



BLACKHAWK
TECHNOLOGY COMPANY

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Universal Installation Manual and Operating Instructions

All Pumps with Above-Wellhead Drive Motors

Questions? Call Blackhawk's info hotline at 800-469-4887.



Atlas



Anchor



Vector



Apollo

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SECTION 1

SHIPMENT INSPECTION

Inspect the supplied equipment for damage. The driver and associated components should be kept in their original shipping cartons until installation.

Customer Supplied Materials

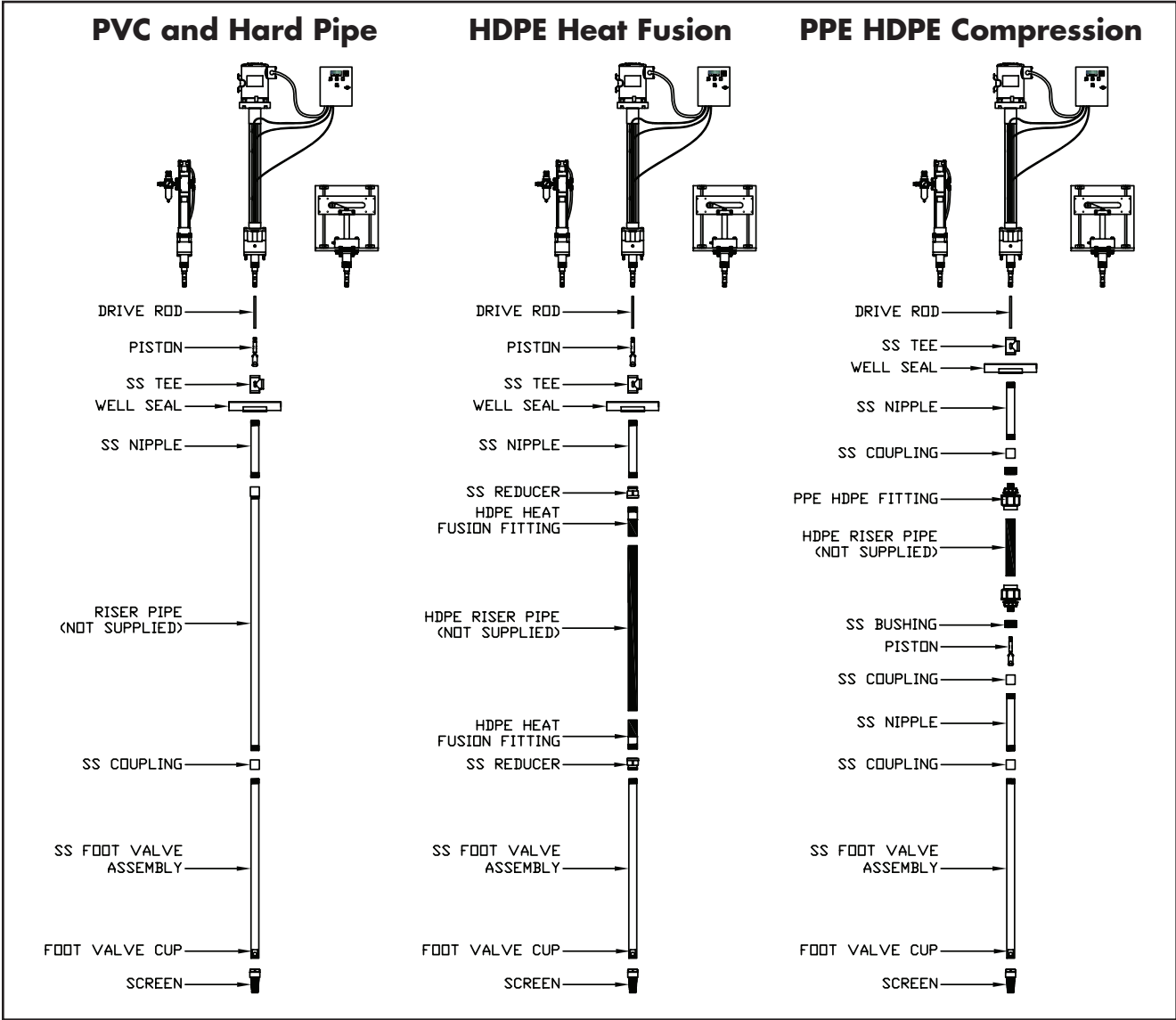
For HDPE discharge installations:
Blackhawk supplies HDPE to the stainless-steel transition fittings.
The customer supplies the HDPE pipe.

For PVC and other hard-pipe discharge installations: Blackhawk supplies the stainless-steel couplings and the customer supplies the NPT-threaded hard pipe.

Tools Required:

- 1. Two pipe wrenches
- 2. Small vise grip pliers
- 3. 5/8" open-end wrench
- 4. 11/16" open-end wrench
- 5. Tape measure
- 6. Hacksaw
- 7. Teflon tape or equivalent

Riser Pipe Downhole Drawings



SECTION 2

PRE-INSTALLATION CHECKLIST

Before beginning installation, the following checks should be made. They are all critical for the proper installation of this pump.

A Condition of the Well

If the pump is installed in a new well, the well should be free of drill cuttings and pipe-casing debris. Determine the actual depth of the well, the static water level in the well and the draw-down level at the pump's maximum capacity. The pump selection and setting depth should be based on this data. The inside diameter of the well casing should be checked to insure that it is not smaller than the pump.

B Condition of the Fluid

Pneumatic pumps are designed to pump fluids with temperatures up to 180°F/82°C. Fluids can be a viscous consistency and fluids can contain gas. For higher-temperature pumping applications, contact Blackhawk. Electric pumps are designed for fluids up to 200° F/93° C [PVC pipe up to 140° F/60° C and steel pipe up to 200° F/93° C]. Fluids can be of viscous consistency and can contain gas.

C Installation Depth

Pumping sand or well sediment can occur when the inlet screen is installed lower than the top of the well screen or within 5 feet of the well bottom. If a Blackhawk pump is used for initial well development, pumping should continue until the pumped liquid is clear. Piston and rod can be used to determine well depth – see photo below.

D Power Supply

The pneumatic driver can operate between 40 psi and 120 psi. The electric driver can be 115V single phase, 230V single/3 phase, or 220 V/460V 3 phase — converting power to either 230V or 460V to run the drive motor. See nameplate for power demand. The solar/electric 1/17 HP or 1/4 motors operate with solar power or electric power supply option, converting 120/240 volts AC to 24 DC.



Using piston and rod to determine well depth

INSTALL THE DOWNHOLE COMPONENTS

Step 1

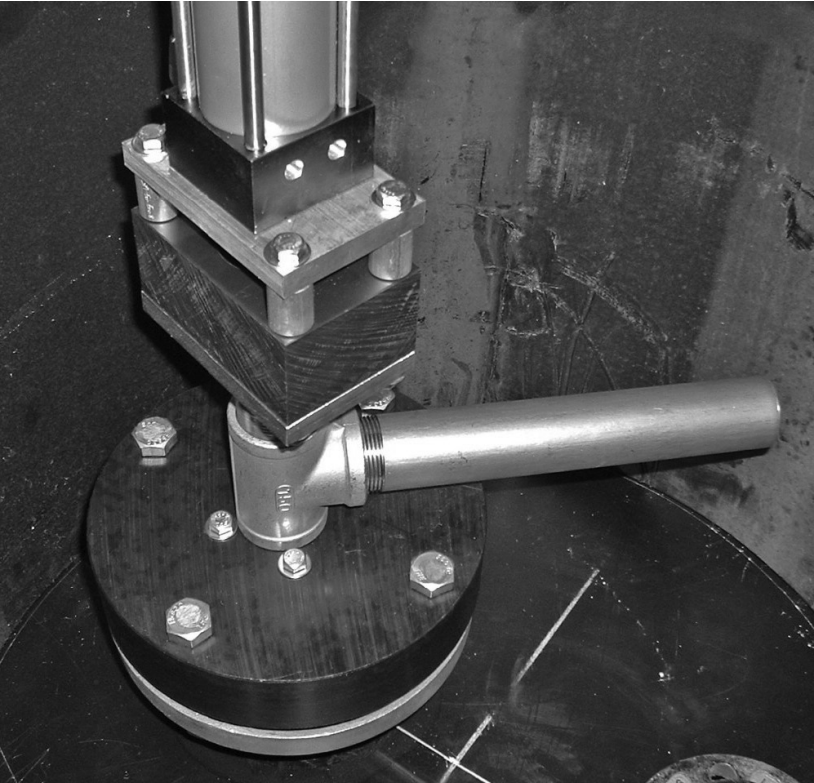
Wellhead Preparation

Prepare the top of the wellhead casing by removing all debris, caps or other closures – opening the well, riser, tank or sump before pump installation. Use either slip couplings, Vanstone flange couplings or straight flange. Install the slip coupling or flange and gasket at this time. Make sure well casing is at proper height to install and service well, generally no higher than 4 feet/1.2 meters. See Section 4, Pages 10 – 13.

