

Wilfley

Technical Handbook

ASME B73.1

Chemical
Processing
Pump

Model A7



WILFLEY

Wilfley Model A7 Chemical Processing Pumps



Wilfley hydraulic seal in actual operation.

ASME B73.1 M-91

Wilfley's Model A7 pump series offers maximum efficiency coupled with ultimate seal flexibility. It is designed to be sealless, but can also be used with virtually any traditional seal—packing or mechanical.

The Model A7 is an end-suction, single-stage centrifugal pump that meets ASME B73.1 M-91 requirements. It handles liquids that are highly corrosive and abrasive. Discharge sizes range from 1" to 8" in diameter. Flow rates range to 4,500 gallons per minute.

Original Sealless Operation

To prevent leakage while running, Model A7 pumps have the original Wilfley expeller. The impeller and expeller rotate together during

operation creating a hydraulic seal that keeps liquids away from the shaft while the pump is operating.

Static seal faces prevent leakage when the pump is shut down. The pump remains leak free while running and while shut down.

Wilfley seals can be run dry without damaging internal parts because wetted parts operate freely with no rubbing contact. Constant down time to repair and replace conventional contact seals is eliminated.

Ultimate Flexibility

Wilfley Model A7 pumps are designed to handle a wide range of corrosive applications—no matter what the requirements. Wilfley engineers each pump to perform to exact specifications.

A.R. Wilfley & Sons is proud of the individual engineering service traditionally provided to customers. Wilfley engineers have developed new sealing flexibility in answer to customers' requests.

The DryLock® and Lube Seal are now exclusively available through Wilfley for the Model A7. The Model A7 can also use most other available seals. This flexibility extends to vapor seals. The A7 series frame can use conventional lip seals, labyrinth or magnet seals.

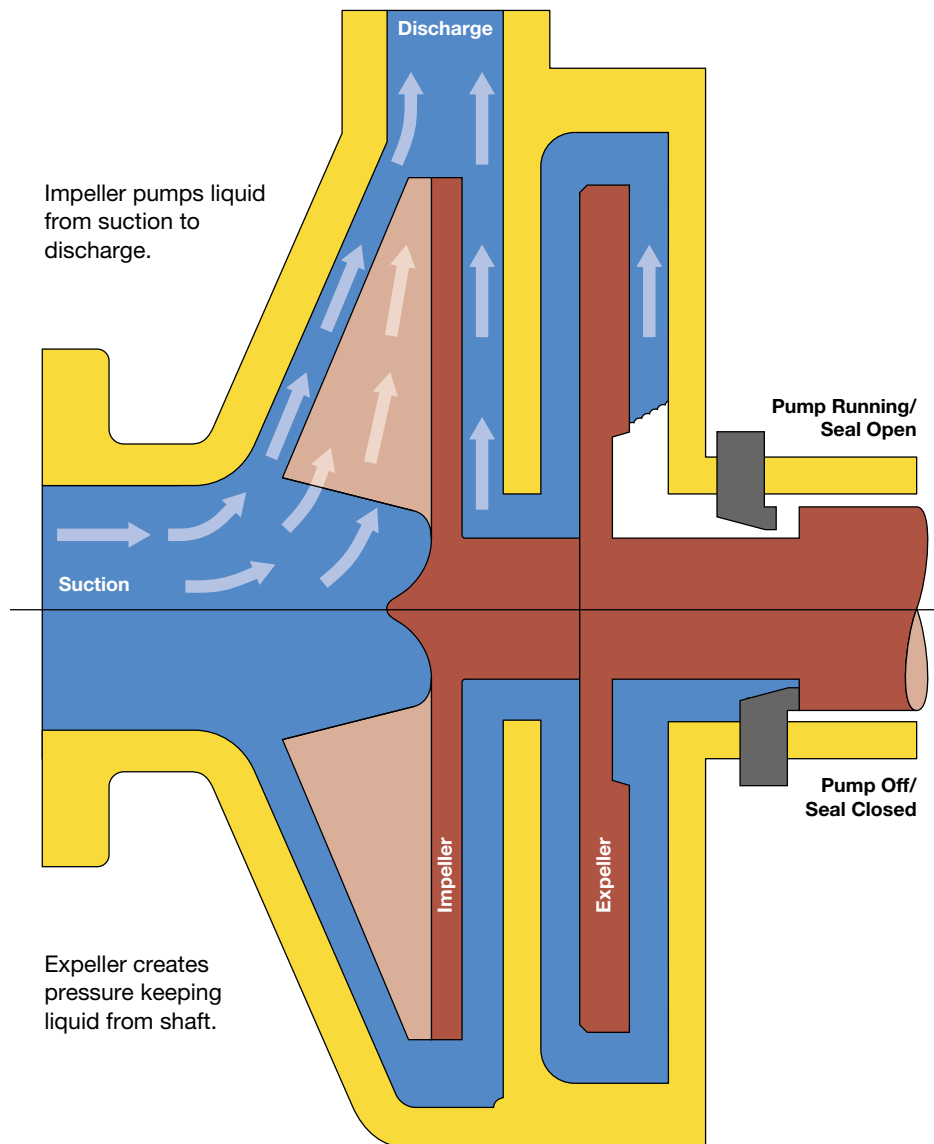
Tradition of Innovation and Quality

Arthur Redman Wilfley was an inventor and entrepreneur. He began working on centrifugal pumps in 1902. Wilfley's first commercially-available pump was sold in 1919 and was built around his unique concept of the expeller for hydraulic sealing. He continued to perfect the expeller design and received a patent in 1920. The expeller is now the hallmark of all Wilfley pumps.

