FINISHING EDUCATION UNIVERSITY

CARLISLE FLUID TECHNOLOGIES

Knowledge is Power

The Brands You Trust

BGK™ products deliver precision-engineered curing capabilities for a full range of coatings including liquid, powder, wax, UV and adhesives.

Binks® products boast innovative spray gun and air cap design along with industry leading pumps and controls.

DeVilbiss® products include low pressure manual and automatic spray guns and related spraying accessories. *DeVilbiss* products are widely acclaimed for ergonomics and innovative spray gun design.

Hosco® products deliver smooth bore, “cavity free” stainless steel fittings and accessories designed for use in paint circulating and application finishing systems.

ms® products include powder coating systems and equipment. ms is recognized throughout the world for quality, efficiency and durability.

Ransburg® manual and automatic electrostatic finishing products offer spray finishing solutions to industrial and automobile manufacturing markets.

Properly Sizing A Fluid Delivery System

Where do you begin when you're trying to select the right model and size of pump for you application

CARLISLE FLUID TECHNOLOGIES

Binks Fluid Delivery

Pump Type	Fluid Transfer	Circulation System	Air/Electrostatic Atomization	Hydraulic/Electrostatic Atomization	
	Low – Medium Pressure (< 49bar/710psi)			Air Assisted Airless	Airless
2 Qrt Cups + Pressure Tanks	✓	×	✓	×	×
	Pressure cups and tanks are simple and robust pressurized containers. Good for materials sensitive to moisture and sensitive to shear, no pulsation.				
Diaphragm Pump (AODD)	✓	✓ (small)	✓	×	×
	Diaphragm pumps do not harm/shear sensitive paints (they squeeze, especially good for specialist coatings)				
Pogo Plus + MX1205	✓	×	✓	×	×
	Low pressure drum pumps for high volume fluid transfer and spray applications of low-medium viscosity fluids				
MX & MXL Pump	×	×	×	✓	✓
	High pressure, 2-ball piston pumps, used as booster pumps and available in package configurations to make it easier to start spraying				
Maple Pump	×	✓	✓	✓	✓
	Best for applications that require no exterior leaking seals, shear and moisture sensitive. High flows over a wide pressure range.				
Smart Pumps	×	✓	✓	×	×
	Energy saving, electrically driven pumps for low to high volume circulation system flows				

So Many Variables…..

Power Source	Application	Material Flow/Pressure	Physical Size	Materials Of Construction	Features
Pneumatic	Solvent/Water Based	Container size	Cart	Packing/Seal/Diaphragm Choices	Energy Savings
Electric	Viscosity/Shear Effect	Single or Multi-gun	Wall	Check Valve (Ball & Seat) Materials	Longer Active Duty
	Deadhead or Circulation	Flow Rates	Tripod/Floor	Pump Body Construction	Low Ice
	Applicator Technology	Pressure Requirements	Hand Held		Pulsation

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Power Source

Innovation Applied

Application

What's in a typical paint?

Innovation Applied

Flow and Pressure

Innovation Applied

Physical Size - Mounting

	Stand Holdable	Floor Standing	Wall Mount	Cart Mount	Tripod Mount	Pail/Drum Mount	Elevator Mount
Guns + Tanks	KBR + SG-2	2 – 60 Gallon					
Diaphragm Pumps		1 – 1-1/2" Gemini II	DX/Gemini II	DX70/DX200	DX70	Gemini II/DX70	DX200
Pegs / MX1205			MX1205	MX1205		Pego/MX4	
MX/860 Pumps			All Models	Most Models	MX4	MX4	
Magnum Pumps		All Models	All Models	Some Models			
Smart Pumps		All Models					

Innovation Applied

Materials of Construction

Compatibility with different coatings

Innovation Applied

Pump Features

Features may increase suitability for application

Innovation Applied

BGK · BINKS · DeVILBISS · Hosco · ms · Ransburg

Thank you!

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Power Source

Different Ways To Power Equipment

Pneumatic Pumps

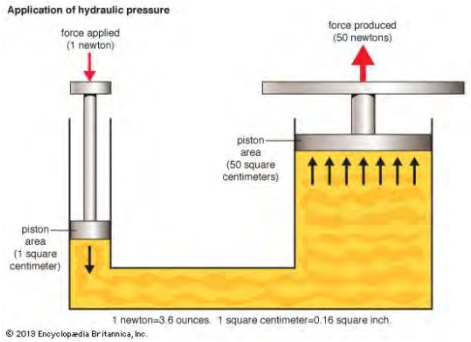
A supply of compressed air, usually between 1 – 10bar (14 – 145psi) is used to drive an air motor. The air motor utilises the energy within the compressed air before exhausting it, where it returns to atmospheric pressure.

Electric Pumps

Electricity is used to drive an electric motor (AC or DC). Cams may be used to change the rotary motion into a reciprocating motion. It is usually cheaper to harness electricity directly to drive a pump mechanism, rather than to convert it into compressed air.

Hydraulic Pumps

Rather than use electricity or air, the work of the pump is done by an incompressible liquid. This in turn is moved around by a secondary electric or pneumatic pump.



Optimize Your Pneumatic Pumps

- Piston pumps: If you're operating it at 94psi – 116psi, consider both pressure ratio and air motor CFM consumption for your process
- Leave 1 bar (15psi) difference between pump pressures and any fluid regulators
  - o The pump will consume more energy to produce the required flow at a pressure that the fluid regulator is going to reduce anyway.
- Some Water Based paints don't really need circulation or agitation. If they don't, no need to run the equipment
  - o Check with your paint supplier
- Pipe Sizing: size pipes to delivery the correct paint flow at the lowest possible pressure
  - o Generating unneeded pressures is wasting air energy

EN

Specification

	Ratio:	1:1
	Maximum air inlet pressure:	7 bar [100 psi]
	Maximum fluid pressure:	7 bar [100 psi]
	Displacement per cycle:	0.20 litres [0.05 US gall]
	Output @ 60 cycles / min:	12 litres/min [3.17 US gall/min]
	Maximum Recommended Continous Cycle Rate [cycles/min]:	25
	Maximum Recommended Intermittent Cycle Rate [cycles / min]:	60
A	Fluid inlet connection:	3/4" BSPP Female
B	Fluid outlet connection:	3/4" BSPP Female
C	Air inlet connection:	1/4" Universal (BSPP/ NPSM) Female
D	Air volume / cycle @ 6.9 bar/100psi:	2.83L [0.1 SCFM]
	Air flow @ 10 cycles / min 6.9 bar / 100psi:	28.3L [1 SCFM]
	Air flow @ 30 cycles / min 6.9 bar / 100psi:	84.9L [3 SCFM]
E	Recommended air quality ISO 8573.1 Class 3.3.2 #:	Dirt: 5 µm Water: -20°C@7bar [940ppm] Oil: 0.1mg/m³ Non Lubricated

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Go Electric!

