SCIENTIFIC WORLD PRODUCTS

Precision Water Technology

HFLOW

Horizontal Booster Pump

Installation & Operating Guide



CERTIFIED ISO 9001:2015 COMPANY

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G35-9S

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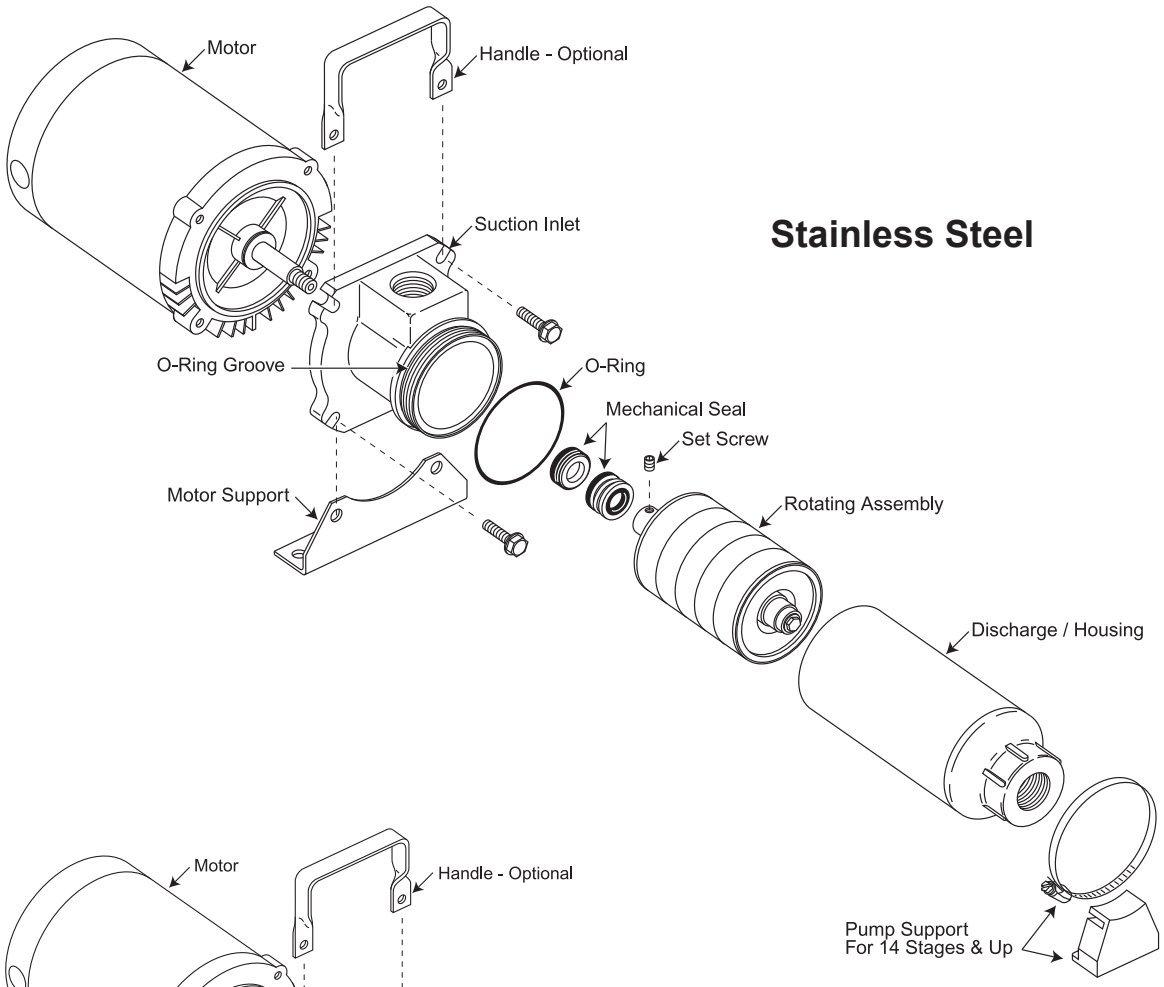
INTRODUCTION

This manual was prepared to assist the installer and/or operator in understanding the proper method of installing, operating and maintaining the H FLOW (close coupled) booster pumps. We recommend that you thoroughly understand the proper installation and start-up procedures, prior to starting the pump. If these procedures are followed, you will have years of trouble-free service.

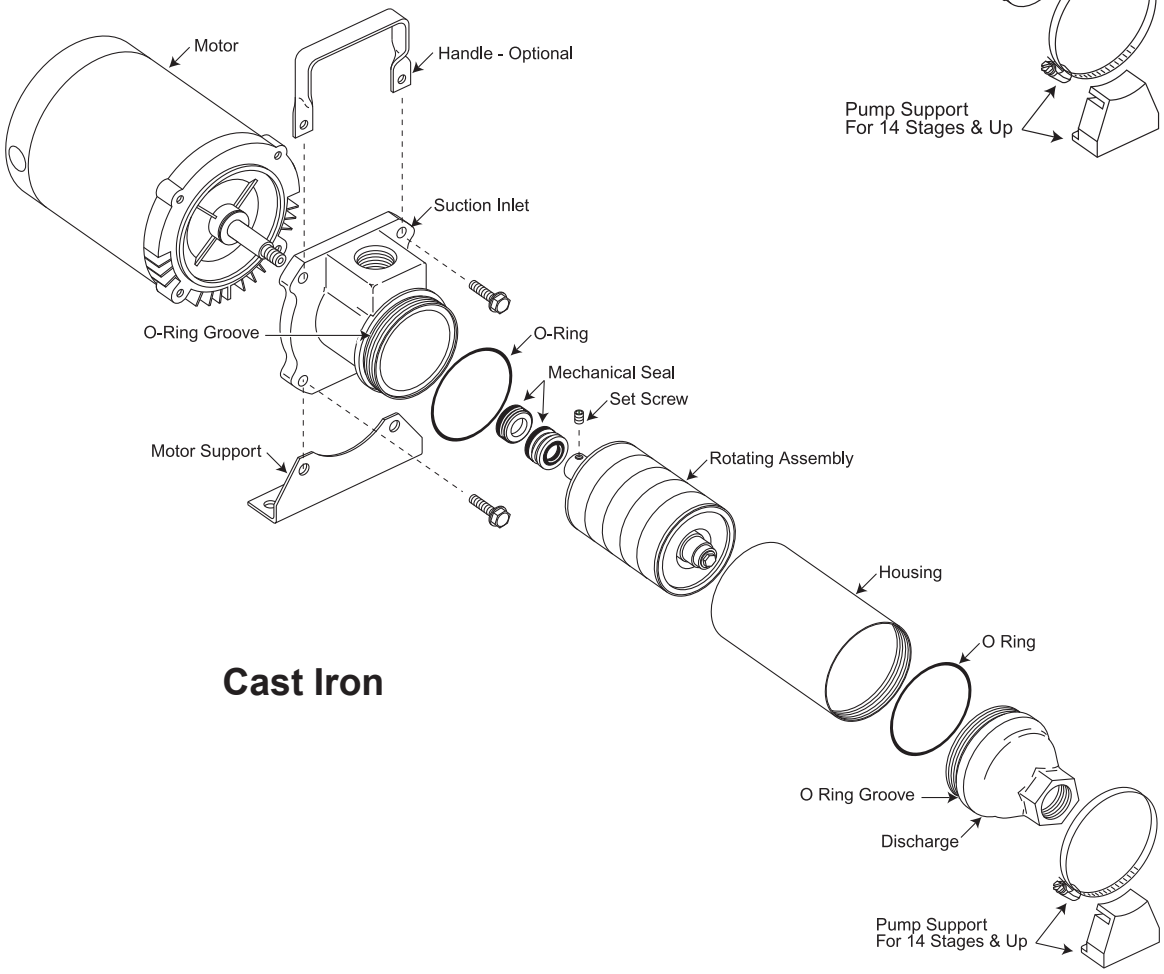
WARNING

1. Read these rules and instructions carefully. Failure to follow them could cause serious bodily injury and/or property damage
2. Check your local codes before installing.
3. For maximum safety, this product should be connected to a grounded circuit, equipped with a ground fault interrupter device.
4. Before installing this product, have the electrical circuit checked by an electrician to make sure it is properly grounded.
5. Before installing or servicing your pump, BE CERTAIN pump power source is disconnected.
6. Make sure the line voltage and frequency of the electrical current supply agree with the motor wiring. If motor is dual voltage type, BE SURE it is wired correctly for your power supply.
7. Complete pump and piping system MUST be protected against below freezing temperature. Failure to do so could cause severe damage and voids the Warranty.
8. Do not run the pump at shutoff pressure, because the pump may be damaged due to high temperatures.
9. Do not run the pump dry. If it is, there will be damage to the pump seal and pump components.
10. Do not operate pump in flammable and/or explosive atmosphere.