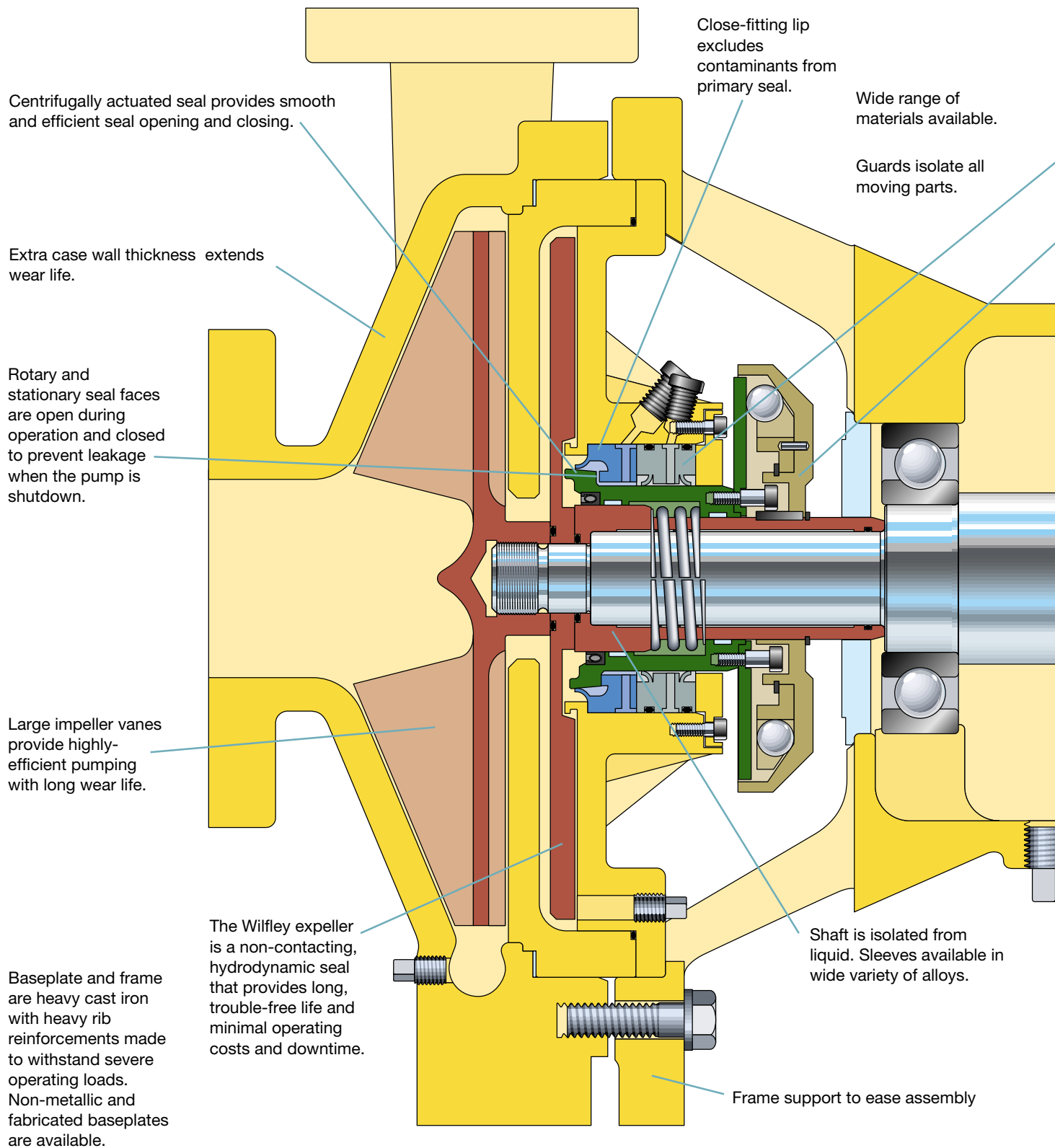
Today, Wilfley's applications and engineering staff continue to provide the most up-to-date information and innovative technology on pumps and pump processes to customers around the world.

Wilfley's pump lines include a wide range of centrifugal pumps that are designed to handle highly-abrasive slurries and corrosive materials.

To locate the Wilfley office or agent nearest you, please contact A.R. Wilfley & Sons, Inc. directly at 1-800-525-9930 or www.wilfley.com.



Wilfley Model A7 Features and Benefits



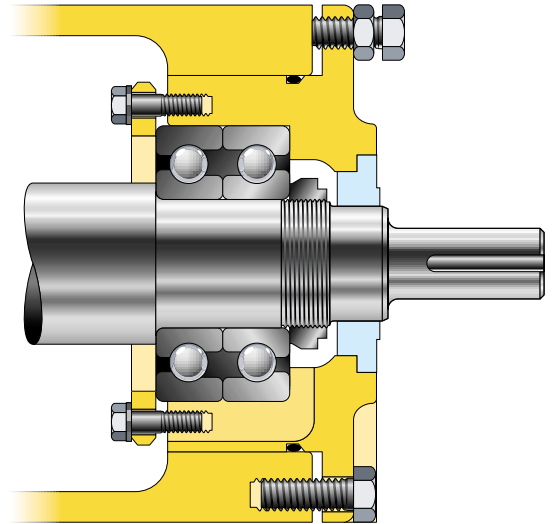
Standard labyrinth seal

Optional vapor seal meets EPA requirements.

Cartridge-type Wilfley hydrodynamic seal to simplify maintenance.

Optimum shaft size to transmit loads and maximize sealing flexibility.

Extreme Duty bearings expand the operating range to include severe duty applications.

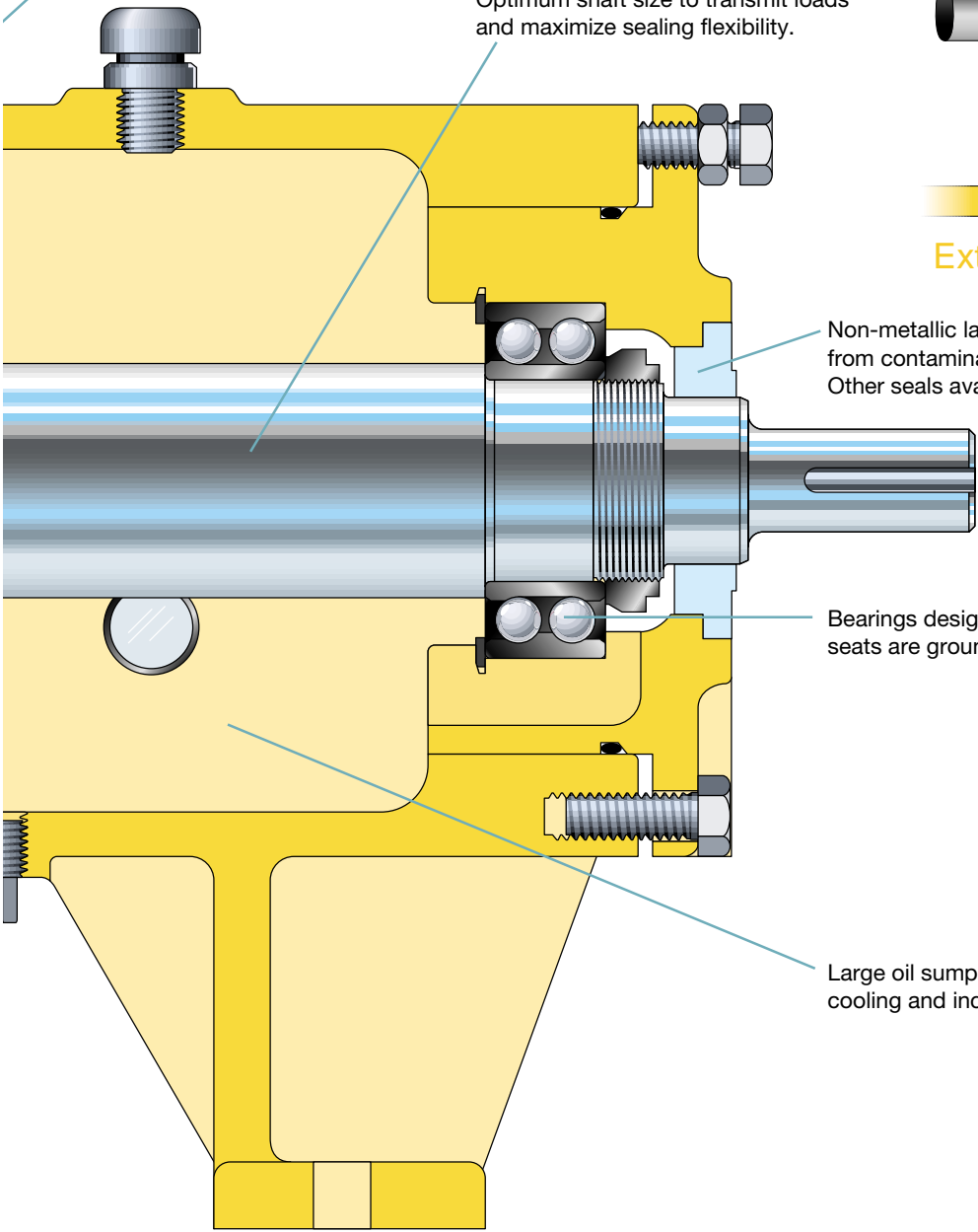


Extreme Duty Bearings

Non-metallic labyrinth seals isolate bearings from contamination to improve durability. Other seals available.

