

## **AIR OPERATED DOUBLE DIAPHRAGM PUMPS (AODD)**







## **directflo**<sup>\*</sup> Technology

#### CONVENTIONAL DOUBLE DIAPHRAGM PUMPS WITH PERIPHERAL FLOW AND BALL VALVES

Since 1985, the SAMOA Group have been selling traditional Air Operated Double Diaphragm Pumps (AODDPs), that pump the fluid around the outside of the pump.

These pumps offer several advantages over electric pumps. However, they have not changed their basic design over the years and they also have some issues.

#### Advantages

#### Disadvantages

- · Lower cost.
- Easier installation and operation.
- Tolerance of dry running.
- No rotary shaft mechanical seals or packings.
- Versatility to handle most fluids.

- Highly pulsating flow.
- High life cycle cost (short life of diaphragms, balls and ball seats and long repair times).
- · Pumps stalling.
- Excessive noise level.
- High air consumption.







To address the issues associated with conventional AODDPs, around year 2000 a radical INSIDE-OUT pump concept was adopted: a pump with a central flow path design.

A new air distribution system was developed. The new system switches the air flow between the pump chambers in a fraction of a second, allowing shorter diaphragm strokes and reducing their fatigue. The new pump had flap valves instead of ball check valves.

This new design went a long way to solve many of the issues of traditional peripheral flow AODDPs but the execution of an excellent concept was not flawless and the offered materials options were very limited.

#### Advantages

#### Disadvantages

- Central flow design with reduced internal hydraulic losses, together with an efficient air valve with reduced air losses. deliver reduced air consumption per litre pumped.
- Central flow provides full serviceability of the pump without removing it from the fluid inlet and outlet lines.
- Longer diaphragm life and reduced parts count design ensure longer maintenance service intervals and fast, non expert, repair.
- Reduced pulsation and noise.

- Inadequate flanges and flange fastenings can lead to fluid leaks.
- Flap valves allowing internal fluid leaks and air valve leaks prevent the pump being used as a "deadheading" system pump.
- Few wetted material options offer compatibility with only a very limited range of fluids











#### **Directflo<sup>®</sup>: Natural pump evolution**

#### Directflo® PUMPS WITH CENTRAL FLOW AND BALL VALVES

In 2010, the INSIDE-OUT pump concept was reengineered to perfect execution of the Central Flow concept whilst retaining the advantages of traditional peripheral flow AODDPs over electric pumps and the advantages offered by the Central Flow design concept. For example, the complete air distribution system (the directional air valve module, end of stroke sensors and the air channels), was refined to avoid air leaks while keeping the fast reciprocating action and the possibility to work with real world air supplies: non-lubricated, oily, dry, humid and dirty. Also, flap valves were replaced with ball check valves, widely used in traditional AODDPs.

Ball check valves have proven over the years to provide reliable sealing and tolerance to solids in suspension.

A wider range of wetted materials is available, allowing complete compatibility with most fluids.

Compared to the superseded year 2000 central flow and flap valves pump design, **Directflo® advantages include:** 

- Complete fluid containment, no fluid leaks in both metallic and plastic versions (increased number of flange bolts, plastic models include a stainless steel clamping flange).
- No compressed air leaks from the air distribution system, including when the pump is in standby in a deadheading application with the fluid outlet line closed.
- Pump stops when the fluid outlet line is closed.
- Non stalling air valve, pump starts up reliably every time.
- Increased suction head.
- Total compatibility of pump wetted materials to pumped fluid (increased range of diaphragm and check ball materials).









