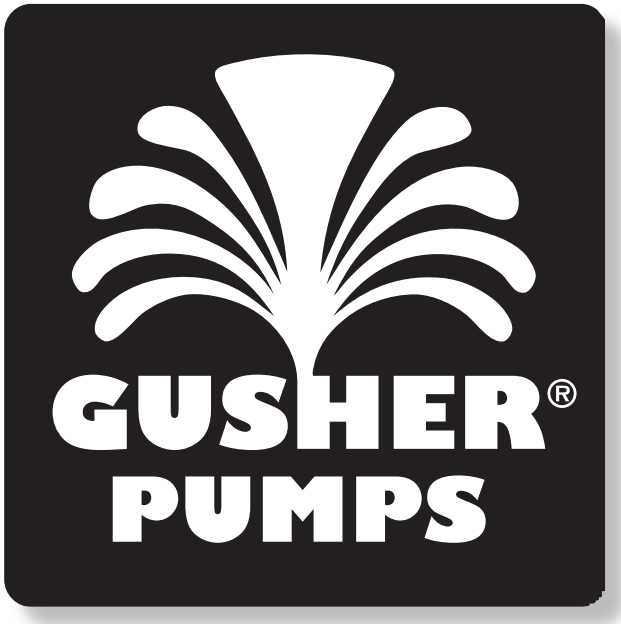


GUSHER PUMPS, INC.
115 INDUSTRIAL DRIVE
WILLIAMSTOWN, KY 41097
PHONE: 859-824-3100
FAX: 859-824-7428
www.gusher.com

7550 SERIES

52 HEAVY DUTY, 53 HEAVY DUTY AND 54 HEAVY DUTY POWER FRAMES

instruction manual

MAINTENANCE • INSTALLATION • OPERATIONS

INDEX

WARRANTY

Gusher Pumps, Inc. will replace or repair, within one year of shipment from our plant, any pump in our judgement that has failed due to defects in materials or workmanship, provided the pump has been properly installed and maintained and has not been subject to abuse. These pumps must return to Gusher Pumps, Inc. with complete history of service for inspection and warranty consideration. Gusher Pumps, Inc. does not accept the responsibility for transportation to and from our plant.

Furthermore, we do not assume any responsibility for consequential damage or loss of production.

RECEIVING AND INSPECTION

The utmost care has been taken at the factory to assure proper coupling alignment and impeller adjustment. However, due to circumstances beyond our control, YOU MUST inspect the pump upon receipt and follow the installation instructions completely before start-up.

RECEIVING:

1. Rotate shaft by hand. If it does not rotate freely:
   a. Check impeller adjustment.
   b. Check for bent coupling guard.
   c. Check slinger (#8).
   d. Check for bent shaft (#I).
2. Check for cracked or damaged parts. If upon receipt, you find the pump damaged, file a claim with the delivering carrier.
3. If drive motor has been supplied, check the R.P.M. and horsepower to be sure it is correct as ordered.
4. Check the pump name tag to be sure we have shipped correctly as ordered:
   a. Model Number
   b. Head in feet (Ft. Hd.)
   c. Gallons per minute (G.P.M.)
   d. Construction:
      1. All iron.
      2. All iron with stainless steel shaft and impeller.
      3. All stainless steel.
5. If there is anything that appears to be incorrect, call the factory immediately.

INSTALLATION

After careful preliminary inspection, you may proceed with the installation of the pump into your system.

1. Lower the pump into system.
2. Make sure mounting plate (#37) is setting firmly on the support channels. (It may be necessary to use metal shims to level plate.)
3. Secure mounting plate (#37) by using hold-down screws in all four corners. Again, care must be taken to make sure plate is firm and level. DO NOT force bowed plate level. Use metal shims if necessary.
4. Making pipe connections:
   a. Extreme care must be taken to support piping without causing any strain on the pump.
   b. Install pipe hanger on the discharge pipe so all piping weight is supported by the hanger and not be the pump or the casing.
   c. Bolt holes must line-up without prying to insert bolts.
   d. When tightening flange bolts, pipe flanges must not be forced together.
   e. Check valve should be placed in discharge line between gate valve and pump discharge pipe to prevent liquid from running back through the pump and causing reverse rotation. This is extremely important in applications with intermittent duty where the pump may be rotating backwards when service is resumed. This will cause damage to the pump and the drive motor.
   f. Pressure gauge should be located at the pump discharge, as all performance data is taken at pump discharge.
   g. If intake piping is used to pump the tank down, It must also be supported independently of the pump.
5. Remove coupling guard and rotate coupling by hand. Pump should rotate freely at this point. If it does not, check for:
   a. Piping strain: without exception, piping must not rest on pump in any manner. (SEE ITEM #4 of the INSTALLATION SECTION.)
   b. Impeller adjustment:
      1. Disconnect coupling (#32) and remove sleeve (#32a).
      2. Loosen three locking screws (#57).
      3. Loosen three adjusting screws (#55).
      4. Lightly tap shaft (#I) until impeller (#12) bottoms on the intake flange (#13).

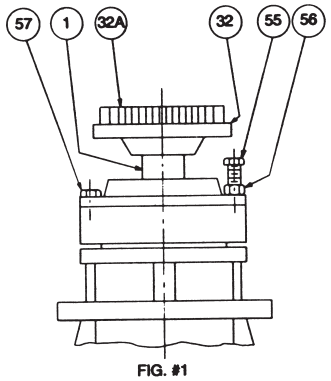
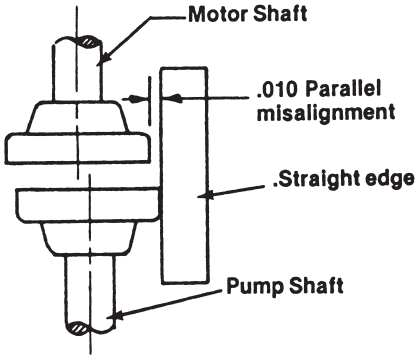
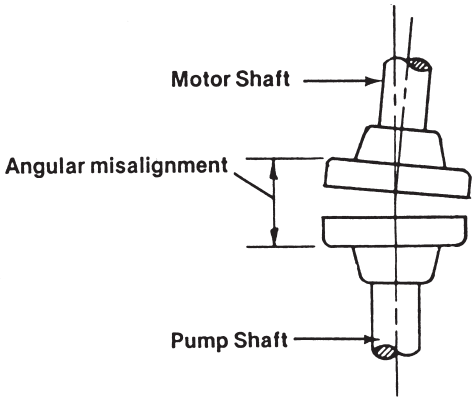


FIG. #1

      5. Tighten three adjusting screws by hand until they touch ball bearing housing (#5).
      6. Tighten three adjusting screws 1/4 turn (approximately .016") by alternating from one screw to the next, until all three screws have been turned 1/4 turn.
      7. Tighten locking screws (#57) and jamb nuts (#56).
      8. Rotate coupling by hand to be sure impeller (#12) does not rub intake flange (#13). If impeller does rub, repeat steps #1 through #7.
      9. Connect Coupling.
   c. Slinger adjustment: The slinger (#8) is set at the factory and normally causes no problems, but should be checked when unit is inspected upon arrival at your plant site and before unit is lowered into position in your system.
   d. Coupling alignment -SEE ITEM #6 below:
6. Coupling alignment: MUST BE CHECKED before and after system start-up.
   a. Check parallel alignment by placing a straight-edge across the two coupling flanges and measuring the maximum offset at various points around the periphery of the coupling. If the maximum offset exceeds .010", realign the coupling.



   b. Check angular alignment with a micrometer or caliper. Measure from the outside of the one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions. DO NOT rotate. The difference between the maximum and the minimum must not exceed .010". If a correction is necessary, be sure to recheck the parallel alignment.



CHM STYLE ONLY (chair mounted style)

c. If coupling alignment is out, adjustment can be made by the following steps.
   1. LATERAL PARALLEL MISALIGNMENT is adjusted by loosening the four motor retaining bolts (#49) after which you loosen the lateral adjusting screws (#58) on the side of the motor that has to be shifted and tighten the remaining lateral adjustment screws until lateral parallel alignment is achieved. (SEE FIG #3) If misalignment is our more than .020" SEE #5.

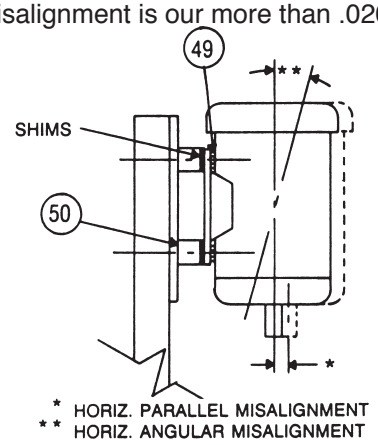


FIG. #2

   2. HORIZONTAL PARALLEL MISALIGNMENT is adjusted by loosening the four motor retaining bolts (#49) after which you add or subtract shims from between motor base and motor support pads (#50). (SEE FIG #2) If more .1875 of an inch total shims are required or alignment cannot be achieved without any shims, SEE #5. Tighten all screws before operating pump.
   3. LATERAL ANGULAR MISALIGNMENT is adjusted by loosening the four motor retaining bolts (#49) after which you loosen the angular alignment screws (#59) on the side of motor that has to be lowered and tighten the angular alignment screws on side of motor that has to be raised, until angular alignment is achieved. (SEE FIG #3) Tighten all screws before operating.
   4. HORIZONTAL ANGULAR MISALIGNMENT is adjusted by loosening the four motor retaining bolts (#49) after which you add or subtract shims from between motor base and motor support pads (#50). (SEE FIG #2) Tighten all screws before operating pump.
   5. If lateral alignment and horizontal parallel alignment cannot be achieved with the above steps use the following operation. Loosen nuts or screws that hold bearing housing to mounting plate. Tap ball bearing housing (#5) with lead hammer to move coupling into alignment. If unable to align coupling by tapping the ball bearing housing then insert a prybar between the ball bearing housing and the burned out hole in the mounting plate (#37) and shift coupling into alignment by prying housing from one position to another as required. Tighten all screws before operating pump.