Bearings designed for long life. Bearing seats are ground to provide a precise fit.

Large oil sump capacity to provide maximum cooling and increase bearing life.

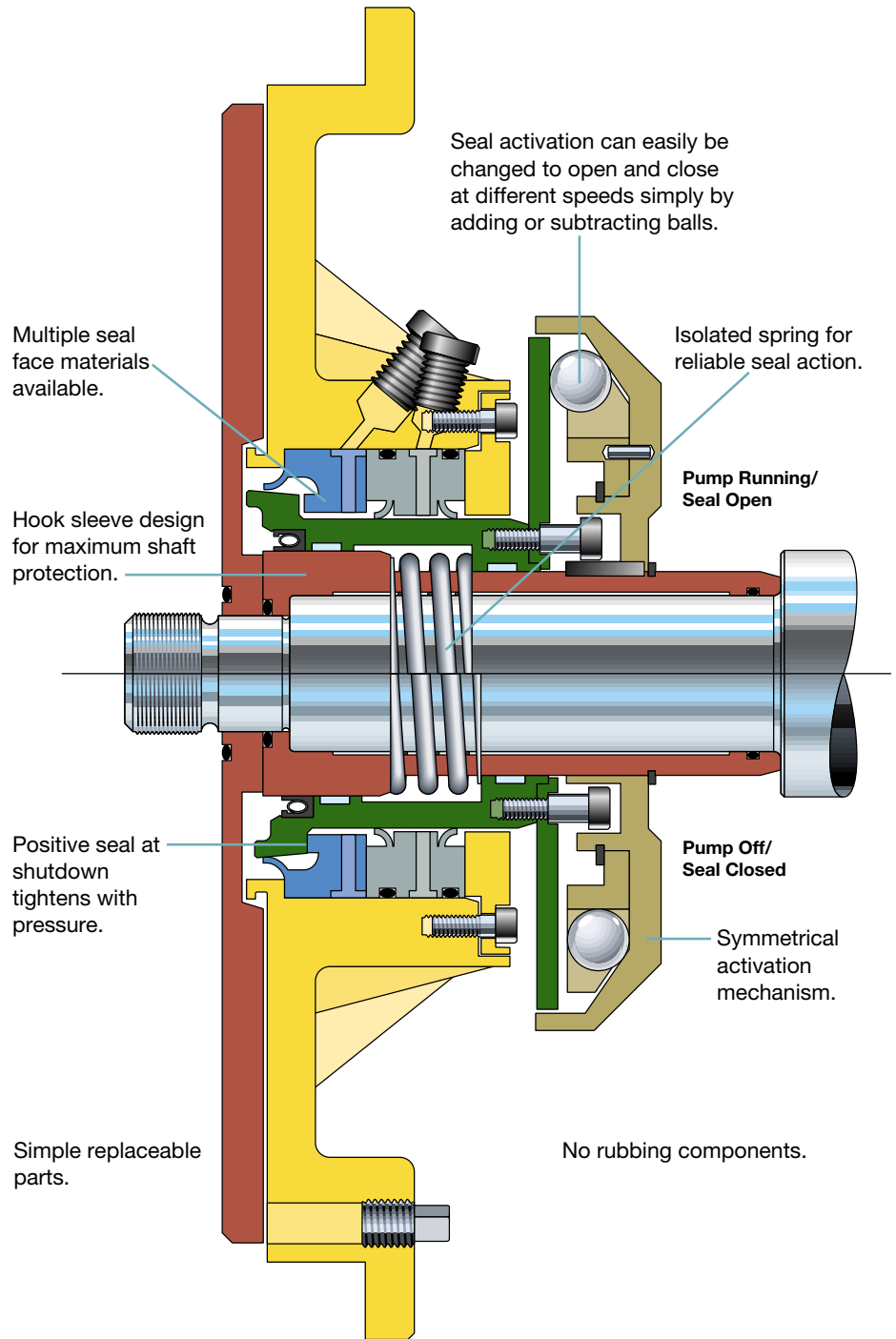


DryLock® Features

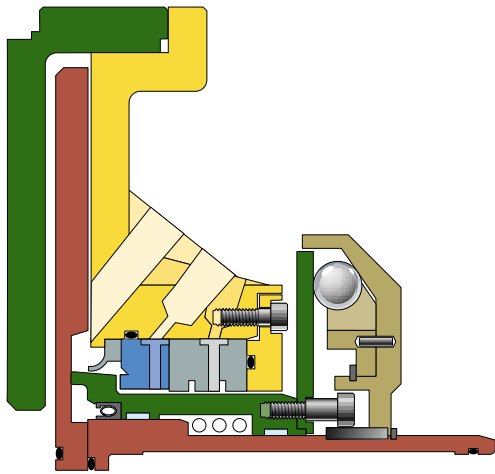
The DryLock® uses the action of centrifugal force combined with the smooth actuation of ball bearings to open and close the seal. As the pump starts up, the expeller evacuates the liquid in the seal area. The balls of the DryLock® are forced outward and slide up a ramp created by the ball housing. The ramp forces the balls into the actuator plate and opens the seal faces. Upon shut-down, the balls lose their centrifugal force allowing the spring-loaded actuator plate to move back into its closed position. The seal is then closed.



