Centrifugal Pumps

- Magnum I
- Magnachrome
- Magnum XL
- Magnum SHEAR
- Vertical
- Sandmaster
- Vortex
- Magnum XP
- Multistage

NATIONAL OILWELL
Mission Products Group

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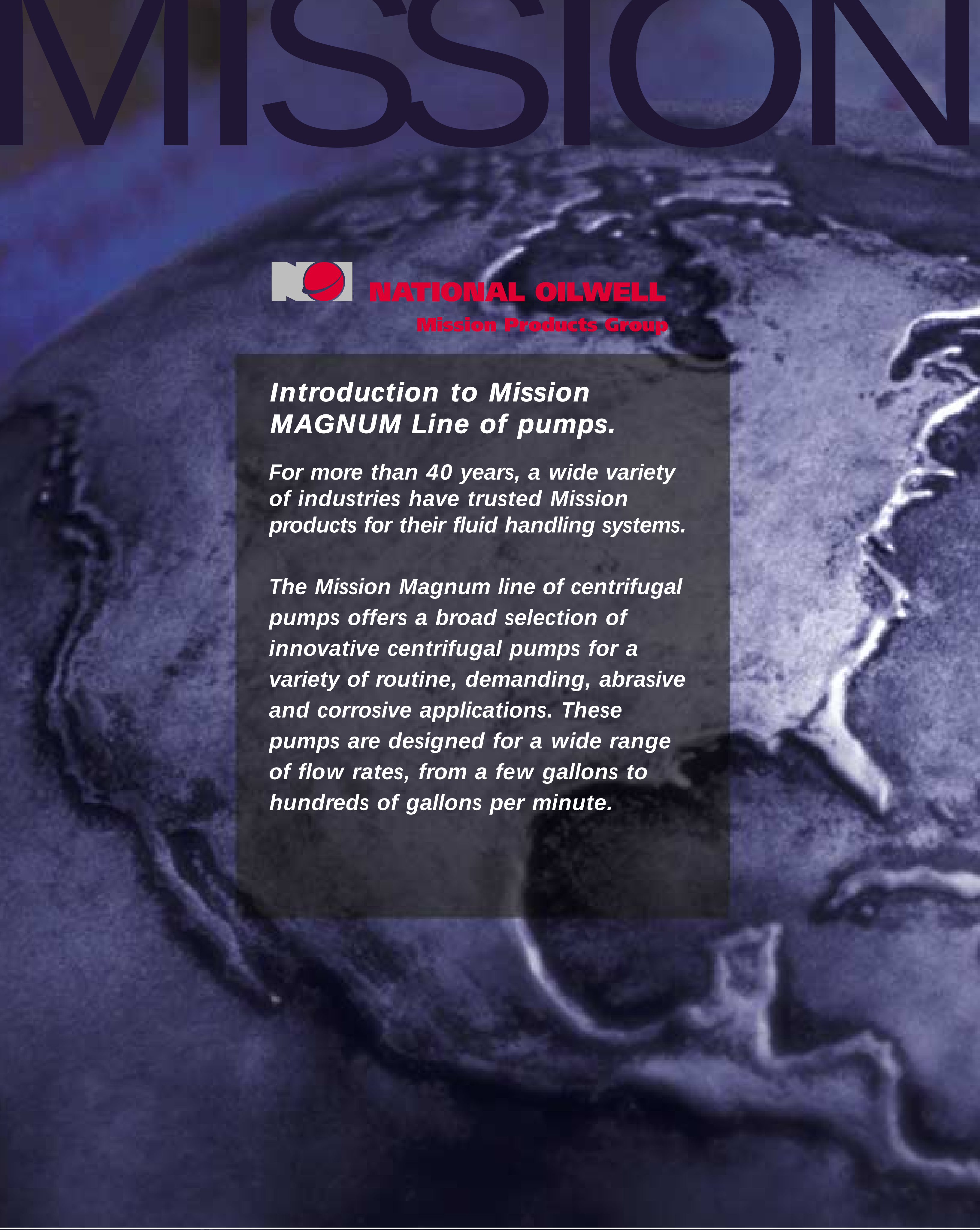


MISSION

NATIONAL OILWELL
Mission Products Group

Introduction to Mission MAGNUM Line of pumps.

For more than 40 years, a wide variety of industries have trusted Mission products for their fluid handling systems.

The Mission Magnum line of centrifugal pumps offers a broad selection of innovative centrifugal pumps for a variety of routine, demanding, abrasive and corrosive applications. These pumps are designed for a wide range of flow rates, from a few gallons to hundreds of gallons per minute.

This catalog has been divided into five major sections:
Each section has been color coded for convenience.

The MAGNUM Pumps

Features of the Leader

Each Mission MAGNUM pump produced and shipped will contain the finest materials, engineering and craftsmanship available in the industry. Some of the basic features of the MAGNUM line have been listed in the call-outs 1-18. Unique features and benefits of the MAGNUM line are described in greater detail on these pages.

The MAGNUM Casing

All of the pumps in the MAGNUM Line feature a casing that is and average of 37% thicker than conventional pump casings, and up to 50% thicker for the larger, mud pumping models.

The concentric casing eliminates vibration, turbulence and cavitation which is caused by cut water in conventional volute pumps. It also reduces the high bearing load and shaft deflection present in other designs at near shutoff flows.

MAGNUM casings are pressure rated at 1.5 times the flange rating and are designed with a 1/8" erosion allowance.

The MAGNUM Impeller

The MAGNUM pump impeller is a highly efficient, open vane impeller. The metal between the vanes is removed, and partial shrouds are provided for maximum vane support. The back vanes are the same curvature as the front vanes. The entrance shape of the vanes is more tangential to the circumference of the suction, which reduces turbulence.

The open-vane design eliminates re-circulation, which occurs in closed impellers.

The reduction of the area affected by unbalanced forces results in a much lower axial thrust and improved bearing life. The back pump-out vanes reduce the concentration of solids at the stuffing box and lower the pressure on the stuffing box.

The impeller has a wider design and greater distance from the tip of the vanes to the casing. Fluid leaving the impeller is allowed to blend with re-circulating fluid, which reduces abrasive wear of the casing. The high scrubbing action of conventional pumps is eliminated.

The impeller is screwed onto the shaft and the threads are sealed by an O-ring. The Hard Iron Magnum is also equipped with an impeller anti-loosening device, which prevents the impeller from loosening if the pump is run backwards during startup and inspection of motor direction.

The MAGNUM Shaft

The MAGNUM line pump shafts are much larger in diameter than conventional pump shafts for heavy-duty performance, minimum deflection and increased operating life of the packing or seals.

The shaft area under the packing has a renewable, hook type sleeve with one end free to expand with temperature variation. This sleeve is easily replaced in the field without shaft removal.

The MAGNUM Heavy-Duty Bearings

Advanced front and rear bearing design reduces both radial and thrust loads.

The outboard bearing is a duplex set of angular contact bearings with high thrust load capabilities and zero end play. The bearing has 24 large balls, which are preloaded so that each set carries an equal load. The front or inboard bearing is a single row roller bearing with high radial load capabilities.

The MAGNUM Stuffing Box

MAGNUM pumps feature an easy-access stuffing box. This feature allows access into the casing and stuffing box chamber with the removal of just one bolt. The deep stuffing box accommodates five standard rings of packing and a Lantern Ring. The stuffing box has a tapped opening to the Lantern Ring for internal flushing if desired. Easy removal also allows convenient replacement of the shaft sleeve.

The stuffing box is completely machined for mechanical seal installation.

These are just a few of the unique features of the MAGNUM line of pumps. Your MISSION sales representative can answer any specific questions you may have about a particular MAGNUM model or application.

1 *Thick, strong concentric casing provides higher efficiencies over a wider operating range than conventional volute designs. The concentric design minimizes turbulence and abrasive wear.*

2 *Wide open-vane impeller creates lower axial thrust for improved bearing life.*

3 *Casing gasket receded for protection.*

4 *Replaceable stuffing-box cover.*

5 *Optional stuffing-boxes available for single and double mechanical seal applications and configured for flush liners.*

6 *Full pipe diameter entrance for minimum turbulence and maximum efficiency.*

7 *Smooth impeller eye for minimum turbulence and higher efficiency.*

8 *Back vanes reduce collection of solids at stuffing box and reduce box pressure.*

9 *Long-life no-adjustment mechanical seal available for near zero leakage.*

10 *Replaceable shaft sleeve prevents shaft wear.*

11 *Single row roller bearings for increased bearing life.*

11a *Roller Bearings are used for all models.*

12 *Duplex angular contact bearings eliminate shaft end play and increases bearing and seal life.*

13 *Oil lubrication for bearings for pump speeds in excess of 2400 rpm, upon request.*

14 *"Frictionless" bearing isolators available to extend bearing life and improve pump efficiency.*

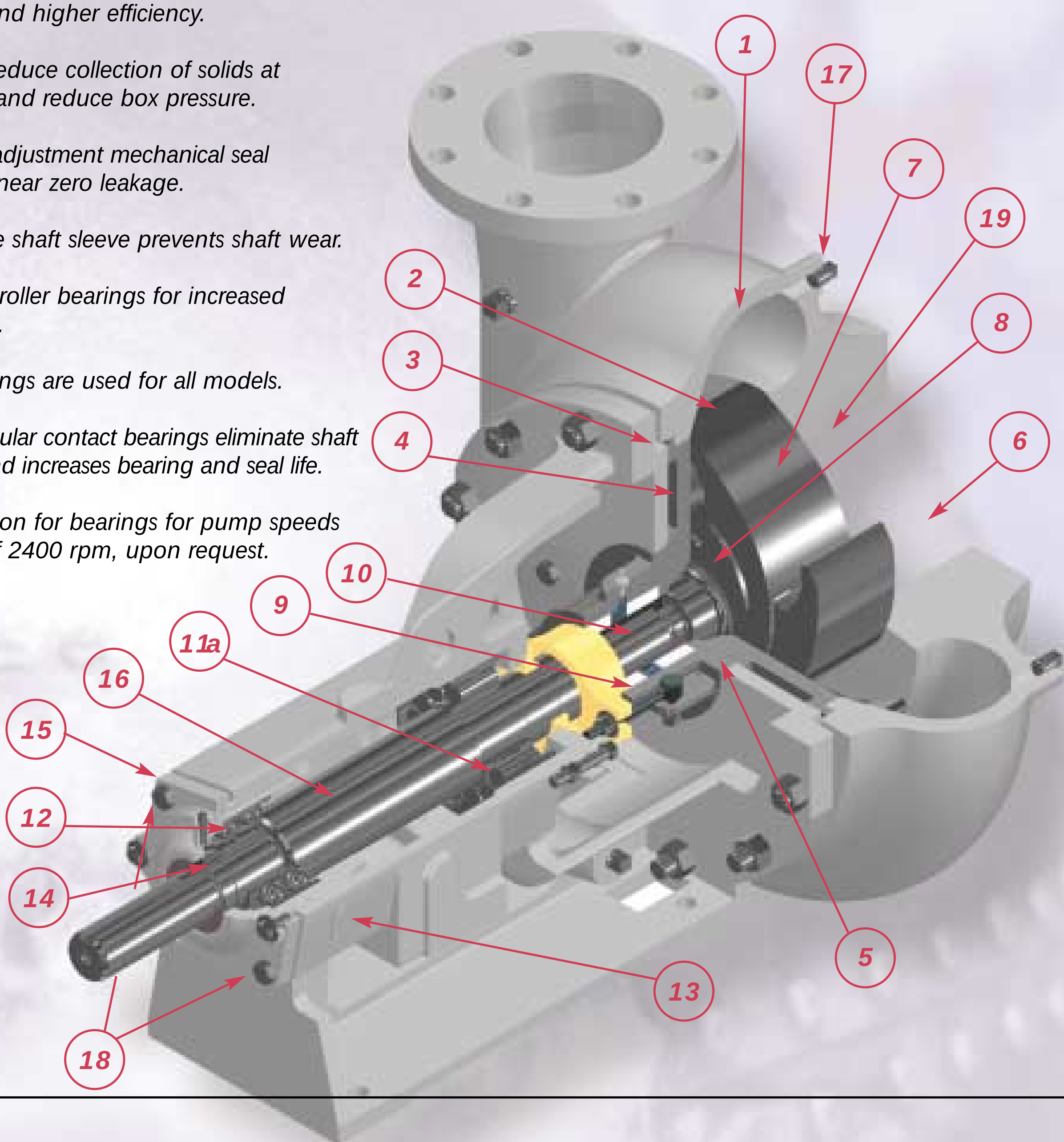
15 *Optional flanged bearing housing available for hydraulic drive.*

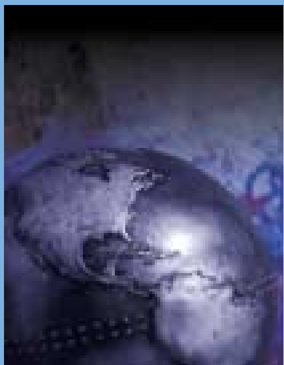
16 *Large supreme-duty shaft reduces deflection for longer life of packing and mechanical seals.*

17 *Easy to get to front access drain, when requested.*

18 *External adjustment of impeller clearance extends pump performance life.*

19 *Impeller anti-loosening device to eliminate pump damage in case of improper motor hook-up.*





The MAGNUM I

The Supreme-Duty Centrifugal Pump

The Mission MAGNUM I has been engineered for the toughest jobs in drilling, production, well-servicing, and industrial applications.

The revolutionary design of the MAGNUM I provides supreme-duty performance in all types of fluid pumping operations. Although it offers greater capacity and higher heads, the MAGNUM I remains the competitive pump of choice for aggressive applications.

The MAGNUM I is more powerful, more durable, and easier to maintain than any conventional pump in use today.

- *Up to 50% more capacity from the 8 x 6 pump*
- *Optimum pressure at low operating speeds*
- *Thicker casing to extend life from wear and corrosion*
- *New impeller design to reduce loads and extend bearing life*
- *Larger, stronger shaft to reduce deflection*
- *Replaceable shaft sleeve in packing wear area*
- *Larger, long-life bearings*
- *Replaceable stuffing box cover*
- *Smoother, non-turbulent flow throughout casing*

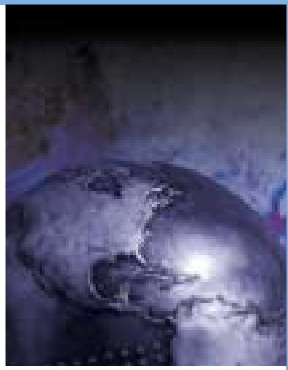
Common applications include:

Barite, ferric oxide and mineral oil base drilling muds
Glass fibers
Sugar processing
Ash or coal conveyors
Cement
Mine de-watering
Lime slurries
Kaolin clay
Crystalline forms

Typical configurations:

3x2x13	6x5x14
4x3x13	8x6x11
5x4x14	8x6x14
6x5x11	10x8x14

See pages 19-31 for pump performance curves
See page 37 for dimensional data



The MAGNACHROME

The MAGNACHROME centrifugal pump is built to deliver superior fluid handling performance in a variety of applications. It's performance incorporates the power, durability and ease of maintenance of the field proven MAGNUM I with a new high strength material in critical component areas.

A chromium alloyed iron provides greater wear resistance and higher strength in the casing, stuffing box, and impeller. This new alloy gives the casing a hardness of 600 HB, and the impeller and stuffing box a hardness of 450 HB.

This process gives the critical components in the MAGNACHROME a more uniform structure; and a 30% carbide content versus hard iron with its soft graphite flakes. The components of the MAGNACHROME have a wear resistance of more than 9 times that of cast iron and more than 6 times that of hard iron.

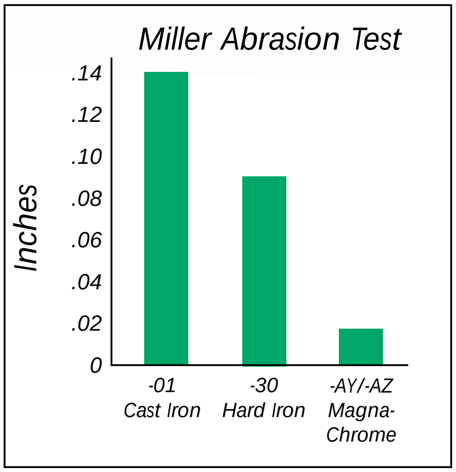
- *High grade, heavy-walled, solid construction offering superior performance over lined pumps and those using inserts*
- *One power fame fits all sizes*
- *Double row angular contact bearings to minimize axial thrust*
- *Double row inboard bearings to minimize effects of radial load*
- *Greater capacity and higher heads for extremely abrasive fluids.*

Common applications include:

Barite, ferric oxide and mineral oil base drilling muds
Glass fibers
Sugar processing
Ash or coal conveyors
Cement
Mine de-watering
Lime slurries
Kaolin clay
Crystalline forms

Typical configurations:

3x2x13
4x3x13
5x4x14
6x5x11
6x5x14
8x6x11
8x6x14
10x8x14



See pages 19-31 for flow rate data
See page 37 for dimensional data

The MAGNUM XL

The MAGNUM XL offers the strength and integrity of the Magnum with added features for the most demanding environments.

The XL fluid end offers a replaceable hardened wear pad, impeller and stuffing box cover to extend the life of the pump. Also featured in the XL fluid end is the impeller with an anti-loosening device. This device prevents the impeller from loosening if the pump is accidentally run backwards.

The Magnum XL offers an inboard roller bearing for even higher radial load capabilities for today's ever increasing demands on our centrifugal pumps.

The XL also offers dynamic exclusion seals for the drive end of the pump. The optional labyrinth seals offer additional value in dusty environments where contaminants tend to get into the power end's lubrication fluid. The exclusion seals have proven to extend the power end life of pumps up to 50% in dirty environments.

Common applications include:

Barite, ferric oxide and mineral oil base drilling muds
Glass fibers
Sugar processing
Ash or coal conveyors
Mine de-watering
Kaolin clay
Cement
Lime slurries
Crystalline forms

Typical configurations:

3x2x13	6x5x14
4x3x13	8x6x11
5x4x14	8x6x14
6x5x11	10x8x14

See pages 19-31 for pump performance curves
See page 37 for dimensional data

The MAGNUM SHEAR

The Magnum Shear pump offers an economical and compact method of shearing polymers into the fluid stream. When properly sheared, polymers can pass through the shaker screen without having to use larger screen sizes that could cause the loss of excess drilling mud. Shearing is accomplished with the addition of our proprietary stuffing box and shear impeller to the standard Magnum 1 pump. There are no modifications to existing piping required and the Magnum Shear pump is constructed of the same materials as the original Magnum 1 pump series. To improve the use of your solids control expenditures use the Magnum Shear pump to add polymers to your solids system.

Common applications include:

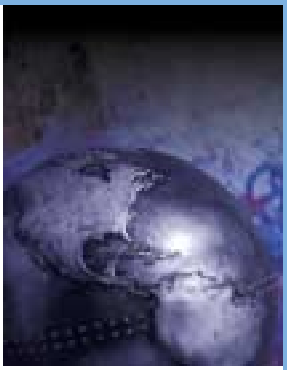
Polymer Additives
Particle Degradation

Typical configurations:

6x5x14
8x6x14

Contact your MISSION Representative for pump performance curves
See page 37 for dimensional data

The VERTICAL



When floor space is at a premium and performance is critical, the VERTICAL MAGNUM provides the solution. The VERTICAL includes virtually all of the features of the MAGNUM I. In addition, the versatile and unique design of the VERTICAL can be utilized in diverse applications.

In a wet pit environment, the VERTICAL requires no bearings or sealing device below the waterline. Use of a vortex impeller allows the passage of any solid that can enter the suction inlet and minimizes particle degradation.

Concentric casing design minimizes shaft cyclical deflection and allows excellent slurry handling.

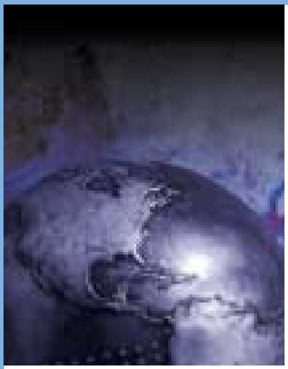
Common applications include:

Mud pumping - offshore/onshore
Solids Control
Dredging
Leveling of rig platform (ballast)

Typical configurations:

3x2x13
4x3x13
5x4x14
6x5x11
6x5x14
8x6x11
8x6x14
10x8x14
3x3x14
4x4x14
6x6v14

See pages 19-31 for pump performance curves
See page 38 for dimensional data



The SANDMASTER

The compact and adaptable SANDMASTER centrifugal pump includes virtually all of the features of the MAGNUM I. In addition, the SANDMASTER is more compact in design and can be adapted for hydraulic motor drive. This added feature makes the SANDMASTER ideal for use in applications such as oilfield frac trucks as well as blending and pump charging service. The SANDMASTER's variable speed hydraulic drive make this an excellent pump for water well drilling applications.

When space is at a premium and prime mover options are limited, the SANDMASTER is the pump of choice.

Common applications include:

Cement	*Charge Pump*
Blender	*Other Mobile uses*
Waterwell Drilling	

Typical configurations:

3x2x13	*6x5x14*
4x3x13	*8x6x11*
5x4x14	*8x6x14*
6x5x11	*10x8x14*

See pages 19-31 for pump performance curves
See page 39 for dimensional data

The VORTEX

The VORTEX centrifugal pump offers users the proven performance of the MAGNUM I adapted with a concentric vortex casing. The VORTEX also features identically sized suction and discharge flanges, and a high performance vortex designed impeller.

The vortex impeller produces a smooth hydraulic whirlpool of fluid around the impeller creating a vacuum which allows fluid to circulate without passing through the impeller. This smooth action increases fluid velocity and produces pressure without turbulence, greatly reducing particle degradation. Solids smaller than the discharge flow easily, without clogging.

The VORTEX eliminates the eye of the impeller reducing the possibility of vapor lock; making it an excellent selection for high suction lift applications where net positive suction head is low.

The unique design of the VORTEX lowers radial loads, decreases shaft deflection and increases bearing life.

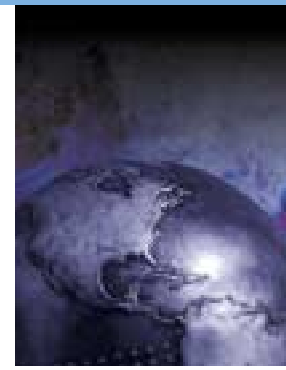
The VORTEX is designed to pump continuously, even without fluid in its case, and can reprime, under positive suction feed, without vapor locking.

Common applications include:

Pulp and paper
Primary metals
Municipal sewage treatment
Chemical process industry

See pages 32-34 for pump performance curves
See page 40 for dimensional data

The MAGNUM XP



The MAGNUM XP is ideally suited for pumping high volumes of heavy slurries that are abrasive, corrosive, or just plain tough to pump. The MAGNUM XP 14x12x22 and 12x10x23 can deliver flow rates from 3000 - 7500 gpm at 75 - 410 feet of head at low speeds.

The compact overall dimensions of the MAGNUM XP make it an excellent choice for high volume mobile and stationary applications where a small footprint is critical.

The MAGNUM XP is designed for continuous operation with minimal maintenance. The low stuffing box pressure can increase seal life approximately 50%. The extra-heavy shaft is designed for minimum deflection. This feature also extends seal life. A unique casing flow divider cuts the radial load in half, doubling bearing life. The heavy duty bearings are permanently lubricated to minimize maintenance.

Common applications include:

- *Sand slurry*
- *Slag*
- *Fly ash*
- *Bottom ash*
- *Dredge tailings*
- *Food processing*
- *Blending*
- *Paper pulp processing*
- *Waste slurries*
- *Sewage*
- *Fluid supercharging*
- *Spent liquor*
- *Nickel shot*
- *Copper, bauxite, and quarry slurries*
- *Lead and zinc ore and tailings*

***Typical configurations**:*

- *12x10x23*
- *14x12x22*

See page 35 for pump performance curves
See page 41 for dimensional data

The MULTISTAGE

The Magnum Multistage, the newest member of the Magnum family, was developed to handle aggressive slurries containing up to 1/2″ particle sizes in higher pressure applications. These pumps may be installed either horizontally or vertically to allow for maximum piping options. The Magnum Multistage (MMS) pumps are designed to operate in series to deliver pressures up to 7,500 psi. This makes this pump a viable option as a riser boost pump, mud prime mover, pipeline mining and saltwater injection.

The Magnum Multistage can be constructed from a wide range of materials to offer superior abrasion and corrosion resistance. API D-1 and S-6 traceability can be offered for critical locations.

The Magnum Multistage is offered with a variety of sealing options. The seal requirement will depend upon pumping suction and discharge pressures, ambient environment and corrosive/abrasive nature of fluid pumped. Single, double and balanced seals are readily available to meet your demanding operating conditions. Typical API flush plans may be used with all of these seal options.

The Magnum Multistage is designed to minimize and in some applications completely eliminate thrust to the motor which greatly reduces motor expenditures. This feature also helps to extend shaft, shaft bushing and mechanical seal life.

Common applications include:

Well Injection
Salt Water Disposal
Mud Booster Pump
Pipeline
Water Purification
Fly Ash

Typical configurations:

MS-6x4

See page 36 for pump performance curves
See page 18 for dimensional data

Pump Sizing Information

Conversion Tables

GPM = .03 x Barrels per day

Specific gravity = $\dfrac{\text{weight fluid in pounds/gal.}}{8.34}$

S.GR. = $\dfrac{\text{Pounds/cu.ft.}}{32.4}$

Feet Head = $\dfrac{\text{PSI x 2.31}}{\text{SP.GR.}}$

PSI = $\dfrac{\text{Feet Head x SP. GR.}}{2.31}$

Brake Horsepower Required=
Curved Horsepower x SP. GR.