## Directflo<sup>®</sup> pumps: The best of both worlds.



DIRECTFLO PUMPS Fluid flows through the center of the pump, compressed air acts on the outside of the diaphragms, which moves the shaft



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Fluid flows through the outside of the pump, compressed air acts on the inside of the diaphragms, which are moved by the shaft

CONVENTIONAL PERIPHERAL FLOW PUMPS







## Directflo<sup>®</sup> pumps: The best of both worlds.

## Directflo<sup>®</sup> pumps offer all the advantages of conventional AODDPs:

- Discharge fluids at up to 100 psi (7 bar), to pump medium viscosity fluids even over long pipe runs and up to significant heights.
- No rotating shaft seals: no leaks pumping abrasive fluids.
- No rotating parts and no tight clearances: pump slurries.
- Gentle pumping action suitable for shear sensitive fluids or fluids that may form emulsions.
- Compressed air operation with no electricity required, inherently safe concept for environments with explosion risks. ATEX certified models available.
- Variable flow rate and pressure through simple adjustment of the air pressure.
- Tolerate dry running.
- Dead heading: pumps stop without any risk of damage when the fluid discharge line is fully closed.

# Plus significant improvements, through the unique Directflo<sup>®</sup> design, that will be appreciated in your application:

• Superior performance against back pressure, less loss of nominal flow capacity under real application conditions.

**directflo**<sup>\*</sup> Technology</sup>

- Significant dry suction lift, eliminate self-priming issues pumping from drums and even tall tanks.
- Dependable lube free directional pivot air valve: starts-up every time. Tolerant of oil, moisture and dirt. Non icing. No air leaks when pumps are stalled by closing the fluid discharge line.
- Reduced air consumption per liter pumped, saves energy and possibly avoids the need to buy a bigger compressor.
- Reduced pulsation, greater accuracy during dosing and less splashing when dispensing.
- Fewer vibrations and lower noise level.
- Extremely reliable: reduced part count design and very long life wear parts.
- Inline servicing of air valve, diaphragms and ball valves, without disconnecting the plumbing. The low part count design allows fast and reliable servicing by non-expert technicians.
- Robust, compact design.











## FRICTIONLESS PIVOTING AIR VALVE

#### Benefits

- Non-freezing/icing, Non-stalling, Non-reciprocating, Non-rotating air valve with no-lube design
- Pump starts every time, won't stick
- Works with non-lubricated, wet, dry, damp or contaminated air
- Extremely fast change over:
  - Increases pump performance
  - Reduces pulsations
- Virtually non wearing





Aro air valve



Graco air valve



Samoa Directflo air valve.

Patented Frictionless Pivoting air valve. Simpler impossible.





Wilden air valve



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#### **CENTRAL FLOW TECHNOLOGY & NO MANIFOLD DESIGN**

#### Benefits

- Directflo pumps eliminate fluid inlet and outlet manifolds, which in conventional pumps typically include four 90 degree elbows resulting in 'pressure losses'.
- 'Significant dry suction lift', eliminate self-priming issues pumping from drums and even tall tanks.
- Robust, compact design.
- Need 'less liquid to flush and clean' a blessing for OEMs.
- 'Less weight & size'









#### **REDUCED PULSATIONS, SHOCK & VIBRATIONS**



## **Directflo technology**

- Efficient end of stroke sensors and extremely fast switch over air valve reduces pulsations



Directflo technology: continuous, steady flow









#### **REDUCED NOISE LEVEL**



## **Benefits**

- Reduced pulsation = less vibrations
- Integrated Muffler
- Non-reciprocating, Non-rotating Air Valve design
- Ball valves with guiding cage, no ball oscillations
- Frictionless pivot air valve requires less air to operate, and no air leaks Well dimensioned air exhaust and muffler









#### SINGLE PIECE FLUID HOUSING

• Ensures no-leak design and encompasses diaphragms and inlet/out housings





Innovative | Unique | Simple | Reliable | Durable | Compact | Efficient | Quiet | Versatile









#### **FLEXIBLE DIAPHRAGM SUSPENSION**

#### Benefits

- Forget bolting and torqueing of diaphragms on center rod!
  'Diaphragms are literally suspended on Centre rod'.
- Diaphragms are stressed less & together with 'short stroke', this increases life
- All PTFE diaphragms are 'bonded single piece long-life diaphragms'.
- Tested 'running dry to 70 million cycles' with no appreciable wear and over 100 million cycles on wet operation
- One of the pumps with highest MTBF in the industry.
- Santoprene, Hytrel and Bonded PTFE and Bonded NBR







