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MUNICIPAL SALES
WATER & WASTEWATER

Pump 18-J-1899 Data Sheet

POSITIVE DISPLACEMENT PUMP - DATA SHEET

Contract:	EN207131
Item Tag(s):	18-J-1899
Revision:	D
Unit:	Rail Unloading
P.O. No.:	SM00004861
Inquiry No.:	
Sheet	2 of 5

REV

Applicable To : ● Purchase

Client :	WORLD ENERGY PARAMOUNT	Unit:	Rail Unloading
Site :	PARAMOUNT, CA	No. of Pumps Required:	1 x 100 % (Note 2.1)
Service :	SINGLE RAIL CAR UNLOADING PUMP	Size & Type:	SLIDING VANE PUMP
Manufacturer :	DXP/Blackmer	Serial Number:	Magnes Series / MS4

GENERAL

No. Motor Driven :	One (1)	Other Driver Type :			
Pump Item No's.:	18-J-1899	Pump Item No's.:			
Motor Item No's.:	18-J-1899M	Driver Item Nos.:	N/A	Gear Item No's.:	
Motor Provided By :	DXP/Blackmer	Driver Provided By :		Gear Provided By :	DXP/Blackmer
Motor Mounted By :	DXP/Blackmer	Driver Mounted By :		Gear Mounted By :	DXP/Blackmer
Motor Data Sheet No. :	13174185-PDS-02	Driver Data Sh. No. :		Gear Data Sh. No. :	

Notes : Information Below To Be Completed : ○ By Purchaser ☐ By Supplier ☒ By Supplier Or Purchaser

OPERATING CONDITIONS

		Min	Normal	Rated	Max (1)
● Capacity	gpm			230	
○ Other Operating Conditions	gpm				
● Discharge Pressure	psig			52	
● Suction Pressure	psig			0.5	
● Differential Pressure	psi			51.5	

○ NPSH Available 35 ft (Excludes margin)

● NPIP Available 13.65 psia **(Excludes margin)**

● NPSHa / NPIP Datum ● 3' above grade

● Duty Cycle (Note 2.1) Intermittent

(1) Maximum - mechanical design

PERFORMANCE

☐ Proposal Curve No. :	MS4	
■ Rated Capacity :	230	gpm
■ NPSH/NPIP Required :	5.47 ft	psia
■ Rated Speed :	233	RPM
■ Displacement :	0.987 gal/rev	gpm
■ Volumetric Efficiency :	100	%
■ Pump Efficiency :	69.2	%
■ Req. Power @ Maximum Viscosity :	8.99	HP
■ Req. Power @ Pres. Limiting Val :	10.8	HP
■ Req. Power @ Rated Condition :	8.99	HP
■ Maximum Allowable Speed :	537	RPM
■ Minimum Allowable Speed :	150	RPM

CONSTRUCTION

Connections :	Size	ANSI Rating	Facing	Position
Suction :	4"	150	RF	Side
Discharge :	4"	150	RF	Top
Grand Flush :				
(Note 2.8)Drains* :	3/4"	150	RF	Skid Edge
Vents* :	Self			
Jacket :				

* Pipe Vents and Drains to Edge of Baseplate

PUMP TYPE

● Sliding Vane

●

PUMPED FLUID

● Type or Name of Pumped Fluid: RAW FEED OR TECHNICAL FEED

		Min	Rated	Max
● Temperature	°F		122	140
● Vapor Pressure	psia		1.5	
● Relative Density	S.G.		0.90	
● Viscosity	cP		24.9	

○ Specific Heat Cp BTU/lb°F

○ Corrosive / Erosive Agents Description

○ Erosive ○ Corrosive

○ Chloride Concentration (ppmw) :

○ H2S Concentration (ppm) :

Fluid ○ Hazardous ○ Flammable ○ Other

○ Gas ○ Entrained ○ Slug Flow % by volume of GVF

● Solids Particle Size Distribution & Min/Max 1/2 (Note 2.4) in

○ Shape ○ Concentration

SITE AND UTILITY DATA

Location : ● Outdoor ● Unheated ● Pit

● Class: I Group: BCD Division: 1

○ Non-Classified

○ Winterization Required ○ Tropicalization Required

Site Data : Elevation (MSL) : 69 ft

Barometer : 14.7 psia

● Range of Ambient Temps : MIN / MAX: 35 / 104 °F

Unusual Conditions :

○ Dust ○ Fumes ○ Salt Atmosphere

○ Other :

○ Utility Conditions

Electricity	Drivers	Heating	Control	Shutdown
Voltage :	460	120	120	
Hertz :	60	60	60	
Phase :	3	1	1	

Cooling Water Source :

Supply Temp °F Max Return Temp °F

Norm. Press psig Design Press. psig

Min. Return Press psig Max. Allow. ΔP psi

Instrument Air Max Min

Pressure : psig 80 psig

Notes :

2.1 Pump shall be intermittent service for rail car unloading. Pump shall be capable of running bone dry for car line stripping.

2.2. Motors is explosion proof for Class 1, Div 1, BCD, T3C as it is located in sump pit. Motors is certified by an NRTL (CSA, UL, etc) recognized by OSHA.

2.3. Pump discharge valve relief set pressure of 110 psig.

2.4 Pump shall be capable of handling solids up to 1/2" diameter as there may be possible bone fragments from the raw tallow feed.

Vendor to provide 4" single basket strainer (316 SS with a flanged top) to reduce down to pump catalog requirement of 1/8" diameter solids.

Pressure drop consideration is also to be taken accordingly.

2.5 Rosemount 3144P on Containment shell is provided for excessive dry run protection.

2.6 Heat tracing and insulation is by others however the equipment design and drawing shall incorporate provision for heat tracing. Details

to be provided to vendor during detail engineering.

2.7 Pump mechanical design temperature to be 190 deg F minimum. MAWP to this temperature.

2.8 Socket Weld connection with casing with pipe and fittings terminating in 3/4" flange at skid edge. Additionally secondary containment drain

with gate valve extended to skid is also provided till skid edge terminating in 1/2" ANSI 150# RF flange.

POSITIVE DISPLACEMENT PUMP DATA SHEET

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P.O. No.:	SM00004861
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REV

APPLICABLE SPECIFICATIONS:

API 676 Positive Displacement Pumps - Rotary

- ○ Governing Specification (If Different)
- ○ NACE MR0103 (6.13.2.13)
- ○ NACE MR0175
- ○ Other

CONSTRUCTION

Casing :

- ■ Max. Allowable Press.(6.3.1): 225 psig @ 190 °F
- ■ Max. Allow. Suction Press. : psig @ °F
- ■ Hydrostatic Test Pressure - Suct / Disch 1.5 MAWP / 338 psig
- ☐ Steam Jacket Press. : psig @ °F

Rotating Elements :

- Rotor Mount : ■ Between Bearings
- Timing Gears : ☐
- Bearing Type : ■ Radial Sleeve ☐ Thrust
- Bearing Number : ☐ Radial ☐ Thrust
- Lubrication Type : ○ Constant Level Oilers
- ■ Pumped Fluid ☒ Ring Oil ☒ Oil Mist
- ○ External ○ Oil Flood ○ Grease
- ☐ Lubricant Info (Visc,etc)
- ○ **Mechanical Seals : Sealless**
- ☐ Supplier and Model :
- ☐ Supplier Code :
- ○ API 682 and Data Sheets :
- ☐ API 682 Seal Code :
- ○ API 682 Seal Flush Plan:

DRIVER TYPE

- ● Induction Motor
- ● Other : Nord Gearbox, S42-250T, 6.65 Ratio

DRIVE MECHANISM

- ● Magnetic Drive
- ■ Coupling Manufacturer : Thomas
- ■ Coupling Type : Flexible Disc
- ☐ Rating (Max Torque) ■ Model : 71
- ■ Spacer Length 7 in ☒ S.F. 1.5 min
- ● Coupling Balanced :
- ○ Coupling Per ARI 671 (7.2.4)
- ● Coupling Hub Attachment
- ●

Coupling Guard Type

- ○
- ■ Non-Spark Coupling Guard (7.2.15)

○ MOTOR DRIVER (SEE MOTOR DATA SHEET)

- ● IEEE 841
- ○ ASD Supplier By:
- ■ Manufacturer Baldor ☐ Type
- ■ Frame 254TC ■ Enclosure XP
- ■ Horizontal
- ☐ HP 15 RPM 1765 Volts 460
- ● Phase 3 Hertz 60 S.F. 1.15
- ○ Variable Speed Range RPM
- ● Minimum Starting Voltage (7.1.2.2) 80% at Motor Terminals
- ■ Insulation F ■ Temp Rise B
- ■ Full Load Amps 17.6
- ☒ Locked Rotor Amps 127 Amps
- ■ Starting Method DOL
- ■ Lube Grease

Bearings (Type / Number)

- ■ Radial Ball
- ■ Thrust Ball

MATERIALS

- ■ MDMT (6.13.6.1) : 32
- ■ Casing : 17-4 PH Stainless Steel
- ☐ Stator / Liner :
- ■ End Plates : 17-4 PH SS
- ☐ Rotory Lobe :
- ■ Vanes : Duravane composite
- ■ Rotor / Shaft : 17-4 PH Stainless Steel
- ☐ Sleeve(s) :
- ■ Gland(s) : N/A
- ■ Bearing Housing : Ductile Iron
- ☐ Timing Gears :
- ■ Elastomers / Gaskets : PTFE

QA INSPECTION AND TEST

- ○ Special Material Tests
- ○ Low Ambient Temp. Materials Tests (6.13.6.5)
- ○ Compliance with Inspector's Check List
- ● Certification of Materials (Casing, Rotor/Shaft, Stator)
- ● Surface and Sub-Surface Examinations
  - ● Radiography: BW in Piping (B31.3)
  - ○ Ultrasonic
  - ● Magnetic Particle: Lifting Lugs
  - ● Liquid Penetrant: Case Attachment Welds
  - ● Component PMI: Per A8KM-PP-000-500512-A
- ○ Hardness of Parts, Welds & Heat Affected Zones
- ● Vendor to Submit Test Procedures (8.3.1.2)
- ○ Supplier to Keep Repair and HT Records (8.2.1.1)

	Non-Witn	Witn	Obsd
● Shop Inspection (8.1)			
● Hydrostatic	●	○	○
● Performance (8.3.4)	●	○	○
○ Retest On Seal Leakage	○	○	○
○ Npsh / Npip (8.3.7.1)	○	○	○
○ True Peak Velocity Data	○	○	○
○ Complete Unit Test (8.3.7.2)	○	○	○
● Sound Level Test (8.3.7.3)	●	○	○
○ Cleanliness Prior To Final Assembly (8.2.3.3)	○	○	○
○ High Discharge Pressure @ Plv	○	○	○
○ Check For Co-Planar At Mounting Pad Surfaces (7.4.7)	○	○	○
● 1 Hr Mechanical Run Test After (Note 3.3) Oil Temp Stable (8.3.5.1)	●	○	○
○ 4 Hr. Mech Run After Oil Temp Stable (8.3.5.2)	○	○	○
○ Auxiliary Equipment Test (8.3.4.3)	○	○	○
○ Other	○	○	○

- ○ Test With Substitute Seal (8.3.5.3)
- ○ Supplier Submit Test Data Within 24 Hours
- ○ Include Plotted Vibration Spectra
- ○ Record Final Assembly Running Clearances (8.2.1.1,f)
- ● Performance Curve & Data Approval Prior to Shipment (8.3.9)

NOTES

~~3.1. Vendor to advise standard coupling manufacturer in quote. If not Rexnord, please offer Rexnord (preferred) as option.~~

3.1 Offered Pump Design Temp is 250 Deg F.

3.2 Bearings are Product Lubricated

3.3 Mechanical run test provided for review / approval.

2

POSITIVE DISPLACEMENT PUMP - DATA SHEET

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Inquiry No.:	
Sheet	4 of 5

REV

PIPING AND APPURTENANCES

Manifold Piping For Purchaser Connection

☒ Vent ☒ Drain ☒ Steam / Cooling Water

○ Heating Jacket Required ☒ Cooling Required

☒ ☒ Fittings

☒

☒ Valves: ☒

☒ Flanges Required in Place of Socket Weld Unions

☒ Mount Seal Pot Off Baseplate

Connection Bolting ○ Cadmium Plated Bolts Prohibited

○ ○

HEATING AND COOLING

Heating Medium ○

☒ Steam Jacket / Cooling Water Press. psig @ °F

Cooling Water Requirements

☐ Bearing Housing	gpm	@	psig	
☐ Lube Oil Cooler	gpm	@	psig	
☐ Seal Oil Cooler	gpm	@	psig	
☐ Other	gpm	@	psig	
Total Cooling Water	gpm	@	psig	

INSTRUMENTATION

○ Accelerometer :

○ Provision for MTG Only

○ Flat Surface Required

○ Radial Bearing Temp. ○ Thrust Bearing Temp.