Pounds per Gallon =
.133 x pounds/cu.ft.

Metric Conversions:
GPM = .264 x liters/min.
GPM = 15.9 x liters/sec.
GPM = 4.4 x meters3/hr.
GPM = 264 x meters3/min.
Feet = 3.28 x meters
PSI = 14.2 x Kg/cm2
SP. GR. = 1 x grams/cu. cm.

Determining horsepower for pumping weighted fluids

The pump performance curves show horsepower for pumping clear water with a specific gravity of 1 and a weight of 8.34 lb/gal. For fluids with a higher specific gravity than plain water, correct the pump performance curves in the following manner:

1. Find the fluid weight in lb/gal.
2. Multiply horsepower shown on the curve by fluid wight in lb/gal., then divide by 8.34.

Corrected HP = $\dfrac{\text{Curve Brake HP x Fluid Wt./Gallon}}{8.34}$

Flow

Barrels/Hour	Barrels/Day.	GPM
4.2	100	3
10.5	250	7.5
21	500	15
31.5	750	22.5
42	1000	30
63	1500	45
83	2000	60
125	3000	90
208	5000	150
312	7500	225
420	10,000	300

Head - for water, Sp. Gr. = 1.0

Feet	Psi	Psi	Feet
10	4.33	10	23.1
20	8.66	20	46.2
25	10.8	25	57.8
30	13	30	69.3
40	17.3	35	80.9
50	21.6	40	92.4
75	32.48	45	104
100	43.2	50	115.5
150	64.8	60	138.6
200	86.4	75	173.2
250	108	100	231
300	130	125	288.7
350	151.6	150	346.5
400	172.8	175	404.2
450	195	200	462

Selecting A Pump Size

Determining Horsepower Requirements

The proper pump size and horsepower for a pumping application can be determined by referring to performance curves. Performance curves of some of the most popular MAGNUM pump configurations can be found on pages 19 - 31 of this catalog. A more complete publication of pump performance curves is available from your NOI Mission representative. Locate the individual pump curves meeting the required GPM and head feet for each application. More than one curve may be applicable.

1. Select the impeller size.
   Speeds of 1750 RPM and below. Read to the nearest 1/4 inch.

2. Select bearing frame.
   Grease lubricated for pump speeds to 2400 RPM or oil lubricated for pump speeds 2600 to 3600 RPM.

3. Calculate the required horsepower.
   A. Read horsepower from curve based on water at operating point on impeller (selected as accurately as possible) then:

   Brake Horsepower Required = Hp curve X SP. GR. Fluid

   B. Alternate method - Read efficiency at the operating point.

   $$\text{Brake Horsepower} = \frac{(\text{GPM})\,(\text{Feet Head})\,(\text{SP. GR.})}{(3960)\,(\text{Efficiency})}$$

4. Calculate your system NPSH available in feet.

   The use of a centrifugal pump requires that consideration be given to the suction conditions for all applications. One of these, NPSH Available (NPSHa) is dependent upon the condition of the liquid being pumped, the process, and the location. The other is NPSH required (NPSHr), depends upon the pump design that is determined by the pump manufacturer and is reflected on the performance curves.

NPSH is the total suction head in feet of liquid acting at the pump suction flange less the absolute vapor pressure (in feet) of the liquid being pumped.

NPSH Available (NPSHa)

NPSHa is determined by four factors.

1. Absolute pressure (in feet) on the surface of the liquid being pumped. In most cases for our pumps, this is the atmospheric pressure in an open mud tank. (see below)
2. Head in feet corresponding to the vapor pressure of the liquid at the temperature being pumped.
3. The difference in elevation between the surface of the pumped liquid and the centerline of the pump.
4. Friction head lost as the liquid flow from the tank to the pump.

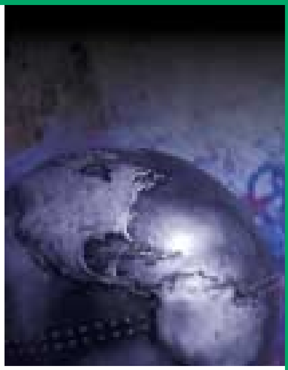
Atmospheric pressure - 68˚F @ sea level is
14.696 psia = 33.96 feet absolute

ALWAYS REMEMBER:

ITEM #1 IS ALWAYS A POSITIVE
ITEM #2 IS ALWAYS A NEGATIVE
ITEM #3 CAN BE EITHER POSITIVE OR NEGATIVE
ITEM #4 IS ALWAYS A NEGATIVE

Selecting A Pump Size

Determining Horsepower Requirements (cont'd)



NPSHa must always be a positive and can be calculated by the following two equations.

<u>SUCTION LIFT</u> - liquid supply level is below the centerline of the pump suction.

NPSHa = Ha - Hvpa - Hst- Hfs

<u>FLOODED SUCTION</u> - liquid supply is above the centerline of the pump suction.

NPSHa = Ha - Hvpa + Hst - Hfs

- *Ha = Absolute pressure (in feet of liquid) on the surface of the liquid supply. (Barometric Pressure from an open tank or pit; Absolute pressure from a closed tank).*
- *Hvpa = Head in feet corresponding to the vapor pressure of the liquid at the temperature being pumped.*
- *Hst = Static height in feet that the liquid supply level is above or below the pump centerline.*
- *Hfs = All suction line losses (in feet) including entrances losses and friction losses through the piping, valves, fitting and etc.*

Elevation = distance from surface of liquid on suction side to center line of pump in feet (above+; below -)

Vapor pressure = vapor pressure fluid at pumping temperature in feet of fluid.

Vapor pressure of water for estimating:

Temperature	Vapor pressure feet of fluid
80^{o} F	1.2
120^{o} F	3.9
140^{o} F	6.8
160^{o} F	11.2
180^{o} F	17.8

5. *Read NPSH required from curve.*
   NPSHr requires no calculation since it is determined by the pump manufacturer by an actual test of the pump. It is usually given in feet of water since most performance tests are conducted with water.

REMEMBER THAT NPSHa MUST ALWAYS BE GREATER THAN NPSHr OR THE PUMP MAY CAVITATE OR NOT PUMP AT ALL.

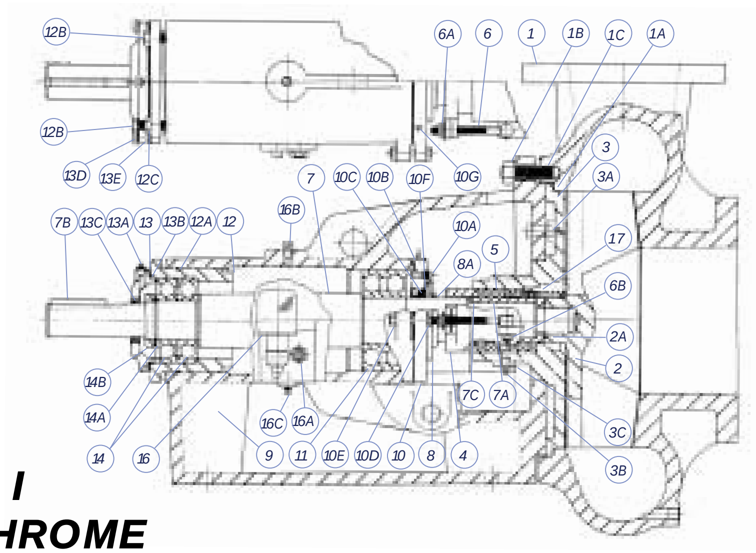
If the NPSHa is less than NPSHr some of the following can help solve this problem.

1. *Raise the fluid level*
2. *Oversize the pump*
3. *Use larger suction pipe to reduce velocity*
4. *Reduce pump speed and increase impeller diameter to achieve same discharge head.*

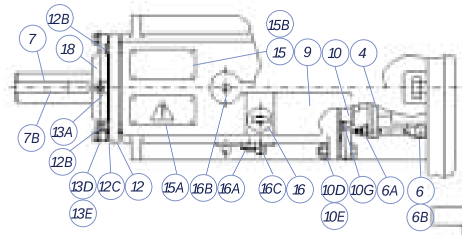
Bill of Materials

For the MAGNUM I, MAGNACHROME, SANDMASTER, MAGNUM SHEAR, MAGNUM XL and VORTEX

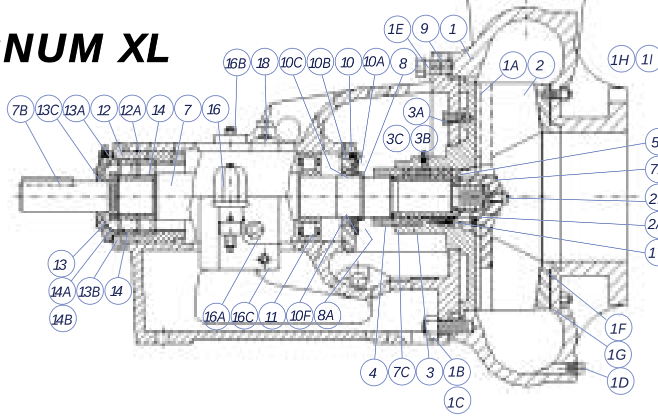
See Publication CP001 for Part Numbers and Pricing

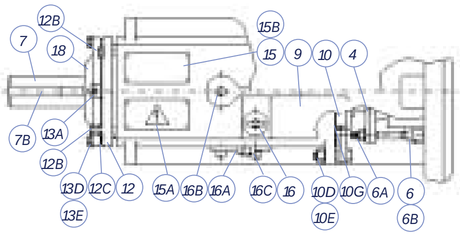


MAGNUM I
MAGNACHROME
SANDMASTER
MAGNUM SHEAR

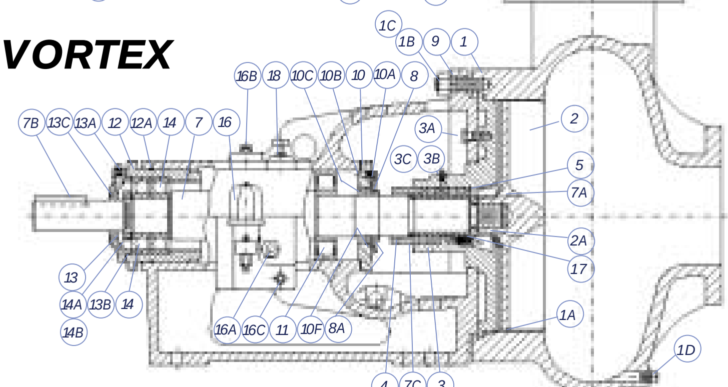


MAGNUM XL





VORTEX

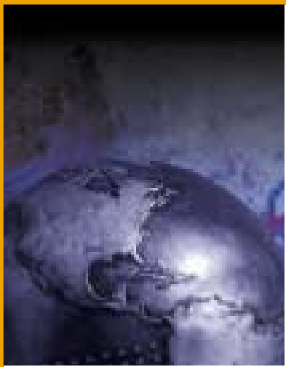


For the MAGNUM I, MAGNACHROME, SANDMASTER, MAGNUM SHEAR, MAGNUM XL and VORTEX

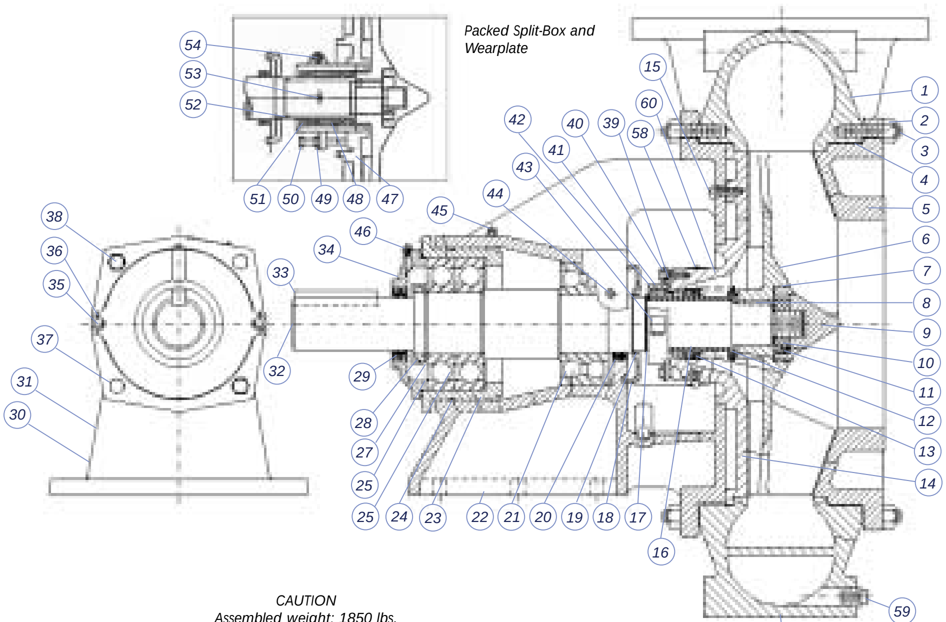
See Publication CP001 for Part Numbers and Pricing

Item #	Description	Quantity	Base Part Number
1	Case	1	*
1A	Case Gasket	1	10399-46-1
1B	Nuts, Case Studs	12	3932-61
1C	Studs, Case	12	3862-76
1D	Plug, Case Drain	1	*
1E	Jackbolt, Case	*	*
1F	Wear Pad, Case	*	*
1G	Gasket, Wear Pad	*	*
1H	Stud, Wear Pad	*	*
1I	Nut, Wear Pad	*	*
2	Impeller	1	*
2A	O-ring, Impeller Seal	1	19110-72
2B	Capscrew – Anti-Rotation, Impeller	1	*
3	Stuffing Box (Packing or Mechanical Seal)	1	*
3A	Bolt, Stuffing Box	1	3861-117
3B	Grease Fitting	1	19368-01
3C	Tag Grease Fitting	1	5949
3D	Shear Ring	*	*
3E	Drive Pins	*	*
3F	Gasket, Shear Ring	*	*
4	Packing Gland Set	1	20622
5	Packing Set	1	*
6	Gland Bolts	2	20629
6A	Nuts, Adjusting for Gland Bolts	2	22216-01
6B	Nuts, for Gland Bolts	2	3932-8
7	Shaft, Standard	1	20612
7A	Sleeve, Shaft	1	20613-21G7A
7B	Key, Coupling	1	4372-5-21
7C	Seal, Shaft Sleeve	1	7496-033
8	Deflector	1	20621
8A	Seal, Deflector	1	23444-03-72
9	Frame	1	*
10	Cover, Inboard Bearing	1	20626
10A	Plug, Inboard Bearing Cover	1	8505-1
10B	Gasket, Inboard Bearing Cover	1	20625
10C	Oil Seal, Inboard Bearing Cover	1	20619-01
10D	Bolt, Inboard Bearing Cover	2	3861-1
10E	Nut, Inboard Bearing Cover	2	3932-8
10F	Exclusion Seal, Inboard Bearing Cover	1	20620-01
10G	Grease Fitting, Inboard Bearing Cover	1	*
11	Bearing, Inboard	1	*
12	Bearing Housing, Outboard	1	20624
12A	Seal, Bearing Housing	1	7496-2531
12B	Bolts, Bearing Housing	4	3861-138
12C	Nuts, Bearing Housing	2	3932-62
13	Cover, Outboard Bearing Housing	1	20617
13A	Plug, Outboard Bearing Cover	1	8505-1
13B	Seal, Outboard Bearing Cover	1	7496-26
13C	Oil Seal, Outboard Bearing Cover	1	20619-02
13D	Bolts, Outboard Bearing Cover	2	3861-139
13E	Washer, Outboard Bearing Cover	2	648-402030
14	Bearing, Outboard	2	20616-1
14A	Lockwasher, Outboard Bearing	1	6124-4
14B	Locknut, Outboard Bearing	1	6123-4
15	Name Plate	1	23017
15A	Drive Screws	8	12530
16	Oiler Assembly, for Oil Lubed Pumps only	1	8478-6
16A	Sight Oil Gauge, for Oil Lubed Pumps only	1	18471
16B	Breather, for Oil Lubed Pumps only	1	8267
16C	Plug – Oil, for Oil Lubed Pumps only	1	8505-1
17	Mechanical Seal, for Oil Lubed Pumps only	1	22451-1
18	Dipstick, for Oil Lubed Pumps only	*	*

For specific options contact your local MISSION Representative.



MAGNUM XP



CAUTION
Assembled weight: 1850 lbs.
Do not attempt to lift with straps.
Use chains, hook, or fork lift.

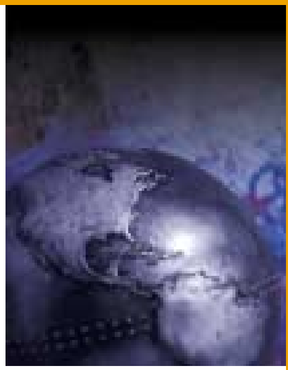
Casing can be flipped for
clockwise or counter-clockwise rotation.
Choose correct impeller

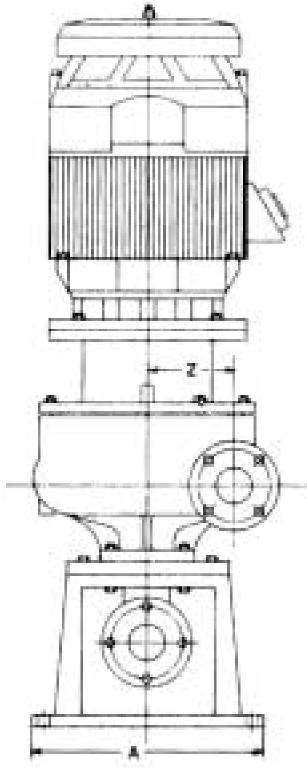
Item #	Description	Qty.	Base Part Number
1	Casing	1	24022-01-XX
2	Nuts, Casing Stud	32	3932-61
3	Stud, Casing	32	3862-86
4	Gasket, Casing	2	10399-66-1
5	Cover, Front	1	24021-01-XX
6	Impeller (Clockwise Rot.)	1	24024 - -XX
	Impeller (Counter-Clockwise Rot.)		24043- -XX
7	Seal, Imp. Nose	1	7496-158
8	Key, Impeller	1	4372-29-21
9	Nose, Impeller	1	24025-01-25L
10	Screw, Set	1	14430-19
11	Jam Nut	1	24026-25L
12	Seal, Impeller	1	7496-153
13	Mechanical Seal (Garlock)	1	24035
	Mechanical Seal (Crane Type)		
14	Stuffing Box, Mech. Seal	1	24027-01-XX
15	Bolt, Stuffing Box	2	3861-117
16	Sleeve, Shaft	1	24029-21BZ
17	Seal, Sleeve	1	7496-234
18	Slinger	1	24030-13
19	Seal, Slinger	1	7496-238P
20	Oil Seal, Inb. Brg.	2	20619-03
21	Bearing, Inboard	1	20615-2
22	Frame	1	24031-01-01
23	Housing, Bearing	1	24032-01-01
24	Seal, Brg. Hsg.	1	7496-272
25	Bearing, Outboard	1	20616-2
26	Seal, Bearing Cover	1	7496-267
27	Lock Washer	1	6124-6
28	Lock Nut, Bearing	1	6123-6
29	Oil Seal, Brg. Cover	2	20619-04
30	Drive Screws	6	12530

Item #	Description	Qty.	Base Part Number
31	Nameplate	1	23017
32	Shaft	1	24028-33
33	Key, Coupling	1	4372-30-21
34	Cover, Bearing	1	24033-01-01
35	Bolts, Brg. Cover	2	3861-139
36	Washer, Brg. Cover	2	3936-19-L8
37	Nuts, Brg. Housing	2	3932-62
38	Bolt, Brg. Housing	4	3861-138
39	Washer, Flat	2	3936-19-LB
40	Bolt, Pkg. Gland	2	3861-165
41	Gland, Packing, Half	2	24D34-01-13
42	Packing Set	1	8264-344-K
43	Screw, Cap	2	3909-4-87
44	Plug, Grease	1	8505-1
45	Breather	1	8267-1
46	Plug, Grease	1	8505-1
58	Plug, Pipe	2	8505-2-01
59	Plug, Pipe	1	8505-6-01
60	Tag, Mechanical Seal	1	22566
Packed Split-Box and Wearplate			
47	Wearplate, Split Box	1	24023-01-XX
48	Packing Set	1	8264-345-K
49	Nut and Washer Assembly	2	22216-02
50	Bolt, Split-Box	2	3861-168
51	Stuffing Box, Split	2	24037-01-87
52	Lantern Ring Half	2	24039-13
53	Fitting, Grease	1	19368-01
54	Screw, Cap	2	3909-13-87
Auxiliary Tools			
55	Tool, Imp. Nose and Nut	1	24040
56	Tool, Imp. Removal	1	24041
57	Tool, Shaft Holder	1	24042

*For specific options contact your local MISSION Representative.

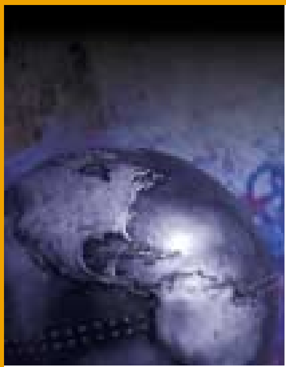
VERTICAL





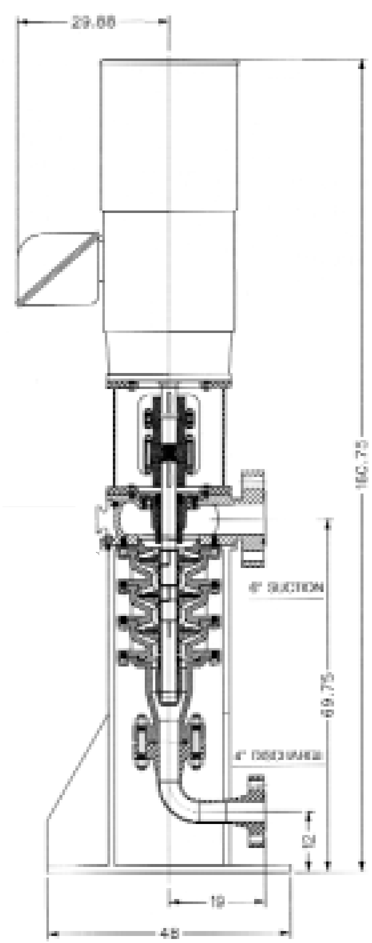
Item #	Description	Quantity	Base Part Number
1	Case	1	*
1A	Case Gasket	1	10399-46-1
1B	Nuts, Case Studs	12	3932-61
1C	Studs, Case	12	3862-76
1D	Plug, Case Drain	1	*
1E	Jackbolt, Case	*	*
1F	Wear Pad, Case	*	*
1G	Gasket, Wear Pad	*	*
1H	Stud, Wear Pad	*	*
1I	Nut, Wear Pad	*	*
2	Impeller	1	*
2A	O-ring, Impeller Seal	1	19110-72
2B	Capscrew – Anti-Rotation, Impeller Nose	*	*
2C	Allen Screw	*	*
3	Stuffing Box (Packing or Mechanical Seal)	1	3861-117
3A	Bolt, Stuffing Box	1	19368-01
3B	Grease Fitting	1	5949
3C	Tag Grease Fitting	*	*
3D	Shear Ring	*	*
3E	Drive Pins	*	*
3F	Gasket, Shear Ring	1	20622
4	Packing Gland Set	*	*
5	Packing Set	1	20629
6	Gland Bolts	1	22216-01
6A	Nuts, Adjusting for Gland Bolts	1	3932-8
6B	Nuts, for Gland Bolts	1	20612
7	Shaft, Standard	1	20613-21G7A
7A	Sleeve, Shaft	1	4372-5-21
7B	Key, Coupling	1	7496-033
7C	Seal, Shaft Sleeve	1	20621
8	Deflector	1	23444-03-72
8A	Seal, Deflector	*	*
9	Adapter	1	20626
10	Base	1	*

*For specific options contact your local MISSION Representative.