Slip Coupling Setup



Flanged Well Seal

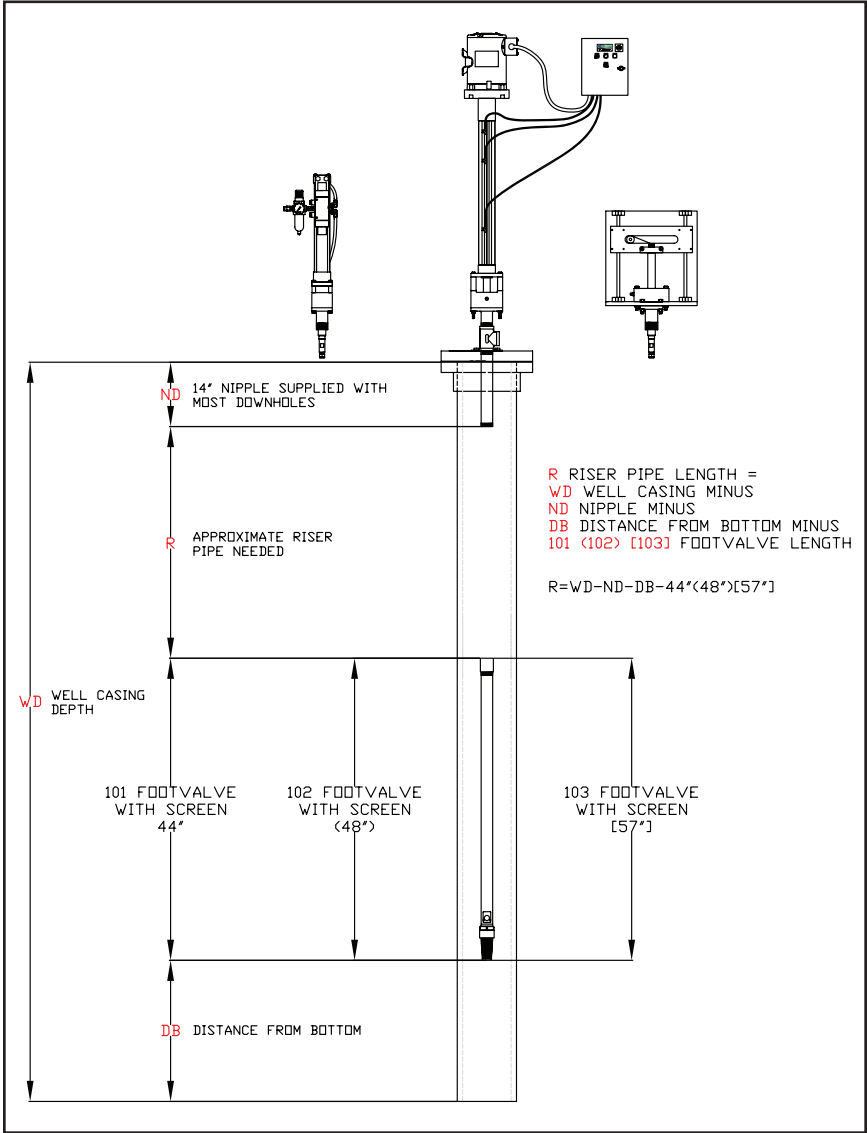


Step 2

Downhole Discharge Assembly

1. Determine depth of the well
2. Lay out pipe, fittings, foot valve, well seal, tee and screen. See riser pipe downhole drawings for detail – page 2.
3. To determine approximate length of riser pipe, measure well depth then subtract combined length of foot valve and screen (which includes fittings). See riser pipe drawing on this page.
4. Assemble downhole per drawings provided separately. Apply Teflon tape or equivalent to threads during assembly. Make sure the pipe nipple has been inserted through the well seal before installing the tee – see photo Page 6.
5. Install downhole assembly into well casing. Some HDPE installations require the piston to be installed before the downhole assembly is installed into well casing.

Riser Pipe Lengths



Discharge Tee Assembly

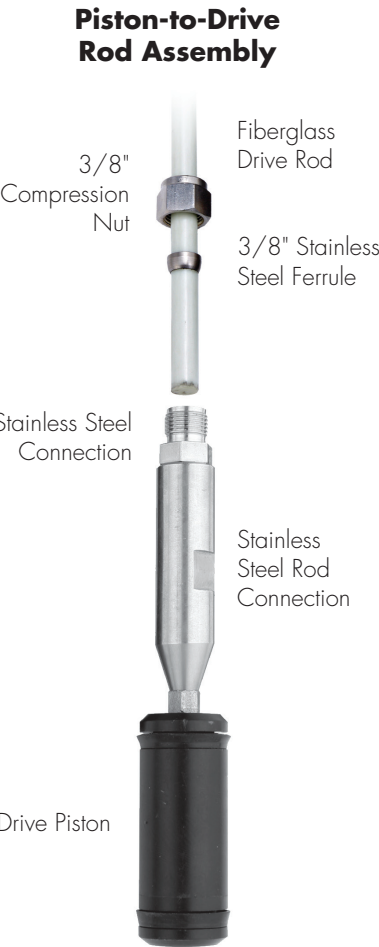
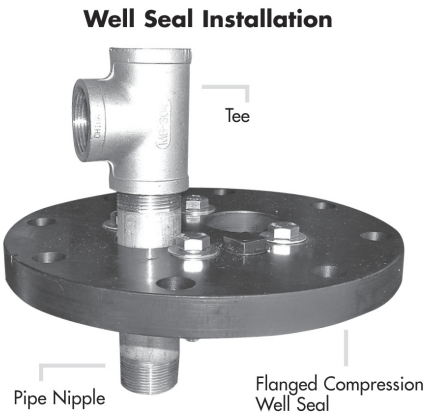


Downhole Discharge Assembly (continued)

- 6. Uncoil the drive rod. Note: Most drive rods come with a nut and ferrule installed on one end of the drive rod.
- Warning: The fiberglass rod is shipped as a coil. The drive rod is under tension. Take care when uncoiling the rod. Uncoil in open area. Wear safety glasses and gloves.**
- 7. Connect piston to the drive rod. If the nut and ferrule are already installed on the rod, connect the piston. Strenuously tighten the nut to piston assembly. Ferrule needs to be crimped or mushroomed into drive rod.
- 8. Insert the piston with the drive rod into the riser assembly – gradually feed the rod through the riser pipe toward the foot valve assembly.
- 9. Hand pump drive rod to fill riser pipe. This also helps indicate that piston is positioned in the foot valve assembly. If using HDPE, wait 15 minutes or more to allow HDPE to acclimate to liquid.
- 10. Make sure piston is bottomed out in foot valve – see drawing, Page 7.
- 11. Mark the drive rod at the top of the tee.



