5"	1.5"	108 (4.25")	44.5 (1.75")	108.5 (4.27")	146.5 (5.77")	150 (5.90")	1 HP	1.5 HP	143TC	281 (11.06")	183 (7.19")	89 (3.50")	133 (5.22")	102 (4.00")	140 (5.50")	70 (2.75")	120 (4.72")	8.7 (11/32")	343 (13.50")
FPX 711/712	2"	1.5"	144 (5.67")	58 (2.28")	113 (4.45")	150 (5.90")	185 (7.28")	1.5 HP		145TC	281 (11.06")	183 (7.19")	89 (3.50")	133 (5.22")	102 (4.00")	140 (5.50")	70 (2.75")	120 (4.72")	8.7 (11/32")	343 (13.50")
FPX 721/731/722	2"	1.5"	170 (6.69")	79 (3.11")	113 (4.45")	150 (5.90")	230 (9.06")	2 HP	2 HP	145TC	281 (11.06")	183 (7.19")	89 (3.50")	133 (5.22")	102 (4.00")	140 (5.50")	70 (2.75")	120 (4.72")	8.7 (11/32")	343 (13.50")
FPX 741/732/742	2.5"	2"	195 (7.68")	96 (3.78")	101 (3.98")	141 (5.55")	270 (10.63")	3 HP		182TC	313 (12.31")	183 (7.19")	114 (4.50")	132 (5.21")	140 (5.50")	191 (7.50")	89 (3.50")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 1741/1732/1742	2.5"	2"	200 (7.87")	91 (3.58")	104 (4.09")	150.5 (5.93")	270 (10.63")	3 HP		182TC	348 (13.69")	183 (7.19")	114 (4.50")	132 (5.21")	140 (5.50")	191 (7.50")	89 (3.50")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 3521/3522	2.5"	2"	190 (7.48")	80 (3.15")	118 (4.64")	162 (6.38")	230 (9.06")	5 HP		184TC	347 (13.68")	216 (8.50")	114 (4.50")	152 (5.97")	140 (5.50")	191 (7.50")	89 (3.50")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 3531/3532	2.5"	2"	191 (7.52")	95 (3.74")	115.5 (4.55")	162 (6.38")	260 (10.24")	5 HP		184TC	386 (15.18")	216 (8.50")	114 (4.50")	152 (5.97")	140 (5.50")	191 (7.50")	89 (3.50")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 3541/3542	3"	2.5"	211 (8.31")	115 (4.53")	118 (4.64")	162 (6.38")	290 (11.42")	7.5 HP		184TC	386 (15.18")	216 (8.50")	114 (4.50")	152 (5.97")	140 (5.50")	191 (7.50")	89 (3.50")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 3451/3452	3"	2"	211 (8.31")	140 (5.51")	114 (4.49")	158 (6.22")	350 (13.78")	7.5 HP		213TC	388 (15.27")	263 (10.34")	133 (5.25")	1.89 (7.46")	140 (5.50")	216 (8.50")	108 (4.25")	140 (5.53")	10.3 (13/32")	343 (13.50")
FPX 3551	3"	2.5"	231 (9.09")	140 (5.51")	119 (4.68")	168 (6.61")	350 (13.78")	10 HP		215TC	388 (15.27")	263 (10.34")	133 (5.25")	1.89 (7.46")	140 (5.50")	216 (8.50")	108 (4.25")	140 (5.53")	10.3 (13/32")	343 (13.50")
								10 HP		215TC	416 (16.49")	263 (10.34")	154 (6.08")	1.89 (7.46")	140 (5.50")	216 (8.50")	108 (4.25")	140 (5.53")	10.3 (13/32")	343 (13.50")
								15 HP		215TC	436 (17.15")	263 (10.34")	133 (5.25")	1.89 (7.46")	140 (5.50")	216 (8.50")	108 (4.25")	140 (5.53")	10.3 (13/32")	343 (13.50")
								15 HP		254TC	447 (17.59")	263 (10.34")	159 (6.25")	225 (8.88")	210 (8.25")	254 (10.00")	121 (4.75")	169 (6.65")	13.5 (17/32")	343 (13.50")
20 HP		256TC	491 (19.34")	263 (10.34")	159 (6.25")	225 (8.88")	254 (10.00")	121 (4.75")	169 (6.65")	13.5 (17/32")	394 (15.50")									
	20 HP		256TC	499 (19.66")	336 (13.25")	159 (6.25")	239 (9.42")	254 (10.00")	254 (10.00")	121 (4.75")	169 (6.65")	13.5 (17/32")	394 (15.50")							

FPX Double Flange Dimensions



- NOTE:
- (1) Motor dimensions may vary depending on manufacturer requested.
 - (2) Pump dimensions are based on clamp fittings.
 - (3) All dimensions are in Millimeters (Inches).