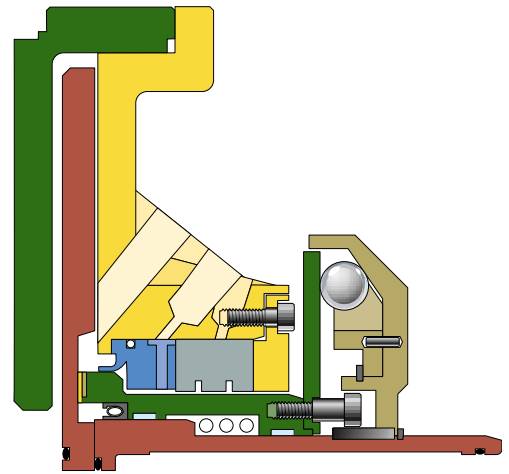
Actuator Assembly



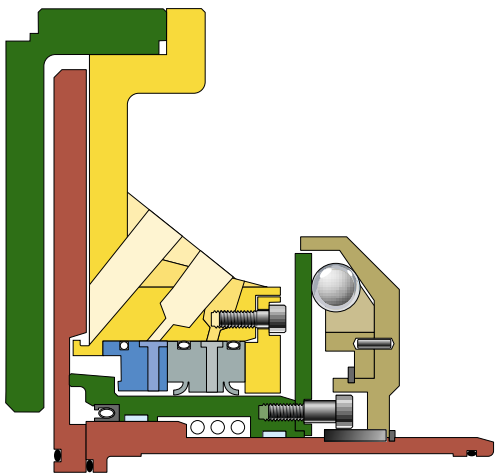
Wilfley Options Seal



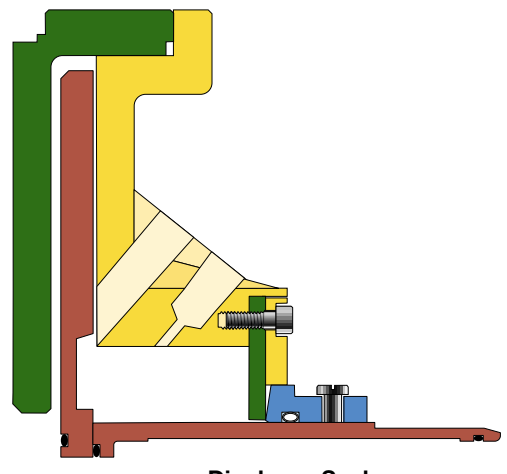
Extreme Temperature Seal



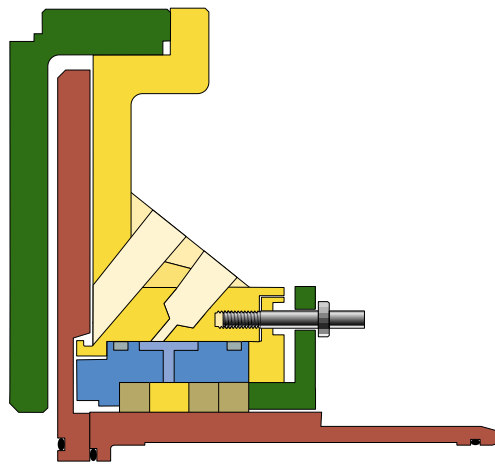
**Drylock/Labyrinth Backup
For Light Slurry Services**