#### VARIOUS MOUNTING ORIENTATIONS

- The close proximity of ball/checks to diaphragms, with increased suction, allows the 'pump to be mounted vertically, without any additional hardware or efficiency loss'
- This also helps in 'fast valve actions'











#### **EXTERNALLY SERVICEABLE**

**directflo**<sup>\*</sup> Technology

#### Benefits

- 'Externally serviceable pumps' without removing pump from the pipeline.
- Repair in less than '10 minutes'
- Countable few moving parts
- Reduced parts count
- Incredibly low downtime











#### **LIMITED PARTS & FEW MOVING PARTS - SIMPLE MAINTENANCE**

#### Benefits

- Easily accessible elastomers
- Removable cage design
- Valve design includes a valve guide cage that contains ball and contributes to reduced wear. Cage material matches fluid housing
- Seats available in Stainless steel, PVDF (Kynar) and Acetal
- Valve balls available in PTFE, Acetal, Stainless steel, Hytrel and Buna.









#### COMPACT



POPULAR COMPETITOR'S 1/2" PUMP VS. SAMOA DIRECTFLO 1/2" PUMP

Directflo pumps are more compact allowing easy and economical installation in applications with:

- OEMs
- Hard to access places
- Congested areas with many pipes and other equipment

#### While producing equal to higher flow rates

SAMOA Directflo Plastic Pump Vs. Popular Competitors\*

Pump Size	Model	<b>Overall Space</b>	Average Flowrates	
1/4"	DC20	3% smaller	16% more flow	
3/8"	DF30	32% smaller	28% more flow	
1/2"	DF50	70% smaller	2% more flow	
3/4"	DF100	58% smaller	24% more flow	
1"	DP200	56% smaller	2% more flow	
*Average of Wilden, ARO, Graco, Blagdon, Warren-				
Runn/Sandniner Versamatic Vamada etc				









#### **EFFICIENT - REDUCED AIR CONSUMPTION**

- The exclusive air distribution system and efficient wet side leads to dramatically reduced air consumption
- The Frictionless Pivot Valve has no air leaks when the pump stops
- Air consumption reduced up to 75% when compared with similar flow rate pumps

Average air	Air				
consumption	consumption		Savings		Annual
by competitor	by SAMOA	Savings	(HP)	Savings	Savings
brands (cfm)	Directflo (cfm)	(CFM)	Approx~	in kW	(GBP)
11.4	3.6	7.8	1.95	1.53	£ 1,926.23

Application #1:

Empty a 5 gallon pit in 1 minute, requiring 60 psi working pressure. A 1/2" pump was chosen .

• <u>Graco</u>	14 cfm	2.80:1
• <u>Aro</u>	16 cfm	3.20:1
• Warren Rupp	10 cfm	2.00:1
• <u>Wilden</u>	10 cfm	2.00:1
• <u>Yamada</u>	7 cfm	1.40:1
• <u>Samoa</u>	3.6 cfm	0.72:1



Innovative | Unique | Simple | Reliable | Durable | Compact | Efficient | Quiet | Versatile







#### COMPACT



SAMOA 1" ALUMINIUM PUMP Vs COMPETITION



Innovative | Unique | Simple | Reliable | Durable | Compact | Efficient | Quiet | Versatile







#### **EFFICIENT - REDUCED AIR CONSUMPTION**

- The exclusive air distribution system and efficient wet side leads to dramatically reduced air consumption
- The Frictionless Pivot Valve has no air leaks when the pump stops
- Air consumption reduced up to 50% when compared with similar flow rate pumps

Average air	Air				
consumption	consumption		Savings		Annual
by competitor	by SAMOA	Savings	(HP)	Savings	Savings
brands (cfm)	Directflo (cfm)	(CFM)	Approx~	in kW	(GBP)
16.4	6.5	9.9	2.95	2.32	£ 2,914.04

Application #2:

Empty a 200 gallon tank in 20 minutes, requiring 60 psi working pressure. A 1" pump was chosen .

