

Parker - Autoclave Engineers Liquid Pumps and Pump Systems



ENGINEERING YOUR SUCCESS.

High Pressure Air Driven Liquid Pumps



High Pressure Air Driven Liquid Pumps

- 5 Different Pump Series for a variety of applications
- Pressures to 60,000 psi (4,140 bar)
- Flows to 7.6 GPM (28.8 liters/min)
- For pumping oil, water, and a variety of other fluids
- Stainless Steel hydraulic parts
- Complete Stand Alone & Custom Designed Pumping Systems available – with Tech Support



Pump Models

ASL Series: Standard Liquid [pressures up to 60,000 psi (4140 bar)]
6 inch diameter air piston



ACL Series: Compact Liquid [pressures up to 31,900 psi (2200 bar)]
3 inch diameter air piston



ACHL Series: ACL series pump that comes complete with ***Hand Lever Operator*** and can be Air Operated for precise pressure control. Handle is spring returned



AHL Series: High Flow, High Pressure Liquid [pressures up to 13,300 psi (917 bar) and Flows to 7 gpm]
Dual 10 inch diameter air pistons



AFL Series: High Flow, High Pressure Liquid, [pressures to 15,000 psi with Flow Rates up to 3 gpm]



Types of Air Drives

<u>Catalog #</u>	<u>Description/Function</u>
------------------	-----------------------------

- | | |
|-------|---------------------------------|
| • -01 | Single Acting,
Single Piston |
| • -02 | Single Acting,
Double Piston |
| • -1D | Double Acting,
Single Piston |
| • -2D | Double Acting,
Double Piston |



-01



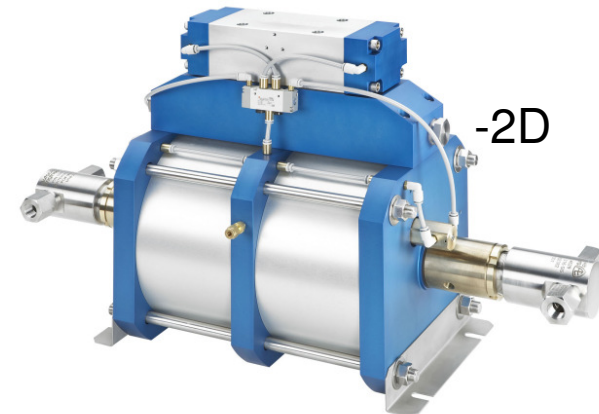
-01



-02



-1D



-2D

Example Catalog #: ASL100-02SNP



How The Pumps Work...

Piston to Plunger Ratio

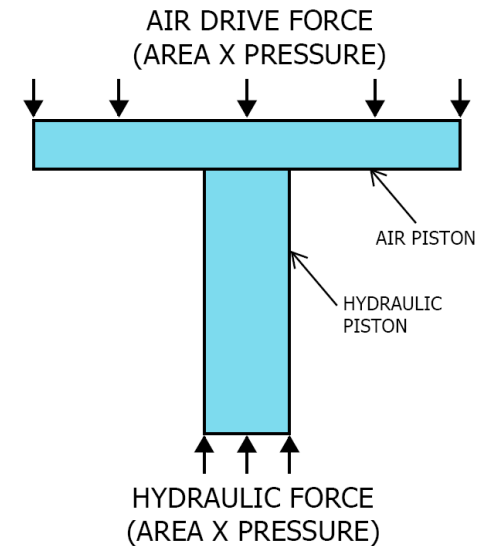
- Compressed air is used to produce hydraulic pressure.
- Works on differential surface area between the large air piston and smaller hydraulic plunger
- Differential is represented by the pressure ratio of the pump

Pressure ratio = Area of Air Piston ÷ Area of Hydraulic Plunger

- The higher the pressure ratio, the higher the output hydraulic pressure

Pressure Output = Pressure Ratio x Air Drive Pressure

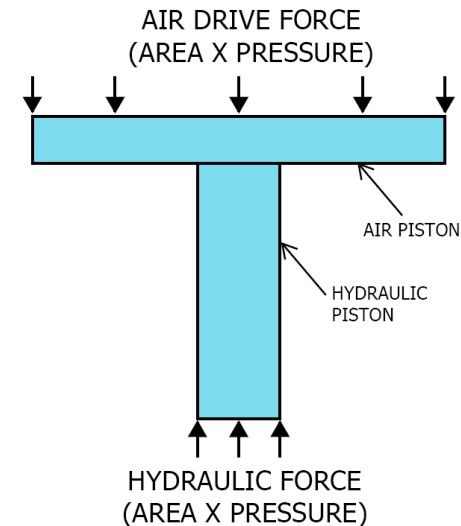
- Example: ASL150-01 Series pump has air to pressure ratio of 1:150, meaning if you applied 100 psi of air to the pump, it would result in an output hydraulic pressure of 15,000 psi