NOTES:
   1. DO NOT LOOSEN THE FOUR MOTOR SCREWS TO MUCH, AS THIS WILL CAUSE DIFFICULTY WHEN TRYING TO ALIGN COUPLING. Motor screws must be snug so a slight force must be applied to move motor.

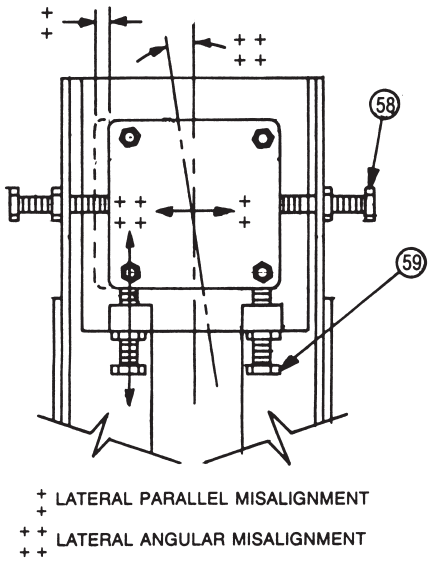


FIG. #3

   2. If an adjustment in either parallel or angular alignment is required, you must check both after adjustment is made.
   3. Coupling alignment must be checked after system has been operating for 300 hours. Then as a preventative maintenance procedure, it should be checked every 1200 hours of normal operation. More sever duty operation requires more frequent attention.
7. Make electrical connection to conform with state and local codes. (It is advised to use approximately 4' length of flexible conduit to facilitate removal of chair, if repair is required.)

Upon initial start-up, pumps may seem to run tight and hot. This is caused by breaking-in of oil seals and ball bearings. Pump will operate normally after approximately 150 hours of service. Ball bearings should not run over 225^0 F. When checking temperature use a pyrometer.

MAINTENANCE

1. Lubrication -all pumps are lubricated at the factory and should not require additional lubrication for approximately 1200 hours of run at 1750 R.P.M. OR 600 hours if run at 3450 R.P.M. A well planned maintenance schedule can only be devised after careful observation of the pump for the first six months of operation and the lubrication that has been required. Each pump installation is unique and requires a different lubrication schedule compatible with that specific operation. Use Chevron SRI #2 ball bearing grease. DO NOT OVER GREASE as it will cause ball bearings to run hot.

To lubricate:

a. Remove pipe plug from back of ball bearing housing (#5).
b. Fill with grease until fresh grease flows from opening.
c. If automatic lubrication system is being used, reliefs must be placed in the tapped hole (1/8" N.P.T.).

2. Coupling alignment: This must be checked before and after system start-up; after 300 hours of operation; and again after 1200 hours of operation. Follow procedure given in ITEM #6 of the INSTALLATION SECTION of this manual. Again, we recommend strongly that a routine preventative maintenance schedule be devised and followed to achieve optimum life and performance from the pump.

DISASSEMBLY

A. CHAIR AND DRIVE MOTOR

1. Disconnect electrical leads. During installation it was advised to allow sufficient flexible conduit (approximately 4 feet) to allow removal without disconnection of electrical leads.
2. Remove coupling guard.
3. Disconnect coupling (#32).
4 . Remove four motor retaining bolts (#49). Motor can now be removed from chair.
5. Break welds loose that hold discharge pipe cover plate to mounting plate (#37).
6. Remove bolts & nuts that hold discharge pipe to impeller housing (#11).
7 . Remove discharge pipe.

52VHD Power Frame

a. Remove bolts, nuts & washer that hold chair (#34) to stem (#7).
b. Remove chair (#34) from pump.

53VHD & 54VHD Power Frames

a. Remove intake flange (#13).
NOT APPLICABLE ON ALL MODELS.
b. Remove impeller housing (#11).
c. Remove impeller retaining nut (#40).
d. Remove impeller retaining washer (#18).
NOT APPLICABLE ON ALL MODELS.
e. Remove impeller (#12).
f. Remove impeller drive key (#19) and tape it to the hub of the impeller so it will not get lost.
g. Loosen set screws in slinger (#8).
h. Remove stem plate (#41).
NOT APPLICABLE ON ALL MODELS.
i. Remove stem (#7).
j. Remove power frame assembly from chair (#34).

B. BARREL AND DRIVE MOTOR

1. Disconnect electrical leads. During installation it is advisable to allow sufficient flexible conduit (approximately 4 feet) to allow removal without disconnection of the electrical leads.
2. Remove coupling guard.
3. Disconnect coupling (#32).
4. Remove bolts that hold barrel (#36) to bearing housing (#5).
5. Remove barrel (#36) & motor from power frame.

C. PUMP DISASSEMBLY

Read thoroughly before disassembly.

1. 52VHD barrel mount or chair mount.
a. Follow steps in section A or B
b. Remove bolts nuts and washers that hold discharge pipe to the impeller housing (#11). Remove bolts, nuts and washers that hold mounting plate (#37) to stem (#7). Remove mounting plate (#37). (Barrel mount only.)
c. Remove intake flange (#13)
NOT APPLICABLE ON ALL MODELS.
d. Remove impeller housing (#11).
e. Remove impeller retaining screw (#16).
f. Remove impeller retaining washer (#18).
g. Remove impeller (#12).
h. Remove impeller drive key (#19). Tape it to the hub of the impeller so it will not get lost.
i. Loosen set screw in slinger (#8).
j. Remove stem plate (#41).
NOT APPLICABLE ON ALL MODELS.
k. Remove stem (#7).
I Remove ball bearing retainer (#2).
m. Slide shaft (#1), telescoping ball bearing housing (#5a), ball bearing (#6), grease and radial bearing retainer (#61) and radial bearing (#4) out of bearing housing (#5) as one unit.
n. Remove ball bearing lock nut (#3) from shaft (#1).
o. Remove ball bearing (#6) from shaft (#1).
p. Remove telescoping ball bearing housing (#5a) from shaft (#1).
q. Remove oil seal (#21) from telescoping ball bearing housing (#5a).
r. Remove grease and radial ball bearing retainer (#61) and radial ball bearing (#4) together from shaft (#I).
s. Remove oil seal (#22) from ball bearing housing (#5).
t. Remove throttle bushing retainer (#9).
NOT APPLICABLE ON ALL MODELS.
u. Remove throttle bushing (#10).

2. 53VHD & 54VHD chair mount.
   a. Follow steps in section A.
   b. Remove 3 bolts (#57). SEE FIG #1.
   c. Slide shaft (#I), ball bearing retainer (#2), thrust ball bearing (#6) and radial ball bearing (#4) out of ball bearing housing (#5) as one unit.
   d. Remove ball bearing retainer (#2).
   e. Slide telescoping ball bearing housing (#5a) down off of the thrust bearing (#6).
   f. Remove ball bearing housing (#3) from shaft (#I).
   g. Remove thrust ball bearing (#6) from shaft (#1).
   h. Slide telescoping ball bearing housing (#5a) off shaft (#1).
   i. Remove bearing and grease retainer (#61) and radial ball bearing (#4) from shaft (#1). Remove both at the same time so as not to damage retainer.
   j Remove oil seal (#21) from telescoping ball bearing housing (#5a).
   k. Remove oil seal (#22) from ball bearing housing (#5).
   l. Remove throttle bushing retainer (#9). NOT APPLICABLE ON ALL MODELS.
   m. Remove throttle bushing (#10).
3. 53VHD & 54VHD barrel mount
   a. Follow steps in section B.
   b. Break welds loose that hold discharge pipe cover plate to mounting plate (#37).
   c. Remove bolts and nuts that hold discharge pipe to impeller housing (#11).
   d. Remove discharge pipe.
   e. Remove intake flange (#13). NOT APPLICABLE ON ALL MODELS.
   f. Remove impeller housing (#11).
   g. Remove impeller retaining nut (#40).
   h. Remove impeller retaining washer (#18). NOT APPLICABLE ON ALL MODELS.
   i. Remove impeller (#12).
   j. Remove impeller drive key (#19) and tape it to the hub of the impeller so it will not get lost.
   k. Loosen set screws in slinger (#8).
   l. Remove stem plate (#41). NOT APPLICABLE ON ALL MODELS.
   m. Remove stem (#7)
   n. Remove power frame from mounting plate (#37)
   o. Remove 3 bolts (#57). SEE FIG #1.
   p. Slide shaft (#I), ball bearing retainer (#2), thrust ball bearing (#6) and radial ball bearing (#4) out of ball bearing housing (#5) as one unit.
   q. Remove ball bearing retainer (#2).
   r. Slide telescoping ball bearing housing (#5a) down off of the thrust bearing (#6).
   s. Remove ball bearing lock nut (#3) from shaft (#1).
   t. Remove thrust ball bearing (#6) from shaft (#1).
   u. Slide telescoping ball bearing housing (#5a) off shaft (#1).
   v. Remove bearing and grease retainer (#61) and radial ball bearing (#4) from shaft (#1). Remove both at the same time so as not to damage retainer.
   w. Remove oil seal (#21) from telescoping ball bearing housing (#5a).
   x. Remove oil seal (#22) from ball bearing housing (#5).
   y. Remove throttle bushing retainer (#9). NOT APPLICABLE ON ALL MODELS.
   z. Remove throttle bushing (#10).

TO REASSEMBLE PUMP REVERSE THE PROCEDURE USED WHILE MAKING SURE OF THE FOLLOWING.

1. For bearing installation see page 7.
2. Check grease seals (#21) and (#22) for wear. Replace if worn.
3. Install retainer (#61) and telescoping ball bearing housing (#5a) on shaft (#I). Before putting bearing (#6) on shaft (#1).
4. Install slinger (#8) on shaft (#1) while connecting stem (#7) to bearing housing (#5).
5. Check throttle bushing for wear. Replace if worn. There are two different versions of throttle bushings. One is a TEFLON TYPE that has a retainer. The other is a CARBON TYPE that is pressed in place.
6. Clearance between impeller and housing or intake flange should not exceed .015". To adjust clearance see INSTALLATION on page 3, section 5b (for SE models only).

CERTAIN MODELS HAVE AN ENCLOSED IMPELLER. THESE MODELS ARE SUPPLIED WITH A CARBON WEAR RING (#27) THAT IS PRESS FITTED INTO THE INTAKE FLANGE (#13). UPON DISASSEMBLY CHECK THE WEAR RING FOR WEAR. REPLACE IF WORN.

