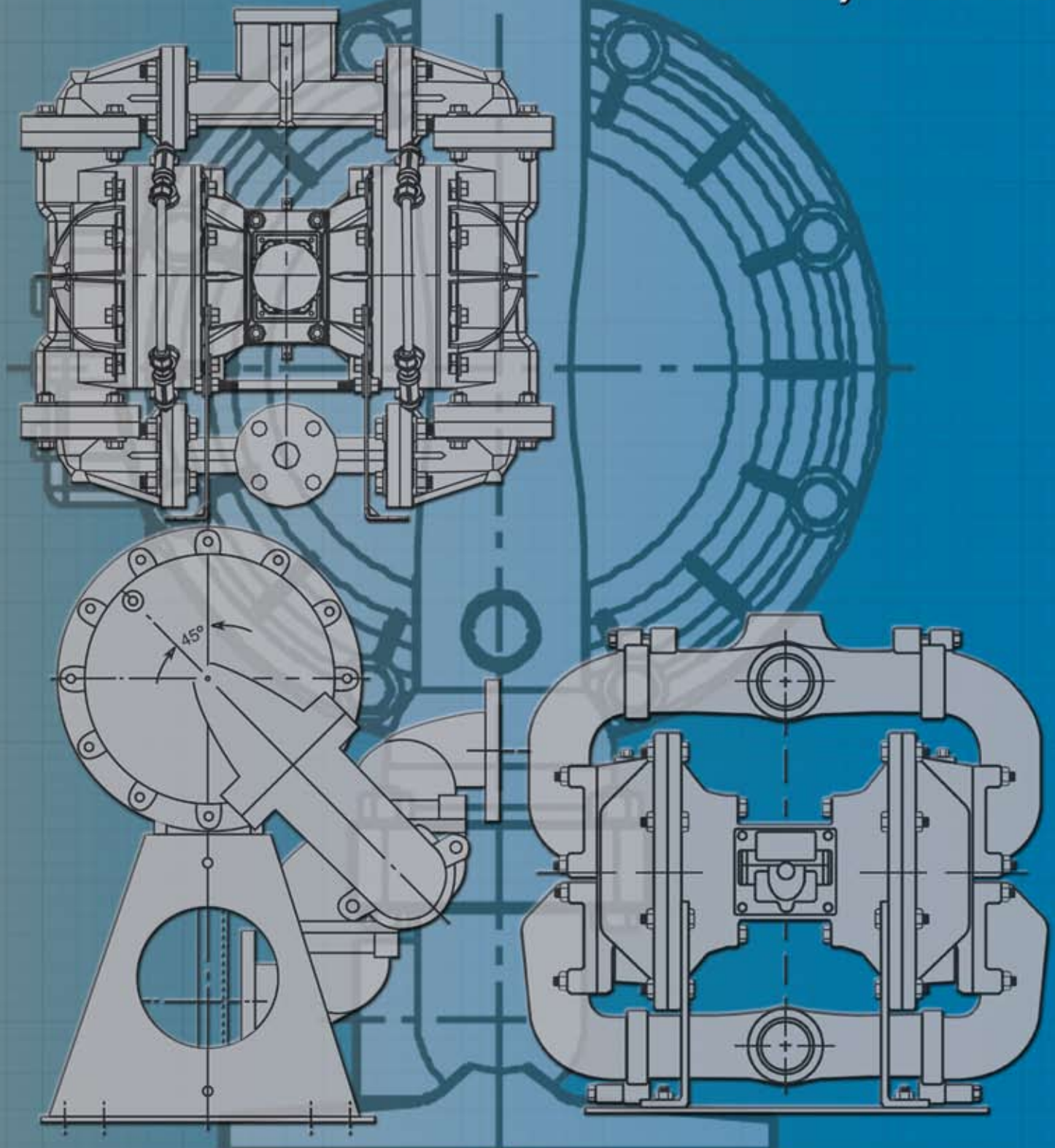
Discover

SANDPIPER® Pumping Solutions

A WARREN RUPP PUMP BRAND

with more ways than one



Discover SANDPIPER® Pumping Solutions

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Message to Our Customers...

Acknowledging the number of pump types commercially available throughout the world today, we are renewing our commitment to provide our customers with technically-sound equipment use, sizing, selection and application knowledge. Enabling representatives and customers to make better-informed choices has been a hallmark commitment from Warren Rupp, Inc. for the past 40 years.

While there are hundreds of pump types manufactured, most can be classified as either centrifugal or displacement, each having its own inherent design strengths and weaknesses. As a result, our company founder, Warren E. Rupp recognized limitations with a one-design-fits-all approach to solving difficult pumping problems. Thus, the non-positive displacement pump, the air (or natural gas) powered, double diaphragm SANDPIPER® pump range offers our customers a variety of unique problem solving Air-Operated Double Diaphragm (AODD) pump designs. Today, our core designs include heavy duty ball, heavy duty flap, containment duty and standard duty configurations.

While we acknowledge that even the most diverse range of AODD pump designs cannot solve all problems or fill the needs of every pumping application, there is no other pump type on the market today that is so universally applicable and so responsive to pumping problem fluids.

We are proud to introduce (or maybe even reintroduce) you to our SANDPIPER® Pump Solutions!

Warren Rupp Team

40th Anniversary '65 '05 WARREN RUPP®

IDEX FLUID & METERING

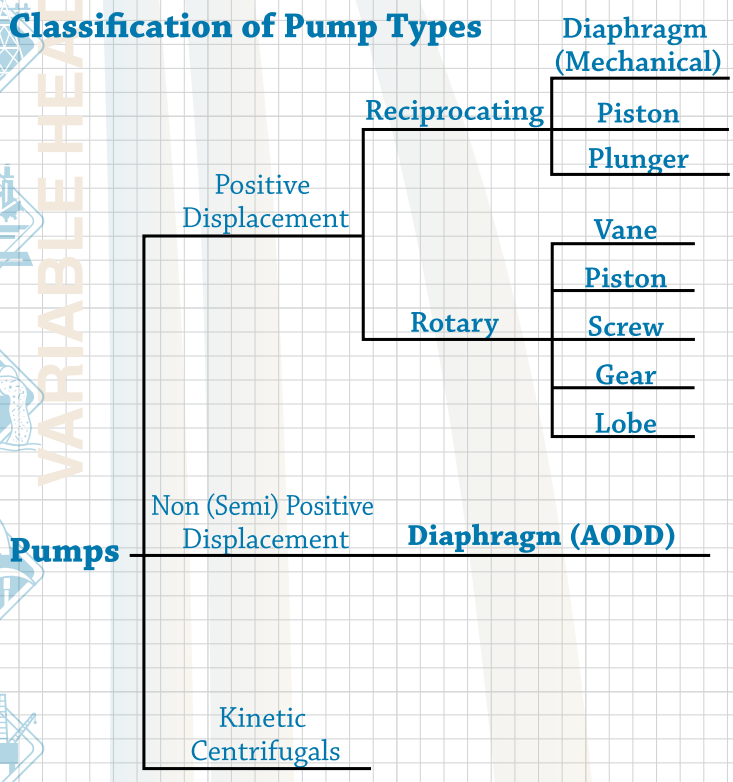
TABLE OF CONTENTS

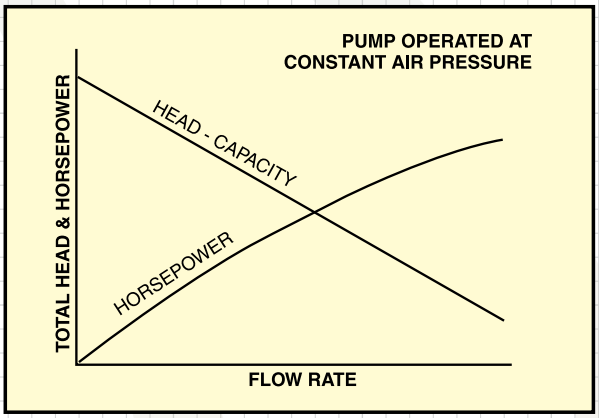
SOLUTION PROVIDING ADVANTAGES...

Informed customers select AODD pumps vs. other pump types when challenged with difficult pumping situations including:

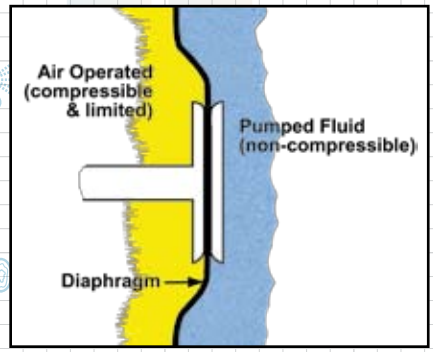
• Suspended Solids • Non-Suspended Solids • Line-Size Solids • Abrasive Sludge & Slurries • High Viscosity Fluids • Dry Running • High Suction Lift • Floor Space Restrictions • Corrosive Fluids • Added Costs for Variable Flow Rates • Added Costs for Installation Bypass Lines • Added Costs for Pressure Relief • High Costs Associated with Packing Glands and Mechanical Seals • Loss of Suction (Prime Damage) • Heat Generation • Catastrophic Mechanical Seal Failures • Leakage from Packed Stuffing Boxes • Insufficient NPSH (a) Cavitation • Coupling Misalignment • Bearing Lubrication Contamination • Shaft Deflections • Slip • Decreased Volumetric Efficiency • Bearing/Shaft (load) problems associated with operating below minimum flow • Deadheading

Classification of Pump Types





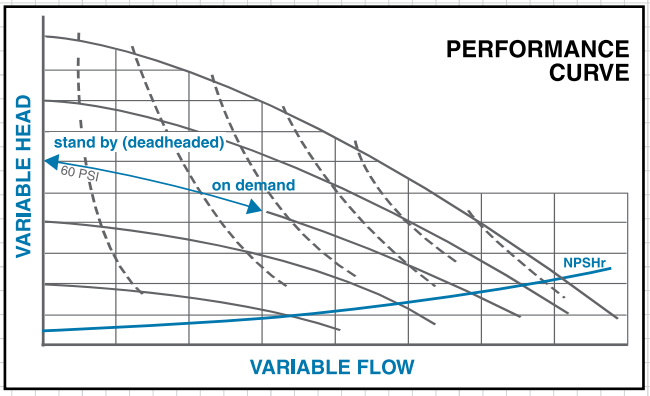
Although the AODD pump is a displacement type it is actually a hybrid and defies strict classification. While its pressure versus capacity characteristics resemble those of a centrifugal pump, it is best defined as a sealless, non (or semi) positive displacement pump. The pumping principle provides 100% efficiency at zero flow.



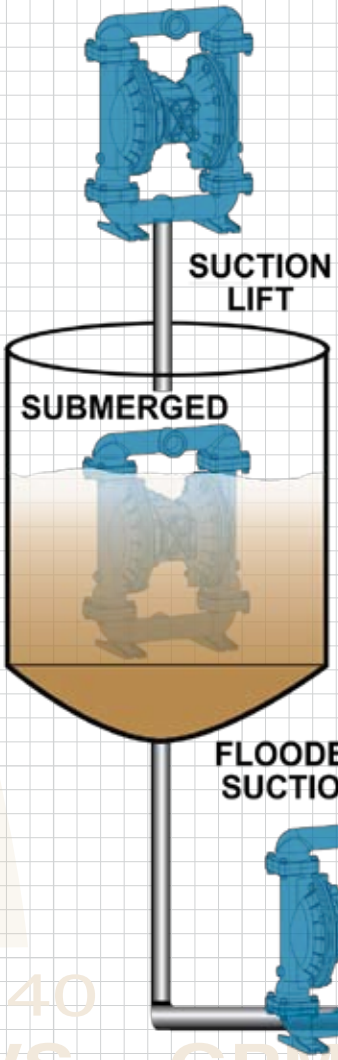
AODD pumps are air (or natural gas) operated displacement type pumps which uniquely differ from all other positive displacement pumps. As a result of air pressure acting on the entire surface of the diaphragm, the diaphragm is in a balanced condition while pumping. This measurably extends diaphragm life over that of mechanically operated diaphragm pumps. Because compressed air is limited, the maximum pressure developed by the pump is also safely limited. Thus AODD pumps are appropriately selected for on-demand intermittent requirements.

Air-Operated Double Diaphragm Pumps

Solution providing AODD pump installation selected to reduce total costs of ownership and minimize floor space allocation.

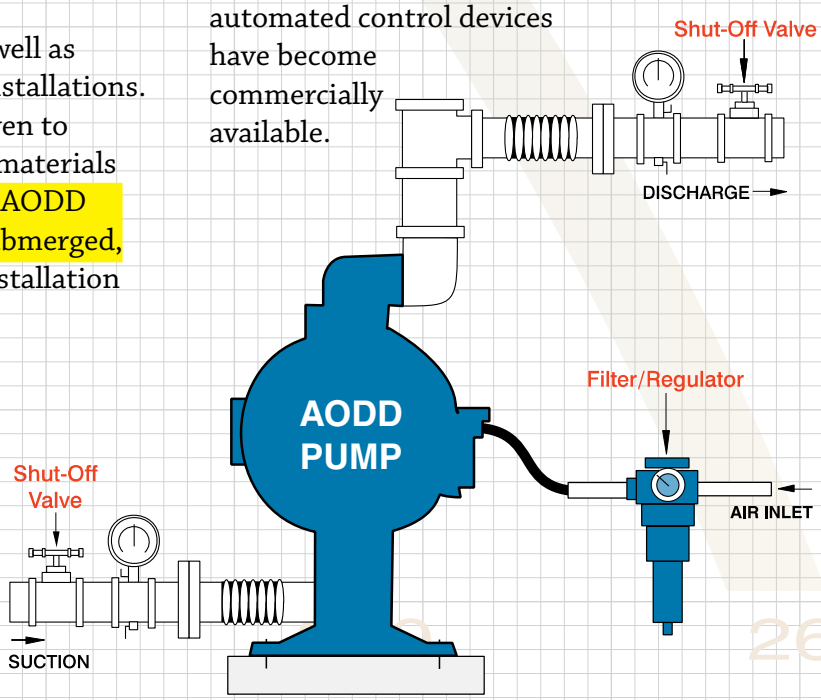


Air-operated double diaphragm pumps safely operate on deadheaded/standby demand without added costs associated with the need to relieve pressure. More importantly, at all deadheaded condition points the AODD pump consumes zero energy (SCFM).



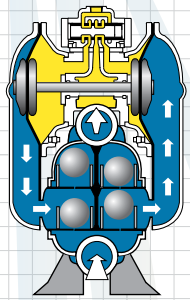
While AODD pumps are self-priming from a dry start, these pumps are frequently installed in flooded suction installations as well as on suction lift installations. With caution given to the non-wetted materials of construction, AODD pumps can be submerged, for maximum installation versatility.

Variable flow and head conditions are achievable with the use of inexpensive off-the-shelf air line pressure regulators. Other commonly used flow control methods include restricting discharge and/or suction shutoff valves. Today, AODD pumps are appropriately selected for "process control" installations as automated control devices have become commercially available.

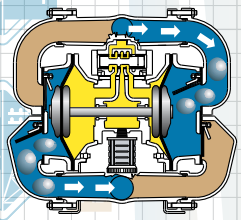


ATEX & CSA Certified Pump Options

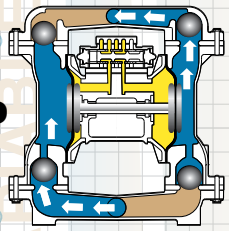
World Leader in Fully Groundable, Spark-Free, Safe, Air & Gas-Operated Double Diaphragm Technology and ATEX Compliant Products.



HDB

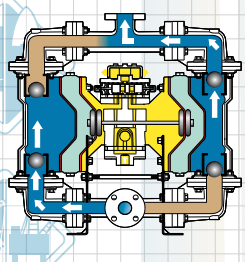


HDF

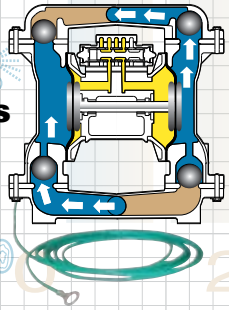


SD

Metallic & Non-Metallic



CD



Gas

SIZE	MODELS	MAX FLOW	MATERIALS: Non-Metallic CP	PP	K	NY	CA	CV	Metallic AL	CI[2]	SS[2]	HC[2]
HEAVY DUTY BALL VALVE												
1"	SB1	42 gpm (159 l/min)							Ex		Ex	Ex
1½"	HDB1½	90 gpm (340 l/min)							Ex	Ex	Ex	Ex
2"	HDB2	135 gpm (511 l/min)							Ex	Ex	Ex	Ex
3"	HDB3	260 gpm (984 l/min)								Ex	Ex	
4"	HDB4	260 gpm (984 l/min)								Ex		
HEAVY DUTY FLAP VALVE												
1"	SA1	42 gpm (159 l/min)							Ex		Ex	
2"	HDF2	140 gpm (530 l/min)							Ex	Ex	Ex	
3"	HDF3	260 gpm (984 l/min)							Ex	Ex		
4"	HDF4	260 gpm (984 l/min)							Ex	Ex		
STANDARD DUTY METALLIC												
¼"	X02	4.4 gpm (16.6 l/min)									Ex	
½"	S05	15 gpm (57 l/min)							Ex		Ex	Ex
1"	S1F	45 gpm (170 l/min)							Ex	Ex	Ex	Ex
1½"	S15	106 gpm (401 l/min)							Ex	Ex	Ex	Ex
2"	S20	150 gpm (568 l/min)							Ex	Ex	Ex	Ex
3"	S30	238 gpm (901 l/min)							Ex	Ex	Ex	Ex
STANDARD DUTY NON-METALLIC												
¼"	PB¼	4 gpm (15 l/min)					Ex					
½"	S05	14 gpm (53 l/min)	Ex				Ex	Ex				
¾"	S07	23 gpm (87 l/min)										
1"	S10	23 gpm (87 l/min)										
1"	S1F	45 gpm (170 l/min)	Ex					Ex				
1½"	S15	100 gpm (378 l/min)	Ex									
2"	S20	160 gpm (606 l/min)	Ex									
3"	S30	238 gpm (901 l/min)										
CONTAINMENT DUTY METALLIC												
1"	ST1-A	42 gpm (159 l/min)							Ex		Ex	Ex
1½"	ST1½-A	90 gpm (340 l/min)							Ex	Ex	Ex	Ex
HIGH PRESSURE 2:1												
2"	EH2 Ball	62 gpm (235 l/min)										
2"	SH2 Flap	62 gpm (235 l/min)								Ex	Ex	
2"	GH2 Gas	62 gpm (235 l/min)							Ex	Ex		
UL LISTED												
1"	U1F	45 gpm (170 l/min)							UL			
GAS PUMPS												
½"	G05	15 gpm (57 l/min)										
1"	G1F	45 gpm (170 l/min)										
1½"	G15	106 gpm (401 l/min)										
2"	G20	150 gpm (568 l/min)										
3"	G30	238 gpm (901 l/min)										

ATEX Compliant

Ex I M2 c T5[2]
II 2GD T5

CP = Conductive Polypropylene
PP = Polypropylene
K = PVDF
NY = Nylon
CA = Conductive Acetal
CV = Conductive PVDF
AL = Aluminum
CI = Cast Iron
SS = Stainless Steel
HC = Alloy C

SOLUTION PROVIDING CAPABILITIES

Pumps abrasive and shear-sensitive materials
Low internal velocities handle abrasive slurries with no damage to the pump or loss of volumetric efficiencies. The gentle pumping action does not shear fragile materials.

Pumps high viscosity fluids
Heavy and pourable fluids efficiently handled

Pumps solids up to 3" line size

Sealless
No mechanical seals or packing to leak

Self-priming
Maximum dry prime capabilities up to 24 ft. of water

Variable flow & pressure
Simply regulate the inlet air supply to adjust the pump flow from zero to maximum rated capacity.

Optional discharge porting
Select bottom porting for high concentration of heavy solids. Select top porting for thin liquids, or if entrained air could be a problem.

Runs dry without damage or heat build-up
No internal damage

Deadheads against closed discharge
Discharge pressures equal to or greater than inlet air pressure stops the pump without damage. Expensive bypass systems & pressure relief valves not required. The pump stops operation until the discharge is opened.

Fully groundable

Portable & submersible

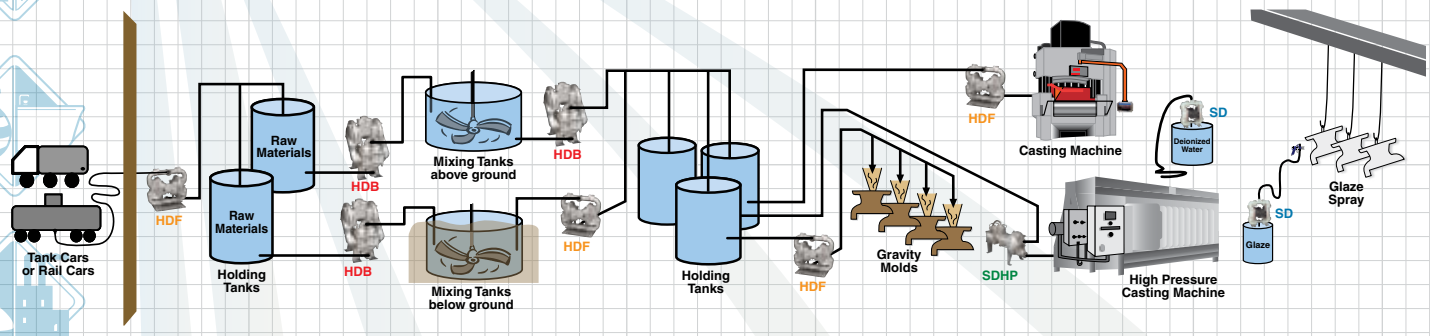
Certifications

ATEX CSA UL CE USDA FDA

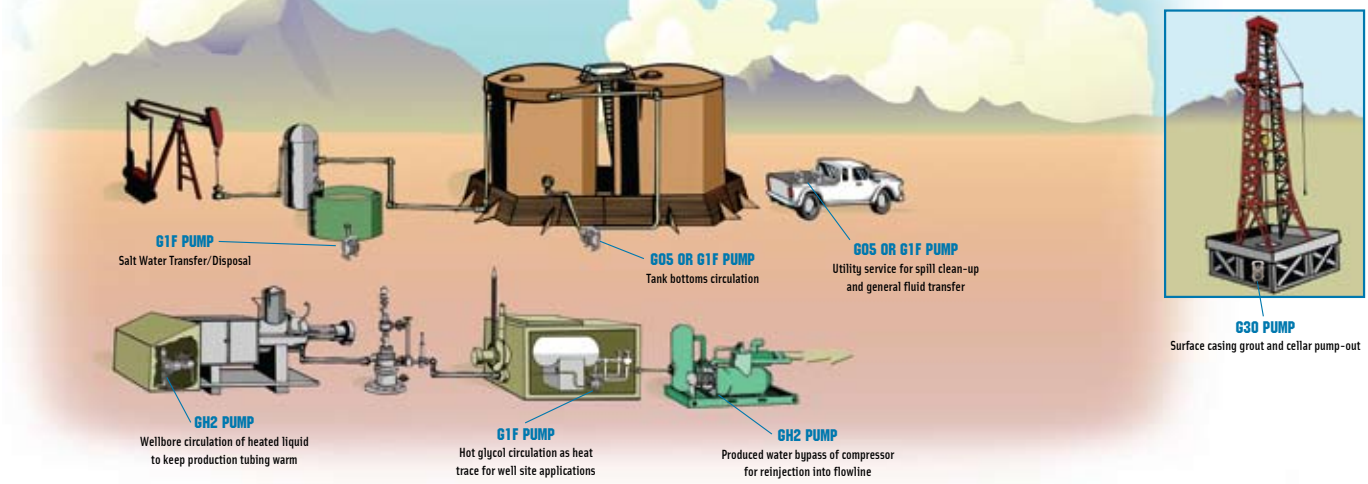
with more ways than one!

PRIMARY MARKET PROCESS MAPS

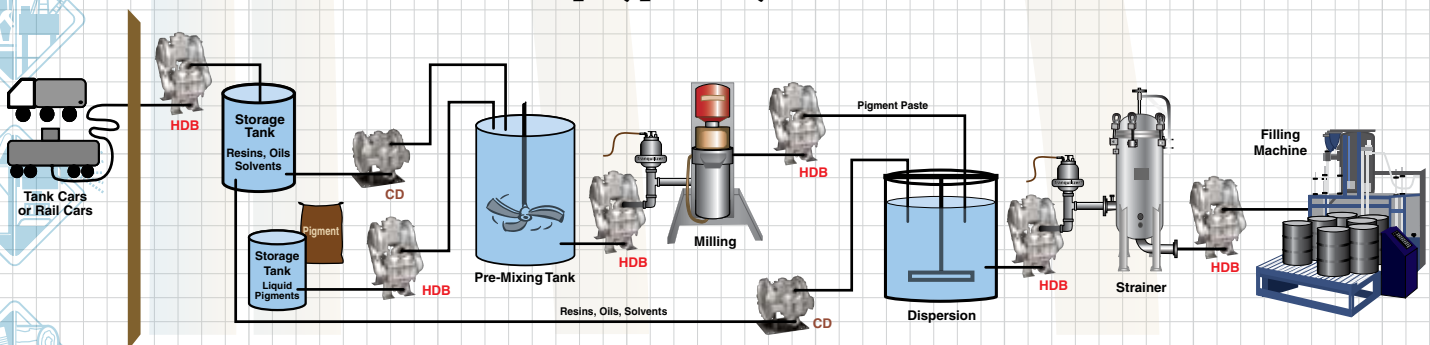
Ideal Pump Types for your Ceramic Process



Ideal Pump Types for your Natural Gas Process



Ideal Pump Types for your Paint Process



PRIMARY MARKETS SERVED

- Automotive/Plating & Finishing
- Ceramic Slip/Glaze
- Chemical/Petrochemical
- Construction/Utilities
- Food Processing/Biotech/ Pharmaceutical
- Industrial/Municipal Wastewater Treatment
- Mining
- Oil & Gas
- Paint/Ink/Coatings
- Pulp/Paper Converters

Heavy Duty Ball Valve Pumps

Heavy Duty Flap Valve Pumps

Containment Duty Metallic Pumps

Standard Duty Non-Metallic Pumps

Standard Duty Metallic Pumps

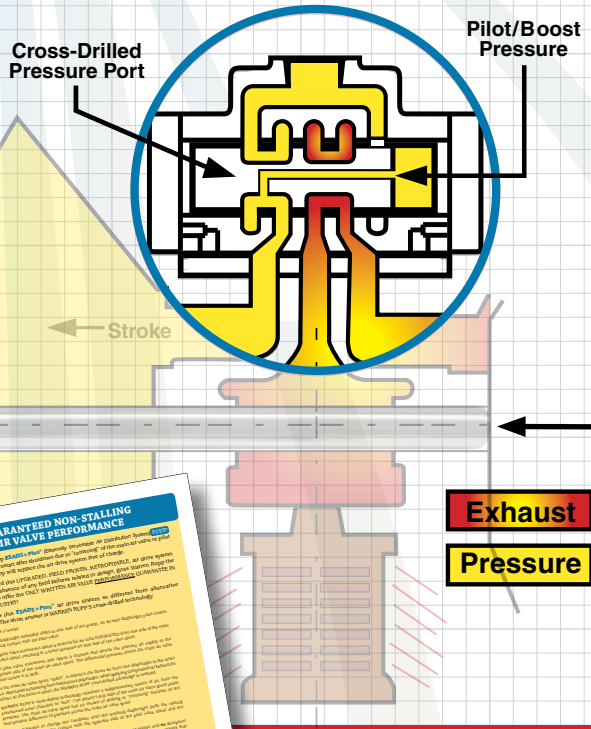
with more ways than one!

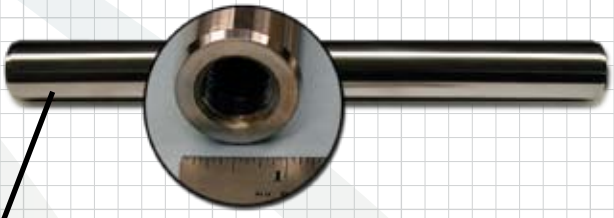
WARREN RUPP SIGNATURE DESIGN

ESADS+Plus® (Externally Serviceable Air Distribution System)

ON-OFF-ON... Reliability - GUARANTEED!

Primary system components = main directional air valve
(with ***PATENTED*** cross-drilled pressure ports) & pilot valve

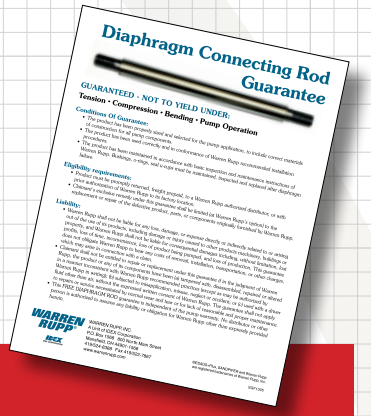


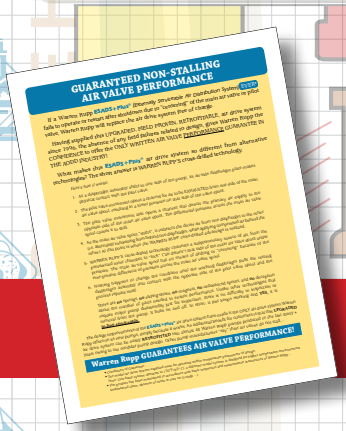


Durable, corrosion resistant 416 (Martensitic) and/or 316 (Austenitic) Stainless Steel diaphragm connecting rod - GUARANTEED!

GUARANTEED
not to yield under

- Tension
- Compression
- Bending
- Pump Operation



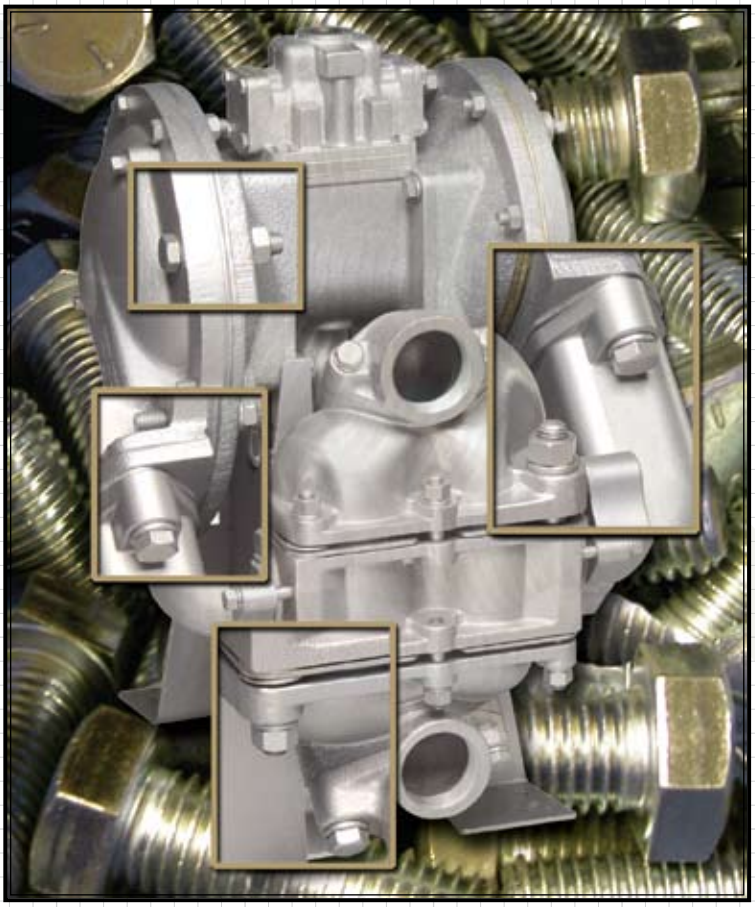


An industry exclusive
PERFORMANCE GUARANTEE!

- **FEATURES:** Independent of the pilot valve position, the cross-drilled pressure ports in the main directional air valve spool provide a pneumatic bias of the spool at either end of travel. This is accomplished by directing (inner) chamber pressure to the end of the spool, boosting and sustaining pilot pressure until point-of-shift of the pilot valve.
- **BENEFITS:** Eliminates spool from drifting due to vibration and or unbalanced pressure or system conditions.
  - **Process Reliability**
  - **Consistent restarts**
  - **Complete IN-LINE serviceable**
  - **Lube Free**

Completely serviceable, "IN-LINE"

PLATFORM



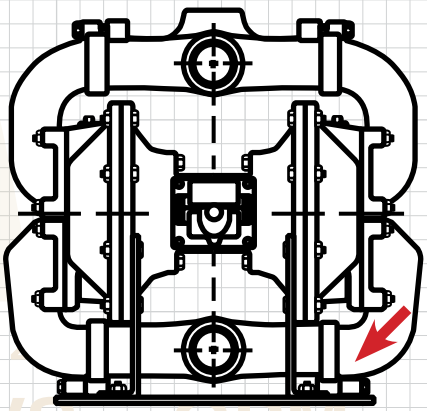
All Bolted Construction

- Instant alignment
  • ease of maintenance
- Uniform torquing of seal
  • improved seal
- Maintains seal after repeated servicing
  • lowers repair costs
- Withstands 4 times the pressure versus V-band clamps
  • eliminates leakage at high pressure and deadheaded conditions

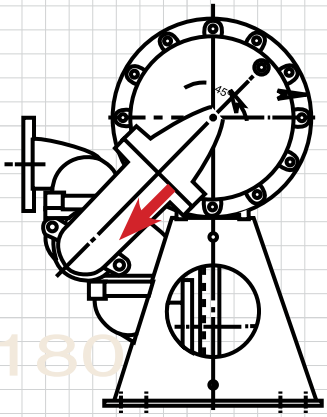
EXCLUSIVE Bottom Discharge Porting
for difficult solids handling

SANDPIPER® designs

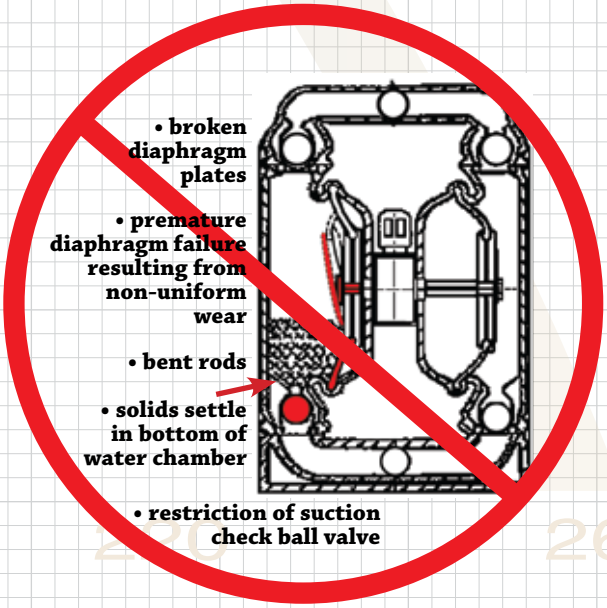
Heavy Duty Flap



Heavy Duty Ball



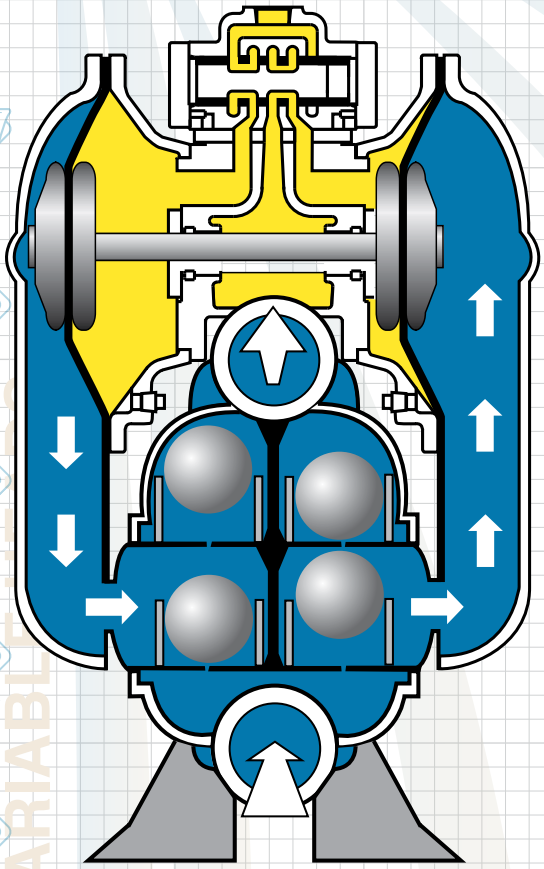
Standard Duty



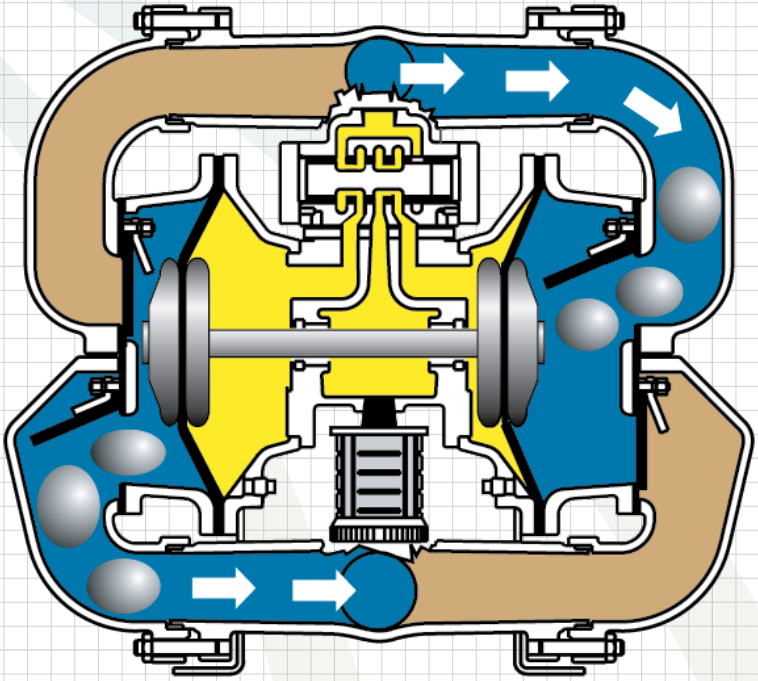
with more ways than one.