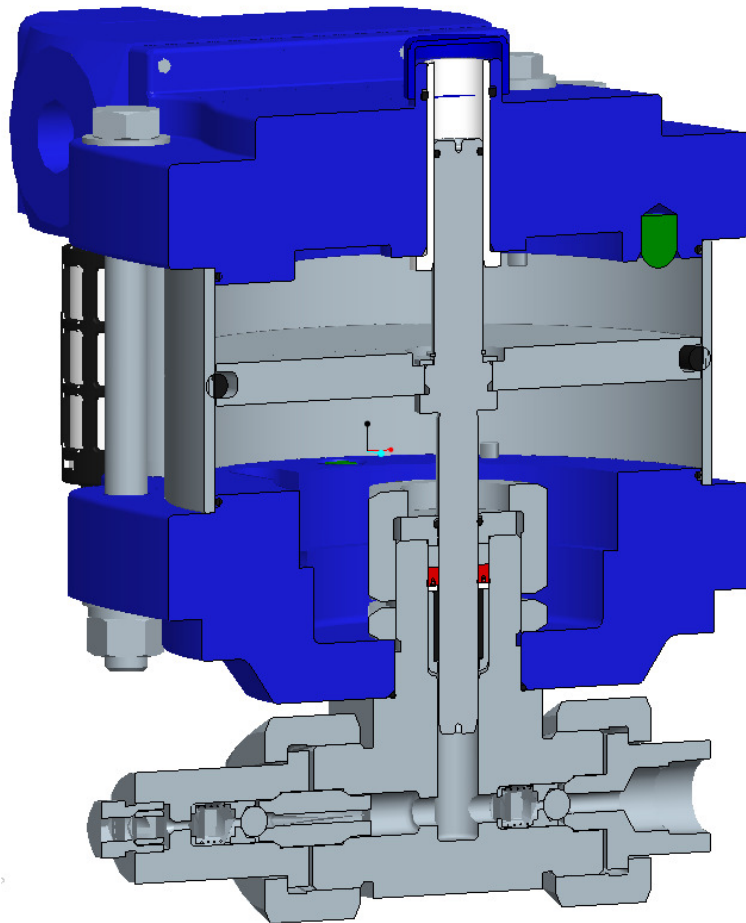
How The Pumps Work...

Piston to Plunger Ratio

- When air is applied to the pump it will cycle until the forces on the air piston equals the forces on the hydraulic plunger. This is the stall pressure.
- Pump will automatically restart if there is a drop in hydraulic pressure or an increase in air drive pressure.
- Double air pistons are available which will double the pressure ratio because you have twice the air piston area acting on the same hydraulic plunger area (Ex: ASL150-02 has a pressure ratio of 300:1)



How The Pumps Work...



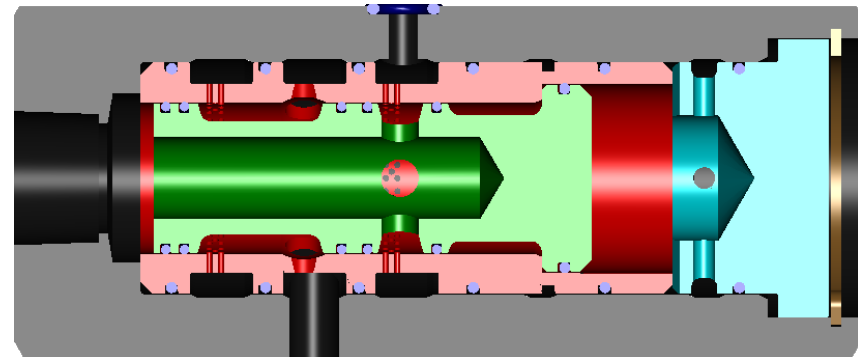
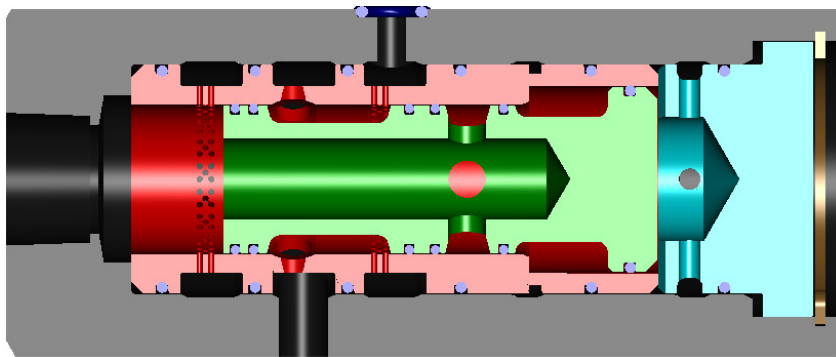
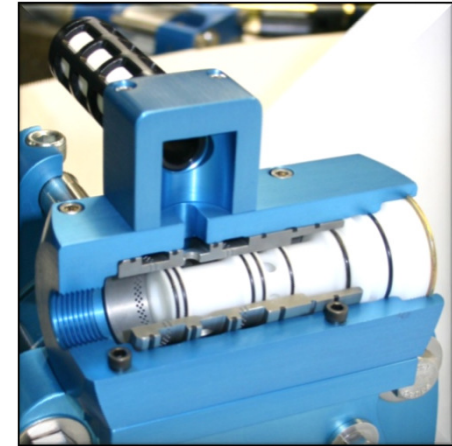
Air Drive Section