Install downhole assembly into riser pipe

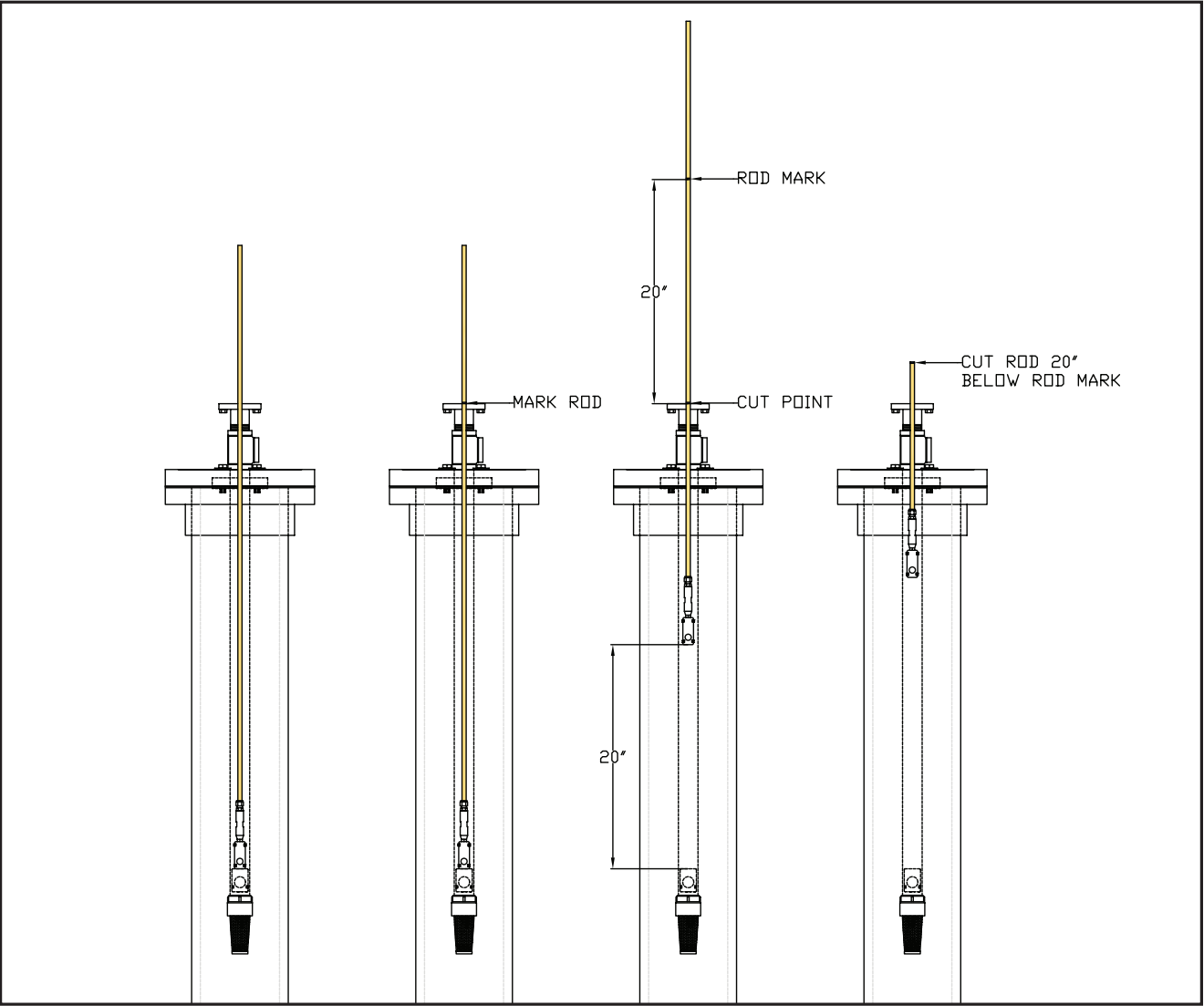


INSTALL THE DRIVE MOTOR

- 1. Lift up the drive rod; mark the rod 20” below first mark. See rod-cutting drawing below.
- 2. If the drive rod cannot be removed from the riser, lightly clamp a pair of vice-grip pliers to the rod to prevent it from slipping into the riser pipe.
- 3. Cut the rod at the lower mark, making sure to cut all the way around the rod to prevent splintering.
- 4. Install nut and ferrule on the drive rod. Insert rod into driver coupling. Strenuously tighten the nut to the coupling. The ferrule needs to be crimped or mushroomed into the drive rod.
- 5. Install tee into pump driver.
- 6. Tighten bolts on well seal.

Note: Supplemental air supply and discharge kits are available – see Page 9

Rod-cutting instructions



Piston must bottom out in foot valve (Fig. 1); cut point is 20” below first mark (Fig. 3)

INSTALL THE DRIVE MOTOR (CONTINUED)



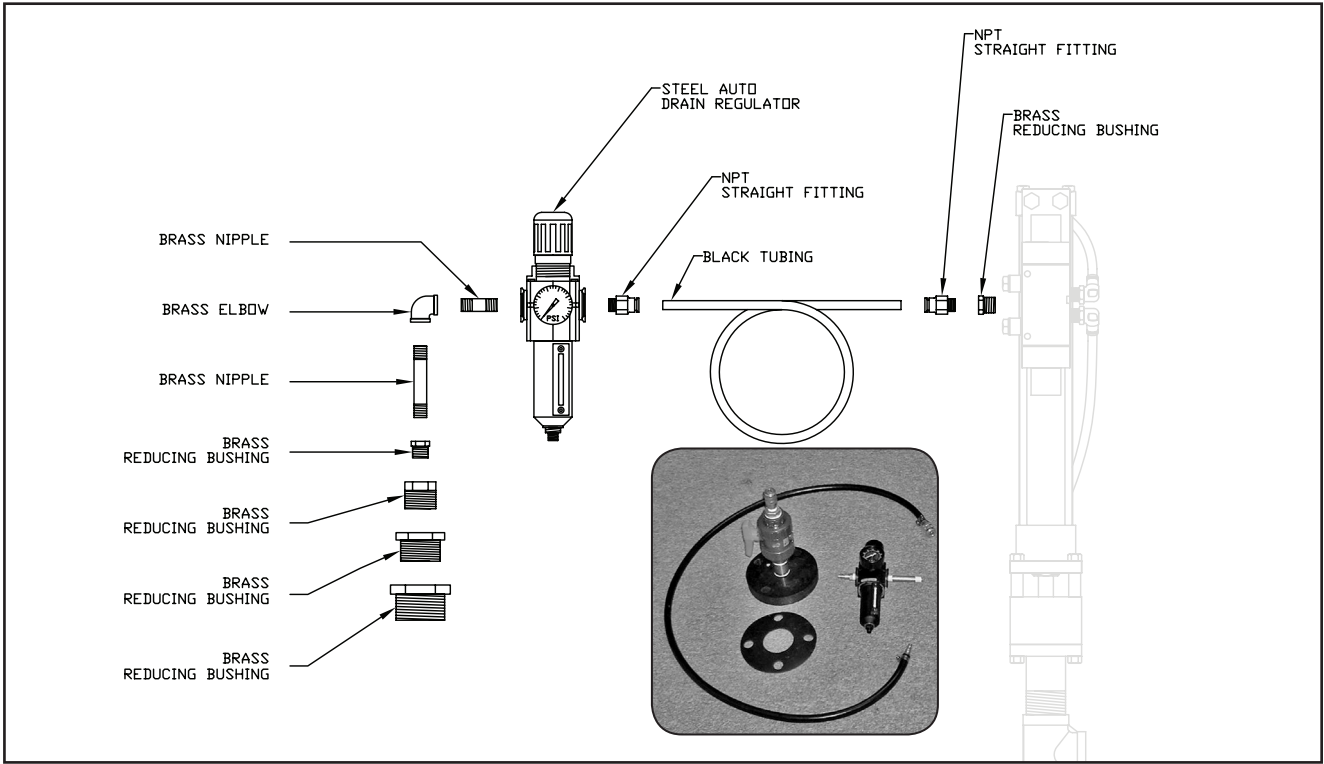
Final assembly – Slide drive rod into pump driver

