

DELIVERING
PERFORMANCE

SPD Centrifugal Pumps



The MUD HOG™



SPD Centrifugal Pumps

SPD is one of the energy industry's leading providers of production and drilling products and value-added services. From valves and seats to pistons and pumps, SPD products are known for world-class quality.

Our centrifugal pump, the MUD HOG™, delivers improved performance, better longevity, and cost savings compared to other mud pumps. The MUD HOG's high quality bearing configuration contributes to greater life expectancy through improved stability and lower vibration. The MUD HOG's parts are completely interchangeable with other pumps currently on the market. And Baker SPD's unique attention to the details that improve performance and extend pump life sets the MUD HOG apart from the competition.

The following pages detail the components and specifications of the MUD HOG. To learn more about Baker SPD's centrifugal pumps, contact a Baker SPD representative today.



Pump Shafts

SPD assures the performance of its pump shafts by specifying the highest quality, fatigue resistant steels, machined to demanding tolerances. The shafts are designed to transmit the required horsepower even in the most challenging applications.

The pump shafts for the 2.5 MUD HOG come with an option of Reverse Rotation Prevention (RRP) system, which protects against accidentally damaging the fluid end components, if the motor were to be inadvertently wired wrong. This shaft is made of 4140 low alloy steel.

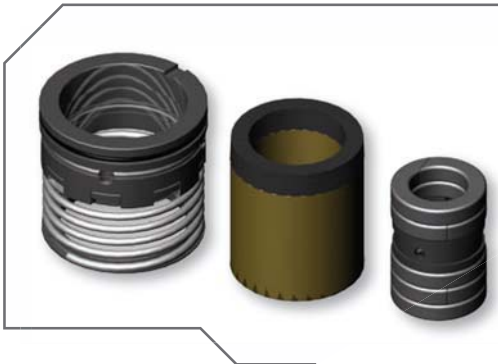
The pump shafts for the 1.8 and 1.1 MUD HOG pumps on the other hand, are offered in stainless steel materials because of their similar "thru-the-impeller" design and the intrinsic requirement for corrosion resistance.



Impellers

Except for the 3 x 2 x 13 and the 4 x 3 x 13, all the impellers for the 2.5, 1.8, and 1.1 MUD HOG pumps have the semi-open design. This ensures an efficient increase in the kinetic energy of the fluid as it passes through the front vanes.

All the impellers have similar and strategically designed back vanes that not only reduce the wear on the stuffing box cover but also boost the mechanical seal's life by limiting the flow of contaminants into the sealing area.



Packing and Mechanical Seals

The 2.5 MUD HOG™ uses an industry leading, heavy-duty mechanical seal as a standard. These rugged mechanical seals have proven themselves time and again in the field and continue to be one of the best features of our superior 2.5 MUD HOG. These mechanical seals can be offered in tungsten carbide or silicon carbide sealing faces, depending on the type of application.

SPD also offers more economical options, for all three of its pump sizes, in the form of regular packing rings, king packing, and the innovative injectable sealants, to address the leakage concerns on centrifugal pumps.

Shaft Sleeves

The 2.5 MUD HOG carries a stainless steel shaft sleeve to protect its low alloy steel shaft from abrasion and corrosion. SPD also offers ceramic coated and 17-4 PH shaft sleeves on its pumps, for use with the alternative packing options. The 1.1 centrifugal pump is only offered with a standard, non-sleeved, stainless steel shaft.



Labyrinth Seals

SPD offers premium quality Labyrinth seals as a standard on all three pump sizes. Apart from effectively keeping the contaminants away from the bearings, the Labyrinth seals have the added advantage of not causing wear on the shafts.

Wear Pads

The 2.5 MUD HOG casings are offered with wear pads on every size, except the 3 x 2 x 13 in. The wear pads can be easily changed by ordering replacement wear pad repair kits, which come with a wear pad, studs, nuts, and a gasket. The 1.8 and the 1.1 MUD HOG pumps have wear surfaces integrated into their casing designs.



Bearings

SPD specifies bearings of the highest quality from the premier bearing manufacturers for its three pump models. All the bearings are interchangeable with other similar and popular centrifugal pumps.

For the 2.5 MUD HOG, the inboard bearing is a double row angular contact bearing, for enhanced stability of the shaft. The outboard side sports two angular contact bearings installed “back-to-back” for maximum thrust handling capability.

Both the 1.8 and the 1.1 MUD HOG pumps carry the simplistic, field-proven, eccentric locking design bearings.

SPD Centrifugal Pumps

Fluid End Components

SPD offers the impellers, stuffing box covers, and wear pads on the 2.5 centrifugal pump in hard iron, for increased wear life. On the 3 x 2 x 13 size for the 2.5 centrifugal pump, which does not have a wear pad, even the casing is cast out of hard iron. The same holds true for all fluid end wear components on the 1.8 and the 1.1 pumps.

Anticipating the high expectations of our customers from our champion workhorse, the 2.5 centrifugal pump, Baker SPD also offers an option of extra hard iron fluid end components for the most demanding of applications which necessitate the longest possible wear life.

Skid Packages

For the convenience of our valued customers, SPD also offers its pumps mounted on skid packages, coupled with the customer specified motors and wired with starters, if so desired. The skids themselves can be painted to customer's specifications or offered in a galvanized condition.

Performance Testing

SPD now has the capability to perform in-house performance testing on centrifugal pumps at our state-of-the-art test lab. We also offer third party certified/witness testing to meet the requirements of our customers.