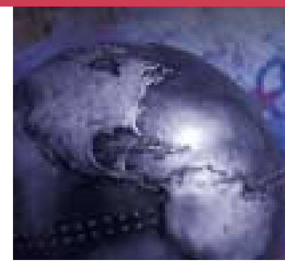
MULTI-STAGE
(Vertical & Horizontal)

Item #	Description	Quantity	Base Part Number
1	STAND, MOTOR - 25171-02-95	1	662014076
2	NUT, ¾ -10	4	648402014
3	CASE, SUCTION - 25160-01-86	1	662002070
4	PLUG, ¾" N.P.T.	1	601474737
5	CAPSCREW, 1⅛ -7 UN x 3" LG. - 3861-170	18	648401082
6	CAPSCREW, ¾ -10 x 2" LG.	4	25019598
7	CAPSCREW, ⅝ -11 UN x 2" LG. - 3861-171	6	648401083
8	STUFFING BOX - 25159-01-86	1	662014066
9	CAPSCREW, 1¼ -7 x 1¾" LG. - 3861-172	8	648401084
10	O-RING, ST. BOX - 23444-07-72 (OR441 V75)	1	648415173
11	BACKUP RING, ST. BOX - 251177-02-01 (BU-441)	1	661010022
12	MECHANICAL SEAL, 3" TYPE 1 T/S	1	661006038
13	HOUSING, STATIONARY - 3" TYPE 1 MS - 25175-01-33H	1	662014074
14	NUT, STATIONARY HOUSING - 3" TYPE 1 MS - 25176-01-33H	1	662014075
15	O-RING, STATIONARY HOUSING - 23444-09-72 (OR345 V75)	1	648415175
16	BACKUP RING, STATIONARY HOUSING - 25177-01-01 (BU-345)	1	661010021
17	0-RING - 23444-10-72 (OR241 V75)	1	648415176
18	BACKUP RING - 25177-04-01 (BU-241)	1	661010024
19	RING, SHOULDER - 25179-01-04	1	662014079
20	ADAPTER - 25162-01-86	1	662014067
21	ADAPTER - 25162-01-86	3	662002069
22	STUD, 1⅛ -7 x 4¼" LG.	54	12081949
23	NUT, 1⅛ -7	108	6300184
24	O-RING, DIFFUSER & ADAPTER - 23444-08-72 (OR452 V75)	5	648415174
25	BACKUP RING, DIFFUSER & ADAPTER - 25177-03-01 (BU-452)	5	661010023
26	IMPELLER - 25158-80-86	3	662007240
27	LOCK RING, IMPELLER - 25163-01-04	3	662014077
28	KEY, IMPELLER - 25178-01-04	3	601212362
29	SET SCREW, IMPELLER & MS SHOULDER - ⅜ -16 x ½" LG.	6	702720408
30	CASE, DISCHARGE - 25161-01-86	1	662002071
31	BEARING, DISCHARGE CASE - 25165	1	661009005
32	CAP, SAND - 25164-01-49	1	662014068
33	SET SCREW, SAND CAP - ⅜ -16 x ¾" LG.	1	702720657
34	ELBOW ASSEMBLY, DISCHARGE - 4" API 2500# R.J. FLANGE	1	665002006
35	GASKET, R38 - 4" API 2500# R.J. FLANGE	8	661010025
36	STUD, 1 ½ -8 x 9½" LG.	16	45810117
37	NUT, 1½ -8	1	49010843
38	SHAFT, 2 STAGE - 25173-01-87	1	662013018
39	NUT, ADJUSTING (COUPLING) - 25169	1	662014069
40	COUPLING, PUMP HALF - 25170-01-45	1	662014070
41	KEY, COUPLING (PUMP HALF) - 4372-32-04 - ¾" SQ. x 4½" LG.	8	601212361
42	STUD, ¾ -10 x 7½" LG.	1	49005215
43	NUT, ¾ -10	16	648402014
44	COUPLING, MOTOR (2.12" I.D.) - 25167-01-45	1	662014071
45	KEY, COUPLING (MOTOR HALF) - 4372-31-04 - ¾" SQ. x 3¼" LG.	1	601212360
46	STUD ASSEMBLY, COUPLING (MOTOR) - ¾ -10 x 3¾" LG. W/2H NUT	12	45165913
47	COUPLING, SPACER - 25168-01-45	1	662014072
48	CAPSCREW, ⅝-11 x 4" LG.	2	75634368
49	STAND, PUMP (2 STAGE) - 25174-02-95	1	662014078



Three Stage
Vertical Configuration
Illustrated

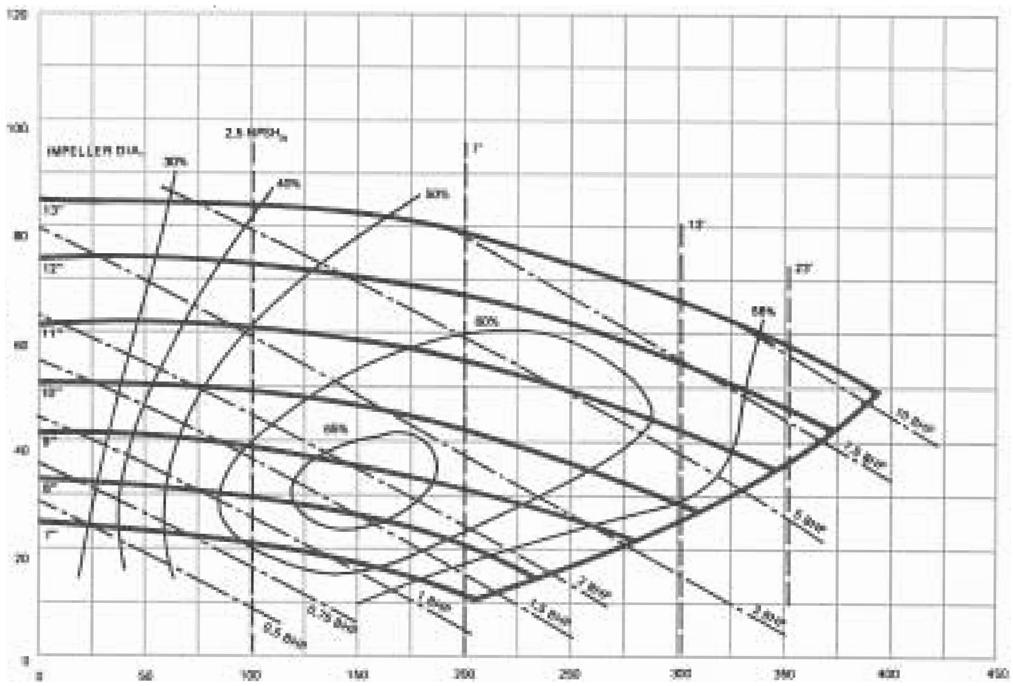
Pump Performance Curves



The following are performance curves for a number of the popular pump configurations.

MAGNUM I	*Open Impeller*
3 x 2 x 13	*Dia: 7˝ to 13˝*
Speed : 1150 RPM	*Eye Area: 7.1 Sq. In.*
Curve: 944	*Max. Sphere: 1/2 In.*

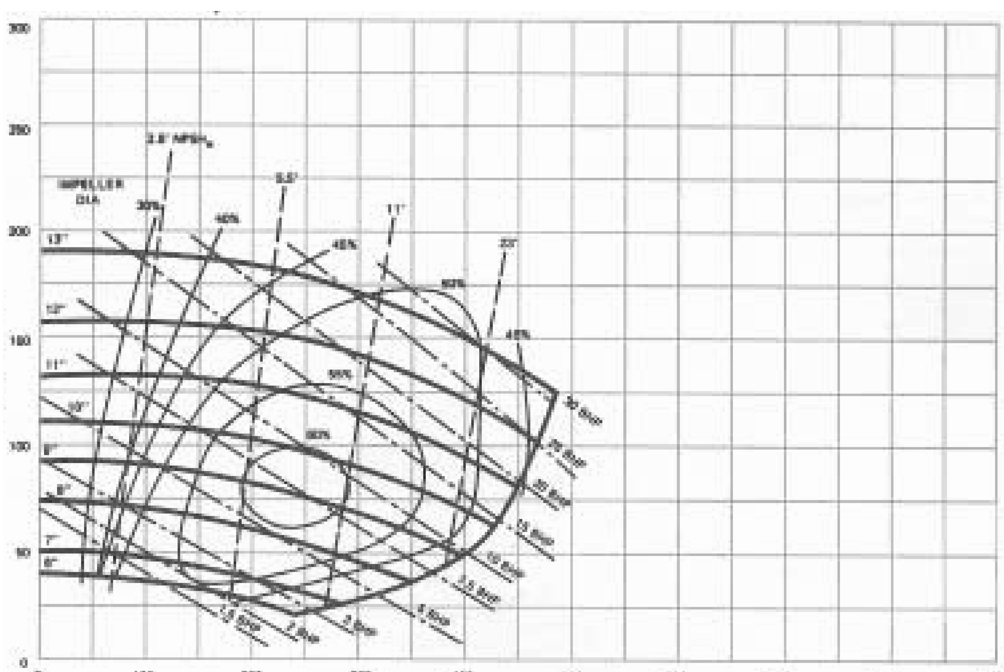
TOTAL HEAD FEET



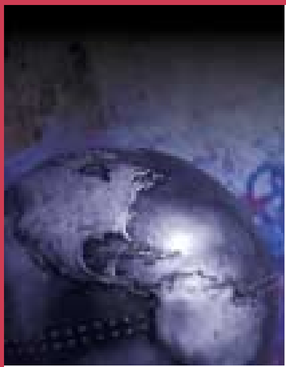
Capacity – U.S. Gallons per Minute

MAGNUM I	*Open Impeller*
3 x 2 x 13	*Dia: 6˝ to 13˝*
Speed : 1750 RPM	*Eye Area: 7.1 Sq. In.*
Curve: 945	*Max. Sphere: 1/2 In.*

TOTAL HEAD FEET



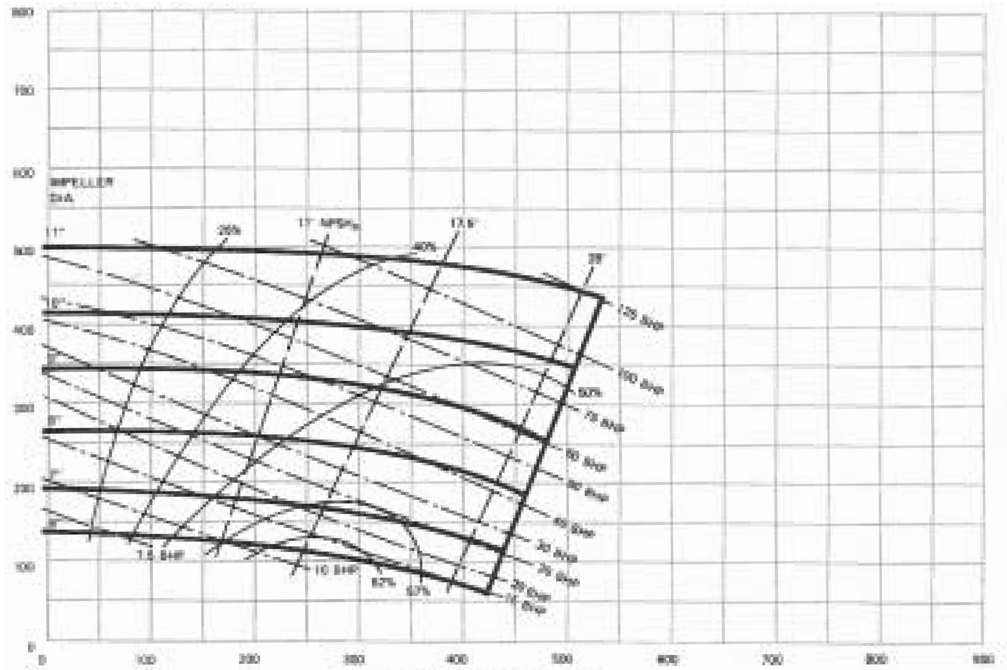
Capacity – U.S. Gallons per Minute



MAGNUM I
3 x 2 x 13
Speed : 3500 RPM
Curve: 946

Open Impeller
Dia: 7″ to 13″
Eye Area: 7.1 Sq. In.
Max. Sphere: 1/2 In.

TOTAL
HEAD
FEET

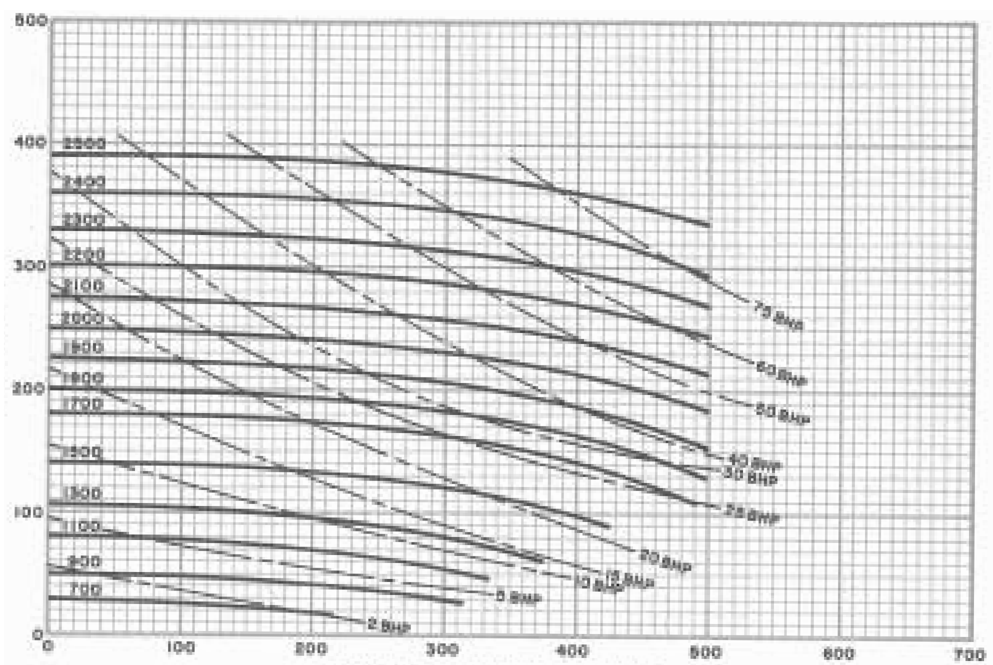


Capacity – U.S. Gallons per Minute

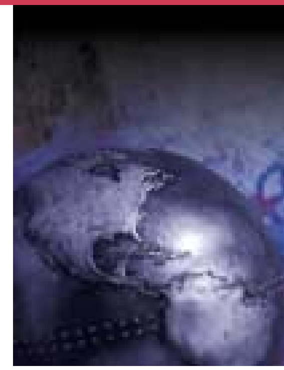
MAGNUM I
3 x 2 x 13
Speed : 700-2500 RPM
Curve: 976

Open Impeller
Dia: 13″
Eye Area: 7.1 Sq. In.
Max. Sphere: 1/2 In.

TOTAL
HEAD
FEET



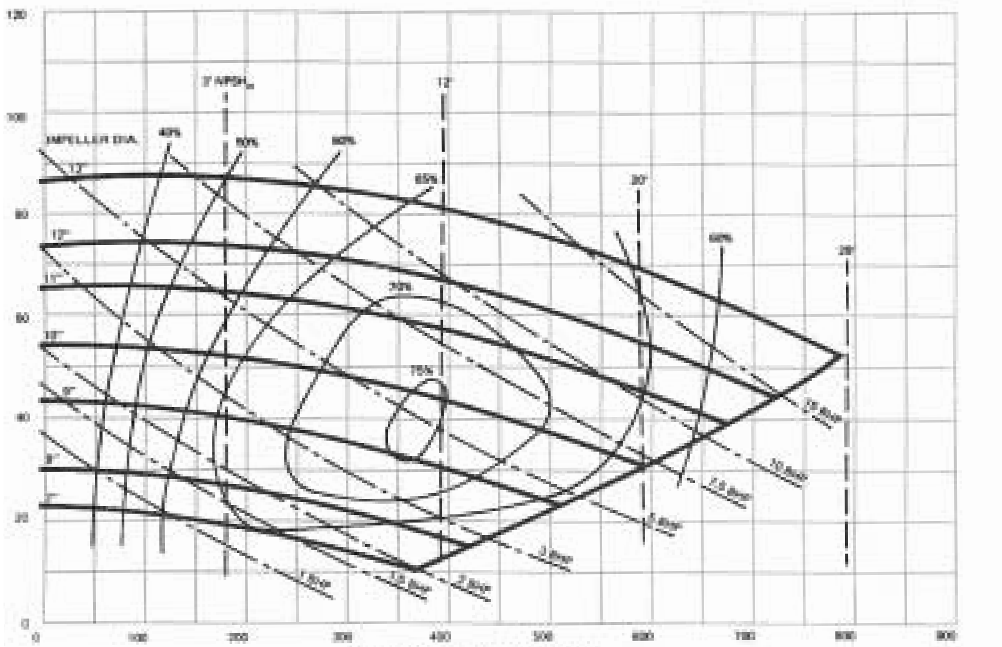
Capacity – U.S. Gallons per Minute



MAGNUM I
4 x 3 x 13
Speed : 1150 RPM
Curve: 947

Open Impeller
Dia: 7″ to 13″
Eye Area: 12.5 Sq. In.
Max. Sphere: 3/4 In.

TOTAL HEAD FEET

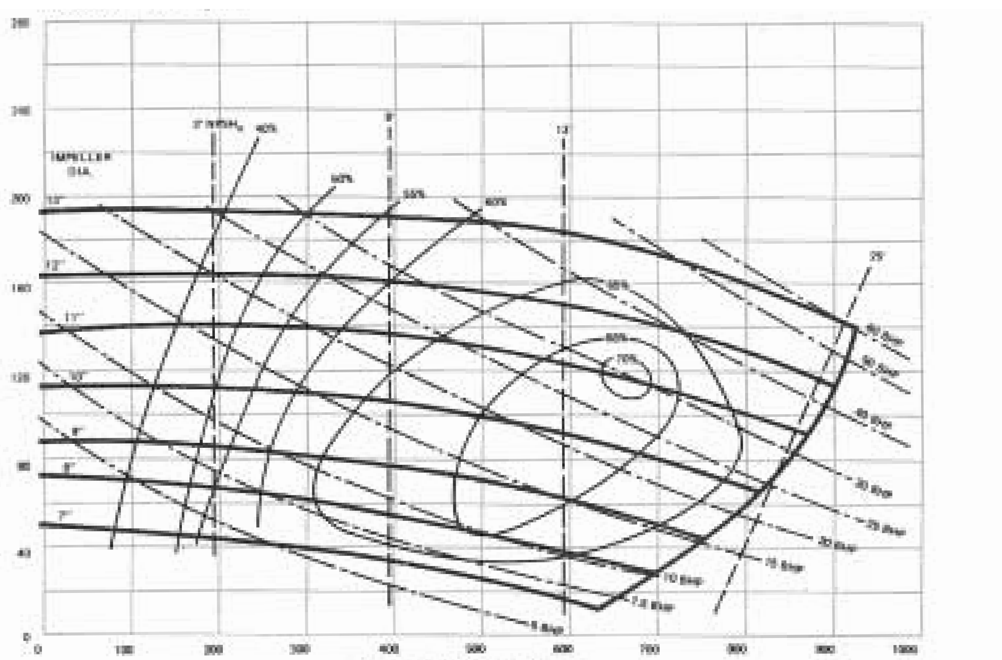


Capacity – U.S. Gallons per Minute

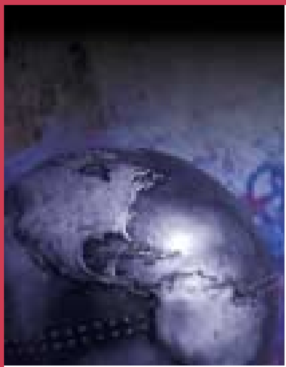
MAGNUM I
4 x 3 x 13
Speed : 1750 RPM
Curve: 948

Open Impeller
Dia: 7″ to 13″
Eye Area: 12.5 Sq. In.
Max. Sphere: 3/4 In.

TOTAL HEAD FEET



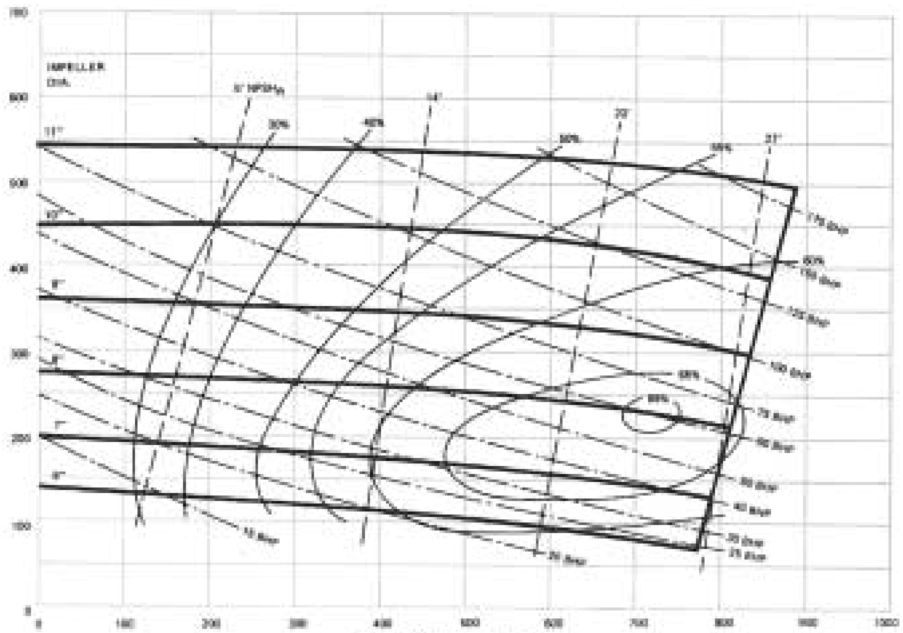
Capacity – U.S. Gallons per Minute



MAGNUM I
4 x 3 x 13
Speed : 3500 RPM
Curve: 949

Open Impeller
Dia: 6˝ to 11˝
Eye Area: 12.5 Sq. In.
Max. Sphere: 3/4 In.

TOTAL
HEAD
FEET

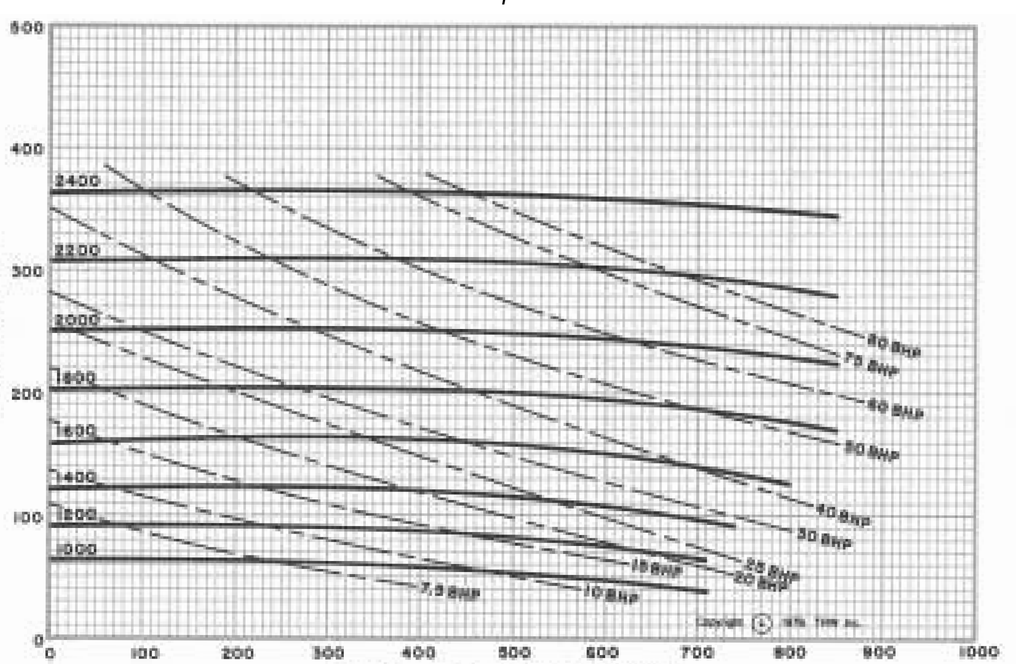


Capacity – U.S. Gallons per Minute

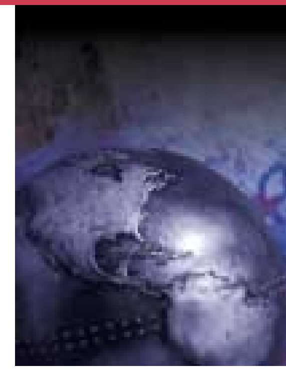
MAGNUM I
4 x 3 x 13
Speed : 1000-2400 RPM
Curve: 977

Open Impeller
Dia: 13˝
Eye Area: 12.5 Sq. In.
Max. Sphere: 3/4 In.

TOTAL
HEAD
FEET



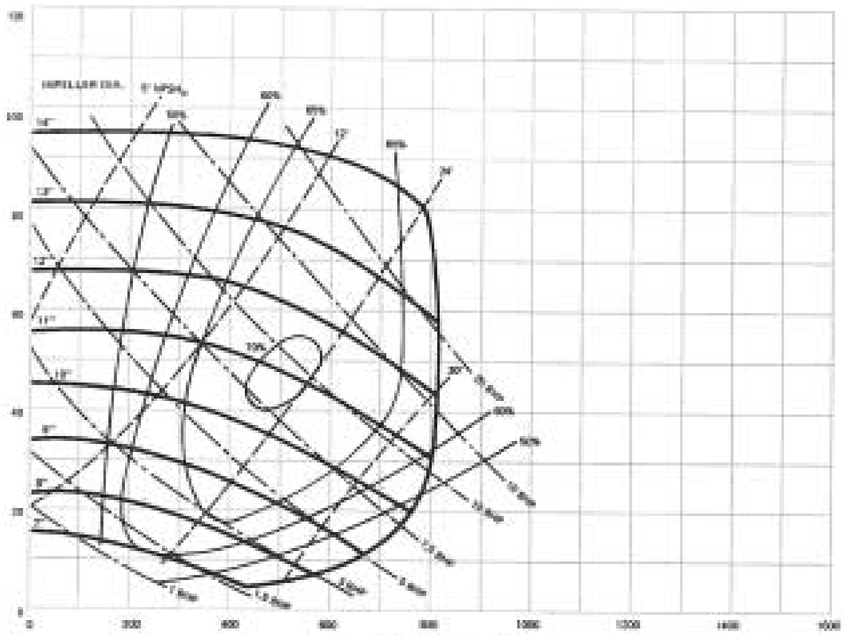
Capacity – U.S. Gallons per Minute



MAGNUM I
5 x 4 x 14
Speed : 1150 RPM
Curve: 950

Open Impeller
Dia: 7″ to 14″
Eye Area: 19.6 Sq. In.
Max. Sphere: 13/32 In.