- Air pilot operated spool provides automatic cycling of air from one side of the piston to the other
- At the end of each stroke, the air piston activates a pilot valve that will cause the spool to shift
- The spool shifting will supply air to one side of the piston while venting the other side of the piston
- This alternating action continues until the pump reaches it's stall pressure

How The Pumps Work...

Spool Section

- Air pilot operated spool provides automatic cycling of air from one side of the piston to the other
- At the end of each stroke, the air piston activates a pilot valve that will cause the spool to shift



- The spool shifting will supply air to one side of the piston while venting the other side of the piston
- This alternating action continues until the pump reaches it's stall pressure



Air Drive Section Special Features

- All Aluminum parts machined from high quality bar stock, no cast aluminum components
- Anodizing with special sealing technique to provide better protection from harsh environments
- Unique Muffler design to give a great combination of high flow and low noise
- Rubber bumpers in end caps to reduce noise of operation
- Latest lubrication technology provides long seal service life and improves pump efficiency and performance
- No lubricator required for air drive source
- Stainless steel tie-rods and hardware

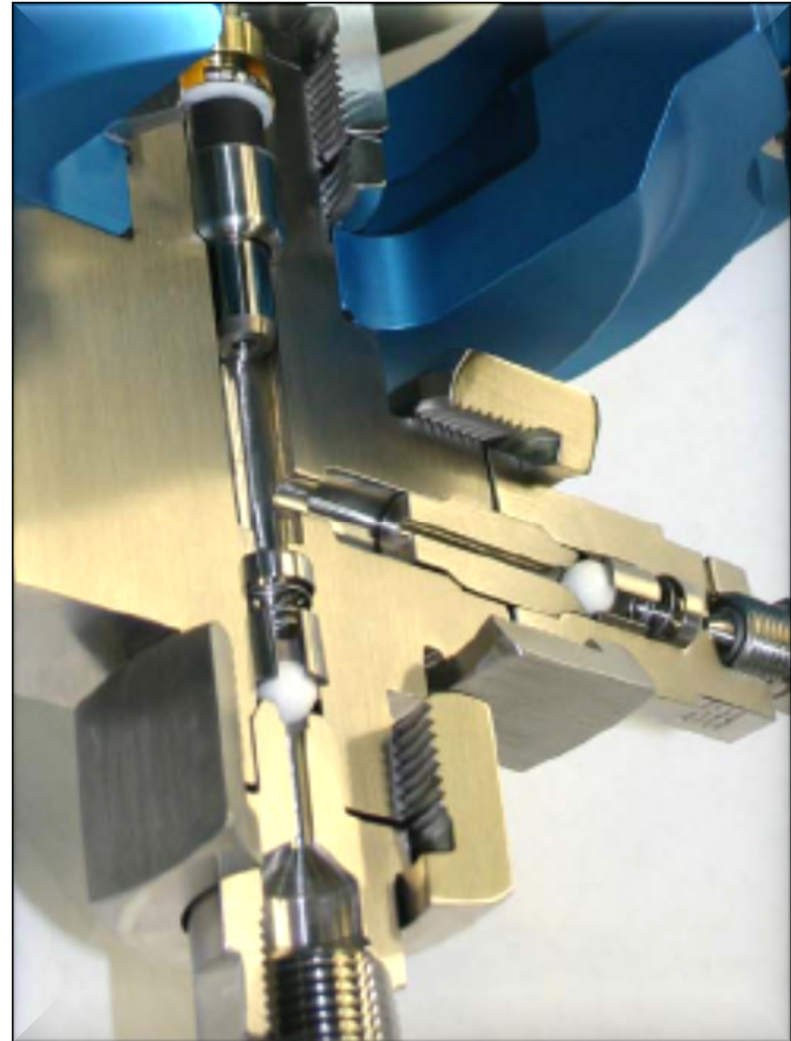


How The Pumps Work...