PUMP MODEL	INLET	OUTLET	DIMENSIONS IN MILLIMETERS (INCHES)					MOTOR HP		MOTOR FRAME	DIMENSIONS IN MILLIMETERS (INCHES)									
			A	B	C	D	ØE	1750 RPM	3500 RPM		H	ØJ	K	L	M	N	P	Q	ØR	S
FPX 1051	4"	4"	250 (9.84")	170 (6.69")	167 (6.57")	202.5 (7.97")	406 (15.98")	7.5 HP		213TC	388 (15.27")	263 (10.34")	133 (5.25")	189 (7.46")	140 (5.50")	216 (8.50")	108 (4.25")	200 (7.87")	10.3 (13/32")	470 (18.50")
FPX 1151	4"	4"	250 (9.84")	170 (6.69")	110.5 (4.35")	146 (5.75")	406 (15.98")	10 HP		215TC	416 (16.40")	263 (10.34")	133 (5.25")	189 (7.46")	178 (7.00")	216 (8.50")	108 (4.25")	200 (7.87")	10.3 (13/32")	470 (18.50")
FPX 1161	4"	4"	250 (9.84")	170 (6.69")	110.5 (4.35")	146 (5.75")	406 (15.98")	15 HP		254TC	447 (17.59")	270 (10.62")	159 (6.25")	226 (8.88")	210 (8.25")	254 (10.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	444 (17.50")
FPX 1161	6"	4"	250 (9.84")	170 (6.69")	111 (4.37")	146 (5.75")	406 (15.98")	20 HP		256TC	499 (19.66")	320 (12.60")	159 (6.25")	239 (9.42")	254 (10.00")	254 (10.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	470 (18.50")
FPX 1742	2.5"	2"	200 (7.87")	91 (3.58")	104 (4.09")	153 (6.02")	270 (10.63")	25 HP		284TC	588 (23.13")	367 (14.44")	178 (7.00")	333 (13.11")	241 (9.50")	279 (11.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	444 (17.50")
FPX 3532	2.5"	2"	191 (7.52")	95 (3.74")	115.5 (4.55")	164.5 (6.48")	260 (10.24")	25 HP		284TSC	588 (23.13")	367 (14.44")	178 (7.00")	333 (13.11")	241 (9.50")	279 (11.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	444 (17.50")
FPX 3542	3"	2.5"	211 (8.31")	115 (4.53")	118 (4.64")	164.5 (6.48")	290 (11.42")	30 HP		286TC	588 (23.13")	367 (14.44")	178 (7.00")	333 (13.11")	279 (11.00")	279 (11.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	444 (17.50")
FPX 3452	3"	2"	211 (8.31")	140 (5.51")	114 (4.49")	160.5 (6.32")	350 (13.78")	30 HP		286TSC	588 (23.13")	367 (14.44")	178 (7.00")	333 (13.11")	279 (11.00")	279 (11.00")	121 (4.75")	200 (7.87")	13.5 (17/32")	444 (17.50")
FPX 3552	3"	2.5"	231 (9.09")	140 (5.51")	119 (4.68")	170.5 (6.71")	350 (13.78")	40 HP		324TC	636 (25.00")	413 (16.25")	203 (8.00")	371 (14.62")	267 (10.50")	318 (12.50")	133 (5.25")	216 (8.50")	16.7 (21/32")	470 (18.50")
								40 HP		324TSC	636 (25.00")	413 (16.25")	203 (8.00")	371 (14.62")	267 (10.50")	318 (12.50")	133 (5.25")	216 (8.50")	16.7 (21/32")	470 (18.50")
								50 HP		326TC	636 (25.00")	413 (16.25")	203 (8.00")	371 (14.62")	305 (12.00")	318 (12.50")	133 (5.25")	216 (8.50")	16.7 (21/32")	470 (18.50")
								50 HP		326TSC	636 (25.00")	413 (16.25")	203 (8.00")	371 (14.62")	305 (12.00")	318 (12.50")	133 (5.25")	216 (8.50")	16.7 (21/32")	470 (18.50")

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FP & FPX Pump Seals

Fristam pump seals are one of the pumps' most outstanding features. Long life and the ability to prevent air from entering the product are two of the greatest benefits of the seal.

Fristam pump seals last far longer than competitive pump seals even under extreme duties. For instance, it is common in product withdrawal from evaporators, which run 24 hours per day, for the seal life to be measured in years, not weeks.

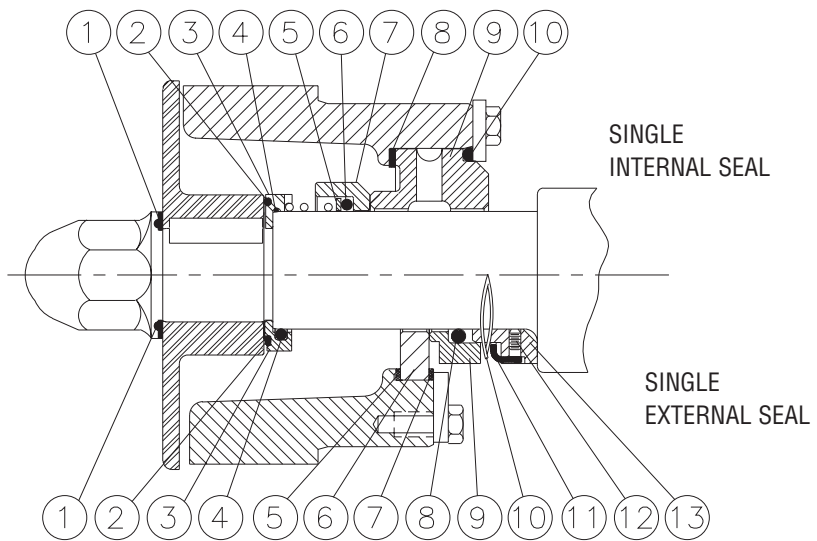
The special internal seal design will absorb pressure surges without releasing product out of the pump.