- Cut out the middleman and power pumps and agitators with electric motors directly.
  - 4CFM produced @90PSI = 1HP
  - To operate a 1-horsepower (hp) air motor at 100 pounds per square inch gauge (psig), approximately 7-8 hp of electrical power is supplied to the air compressor.
- Pump Pressure 12 bar Flow Rate 35.3 L/min 24/7 Operation (Average of 'Clearcoat & Hardener' Systems)
  - Pneumatic Pump uses 33 cfm Air to achieve 12 bar @ 35.3 L/min
  - Power required to produce air at the compressor 5cfm (8.5M³/hr) @ 100 psi (7.0 bar) requires 1kW of Energy (1cfm 0.2kW)
- Air Pump Calculated Power 33 x 0.2 = 6.6 kWh
- Electric Pump E4-60 - 12 bar at 35.3 L/min requires 1.5kWh (Measured Power)

Application

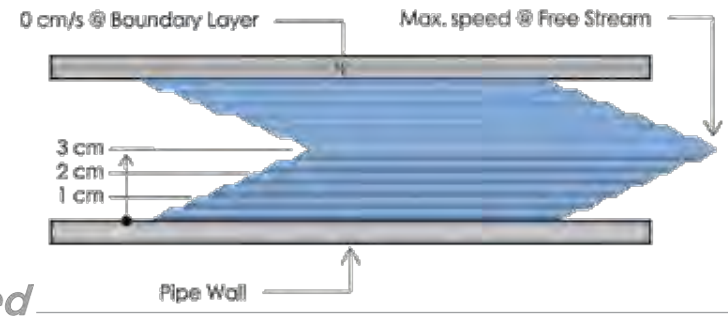
What's in a typical paint?

Solvent vs. Water-borne Coatings

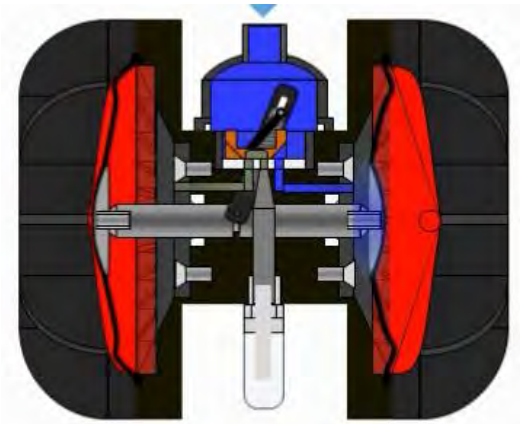
- Solvent-Based – primary solvents used are VOC's
- Water-Borne – water is the primary solvent but not the only solvent
  - Water-Borne coatings can contain small amounts of VOC's call co-solvents
  - The solvents are dispersion intermediary; enabling water and polymers to mix in a way that they wouldn't without the VOC
- Water-Based – term used interchangeably but could mean that there are no VOC co-solvents

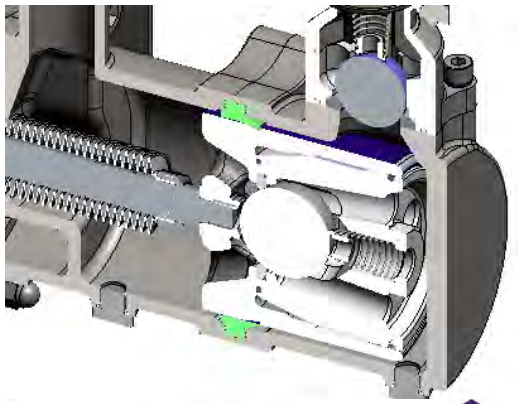
Material Integrity: Shear

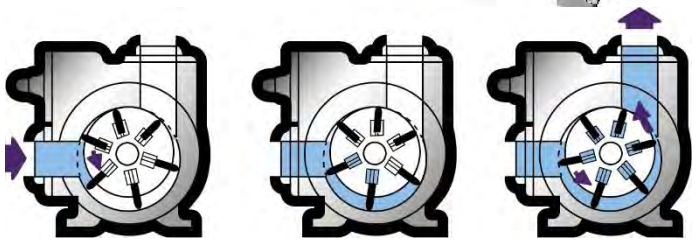
- Fluid is made up of multiple layers
  - Applying force to some layers and not others (relative motion) cause layers to slide apart (Shear).
- Some fluids are more susceptible to Shear (sensitive) than others.
- Properties of the fluid is degraded.



- Style of Pump.
  - Diaphragm pumps very good
  - Positive Displacement Piston pumps good
  - Plunger Pump medium
  - Rotary & Turbine Pumps bad







Viscosity – Poise Converter

- Material viscosity can be affected by many factors.
  - Temperature
  - Shear stress
  - Pressure
  - Time
  - Humidity / Moisture Sensitivity
- **Solvent Based Paint** viscosity is mainly affected by temperature, the static viscosity is similar to the dynamic viscosity constant.
- **Water Based Paints** are affected mainly by both temperature and shear so the static viscosity is much higher than the dynamic viscosity.
- Convert viscosity cup measurements to Poise or Centipoise for calculations

Poise	0.10	0.15	0.20	0.25	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.20	1.40	1.60	1.80	2.00
Centipoise	10	15	20	25	30	40	50	60	70	80	90	100	120	140	160	180	200
Ford #3			12	15	19	25	29	33	36	41	45	50	58	66			
Ford #4	5	8	10	12	14	18	22	25	28	31	32	34	41	45	50	54	58
Zahn #1	30	34	37	41	44	52	60	68									
Zahn #2	16	17	18	19	20	22	24	27	30	34	37	41	49	58	66	74	82
Zahn #3											10	12	14	16	18	20	23
Zahn #4												10	11	13	14	16	17
DIN #4	11	21	14	16	20	23	25	26	28	30	34	38	42	45	49	52	
ISO #4		17	23	34	51	60	68	74	82	93							

High Solids & Pumps

Historically, coatings are 50-70% solvents; low solids, high VOC

High Solids coatings = 20-50% solvents

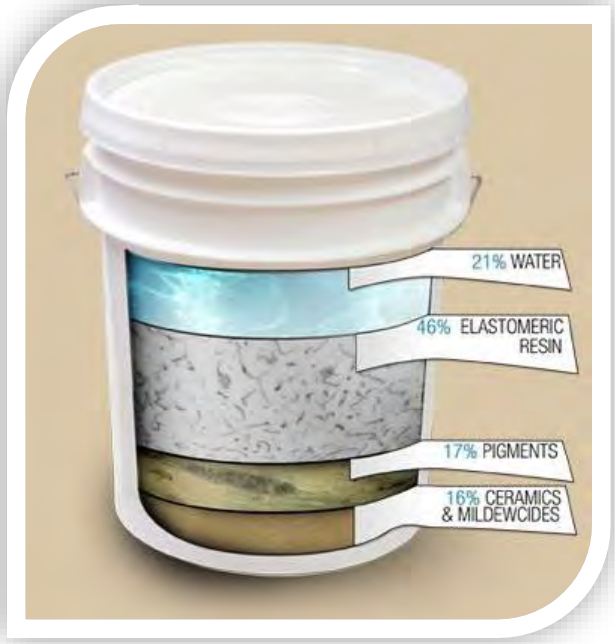
- Lower VOC, environmentally friendlier

High solids coatings can contain highly abrasive pigments and/or fillers.