EXPLODED VIEWS



Stainless Steel



Cast Iron

PUMP INSPECTION AND HANDLING

When receiving your pump, check to see if the shipment has been damaged in any way or if any parts seem to be missing. If so, note the damage or shortage on the bill of lading and the freight bill. Make any claims to the transportation company immediately. Keep all packaging materials until the claim is resolved.

The SWP H-Flow Booster pump should remain in the shipping carton until it is ready to be installed.

When handling the pump, support both the motor and pump housing. This can be done by some sort of sling wrapped around the pump and motor. To avoid any possible damage to the pump, motor or mechanical seal, always handle with care.

MODEL NUMBER EXPLANATION

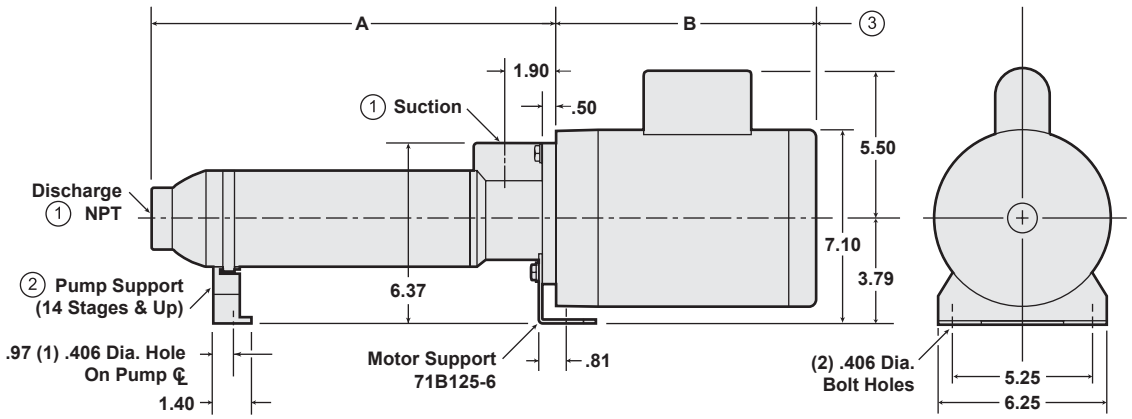
The letters G and H denote the following: G = General duty operation, H = Heavy duty operation, 5 = GPM, B= Booster, 12 = Number of stages

Adding the number 16 after the letter S signifies 316 stainless steel construction (Example: H5B12S16)
Several heavy duty pumps have a (-1) in the model number, this implies the motor is rated for 5 HP.

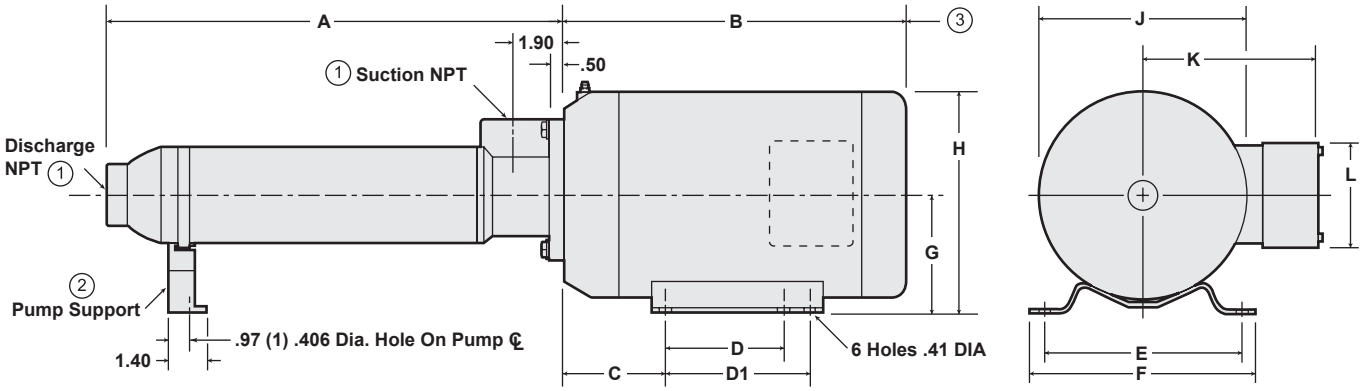
Example: H5B23-1-3P = Cast Iron, H5B23-1S16-3H = 316SS

Construction Materials		
Part	**Cast Iron**	**316 SS**
Inlet/Motor Bracket	Cast Iron	316 SS
Discharge Housing	Cast Iron	316 SS
Pump Housing	304 SS	316 SS
Impellers	Thermoplastic	Thermoplastic
Diffusers	Thermoplastic	Thermoplastic
Wear Rings	316 SS	316 SS
Shaft & Coupling	316 SS	316 SS
Mechanical Seal	Carbon/Ceramic	Carbon/Ceramic
O-Rings	Buna-N	Viton™

HFLOW SERIES DIMENSIONS



1/3 - 3 HP Models



5 HP Models

1. The inlet and discharge thread size for C.I. and stainless steel models in the 5, 10, 15 GPM pump sizes is 1" NPT; The 20 and 35 GPM pump size is 1 1/2" NPT.

2. Pump models that are 14 stages or more are equipped with a pump support located near the discharge of the pump. For stability, this support should be mounted approximately 4" from the discharge.

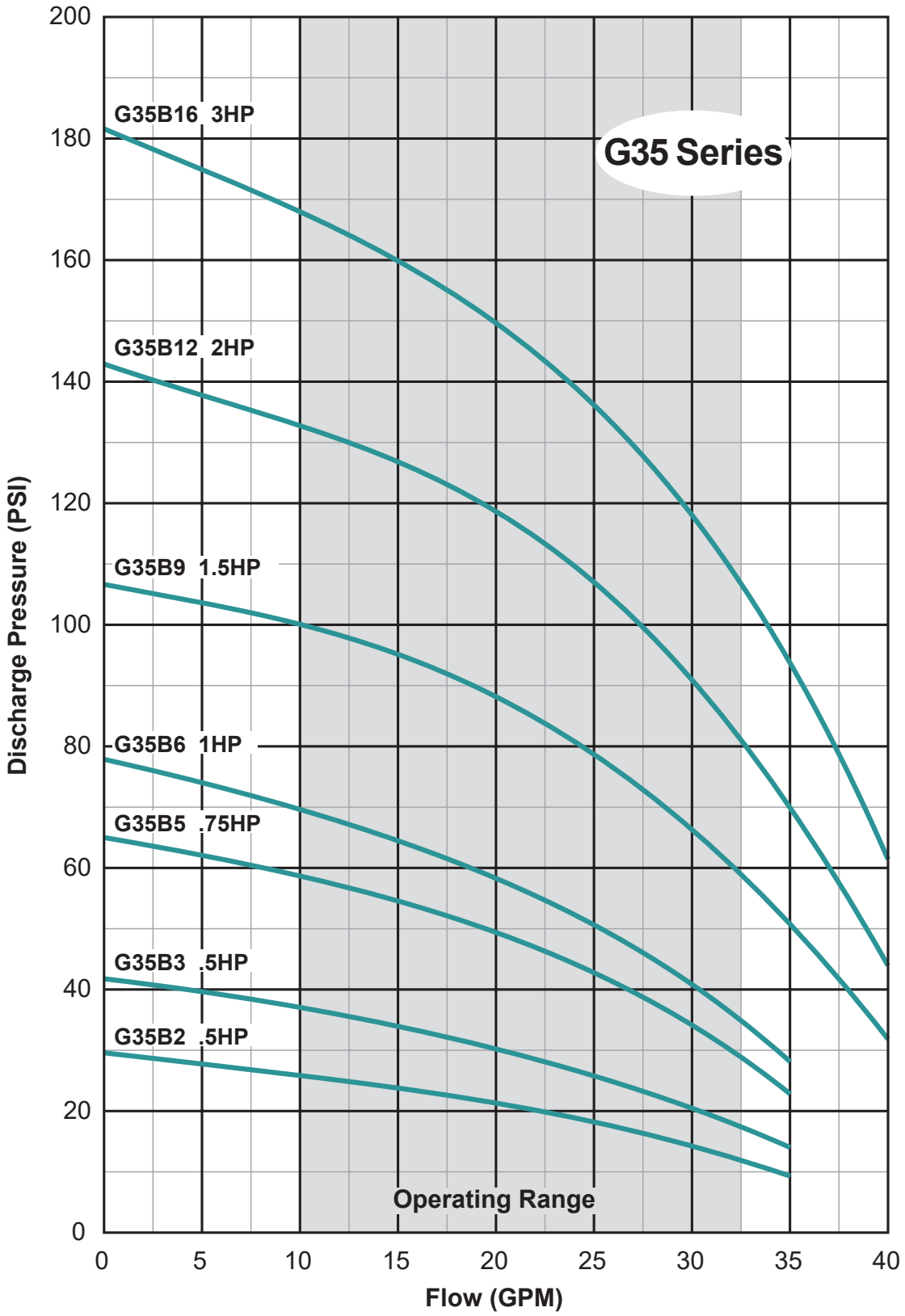
3. Allow 8" minimum clearance behind the motor for maintenance.

