

# ARO®

## DIAPHRAGM AND PISTON PUMPS

PRODUCTS OVERVIEW AND APPLICATIONS





## **ARO® - We make Success Flow**

ARO is a leading worldwide manufacturer of fluid management products that are expertly engineered to deliver performance and serviceability, allowing success to flow freely in our customers' businesses. That's why ARO is fluid intelligence—the smart choice in fluid management products for industrial operations.

With an 85-year legacy of premier product performance and service excellence, ARO provides fluid management equipment for customers and industries around the globe, including chemical, manufacturing, energy, pharmaceutical, mining and more.

ARO has the right product to meet our customers' specific needs. We offer air-operated diaphragm pumps, piston pumps and packages, filters, regulators, and lubricators (FRLs), lubrication equipment, and pneumatic valves and cylinders.

## **Product and Technical Support**

Every ARO product is backed by an expert team of trusted advisors dedicated to designing products that promote success around the world. Because ARO products are built to be as simple as they are smart, customers benefit from efficient operation and high performance for the best total cost of ownership.

**At ARO, we make success flow.**



# The Heart of your Process

Ingersoll Rand / ARO offers a wide range of Fluid Technologies for today's demanding industries and applications.

- ✓ Bulk material transfer and circulation
- ✓ Dispensing
- ✓ Filling
- ✓ Finishing
- ✓ Formulation
- ✓ High-pressure cleaning
- ✓ Lubrication
- ✓ Packaging
- ✓ Printing flexo/offset

## Industries

Aerospace

Automotive

Ceramic

Chemical Processing

Machine Builders – Formulation

Mining and Construction

Oil / Gas Petrochemical

Paint and Finishing

Pharmaceutical and Cosmetics

Print Shop and Ink Manufacture

Shipbuilding and Marine



# ARO® Diaphragm Pumps

ARO Air Operated Diaphragm Pumps are designed for general use. They can easily pump from clean, light viscosity fluids to corrosive, abrasive medium viscosity fluids and can transfer large particles without damage. Due to their pneumatic motor, they can be used in potentially explosive areas. Most of the ARO Diaphragm Pumps are ATEX certified (CE ExII 2GD X).

## Highly flexible

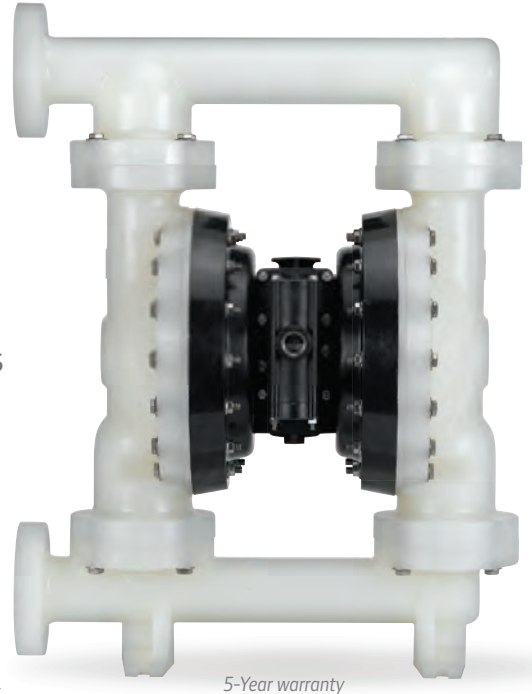
ARO diaphragm pumps offer the ability to vary the flow outlet and discharge pressure as slow as one litre (gallon) per minute up to 1040 litres (275 gal) per minute for our larger sizes and adjust fluid pressure up to 8.6 bars (125 psi), with just using an air filter/regulator or a needle valve.

## Self-priming

These pumps are self-priming up to an elevation of 8.3 m (27.2 feet) with water and can operate dry without any damage. If the fluid outlet is closed, the pump stops; it restarts with the reopening of the fluid circuit; no pressure relief valve or bypass is necessary.