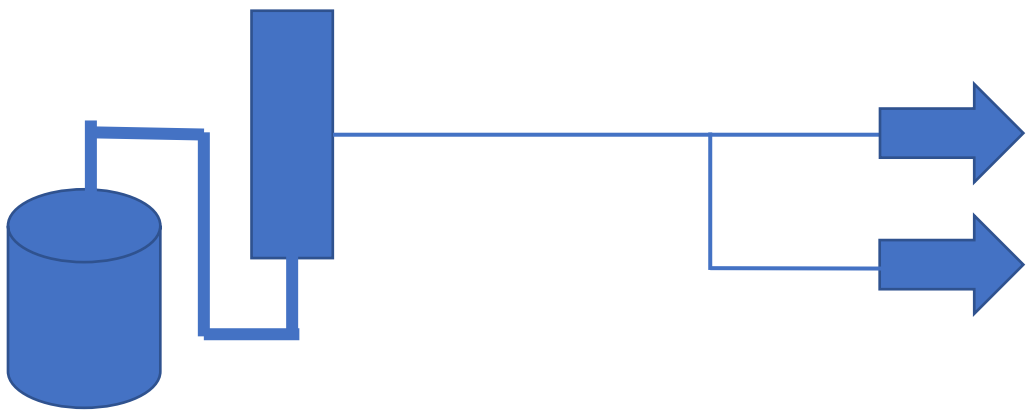
- Leads to premature wear of the pump parts.

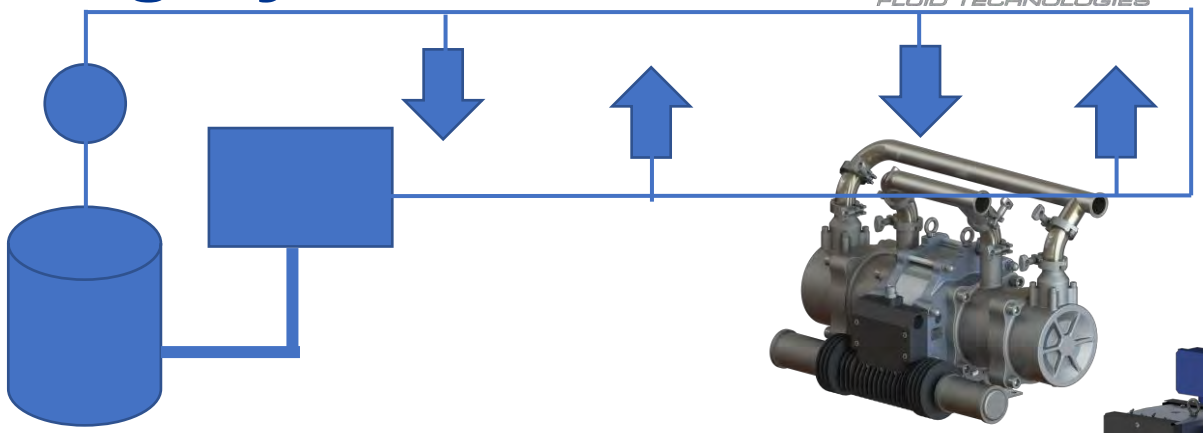
High solids coatings are more viscous

- require higher pressures to move



Deadhead vs Paint Circulating System





- Deadhead paint systems require pump to automatically stall (stop) when no demand
- **MOVE** liquid material from point A to B

- Pump expected to continually operate circulating paint
- **MOVE** liquid material from point A to B and back to C
- Supply consistent **PRESSURE** at point B (when material is in demand)
- Supply consistent **FLOW** at point B (when material is in demand)
- Maintain **MATERIAL INTEGRITY** 24/7/365

Applicator Technology

- Low Pressure
  - Air atomisation gives a much better/finer paint finish. Low viscosity paints atomised into fine droplets. Above 50 seconds viscosity, *may* need to move to Air Assisted Airless.
  - Air atomising guns are able to break up/atomise the paint designed for this application.
  - There's a limit to how far you can push paint down a hose with low pressures (based on length and I/D)
- AAA (**A**ir **A**ssisted **A**irless, or *Air Combi*, *Airmix*, *Aircoat*) uses an Airless type Tungsten Carbide orifice to produce is primary atomisation and then artificially adds air to:
  - improve atomisation
  - eliminate 'tails'
  - alter spray fan length
- Airless is an atomisation method that uses no artificially added air at the head of the gun.

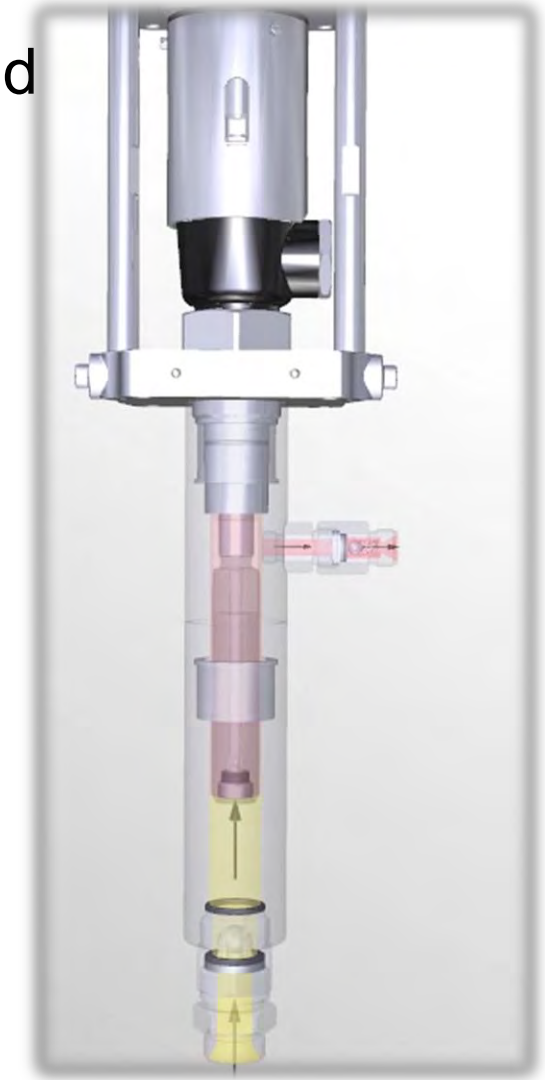
Flow and Pressure

Pump Cycles and Strokes

- Reciprocating motion, used in reciprocating pumps and other mechanisms, is a back-and-forth motion. Each movement back and forth is a **stroke**.

- Each **cycle** of reciprocation consists of two opposite motions: there is a motion in one direction, and then a motion back in the opposite direction.

- On each stroke, pumps displace a certain volume of fluid. The **volume displaced per cycle** is the combined volume of two strokes.