Manufacturer	Motor Frame Size	Phase	Enclosure	B	C	D / D1	E	F	G	H	J	K	L
Baldor	184CYZ	3	TEFC	13.80	3.88	4.50 / 5.50	7.50	8.63	4.50	8.44	7.88	6.75	4.00
Baldor	184CYZ	3	ODP	12.25	3.88	4.50 / 5.50	7.50	8.63	4.50	8.44	7.88	6.75	4.00
Baldor	184CYZ	1	TEFC	15.30	3.88	4.50 / 5.50	7.50	8.63	4.50	8.44	7.88	7.88	6.25
Baldor	184CYZ	1	ODP	12.25	3.88	4.50 / 5.50	7.50	8.63	4.50	8.44	7.88	6.64	5.125

Cast Iron and Stainless Steel - Dimensions (Inches)

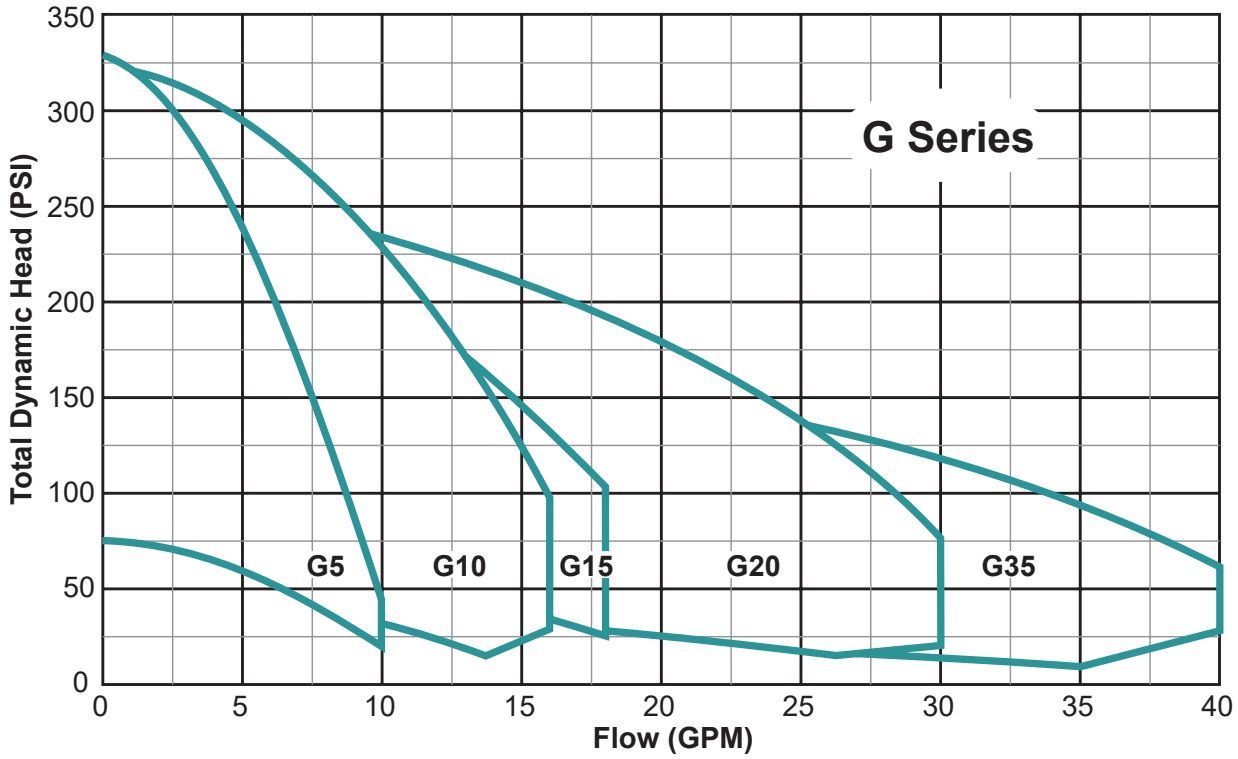
Cast Iron Model No.	A	B
G20B7	15.14	10.53
G35B9	19.16	11.63
G35B16	30.47	13.63

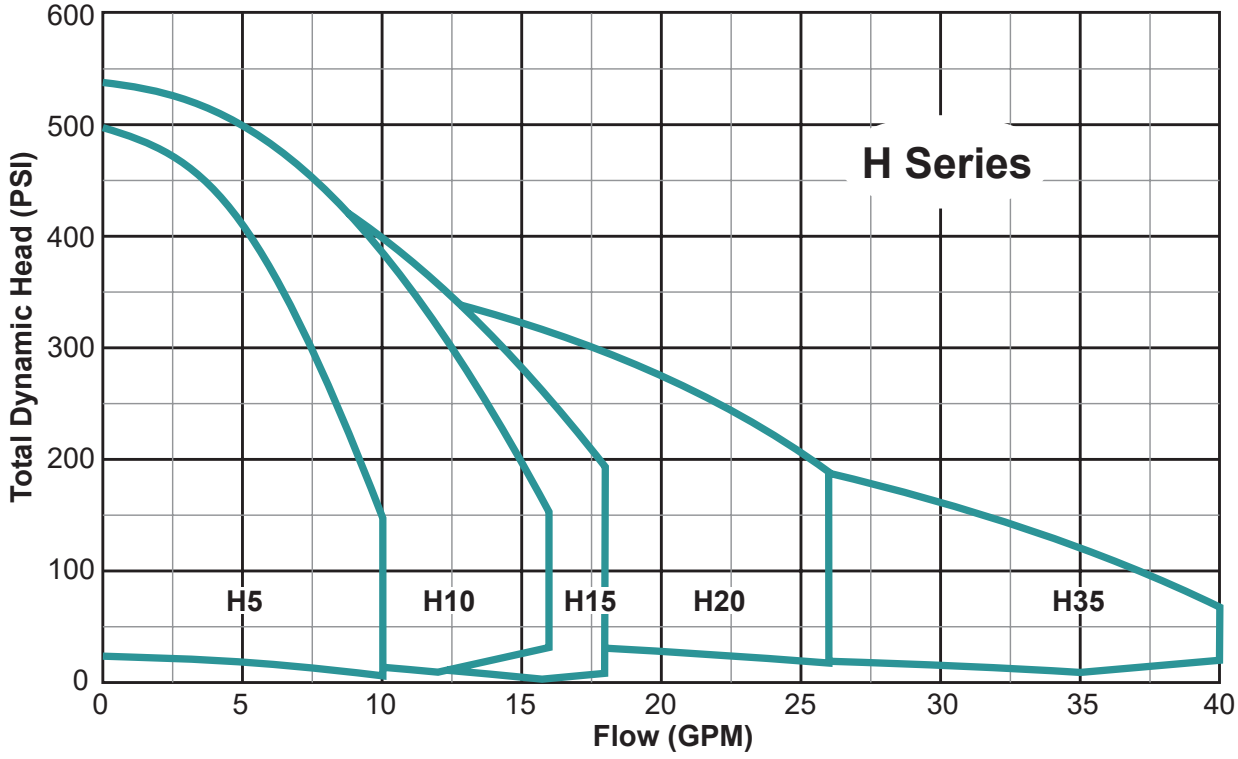
G35 SERIES GROUP CURVES



NOTE:
Curves are based on 60 Hz 3450 rpm motors. 50 Hz 2875 rpm curves are available. These curves are for general guidance only. Individual pump curves are available upon request. A certified curve may be requested for an additional cost. SWP will build pumps to fit your specific needs, contact factory for pricing.