The inboard design of the seal enables the product or cleaning solution to clean, cool and lubricate the front seal area. Because of this construction, there is no contact between seal wear surfaces and any pump component such as a back plate or wear plate. There is never a need to replace pump components because of wear where they interface with the seal.

The illustration shown at right represents the single internal seal components and single external seal components. The external seal was developed as an option for applications where the customer prefers an external seal design.

ITEM	QUANTITY	DESCRIPTION	MATERIAL*
1	1	Impeller nut gasket	Viton
2	1	Outside O-ring front spring disc	Viton
3	1	Front spring disc driver	Stainless steel
4	1	Inside O-ring front spring disc (factory installed)	Viton
5	1	Front rotating seal washer	Stainless steel
6	1	Front rotating seal O-ring	Viton
7	1	Front seal ring	Chrome oxide coated stainless steel
8	1	Center stationary seal flat gasket	Viton
9	1	Center stationary seal	Carbon
10	1	Center stationary seal O-ring	Viton

*Standard materials shown. Other materials available.



ITEM	QUANTITY	DESCRIPTION	MATERIAL*
1	1	Impeller nut gasket	Viton
2	1	Outside O-ring front spring disc	Viton
3	1	Seal driver spacer	Stainless steel
4	1	Inside O-ring seal drive spacer (factory installed)	Viton
5	1	Flat gasket	Viton
6	1	Stationary center seal	Silicon carbide
7	1	Flat gasket	Teflon
8	1	Inside O-ring front seal ring	Viton
9	1	Rotating seal ring	Carbon
10	1	Spring	Stainless steel
11	1	Seal drive ring	Stainless steel
12	2	10-32 set screw	Stainless steel
13	1	Driver	Stainless steel

*Standard materials shown. Other materials available.

The wear components of the standard double seal consist of a chrome oxide-coated stainless steel front seal face, carbon center seal and ceramic rear seal. The chrome oxide against carbon front wear face combination is particularly good for reducing the friction and heat that cause wear.

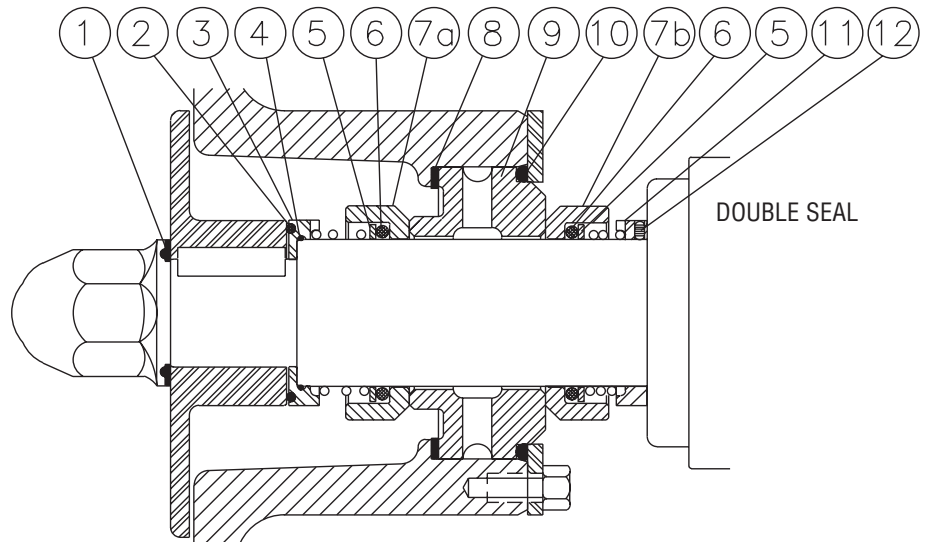
The standard double seal, available on the FP series only, includes piping for a water flush. The water not only cools and lubricates the contact surfaces, but also helps to provide a barrier against air.

Properly installed, the double seal and water flush prevent air being drawn into the product area through the seal. If the seal should wear to the point that it leaks, then either the seal water will become discolored with product or the flow from the discharge will be interrupted. This is an obvious indication of the necessity to replace the seal.

There are only 4 sizes for the American manufactured Fristam FP and FPX centrifugal pumps. This eliminates the need to stock a large number of seals. The chart below indicates the corresponding seal size and motor size.

FP and FPX Seal Size and Motor Frame size

Seal Size	FP	FPX
633	up to 215 TC	up to 215 TC
735	254-286 TC	254-286 TC
736	324-365 TC	324-365 TC
102	324-405 TC	N/A