## Wide range of material configurations

The ARO range of diaphragm pumps offers many materials of construction ideal for the chemical industry: our metallic offering consists of aluminium, cast iron, stainless steel and Hastelloy. Our non-metallic offering consists of polypropylene, acetal and PVDF.



5-Year warranty

## ARO® Diaphragm Pumps Range and Applications

### Compact Pumps, 1/4" to 3/4" ports

Ideal for OEM and general industrial applications, these pumps feature big performance in a small package. Flow rates up to 56 l/min (15 gal) with a large range of material configurations.

### EXP Series Pumps, 1" to 3" ports

ARO's Process Grade, Expert Series Pumps feature the best total cost of ownership compared to some of our leading competitors. A favorite among process professionals with flow rates up to 1040 l/min (275 gal) and a large range of material configurations.

### Pro Series Pumps, 1" to 3" ports

ARO's Industrial Grade, Pro-Series Diaphragm Pumps provide high performance and stall-free reliability with flow rates up to 897 l/min (237 gal).

### Specialty Application Pumps

Pumps providing the same high level of performance and satisfaction but in a design tailored for your specific application. This range includes many specific models (see details pages 8 and 9).





**Productivity:** Maximized flow rates + Minimized pulsation and air consumption = Maximum Performance.



**Versatility:** Multiple porting options available along with interface options allow you to customize this pump specifically to your OEM application.



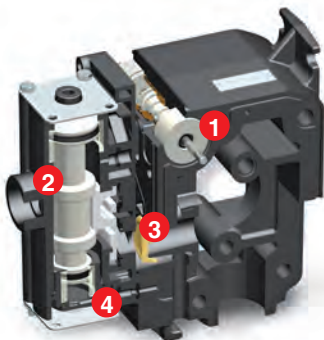
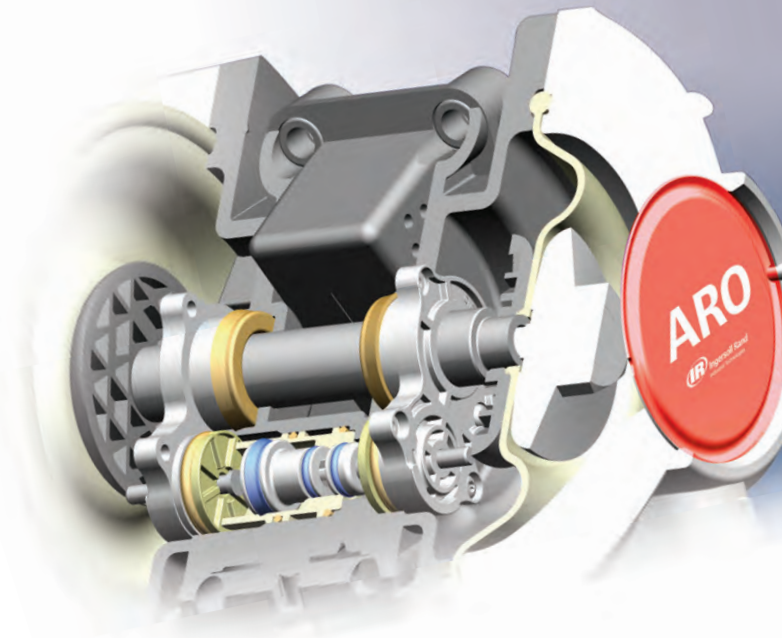
**Reliability:** Lube free patented differential valve both on major air valve and SimulShift™ (pilot valve) provides reliable worry free operation – fluid on demand every time.



**Environmentally Sound:** Bolted construction in conjunction with a wide range of material options provides maximum chemical and leak resistance.



**Serviceability:** Modular construction, reduced parts count and simple to use repair kits minimize repair time and cost.



