Estudio de Fluidos
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ARO

Diaphragm & Piston Pumps

Products Overview & Applications

Ingersoll Rand
Industrial Technologies

The pump professionals

Leader in pneumatic pumps, ARO offers a wide range of diaphragms and piston pumps for low to high viscosity fluids.
The ARO pumps benefit from 80 years experience, making them highly reliable and rugged for use in the chemical, process industries and any other difficult environment (explosive, dusty, wetted and heated atmosphere).

Engineering

We consistently deliver best-in class technologies designed by highly skilled engineers who know how you work. We consult with you to identify your needs and customise solutions to best fit them.

Technical Support

No matter what your application or location happens to be, if you have questions or need assistance, our professional, experienced technical support personnel are merely a phone call or e-mail away.

Logistics

With our global manufacturing and distribution network, you're guaranteed to have quick access to the equipment, parts or accessories you need to keep your operation running smoothly.

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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 Ex11 2GD X).

Highly flexible

ARO diaphragm pumps offer the ability to vary to flow outlet and discharge pressure as slow as one litre per minute up to 1040 litres per minute for our larger sizes and adjust fluid pressure up to 8,5 bars, with just using an air filter / regulator and a needle valve.

Self-priming

These pumps are self-priming up to an elevation of 8.3m (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 material of construction compatible 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.

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 with a large range of material configurations.

EXP Series Pumps, 1" to 3" ports

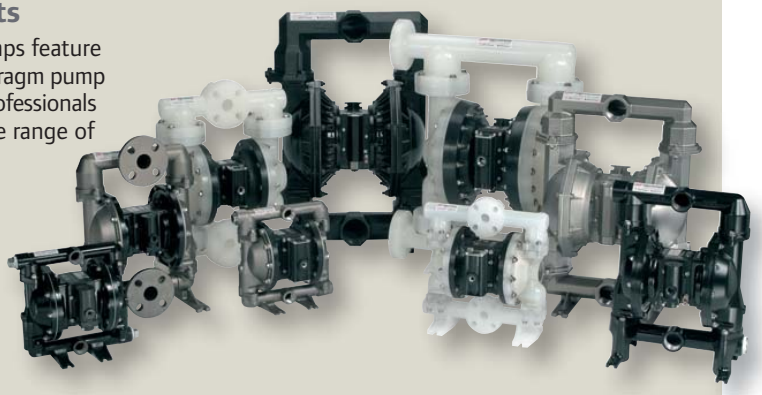
ARO's PROCESS GRADE, Expert Series Pumps feature the best total cost of ownership of any diaphragm pump on the market. A favourite among process professionals with flow rates up to 1041 l/min and a large range of material configurations.

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.

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).



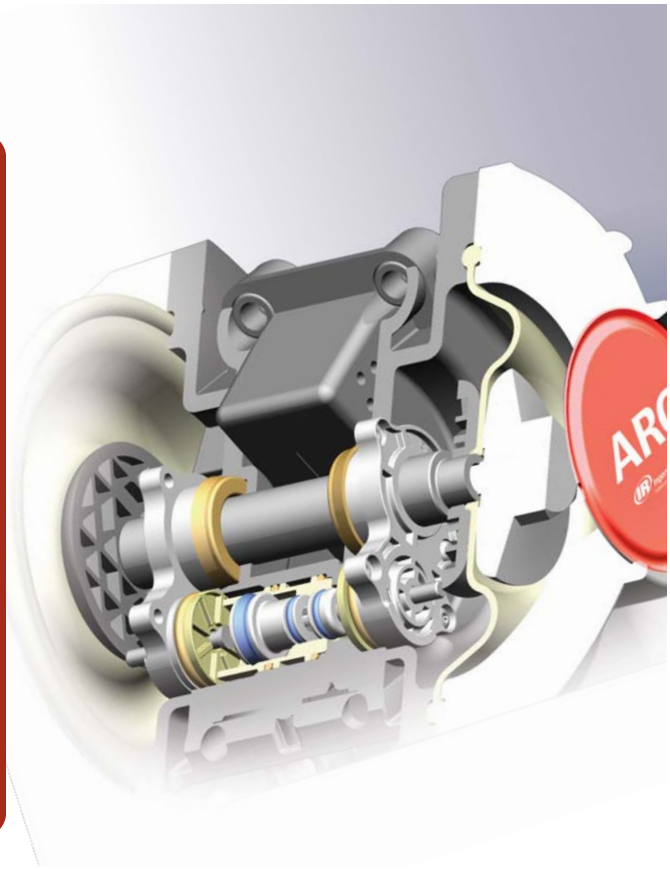
Productivity: Maximised flow rates + Minimised pulsation and air consumption = Maximum Performance.