Flow Rates

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Table 1. Theoretical Fluid Nozzle diameter recommendations

Application Size	Typical Applications	Fluid Flow ml/min	Suction Gun Hole dia mm	Gravity Gun Hole dia mm	Pressure Gun Hole dia mm
Small	Adhesive	10 to 100	0.85 to 1.2	0.7 to 1.0	0.5 to 0.7
	Mobile Telephones	50 to 150	1.0 to 1.4	0.85 to 1.2	0.7 to 1.0
	Cosmetics Containers	100 to 200	1.2 to 1.6	1.0 to 1.4	0.85 to 1.2
	General Industrial Finishing	150 to 250	1.4 to 1.8	1.2 to 1.6	1.0 to 1.4
	Wooden Furniture	200 to 300	1.6 to 2.0	1.4 to 1.8	1.2 to 1.4
	Aerospace, Tableware Ceramic	250 to 350	1.8 to 2.2	1.6 to 2.0	1.2 to 1.6
	Rolling Stock,	300 to 400	Not possible	1.8 to 2.2	1.4 to 1.6
	Leather Finishing	350 to 500	Not possible	Not possible	1.4 to 1.6
	Protective Wax	400 to 600	Not possible	Not possible	1.4 to 1.8
	Lubrication Oil	600 to 800	Not possible	Not possible	1.6 to 1.8
Very Large	Sanitaryware Ceramic	700 to 1000	Not possible	Not possible	1.8 to 2.0

The above chart is based solely upon the theoretical Fluid Nozzle diameter needed for an average coating fluid type 15 to 25 seconds Din 4 viscosity. In the real world the selection must also take into account the viscosity of the material. As the viscosity of the coating increases the Fluid Nozzle required will generally increase as well. Likewise, as the viscosity decreases, the Fluid Nozzle diameter needed for a given fluid flow will decrease as well. Not all Fluid Nozzle hole sizes will be available for all gun types.

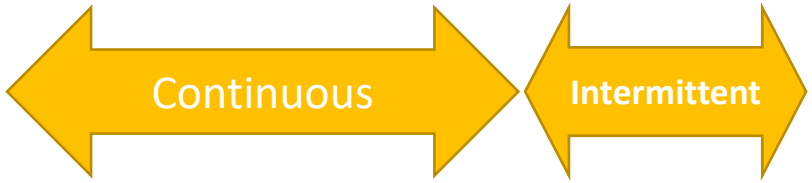
Pressure Ranges

APPLICATION	TYPICAL FLUID PRESSURES
Air Spray Supply	1 – 6.9 bar (15 – 100psi)
Transfer and Supply	6.9 bar (100 psi)
Paint Circulation	10 - 15 bar (145 - 220psi)
AAA Spray	60 – 140 bar (900 – 2000psi)
Airless Spray	140 – 400 bar (2000 – 6000psi)
Sealant & Adhesive Dispensing	140 – 345 bar (2000 – 5000psi)

Pressure ranges have been rounded to make the figures easier

Pumps generate flow not pressure. They have capability to generate flow against resistance.

Binks Pumps Flow/Pressure Capabilities



Min/Max Range	Fluid Pressure Range		Capacity / Per Cycle		Flow @ 10 Cycles/min		Flow @ 20 Cycles/min		Flow @ 40 Cycles/min		Flow @ 60 Cycles/min		Connections	
	Bar	PSI	Litres	Gal	Litres	Gal	Litres	Gal	Litres	Gal	Litres	Gal	Inlet	Outlet
Cups + Tanks	0 – 7.6	0 - 110	2 - 227	0.5 - 60										3/8" – 3/4"
Diaphragm Pumps	0 - 7	0 - 100	0.07 - 3	0.018 – 0.82	0.7 - 30	0.18 – 8.2	1.4 - 60	0.36 – 16.4	2.8 - 120	0.72 – 32.8	4.2 - 186	1.1 - 49.2	3/8"	3/8"
Pogo + MXL1205	4 – 39	58 - 557	0.072 – 0.081	0.019 - 0.021	0.72 – 0.81	0.19 – 0.21	1.44 – 1.62	0.38 – 0.42	2.88 – 3.24	0.76- 0.84	4.3 – 4.9	1.2 – 1.3	*/3/4"*	3/8" - 1/2"
MX/MXL Pumps	11 - 490	160 - 4263	0.024 – 0.880	0.008 – 0.24	0.24 – 8.8	0.08 – 2.4	0.48 – 17.6	0.16 – 4.8	0.96 – 35.2	0.32 – 9.6	1.4 – 52.8	0.48 – 14.4	3/4" – 2"	3/8" – 1-1/2"
Maple Pumps	3 - 252	44 - 3654	0.071 - 3	0.019 – 0.8	0.71 - 30	0.19 - 8	1.42 - 60	0.38 - 16	2.84 - 120	0.76 - 32	4.26 - 180	1.125 - 48	1" - 2"	3/8" – 2"
Smart Pumps	3 - 20	44 - 290	0.166 – 2.5	0.044 – 0.65	1.66 - 25	0.44 - 6.5	3.32 - 50	0.88 - 13	6.64 - 100	1.75 - 26			1" – 2"	1" – 2"

Pressure Drop *Delta P* Formula

$$\Delta \text{ Pressure loss} = \frac{\text{Friction Factor x Flow/min x Pipe Length x Dynamic Viscosity}}{\text{Internal Pipe Diameter}^4 \text{ (dxdxdxd)}}$$

OR $\Delta P = \frac{FQVL}{ID^4}$

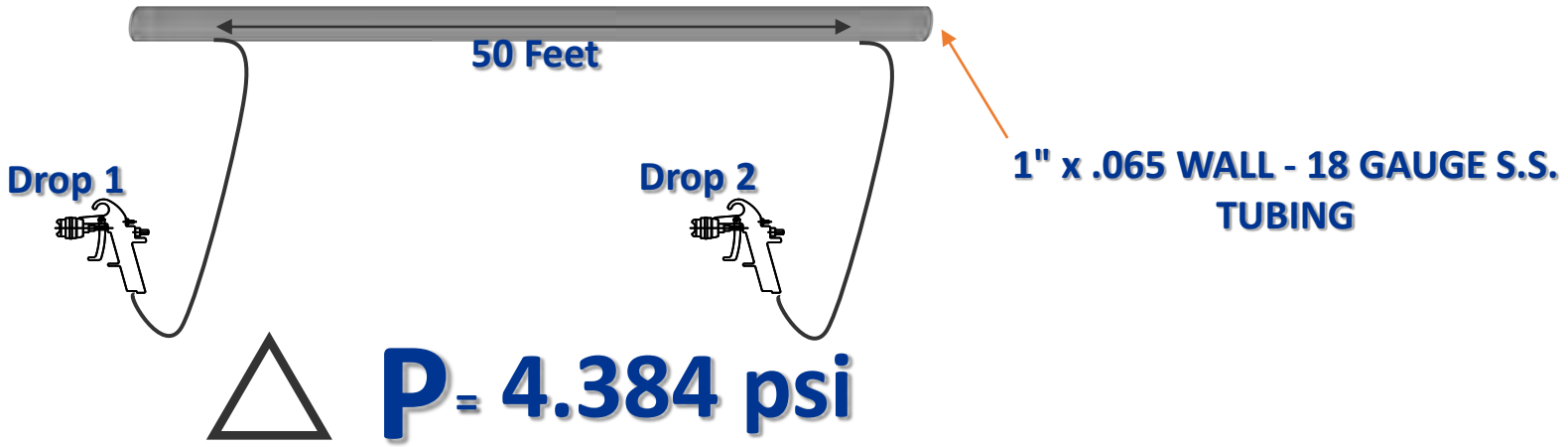
- Friction Factor based on the mass flow characteristics for typical pipe / hose used for installation
  - Imperial – 0.0273
  - Metric – 679
- Flow
  - Gallons per minute
  - Litres per minute
- Length
  - Feet
  - Metres
- Viscosity must be Dynamic Viscosity
  - Poise
- Pipe Diameter
  - Inches
  - Millimetres