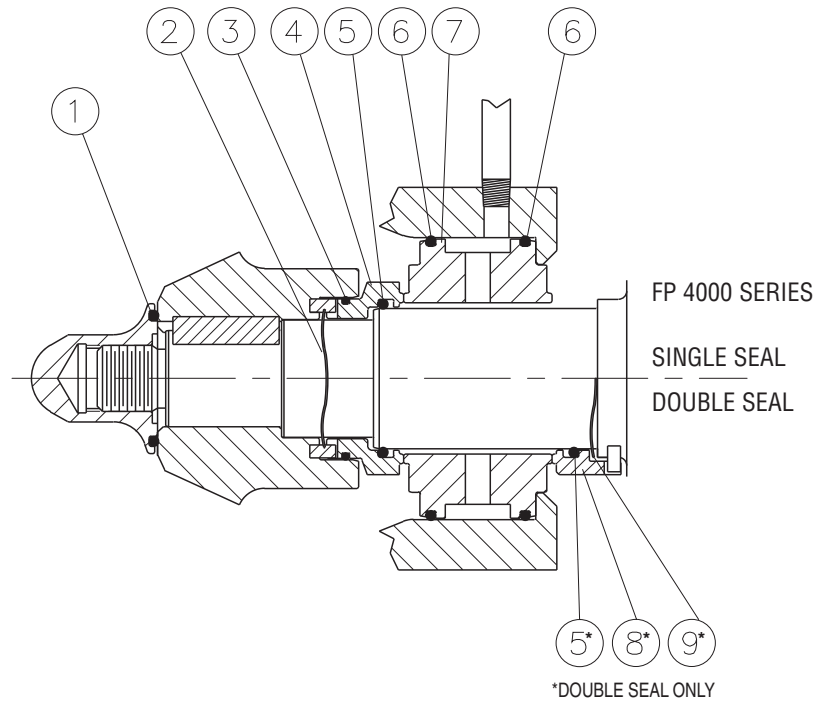


ITEM	QUANTITY	DESCRIPTION	MATERIAL*
1	1	Impeller nut gasket	Viton
2	1	Outside O-ring front spring disc	Viton
3	1	Front spring disc driver	Stainless steel
4	1	Inside O-ring front spring disc (factory installed)	Viton
5	1	Front/rear seal washer	Stainless steel
6	1	Front/rear seal O-ring	Viton
7A	1	Front rotating seal ring	Chrome oxide coated stainless steel
7B	1	Rear rotating seal ring	Ceramic
8	1	Stationary seal flat gasket	Viton
9	1	Stationary seal	Carbon
10	1	Stationary seal O-ring	Viton
11	1	Rear spring disc (driver)	Stainless steel
12	2	10-32 set screw	Stainless steel

*Standard materials shown. Other materials available.

The illustration shown below represents the new 102 single and double internal front pull-out seal. This redesigned seal is currently only available in the FP 4000 model. The pull-out design eliminates the need to remove the pump housing during seal replacement.

ITEM	QUANTITY	DESCRIPTION	MATERIAL *
1	1	Impeller nut O-ring	Viton
2	1	Single seal spring	Stainless steel
3	1	Outer rotating seal O-ring	Viton
4	1	Rotating seal	Chrome oxide coated stainless steel
5	1	Inner rotating seal O-ring	Viton
6	2	Stationary seal O-ring	Viton
7	1	Stationary seal	Carbon



ITEM	QUANTITY	DESCRIPTION	MATERIAL *
1	1	Impeller nut O-ring	Viton
2	1	Single seal spring	Stainless steel
3	1	Outer rotating seal O-ring	Viton
4	1	Front rotating seal	Chrome oxide coated stainless steel
5	2	Inner rotating seal O-ring	Viton
6	2	Stationary seal O-ring	Viton
7	1	Stationary seal	Carbon
8	1	Rear rotating seal	Ceramic
9	1	Double seal spring	Stainless steel

*Standard materials shown. Other materials available.

Options



Fittings

Fristam pumps can be supplied with most types of sanitary or industrial fittings. Some alternate inlet sizes are also available. Non-sanitary fittings cannot be used on pumps that are required to meet 3-A standards.

Motor Options

Standard motors provided are “Inverter Ready”, TEFC with a locked front bearing. The following options are available:

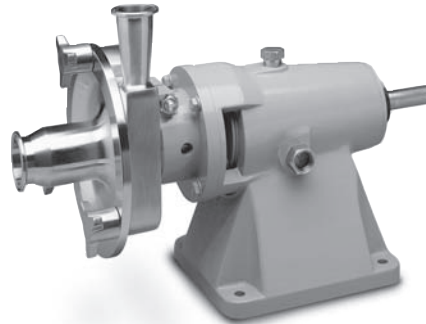
- Washdown
- Premium Efficiency
- Explosion-Proof
- IEC
- Chemical Duty

Surface Finish

Standard surface finish is 32 Ra. Finer finishes up to 15 Ra and electropolished are available.

Tungsten Carbide Coatings

For extremely abrasive products, internal components can be coated with tungsten carbide to prevent erosion.



Bearing Blocks

Fristam pumps are available with a bearing block style mounting which can accommodate motors up to 100 HP. The base plate is stainless steel.



Adjustable Base

Fristam pumps' adjustable bases use solid stainless steel components with adjustable legs.

Stainless Steel Motors/Adapters

Pumps can be provided with S.S. motors and adapters for protection against corrosive environments and a clean appearance.

Portable Cart

Most Fristam pumps can be mounted on a stainless steel cart, depending on motor size.

Pump Inquiries

To properly process an inquiry we need the following information:

Requested by _____ Date _____

Customer _____

Address _____

Telephone _____ Fax _____

Description of product to be pumped _____

Temperature _____ Specific Gravity _____ or Density _____ lb./gal.

Viscosity _____ Centipoise (CPS) or other

Desired Flow Rate _____ GPM or lb./hr.