TOTAL HEAD FEET

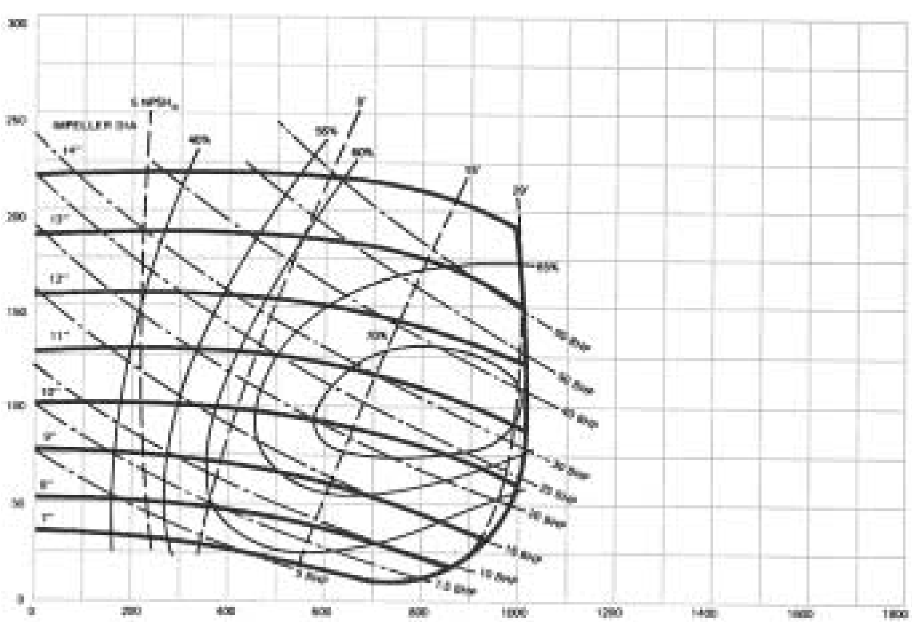


Capacity – U.S. Gallons per Minute

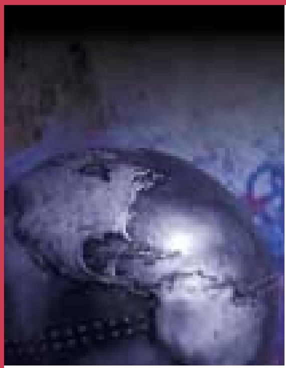
MAGNUM I
5 x 4 x 14
Speed : 1750 RPM
Curve: 951

Open Impeller
Dia: 7″ to 14″
Eye Area: 19.6 Sq. In.
Max. Sphere: 13/32 In.

TOTAL HEAD FEET



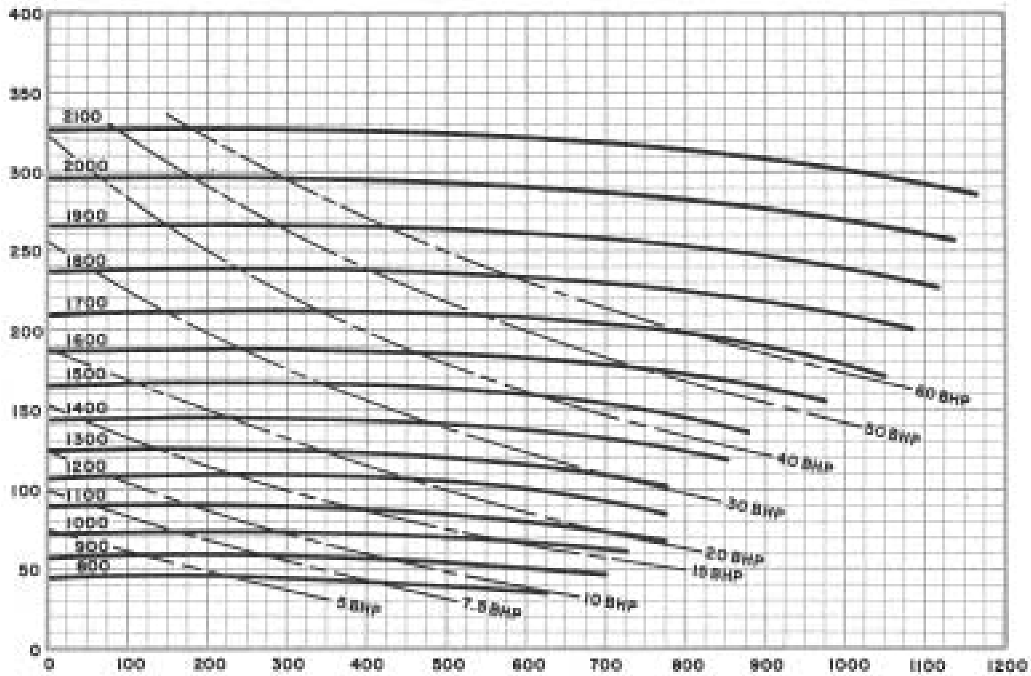
Capacity – U.S. Gallons per Minute



MAGNUM I
5 x 4 x 14
Speed : 800-2100 RPM
Curve: 978

Open Impeller
Dia: 14˝
Eye Area: 19.6 Sq. In.
Max. Sphere: 13/32 In.

TOTAL HEAD FEET

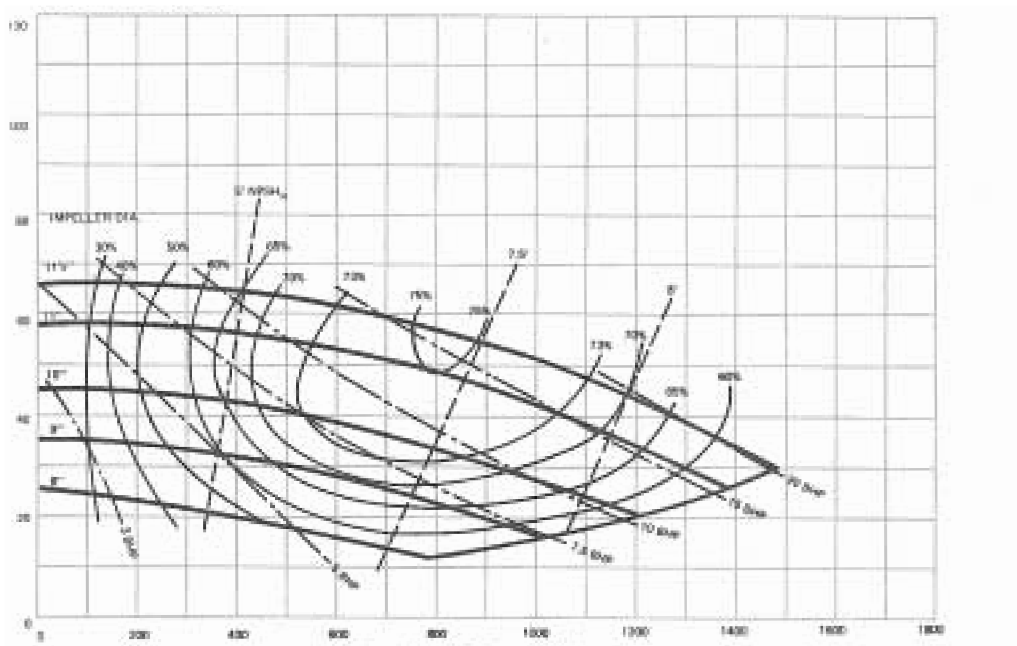


Capacity – U.S. Gallons per Minute

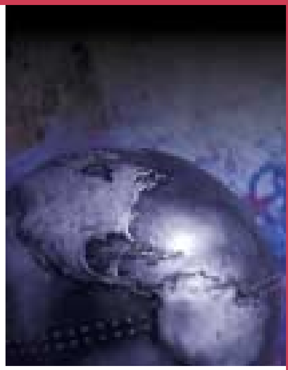
MAGNUM I
6 x 5 x 11
Speed : 1150 RPM
Curve: 954

Open Impeller
Dia: 8˝ to 11 1/2˝
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET



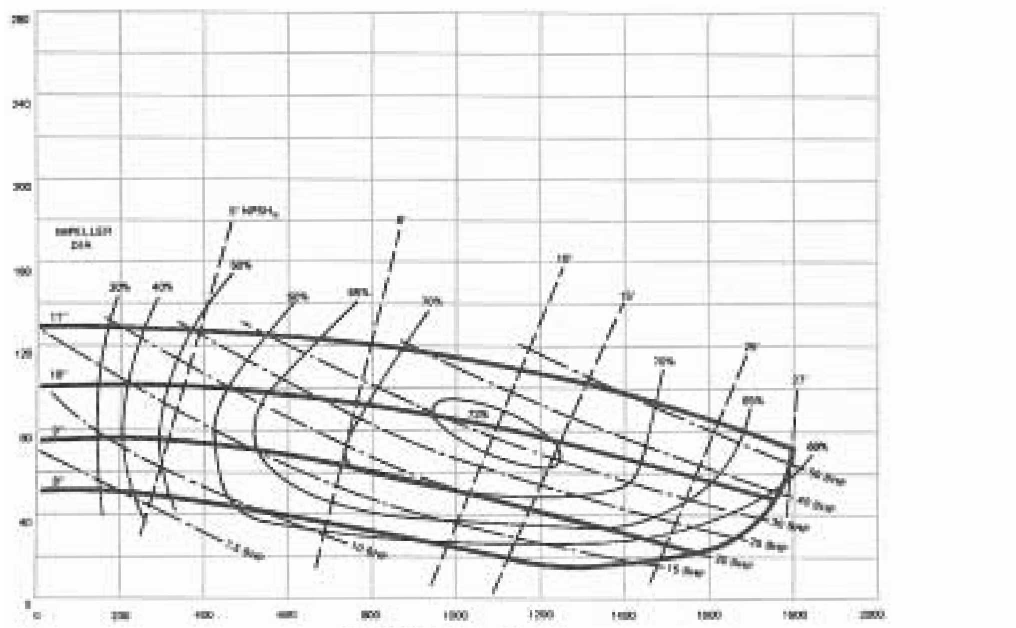
Capacity – U.S. Gallons per Minute



MAGNUM I
6 x 5 x 11
Speed : 1750 RPM
Curve: 955

Open Impeller
Dia: 8˝ to 11˝
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET

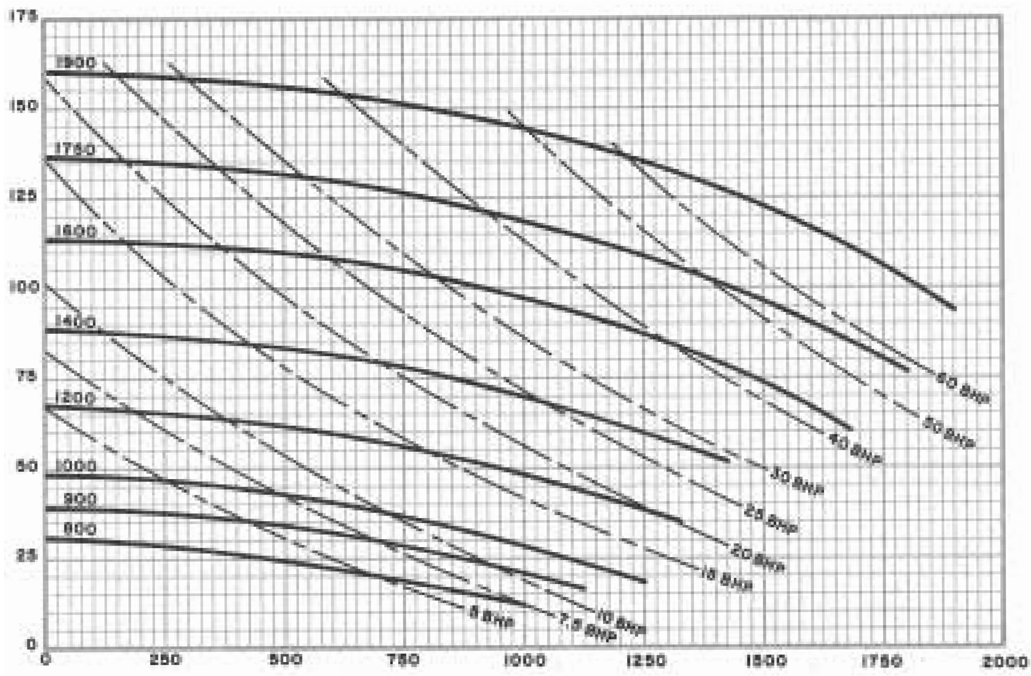


Capacity – U.S. Gallons per Minute

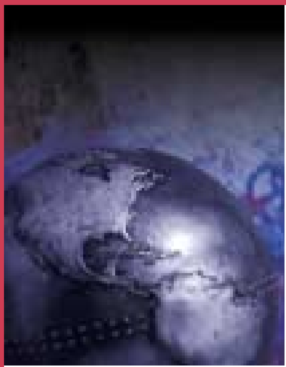
MAGNUM I
6 x 5 x 11
Speed : 800-1900 RPM
Curve: 981

Open Impeller
Dia: 11˝
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET



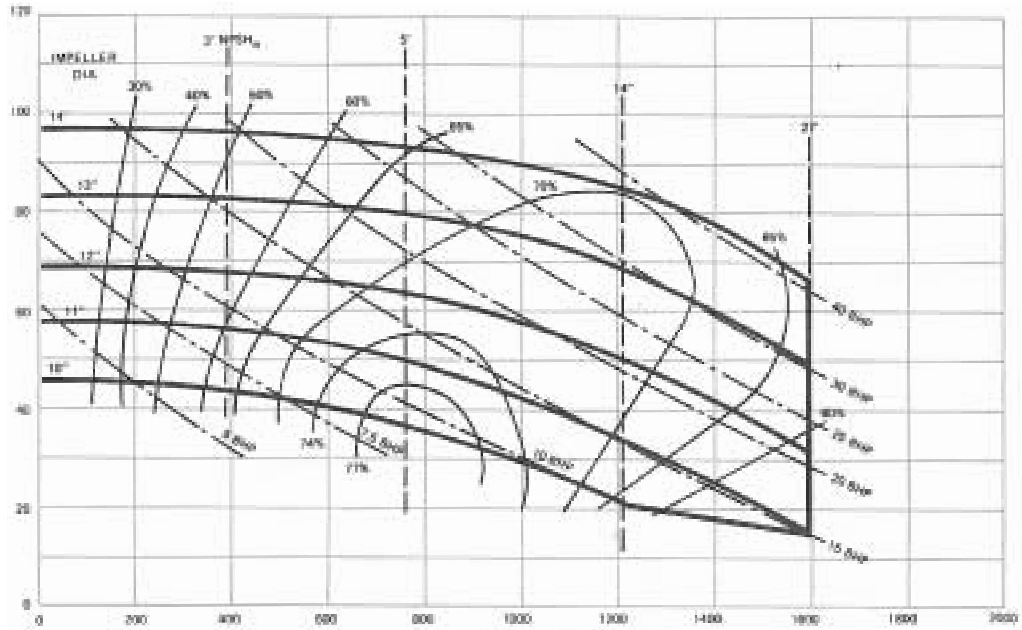
Capacity – U.S. Gallons per Minute



MAGNUM I
6 x 5 x 14
Speed : 1150 RPM
Curve: 952

Open Impeller
Dia: 10″ to 14″
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET

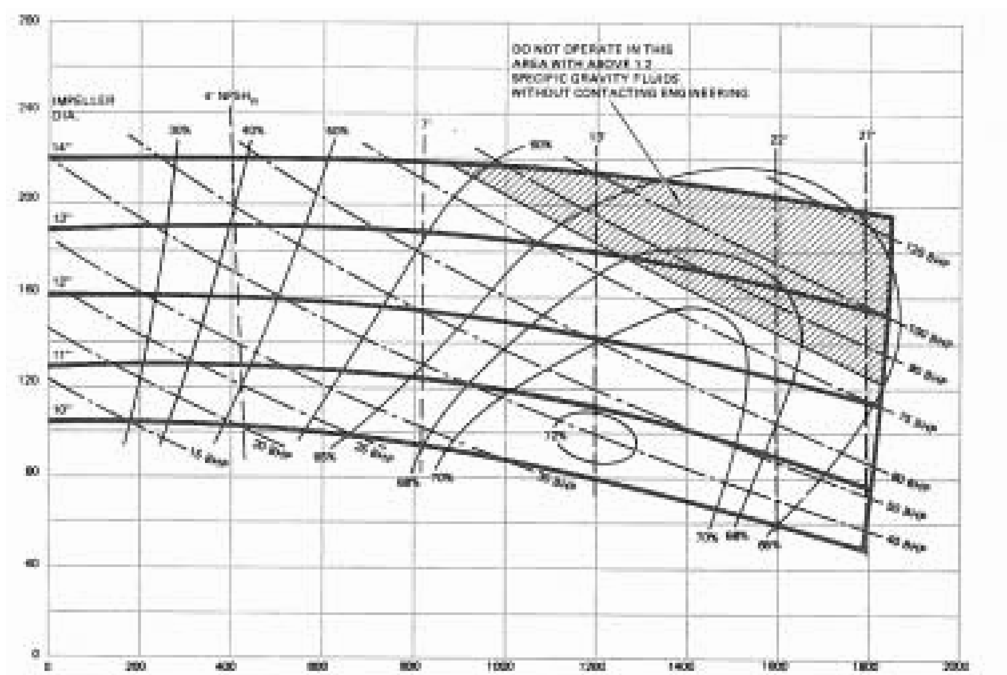


Capacity – U.S. Gallons per Minute

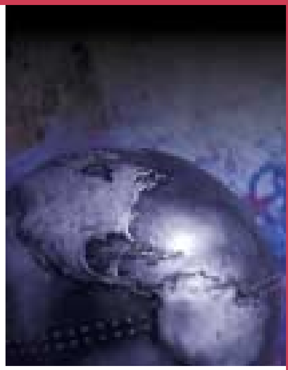
MAGNUM I
6 x 5 x 14
Speed : 1750 RPM
Curve: 953

Open Impeller
Dia: 10″ to 14″
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET



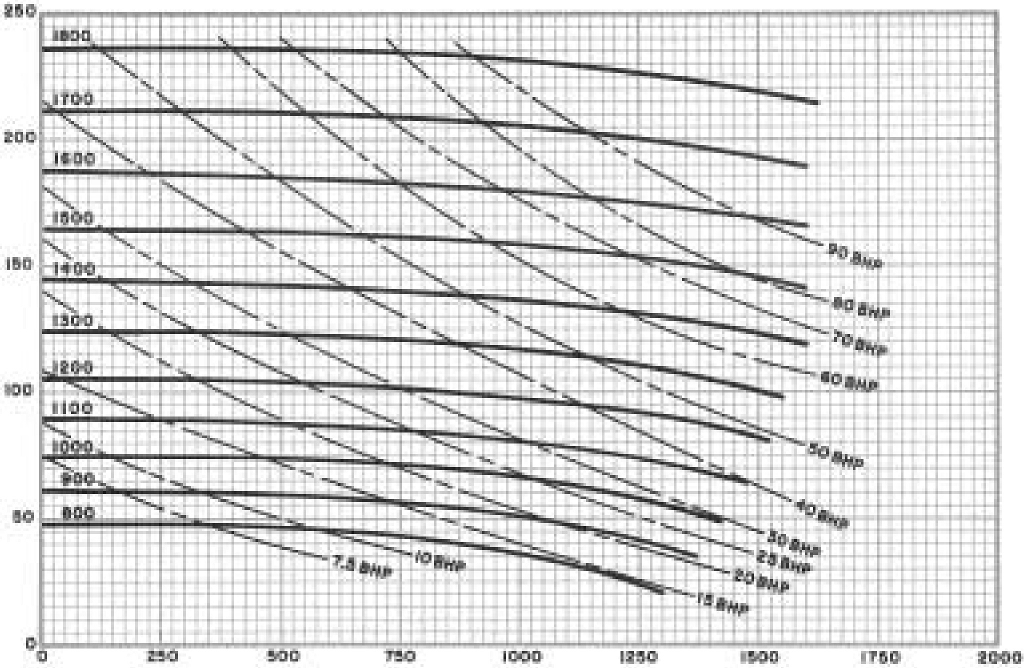
Capacity – U.S. Gallons per Minute



MAGNUM I
6 x 5 x 14
Speed : 800-1800 RPM
Curve: 979

Open Impeller
Dia: 14˝
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET

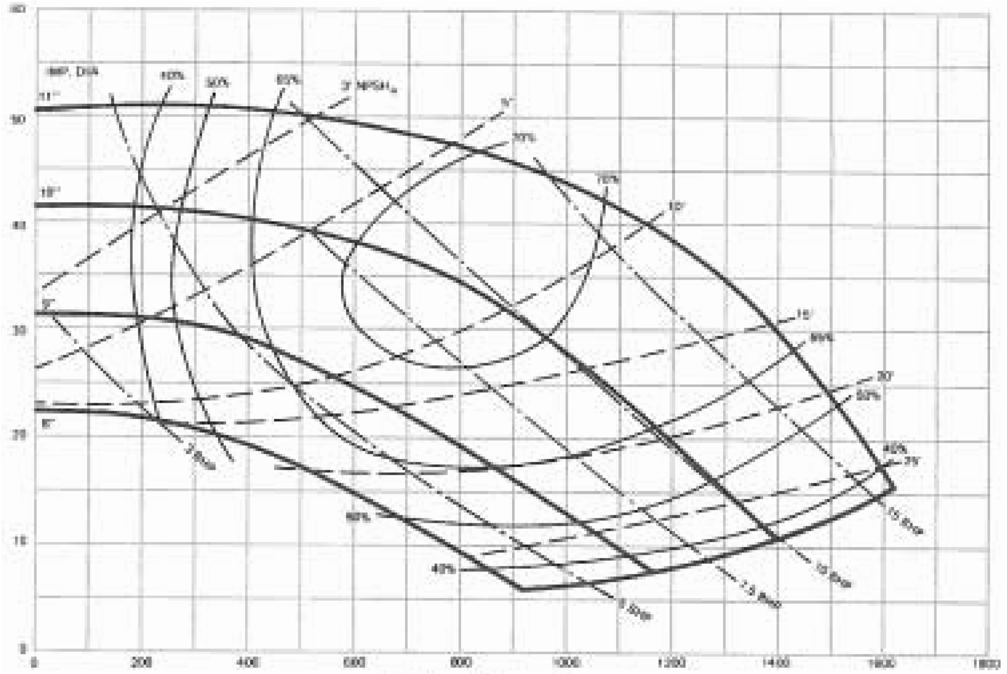


Capacity – U.S. Gallons per Minute

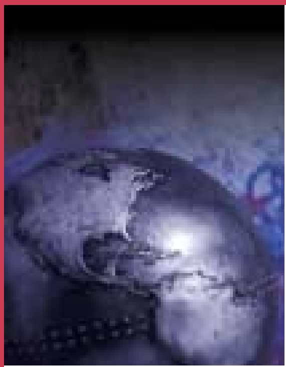
MAGNUM I
8 x 6 x 11
Speed : 1150 RPM
Curve: 974

Open Impeller
Dia: 8˝ to 11˝
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL HEAD FEET



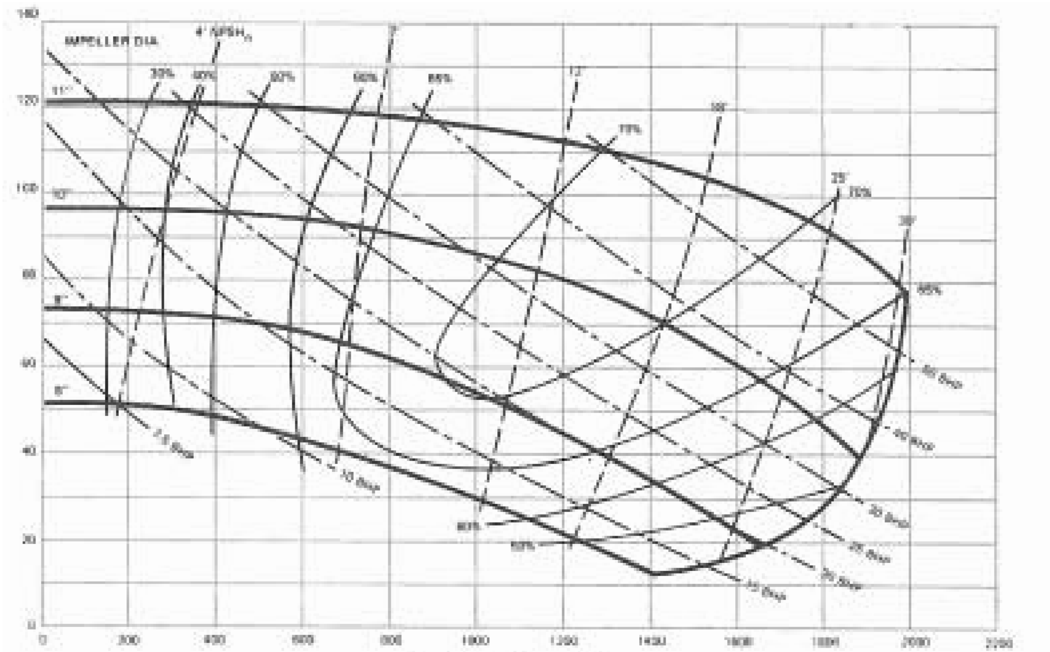
Capacity – U.S. Gallons per Minute



MAGNUM I
8 x 6 x 11
Speed : 1750 RPM
Curve: 975

Open Impeller
Dia: 8″ to 11″
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL
HEAD
FEET

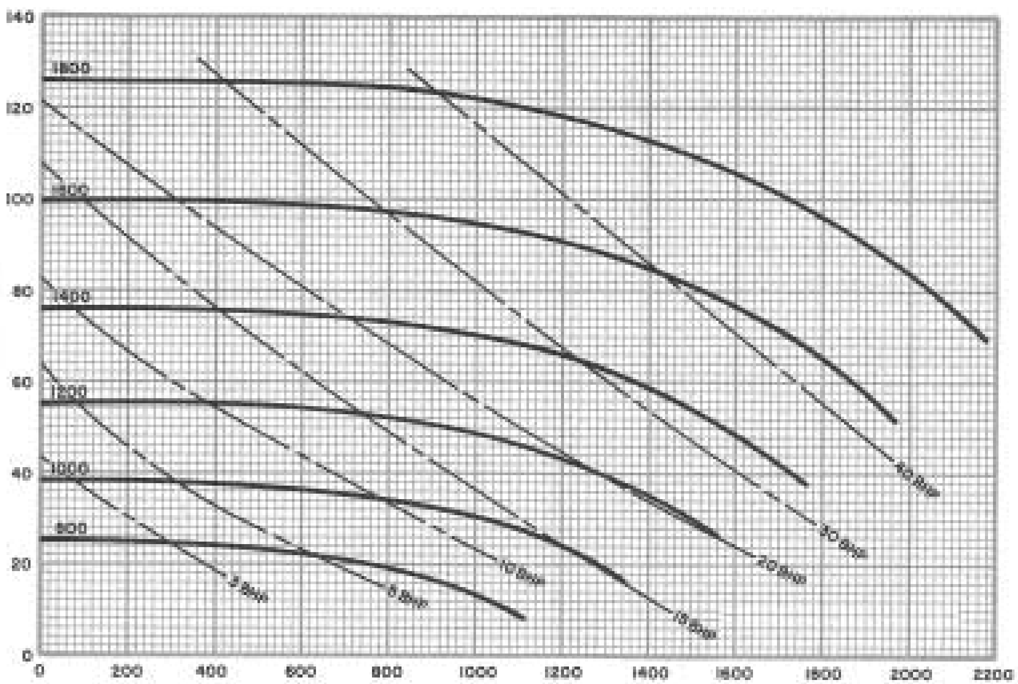


Capacity – U.S. Gallons per Minute

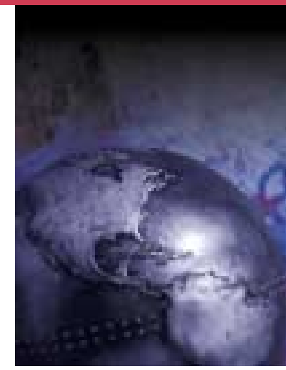
MAGNUM I
8 x 6 x 11
Speed : 800-1800 RPM
Curve: 982

Open Impeller
Dia: 11″
Eye Area: 28.3 Sq. In.
Max. Sphere: 15/16 In.