Hydraulic Functionality

Suction stroke: hydraulic plunger moves away from the head, causing the inlet check valve to open and draw fluid into the head while the outlet check valve closes due to the spring load on ball

Compression stroke: hydraulic plunger moves toward the head which compresses the hydraulic fluid while closing the inlet check valve and opening the outlet check valve



Hydraulic Section

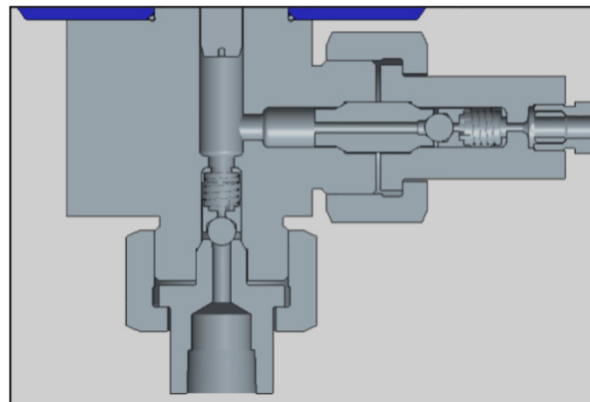
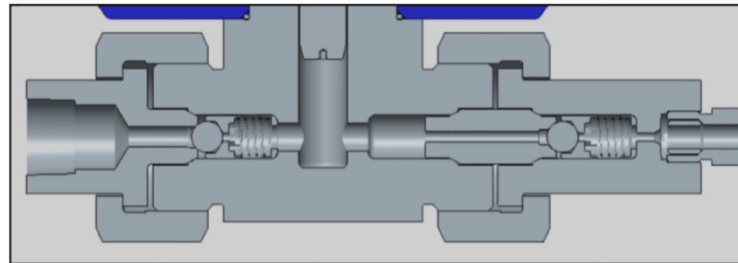
Pump Head

- Pump Head: machined out of high quality stainless steel bar stock
- Pump head inlet port can be ordered as either:
(on most pumps*)

-Side Inlet →

or

-Bottom Inlet →



* AHL series pumps come with side inlet pump head only



Hydraulic Section

Isolation Chamber

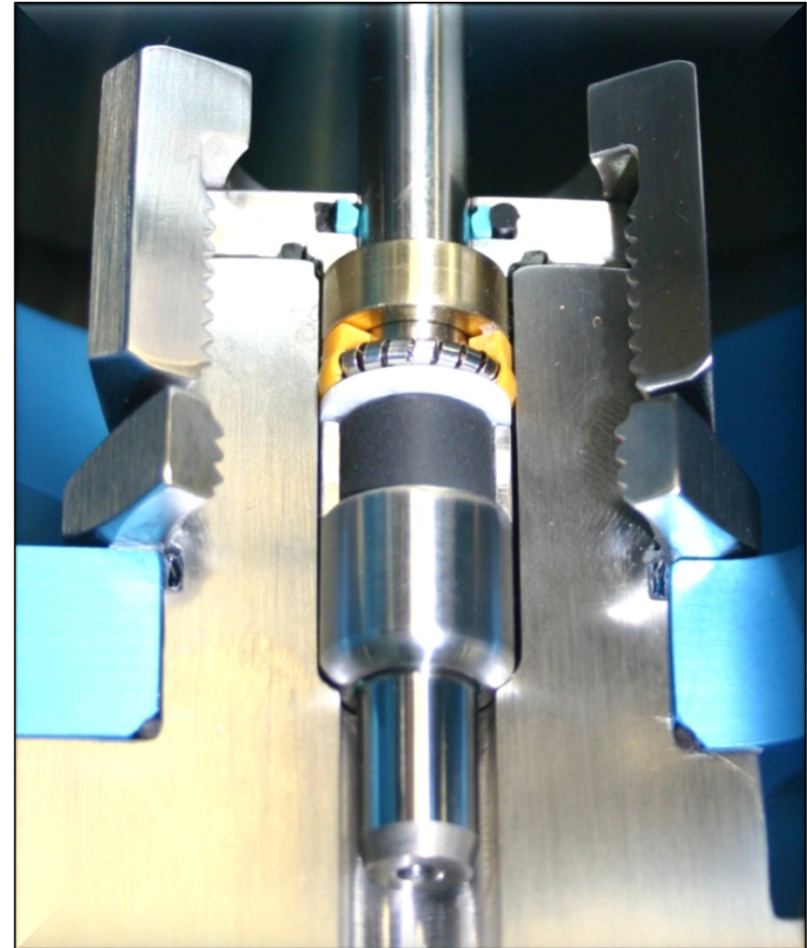
- Isolation Chamber: protects air drive section from any hydraulic seal leaks
- Prevents hazardous fluids from becoming air-borne through air drive section if a hydraulic seal were to fail
- Optional on most models
- Comes as standard on the ASL400-02, ASL250-02, and all AFL & AHL Series Pumps
- 1/8" NPT connection on drain port