BEARING INSTALLATION

Begin by cleaning your work area thoroughly, contaminants can cause bearing failures as fast as any other reason.

When a bearing is installed, the mounting force should be applied against the ring, and only the ring, which is being press-fitted. A bearing should never be forced onto a shaft by pressure or hammer blows applied to the other ring, nor should the bearing be press-fitted into housing by force allied to the inner ring.

Using an arbor press, the bearing may be laid on a face block which contacts only the bearing inner ring and which has a hole diameter greater than the bearing bore, as shown in FIG. 10. The shaft is pressed through the bearing until it is seated firmly against the shaft shoulder.

If the shaft is not too long, it can be supported beneath the table of the arbor press and the bearing pressed onto it by ram pressure against a piece of soft metal tubing, as shown in FIG. 11. The tubing must be clean, inside and out, and the diameter of the tubing should be slightly greater than the bearing bore. The end of the tubing should be square (with corners chamfered to avoid flaking) and should contact only the bearing inner ring. The shaft must be held in line with the ram of the arbor press to avoid cocking the bearing on the shaft seat.

When an arbor press is not available, the bearing can be driven onto the shaft seat by light hammer blows against the end of the soft metal tubing. These blows should be made alternately against opposite sides of the tubing face, and great care must be taken to avoid cocking the bearing as it is driven onto the shaft seat.

When a ball bearing is installed into the housing it is normally a slip fit, however if force is necessary to install bearing the force should be exerted on the outer ring of the bearing as shown in FIG. 12. Again the force must be applied evenly so as not to cock the bearing in the bore.

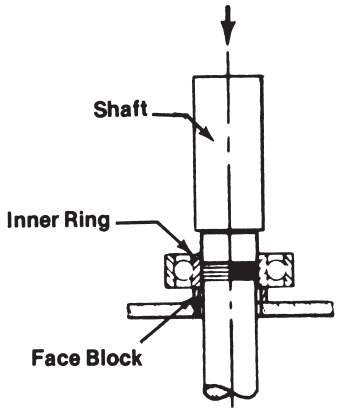


Fig. 10

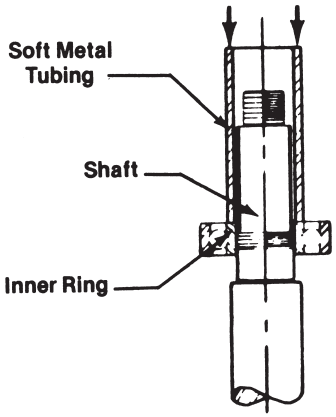


Fig. 11

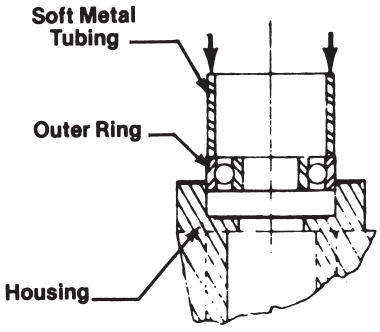


Fig. 12

TROUBLE SHOOTING

NO WATER DELIVERED.

(1) Pump not primed.
+ (2) Speed to low.
(3) Discharge head too high.
(4) Suction line or suction strainer is clogged.
(5) Impeller completely clogged.
(6) Wrong direction of rotation.
(7) Too much clearance between impeller and intake flange.

NOT ENOUGH WATER DELIVERED.

(1) Air leaks in suction or stuffing boxes.
+ (2) Speed too low.
(3) Discharge head higher than anticipated.
(4) Too much clearance between impeller and intake flange.
(5) Impeller partially clogged.
(6) Not enough suction head for hot water.
(7) Mechanical defects:
Wear ring is worn.
Impeller damaged.
(8) Impeller diameter too small.
(9) Foot valve too small.
(10) Foot valve or suction opening not submerged deep enough.

NOT ENOUGH PRESSURE.

+ (1) Speed too low.
(2) Air in water.
(3) Mechanical defects:
Wear ring is worn.
Impeller damaged.
(4) Impeller diameter too small.

VIBRATION.

(1) Bent shaft.
(2) Pipe strain.
(3) Impeller clogged.
(4) Coupling alignment off.

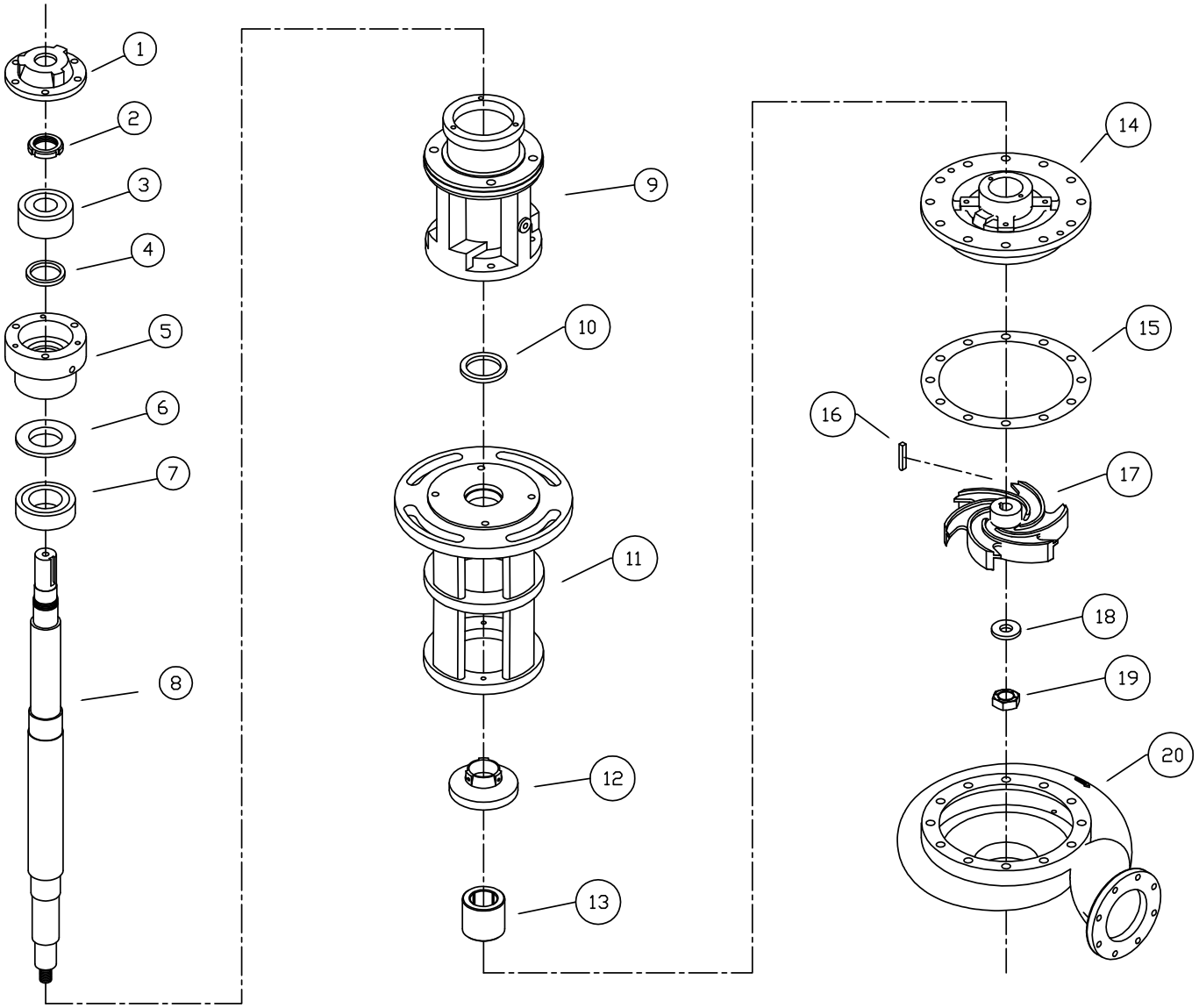
PUMP WORKS FOR A WHILE AND THEN LOSES SUCTION.

(1) Leaky suction line.
(2) Water seal plugged.
(3) Impeller clogged.
(4) Air or gasses in liquid.

PUMP TAKES TOO MUCH POWER.

+ (1) Speed too high.
(2) Head lower than rating, pumps too much water.
(3) Specific gravity or viscosity too high.
(4) Mechanical defects:
Shaft bent.
Power frame in bind.
Wear ring is worn.
(5) Impeller diameter too large.
(6) Pump delivering too many gallons.

+ When directly connected to electric motors, check for full voltage across all electrical leads.



PART NO.	DESCRIPTION
1	BALL BRG. RETAINER
2	LOCK NUT
3	THRUST BALL BRG.
4	OIL SEAL
5	TELESCOPING BALL BRG. HOUSING
6	GREASE & RADIAL BRG. RETAINER
7	RADIAL BALL BRG.
8	SHAFT
9	BALL BRG. HOUSING
10	OIL SEAL
11	STEM
12	SLINGER
13	THROTTLE BUSHING
14	STEM PLATE
15	GASKET
16	KEY
17	IMPELLER
18	IMPELLER RETAINING WASHER
19	IMPELLER RETAINING NUT
20	IMPELLER HOUSING

UNLESS OTHERWISE SPECIFIED
TOL ON 2 PL DEC. =+/-.02
TOL ON 3 PL DEC. =+/-.005
TOL ON FRACTIONS=+/-1/32
TOL ON ANGLES=+/-1°

ALL FINISHED SURFACES ARE 125 MICROINCHES (MAX.)