General Applications for SPD MUD HOG™ Centrifugal Pumps

- Fresh water
- Sea water
- Drilling mud

Features

- Stainless steel casing and wear pad nuts allow easy access
- Labyrinth seals reduce bearing contamination and shaft wear
- All of our bearings, Labyrinth seals, and mechanical seals are provided by world renown suppliers who are industry leaders in their respective fields



Our redesigned 2.5 centrifugal pump frame is more than 50 lb lighter and has better stress characteristics than the corresponding frame from our major competitors.

2.5 MUD HOG™ Sizes	1.8 MUD HOG™ Sizes	1.1 MUD HOG™ Sizes
3 x 2 x 13 in.	2 x 3R x 13 in.	1 x 1-1/2C11
4 x 3 x 13 in.	3 x 4R x 13 in.	1-1/2 x 2R11
5 x 4 x 14 in.	4 x 5R x 12 in.	2 x 3R11
6 x 5 x 11 in.	5 x 6R x 12 in.	–
8 x 6 x 11 in.	6 x 8R x 13 in.	–
8 x 6 x 14 in.	–	–

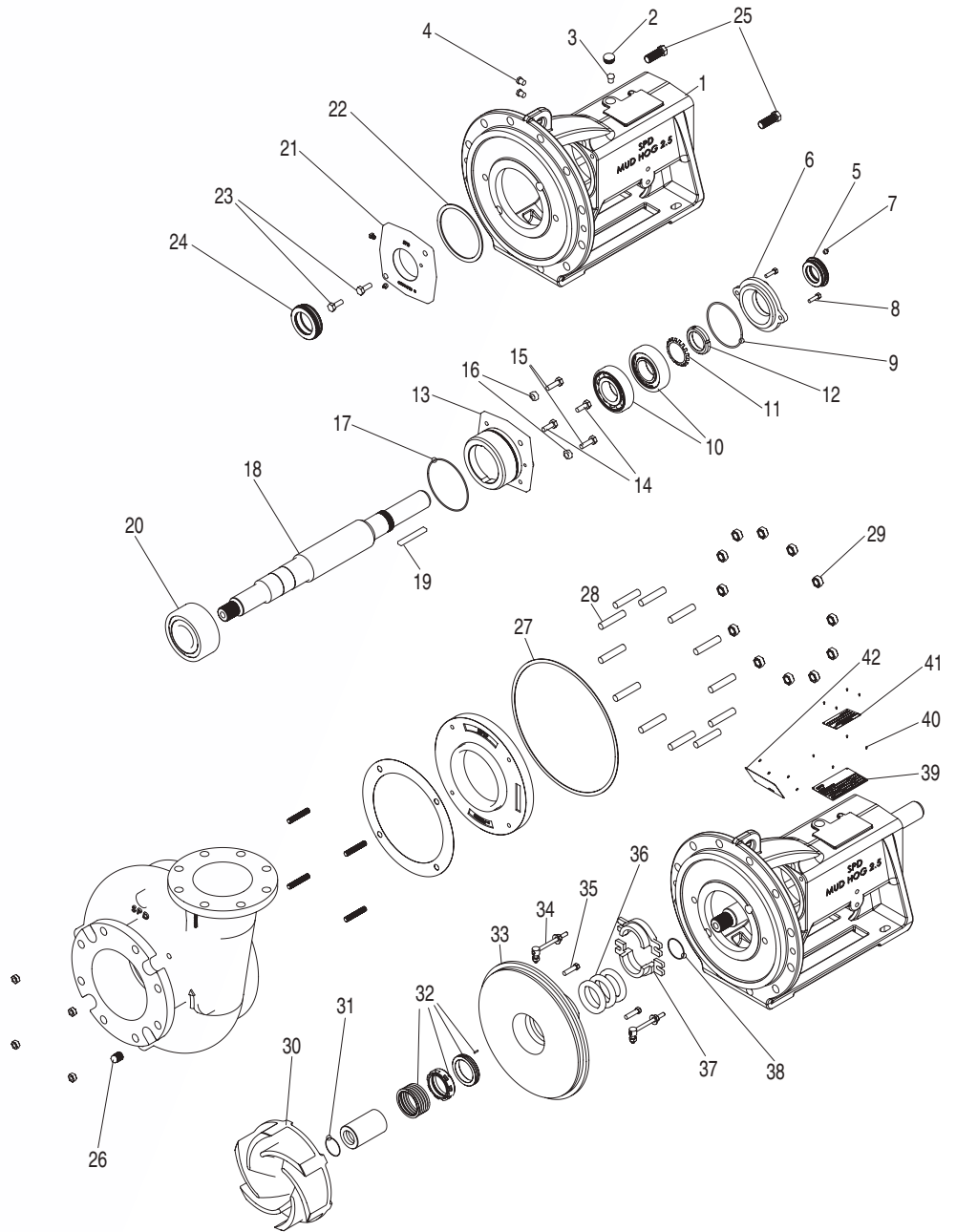
Standard Specifications, Alternate Materials, and Special Options

- All 2.5 and 1.8 MUD HOG™ centrifugal pumps are now ATEX certified (ATEX certificate available at no charge—please contact factory for details)
- All MUD HOG pumps are hydrostatically tested at no charge
- Casing repair kits and stuffing box covers are hydrostatically tested at no charge
- All standard MUD HOG pumps are painted with 3 to 6 mils DFT of Alkyd paint—offshore coating available at an additional charge (Primer: Zinc, Second Coat: Epoxy base, Top Coat: high build Polyurethane)
- Material certification for MUG HOG centrifugal pump available upon request at an additional charge (consult factory)
- Performance test available at an additional charge (consult factory)
- Please consult factory for alternate materials and coating options