Electric Flows at Selected Speeds

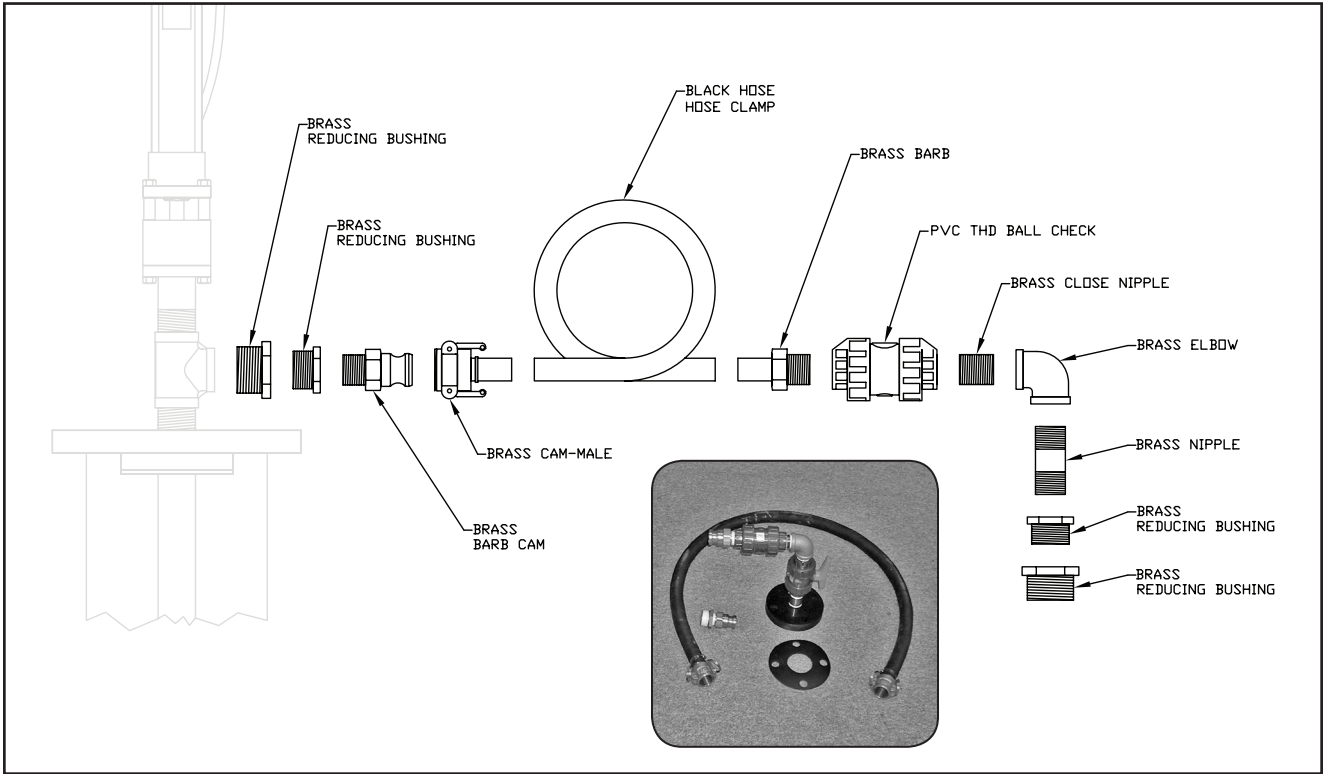
Speed	101 gpm	102 gpm	103 gpm	Strokes per Minute (SPM)
50	1.19	2.89	6.53	19.98
40	1.02	2.47	5.58	19.03
30	0.82	1.98	4.47	16.75
20	0.58	1.40	3.16	12.75
10	0.30	0.73	1.65	6.97

AIR SUPPLY AND DISCHARGE PARTS

Air Supply Parts Kit



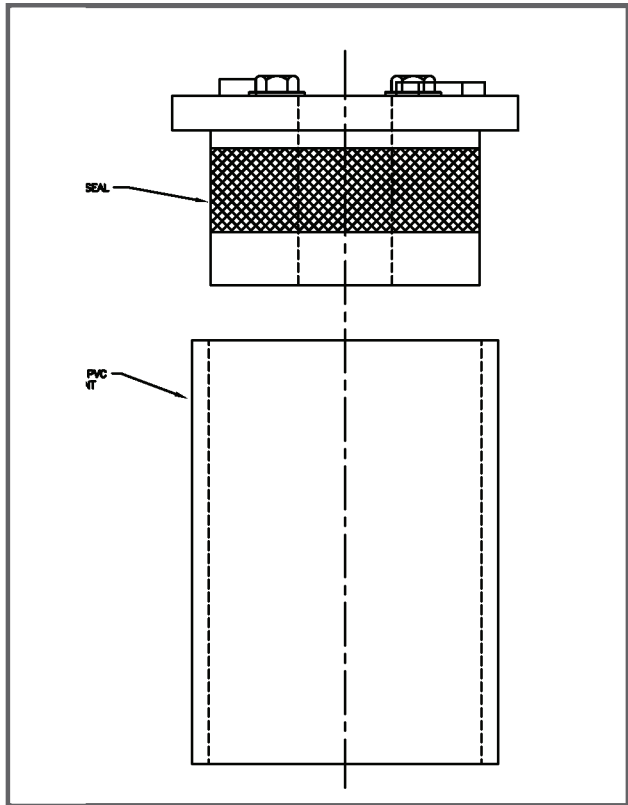
Discharge Parts Kit



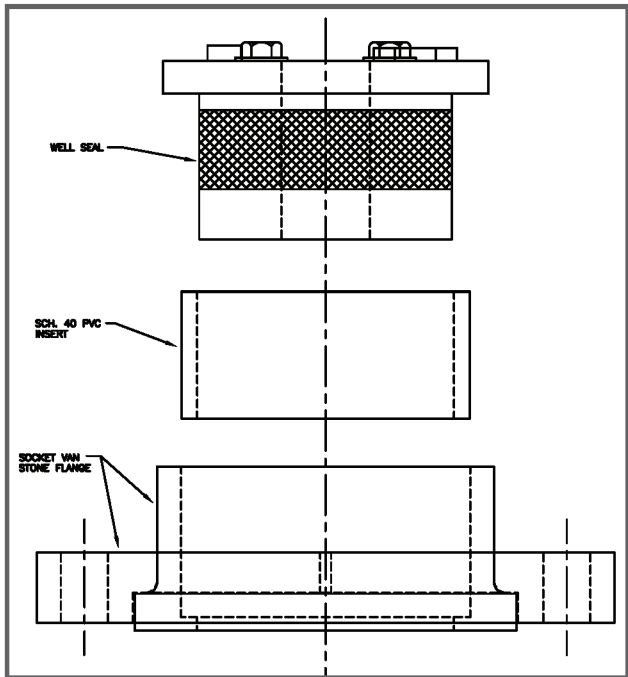
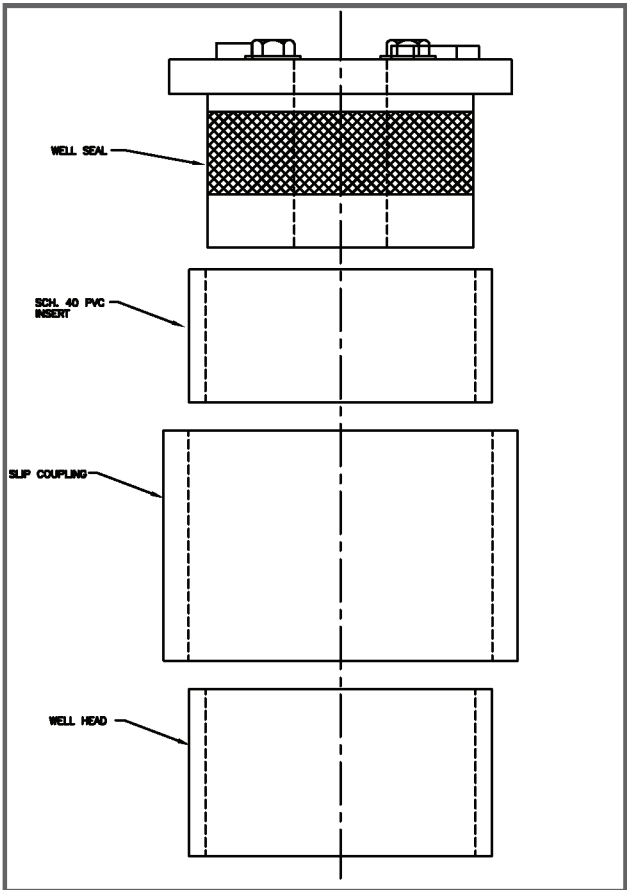
WELLHEAD ASSEMBLY