ALL THREADS TO BE ANSI DESIGNATION 62 UNC OR UNF

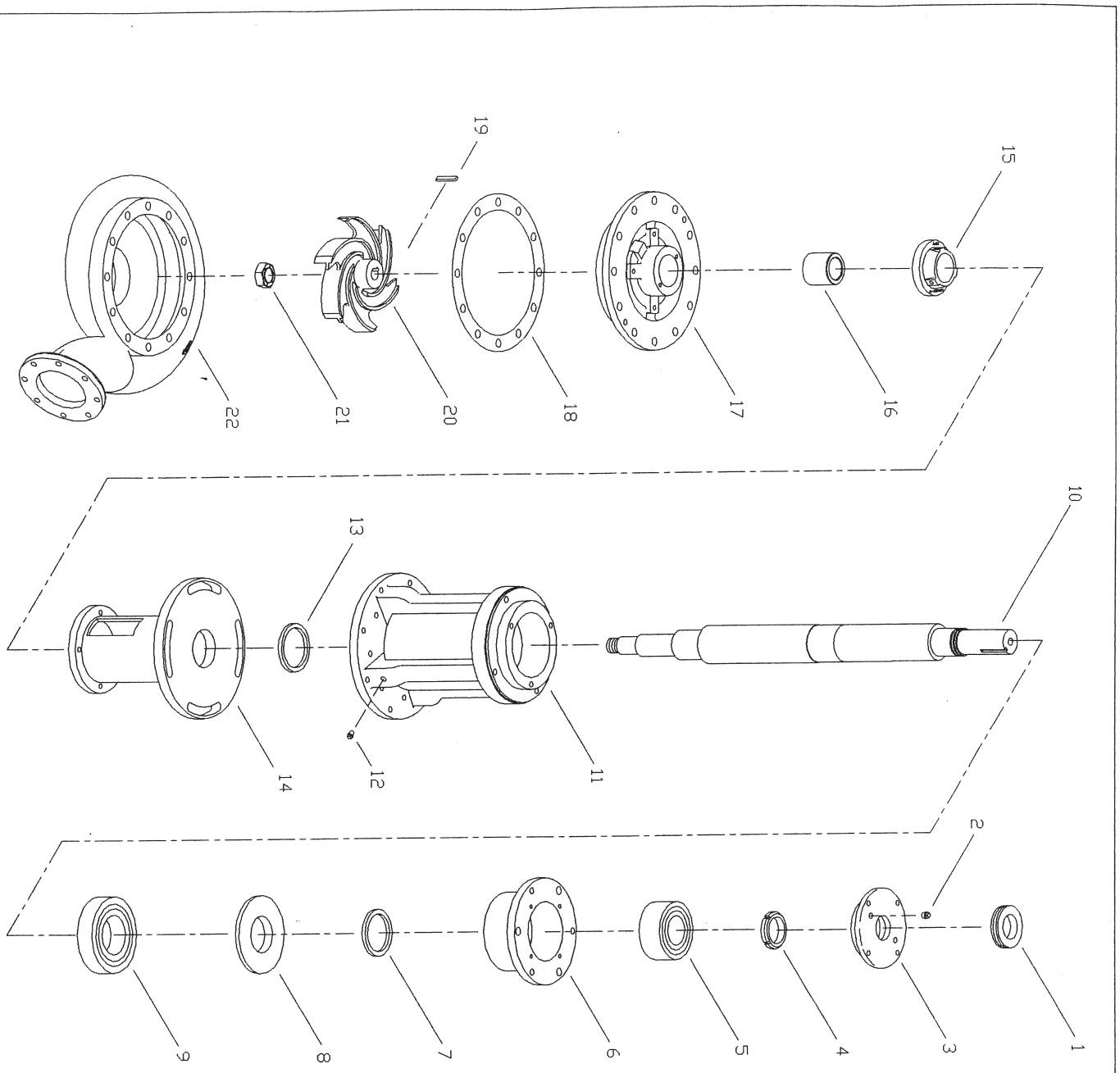
DRAWN BY: BURKHEAD

DATE: 5/14/96

GUSHER PUMPS
DIVISION OF RUTHMAN PUMP AND ENGINEERING, INC.
RUTHMAN DRIVE-DRY RIDGE, KENTUCKY 41035

TITLE: EXPLODED VIEW ASSEMBLY FOR 7550 HEAVY DUTY

SCALE	MATERIAL	WEIGHT
REV: 0.0	AK 960514-1	



PART NO.	DESCRIPTION
1	UPPER SLINGER
2	NPT PLUG
3	BEARING RETAINER
4	LOCK NUT
5	THRUST BEARING
6	CARTRIDGE
7	OIL SEAL
8	BEARING & GREASE RETAINER
9	RADIAL BEARING
10	SHAFT
11	BEARING HOUSING
12	NPT PLUG
13	OIL SEAL
14	STEM
15	SLINGER
16	THROTLLE BUSHING
17	STEM PLATE
18	GASKET
19	KEY
20	IMPELLER
21	IMPELLER RETAINING NUT
22	IMPELLER HOUSING

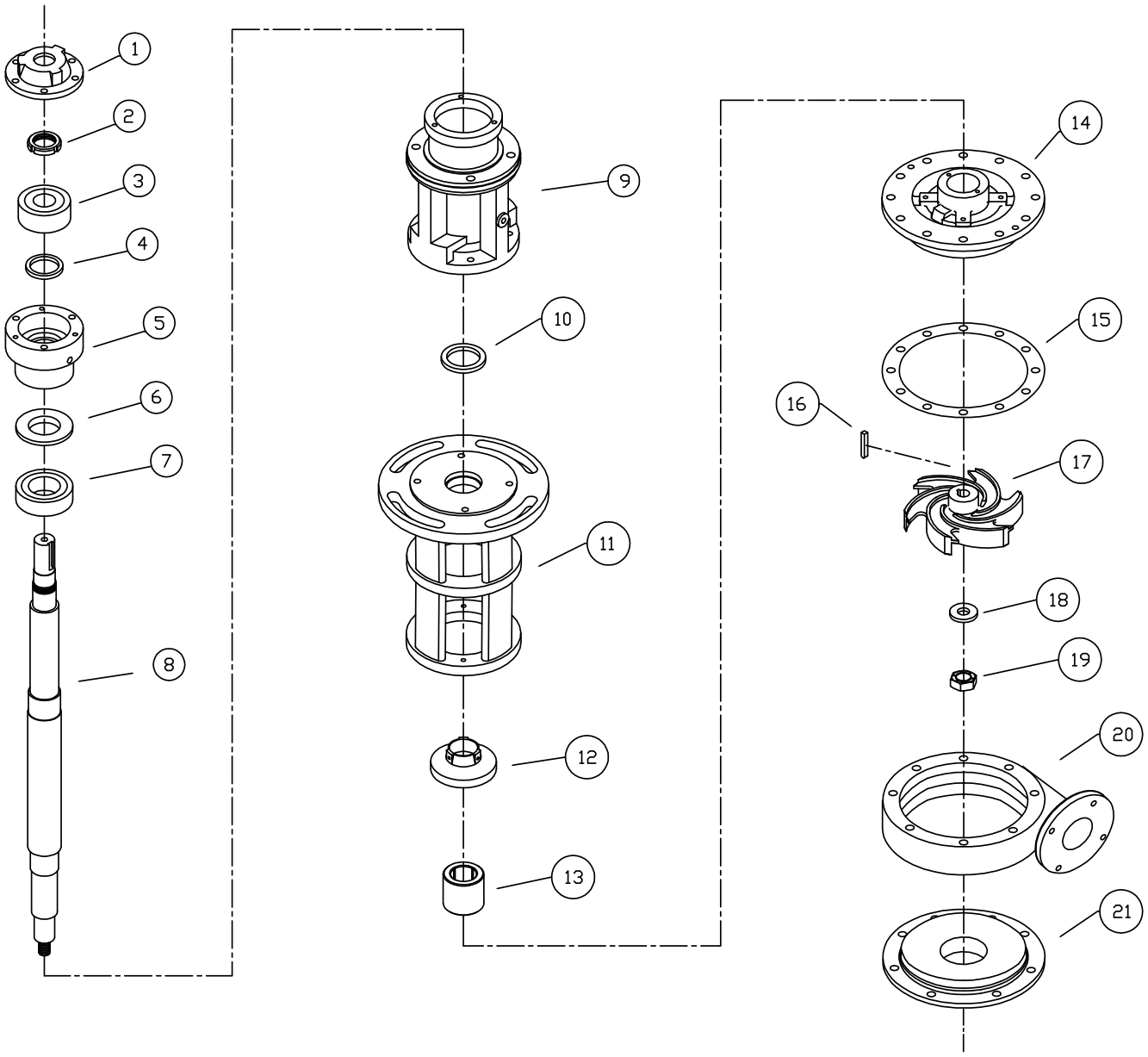
UNLESS OTHERWISE SPECIFIED
TOL ON 2 PL DEC= +/- .02
TOL ON FRACTIONS=+/-1/32
TOL ON ANGLES=+/-1°
ALL FINISHED SURFACES ARE 125 MICRO INCHES (MAX.)
ALL THREADS TO BE ANSI DESIGNATION 2B UNC OR UNF

GUSHER PUMPS
A DIVISION OF RUTHMAN PUMP AND ENGINEERING, INC.
RUTHMAN DRIVE-38Y RIDGE, KENTUCKY 41035

TITLE
EXPLODED VIEW OF 53/54HD PF

DRAWN BY	SCALE	MATERIAL	WEIGHT
CAD-CAM	REV: 0.0	AK 960406-9	
DATE			
4/6/96			

53 HD & 54 HD



PART NO.	DESCRIPTION
1	BALL BRG. RETAINER
2	LOCK NUT
3	THRUST BALL BRG.
4	OIL SEAL
5	TELESCOPING BALL BRG. HOUSING
6	GREASE & RADIAL BRG. RETAINER
7	RADIAL BALL BRG.
8	SHAFT
9	BALL BRG. HOUSING
10	OIL SEAL
11	STEM
12	SLINGER
13	THROTTLE BUSHING
14	STEM PLATE
15	GASKET
16	KEY
17	IMPELLER
18	IMPELLER RETAINING WASHER
19	IMPELLER RETAINING NUT
20	IMPELLER HOUSING
21	INTAKE FLANGE

NON-CENTER LINE

UNLESS OTHERWISE SPECIFIED
TOL ON 2 PL DEC. =+/-.02
TOL ON 3 PL DEC. =+/-.005
TOL ON FRACTIONS=+/-1/32
TOL ON ANGLES=+/-1°
ALL FINISHED SURFACES ARE 125 MICROINCHES (MAX.)
ALL THREADS TO BE ANSI DESIGNATION #2 UNC OR UNF