WARREN RUPP SIGNATURE

Heavy Duty Ball



Heavy Duty Flap



FEATURES - BENEFITS

ESADS+Plus® - Performance Guaranteed - In-line Serviceable Air Valve System

Bolted Construction - Safe - Reliable - Easy Maintenance

Durable, Single-Purpose, Corrosion Resistant, Diaphragm Connecting Rod - Guaranteed

Bottom Discharge Porting - Eliminates Settling Solids

Thick Wall Construction

Horizontal and Vertical Manifold Connections

Free Standing Base - Reduces Downtime - Easy Re-Build

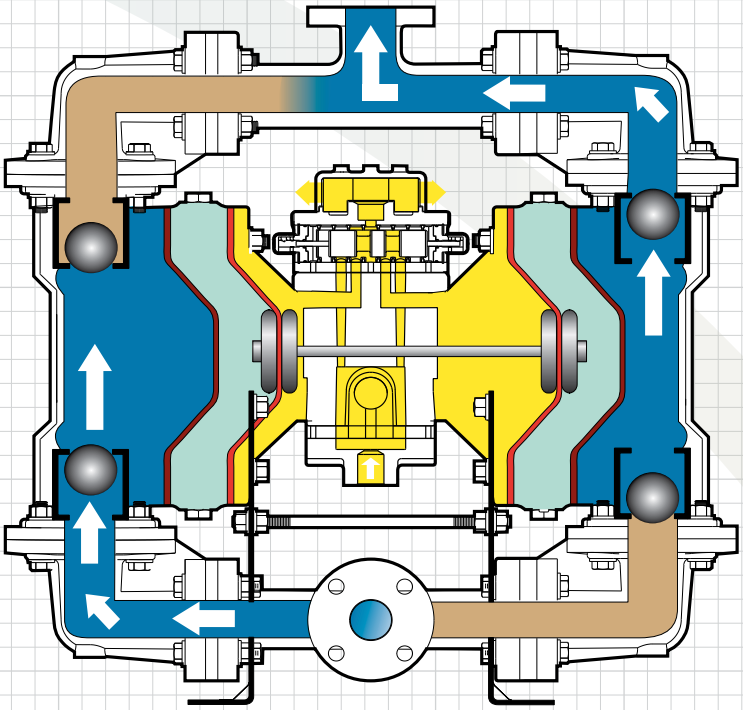
Heavy Duty Wear Package - Extends "MTBF"

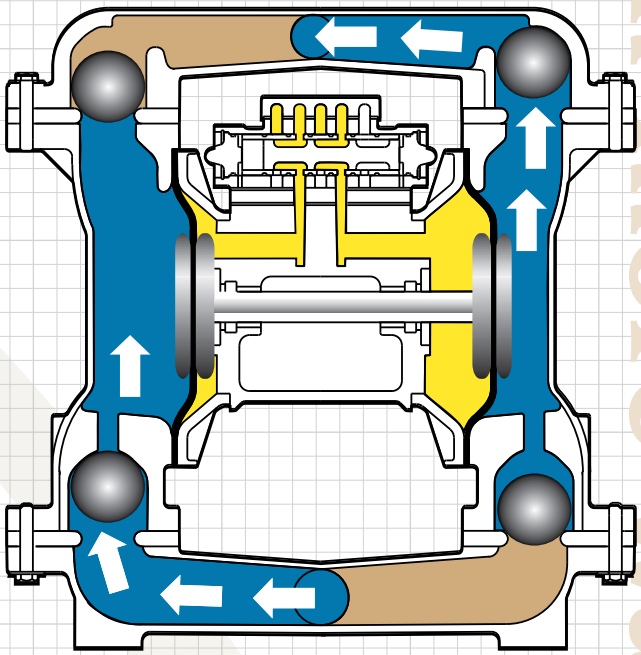
Weighted Ball Check Valves	Hinged Flap Check Valves
Solids Range +1/4" (6mm) to 7/8" (22mm)	Solids Range +1" (25mm) to 3" (76mm)
Dry Primes up to 20 Feet of Water	Dry Primes up to 24 Feet of Water

CONFIGURATIONS

Containment Duty **Standard Duty**

Metallic & Non-Metallic





FEATURES - BENEFITS

ESADS+Plus® - Performance Guaranteed - In-line Serviceable Air Valve System

Bolted Construction - Safe - Reliable - Easy Maintenance

Durable, Single-Purpose, Corrosion Resistant, Diaphragm Connecting Rod - Guaranteed

Top Discharge Porting - Eliminates Entrained Air

Metallic and Non-Metallic Materials of Construction

Ball Check Valves - Light Weight - Portable

90^0 - 180^0 Manifold Connection Rotation

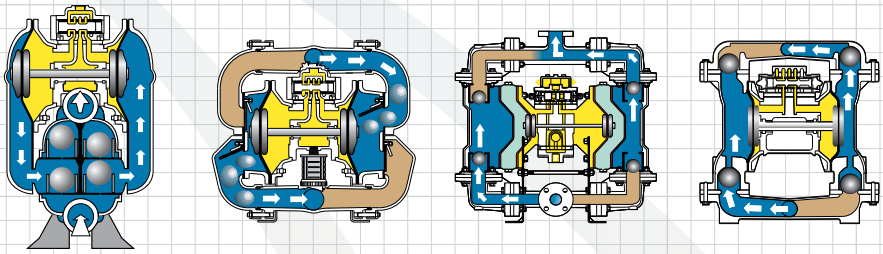
Containment Chamber with Leak Detection	
Hydraulically Balanced/Coupled Pumping and Driver Diaphragm Assemblies	
Solids Range+1/4" (6mm) to 3/4" (18mm)	Solids Range +1/8" (3mm) to 1/2" (12.7mm)
Dry Primes up to 18 Feet of Water	Dry Primes up to 20 Feet of Water
Free Standing Support Base	

BEST PRACTICES - AODD Pump Selection

A. SELECT PUMP DESIGN

A fundamental review of fluid characteristics, intended installation, and duty requirements are recommended for "best fit" design selections.

This design selection best practice ensures longest life whether measuring MTBF (mean time between failures), MTBR (mean time between repairs), MTBC (mean time between changes) or MTBM (mean time between maintenance).

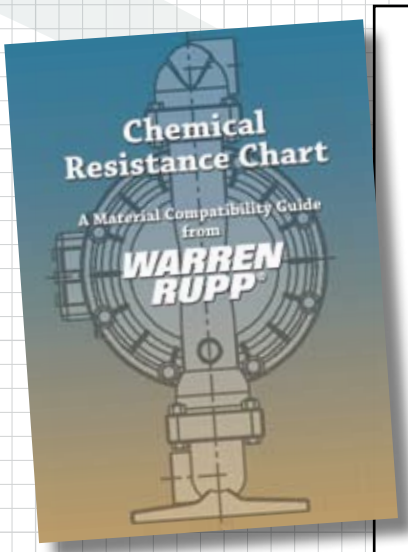


			Heavy Duty Ball Bottom Discharge	Heavy Duty Flap Bottom Discharge	Containment Duty Top Discharge		Standard Duty Top Discharge	
					Metallic	Non-Metallic	Metallic	Non-Metallic
Fluid Characteristics	Water (base reference)		A	A	A	A	A	A
	Suspended Solids		A (top discharge porting)	B	A	B	A	B
	Non-Suspended Solids		A (bottom discharge porting)	A (bottom discharge porting)	X	X	C	X
	Line Size Solids		X	A	X	X	X	X
	Sludge / Slurry		A (bottom discharge porting)	A (bottom discharge porting)	B	C	B	C
	High Viscosity (Flowable Fluids)		A (weighted check valves)	B	B	B	B	B
	Erosion / Abrasive Fluids	High	A	A	B	C	B	C
		Moderate	A	A	B	C	B	C
		Low	A	A	A	B	A	B
	Corrosion		B	B	B	A	B	A
Installation	Permanent		A	A	B	B	B	B
	Portable		B	A	A	A	A	A
	Containment / Prevention		C	C	A	A	C	C
	Flooded Suction		A (weighted check valves)	B	B	B	B	B
	Suction Lift		B	A	B	B	B	B
	Submerged		B	B	B	C	B	C
Duty	Intermittent / On-Demand		A	A	A	A	A	A
	Continuous		A	B	B	B	B	B

A = Best Type	B = Suitable	C = Caution (Limitations)	X = Unsuitable

B. SELECT MATERIALS OF CONSTRUCTION

Reference the SANDPIPER® Chemical Resistance Chart

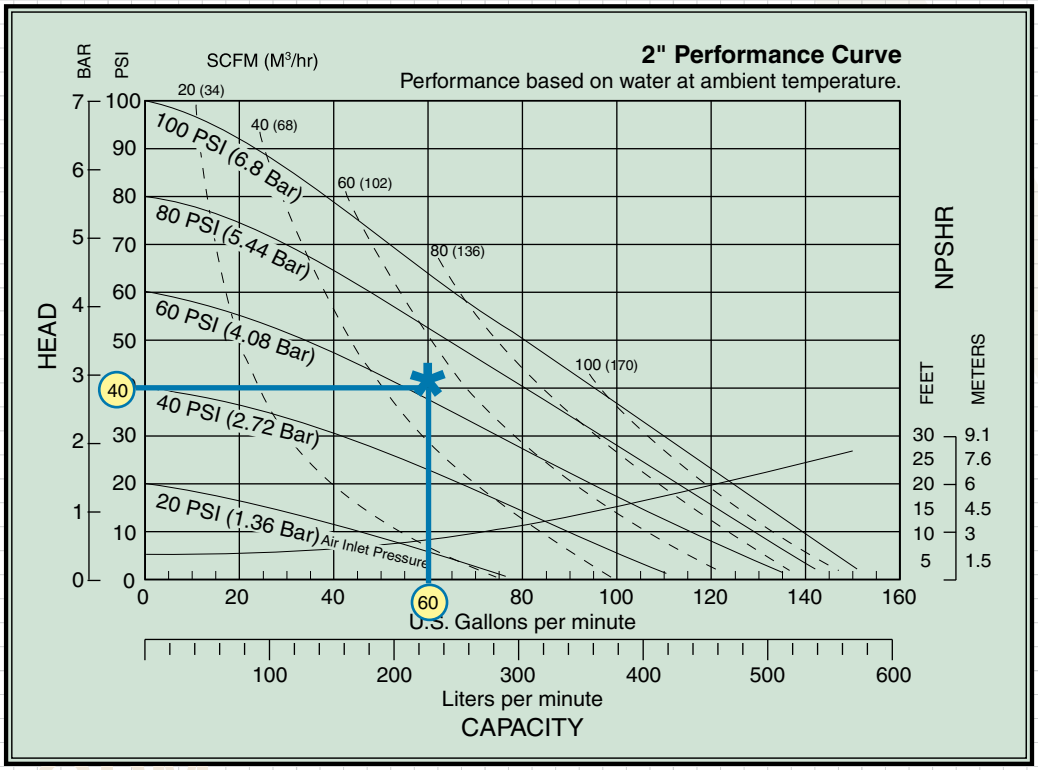


CHEMICAL Formula	ELASTOMERS										METAL PARTS				PLASTICS					
	RUPPLON™ (Polyurethane)	NEOPRENE	BUNA-N	E.P.D.M.	HYTREL®	(FKM) FLUOROCARBON	BLUE GYLON®	PTFE, PFA	ENVELON®	SANTOPRENE®	ALUMINUM	CAST IRON/STEEL	STAINLESS STEEL	Alloy C (Hastelloy Equiv.)	POLYPROPYLENE	ACETAL	PVDF	NYLON	RYTON®	UHMW POLYETHYLENE
Lime, Soda (Slaked Lime & Soda Ash) CaO	C	B	B	A		B		A		A					B					
Lime Bleach		C	A	A		A		A		A	X				B					
Lime Slurries		A	B		C	B		A			B		B							
Lime Sulfur $CaS+CaSO_3$		A	A	A		A		A		B	X		A		A			B		A
Limonene $C_{10}H_{16}$		X	C	X		A		A												
Linoleic Acid $C_{18}H_{32}O_2$		X	B	X		B		A		B	A		A	A	A		A			
Linseed Oil (Flaxseed Oil) Glycerides	B	A	A	C	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A
Lindol (Tricloyl Phosphate) $C_{12}H_{15}O_4P$		C	X			B		A		A										
Lithium Bromide $LiBrH_2O$		X	A			A		A	A			A					A			
Lubricating Oils (Petroleum) Hydrocarbons	C	B[1][2]	A	X	A	A	A	A	A	X	A	A	A	A	C	A	A	A	A	A
Lye (Potassium Hydroxide)																				

C. SELECT PUMP SIZE

1) Enter Flow (GPM) and Head (example: 60 GPM @ 40 PSI)

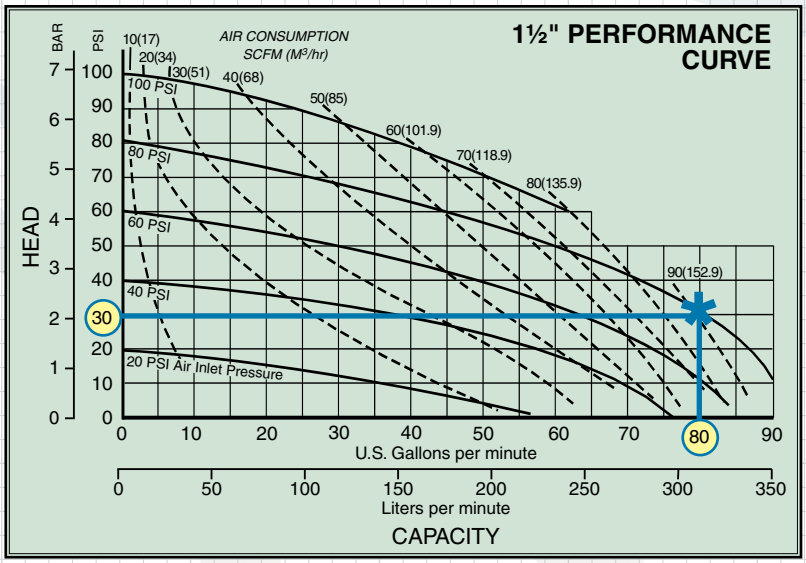
2) Approximate energy requirements in Pressure and Volume (example: 62 PSI @50 SCFM)

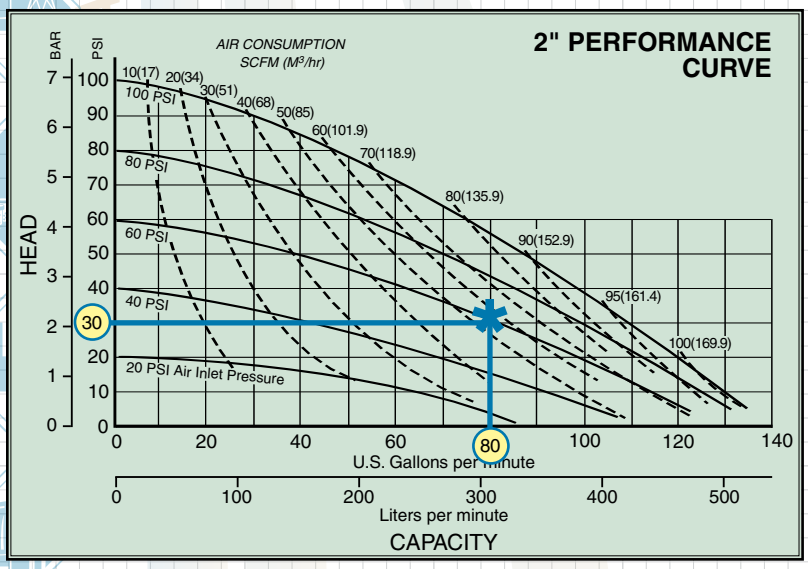


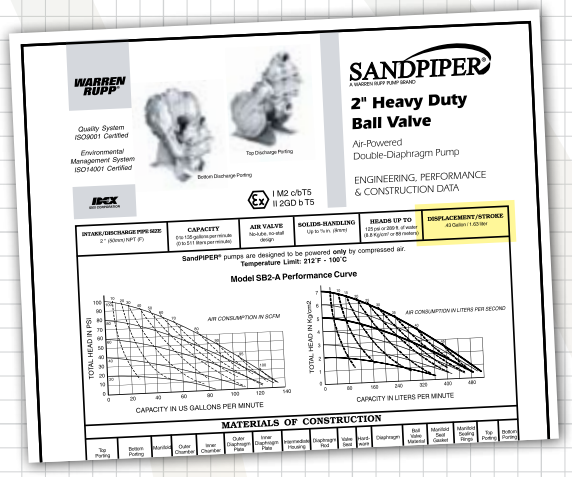
BEST PRACTICES - SIZING to extend MTBF and...

Pumping requirements (flow & head) for most applications can be met by multiple sizes of pumps. Talk to Warren Rupp's application engineers to assist you with a size selection which best fits your total cost of ownership budget. An appropriately sized-up pump will lower the consolidated initial investment, repair, labor and energy costs. This BEST PRACTICE ensures desirable returns on the initial investment frequently measurable in weeks.

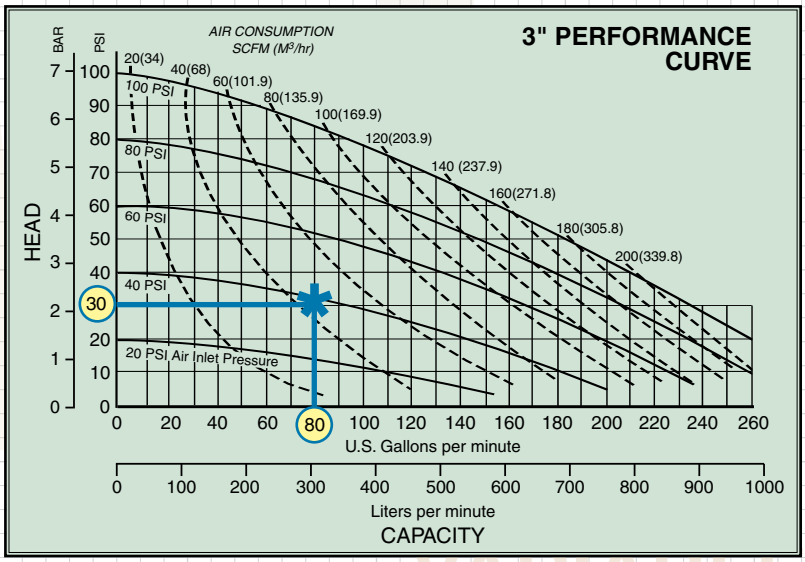
EXAMPLE: 80 GPM @ 30 PSI







Experienced application engineers are available to help you determine the best fit pump size for your application. Call our factory or email apptech.warrenrupp@idexcorp.com.



lower Total Cost of Ownership

Comparative Example

Compare the total cost of ownership of 2 to 3 AODD pump sizes, including purchase price, compressed air cost, repair parts cost, and maintenance labor cost. Required inputs are flow rate (gpm), discharge pressure (PSI), air inlet pressure (PSI), air consumption (scfm), displacement per stroke (gal), wet end kit cost, electricity cost ($/kw-hr), labor cost ($/hr) and weekly hours of operation.

INDUSTRY ACCEPTED BEST PRACTICES & ASSUMPTIONS

- Maintenance performed every 10 million pump strokes
- Two hours of labor required for each rebuild

Step 1: Input Pump Data

Pump Size	Model	Price ($)	Flow Rate (gpm)	Discharge Pressure (PSI)	Air Inlet Pressure (PSI)	Air Consumption (scfm)	Displacement per Stroke (gal)	Wet End Kit Cost ($)
A	1½"	$1,217.00			79	91	0.34	$151.42
B	2"	$1,354.00	80	30	60	55	0.43	$249.85
C	3"	$3,225.00			37	43	1.8	$508.35

Step 2: Input Cost Data

Electricity Cost ($/kw-hr)	$ 0.07
Labor Cost ($/hr)	$75.00
Weekly Hours of Operation	40

Step 3: View Cost Summary

Pump Size	Annual Air Consumption Cost	Annual Replacement Parts Cost	Annual Maintenance Labor Cost	Maintenance Frequency (weeks)	Weekly Pump Operating Cost	Annual Pump Operating Cost	Total First Year Investment (Price +Operating Cost)
A	$1,720.18	$221.70	$220.24	35	$41.58	$2,162.12	$3,379.12
B	$ 880.89	$290.23	$174.14	45	$25.87	$1,345.26	$2,699.26
C	$ 514.70	$140.89	$ 41.60	188	$13.41	$ 697.18	$3,922.18

Step 4: Evaluate Return on Investment

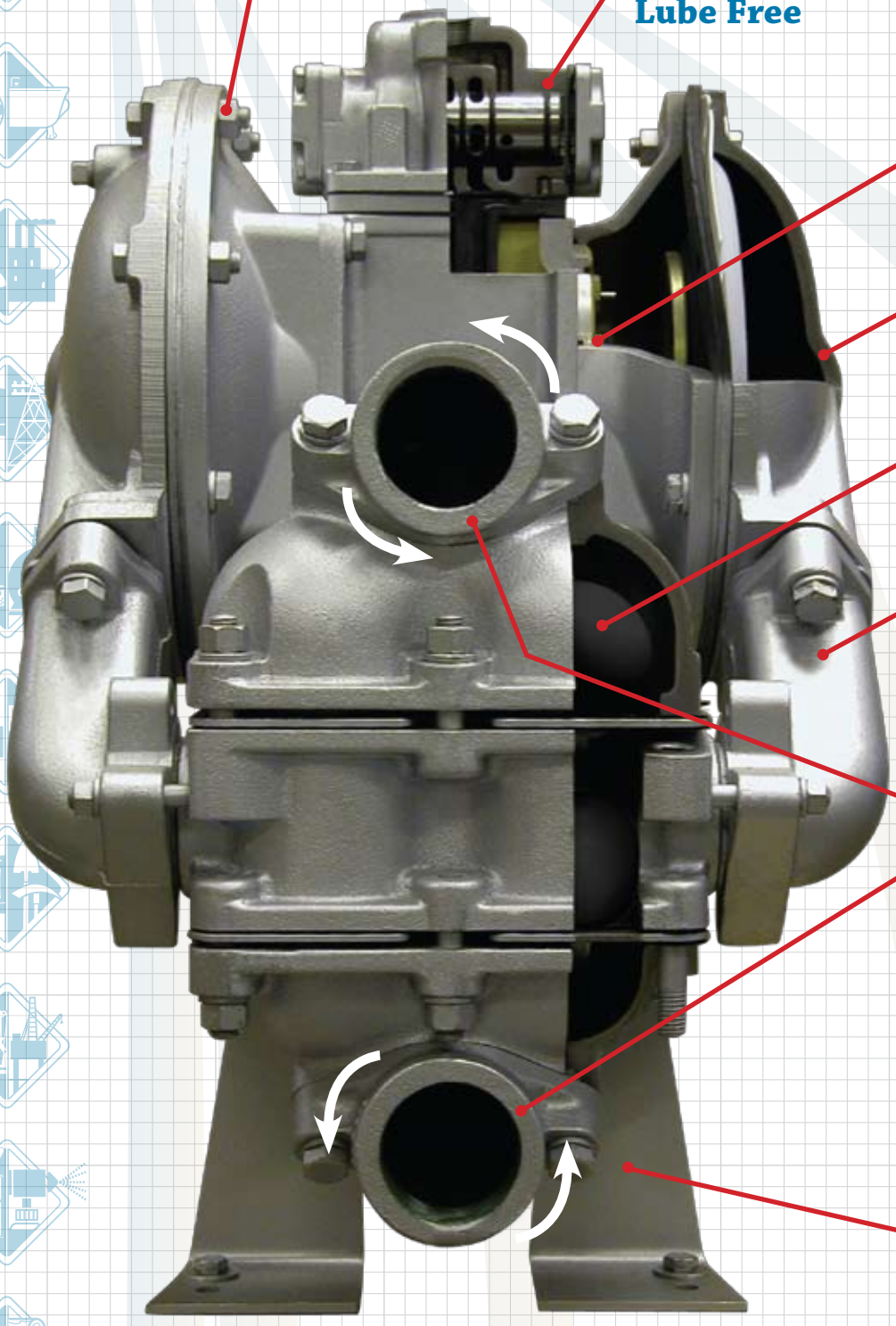
Additional Investment Payback Period (weeks)

Pump Size **B** (Higher Price) **vs.** Pump Size **A** (Lower Price)

= 8.7 weeks

Total Cost of Ownership calculator allows user to compare the total cost of ownership of 2 to 3 AODD pump sizes. This calculator is available through IDEX Commercial Operations Regional Managers.

HEAVY DUTY BALL



All Bolted Construction

ESADS+Plus®
(Externally Serviceable Air Distribution System)
Lube Free

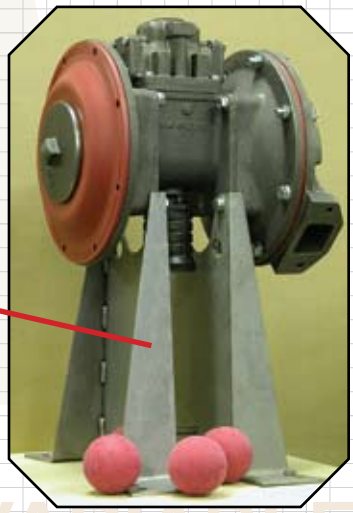
Durable Diaphragm Connecting Rod

Thick Wall Construction

Weighted Elastomeric Ball Checks

Bottom Discharge Ported

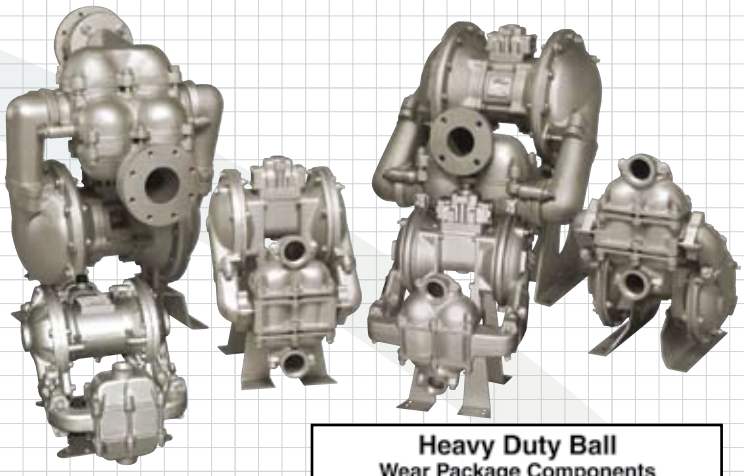
Rotate Porting Flange 180° to Achieve 90° Vertical Connections



Free Standing Support Base

Warren Rupp Signature Features - in BLUE

CONFIGURATION FEATURES



HEAVY DUTY BALL

ESADS+Plus®

All Bolted Construction

Bottom Discharge

HD Extended Wear Package (1½" to 4")

Thick Wall Construction

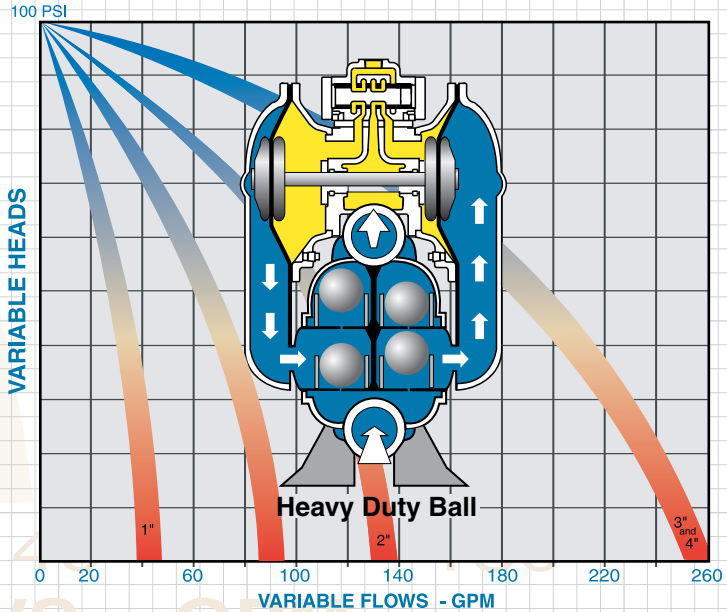
Durable Diaphragm Connecting Rod

Horizontal and Vertical Manifold Connections

Solids Range +1/4" (6mm) to 7/8" (22mm)

Dry Primes up to 20 Feet of Water

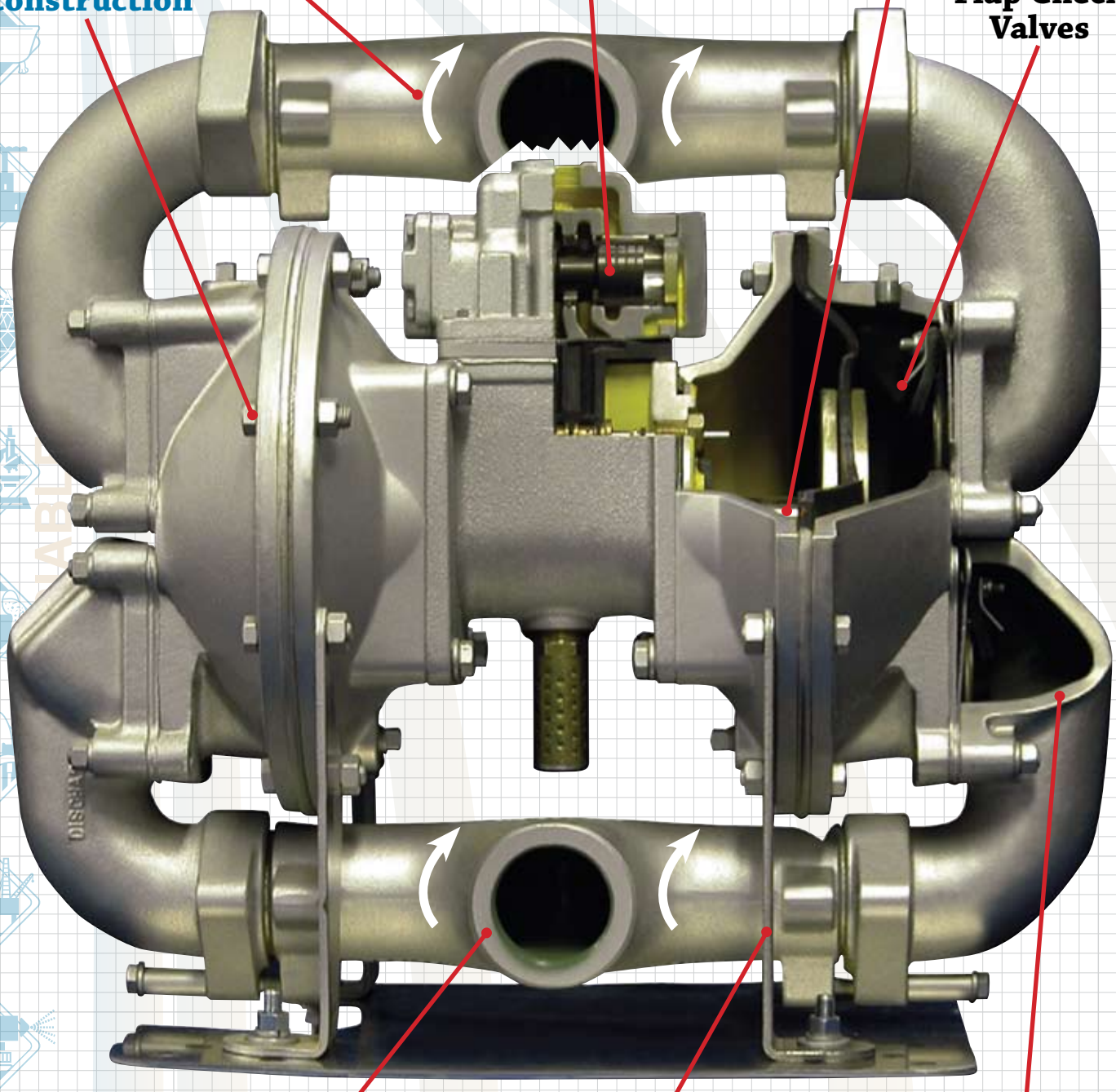
Free Standing Support Base



			Heavy Duty Ball Bottom Discharge
Fluid Characteristics	Water (base reference)		A
	Suspended Solids		A (top discharge porting)
	Non-Suspended Solids		A (bottom discharge porting)
	Line Size Solids		X
	Sludge / Slurry		A (bottom discharge porting)
	High Viscosity (Flowable Fluids)		A (weighted check valves)
	Erosion / Abrasive Fluids	High	A
		Moderate	A
		Low	A
	Corrosion		B
Installation	Permanent		A
	Portable		B
	Containment / Prevention		C
	Flooded Suction		A (weighted check valves)
	Suction Lift		B
	Submerged		B
Duty	Intermittent / On-Demand		A
	Continuous		A

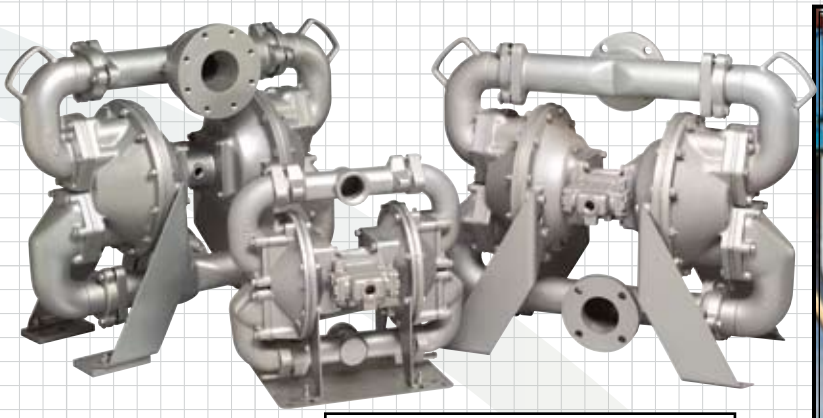
A = Best Type
B = Suitable
C = Caution (Limitations)
X = Unsuitable

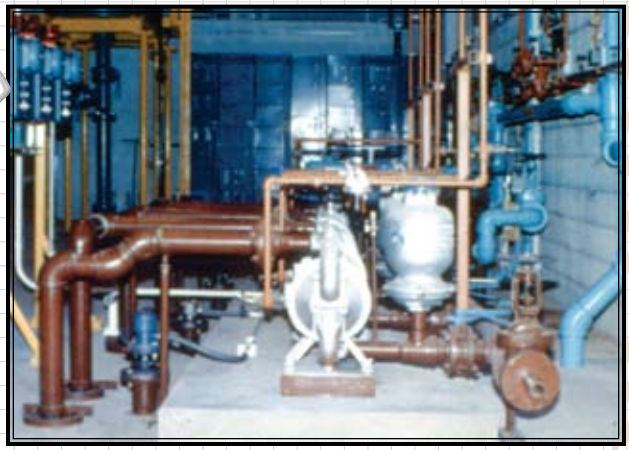
HEAVY DUTY FLAP



Warren Rupp Signature Features - in BLUE

CONFIGURATION FEATURES





HEAVY DUTY FLAP

ESADS+Plus®

All Bolted Construction

Bottom Discharge

Flap Check Valves

HD Extended Wear Package (2" to 4")

Thick Wall Construction

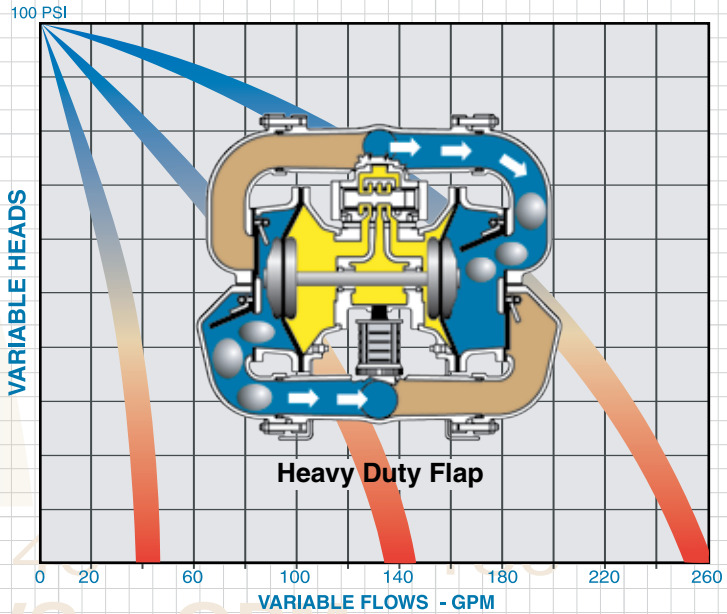
Durable Diaphragm Connecting Rod

90⁰ - 180⁰ Manifold Connection Rotation

Solids Range +1" (25mm) to 3" (76mm)

Dry Primes up to 24 Feet of Water

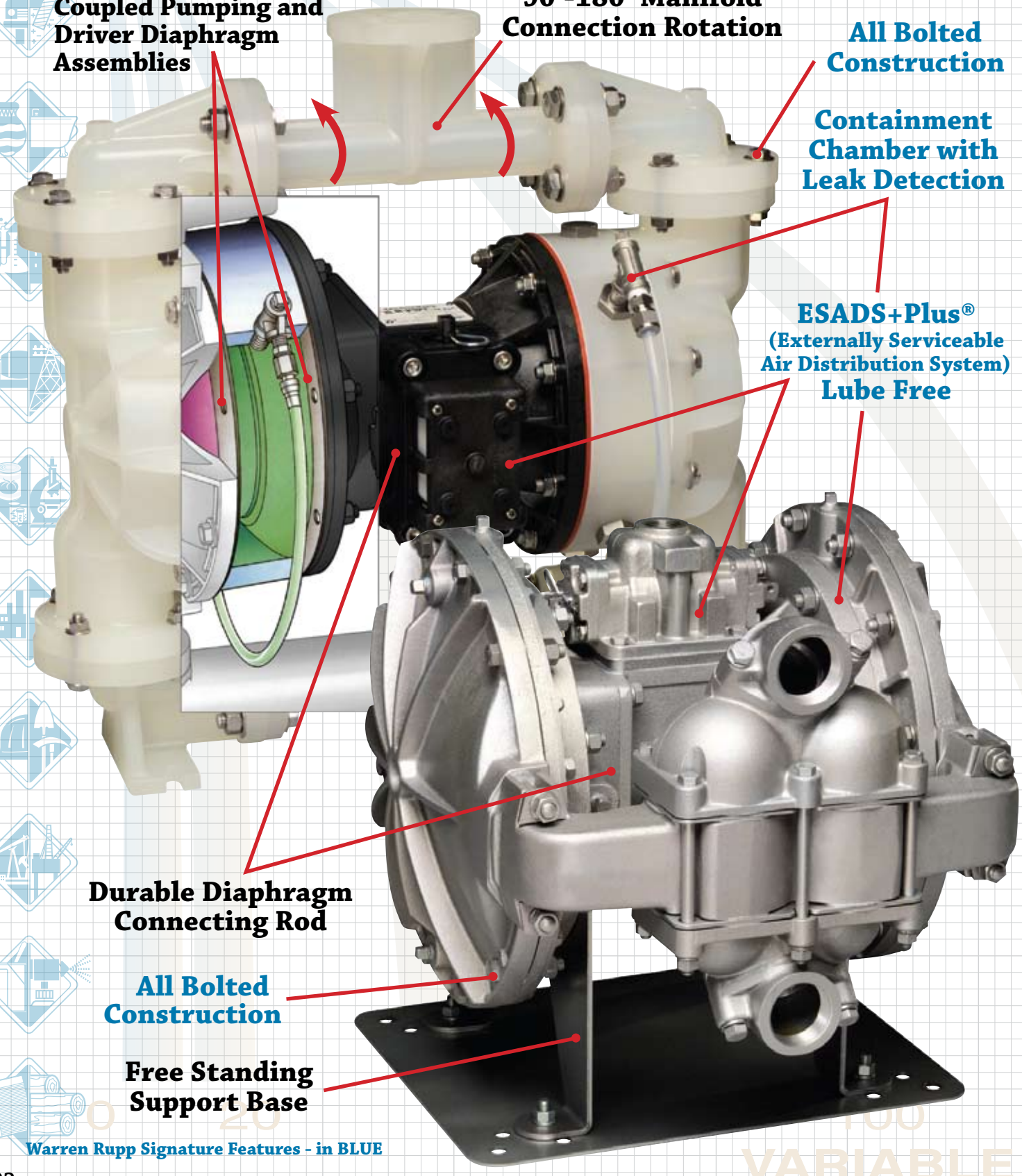
Free Standing Support Base



		Heavy Duty Flap Bottom Discharge
Fluid Characteristics	Water (base reference)	A
	Suspended Solids	B
	Non-Suspended Solids	A (bottom discharge porting)
	Line Size Solids	A
	Sludge / Slurry	A (bottom discharge porting)
	High Viscosity (Flowable Fluids)	B
	Erosion / Abrasive Fluids – High	A
	Erosion / Abrasive Fluids – Moderate	A
	Erosion / Abrasive Fluids – Low	A
	Corrosion	B
Installation	Permanent	A
	Portable	A
	Containment / Prevention	C
	Flooded Suction	B
	Suction Lift	A
	Submerged	B
Duty	Intermittent / On-Demand	A
	Continuous	B