TOTAL
HEAD
FEET



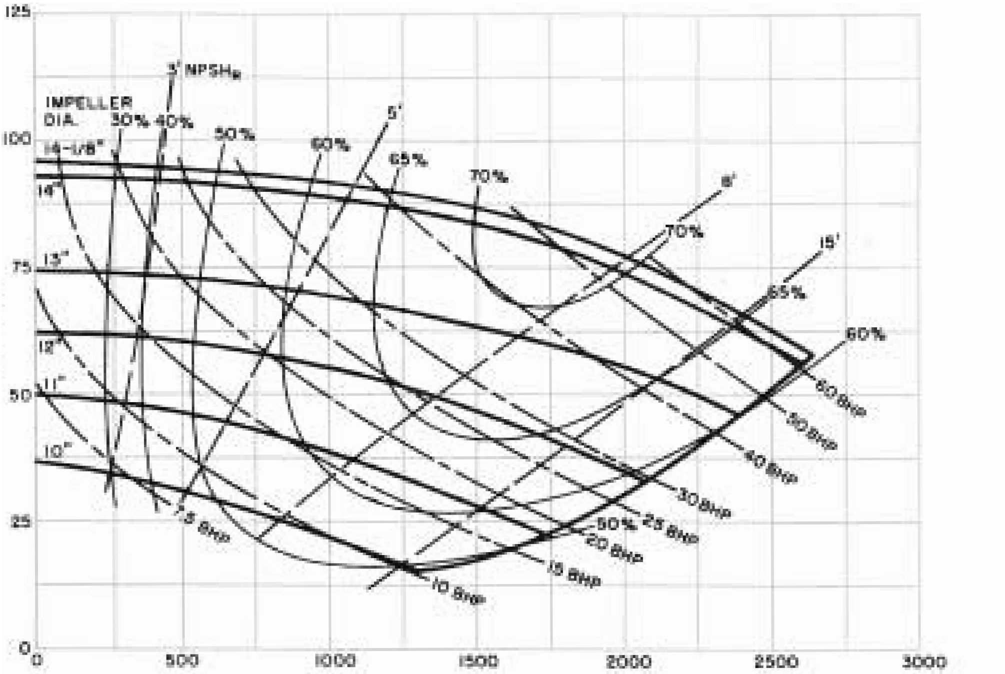
Capacity – U.S. Gallons per Minute



MAGNUM I
8 x 6 x 14
Speed : 1150 RPM
Curve: 956

Open Impeller
Dia: 10″ to 14 1/8″
Eye Area: 50.3 Sq. In.
Max. Sphere: 1 3/8 In.

TOTAL HEAD FEET

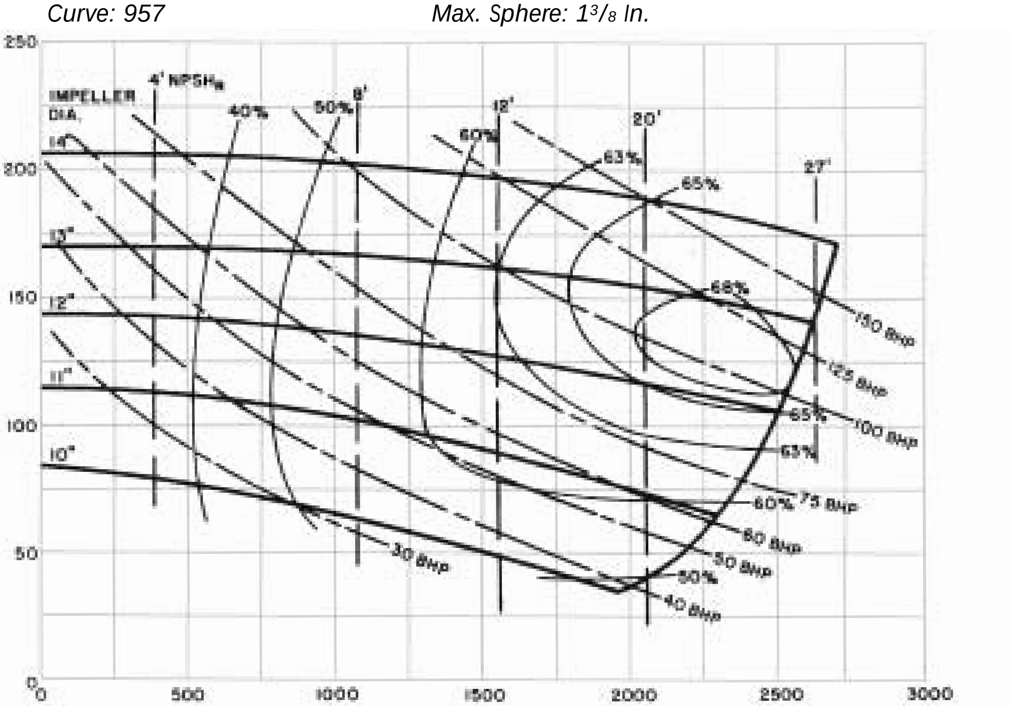


Capacity – U.S. Gallons per Minute

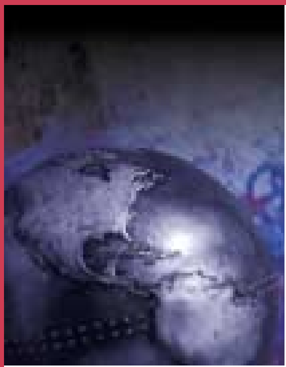
MAGNUM I
8 x 6 x 14
Speed : 1750 RPM
Curve: 957

Open Impeller
Dia: 10″ to 14″
Eye Area: 50.3 Sq. In.
Max. Sphere: 1 3/8 In.

TOTAL HEAD FEET



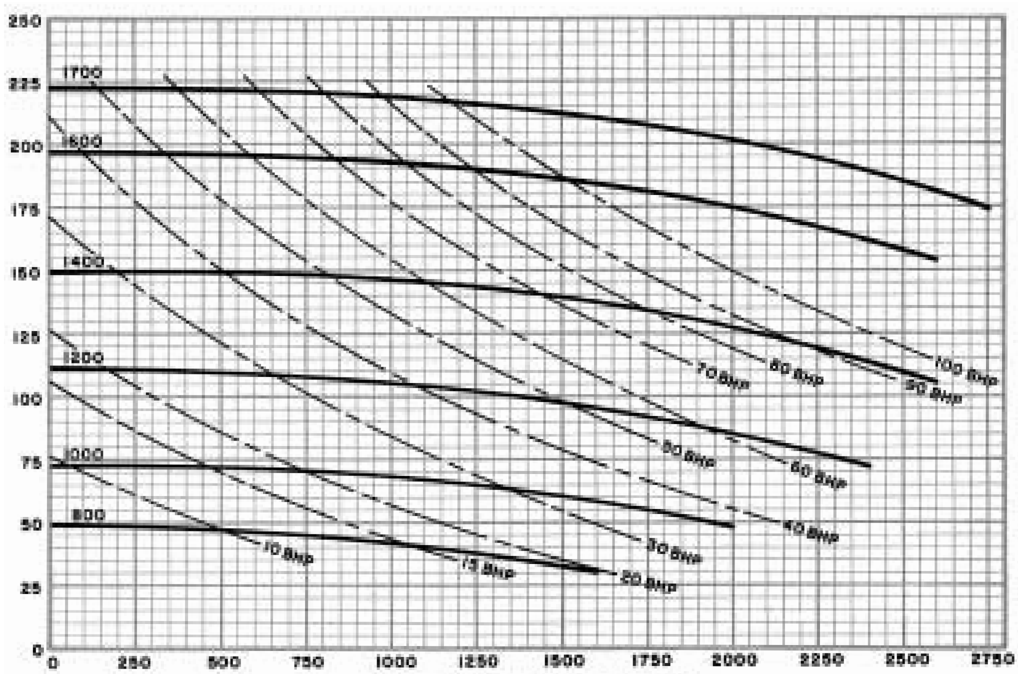
Capacity – U.S. Gallons per Minute



MAGNUM I
8 x 6 x 14
Speed : 800-1700 RPM
Curve: 980

Open Impeller
Dia: $14^{1}/_{8}$″
Eye Area: 50.3 Sq. In.
Max. Sphere: $1^{3}/_{8}$ In.

TOTAL
HEAD
FEET

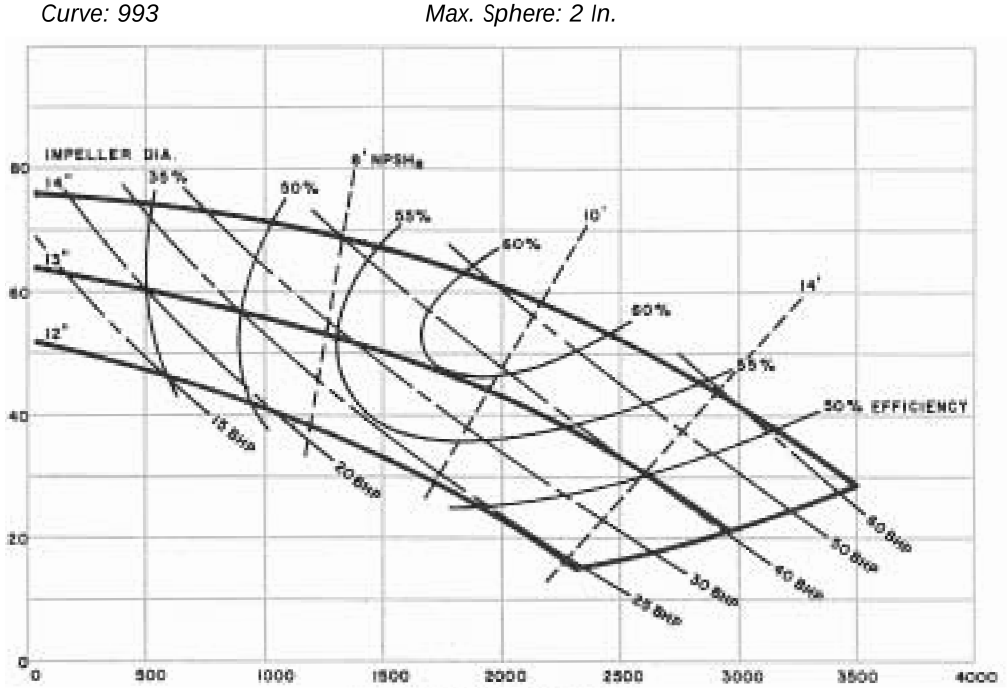


Capacity – U.S. Gallons per Minute

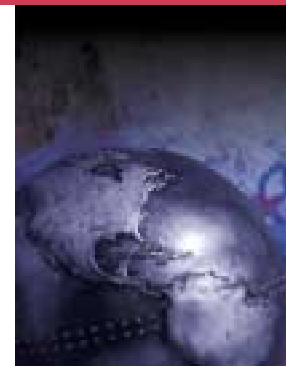
MAGNUM I
10 x 8 x 14
Speed : 1150 RPM
Curve: 993

Open Impeller
Dia: 12″ to 14″
Eye Area: 63 Sq. In.
Max. Sphere: 2 In.

TOTAL
HEAD
FEET



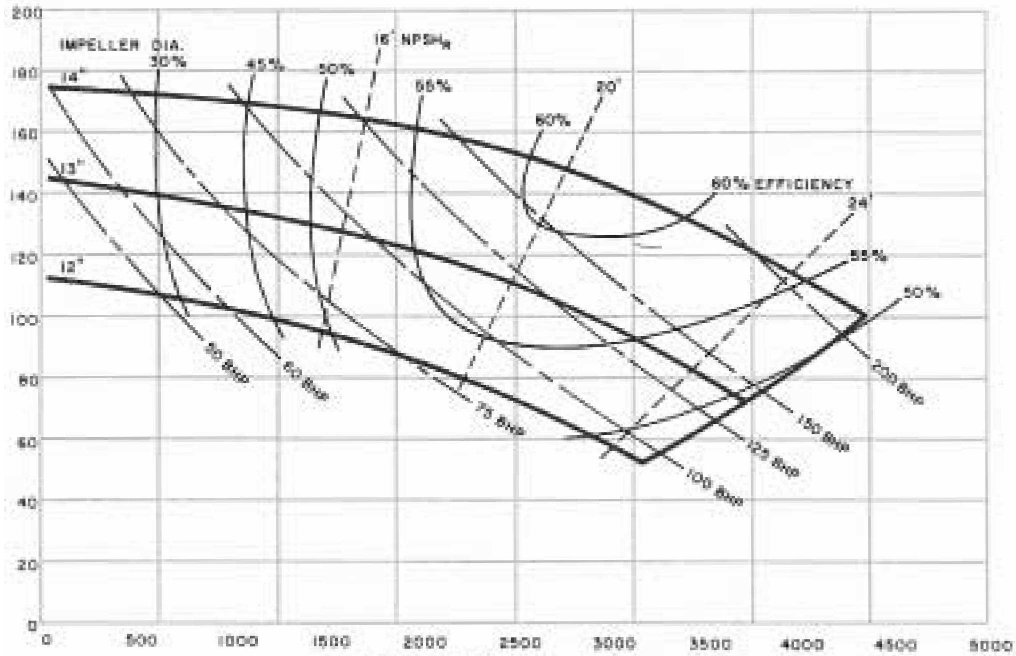
Capacity – U.S. Gallons per Minute



MAGNUM I
10 x 8 x 14
Speed : 1750 RPM
Curve: 994

Open Impeller
Dia: 12″ to 14″
Eye Area: 63 Sq. In.
Max. Sphere: 2 In.

TOTAL HEAD FEET

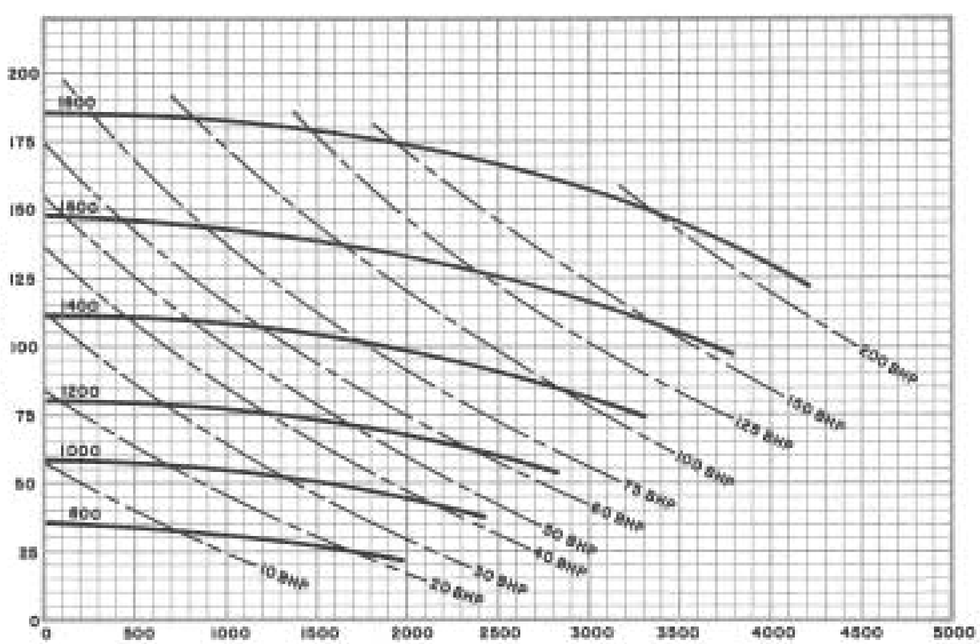


Capacity – U.S. Gallons per Minute

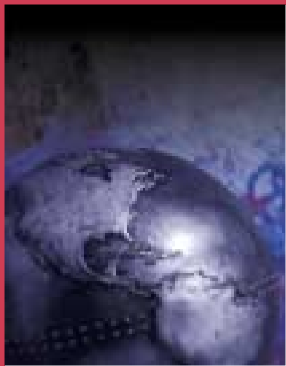
MAGNUM I
10 x 8 x 14
Speed : 800-1800 RPM
Curve: 995

Open Impeller
Dia: 14 1/8″
Eye Area: 63 Sq. In.
Max. Sphere: 2 In.

TOTAL HEAD FEET



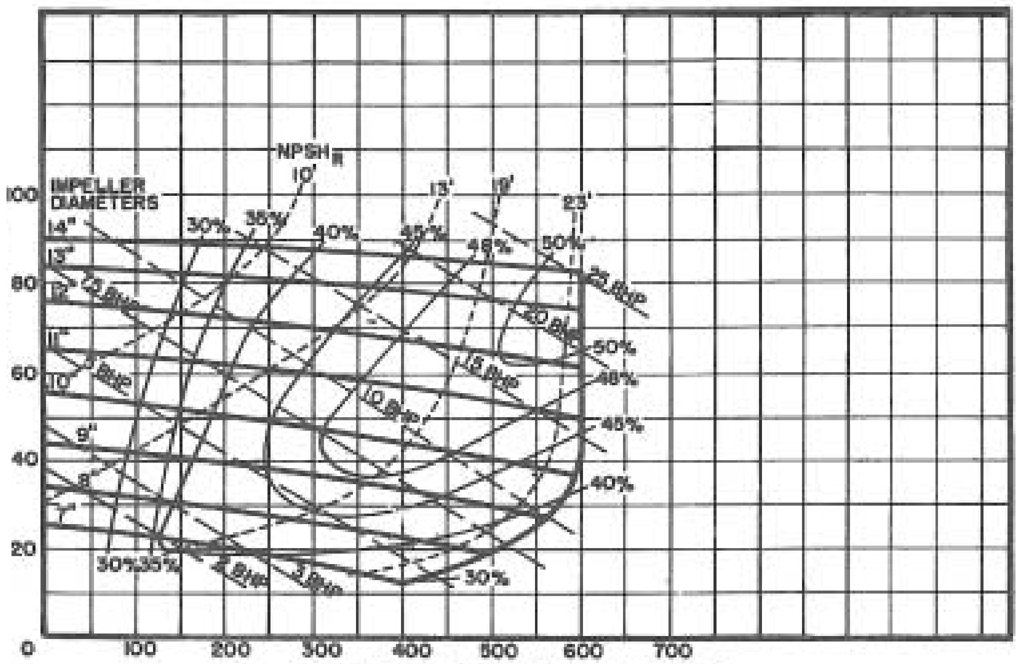
Capacity – U.S. Gallons per Minute



VORTEX
3 x 3
Speed : 1150 RPM

Straight Vane Impeller
Dia: 7˝ to 14˝
Max. Sphere: 2 15/16 In.

TOTAL
HEAD
FEET

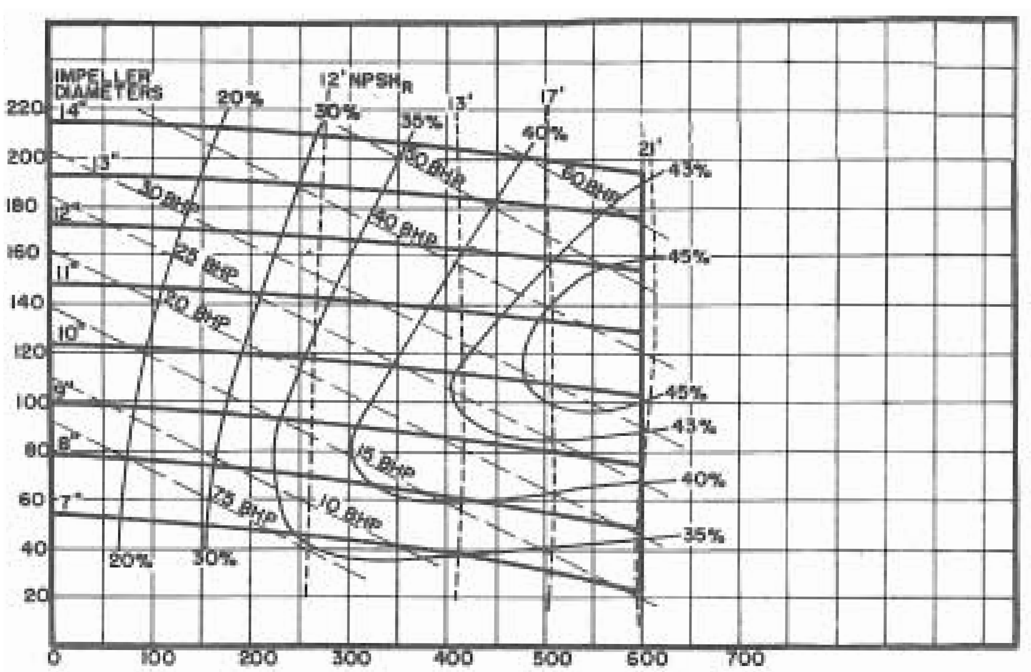


Capacity – U.S. Gallons per Minute

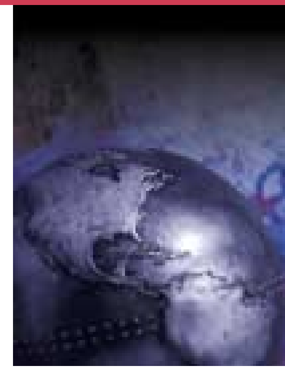
VORTEX
3 x 3
Speed : 1750 RPM

Straight Vane Impeller
Dia: 7˝ to 14˝
Max. Sphere: 2 15/16 In.