GUSHER PUMPS
DIVISION OF RUTHMAN PUMP AND ENGINEERING, INC.
RUTHMAN DRIVE-DRY RIDGE, KENTUCKY 41035

TITLE: EXPLODED VIEW ASSEMBLY
7550 HEAVY DUTY NON CL MODELS

DRAWN BY	SCALE	MATERIAL	WEIGHT
J. HEEGER			
DATE: 9-06-07	REV: 0.0	AK 7550 HD	

52 HD POWER FRAME

Model	Shaft	Radial Bearing	Thrust Bearing	Locknut	Cartridge	Brg. Housing	Brg./Grs. Retainer	Brg. Retainer	Brg.Hsg Oil Seal	Cartridge Oil Seal	Slinger
CL 1x1.5- 6	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1.5x3-6	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 2x3-6	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1x1.5-8	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1.5x3-8	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-7	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 2x3-8	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-8	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-8B	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1x2-10	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1.5x3-10	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 2x3-10	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-10	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-10B	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 4x6-10	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 1.5x3-13	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 2x3-13	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 3x4-13	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002
CL 4x6-13	100098	41211	41308-DR	68100	51019	51231	14003	14079	83006	83000	58002

Model	Throttle Bushing	Mounting Plate	Stem Plate	Impeller	Impeller Housing	Impeller Hsg. Gasket	Drive Key	Impeller Nut	Impeller Washer	Grease Pack
CL 1x1.5- 6	62001-C	47027-1	NA	25100-J-5	27100A	61171	71099(2)	68137	68510	71421
CL 1.5x3-6	62001-C	47027-1	NA	25101-J-1	27101A	61171	71099(2)	68137	68510	71421
CL 2x3-6	62001-C	47027-1	NA	25102-J-1	27102A	61171	71099(2)	68137	68510	71421
CL 1x1.5-8	62001-C	47027-1	21104-H	25103-J-1	27103A	61108	71099(2)	68137	68510	71421
CL 1.5x3-8	62001-C	47027-1	21104-H	25104-J-2	27104A	61103	71099(2)	68137	68510	71421
CL 3x4-7	62001-C	47027-2	21108-H	25106-J-1	27106A	61108	71099(2)	68137	68510	71421
CL 2x3-8	62001-C	47027-2	21108-H	25107-J-1	27107A	61108	71099(2)	68137	68510	71421
CL 3x4-8	62001-C	47027-2	21108-H	25108-J-4	27108A	61108	71099(2)	68137	68510	71421
CL 3x4-8B	62001-C	47207-2	21108-H	25109-J-4	27109A	61108	71099(2)	68137	68510	71421
CL 1x2-10	62001-C	47027-1	21111-H	25110-J-1	27110A	61115	71099(2)	68137	68510	71421
CL 1.5x3-10	62001-C	47027-1	21111-H	25111-J-4	27111A	61115	71099(2)	68137	68510	71421
CL 2x3-10	62001-C	47027-2	21111-H	25112-J-2	27112A	61115	71099(2)	68137	68510	71421
CL 3x4-10	62001-C	47027-2	21220-H	25113-J-1	27113A	61115	71099(2)	68137	68510	71421
CL 3x4-10B	62001-C	47027-2	21220-H	25114-J-1	27114A	61115	71099(2)	68137	68510	71421
CL 4x6-10	62001-C	47027-2	21220-H	25115-J-7	27115A	61115	71099(2)	68137	68510	71421
CL 1.5x3-13	62001-C	47027-2	21173-H	25416-J-1	27116A	61116	71099-2(2)	68137	68510	71421
CL 2x3-13	62001-C	47027-2	21173-H-8	25117-J-6	27117A-2	61116	71099-2(2)	68137	68510	71421
CL 3x4-13	62001-C	47027-2	21170-H	25118-J-1	27118A	61116	71099(2)	68137	68510	71421
CL 4x6-13	62001-C	47027-2	21170-H	25119-J-6	27119A	61116	71099(2)	68137	68510	71421

* For specific part numbers please provide serial number.

53 HD POWER FRAME

Model	Shaft	Grease Retainer	Bearing Retainer	Stem	Stem Plate	Impeller	Impeller Hsg.
CL 3x4-16E	100025-CRS	14080-CI	14083-CI	17143-HRS	21141-H-4-DI	25132E-DI-K-1	27132EA-DI
CL 5x6-16E	100025-CRS	14080-CI	14083-CI	17143-HRS	21141-H-4-DI	25141E-DI-K-1	27141EA-DI
CL 6x8-13	100025-CRS	14080-CI	14083-CI	17171-HRS	21136-H-10-CI	251020-DI-K-7	27120A-8-DI

Model	Ball Bearing Radial	Ball Bearing Thrust	Main Bearing Hsg.	Bearing Hsg.	Slinger	Slinger	Imp. Hsg. Gasket	Carbon Bushing
CL 3x4-16E	41316-0	41312-DR-0	51080-CI	51083-CI	58053-RUB	58055-HRS	61141	62025-C
CL 5x6-16E	41316-0	41312-DR-O	51080-CI	51083-CI	58055-HRS	58055-HRS	61141	62025-CI
CL 6x8-13	41316-0	41312-DR-0	51080-CI	51083-CI	58053-RUB	58055	61116	62025-C

Ball Brg. Lock Nut	Long Key	Oil Seal	Oil Seal	Mtg. Plate	Wear Ring	Grease Pack	Pipe
68100-1	71099-1	83010	83011	47128-HRS	65132	71422	90558+16
68100-1	71099-1	83010	83011		65141	71422	90402
68100-1	71099-1	83010	83011			71422	90436

54 HD POWER FRAME

Model	Shaft	RAD Bearing Retainer	THR Bearing Retainer	Stem	Stem Plate	Impeller	Impeller Hsg.
CL 3x4-16E	100035-CRS	14081-CI	14082-CI	17273-HRS	21141-H-3-DI	25132E-DI-M-1	27132EA-DI
CL 5x6-16E	100035-CRS	14081-CI	14082-CI	17273-HRS	21141-H-3-DI	25141E-DI-M-1	27141EA-DI
CL 6x8-13	100035-CRS	14081-CI	14082-CI	19269-HRS	21136-H-20-CI	25120-DI-M-7	27120A-8-DI
CL 6X8-15	100035-CRS	14081-CI	14082-CI	17262-FSS		25122-DI-M-1	27122A-DI
CL 8X10-13	100035-CRS	14081-CI	14082-CI		21136-H-13-CI	25121-DI-M	27121A-DI
CL8X10-15	100035-CRS	14081-CI	14082-CI		21122-H-3-HRS	25123-DI-M	27123A-DI
CL8X10-15B	100035-CRS	14081-CI	14082-CI	17261-HRS		25124-DI-M	27124A-DI

Model	Ball Bearing Radial	Main Bearing Hsg.	Ball Bearing Thrust	Bearing Hsg.	Slinger	Slinger	Imp. Hsg. Gasket	Carbon Bushing
CL 3x4-16E	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071L-RUB	61141	62054-C
CL 5x6-16E	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071L-RUB	61141	62054-C
CL 6x8-13	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071L-RUB	61116	62054-C
CL 6X8-15	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071I-RUB	61122	62054-C
CL 8X10-13	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071L-RUB	61116	62054-C
8X10-15	41319-0	51081-CI	41314-DR-0	51082-CI	58054-CI	58071L	61122	62054-C
8X10-15B	41319-0	51081-CI	41314-DR-0	51082-CL	58054-CI	58071L	61122	62054-C

Model	Long Key	Oil Seal	Oil Seal	Wear Ring	Grease Pack	Pipe
CL 3x4-16E	71099-1	83012	83013	65132	71422	90558
CL 5x6-16E	71099-1	83012	83013	65141	71422	90402
CL 6x8-13	71099-1	83012	83013		71422	90436
CL 6X8-15	71099-1	83012	83012		71422	
CL 8X10-13	71099-1	83012	83013		71422	
8X10-15	71099-1	83012	83013		71422	90617
8X10-15B	71099-1	83012	83013		71422	90600

* For specific part numbers please provide serial number.

7550 NON-CENTERLINE

Model	#11 Impeller Housing	#12 Impeller	#13 Intake Flange	#27 Wear Ring	#38 Impeller Hsg. Gasket	#39 Stem Pit. Gasket	#41 Stem Plate
1.25x1.5-7	27037	25015	33015	-	61013	61149	21037H
1.5x2-7	27039	25016	33016	-	61013	61149	21037H
2x2.5-7	27041	25017	33017	-	61013	61149	21037H
2.5x3-7	27043	25018	33018	-	61013	61149	21037H
3x4-7	27013	25013	33013	-	61013	-	-
4x5-7	27047	25020	33020	-	61013	61149	21037H
1.25x1.5-9	27038	25011	33011	-	61011	61011	21038H
5x6-9	27049	25022	33022	-	61011	61011	21038H
1.5x2-10	27040	25009	33009	-	61007	61007	21040H
2x2.5-10	27042	25010	33010	-	61007	61007	21040H
2.5x3-10	27044	25007	33001	-	61007	61007	21040H
3x4-10	27046	25006	33000	-	61007	61007	21040H
5x6-10	27053	25023	33023	65012	61007	61007	21040H
4x5-11	27048	25008	33008	-	61008	61008	21048H
6x8-11	27300-1	25027	-	-	61008	-	21048H-1
3x4-13	27051-1	25019	33019	65019	61012	61012	21051H
4x5-13	27052-1	25021	33021	65019	61012	61012	21051H
5x6-13	27154	25012	33012	65012	61012	61012	21051H
6x6-14	27024	25024	-	-	61024	-	-

