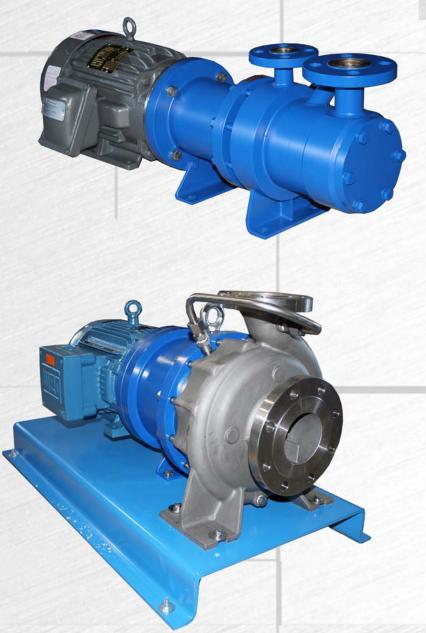


WARRENDER, LTD. Seal-less Mag-Drive Pumps From Stock or Built-to-Spec™

Ammonia & CO² Circulation and Transfer Pumps

Providing environmentally safe seal-less magnetic pumps of the highest quality for over 30 years

Our company goals are to provide the solutions that protect our surroundings, raise the environmental awareness, and promote the growth of the community.





Services

Refrigeration Systems

- Ammonia, CO2
- Fluorocarbon Refrigerants

API & CPI Processes

- Liquefied Gases
- Petroleum By-Products
- Hydrocarbons
- Petrochemicals
- Chemical Processing

Thermal Transfer Systems

- High-temp Synthetic Oils
- Low-temp Synthetic Oils
- Super Heated Water

Zero Emissions Low Heat Load No Flashing

WARRENDER SEAL-LESS MAG-DRIVE PUMPS

Seal-less Pumps - Standard Motors™

Warrender mag-drive seal-less pumps meet EPA zero emissions regulations with versatile magnetic coupling technology. Minimal heat loads, field serviceability and lower installation costs are significant process advantages. Solve your most challenging pumping problems with reliable and cost effective solutions.

Zero Emissions and Maximum Safety

Benefit from a process free of leakage, contamination or toxic releases while avoiding constant monitoring and potential environmental fines. Eliminate all toxic and dangerous chemical releases including volatile and toxic liquids that can react with atmospheric contact.

Advanced Technology and the Highest Quality for Long Pump Life

WARRENDER pump designs are built to the highest quality standards to protect your process, preventing costly maintenance and lost production time.

- Robust, high thickness pump casings
- High efficiency impellers with low NPSH requirements
- · High strength, rare earth magnetic couplings suitable for extreme temperatures
- Heavy duty rear casings
- Rugged internal bearing system withstands process upsets

Performances to the Extreme

- Flows from 0.1 to 1500 gpm
- Pressures up to 2200 psig
- Heads to 1000 feet
- Temperatures from -139°F to +600°F
- · Pump liquefied gases or liquids with low NPSH
- Compatible with VFD control systems



Three Designs Provide <u>Complete</u> Hydraulic Coverage

- High head turbine for transfer systems
- High flow centrifugal for compressor circulation systems
- Low flow rotary vane for injection systems

Typical Applications

- Liquid Ammonia, CO2 and Fluorocarbon Refrigerants
- All EPA monitored chemicals
- Dangerous, toxic, noxious and carcinogenic liquids
- Solvents, hydrocarbons, pyrophorics and other volatile liquids
- Heat transfer fluids (up to + 600°F, 840°F w/ heat exchanger).
- Hot / super heated water
- Liquefied gases
- High pressure circulation systems
- Pressurizing mechanical seal pots
- Sampling, metering or chemical injection systems



Series WMTA-LN Regenerative Turbine

(high heads, low to medium flows)



Transfer Pumps: Low NPSH - High Head, Seal-less Turbine

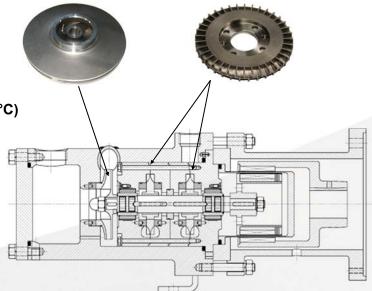
Series WMTA-LN mag-drive regenerative turbine pumps safely meet high head, low NPSH system requirements. Dynamic turbine impeller pumping action handles entrained gases to resist vapor locking.