### Patented ARO® Air Motor Technology

- 1 SimulShift™ Valve; avoids stall-out – provides faster pump trip-over with more flow.
- 2 “Unbalanced” Major Air Valve; eliminates pump stall-out, even under low air inlet pressures.
- 3 “D” Valve for optimum energy efficiency while avoiding costly air “blow-by” – ceramic construction for long service life.
- 4 Quick Dump™ Checks, eliminates pump ice-up by diverting cold, wet exhaust air away from the major air valve.

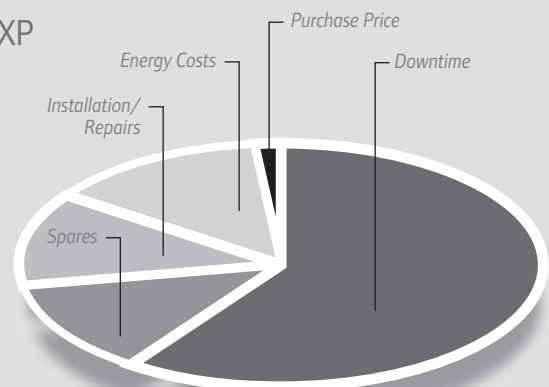
## ARO® Diaphragm Pumps: the best “total cost of ownership” in the industry

**Energy Efficient:** ARO EXP pumps are 20% to 40% more efficient than competitive models.

**Downtime Reduction:** The mean time between failure for EXP is up to four-times longer than competitive pumps.

**Installation/Repairs and Spare Parts:** EXP diaphragms provide up to four-times the life of competitive diaphragms. EXP spares include cost-effective service kits, not the expensive full-motor replacements of some competitors.

**EXP Total Value Proposition:** EXP provides the best total cost of ownership compared to some of our leading competitors.



# ARO® Diaphragm Pumps



## Non-Metallic Models – Range and Performance



	EXPERT Series	EXPERT Series	EXPERT Series	EXPERT Series	PRO Series	EXPERT Series	PRO Series	EXPERT Series	PRO Series	EXPERT Series
	1/4"	3/8"	1/2"	3/4"	1"	1"	1 1/2"	1 1/2"	2"	2"
1 min. 	20 l/min (5.3gal)	40.1 l/min (10.6gal)	54.5 l/min (14.4gal)	56 l/min (14.8gal)	178 l/min (47gal)	200 l/min (53gal)	378 l/min (100gal)	465 l/min (123gal)	549 l/min (145gal)	696 l/min (184gal)
Max. 	8.6 bar (125 psi)	6.9 bar (100 psi)	6.9 bar (100 psi)	6.9 bar (100 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)
	1/4" NPT 1/4" BSP	3/8" NPT 3/8" BSP	1/2" NPT 1/2" BSP	3/4" NPT 3/4" BSP	1" NPT 1" BSP 1" ANSI / DIN	1" NPT 1" BSP 1" ANSI / DIN	1 1/2" ANSI / DIN	1 1/2" ANSI / DIN	2" ANSI / DIN	2" ANSI / DIN
	1/4" NPT 1/4" BSP	3/8" NPT 3/8" BSP	1/2" NPT 1/2" BSP	3/4" NPT 3/4" BSP	1" NPT 1" BSP 1" ANSI / DIN	1" NPT 1" BSP 1" ANSI / DIN	1 1/2" ANSI / DIN	1 1/2" ANSI / DIN	2" ANSI / DIN	2" ANSI / DIN
Matériel	Polypropylene PVDF Groundable acetal	Polypropylene PVDF Groundable acetal	Polypropylene PVDF Groundable acetal	Polypropylene	Polypropylene PVDF PVDF	Polypropylene PVDF Conductive polypropylene	Polypropylene PVDF	Polypropylene PVDF Conductive polypropylene	Polypropylene PVDF	Polypropylene PVDF Conductive polypropylene
Max. 	1.6 mm (.06in)	1.6 mm (.06in)	2.4 mm (.09in)	2.4 mm (.09in)	3.2 mm (.12in)	3.2 mm (.12in)	6.4 mm (.25in)	6.4 mm (.25in)	6.4 mm (.25in)	6.4 mm (.25in)
 ATEX certified	With wetted parts in groundable acetal.	With wetted parts in groundable acetal.	With wetted parts in groundable acetal.	—	—	With conductive polypropylene motor	—	With conductive polypropylene motor	—	With conductive polypropylene motor