Calculating Delta P

Substitute numbers into formula

FORMULA ~ $\triangle P = .0273 \frac{Q\ V\ L}{ID\ \ 4}$

FORMULA ~ $\triangle P = .0273 \frac{1.84 * 1 * 50}{.87x.87x.87x.87}$



$\triangle P = 4.384$ psi

Pressure Drop Quick Table

Pressure Line Drop Calculations

$$\Delta P = \frac{0.0273\ QVL}{ID^4}$$

Flow Rate (GPM)	Viscosity (poise)	Pipe/Hose Length (feet)	Pipe/Hose ID (inches)	Pressure Drop (psi)
1.84	1	50	0.87	4.4
1.84	1	**100**	0.87	**8.8**
1.84	1	100	**0.62**	**34.0**
1.1	1	100	**0.62**	**20.3**

Take Off Hoses – are often not considered in the overall design!
Diameter and Length of the hose has a dramatic effect on System Balance

Paint Flow Short Circuit will result in Higher Pump Flow and Pressure requirement

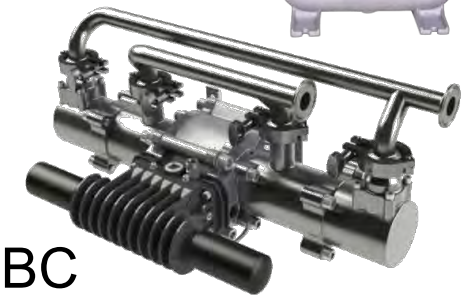
- Wasting energy
- Potentially damaging paint
- Causing pigment settlement issues
- Increasing wear and tear on the pump and system

Supply Tanks

- Top Outlets
- Bottom Outlets

- 5 Gallon Pails
  - o Pail Mounts
  - o Suction Lance

- 55 Gallon Drums
  - o Drum Mount
  - o Suction Lance
  - o Elevator



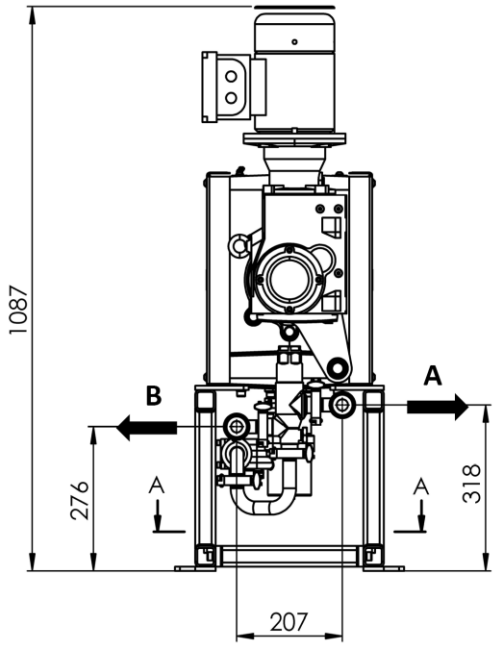
- Tote/IBC
- Stainless Steel Tank

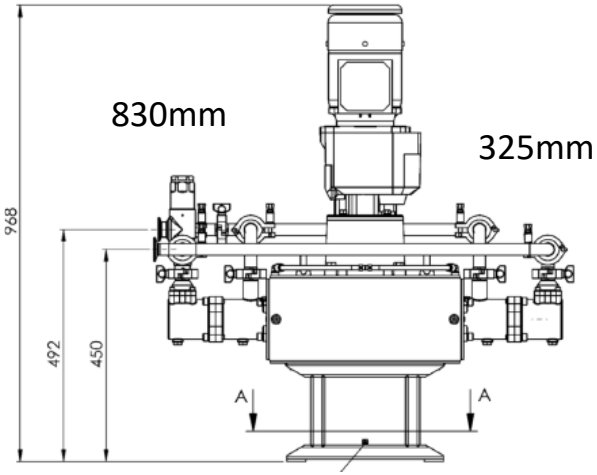
Physical Size - Mounting

Pail


Tripod


Wall





	Hand Holdable	Floor Standing	Wall Mount	Cart Mount	Tripod Mount	Pail/Drum Mount	Elevator Mount
Cups + Tanks	KBII + SG-2	2 – 60 Gallon					
Diaphragm Pumps		1 – 1-1/2” Gemini II	DX/Gemini II	DX70/DX200	DX70	Gemini II/DX70	DX200
Pogo + MXL1205			MX1205	MX1205		Pogo/MX4	
MX/MXL Pumps			All Models	Most Models	MX4	MX4	
Maple Pumps		All Models	All Models	Some Models			
Smart Pumps		All Models					

Materials of Construction

Compatibility with different coatings

The Binks Pressure Tank Range

ASME Code Tanks: *Numerous government and insurance bodies (e.g. OSHA, your fire marshal, your insurance underwriter, etc.) use National Fire Protection Association (NFPA) standards. NFPA standards call for the use of ASME-code tanks. All Binks pressure tanks are made to ASME standards*

PT ASME Zinc Plated Lid/Shell

- Ideal for solvent-based coatings when used with a disposable tank liner.
- Zinc plated lid and all wetted parts in lid assembly including: fluid tube, lid bushing, outlet elbow and fitting, and agitator shaft, including a Zinc plated tank shell.

PT ASME SS Lid/Zinc Shell

- Ideal for waterborne coatings when used with a disposable tank liner.
- 300 grade stainless steel lid and all wetted parts in lid assembly including fluid tube, lid bushing, outlet elbow and fitting, agitator shaft with Zinc plated tank shell.

80 PSI

Galvanized Pressure Tanks

- Galvanized steel tanks are primarily used with non-corrosive materials.
- Constructed with a heavy pressed steel lid and forged steel clamps, galvanized tanks are equipped with top outlet. Can be adapted for bottom outlet.
- The bottom outlet is recommended for heavy, viscous materials such as emulsified asphalts, cutback asphalts, rubber compounds, etc.

Stainless Steel Pressure Tanks

- Stainless Steel Pressure Tanks are suitable for virtually all fluids and solvents.
- Tanks and lids are constructed of heavy gauge 304 stainless steel and are also electro polished. Wetted parts are non-corrosive and non-corroding.
- All models are equipped with top outlet. Can be adapted for bottom outlet.