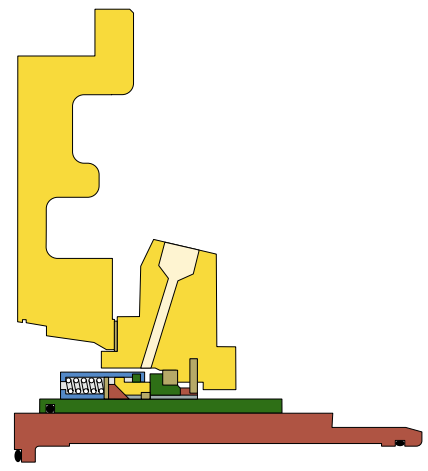
Carbon Drylock/Vapor Barrier



Diaphragm Seal



Expeller/Packing

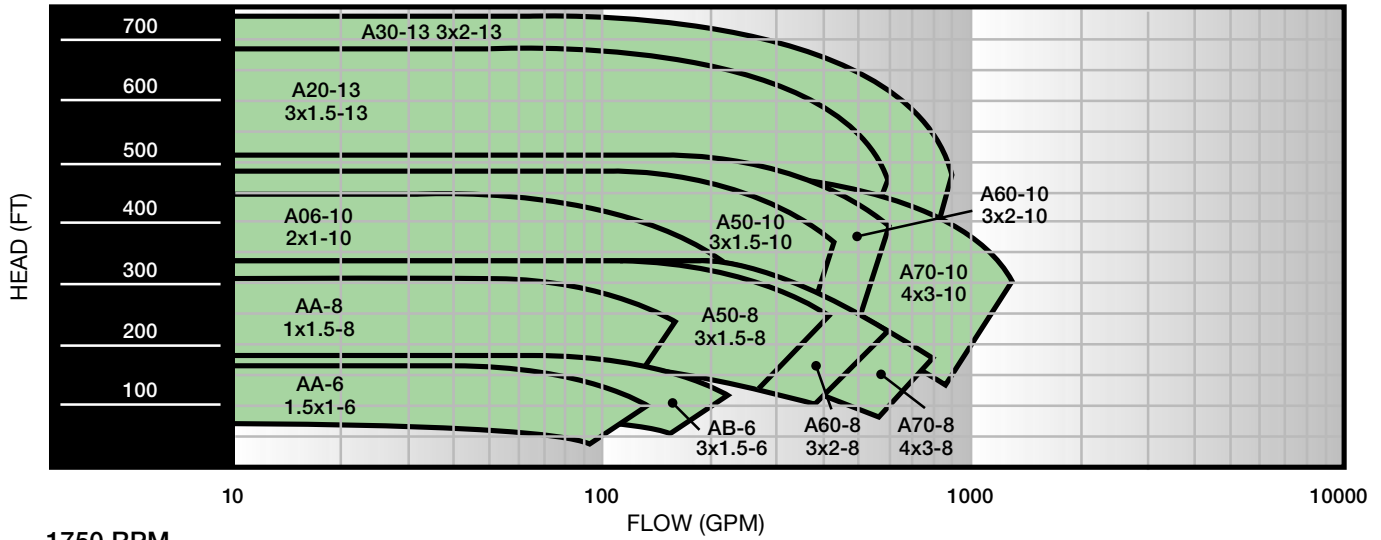


Mechanical Seal

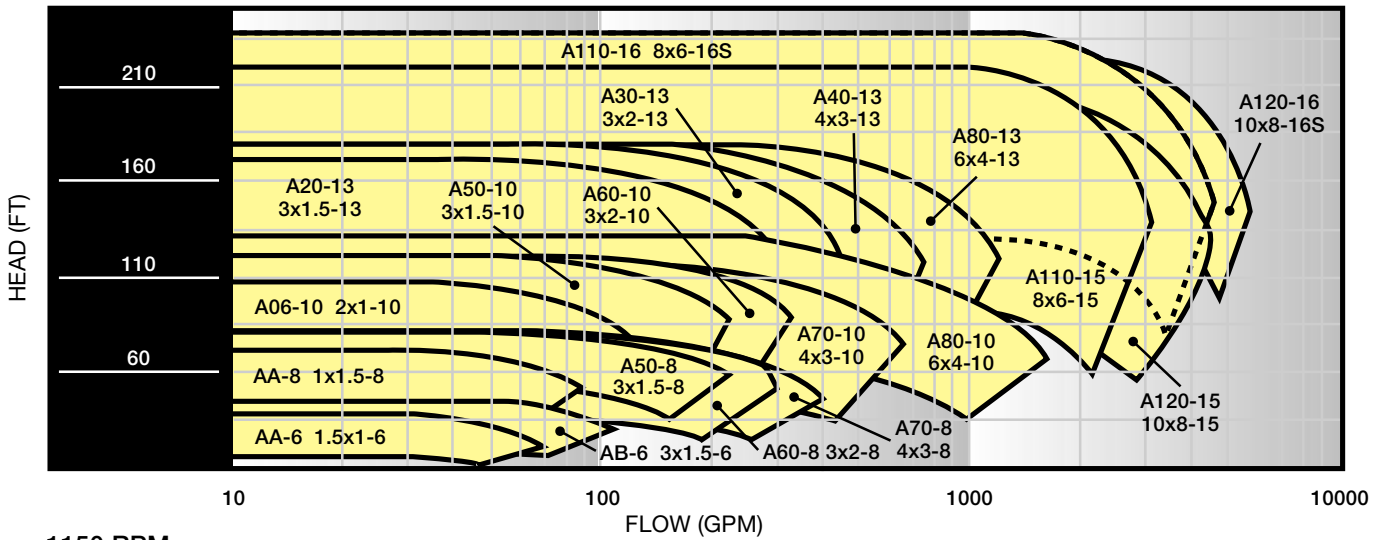
Model A7 Pump Capacities

60 cycle performance

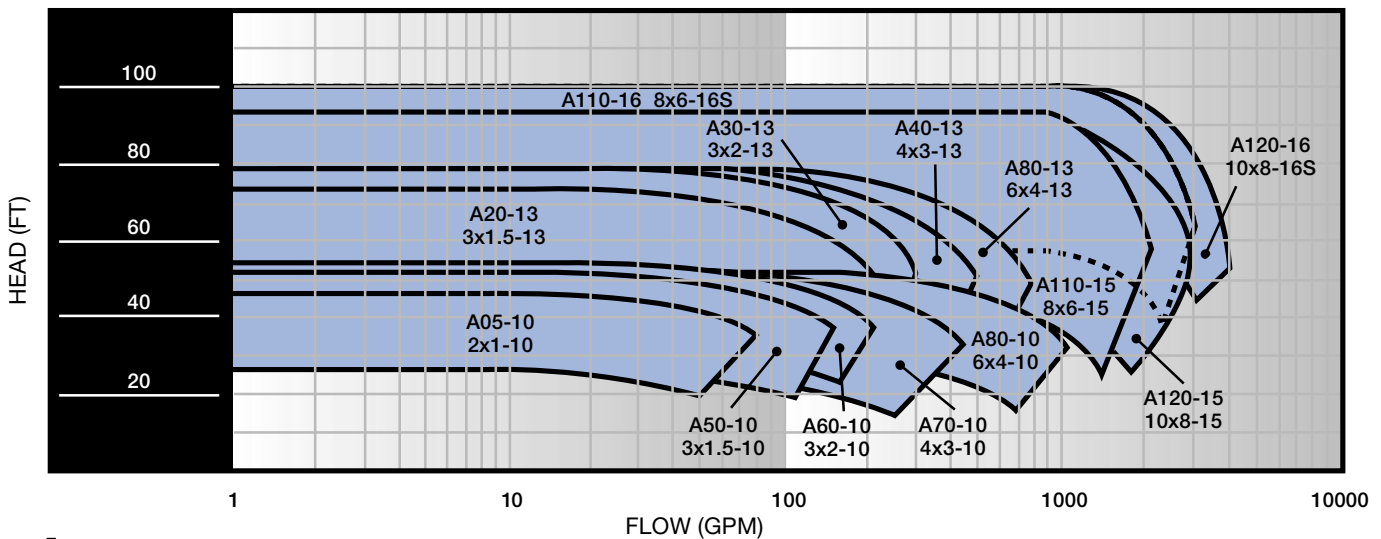
3550 RPM



1750 RPM

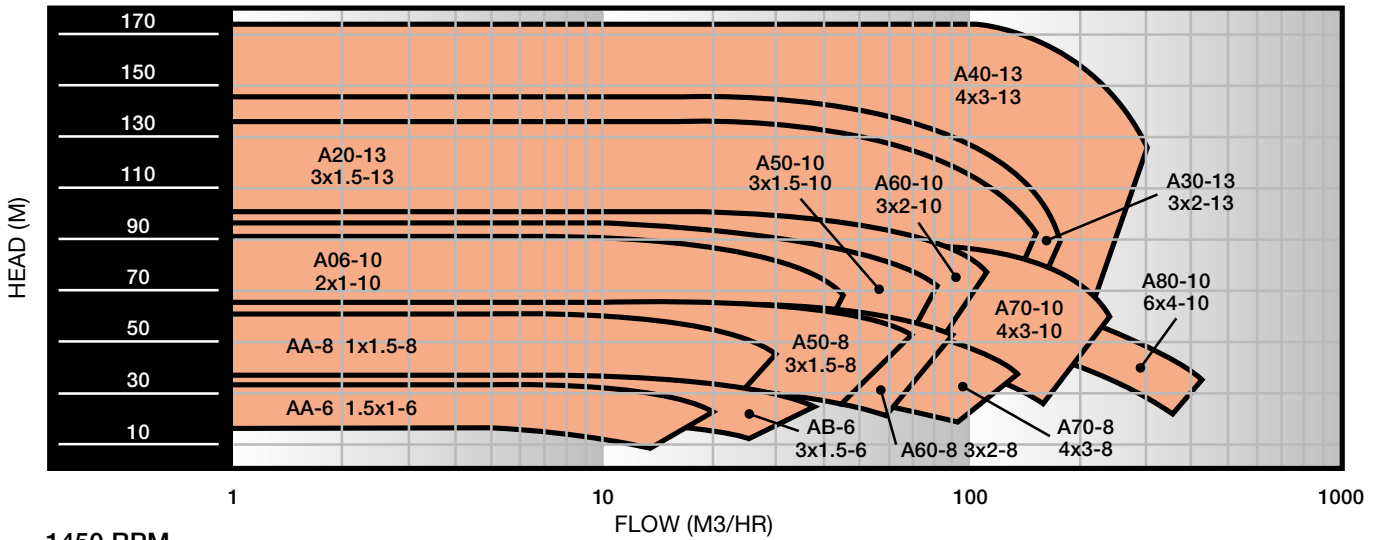


1150 RPM

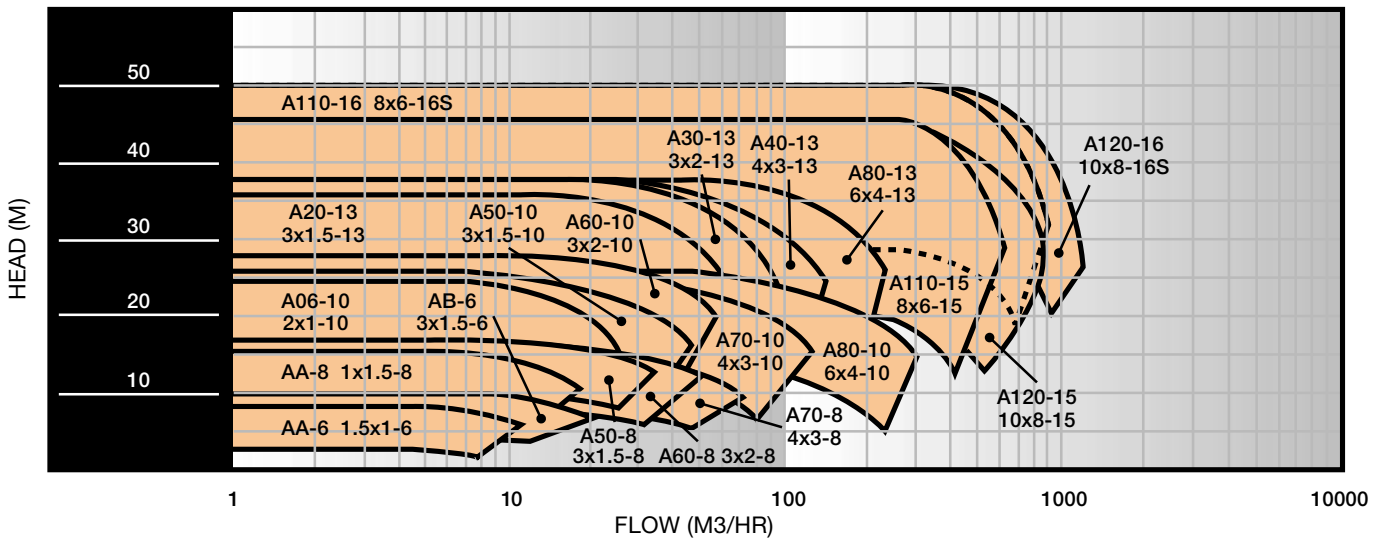


50 cycle performance

2950 RPM



1450 RPM



Materials

Materials

AR Wilfley & Sons produces Model A7 centrifugal pumps in a variety of materials to meet a wide variety of pumping conditions.

Model A7 pumps have been manufactured in ductile iron, duplex, stainless steel, Hastelloys, hard irons, and a variety of austenitic stainless steels including; Alloy 20 (CN7M) 304L (CF3), 316L (CF3M).

Wilfley's Engineering Staff has the knowledge and experience to assist you in material selection. Wilfley maintains an extensive library of pumping services and corrosion/abrasion data. Wilfley continually tests the effects of abrasion and corrosion on a wide variety of materials.