## Metallic Models – Range and Performance



**EXPERT  
Series**

**EXPERT  
Series**

**PRO  
Series**

**EXPERT  
Series**

**PRO  
Series**

**EXPERT  
Series**

**PRO  
Series**

**EXPERT  
Series**

**PRO  
Series**

**EXPERT  
Series**

1/2"	3/4"	1"	1"	1 1/2"	1 1/2"	2"	2"	3"	3"
<b>45.4 l/min (12gal)</b>	<b>51.5 l/min (13.6gal)</b>	<b>133 l/min (35gal)</b>	<b>197 l/min (52gal)</b>	<b>340 l/min (90gal)</b>	<b>465 l/min (123gal)</b>	<b>651 l/min (172gal)</b>	<b>651 l/min (172gal)</b>	<b>897 l/min (237gal)</b>	<b>1041 l/min (275gal)</b>
6.9 bar (100 psi)	6.9 bar (100 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)	8.3 bar (120 psi)
1/2" NPT	3/4" NPT	1" NPT	1" NPT	1 1/2" NPT	1 1/2" NPT 1 1/2" BSP	2" NPT	2" NPT 2" BSP	3" NPT	3" NPT
1/2" BSP	3/4" BSP	1" BSP	1" BSP	1 1/2" BSP	1 1/2" ANSI/DIN	2" BSP	2" ANSI/DIN	3" BSP	3" BSP
1/2" NPT	3/4" NPT	1" NPT	1" NPT	1 1/2" NPT	1 1/2" NPT 1 1/2" BSP	2" NPT	2" NPT 2" BSP	3" NPT	3" NPT
1/2" BSP	3/4" BSP	1" BSP	1" BSP	1 1/2" BSP	1 1/2" ANSI/DIN	2" BSP	2" ANSI/DIN	3" BSP	3" BSP
Aluminium	Aluminium	Aluminium	Aluminium	Aluminium	Aluminium	Aluminium	Aluminium	Aluminium	Aluminium
			Cast iron		Cast iron		Cast iron		Cast iron
Stainless steel		Cast iron	Stainless steel	Cast iron	Stainless steel	Cast iron	Stainless steel	Cast iron	Stainless steel
		Stainless steel	Hastelloy	Stainless steel	Hastelloy	Stainless steel	Hastelloy	Stainless steel	Hastelloy
2.4 mm (.09in)	2.4 mm (.09in)	3.2 mm (.12in)	3.3 mm (.12in)	6.4 mm (.25in)	6.4 mm (.25in)	6.4 mm (.25in)	6.4 mm (.25in)	9.5 mm (.37in)	9.5 mm (.37in)
All models	All models	All models	With aluminium or stainless steel motor	All models	With aluminium or stainless steel motor	All models	With aluminium or stainless steel motor	All models	With aluminium or stainless steel motor