Part #	Description	52VHD Power Frame	53HVD Power Frame 6x6-14E	53VHD Power Frame	54VHD Power Frame
1	Shaft	100098	100025	100034	100035
2	Ball Brg. Retainer	14003	14083	14083	14082
3	Lock Nut	68100	68100-1	68100-1	68100-2
4	Radial Ball Brg.	41211	41316	41316	41319
5	Ball Brg. Housing	51231-CI	51080	51080	51081
5A	Telescoping Ball Bearing Housing	51019	51083	51083	51082
6	Trust Ball Brg.	41308-DR	41312-DR	41312-DR	41314-DR
8	Slinger	58002	58055	58054	58054
9	Bushing Retainer	71003	71003-1	71091	71091
10	Throttle Bushing (Teflon)	62001	62001-7	62024	62054
10	Throttle Bushing (Carbon)	62001-C	62025	----------	62054-C
14	Slinger	---------	58053	58053	58071L
16	Impeller Retaining Nut	68137	--------	--------	---------
18	Impeller Retaining Washer	68510	-------	--------	68024-3
19	Impeller Drive Key	71099	71099-1	71099-1	71099-1
21	Oil Seal	83000	83010	83010	83012
22	Oil Seal	83006	83011	83011	83013
40	Impeller Retaining Nut	--------	71213	71213	71213
61	Grease & Radial Brg. Retainer	14079	14080	14080	14081

Model	52VHD	53VHD	54VHD
1.25x1.5-7	17005	17171	-
1.5x2-7	17005	17171	-
2x2.5-7	17005	17171	-
2.5x3-7	17005	17171	-
3x4-7	17005	17171	-
4x5-7	17005	17171	-
1.25x1.5-9	17005	17171	-
5x6-9	17005	17171	-
1.5x2-10	17005	17171	-
2x2.5-10	17005	17171	-
2.5x3-10	17005	17171	-
3x4-10	17005	17171	-
5x6-10	17005	17171	-
4x5-11	17005	17171	-
6x8-11	17005	17171	-
3x4-13	17005	17171	-
4x4-13	17005	17171	-
5x6-13	17005	17171	-
6x6-14	17005	17171	-

* For specific part numbers please provide serial number.

MAINTENANCE HISTORY

SERIAL NO. _____

MODEL NO. _____ IMP. DIA. _____

OPERATING COND. _____ GPM @ _____ FT. THD

HP. _____ SPEED/RPM_____

Start-Up Date _____ Amps at Start-Up_____

Pressure at Start-Up _____

ENGINEERING DATA

POWER FRAME	52HD	53HD	54HD
1. RADIAL BRG.	41211	41316	41319
2. THRUST BRG.	41308-DR	41312-DR	41314-DR
3. BALL BRG. SPAN	9.032	12.750	12.750
4. SHAFT DIA'S.			
@ RADIAL BRG.	2.1655	3.1497	3.7403
@ THRUST BRG.	1.5750	2.3623	2.7560
@ THROTTLE BUSHING	1.735	1.875*	2.500
@ IMPELLER	1.375	1.500	1.750
BET. BALL BRG'S.	1.937	3.125	3.625
BET. RADIAL BRG. & THROTTLE SLV.	2.250	3.250	4.250
		*2.010 (6x6-14)	

GREASE LUBRICATION

DATE	GREASED	DATE	GREASED	DATE	GREASED

TYPE GREASE USED _____

COUPLING ALIGNMENT

Parallel Alignment						Angular Alignment					
Date Checked	Amt. Out	Date Checked	Amt. Out	Date Checked	Amt. Out	Date Checked	Amt. Out	Date Checked	Amt. Out	Date Checked	Amt. Out

NOTES: _____

Frequently Used Formulas & Equivalents

HEAD & PRESSURE FORMULA

$$\text{Head in feet} = \frac{(\text{Head in psi}) \times 2.31}{(\text{Sp. Gr.})}$$

$$\text{Head in psi} = \frac{(\text{Head in ft}) \times (\text{Sp. Gr.})}{2.31}$$

NET POSITIVE SUCTION HEAD

Flooded suction: $NPSH = h_a - h_v + h_s - h_f$

Suction lift: $NPSH = h_a - h_v - h_s - h_f$

h_a = the absolute pressure in feet of liquid on the surface of the supply liquid.
h_v = the vapor pressure of the liquid being pumped expressed in feet of head.
h_s = the height in feet of the supply liquid surface with respect to the pump inlet.
h_f = suction line friction losses expressed in feet of head.
These calculations yield the *available* net positive suction head for a given system. This must be compared to the required net positive suction head $NPSH_R$ calculated by the manufacturer. $NPSH_A$ must exceed $NPSH_R$.

PRESSURE EQUIVALENT TABLE

Convert from \ to	lb/in²	lb/ft²	Atmos-pheres	kg/cm²	kg/m²	in. water (68F)°	ft. water (68F)°	in mercury (32F)	mm mercury (32F)	Bars ‡	Mega-Pascals (MPa) ‡
lb/in²	1	144	0.068046	0.070307	703.070	27.7276	2.3106	2.03602	51.7150	0.06895	0.006895
lb/ft²	0.0069444	1	0.000473	0.000488	4.88241	0.1926	0.01605	0.014139	0.35913	0.000479	0.0000479
Atmospheres	14.696	2116.22	1	1.0332	10332.27	407.484	33.9570	29.921	760	1.01325	0.101325
kg/cm²	14.2233	2048.155	0.96784	1.	10000.	394.38	32.8650	28.959	735.559	0.98067	0.098067
kg/m²	0.001422	0.204768	0.0000968	0.0001	1.	0.03944	0.003287	0.002896	0.073556	0.000098	0.0000098
in. water*	0.036092	5.1972	0.002454	0.00253	25.375	1.	0.08333	0.073430	1.8651	0.00249	0.000249
ft. water*	0.432781	62.3205	0.029449	0.03043	304.275	12.	1.	0.88115	22.3813	0.029839	0.0029839
in. mercury	0.491154	70.7262	0.033421	0.03453	345.316	13.6185	1.1349	1.	25.40005	0.033864	0.0033864
mm mercury	0.0193368	2.78450	0.0013158	0.0013595	13.59509	0.53616	0.044680	0.03937	1.	0.001333	0.0001333
Bars	14.5038	2088.55	0.98692	1.01972	10197.2	402.156	33.5130	29.5300	750.062	1.	0.10
MPa	145.038	20885.5	9.8692	10.1972	101972.0	4021.56	335.130	295.300	7500.62	10.0	1.

*Water at 68F (20 C) mercury at 32F (0 C) 1 MPa (MegaPascal) = 10 Bars = 1,000,000 N/m² (Newtons/meter²)
Courtesy of Crane Co. Technical Paper 410.

FLOW EQUIVALENTS

Convert from \ to	U.S. gal/ min.	Imp. gal/ min.	U.S. million gal/day	Cu. ft per. sec. (sec.-ft.)	Cu. meters per. hour	Liters per. sec.
U.S. gal/min.	1.	0.8327	0.00144	0.00223	0.2271	0.0631
Imp. gal/min.	1.201	1.	0.00173	0.002676	0.2727	0.0758
U.S. million gal/day	694.4	578.25	1.	1.547	157.7	43.8
Cu. ft/sec.	448.83	373.7	0.646	1.	0.060	28.32
Cu. m/sec.	15852	13200	22.83	35.35	3600	1000
Cu. m/min.	264.2	220	0.3804	0.5886	60.0	16.667
Cu. m/hr.	4.403	3.67	0.00634	0.00982	1	0.2778
Liters/sec.	15.85	13.20	0.0228	0.0353	3.60	1
Liters/min.	0.2642	0.220	0.000380	0.000589	0.060	0.0167

VOLUME & WEIGHT EQUIVALENTS

Convert from \ to	Volume and weight equivalents-any liquid						*Weight equivalent basis water at 60°F (15.6°C)		
	U.S. gallons	Imperial gallons	Cubic inches	Cubic feet	Liters	Cubic meters	Pounds	U.S. tons	Kilo-grams
U.S. gallons	1.	0.8327	231.	0.13368	3.7854	0.0037854	8.338	0.00417	3.782
Imperial gallons	1.20094	1.	277.39	0.16054	4.546	0.004546	10.0134	0.005	4.542
Cubic inches	0.004329	0.003605	1.	0.0005787	0.016387	0.000016387	0.036095	55409	0.016372
Cubic feet	7.48052	6.229	1728	1.	28.317	0.02832	62.3714	0.03119	28.291
Liters	0.2642	0.2200	61.024	0.035315	1.	0.001	2.2029	0.0011	0.1000
Cubic meters	264.2	220.0	61024	35.315	1000.	1.	2202.65	1.10133	1000.0
Pounds*	0.1199	0.09987	27.71	0.016033	.4539	.000454	1.	0.0005	0.45359
U.S.tons*	239.87	199.7	55409	32.066	907.9	0.908	2000	1.	907.2
Kilograms*	0.2644	0.2202	61.08	0.03534	1.000	.001	2.205	0.0011	1

*Volume and weight equivalents basis water 60°F (15.6°C); for weights and volumes at other temperatures see page 4-4.

VACUUM PRESSURE EQUIVALENTS

1 atmosphere = 29.92 in Hg = 760mm Hg = 14.7 psi
1 mm Hg = 1 Torr = (3.937×10^{-2}) in Hg = 1000μHg = 1.333 millibars
1 bar = 10^3 millibars = 10^6 microbars = 750.06 mrn Hg
1 microbar = 0.75 micron
1 inch Hg = 254×10^1 mm Hg

x in. Hg vacuum = (29.92 -x) in Hg absolute
y mm Hg vacuum = (760 -y) mm Hg absolute
z PSIG = (z + 14.7) PSIA
W PSIA = (w -14.7) PSIG

GENERAL ENGINEERING DATA

VISCOUS LIQUIDS

CHART II VISCOSITY MEASURES A LIQUID'S RESISTANCE TO FLOW

VISCOSITY CONVERSION TABLE							
SAYBOLT UNIVERSAL SSU	**STOKES**	**CENTI STOKES**	**POISES***	**CENTI* POISES**	**ENGLER SECONDS**	**REDWOOD NO. 1 SECONDS**	**TYPICAL LIQUIDS AT 70°F**
31	.010	1.00	.008	.8	54	29	WATER
35	.025	2.56	.020	2.05	59	32.1	KEROSENE
50	.074	7.40	.059	5.92	80	44.3	NO. 2 FUEL OIL
80	.157	15.7	.126	12.6	125	69.2	NO. 4 FUEL OIL
100	.202	20.2	.162	16.2	150	85.6	TRANSFORMER OIL
200	.432	43.2	.346	34.6	295	170	HYDRAULIC OIL
300	.654	65.4	.522	52.2	470	254	SAE 10W OIL
500	1.10	110	.88	88.0	760	423	SAE 10 OIL
1,000	2.16	220	1.73	173	1,500	896	SAE 20 OIL
2,000	4.40	440	3.52	352	3,000	1,690	SAE 30 OIL
5,000	10.8	1,080	8.80	880	7,500	4,230	SAE 50 OIL
10,000	21.6	2,160	17.0	1,760	15,000	8,460	SAE 60-70- OIL
50,000	108	10,800	88	8,800	75.000	43,660	MOLASSES B
100,000	216	21,600	173	17,300	150,000	88,160	MOLASSES C

*Poises and centipoises are given for oil of .8 spec. Gravity, Relationship: centistokes X specific gravity = centipoises.