Compression Well-Seal Assembly Options

Straight Well Casing Assembly



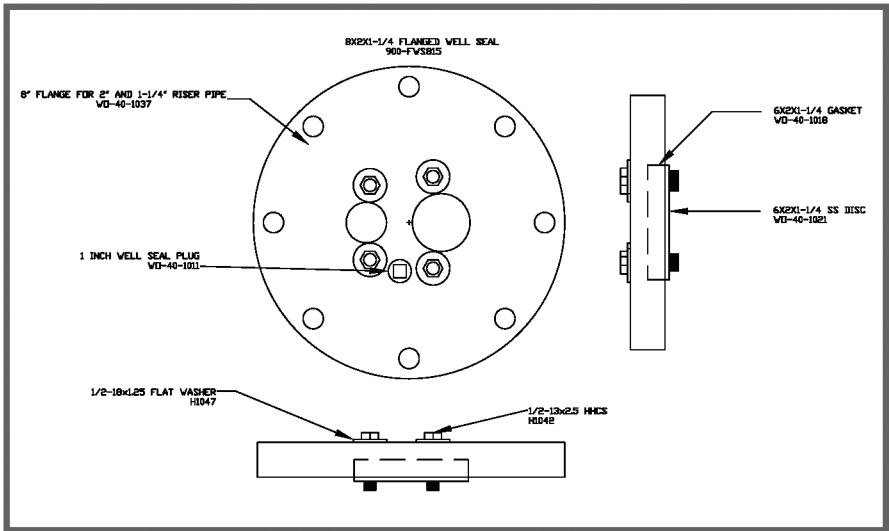
Slip-Coupling Assembly



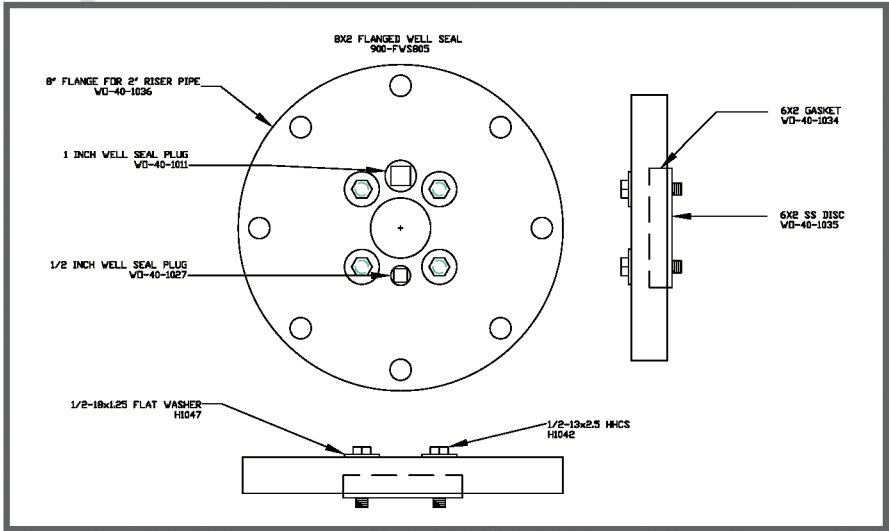
Vanstone Flange Assembly

WELLHEAD ASSEMBLY (CONTINUED)

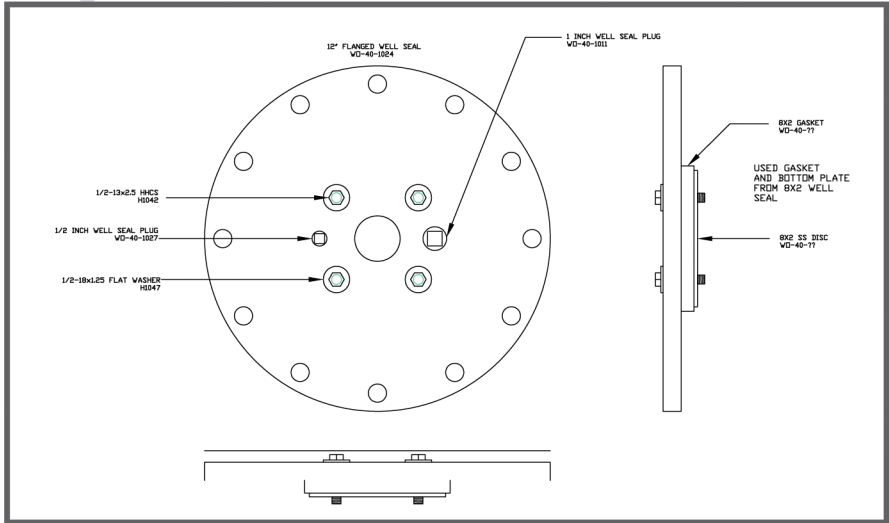
Flanged HDPE Compression Well-Seal Options