Wilfley's in-house metallurgical resources have developed unique materials to survive in the most hostile environments. These proprietary materials were developed to extend the erosion - corrosion performance and reliability of the A7 pump under extreme conditions.

WCD4 – Wilfley improved CD4MCu duplex stainless steel offering a 40% higher hardness, 42% increase in tensile strength, 65% increase in yield strength, resulting in a lower wear rate and higher corrosion resistance than the industry standard CD4MCu.

Maxalloy 5 – is a high chrome white iron providing a material hardness up to 650 HBN and 4 to 9.5 pH operating range.

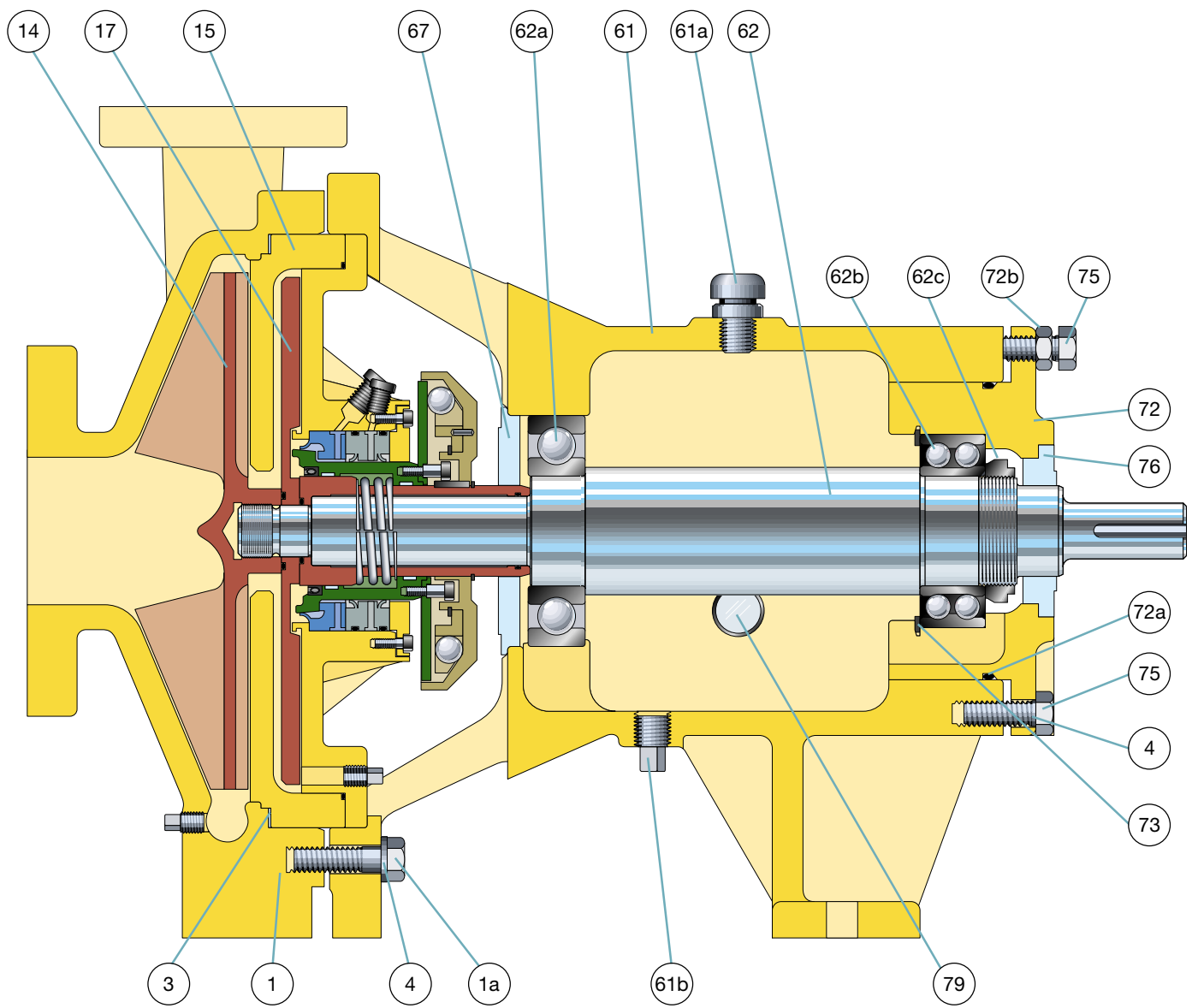
Maxalloy 8 – is a proprietary high chrome white iron providing 450-520 HBN hardness, able to withstand chemical deterioration within a 1.3 to 13.2 pH range.

To assist with proper material selection, Wilfley can provide material coupons for testing in your particular application followed by a material deterioration analysis report.