TOTAL
HEAD
FEET



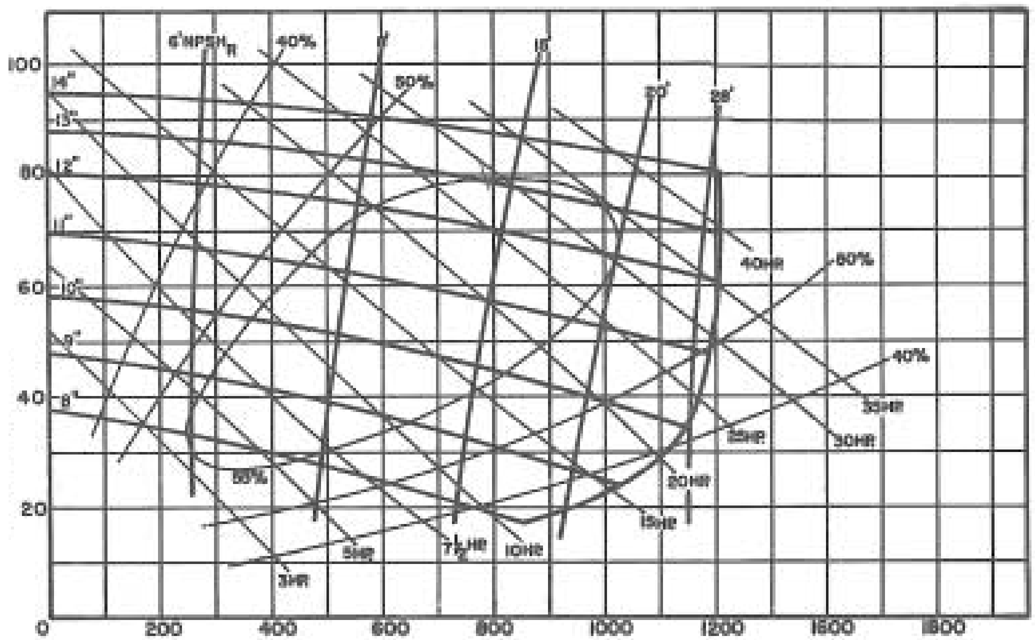
Capacity – U.S. Gallons per Minute



VORTEX
4 x 4
Speed : 1150 RPM

Straight Vane Impeller
Dia: 8˝ to 14˝
Max. Sphere: 4 In.

TOTAL HEAD FEET

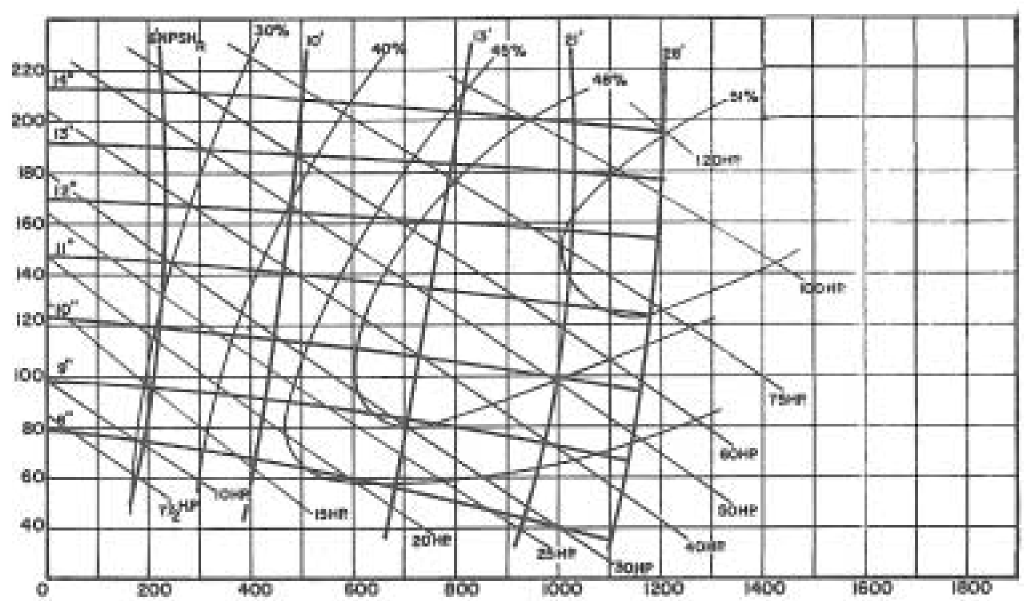


Capacity – U.S. Gallons per Minute

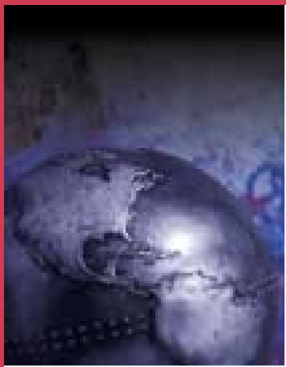
VORTEX
4 x 4
Speed : 1750 RPM

Straight Vane Impeller
Dia: 8˝ to 14˝
Max. Sphere: 4 In.

TOTAL HEAD FEET



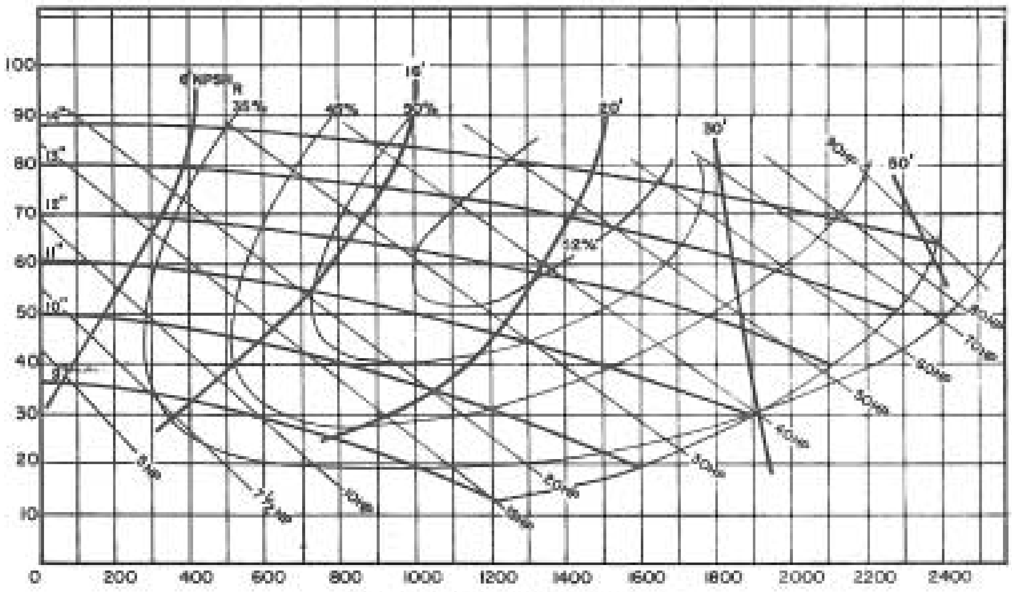
Capacity – U.S. Gallons per Minute



VORTEX
6 x 6
Speed : 1150 RPM

Straight Vane Impeller
Dia: 9˝ to 14˝
Max. Sphere: 6 In.

TOTAL HEAD FEET

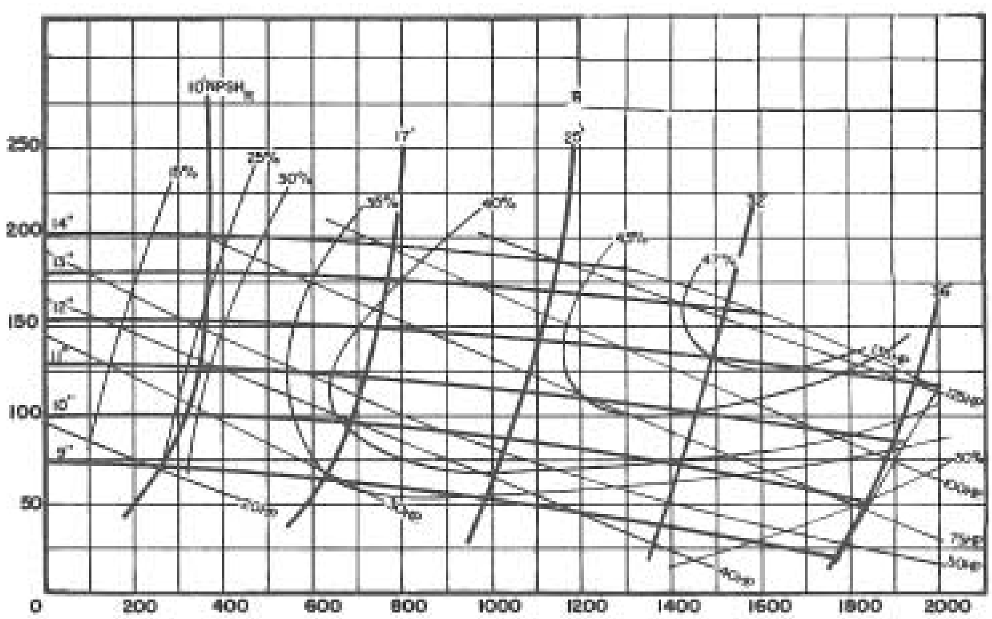


Capacity – U.S. Gallons per Minute

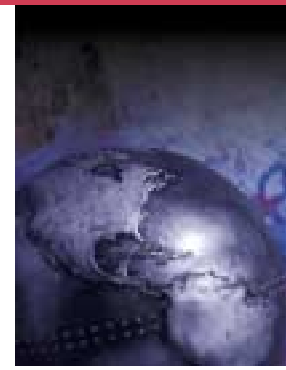
VORTEX
6 x 6
Speed : 1750 RPM

Straight Vane Impeller
Dia: 9˝ to 14˝
Max. Sphere: 6 In.

TOTAL HEAD FEET

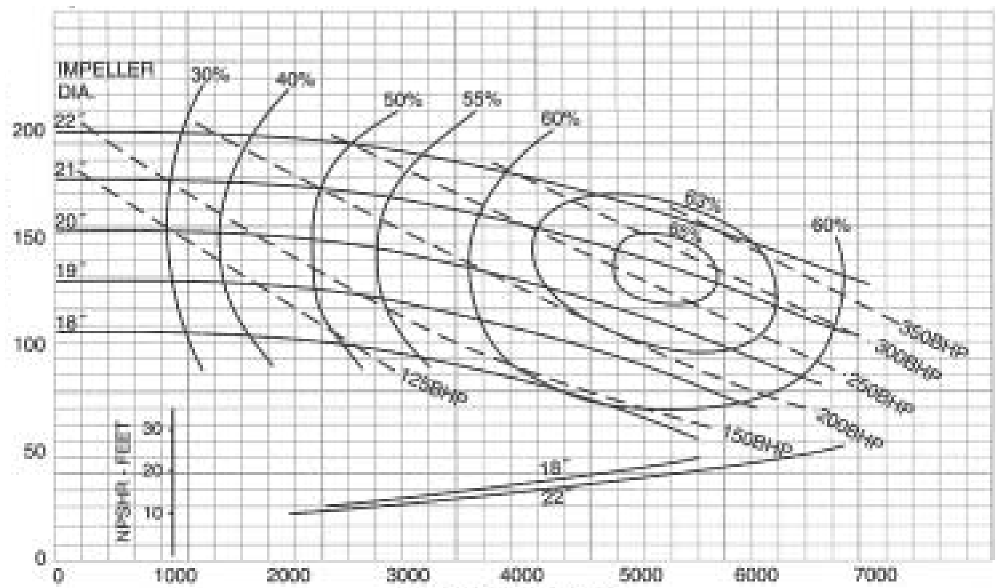


Capacity – U.S. Gallons per Minute



MAGNUM XP
14 x 12 x 22
Speed : 1200 RPM

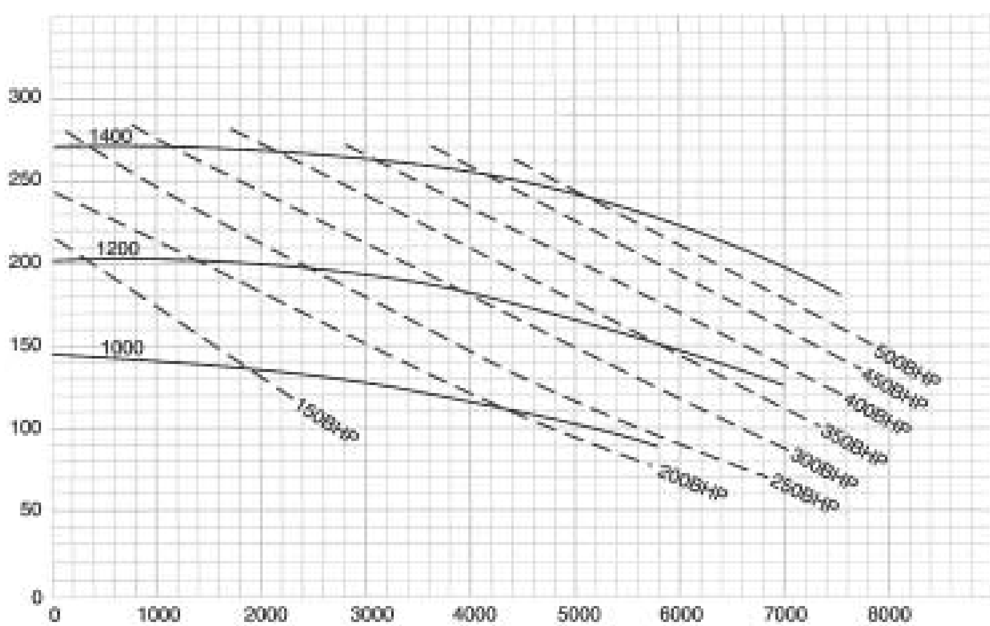
TOTAL HEAD FEET



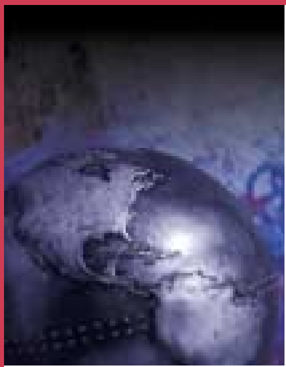
Capacity – U.S. Gallons per Minute

MAGNUM XP
14 x 12 x 22
Speed : 1000-1400 RPM

TOTAL HEAD FEET

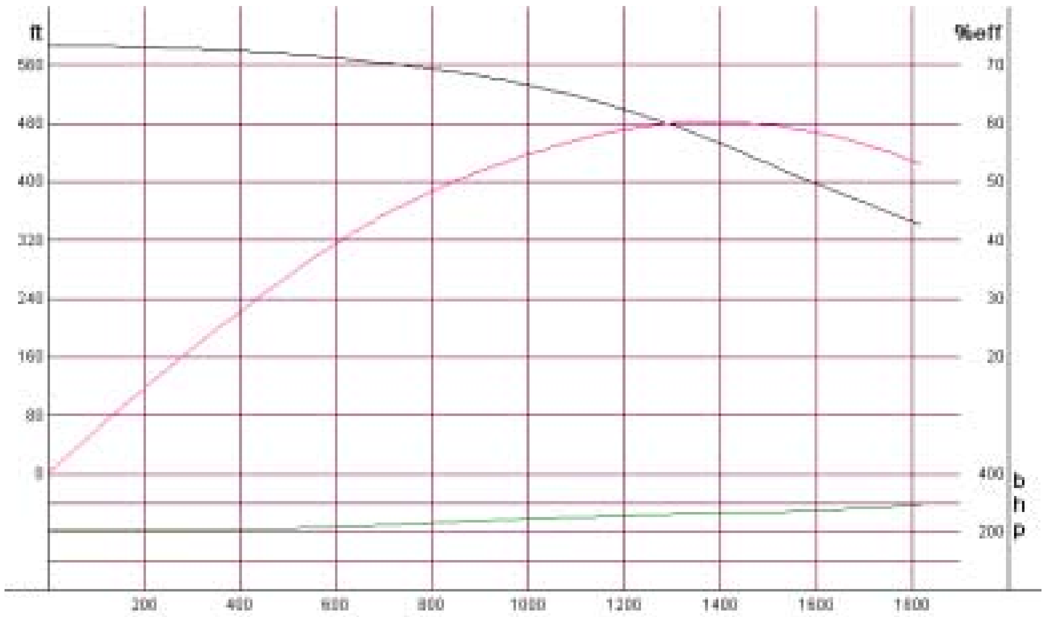


Capacity – U.S. Gallons per Minute



MAGNUM MULTISTAGE
Single Stage Performance
Dia: 13˝ IMP
Speed : 3600 RPM

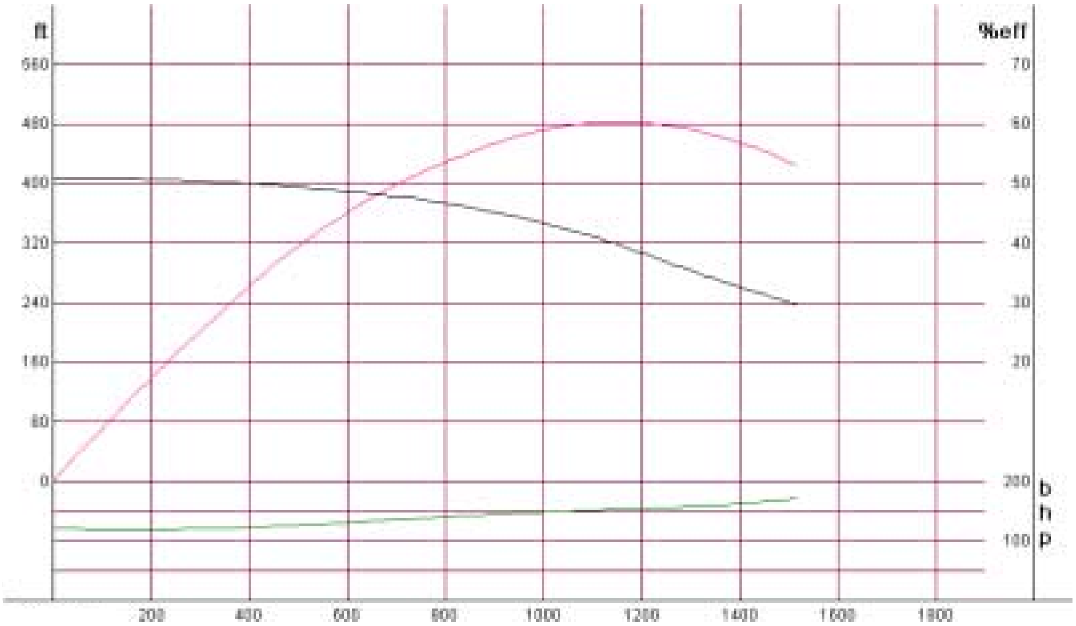
TOTAL HEAD FEET



Capacity – U.S. Gallons per Minute

MAGNUM MULTISTAGE
Single Stage Performance
Dia: 13˝ IMP
Speed : 3000 RPM

TOTAL HEAD FEET

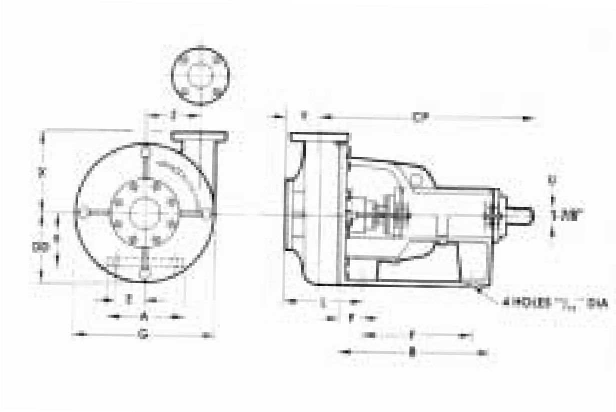


Capacity – U.S. Gallons per Minute

Engineering Data

Pump Dimensions

MAGNUM I, MAGNUM XL, MAGNACHROME & MAGNUM SHEAR

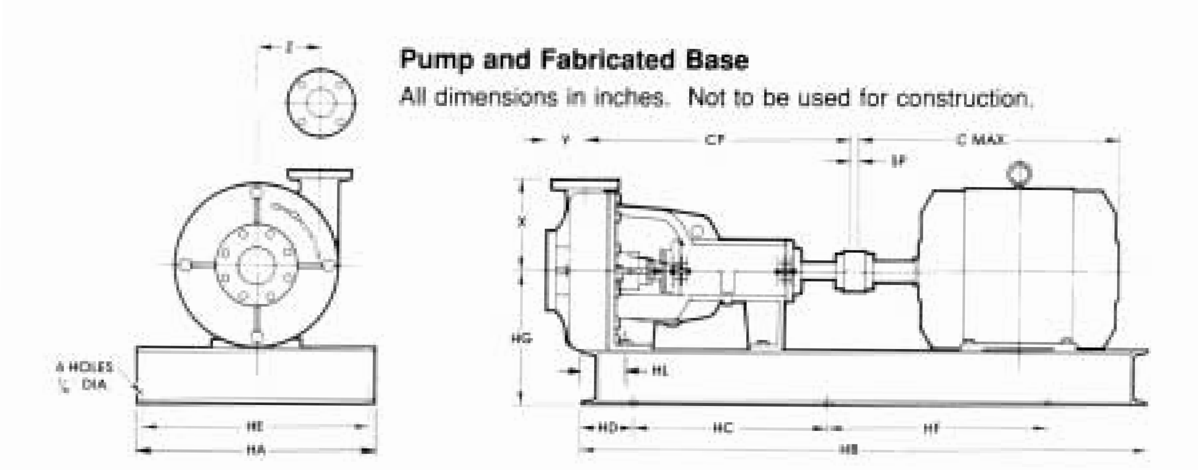


Flange Dimensions*

Size	ID	OD	BC	Thickness	No. of Holes	Size of Holes
2	2	6	4 3/4	5/8	4	3/4
3	3	7 1/2	6	3/4	4	3/4
4	4	9	7 1/2	15/16	8	3/4
5	5	10	8 1/2	15/16	8	7/8
6	6	11	9 1/2	1	8	7/8
8	8	13 1/2	11 3/4	1 1/8	8	7/8
10	10	16	14 1/4	1 3/16	12	1

*The above drilling is standard 125 lb. Cast Iron or Series 150 Steel Flat Face.

Pump Size	A	B	E	F	G	L	P	X	Y	Z	CP	DD	WT
3 x 2 x 13	9	19 5/8	3 1/2	15 7/16	17 7/8	8 3/4	2 5/16	10 1/4	3 3/4	7	29 1/4	8 15/16	440
4 x 3 x 13	9	19 5/8	3 1/2	15 7/16	17 7/8	9 3/8	2 5/16	10 1/4	4 1/4	6 3/4	29 3/8	8 15/16	436
5 x 4 x 14	9	19 5/8	3 1/2	15 7/16	19	10 3/4	2 5/16	11	5	6 1/8	30	9 1/2	485
6 x 5 x 11	9	19 5/8	3 1/2	15 7/16	17 7/8	12 1/16	2 5/16	11	5 3/4	6	30 5/8	8 15/16	507
6 x 5 x 14	9	19 5/8	3 1/2	15 7/16	21	12 1/16	2 5/16	11	5 3/4	6	30 5/8	10 1/2	550
8 x 6 x 11	9	19 5/8	3 1/2	15 7/16	20	13 1/4	2 5/16	14	6 1/4	8 3/8	31 1/4	10	583
8 x 6 x 14	9	19 5/8	3 1/2	15 7/16	23 9/16	13 1/4	2 5/16	14	6 1/4	8 3/8	31 1/4	11 13/16	616
10 x 8 x 14	9	19 5/8	3 1/2	15 7/16	22 3/8	13 11/16	2 5/16	14 3/16	7	8	31 1/4	11 3/16	810



Pump and Fabricated Base

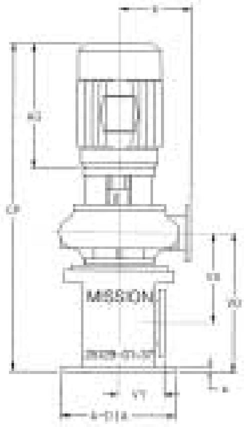
All dimensions in inches. Not to be used for construction.