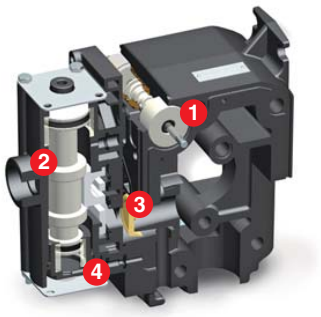
Versatility: Multiple porting options available along with interface options allow you to customise this pump specifically to your OEM application.

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 minimise 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 of any diaphragm pump on the market today.

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ARO® Diaphragm Pumps

Non-metallic

Non-Metallic Models – Range and Performance

	EXPERT Series	EXPERT Series	EXPERT Series	PRO Series	EXPERT Series	PRO Series	EXPERT Series	PRO Series	EXPERT Series
	3/8"	**1/2"**	**3/4"**	**1"**	**1"**	**1 1/2"**	**1 1/2"**	**2"**	**2"**
1 min.	**40.1 l/min**	**54.5 l/min**	**56 l/min**	**178 l/min**	**200 l/min**	**378 l/min**	**465 l/min**	**549 l/min**	**696 l/min**
Max. bar	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)
	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
	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
Material	Polypro-pylene PVDF Groundable acetal	Polypro-pylene PVDF Groundable acetal	Polypro-pylene	Polypro-pylene PVDF	Polypro-pylene PVDF	Polypro-pylene PVDF	Polypro-pylene PVDF	Polypro-pylene PVDF	Polypro-pylene PVDF
Max.	1.6 mm	2.4 mm	2.4 mm	3.2 mm	3.2 mm	6.4 mm	6.4 mm	6.4 mm	6.4 mm
ATEX certified	*With wetted parts in groundable Acetal.*	*With wetted parts in groundable Acetal.*	—	—	*With groundable Acetal motor*	—	*With conductive polypropylene motor*	—	*With conductive polypropylene motor*

Metallic

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"**
45.4 l/min	**51.5 l/min**	**133 l/min**	**197 l/min**	**340 l/min**	**465 l/min**	**651 l/min**	**651 l/min**	**897 l/min**	**1041 l/min**
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 1/2" BSP	3/4" NPT 3/4" BSP	1" NPT 1" BSP	1" NPT 1" BSP	1 1/2" NPT 1 1/2" BSP	1 1/2" NPT 1 1/2" BSP 1 1/2" ANSI/DIN	2" NPT 2" BSP	2" NPT 2" BSP 2" ANSI/DIN	3" NPT 3" BSP	3" NPT 3" BSP
1/2" NPT 1/2" BSP	3/4" NPT 3/4" BSP	1" NPT 1" BSP	1" NPT 1" BSP	1 1/2" NPT 1 1/2" BSP	1 1/2" NPT 1 1/2" BSP 1 1/2" ANSI/DIN	2" NPT 2" BSP	2" NPT 2" BSP 2" ANSI/DIN	3" NPT 3" BSP	3" NPT 3" BSP
Aluminium Stainless steel	Aluminium	Aluminium Cast iron Stainless steel	Aluminium Cast iron Stainless steel Hastelloy	Aluminium Cast iron Stainless steel	Aluminium Cast iron Stainless steel Hastelloy	Aluminium Cast iron Stainless steel	Aluminium Cast iron Stainless steel Hastelloy	Aluminium Cast iron Stainless steel	Aluminium Cast iron Stainless steel Hastelloy
2.4 mm	2.4 mm	3.2 mm	3.3 mm	6.4 mm	6.4 mm	6.4 mm	6.4 mm	9.5 mm	9.5 mm
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 (continued)