HFLOW SERIES GROUP CURVES





PRE-INSTALLATION

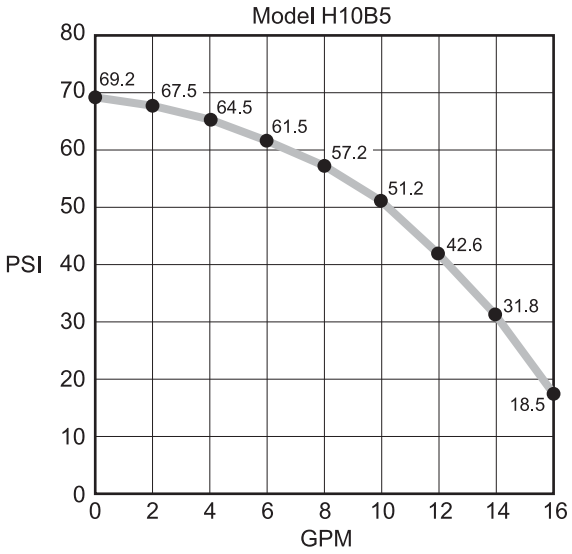
Pump is non-submersible. Keep motor dry at all times. Do not wash or immerse the motor.

Sizing - Select a pump that will deliver the required flow rate in GPM at the required discharge pressure.

Example: Select a pump that will deliver 10 GPM and will boost inlet pressure by 50 PSI.

Liquid: Water
Motor: 1 phase, 230v
Duty: continuous
Suction pressure: 30 PSI
Model: H10B5

The discharge pressure of the pump operating at 10 GPM is 30 PSI + 51 PSI = 81 PSI



Warning: Never run the pump dry. The internal running surfaces of the pump and mechanical seal require water lubrication for consistent operation. Allowing the pump to run dry will severely damage pump and seal.

Do not pump chemicals or corrosive liquids with the pump unless they are compatible with the pump component materials. (Consult SWP for verification at (800) 934-0051. Use with nonflammable liquids.

Pump can transfer water from cisterns, tanks, or ponds with suction lifts up to 5 feet using a foot valve and priming tee. The suction lift will vary depending on elevation (altitude) and water temperature.

Warning: Do not run the pump with the discharge shut-off. To do so, will result in temperatures exceeding 200 degrees F. To avoid burns never touch the pump housing, and allow it to cool several hours after shut-down before handling the pump.

To avoid internal damage to the pump, do not operate with the water temperature above 140 degrees F.

Pump must be full of liquid before operating. Do not pump dirty water or abrasive liquids. To do so, will cause the carbon seal face, and elastomers in the seal to wear and leak. Mechanical seal materials, compatible with liquids containing abrasives, are available upon request.

Avoid air pockets in suction piping or air will accumulate at the high points, making priming difficult. (See Figure 1)

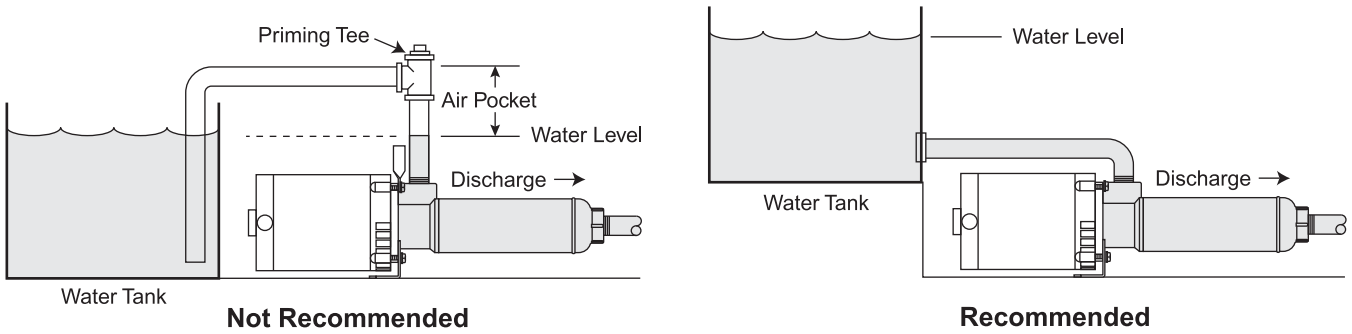


Figure 1

INSTALLATION

Locate the pump as close to the liquid source as possible, so that a short, direct suction pipe may be used. Place the unit so that it is readily accessible for service, maintenance and allows air to circulate freely around the motor.

Mount pump in a dry location, on a secure base or foundation. This will prevent noise and vibration.

Piping should be galvanized, rigid plastic or other suitable pipe that will not collapse or burst when exposed to suction and discharge pressure. The piping should be as free from turns and bends as possible, as elbows and fittings greatly increase friction losses.

Pipes must line up and not be forced into position by unions. The inlet pipe should be at least one size larger than the suction inlet tapping (See table 1) and should have a minimum number of elbows and fittings to minimize friction losses.

Table 1

Series in GPM	Threaded Inlet Size	Threaded Discharge Size
5, 10, 15	1	1
20, 35	1 1/2	1 1/2

Figure 2 - Whenever dirt, sand or debris is present in the water supply, install a filter or strainer to prevent clogging or damaging the pump or mechanical seal faces.

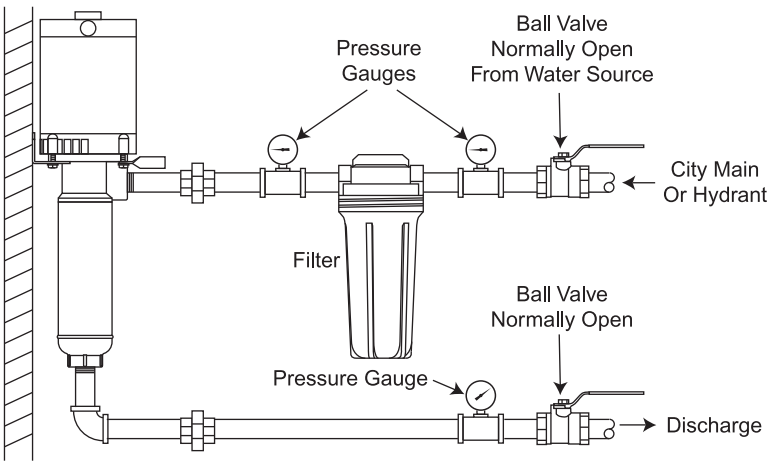


Figure 2

Figure 3 - This pump installation is designed to boost water pressure obtained from a water tank, which provides a gravity flow, flooded suction.

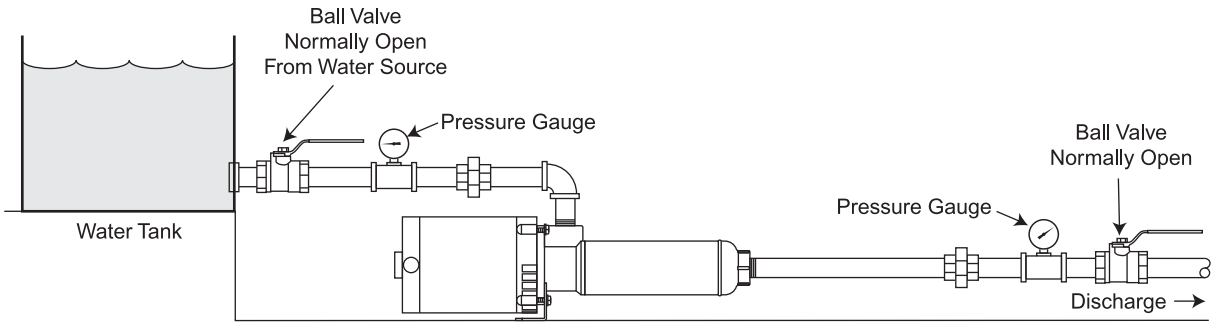


Figure 3

Figure 4 - The following applies whenever the pump is required to lift water from a pond, cistern, or container.