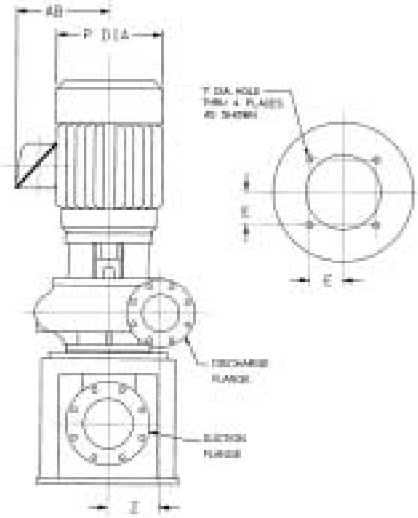
Dimensions determined by motor*

Motor Frames	Base	C Max	HA	HB	HC	HD	HE	HF	HG	HL	SP*	Base Wt.
182T-215T	FB-5	19 13/32	13 7/16	47 3/4	13	3 23/32	12 1/2	22	13	4 7/8	1	109
254T-286T	FB-2	28 7/64	20 11/32	56 7/32	20	3 59/64	19	21	15	4 7/8	1	170
324T-326T	FB-2	31 1/8	20 11/32	56 7/32	20	3 59/64	19	21	15	4 7/8	1	170
364T-365T	FB-3	33 7/8	26 3/32	64 11/32	22	5 59/64	25	25	17	4 7/8	1	229
404T-405T	FB-3	37 63/64	26 3/32	64 11/32	22	5 59/64	25	25	17	4 7/8	1	229
444T-445T	FB-4	44 1/4	31 7/32	69 31/32	24	5 59/64	27 3/8	30	17 1/2	4 7/8	1	257

*Unless spacer coupling is specified

VERTICAL





VORTEX

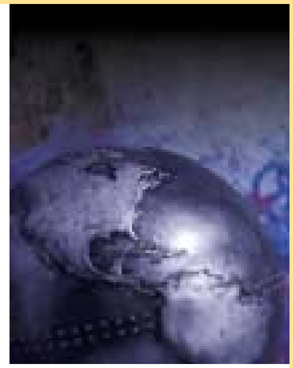
Motor Frames	AB	AG	CP 3x3x14	CP 4x4x14	CP 6x6x14	P	Motor Wt.
213P	9	20	61	65	65	11	310
215P	9	20	61	65	65	11	360
254P	10 1/2	24	66	69	69	13 1/4	380
256P	10 1/2	24	66	69	69	13 1/4	410
284P	13	26 3/4	67	71	71	14	620
286P	13	26 3/4	67	71	71	14	640
324P	14 1/4	29	71	74	74	17	885
326P	14 1/4	29	71	74	74	17	910
364P	15	31	73	76	76	18	1200
365P	15	31	73	76	76	18	1470
Assembled unit weight less motor – pounds			825	855	965		

Pump Size	Pipe Flanges: Suction Pipe Size	Suction Pipe Bolt Pattern	Discharge Pipe Size	Discharge Pipe Bolt Pattern	Dimensions in Inches: A	E	G	VD	VS	VY	X	Z
3 x 3 x 14	3	4 Holes 3/4 D-6 B.C.	3	4 Holes 3/4 D-4 3/4 B.C.	22 1/2 D	5 5/16	1	27 3/4	16 1/4	7 1/4	11	7 1/4
4 x 4 x 14	4	8 Holes 3/4 D-7 1/2 B.C.	4	8 Holes 3/4 D-7 1/2 B.C.	22 1/2 D	5 5/16	1	27 3/4	16 3/16	9	11	7 1/4
6 x 6 x 14	6	8 Holes 7/8 D-9 1/2 B.C.	6	8 Holes 7/8 D-9 1/2 B.C.	22 1/2 D	5 5/16	1	29 1/2	21 13/16	9 1/2	13	7 1/4

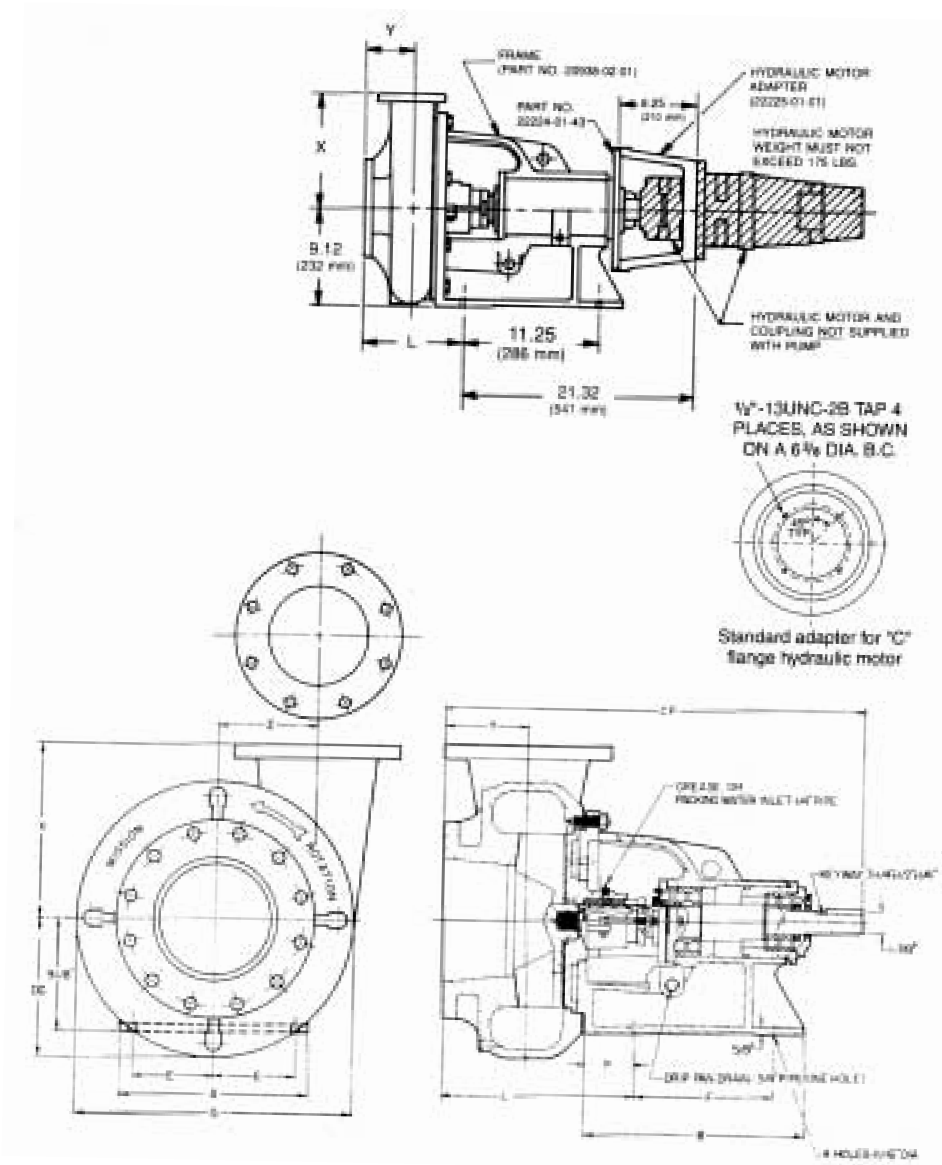
MAGNUM

Motor Frames	AB	AG	CP 3x2x13	CP 4x3x13	CP 5x4x14	CP 6x5x11	CP 6x5x14	CP 8x6x11	CP 8x6x14	P	Motor Wt.
213P	9	20	56	57	58	59 3/4	59 3/4	60	60	11	310
215P	9	20	56	57	58	59 3/4	59 3/4	60	60	11	360
254P	10 1/2	24	60	61	62	64	64	65	65	13 1/4	380
256P	10 1/2	24	60	61	62	64	64	65	65	13 1/4	410
284P	13	26 3/4	62 3/4	63	64 3/4	66	66	67 1/4	67 1/4	14	620
286P	13	26 3/4	62 3/4	63	64 3/4	66	66	67v	67 1/4	14	640
324P	14 1/4	29	65	66	67	69	69	70	70	17	885
326P	14 1/4	29	65	66	67	69	69	70	70	17	910
364P	15	31	67	68	69	71	71	71	72	18	1200
365P	15	31	67	68	69	71	71	71	72	18	1470
Assembled unit weight less motor – pounds			800	820	855	885	925	960	990		

Pump Size	Pipe Flanges: Suction Pipe Size	Suction Pipe Bolt Pattern	Discharge Pipe Size	Discharge Pipe Bolt Pattern	Dimensions in Inches: A	E	G	VD	VS	VY	X	Z
3 x 2 x 13	3	4 Holes 3/4 D-6 B.C.	2	4 Holes 3/4 D-4 3/4 B.C.	22 1/2 D	5 5/16	1	25 1/4	13 3/4	7 1/4	10 1/4	7
4 x 3 x 13	4	8 Holes 3/4 D-7 1/2 B.C.	3	8 Holes 3/4 D-6 B.C.	22 1/2 D	5 5/16	1	25 3/4	14	9	10 1/4	6 3/4
5 x 4 x 14	5	8 Holes 7/8 D-8 1/2 B.C.	4	8 Holes 7/8 D-7 1/2 B.C.	22 1/2 D	5 5/16	1	26 1/2	16 1/4	8 1/2	11	6 1/8
6 x 5 x 11	6	8 Holes 7/8 D-9 1/2 B.C.	5	8 Holes 7/8 D-8 1/2 B.C.	22 1/2 D	5 5/16	1	26 1/4	18	9 1/2	11	6
6 x 5 x 14	6	8 Holes 7/8 D-9 1/2 B.C.	5	8 Holes 7/8 D-8 1/2 B.C.	22 1/2 D	5 5/16	1	26 1/4	18	9 1/2	11	6
8 x 6 x 11	8	8 Holes 7/8 D-11 3/4 B.C.	6	8 Holes 7/8 D-9 1/2 B.C.	22 1/2 D	5 5/16	1	26 3/4	21	14	14	8
8 x 6 x 14	8	8 Holes 7/8 D-11 3/4 B.C.	6	8 Holes 7/8 D-9 1/2 B.C.	22 1/2 D	5 5/16	1	26 3/4	21	14	14	8 3/8



SANDMASTER

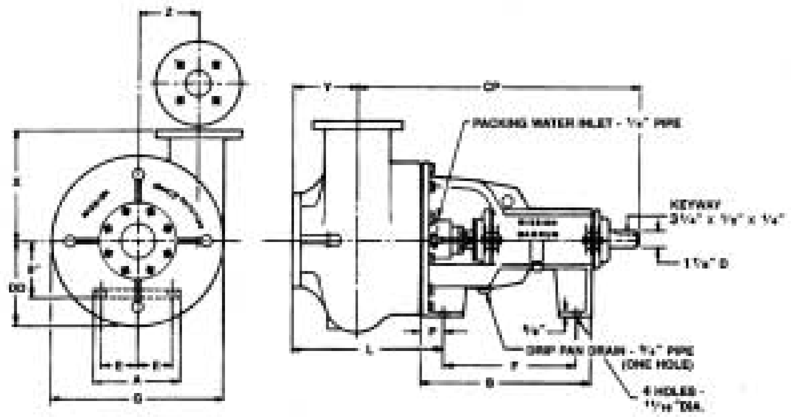


Dimensions in inches

Pump Size	A	B	E	F	G	L	P	X	Y	Z	CP	DD	WT
3 x 2 x 13	15 1/4	17 3/4	6 9/16	11 1/4	17 7/8	10 7/8	4	10 1/4	3 3/4	7	28 13/16	8 15/16	475
4 x 3 x 13	15 1/4	17 3/4	6 9/16	11 1/4	17 7/8	11 1/16	4	10 1/4	4 1/4	6 3/4	29 7/16	8 15/16	491
5 x 4 x 14	15 1/4	17 3/4	6 9/16	11 1/4	19	12 7/16	4	11	5	6 1/8	30 13/16	9 1/2	520
6 x 5 x 11	15 1/4	17 3/4	6 9/16	11 1/4	17 7/8	13 3/4	4	11	5 3/4	6	32 1/8	8 15/16	550
6 x 5 x 14	15 1/4	17 3/4	6 9/16	11 1/4	21	13 3/4	4	11	5 3/4	6	32 1/8	10 1/2	609
8 x 6 x 11	15 1/4	17 3/4	6 9/16	11 1/4	20	14 15/16	4	14	6 1/4	8 3/8	33 5/16	10	659
8 x 6 x 14	15 1/4	17 3/4	6 9/16	11 1/4	23 9/16	14 15/16	4	14	6 1/4	8 3/8	33 5/16	11 13/16	701
10 x 8 x 14	15 1/4	17 3/4	6 9/16	11 1/4	22 3/8	15 3/8	4	14 3/16	7 1/100	8	33 3/4	11 3/16	705

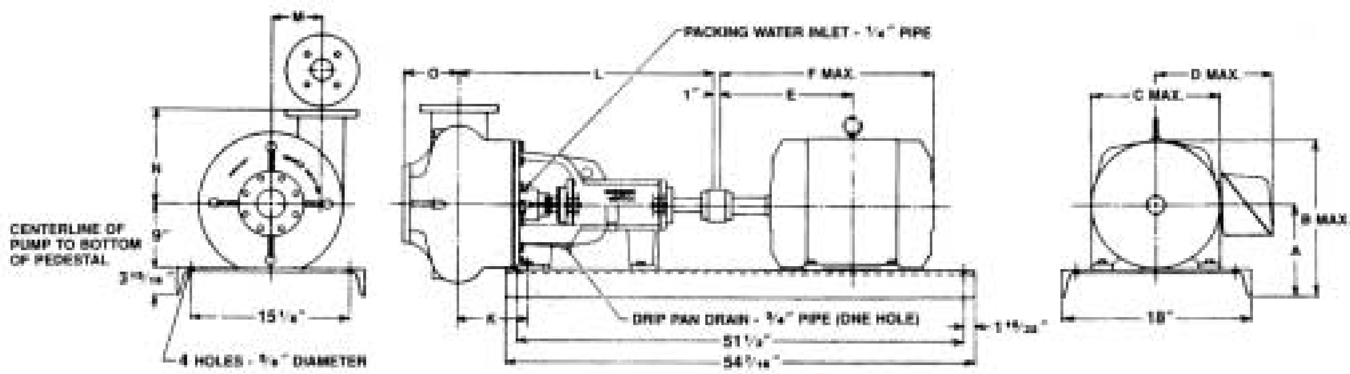
VORTEX

Frame and casing installation dimensions for the Vortex Pump.



Pump Size	Wt. Lbs.	Piping Flanges* Discharge Pipe Size	Drilling	Suction Pipe Size	Drilling	Dimensions in inches A	B	E	F	G	L	P	X	Y	Z	CP	Z
3 x 3	505	3	4 Holes 3/4 D-6 B.C.	3	4 Holes 3/4 D-6 B.C.	9	19 5/8	3 1/2	15 7/16	19	13 15/16	2 5/16	11	6 1/4	7 1/4	32	9 1/2
4 x 4	566	4	8 Holes 3/4 D-7 1/2 B.C.	4	8 Holes 3/4 D-7 1/2 B.C.	9	19 5/8	3 1/2	15 7/16	20	15	2 5/16	11 7/8	6 7/16	7 1/4	32 13/16	10
6 x 6	618	6	8 Holes 7/8 D-9 1/2 B.C.	6	8 Holes 7/8 D-9 1/2 B.C.	9	19 5/8	3 1/2	15 7/16	22	17 1/2	2 5/16	13 7/8	7 9/16	7 1/4	34 3/16	11

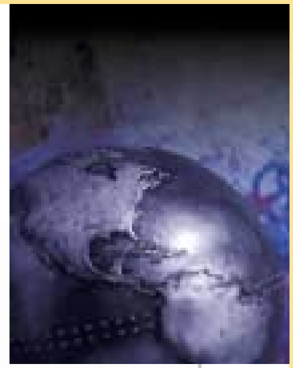
*The above drilling is ANSI standard 125lb. cast iron or ASNI series 150 flat face steel flange.



Pump Size	Piping Flanges* Discharge Pipe Size	Drilling	Suction Pipe Size	Drilling	Dimensions in inches K	L	M	N	O
3 x 3	3	4 Holes 3/4 D-6 B.C.	3	4 Holes 3/4 D-6 B.C.	7 11/16	32	7 1/4	11	6 1/4
4 x 4	4	8 Holes 3/4 D-7 1/2 B.C.	4	8 Holes 3/4 D-7 1/2 B.C.	8 9/16	33 1/4	7 1/4	11 7/8	6 7/16
6 x 6	6	8 Holes 7/8 D-9 1/2 B.C.	6	8 Holes 7/8 D-9 1/2 B.C.	9 15/16	34 1/4	7 1/4	13 7/8	7 9/16

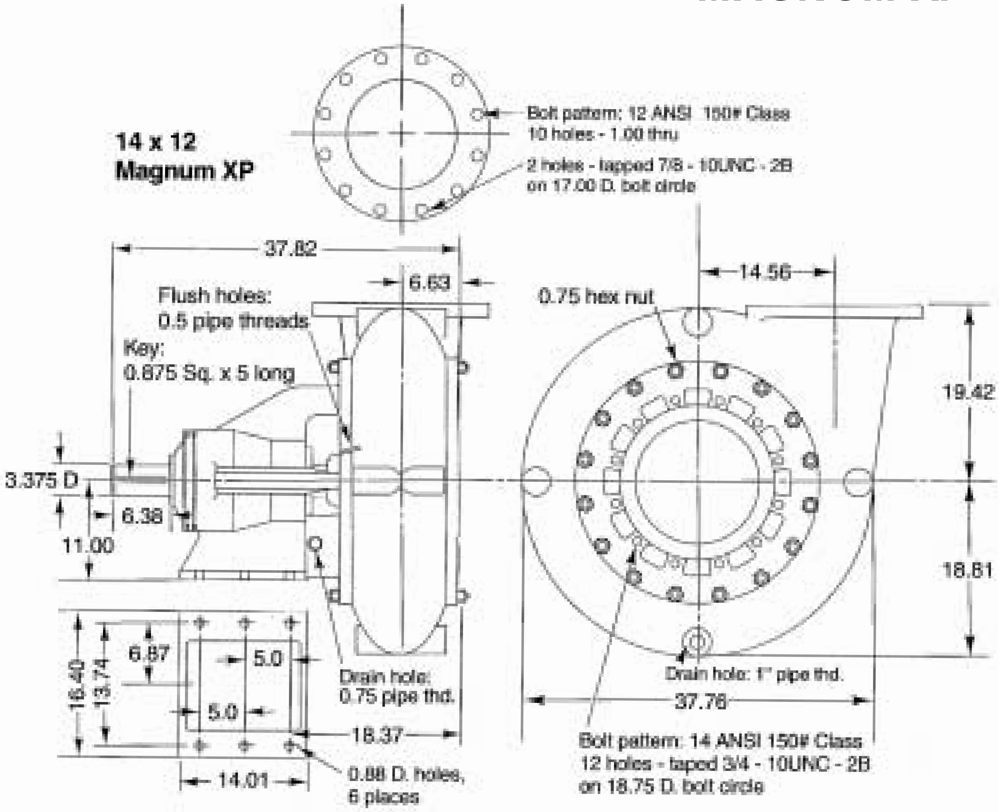
*The above drilling is ANSI standard 125lb. cast iron or ASNI series 150 flat face steel flange.

Motor Frame	Base No.	A	B	C	D	E	F
143T	15901-3	12 15/16	16 9/16	7 3/4	7 15/16	6 1/2	13 1/4
145T	15901-3	12 15/16	16 9/16	7 3/4	7 15/16	7	14 1/4
182T	15901-3	12 15/16	17 9/16	9 3/8	7 1/4	7 3/4	14 9/16
184T	15901-3	12 15/16	17 9/16	9 3/8	7 1/4	8 1/4	15 9/16
213T	15901-3	12 15/16	18 7/16	11	9 1/4	9 5/8	17 7/8
215T	15901-3	12 15/16	18 7/16	11	9 1/4	10 3/8	19 7/16
254T	15901-3	12 15/16	19 7/16	13	10 1/2	12 3/8	22 3/4
256T	15901-3	12 15/16	19 7/16	13	10 1/2	13 1/4	24 9/16
284T	15901-3	12 15/16	20 5/32	14 1/2	12 5/16	14 1/8	26 5/8
284TS	15901-3	12 15/16	20 5/32	14 1/2	12 5/16	12 3/4	25 1/4
286T	15901-3	12 15/16	20 5/32	14 1/2	12 5/16	14 7/8	28 1/8
286TS	15901-3	12 15/16	20 5/32	14 1/2	12 5/16	13 1/2	26 3/4
324T	15901-3	12 15/16	21 3/8	16 7/8	14 7/16	15 3/4	28 15/16
324TS	15901-3	12 15/16	21 3/8	16 7/8	14 7/16	14 1/4	28 1/8
326T	15901-3	12 15/16	21 3/8	16 7/8	14 7/16	16 1/2	31 1/8
326TS	15901-3	12 15/16	21 3/8	16 7/8	14 7/16	15	29 5/8



MAGNUM XP

14 x 12
Magnum XP



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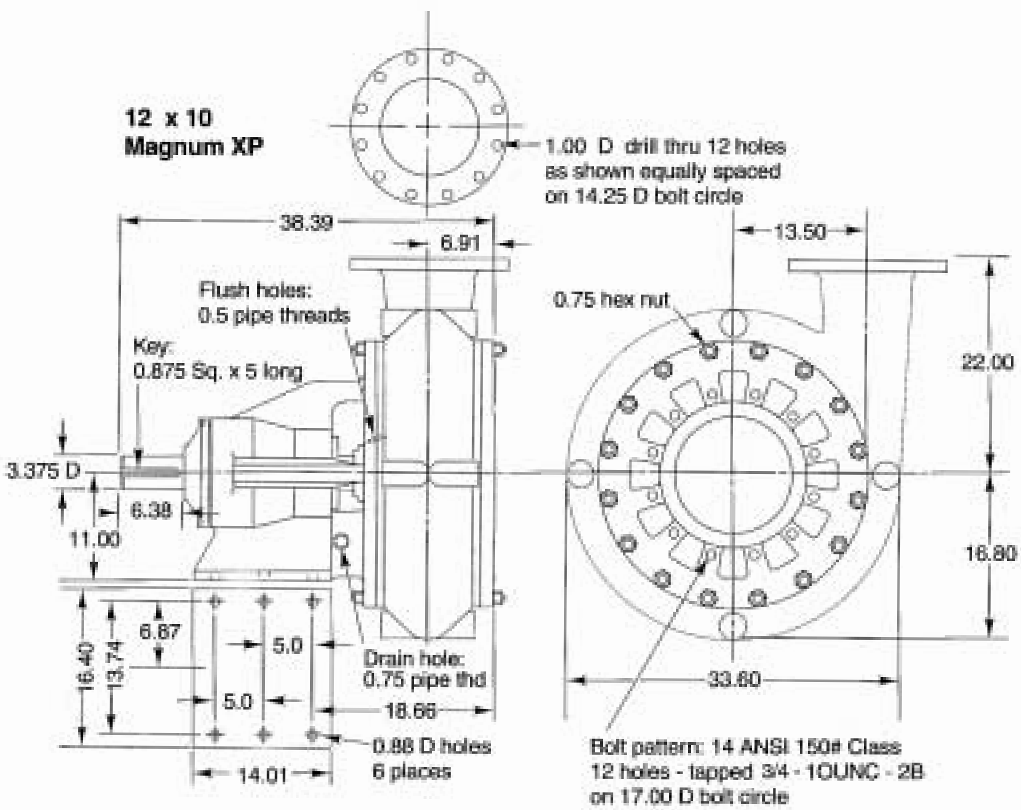


Theoretical Discharge

Theoretical Discharge of Nozzles in U.S. Gallons Per Minute

Head*		Velocity of disch	Diameter of Nozzles in inches														
lb.	Feet	ft/sec.	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
10	23.13	38.6	13.3	23.6	36.9	53.1	72.4	94.5	120	148	179	213	289	378	479	591	714	851
15	4.6	47.25	16.3	28.9	45.2	65.0	88.5	116.0	147	181	219	260	354	463	585	723	874	1041
20	46.2	54.55	18.8	33.4	52.2	75.1	102.0	134.0	169	209	253	301	409	535	676	835	1009	1203
25	57.7	61.0	21.0	37.3	58.3	84.0	114.0	149.0	189	234	283	336	458	598	756	934	128	1345
30	69.3	66.85	23.0	40.9	63.9	92.0	125.0	164.0	207	256	309	368	501	655	828	1023	1236	1473
35	80.8	72.2	24.8	44.2	69.0	99.5	135.0	177.0	224	277	334	398	541	708	895	1106	1335	1591
40	92.4	77.2	26.6	47.3	73.8	106.0	145.0	188.0	239	296	357	425	578	756	957	1182	1428	1701
45	103.9	81.8	28.2	50.1	78.2	113.0	153.0	200.0	253	313	379	451	613	801	1015	1252	1512	1802
50	115.5	86.25	29.7	52.8	82.5	119.0	162.0	211.0	267	330	399	475	647	845	1070	1320	1595	1900
55	127.0	90.5	31.1	55.3	86.4	125.0	169.0	221.0	280	346	418	498	678	886	1121	1385	1671	1991
60	138.6	94.6	32.5	57.8	90.4	130.0	177.0	231.0	293	362	438	521	708	926	1172	1447	1748	2085
65	150.1	98.3	33.8	60.2	94.0	136.0	184.0	241.0	305	376	455	542	737	964	1220	1506	1819	5165
70	161.7	102.1	35.2	62.5	97.7	141.0	191.0	250.0	317	391	473	563	765	1001	1267	1565	1888	2250
75	173.2	105.7	36.4	64.7	101.0	146.0	198.0	259.0	327	404	489	582	792	1037	1340	1619	1955	2330
80	184.8	109.1	37.6	66.8	104.0	150.0	205.0	267.0	338	418	505	602	818	1070	1354	1672	2020	2405
85	196.3	112.5	38.8	68.9	108.0	155.0	211.0	276.0	349	431	521	620	844	1103	1395	1723	2080	2480
90	207.9	115.8	39.9	70.8	111.0	160.0	217.0	284.0	359	443	536	638	868	1136	1436	1773	2140	2550
95	219.4	119.0	41.0	72.8	114.0	164.0	23.0	292.0	369	456	551	656	892	1168	1476	1824	2200	2625
100	230.9	122.0	42.1	74.7	117.0	168.0	229.0	299.0	378	467	565	672	915	1196	1512	1870	2255	2690

*Head loss across nozzle. The actual quantity discharged by a nozzle will be less than above table. A well tapered smooth nozzle may be assumed to give 97 to 99% of the values in the tables.

Values of C

Values of C for various types of pipe are given below together with the corresponding multiplier which should apply to the tabulated values of the head loss, h_f.