Hydraulic Section

Hydraulic Seal

- High pressure hydraulic seal: forms a seal against the plunger and head to assure against external leaks and leaks into the air drive section
- Section Components Include:
 - Bearing Guide & Sleeve
 - Bottom Washer
 - Seal
 - Seal Backup
 - Seal Retainer
 - Backpressure O-ring

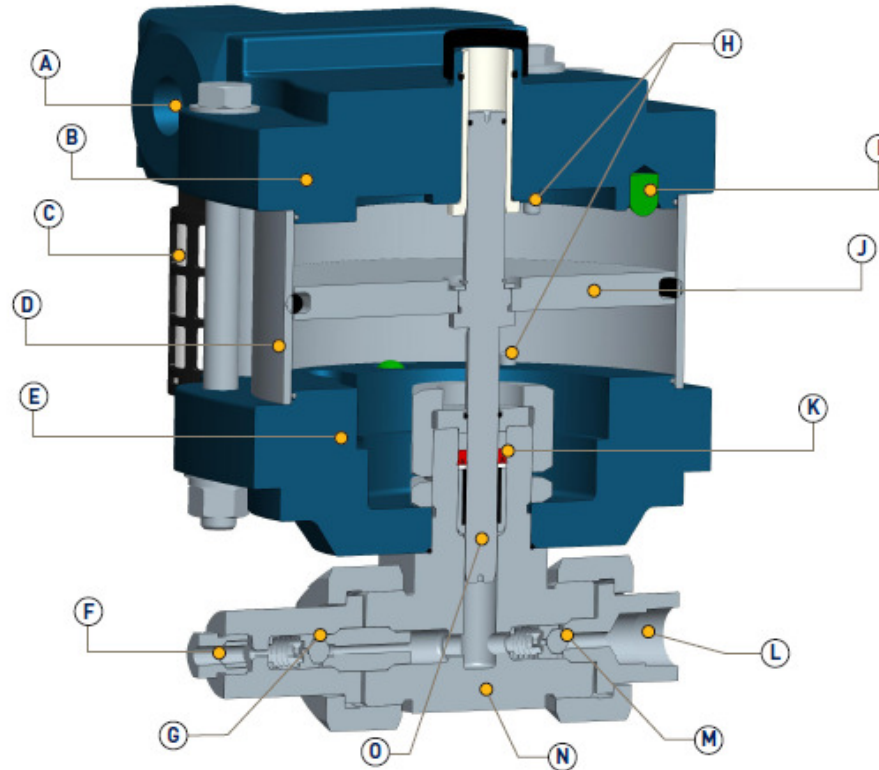


Hydraulic Section Special Features

- Stainless plunger coated with a proprietary multi-layer carbon based coating with diamond like carbon exterior layer:
 - *Exceptional hardness (**3 times harder than Stellite**)*
 - *Inert, so it has superior chemical compatibility and corrosion resistance*
 - *Low friction that limits seal wear and increases efficiency (**coefficient of friction equal to or less than PTFE**)*
 - *Tough coating that provides long plunger cycle life. (Have never had to replace a coated plunger during prototype testing)*
- Pressure head specially designed and engineered for high cycle life
- Spring energized u-cup seal provides better sealing performance at wide ranges of pressures
- Extended service life check valves with Ceramic balls for high pressure applications



Typical Pump Cut-Away



	Description			Description
A	Air Inlet		I	Air Piston Bumper
B	Top End Cap		J	Air Piston
C	Air Muffler		K	High Pressure Seal Assembly
D	Air Cylinder		L	Liquid Inlet Connection
E	Bottom End Cap		M	Inlet Check Valve
F	High Pressure Outlet Connection		N	Pump Head Body
G	Outlet Check Valve		O	Hydraulic Plunger
H	Pilot Valve			



How to Select a Pump...