110 PSI

Product Range – 30/60 Gallon Tanks

- Larger supply jobs supporting multiple guns
- Galvanized steel tanks for solvent based materials
- Galvanized tanks fitted with Stainless Steel liners for water based materials
  - Liner only available at time of purchase

Pump Materials Of Construction

Conductive Acetal (DX70/Gemini II)
- Good solvent and coating resistance
- Water-borne compatible
- For use with flammables
- Good levels of abrasion resistance

Anodized Aluminium (DX200)
- Strong
- Heat resistant
- Medium corrosion resistance against water-borne
- Resists abrasion

Stainless Steel
- 316+17-4 Grades High level of corrosion resistance and good with acids
- Best for abrasion resistance
- Rugged
- 440C Grade high strength, hardness and wear resistance

Ceramic
- Extremely abrasion resistant

Tungsten Carbide
- Extremely hard
- Abrasion resistant

UHMWPE
- Abrasion resistant
- Self lubricating
- Not for high temperatures
- Ceramic Filled increases resistance

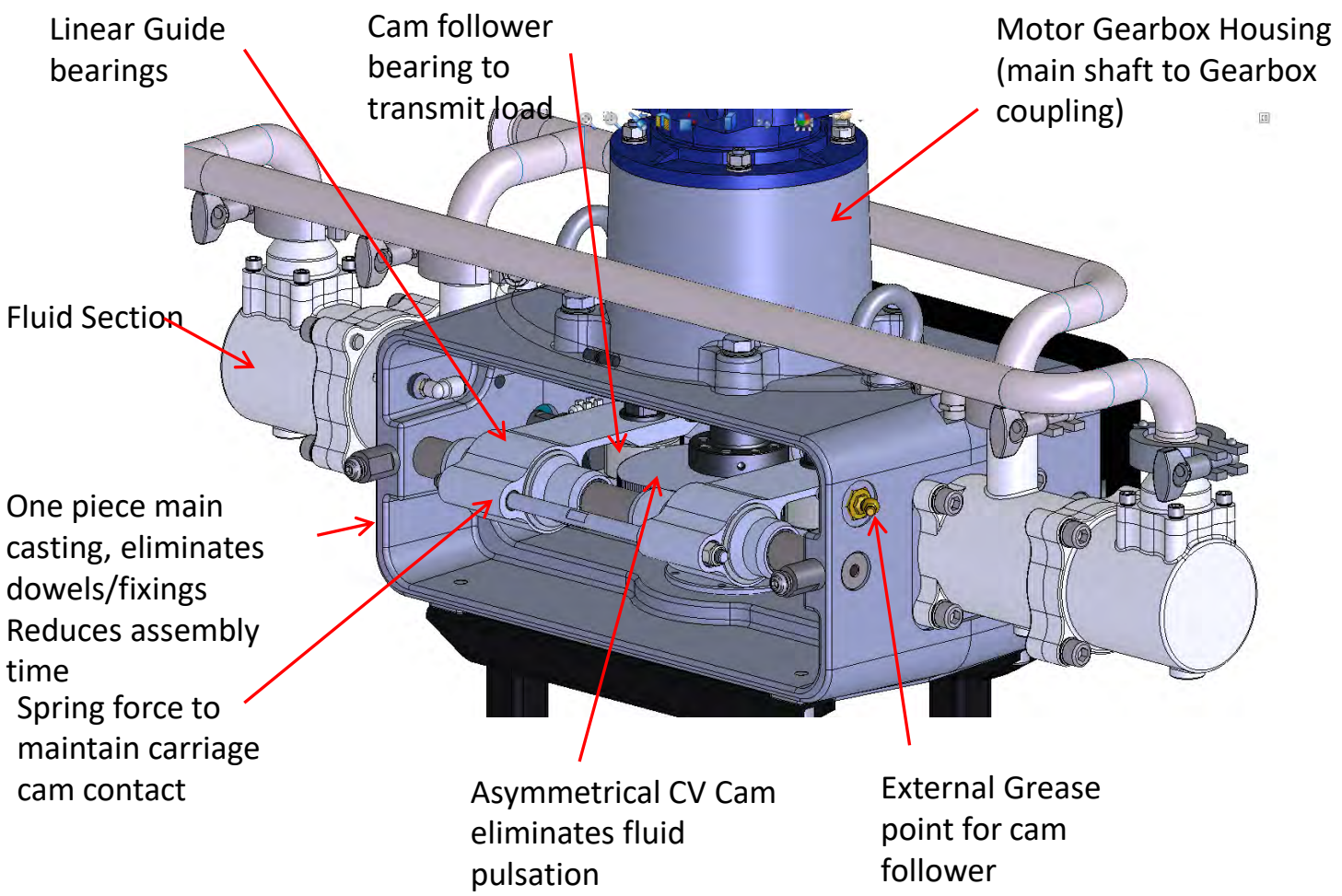
FKM (Fluoroelastomer)
- Wide compatibility with fluids
- Resistant to aggressive solvents
- Very good compression set resistance

PTFE
- Chemically inert to most fluids
- Excellent when used with solvents
- Can use for high temperature
- Can be glass filled for durability

Leather
- Can be used for high temperature
- Natural material; seals with very minor damage