*Discharge Head _____ Ft. or PSI

Suction Conditions

Is the pump withdrawing from a vacuum? _____ Yes _____ No

If so, how much? _____ in. Hg.

Is the product level on the inlet side of the pump above or below the center line of the pump inlet?

_____ Above _____ Below _____ By how much? _____ in. or ft.

Tubing _____ in. Diameter _____ Length _____ No. of elbows _____ No. of tees

Tubing _____ in. Diameter _____ Length _____ No. of elbows _____ No. of tees

No. of size of valves in suction piping:

_____ no. _____ size (in.)

_____ no. _____ size (in.)

Other equipment in the suction piping _____

*If you do not know the desired discharge head, please provide the following:

Discharge Conditions

Is the final destination of the pump above or below the center line of the pump inlet?

_____ Above _____ Below _____ By how much? _____ in. or ft.

Tubing _____ in. Diameter _____ Length _____ No. of elbows _____ No. of tees

Tubing _____ in. Diameter _____ Length _____ No. of elbows _____ No. of tees

Tubing _____ in. Diameter _____ Length _____ No. of elbows _____ No. of tees

No. and size of valves in suction piping:

_____ no. _____ size (in.)

_____ no. _____ size (in.)

_____ no. _____ size (in.)

Other equipment and the drop or pressure requirement (PSI) in the discharge piping _____

Ordering Matrix

Elastomers

1st - seal
2nd - cover gasket

*B - BUNA (cover gasket)
E - EPDM
K - Kalrez
R - Chemraz
S - Silicone
W - White Viton
*V - Viton (seal)
O - Other, please specify

Fitting Types

B - Bevel Seat #15
*C - Clamp
D - DIN Threaded #11851
F - 150# Flange
I - "I" Line Female
J - No-bac, Female
M - NPT, Female (standard) N-NPT, Male
O - Other, please specify

Impeller Diameters

Standard sizes listed
on curves in millimeters

Series

FP - FP Model
FPX - FPX Model

RPM

1 - Low Speed
2 - High Speed

FP 3541 / 205 - 3x2.5 C - 3 FR/N/K - VB - xxx

Housing Size

Standard sizes on curves

Inlet and Outlet Sizes

Standard sizes on curves

Seal Types

1 - Single Internal (FP or FPX)
2 - Single Internal w/water cascade (FP or FPX)
3 - Double Internal (FP only)
4 - Single External (FPX only) C/N, Standard
5 - John Crane Type 8 Single
6 - John Crane Type 8 Double
7 - Other

Seal Materials

1st - Internal Rotating
2nd - Center Stationary
3rd - External Rotating

● FR - Chrome Oxide
○ N - Carbon
■ K - Ceramic
□ C - Silicon Carbide
◆ CN - Silicon Carbide/Carbon split
TC - Tungsten Carbide
O - Other, please specify

Options

A - Aseptic
B - Bearing Block Mounting
D - Discharge Orientation if other than vertical
E - Enlarged Inlet
F - Front Seal Flush
I - I.E.C. Motor Adapter
J - Jacketed Rear Housing
L - Adjustable Base with Legs
S - Stainless Steel Flange Support/ Pedestal
T - Tungsten Carbide Coating (specify)
W - WFI Modifications (specify)

Legend

* Standard
● Standard Internal Rotating
○ Standard Center Stationary
■ Standard External Rotating
□ Internal or External Rotating only
◆ Center Stationary only

Additional Items

Motors: motors must be specified in addition to the above matrix.
Standard motors are C-faced TEFC, others must be specified.

Horsepower Range:

FP Series: 0.25HP - 100HP

FPX Series: 1.0HP - 50HP

How To Calculate Required Pressure

Example:

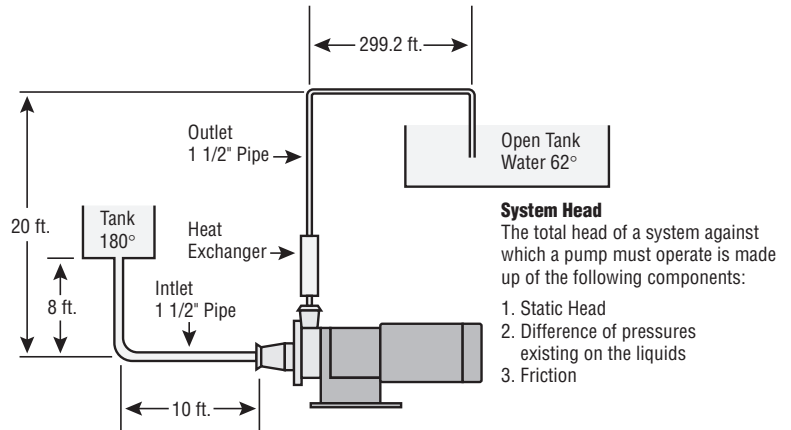
Find the head under these conditions: Pump is drawing from an open tank to discharge through a heat exchanger into an open tank that is 20 ft. above the pump. The supply is 8 ft. above the pump. 50 GPM flow is required.

Solution:

1. Height to be pumped is 20 ft. minus 8 ft. = 12.0 ft.
2. Friction loss from pipe is
(8 ft. + 10 ft. + 20 ft. + 299.2 ft. = 337.2 ft.)
 $337.2 \times .25 \text{ ft./ft.} = 84.3 \text{ ft.}$
3. Friction loss from 3 elbows is = .6 ft. = 0.6 ft.
4. *Heat Exchanger loss 2.31 times 16.5 PSI = 38.1 ft.