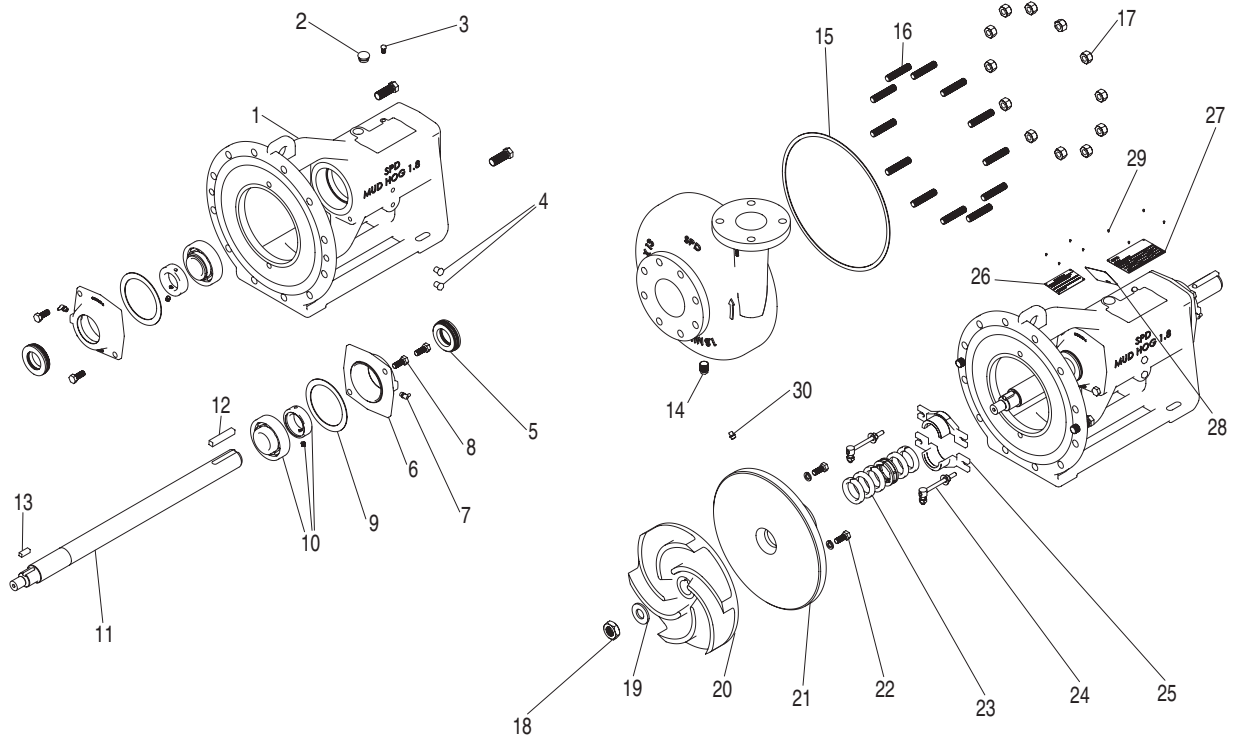
Skid Packages

- Galvanized skid available at an additional charge (consult factory)
- All standard skid packages are painted with 3 to 6 mils DFT of Alkyd paint—offshore coating available at an additional charge (Primer: Zinc, Second Coat: Epoxy base, Top Coat: high build Polyurethane)
- Delivery is subject to motor availability at time of order
- Please consult factory for alternate skid options

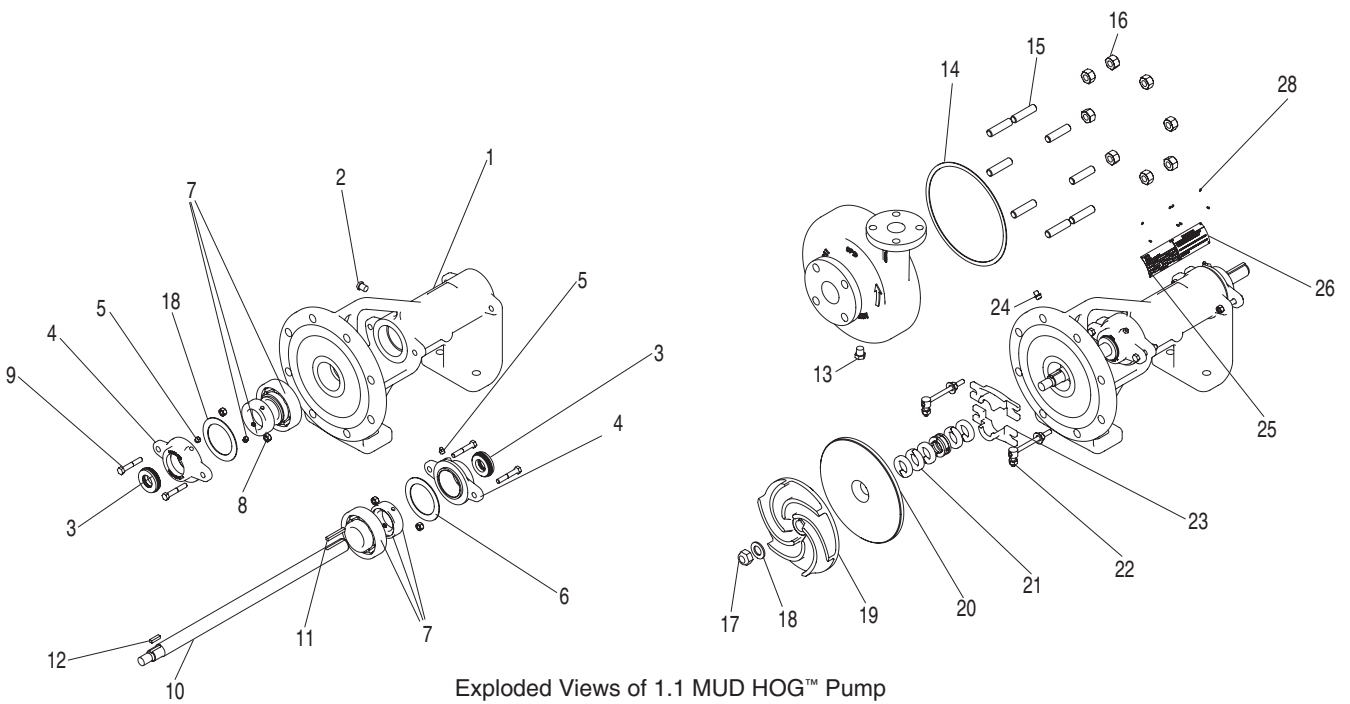
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Exploded Views of 2.5 MUD HOG™ Pump