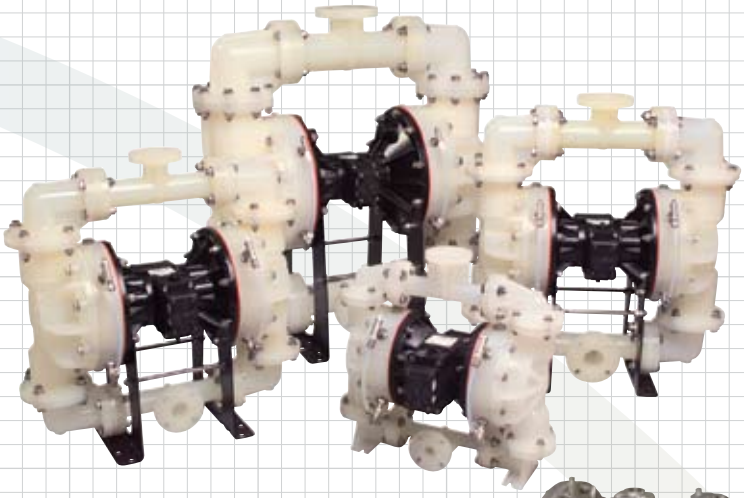
A = Best Type
B = Suitable
C = Caution (Limitations)
X = Unsuitable

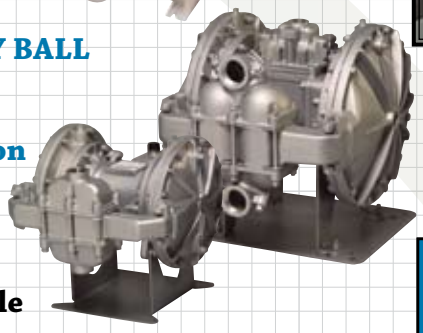
CONTAINMENT DUTY BALL



Warren Rupp Signature Features - in BLUE

CONFIGURATION FEATURES





CONTAINMENT DUTY BALL

ESADS+Plus®

All Bolted Construction

Top Discharge

Ball Check Valves

Light Weight - Portable

Containment Chamber with Leak Detection

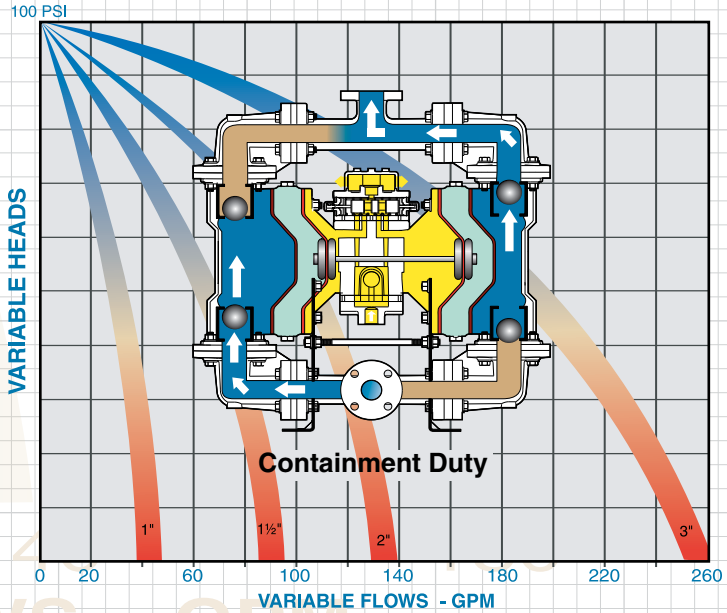
Durable Diaphragm Connecting Rod

90⁰ - 180⁰ Manifold Connection Rotation

Solids Range +1/4" (6mm) to 3/4" (18mm)

Dry Primes up to 18 Feet of Water

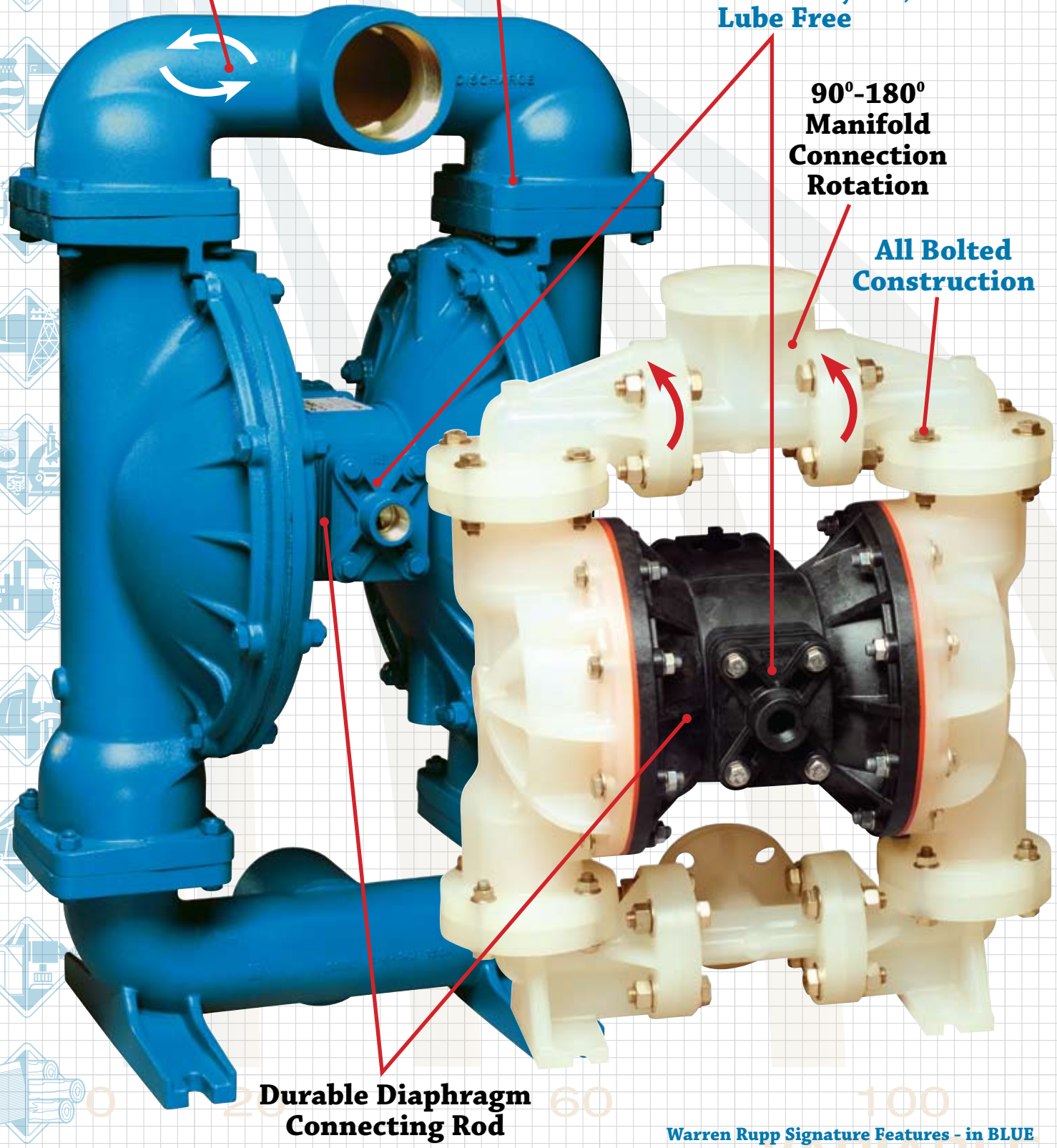
Free Standing Support Base



			Containment Duty Top Discharge	
			Metallic	Non-Metallic
Fluid Characteristics	Water (base reference)		A	A
	Suspended Solids		A	B
	Non-Suspended Solids		X	X
	Line Size Solids		X	X
	Sludge / Slurry		B	C
	High Viscosity (Flowable Fluids)		B	B
	Erosion / Abrasive Fluids	High	B	C
		Moderate	B	C
		Low	A	B
	Corrosion		B	A
Installation	Permanent		B	B
	Portable		A	A
	Containment / Prevention		A	A
	Flooded Suction		B	B
	Suction Lift		B	B
	Submerged		B	C
Duty	Intermittent / On-Demand		A	A
	Continuous		B	B

A = Best Type
B = Suitable
C = Caution (Limitations)
X = Unsuitable

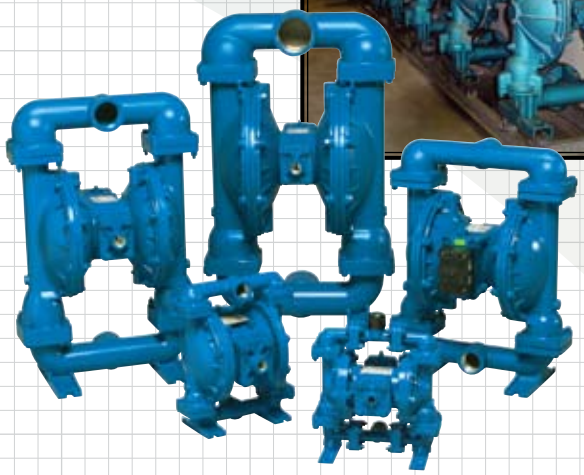
STANDARD DUTY BALL

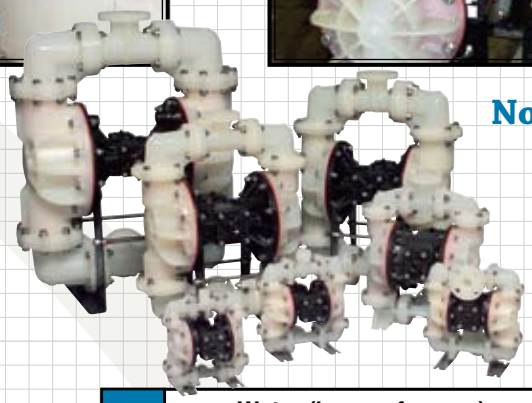


Warren Rupp Signature Features - in BLUE

CONFIGURATION FEATURES

Metallic





Non-Metallic

STANDARD DUTY BALL

ESADS+Plus® All Bolted Construction

Top Discharge Ball Check Valves

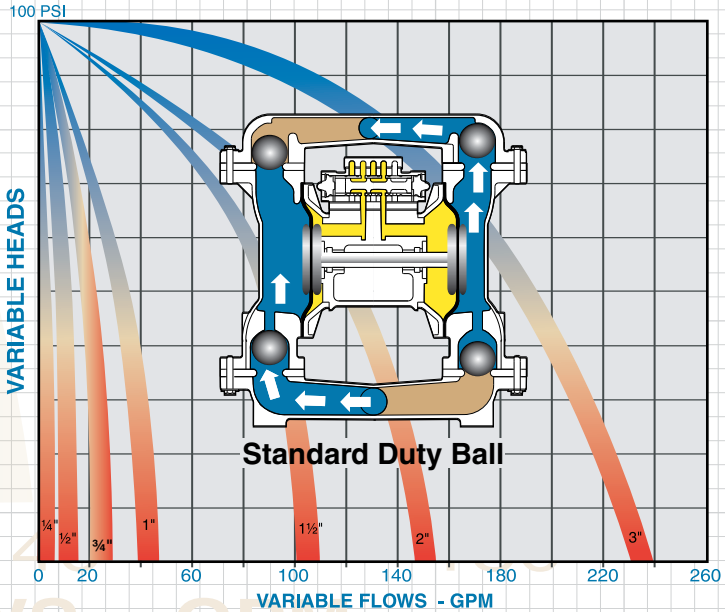
Durable Diaphragm Connecting Rod

Light Weight - Portable

90⁰ - 180⁰ Manifold Connection Rotation

Solids Range +1/8" (2mm) to 1/2" (12.7mm)

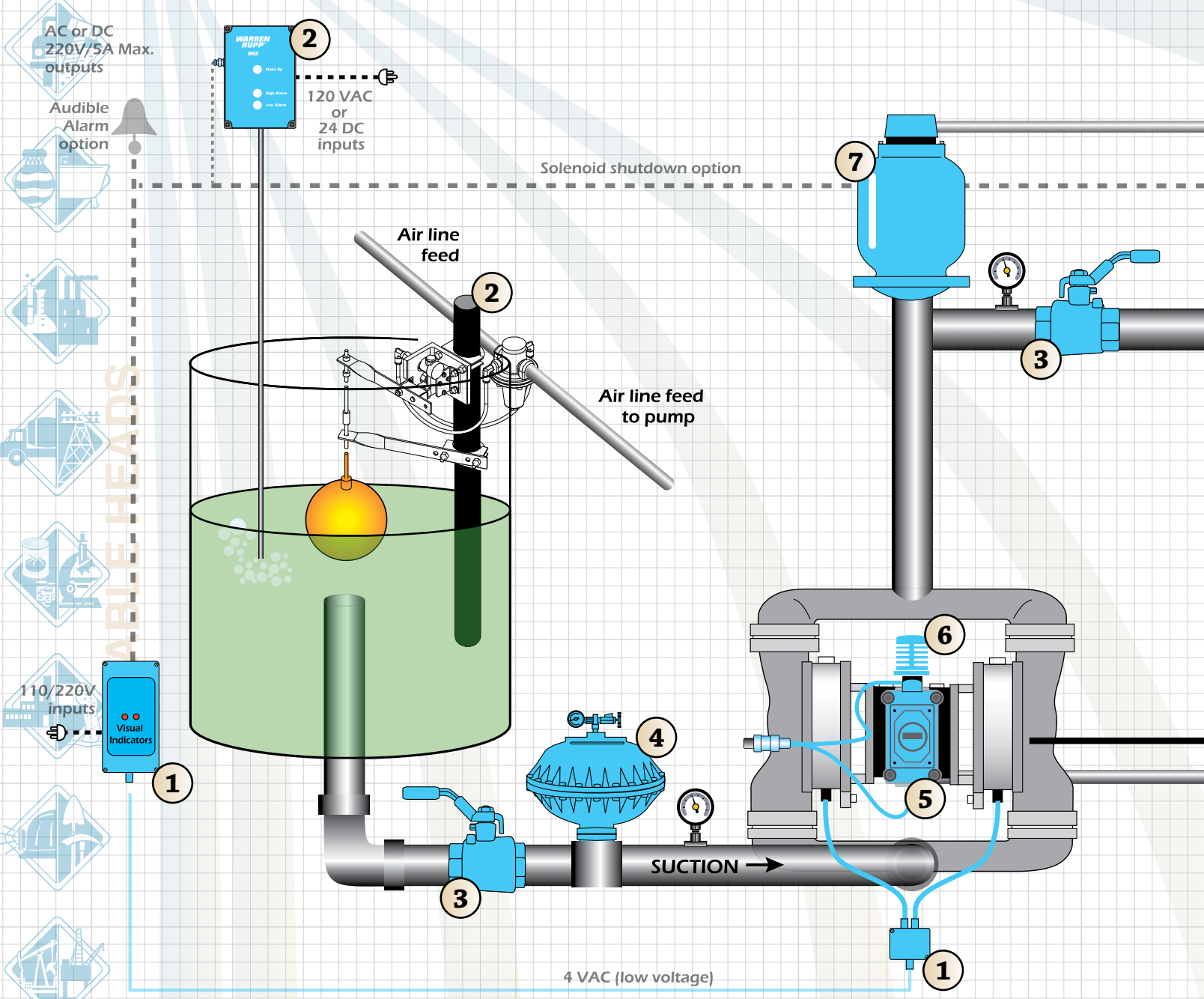
Dry Primes up to 20 Feet of Water



		Standard Duty Top Discharge	
		Metallic	Non-Metallic
Fluid Characteristics	Water (base reference)	A	A
	Suspended Solids	A	B
	Non-Suspended Solids	C	X
	Line Size Solids	X	X
	Sludge / Slurry	B	C
	High Viscosity (Flowable Fluids)	B	B
	Erosion / Abrasive Fluids – High	B	C
	Erosion / Abrasive Fluids – Moderate	B	C
	Erosion / Abrasive Fluids – Low	A	B
	Corrosion	B	A
Installation	Permanent	B	B
	Portable	A	A
	Containment / Prevention	C	C
	Flooded Suction	B	B
	Suction Lift	B	B
	Submerged	B	C
Duty	Intermittent / On-Demand	A	A
	Continuous	B	B

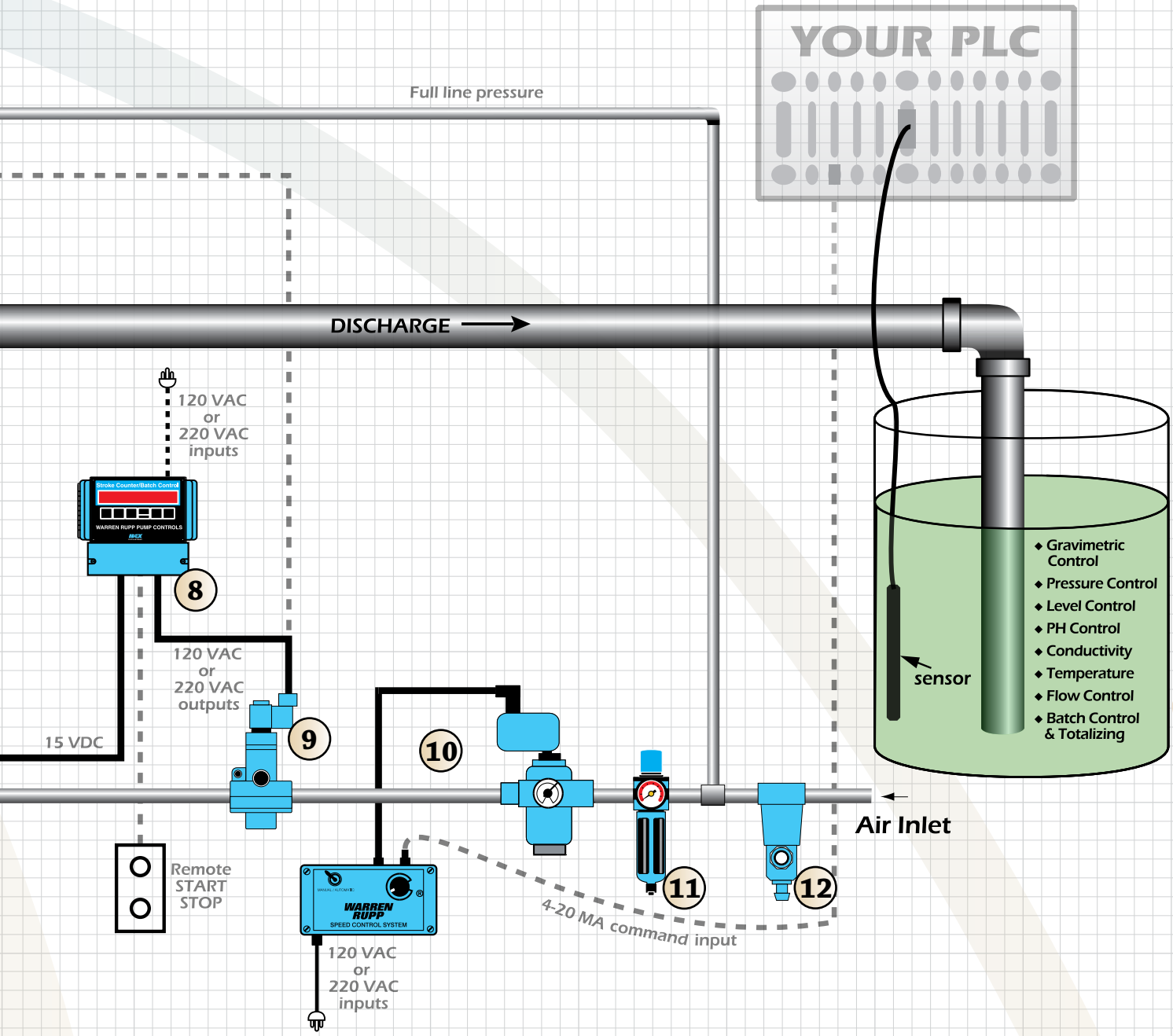
A = Best Type C = Caution (Limitations)
B = Suitable X = Unsuitable

BEST PRACTICES -
Recommended Process Control Loop



1. Leak Detection
2. Liquid Level Controls
3. Banjo Ball Valve
4. Blacoh® Inlet Stabilizer
5. Pulse Output Kits
6. Muffler Options

Accessory Components



7. Tranquilizer® (Surge Dampeners)
   Blacoh® Plastic Dampener

8. Stroke Counter/Batch Control

9. Air Line Solenoid

10. Variable Speed Control

11. Filter/Regulator

12. Air Dryer

Accessories - Process Control Loop

1. LEAK DETECTION

Electronic

At the point the primary pumping diaphragm fails, this modular, watertight unit senses conductivity changes between the driver fluid and the pumped fluid. Warning lights indicate which side of the pump is tainted. The unit can also be wired for audible alarm or pump shutdown. Low voltage. Simple installation.

Part # 032.XXX.000.

Visual

A sight tube style leak detector is installed on each driver chamber. If a pumping diaphragm break occurs, liquid in the sight tube changes. This type of leak detection is standard construction on non-metallics spill containment pumps.

Standard

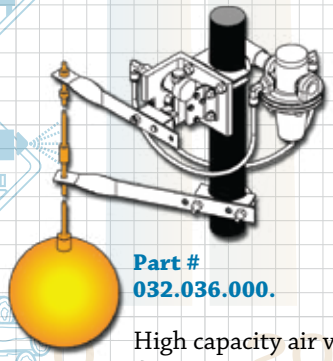
Mechanical

When a leak chemically attacks an internal o-ring on this detector, it actuates a plunger.

Part # 031.XXX.110.

This opens an air valve, which in turn activates a customer-supplied solenoid (or similar device) to trigger a signal. For use with the CONTAINMENT DUTY Spill Containment SANDPIPER® pumps ONLY.

2. LIQUID LEVEL CONTROLS



Part # 032.036.000.

Warren Rupp's float actuated liquid level control provides all-pneumatic operation. Especially useful in sump and liquid transfer situations, the float actuated switch opens and closes air supply to the pump for positive ON-OFF response. High capacity air valve accommodates air flow requirements up to 125 cfm, with a pressure drop less than 10 PSI.

Liquid level controls provide liquid level and process control for all types of materials and applications, including constant sump flushing, reducing flow to a filter, balancing inlet flow to parallel filters, sump transfers, and chemical additions. Product line includes single and dual pump controllers, proportional controls that operate on plant air only, and controllers for up to four devices.

3. BANJO® BALL VALVE

Precision-molded Polypropylene ball valves are reinforced with fiberglass for additional strength.

316 Stainless Steel two-piece ball valves have blow-out proof stems and are rated at 1000 PSI.

Both Polypropylene and Stainless Steel have PTFE seals and seats. Tank accessories include 150# ANSI flanges and ANSI flange gaskets in both EPDM and FKM.

4. BLACOH® SENTRY® INLET STABILIZER

Blacoh's® SENTRY® Inlet (Suction) Stabilizers at the pump's inlet reduces pressure fluctuations and aids in filling the pump head with fluid during each inlet stroke. In high suction lift applications, SENTRY® Inlet Stabilizers will momentarily maintain the flow of the accelerated fluid.

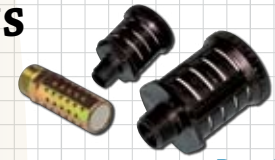
5. PULSE OUTPUT KITS

Part # 475.000.000.

Offered in a wide variety of sizes and voltages. These controls interface with the Warren Rupp Batch Controller, or your own process controls (PLC's). Available in kits, for field installation, or factory built into a new pump.

Refer to Service Manuals & Data Sheets for ATEX Compliance.

6. MUFFLER OPTIONS



Part # 530.XXX.000.

Effective sound dampening for Warren Rupp pumps. Mufflers are a rugged Polymer or metallic housing. Sound dampening and encapsulated mufflers have replaceable acoustic composite inserts. All Warren Rupp pumps are supplied with a basic muffler. Meets OSHA dBA requirements.

7. TRANQUILIZER®/DAMPENERS

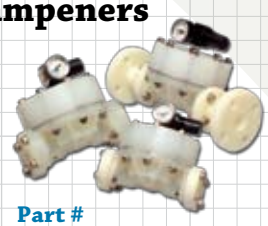
Metallic Surge Suppressors

For use with any reciprocating pump, Tranquilizer surge suppressors maintain a constant air cushion volume in a pumping application for the most effective surge suppression. All Tranquilizer models are automatically self-charging and self-venting. Flexible diaphragm separates air cushion from pumped product.

Part # TA-1, TD-1½, TA-2, TA-3

Non-Metallic Surge Dampeners

Designed for use with ½", ¾" and 1" pumps, these dampeners are manually charged with air. PTFE diaphragms are standard, with wetted parts available in Polypropylene, PVDF, and Nylon. The DA05 is also available in Aluminum and Stainless Steel. Flow and pressure fluctuations are minimized, the dampener consumes no air after initial charging. Hardware is 302/304 Stainless Steel.



Part # DA05, DA07 & DA10

Blacoh® SENTRY® Plastic Pulsation Dampeners

These dampeners remove virtually all hydraulic shock, enhancing all-around performance and reliability of fluid handling equipment in industrial and chemical transfer applications.

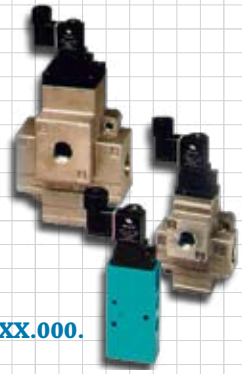
8. STROKE COUNTER/ BATCH CONTROL

Part # 249.006.000.

Transforms your diaphragm pump into an accurate, controllable pump system. Uses interfaceable, user-friendly components in your process control systems and existing or new pumps. It eliminates troublesome and expensive flow-sensing devices. The Stroke Counter/Batch Control is an interfaceable electronic control to program repetitive diaphragm pump operations. This industrial-grade control offers performance and repeatability. Compatible with all Warren Rupp air-operated diaphragm pumps. The control unit functions as a batch control, a stroke counter, or both. The complete system requires the Stroke Counter/Batch Controller, the Pulse Output Kit & the Air line Solenoid.

9. AIR LINE SOLENOID

Provides automatic on/ off operation of air-driven equipment. 110/120VAC and 220/240VAC (50/60 hertz) kits operate with the Warren Rupp or customer's control units. 12VDC and 24VDC kits operate with customer-supplied controls only.



Part # 894.XXX.000.

10. ELECTRONIC SPEED CONTROL

Part # 032.XXX.000.

Easy installation and operation. Fits most air-operated diaphragm pumps with operating pressures to 125 PSI. Accurate control of variable flow rates, from zero flow to maximum. Operates on 110 or 220VAC. Manual operation with on-board, single turn potentiometer or automatic mode for remote control using the optional 4-20 mA input terminal. Speed Control System can be integrated with existing process control systems

11.FILTER/REGULATOR

Clean, dry air is the key to trouble-free pump operation. The Warren Rupp Filter/ Regulator line offers modular convenience for easy installation and service.

Part # 020.XXX.XXX.

12. AIR DRYER

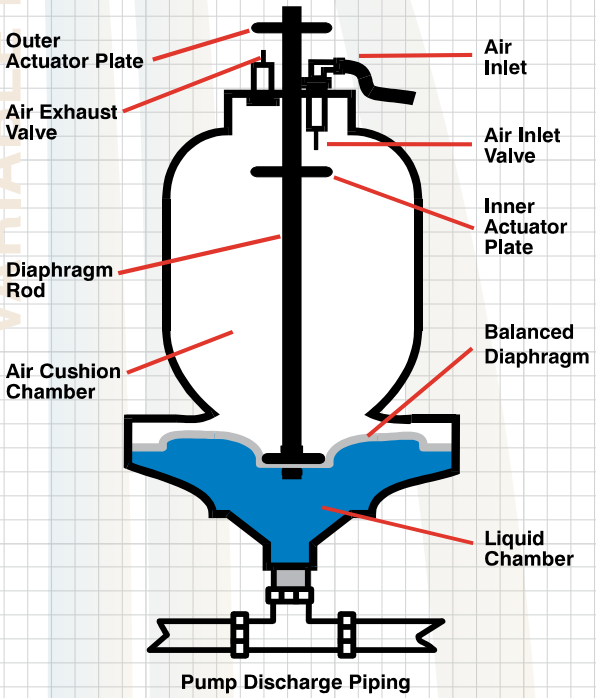
This point-of-use air dryer is designed to remove 99% of the water, rust and other contaminants commonly present in compressed air lines. Clean, dry air enhances the life and performance of pneumatically-driven equipment.

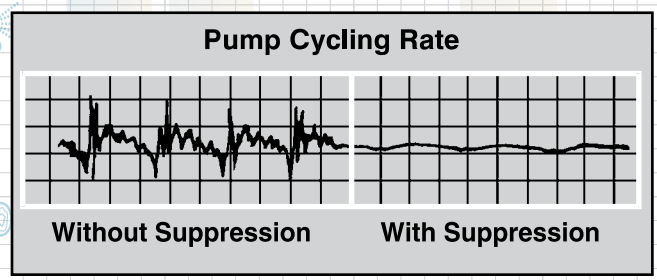
Part # 020.XXX.XXX.

Accessories - TRANQUILIZER®

Surge Suppression for AODD Pumps

- Virtually surge-free flows
- Steadier pressures
- Less vibration and noise
- Simple installation
- Variety of sizes and materials
- Automatically self-charging and self-venting
- Longest life balanced diaphragm





OPERATING PRINCIPLE

An air cushion is established by liquid pressure pushing the diaphragm upward. This allows air to enter the chamber. The balancing air cushion keeps the diaphragm centered at mid stroke.

During operation, the diaphragm(s) flex within the mid-range position, absorbing and equalizing discharge surge.

If pressure changes in the system, the air cushion pressure compensates, automatically increasing or decreasing. If liquid pressure is released, air in the suppressor chamber exhausts into the atmosphere.

Properly sized and installed, Tranquilizers provide virtually surge-free discharge flow.

TRANQUILIZER® Options

Model & Description	Max. Pressure	Air Inlet Size	Liquid Inlet Size	Dimensions Inches (mm)	Available Wetted Materials									
					Chamber				Diaphragm					
					AL	SS	CI	HC	N	B	V	I	NT	S
TA1 Designed for 1" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT (external thread)	1" NPT	13 5/8" to 15 1/8" height (346mm to 384mm) 9" diameter (229mm) NPT(F)	■	■			■	■	■	■	■	■
TA25 Designed for 1" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT (external thread)	1" BSP (Tapered internal thread)	13 5/8" to 15 1/8" height (346mm to 384mm) 9" diameter (229mm) NPT(F)	■	■			■	■	■	■	■	■
TD1½ Designed for 1" and 1½" pumps. 11¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT (external thread)	1½" NPT (internal thread)	19 7/8" to 21 3/8" height (505mm to 543mm) 10½" diameter (267mm) NPT(F)	■	■			■	■	■	■	■	■
TD40 Designed for 1" and 1½" pumps. 11¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT (external thread)	1½" BSP (Tapered internal thread)	19 7/8" to 21 3/8" height (505mm to 543mm) 10½" diameter (267mm) NPT(F)	■	■			■	■	■	■	■	■
CE **TA2** Designed for 1½" and 2" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT (external thread)	2" NPT (internal thread)	20¼" to 23 3/16" height (514mm to 589mm) 12½" diameter (317mm) NPT(F)	■	■	■	■	■	■	■	■	■	■
CE **TA50** Designed for 1½" and 2" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-charging. Self-venting.	¼" NPT	2" BSP (Tapered internal thread)	20¼" to 23 3/16" height (514mm to 589mm) 12½" diameter (317mm) NPT(F)	■	■	■	■	■	■	■	■	■	■
CE **TA3** Designed for 3" and 4" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-Charging. Self-venting.	¼" NPT	3" 150# ANSI-style flange or 3" NPT internal thread	20 1/8" to 23 1/8" height (511mm to 587mm) 16 3/16" diameter (411mm) NPT(F)	■	■	■		■	■	■	■	■	■
CE **TA80** Designed for 3" and 4" pumps. 13¼" air inlet hose whip line supplied.	125 psi 8.6 bar Self-Charging. Self-venting.	¼" NPT	3" BSP (Tapered internal thread) or 80mm DIN-style Flange	20 1/8" to 23 1/8" height (511mm to 587mm) 16 3/16" diameter (411mm) NPT(F)	■	■	■		■	■	■	■	■	■

Blacoh® Sentry®
Plastic Dampeners
Designed for 1", 2" and 3" pumps.

Wetted Materials
Polypropylene/PVDF
Non-wetted
Polypropylene
Bladder
PTFE/Santoprene/FKM

Blacoh® Sentry®
Inlet Stabilizers
Designed for 1", 2" and 3" pumps.

Wetted Materials
Polypropylene/PVDF
Non-wetted
Polypropylene
Bladder
PTFE/Santoprene/FKM

Also available from Warren Rupp: Surge Dampeners for smaller pumps. Ask about the DA Series of Surge Dampeners. Now available in Aluminum, Polypropylene, PVDF and Stainless Steel.
See ACCESSORIES #7 on page 27.

AL= Aluminum
B = Nitrile
C = Cast Iron
E = EPDM
N = Neoprene
T = Virgin PTFE
V = FKM (Fluorcarbon)
T# = Overlay, Neoprene with Virgin PTFE
HC = Alloy C (Hastelloy Equiv.)
SS = Alloy 316 Stainless Steel

Accessories - DRUM PUMP

Pail & Drum Kits

Converting our ¼", ½" and ¾" plastic pumps to a drum or pail application is easy. The adaptor kits are constructed of chemically-resistant materials to handle the job. Plastic pipe assembly comes complete with all the hardware needed. Simply attach the threaded end to the suction manifold and lower it into the liquid source.

The 55-gallon Drum Transfer Kit includes pump support legs to minimize the vibration occurring in a diaphragm pump.

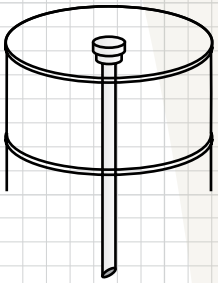
The 120# Barrel Transfer Kit includes a lid with adjustment screws for a snug fit every time.

Part # 475.196.XXX.

Part # 031.091.000.

Pail mounted SANDPIPER® Pumps installed on paint spray booth station.

The Pail Transfer Kit also includes a lid with adjustment screws, plus handles for easy mobility.



Part #
475.149.XXX.
475.150.XXX.
475.151.XXX.
475.194.XXX.
475.195.XXX.

OEM Solutions

Warren Rupp offer existing products, modified products and custom built products. Whether you need private labeling, special accessories, or an entire system, let our experienced staff assist you in meeting your special needs.

- **Standard**
  Special blanket pricing available on standard pumps in larger quantities.
- **Special**
  Special material combinations, construction, painting and labeling.
- **Custom**
  Custom built, multi-pump systems. Customized shipping materials and fixtures to fit your manufacturing process.