BRAND	Fluid Flow	Cubic Feet / Min	Total Air Consumed
Wilden	10 gpm	19.0	380 cf
Warren Rupp	10 gpm	14.0	280 cf
Aro	10 gpm	14.0	280 cf
Yamada	10 gpm	18.0	360 cf
Graco	10 gpm	17.0	340 cf
Samoa DF100	10 gpm	6.0	120 cf
Samoa DP200	10 gpm	7.0	140 cf





#### INTEGRATED MUFFLER/SILENCER ONTO AIR EXHAUST

#### BALL CHECK VALVES ADJACENT TO DIAPHRAGMS

Faster valve action for improved overall pump performance.

#### **REMOVABLE BALL CAGES**

Ensures no valve ball oscillations and easy servicing.

#### SINGLE PIECE LONG-LIFE DIAPHRAGMS



Air Operated Double Diaphragm Pumps

#### FRICTIONLESS PIVOTING AIR VALVE

Non-reciprocating, non-rotating, but extremely fast 'pivoting' air valve ensures frictionless operation, reduces air consumption, minimizes pulsation, vibration, turbulence and noise. Nonfreezing/icing, non-stalling, no lube design air motor with integrated muffler ensures superior start-up reliability and can handle non-lubricated, wet, dry, damp or contaminated air.

#### STRESS FREE DIAPHRAGM COUPLING

Diaphragms suspended onto centre shaft instead of rigid connections. No bolting or torquing required, ensures stress-free diaphragms and low downtime.

#### SINGLE PART MOULDED PUMP BODY

Minimum energy losses within the pump: compact and leak free design.

#### **NO MANIFOLD DESIGN**

Central flow technology with nomanifold design minimizes pressure losses and reduces air consumption, resulting in a compact, light-weight pump with significant dry suction.



#### **GLOBALLY PATENTED NEXT GENERATION AODD PUMPS**







Traditional Pump Directflo Pump Compact and lighter up to 50%

		SIZE & FLOWRATES	
Pump Size	Model	Overall Space	Flowrates
1/4″	DC20	Upto 3% smaller	Upto 16% more flow
3/8″	DF30	Upto 32% smaller	Upto 28% more flow
1/2″	DF50	Upto 70% smaller	Upto 2% more flow
3/4″	DF100	Upto 58% smaller	Upto 24% more flow
1″	DP200	Upto 56% smaller	Upto 2% more flow
		AIR CONSUMPTION	
Pump Size	Flow Rate	Average air consumption @ 60 psi by competitor brands*	Air consumption @ 60 psi by SAMOA Directflo
1/2″	5 GPM (US)	11.4 CFM	3.6 CFM
1″	10 GPM (US)	16.4 CFM	7 CFM

\* - Top 5 competitors in the market considered

Externally serviceable pump design



## **directflo** Technology

## **Better by design**

#### PROVEN SUPERIOR PERFORMANCE

- Superior dry suction
- Non icing
- Reduced pulsation
- Variable flow rate and pressure by adjusting the air pressure

#### **RELIABLE**

- Superior start up reliability
- No stalling
- Tolerates dry, damp, dirty or oily air.
- Leak free operation through the pump's life

#### SMOOTH RUNNING

- Gentle pumping
- Reduced pulsation
- Fewer vibrations

### COST EFFICIENT

- Reduced air consumption
- Reduced internal pressure drop

#### COMPACT

- One-piece fluid section
- Integrated muffler

#### **SIMPLE**

- Fast and easy maintenance
- Easy operation
- Orientable air inlet

#### DURABLE

- First quality materials
- Long diaphragm life
- Short stroke and robust construction









## **Summary of Directflo Pump Benefits**

- Extremely reliable: Long service intervals, with diaphragms tested to run dry for at least 70 million cycles without any appreciable wear
- Higher suction ability: Primes faster and further. A benefit with heavier fluids
- Very low pulsations: Dependent upon the application, could be used without pulsation dampeners. Won't shake piping as other like pumps
- Center fluid housing: Material flows through the pump rather than around. In the DF series, the pump outlet is lower than inlet, allows fluids that fall out of suspension to exit, without damaging diaphragm, shaft or air/fluid plates.