The Total Head Loss is 135.0 ft.

*Heat Exchanger information supplied by manufacturer.



Determining Net Positive Suction Head (NPSH)

Fristam pumps are well known for requiring less net positive suction head available than other sanitary centrifugal pumps. However, due to the hydraulic principles involved, some level of NPSH is still required in order for the pump to run efficiently and without cavitating.

The NPSH required for each Fristam pump model has been determined by careful testing. The results of these tests are illustrated by the NPSH curve under the performance curves for each pump model.

To determine the NPSH available, first add the physical height of the liquid above the centerline of the pump inlet to the pressure above the liquid (in an open tank this is atmospheric pressure). From this total, subtract the friction losses of the line and fittings on the suction side and the vapor pressure of the liquid at the operating temperature. The remainder is the NPSH available. This number must meet or exceed the NPSH required in order for the pump to function properly. As an example, figure the NPSH available and required to pump 50 GPM and generate 135 feet water column of pressure.

The pump required is an FP/FPX 722/145 (see Selecting A Fristam Pump, pages 2 and 3). From the actual pump curve on page 24 or from the example in Selecting A Fristam Pump, we see that the NPSH required is 3 feet.

Assuming 10 feet of 1 1/2 inch line and one elbow in the suction line, 8 feet of height of liquid above the pump center line and pumping 180°F water from an open tank, we can compute the NPSH available.

NPSH available = Physical height of liquid + atmospheric pressure - friction losses - vapor pressure (see page 47).

$$\text{NPSH available} = 8 \text{ ft.} + 33.9 \text{ ft.} - 4.7 \text{ ft.} - 17.3 \text{ ft.} = 19.9 \text{ ft.}$$

Since the NPSH available of 19.9 feet is greater than the NPSH required 3 feet, the pump has sufficient NPSH available to run properly.

Specific Gravity and Viscosity For Various Liquids

Product	SP. Gr.	Visc. (cps)	Temp °F	Condition
Acetone	0.80	1	70	
Acid:				
Acetic	1.01	1	100	5%
Citric	1.02	1	140	10%
Lactic	1.10	1	140	
Nitric	1.02	18	70	
Alcohol:				
Ethyl	0.82	1.4	70	
Methyl	0.79	0.6	70	
Alum	1.33	80	40	50% Conc.
Barbecue Sauce	1.10	150	70	33° Brix
Beer	1.02	1	40	
Beverage Concentrate	1.26	80	80	
Blood	1.00	5	20	
Brine	1.10 to 1.20	1	40	Sodium Chloride 1.20
Butter—melted	0.95	90	90	
Buttermilk	1.04	20	40	
Carbon Tetrachloride	1.59	1	70	
Catsup	1.15	100	60	
Chocolate Bar Coating	1.08	65	120	
Cream	0.99	20	40	40% Fat
Dye, Water Base	1.10	10	70	
Egg—Whole	1.04	68	40	
Egg Yolk	1.12	400	68	
		200	86	
Ethylene Glycol	1.10	18	70	
Fat—Animal Melted	0.90	43	110	
Glaze—Donut	1.22	55	120	
Honey	1.30	230	100	81.2° Brix
		1500	70	
Ice Cream Mix	1.15	300	40	Varies
Ink, Printer's	1.20	520	130	
Juice—Single Strength:				
Apple, Clear	1.05	20	140	
Cranberry	1.03	10	140	
Grape	1.05	25	140	
Orange	1.05	20	140	
Tomato	1.03	180	140	
Juice—Concentrate:				
Apple	1.36	600	50	Thixotropic
Cranberry	1.03	250	100	Thixotropic
Grapefruit		1000	38	Thixotropic
Orange	1.32	5000	38	Thixotropic
Liqueurs	1.15	10	70	
Margarine	0.93	50	120	
Milk—Whole	1.03	1	40	
Milk—Concentrated	1.10	1000	50	40% TS
	1.30	100	131	75% TS
Milk—Concentrated	1.20	20	110	45% TS
Skim	1.10	95	70	30% TS
Milk—Evaporated	1.17	60	70	48% TS
Milk—Skim Condensed	1.20	20	110	45% TS

Detailed information is available on viscosity correction factors. Write Fristam Pumps for details. The following viscosities may vary, depending upon products, formulas, and processes used by processors.