○ Temp. Gauges (With Thermowells)

○ Pressure Gauge Type

● Other : Temp. monitor for primary containment (Note 2.5)

○ Other :

○ Other :

PREPARATION FOR SHIPMENT

● Domestic ○ Export Boxing Req'd **(Required if overseas)**

● **Outdoor Storage for 12 Months minimum**

● Specification 4WGN-10001, Shipment and Packing Specification

SURFACE PREPARATION AND PAINT

● **Supplier's Standard in compliance or exceed ISO 12944-5 C4**

● Specification Number : **Manufacturer's Standard**

Pump (8.4.3.1)

● Primer Fab. Standard in compliance or exceed ISO 12944-5 C4

● Finish Coat ISO 12944-5 C4, Color Code RAL 7035

Baseplate (8.4.3.1)

● Primer Primer to be compatible w/ epoxy grout & ISO 12944-5 C4

● Finish Coat No finish coat on underside.

WEIGHTS

■ Pump	469	lb	■ Base	652	lb
■ Driver	317	lb	■ Gear	350	lb
Total	1788	lb			

BASEPLATE

● By Pump Manufacturer ● Suitable For Epoxy Grout

○ Extended For :

○ Non-Grout Construction (7.4.2)

● Drain - Rim ○ Drain - Pan

OTHER PURCHASER REQUIREMENTS

Nameplate Units : ● USGS

● Relief Valves By Pump Mfgr : (Note 4.2) Internal

Piping For Seal Flush Furnished By :

○

Piping For Cooling Water / Heating Furnished By :

○

● Provide Technical Data Manual

■ Installation List in Proposal (9.2.3.1)

NOTES

4.1. All structural steel base plates and supports shall meet design load requirements per Project Spec. A8KM-PP-000-400002-A, Structural Data for Mechanical Equipment, and A8KM-PP-000-200001-A, Plant Site Data Sheet.

4.2 External relief valve for downstream protection is by others.

4.3 Vendor to provide cleats and supports whenever applicable to maintain process fluid temperature as agreed in clarification.

FLUOR

world energy

LOW VOLTAGE MOTOR (IEEE 841)

DATA SHEET

U.S. CUSTOMARY UNITS

APPLICABLE MOTOR SPECIFICATION
A8KM-PP-000-50670-A

Contract:	EN207131		
Item No:	18-J-1899		
Revision:	D	**Date:**	1-Feb-23
Unit:	Rail Unloading		
RFQ / P.O. No.:	SM00004861		
Sheet	5		

Rev

APPLICABLE TO ○ PROPOSAL ● PURCHASE ○ AS BUILT

CLIENT: WORLD ENERGY PARAMOUNT — SERVICE: Rail Unloading

PLANT: WORLD ENERGY RENEWABLES PLANT — MOTOR TAG NO. / NO. REQ'D: 18-J-1899M / 1

SITE: PARAMOUNT, CA — DRIVEN EQUIPMENT TYPE / TAG NO.: Sliding Vane Pump / 18-J-1899

DESIGN DATA AND ACCESSORY EQUIPMENT

NAMEPLATE 15 HP 1.15 S.F 1765 RPM — POWER (VOLTAGE/PHASE/HERTZ) 460 / 3 / 60 — 2

ROTATION (WHEN FACING MOTOR OPPOSITE DRIVE END): ○ CW ○ CCW Fans shall be bi-directional

INSULATION CLASS: ○ B ● F ○ H ○ VPI TEMP. RISE CLASS B / ____ °C over 40 °C AMBIENT

AREA CLASSIFICATION: ● CLASS I , GROUP BCD DIV. 1 ● T-RATING T3C / ____ °F — 2

○ UNCLASSIFIED ○ ____

LOCATION: ○ INDOOR ● OUTDOOR ○ SHELTERED UNUSUAL CONDITIONS: ○ DUST ○ OTHER ____

AMBIENT TEMPERATURE: MAX 104 °F / MIN. 35 °F ALTITUDE 69 ft

ENCLOSURE: ○ TOTALLY-ENCLOSED FAN-COOLED ○ TOTALLY-ENCLOSED NONVENTILATED ● EXPLOSION PROOF

MOUNTING METHOD: ● FOOT ○ FLANGE, TYPE: ____

MOUNTING ARRANGEMENT: ● HORIZONTAL ○ VERTICAL SHAFT DOWN ○ VERTICAL SHAFT UP

BEARING TYPE: ● BALL ○ ROLLER BEARING LUBRICATION: ● GREASE ○ OIL ○ PURE OIL MIST

CONNECTION TO LOAD: ● DIRECT CONNECTED ○ V-BELT ● THROUGH GEAR ○ CLOSE COUPLED

EQUIPMENT OPERATION: ○ CONTINUOUS ○ SPARED CONTINUOUS ● INTERMITTENT-CYCLES / DAY ____

SOUND PRESSURE LEVEL REQUIREMENTS: 85 dBA @ 3 FEET

STARTING: ● FULL VOLTAGE ● REDUCED VOLTAGE, 80 % OF VOLTAGE Starting Voltage Dip Allowance

○ UNLOADED ● LOADED ○ CAPACITORS FOR POWER FACTOR CORRECTION

○ SPACE HEATERS ____ V ____ PHASE ____ °F MAX. TEMP

● OVERSIZE TERMINAL BOX ● DRAIN PLUGS

● SS NAMEPLATE ○ AUXILIARY NAMEPLATE

TEST ● ROUTINE ○ COMPLETE ● VIBRATION ● REPORT ● FOOT FLATNESS

REMARKS: 5.1) This data sheet applies to motors 1/2 hp through 500 hp with anti-friction bearings.

5.2) IP55 degree of protection is required.

5.3) Average relative humidity is 54%.

INFORMATION BELOW TO BE COMPLETED BY VENDOR

MOTOR MFR. Baldor — MODEL CDRX251544T — SERIAL NO. Z2302280217 — 2

NAMEPLATE HP 15 — FULL LOAD RPM 1765 — FRAME 254TC — WEIGHT 317 LB — 2

MOTOR OUTLINE DRAWING NO. 09LYF368 — 2

ROTOR CAGE MATERIAL OF CONSTRUCTION Aluminum — MOTOR WINDING MATERIAL Copper — 2

BEARING MANUFACTURER SKF — SIZE ____ — 2

VERTICAL MOTOR THRUST BEARING: TYPE N/A — CAPACITY: UP ____ LBS DOWN ____ LBS LOCATION ____ — 2

LOAD	FULL	3/4	1/2	OTHER
AMPERES	18.1	14.5	11	
EFFICIENCY, %	92.4	92.7	92.2	
POWER FACTOR	83	79	69	
SPEED, RPM	1765.2	1774	1783.1	

LOCKED ROTOR AMPS*	127	AMPS	2
FULL LOAD TORQUE*	44.5	LB-FT	2
LOCKED ROTOR TORQUE*	86.5	LB-FT	2
PULL UP TORQUE*	69.5	LB-FT	2
BREAKDOWN TORQUE*	153	LB-FT	2
ACCEL. TIME W/ LOAD (0 TO FULL SPEED)*		SEC.	
STALL TIMES AT ZERO RPM* - HOT / COLD	/	SEC.	2
NUMBER OF CONSECUTIVE STARTS*			2

SOUND LEVEL: GUARANTEED 85 dBA / EXPECTED <82 dBA

FAN MATERIAL Plastic (NON-SPARKING)

* INDICATED AT RATED VOLTAGE

INFORMATION BELOW TO BE PROVIDED BY VENDOR AFTER PURCHASE (REFER TO RFQ/PO DOCUMENTS)

● SAFE TIME - CURRENT CURVE

● SPEED - TORQUE CURVE

● SAFE LOCKED ROTOR TIME HOT ____ COLD ____

MAX. SURFACE TEMP. DURING NORMAL STARING OR OPERATION OF:

○ ROTOR ____ °F ○ STATOR ____ °F ○ ENCLOSURE ____ °F

NOTES:

5.4 Motor nameplate shall indicate service factor, area classification and T-rating. T-rating relates to both external and internal components.

5.5 Provide accessory loads on submittal documents, e.g. Volts, HP, kVA, etc.

5.6 Motor shall be rated for Explosion Proof, Class 1 Div 1, Gr. BCD, T3C. Motors is certified by an NRTL (CSA, UL, etc) recognized by OSHA.Certificate and Nameplate marking to be included. — 2

5.7 Vendor shall provide oversized motor termination boxes and grounding provisions inside the box and outside on frame.

5.8 Motor is suitable for inverter-duty rated as provision for possible future VFD.

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MUNICIPAL SALES
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Blackmer Pump Brochure

MAGNES Series

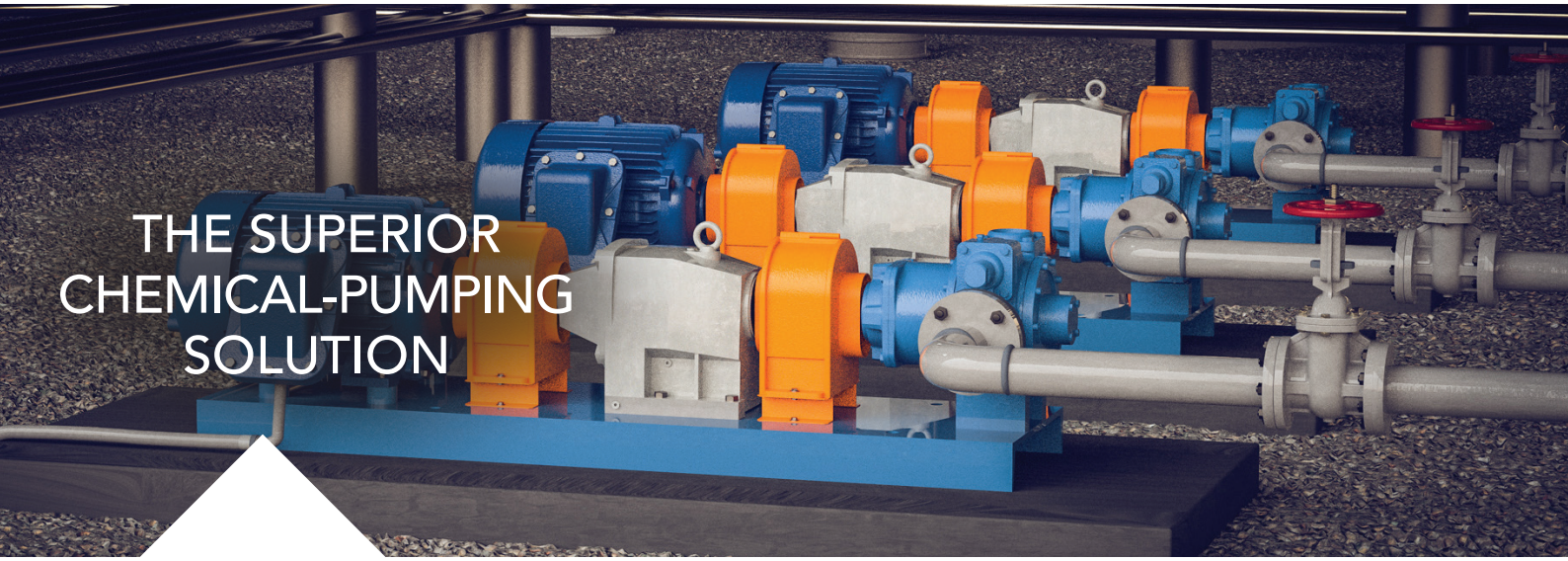
SLIDING VANE MAGNETIC DRIVE PUMPS | PRODUCT BROCHURE

PSG a DOVER company

Blackmer®

Where Innovation Flows

MAGNES, the sliding vane magnetic drive pump by Blackmer® contains no dynamic seals and provides a leak-free pumping solution for difficult-to-seal liquids and any liquid that is expensive, valuable, dangerous or hazardous.