- Determine minimum air pressure available
- Determine required hydraulic output pressure
- Divide outlet hydraulic pressure by available air pressure, this is the minimum pressure ratio required
- Example: 100 psi air and 20,000 psi required yields 1:200 ratio pump
- Decide flow rate required
 - *Volume to be filled*
 - *Time available to fill volume and pressurize*
 - *Is volume going to be pre-filled? If so, manually or with another pump?*



How to Select a Pump...

- Use the ratio and flow rate to specify appropriate series pump
- A two piston air drive option will give the best flow vs. outlet pressure characteristics
- All liquid flow curves and volume displacements are located in the pump literature
- Pumps run fast initially at free flow with no pressure building, but slows down as pressure increases and pump stalls



Pump Ordering Guide Basics

- Pumps Catalog # Breakdown
 - Pump Category
 - Nominal Ratio
 - Air Drive Type
 - Pump Head Liquid Inlet Location
 - Isolation Chamber
 - Hydraulic Seal Material (need to know media)
 - Repair Kits Catalog # Breakdown
 - Spool Valve
 - Pilot Valve
 - Air Drive
 - Hydraulic Seals
 - Check Valves
- * Full Rebuild Kits are Available



Pump Catalog Number Matrices

ACL Pumps

Typical catalog number example: ACL189-01SNP (catalog number is created based on customer selection of product parameters, see below for example)			
ACL189-01	S	N	P
Pump Series Type/Size/Ratio	Liquid Inlet Location	Isolation Chamber	Liquid Seal Material
ACL <ul style="list-style-type: none"> • Compact Liquid High Pressure Pump • 3" Single Piston Air Drive • 1:220 Air-to-Liquid Pressure Ratio • Maximum 31,900 psi (2,199 bar) 	S* = Side B = Bottom	N* = None	P* = UHMWPE U-Cup with Elgiloy Spring Energizer U = Urethane U-Cup

* Standard for stock pumps

Flow Rate Table: Air Drive Pressure (psi) vs. Outlet Pressure (psi)

Catalog Number	Air Drive Pressure (psi)	Outlet Pressure (psi)											
		0	500	1,500	3,000	5,000	7,500	10,000	15,000	25,000	40,000	55,000	in ³ /min.
ACL72-01	60	42	32	17	9	1							
	90	42	34	25	18	7	1						
	120	43	35	29	24	17	7	2					
ACL111-01	60	28	23	14	9	5	1						
	90	28	25	19	15	10	5	2					
	120	29	26	21	18	15	10	6	1				
ACL189-01	60	15	15	14	13	12	9	6					
	90	15	15	15	14	14	13	11	6				
	120	15	15	15	15	15	14	13	10	1			
ACL189-02	60	13	12	11	10	9	7	7	5	1			
	90	14	13	12	11	8	8	8	7	5			
	120	17	16	14	12	10	9	8	8	7	4		



Pump Catalog Number Matrices

ACHL Pumps

Typical catalog number example: **ACHL189-01SNP**

(catalog number is created based on customer selection of product parameters, see below for example)

ACHL189-01	S	N	P
Pump Series Type/Size/Ratio	Liquid Inlet Location	Isolation Chamber	Liquid Seal Material
ACHL <ul style="list-style-type: none"> • Compact Liquid High Pressure Pump with hand lever • 3" Single Piston Air Drive • 1:213 Max. Air-to-Liquid Pressure Ratio • Maximum 31,900 psi (2,199 bar) 	S* = Side B = Bottom	N* = None	P* = UHMWPE U-Cup with Elgiloy Spring Energizer U = Urethane U-Cup

* Standard for stock pumps

Flow Rate Table: Air Drive Pressure (psi) vs. Outlet Pressure (psi)

Catalog Number	Air Drive Pressure (psi)	Outlet Pressure (psi)											
		0	500	1,500	3,000	5,000	7,500	10,000	15,000	25,000	40,000	55,000	
ACHL72-01	60	42	32	17	9	1							in ³ /min.
	90	42	34	25	18	7	1						
	120	43	35	29	24	17	7	2					
ACHL189-01	60	15	15	15	15	14	13	8					
	90	15	15	15	15	15	13	11	7				
	120	15	15	15	15	15	13	12	8	1			

Pump Catalog Number Matrices

ASL Pumps

Typical catalog number example: ASL250-01SNP (catalog number is created based on customer selection of product parameters, see below for example)			
ASL250-01	S	N	P
Pump Series Type/Size/Ratio	Liquid Inlet Location	Isolation Chamber	Liquid Seal Material
ASL • Standard Liquid High Pressure Pump • 6" Single Piston Air Drive • 1:265 Max. Air-to-Liquid Pressure Ratio • Maximum 38,400 psi (2,648 bar)	S* = Side B = Bottom	N* = None C = Included	P* = UHMWPE U-Cup (See table below)

* Standard for stock pumps

Available seal material for the following models.