PUMPING VISCOUS LIQUIDS WITH CENTRIFUGAL PUMPS

VISCOSITY SSU	**30**	**100**	**250**	**500**	**750**	**1000**	**1500**	**2000**
Flow Reduction GPM %	--	3	8	14	19	23	30	40
Head Reduction Feet %	--	2	5	11	14	18	23	30
Horsepower Increase %	--	10	20	30	50	65	85	100

CONVERSION CHART

BARS	x	14.5	=	LBS / SQ. INCH
CELSIUS	=	.556 X	(^{0}F -32)	
CUBIC METRE PER HOUR	x	4.403	=	GALLONS-U.S. PER MINUTE
FAHRENHEIT	=	(1.8 x ^{0}C)	+	32
FEET	x	.3048	=	METERS
FEET OF WATER	x	.4335	=	LBS / SQ. INCH
GALLONS-IMPERIAL	x	1.20095	=	GALLONS-U.S.
GALLONS-U.S.	x	.83267	=	GALLONS-IMPERIAL
GALLONS-U.S.	x	3.785	=	LITRES
GALLONS-U.S. PER MINUTE	x	.2271	=	CUBIC METRE PER HOUR
HORSE POWER	x	.746	=	KILOWATT
INCHES	x	25.4	=	MILLIMETRES
KILOWATT	x	1.34048	=	HORSE POWER
LITRES	x	.2642	=	GALLONS-U.S.
METRES	x	3.281	=	FEET
MILLIMETRES	x	.03937	=	INCHES
POUNDS / SQ. INCH	x	2.307	=	FEET OF WATER
POUNDS / SQ. INCH	x	.0689	=	BARS

ENGINEERING DATA

CAPACITY AND HEAD IN FEET . . .Gallons per minute (G.P.M.) and Foot heads in the performance charts in this catalog were compiled from actual tests. The Maximum G.P.M. shown is the pump capacity at rated horsepower. The maximum Head in Feet is at full rated speed (60 cycle current). For Maximum G.P.M. all piping should be straight, short and large as possible. Heads and G.P.M. are based on tests with specific gravity of 1 and a temperature of 70°F.

HOW TO FIGURE HEAD..

1. **Determine static lift (height liquid is to be raised above reservoir)**
2. **Determine friction loss (losses due to piping depend on size, length and condition of piping system in relation to G.P.M. needed, see table below. Friction losses also include loss due to valves and fittings)**
3. **Determine velocity head (refer to table below)** $V_H = \left(\frac{Vel}{8.02}\right)^2$
4. **Total all three of the above and compare to performance chart. Select pump which delivers total head at desired G.P.M.**

PIPE FRICTION

Loss of Head In Feet, Per 100 Ft. of 15-year-old Ordinary Iron Pipe Due to Friction.

Gallons per Minute	1/2" Pipe		3/4" Pipe		1" Pipe		1 1/4" Pipe		1 1/2" Pipe		2" Pipe		2 1/2 Pipe		3" Pipe	
	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.
1	1.05	2.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	2.10	7.4	1.20	1.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	3.16	15.8	1.80	4.1	1.12	1.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	4.21	27.0	2.41	7.0	1.49	2.14	0.86	0.57	0.63	0.26	.....	.....	.....	.....	.....	.....
5	5.26	41.0	3.01	10.5	1.86	3.25	1.07	0.84	0.79	0.39	.....	.....	.....	.....	.....	.....
10	10.52	147.0	6.02	38.0	3.72	11.7	2.14	3.05	1.57	1.43	1.02	0.5	0.65	0.17	0.45	0.07
15	.....	.....	9.02	80.0	5.60	25.0	3.2	6.5	2.36	3.0	1.53	1.0	0.98	0.36	0.68	0.15
20	.....	.....	12.03	136.0	7.44	42.0	4.29	11.1	.....	.....	.....	1.83	1.31	0.61	0.91	0.25
25	.....	.....	.....	.....	9.30	64.9	5.36	16.6	3.94	7.8	2.55	2.73	1.63	0.92	1.13	0.38
30	.....	.....	.....	.....	11.15	89.0	6.43	23.5	4.72	11.0	3.06	3.84	1.96	1.29	1.36	0.54
35	.....	.....	.....	.....	13.02	119.0	7.51	31.2	5.51	14.7	3.57	5.1	2.20	1.72	1.59	0.71
40	.....	.....	.....	.....	14.88	152.0	8.58	40.0	6.3	18.8	4.08	6.6	2.61	2.20	1.82	0.91
45	.....	.....	.....	.....	.....	.....	9.65	50.	7.08	23.2	4.60	8.2	2.94	2.80	2.05	1.15
50	.....	.....	.....	.....	.....	.....	10.72	60.	7.87	28.4	5.11	9.9	3.27	3.32	2.27	1.38
70	.....	.....	.....	.....	.....	.....	15.01	113.	11.02	53.0	7.15	18.4	4.58	6.2	3.18	2.57
90	.....	.....	.....	.....	.....	.....	.....	.....	14.17	84.0	9.19	29.4	5.88	9.8	4.09	4.08
100	.....	.....	.....	.....	.....	.....	.....	.....	15.74	102.0	10.21	35.8	6.54	12.0	4.54	4.96
120	.....	.....	.....	.....	.....	.....	.....	.....	18.89	143.0	12.25	50.0	7.84	16.8	5.45	7.0
140	.....	.....	.....	.....	.....	.....	.....	.....	22.04	190.0	14.30	67.0	9.15	22.3	6.35	9.2
160	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16.34	86.0	10.46	29.0	7.26	11.8
180	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.38	107.0	11.76	35.7	8.17	14.8
200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20.42	129.0	13.07	43.1	9.08	17.8
220	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	22.47	154.0	14.38	52.0	9.99	21.3
240	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24.51	182.0	15.69	61.0	10.89	25.1
260	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26.55	211.0	16.99	70.0	11.80	29.1
280	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.30	81.0	12.71	33.4
300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	19.61	92.0	13.62	38.0

Friction of Water in 90° Elbows

Size of Elbow, Inches.....	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Friction Equivalent Feet Straight Pipe.....	5	6	6	8	8	8	11	15	16	18	18

To Compute Break Horse Power

$$BHP = \frac{GPM \times H \times S.G.}{3960 \times \text{pump Eff.}^*}$$

S.G. = Specific Gravity,
BHP = Break Horse Power,
GPM = Gallons per Minute,
H = Head in Feet
Eff. = Efficiency
Horse Power and Pressure (PSI) vary in direct proportion to the Specific Gravity.

Effect of Speed Changes

1. Capacity (GPM) is directly proportional to the change in speed.
2. Head is proportional to the square of the change in speed.
3. Horse Power is proportional to the cube of the change in speed.

Pipe Friction (Continued)

Loss of Head in Feet, Per 100 Ft. of 15-year-old Ordinary Iron Pipe Due to Friction.

Gallons per Minute	4" Pipe		5" Pipe		6" Pipe	
	Vel.	Fric.	Vel.	Fric.	Vel.	Fric.
40	1.02	0.22	.....	.....	.....	.....
45	1.17	0.28	.....	.....	.....	.....
50	1.28	0.34	.....	.....	.....	.....
70	1.79	0.63	1.14	0.21	.....	.....
75	1.92	0.73	1.22	0.24	.....	.....
100	2.55	1.23	1.63	0.39	1.14	0.14
120	3.06	1.71	1.96	0.57	1.42	0.25
125	3.19	1.86	2.04	0.64	1.48	0.28
150	3.84	2.55	2.45	0.88	1.71	0.32
175	4.45	3.36	2.86	1.18	2.00	0.48
200	5.11	4.37	3.27	1.48	2.28	0.62
225	6.32	6.61	3.67	1.86	2.57	0.74
250	6.40	6.72	4.08	2.24	2.80	0.92
275	7.03	7.99	4.50	2.72	3.06	1.15
300	7.66	9.38	4.90	3.15	3.40	1.29
350	8.90	12.32	5.72	4.19	3.98	1.69
400	10.20	15.82	6.54	5.33	4.54	2.21
450	11.50	19.74	7.35	6.65	5.12	2.74
475	12.30	22.96	7.88	7.22	5.55	3.21
500	12.77	24.08	8.17	8.12	5.60	3.26
550	.....	.....	9.09	9.66	6.16	3.93
600	.....	.....	9.80	11.34	6.72	4.70
650	.....	.....	10.62	13.16	7.28	5.60
700	.....	.....	11.44	15.12	7.84	6.38
750	.....	.....	12.26	17.22	8.50	7.00
800	.....	.....	.....	.....	9.08	7.90
850	.....	.....	.....	.....	9.58	8.75
900	.....	.....	.....	.....	10.30	10.11
950	.....	.....	.....	.....	10.72	10.71
1000	.....	.....	.....	.....	11.32	12.04
1100	.....	.....	.....	.....	12.50	14.31
1200	.....	.....	.....	.....	13.52	16.69