Straight Flanged Wellhead Assembly - 8 x 2 x 1 1/4



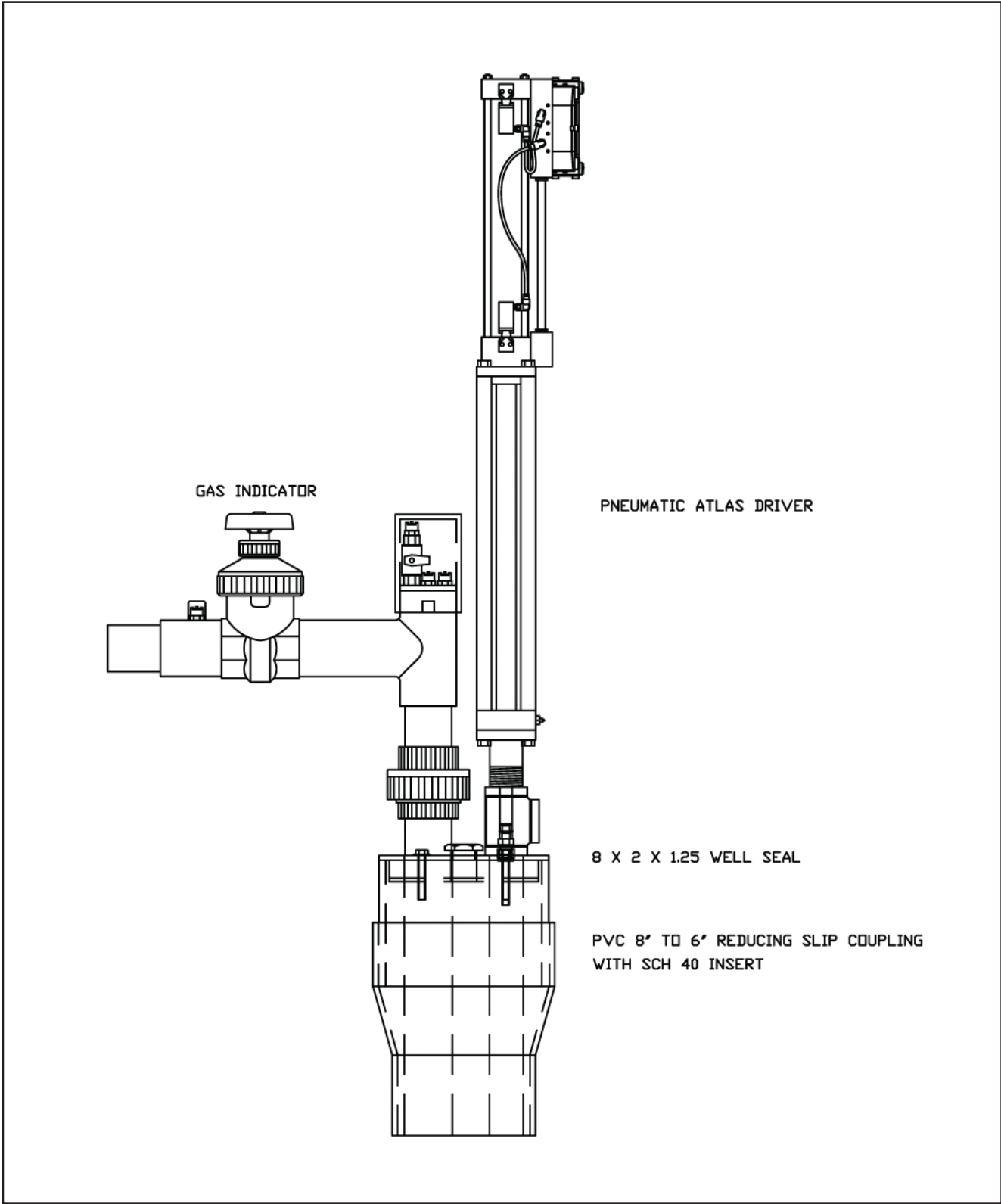
Flanged Wellhead Assembly - 8 x 2



Flanged Wellhead Assembly - 12-inch

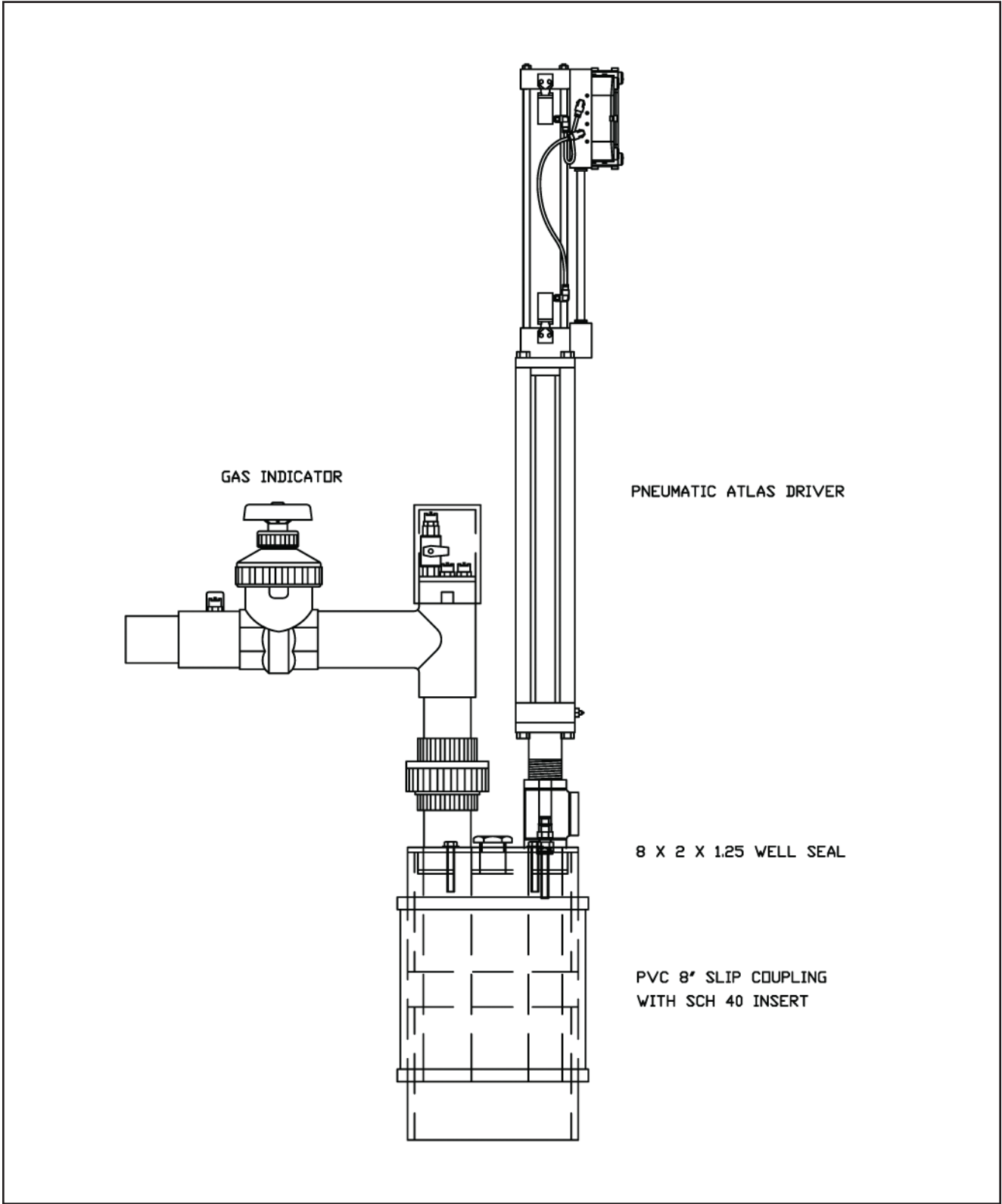
WELLHEAD ASSEMBLY (CONTINUED)

6" Gas Well Head Assembly

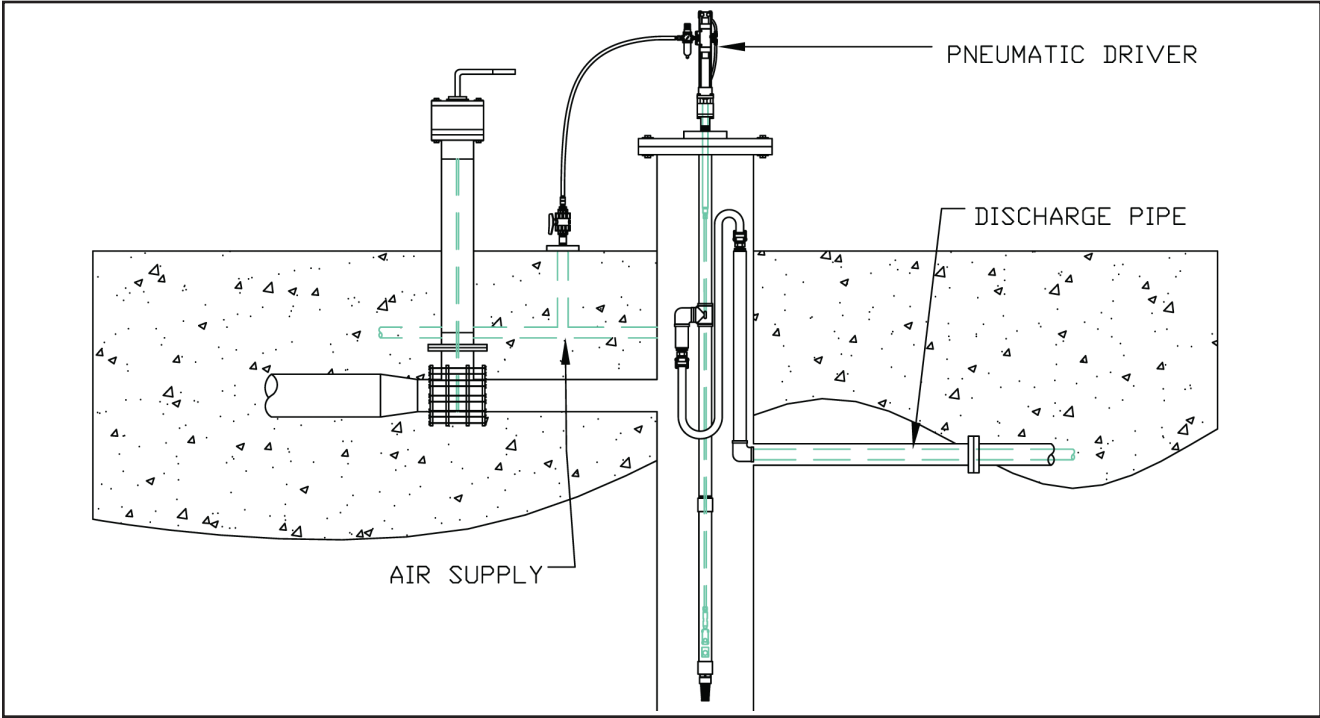


WELLHEAD ASSEMBLY (CONTINUED)