- **ENGINEERING SERVICES**
  Experienced Engineering staff • Latest Cad/Cam design equipment with 3-D modeling • Cad library • Precise laboratory test equipment
- **TECHNICAL SERVICES**
  Experienced staff for technical support • Available in-house and field service analysis • Worldwide support
- **MANUFACTURING SERVICES**
  Latest in CNC capabilities • Quick turnaround to meet customer scheduling needs • Just-in-time scheduling available • Custom packaging • Fabrication experience
- **FLEXIBLE KANBAN AGREEMENTS**

WR10 ⅜" AODD OEM Pump

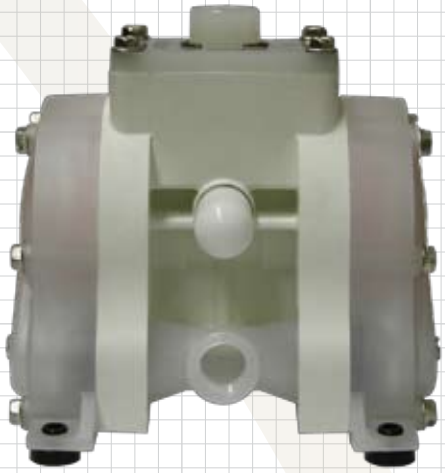
BENEFITS:

- Flows to 5 GPM (19 LPM)
- Multiple mounting positions
- Similar envelope dimensions to a standard ¼" pump, but almost double the flow rate
- Cost competitive
- Dependable operation
- Size ideal for OEM applications

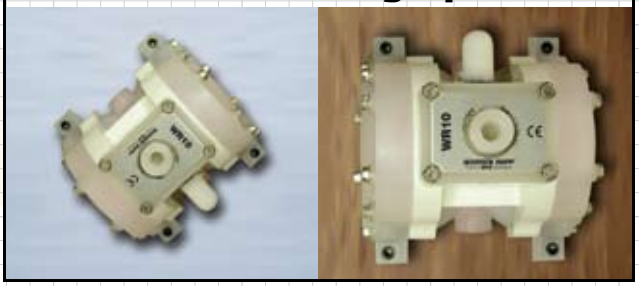
APPLICATIONS:

- Car Wash Chemicals
- Wash Solutions
- Dispensing of:
  • Pigments • Inks • Paints
  • Additives • Sanitizers
- Drum Transfer

WR10



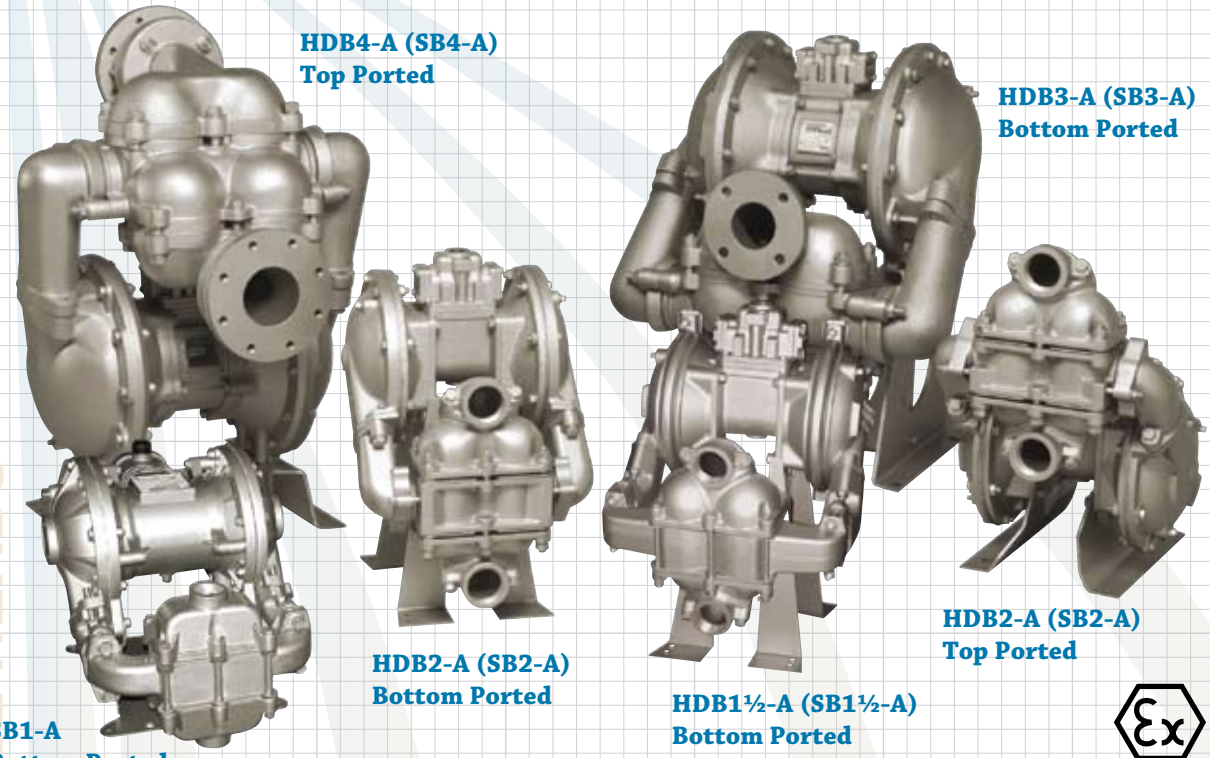
Various Mounting Options



Ceiling mount Wall mount

WR10 SPECIFICATIONS		
Shipping wt.	3 lbs.	1.36 kg
Max. pressure	100 psi	6.9 bar
Min. pressure	15 psi	1 bar
Max. particle size	1/16"	1.5 mm
Suction lift (dry)	16.5 ft.	5m
Suction lift (wet)	20 ft.	6m
Air inlet	¼" NPT (f)/BSP	
Materials: Polypropylene body with Santoprene elastomers; Polypropylene body with PTFE elastomers; PVDF body with Santoprene elastomers; PVDF body with PTFE elastomers		

HEAVY DUTY BALL



HDB4-A (SB4-A)
Top Ported

HDB3-A (SB3-A)
Bottom Ported

HDB2-A (SB2-A)
Bottom Ported

HDB2-A (SB2-A)
Top Ported

HDB1½-A (SB1½-A)
Bottom Ported

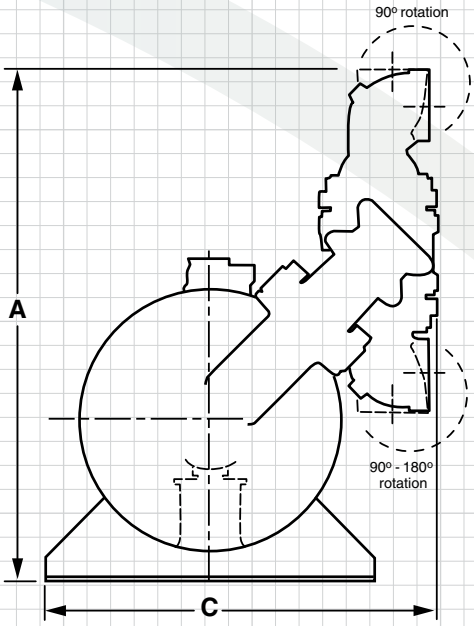
SB1-A
Bottom Ported

ATEX 100a
Compliant

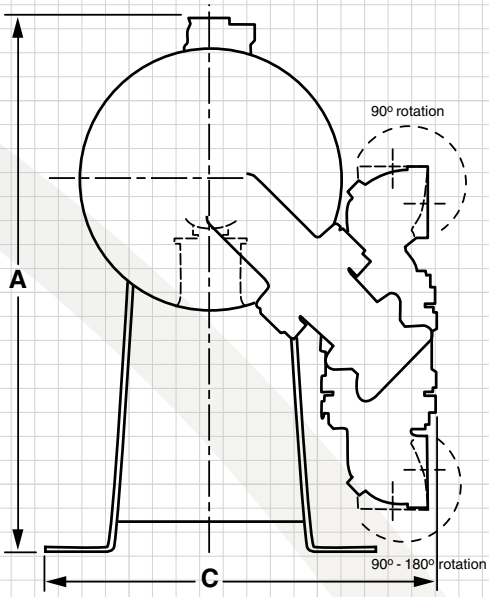
HDB (SB) Metallic Pumps are ideal for thin to highly viscosity and small solids laden fluids. SANDPIPER® Heavy Duty Ball Valve Pumps (SB) provide excellent suction lift capability and exclusive variable porting options (side, top, bottom and dual). HDB pumps are thick wall constructed of Sand Casted Aluminum, Cast Iron, Stainless Steel or Alloy C with elastomer, TPE (thermal plastic elastomers) and PTFE options in diaphragms and check valves. HDB pumps are enhanced with an extended wear package.

3" HDB bottom ported pump installed as a plate & frame filter press, pre-coat supply pump.

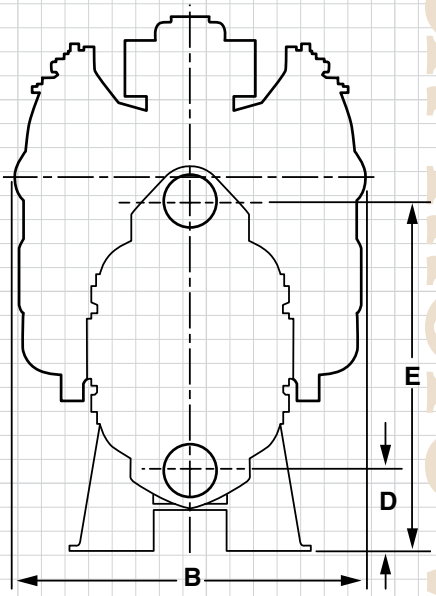
Dimensional Detail



Top Ported



Bottom Ported

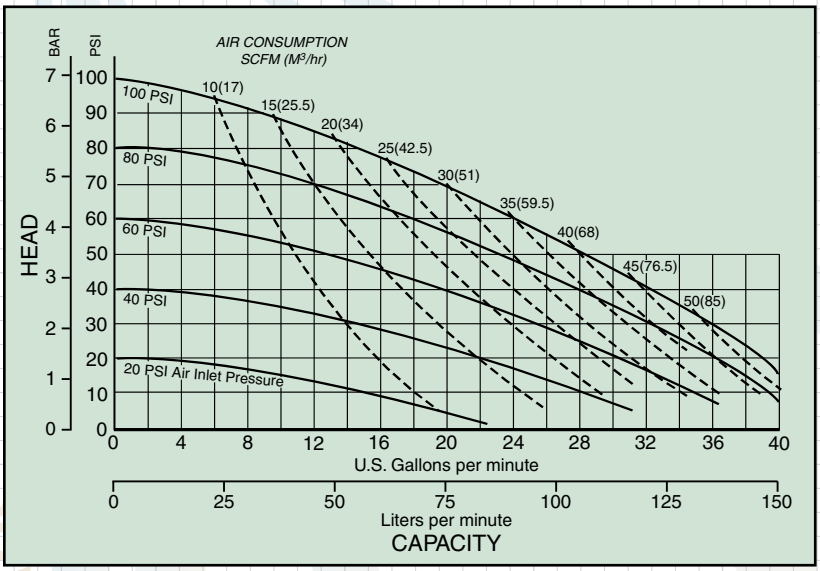


Front View of Bottom Ported

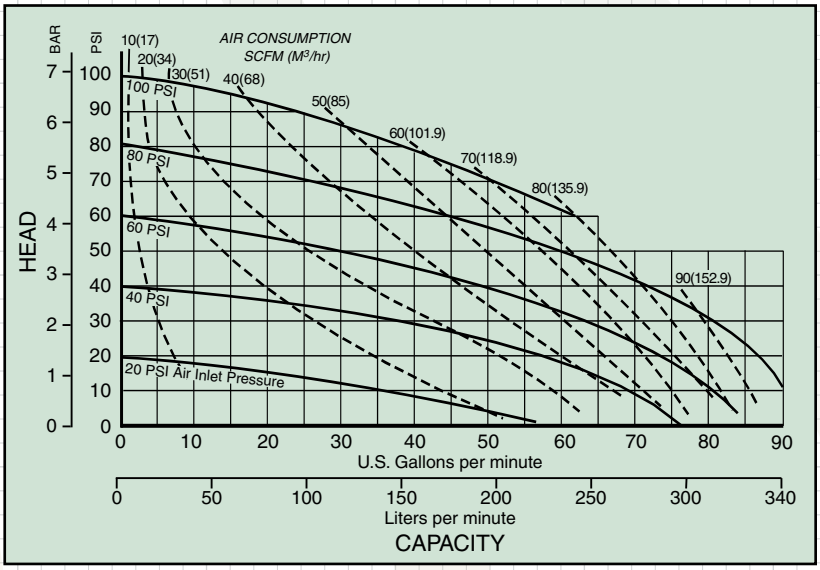
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	PSI (bar)
SB1-A/SB25A	14 7/16 (367)	11 3/4 (298)	13 9/32 (337)	5 1/4 (133)	13 (330)	1" NPT/BSP	1 (25)	.09 (.34)	42 (159)	.25 (6)	125 (8.6)
SB1-A TOP SB1-A BOTTOM	13 1/2 (342) 13 11/16 (347)	11 3/4 (298) 11 3/4 (298)	14 7/8 (378) 14 7/8 (378)	5 5/8 (142) 27/32 (21)	13 1/2 (342) 8 7/16 (214)	1" NPT/BSP 1" NPT/BSP	1 (25) 1 (25)	.09 (.34) .09 (.34)	42 (159) 42 (159)	.25 (6) .25 (6)	125 (8.6) 125 (8.6)
SB1½-A/SB40A	13 13/16 (351)	15 1/2 (394)	14 1/8 (359)	2 1/4 (57)	12 3/16 (310)	1½" NPT/BSP	1.5 (40)	.34 (1.29)	90 (340)	.25 (6)	125 (8.6)
HDB1½-A TOP HDB1½-A BOTTOM	19 7/32 (488) 18 9/16 (471)	15 1/2 (419) 15 1/2 (419)	17 (432) 17 (432)	8 9/64 (207) 6 9/64 (156)	18 5/64 (459) 16 (406)	1½" NPT/BSP 1½" NPT/BSP	1.5 (40) 1.5 (40)	.34 (1.29) .34 (1.29)	90 (340) 90 (340)	.25 (6) .25 (6)	125 (8.6) 125 (8.6)
SB2-A TOP HDB2-A TOP	22 3/16 (564)	15 1/2 (394)	16 13/16 (427)	9 1/8 (232)	20 7/8 (530)	2" NPT	2 (50)	.43 (1.63)	135 (511)	.38 (9)	125 (8.6)
SB2-A BOTTOM HDB2-A BOTTOM	23 1/4 (591)	15 1/2 (394)	16 13/16 (427)	3 7/16 (87)	15 3/16 (386)	2" NPT	2 (50)	.43 (1.63)	135 (511)	.38 (9)	125 (8.6)
SB3-A TOP HDB3-A TOP	37 1/8 (943)	26 (661)	20 3/4 (527)	20 (509)	33 3/8 (848)	3" 125# ANSI	3 (80)	1.8 (6.81)	260 (988)	.87 (22)	125 (8.6)
SB3-A BOTTOM HDB3-A BOTTOM	31 1/4 (794)	26 (661)	24 5/8 (625)	5 3/4 (146)	19 3/8 (492)	3" 125# ANSI	3 (80)	1.8 (6.81)	260 (988)	.87 (22)	125 (8.6)
SB4-A TOP HDB4-A TOP	37 7/8 (962)	26 (661)	23 3/4 (603)	20 (509)	33 3/8 (848)	4" 125# ANSI	4 (100)	1.8 (6.81)	260 (988)	.87 (22)	125 (8.6)
SB4-A BOTTOM HDB4-A BOTTOM	31 1/4 (793)	26 (661)	27 1/2 (699)	5 3/4 (146)	19 3/8 (492)	4" 125# ANSI	4 (100)	1.8 (6.81)	260 (988)	.87 (22)	125 (8.6)

All Dimensions +/- 1/8 (3)

HEAVY DUTY BALL



SB1-A Performance Curve

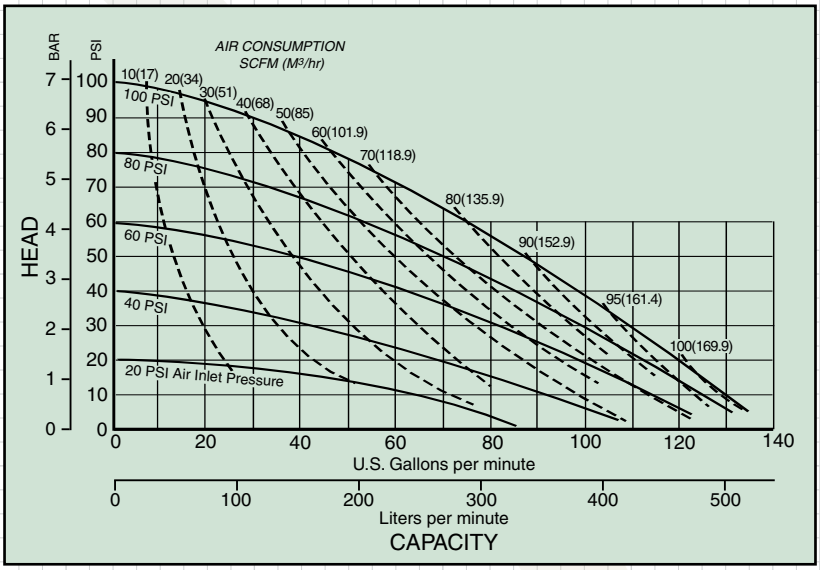


HDB1½-A (SB1½-A) Performance Curve

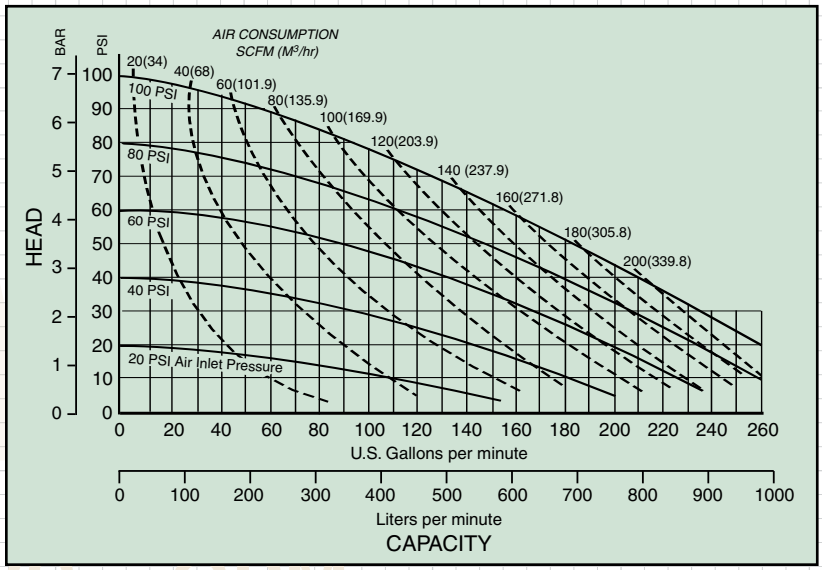
HDB bottom discharge ported pumps with tranquilizers installed at an industrial waste treatment facility.

1" ball valve pumps installed in a paint mixing and tinting operation.

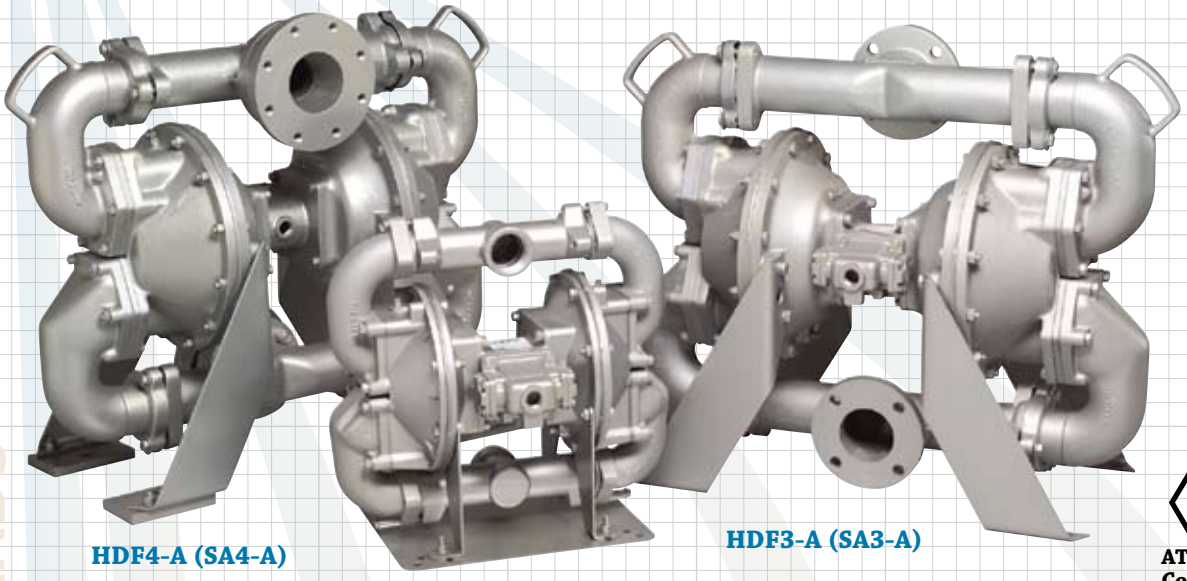
HDB2-A (SB2-A) Performance Curve



HDB3-A (SB3-A) & HDB4-A (SB4-A) Performance Curve



HEAVY DUTY FLAP



HDF4-A (SA4-A)

HDF2-A (SA2-A)

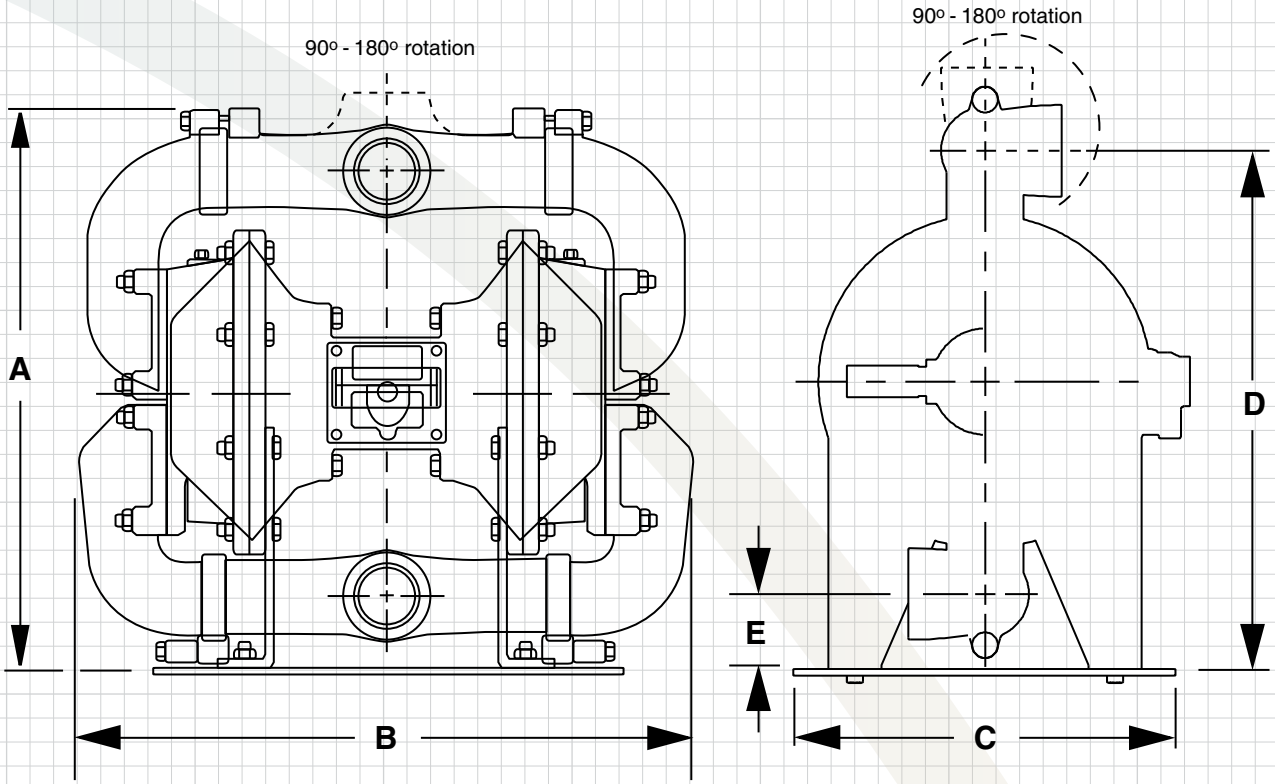
HDF3-A (SA3-A)

ATEX 100a Compliant

HDF (SA) Pumps are recommended for abrasive slurries, suspended and non-suspended solids and line-size solids requirements. All SANDPIPER® Heavy Duty Flap Valve pumps (SA) are configured in bottom discharge porting arrangements and provide superior suction lift. HDF pumps are thick wall constructed of Sand Casted Aluminum, Cast Iron and Stainless Steel with elastomer, TPE (thermal plastic elastomers) and PTFE options in diaphragms and check valves. HDF pumps are enhanced with an extended wear package.

Heavy duty flap valve pumps with tranquilizers permanently installed in an automotive industrial waste treatment facility.

Dimensional Detail

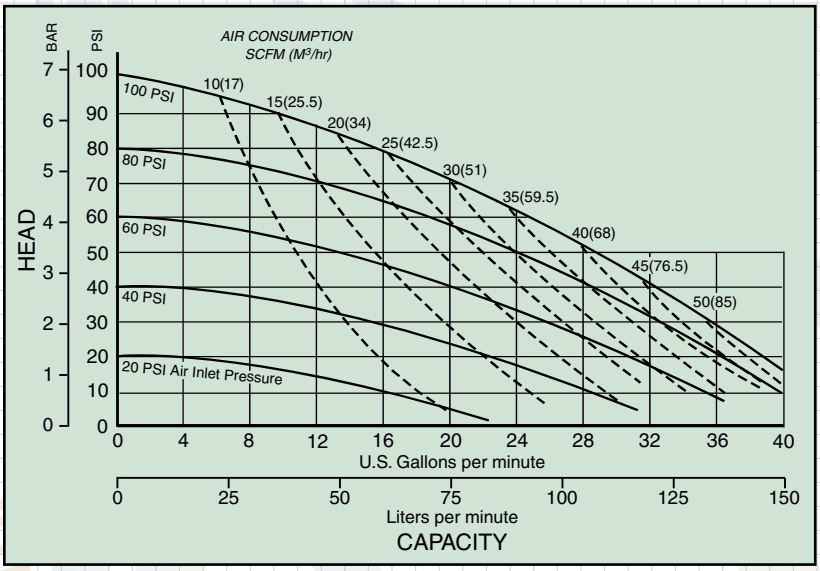


Bottom Discharge Ported

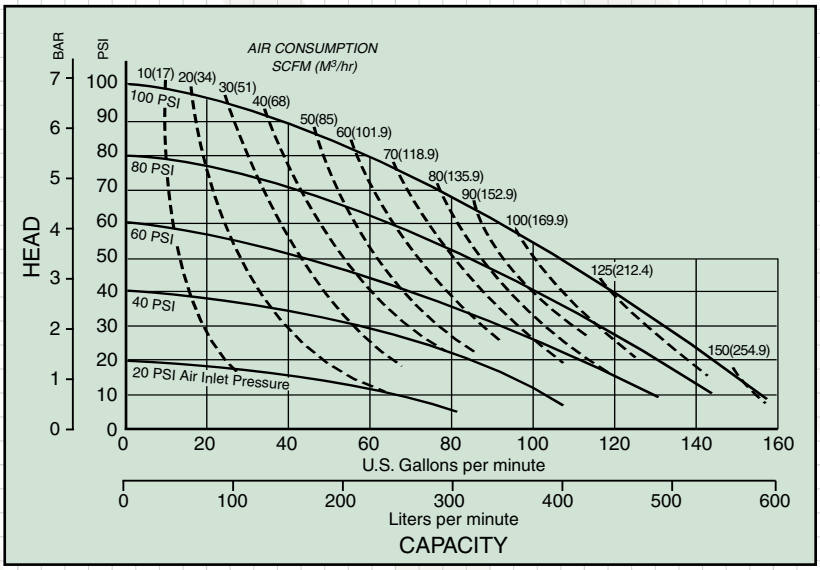
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
SA1-A/SA25A	14 7/16 (367)	11 3/4 (298)	10 13/16 (275)	3 3/16 (81)	3 3/16 (81)	1" NPT/BSP	1 (25)	.09 (.34)	42 (159)	1 (25)	125 (8.6)
SA2-A HDF2-A	20 5/16 (516)	21 3/4 (552)	13 5/8 (346)	17 11/16 (449)	2 9/16 (65)	2" NPT only	2 (50)	.43 (1.60)	140 (530)	2 (50)	125 (8.6)
SA3-A HDF3-A	29 1/2 (749)	36 9/16 (929)	16 1/4 (413)	25 3/4 (654)	4 1/4 (108)	3" 125# ANS	3 (80)	1.62 (6.15)	260 (988)	3 (80)	125 (8.6)
SA3-M HDF3-M	30 1/4 (768)	32 5/16 (821)	16 3/16 (411)	26 1/2 (673)	5 (127)	3" 125# ANSI	3 (80)	1.23 (4.66)	260 (988)	3 (80)	125 (8.6)
SA4-A HDF4-A	31 (787)	36 9/16 (929)	21 1/4 (540)	26 1/2 (673)	5 (127)	4" 125# ANSI	4 (100)	1.62 (6.15)	260 (988)	3 (80)	125 (8.6)
SA4-M HDF4-M	31 (787)	32 5/16 (821)	16 3/16 (411)	26 1/2 (673)	5 (127)	4" 125# ANSI	4 (100)	1.23 (4.66)	260 (988)	3 (80)	125 (8.6)

All Dimensions +/- 1/8 (3)

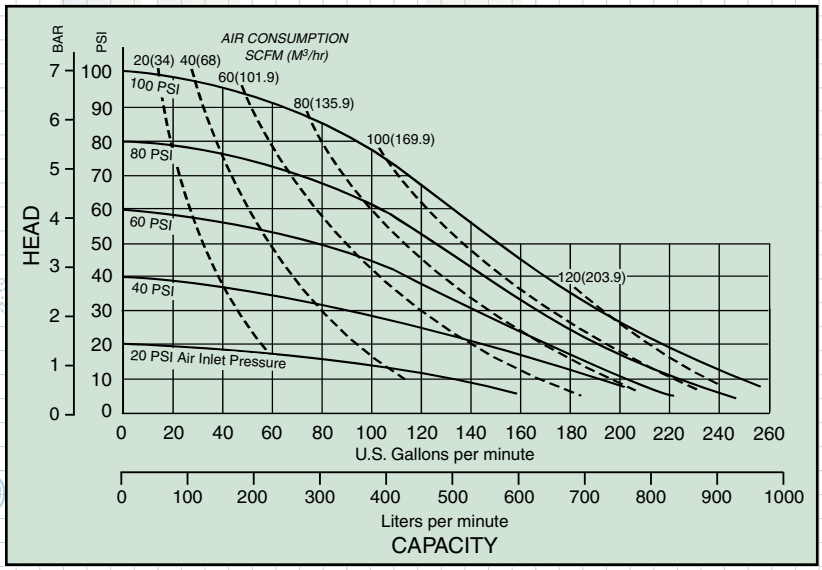
HEAVY DUTY FLAP



SA1-A Performance Curve

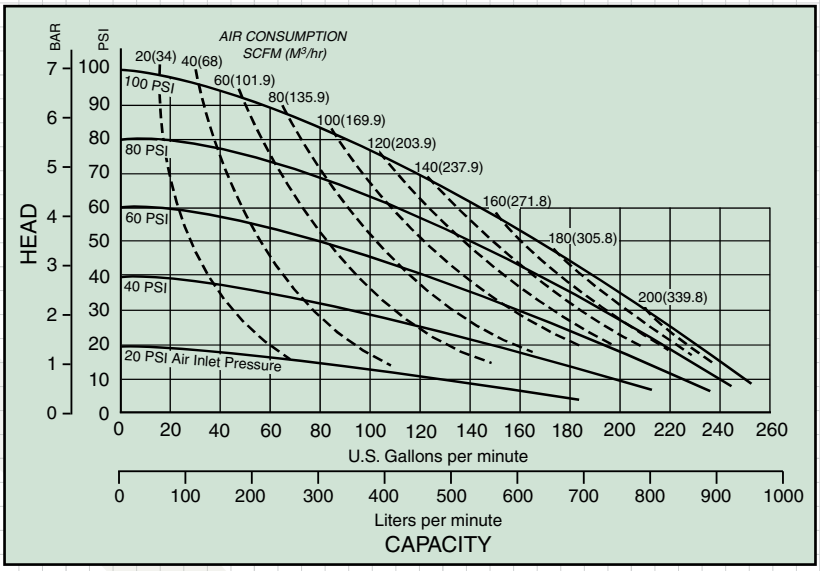


HDF2-A (SA2-A) Performance Curve

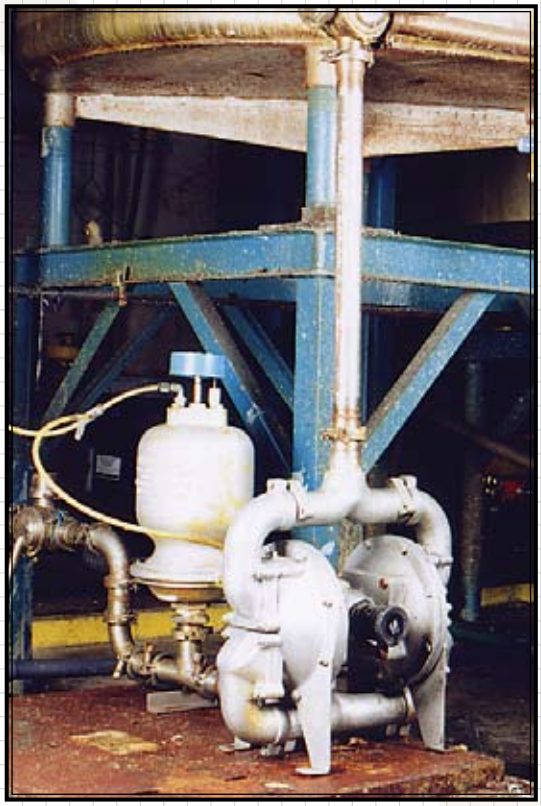


HDF3-A (SA3-A) & HDF4-A (SA4-A) Performance Curve

HDF3-M (SA3-M)
HDF4-M (SA4-M)
Performance Curve

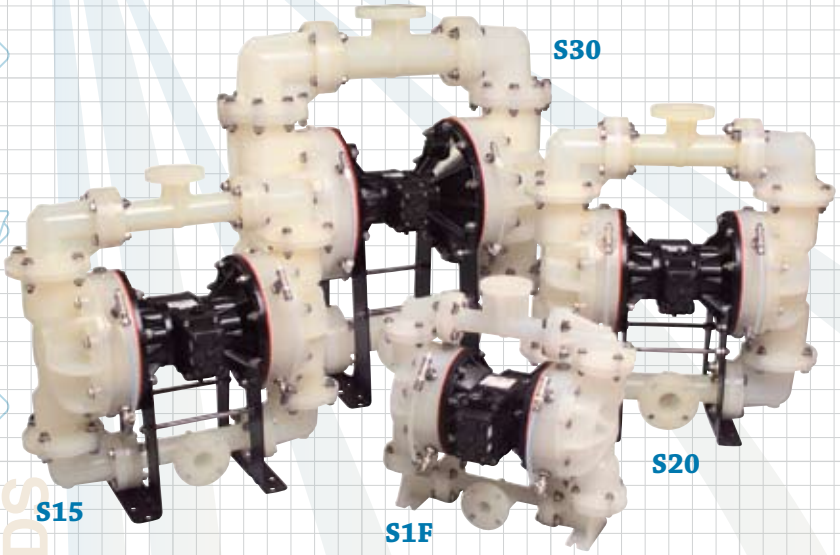


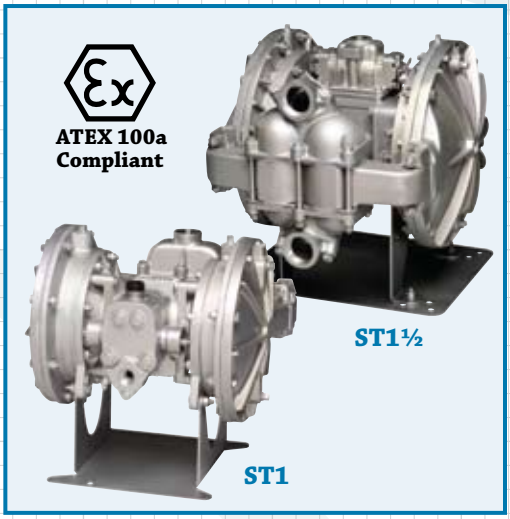
Heavy duty flap valve pump temporarily installed pumping settling pond sludge. (Perfect alignment not required).



Heavy duty flap valve pump installed on an underflow sludge transfer application.

CONTAINMENT DUTY BALL





Containment Duty Metallic and Non-Metallic Pumps are ideal for highly corrosive and hazardous chemical fluid requirements. All CD duty pumps are exclusively designed with containment chambers, hydraulically balanced/coupled pumping diaphragm and driver diaphragm assemblies. All containment chambers are designed to accommodate visual, mechanical and low voltage leak detection devices. CD pumps are constructed of Aluminum, Cast Iron, Stainless Steel, Alloy C, Polypropylene and PVDF with TPE (thermal plastic elastomers), PTFE options in diaphragms and check valves.

Containment Duty Pumps additional FEATURES and BENEFITS

Spill Containment

- Safe pumping of aggressive, unpredictable, hazardous or toxic liquids.
- Chambers keep accidental spills from entering the air valve, protecting plant environment and personnel.
- Allows the pump to complete the batch or operation in progress, before repair has to be done.

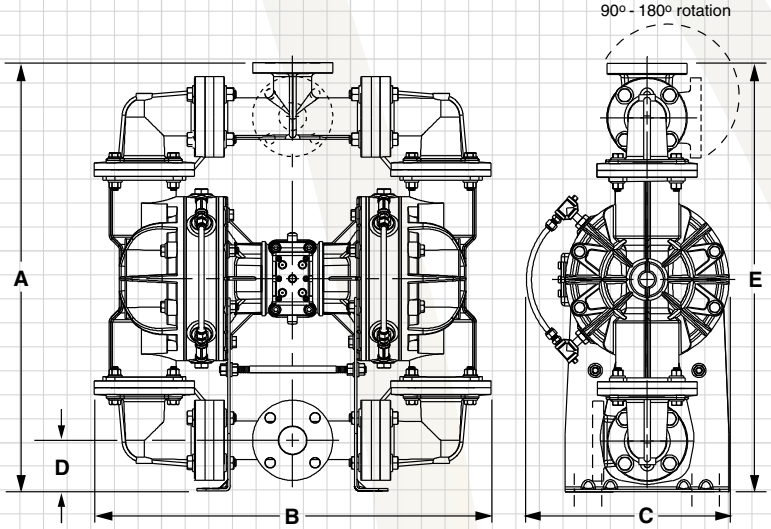
Hydraulically Balanced/Coupled Diaphragms

- Pumping diaphragms are balanced on suction and discharge stroke.
- Evenly distributed pressure over the surface of the diaphragm gives longer flex life.

Save Money and Downtime

- Protects air valve parts from contamination, meaning fewer service parts and less maintenance time.
- Longer flex life of the diaphragm means less frequent routine servicing.