Pump Features

Features may increase suitability for application



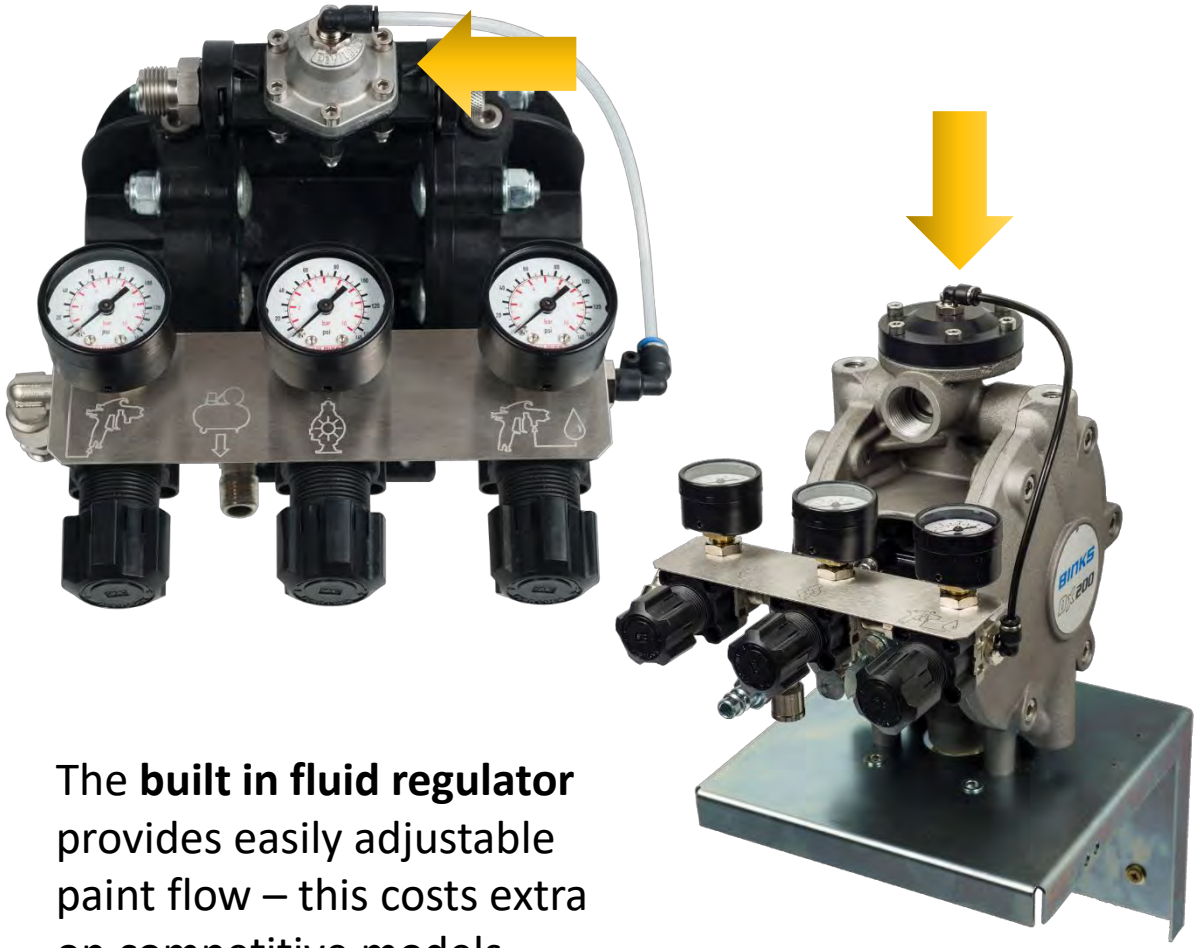
DeVilbiss KBII + Binks SG-2

- 2 QTS/2L LITRE REMOTE CUP
  - ALUMINIUM & ST ST
- Light weight, portable and easy to use
  - 2.3 Litre capacity - greater area coverage, less refills
  - Complete gun manoeuvrability at any angle its suitable for most Conventional or Compliant pressure/suction guns
  - Stable, wide, reinforced base
  - **Aluminium** or **Stainless Steel** options (for water-borne materials)
  - SG-2 has 50psi option for higher viscosities
  - Positive grip carry handle for operator comfort
  - At-the-job controls with lid mounted pressure gauge Available complete with short cup to gun air and fluid hoses.

DX Difference

- Ease Of Maintenance
  - Access to key components quick and easy
  - Spare parts kits designed around repair jobs
- Non Stall Air Valve
- Unique diaphragm shape for long and durable life
- Choice of wetted materials
  - Conductive acetal, anodized aluminium, stainless steel
- Choice of pump packages
  - Filters, air regulators, Gun & Hoses

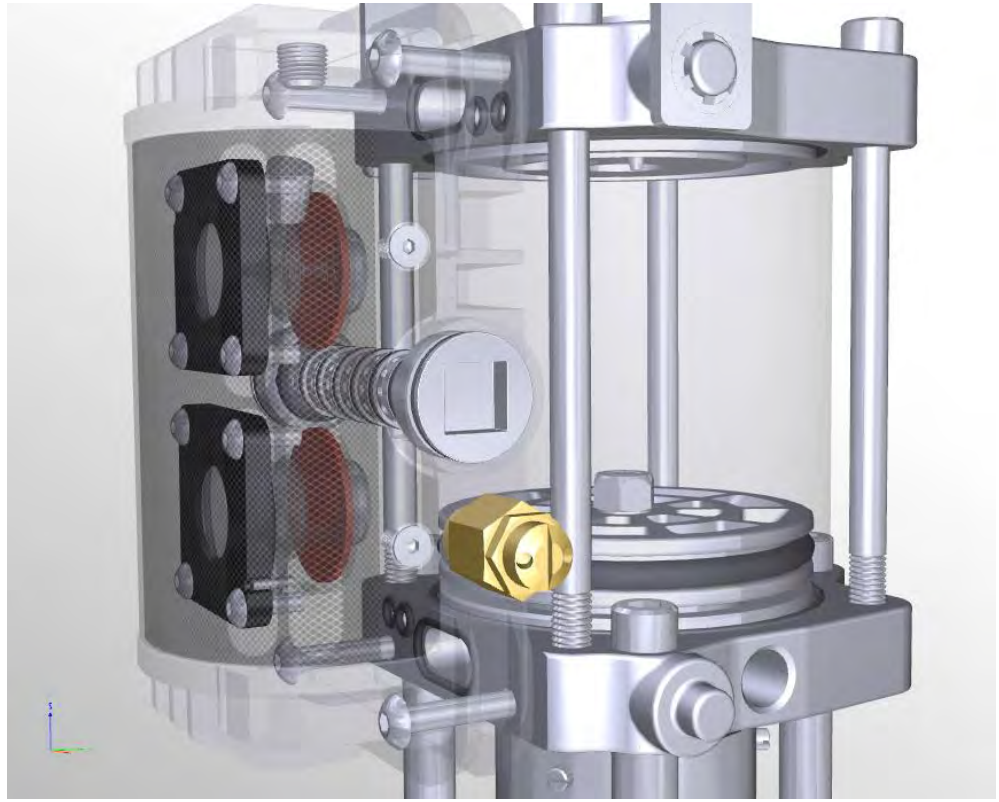
DX Built In Fluid Regulator

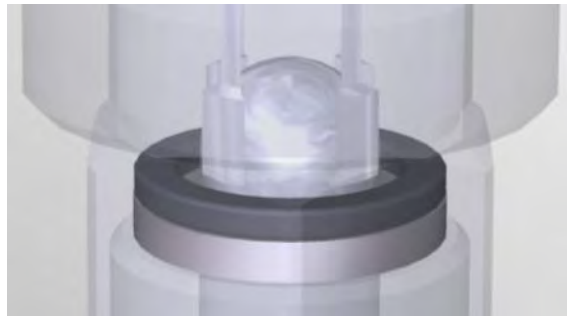


The **built in fluid regulator** provides easily adjustable paint flow – this costs extra on competitive models.