Model Number	Seal Material
ASL10 ASL15	*PV = UHMWPE U-Cup and Viton O-Rings PE = UHMWPE U-Cup and EPDM O-Rings PB = UHMWPE U-Cup and Buna-N O-Rings PC = UHMWPE U-Cup and Perfluoroelastomer O-Rings UV = Urethane U-Cup and Viton O-Rings UE = Urethane U-Cup and EPDM O-Rings UB = Urethane U-Cup and Buna-N O-Rings TV = Thermoplastic Polyester U-Cup and Viton O-Rings TE = Thermoplastic Polyester U-Cup and EPDM O-Rings TB = Thermoplastic Polyester U-Cup and Buna-N O-Rings TC = Thermoplastic Polyester U-Cup and Perfluoroelastomer O-Rings
ASL25 ASL35	*PV = UHMWPE U-Cup and Viton O-Rings PE = UHMWPE U-Cup and EPDM O-Rings PB = UHMWPE U-Cup and Buna-N O-Rings PC = UHMWPE U-Cup and Perfluoroelastomer O-Rings UV = Urethane U-Cup and Viton O-Rings UE = Urethane U-Cup and EPDM O-Rings UB = Urethane U-Cup and Buna-N O-Rings
ASL60	*P = UHMWPE U-Cup with Elgiloy Spring O-Rings UV = Urethane U-Cup and Viton O-Rings UE = Urethane U-Cup and EPDM O-Rings UB = Urethane U-Cup and Buna-N O-Rings
ASL100 ASL150 ASL250 ASL400	*P = UHMWPE U-Cup UE = Urethane U-Cup

Flow Rate Table: Air Drive Pressure (psi) vs. Outlet Pressure (psi)

Catalog Number	Air Drive Pressure (psi)	Outlet Pressure (psi)											
		0	500	1,500	3,000	5,000	7,500	10,000	15,000	25,000	40,000	55,000	
ASL10-01	60	1277	489										in ³ /min.
	90	305	826										
	120	1360	925										
ASL15-01	60	887	485										
	90	906	591										
	120	945	642	474									
ASL25-01	60	508	342	127									
	90	520	387	303									
	120	543	427	360	202								
ASL35-01	60	315	273	121									
	90	322	291	211	58								
	120	328	302	250	157								
ASL60-01	60	168	155	125	79								
	90	175	161	134	106	63							
	120	182	167	140	118	94	45						
ASL100-01	60	104	99	88	70	46							
	90	108	103	92	78	65	44	11					
	120	112	106	95	83	72	60	47					
ASL150-01	60	81	79	76	66	49	19						
	90	83	82	80	75	67	53	35					
	120	84	83	82	78	73	66	55	25				
ASL250-01	60	46	45	44	42	37	26	20	2				
	90	47	46	45	44	43	40	36	26				
	120	48	47	47	46	45	43	41	34	17			
ASL400-01	60	39	38	37	36	33	29	23	10				
	90	40	39	38	38	37	35	32	26	8			
	120	41	40	39	38	38	37	36	32	21			
ASL10-02	60	880	720										
	90	890	800	350									
	120	900	840	570									
ASL15-02	60	615	550	200									
	90	625	575	410									
	120	630	600	500	225								
ASL25-02	60	345	330	265	60								
	90	350	335	300	208	15							
	120	355	345	320	265	150							
ASL35-02	60	240	230	210	115								
	90	242	232	225	190	115							
	120	245	235	230	210	170	95						