Specialty

Specialty Models – Range and Performance

PP Series

PM Series

Pit Boss Series

HP Series

PF Series

	Powder Pumps		Sanitary Pumps					Dewatering Pumps			High Pressure Pumps		Flap Valve Pumps
?:1	1:1		1:1					1:1			3:1	2:1	1:1
Ø	2"	3"	1/2"	1"	1 1/2"	2"	3"	1 1/2"	2"	3"	1"	3"	2"
1 min.	Max. powder density = 800 kg/m³		49.2 l/min	198 l/min	465 l/min	651 l/min	1041 l/min	302.8 l/min	590.5 l/min	821.3 l/min	50 l/min	605 l/min	651 l/min
Max. bar	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)		8.3 bar (120 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	3" NPT / 3" BSP	2" NPT / 2" BSP
Material	Aluminium / Stainless steel		FDA accepted material					Aluminium			Stainless steel		Aluminium / Cast iron / Stainless steel
Max.	6.4 mm	9.5 mm	2.4 mm	3.3 mm	6.4 mm	6.5 mm	9.5 mm	12.7 mm	19.1 mm	25.4 mm	3.2 mm	9.5 mm	51mm (semi-solids)
ATEX certified	*All models*		*All models*	*With aluminium or stainless steel motor*				*All models*			*All models*		*With aluminium or stainless steel motor*

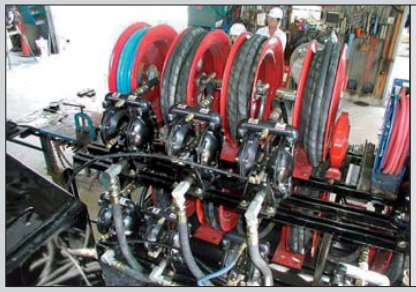
ARO® Diaphragm Pump Applications

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

PD02 Series	DAB05 Series	SumPump Series
Mini Pumps	**Drum Pumps**	**Submersible Pumps**
1:1	**1:1**	**1:1**	**—**	**—**
1/4"	**1/2"**		**2 1/2"**	**2"**
17.4 l/min	45.4 l/min	54.5 l/min	757 l/min	870 l/min
6.9 bar (100 psi)	6.9 bar (100 psi)		6.2 bar (90 psi)	
1/4" NPT 3/8" NPT	Siphon tube		Screened inlet	
Polypropylene Groundable Acetal Kynar® PVDF	Aluminium Stainless steel	Polypropylene	Cast iron	
0 mm	2.4 mm	2.4 mm	6.4 mm	6.4 mm
With wetted parts in groundable Acetal.	*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 air motor

Most ARO piston pumps feature 6" working stroke. Compared to the shorter strokes of other brands, the ARO air motor will cycle less frequently to deliver the same quantity of fluid and ultimately prolong motor life.
ARO air motors have far fewer parts than competitive models. Backed by a 5-year warranty, our air motors perform reliably in any application.

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.

ARO® 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.

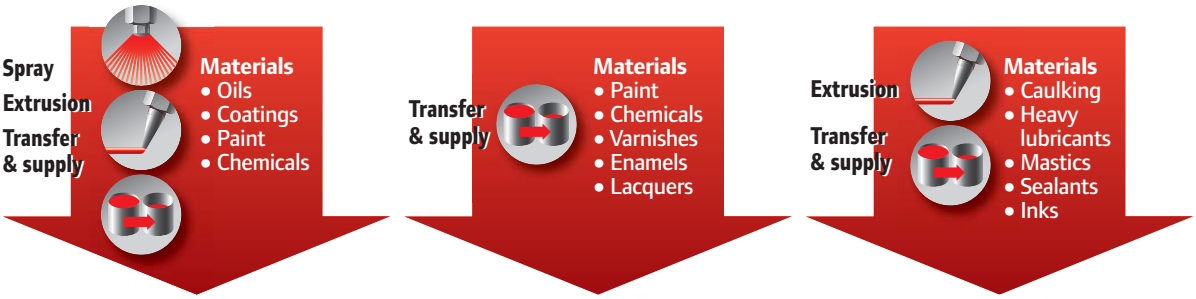
Agitator Lift Packages
Ideal for finishing and adhesive applications where you need to keep fluid mixed.

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.

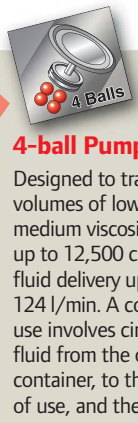
Extrusion: Involves using a Piston Pump to apply medium-to-high viscosity materials. Typical extrusion applications require accessories like rams and fluid regulators. Chop-Check and 2-ball pumps are used in extrusion applications.

Coating Application: Involves application of a material by either spray or dipping. Coating applications use 2-ball and 4-ball pumps.