WMTA-LN Features

- High head pumping with pulsation free performance
- Handles up to 20% entrained gas, resists vapor locking
- Dynamic design (avoid over pressurization w/ P.D. pumps)
- Low heat induction to avoid flashing
- See pages 8-9 for more information

WMTA-LN Performance Range

- Flows from 5 to 40 gpm (1.1 9.1 m3/h)
- Heads to 1000 feet (305 m)
- System Pressures to 1450 psig (100 bar)
- Temperatures from -139 to +600°F (-95 to +315°C)
- NPSHr to 1'



Performance Curves 3600 RPM (60Hz)

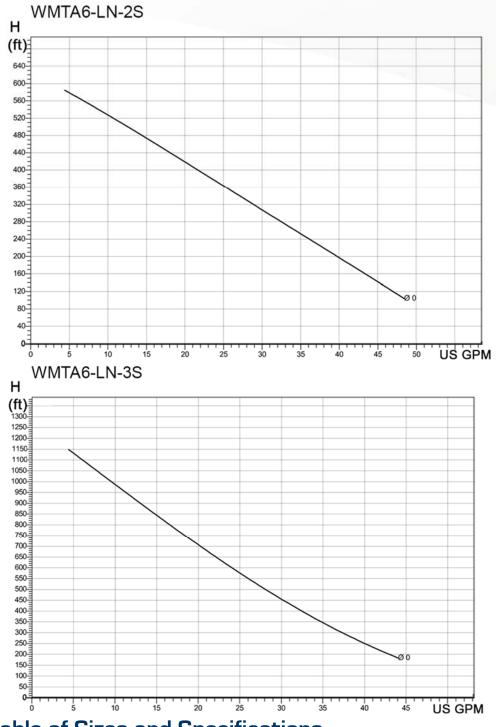
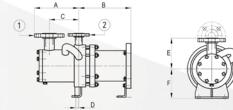
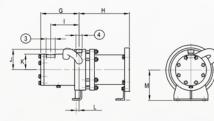


Table of Sizes and Specifications



DUMD	0\	/ERALL	DIME	NSION	PO	WEIGHT				
PUMP MODEL	Α	В	С	D	E	F	FLG 1 SUCTION ANSI 300 #	FLG 2 DISCHARGE ANSI 300 #	WEIGHT Lbs.	
WMTA6F-LN 2S	8.40	10.47	5.91	0.59	6.70	6.30	1 1/2" DN	1" DN	156	
WMTA6F-LN 3S	11.54	10.47	8.46	0.59	6.70	6.30	1 1/2" DN	1" DN	180	

5



PUMP		OVE	RALL I	DIMENS	POF	WEIGHT				
MODEL	G	н	I	J	к	L	М	TRD 3 SUCTION	TRD 4 DISCHARGE	Lbs.
WMTA6T-LN 2S	7.95	10.47	5.91	4.23	3.25	0.59	6.30	1" 1/2 NPT	1" NPT	139
WMTA6T-LN 3S	10.50	10.47	8.46	4.23	3.25	0.59	6.30	1" 1/2 NPT	1" NPT	170

Rise to Shut-Off & Flow Control

Turbine pumps are rated for continuous duty in low flow – high head systems. Variations in differential heads have minimal effect on turbine pump flow due to the high rise to shut-off. Dynamic turbine pump characteristics accommodate control valve regulation without by-passing.



Series WMTA Standard Turbine Mag-Drive

WMTA Performances Range

- Continuous or intermittent low flow high head pumping
- Handles up to 20% entrained gas and resists vapor locking
- Flows up to 40 gpm (9.1 m3/hr)
- Heads up to 500 feet (115 m)
- System pressures from vacuum up to 2200 psig (150 bar)
- Temperature from -150°F/ -100°C to +600°F/ 315°C

Composite Curves 3600 RPM (60Hz)

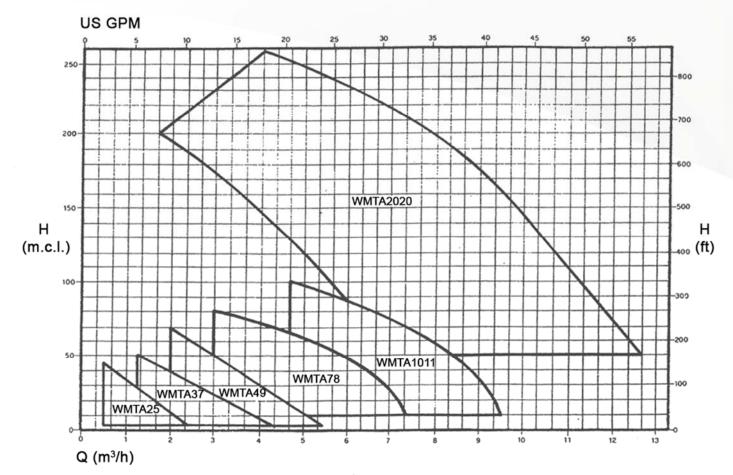
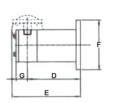
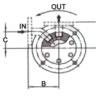
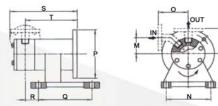