MX/Maple Benefits

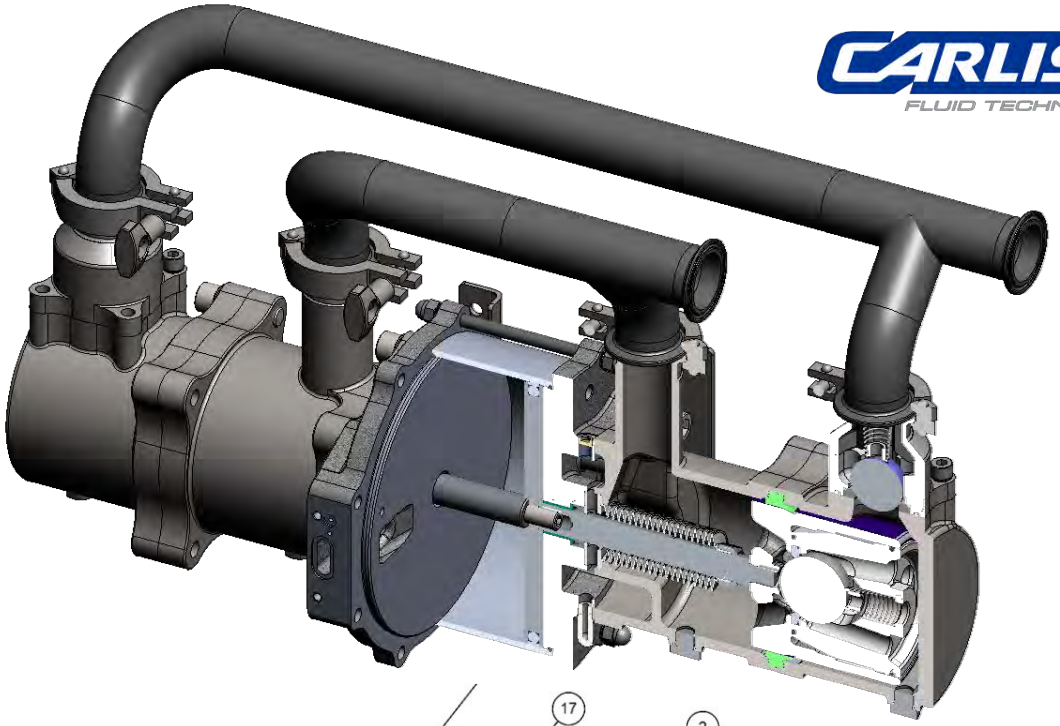
- Ceramic Coated Piston
  - o Lasts 4x longer than chrome
- Anti-Stall Magnetic Detents
  - o Quick stroke changeover/reduced pulsation
- Low Ice Air Motor with Quick Exhaust
  - o Prevents pump from stalling
- Lubrication Free Air Motor
- Tungsten Carbide Valve Seats
  - o Long operating life
- Spring Loaded Packings
  - o Self adjusting, less maintenance

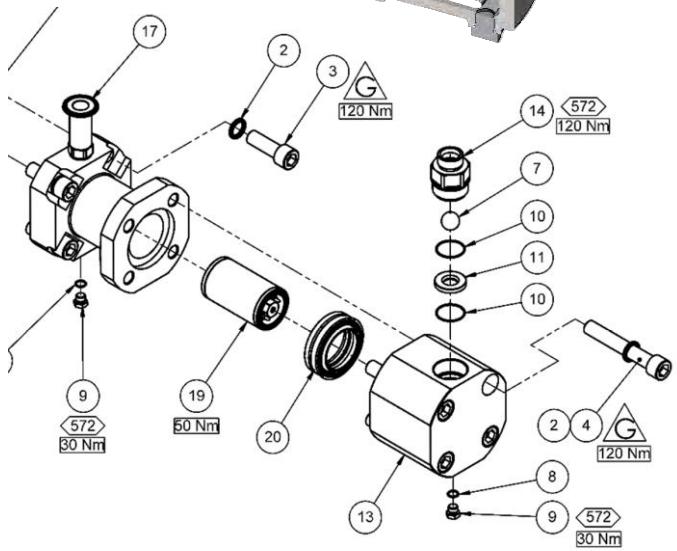


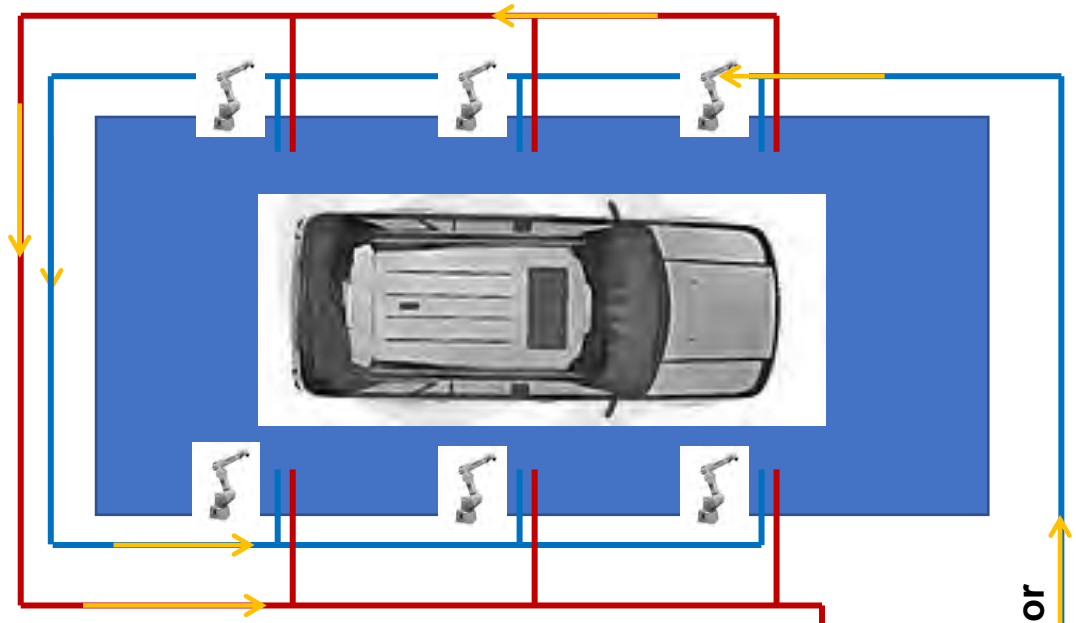


Maple/Smart Advantage

- Horizontal fluid section handles shear sensitive materials with kid-gloves
- Reciprocating horizontal piston configuration provides smooth balanced fluid pressure on each stroke, reducing pressure fluctuations on changeover
- Enclosed Bellows Seals - no exposed seals, eliminating shaft packing lubrication and significantly reducing pump maintenance
- Easy maintenance with quick access to balls, seats and piston seal







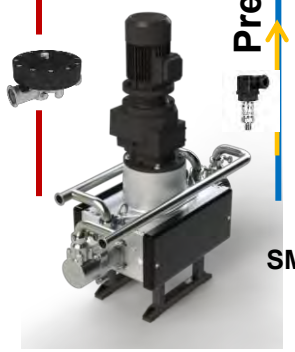
Smart System
Open Loop
Flow 5.5L
@ 4 bar pressure

Closed Loop
Reactive Flow
5.5L → Max 11.2L
@ 12 bar pressure

System is Set up in Smart Mode for:-
- Maximum Needed Dynamic Flow
- Minimum Pressure needed at last 'take off'

Open Loop :-
BPR is set up for 0 bar Pressure
Pump Develops pressure to overcome the pipework friction losses

Closed Loop:-
BPR set to maintain 8 bar at last take off
Reactive to flow demand changes



Pump is Flow Reactive for:-
19 mm bore main pipe

Open Loop Flow 5.5 L/min
Flow Velocity 0.322m/s

Closed Loop Flow 11.2 L/min (worst case)
Flow Velocity 0.656m/s

BGK A CARLISLE BRAND

BINKS A CARLISLE BRAND

DEVILBISS A CARLISLE BRAND

HOSCO A CARLISLE BRAND

ms A CARLISLE BRAND

Ransburg A CARLISLE BRAND

CARLISLE FLUID TECHNOLOGIES

Thank you!