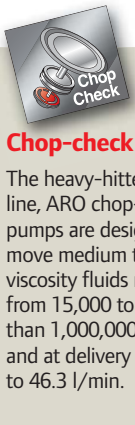
2-ball Pumps

The most versatile pumps in the ARO line. They are capable of handling applications from simple transfer to the extrusion of low to medium viscosity materials up to 100,000 centipoise (cPs) with fluid delivery up to 68.6 l/min.



4-ball Pumps

Designed to transfer high volumes of low and medium viscosity fluids up to 12,500 cPs with fluid delivery up to 124 l/min. A common use involves circulating fluid from the original container, to the point of use, and then back.



Chop-check Pumps

The heavy-hitters of the line, ARO chop-check pumps are designed to move medium to high viscosity fluids ranging from 15,000 to more than 1,000,000 cPs, and at delivery rates up to 46.3 l/min.

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

Range and Performance

2-ball Piston Pumps

2-ball Piston Pumps

?:1	1 min.	Max. bar			Material	Motor Dia.
1:1	18 l/min	0 - 10	Immersed	3/4"	Carbon steel	2"
2:1	8.1 l/min	4 - 21	1 1/4" or immersed	3/4"	Carbon steel or Stainless Steel	2"
4:1	8 l/min	8 - 41	1 1/4" or immersed	3/4"	Carbon steel or Stainless Steel	3"
9:1	10.8 l/min	18 - 93	1 1/4" NPT	3/4"	Stainless Steel	4 1/4"
9:1	10.8 l/min	18 - 93	1 1/2" or immersed	3/4"	Carbon Steel	4 1/4"
10:1	68.6 l/min	20 - 83	2" NPT	1 1/4"	Stainless Steel	8"
11:1	13.9 l/min	22 - 113	1" NPT	1"	Stainless Steel	4 1/4"
15:1	68.6 l/min	31 - 93	2" NPT	1 1/4"	Stainless Steel	10"
18:1	2.3 l/min	35 - 185	1/2" NPT	1/4"	Stainless Steel	3"
22:1	7.2 l/min	46 - 226	1" NPT	1"	Stainless Steel	4 1/4"
23:1	14 l/min	46 - 236	1" NPT	1"	Stainless Steel	6"
23:1	68.6 l/min	46 - 142	2" NPT	1 1/4"	Stainless Steel	12"
28:1	1.4 l/min	56 - 288	1/2" NPT	1/4"	Stainless Steel	3"
30:1	5.4 l/min	63 - 309	1" NPT	1"	Stainless Steel	4 1/4"
40:1	14 l/min	80 - 332	1" NPT	1"	Stainless Steel	8"
45:1	7.3 l/min	95 - 373	1" NPT	1"	Stainless Steel	6"
45:1	23.7 l/min	95 - 279	2" NPT	1"	Carbon Steel	10"
60:1	5.4 l/min	126 - 414	1" NPT	1"	Stainless Steel	6"
65:1	23.7 l/min	130 - 396	2" NPT	1"	Carbon Steel	12"

4-ball Piston Pumps

?:1	1 min.	Max. bar			Material	Motor Dia.
2:1	80.6 l/min	4 - 20.6	2" NPT	1"	Stainless Steel	4 1/4"
3:1	110.8 l/min	6 - 31	2" NPT	1"	Stainless Steel	6"
4:1	80.6 l/min	8.5 - 41	2" NPT	1"	Stainless Steel	6"
5:1	124 l/min	10.5 - 42	2" NPT	1"	Stainless Steel	8"
7:1	88.8 l/min	14 - 58	2" NPT	1"	Stainless Steel	8"