Table of Sizes and Specifications



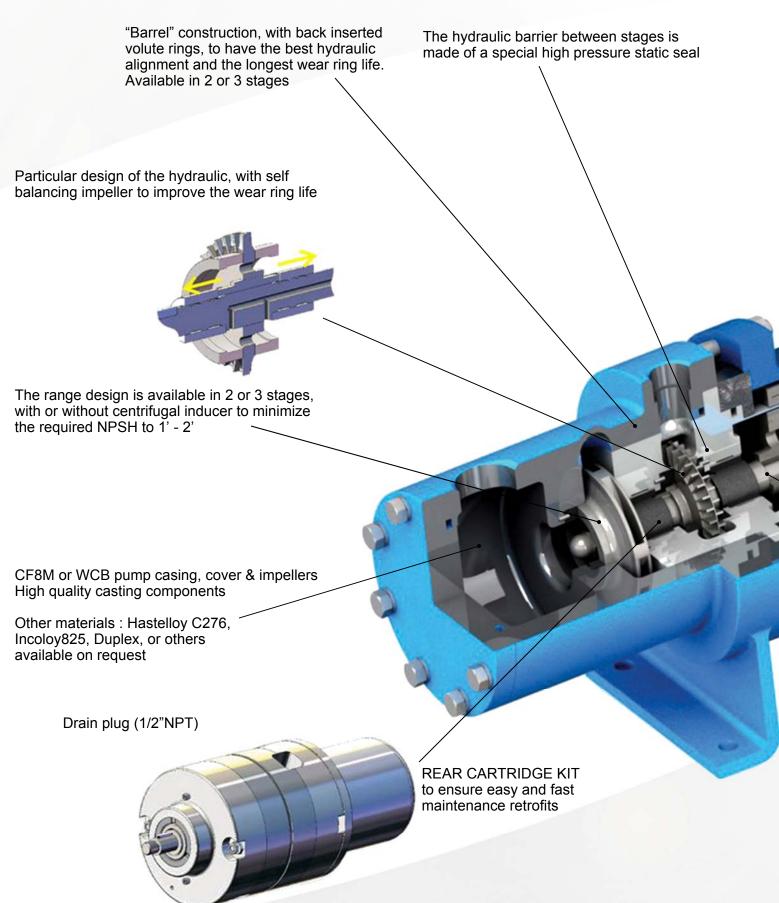


PUMP		OVER/	ALL DI	MENSI	POF	WEIGHT							
MODEL	Α	В	С	D	Е	F	G	TRD	FLG	Lbs.			
WMTA25	3" 1/2	3" 1/2	2" 1/8	6" 5/8	8" 3/8	6" 5/8	7/8"	1/2" NPT	1/2" DN	11			
WMTA37	4"	3" 7/8	2" 3/8	6" 3/4	8" 5/8	6" 5/8	1"	3/4" NPT	3/4" DN	14			



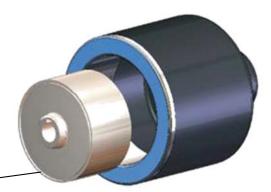
	PUMP MODEL	0191	OVERALL DIMENSIONS (Inches)											WEIGHT
		Н	L	М	Ν	0	Р	Q	R	S	Т	TRD	FLG	Lbs.
	WMTA49	5" 3/8	4" 3/8	2" 5/8	6" 1/8	4" 3/8	7" 7/8	7" 1/2	2" 3/4	9" 5/8	7" 1/2	1" NPT	1" DN	32
	WMTA 78 WMTA1011	6" 7/8	5" 1/4	3" 3/8	8" 5/8	5" 1/4	9" 7/8	9" 7/8	2" 1/4	11" 1/8	9"	1" NPT	1" DN	42

WMTA-LN Features



Epoxy primer and polyacrylic enamel water-based painting for optimal chemical resistance, yet environmentally friendly