Exploded Views of 1.8 MUD HOG™ Pump



Exploded Views of 1.1 MUD HOG™ Pump

SPD Centrifugal Pumps

2.5 Centrifugal Pump Crossover List

No.	Description	Qty. Req.	Part Number	Mission® Stock No.	Mission® Part No.	Halco®
1	Frame (pedestal)	1	052136610	644302499	20618-12-1	H17444
2	Plastic plug	1	WVCCCF118	N/A	N/A	N/A
3	Plug for breather port	1	WWWX00012	601474737	8505-1	H8505-1
4	Oil plug	2	WWWX00012	601474737	8505-1	H8505-1
5	Outboard bearing Labyrinth seal	1	WVIN00262	N/A	N/A	H2564-3
6	Outboard bearing cover	1	052136910	20617AH	20617	H20617-01-01
7	Outboard/inboard bearing grease fitting	2	WWW00C003	N/A	N/A	N/A
8	Outboard bearing cover bolt	2	WWG31D107	3861-139-4	3861-139	H3861-139
9	Outboard bearing cover seal	1	WWB248P41	72200017	7496-26	H7496-26
10	Outboard bearing	2	WWESK7311	648408201S	20616-1	H20616-1
11	Bearing lock washer	1	WV00W1100	648402105	6124-4	H6124-4
12	Bearing lock nut	1	WV00N1100	648402055	6123-1	H6123-4
13	Outboard bearing housing	1	052136810	20624H	20624-01-01	H20624-01-01
14	Outboard bearing housing bolt	2	WWG31H187	N/A	N/A	N/A
15	Outboard bearing housing adjusting bolt	2	WWG31H1H7	3861-138	3861-138	H3861-138
16	Outboard bearing housing nut	2	WWJ31H800	658404702	3932-62	H3932-62
17	Outboard bearing housing seal	1	WWB254H30	648402295	7496-253	H7496-253
18	Shaft	1	052133900	646490557	20612-02-33	H20612-02-33
19	Coupling end key	1	WWW00A004	601212392	4372-5-21	H4372-5-21
20	Inboard bearing	1	WWENT5313	2564-3H	20615-1	H20615-1
21	Inboard bearing cover	1	052136710	17950AH	20626	H17950
22	Inboard bearing cover gasket	1	052137400	648408706	20625	H20625
23	Inboard bearing cover bolt	2	WWG31H1H7	3861-1H	3861-1	H3861-1
24	Inboard bearing cover Labyrinth seal	1	WVINM0026	2564-4H	N/A	H2564-4
-	Inboard oil seal	1	WWW003002	648408300	20619-01	H20619-01
-	Inboard exclusion seal	1	WWW003001	648408409	20620-01	H20620-01
25	Jack bolts	2	WWG31S28F	2538-1H	2538	H2538
26	Casing drain plug 1/2 in.	1	WWWX00015	N/A	N/A	N/A
-	Casing 3 x 2 x 13 repair kit	1	052134000	19203AH	19203-01-30A	H19203-01-30A
-	Casing 4 x 3 x 13 repair kit	1	052134100	19205AH	19205-01-30A	H19205-01-30A
-	Casing 5 x 4 x 14 repair kit	1	052134200	19222AH	19222-01-30A	H19222-01-30A
-	Casing 6 x 5 x 11 repair kit	1	052134300	19122AH	19122-01-30A	H19122-01-30A
-	Casing 6 x 5 x 14 repair kit	1	052134400	19123AH	19123-01-30A	H19123-01-30A
-	Casing 8 x 6 x 11 repair kit	1	052134500	19763AH	19763-01-30A	H19763-01-30A
-	Casing 8 x 6 x 14 repair kit	1	052134600	19117AH	19117-01-30A	H19117-01-30A
-	Wear pad 4 x 3 x 13 repair kit	1	052134700	2501-37AH	N/A	H2501-01-30A
-	Wear pad 5 x 4 x 14 repair kit	1	052134800	2502-37AH	N/A	H2502-01-30A
-	Wear pad 6 x 5 x 11 repair kit	1	052134900	2503-37AH	N/A	H2503-01-30A
-	Wear pad 6 x 5 x 14 repair kit	1	052135000	2504-37AH	N/A	H2504-01-30A
-	Wear pad 8 x 6 x 11 repair kit	1	052135100	2505-37AH	N/A	H2505-01-30A
-	Wear pad 8 x 6 x 14 repair kit	1	052135200	2506-37AH	N/A	H2506-01-30A
27	Casing gasket	1	052137100	648403012	10399-46-1	H10399-46-1
28	Casing stud	12	WWHS1S3HA	648401115	3862-76	H2507-3
29	Casing stud nut	12	WWJ11S800	3932-61H	3932-61	H3932-61