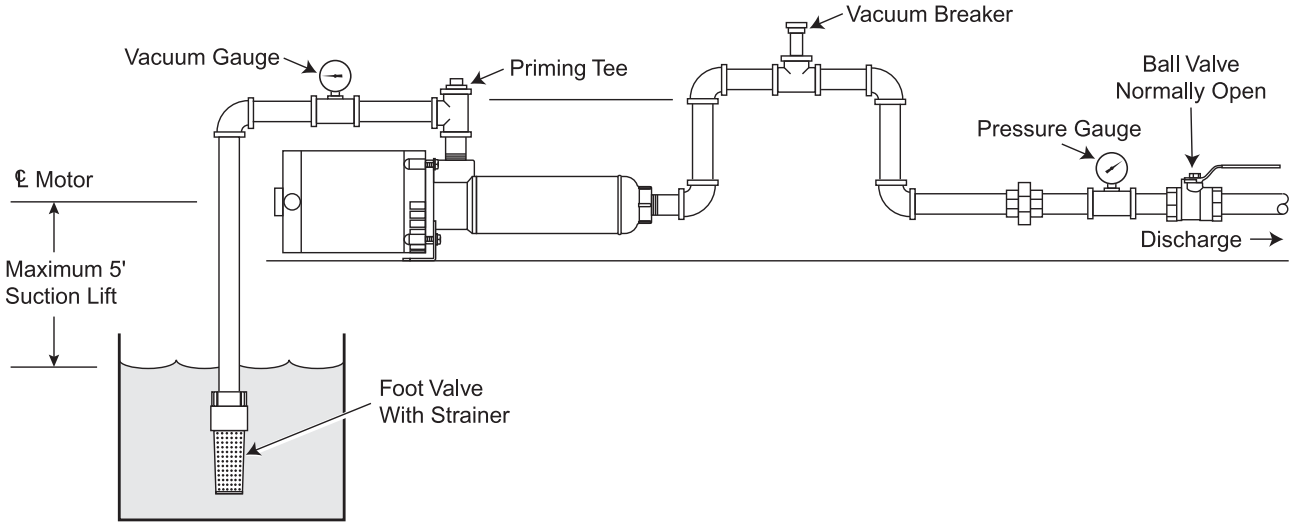


Figure 4

1. Install a service tee with a pipe plug, at the highest point in the suction line for initial priming

2. Install a foot valve at the end of the suction line.

3. Install a vacuum gauge in the suction line.

4. To retain water in the pump after turning the pump off, install a vacuum breaker in the discharge line. The horizontal run of pipe containing the vacuum breaker should be above the horizontal run of pipe containing the vacuum gauge.

Figure 5 - Pump used to boost incoming pressure from a wall hydrant for a washdown application.

Whenever a spray nozzle is used, a pressure switch can be installed to automatically turn the pump on and off. This eliminates the possibility of operating the booster pump at shutoff pressure, which could damage the pump due to high temperatures.

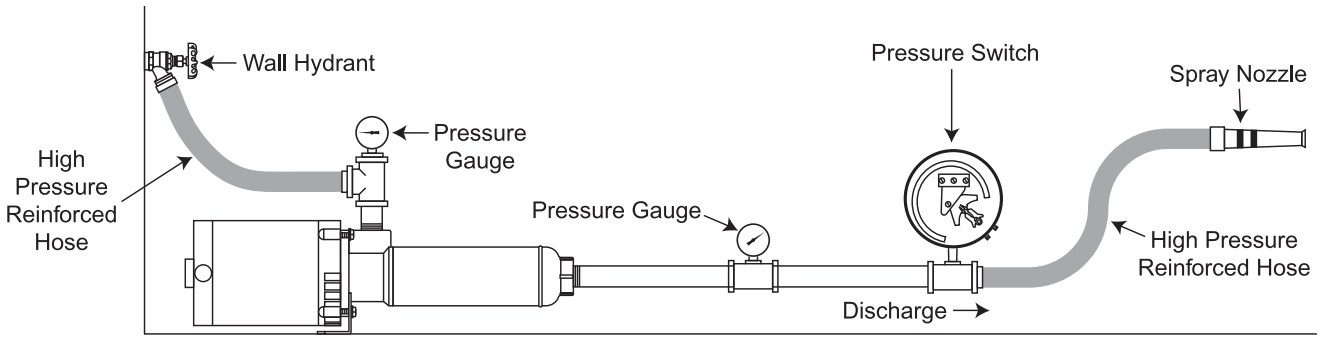
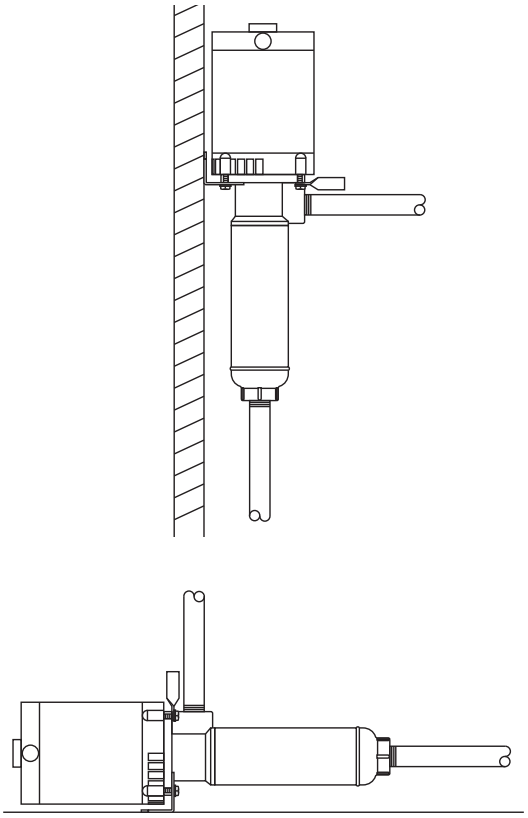


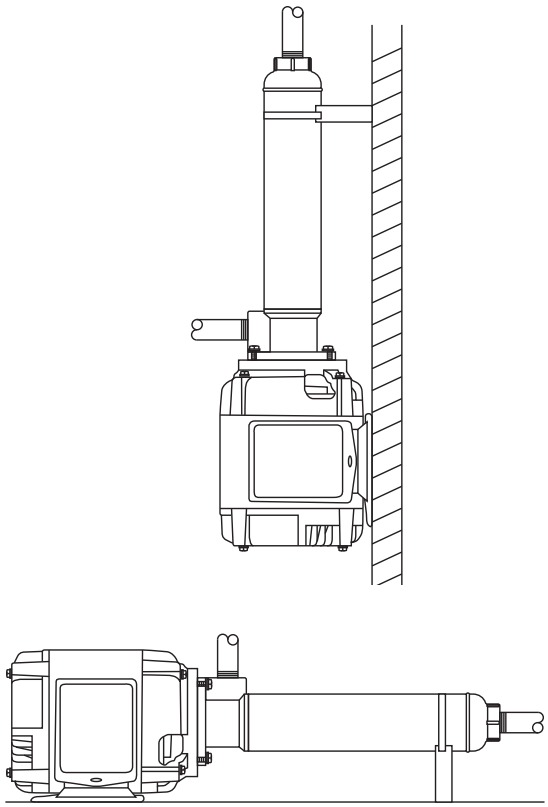
Figure 5

Properly sized components required. Consult SWP for components.

Mount the pump in the correct position shown or pump failure will result. (Horizontal is Preferred)



1/2 - 3 HP Motors



Pump Model Number Contains A (-1) Indicates
a 5 HP, High Thrust Motor

Example: H5B23-1S16-3
5 HP Motor

Figure 7

Warning: A pump with a 5 HP motor with (-1) in the model number utilizes an angular contact bearing to support the thrust load, generated by the pump. Consequently, the motor must be located down when the pump is mounted vertically, to properly load the bearing (See Figure 7).

ELECTRICAL CONNECTIONS

Before wiring the pump to the power source, verify that the voltage of the motor matches the voltage of the power supply. See motor nameplate. The supply voltage must be within + 10% of nameplate voltage. Incorrect voltage can cause fire or seriously damage the motor and voids the warranty.

Wire the motor according to the diagram shown on the motor nameplate. If the nameplate diagram differs from the wiring diagrams shown in this manual, follow the nameplate diagram. Both 1 and 3 phase motors are factory wired for 230 volts.

Install ground wire and maintain this pump in compliance with the National Electrical Code (NEC) or the Canadian Electrical Code (CEC) and with all local codes and ordinances that apply. Consult your local building inspector for local code information.