Pump Catalog Number Matrices

AHL Pumps

Typical catalog number example: AHL66-2DSCUV (catalog number is created based on customer selection of product parameters, see below for example)			
AHL66-2D	S	C	UV
Pump Series Type/Size/Ratio	Liquid Inlet Location	Isolation Chamber	Liquid Seal Material (AHL33 and AHL66)
AHL <ul style="list-style-type: none"> • High Flow Liquid High Pressure Pump • 10" Dual Piston Air Drive • 1:133 Max. Air-to-Liquid Pressure Ratio • Maximum 13,300 psi (917 bar) • Double Acting Liquid Heads 	S* = Side	C* = Included	UV* = Urethane U-Cup and Viton O-Rings UE = Urethane U-Cup and EPDM O-Rings UB = Urethane U-Cup and Buna-N O-Rings TV = Thermoplastic Polyester U-Cup and Viton O-Rings TE = Thermoplastic Polyester U-Cup and EPDM O-Rings TB = Thermoplastic Polyester U-Cup and Buna-N O-Rings TC = Thermoplastic Polyester U-Cup and Perfluoroelastomer O-Rings C = Perfluoroelastomer O-Rings

* Standard for stock pumps

Reference Guide

Pump Model Series	Pressure Ratio	Maximum Rated Outlet Pressure PSI (bar)	Displacement Per Cycle .in³ (cm³)	Liquid Connections	
				Inlet	Outlet
AHL Series					
AHL33-2D	1:67	6,700 (462)	15.3 (250.7)	1" FNPT	1/2" FNPT
AHL66-2D	1:133	13,300 (917)	7.8 (127.8)	1/2" FNPT	1/2" FNPT



Pump Catalog Number Matrices

AFL Pumps

Typical catalog number example: AFL100-1DBPV (catalog number is created based on customer selection of product parameters, see below for example)			
AFL100-1D	B	C	PV
Pump Series Type/Size/Ratio	Liquid Inlet Location	Isolation Chamber	Liquid Seal Material (AFL35, AFL60, AFL100)
AFL <ul style="list-style-type: none"> • High Flow, High Pressure Pump • 6" Dual Piston Air Drive • 1:113 Max. Air-to-Liquid Pressure Ratio • Maximum 15,000 psi (1034 bar) • Single Ended, Double Acting Liquid Heads 	B* = Bottom	C* = Included	PV* = UHMWPE U-Cup and Viton O-Rings PE = UHMWPE U-Cup and EPDM O-Rings PB = UHMWPE U-Cup and Buna-N O-Rings PC = UHMWPE U-Cup and Perfluoroelastomer O-Rings

* Standard for stock pumps

Flow Rate Table: Air Drive Pressure (psi) vs. Outlet Pressure (psi)

Catalog Number	Air Drive Pressure (psi)	Outlet Pressure (psi)								
		0	500	1,500	3,000	4,500	6,000	10,000	15,000	
AFL35	60	24	19	9						Liters /min.
	90	25	21	16	6					
	120	26	23	19	12	2				
AFL60	60	14	12	9	4					
	90	14	13	11	8	6	1			
	120	15	14	12	10	8	6			
AFL100	60	10	9	7	5	3	1			
	90	11	10	8	7	6	5	1		
	120	12	11	9	8	7	6	3		



Packaged Pump Testing Systems



- Standard and Custom pump skids and portable carts
- Self contained units complete with pump, reservoir, valves, tubing, gauges, air controls, etc.
- Only an air source is required for operation, no electricity required
- Great for moving from location to location within a plant, facility, or out in the field.



Packaged Pump Testing Systems



- Move your High Pressure Test Stand Anywhere You Need it to be
- Single or Dual Pump Systems with Optional Reservoir
- Systems Designed for Pressures up to 60,000 psi
- Totally Self-Contained, Electricity not Required



Pump Accessories

- Air filter
- Air pressure regulator
- Air shutoff valves
- Cycle stroke counter
- Pneumatic pilot switches and Solenoid valves
- Relief/safety devices
- High Pressure Hose (Parker Polyflex)



Oil & Gas.....

- Chemical Injection
- Actuation of Safety Shutdown Valves
- Hydraulic Power Units
- Portable Hydraulic Power Source
- Bolt Tensioning
- Hydraulic Hose Testing
- Product Pressure Testing
- Mobile Pressure Test Rigs



Industrial...

- Engineering
- Aerospace
- Hydraulic/Pneumatic Manufacturing
- Chemical & Process
- Automotive and Heavy Equipment
- Product Pressure Testing



Applications...

- Hydrostatic and leak testing of pressure containing parts (valves, vessels, tubing, etc)
- Cycle, fatigue and burst testing
- Calibration of pressure gauges and transducers
- Chemical injection in wells
- PH Control in Chemical Pipelines
- Corrosion Testing
- Bolt torque and tensioning



Applications...

- Cold Isostatic Presses
- Hydraulic driven tools
- High pressure lubrication
- Lifting and Jacking
- Mobile pressure test rigs
- Test benches and consoles
- Hydraulic hose testing
- Down hole performance simulators