Leak Detection - See page 41

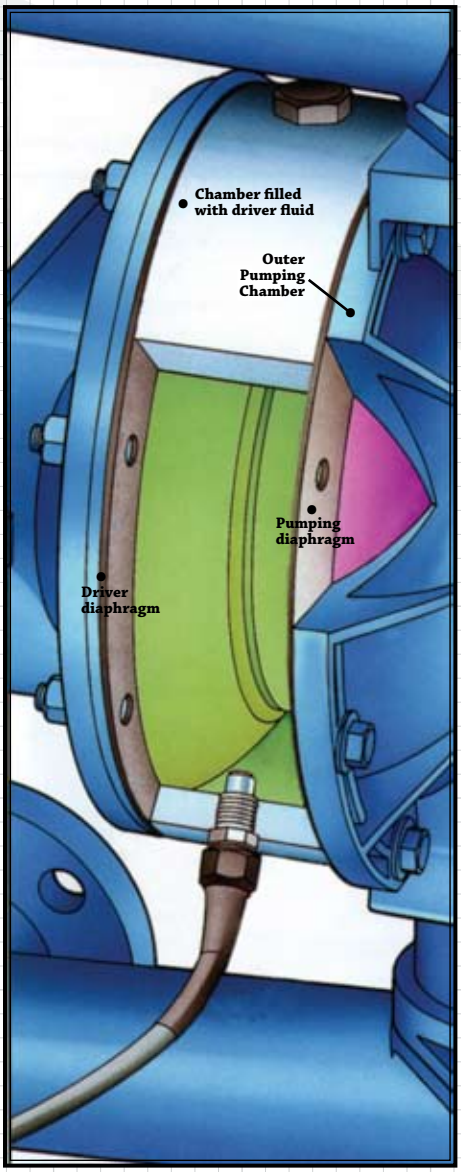


PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter	inch (mm)	psi (bar)
ST1-A/ST25A	14 13/32 (366)	14 17/32 (369)	14 9/32 (363)	5 1/4 (133)	13 (330)	1" NPT/BSP	1 (25)	.09 (.34)	42 (159)	.25 (6)	125 (8.6)
ST1½-A/ST40A	17 1/2 (445)	16 1/2 (419)	18 5/8 (473)	5 9/32 (134)	15 15/64 (387)	1½" NPT/BSP	1.5 (40)	.30 (1.14)	90 (340)	.25 (6)	125 (8.6)
S1F	20 3/4 (527)	21 3/4 (553)	12 1/16 (306)	2 1/2 (64)	20 3/4 (527)	1" 125# ANSI	1 (25)	.17 (64)	45 (170)	.25 (6)	100 (6.9)
S15	28 11/16 (729)	28 5/8 (728)	15 1/4 (387)	3 1/2 (89)	28 11/16 (729)	1½" 125# ANSI	1.5 (40)	.36 (1.36)	100 (378)	.47 (12)	100 (6.9)
S20	32 1/16 (814)	29 3/8 (746)	15 1/4 (387)	3 13/16 (96)	32 1/16 (814)	2" 125# ANSI	2 (50)	.36 (1.36)	160 (605)	.66 (17)	100 (6.9)
S30	40 5/8 (1032)	37 15/16 (964)	19 5/8 (498)	4 7/8 (124)	40 5/8 (1032)	3" 125# ANSI	3 (80)	.9 (3.41)	238 (901)	.71 (18)	100 (6.9)

All Dimensions +/- 1/8 (3)

Leak Detection Operating Principle

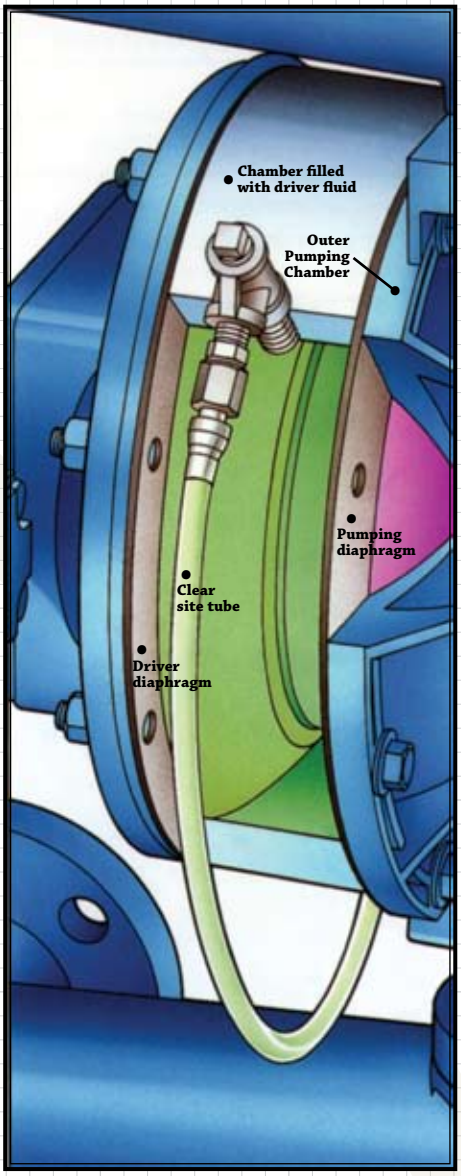
Electronic Leak Detection



How electronic leak detection works.

At a point the pumping diaphragm fails, pumped liquid enters the spill chamber displacing driver fluid. The leak detector, working on the principle of conductance, senses the conductivity change. This activates a warning light on the control box. The device can also be wired into the pump user's existing system, for an audible or visual alarm, or pump shut-down response. It is important to specify an appropriate drive fluid which is both chemically compatible with the pumped fluid and displays the opposite conductance properties. Polarity of the leak detector can be set to sense conductive or non-conductive fluid. If a leak occurs, pumpage is contained in the spill chamber. The pump will continue to work, and in many cases, repairs can be done when the batch is completed. The air valve and work environment are protected.

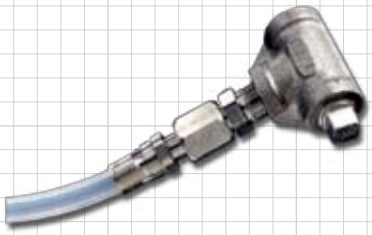
Visual Leak Detection



How visual leak detection works.

At a point the pumping diaphragm fails, pumped liquid enters the spill chamber, displacing driver fluid. The exchange of pumpage and driver fluid displays a color change in the sight tube, giving a visible signal. Driver fluid should be chemically compatible with the pumped fluid, with an obvious difference in color. In the event a leak occurs, pumpage is contained in the spill chamber. The pump will continue to work, and in many cases, repairs can be done when the batch is completed. The air valve and work environment are protected.

ELECTRONIC LEAK DETECTOR: Working on the principle of conductance, this monitor can be wired for visual, audible or pump shut-down response. The electronic leak detector is an optional accessory which can be installed on all models.

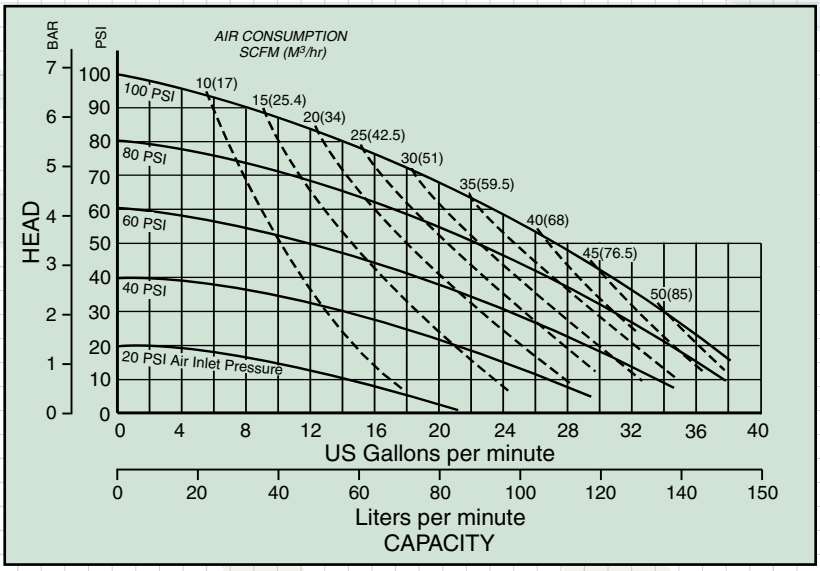


VISUAL LEAK DETECTOR: A sight tube style leak detector is installed on each driver chamber. If a pumping diaphragm break occurs, liquid in the sight tube changes color.

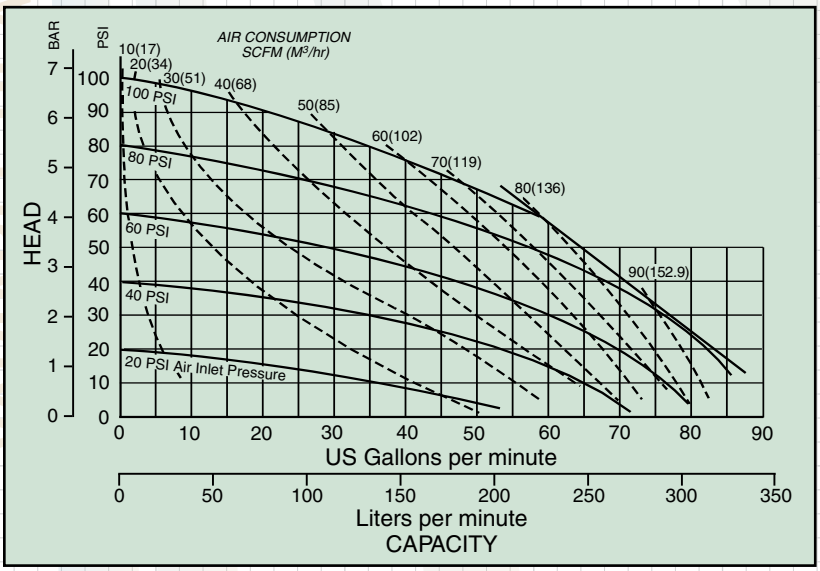
MECHANICAL LEAK DETECTOR: When a leak chemically attacks an internal o-ring on this detector, it actuates a plunger. This opens an air valve, which in turn activates a customer-supplied solenoid (or similar device) to trigger a signal.

CONTAINMENT DUTY BALL

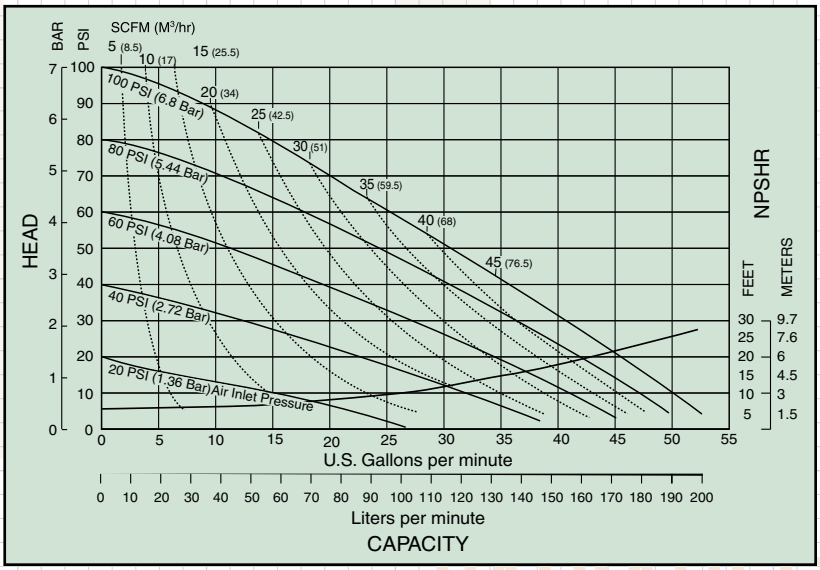
ST1-A Metallic Performance Curve



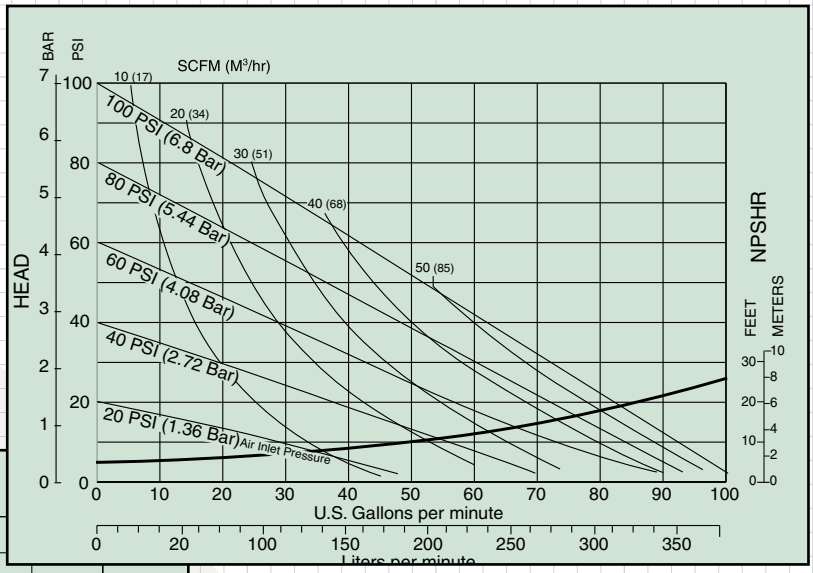
ST1½-A Metallic Performance Curve



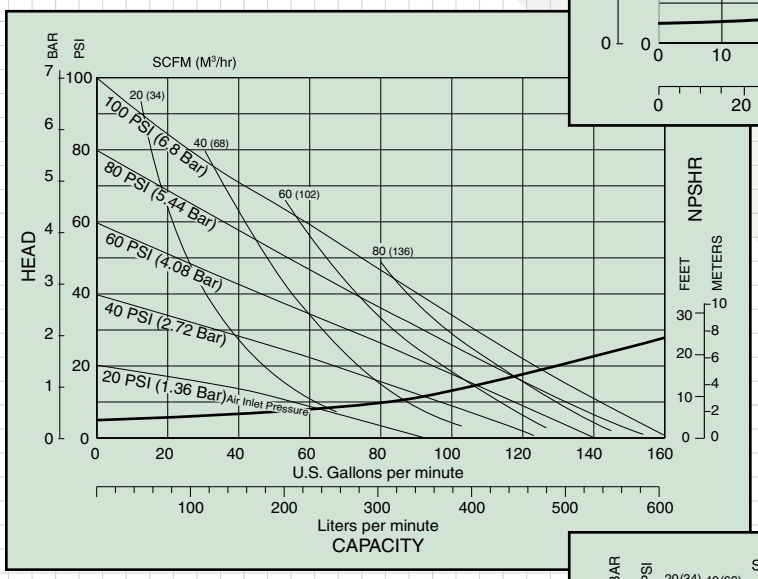
S1F Non-Metallic Performance Curve



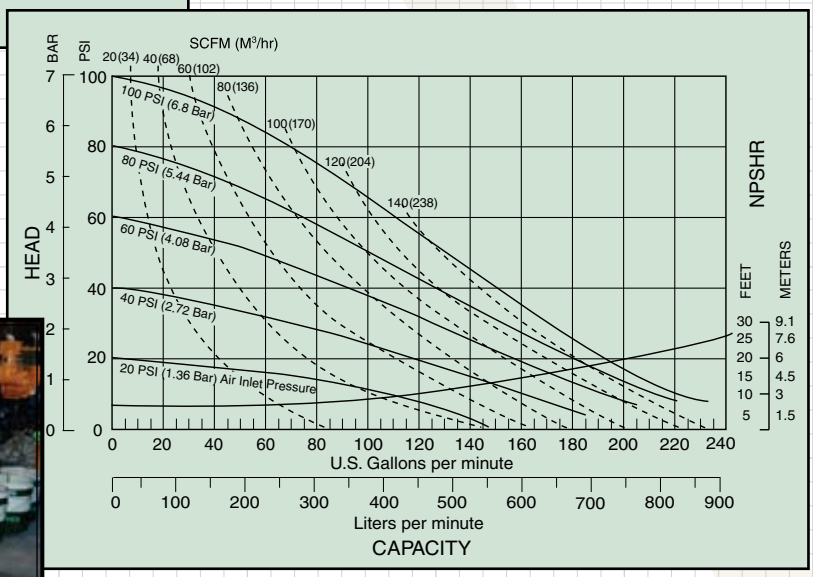
SI5 Non-Metallic Performance Curve



S20 Non-Metallic Performance Curve

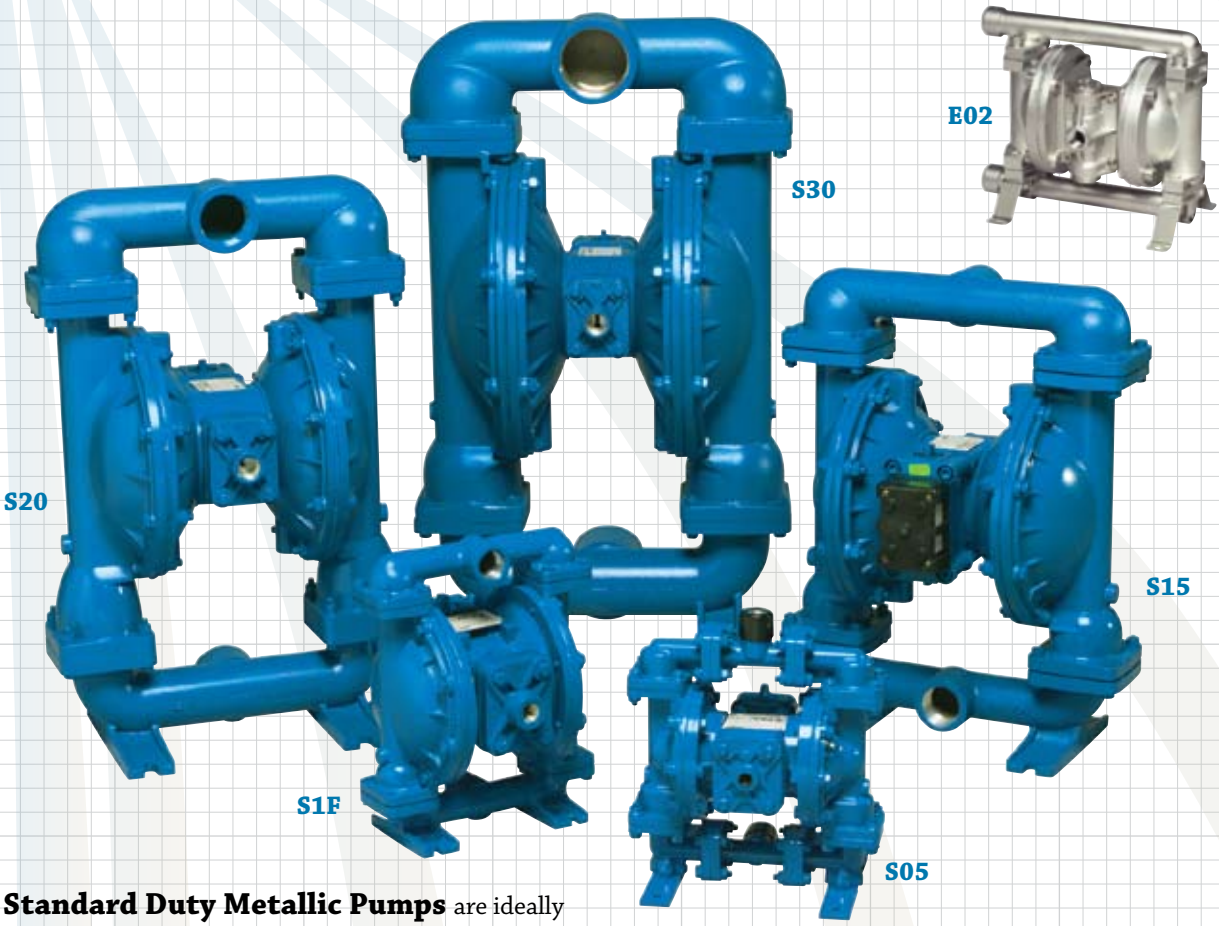


S30 Non-Metallic Performance Curve



Metallic Containment duty pumps and tranquilizers installed in a chemical processing plant.

STANDARD DUTY BALL - Metallic



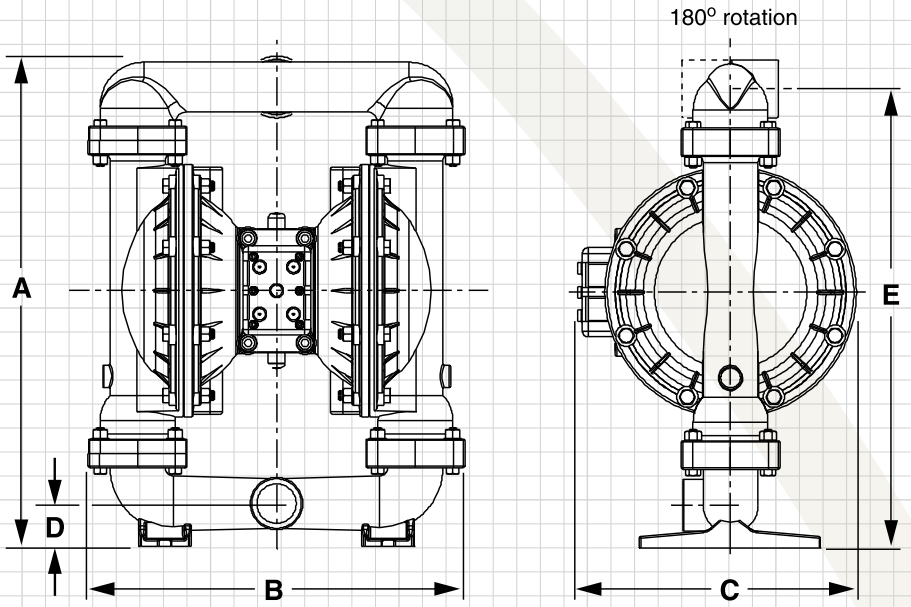
Standard Duty Metallic Pumps are ideally suited for intermittent/on-demand, portable, moderately abrasive fluids, and suspended solids. Standard duty metallic pumps are constructed in Aluminum, Cast Iron, Stainless Steel and Alloy C with elastomer TPE (thermal plastic elastomers) and PTFE options in diaphragms and check valves.

NOTE: Pumps are only ATEX Compliant when ordered with wetted option C (Conductive Polypropylene) or wetted option V (Conductive PVDF), non-wetted option C (Conductive Polypropylene), pump options 6 or 7, ***and*** kit options 00, P1, E1, E3, E5, E7, E8 or E9. All options must be included to meet ATEX Compliance.

Metallic standard duty pumps handling suspended solids in an industrial waste treatment operation.

Dimensional Detail

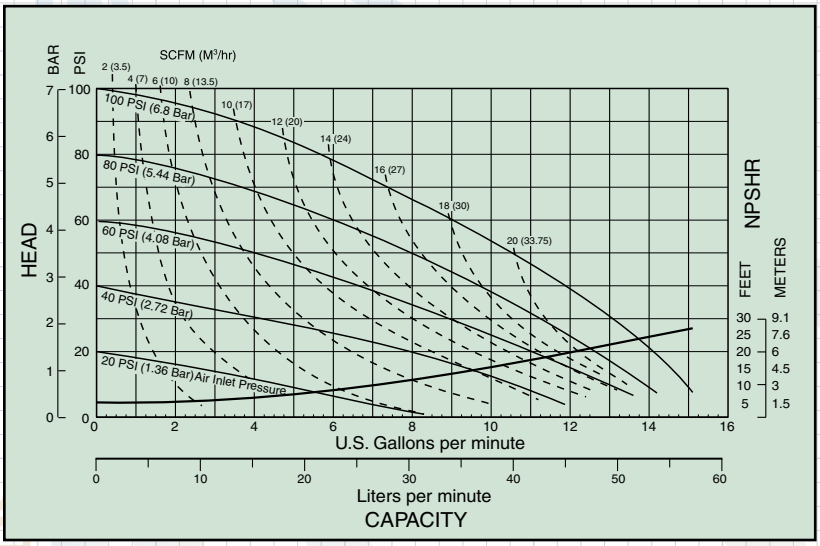
Metallic standard duty pumps installed for exterior sump pumping requirements.



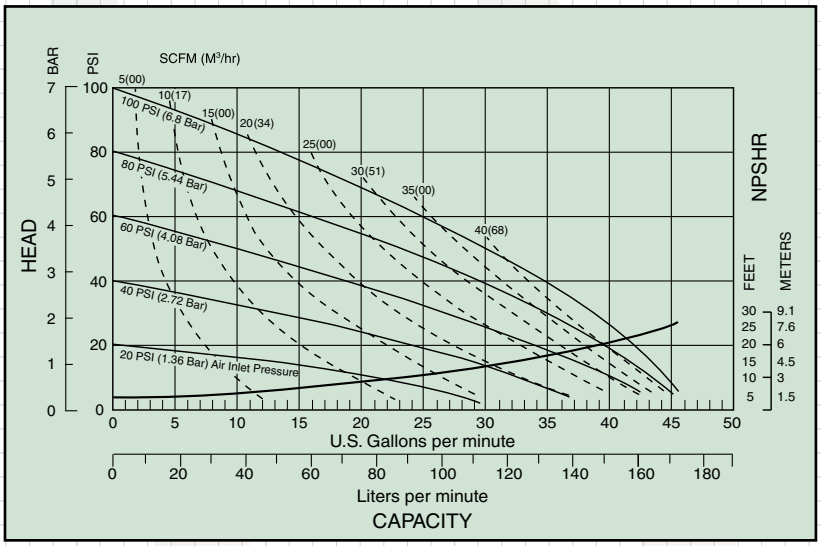
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
E02	5 13/16 (148)	7 7/16 (189)	4 3/8 (111)	5/8 (16)	5 13/32 (138)	1/4" NPT	.25 (6)	.003 (.01)	4.4 (16.6)	.079 (2)	125 (8.6)
S05 AL	11 1/2 (292)	10 1/4 (260)	7 1/16 (179)	1 5/16 (33)	11 1/2 (292)	1" MNPT	.5 (13)	.026 (.098)	15 (57)	.125 (3)	125 (8.6)
S05 SS	10 3/8 (264)	10 1/4 (260)	7 1/16 (179)	1 5/16 (33)	9 23/32 (247)	1" MNPT	.5 (13)	.026 (.098)	15 (57)	.125 (3)	125 (8.6)
S1F AL / CI	12 23/32 (323)	10 1/4 (260)	10 3/8 (264)	1 3/32 (28)	11 27/32 (301)	1" NPT	1 (25)	.11 (.42)	45 (170)	.25 (6)	125 (8.6)
S1F SS	12 27/32 (326)	10 1/4 (260)	10 3/8 (264)	1 7/32 (31)	11 31/32 (304)	1" NPT	1 (25)	.11 (.42)	45 (170)	.25 (6)	125 (8.6)
S15 AL / CI	21 37/64 (548)	16 21/32 (423)	12 23/64 (314)	1 29/32 (49)	20 5/16 (516)	1½" NPT	1.5 (40)	.41 (1.55)	106 (401)	.25 (6)	125 (8.6)
S15 SS	21 21/32 (550)	16 21/32 (423)	12 23/64 (314)	1 31/32 (50)	20 3/8 (518)	1½" NPT	1.5 (40)	.41 (1.55)	106 (401)	.25 (6)	125 (8.6)
S20 AL / CI	26 5/16 (669)	16 7/8 (428)	12 19/32 (320)	1 7/8 (48)	24 5/8 (625)	2" NPT	2 (50)	.42 (1.59)	150 (567)	.25 (6)	125 (8.6)
S20 SS	26 5/16 (669)	16 7/8 (428)	12 19/32 (320)	2 (51)	24 3/4 (629)	2" NPT	2 (50)	.42 (1.59)	150 (567)	.25 (6)	125 (8.6)
S30 Al/CI	32 1/16 (814)	19 21/32 (499)	15 3/4 (400)	2 11/32 (60)	29 31/32 (761)	3" NPT	3 (80)	.94 (3.56)	238 (901)	.38 (9.5)	125 (8.6)
S30 SS	32 9/32 (820)	19 21/32 (499)	15 3/4 (400)	2 9/32 (65)	30 3/16 (767)	3" NPT	3 (80)	.94 (3.56)	238 (901)	.38 (9.5)	125 (8.6)

All Dimensions +/- 1/8 (3)

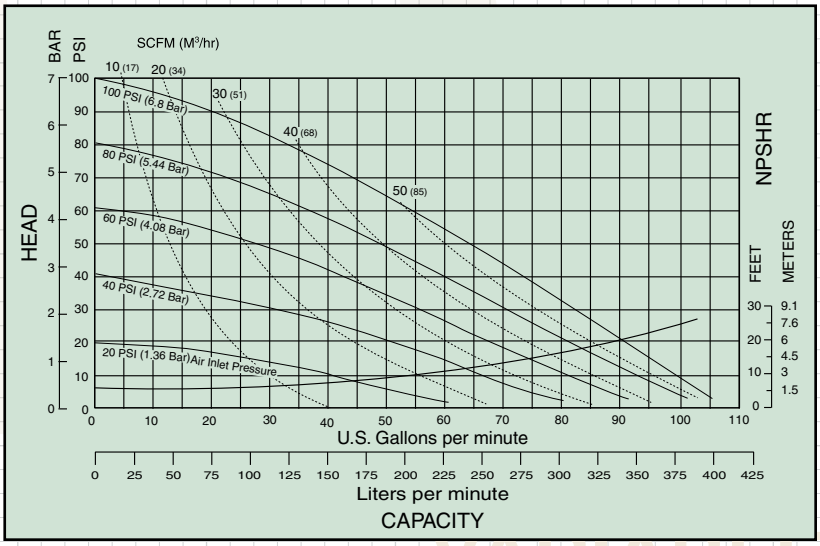
STANDARD DUTY BALL - Metallic



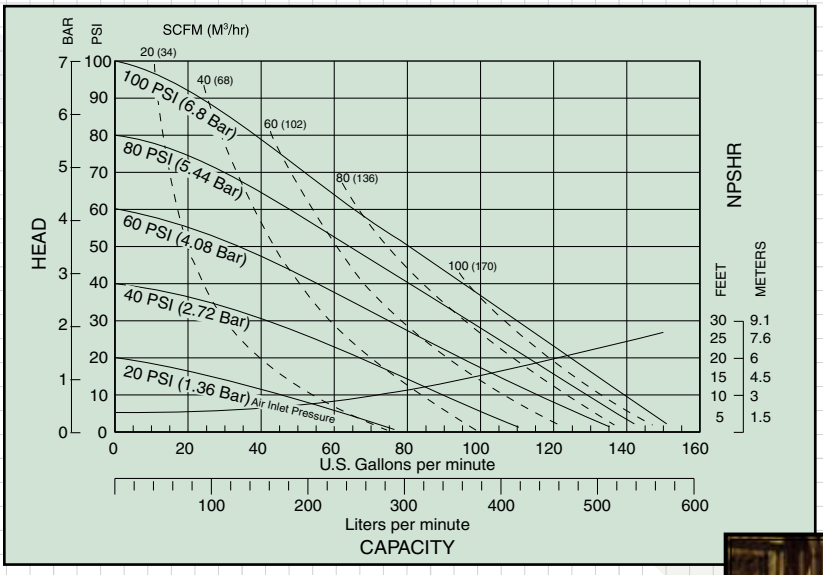
S05 Metallic Performance Curve



S1F Metallic Performance Curve

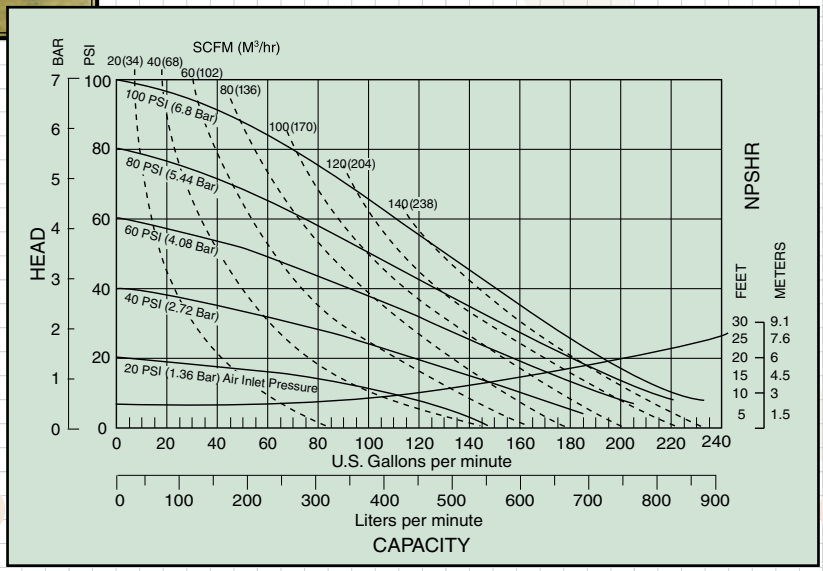


S15 Metallic Performance Curve



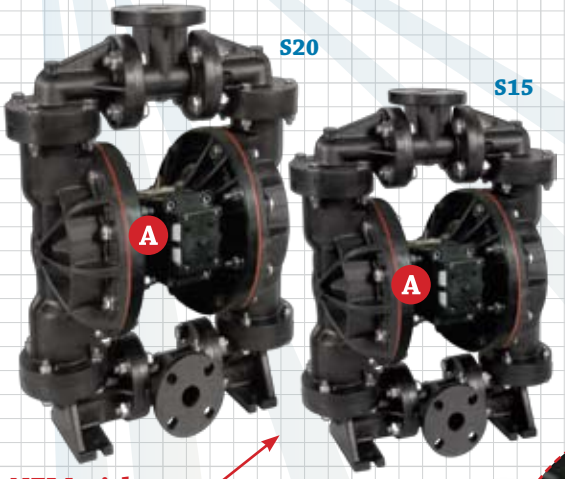
S20 Metallic Performance Curve

Permanently installed metallic standard duty pumps in an interior chemical industry sumping installation.



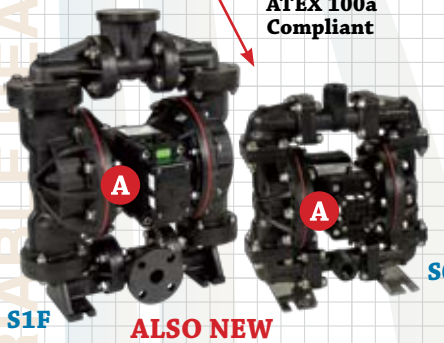
S30 Metallic Performance Curve

STANDARD DUTY BALL - Non-Metallic



NEW with ATEX Conductive Polypropylene

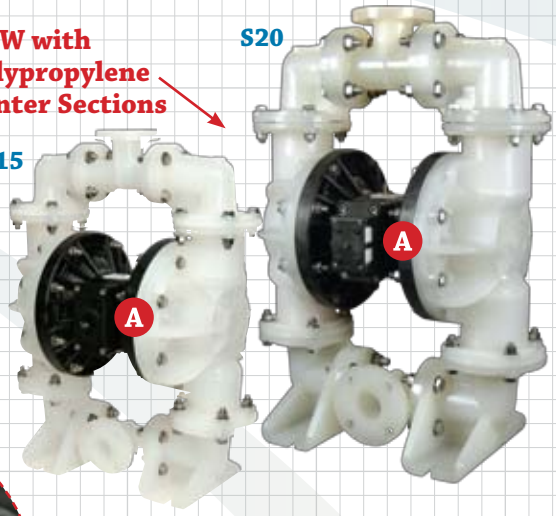
ATEX 100a Compliant

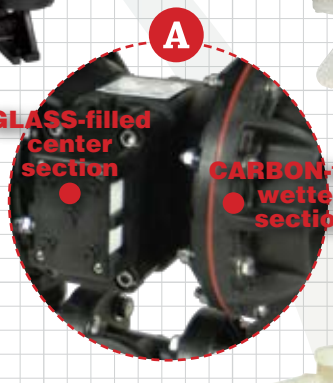


ALSO NEW with ATEX Compliant* Conductive PVDF

**ATEX 100a Compliance to EC Directive 94/9/EC for use of equipment in potentially explosive environments.*

NEW with Polypropylene Center Sections



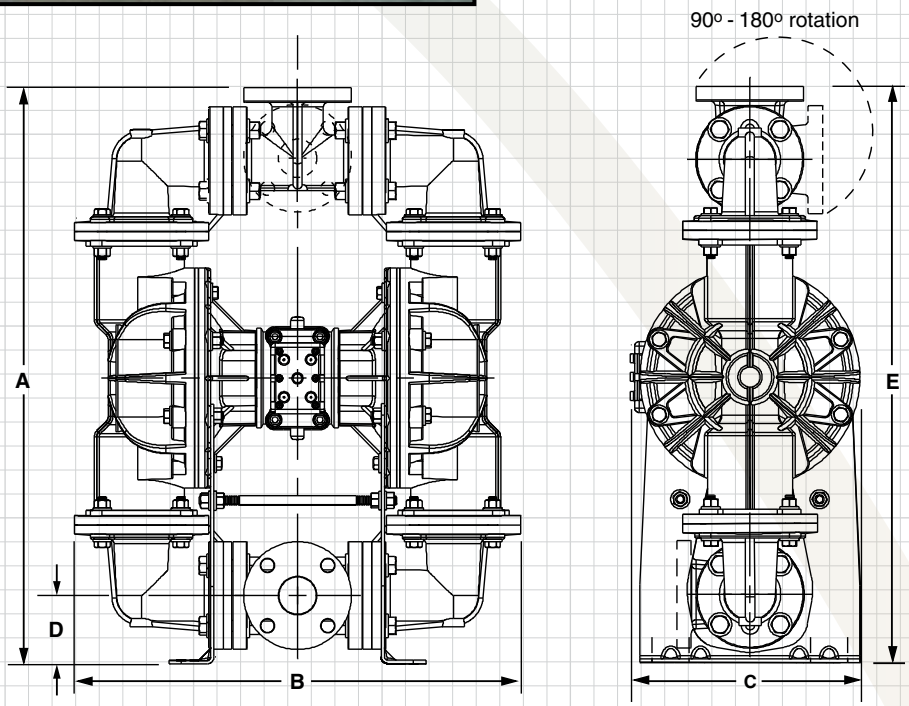


Standard Duty Polypropylene pumps installed for chemical processing.

Standard Duty Non-Metallic Pumps are ideally suited for highly corrosive fluids, intermittent/on-demand, portable, low abrasive fluids, and suspended solids. Standard duty non-metallic pumps are constructed in Polypropylene, PVDF, Conductive Acetal and Conductive Polypropylene with TPE (thermal plastic elastomers) and PTFE options in diaphragms and check valves.

Dimensional Detail

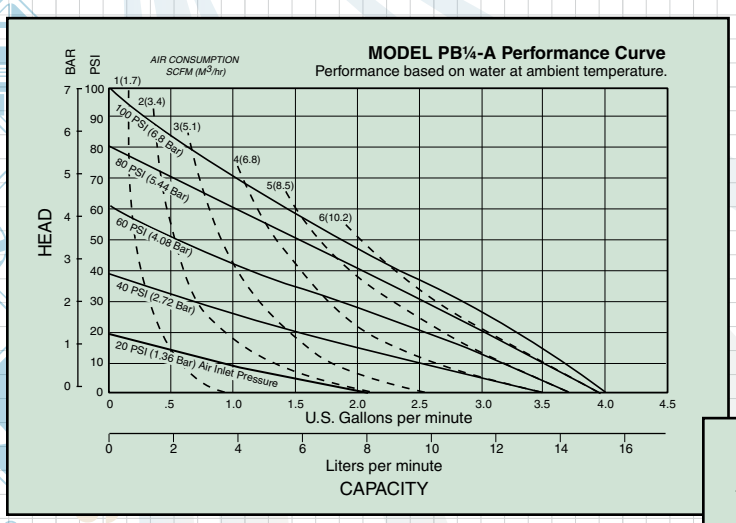
Distributor fabricated portable filtration cart with standard duty non-metallic pump.