Product	SP. Gr.	Visc. (cps)	Temp °F	Condition
Milk—Sweetened	1.25	2000	50	
Condensed		500	150	
Milk of Magnesia	1.08	200	70	
Oils:				
Butter	0.90	40	70	
Corn	0.93	150	60	
Frying	0.90	10	400	
Lard	0.96	165	80	
Mineral	0.93	150	70	
Olive	0.92	110	60	
Peanut	0.92	100	60	
Soybean	0.93	95	60	
Vegetable	0.92	40	100	
Paint Solvents	0.90	10	70	
Paper Coatings	1.05	400	70	35% TS
Paraffin	0.90	9	140	
Pear Puree	1.30	4000	160	Thixotropic
Perfume	0.95	1	70	
Pie Filling	1.20	200	140	
Propylene Glycol	1.02	20	30	50%
Sauce—Apple		2000	71	
		800	190	
Salad Dressing	0.96	5000	75	
Shampoo	1.00	350	70	
Sorbitol	1.30	150	70	75%
Soup, Clear	1.00	20	160	
Spaghetti Sauce	1.10	200	140	
Syrups:				
Corn	1.39	240	180	40° Be
Dextrose	1.35	280	180	77° Brix
HFCS 42	1.35	160	70	42% TS
HFCS 55	1.35	800	70	55% TS
Invert	1.38	800	80	76° Brix
Maple	1.37	600	68	
Sugar	1.33	220	80	68° Brix
Soft Drink	1.26	80	80	
Toulene	0.87	1	70	
Tomato Paste	1.14	150	75	11% TS
	1.14	100	180	11% TS
	1.14	1500	200	17% TS
Varnish	0.90	125	100	
Vinegar	1.01	1	70	
Water	1.00	1	70	Includes WFI
Wax, Liquid	1.00	75	70	
Whey:				
Acid/Sweet	1.06	2	100	
Condensed	1.11	20	100	27% TS
	1.20	800	40	40% TS
	1.20	400	130	50% TS
	1.20	550	65	50% TS
	1.24	1500	65	60% TS
Sweetened	1.20	900	55	50% TS
	1.24	600	145	60% TS
Salt	1.06	2	80	
Wort	1.05	100	150	
Yeast—Brewer's				
Fermenting	1.10	150	40	20% TS
Yeast Slurry	1.10	270	45	35% TS
Yogurt Mix	1.03	20	40	

Conversion Factors

Length

Meters	x	3.281	= Feet
Centimeters	x	0.394	= Inches
Millimeters	x	0.0394	= Inches

Mass

Kilograms	x	2.2	= Lbs.
Gallons Of Water	x	8.34	= Lbs.
Cubic Feet of Water	x	62.4	= Lbs.
Pounds	x	0.454	= Kilograms

Volume

Liter	x	0.264	= Gallon
Cubic Feet	x	7.48	= Gallon
Lbs. Of Water	x	0.119	= Gallon
Imperial Gallon (British)	x	1.2	= Gallon (U.S.)
U.S. Gallon	x	3.785	= Liter

Pressure

Feet of Water	x	0.433	= PSI
Inches of Hg.	x	0.491	= PSI
Atmosphere	x	14.7	= PSI
Meters of Water	x	1.42	= PSI
Kilograms/sq. Centimeter	x	14.22	= PSI
Bar	x	14.7	= PSI

Pressure (continued)

Atmosphere	x	33.9	= Feet of Water
PSI	x	2.31	= Feet of Water
Inches of Hg.	x	1.13	= Feet of Water

Flow

Lbs. Of Water/Hour	x	0.002	= GPM
Lbs. Of Fluid/Hour	x	0.002	= GPM
Specific Gravity			
Cu. Meter/Hour	x	4.4	= GPM
Kg. Of Water/Minute	x	0.264	= GPM
Liters/Minute	x	0.264	= GPM
GPM	x	3.785	= Liters/Minute

Power

$$\text{Liquid HP} = \frac{\text{GPM} \times \text{Head ft.} \times \text{Specific Gravity}}{3960}$$

$$\text{BHP} = \frac{\text{GPM} \times \text{Head ft.} \times \text{Specific Gravity}}{3960 \times \text{Pump Efficiency}}$$

Viscosity

$$\text{Centipoise} = \text{Centistokes}$$

$$\text{Specific Gravity}$$

$$\text{Centistokes} \times 4.64 = \text{SSU (Approx.)}$$

Temperature

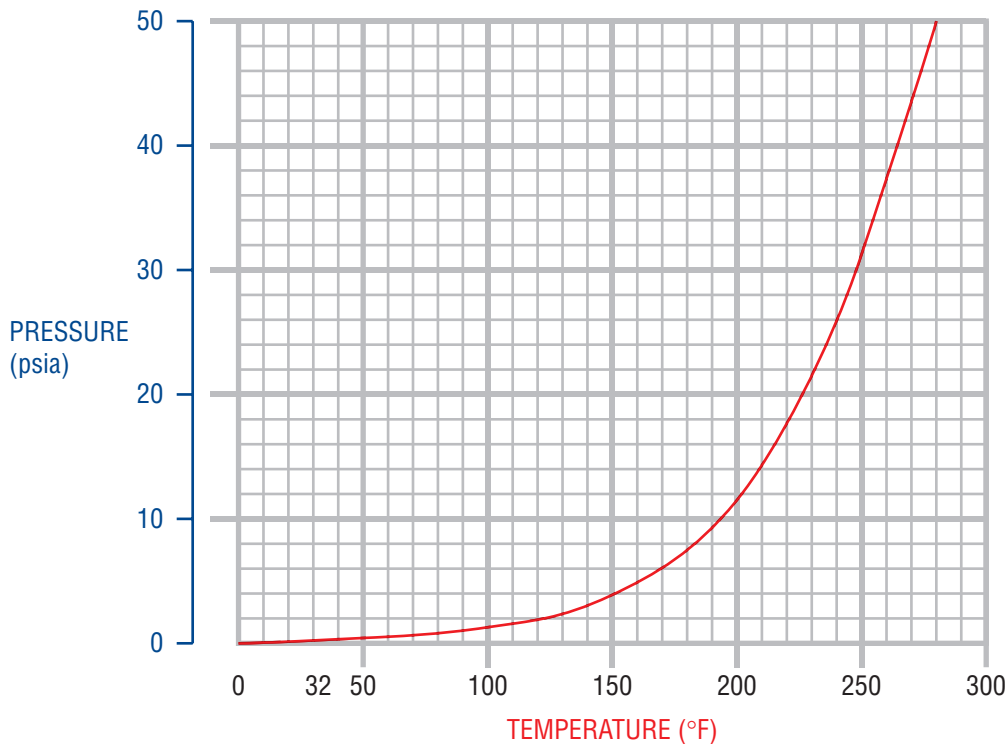
$$(1.8 \times ^\circ\text{C}) + 32 = ^\circ\text{F}$$