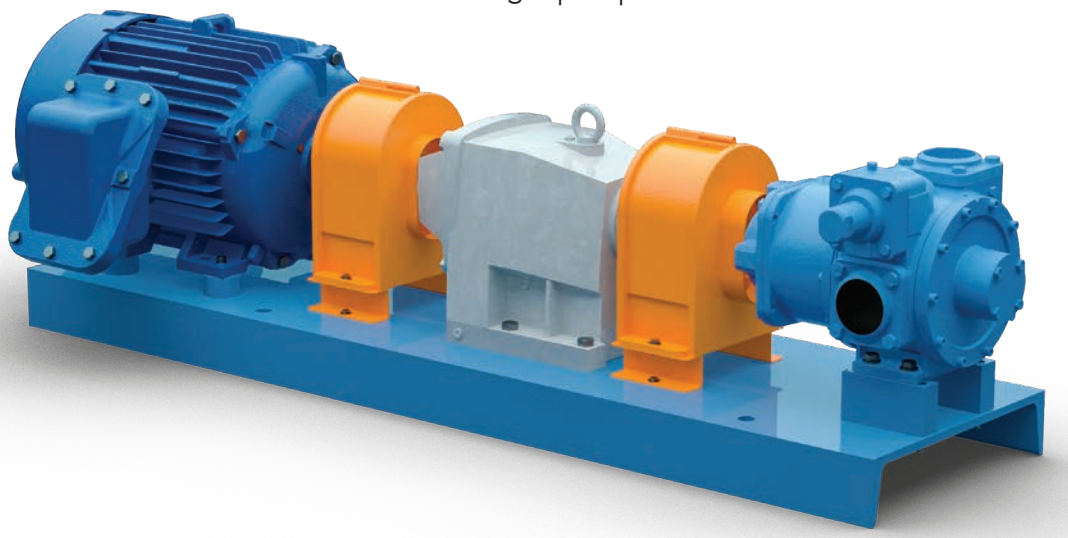


Blackmer® MAGNES Series Sliding Vane Magnetic Drive Pumps

With 3- and 4-in models available in either iron (MI3, MI4) or stainless-steel (MS3, MS4) construction and flow rates up to 520 gpm (1,968 L/min), MAGNES Sliding Vane Pumps provide superior magnetic drive capabilities. Innate advantages of sliding vane technology provide a world class solution to the chemical market. **MAGNES is a true self-priming pump**, that will not need to be pre-flooded prior to start-up, and is well suited for **continuous duty operation**, since the pump has no cumulative dry run limit, providing operators the confidence that dry run events will not result in catastrophic pump failure.

MAGNES offers **numerous advantages** of sliding vane technology such as self-priming, line-stripping, product recovery, dry-run capability, solids handling, thin/thick viscosity flexibility, easy maintenance and 70% to 90% pump efficiencies.

These advantages make MAGNES an effective alternative to centrifugal pumps.

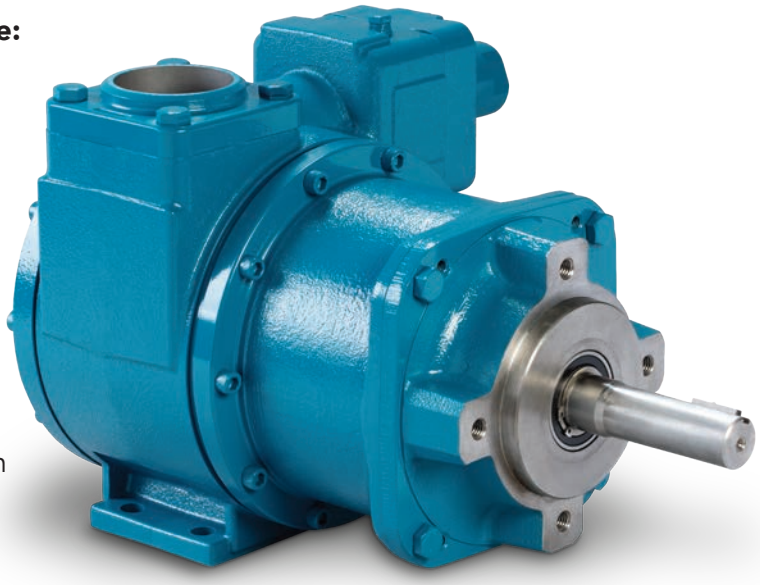


Blackmer® MAGNES Series | Features & Benefits

The MAGNES Series is enhanced with a new magnetic drive design that offers **zero leakage** and numerous operational benefits to deliver the performance necessary for effective high volume liquid transfer within chemical-processing applications.

Among the most notable MAGNES benefits are:

- Indefinite Dry Run
- Solids Handling
- Low to Zero NPSHr – Cavitation & Vapor Mixtures Handling
- Full Curve & System Performance



- Indefinite dry-run capability: Eliminates sensitivity to both unexpected and expected dry-run scenarios. The guaranteed dry-run performance is orders of magnitude better than competing technologies. The indefinite dry-run allowance contrasts with the brief cumulative allowances offered by competing seal-less pumps.

- Solids handling: Unlike most competing technologies that self-destruct when confronted with contaminants, leak-free vane pumps can effectively process liquids with suspended-solids levels of up to 20%.

- Low required NPSH: MAGNES offers sustained performance with liquids that contain up to 20% vapor, operating as a zero-NPSHr solution. MAGNES processes vapor where competing pumps fail, regardless if vapor forms in the tank, piping, or pump.

- Full-curve BEP: Unlike centrifugal pumps that are tuned to a single best efficiency point or BEP, MAGNES offers robustness and flexibility across a wide operating range. Sliding vane technology seamlessly handles the dynamic conditions expected in chemical-processing systems.

- Zero leakage: The containment shell is unlike any currently available, because it has the thickness of a metallic shell with the benefits of a composite shell. As a thermoplastic polymer, the shell will not create heat or produce eddy currents like traditional metallic shells. The proprietary MAGNES shell has long carbon fibers embedded in PEEK (polyether ether ketone) and is capable of unmatched pressure containment capability given its thickness. Competing shells use chopped carbon fiber or unreinforced polymers, which require much greater thickness for the same pressure, reducing the strength of the coupling and increasing the cost.

- Self-priming operation: With suction-lift capability exceeding 25 feet (7.6 meters), sliding vane pumps offer new functionality, reduce operating costs and enhance safety for all operators by eliminating the need to pre-prime the system.

- Product recovery: Exceptional line-stripping ability reduces product waste during or after production runs, recovers the cost of expensive liquids and enhances safety for plant operators and their staff.

BLACKMER® MAGNES SERIES

Positive Displacement Design

- A flow-creating pump that transports a fixed volume of fluid for each pump rotation
- Matches the system's backpressure, accommodating a wide range of operating conditions
- Has inherent functionality: self-prime, suction lift, line strip and solids & vapor handling

Aftermarket & Maintenance

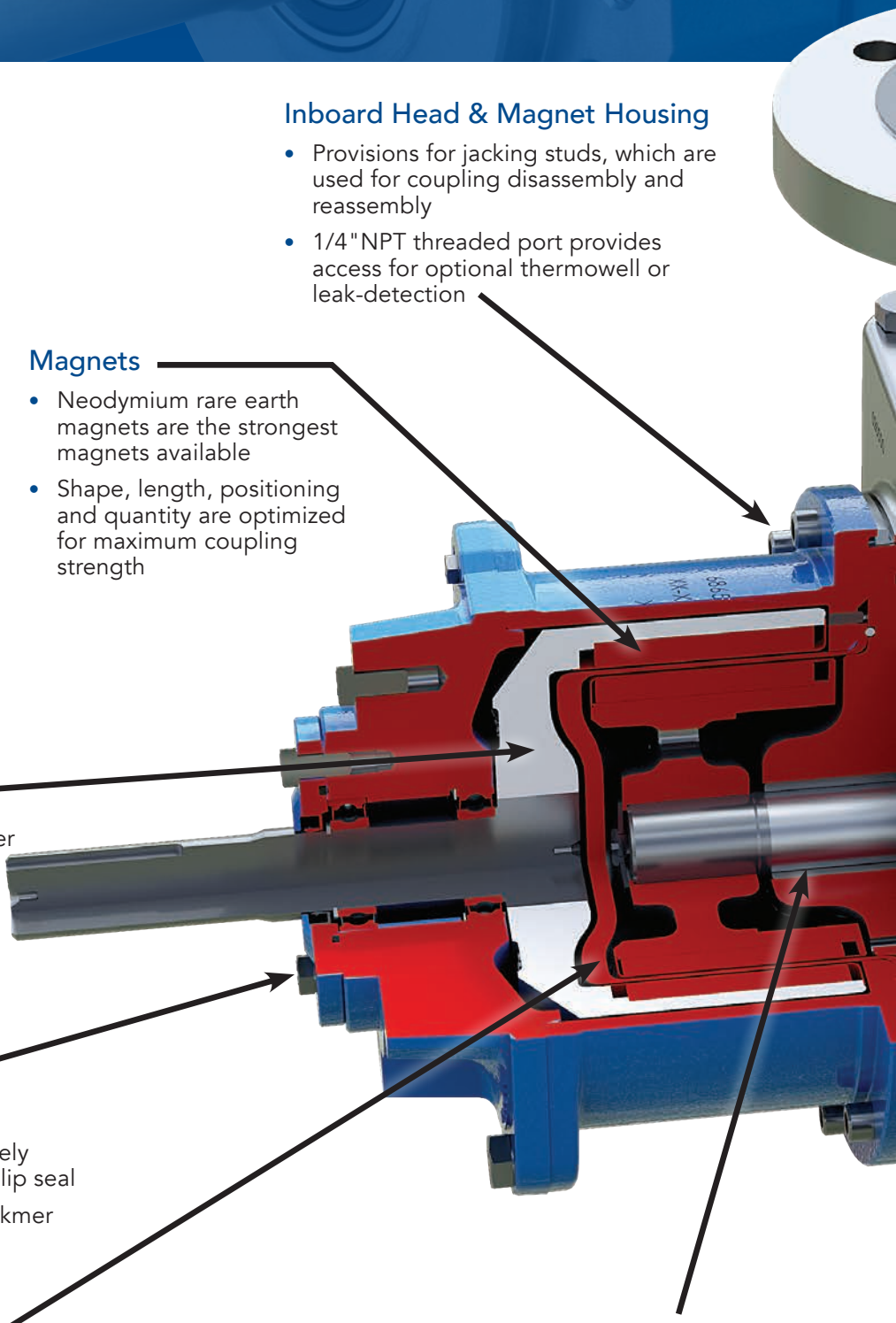
- Low-cost and renewable wear parts provide an optimized total lifecycle cost
- Designed for continuous and extended operating time between maintenance intervals
- Simple maintenance renews performance while the pump remains installed in the piping system

Inboard Head & Magnet Housing

- Provisions for jacking studs, which are used for coupling disassembly and reassembly
- 1/4"NPT threaded port provides access for optional thermowell or leak-detection

Magnets

- Neodymium rare earth magnets are the strongest magnets available
- Shape, length, positioning and quantity are optimized for maximum coupling strength



Magnet Coupling

- Designed and manufactured by Blackmer to have unmatched torque density (torque/volume)
- 3"size: 415 ft-lb (560 Nm)
- 4"size: 990 ft-lb (1340 Nm)