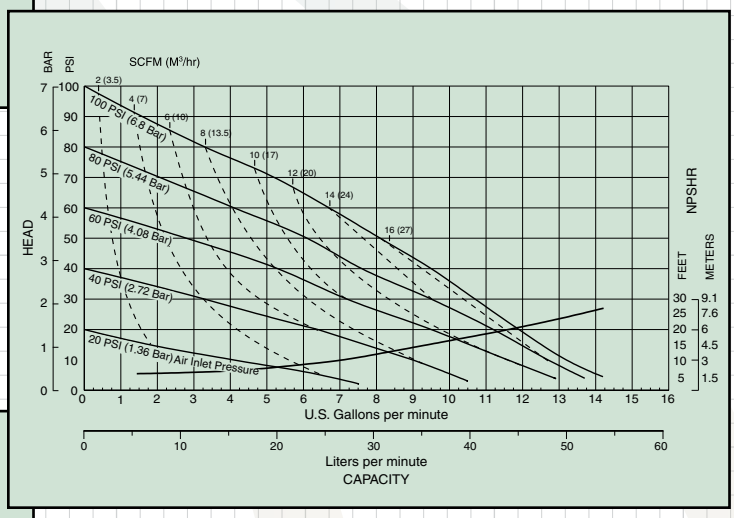
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
PB¼-A	7 13/16 (198)	7 (178)	5 1/2 (140)	3/4 (19)	7 13/16 (198)	½" MNPT	.25 (6)	.01 (.04)	4 (15)	.03 (1)	100 (6.9)
S05	11 5/16 (287)	10 1/8 (257)	7 1/16 (179)	1 3/8 (35)	11 5/16 (287)	1" MNPT	.5 (13)	.026 (.098)	14 (52)	.125 (3)	100 (6.9)
S07T*	13 11/32 (339)	11 13/16 (300)	7 1/16 (179)	1 13/16 (46)	13 11/32 (339)	1½" MNPT	.75 (20)	.016 (.059)	13 (48)	.38 (9)	100 (6.9)
S07	13 11/32 (339)	11 13/16 (300)	7 1/16 (179)	1 13/16 (46)	13 11/32 (339)	1½" MNPT	.75 (20)	.026 (.098)	23 (87)	.15 (4)	100 (6.9)
S10	13 13/16 (351)	11 13/16 (300)	7 9/16 (192)	2 1/2 (64)	11 11/16 (297)	1" 125# ANSI	1 (25)	.026 (.098)	23 (87)	.15 (4)	100 (6.9)
S1F	21 (533)	17 (433)	11 5/8 (295)	2 1/2 (64)	21 (533)	1" 125# ANSI	1 (25)	.17 (.64)	45 (170)	.25 (6)	100 (6.9)
S15	28 3/4 (730)	23 (584)	13 (330)	3 1/2 (89)	25 3/16 (640)	1½" 125# ANSI	1.5 (40)	.36 (1.36)	100 (378)	.47 (12)	100 (6.9)
S20	32 1/4 (819)	23 13/16 (605)	13 (330)	3 13/16 (97)	28 3/16 (716)	2" 125# ANSI	2 (50)	.36 (1.36)	160 (605)	.66 (17)	100 (6.9)
S30	40 5/8 (1032)	33 3/8 (848)	18 1/4 (464)	4 7/8 (124)	40 5/8 (1032)	3" 125# ANSI	3 (80)	.9 (3.41)	238 (901)	.71 (18)	100 (6.9)

All Dimensions +/- 1/8 (3) *T= Trihedral

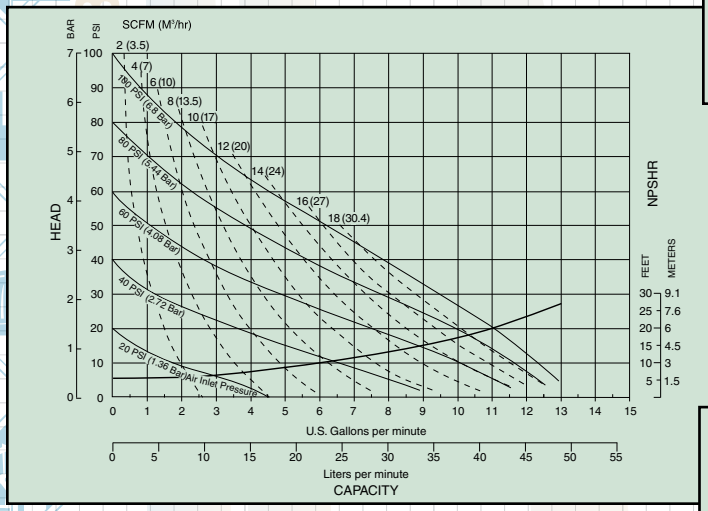
STANDARD DUTY BALL - Non-Metallic



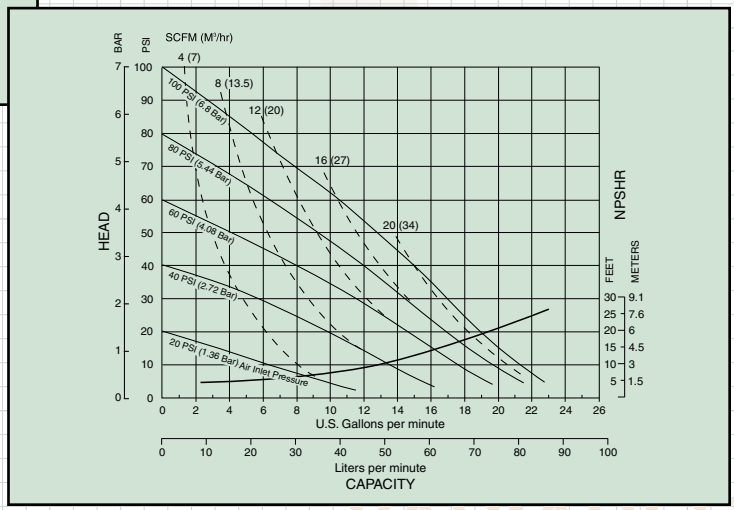
PB¼-A Non-Metallic Performance Curve



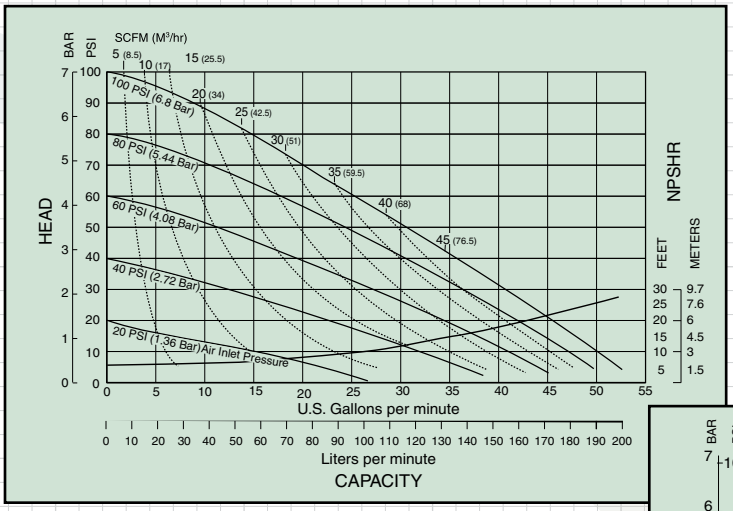
S05 Non-Metallic Performance Curve



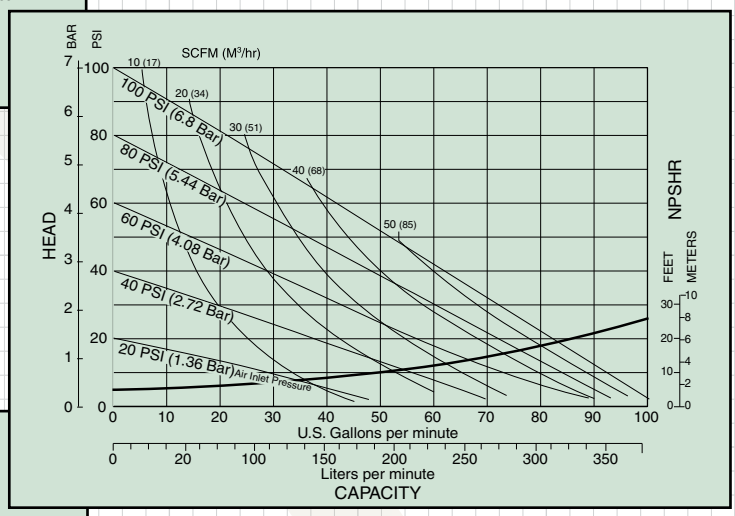
S07T Trihedral Non-Metallic Performance Curve



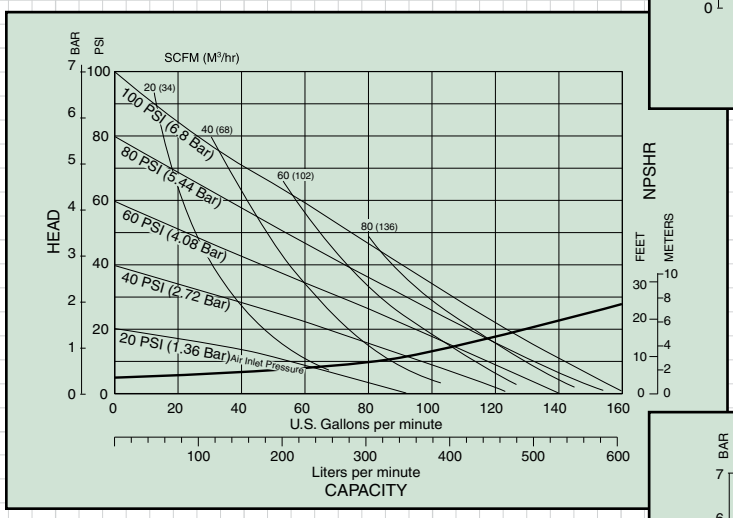
S07/S10 Non-Metallic Performance Curve



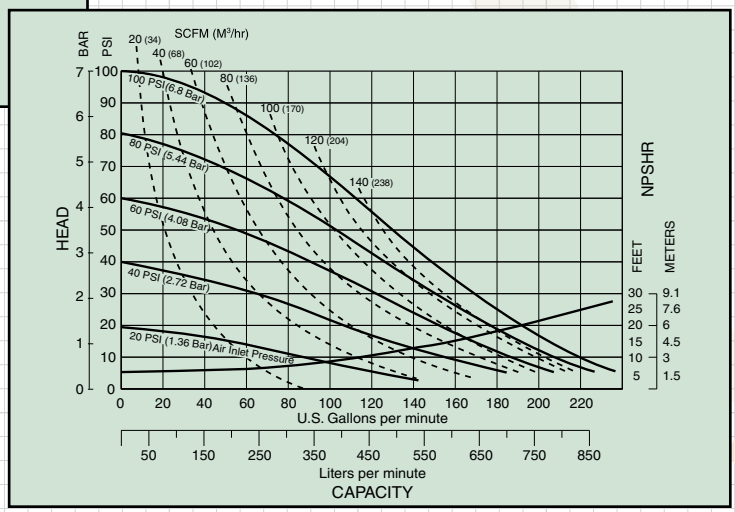
S1F Non-Metallic Performance Curve



S15 Non-Metallic Performance Curve

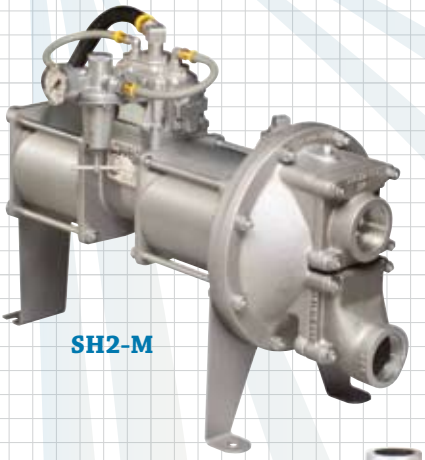


S20 Non-Metallic Performance Curve

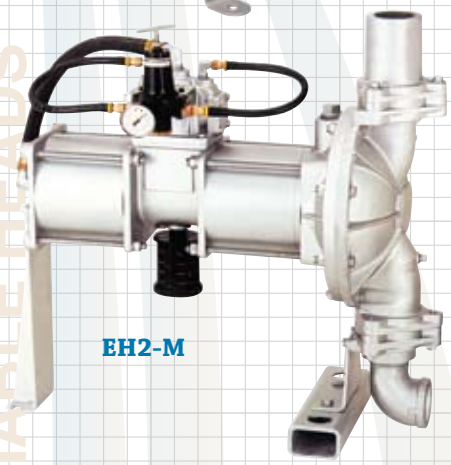


S30 Non-Metallic Performance Curve

HIGH PRESSURE DUTY

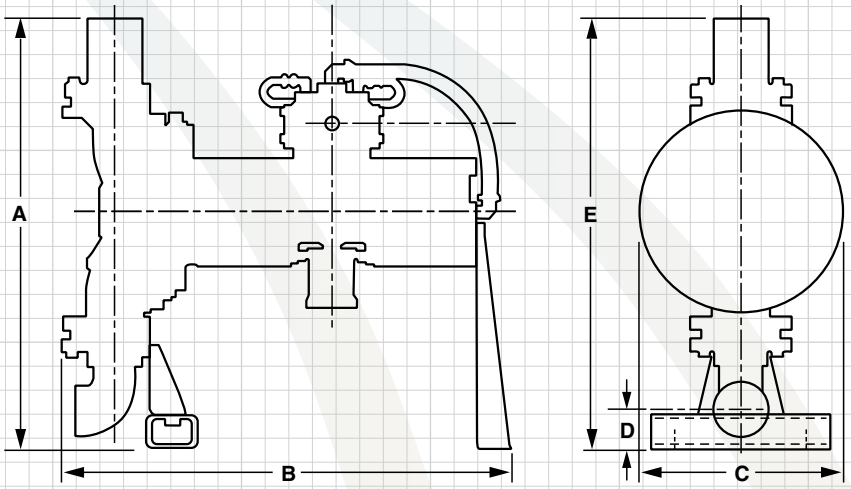


SH2-M



EH2-M

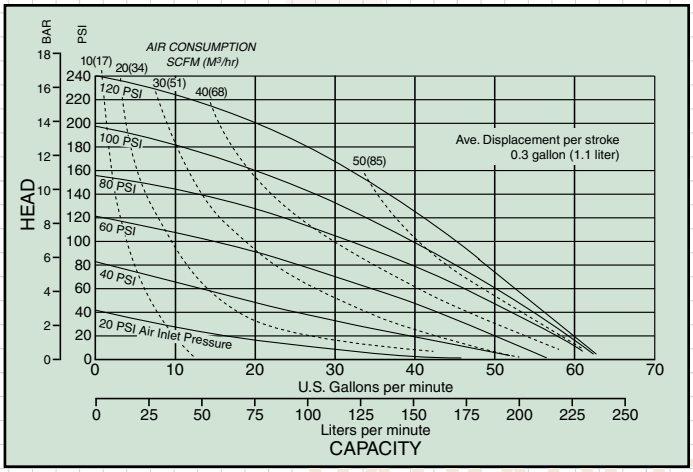
Air-powered single diaphragm high pressure metallic pumps deliver discharge pressure twice the inlet pressure, up to 250 PSI (17 BAR). Designed for filter press feed and applications requiring higher discharge pressures. Available in Aluminum, Cast Iron and Stainless Steel with various elastomer options.



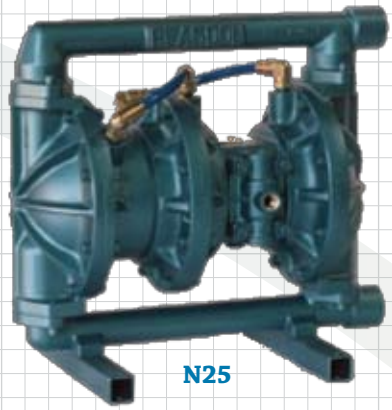
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
EH2-M	25 (635)	25 13/16 (656)	11 3/4 (298)	2 3/16 (56)	25 (635)	2" NPT	2 (50)	.30 (1.1)	62 (235)	.25 (6)	250 (17.2)
SH2-M	18 9/16 (471)	26 7/8 (683)	11 3/8 (289)	11 15/32 (291)	5 11/32 (136)	2" NPT	2 (50)	.30 (1.1)	62 (235)	2 (50)	250 (17.2)

All Dimensions +/- 1/8 (3)

EH2-M & SH2-M Performance Curve



HIGH PRESSURE DUTY - BLAGDON

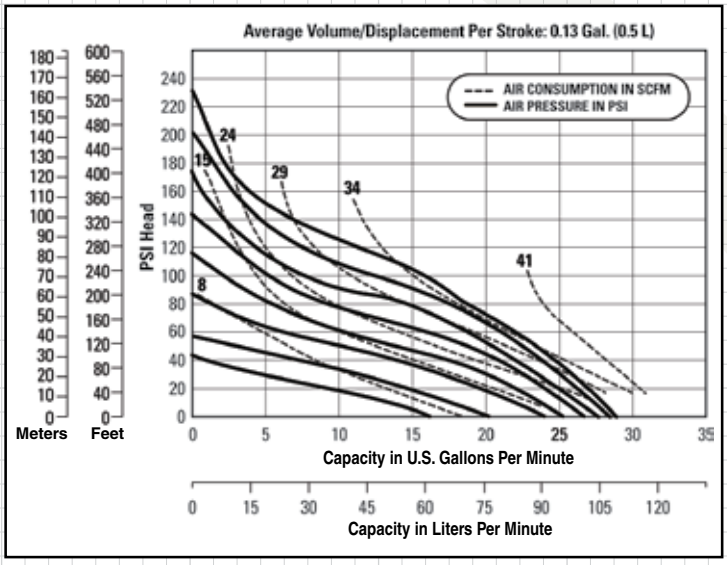


N25

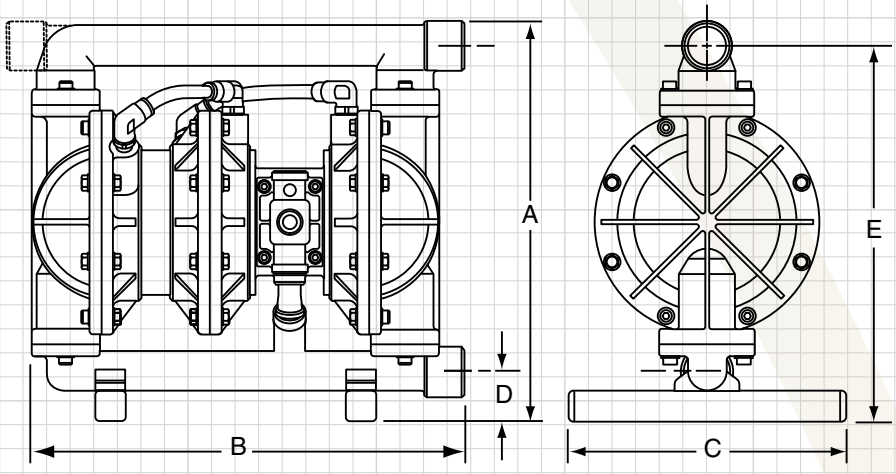
Blagdon 1" High-Pressure Pumps provide enhanced power in applications where pressure is paramount and flow rate is an issue. Using two air chambers to double the air per stroke, the N25 achieves discharge pressure up to 238 pounds per square inch with flow rates as high as 30 gallons per minute.

The N25's full flow design incorporates an additional air chamber to deliver higher flow rates with less pulsation, so there's less wear on pipes and fittings. In addition, the pump can start at zero head pressure with no damage to diaphragms and no need for a separate fill pump.

The N25 is available in either aluminum or stainless steel. It features a non-stalling, non-icing air valve system with shoe-valve technology to eliminate blow-by.



N25 Performance Curve



PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
N25	15.94 (405)	18.27 (464)	11.02 (280)	1.97 (50)	14.95 (380)	1" NPT	1 (25)	.13 (.5)	30 (114)	.125 (3)	238 (16)

All Dimensions +/- 1/8 (3)

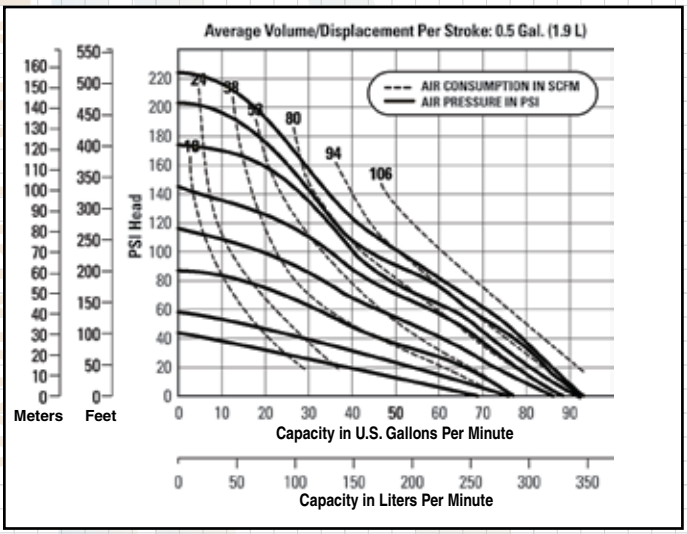
HIGH PRESSURE DUTY - BLAGDON

N50

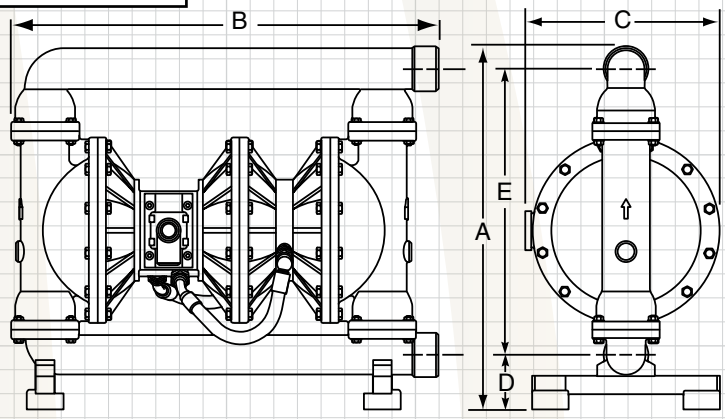
Blagdon 2" High-Pressure Pumps provide enhanced power in applications where pressure is paramount and flow rate is an issue. Using two air chambers to double the air per stroke, the N50 achieves discharge pressure up to 238 pounds per square inch with flow rates as high as 90 gallons per minute.

The N50's full flow design incorporates an additional air chamber to deliver higher flow rates with less pulsation, so there's less wear on pipes and fittings. In addition, the pump can start at zero head pressure with no damage to diaphragms and no need for a separate fill pump.

The N50 is available in either aluminum or stainless steel. It features a non-stalling, non-icing air valve system with shoe-valve technology to eliminate blow-by.



N50
Performance Curve



PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
N50	24.41 (620)	28.70 (729)	13.07 (332)	3.66 (93)	22.95 (583)	1" NPT	2 (50)	.5 (1.9)	90 (341)	.125 (3)	238 (16)

All Dimensions +/- 1/8 (3)

FILTER PRESS SYSTEMS

Built-to-order, multi-pump systems combine a high volume fill pump with a high pressure feed pump. Frequently used for filter press feed applications, the systems produce operating pressures to 250 PSI (17 BAR). This results in shortened press cycles, drier cake and less costly disposal.

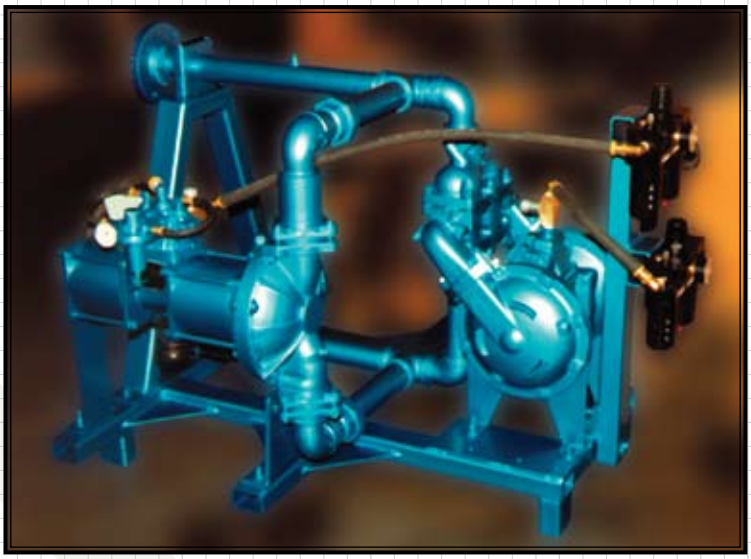


Plate and frame filter press base system.

BASE SYSTEMS

040.010.000. consists of:
(1) S20W1INCANS100.
(1) EH2-M, TN-4-I
Filter/Regulator (1) 020.052.000.
Filter/Regulator (1) 020.051.000.

Includes base & piping with 2" flange suction & discharge connections.

040.011.000. consists of:
(1) S30W1INCANS100.
(1) EH2-M, TN-4-I
Filter/Regulator (1) 020.052.000.
Filter/Regulator (1) 020.051.000.

Includes base & piping with 3" flange suction & discharge connections.

040.003.000. consists of:
(1) SA2-A, DA-5-II
(1) SH2-M, DN-7-I
Filter/Regulator (1) 020.052.000.
Filter/Regulator (1) 020.051.000.

Includes base & piping with 2" flange suction & discharge connections.

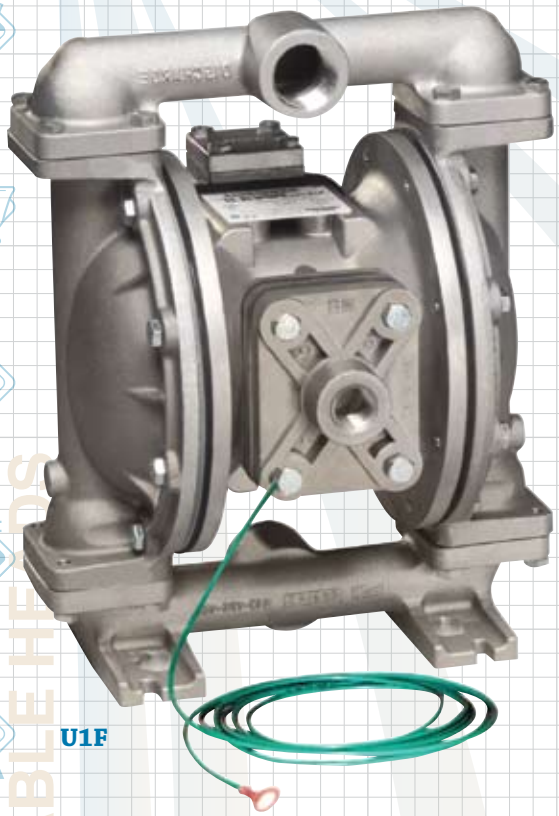
040.004.000. consists of:
(1) SA3-M, DA-2-II
(1) SH2-M, DN-7-I
Filter/Regulator (1) 020.052.000.
Filter/Regulator (1) 020.051.000.

Includes base & piping with 3" flange suction & discharge connections.

Custom built heavy duty wastewater, filter press pumping system.

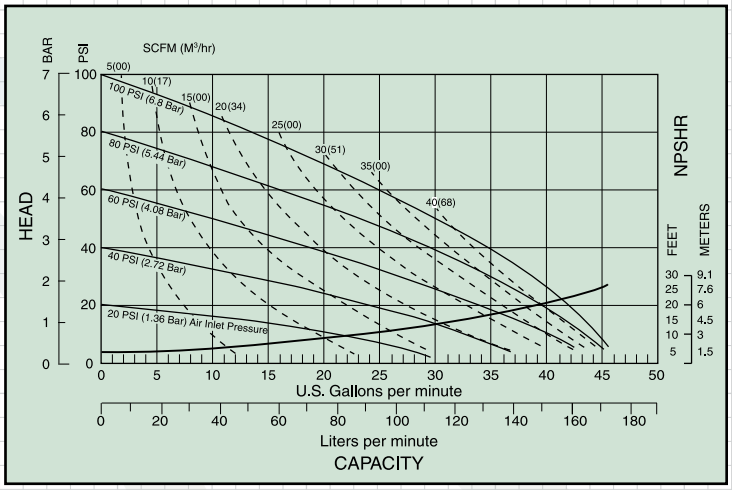
PLEASE CONSULT FACTORY FOR 1) LEAD TIME; 2) PRICING; AND 3) COMBINATIONS OF PUMPS FOR OTHER SYSTEMS

SPECIAL DUTY - UL Pump



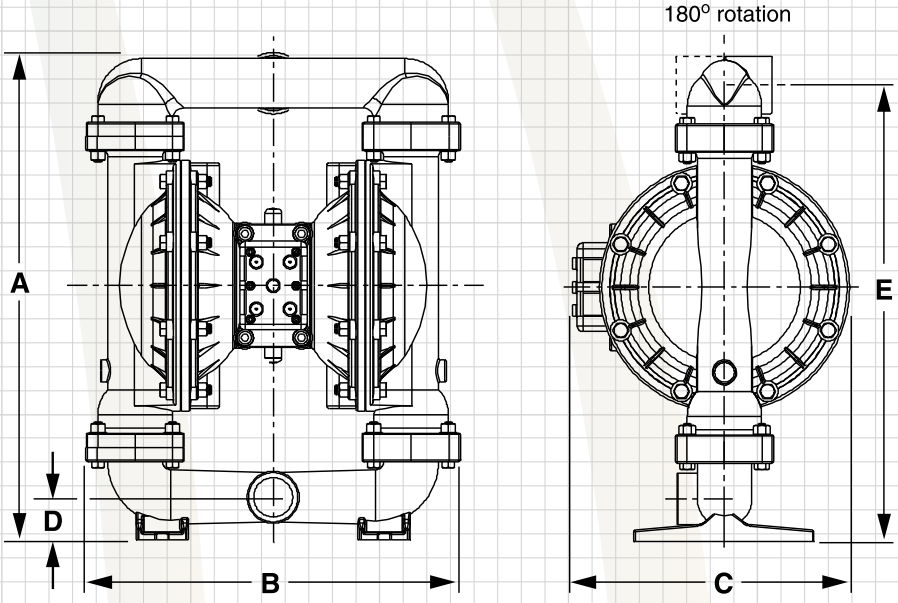
U1F

U1F Performance Curve



UL (Underwriters Laboratory) Pumps are designed to meet UL79 standards for diaphragm pumps handling flammable liquids. All Aluminum construction with approved Buna or Virgin PTFE UL elastomers. Fully groundable to prevent static discharge.

Underwriters Laboratory



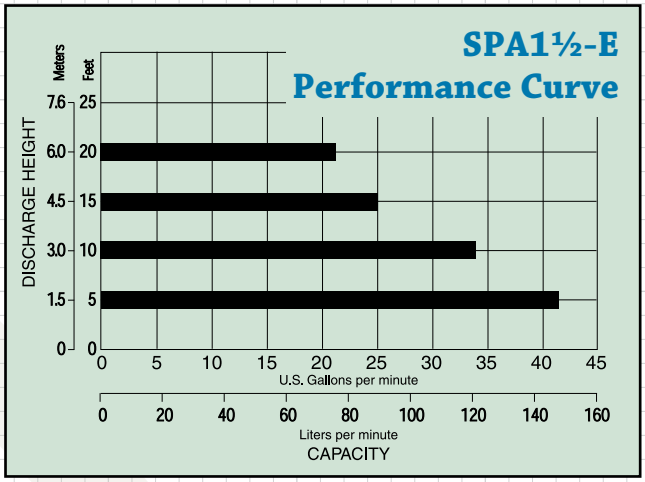
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
U1F	12 23/32 (323)	10 1/4 (260)	10 3/8 (264)	1 3/32 (28)	11 27/32 (301)	1" NPT	1 (25)	.11 (.42)	45 (170)	.25 (6)	125 (8.6)

All Dimensions +/- 1/8 (3)

DEWATERING DUTY - Submersible Pumps

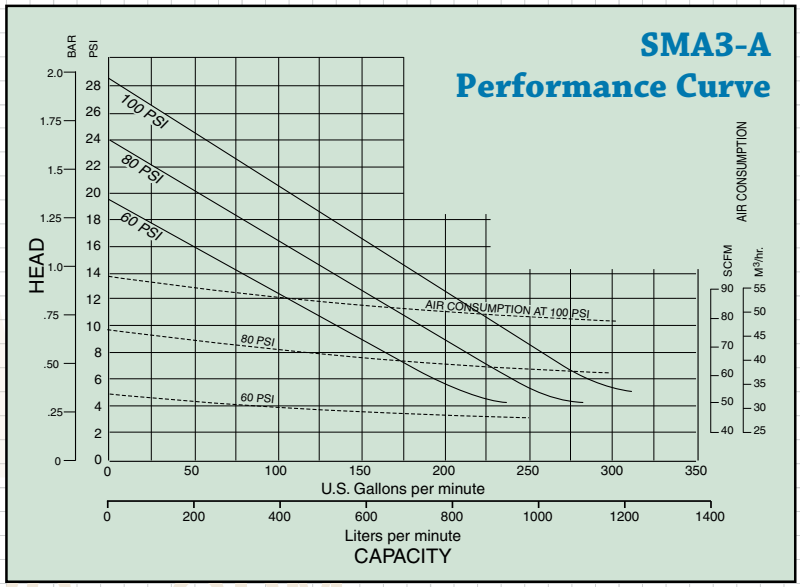
PortaPump®
SPA1½-E

The PortaPump® Submersible, Battery-Powered Pump operates using any 12-volt car or truck battery. It comes equipped with cables and battery clips. Extremely portable, the pump weighs only 33 pounds (15kg) and can fit through openings as small as 10" (25cm). Electrically safe and whisper quiet.

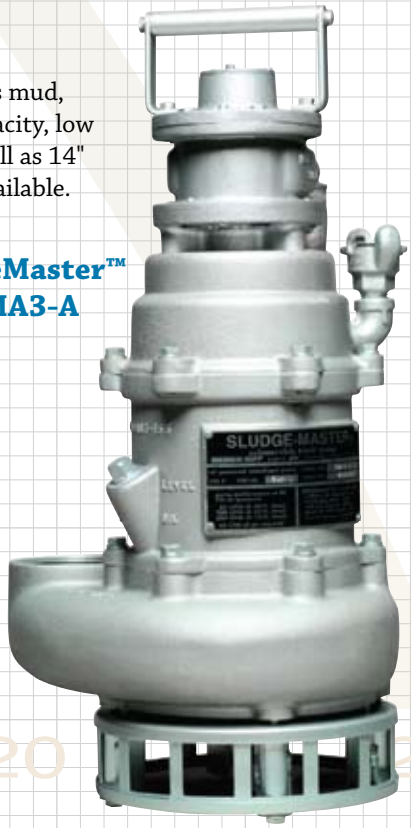


PUMP MODELS	Pipe Size	Max Flow Per Minute	Max Solids Handling	Max Discharge Height
	Inches (mm)	gal (liters)	Inches (mm)	feet (m)
SPA11/2-E3	1.5 (40)	43 (163)	1/16 (1)	25 (7.6)
SMA3-A	3 (80)	300 (1140)	1.5 (40)	65 (19.8)

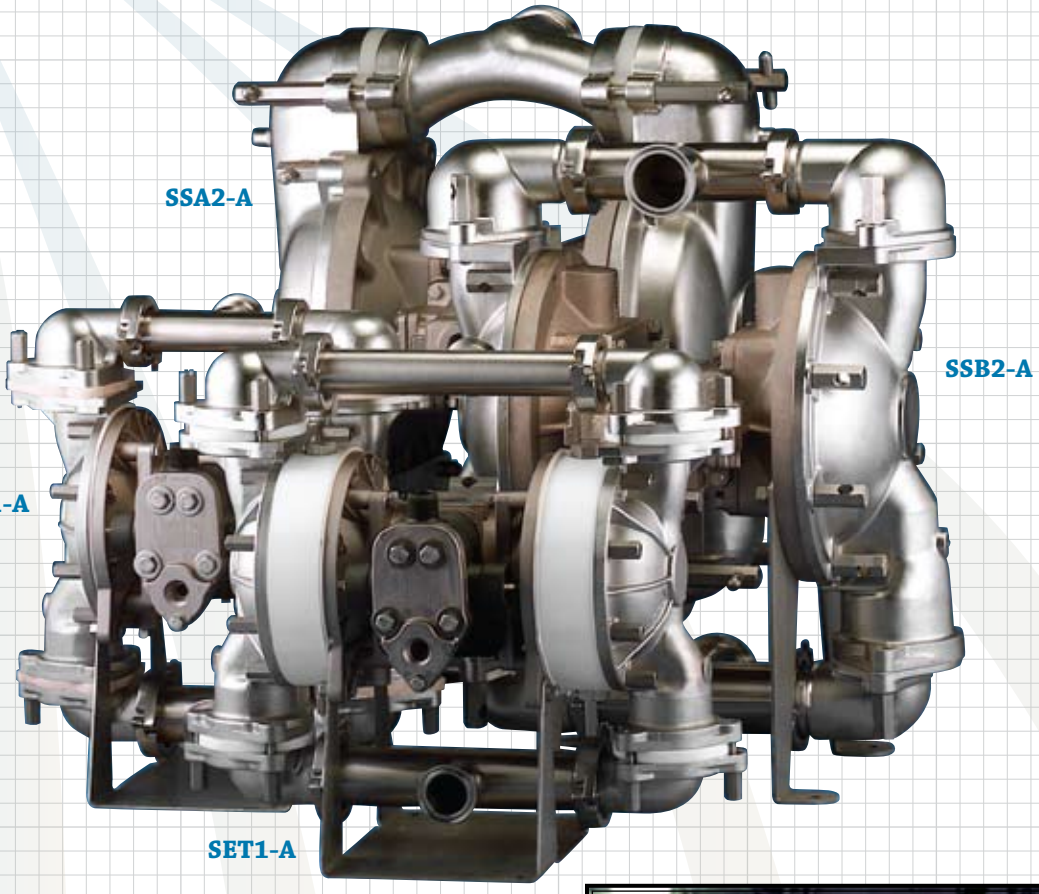
The SludgeMaster™ Submersible, Air-Powered Trash Pump handles mud, leaves, twigs, sand, sludge, trash-laden water and soft solids to 1½" (3.8cm). High capacity, low head. The pump weighs only 59 pounds (26kg), and can fit through an opening as small as 14" (35cm). Sturdy construction for rough handling and long life. Optional rock screen available.



SludgeMaster™
SMA3-A

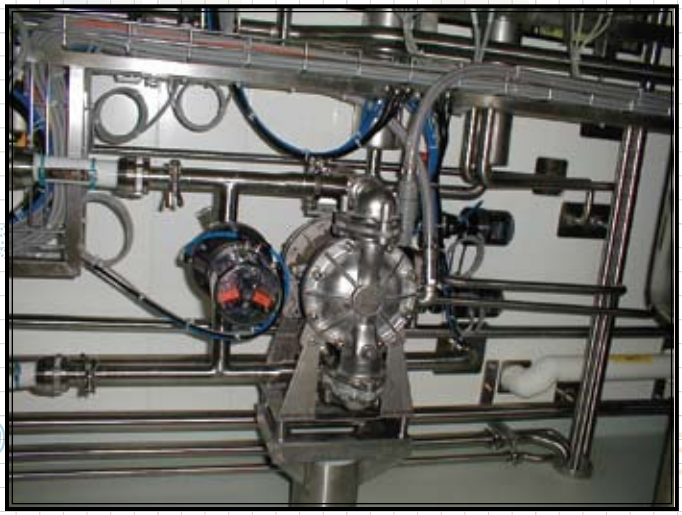


SPECIAL DUTY - USDA (United States Department of Agriculture) Pumps



USDA certified flap check valve pumps transferring tomato paste at a major university processing facility.