2.5 Centrifugal Pump Crossover List (continued)

No.	Description	Qty. Req.	Part Number	Mission® Stock No.	Mission® Part No.	Halco®
30	*Impeller, 3 x 2 x 13, 2.5 centrifugal pump	1	05213571x	N/A	19204-90-30	H2521-90-30
30	*Impeller, 4 x 3 x 13, 2.5 centrifugal pump	1	05213581x	N/A	19206-90-30	H2522-90-30
30	*Impeller, 5 x 4 x 14, 2.5 centrifugal pump	1	05213591x	N/A	19224-AO-30	H2523-AO-30
30	*Impeller, 6 x 5/8 x 6 x 11, 2.5 centrifugal pump	1	05213601x	N/A	19121-70-30	H2524-70-30
30	*Impeller, 6 x 5 x 14, 2.5 centrifugal pump	1	05213621x	N/A	19121-AO-30	H2524-AO-30
30	*Impeller, 8 x 6 x 14, 2.5 centrifugal pump	1	05213631x	N/A	19116-AO-30	H2525-AO-30
31	Impeller seal	1	WWB032V35	648405082	19110-72	H19110-72
–	Shaft sleeve kit	1	052137000	641102182	20943-04A	H20613-21A
–	Ceramic coated shaft sleeve kit	1	052144200	641102181	20613-21G-7A	H20613-21G-7A
–	17-4Ph shaft sleeve kit for injectable packing	1	052137001	N/A	N/A	N/A
32	Mechanical seal kit tungsten/tungsten	1	WVBUF9000	648414308	22451-1	H22451-1A
32	Mechanical seal kit silicon/tungsten	1	WVBUF5000	648414357	22451-3	N/A
32	King packing	1	052153400	661007008	25015-04M-BA	
32	5 ring packing with lantern ring	1	052153500	661007005	25014-04M-B	H8264-24-9A
32	Injectable packing starter kit 2.5 in.	1	WVUT060074	N/A	N/A	N/A
33	Stuffing box cover for mechanical seal	1	052136410	22223AH	22223-01-30A	H22223-01-30A
33	Stuffing box cover for mechanical seal aluminum bronze	1	052136430	22223-13H	22223-03-13A	H22223-01-13A
–	Stuffing box cover for packed	1	052144910	20614H	20614-01-30	H20614-01-30A
34	Gland assembly bolt	2	052137280	601102494	B3701A	H3701A
35	Stuffing box cover bolt	2	WWG31H187	648401016	3861-117	H3861-117
36	Packing, 3 ring for mechanical seal	1	052141500	648402600	N/A	H2537-24A
37	Gland set	1	052136500	20622AH	20622A	H20622A
38	Shaft sleeve seal	1	WWB225V40	648415156	7496-033	H746-236
39	Name plate	1	052141400	N/A	N/A	N/A
40	Drive screws	12	WWGT06060	N/A	N/A	N/A
41	Warning label	1	052151700	N/A	N/A	N/A
42	ATEX name plate	1	052170700	N/A	N/A	N/A
–	Casing drain plug 1/4 in.	1	WWWX00012	8505-1	8505-1	H8505-1
–	Fluid end gasket kit	1	052145400	641101076	10399-46-1A	10399-46-1A
–	Power end gasket kit	1	052145500	641103353	20625A	H20625A
–	Labyrinth seal replacement kit	1	052145600	N/A	N/A	N/A
–	Lock nut replacement kit	1	052145700	641100409	6123-4A	H6123-4A
–	Oil seal kit	1	052149000	641103312	20619A	H20619A
–	Deflector	1	WWW003003	641116108	22210-1A	H22210-1
–	Hydraulic gun for injectable packing	1	WVGRG1050	N/A	N/A	N/A
–	1-1/2 in. x 8 in. injectable packing sticks		WVUT680033	N/A	N/A	N/A
–	Impeller bolt**	1	WWGL1S203	7415648	N/A	N/A
–	Impeller bolt seal**	1	WWB018V35	N/A	N/A	N/A
–	Rebuild kit		999881000	N/A	N/A	N/A

*See page 10 for impeller size code; **For reverse rotation preventions system

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1.8 Centrifugal Pump Crossover List