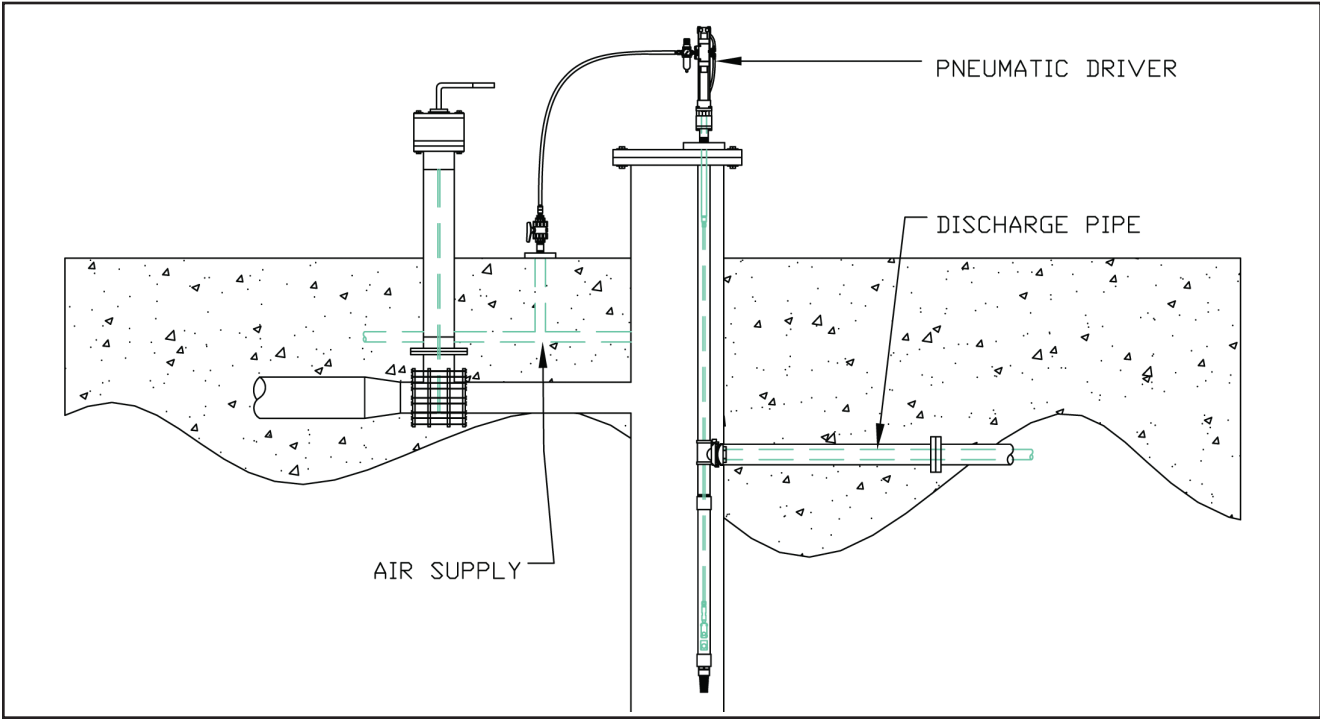
8" Gas Well Head Assembly



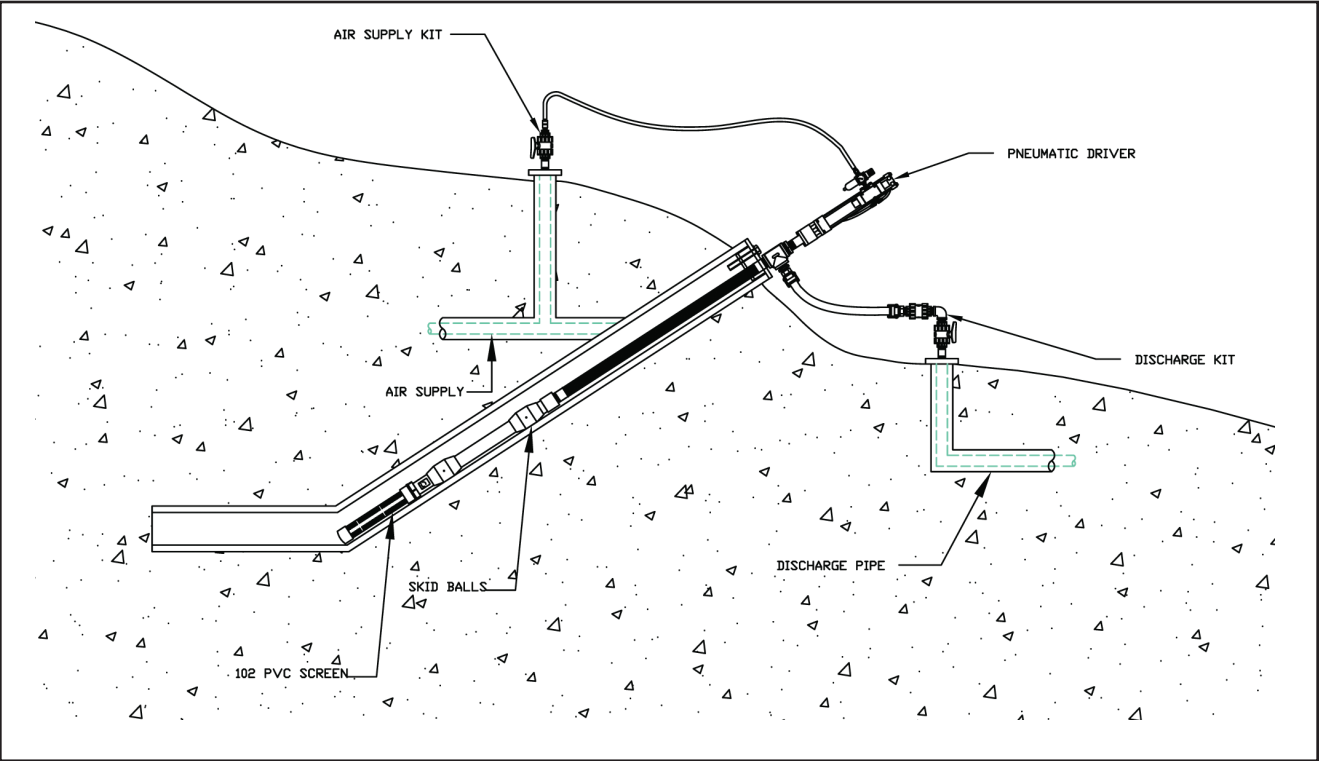
Below-Grade Flexible Hose Discharge Adaptor



Below-Grade Pitless Discharge Adaptor



Side Slope Installation



SECTION 6

SYSTEM START UP

Pneumatic

1. Attach a temporary hose to the discharge tee, making provisions if necessary to capture the liquid for proper disposal.
2. Connect the air supply to the push-to-connect fitting on the regulator.
3. Turn on the air supply and set the regulator to between 40 psi and 100 psi. Supply pressure requirements will vary based on depth of the well and viscosity of the fluid being pumped.
4. Adjust the speed mufflers on the air valve using an Allen wrench at the muffler end to achieve approximately 10 strokes per minute.

NOTE: The speed mufflers should be adjusted equally for best performance.

5. Operate the pump until fluid runs clear of sand and silt. Do not stop the pump until the fluid is clear of sediment.
6. After the fluid becomes clear, adjust the speed mufflers (balance the adjustment) until the desired stroke rate is achieved – 40 strokes per minute is the maximum recommended speed.
7. Turn off the air supply and complete final discharge connections.

NOTE: Under no circumstances should the pump be operated with the discharge valve closed or the discharge pipe clogged. This can cause stuffing box seal to fail, requiring replacement.

8. Start the pump and check the stroke rate.

Electric

The easiest and best way to check for rotation. We do not recommend checking for rotation with drive motor installed.

1. Set the drive on the ground with at least 2 feet of room for the rod to move in and out.
2. Pull the rod out by hand at least 1 foot. If you can not pull the rod out by hand, turn the motor counterclockwise until it is extended at least 1 foot.
3. Make sure power feed is disconnected, and wire up the feed and the motor. Be sure to connect the feed and motor ground to the drive.
4. If it is not possible to see motor rotation, remove any piping from the discharge tee. You will be able to see the rod moving inside the tee.
5. Set the Hand/Auto selector switch to Hand. Turn the power and drive switch on.
6. The rod should move in toward the motor first and then cycle out and in. The motor should first rotate clockwise as seen from above the motor.
7. If the rod moves in toward the motor or up and clockwise, the rotation is correct. Go to Step #10
8. If the rod moves away from the motor or down first and counterclockwise, the rotation is wrong. Turn the drive switch and the power off. **WAIT THREE MINUTES.** Switch two of the motor leads, either at the motor T1 and T3 or U and W at the VFD (Commander SK). **Do not switch the power feed wires or L1, L2, L3; this will not reverse the rotation.**
9. Return to step #5
10. Turn the drive switch and power off. Connect the sucker rod and install drive unit on the well.
11. If the Auto/Hand selector switch was set to Hand mode, reselect the Auto mode. The level control can not work unless the Auto/Hand selector switch is in the Auto mode.

SECTION 7

INSPECTION/PERIODIC MAINTENANCE

Pneumatic

1. The pump should be checked periodically for fluid quality, pressure, draw down, cycle rate and performance.
2. Visually inspect the pump. Make sure the chrome-plated stainless steel drive rod is clean and free from dirt, stains, and sticky residue.
3. Check liquid discharge.
4. Grease or oil rod once a month. Blackhawk suggests continuous oilers such as the Memolub® automatic lubricator, which is rated for six months of service. If grease is used, inject waterproof lithium grease in Zerk fitting. **DO NOT OVER GREASE**, no more than 1/2 pump per application per month. Grease lightly when polished drive rod appears dirty, and only until you feel resistance and back pressure. Do not force grease; no full strokes.

Electric

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TROUBLESHOOTING

OBSERVATION	CAUSE	SOLUTION
– Pump not operating.	– No power. – Restricted liquid discharge. – Piston drive disconnected.	– Check to see that the power supply is on, and that all connections are sound. – Open discharge valve.
– Pump driver operating (cycling), but not pumping liquid.	– Restricted liquid discharge. – Piston drive disconnected.	– Check for closed valve, clogged discharge or any other obstruction. – Remove obstruction and restart pump. – Make sure drive rod is connected. – If separated at compression fitting, a replacement drive rod ferrule will be required. (Ferrules cannot be re-crimped).
– Driver cycles properly but pump not pumping liquid.	– Plugged bottom intake.	– Perform inflation (glove) test. – Disconnect liquid discharge hose/pipe from pumps discharge tee. Hold latex glove (or other inflatable object) over discharge tee mouth. Seal with a tight grip. Allow pump to operate. Pull pump and raise out of mud.
– Glove does not inflate or deflate as pump cycles.	– Downhole drive rod may have been cut incorrectly. – Riser pipe string may have a leak. – Drive rod disconnected from drive motor.	– Remove and re-cut or adjust rod length as per installation instructions. – Check pipe connections and check for cracks or leaks. Repair or replace compromised pipe or fittings.
– Glove inflates more and more as pump cycles.	– No liquid at pump intake (downhole) to pump.	– Check to make sure that there is liquid to pump.