Chop-Check Piston Pumps

?:1	1 min.	Max. bar			Material	Motor Dia.
12:1	12.3 l/min	24 -123	Flange mount	1"	Carbon Steel	4 1/4"
13:1	46.3 l/min	27 -108	Follower plate, mounted or immersed	1 1/2"	Carbon Steel	8"
20:1	46.3 l/min	40 -124	Flange mount	1 1/2"	Carbon Steel	10"
22:1	1.9 l/min	44 - 226	Follower plate, mounted or immersed	1/2"	Carbon steel or Stainless Steel	3"
23:1	6,8 l/min	46 - 237	Flange mount	1"	Carbon Steel	4 1/4"
23:1	12.3 l/min	46 - 237	Flange mount	1"	Carbon Steel	6"
28:1	22.9 l/min	56 - 232	Flange mount	1 1/4"	Carbon Steel	8"
30:1	46.3 l/min	60 - 186	Flange mount	1 1/2"	Carbon Steel	12"
43:1	2.8 l/min	86 - 443	Follower plate, mounted or immersed	1/2"	Carbon steel or Stainless Steel	4 1/4"
44:1	14.3 l/min	92 - 365	Flange mount	1"	Carbon Steel	8"
44:1	22.9 l/min	92 - 273	Flange mount	1 1/4"	Carbon Steel	10"
46:1	6.8 l/min	92 - 473	Flange mount	1"	Carbon Steel	6"
65:1	5.1 l/min	45 - 516	Flange mount	3/4"	Carbon Steel	6"
65:1	22.9 l/min	136 - 403	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 colouring 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 customised 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 process

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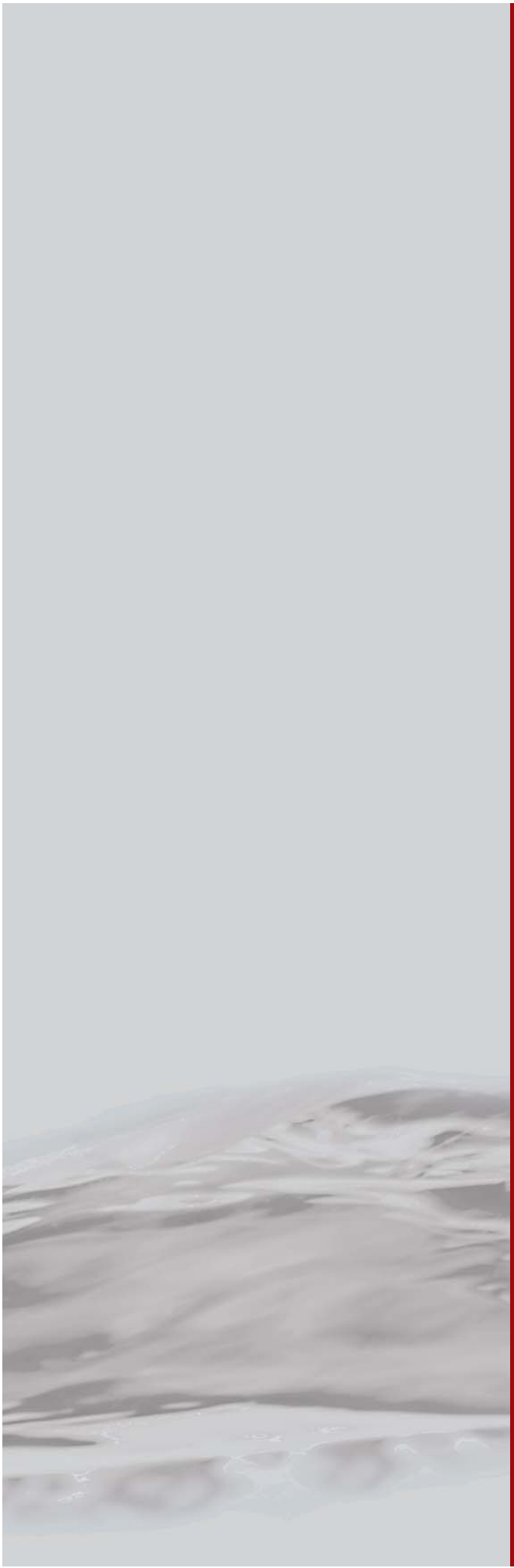

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- **Pump selection software**
  Allows you to identify the best pump for your application.
- **Competitive model crossover**
  Visitors can easily and quickly crossover competitive units to ARO models.
- **Productivity Park**
  An interactive 3D tour of markets and industries where Ingersoll Rand Fluid products are utilised.

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Progress is greener with Ingersoll Rand

Many of the Ingersoll Rand / ARO products feature patented, market-leading energy efficient designs. This is just one of the ways we help our customers minimise their impact on the environment.

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Ingersoll Rand
Industrial Technologies

Ingersoll Rand Industrial Technologies provides products, services and solutions that enhance our customers' energy efficiency, productivity and operations. Our diverse and innovative products range from complete compressed air systems, tools and pumps to material and fluid handling systems. We also enhance productivity through solutions created by Club Car®, the global leader in golf and utility vehicles for businesses and individuals.

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