Wet End					
Item Number	Item Name	Material			
		Alloy 20	316SS	WCD4™	Ductile Iron
1	Casing	A20	316SS	WCD4™	DI**
1a	Cap Screw	18-8	18-8	18-8	18-8
3	Gasket, Casing	Teflon®	Teflon®	Teflon®	Teflon®
4	Lockwasher	18-8	18-8	18-8	18-8
14	Impeller	A20	316S	WCD4™	DI**
15	Casing Plate	A20	316S	WCD4™	DI**
17	Expeller	A20	316S	WCD4™	DI**
Power End					
61	Frame	DI**	DI**	DI**	DI**
61a	Breather	MS	MS	MS	MS
61b	Drain Plug	Steel	Steel	Steel	Steel
62	Shaft	WMS*	WMS*	WMS*	WMS*
62a	Bearing, Inboard	Steel	Steel	Steel	Steel
62b	Bearing, Outboard	Steel	Steel	Steel	Steel
62c	Locknut	Steel	Steel	Steel	Steel
67	Oil Seal, Inboard	Teflon®	Teflon®	Teflon®	Teflon®
72	Bearing Carrier	DI**	DI**	DI**	DI**
72a	O-ring, Bearing Carrier	Viton®	Viton®	Viton®	Viton®
72b	Jam Nut	18-8	18-8	18-8	18-8
73	Retaining Ring	Steel	Steel	Steel	Steel
75	Cap Screw	18-8	18-8	18-8	18-8
76	Oil Seal, Outboard	Teflon®	Teflon®	Teflon®	Teflon®
79	Sight Glass	18-8	18-8	18-8	18-8
Seals					
	DryLock®	A20	316SS	WCD4™	DI**

* WMS – hardened steel

** DI – ductile iron



Model A7 Options and Engineering Specials

Features	Options	Engineered Specials
Bearings – single row	Extreme duty bearings Single row deep groove – inboard bearing Duplex angular contact – outboard	
Oil lubricated bearings	Grease, oil mist, constant level oiler	
Labyrinth bearing seal	Magnetic Bearing Seal Oil Filter	
Frame and bearing carrier material: Ductile iron	316SS	Corrosion resistant alloys
Frame with large sight glass on the right side when viewed from coupling end.	Sight glass on the opposite side or on both sides Oil cooling provisions	
O-Ring material: Viton	Kalrez® Teflon® encapsulated	
Wet end material: DI, 316SS, A20, WCD4™, High Nichol Alloy, Max5/Ma8	1/2" NPT connection for case drain Steam jackets	1/4" NPT connection for gauge Alloys – special order
150 lbs. raised faced flanges	300 lbs raised faced flanges	
DryLock® seal	Packing Mechanical seal	
Labyrinth seal	Lube seal	
Flush connections for seals Expeller cavity drain		Flushing hardware

Special Modifications

A.R. Wilfley & Sons is dedicated to manufacturing pumps that maximize their full potential. Wilfley routinely accommodates customer requests for steam jackets, special paint, flush ports, special drain plugs and other modifications required to fit specific needs.

Many applications require special motor and drive configurations, including baseplates and mounting brackets. Non-metallic and fabricated baseplates are available.

Wilfley engineers assist in any special configurations that the liquid and process require. Wilfley's famous high-quality workmanship applies to all special designs to customers' needs.

Construction Details

	Frame 1			Frame 2								Frame 3				Frame 4	
General	AA-6	AB-6	AA-8	A5O-8	A6O-8	A7O-8	A05-10	A5O-10	A6O-10	A7O-10	A8O-10	A2O-13	A3O-13	A4O-13	A8O-13	A11O-15	A12O-15
Pump weight	137 lbs 62 kg	167 76	152 69	371 168	375 170	411 186	420 191	468 212	473 215	492 223	549 249	478 217	490 222	528 240	574 260	1090 494	1207 547
Max. working* temperature	250 °F 120 °C			250 120								250 120				250 120	
Max. working pressure	200 psi 675 kPa			200 675								200 675				200 675	
Max. solids size	3/16 in. 5 mm	1/4 6	5/16 8	1/4 6	1/4 6	3/8 10	1/4 6	3/8 10	3/8 10	3/8 10	3/8 10	1/4 6	3/8 10	3/8 10	3/8 10	1/2 13	1/2 13
Shaft																	
Diameter at Impeller	.75 in. 19 mm			1 25.4								1.125 28.6				2.125 53.9	
Diameter at Sleeve	1.375 in. 34.9 mm			1.375 34.9								1.875 47.6				2.123 53.9	
Diameter at Coupling	.875 in. 22.2 mm			1.125 28.5								1.125 28.5				2.375 60.3	
Diameter between bearings	1.94 in. 49.3 mm			2.5 63.5								2.84 72.1				4.41 112	
Shaft overhang	6.413 in. 162.9 mm			6.85 173.9								7.79 197.9				10.21 259.3	
Bearing span	3.175 in. 80.6 mm			7.71 195.8								6.63 168.4				9.99 253.7	
Bearings																	
Standard radial bearing	6308			6311								6312				6319A	
Standard thrust bearing	5208A			5211A								5312				7319BECB	
Extreme duty radial bearing	6308			311M								312M				NU319EC	
Extreme duty thrust bearing	7308BECB			7310BECB								7312BECB				7319BECB	

*Modified seal configurations are available for special pumping conditions up to 400° F.