Hastelloy®-C276 or Titanium-G5 isolation shell material - providing a safe and efficient solution – system pressure max 100 BAR



High torque synchronous rare earth magnetic coupling

The high performance magnets can be operated at liquid temperatures of up to 600°F (315°C) without external cooling



Confined casing O-rings prevents product leakage to atmosphere – different materials available:

- PTFE
- Buna
- Viton
- Kalrez

Field servicing of the lubricated bearings does not require special tools

The bearing materials are available in three different materials to match each application: Silicon Carbide (SIC), Tungsten Carbide (TC), Carbon to allow intermittent dry running



Series WMCA ISO-2858 / API-685 **Process Centrifugal**

(medium to high flows)

Compressor Circulation Pumps: Low Heat Load Seal-less Centrifugal

Series WMCA- ISO-2858 mag-drive centrifugal pumps are engineered for long-life, zero emissions pumping in the most arduous process conditions. Low heat induction avoids costly down-time and repairs due to flashing, in ammonia, CO2, refrigerants and hot oil systems.



ACKETED BEARINGS SUPPORT JACKETED CASING JACKETED BRACKET

ISO 8x6x13 High Capacity Refrigeration System @ -50° F

WMCA Features

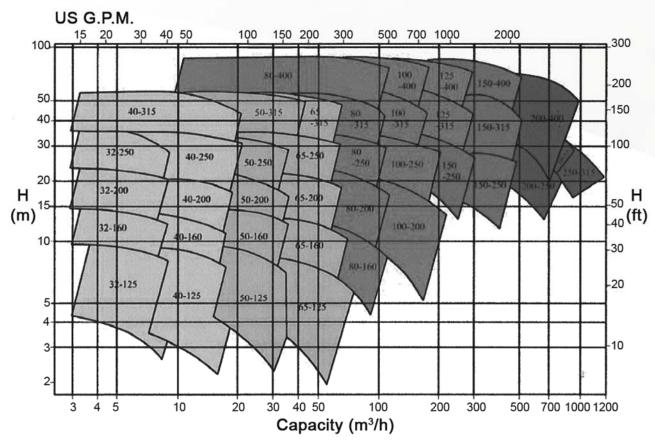
- Seal-less design free of mechanical seal maintenance
- Low heat load avoids flashing
- Magnetic coupling design for process & inventory flexibility
- Standard NEMA motors meet UL and EXP requirements

WMCA Performance Range

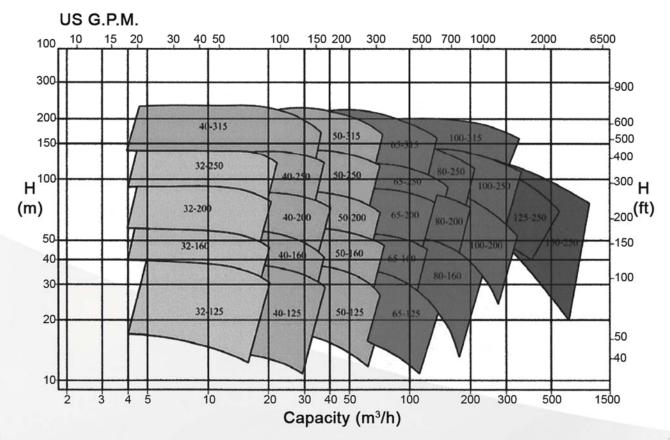
- Flows from 8 to 4500 gpm (2-1000 m3/h)
- Heads to 650 feet (200 m)
- System Pressures to 1,450 psig (100 bar)
- Temperatures from -139 to +600°F (-95 to +315°C)



Composite Curves 1800 RPM (60Hz)



Composite Curves 3600 RPM (60Hz)



Epoxy primer and polyacrylic enamel water based paint system for a corrosion resistant coating, yet environmentally friendly.

Close coupled and bearing

pedestal drive assemblies

Field assembling of the product lubricated bearing arrangement does not require special tools. The bearing materials available in three different materials to provide the best solution for each application: Silicon Carbide (SSIC), Tungsten Carbide (TC) and Carbon.

The use of tolerance rings reduces the sleeve and thrust bearing loads to guarantee many years of maintenance-free operation.

> CF8M pump casing & impeller High quality casting components

Other materials : Hastelloy C276, Incoloy825, Duplex, Titanium, or others available on request

> REAR CARTRIDGE KIT For quick retrofits

Closed impeller statically and dynamically balanced. The axial thrust loads are balanced by back vanes.