Bearing Housing

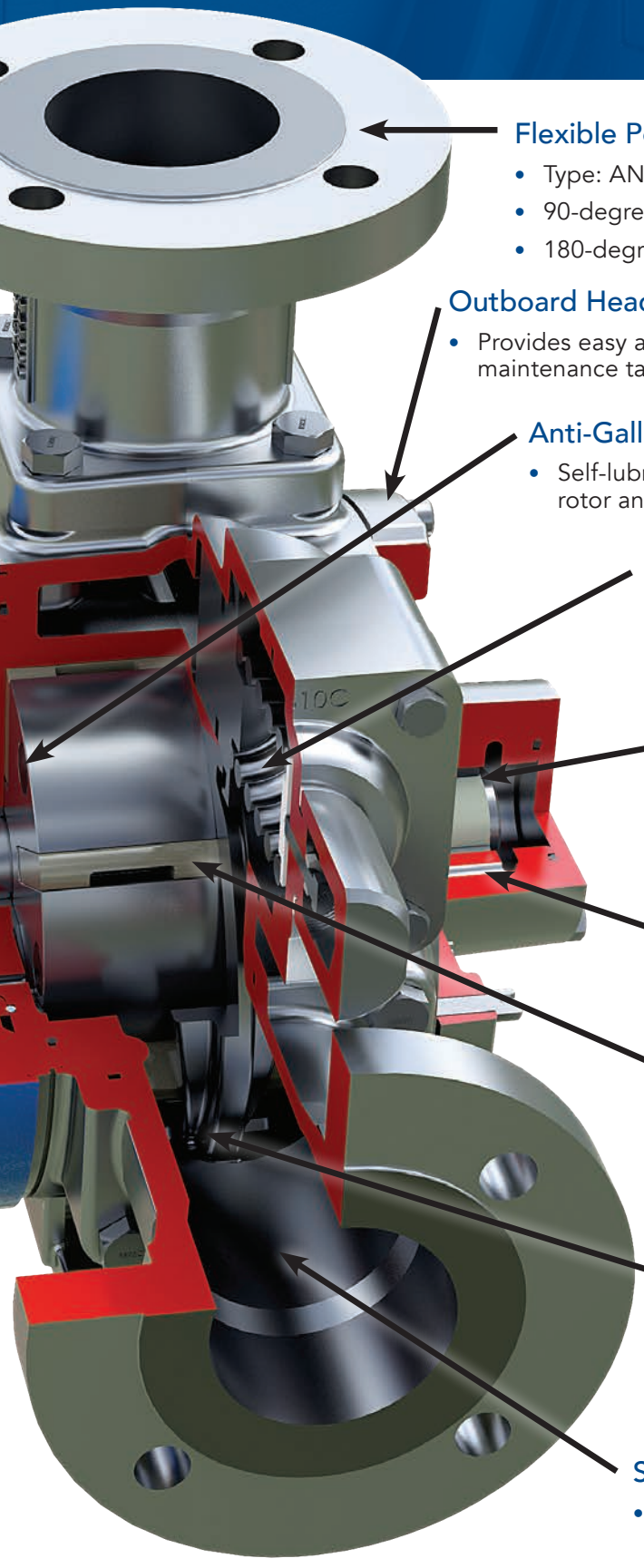
- Sealed for life bearings are completely maintenance free and protected by lip seal
- Machined for use with optional Blackmer alignment-free gear reducers

Containment Shell

- Coupling strength of a thin-wall metallic shell and reliability from being eddy-current-free
- Long carbon fibers improve strength
- Polyether ether ketone (PEEK) thermoplastic polymer has excellent chemical compatibility

Hydrodynamic Lubrication

- A film of pumped liquid suspends the shaft within each bearing, enabling frictionless and maintenance free operation
- Turbulence within the magnet area prevents solids from settling



Flexible Porting Options

- Type: ANSI flanged, welded, and NPT threaded
- 90-degree: side inlet & top outlet (standard for all models)
- 180-degree: side inlet & side outlet (option for iron models MI3, MI4)

Outboard Head

- Provides easy access to the main pumping chamber for maintenance tasks that renew pumps to new condition

Anti-Galling Rotor Thrust Pad

- Self-lubricating carbon thrust pads prevent contact between rotor and head (stainless steel MS3 and MS4 models only)

Integral Relief Valve

- Relief valve is integral to the pump cylinder (casing). Pressure setting corresponds to motor rating, preventing overload and nuisance trips of motors

Self-Lubricating Bearings

- Low rotational speed & low surface velocity yield exceptional life
- Lubricating materials allow for expected and unexpected dry run, non-lubricating and abrasive liquids and vapor mixtures

Internal Porting

- Internal porting routes fluid back to the pump inlet (along with any solids) on both inboard and outboard ends

Sliding Vanes

- Vanes are non-metallic and lubricating, well suited for dry run, vapor and suspended solids
- Vanes self-compensate for wear, providing like-new performance throughout the life cycle

Pump Chamber

- Open flow paths are well suited for suspended solids
- Large internal volume yields high displacement, resulting in one or more port sizes smaller than competing positive displacement pumps

Sheer Sensitive Profile

- Low internal flow velocity and unobstructed inlet and outlet create a gentle flow path for sheer sensitive liquids and those with low available NPSH

THE SOLUTION FOR PUMPING PAIN POINTS

MAGNES Series | For Indefinite Dry Run

MAGNES Series Magnetic-Drive Sliding Vane Pump provides an innovative alternative to centrifugal pumps, mag-drive or otherwise. A key differentiator of MAGNES is its non-metallic proprietary containment shell, which prevents the pump from overheating. MAGNES also has no dynamic seals around pressure parts, which makes it ideal for difficult-to-seal liquids that are too valuable, dangerous or hazardous to leak. MAGNES can pull a vacuum, strip lines and create suction lift exceeding 25 feet (7.6 meters) while ultimately working continuously during and after any planned or unanticipated dry-run events.

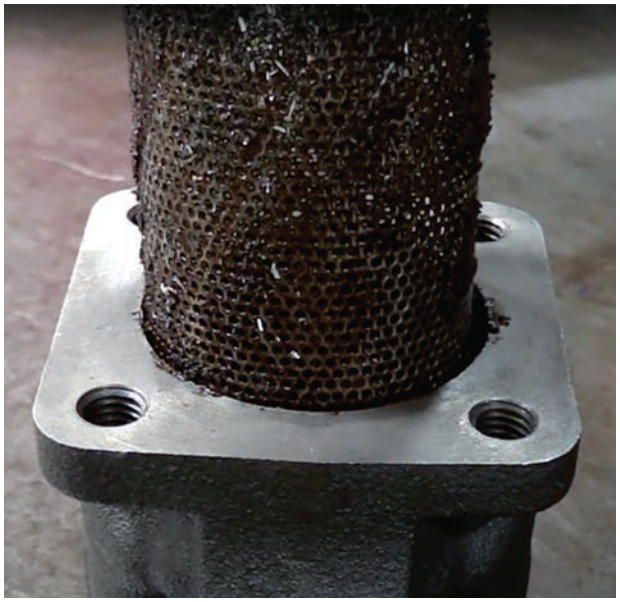
Some of the most common dry run events are due to the following conditions:

- Unanticipated Dry Run – caused by operator error, faulty instrumentation or system transients
- Self-Priming – Required when a pump isn't pre-flooded
- Line Stripping – Required when liquid is to be recovered

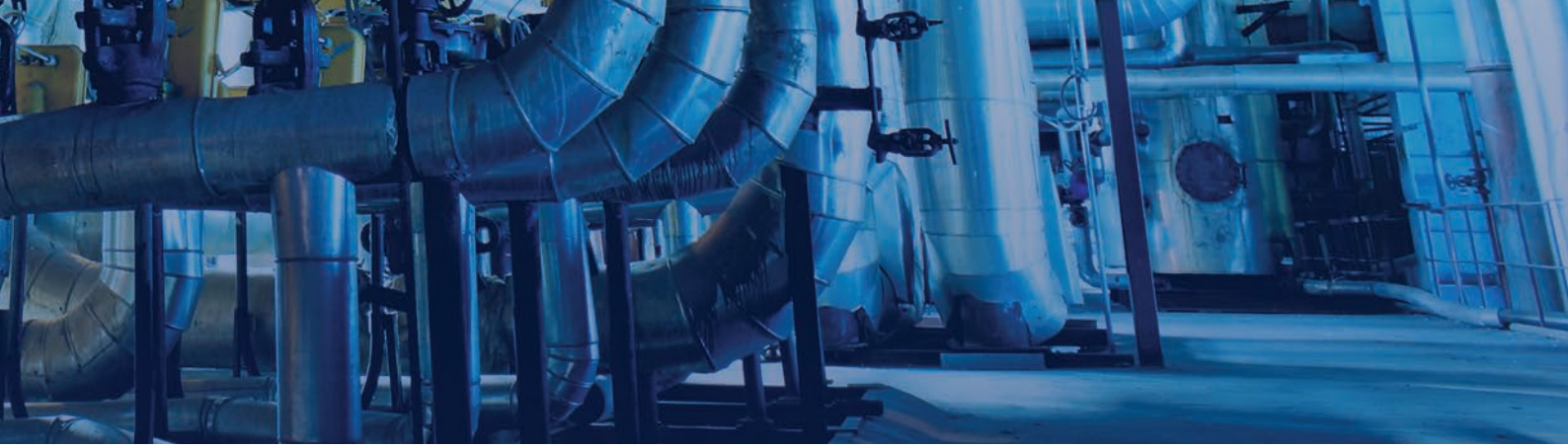
Dry run seems simple — "operating a pump without any liquid" — but the consequences of doing it are anything but, unless you have MAGNES.

MAGNES Series | For Solids Handling

Clogged strainers and contaminated tanks are legitimate threats to most process pumps and maintenance budgets, but MAGNES has been designed to accommodate the transfer of liquids with suspended solids of up to 1/8-inch (3.7 mm) in size. This ability stems from the fact that the general design of sliding vane pumps allows for open flow paths between the vanes. MAGNES has low internal flow velocities, which means that the particles are not moved violently through the pump casing, as is the case with pump styles that rely on high internal flow velocities to operate effectively (e.g., centrifugal pumps).



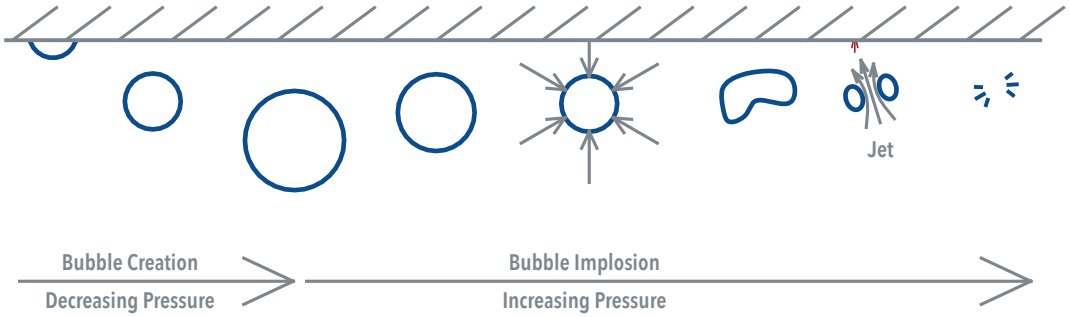
Clogged strainers signal suspended solids, which are a legitimate threat to most process pumps.



MAGNES Series | For Cavitation & Vapor Mixture Handling

Positive displacement sliding vane pumps like MAGNES are able to operate with vapor mixtures and can overcome or eliminate cavitation. The design of MAGNES allows it to pump liquids with a 20% vapor content at an NPSHr level that is close to zero. Comparisons of NPSHa and NPSHr can signal when vapor is formed within a pump. MAGNES processes this vapor as well as any vapor formed upstream within the tank or piping. This is especially convenient when the liquids that are being pumped are stored in vacuum tanks, which lowers the level of NPSHa. Vapor mixtures are often detrimental, as most pumps fail while operating under cavitation. MAGNES is a permanent solution for these difficult applications.

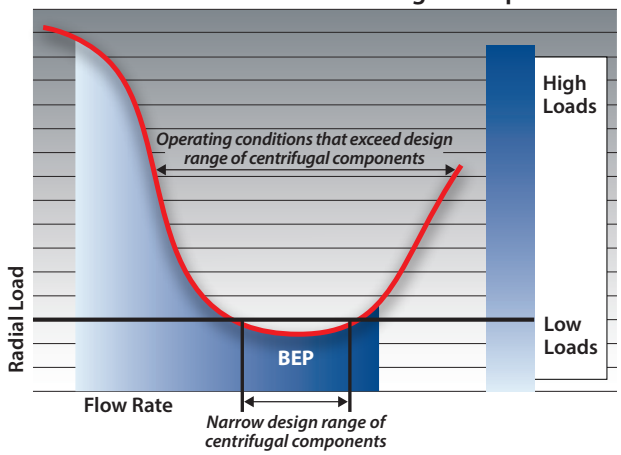
Entrained vapor and poor inlet conditions degrade the performance of centrifugal and gear pumps, often leading to costly pump damage.