No.	Description	Qty. Req.	Part Number	Mission® Stock No.	Mission® Part No.
1	Frame	1	052146810	601206873	L3785
2	Plastic plug	1	WVCCCF118	N/A	N/A
3	Plug for breather port	1	WWWX00011	N/A	601473689
4	Oil plug	2	WWWX00012	N/A	8505-2
5	Labyrinth seal	2	WVIN00498	N/A	N/A
6	Bearing cover	2	052146610	601196702	3790A
7	Bearing grease fitting	2	WWW00C004	N/A	N/A
8	Bearing cover bolt	4	WWG31H167	601407505	3861-1
9	Bearing cover gasket	2	052146500	601478191	10399-23-1
10	Bearing	2	WWESH0P06	601410293	3944-03
11	Shaft 416SS no coating (2 x 3R, 3 x 4R, 4 x 5R, 5 x 6R)	1	052145280	601118409	4932-21A
11	Shaft 416SS with chrome oxide coating (2 x 3R, 3 x 4R, 4 x 5R, 5 x 6R)	1	052151180	601120108	17238-21G7A
11	Shaft 416SS with 17-4PH fitted sleeve (2 x 3R, 3 x 4R, 4 x 5R, 5 x 6R)	1	052155580	N/A	N/A
11	Shaft 416SS no coating (6 x 8R)	1	052156680	601190135	14928-21A
11	Shaft 416SS with chrome oxide coating (6 x 8R)	1	052156580	601195001	24927-21G7A
11	Shaft 416SS with 17-4PH fitted sleeve (6 x 8R)	1	052153880	N/A	N/A
12	Coupling end key	1	WWW00A004	601212392	4372-5-21
13	Impeller key	1	WWW00A005	601212327	4372-3-21
-	Casing 2 x 3R repair kit hard iron	1	052149200	601115207	G4676-30A
-	Casing 2 x 3R repair kit aluminum bronze	1	052149201	601114994	G4676-13A
-	Casing 3 x 4R repair kit hard iron	1	052148900	601113871	F4644-30A
-	Casing 3 x 4R repair kit aluminum bronze	1	052148901	601113665	F4644-13A
-	Casing 4 x 5R repair kit hard iron	1	052149900	601115975	F4732-30A
-	Casing 5 x 6R repair kit hard iron	1	052145300	601116536	F4742-30A
-	Casing 6 x 8R repair kit hard iron	1	052149600	601117161	F5144-30A
14	Casing drain plug	1	WWWX00015	N/A	N/A
15	Casing gasket	1	052150500	601477987	10399-20-1
16	Casing studs	12	WWHS1M30A	601408305	11907-83
17	Casing nuts	12	WWJ11M800	601408552	3932-1
18	Impeller nut 304SS	1	WWJ510800	601429905	6209-8-25
19	Impeller washer	1	WWK410000	601408834	3936-16-4
20	*Impeller, 2 x 3R x 13, 1-7/8 centrifugal pump hard iron	1	05214911x	602232589	4610-90-30
20	*Impeller, 3 x 4R x 13, 1-7/8 centrifugal pump hard iron	1	05214931x	602227092	4605-90-30
20	*Impeller, 4 x 5R x 12, 1-7/8 centrifugal pump hard iron	1	05214941x	602235731	4705-80-30
20	*Impeller, 5 x 6R x 12, 1-7/8 centrifugal pump hard iron	1	05214511x	602239154	4710-80-30
20	*Impeller, 6 x 8R x 13, 1-7/8 centrifugal pump hard iron	1	05214951x	602240863	5142-90-30

*See page 10 for impeller size code

1.8 Centrifugal Pump Crossover List (continued)

No.	Description	Qty. Req.	Part Number	Mission® Stock No.	Mission® Part No.
21	Stuffing box packed	1	052151310	N/A	N/A
–	Stuffing box mechanical seal	1	052146910	2571H	N/A
22	Stuffing box cover bolt	2	WWG31H167	N/A	N/A
23	Packing 5 ring with lantern ring graphite acrylic	1	052151200	661007001	25014-02W-D
–	King packing	1	052167500	661007009	25015-02W-BA
24	Gland assembly bolt	2	052137280	601102494	B3701A
25	Packing gland set	1	052146700	601367204	7406-13A
26	Warning label	1	052151700	N/A	N/A
27	Name plate	1	052141400	N/A	N/A
28	ATEX name plate	1	052170700	N/A	N/A
29	Drive screws	12	WWGT06060	N/A	N/A
30	Fitting, grease 1/4-18 NPT	1	WWW00C004	N/A	N/A
–	Mechanical seal tungsten repair kit	1	WVBUP0118	2558-3AH	N/A
–	Deflector/water slinger	1	052147180	601499882	22707A
–	Dipstick (oil lubricated pumps only)	0	WWW003005	N/A	N/A
–	Wear plate	1	052151810	601205677	3779-30
–	Grease seal	2	WWW003005	N/A	3943-14
–	1-7/8 in. injectable packing starter kit 1.8	1	WVUT060109	N/A	N/A

*2.5 and 1.8 Impeller Size Code

x	Diameter	x	Diameter
0	Ø14 in.	H	Ø9-3/4 in.
1	Ø13-3/4 in.	J	Ø9-1/2 in.
2	Ø13-1/2 in.	K	Ø9-1/4 in.
3	Ø13-1/4 in.	L	Ø9 in.
4	Ø13 in.	M	Ø8-3/4 in.
5	Ø12-3/4 in.	N	Ø8-1/2 in.
6	Ø12-1/2 in.	P	Ø8-1/4 in.
7	Ø12-1/4 in.	R	Ø8 in.
8	Ø12 in.	S	Ø7-3/4 in.
9	Ø11-3/4 in.	T	Ø7-1/2 in.
A	Ø11-1/2 in.	U	Ø7-1/4 in.
B	Ø11-1/4 in.	V	Ø7 in.
C	Ø11 in.	W	Ø6-3/4 in.
D	Ø10-3/4 in.	X	Ø6-1/2 in.
E	Ø10-1/2 in.	Y	Ø6-1/4 in.
F	Ø10-1/4 in.	Z	Ø6 in.
G	Ø10 in.	–	–