THEORETICAL DISCHARGE OF NOZZLES IN U. S. GALLONS PER MINUTE

HEAD		Velocity of Discharge Feet Per Second	DIAMETER OF NOZZL IN INCHES								
Pounds	**Feet**		1/16	1/8	3/16	1/4	3/8	1/2	5/8	3/4	7/8
10	23.1	38.6	0.37	1.48	3.32	5.91	13.3	23.6	36.9	53.1	72.4
15	34.6	47.25	0.45	1.84	4.06	7.24	16.3	28.9	45.2	65.0	88.5
20	46.2	54.55	0.52	2.09	4.69	8.35	18.8	33.4	52.2	75.1	102
25	57.7	61.0	0.58	2.34	5.25	9.34	21.0	37.3	58.3	84.0	114
30	69.3	66.85	0.64	2.56	5.75	10.2	23.0	40.9	63.9	92.0	125
35	80.8	72.2	0.69	2.77	6.21	11.1	24.8	44.2	69.0	99.5	135
40	92.4	77.2	0.74	2.96	6.64	11.8	26.6	47.3	73.8	106	145
45	103.9	81.8	0.78	3.13	7.03	12.5	28.2	50.1	78.2	113	153
50	115.5	86.25	0.83	3.30	7.41	13.2	29.7	52.8	82.5	119	162
55	127.0	90.4	0.87	3.46	7.77	13.8	31.1	55.3	86.4	125	169
60	138.6	94.5	0.90	3.62	8.12	14.5	32.5	57.8	90.4	130	177
65	150.1	98.3	0.94	3.77	8.45	15.1	33.8	60.2	94.0	136	184
70	161.7	102.1	0.98	3.91	8.78	15.7	35.2	62.5	97.7	141	191
75	173.2	105.7	1.01	4.05	9.08	16.2	36.4	64.7	101	146	198
80	184.8	109.1	1.05	4.18	9.39	16.7	37.6	66.8	104	150	205
85	196.3	112.5	1.08	4.31	9.67	17.3	38.8	68.9	108	155	211
90	207.9	115.8	1.11	4.43	9.95	17.7	39.9	70.8	111	160	217
95	219.4	119.0	1.14	4.56	10.2	18.2	41.0	72.8	114	164	223
100	230.9	122.0	1.17	4.67	10.0	18.7	42.1	74.7	117	168	229
105	242.4	125.0	1.20	4.79	10.8	19.2	43.1	76.5	120	172	234
110	254.0	128.0	1.23	4.90	11.0	19.6	44.1	78.4	122	176	240
115	265.5	130.9	1.25	5.01	11.2	20.0	45.1	80.1	125	180	245
120	277.1	133.7	1.28	5.12	11.5	20.5	46.0	81.8	128	184	251
125	288.6	136.4	1.31	5.22	11.7	20.9	47.0	83.5	130	188	256
130	300.2	139.1	1.33	5.33	12.0	21.3	48.0	85.2	133	192	261
135	311.7	141.8	1.36	5.43	12.2	21.7	48.9	86.7	136	195	266
140	323.3	144.3	1.38	5.53	12.4	22.1	49.8	88.4	138	199	271
145	334.8	146.9	1.41	5.62	12.6	22.5	50.6	89.9	140	202	275
150	346.4	149.5	1.43	5.72	12.9	22.9	51.5	91.5	143	206	280
175	404.1	161.4	1.55	6.18	13.9	24.7	55.6	98.8	154	222	302
200	461.9	172.6	1.65	6.61	14.8	26.4	59.5	106	165	238	323

HEAD		Velocity of Discharge Feet Per Second	DIAMETER OF NOZZL IN INCHES								
Pounds	**Feet**		**1**	**1 1/8**	**1 1/4**	**1 3/8**	**1 1/2**	**1 3/4**	**2**	**2 1/4**	**2 1/2**
10	23.1	38.6	94.5	120	148	179	213	289	378	479	591
15	34.6	47.25	116	147	181	219	260	354	463	585	723
20	46.2	54.55	134	169	209	253	301	409	535	676	835
25	57.7	61.0	149	189	234	283	336	458	598	756	934
30	69.3	66.85	164	207	256	309	368	501	655	828	1023
35	80.8	72.2	177	224	277	334	398	541	708	895	1106
40	92.4	77.2	188	239	296	357	425	578	756	957	1182
45	103.9	81.8	200	253	313	379	451	613	801	1015	1252
50	115.5	86.25	211	267	330	399	475	647	845	1070	1320
55	127.0	90.0	221	280	346	418	498	678	886	1121	1365
60	138.6	94.5	231	293	362	438	521	708	926	1172	1447
65	150.1	98.3	241	305	376	455	542	737	964	1220	1506
70	161.7	102.1	250	317	391	473	563	765	1001	1267	1565
75	173.2	105.7	259	327	404	489	582	792	1037	1310	1619
80	184.8	109.1	267	338	418	505	602	818	1010	1354	1672
85	196.3	112.5	276	349	431	521	620	844	1103	1395	1723
90	207.9	115.8	284	359	443	536	638	868	1136	1436	1773
95	219.4	119.0	292	369	456	551	656	892	1168	1476	1824
100	230.9	122.0	299	378	467	565	672	915	1196	1512	1870
105	242.4	125.0	306	388	479	579	689	937	1226	1550	1916
110	254.0	128.0	314	397	490	593	705	960	1255	1588	1961
115	265.5	130.9	320	406	501	606	720	980	1282	1621	2005
120	277.1	133.7	327	414	512	619	736	1002	1310	1639	2050
125	288.6	136.4	334	423	522	632	751	1022	1338	1690	2090
130	300.2	139.1	341	432	533	645	767	1043	1365	1726	2132
135	311.7	141.8	347	439	543	656	780	1063	1390	1759	2173
140	323.3	144.3	354	448	553	668	795	1082	1415	1790	2212
145	334.8	146.9	360	455	562	680	809	1100	1400	1820	2250
150	346.4	149.5	366	463	572	692	824	1120	1466	1853	2290
175	404.1	161.4	395	500	618	747	890	1210	1582	2000	2473
200	461.9	172.6	423	535	660	799	950	1294	1691	2140	2645

NOTE-The actual quantities will vary from these figures, the amount of variation depending upon the shape of nozzle and size of pipe at the point where the pressure is determined. With smooth taper nozzles the actual discharge is about 94 per cent of the figures given in the labels.

GUSHER® PUMPS

A RUTHMAN COMPANY

Ruthman... Another Word for Innovation

It began in 1913, servicing mechanical components of the steamboats on the Ohio River. The company founder, Alois Ruthman, was a man of vision and saw part of the future of the company was in the development of a reliable industrial pump.

In 1924, with the conception of the first vertical ball bearing sealless centrifugal pump, Ruthman Pump and Engineering furthered the design on a unit with a one piece motor driven shaft. The pump was called “Gusher”, giving birth to the trade name Gusher Pumps, and the coining of the term “coolant pump”.

Wanting to carry on the tradition of quality and reliability started by his father, Thomas R. Ruthman joined the company in 1949. In the early 1990’s Thomas R. Ruthman’s son, Thomas G. Ruthman joined the company, continuing this same tradition. Maintaining the reputation of Gusher Pumps by innovation and customer service, the company has grown to service companies worldwide.

Gusher Pumps is a Division of Ruthman Companies
Corporate Headquarters
1212 Streng Street
Cincinnati, OH 45233
Phone: 513-559-1901
Fax: 513-559-0035
Web: www.ruthmancompanies.com

Gusher Pumps of Dry Ridge
22 Ruthman Drive
Dry Ridge, KY 41035
Phone: 859-824-5001
Fax: 859-824-3011
Web: www.gusher.com

Gusher Pumps of Williamstown
115 Industrial Drive
Williamstown, KY 41097
Phone: 859-824-3100
Fax: 859-824-7248
Web: www.gusher.com

Gusher Pumps of Cincinnati
1212 Streng Street
Cincinnati, OH 45233
Phone: 513-559-1901
Fax: 513-559-0035
Web: www.gusher.com

Gusher Pumps of California
8226 Salt Lake Avenue
Cudahy, CA 90201
Phone: 323-773-0847
Fax: 323-773-0958
Email: www.gusherca@aol.com

Gusher Pumps of New Castle
403 North Ninth Street
New Castle, IN 47362
Phone: 765-529-5624
Fax: 765-521-0008
Email: www.gusherpump@insightbb.com

BSM Pump Corp.
180 Frenchtown Road
North Kingstown, RI 02852
Phone: 401-471-6350
Fax: 401-471-6370
Web: www.bsmpump.com

Nagle Pumps
1249 Center Avenue
Chicago Heights, IL 60411
Phone: 708-754-2940
Fax: 708-754-2944
Web: www.naglepumps.com

RUTHMAN™ COMPANIES

Wagner Processing – Bay Area
23510 Bernhardt Street
Hayward, CA 94545
Phone: 510-786-3929
Fax: 510-786-3722
Web: www.wagnerprocess.com

Wagner Processing – Central Valley
3675 N. Wilcox Street #C
Stockton, CA 95215
Phone: 209-931-0100
Fax: 209-931-7910
Web: www.wagnerprocess.com

Great Lakes Pump & Supply Co.
1075 Naughton
Troy, MI 48083
Phone: 248-528-9100
Fax: 248-528-9015
Web: www.greatlakespump.com

Process Systems, Inc.
Michigan, Main Headquarters
23633 Pinewood
Warren, MI 48091
Phone: 586-757-5711
Fax: 586-758-6996
Web: www.INFOatpsi4pumps.com
Indiana
485 N State Route 3431 South
Mellott, IN 47958
Phone: 765-295-2206
Fax: 765-295-2243
Web: www.process-systems-inc.com

Worldwide:

Ruthmann Pumpen
Northberger Strabe 60
Eschweiler Germany D-52249
Phone: +49 (0) 2403 5595 0
Fax: +49 (0) 2403 5595 20
Web: www.ruthmannpumpen.de
Birmingham Pump
Unit 7 Network Park
Duddeston Mill Road
Saltley, Birmingham England B81AU
Phone: +44 (0) 121 503 3000
Fax: +44 (0) 121 503 3002
Web: www.birminghampumps.co.uk

Guan Shen Industrial Pumps (Shanghai) Company
广申工业泵（上海）有限公司
Gusher Pumps (Shanghai) Co., Ltd.
Building D, Room 416
No. 188 East Jiagwan Road
Shanghai, 200081
P.R. CHINA
上海市东江湾路 188 号 D 栋 416 室
Phone: 86-21-33872056
Phone: 86-21-33872058
Fax: 86-21-33872057

电话: 86-21-33872056
86-21-33872058
传真: 86-21-33872057