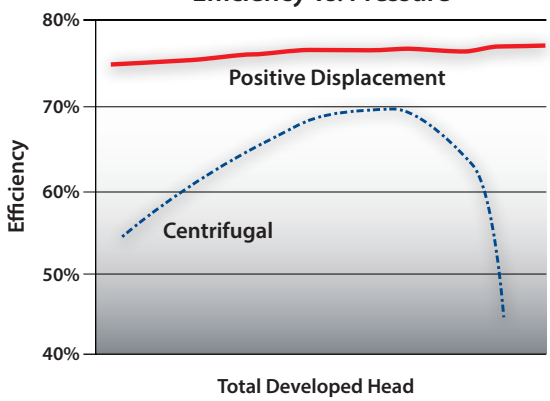
MAGNES Series | For Full Curve & System Performance

Positive displacement sliding vane pumps feature a constant-flow method of operation – vanes slide in and out of the pump rotor as it turns, creating pockets where a uniform amount of liquid is captured and carried to the discharge port – that is impervious to changes in volume, pressure, and viscosity. The result is optimized liquid output across the entire flow curve. This benefits real world piping systems that operate across a wide range of operating points, and not a narrow range. Wide operating ranges are often devastating to magnetic drive centrifugal pumps, but not MAGNES, the sliding vane magnetic drive pump.

Radial Load on Centrifugal Pumps



Efficiency vs. Pressure

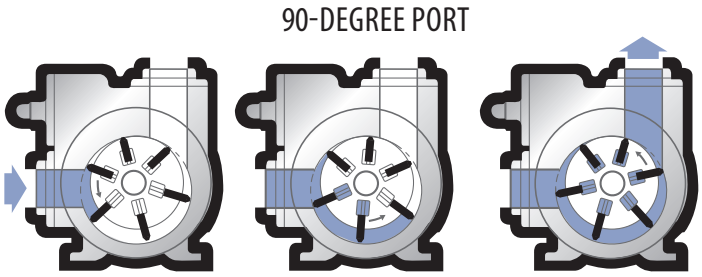


BLACKMER® MAGNES SERIES

Blackmer® | Sliding Vane Technology

How Blackmer Sliding Vane Pumps Work

Blackmer Sliding Vane Pumps use a rotor with sliding vanes that draw the liquid in behind each vane, through the inlet port and into the pumping chamber. As the rotor turns, the liquid is transferred between the vanes to the outlet where it is discharged as the pumping chamber is squeezed down. Each vane provides a positive mechanical push to the liquid before it.



Vane contact with the chamber wall is maintained by three forces: (1) centrifugal force from the rotor's rotation, (2) push rods moving between opposing pairs of vanes, and (3) liquid pressure entering through the vane grooves and acting on the rear of the vanes.

Each revolution of a Blackmer pump displaces a constant volume of fluid. Variance in pressure has minimal effect. Energy-wasting turbulence and slippage are minimized and high volumetric efficiency is maintained.

Advantages of sliding vane technology:

- Unique sliding vane pump design self-adjusts for wear to maintain flow rates
- Excellent at self-priming, eliminates expensive priming systems
- Extended dry-run capability, eliminates nuisance current monitoring systems
- Sliding vane design provides sustained performance and trouble-free operation
- Easy maintenance: vanes can be easily replaced without removing the pump from the piping system
- High suction lift abilities that exceed 25 feet (7.6 meters) and line-stripping capabilities to completely empty tanks, and piping of fluid
- Low maintenance and low life-cycle costs, pumps are renewable and repairable
- Solids handling, provided by large displacement and slow internal velocities
- Thin to thick fluid viscosity flexibility, eliminates expensive heating systems
- Highly efficient, sliding vane pumps require less horsepower than other pumps, meaning spending less on motors initially and less on electricity to power the pump

Blackmer® MAGNES Series | Capabilities

MAGNES vs. Gear & Centrifugal Pumps

- As a true self-priming pump, MAGNES never requires pre-flooding prior to startup.
- As an air moving pump, MAGNES can pull a vacuum, strip lines and create suction lift exceeding 25 feet (7.6 meters).
- As a flow-creating pump, MAGNES generates the pressure and flow rate at 400 rpm that other pumps require upwards of 3,600 rpm. Reduced speed eliminates heat buildup and component wear.
- As a leak-free pump, MAGNES is well suited to replace leaking pumps: single mechanical seals, double mechanical seals, and cartridge lip seals.
- As a positive displacement pump, MAGNES has sustained efficiency of up to 90% across wide operating ranges.

Chemical Transfer Capabilities Comparison for Sliding Vane, Centrifugal and Gear Pumps	MAGNES	Centrifugal	Gear
Indefinite Dry-Run Capability	YES	NO	NO
Leak-Free Pumping	YES	YES	YES
Seal-Less Technology	YES	YES	YES
Ability to Pump Liquid/Vapor Mixtures	YES	NO	NO
Low Required NPSH	YES	NO	NO
Solid & Abrasive Media Handling	YES	NO	NO
Full-Curve BEP Capability	YES	NO	YES
Self-Priming Operation	YES	NO	NO
Product Recovery	YES	NO	NO

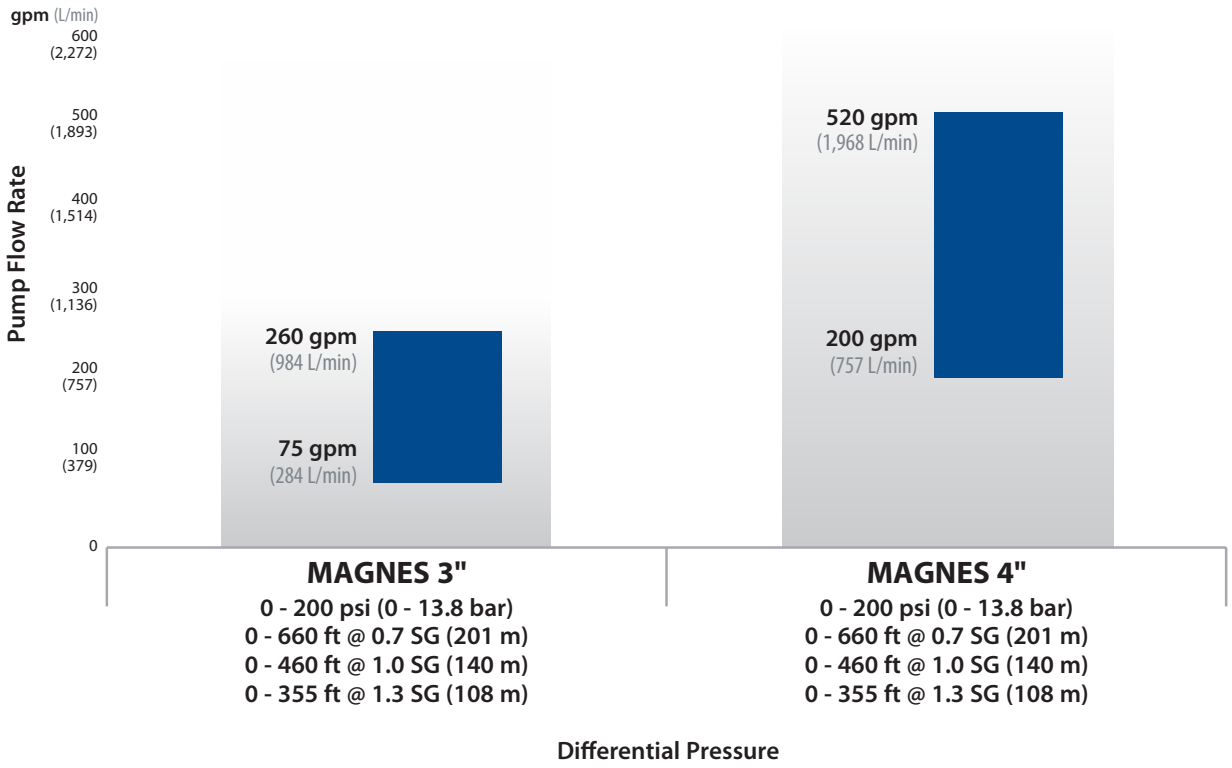
Available MAGNES Accessories:

- **Baseplate:** C-channel (standard), fabricated steel (optional), or BaseTek composite (optional)
- **Gear Reducer:** NORD SK52W (standard)
- **Guards:** Rexnord Orangepeel (standard), sheet metal (optional)
- **Couplings:** Jaw couplings and sleeve couplings
- **Motors:** An array of NEMA and IEC/ATEX options, for both 60Hz and 50Hz service

Accessories **Not Required** by MAGNES *(due to inherent functionality):*

- Separate low-flow models
- Run-dry bearings or coatings
- Steam heat jackets or viscosity suppression systems
- Power monitors and temperature probes
- Priming systems & tanks

Nominal Flow Rate Range



Operating Limits (Standard Materials)

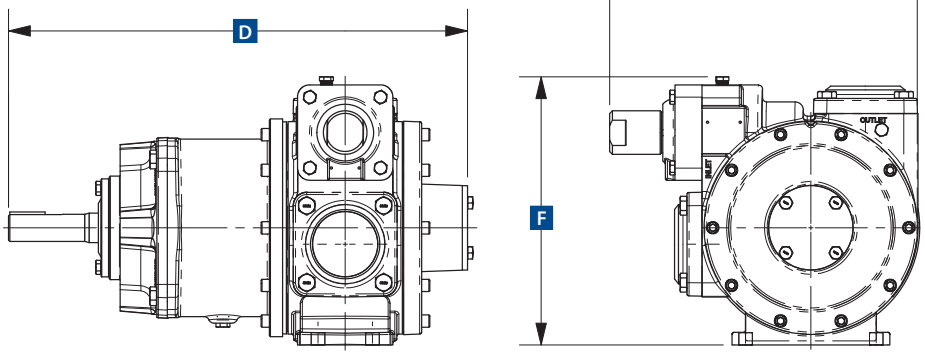
Pump Model	Nominal Flow Rate Range	Viscosity	Maximum Operating Temperature	Minimum/ Maximum Speed	Maximum Working Pressure	Maximum Differential Pressure	Total Developed Head (1.0 sg)	Power at Maximum Speed & Pressure
3" DN80	75 to 260 gpm (284 to 984 L/min)	0.2 to 500 cP	-30°F to 250°F (-34°C to 121°C)	250 to 640 rpm	225 psi (15.5 bar)	200 psi (13.8 bar)	0 to 460 ft. (0 to 140 m)	3 to 40 HP (0 to 30 kW)
4" DN100	200 to 520 gpm (757 to 1,968 L/min)	0.2 to 500 cP	-30°F to 250°F (-34°C to 121°C	250 to 520 rpm	225 psi (15.5 bar)	200 psi (13.8 bar)	0 to 460 ft. (0 to 140 m)	3 to 75 HP (0 to 55 kW)

Maintenance Kits: Wear Parts
3": MI3: BLK899097 | MS3: BLK899098
4": MI4: BLK899083 | MS4: BLK899084

Rebuild Kits: Wear Parts & Rotor/Shaft
3": MI3: BLK899197 | MS3: BLK899198
4": MI4: BLK899183 | MS4: BLK899184

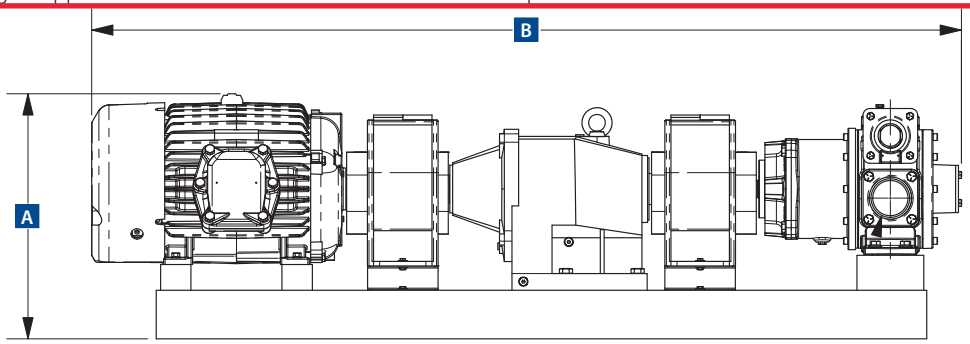
Note: Kits include FKM elastomers

MAGNES Series | Dimensions[1]



Pump Model	Length (D)	Width (E)	Height (F)	Max. Weight
MAGNES 3"	21 1/16" (535 mm)	14 1/8" (358 mm)	12 1/4" (311 mm)	SS 205 lb (93 kg) Iron 199 lb (90 kg)
MAGNES 4"	27 3/16" (691 mm)	18 9/16" (471 mm)	16 7/8 (429 mm)	SS 469 lb (213 kg) Iron 452 lb (205 kg)

[1] All dimensions and weights approximate. Please refer to Dimension Sheets for precise dimensions.