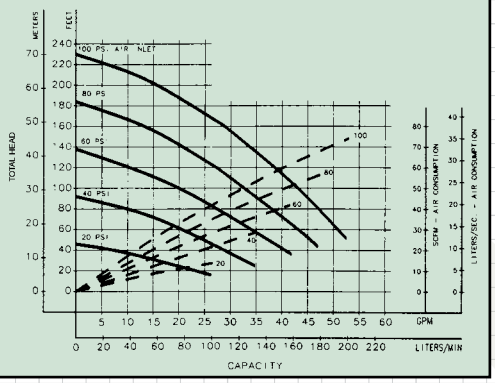
USDA certified ball check valve pump in a clean-in-place, sanitary piping installation.



DSB1-A Designed to meet USDA (Dairy Division) Standards.
Must be fitted with Electronic Leak Detector to maintain Dairy Approval. Leak Detector purchased separately.

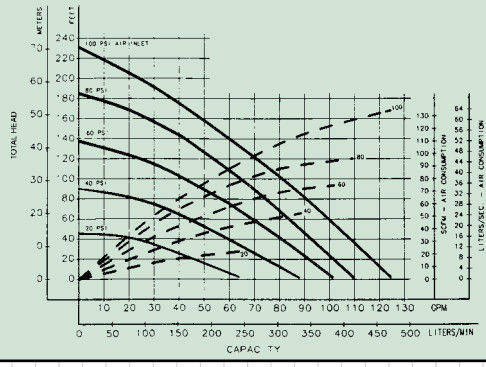
SSB1-A Designed to meet USDA Standards.
1½" (38mm) Ball Valve, 0 to 54 GPM (204 liters)
Handles solids to ¼" (6mm), Top Discharge

This performance based on water, approximate .09 gal. (.34 liters) displacement per pump stroke.



SSB2-A Designed to meet USDA Standards.
2" (50.8mm) Ball Valve, 0 to 125 GPM (473 liters)
Handles solids to ¼" (6mm), Top Discharge

This performance based on water, approximate .36 gal. (1.36 ltrs.) displacement per pump stroke.



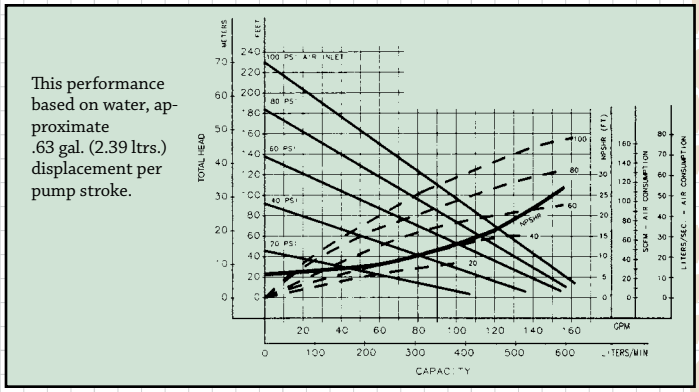
Electronic Leak Detector - This leak detector works on the principle of conductance, sensing liquid or condensation entering the air side of the pump. It is installed through a boss on the inner chambers. A probe senses pooled conductive liquid, producing a low current (1.2 volt DC), which signals a control unit. Indicator lights signal not only contamination, but also which side is tainted. The control unit can be easily wired to an audible alarm or pump shutdown mechanism if needed. Modular, water-tight construction. Sensitivity range is adjustable from 500 ohm (2000 micro mho) to 100,000 ohm (10 micro mho). Available for 115V (032.017.000) and 220V (032.018.000) power supply. **This unit must be purchased separately.**

Materials of Construction - Wetted parts of these Meat/Poultry* pumps are electropolished 316 and 302/304 Stainless Steel. Non-wetted parts are electroless nickel-plated aluminum and polypropylene. All are fitted with food grade, white nitrile elastomers. The Dairy* pumps have mechanically-polished 316 Stainless Steel wetted parts, and must be fitted with the Warren Rupp* Electronic Leak Detector to maintain Dairy standards.

*Designed to meet USDA Standards.

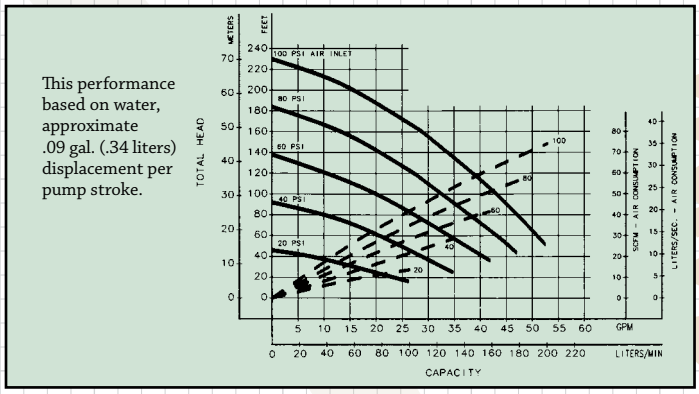
SSA2-A Designed to meet USDA Standards.
2½" (63.5mm) Flap Valve, 0 to 150 GPM (570 liters)
Handles solids to 1 1/16" (27.4mm), Top or Bottom Discharge

This performance based on water, approximate .63 gal. (2.39 ltrs.) displacement per pump stroke.



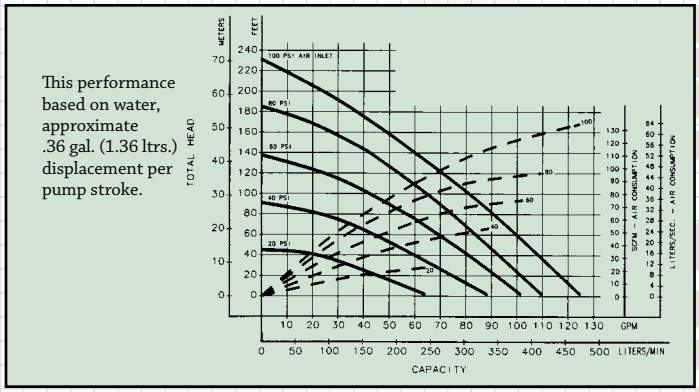
SET1-A Sanitary Pump designed to meet USDA Standards.
1" (25.4mm) Ball Valve, 0 to 54 GPM (204 liters)
Handles solids to ¼" (6mm), Top Discharge

This performance based on water, approximate .09 gal. (.34 liters) displacement per pump stroke.



SET2-A Sanitary Pump designed to meet USDA Standards.
2" (50.8mm) Ball Valve, 0 to 123 GPM (465 liters)
Handles solids to ¼" (6mm), Top Discharge

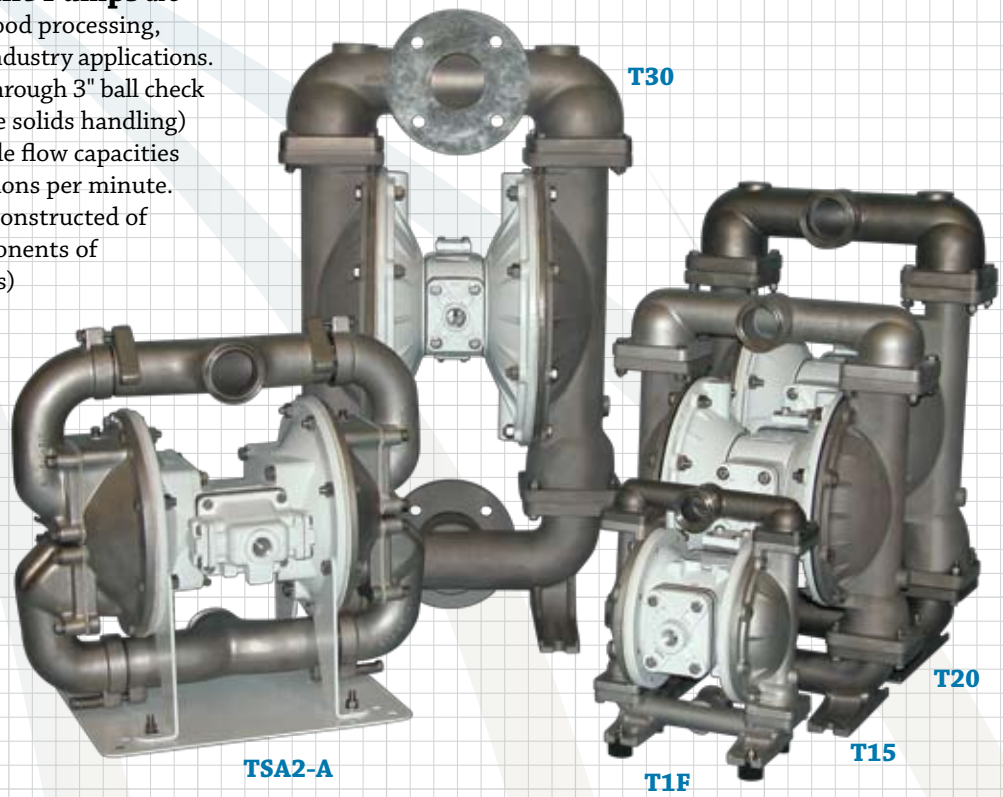
This performance based on water, approximate .36 gal. (1.36 ltrs.) displacement per pump stroke.

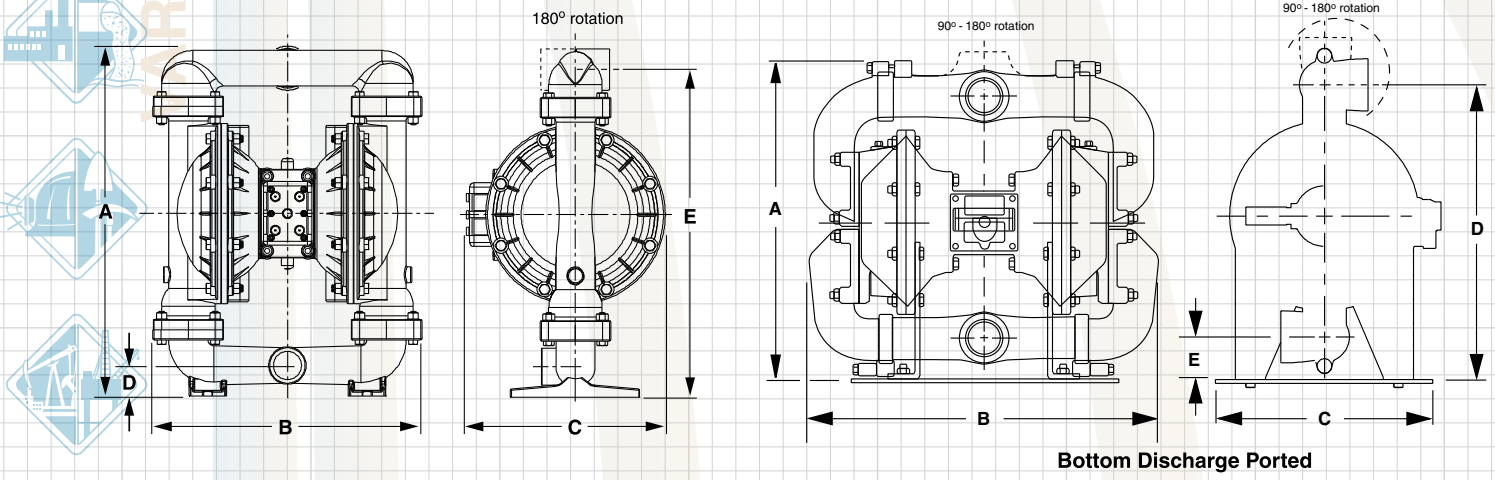


Note: The Electronic Leak Detector must be purchased separately.

SPECIAL DUTY - FDA (Food & Drug Administration) Compliant Pumps

FDA Materials Compliant Pumps are ideally suited for a variety of food processing, pharmaceutical and cosmetic industry applications. The pumps are available in 1" through 3" ball check valve designs and a 2" (line size solids handling) flap check valve design. Variable flow capacities across the range are 0–235 gallons per minute. These special duty pumps are constructed of FDA material compliant components of Stainless Steel (wetted castings) and a selection of FDA Santoprene, FDA Nitrile and PTFE diaphragms, check valves and valve seats. Standard non-wetted components are white epoxy coated Aluminum with stainless steel hardware. 1", 1½" and 2" pumps are offered with sanitary clamp fittings and 3" pumps are offered with an ANSI flange.



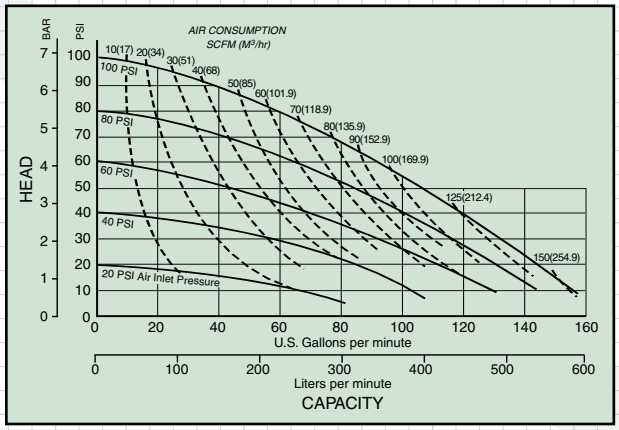


Bottom Discharge Ported

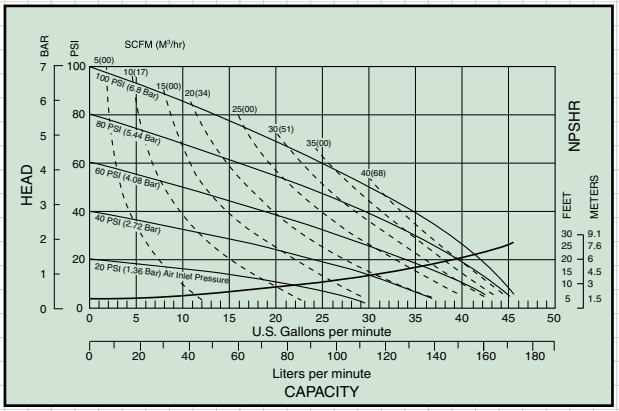
PUMP MODELS	A	B	C	D	E	Connection Style Sanitary Clamp	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
TSA2-A	20 13/16 (529)	21 1/4 (539)	13 (330)	2 9/16 (55)	17 9/16 (447)	2½" Clamp	2 (50)	.43 (1.60)	140 (530)	2 (50)	125 (8.6)
T1F	12 31/32 (326)	10 1/4 (260)	10 3/8 (264)	1 7/32 (31)	11 31/32 (304)	1½" Clamp	1 (25)	.11 (.42)	45 (170)	.25 (6)	125 (8.6)
T15	21 13/16 (554)	16 21/32 (423)	12 23/64 (314)	1 31/32 (50)	20 3/8 (518)	2" Clamp	1.5 (40)	.41 (1.55)	106 (401)	.25 (6)	125 (8.6)
T20	26 9/16 (674)	16 7/8 (428)	12 19/32 (320)	2 (51)	24 3/4 (629)	2½" Clamp	2 (50)	.42 (1.59)	150 (567)	.25 (6)	125 (8.6)
T30	32 9/32 (820)	19 21/32 (499)	15 3/4 (400)	4 7/32 (107)	30 27/32 (808)	3" # FF ANSI	3 (80)	.94 (3.56)	238 (901)	.38 (9.5)	125 (8.6)

All Dimensions +/- 1/8 (3)

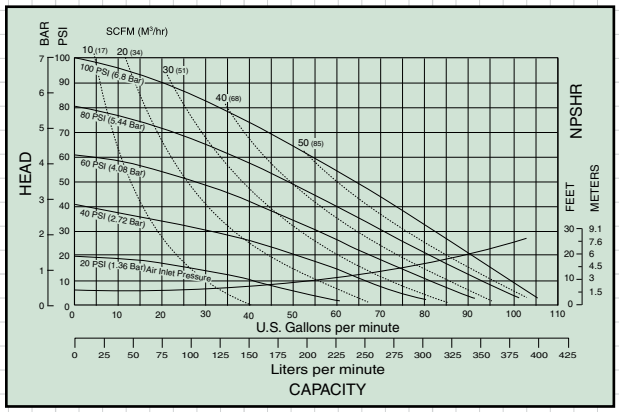
TSA2-A Performance Curve



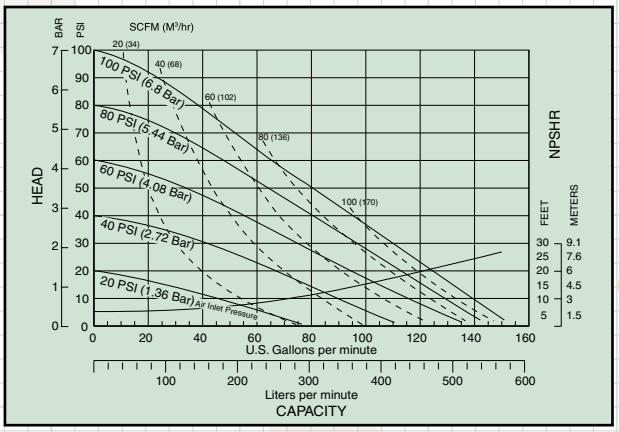
T1F Performance Curve



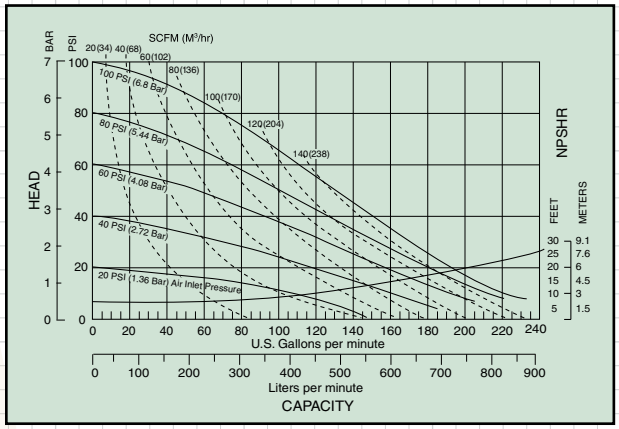
T15 Performance Curve



T20 Performance Curve

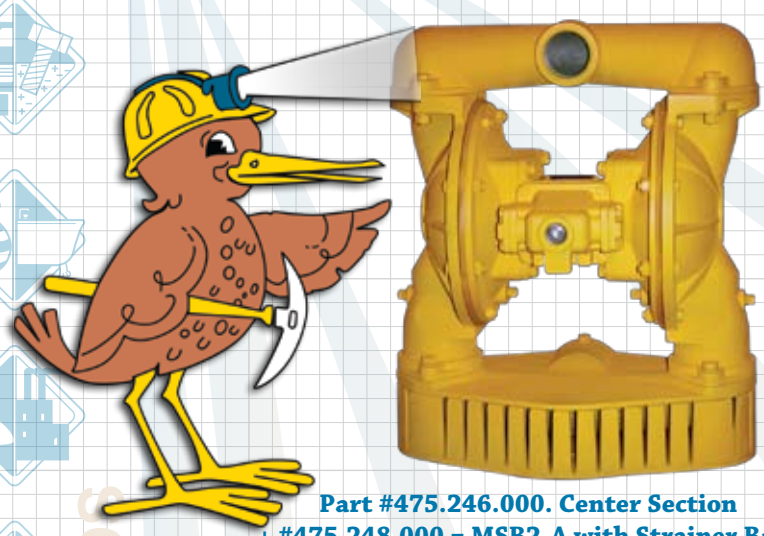


T30 Performance Curve



T30 FDA Material compliant pump cart system for wine industry applications.

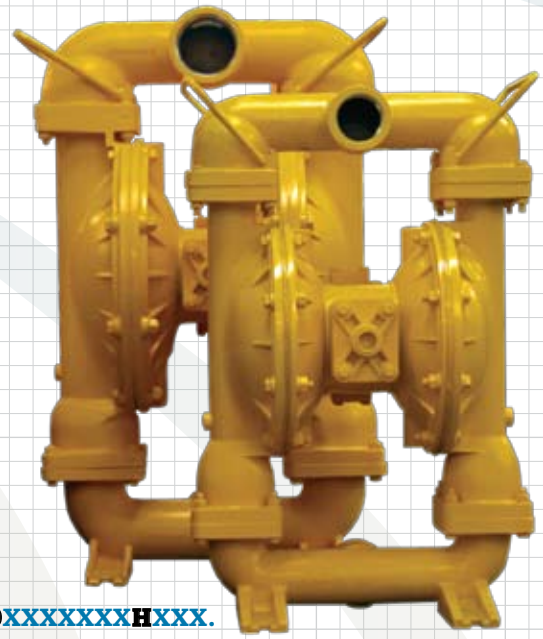
SPECIAL DUTY - Mine/Construction Pumps



Part #475.246.000. Center Section
+ #475.248.000 = MSB2-A with Strainer Base

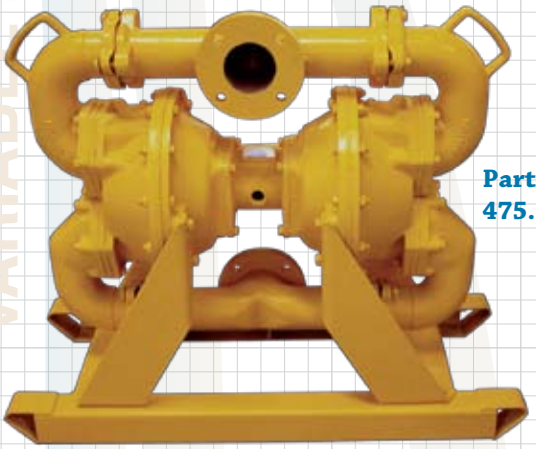
Also available Model MSB2-B
with Manifold Mounting Feet #475.249.000

Handle Mounted Standard Duty



S30XXXXXXX**H**XXX.

S20XXXXXXX**H**XXX.

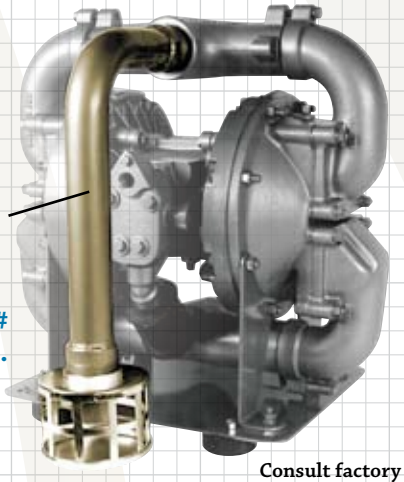


Part #
475.040.000.

Skid Mounted SA3-C

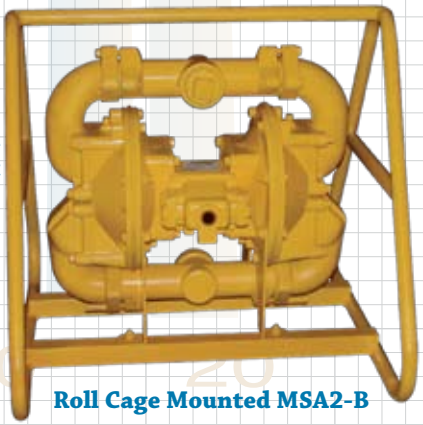
Consult factory for
skid base dimensions.

Suction Stub
and Strainer

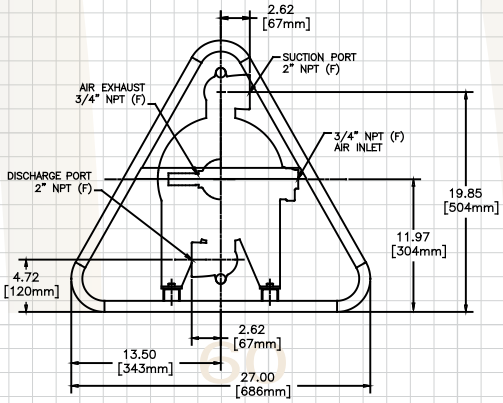


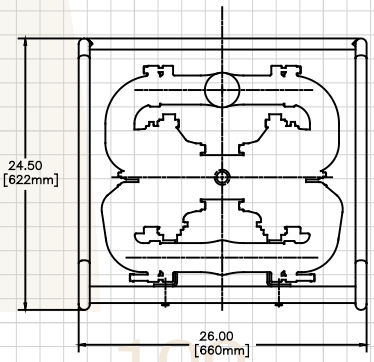
Part #
475.039.000.

Consult factory for
suction tube dimensions.



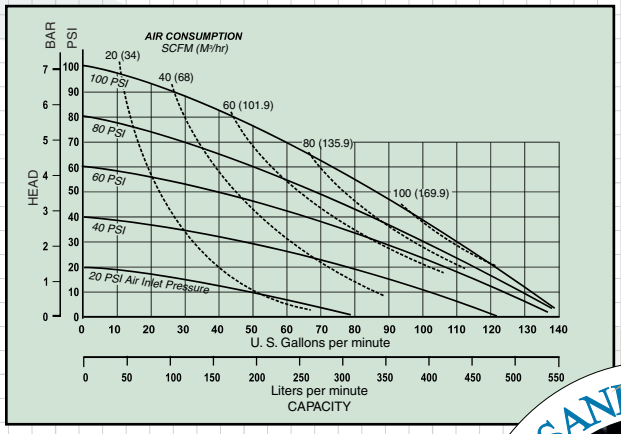
Roll Cage Mounted MSA2-B



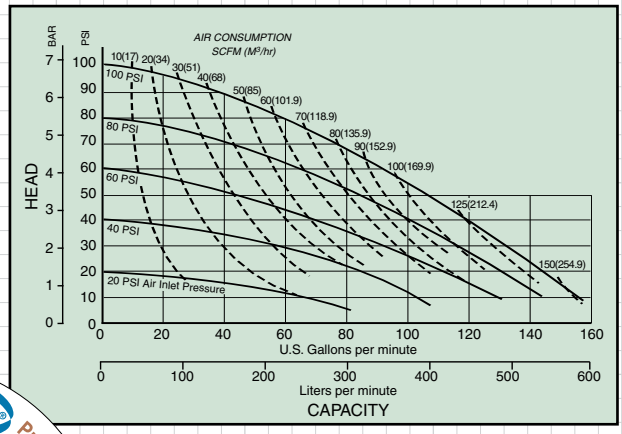


SPECIAL DUTY - Mine/Construction Pumps

MSB2 Performance Curve

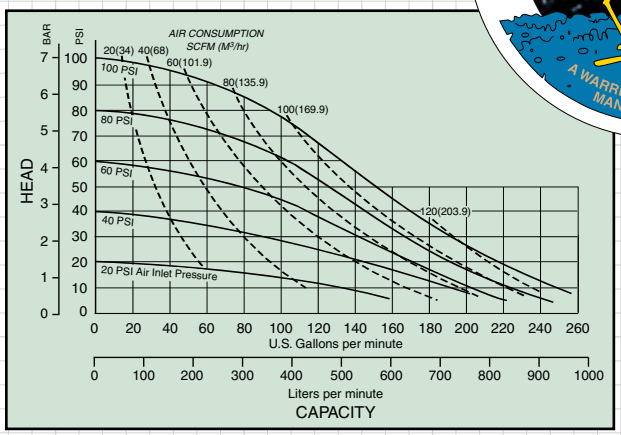


MSA2-A/MSA2-B/SA2-C Performance Curve

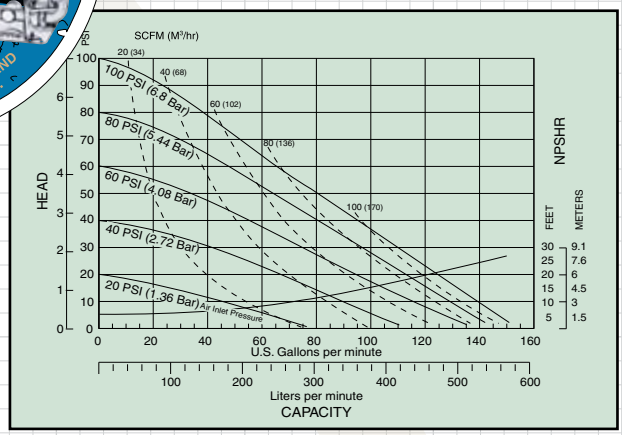


Hard Hat Decals Available

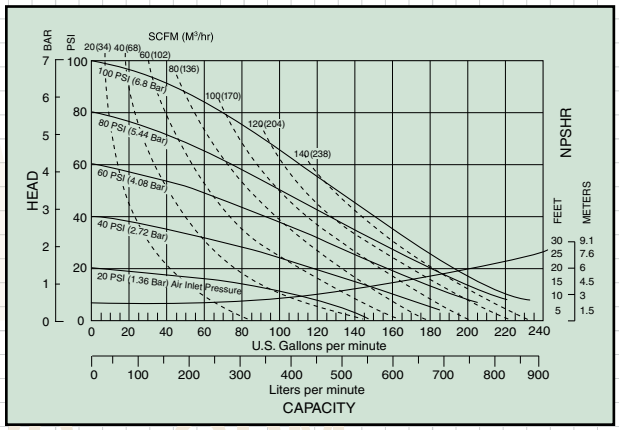
SA3-C Performance Curve



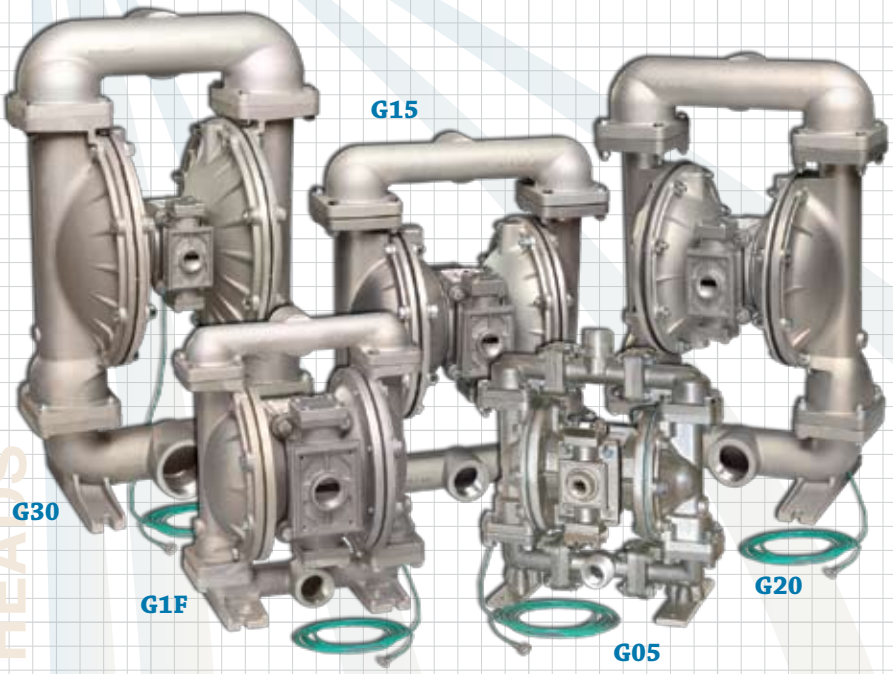
S20 Performance Curve



S30 Performance Curve



SPECIAL DUTY BALL - Natural Gas



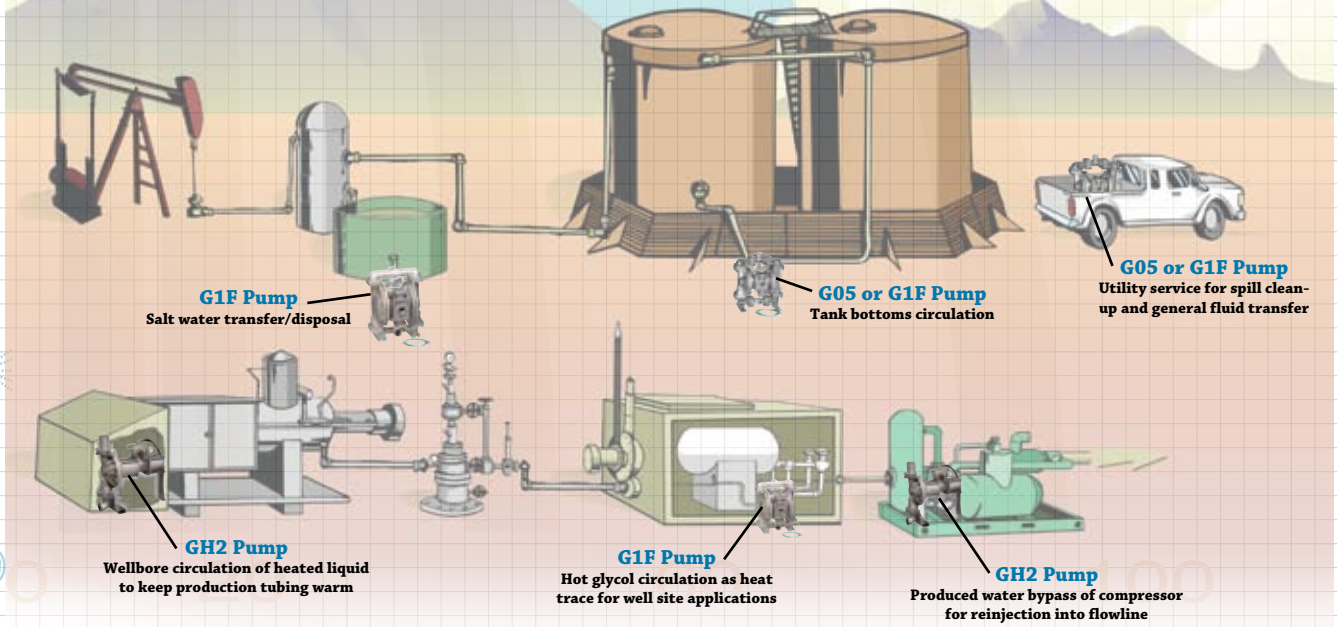
Burst Pressure to:
500 PSI (34.5 bar)

Temperature Limits:
-10°F (-23°C) to +180°F (82°C)

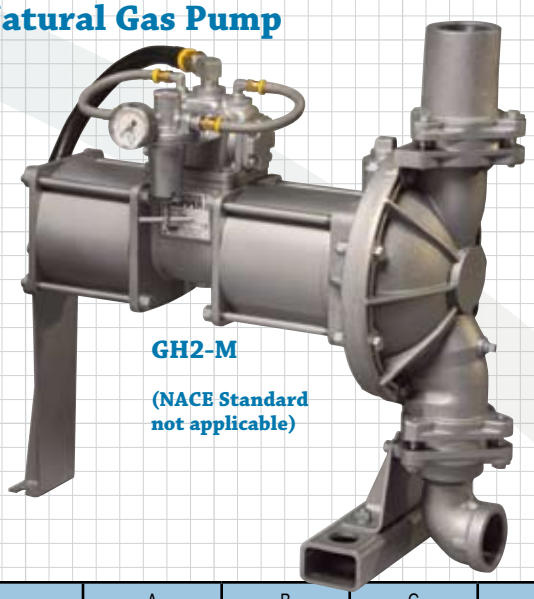
These stringent tests meet the actual minimum and maximum temperatures that pumps are subjected to in typical gas and oil field applications.

Natural Gas Operated Pumps are CSA* (Canadian Standards Association) certified for operation using sweet or sour natural gas. The pumps are also compliant with NACE Standard MR0175/ISO15156. The gas pump utilizes Aluminum or 316 Stainless Steel wetted construction with Buna or Virgin PTFE diaphragms and check balls. The gas valve is constructed of Aluminum with Buna or FKM (fluorocarbon) elastomers. Pumps are fully groundable, preventing static discharge. A Stainless Steel gas valve option is available on G15 to G30 pumps for more corrosive applications.