High strength, synchronous magnetic couplings, are free of epoxy or potting materials, and fitted with samarium cobalt rare earth magnets. The high performance magnets can be operated at liquid temperatures up to 662 °F (350 °C) without external cooling. Power capability exceeds 700 HP / 520 kW. Confined casing gaskets prevent leakage to the atmosphere – optional materials available:

- PTFE

- Graphoil type
- Garlock type
- Gylon type
- Flexitallic type

Table of Sizes and Specifications (DIN / ISO2858)

MODEL ISO 2858	MODEL DIN 24256	Shaft Range	Suction Flange ANSI 150#	Discharge Flange ANSI 150#	Impeller Inches
WMCA 2x1.25x5	32-125	24 – 1st	2"	1 1/4"	5"
WMCA 2.5x2x5	50-125	24 – 1st	2 1/2"	2"	5"
WMCA 3x2.5x5	65-125	24 – 1st	3"	2 1/2"	5"
WMCA 4x3x5	n.a.	24 – 1st	4"	3"	5"
WMCA 2x1.25x6	32-160	24 – 1st	2"	1 1/4"	6"
WMCA 2.5x2x6	50-160	24 – 1st	2 1/2"	2"	6"
WMCA 3x2.5x6	65-160	24 – 1st	3"	2 1/2"	6"
WMCA 4x3x6	80-160	32 – 2nd	4"	3"	6"
WMCA 5x3x6	n.a.	32 – 2nd	5"	3"	6"
WMCA 2x1.25x8	32-200	24 – 1st	2"	1 1/4"	8"
WMCA 2.5x1.5x8	40-200	24 – 1st	2 1/2"	1 1/2"	8"
WMCA 3x2x8	50-200	24 – 1st	3"	2"	8"
WMCA 4x2.5x8	65-200	32 – 2nd	4"	2 1/2"	8"
WMCA 5x3x8	80-200	32 – 2nd	5"	3"	8"
WMCA 5x4x8	100-200	32 – 2nd	5"	4"	8"
WMCA 2x1.25x10	32-250	32 – 2nd	2"	1 1/4"	10"
WMCA 2.5x1.5x10	40-250	32 – 2nd	2 1/2"	1 1/2"	10"
WMCA 3x2x10	50-250	32 – 2nd	3"	2"	10"
WMCA 4x2.5x10	65-250	32 – 2nd	4"	2 1/2"	10"
WMCA 5x3x10	n.a.	32 – 2nd	5"	3"	10"
WMCA 2.5x1.5x13	40-315	32 – 2nd	2 1/2"	1 1/2"	13"
WMCA 3x2x13	50-315	32 – 2nd	3"	2"	13"

WMCA Conditions and Specifications

Max. Flow	1000 gpm
Max. Head	650 Feet
Max. Allowable Working Pressure	40 BAR/ 600 PSI Standard
Max. Allowable Working Pressure	100 BAR/ 1450 PSI Built-to-Spec
Specific Gravity	0.15 - 2.0
Max. Viscosity	400 cP
Liquid Temperature Range	-139 °F to +600 °F
Pump Material	Carbon Steel, Duplex, 316SS
Motor Horsepower Range	2 - 200 HP

Centrifugal Flow Ratings

The accepted guideline for centrifugal pumps is 10% to the right of BEP (Best Efficiency Point) and 20% to the left. This ensures optimal hydraulic efficiencies and prevents runout and high head cavitation. Recirculation frictional heat of process liquid within centrifugal pumps operating below minimum stable flows can lead to high head cavitation from the energy that is imparted into the liquid.



Series SR Close-Coupled Centrifugal

(low to medium flows)

Compressor Circulation or Transfer: Versatile Seal-less Centrifugal

SR Performance Range

- Flows from 2 to 150 gpm (.5 34 m3/h)
- Heads to 115 feet (35 m)
- System Pressures to 720 psig (50 bar)
- Temperatures from -148 to +450°F (-100 to +232°C)

Series SR compact mag-drive centrifugal pumps meet low flow requirements with comparable features of the WMCA design.