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No.	Description	Qty. Req.	Part Number	Mission® Stock No.	Mission® Part No.
1	Frame, 1-1/8 (pedestal)	1	052170210	601203995	E3768
2	Plug, standard 1/4-18 NPT	1	WWWX00012	601471964	8262-2
3	Isolator	2	WVIN02802	N/A	N/A
4	Cover, bearing 1-1/8	2	052148010	601196504	3773A
5	Fitting, grease 1/8-27 NPT 45 degrees	2	WWW00C005	N/A	N/A
6	Gasket, bearing cover	2	052170800	601478050	10399-21-1
7	Bearing, ball	2	WWESH0618	601410152	3944.01
8	Nut, hex, bearing cover	4	WWJ11D800	601408560	3932.2
9	Cap screw, bearing cover	4	WWG31D287	601407505	3861-1
10	Shaft 1-1/8	1	052149780	601118300	3769-21A
11	Key, coupling	1	WWW00A007	601212251	4372-2-21
12	Key, impeller	1	WWW00A008	601212186	4372-1-21
-	Casing 1 x 1-1/2C x 11 repair kit	1	052151900	601103518	G3766-1A
-	Casing, 1-1/2 x 2R x11 repair kit	1	052150100	601112618	G4576-1A
-	Casing, 2 x 3R x 11 repair kit	1	052148400	601113947	F4672-1A
13	Plug, standard 3/8-18 NPT	1	WWWX00013	N/A	N/A
14	Gasket, casing	1	052172600	601477912	10399-19-1
15	Stud, casing	8	WWHS1M2HA	601408479	11907-82
16	Nut, casing	8	WWJ11M800	601408552	3932-1
17	Nut, impeller	1	WWJ51M800	N/A	N/A
18	Washer, impeller	1	WWK41U100	601408842	3936-2-4
19	*Impeller, 1 x 1-1/2C x 8.5	1	*05215031x	602208647	4170-44-1
19	*Impeller, 1-1/2 x 2R x 8.5	1	*05215021x	602213688	4571-44-1
19	*Impeller, 2 x 3R11 x 8.5	1	*05214881x	602218729	4574-44-1
20	**Cover, stuffing box 1-1/8	1	052147910	N/A	N/A
21	Packing, 5 ring with lantern	1	052172800	661007002	25014-01S-B
22	Bolt, gland assembly 1-1/8	2	052137280	601102494	B3701A
23	Gland set 1-1/8	1	052150800	601373004	8204-13A
24	Fitting, grease 1/8-27 NPT 65 degrees	1	WWW00C004	N/A	N/A
25	Warning label	1	052151700	N/A	N/A
26	Name plate	1	052172500	N/A	N/A

**Stuffing box cover (wear plate) only available in ductile cast iron

*1.1 Impeller Size Code

x	Diameter	x	Diameter
0	8-1/2 in.	D	6-7/8 in.
1	8-3/8 in.	E	6-3/4 in.
2	8-1/4 in.	F	6-5/8 in.
3	8-1/8 in.	G	6-1/2 in.
4	8 in.	H	6-3/8 in.
5	7-7/8 in.	J	6-1/4 in.
6	7-3/4 in.	K	6-1/8 in.
7	7-5/8 in.	L	6 in.
8	7-1/2 in.	M	5-7/8 in.
9	7-3/8 in.	N	5-3/4 in.
A	7-1/4 in.	P	5-5/8 in.
B	7-1/8 in.	R	5-1/2 in.
C	7 in.	-	-

System Head Requirement Calculation

Type of liquid being pumped		
Flow Rate		GPM
Specific gravity of liquid being pumped		
Liquid temperature		°F

Suction

Pipe size (D_s)		in.
Height of liquid above (+) or below (-) the pump inlet centerline (H_s)		ft
Total length of suction line (L_s)		ft

Straight Pipe Length Equivalence of Suction Fittings			
Type	Qty.	*Equivalent Straight Length of Pipe per Fitting (ft)	Sum of Equivalent Length of Straight Suction Pipe (ft)
Elbow		x =	
Tee		x =	
Swing check		x =	
Globe valve		x =	
Gate valve		x =	
Butterfly valve		x =	
Total equivalent length (EL_s) =			

Total length of suction pipe (TL_s) = $L_s + EL_s$		ft
--	--	----

Suction friction loss head (FL_s) = $(TL_s \times \text{head loss}^{**}) / 100 =$		
---	--	--

Discharge

Pipe size (D_d)		in.
Maximum height above the pump centerline that the liquid rises to, on the discharge side of the system (H_d)		ft
Total length of discharge line (L_d)		ft

Straight Pipe Length Equivalence of Discharge Fittings			
Type	Qty.	*Equivalent Straight Length of Pipe per Fitting (ft)	Sum of Equivalent Length of Straight Discharge Pipe (ft)
Elbow		x =	
Tee		x =	
Swing check		x =	
Globe valve		x =	
Gate valve		x =	
Butterfly valve		x =	
Total equivalent length (EL_d) =			

Total length of discharge pipe (TL_d) = $L_d + EL_d$		ft
--	--	----

Discharge friction loss head (FL_d) = $(TL_d \times \text{head loss}^{**}) / 100 =$		
---	--	--

Required pressure at discharge (P_d)		psi
--	--	-----

Head required at discharge (H_d) = $(P_d \times 2.31) / \text{Sp. Gr.}$		ft
---	--	----

Total friction head (H_f) = $FL_s + FL_d$		ft
---	--	----

Total elevation head (H_e) = $H_s + H_d$		ft
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Total head required (H_{RQ}) = $H_f + H_e + H_d$		ft
--	--	----

*See page 13 for pipe fittings; **See page 13 for head loss

For a complimentary copy of this calculation sheet in Excel format, please contact your nearest SPD sales agent.