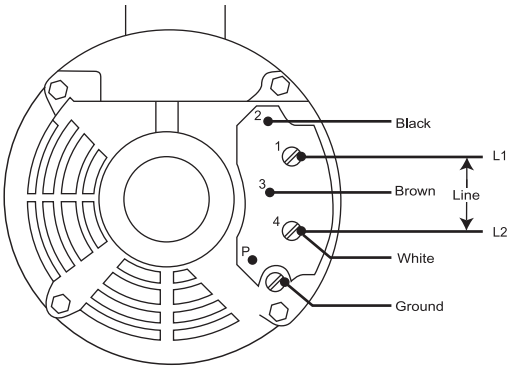
The motors used on the H-FLOW Booster pumps are commonly manufactured by U.S. Motors, Century Electric or Baldor. Both 1 and 3 phase motors are factory wired for 230 volts.

U.S. Motors 1 Phase ODP Motor		
Catalog Number	See Figure	HP
EU0502 EU0752	8 8	1/2 3/4
EU1002 EU1502	8 8	1 1 1/2
EU2002 EU3002	8 9	2 3*

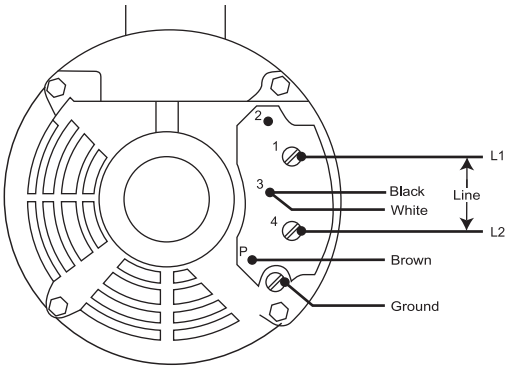
U.S. Motors 3 Phase ODP Motor		
Catalog Number	See Figure	HP
EE155 EE446	10 10	1/2 3/4
EE506 EE607	10 10	1 1 1/2
EE733 EE734	10 10	2 3

*The 3 HP - 1 Phase motor is dual voltage (208/230v) and cannot be connected to 115v. Please check motor nameplate before wiring.

U.S. Motors - Connection Diagrams



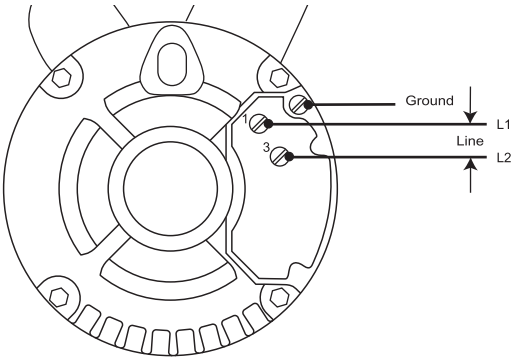
1 Phase, 1/2 - 2 HP
Wired 115v



1 Phase, 1/2 - 2 HP
Factory Wired 208/230v

Figure 8

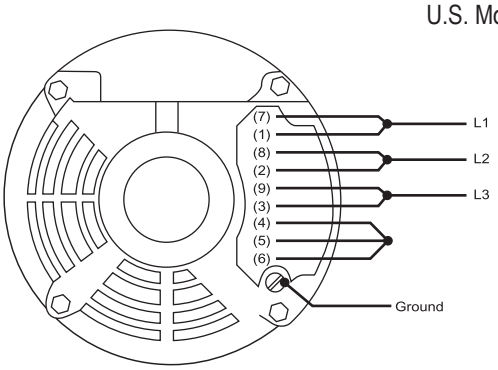
U.S. Motors - Connection Diagrams



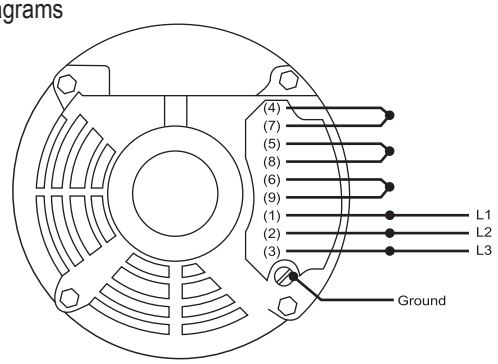
1 Phase, 3 HP
Factory Wired 208/230v

Figure 9

U.S. Motors - Connection Diagrams



3 Phase, 1/2 - 3 HP
Factory Wired 208/230v



3 Phase, 1/2 - 3 HP
Wired 460v

Figure 10

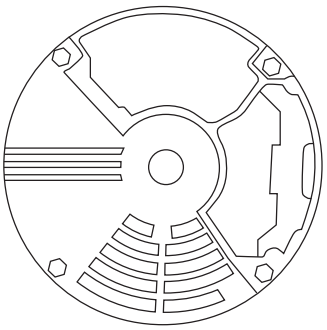
If the supply voltage for a 1 phase motor is 115 volts, refer to the motor wiring connections shown below to properly rewire the motor.

Century Electric 1 Phase ODP Motor		
Stock Number	**See Figure**	**HP**
T1052	11	1/2
T1072	11	3/4
T1102	11	1
T1152	11	1 1/2
T1202	11	2
ST1302VI	12	3

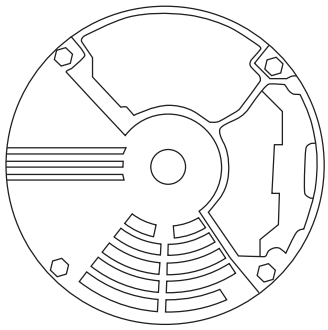
Century Electric 3 Phase ODP Motor		
Stock Number	**See Figure**	**HP**
T3052	13	1/2
T3072	13	3/4
T3102	13	1
T3152	13	1 1/2
T3202	13	2
H741	13	3

Please check motor nameplate before wiring.

Century Motors - Connection Diagrams



1 Phase, 1/2 - 2 HP
Wired 115v



1 Phase, 1/2 - 2 HP
Factory Wired 230v

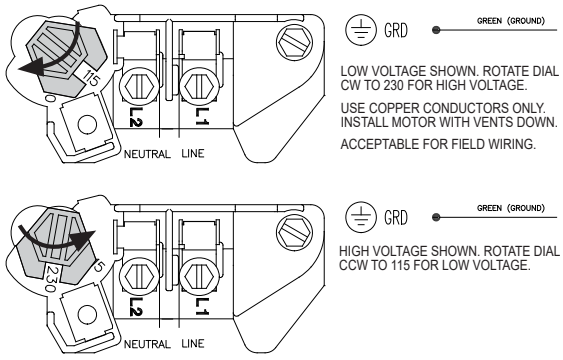
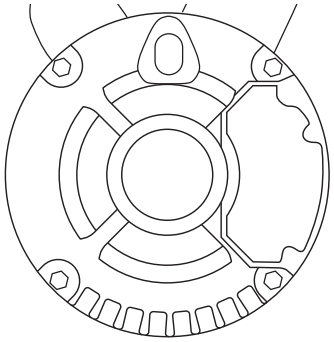


Figure 11

Century Motors - Connection Diagrams



1 Phase, 3 HP
Factory Wired
208/230v

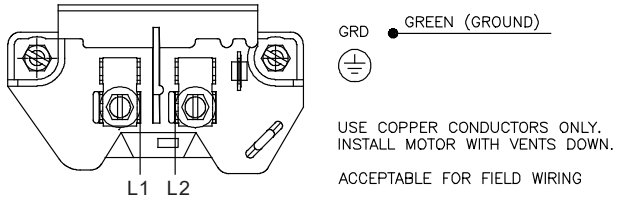
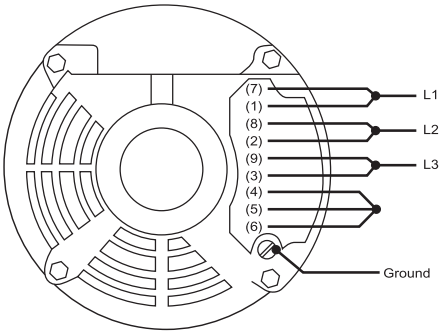
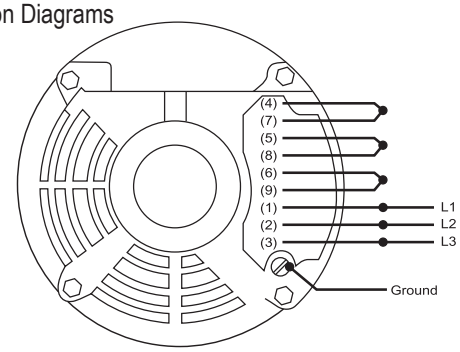


Figure 12

Century Motors - Connection Diagrams



3 Phase,
1/2 - 3 HP
Factory Wired
208/230v



3 Phase,
1/2 - 3 HP
Wired 460v

Figure 13

If the supply voltage is 460 volts, refer to the motor wiring diagram show in (Figure 5) to properly rewire the motor.