Dimensions

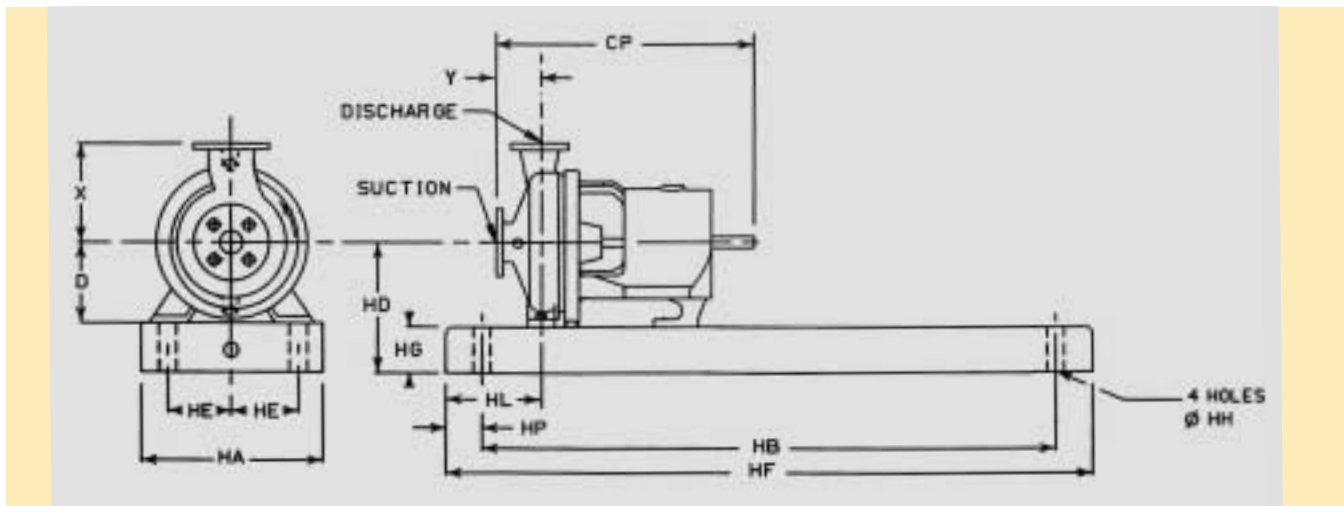
Pump Group	Dimension Designation	Size, Suction X Discharge X Nominal Impeller Diameter	Pump Dimensions				Motor Frame Range		Baseplate Number
			CP	D	X	Y	Nema	IEC	
1	AA	1.5 X 1 X 6 (40 X 25 X 150)	17.5 (445)	5.25 (133)	6.5 (165)	4 (102)	143T - 184T	80M - 90L	139
	AB	3 X 1.5 X 6 (80 X 40 X 150)	17.5 (445)	5.25 (133)	6.5 (165)	4 (102)	213T-256T	132M - 160L	148
	AA	1.5 X 1 X 8 (40 X 25 X 200)	17.5 (445)	5.25 (133)	6.5 (165)	4 (102)	284TS - 326TS	180M - 180L	153
2	A50	3 X 1.5 X 8 (80 X 40 X 200)	23.5 (597)	8.25 (210)	8.5 (216)	4 (102)			
	A60	3 X 2 X 8 (80 X 50 X 200)	23.5 (597)	8.25 (210)	9.5 (242)	4 (102)			
	A70	4 X 3 X 8 (100 X 80 X 200)	23.5 (597)	8.25 (210)	11 (280)	4 (102)			
	A05	2 X 1 X 10 (50 X 25 X 250)	23.5 (597)	10 (254)	8.5 (216)	4 (102)			
	A50	3 X 1.5 X 10 (80 X 40 X 250)	23.5 (597)	10 (254)	8.5 (216)	4 (102)			
	A60	3 X 2 X 10 (80 X 50 X 250)	23.5 (597)	10 (254)	9.5 (242)	4 (102)			
	A70	4 X 3 X 10 (100 X 80 X 250)	23.5 (597)	10 (254)	11 (280)	4 (102)			
	A80	6 X 4 X 10 (150 X 100 X 250)	23.5 (597)	10 (254)	13.5 (343)	4 (102)			
	A20	3 X 1.5 X 13 (80 X 40 X 330)	23.5 (597)	10 (254)	10.5 (266)	4 (102)			
	A30	3 X 2 X 13 (80 X 50 X 330)	23.5 (597)	10 (254)	11.5 (292)	4 (102)			
	A40	4 X 3 X 13 (100 X 80 X 330)	23.5 (597)	10 (254)	12.5 (318)	4 (102)			
	A80	6 X 4 X 13 (150 X 100 X 330)	23.5 (597)	10 (254)	13.5 (343)	4 (102)			
	3	A110	8 X 6 X 15 (200 X 150 X 380)	33.875 (860)	14.5 (368)	18 (457)			
A120		10 X 8 X 15 (250 X 200 X 380)	33.875 (860)	14.5 (368)	19 (483)	6 (152)	324T - 405T	200L - 250M	380
							444T - 449TS	280S - 315L	398

The dimensions listed above conform to ASME B73.1 specifications and apply to fabricated and non-metallic base plates only. Dimensions are different for iron bases.

These dimensions are not for construction. Certified dimension prints are available for your specific installation.

All dimensions printed in black are in inches and those in red are the approximate equivalent in millimeters.

Flanges are drilled to match ASME B16.5 150lbs.



General Installation Recommendations

	HA	HB	HD		HE	HF	HG	HH	HL	HP
	15 (381) 18 (457) 21 (533)	39 (991) 48 (1219) 53 (1346)	9 (229) 10.5 (267) 12.88 (327)		4.5 (114) 6 (152) 7.5 (191)	36.5 (927) 45.5 (1156) 50.5 (1283)	3.75 (95) 4.13 (105) 4.75 (121)	.75 (19) .75 (19) .75 (19)	4.5 (114) 4.5 (114) 4.5 (114)	1.25 (32) 1.25 (32) 1.25 (32)
			Frame 2	Frame 3 (and 6x4x10)						
	15 (381) 18 (457) 21 (533) 21 (533) 26 (660) 26 (660)	45 (1143) 52 (1321) 58 (1473) 64 (1626) 68 (1727) 80 (2032)	12 (305) 12.38 (314) 13 (330) 13.88 (353) 14.88 (378) 15.88 (403)	13.75 (349) 14.13 (359) 14.75 (375) 14.75 (375) 14.88 (378) 15.88 (403)	4.5 (114) 6 (152) 7.5 (191) 7.5 (191) 9.5 (241) 9.5 (241)	42.5 (1080) 49.5 (1257) 55.5 (1410) 61.5 (1562) 65.5 (1664) 77.5 (1969)	3.75 (95) 4.13 (105) 4.75 (121) 4.75 (121) 4.75 (121) 4.75 (121)	.75 (19) .75 (19) 1.00 (25) 1.00 (25) 1.00 (25) 1.00 (25)	4.5 (114) 4.5 (114) 4.5 (114) 4.5 (114) 4.5 (114) 4.5 (114)	1.25 (32) 1.25 (32) 1.25 (32) 1.25 (32) 1.25 (32) 1.25 (32)
	26 (660) 26 (660) 26 (660)	68 (1727) 80 (2032) 98 (2489)	19.25 (489) 19.25 (489) 19.25 (489)		9.5 (241) 9.5 (241) 9.5 (241)	65.5 (1664) 77.5 (1969) 95.5 (2426)	4.75 (121) 4.75 (121) 4.75 (121)	1.00 (25) 1.00 (25) 1.00 (25)	6.5 (165) 6.5 (165) 6.5 (165)	1.25 (32) 1.25 (32) 1.25 (32)

Choosing Pump Location

Locate the pump as close to the liquid source as practical so the suction pipe is short and direct with a minimum of elbows, fittings and valves.

Place the pump in a location so the unit is accessible for inspection during operation as well as for maintenance operations involving removal and disassembly.

Foundation

The foundation should be strong enough to absorb any vibration and to form a permanent support for the baseplate. This is important in maintaining the alignment of the direct connected unit. Foundation bolts of the proper size should be embedded in the concrete located by the outline drawing.

Alignment

The pump and motor are aligned at the factory before shipment. However, realignment is necessary

after the complete unit has been installed. Guidelines for checking and aligning the pump components may be found in the Hydraulic Institute Standards.

Piping

Both suction and discharge pipes should be supported independently near the pump so when the flange bolts are tightened no strain will be transmitted to the casing.

A check valve should be installed in the discharge line to prevent fluid from flowing back through the pump while it is shut down. Gate valves should be installed in both discharge and suction lines to isolate the pump during maintenance.

Care must be taken in sizing and locating suction piping to prevent cavitation.

Ordering Information

Wilfley pumps are engineered to operate in compliance with your

specifications. Careful evaluation of pumping conditions is needed to provide accurate pump recommendations and quotations.

This list will help establish specific pumping system conditions.

- Liquid
- Temperature
- Static Head
- Discharge Pipe Size
- Length, Discharge Pipe
- Discharge Pipe Fittings
- Equivalent Length Discharge Pipe
- Total Head
- Maximum Suction Pressure
- Minimum Suction Pressure
- Capacity
- Specific Gravity
- % Solids by Weight
- Mesh Analysis
- Viscosity
- NPSH Available

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