# ARO® Diaphragm Pumps



## Specialty Models – Range and Performance



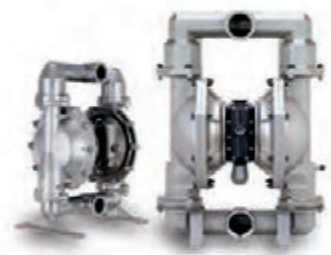
**PP  
Series**



**PM  
Series**



**Pit Boss  
Series**



**PH  
Series**

	Powder Pumps		Sanitary Pumps					Dewatering Pumps			High Pressure Pumps			
<b>?:1</b>	1:1		1:1					1:1			3:1	2:1	2:1	2:1
<b>Ø</b>	2"	3"	1/2"	1"	1 1/2"	2"	3"	1 1/2"	2"	3"	1"	1 1/2"	2"	3"
<b>1 min.</b> 	Max. powder density = 800 kg/m <sup>3</sup> (45 lbs/cu ft)		49.2 l/min (12.9 gal)	198 l/min (52.3 gal)	465 l/min (123 gal)	651 l/min (172 gal)	1041 l/min (275 gal)	302.8 l/min (80 gal)	590.5 l/min (156 gal)	821.3 l/min (217 gal)	50 l/min (13.2 gal)	238 l/min (63 gal)	348 l/min (92 gal)	605 l/min (160 gal)
<b>Max.</b> 	6.9 bar (100 psi)		6.9 bar (100 psi)	8.3 bar (120 psi)				8.3 bar (120 psi)			6.9 bar (100 psi)			
	2" NPT 2" BSP	3" NPT 3" BSP	1 1/2" Tri-clamp		2" Tri-clamp	2 1/2" Tri-clamp	3" Tri-clamp	1 1/2" BSP	2" BSP	3" BSP	1" NPT 1" BSP	1 1/2" NPT 1 1/2" BSP 1 1/2" ANSI DIN	2" NPT 2" BSP 2" ANSI DIN	3" NPT 3" BSP
<b>Matériel</b>	Aluminium Stainless steel		FDA accepted material					Aluminium			Stainless steel			
<b>Max.</b> 	6.4 mm (.25)	9.5 mm (.37)	2.4 mm (.09)	3.3 mm (.12)	6.4 mm (.25)	6.5 mm (.25)	9.5 mm (.37)	12.7 mm (.50)	19.1 mm (.75)	25.4 mm (1.0)	3.2 mm (.25)	6.4 mm (.25)	6.4 mm (.25)	9.5 mm (.37)
	All models		All models	With aluminium or stainless steel motor				All models			All models			



# ARO® Diaphragm Pump Applications

Here are some examples. Other application pictures are presented on page 14.



**PF Series**

**DAB05 Series**

**P Series**

Flap Valve Pumps	Drum Pumps		Submersible Pumps	
1:1	1:1	1:1	—	—
2"	1/2"		2 1/2"	2"
651 l/min (172 gal)	45.4 l/min (12 gal)	54.5 l/min (14.4 gal)	757 l/min (200 gal)	870 l/min (230 gal)
8.3 bar (120 psi)	6.9 bar (100 psi)		6.2 bar (90 psi)	
2" NPT 2" BSP	Siphon tube		Screened inlet	
Aluminium Cast iron Stainless steel	Aluminium Stainless steel	Polypropylene	Cast iron	
51mm (2.0) (semi-solids)	2.4 mm (.09)	2.4 mm (.09)	6.4 mm (.25)	6.4 mm (.25)
With aluminium or stainless steel motor	With aluminium motor	—	—	—



1 1/2" diaphragm pump installed in a chemical process to transfer chloride methylene



2" stainless steel diaphragm pumps assembled with PVDF pulsation dampeners used to download hydrofluoric acid



UL approved fuel pump 1" size, used assembled on skid dedicated in the aviation to fill and unload kerosene



3" diaphragm pumps mounted on a skid to transfer clay in a ceramic manufacture



3" sanitary pump used to transfer cosmetic basis for shampoos

# ARO® Piston Pumps

ARO piston pumps provide industry proven dependability, economy and precision control for the delivery of a wide range of flowable materials. Whether you are moving a small amount of low viscosity fluid a few feet or a large amount of high viscosity material a longer distance, ARO has a pump to meet your application needs.

## Simply reliable and safe air motor

At the heart of ARO-Force piston pumps are superior air motors, featuring our proprietary AFX technology. With only five moving parts, our air motors are truly advanced yet simple. No other air motor out there delivers the precise performance, flexibility, and simplicity of an AFX air motor.

- Minimized failure risk due to fewer moving parts
- True Link Valve™ virtually eliminates pulse profile.
- No springs to fail due to fatigue or corrosion.
- Requires no lubrication and no lubricator installation.
- Backed by a 5-year warranty.