Motor Size	HP	MAGNES 3"				MAGNES 4"			
		A	B	Max. Weight SS	Max. Weight Iron	A	B	Max. Weight SS	Max. Weight Iron
213T	7.5	18 3/16" (462 mm)	66 1/8" (1680 mm)	969 lb (439 kg)	963 lb (436 kg)	—	—	—	—
215T	10	18 3/16" (462 mm)	66 1/8" (1680 mm)	992 lb (449 kg)	986 lb (447 kg)	—	—	—	—
254T	15	20 3/16" (584 mm)	69 15/16" (1776 mm)	1,114 lb (505 kg)	1,108 lb (502 kg)	—	—	—	—
256T	20	20 3/16" (584 mm)	71 11/16" (1820 mm)	1,138 lb (516 kg)	1,132 lb (513 kg)	—	—	—	—
284T	25	20 15/16" (532 mm)	72 7/8" (1851 mm)	1,282 lb (581 kg)	1,276 lb (578 kg)	22 5/8" (559 mm)	90 5/8" (2,286 mm)	1,802 lb (817 kg)	1,835 lb (832 kg)
286T	30	20 15/16" (532 mm)	74 3/8" (1889 mm)	1,334 lb (605 kg)	1,328 lb (602 kg)	22 7/8" (559 mm)	88 1/8" (2,235 mm)	1,894 lb (859 kg)	1,927 lb (874 kg)
324T	40	21 1/2" (546 mm)	77 1/16" (1957 mm)	1,503 lb (681 kg)	1,496 lb (678 kg)	24 1/16" (610 mm)	91" (2,311 mm)	2,089 lb (948 kg)	2,122 lb (963 kg)
326T	50	21 1/2" (546 mm)	77 1/16" (1957 mm)	1,535 lb (696 kg)	1,528 lb (693 kg)	23 13/16" (584 mm)	91 13/16" (2,311 mm)	2,095 lb (950 kg)	2,128 lb (965 kg)
364T	60	—	—	—	—	24 11/16" (610 mm)	93 3/4" (2,362 mm)	2,204 lb (1,000 kg)	2,237 lb (1,015 kg)
365T	75	—	—	—	—	24 11/16" (610 mm)	93 3/4" (2,362 mm)	2,382 lb (1,081 kg)	2,415 lb (1,095 kg)

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110-001_A4 07/21

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WATER & WASTEWATER

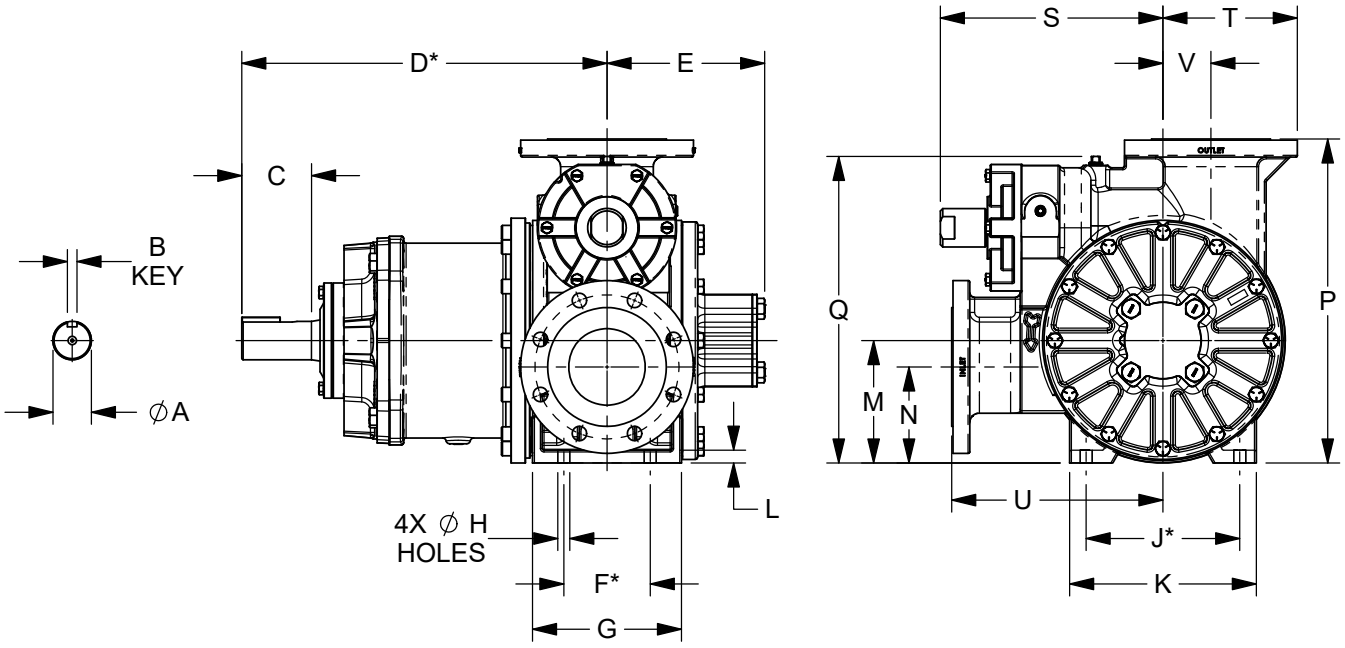
Blackmer Dimension Drawing

www.blackmer.com	TYPE	SIZE	UNIT STYLE	DIMENSIONS 110-104
	MS4	4	PO	Section 110 Effective AUGUST 2021 Replaces NEW Page 1 / 2

RIGHT HAND ROTATION. FOR LEFT HAND ROTATION, SHAFT PROJECTION IS OPPOSITE THAT SHOWN.

*TOLERANCE ± 1/8"

TOLERANCE ON OTHER DIMENSIONS ± 1/4"



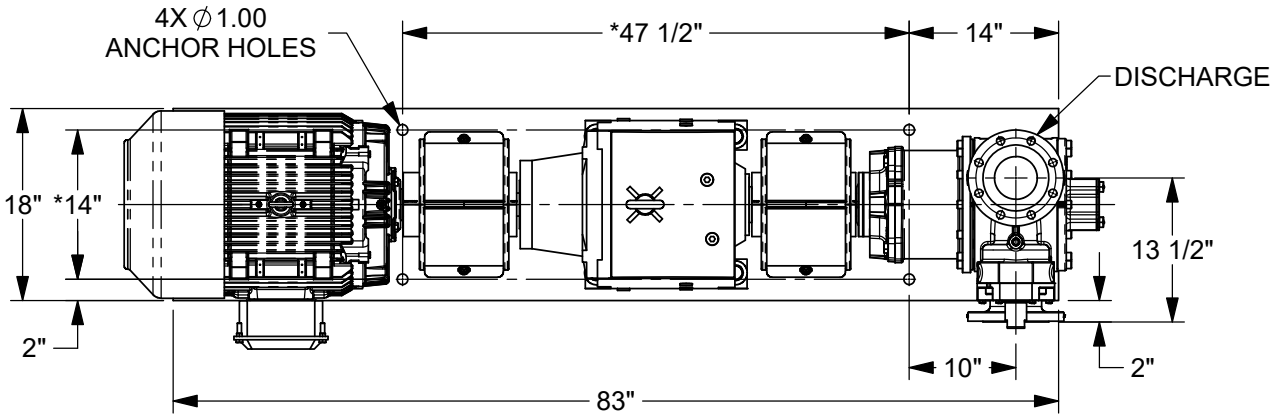
DIMENSIONS											WEIGHTS	
UNITS	A	B	C	D	E	F	G	H	J	K	UNITS	PUMP ONLY
IN	2	1/2	3 5/8	19	8 3/16	4 1/2	7 3/4	5/8	8	9 3/4	LBS	469
MM	50,8	12,7	92,1	482,6	208	114,3	196,9	15,9	203,2	247,7	KG	213
	L	M	N	P	Q	R	S	T	U	V		
IN	11/16	6 3/8	5	16 7/8	16	---	11 9/16	7	11	2 1/2		
MM	17,5	161,9	127	428,6	406,4	---	293,7	177,8	279,4	63,5		
	W	X	Y	Z	AA	BB	CC	DD	EE	FF		
IN	---	---	---	---	---	---	---	---	---	---		
MM	---	---	---	---	---	---	---	---	---	---		
	GG	HH	JJ	KK	LL	MM						
IN	---	---	---	---	---	---						
MM	---	---	---	---	---	---						

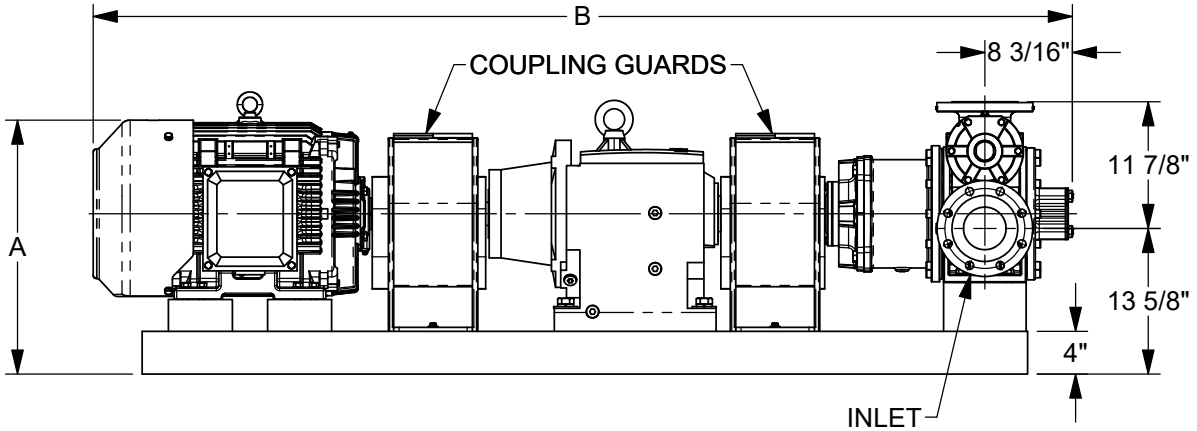
Blackmer www.blackmer.com	TYPE	SIZE	UNIT STYLE	DIMENSIONS 110-104
	MS4	4	SK72	Section 110 Effective AUGUST 2021 Replaces NEW Page 2 / 2

RIGHT HAND ROTATION SHOWN.