Type of pipe	Range High= best, smooth, well laid Low= poor and corroded	Average value for good, clean, new pipe	Commonly used value for design purposes
Cement - asbestos	160-140	150	140
Fibre	-	150	140
Bitumastic-enamel-lined iron or steel centrifugally applied	160-130	148	140
Cement lined iron or steel centrifugally applied	-	150	140
Copper, brass, lead, tin or glass pipe and tubing	150-120	140	130
Wood-stave	140-110	120	110
Welded and seamless steel	150-80	140	100
Continuous-interior riveted steel (no projecting rivets or joints)	-	139	100
Wrought iron	150-80	130	100
Cast-iron	150-80	130	100
Tar-coated cast-iron	145-80	130	100
Girth-riveted steel (projecting rivets in girth seams only)	-	130	100
Concrete	152-85	120	100
Full-riveted steel (projecting rivets in girth and horizontal seams)	-	115	100
Vitrified	-	110	100
Spiral-riveted steel (flow with lap)	-	110	100
Spiral-riveted steel (flow against lap)	-	100	90
Corrugated steel	-	60	60

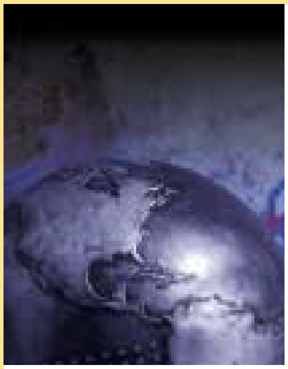
Table Correction Multipliers

Value of C	150	140	130	120	110	100	90	80	70	60
Multiplier to correct tables	0.47	.054	0.63	0.71	0.84	1.0	1.22	1.58	1.93	2.57

Friction Loss Data

Friction Loss in Pipe; C = (For Old Pipe)
v = Velocity, ft/sec
h_f = Head Loss (per 100 ft. pf pipe)

U.S. gallons per minute	1 in. (1.049˝ I.D.)			$1\frac{1}{2}$ in. (1.610˝ I.D.)			2 in. (2.067˝ I.D.)			3 in. (3.068˝ I.D.)		
	V	$\frac{V}{2g}$	h_f	V	$\frac{V}{2g}$	h_f	V	$\frac{V}{2g}$	h_f	V	$\frac{V}{2g}$	h_f
4	1.48	.034	2.14									
5	1.86	.053	3.24									
6	2.23	.077	4.54									
8	2.97	.137	7.73	1.26	.025	.96						
10	3.71	.214	11.7	1.58	.039	1.45						
12	4.45	.308	16.4	1.89	.056	2.04						
14	5.20	.420	21.8	2.21	.076	2.71						
16	5.94	.548	27.9	2.52	.099	3.47						
18	6.68	.694	34.7	2.84	.125	4.31						
20	7.42	.857	42.1	3.15	.154	5.24	1.91	.06	1.55			
25	9.29	1.34	63.5	3.94	.241	7.64	2.31	.09	2.26			
30	11.1	1.93	89.2	4.73	.347	11.1	2.87	.128	3.29			
35	13.0	2.62	119	5.52	.473	15.1	3.35	.174	4.37			
40	14.8	3.43	152	6.30	.618	18.9	3.82	.227	5.60			
50				7.88	.965	28.5	4.78	.355	8.45	2.17	.073	1.38
60				9.46	1.39	40.0	5.74	.511	11.9	2.60	.105	1.94
80				12.6	2.47	68.1	7.65	.909	20.2	3.47	.187	3.30
100				15.8	3.86	103	9.56	1.42	30.5	4.34	.293	4.98
120							11.5	2.05	42.7	5.21	.421	6.98
140							13.4	2.78	56.9	6.08	.574	9.28
160							15.3	3.64	72.8	6.94	.749	11.9
180							17.2	4.60	90.5	7.81	.948	14.8
200							19.1	5.68	110.0	8.68	1.17	18.0
220							21.0	6.88	131.0	9.55	1.42	21.4
240							22.9	8.18	154.0	10.4	1.69	25.2
260							24.9	9.60	179.0	11.3	1.98	29.2
280							26.8	11.1	205.0	12.2	2.29	33.5
300							28.7	12.8	233.0	13.0	2.63	38.0
350										15.2	3.57	50.9
400										17.4	4.68	64.7
500										21.7	7.32	97.8

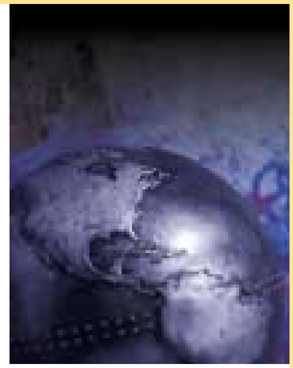


Friction Loss Data

Friction Loss in Pipe; C = (For Old Pipe)
v = Velocity, ft/sec
h_f = Head Loss (per 100 ft. pf pipe)

U.S. gallons per minute	4 in. (4.026˝ I.D.)			5 in. (5.047˝ I.D.)			6 in. (6.065˝ I.D.)			8 in. (7.981˝ I.D.)		
	V	V/2g	h_f	V	V/2g	h_f	V	V/2g	h_f	V	V/2g	h_f
140	3.53	.193	2.27	2.25	.078	.773						
160	4.03	.253	2.93	2.57	.102	.990						
180	4.54	.320	3.64	2.89	.129	1.23						
200	5.04	.395	4.43	3.21	.160	1.50	2.22	.077	.616			
240	6.05	.569	6.21	3.85	.230	2.10	2.66	.110	.863			
280	7.06	.774	8.25	4.49	.313	2.79	3.11	.150	1.15			
320	8.06	1.01	10.6	5.13	.409	3.57	3.55	.196	1.47			
360	9.07	1.28	13.1	5.77	.518	4.44	4.0	.240	1.83			
400	10.1	1.58	16.0	6.41	.639	5.39	4.44	.307	2.22	2.57	.102	.548
450	11.3	2.00	19.7	7.23	.811	6.74	5.00	.388	2.76	2.89	.129	.681
500	12.6	2.47	24.1	8.02	.999	8.15	5.55	.479	3.36	3.21	.160	.828
600	15.1	3.55	33.8	9.62	1.44	11.7	6.66	.690	4.70	3.85	.230	1.16
700	17.6	4.84	45.0	11.2	1.96	15.2	7.77	.939	6.25	4.49	.313	1.54
800	20.2	6.32	57.6	12.8	2.56	19.4	8.88	1.23	8.00	5.13	.409	1.97
900	22.7	8.00	71.6	14.4	3.24	24.2	9.99	1.55	9.95	5.77	.518	2.46
1000	25.2	9.87	87.0	16.0	4.0	29.4	11.1	1.92	12.1	6.41	.639	2.98
1200				19.2	5.76	41.1	13.3	2.76	16.9	7.70	.920	4.18
1400				22.5	7.83	54.7	15.5	3.76	22.5	8.98	1.25	5.56
1600				25.7	10.2	70.1	17.8	4.91	28.9	10.3	1.64	7.12
1800							20.0	6.21	35.9	11.5	2.07	8.85
2000							22.2	7.67	43.6	12.8	2.56	10.8
2400							26.6	11.0	61.1	15.4	3.68	15.1

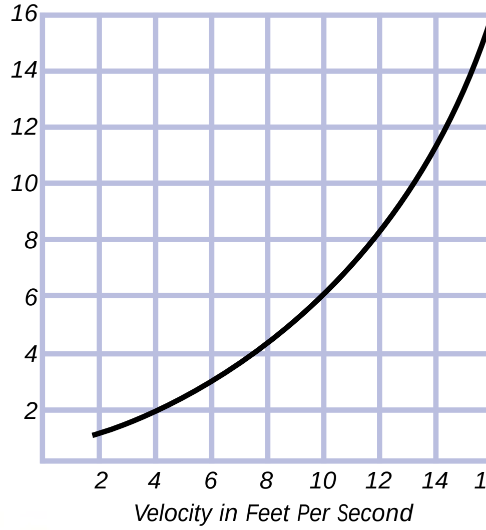
Friction Loss in Pipe Fittings in Terms of Equivalent Feet of Straight Pipe

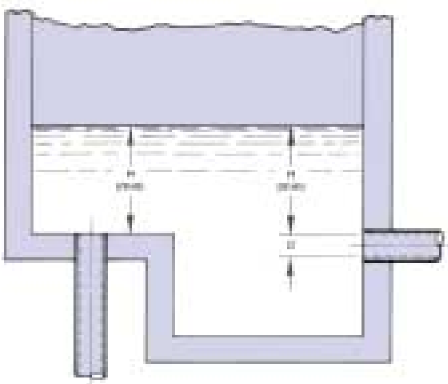


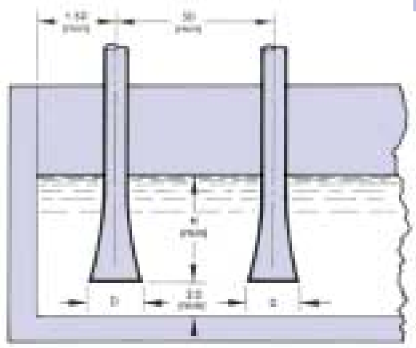
Nom. pipe size	Actual inside diam. d	Friction factor f	Gate valve – full open	90° elbow	45° elbow	Std. tee – thru flow	Std. tee – branch flow	Close return bend	Swing check valve – full open	Angle valve – full open	Globe valve – full open	Butter-fly valve	90° welding elbow r/d=1	r/d=2		
1/2	.622	.027	.41	1.55	.83	1.04	3.11	2.59	5.18	7.78	17.6					
3/4	.824	.025	.55	2.06	1.10	1.37	4.12	3.43	8.86	10.3	23.3					
1	1.049	.023	.70	2.62	1.40	1.75	5.25	4.37	8.74	13.1	29.7					
1 1/4	1.380	.022	.92	3.45	1.84	2.30	6.90	5.75	11.5	17.3	39.1					
1 1/2	1.610	.021	1.07	4.03	2.15	2.68	8.05	6.71	13.4	20.1	45.6					
2	2.067	.019	1.38	5.17	2.76	3.45	10.3	8.61	17.2	25.8	58.6	7.75	3.45	2.0	2.58	10.3
2 1/2	2.469	.018	1.65	6.17	3.29	4.12	12.3	10.3	20.6	30.9	70.0	9.26	4.12	2.47	3.08	12.3
3	3.068	.018	2.04	7.67	4.09	5.11	15.3	12.8	25.5	38.4	86.9	11.5	5.11	3.07	3.84	15.3
4	4.026	.017	2.68	10.1	5.37	5.71	20.1	16.8	33.6	50.3	114	15.1	6.71	4.03	5.03	20.1
5	5.047	.016	3.36	12.6	6.73	8.41	25.2	21.0	42.1	63.1	143	18.9	8.41	5.05	6.31	25.2
6	6.065	.015	4.04	15.2	8.09	10.1	30.3	25.3	50.5	75.8	172	22.7	10.1	6.07	7.58	30.3
8	7.981	.014	5.32	20.0	10.6	13.3	39.9	33.3	33.3	99.8	226	29.9	13.3	7.98	9.98	39.9
10	10.02	.014	6.68	25.1	13.4	16.7	50.1	41.8	41.8	125	284	29.2	16.7	10.0	12.5	50.1
12	11.938	.013	7.96	29.8	15.9	19.9	59.7	49.7	49.7	149	338	34.8	19.9	11.9	14.9	59.7
14	13.124	.013	8.75	32.8	17.5	21.8	65.6	54.7	54.7	164	372	38.2	21.8	13.1	16.4	65.6
16	15.00	.013	10.0	37.5	20.2	25.0	75.0	62.5	62.5	188	425	31.3	25.0	15.0	18.8	75.0
18	16.876	.012	16.9	42.2	22.5	28.1	84.4	70.3	70.3	210	478	35.2	28.1	16.9	21.1	84.4
20	18.814	.012	12.5	47.0	25.1	31.4	94.1	78.4	78.4	235	533	39.2	31.4	18.8	23.5	94.1
24	22.628	.012	15.1	56.6	30.2	37.7	113	94.3	94.3	283	641	47.1	37.7	22.6	28.3	113
30	28	.011	18.7	70	37.3	46.7	140	117					46.7	28	35	140
36	34	.011	22.7	85	45.3	56.7	170	142					56.7	34	43	170
42	40	.010	26.7	100	53.3	66.7	200	167					56.7	40	50	200
48	46	.010	30.7	115	51.3	76.7	230	192					76.7	46	58	230
	L/D		8	30	16	20	60	50	1/2 to 6 =100 24 to 48 =50	150	340		20	12	15	60

Calculated from data in Crane Co. – Technical Paper 410

Recommended Piping Practices

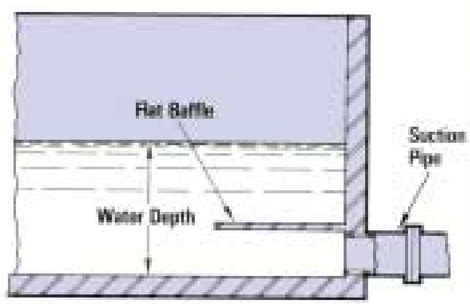




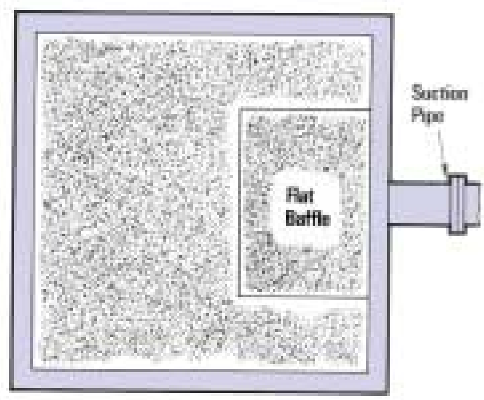


This can be used as a guide for minimum submergence and piping design.

$$\text{Velocity, feet per second} = \frac{\text{GPM} \times .4}{D^2 \text{ (inches)}}$$

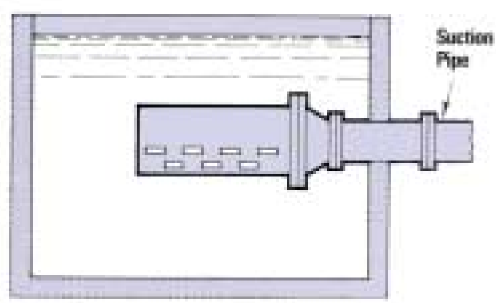


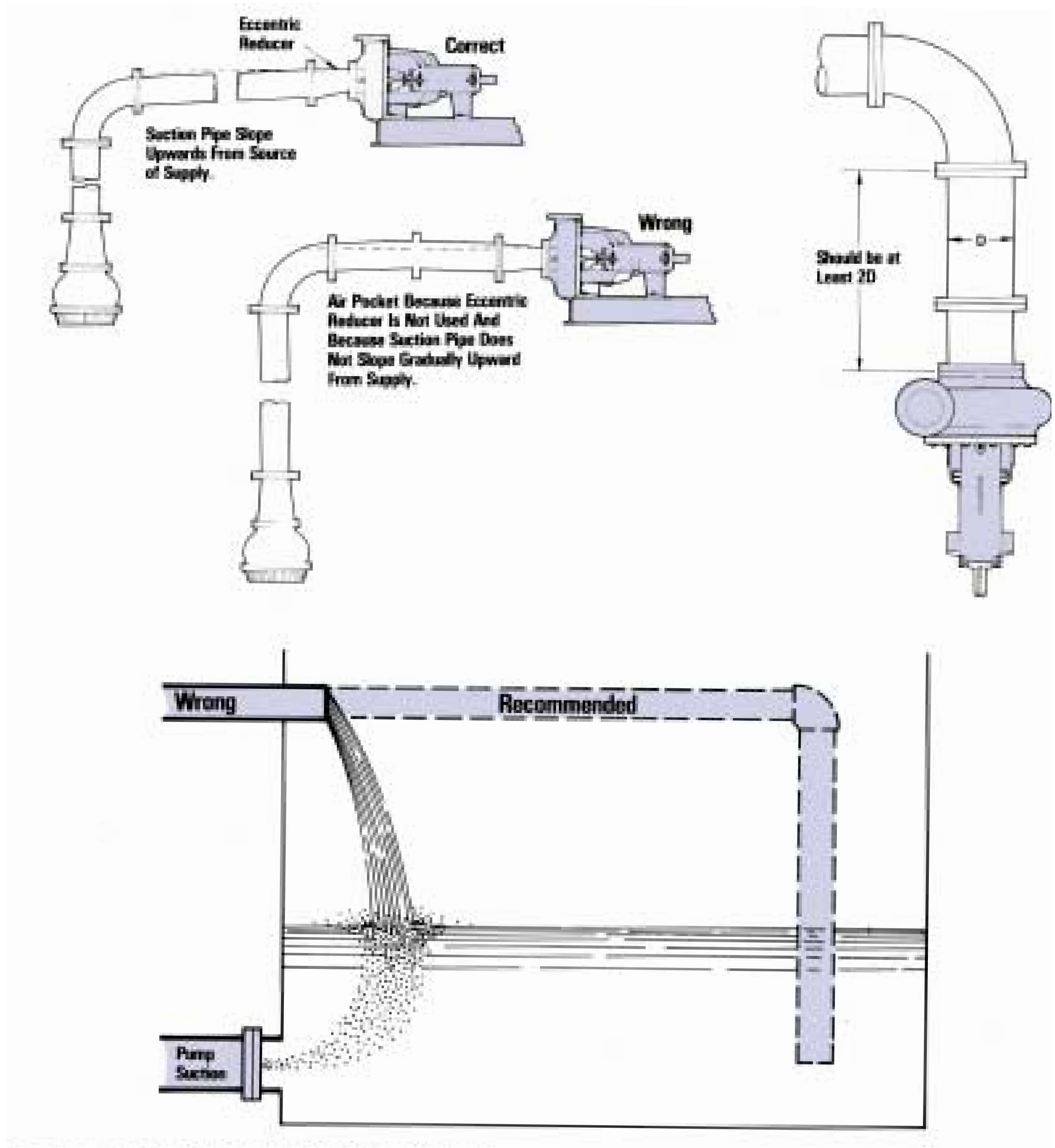
Side View



Top View

Vortex can be prevented by proper baffle arrangements.





To minimize air entering the mud, return should be away from the suction and below liquid level.

Selecting A Motor

(Average values of full load amperes at motor terminals chart)

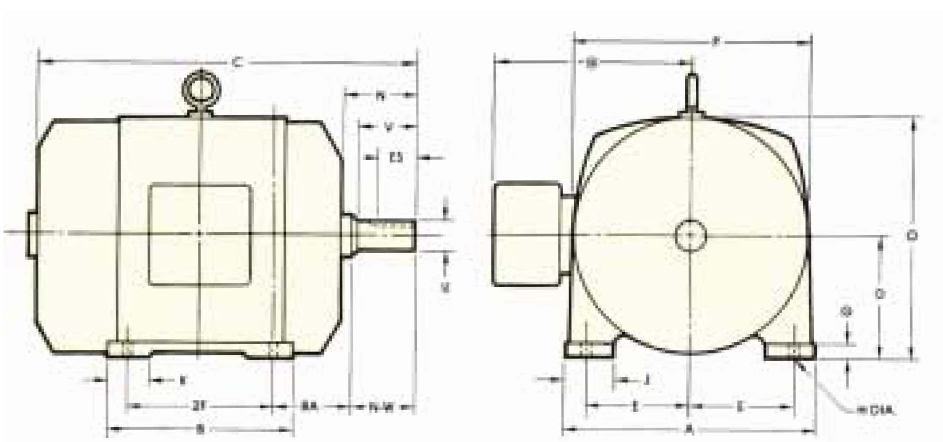
The selection of a motor enclosure depends on the surrounding conditions of the pump application. The two general classifications of motor enclosures are "open" and "totally enclosed." An open motor has ventilating openings which permit air to pass directly over the motor windings for cooling. This is not recommended where high moisture is present. A totally enclosed motor is designed for cooling by heat radiation from the outside of the motor without free air passage over the windings. It is recommended for high moisture, but not hazardous locations. For hazardous locations, a totally enclosed motor designed to be explosion-proof must be installed.

Open Drip-Proof - An open motor in which all ventilating openings are constructed so that drops of liquid of solid particles falling on the motor at any angle from 0 to 15 degrees from vertical cannot enter the machine. This is the most common motor type and it is designed for use in non-hazardous, relatively clean, industrial areas.

Totally Enclosed, Fan-Cooled – An enclosed motor equipped for external cooling by means of a fan integral with the motor, but external to the enclosed parts. TEFC motors are designed for use in extremely wet, dirty, or dusty areas.

Explosion-Proof, Dust-Ignition Proof – An enclosed motor whose enclosure is designed to withstand an explosion of a specified dust, gas, or vapor which may occur within the motor and to prevent the ignition of this dust, gas, or vapor surrounding the motor. A motor manufacturer should be consulted regarding the various classes and groups of explosion-proof motors available and the application of each.

Conduit box located on the opposite side when F-2, W-1, W-5, W-7, or C-1 mounting is specified. Standard double shaft supplied only when specified. If mounting clearance details are required consult factory.



Maximum permissible shaft runout when measured at end of standard shaft extensions is .002 T.I.R. up to and including 1.625 diameter and .003 T.I.R. 1.625 to 5 inch diameter.

** Varies with manufacturer and insulation types.*

Frame (4)	A	D	E	G	H	J	O	P	BA	K
143T-145T	6.50	3.50	2.75	.12	.34	–	7.12	6.88	2.25	–
182T-184T	8.50	4.50	3.75	.19	.44	.97	9.00	9.00	2.75	–
143T-145T	9.50	5.25	4.25	.19	.44	.75	10.44	10.38	3.50	–
143T-145T	11.50	6.25	5.00	.25	.56	1.19	12.16	11.78	4.25	
143T-145T	13.75	7.00	5.50	.62	.56	2.50	14.25	14.50	4.75	2.75
143T-145T	15.50	8.00	6.25	.62	.69	2.75	16.25	16.50	5.25	3.12
143T-145T	17.00	9.00	7.00	.88	.69	2.75	18.50	19.00	5.88	4.00
143T-145T	19.00	10.00	8.00	1.12	.81	3.25	21.31	21.25	6.62	3.25
143T-145T	21.00	11.00	9.00	1.12	.81	3.25	23.62	25.00	7.50	3.25

Average values of full load amperes at motor terminals.

Three-phase A-C induction type squirrel cage and wound rotor

Motor HP	230 volts	460 volts	575 volts
1	3.6	1.8	1.4
1.5	5.2	2.6	2.1
2	6.8	3.4	2.7
3	9.6	4.8	3.9
5	15.2	7.6	6.1
7.5	22	11	99
10	28	14	11
15	42	21	17
20	54	27	22
25	68	34	27
30	80	4	32
40	104	52	41
50	130	65	52
60	154	77	62
75	192	96	77
100	240	120	96
125	296	148	118

	Dimensions in inches									
					Backend shaft & keyway					
Frame (4)	C TEFC	B	2F	N	N-W	U	V	ES (Min)	Sq. Key	wt
143T	12.25	4.88	4.00	2.31	2.25	.875	2.25	1.14	.19	28
145T	13.25	5.88	5.00	2.31	2.25	.875	2.25	1.41	.19	38
182T	14.69	5.50	4.50	2.94	2.75	1.125	2.50	1.78	.25	65
184T	15.69	6.50	5.50	2.94	2.75	1.125	2.50	1.78	.25	85
213T	17.75	6.50	5.50	3.56	3.38	1.375	3.12	2.41	.31	120
215T	19.12	8.00	7.00	3.56	3.38	1.375	3.12	2.41	.31	140
254T	22.75	9.75	8.25	4.25	4.00	1.625	3.75	2.91	.38	200
256T	24.50	11.50	10.00	4.25	4.00	1.625	3.75	2.91	.38	230
284T	25.94	11.50	9.50	4.88	4.62	1.875	4.38	3.28	.50	280
284TS	24.56	11.50	9.50	3.50	3.25	1.625	3.00	1.91	.38	278
286T	27.44	13.00	11.00	4.88	4.62	1.875	4.38	3.28	.50	330
286TS	26.06	13.00	11.00	3.50	3.25	1.625	3.00	1.91	.38	328
324T	28.94	13.25	10.50	5.50	5.25	2.125	5.00	3.91	.50	430
324TS	27.44	13.25	10.50	4.00	3.75	1.875	3.50	2.03	.50	427
326T	30.44	14.75	12.00	5.50	5.25	2.125	5.00	3.91	.50	480
326TS	28.94	14.75	12.00	4.00	3.75	1.875	3.50	2.03	.50	477
364T	33.44	15.25	11.25	6.12	5.88	2.375	5.62	4.28	.62	650
364TS	31.31	15.25	11.25	4.00	3.75	1.875	3.50	2.03	.50	644
365T	33.44	15.25	12.25	6.12	5.88	2.375	5.62	4.28	.62	700
365TS	31.31	15.25	12.25	4.00	3.75	1.875	3.50	2.03	.50	694
404T	36.82	14.50	12.25	7.62	7.25	2.875	7.00	5.65	.75	975
404TS	33.81	14.50	12.25	4.62	4.25	2.125	4.00	2.78	.50	975
405T	38.31	16.00	13.75	7.62	7.25	2.875	7.00	5.65	.75	1100
405TS	35.31	16.00	13.75	4.62	4.25	2.125	4.00	2.78	.50	1100
444T	42.62	17.00	14.50	8.94	8.50	3.375	8.25	6.91	.88	1350
444TS	38.88	17.00	14.50	5.19	4.75	2.375	4.50	3.03	.62	1350
445T	44.62	19.00	16.50	8.94	8.50	3.375	8.25	6.91	.88	1500
445TS	40.88	19.00	16.50	5.19	4.75	2.375	4.50	3.03	.62	1500

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