Motor shaft rotation - 3 phase motors

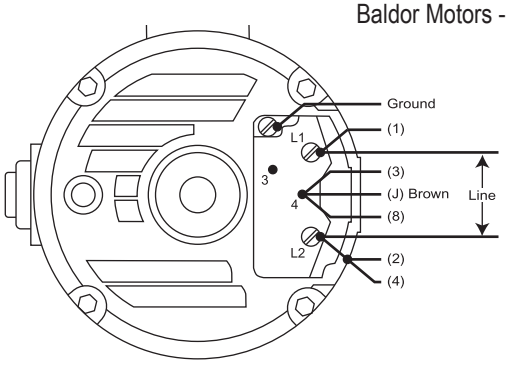
1. Turn the power off.
2. Remove the circular end cap located on the back of the motor. This will expose the motor shaft.
3. Momentarily start pump. If the connection is correct, the shaft will rotate clockwise. If not reverse any two incoming lines (Power Leads).

Baldor 1 Phase ODP Motor		
Catalog Number	**See Figure**	**HP**
JL1303A JL1306A	14 14	1/2 3/4
JL1309A JL1313A	14 14	1 1 1/2
JL1317A JL1323A	14 15	2 3*
36J685-0190G1	15	5*

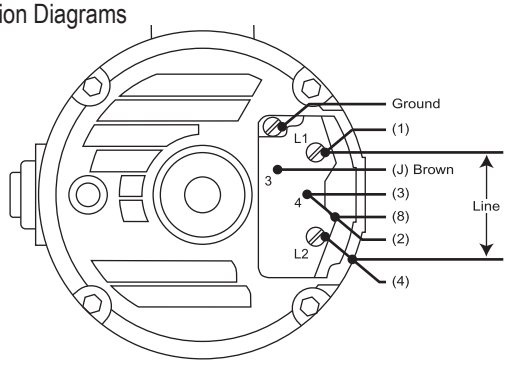
Baldor 3 Phase ODP Motor		
Catalog Number	**See Figure**	**HP**
JM3107 JM3111	16 16	1/2 3/4
JM3115 JM3120	16 16	1 1 1/2
JM3155 JM3158	16 16	2 3
36J642W243G1	16	5

*The 3 & 5 HP 1 Phase motor is single voltage (230v) and cannot be connected to 115v. Please check motor nameplate before wiring.

Baldor Motors - Connection Diagrams



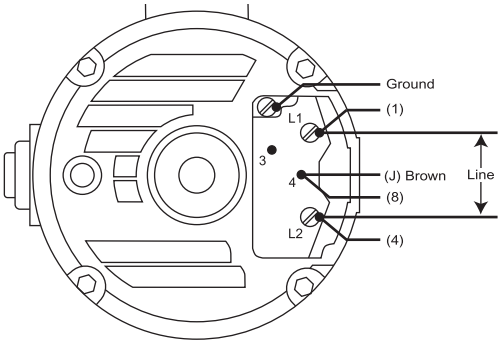
1 Phase, 1/2 - 2 HP
Wired 115v



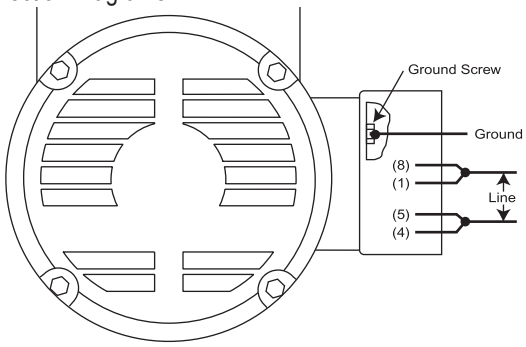
1 Phase, 1/2 - 2 HP
Factory Wired 230v

Figure 14

Baldor Motors - Connection Diagrams



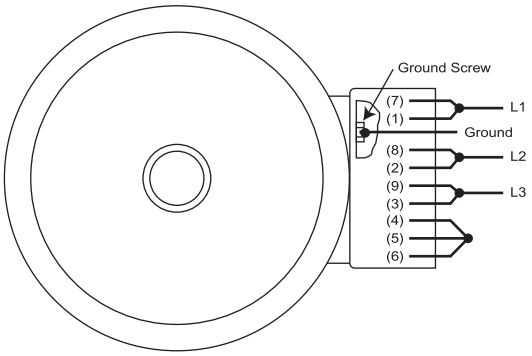
1 Phase, 3 HP
Factory Wired 230v



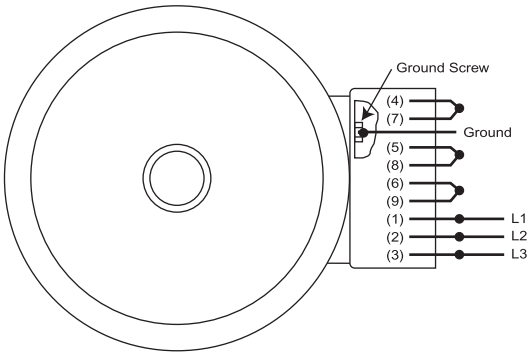
1 Phase, 5 HP
Factory Wired 230v

Figure 15

Baldor Motors - Connection Diagrams



3 Phase, 1/2 - 5 HP
Factory Wired 230v



3 Phase, 1/2 - 5 HP
Wired 460v

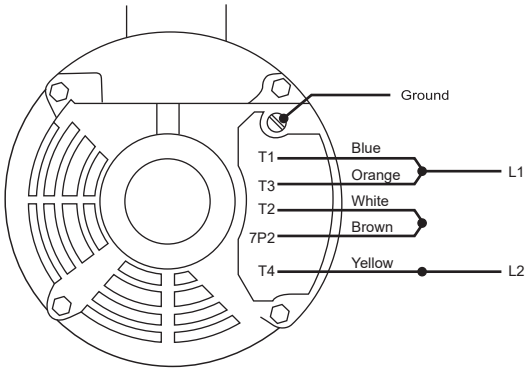
Figure 16

WEG 1 Phase ODP Motor		
Catalog Number	**See Figure**	**HP**
.5036OS1BJPRW56J-S	17	1/2
.7536OS1BJPRW56J-S	17	3/4
00136OS1BJPR56J-S	17	1
00156OS1BJPR56J-S	17	1 1/2
00236OS1BJPR56J-S	17	2
00336OS1DJPR56J	18	3*

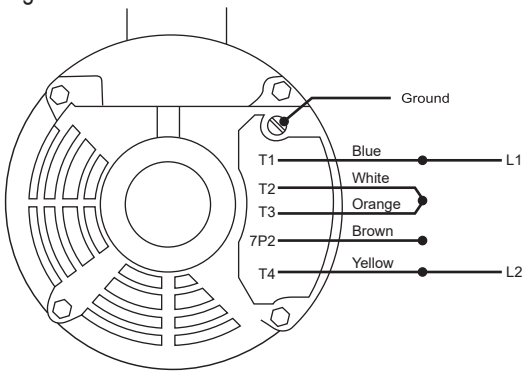
WEG 3 Phase ODP Motor		
Catalog Number	**See Figure**	**HP**
.5036OS3EJPR56J-S	19	1/2
.7536OS3EJPR56J-S	19	3/4
00136OS3EJPR56J-S	19	1
00156OS3EJPR56J-S	19	1 1/2
00236OS3EJPR56J-S	19	2
00336OS3EJPR56J-S	19	3

*The 3 HP - 1 Phase motor is single voltage (230v) and cannot be connected to 115v.
Please check motor nameplate before wiring.