TROUBLESHOOTING (CONTINUED)

OBSERVATION	CAUSE	SOLUTION
– Glove inflates on up stroke and deflates on down stroke, and does not inflate more and more with every stroke.	– Plugged intake.	– Raise pump.
– Foot valve assembly/pipe string not water tight.	– With drive rod and drive piston out of riser pipe, fill riser pipe with water. Water drains out quickly.	– Remove riser pipe and foot valve assembly and inspect, replace, and/ or repair.
– Water stays in riser pipe (and drive rod and drive piston have been deemed OK).	– Foot valve assembly/pump intake clogged.	– Remove riser pipe and foot valve assembly and inspect. – Clean piston and foot valve. Raise pump out of mud.
– Drive rod/drive piston assembly tough to remove from foot valve assembly/riser pipe. Suction pull back.	– Pump intake may be clogged.	– Follow directions for clogged intake foot valve.
– Pump driver moving erratically when operating.	– Loose connections. – Downhole drive rod length incorrect.	– Check all connections to be sure they are tight. – Check rod length and adjust as per installation instructions.
– Stuffing box drain port leakage.	– Stuffing box seals worn.	– Replace stuffing box seals.

ELECTRIC PUMP RATING DATA

Figure 2-1 Model code explanation

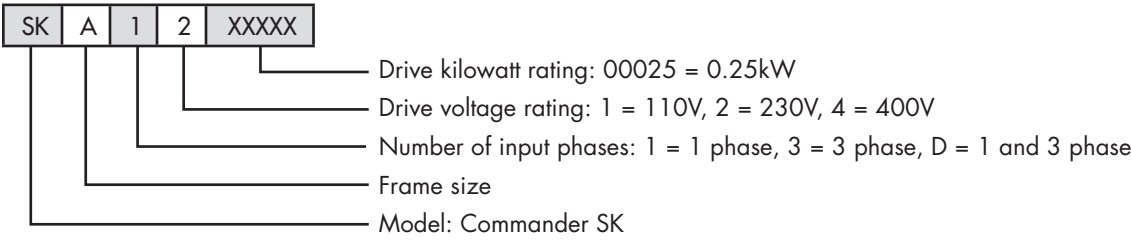


Table 2-1 Commander SK, 1 phase, 200 to 240VAC ±10%, 48 to 62Hz units

Model Number	Nominal motor power		Input fuse rating	Typical full load input current	100% RMS output current	150% overload current for 60s	Minimum braking resistor value
	kW	hp			A	A	
			Heavy Duty				
SKA1200025	0.25	0.33	6	4.3	1.7	2.55	68
SKA1200037	0.37	0.5	10	5.8	2.2	3.3	68
SKA1200055	0.55	0.75	10	8.1	3.0	4.5	68
SKA1200075	0.75	1.0	16	10.5	4.0	6.0	68

Table 2-2 Commander SK, 1 phase, 100 to 120VAC ±10%, 48 to 62Hz units

Model Number	Nominal motor power		Input fuse rating	Typical full load input current	100% RMS output current	150% overload current for 60s	Minimum braking resistor value
	kW	hp			A	A	
			A	A			Ω
SKB1100075	0.75	1.0	25	19.6	4.0	6.0	28
SKB1100110	1.1	1.5	32	24.0	5.2	7.8	28

Table 2-3 Commander SK, 1 and 3 phase, 200 to 240VAC ±10%, 48 to 62Hz units

Model Number	Nominal motor power		Input fuse rating A		Typical full load input current A		Maximum continuous input current A		100% RMS output current A	150% overload current for 60s A	Minimum braking resistor value Ω
	kW	hp	1 ph	3 ph	1 ph	3 ph	1 ph	3 ph	Heavy Duty		
SKBD200110	1.1	1.5	16	10	14.2	6.7		9.2	5.2	7.8	28
SKBD200150	1.5	2.0	20	16	17.4	8.7		12.6	7.0	10.5	28
SKCD200220	2.2	3.0	25	20	23.2	11.9		17.0	9.6	14.4	28
SKDD200300	3.0	3.0	25	16	23.6	12.5		16.6	12.6	18.9	20
SKD3200400	4.0	5.0		20		15.7		19.5	17.0	25.5	20

Table 2-4 Commander SK, 3 phase, 380 to 480VAC ±10%, 48 to 62Hz units

Model Number	Nominal motor power		Input fuse rating	Typical full load input current	Maximum continuous input current	100% RMS output current	150% overload current for 60s	Minimum braking resistor value
	kW	hp				A	A	
			Heavy Duty				Ω	
SKB3400037	0.37	0.5	6	1.7	2.5	1.3	1.95	100
SKB3400055	0.55	0.75	6	2.5	3.1	1.7	2.55	100
SKB3400075	0.75	1.0	6	3.1	3.75	2.1	3.15	100
SKB3400110	1.1	1.5	6	4.0	4.6	2.8	4.2	100
SKB3400150	1.5	2.0	10	5.2	5.9	3.8	5.7	100
SKC3400220	2.2	3.0	16	7.3	9.6	5.1	7.65	100
SKC3400300	3.0	3.0	16	9.5	11.2	7.2	10.8	55
SKC3400400	4.0	5.0	16	11.9	13.4	9.0	13.5	55
SKC3400550	5.5	7.5	16	12.4	14.3	13.0	19.5	53
SKC3400750	7.5	10.0	20	15.6	16.9	16.5	24.75	53

Output frequency

0 to 1500Hz

Output voltage

110V drives: 3 phase, 0 to 240VAC (240VAC maximum set by Pr 08).

Note: 110V drives contain a voltage doubler circuit on the AC input.

200V and 400V drives: 3 phase, 0 to drive rating (240 or 480VAC maximum set by Pr 08).

Note: The output voltage can be increased by 20% during deceleration.

Note: The maximum continuous current inputs are used to calculate input cable and fuse sizing. Where no maximum continuous input currents are indicated, use the typical full load input current values.

SECTION 10

TERMS AND CONDITIONS

Final delivery date will be determined at time of order. All prices are in U.S. dollars, F.O.B. Glen Ellyn, IL USA. A copy of Buyers Purchase Order is required at time of order. "Delivery time on all specials will be determined after receipt of order." Terms are Net 30 days. Total quoted price does not include freight charges. Freight will be prepaid and added to Seller's final invoice to Buyer. A service charge of 1.5% per month will be applied to all past-due invoices. Pricing is valid for 30 days. Notwithstanding anything contained herein to the contrary, the parties agree that the terms and conditions set forth in the Limited Warranty of Blackhawk Technology Company shall supersede any of the terms and conditions otherwise set forth.

Blackhawk Pumps manufactured by Blackhawk Technology Company (Blackhawk) are warranted to the original user only to be free of defects in material and workmanship for a period of 12 months from date of manufacture.

Blackhawk's liability under this warranty shall be limited to repairing or replacing at Blackhawk's option, without charge, F.O.B. Blackhawk's factory, any product that Blackhawk manufactures. Blackhawk will not be liable for any costs of removal, installation, transportation or any other changes that arise in connection with a warranty claim. Products that are sold but not manufactured by Blackhawk are subject to the warranty provided by manufacturer of said products and not by Blackhawk's warranty. Blackhawk will not be liable for damage or wear to said products by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Blackhawk's printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to Blackhawk together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, contact will be made to Blackhawk for instructions prior to return of defective product. Any defective product to be returned to Blackhawk must be sent freight prepaid; documentation supporting the warranty claim/or a return Material Authorization must be included if so instructed.

Blackhawk will not be liable for any incidental or consequential damages, losses, or expenses arising from installation, use, or any other causes. There are not expressed or implied warranties, including mechanical ability of fitness for a particular purpose, that extend beyond those warranties described or referred to above.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, and some jurisdictions do allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights that vary from jurisdiction to jurisdiction.

Questions? Call Blackhawk's info hotline at 800-469-4887.



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