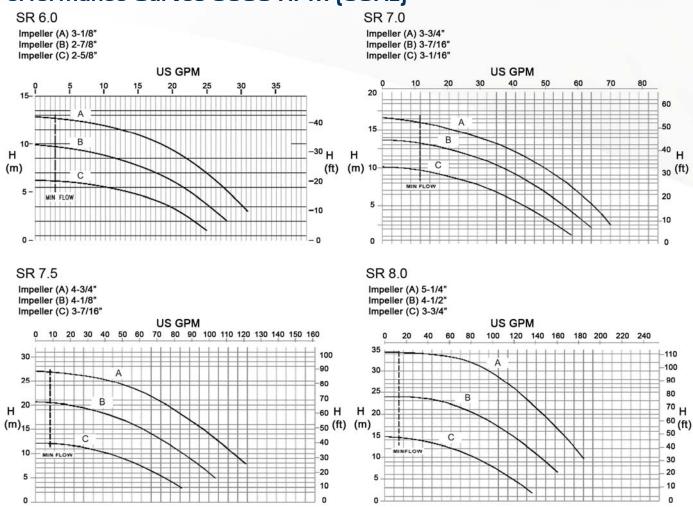
Table of Sizes and Specifications

PUMP MODEL	Port Size (NPT or Flanged)	*MAX GPM	*MAX TDH	HP	Frame
SR6.0	1"x3/4"	30	40	0.5	56C
SR7.0	1-1/2" x1"	65	52	1.5	56C or 143/5TC
SR7.5	1-1/2" x1-1/4"	110	90	2-3	143/5TC
SR8.0	2" x 1-1/2"	170	110	5-7.5	182/4TC

Standard SR Wetted Materials: 316L-SS front casing, impeller and rear casing, PTFE-C or Carbon sleeve and thrust bearings, single confined o-ring.

- Note: Maximum condition stated references open pumping capacity and maximum head at the limits of the curve.
- * depending on operating temperature

Performance Curves 3600 RPM (60Hz)



Series MPA Rotary Vane (low flows - high pressure)



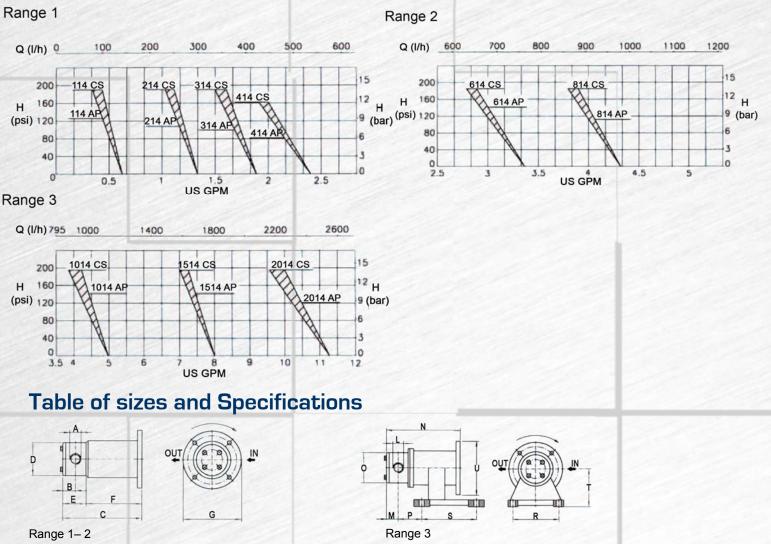
MPA Features

- Seal-less magnetic coupling eliminates seals or packing glands
- No metal to metal contact for extended MTBF
- Capable of differential pressures up to 200 psig
- Self-priming up to 13 feet of dry lift, runs dry without damage

MPA Performance Range

- Flows from 0.1 to 11 gpm (22 to 2500 l/h) Range 1° from 0.1 to 2.2 gpm Range 2° from 2.2 to 5 gpm Range 3° from 5 to 11 gpm
- Heads to 200 psig (12 bar)
- System Pressures to 600 psig (40 bar)
- Temperatures to 450°F (232°C)

MPA Performance Curves 1800 RPM (60Hz)



PUMP	1		WEIGHT					
MODEL	Α	В	С	D	E	F	G	Lbs.
Range 1 AP-CS 114 - 214 - 314 - 414	3/8" NPT	1"	6"	2" 3/4	1" 7/8	4" 1/8	6" 1/2	7
Range 2 AP-CS 614 - 814	1/2" NPT	1" 3/8	8"	3" 3/4	2" 5/8	5" 1/2	6" 1/2	12

PUMP	OVERALL DIMENSIONS (Inches)									WEIGHT
MODEL	L	М	Ν	0	Р	U	R	S	Т	Lbs.
Range 3 AP-CS 1014 - 1514 - 2014	3/4" NPT	1" 7/8	10"	4" 7/8	3" 1/2	7" 7/8	6" 1/8	7" 1/2	4" 1/2	28



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