WEG Motors - Connection Diagrams



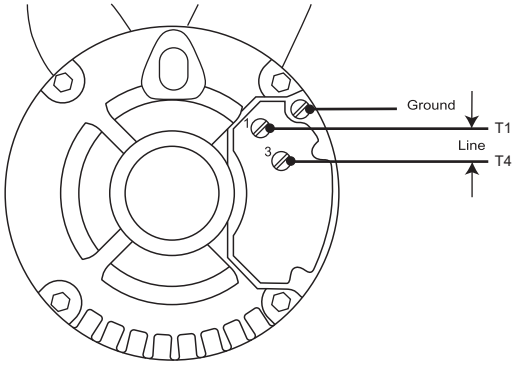
1 Phase, 1/2 - 2 HP
Wired 115v



1 Phase, 1/2 - 2 HP
Factory Wired 208/230v

Figure 17

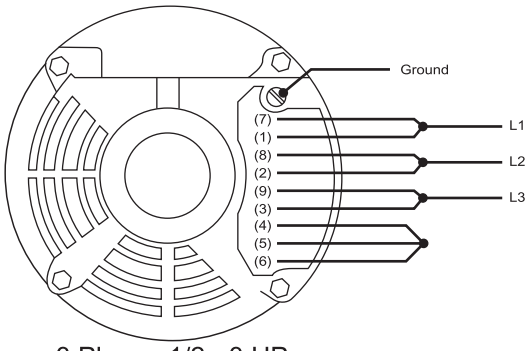
WEG Motors - Connection Diagram



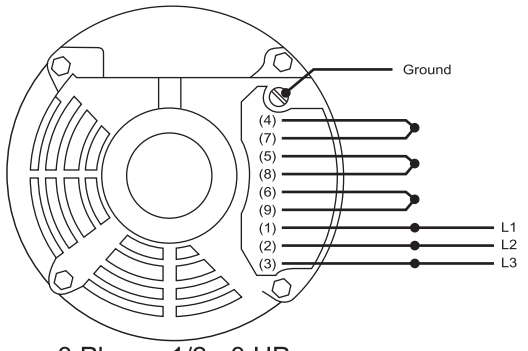
1 Phase, 3 HP
Factory Wired 208/230v

Figure 18

WEG Motors - Connection Diagram



3 Phase, 1/2 - 3 HP
Factory Wired 208/230v



3 Phase, 1/2 - 3 HP
Wired 460v

Figure 19

START-UP PROCEDURES

To check for a free turning pump turn the power off and rotate the pump shaft. On pumps that use a 56J frame motor (1/2 - 3 HP), this can be done by removing the motor end cap located on the back of the motor. Rotate the motor shaft in a clockwise direction. (See Warning 1)

On pumps that use a 5 HP motor, insert a 7/16" nutdriver into the discharge of the pump and rotate the bolt head in a clockwise direction. (See Warning 1 & 2)

Shaft Rotation - 3 Phase Motors (1/2 - 3 HP) - After the proceeding instructions have been completed, turn the motor on for **1 second**. If the connection is correct, the shaft will rotate clockwise when viewed from the back of the motor (end opposite the pump). If the rotation is not correct, reverse any two leads to the starter. The rotation will now be correct.

5 HP motor - To check for the correct shaft rotation, turn the motor on for **1 second**. Look into the fan louvers located on the back of the motor (end opposite the pump). If the connection is correct, the fan will rotate clockwise. If the rotation is not correct, reverse any two leads to the starter. The rotation will now be correct.

Shaft Rotation - 1 Phase Motor (5 HP Baldor Motor) - To check for the correct shaft rotation, turn the motor on for **1 second**. Look into the fan louvers located on the back of the motor. If the connection is correct, the fan will rotate clockwise. If the rotation is not correct, interchange the 5 & 8 leads. The rotation will now be correct.

Warning:

1. Do not start the pump if the motor shaft cannot be rotated.
2. To avoid releasing the compression on the impellers, which can cause the pump to fail, rotate the nutdriver in a clockwise direction.
3. During operation, a minimum reading of 2 PSI is required at all times on the pressure gauge installed in the inlet line.

Valves - The suction inlet valve should be fully open and the discharge valve should be partially open. This will allow the pump to develop back pressure when it is started.

Priming - The pump will automatically fill with water when the pump is connected to a city main or hydrant. To relieve the trapped air inside the pump, allow the water supply to run a minimum of 1 minute before starting the pump. (See Warning 3)

After filling the pump and inlet pipe with water, turn the motor on and off several times to free the air trappedinside the pump. Repeat this priming sequence several times to be sure that all the air has been removed from the pump.

On a suction lift application, fill the pump and inlet pipe with water. This can be done by using the priming tee. The pressure gauge installed in the inlet line should never read over five feet of vacuum or pump failure will occur. (See Figure 4)

Once the preceding instructions have been completed, the pump can be started. The pump should be pumping water and rapidly build pressure. If not repeat the priming instructions.

Final Inspection - Once the proceeding instructions have been completed, the pump can be started. During the first few hours of operation, inspect the pump, piping and auxiliary equipment, used in conjunction with the pump. Check for leaks, vibration or noises.

If a problem arises, consult a Webtrol representative or call SWP at (800) 934-0051 for assistance.

LUBRICATION

On most models, it is not necessary to lubricate the pump or motor. The motor is designed with sealed ball bearings up thru 3 HP. However, the 5 HP motor contains an angular contact bearing that requires periodic lubrication. To regrease the bearing, wipe fitting clean and use 1/2 ounce of chevron SR1-2 or equivalent.

SYSTEM TROUBLESHOOTING

Motor Fails To Start Or Run At Full Speed	
Possible Cause Of Trouble	Corrective Action
Start capacitor failed - 1 phase motor (motor hums)	Replace start capacitor
Power Loss	Replace bad fuse or reset circuit breaker (check for correct fuse/breaker size)
Incorrect voltage - voltage must be within + 10% of motor rated voltage. Example: Rated voltage 230 volts Range: 207 - 253 volts	1. Check incoming voltage, contact power company. 2. Verify that the voltage of the motor matches the power supply voltage. 3. Check wire size from main switch to motor.
Defective wire or connections	Replace defective wires, tighten and clean connections.
Grounded motor	Have motor rewound with new windings or replace motor.
Wired for incorrect voltage	Check motor wiring diagram for proper voltage

Pump Leaks	
Possible Cause Of Trouble	Corrective Action
Worn mechanical seal due to abrasive liquid/corrosion	1. Replace seal with materials compatible with liquid pumped. 2. Install filter on inlet line.
Lack of water - carbon seal on mechanical seal face overheats and wears rapidly or cracks	1. Replace mechanical seal, and o-ring 2. Verify inlet pressure, minimum pressure on inlet gauge is 2 PSIG
Inlet pressure too high	1. Check pressure rating of mechanical seal (100 or 250 PSI) 2. Reduce inlet pressure
Misalignment of mechanical seal	1. Check for a bent motor shaft 2. Clean seal and seal seat area in the inlet housing.
Worn or pinched o-ring seals	Replace the seals
Cracked weld on discharge / pump housing, stainless steel models	Replace discharge / pump housing

Pump Operates, But Delivers Little Or No Water	
Possible Cause Of Trouble	Corrective Action
Incorrect rotation on 3 phase motor	Interchange any two incoming power leads to the motor.
Low line voltage	(See motor trouble shooting section above)
Air Locked Pump	Fill pump & inlet pipe with water - jog motor on and off several times. Refill with water. Repeat procedure several times to remove all air
Suction lift to high - maximum suction lift is 5 feet (See Figure 3)	Reduce suction lift
Worn or plugged impellers	1. Replace rotating assembly, o-ring, and mechanical seal 2. Clean clogged impeller, install filter on Inlet
Inadequate inlet pressure	Minimum pressure on the inlet side of booster pump is 2 PSIG
Diameter of suction/discharge pipe is to small	1. Size of inlet pipe should be at least equal to the threaded inlet size in the pipe inlet housing (See Table 1) 2. Calculate friction losses for the discharge pipe. Replace undersized piping. For assistance call SWP (800) 934-0051
Broken Shaft	1. If motor shaft is broken replace motor 2. If pump shaft is broken replace rotating assembly, o-ring, and mechanical seal
Defective or plugged strainer	Clean, repair or replace as required
Wired for incorrect voltage	Check motor wiring diagram for proper voltage

SYSTEM TROUBLESHOOTING CONT.

Excessive Noise While Pump Is Operating	
Possible Cause Of Trouble	Corrective Action
Cavitation (noise like gravel in pump)	1. Increase size of inlet line 2. Reduce flow rate - GPM 3. Too viscous (liquid is too thick) maximum viscosity is 80 centipoise (CPS)
Pump not secured to firm foundation	Bolt down to secure and rigid base
Noisy motor	1. Ensure that motor fan is clear 2. Remove motor from pump. If noise persists check for smooth bearing operation. Replace bad bearings/or motor
Wired for incorrect voltage	Check motor wiring diagram for proper voltage
Insufficient supply voltage	Check incoming voltage, contact power company
5 HP (-1) Pump Models, bearing not properly loaded	Motor should be below pump, when mounted in vertical position (See Figure 7)

NOTES

THANK YOU FOR PURCHASING AN H-FLOW BOOSTER PUMP

SCIENTIFIC WORLD PRODUCTS

Precision Water Technology