*TOLERANCE ± 1/8"

TOLERANCE ON OTHER DIMENSIONS ± 1/4"





"A" DIMENSION LESS MOTOR EYEBOLT

MOTOR			BASE NO.	DIMENSIONS									APPROX. UNIT WT. - POUNDS	
FRAME SIZE	H.P.	RPM		A	B	C	D	E	F	G	H	J	LESS MOTOR	INCL MOTOR
284T	25	1800	901392	22 5/8	90 5/8	---	---	---	---	---	---	---	1402	1802
286T	30	1800	901392	22 7/8	88 1/8	---	---	---	---	---	---	---	1402	1894
324T	40	1800	901393	24 1/16	91	---	---	---	---	---	---	---	1415	2089
326T	50	1800	901393	23 13/16	91 13/16	---	---	---	---	---	---	---	1415	2095
364T	60	1800	901394	24 11/16	93 3/4	---	---	---	---	---	---	---	1399	2204
365T	75	1800	901394	24 11/16	93 3/4	---	---	---	---	---	---	---	1399	2382

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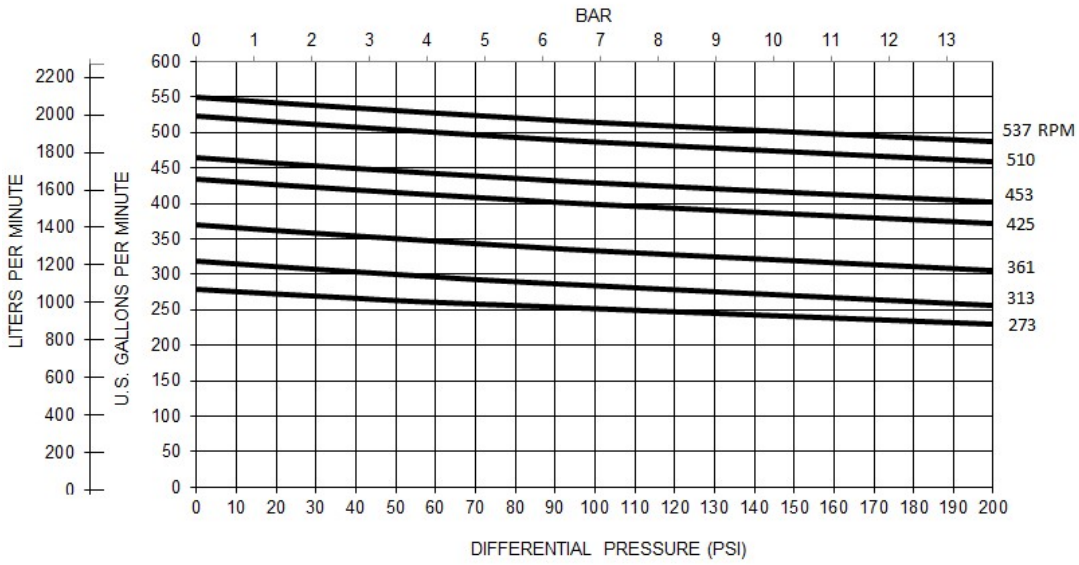
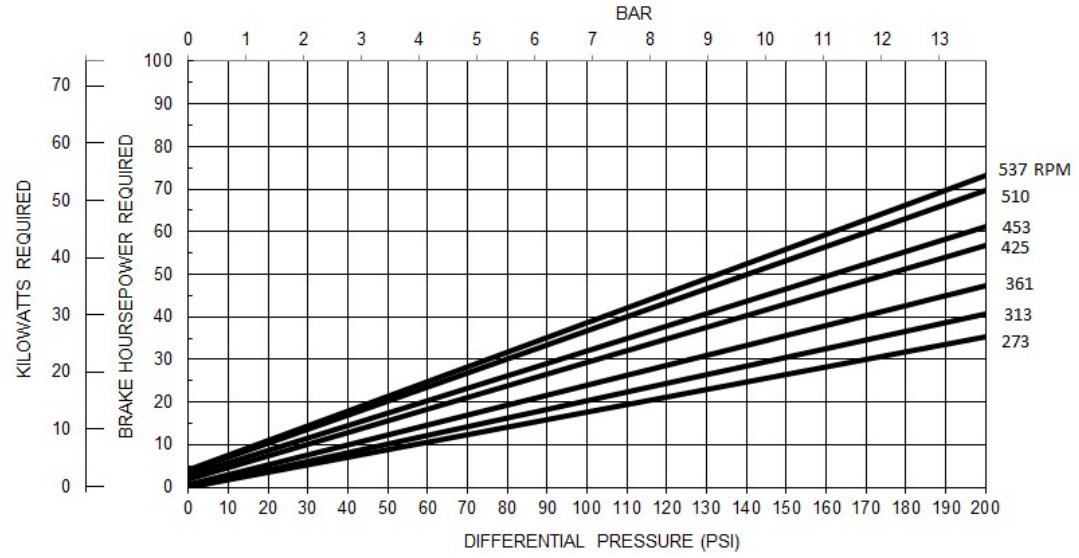
Blackmer Pump Curve

1 CP



1 CP

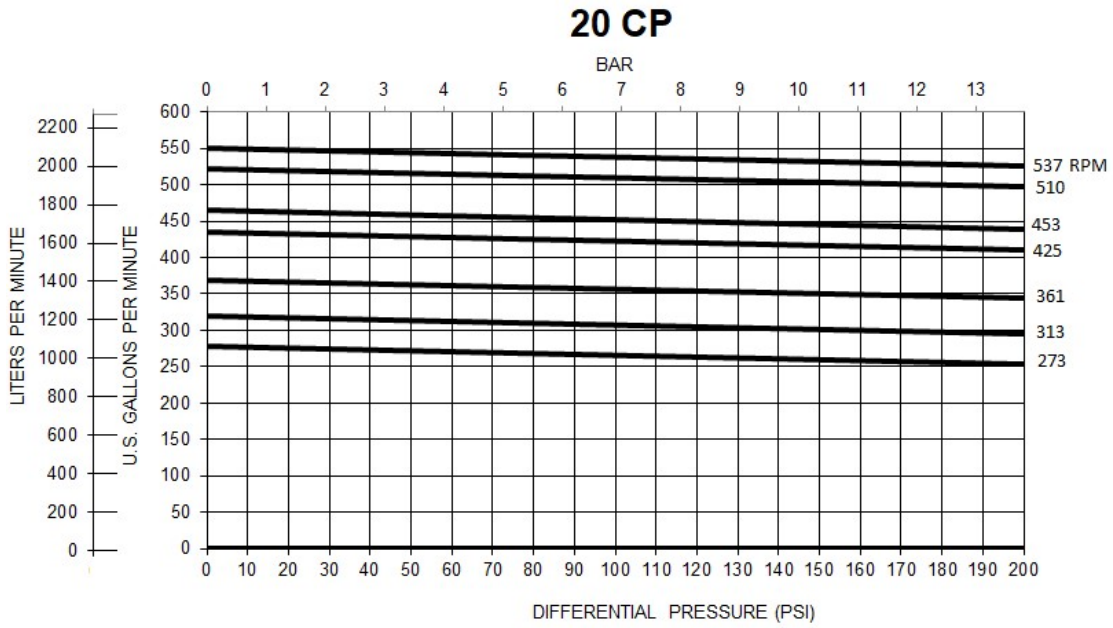


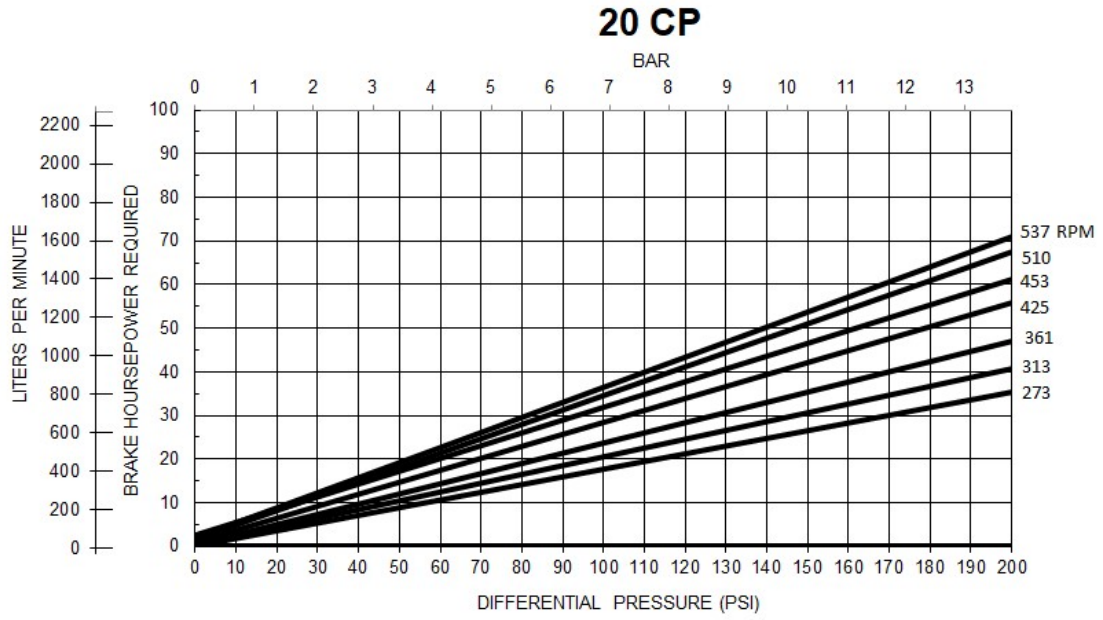
Blackmer Characteristic Curves are based on Brake Horsepower (BHp). To determine Motor Horsepower, drive train inefficiencies must be added to the BHp.

Actual capacities are dependent upon the vapor pressure of the liquid and the inlet conditions of the system.

Centipoise = centistokes at 1.0 specific gravity.

CHARACTERISTIC CURVES
Models: MI4, MS4





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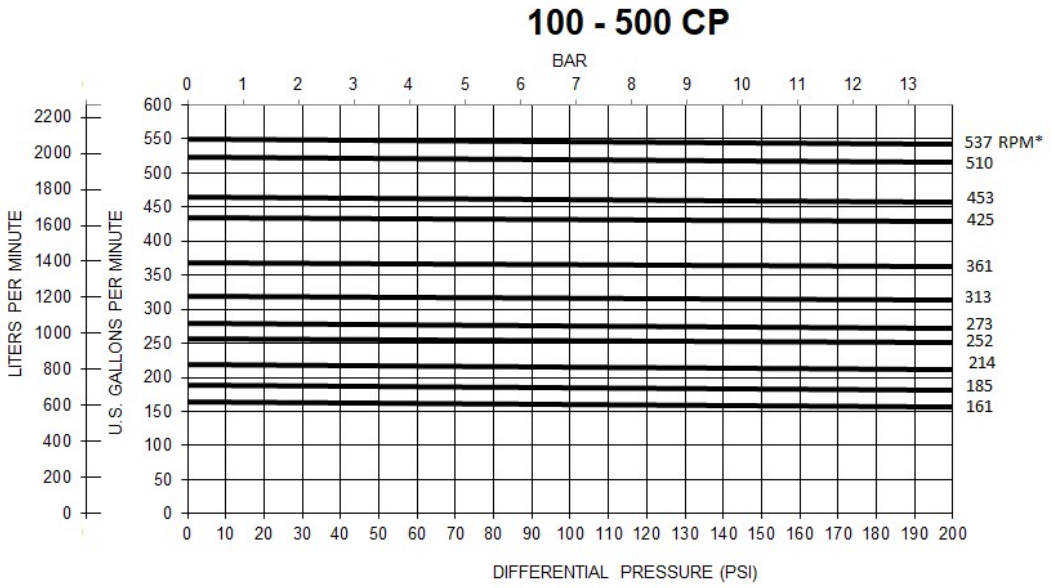

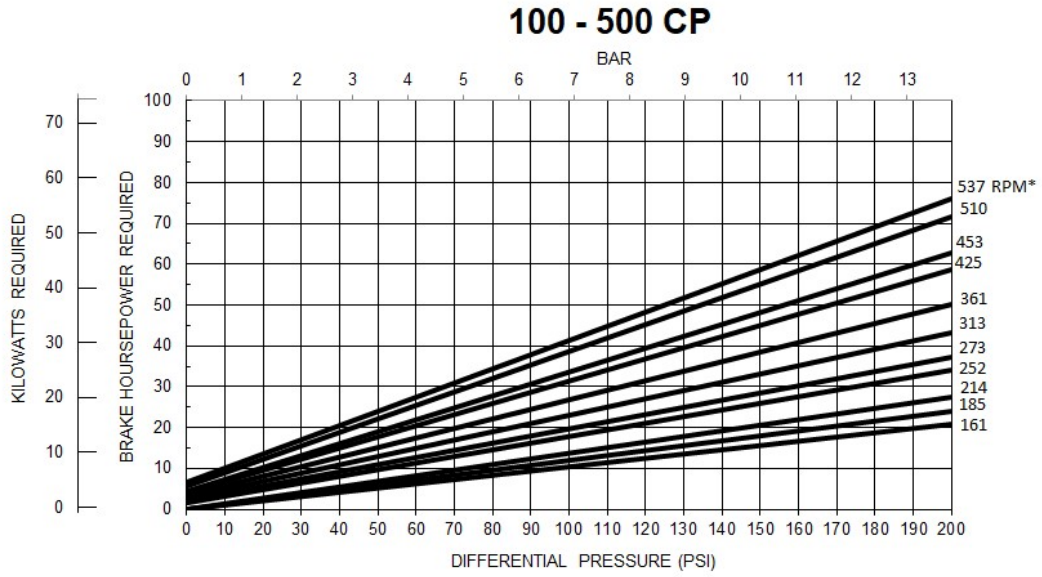

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Blackmer Material of Construction

NOTE: Temperature and viscosity ratings given below apply to individual components **Only.** For actual maximum temperatures and viscosities for the rated pump, see **"Operating Limits"** on backside.