- Compared to competition, on the average 30-50%
  smaller, yet producing equivalent flow rates
- Serviceability: Can be quickly repaired in line, and has substantially less parts
- Air consumption: Requires up to **50%-70% less air** than competitive models, for an equal flow rate and pump size
- Air valve: Quieter, less noise, won't ice and can handle unconditioned air (wet, dirty, oily, etc.)
- Extremely compact and light weight
- 100% European







# UP20 PUMP

Frictionless PIVOT Air Valve Universal Design

## 2" Air-Operated Diaphragm Pumps

NETAL UP20



NO VIBRATION I Proven superior performance I RELIABLE I DURABLE I COST EFFICIENT I UNIVERSAL



## **directflo** Technology

Modular air valve.

· Reduced downtime.

Simplified maintenance and cleaning



## FLOW



The new SAMOA UP20 pump combines a Universal design with a unique frictionless Pivot Air Valve to provide maximum performance and energy efficiency, exceeding market expectations.









UP20 pump includes a patented air valve based on the well proven SAMOA frictionless Pivot Air Valve.

This valve, that provides an incredibly fast changeover action, results larger flow delivery and smooth pump operation with reduced pulsation and no vibration.









The air valve has no dynamic seals and therefore no parts subject to wear and it can reliabily work with dry or humid air.

No stall operation, even with low air pressures, thanks to the patented **Smooth Start Shifter ( 3s )**, a device which activates the pivot valve to prevent stall.

















UP20

## HIGHER EFFICIENCY

Maximum fluid flow with reduced air consumption.







UP20

## **HIGHER EFFICIENCY**

Maximum fluid flow with reduced air consumption.

#### INCREASED RELIABILITY

No stall, no icing, reliable start-up and longer air valve and diaphragm lifes.







UP20

## **HIGHER EFFICIENCY**

Maximum fluid flow with reduced air consumption.

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#### MAXIMUM VERSATILITY

Metal pumps and a wide range of diaphragms, seats and balls offer broad fluid and application compatibility.







METAL UP20

## **HIGHER EFFICIENCY**

Maximum fluid flow with reduced air consumption.

#### **INCREASED RELIABILITY**

No stall, no icing, reliable start-up and longer air valve and diaphragm lifes.

#### MAXIMUM VERSATILITY

Metal pumps and a wide range of diaphragms, seats and balls offer broad fluid and application compatibility.

#### EASY SERVICING

Simplified maintenance and cleaning. Components designed for long life and reliability.



## A

#### CENTER SECTION AND AIR CAPS: Aluminium

ATEX certified

## 3

#### FLUID COVERS AND MANIFOLDS:

Aluminium Stainless steel

## C

#### CHECK VALVE SEATS: Santoprene® Hytrel® Aluminium Nitrile Stainless Steel

Stainless Steel Stainless Steel PTFE (Teflon<sup>®</sup>) PVDF

#### D CHECK VALVE BALLS: Santoprene®

Hytrel<sup>®</sup> Nitrile PTFE (Teflon<sup>®</sup>) Viton<sup>®</sup>

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#### DIAPHRAGMS:

Santoprene<sup>®</sup> Hytrel<sup>®</sup> PTFE with Santoprene<sup>®</sup> backup (2 piece diaphragm)

Nitrile (single piece) Santoprene<sup>®</sup> (single piece) Hytrel<sup>®</sup> (single piece) PTFE bonded with EPDM (single piece diaphragm)



## UP20

### **AVAILABLE MATERIALS**