We incorporated important features to make our AFX air motors safe (dump pressure manually, groundable / ATEX-compliant, standard muffler).

## Superior performance with abrasive fluids

- Plunger rods and cylinder tubes feature the exclusive ARO ceramic ultra-coating, extending service life up to twice as long.
- Chrome-plated stainless steel plungers for superior resistance to rust and corrosion.
- Eight packing options are available, including ultra-high molecular weight polyethylene (UHMW-PE), for even better material compatibility and maximum abrasion resistance.



## Application Package: The right package for your application

Most applications require more than just a pump. ARO offers a wide range of transfer, extrusion, and finishing packages that not only enhance your productivity, but also simplify the ordering process. We provide you with the right configuration of air motor, piston pump, mount, follower, controls, and downstream accessories.

### FINISHING, COATINGS, SEALANTS, INKS & ADHESIVES



#### Two-post Ram Packages

Features a two-post ram, pump, follower plate and controls designed for high viscosity applications.



#### Single-post Ram Packages

Single-post ram with pump, follower plate, and controls for medium to heavy viscosity extrusion.



#### Airless Spray Pump Packages

Popular in airless spray applications, these packages are delivered with air control, material filter, and suction hose.



#### Cart-mounted Pump Packages

When portability is required for light- to medium-viscosity (less than 50K cPs) extrusion.