PART NAME	STANDARD MATERIALS	AVAILABLE OPTIONS
Heads	17-4 PH Stainless Steel	
Cylinder	17-4 PH Stainless Steel	
Driven Hub (Wetted)	17-4 PH Stainless Steel	
Driving Hub	Ductile Iron, ASTM A536	
Bearing Cover	304 Stainless Steel	
Sleeve Bearings	Metal Impregnated Graphite	
Rotor & Shaft		
Rotor	17-4 PH Stainless Steel (Thrust Bushing Pads: Carbon)	
Shaft	17-4 PH Stainless Steel (Tungsten Carbide/Cobalt Coating)	
Bearing Housing	Cast Iron, ASTM A48	
Relief Valve Spring	Stainless Steel	
R/V Spring Ranges	151-200 psi	
O-Rings / Seal Rings	FKM	PTFE
Capscrews	Steel	
Vanes	**Duravane -** Full Size with 316 Stainless Steel wear plate to 240°F (115°C) (150 psi differential pressure maximum)	**Laminate** – Stainless Steel Wear Plane (200 psi differential pressure maximum) **Enduravane** - Full Size with 316 Stainless Steel wear plate to 240°F (115°C) (200 psi differential pressure maximum)
Relief Valve	316 Stainless Steel, PTFE Coated	
Push Rods	Nitronic “60”® Chrome Plated	
Magnet Housing	Cast Iron	
Magnet Assembly		
Inner Magnet	Neodymium Iron Boron	
Outer Magnet	Neodymium Iron Boron	
Containment Can	PEEK Composite	
Hub Sleeve	316 Stainless Steel	
Driven Key (Wetted)	17-4 PH Stainless Steel	
Gage Ports	1/4” NPT	

Centipoise (cP) = centistokes (cSt) at fluid specific gravity of 1.0.

PIPE COMPANION FLANGES

PUMP SIZE	STANDARD[1]	OPTIONAL
MS4	4” Integral Stainless Steel ANSI 150 lb Compatible RF Flanges	

OPERATING LIMITS

	STANDARD MATERIALS	OPTIONAL MATERIALS
Maximum Temperature	-30°F (-29°C) to 250°F (121°C)	Consult Factory for higher temperature ratings.
Maximum Viscosity	500 Cp	Some viscosities may have differential pressure limits; consult performance curves for limits. Consult Factory for higher viscosity ratings.
Maximum Pump Speed	537 rpm	
Maximum Differential Pressure	200 psi	
Maximum Working Pressure	225 psi	

Centipoise (cP) = centistokes (cSt) at fluid specific gravity of 1.0.

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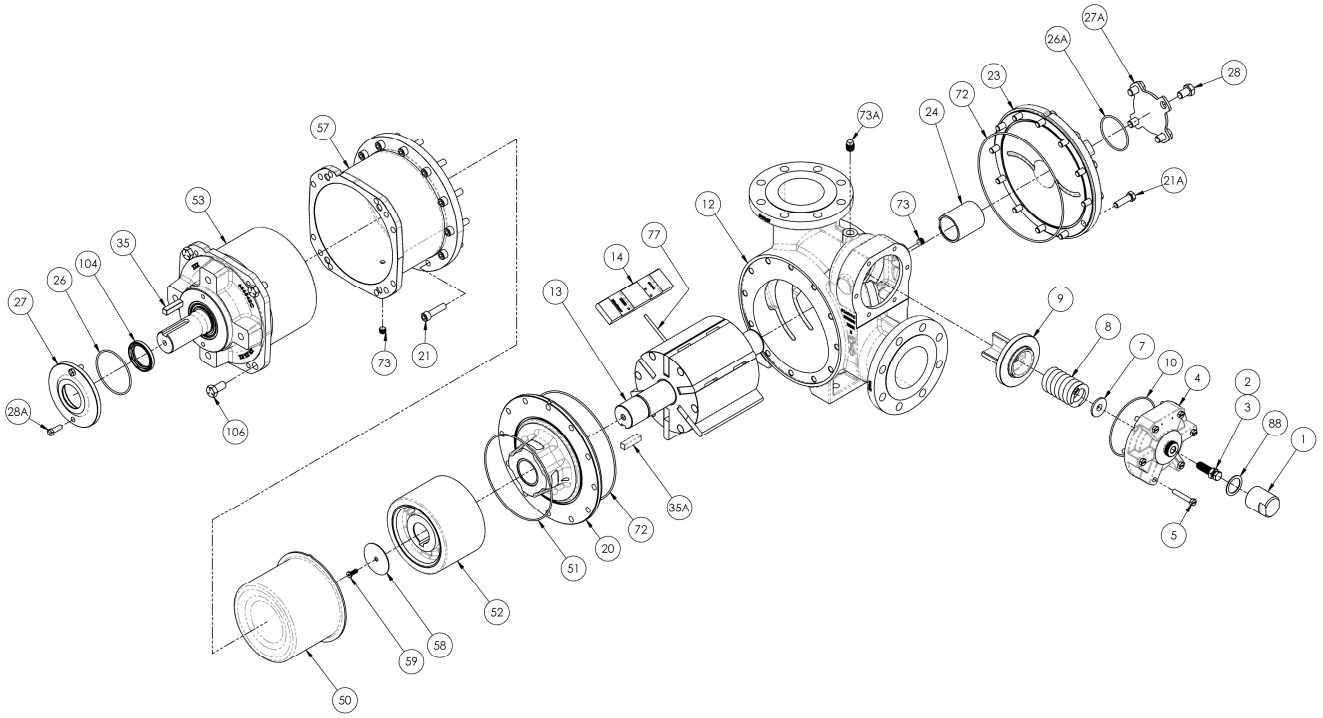
MUNICIPAL SALES
WATER & WASTEWATER

Blackmer Parts List

BLACKMER PARTS LIST
PUMP MODELS: MAGNES SERIES – MI4, MS4

Section	110
Effective	Jun 2022
Replaces	Jan 2022

Keep with Instructions 110-A00 for Installation, Operation, and Maintenance



Ref. No.	Description	Qty	MS4 Part No.	MI4 Part No.	Ref. No.	Description	Qty	MS4 Part No.	MI4 Part No.
1	Cap - Relief Valve (R/V)	1	413958	413957	26A	O-Ring - OB Bearing Cover (FKM)[4,5]	1	702222	
2	Adjusting Screw – R/V	1	436313	436307		O-Ring - OB Bearing Cover (PTFE)		702225	
	Adjusting Screw - R/V (high pressure)[1]		436312	436311		O-Ring - OB Bearing Cover (Buna-N)		N/A	702219
3	Locknut - R/V	1	436352	436355	27	Inboard Bearing Cover	1	041603	
4	Cover – R/V	1	N/A	411968	27A	Outboard Bearing Cover	1	041901	041900
	Cover - R/V (high pressure)[1]		411979	411969	28	Capscrews – OB Bearing Cover	4	920612	920611
5	Capscrew – R/V Cover	6	N/A	920351	28A	Capscrews – IB Bearing Cover	2	920341	
	Capscrew - R/V Cover (high pressure)[1]		920422	920421	35	Key - Shaft[4,5]	1	909191	
7	Spring Guide - R/V	1	426365	426355	35A	Key - Wet End[4,5]	1	909161	
8	Spring – R/V (51-75 psi)	1	476314		42	See page 2 for Flange Options			
	Spring - R/V (76-150 psi)		476321		50	Containment Shell	1	686662	
	Spring - R/V (151-200 psi)[1]		476969		51	O-ring - Canister (FKM)[4,5]	1	711938	
9	Valve - R/V	1	456325	456315		O-ring - Canister (PTFE)		702129	
	Valve – R/V (Nickel Plated)		N/A	456300		O-ring - Canister (Buna-N)		N/A	702041
10	O-Ring - R/V Cover (FKM)[4,5]	1	702229		52	Magnet Assembly - Driven	1	686602	686702
	O-Ring - R/V Cover (PTFE)		702230		53	Power End Assembly	1	686598	
	O-Ring – R/V Cover (Buna-N)		N/A	702228	57	Magnet Housing	1	686552	
12	Cylinder	1	026509	021906	58	Washer - Driven Magnet	1	906813	
	Cylinder (Horizontal Porting)		N/A	021915	59	Capscrew - Driven Magnet	1	922000	
13	Rotor & Shaft[5]	1	266602	266702	72	O-Ring - Head (FKM)[4,5]	2	702128	
14	Vane - Enduravane[4,5]	6	091961			O-Ring - Head (PTFE)		702129	
	Vane - EC Laminate		091931			O-Ring – Head (Buna-N)		N/A	702127
	Vane - Duravane		091924		73	Hex Head Pipe Plug - 1/4 NPT	2	908192	908198
20	Head & Bushing Asy. - Inboard	1	036602	036702	77	Push Rods[4,5]	3	121906	121905
21	Capscrews – IB Head	12	920538	920537	88	Gasket - R/V Cap[4,5]	1	533909	
21A	Capscrews – OB Head	12	920467	920532	104	Seal	1	904203	
23	Head & Bushing Asy. - Outboard	1	036662	031977	106	Capscrew - Bearing Housing	4	350726	350726
24	Bushing (Sleeve Bearing)[4,5]	2	161900		—	Kit — Maintenance	—	899084	899083
26	O-Ring - IB Bearing Cover (FKM)	1	701991		—	Kit — Rebuild	—	899184	899183

[1] High Pressure Relief Valve parts must be grouped together and cannot be used with other springs

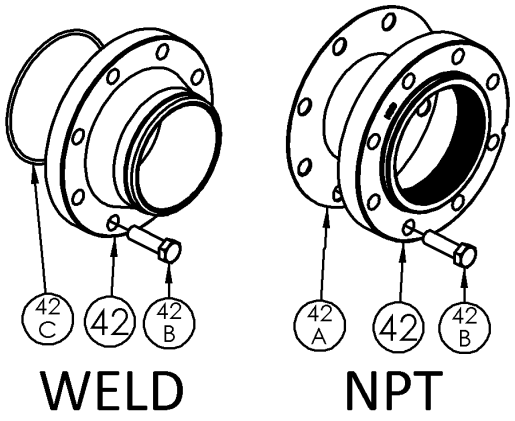
[4] Included in Maintenance Kit, kit will include FKM o-rings, gaskets for NPT Flanges (MI4)

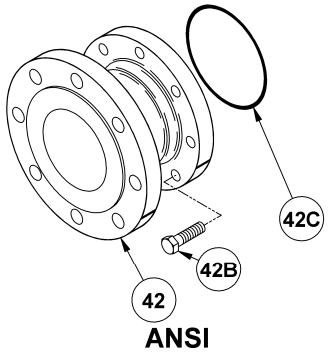
[5] Included in Rebuild Kit, kit will include FKM o-rings, gaskets for NPT Flanges (MI4)

FLANGE OPTIONS

Ref No.	Part Name	Parts Per Pump	MI4 P/N
42	Flange - 4" NPT	0-2	651900
	Flannge - 4" Weld		651906
	Flange - ANSI 4" 150 lb RF		651917
42A	Gasket - NPT Flange (Comp.)[4, 5]	0-2	381904
42B	Capscrew	0-16	920532
42C	O-ring - Flange (FKM)[4, 5]	0-2	702238
	O-ring - Flange (PTFE)		702239
	O-ring - Flange (Buna-N)		702237

* MS4 Pump has Integral 150# ANSI Flange





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