$$.555 (^{\circ}\text{F} - 32^{\circ}) = ^\circ\text{C}$$

$$\text{Degrees Kelvin} - 273.2 = \text{Degrees Centigrade}$$

Vapor Pressure Chart

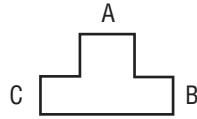
VAPOR PRESSURE OF WATER



Loss of Head Due to Friction in Feet per Foot of Stainless Steel Tubing and in Feet for Sanitary Fittings

Notes:

1. Flow Elbows—R/D = 1.5
2. Flow Through Tees—Flow A to B Port C Capped Off.
3. Test Medium—Water at 70°F
4. 16 gauge tubing was used for the measurements when the outer diameter (O.D.) was between 1" - 3" and 14 gauge tubing was used with the 4" O.D. measurement.



*Calculated data for estimating purposes only. Consult your tubing manufacturer with specific questions.

Capacity in U.S. G.P.M.	O.D. - 1"			O.D. - 1½"			O.D. - 2"			O.D. - 2½"			O.D. - 3"			O.D. - 4"		
	I.D. - .870"			I.D. - 1.370"			I.D. - 1.870"			I.D. - 2.370"			I.D. - 2.870"			I.D. - 3.834"		
	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee	Tubing	Elbow	Tee
2	.01	.01	.1															
4	.025	.02	.2															
5	.035	.025	.25															
10	.12	.06	.4	.02	.01	.15	.005	.015	.1									
15	.25	.1	.8	.04	.02	.25	.013	.02	.15									
20	.43	.22	1.5	.06	.03	.3	.02	.025	.2	.005	.02	.1	.003	.02	.06			
25	.66	.4	2.3	.08	.04	.4	.025	.03	.25	.006	.03	.15	.004	.03	.08			
30	.93	.7	3.3	.105	.06	.55	.035	.05	.3	.008	.05	.2	.005	.04	.1			
35	1.22	1.25	5.2	.135	.09	.8	.04	.06	.4	.011	.06	.25	.006	.05	.13			
40				.17	.11	1.0	.05	.08	.5	.015	.07	.3	.007	.06	.15			
45				.21	.16	1.3	.063	.1	.6	.02	.09	.35	.008	.065	.18			
50				.25	.2	1.6	.073	.12	.7	.022	.1	.4	.01	.07	.2			
60				.34	.35	2.2	.1	.18	.9	.03	.12	.45	.015	.08	.25			
80				.57	.76	3.7	.16	.3	1.5	.05	.15	.55	.02	.1	.4			
100				.85	1.35	5.8	.23	.44	2.3	.075	.18	.6	.03	.11	.5	.008	.04	.1
120				1.18	2.05	9.1	.32	.64	3.3	.105	.21	1.0	.04	.13	.6	.01	.05	.15
140							.42	.85	4.5	.14	.23	1.25	.05	.16	.8	.013	.06	.2
160							.54	1.13	5.8	.17	.28	1.6	.07	.2	1.1	.015	.07	.25
180							.67	1.45	7.4	.205	.31	2.0	.08	.21	1.3	.02	.08	.3
200							.81	1.82	9.0	.245	.35	2.5	.1	.26	1.6	.025	.09	.4
220							.95	2.22	11.0	.29	.41	3.0	.12	.3	1.9	.028	.1	.5
240							1.10	2.63	13.5	.34	.48	3.7	.14	.33	2.2	.035	.11	.55
260										.39	.53	4.5	.165	.39	2.5	.04	.115	.6
280										.45	.61	5.3	.19	.42	2.8	.045	.12	.65
300										.515	.7	6.2	.22	.5	3.1	.05	.13	.7
350										.68	1.05	8.5	.28	.67	4.1	.07	.15	.9
400										.86	1.55	11.0	.36	.88	5.2	.085	.18	1.2
450										1.05	2.25	13.5	.44	1.1	6.6	.105	.2	1.5
500													.54	1.4	8.0	.13	.23	1.75
550													.64	1.7	9.5	.15	.27	2.1
600													.75	2.05	10.2	.175	.3	2.5
650													.87	2.41	13.0	.2	.34	2.8
700													1.0	2.8	15.0	.23	.4	3.4
750																.26	.43	3.8
800																.3	.5	4.4
850																.33	.56	5.0
900																.37	.62	5.7
950																.41	.7	6.3
1000																.45	.8	7.0
1100																.53	1.06	8.6

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