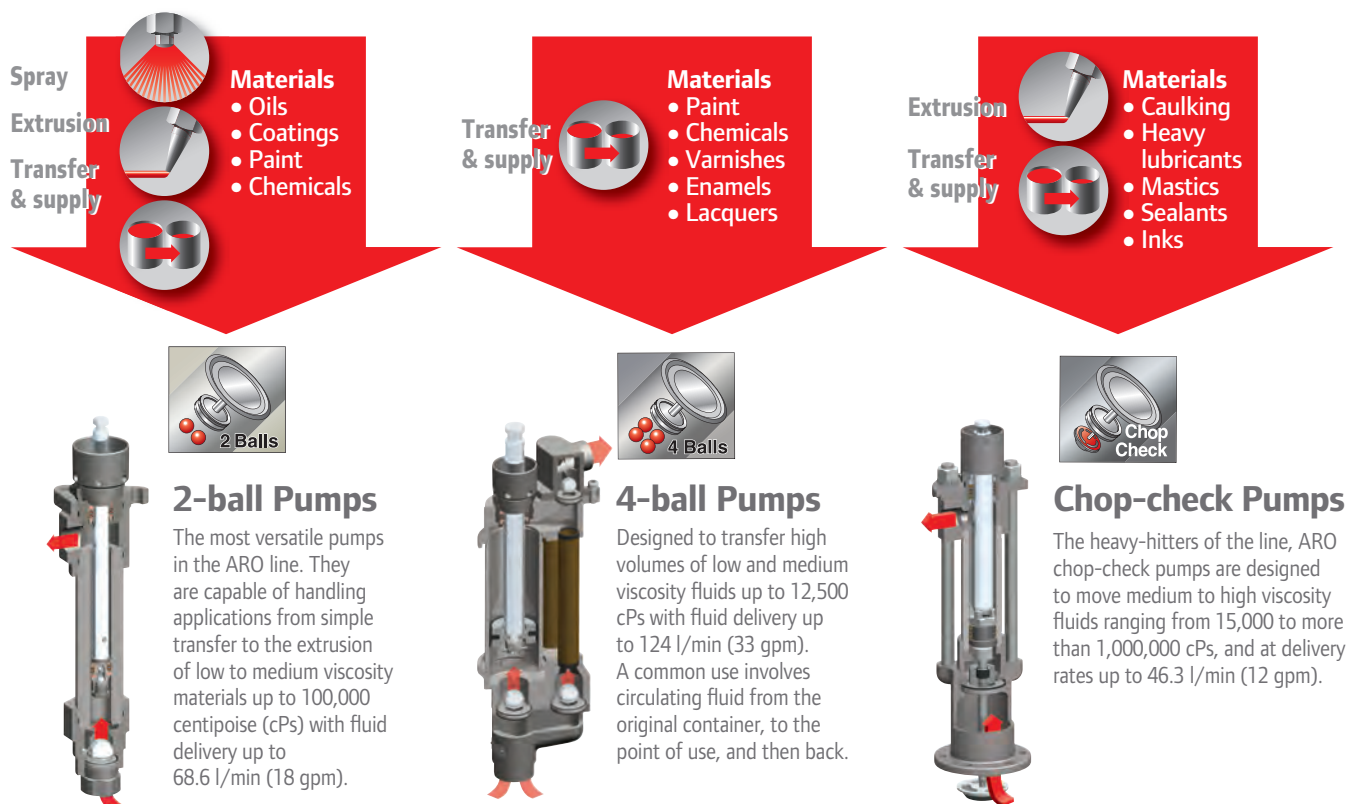
#### Agitator Lift Packages

Ideal for finishing and adhesive applications where you need to keep fluid mixed.

## ARO® Piston Pump Types and Applications

**Transfer:** Involves moving a low-to-medium viscosity fluid. 2-ball and 4-ball pumps are most frequently used in transfer applications.

**Extrusion:** Involves using a Piston Pump to apply medium-to-high viscosity materials. Typical extrusion applications require accessories like rams and fluid regulators. Chop-Check and 2-ball pumps are used in extrusion applications.



### LUBRICATION



#### Lubrication Packages

The ARO line of lubrication pumps for the transfer and supply of oil and grease – Fitted with drum cover, or with bung adaptor to thread into the container.

### BULK MATERIAL TRANSFER / CIRCULATION



#### Floor Mount Packages

Ideal for fluid transfer from tanks and piping systems.

#### Wall Mount Packages

The compact design of our piston pumps make them ideal for mounting on walls or appropriate structures.

### HIGH PRESSURE CLEANING



#### Wash Pump Packages

When it is time to clean up, our wash pump is a great high-power cleaning solution.



# ARO® Piston Pumps



2 Balls



4 Balls



Chop Check

## Range and Performance

2-ball  
Piston Pumps



### 2-ball Piston Pumps





?:1	1 min. 	Max. bar 			Matériel	Motor Dia.
1:1	18 l/min (4.7 gal)	10 (145)	Immersed	3/4"	Carbon steel	2"
2:1	8.1 l/min (2.1 gal)	21 (305)	1 1/4" or immersed	3/4"	Carbon steel or stainless steel	2"
4:1	8 l/min (2.1 gal)	41 (595)	1 1/4" or immersed	3/4"	Carbon steel or stainless steel	3"
9:1	10.5 l/min (2.7 gal)	90 (1305)	1 1/2" or immersed	3/4"	Carbon steel	4 1/4"
9:1	10.8 l/min (2.8 gal)	90 (1305)	1 1/4" NPT	3/4"	Stainless steel	4 1/4"
10:1	58.9 l/min (15.5 gal)	80 (1160)	2" NPT	1 1/4"	Stainless steel	8"
11:1	14 l/min (37.2 gal)	120	1" NPT	1"	Stainless steel	4 1/4"
15:1	68.6 l/min (18.1 gal)	90 (1305)	2" NPT	1 1/4"	Stainless steel	10"
18:1	2.3 l/min (.60 gal)	185	1/2" NPT	1/4"	Stainless steel	3"
22:1	7.3 l/min (1.9 gal)	235	1" NPT	1"	Stainless steel	4 1/4"
23:1	14.3 l/min (3.7 gal)	240	1" NPT	1"	Stainless steel	6"
23:1	68.6 l/min (18.1 gal)	140 (230)	2" NPT	1 1/4"	Stainless steel	12"
28:1	1.4 l/min (.36 gal)	288	1/2" NPT	1/4"	Stainless steel	3"
28:1	23.7 l/min (6.2 gal)	230	2" NPT	1"	Stainless steel	8"
30:1	4.9 l/min (1.2 gal)	320	1" NPT	1"	Stainless steel	4 1/4"
40:1	14 l/min (3.6 gal)	340	1" NPT	1"	Stainless steel	8"
45:1	7.3 l/min (1.9 gal)	375	1" NPT	1"	Stainless steel	6"
45:1	23.7 l/min (6.2 gal)	280	2" NPT	1"	Carbon steel	10"
60:1	5.4 l/min (1.4 gal)	425	1" NPT	1"	Stainless steel	6"
65:1	23.7 l/min (6.2 gal)	400	2" NPT	1"	Carbon steel	12"