**CSA is the Canadian Standards Association, an international organization for testing products to ensure public safety, and the governing agency for the Natural Gas Industry.*

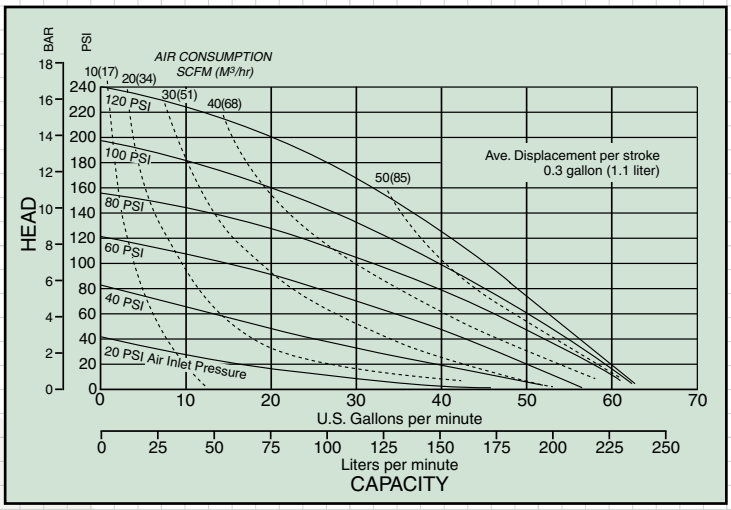


High Pressure Natural Gas Pump



GH2-M

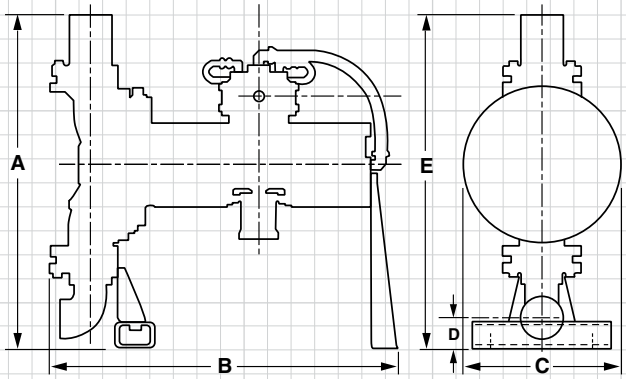
(NACE Standard not applicable)

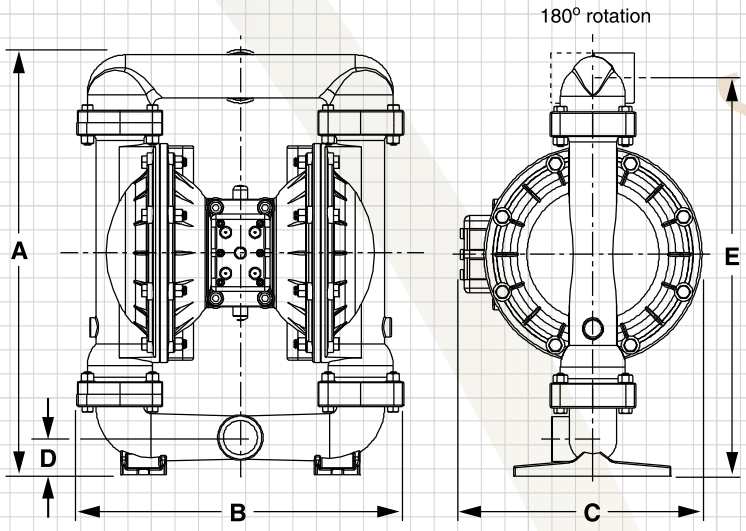


GH2-M Performance Curve

PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
GH2-M	25 (635)	25 13/16 (656)	11 3/4 (298)	2 3/16 (56)	25 (635)	2" NPT	2 (50)	.30 (1.1)	62 (235)	.25 (6)	250 (17.2)

All Dimensions +/- 1/8 (3)

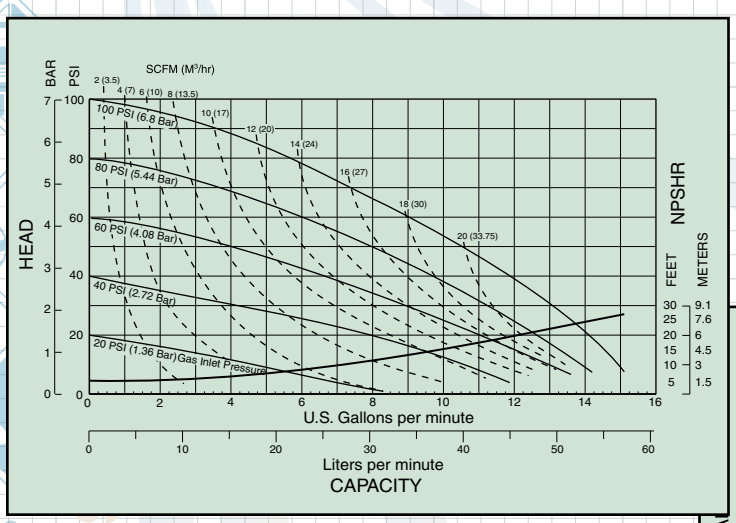




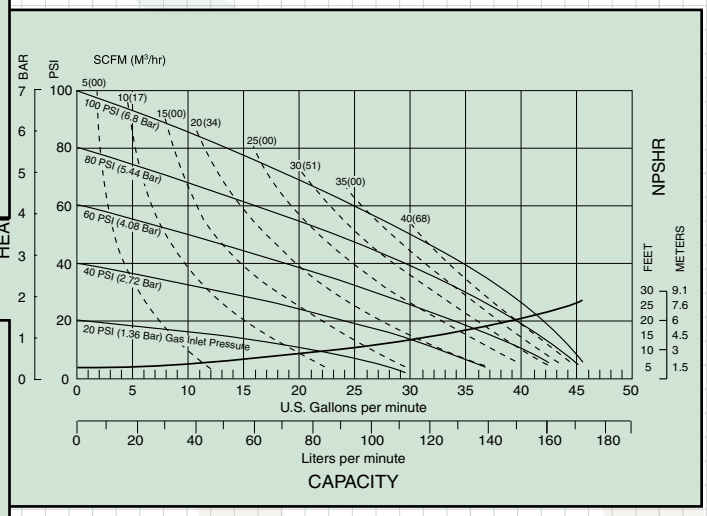
PUMP MODELS	A	B	C	D	E	Connection Style	Pipe Size	Displacement Per Stroke	Max Flow Per Minute	Max Solids Handling	Max Discharge Pressure
	Height	Width	Depth	Bottom of Base to Center Line of: Suction	Discharge						
	inches (mm)	inches (mm)	inches (mm)	inches (mm)	inches (mm)		inch (mm)	gal (liter)	gal (liter)	inch (mm)	psi (bar)
G05	11 1/2 (292)	10 1/4 (260)	7 1/16 (179)	1 5/16 (33)	11 1/2 (292)	1" MNPT	.5 (13)	.026 (.098)	15 (57)	.125 (3)	125 (8.6)
G1F	12 23/32 (323)	10 1/4 (260)	10 3/8 (264)	1 3/32 (28)	11 27/32 (301)	1" NPT	1 (25)	.11 (.42)	45 (170)	.25 (6)	125 (8.6)
G15	21 37/64 (548)	16 21/32 (423)	12 23/64 (314)	1 29/32 (49)	20 5/16 (516)	1½" NPT	1.5 (40)	.41 (4.55)	106 (401)	.25 (6)	125 (8.6)
G20	26 5/16 (668)	16 7/8 (428)	12 19/32 (320)	1 7/8 (48)	24 5/8 (625)	2" NPT	2 (50)	.42 (1.59)	150 (567)	.25 (6)	125 (8.6)
G30	32 1/16 (814)	19 21/32 (499)	15 3/4 (400)	2 11/32 (60)	29 31/32 (761)	3" NPT	3 (80)	.94 (3.56)	238 (901)	.38 (9.5)	125 (8.6)

All Dimensions +/- 1/8 (3)

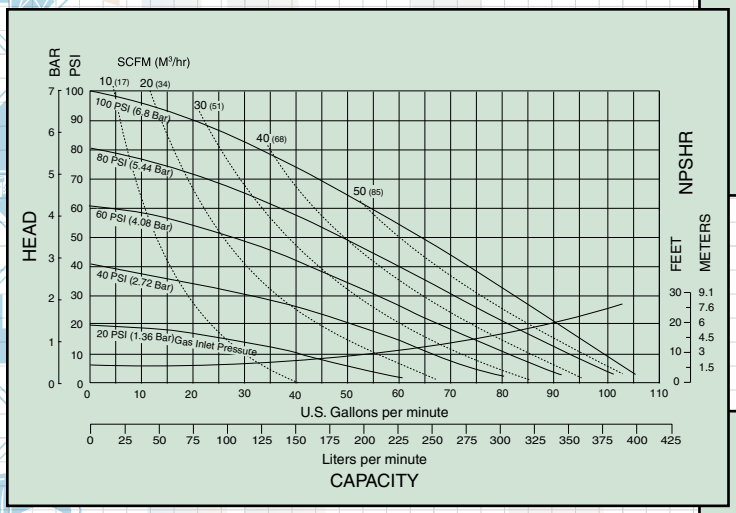
SPECIAL DUTY BALL - Natural Gas



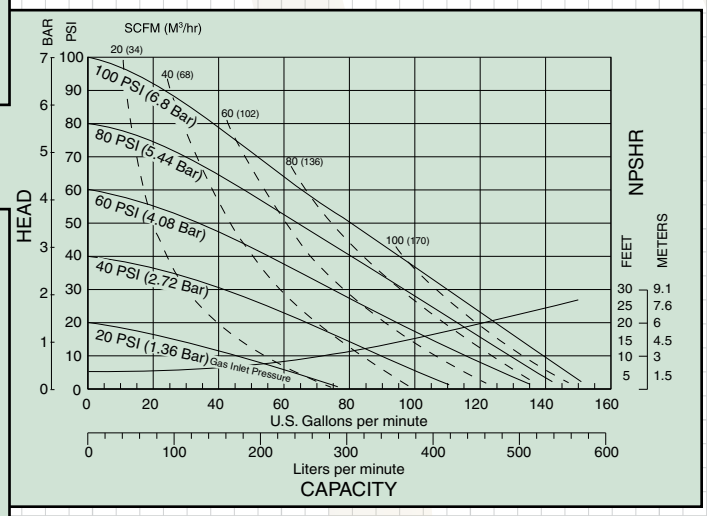
G05 Performance Curve



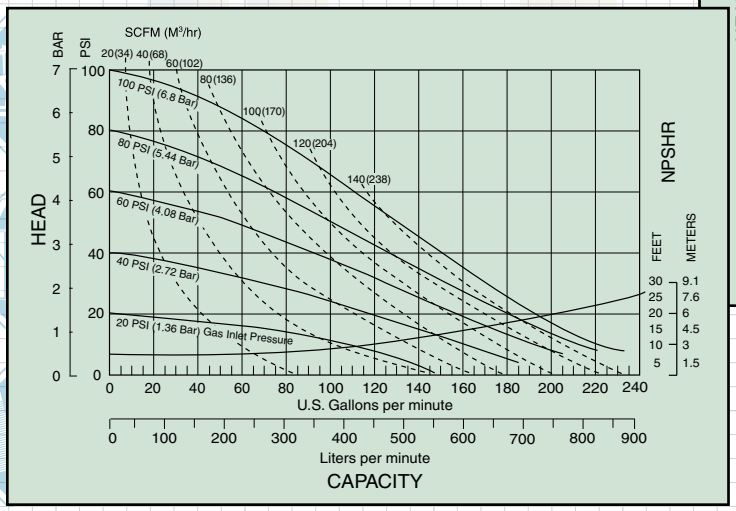
G1F Performance Curve



G15 Performance Curve



G20 Performance Curve



G30 Performance Curve

CSA CERTIFIED Natural Gas Regulators

All of the regulators have vent ports that are tapped ¼" NPT. A pipe or hose fitting can be installed and any natural gas that escapes due to a diaphragm rupture can be diverted to be reclaimed. No gas is vented into the surrounding atmosphere. This feature provides for a safer regulator and is environmentally friendly.

¼" Regulator 020.057.000

Superior regulation and excellent stability make the 020.057.000 regulator ideal for lower flow applications. Square head adjustment screw allows for easy in-field calibration. The 020.057.000 is available with hand wheel adjustment, output pressure gauge and/or mounting bracket as options.

½" Regulator 020.058.000

¾" Regulator 020.059.000

The 020.058.000 & 020.059.000 contain many of the same characteristics as the 020.060.000, but at a reduced cost. At 110 SCFM (16.5 Mbtu/hr.), the 020.059.000 offers flow rates comparable to current market suppliers. The use of a relief valve is recommended for this product in accordance with NFPA 58.

¾" Regulator 020.060.000

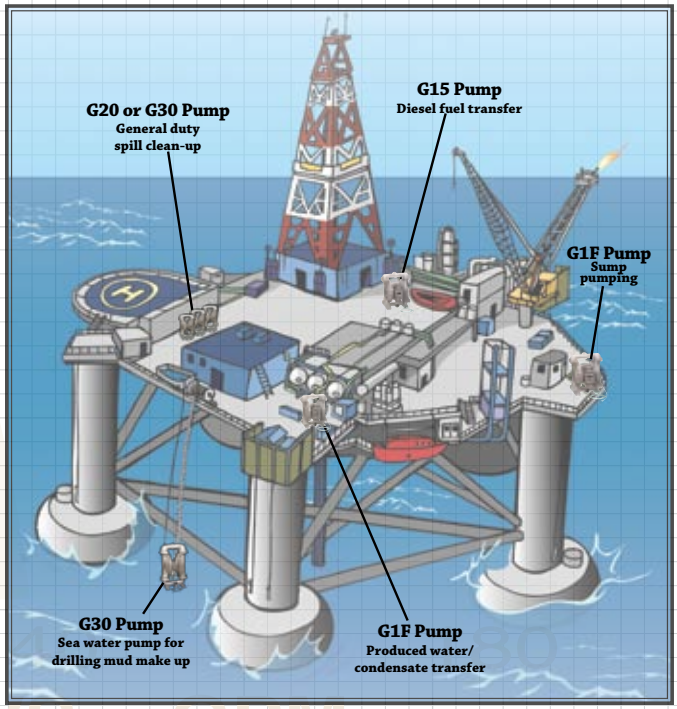
The 020.060.000 uses a patented balanced pintle design which eliminates unsteady changes in outlet pressure due to inlet pressure fluctuations. The 020.060.000 is a spring opposed, diaphragm-operated, non-relieving regulator. The use of a relief valve is recommended for this product in accordance with NFPA 58.

Note: Regulators come standard with gauge. Replacement gauges 020.061.000 are available.

Interceptor (Particulate Removal) 3P U - Aluminum Housing Filter

Applications: Particulate removal where very high dirt-holding capacity is required. Safety after filter for desiccant dryer, pore matched prefilter for coalescer or as general use for final instrument air protection.

• Desiccant dryer after filter • Prefilter for coalescer • Systems with high concentrations of solid contaminant
• Particulate protection for non-lubricated systems



Natural Gas-Operated Pumps used for Offshore Drilling and Production Applications

Interceptor End Seals: U=Molded urethane.
Standard on all 3P pleated cellulose filter elements.

020.064.000
3/4" NPT Filter

Replacement Element:
020.066.000

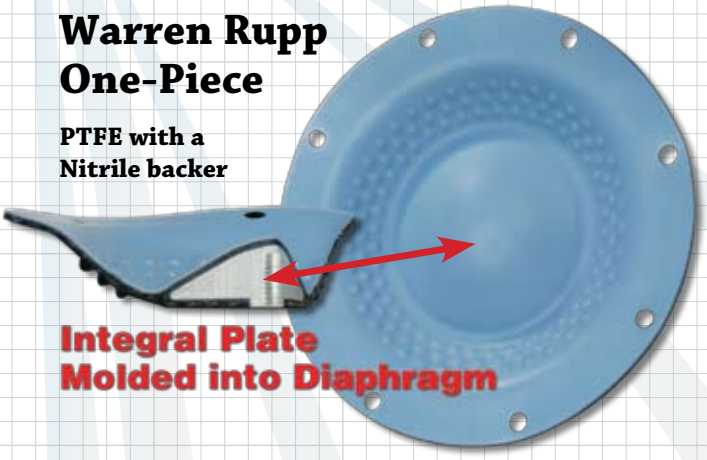
020.062.000
1/4" NPT Filter

Replacement Element:
020.065.000

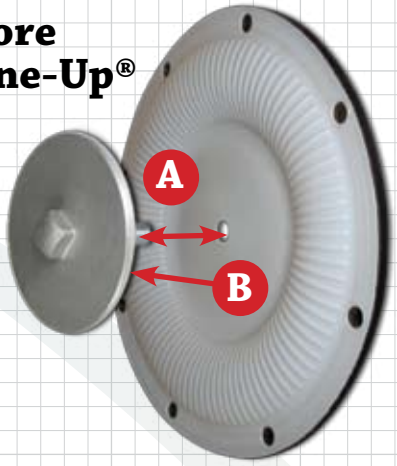
Warren Rupp One-Piece Diaphragm

Warren Rupp One-Piece

PTFE with a Nitrile backer



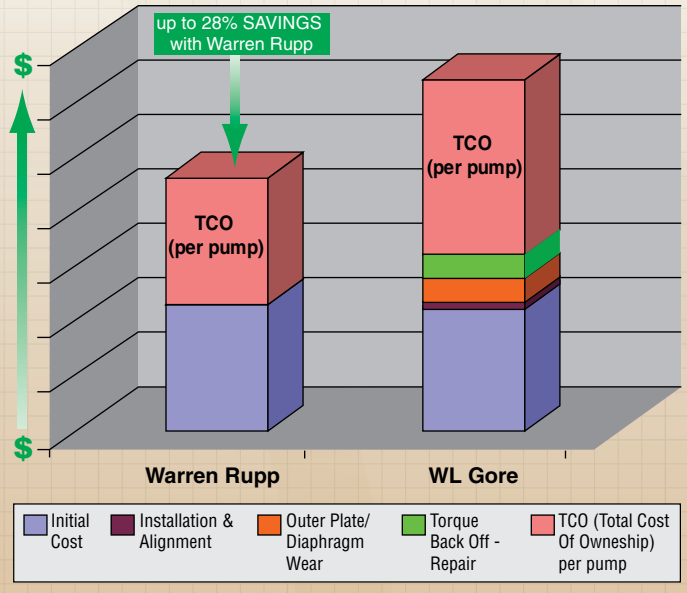
Gore One-Up®



BENEFITS of our One-Piece Diaphragm assembly are:

- TORQUE-FREE – "Spin & Go"– one-piece diaphragm is simply hand turned into position
- Tool-less installation
- Fewer leak paths A
- Fewer parts – less inventory
- No outer diaphragm plate abrasion due to trapped fluids B
- Diaphragm flex life improvements of 20% to 400% as reported by end users and documented lab testing
- Start-up pressure of less than 10 psi on Warren Rupp One-Piece Diaphragm vs. 25 psi or more on competitive designs

Compare the **SAVINGS**



Part Number (Conversion Kit)*	Inner diaphragm Plate**	Where Used	Wet End Kit	Where Used
286.116.000 (475.251.000)	612.221.330	S05, S07, S10 Non-Metallic and S05 Metallic	476.202.659 476.199.659	S05 Non-Metallic S05 Metallic
286.112.000 (475.250.000)	612.218.330	S1F Metallic, SB1	476.034.659 476.194.659	SB1-A S1F Metallic
286.118.000 (475.252.000)	612.215.330	HDB2	476.043.659	HDB2
286.118.000 (475.253.000)	612.214.150	S20 Metallic	476.042.659	S20 Metallic
286.113.000 (475.254.000)	612.217.150	S15 Metallic	476.182.659	S15 Metallic
286.114.000 (475.255.000)	612.219.150	HDB1½	476.194.659	HDB1½

*Conversion Kits include (2) Diaphragms w/Studs and (2) Inner Plates **Order this Inner Diaphragm Plate when ordering the One-Piece Diaphragm

PUMPER PARTS®- After Market Parts

Quality after market service parts for standard duty pump brands.

- Competitive Pricing
- Prompt Shipment
- All Parts Warranted

Products

Pumper parts has individual parts and repair kits that fit Wilden®, ARO® and Yamada® air-operated double diaphragm pumps. Materials include synthetic rubbers, injection-molded thermoplastics and Teflon®.

Quality

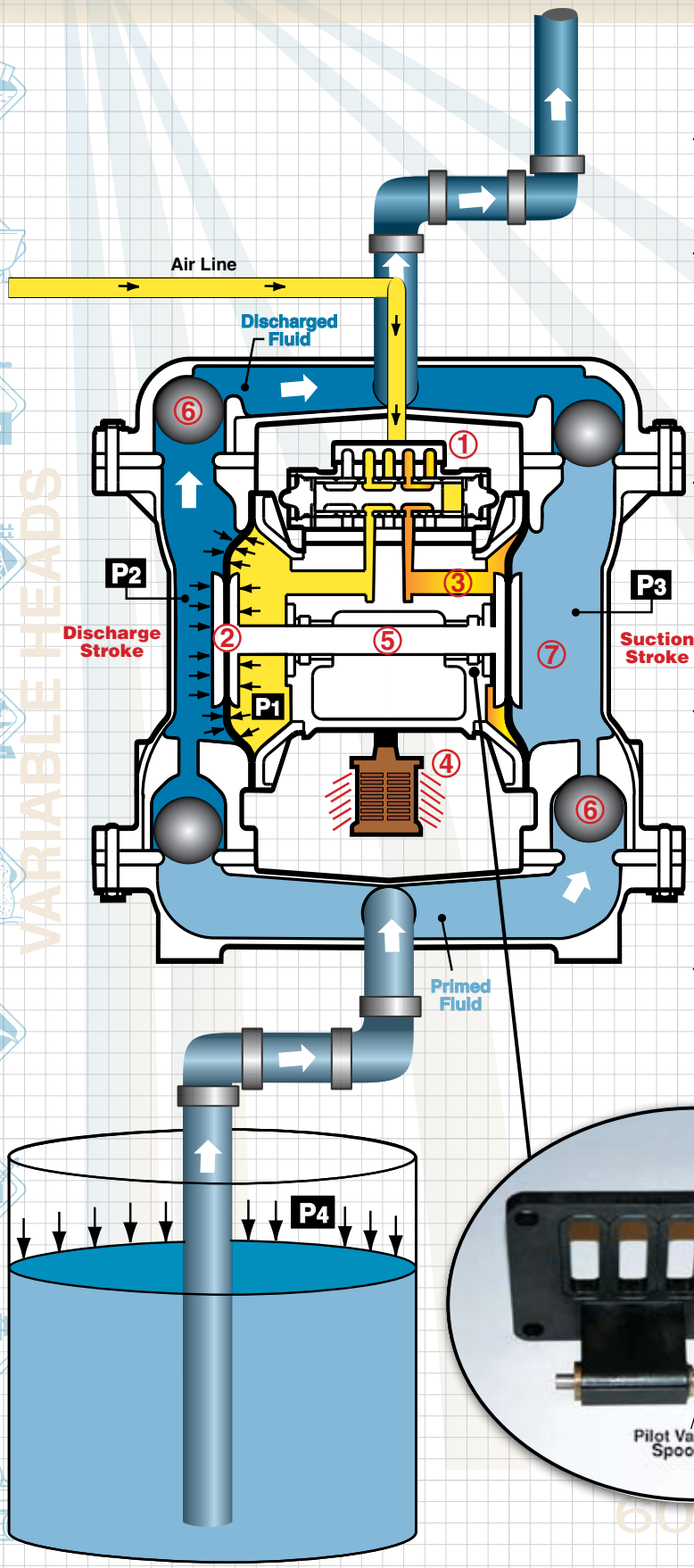
Pumper Parts manufactures to meet or exceed the highest quality standards in the industry. All parts are engineered to perform equal to or better than the original equipment manufacturer's specifications.

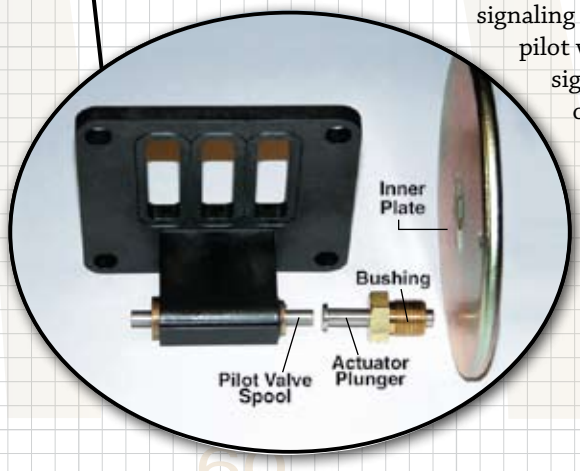
Replacement Parts Fitting ARO® PUMPS

Replacement Parts Fitting WILDEN® PUMPS

Replacement Parts Fitting YAMADA® PUMPS

PRINCIPLE OF OPERATION





- SANDPIPER® Air-operated double diaphragm (AODD) pumps are powered by compressed air, nitrogen or natural gas.
- The main directional (air) control valve ① distributes compressed air to an air chamber, exerting uniform pressure over the inner surface of the diaphragm ②. At the same time, the exhausting air ③ from behind the opposite diaphragm is directed through the air valve assembly(s) to an exhaust port ④.
- As inner chamber pressure **(P1)** exceeds liquid chamber pressure **(P2)**, the rod ⑤ connected diaphragms shift together creating discharge on one side and suction on the opposite side. The discharged and primed liquid's directions are controlled by the check valves (ball or flap) ⑥ orientation.
- The pump primes as a result of the suction stroke. The suction stroke lowers the chamber pressure **(P3)** increasing the chamber volume. This results in a pressure differential necessary for atmospheric pressure **(P4)** to push the fluid through the suction piping and across the suction side check valve and into the outer fluid chamber ⑦.
- Suction (side) stroking also initiates the reciprocating (shifting, stroking or cycling) action of the pump. The suction diaphragm's movement is mechanically pulled through its stroke. The diaphragm's inner plate makes contact with an actuator plunger aligned to shift the pilot signaling valve. Once actuated, the pilot valve sends a pressure signal to the opposite end of the main directional air valve, redirecting the compressed air to the opposite inner chamber.

MATERIALS PROFILE

MATERIALS PROFILE	OPERATING TEMPERATURES MAXIMUM	OPERATING TEMPERATURES MINIMUM
Nitrile General purpose, oil-resistant. Shows good solvent, oil, water, and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons, and nitro hydrocarbons	190°F 88°C	-10°F -23°C
EPDM Shows very good water and chemical resistance. Has poor resistance to oils and solvents, but is fair in ketones and alcohols.	280°F 138°C	-40°F -40°C
Hytrel® Good on acids, bases, amines and glycols at room temperatures only.	220°F 104°C	-20°F -29°C
Neoprene All purpose. Resistant to vegetable oils. Generally not affected by moderate chemicals, fats, greases, and many oils and solvents. Generally attacked by strong oxidizing acids, ketones, esters, and nitro hydrocarbons and chlorinated aromatic hydrocarbons.	200°F 93°C	-10°F -23°C
Rupplon® (Urethane) Shows good resistance to abrasives. Has poor resistance to most solvents and oils.	150°F 66°C	32°F 0°C
Santoprene® Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.	275°F 135°C	-40°F -40°C
UHMW PE A thermoplastic polymer that is highly resistant to a broad range of chemicals. Exhibits outstanding abrasion and impact resistance, along with environmental stress-cracking resistance.	180°F 82°C	-35°F -37°C
Virgin PTFE (PFA/TFE) Chemically inert, virtually impervious. Very few chemicals are known to chemically react with PTFE; molten alkali metals, turbulent liquid or gaseous fluorine and a few fluoro-chemicals such as chlorine trifluoride or oxygen difluoride which readily liberate free fluorine at elevated temperatures.	220°F 104°C	-35°F -37°C

MATERIALS PROFILE	OPERATING TEMPERATURES MAXIMUM	OPERATING TEMPERATURES MINIMUM
FKM (Fluorocarbon) Shows good resistance to a wide range of oils and solvents; especially all aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils. Hot water or hot aqueous solutions (over 70° F) will attack **FKM**.	350°F 177°C	-40°F -40°C
Conductive Acetal Tough, impact resistant, ductile. Good abrasion resistance and low friction surface. Generally inert, with good chemical resistance except for strong acids and oxidizing agents.	190°F 88°C	-20°F -29°C
Nylon 6/6 High strength and toughness over a wide temperature range. Moderate to good resistance to fuels, oils and chemicals.	180°F 82°C	32°F 0°C
Polypropylene A thermoplastic polymer. Mod erate tensile and flex strength. Resists strong acids and alkalie. Attacked by chlorine, fuming nitric acid and other strong oxidizing agents.	180°F 82°C	32°F 0°C
PVDF (Polyvinylidene Fluoride) A durable fluoroplastic with excellent chemical resistance. Excellent for UV applications. High tensile strength and impact resistance.	250°F 121°C	0°F -18°C

Alloy C equal to ASTM494 CW-12M-1 specification for nickel and nickel alloy.

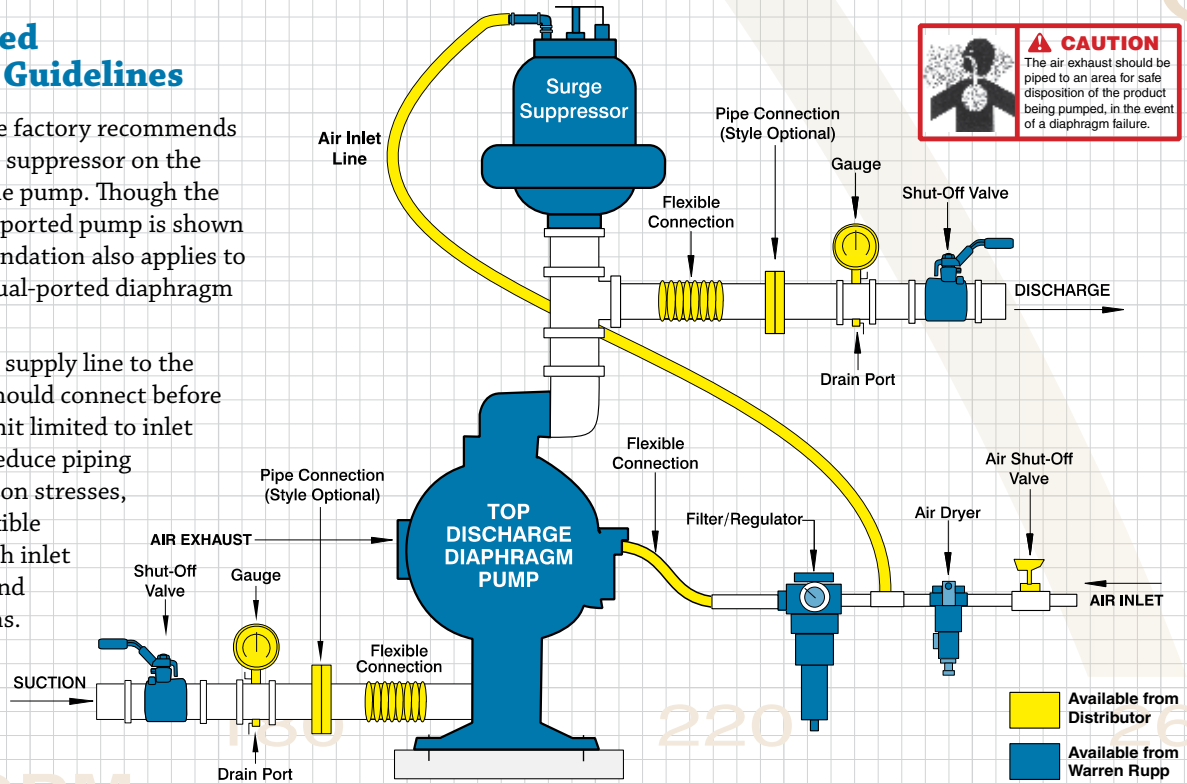
Stainless Steel equal to or exceeding ASTM specification A743 CF-8M for corrosion resistant iron chromium, iron chromium nickel, and nickel based alloy castings for general applications. Commonly referred to as 316 Stainless Steel in the pump industry.

Maximum and Minimum Temperatures are the limits for which these materials can be operated. Temperatures coupled with pressure affect the longevity of diaphragm pump components. Maximum life should not be expected at the extreme limits of the temperature ranges.

Recommended Installation Guidelines

For best results, the factory recommends installing the surge suppressor on the discharge side of the pump. Though the more common top-ported pump is shown here, this recommendation also applies to bottom, side and dual-ported diaphragm pumps.

The compressed air supply line to the surge suppressor should connect before a filter/regulator unit limited to inlet air of 125 PSI. To reduce piping and pump connection stresses, we recommend flexible connections on both inlet and outlet piping and air inlet connections.



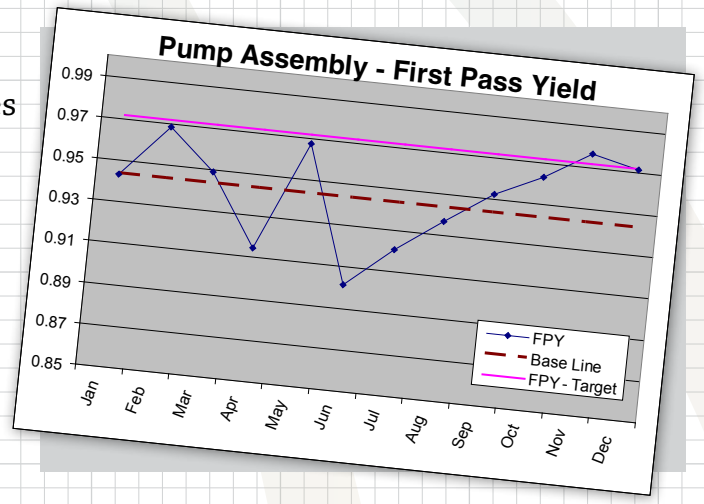
CAUTION
The air exhaust should be piped to an area for safe disposition of the product being pumped, in the event of a diaphragm failure.

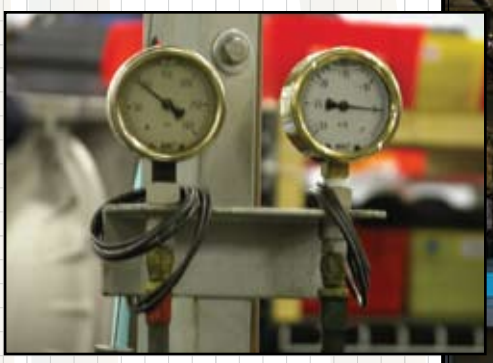
Commitment to Quality Built Products

Pump Testing for Quality Assurance

To complete the pump assembly process, ALL PUMPS are tested in the following manner to ensure a quality built SANDPIPER® product:

- Tested at 95 PSI for fluid and air leakage
- Prime from a dry start
- Deadhead the pump (each side) for a specific check for fluid or air leakage (internal and external)
- Observation run cycle at high PSI/cycling rate
  1) Checking for porosity
  2) Rhythmic cycling
  3) Abnormal mechanical noises
  4) Visual inspection
     - Hardware
     - Mating surfaces
     - Pipe threads
     - Wetted materials
- Maximum vacuum check
- Drain and air dry pump





Experienced Warren Rupp assembler monitors pump performance with pressure and vacuum gauges.

Commitment to Quality & Excellence!

5-Year Limited Product Warranty

Quality System ISO9001 Certified
Environmental Management Systems ISO14001 Certified

Warren Rupp, Inc., ("Rupp") warrants its products to the original end-use purchaser to be
free of defective materials and workmanship under normal use and service for a period o
five (5) years from date of shipment from Rupp's plant. This warranty applies only to product
which are used in accordance with all maintenance and operation instructions provide
by Rupp.

To be eligible for warranty repair or replacement, the pump must be promptly returned, freig
prepaid, to a Rupp authorized distributor, or, with prior authorization of Rupp, to Rup
factory; 800 North Main Street; Mansfield, Ohio 44902-1568.

Claimant's exclusive remedy under this warranty shall be limited (at Rupp's option) to
replacement of repair of the defective product, parts, or components originally furnis
by Rupp.

Rupp shall not be liable for any loss, damage, or expense directly or indirectly related
arising out of the use of its products, including damage or injury caused to other pro
machinery, buildings, or property, and Rupp shall not be liable for consequential dam
including, without limitation, lost profits, loss of time, inconvenience, loss of product
pumped, and loss of production. This warranty does not obligate Rupp to bear any c
removal, installation, transportation, or other charges which may arise in connection
warranty claim.

Claimant shall not be entitled to repair or replacement under this warranty if in the jud
of Rupp the product or any of its components have been (a) tampered with, disass
repaired or altered (except as may be authorized by Rupp in writing); (b) sub
misapplication, misuse, neglect or accident; or (c) used to pump materials for
pump was not designed, which may attack or harm the materials used in construc
product, or which may otherwise harm the operation of the product. The warrant
apply to repairs or service neces
and proper maintenance.

THIS IS RUPP'S SOLE WARR
EXPRESS OR IMPLIED, INC
OR FITNESS FOR A PARTICU
distributor or other person is a
than expressly provided herein

Diaphragm Connecting Rod Guarantee

GUARANTEED - NOT TO YIELD UNDER:
Tension • Compression • Bending • Pump Operation

Conditions Of Guarantee:

- The product has been properly sized and selected for the pump application, to include correct materials of construction for all pump components.
- The product has been used correctly and in conformance of Warren Rupp recommended installation procedures.
- The product has been maintained in accordance with basic inspection and maintenance instructions of Warren Rupp. Bushings, o-rings, seal u-cups must be maintained, inspected and replaced after diaphragm failure.

Eligibility requirements:

- Product must be promptly returned, freight prepaid, to a Warren Rupp authorized distributor, or with prior authorization of Warren Rupp to its factory location.
- Claimant's exclusive remedy under this guarantee shall be limited (at Warren Rupp's option) to the replacement or repair of the defective product, parts, or components originally furnished by Warren Rupp.

or indirectly related to or arising
products machinery, buildings or
including, without limitation, lost
oss of production. This guarantee
transportation, or other charges,

ee if in the judgment of Warren
disassembled, repaired or altered
ept as may be authorized by
r accident; or (c) used with a driver
p. The guarantee shall not apply
asonable and proper maintenance.
arranty. No distributor or other
other than expressly provided

ESADS+Plus, SANDPIPER and Warren Rupp
e registered tradenames of Warren Rupp, Inc.

SGF1305

GUARANTEED NON-STALLING AIR VALVE PERFORMANCE

If a Warren Rupp **ESADS+Plus®** *(Externally Serviceable Air Distribution System)* EVER® fails to operate or restart after shutdown due to "centering" of the main air valve or pilot valve, Warren Rupp will replace the air drive system free of charge.

Having supplied this UPGRADED, FIELD PROVEN, RETROFITABLE, air drive system since 1996, the absence of any field failures related to design, gives Warren Rupp the CONFIDENCE to offer the ONLY WRITTEN AIR VALVE PERFORMANCE GUARANTEE IN THE AODD INDUSTRY!

What makes this **ESADS+Plus®** air drive system so different from alternative technologies? The short answer is WARREN RUPP'S cross-drilled technology.

Here's how it works:

1. As a diaphragm assembly shifts to one side of the pump, its air-side diaphragm plate makes physical contact with the pilot valve.
2. The pilot valve movement opens a channel for air to be EXHAUSTED from one side of the main air valve spool, resulting in a lower pressure on that side of the valve spool.
3. The pilot valve movement also opens a channel that directs the primary air supply to the opposite side of the main air valve spool. The differential pressure across the main air valve spool causes it to shift.
4. As the main air valve spool "shifts", it redirects the driver air from one diaphragm to the other (i.e. alternately exhausting from behind one diaphragm, while applying compressed air behind the other.) At this point is when the WARREN RUPP cross-drilled advantage is realized.
5. WARREN RUPP'S cross-drilled technology channels a supplementary source of air, from the pressurized inner chamber, to "lock" ("air detent") that side of the main air valve spool under pressure. The main air-valve spool has no means of drifting or "centering" because of the ever-present difference of pressure across the main air valve spool.
6. Nothing happens to change the condition until the working diaphragm pulls the resting diaphragm assembly into contact with the opposite side of the pilot valve spool and the process repeats itself.

There are **no** springs, **no** sliding-shoes, **no** magnets, **no** unbalanced spools, and **no** deception about the number of parts needed to ensure performance. Unlike other technologies that require major pump disassembly just for inspection, there is no difficulty in inspection or removal from the pump. It bolts on and off. In short, it just keeps working and **YES,** it is **in-line serviceable.**

The design improvements of the **ESADS+Plus®** air drive system have made it the ONLY air drive system Warren Rupp offers on its new pumps, simply because it works. An additional benefit for customers is that this **UPGRADED** air drive system can be easily **RETROFITTED** into almost all Warren Rupp pumps produced in the last thirty + years owing to our modular pump design. Other pump manufacturers "say" their air valves do not stall...

Warren Rupp GUARANTEES AIR VALVE PERFORMANCE!

- Conditions of Guarantee:
- The model air drive system supplied must be operated within temperature parameters of design.
  Note: One basic system operates to 130°F (65° C). a different model system is designed for higher temperature environments.
- The product has been maintained in accordance with basic inspection and maintenance instructions of Warren Rupp ...
  (maintained clean, absence of nicks or cuts on O-rings ...)

SANDPIPER® products are marketed worldwide, in every major trading area. Contact your local Factory-Authorized Distributor for pricing and availability. To locate your local distributor, or receive additional information, contact the factory or visit our website.

with more ways than one...globally!

This brochure available in more languages than one

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