**Friction of Water in Pipes (C=100)

GPM	2 in. Pipe		3 in. Pipe		4 in. Pipe		5 in. Pipe		6 in. Pipe		8 in. Pipe		GPM
	V	F	V	F	V	F	V	F	V	F	V	F	
30	3.06	3.69	1.36	0.53	0.77	0.13	-	-	-	-	-	-	30
40	4.08	6.40	1.81	0.91	1.02	0.22	-	-	-	-	-	-	40
50	5.11	9.90	2.27	1.38	1.28	0.34	0.82	0.11	-	-	-	-	50
60	6.13	13.40	2.72	1.92	1.53	0.48	0.98	0.16	-	-	-	-	60
70	7.15	17.04	3.18	2.56	1.79	0.63	1.14	0.21	0.79	0.088	-	-	70
80	8.17	22.50	3.63	3.28	2.04	0.81	1.31	0.27	0.91	0.11	-	-	80
90	9.19	28.00	4.08	4.08	2.30	1.01	1.47	0.34	1.02	0.14	-	-	90
100	10.21	35.80	4.54	4.96	2.55	1.22	1.63	0.41	1.14	0.17	-	-	100
125	12.76	50.90	5.68	7.50	3.19	1.85	2.04	0.62	1.42	0.26	-	-	125
150	15.32	76.00	6.81	10.50	3.83	2.59	2.47	0.87	1.70	0.36	0.96	0.09	150
175	17.86	92.50	7.95	14.00	4.47	3.44	2.86	1.16	1.99	0.48	1.12	0.12	175
200	20.40	129.00	9.08	17.90	5.10	4.41	3.27	1.49	2.27	0.61	1.28	0.15	200
225	-	-	10.20	22.30	5.74	5.48	3.68	1.85	2.55	0.76	1.44	0.19	225
250	-	-	11.30	27.10	6.38	6.67	4.08	2.25	2.84	0.93	1.60	0.23	250
275	-	-	12.50	32.30	7.02	7.96	4.50	2.68	3.12	1.11	1.76	0.27	275
300	-	-	13.60	37.90	7.65	9.34	4.90	3.13	3.41	1.30	1.91	0.32	300
350	-	-	15.90	50.40	8.93	12.40	5.72	4.20	3.97	1.73	2.23	0.43	350
400	-	-	18.20	64.60	10.20	15.90	6.54	5.38	4.54	2.21	2.25	0.55	400
450	-	-	-	-	11.50	19.80	7.36	6.60	5.10	2.75	2.87	0.68	450
500	-	-	-	-	12.80	24.10	8.18	8.12	5.68	3.34	3.19	0.82	500
550	-	-	-	-	14.00	28.70	8.99	9.69	6.24	3.99	3.51	0.98	550
600	-	-	-	-	15.30	33.70	9.81	11.40	6.81	4.68	3.82	1.15	600
650	-	-	-	-	16.60	39.10	10.60	13.20	7.38	5.43	4.15	1.34	650
700	-	-	-	-	17.90	44.90	11.40	15.10	7.94	6.23	4.47	1.53	700
750	-	-	-	-	18.90	51.30	12.30	17.20	8.51	7.08	4.78	1.74	750
800	-	-	-	-	-	-	13.10	19.40	9.08	7.98	5.10	1.97	800
900	-	-	-	-	-	-	14.70	24.10	10.20	9.92	5.74	2.44	900
1,000	-	-	-	-	-	-	16.30	29.30	11.40	12.10	6.38	2.97	1,000
1,100	-	-	-	-	-	-	18.00	35.00	12.50	14.40	7.02	3.55	1,100
1,200	-	-	-	-	-	-	19.56	41.20	13.60	16.90	7.66	4.17	1,200
1,300	-	-	-	-	-	-	21.19	48.00	14.80	19.60	8.30	4.83	1,300
1,400	-	-	-	-	-	-	22.82	54.80	15.90	22.50	8.93	5.54	1,400
1,500	-	-	-	-	-	-	24.45	62.40	17.00	25.50	9.55	6.30	1,500
1,600	-	-	-	-	-	-	-	-	18.20	28.80	10.20	7.10	1,600
1,800	-	-	-	-	-	-	-	-	20.52	35.90	11.50	9.83	1,800
2,000	-	-	-	-	-	-	-	-	22.80	43.60	12.80	10.70	2,000

V = Velocity feet per second; F = Friction head in feet

Loss of head in feet, due to friction, per 100 ft of ordinary pipe and velocity in feet per second

Values taken from Williams and Hazen tables, based on coefficient C = 100

For new pipes multiply friction loss value by 0.70

*Pipe Fittings Equivalent to Feet of Straight Pipe

Size of Fitting	2	3	4	5	6	8
90 ft Elbow	5.5	8.0	11.0	14.0	16.0	21.0
45 ft Elbow	2.5	3.8	5.0	6.3	7.5	10.0
Long sweep elbow	3.5	5.2	7.0	9.0	11.0	14.0
Close return bend	13.0	18.0	24.0	31.0	37.0	51.0
Tee-straight run	3.5	5.2	7.0	9.0	11.0	14.0
Tee-side inlet or outlet	12.0	17.0	22.0	27.0	33.0	43.0
Globe valve open	55.0	82.0	110.0	140.0	190.0	260.0
Angle valve open	27.0	41.0	53.0	70.0	-	-
Butterfly valve fully open	1.2	1.7	6.0	5.0	5.0	7.0
Gate valve fully open	1.2	1.7	2.3	2.9	3.5	4.5
Gate valve half open	27.0	41.0	53.0	0.0	0.0	130.0
Check valve	19.0	32.0	43.0	58.0	63.0	90.0