4-ball Piston Pumps







Chop-Check Pumps

## 4-ball Piston Pumps

?:1	1 min. 	 Max. bar			Matériel	Motor Dia.
2:1	80.6 l/min (21.2 gal)	21 (305)	1 1/2" NPT	1"	Stainless steel	4 1/4"
3:1	110.8 l/min (29.2 gal)	31 (450)	1 1/2" NPT	1"	Stainless steel	6"
4:1	80.6 l/min (21.2 gal)	45 (652)	1 1/2" NPT	1"	Stainless steel	6"
5:1	124 l/min (32.7 gal)	48 (696)	1 1/2" NPT	1"	Stainless steel	8"
7:1	88.8 l/min (23.4 gal)	70 (1015)	1 1/2" NPT	1"	Stainless steel	8"

## Chop-Check Piston Pumps

?:1	1 min. 	 Max. bar			Matériel	Motor Dia.
12:1	12.3 l/min (3.2 gal)	144	Flange mount	1"	Carbon steel	4 1/4"
13:1	46.3 l/min (12.2 gal)	130	Flange mount	1 1/2"	Carbon steel	8"
20:1	39.7 l/min (10.4 gal)	155	Flange mount	1 1/2"	Carbon steel	10"
22:1	1.9 l/min (.50 gal)	225	Follower plate or immersed	3/4"	Carbon steel or stainless steel	3"
23:1	6.9 l/min (1.8 gal)	254	Flange mount	1"	Carbon steel	4 1/4"
23:1	12.3 l/min (3.2 gal)	290	Flange mount	1"	Carbon steel	6"
28:1	22.7 l/min (5.9 gal)	230	Flange mount	1 1/4"	Carbon steel	8"
30:1	46.3 l/min (12.2 gal)	220	Flange mount	1 1/2"	Carbon steel	12"
43:1	2.8 l/min (.73 gal)	450	Follower plate	1/2"	Carbon steel or stainless steel	4 1/4"
44:1	14.3 l/min (3.7 gal)	410	Flange mount	1"	Carbon steel	8"
44:1	22.9 l/min (6.0 gal)	270	Flange mount	1 1/4"	Carbon steel	10"
46:1	6.9 l/min (1.8 gal)	515	Flange mount	1"	Carbon steel	6"
65:1	5.1 l/min (1.3 gal)	515	Flange mount	3/4"	Carbon steel	6"
65:1	22.9 l/min (6.0 gal)	400	Flange mount	1 1/4"	Carbon steel	12"

# Overview of ARO® Pump Applications

## Diaphragm Pumps Applications



*1/2" diaphragm pumps assembled in an ink formulation system*



*1/2" diaphragm pumps installed in a coloring process*



*1 1/2" aluminium diaphragm pumps installed to feed a chemical reactor*



*3" stainless steel diaphragm pumps installed on a bulk transfer process*

## Piston Pumps Applications



*2-ball piston pumps 4:1 ratio, used in a painting process manufacturing*



*2-ball piston pumps, 11:1 ratio, used in a painting circulating system*



*2-ball piston pump 9:1 ratio, used in a customized lubrication process*



*Large extrusion piston pumps, 13:1 ratio, installed on an offset ink formulation system process*



*Extrusion pumps 23:1 ratio, used in a multi component skids to transfer silicon*



*4-ball piston pumps, 4:1 ratio, installed on a paint formulation system process*



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