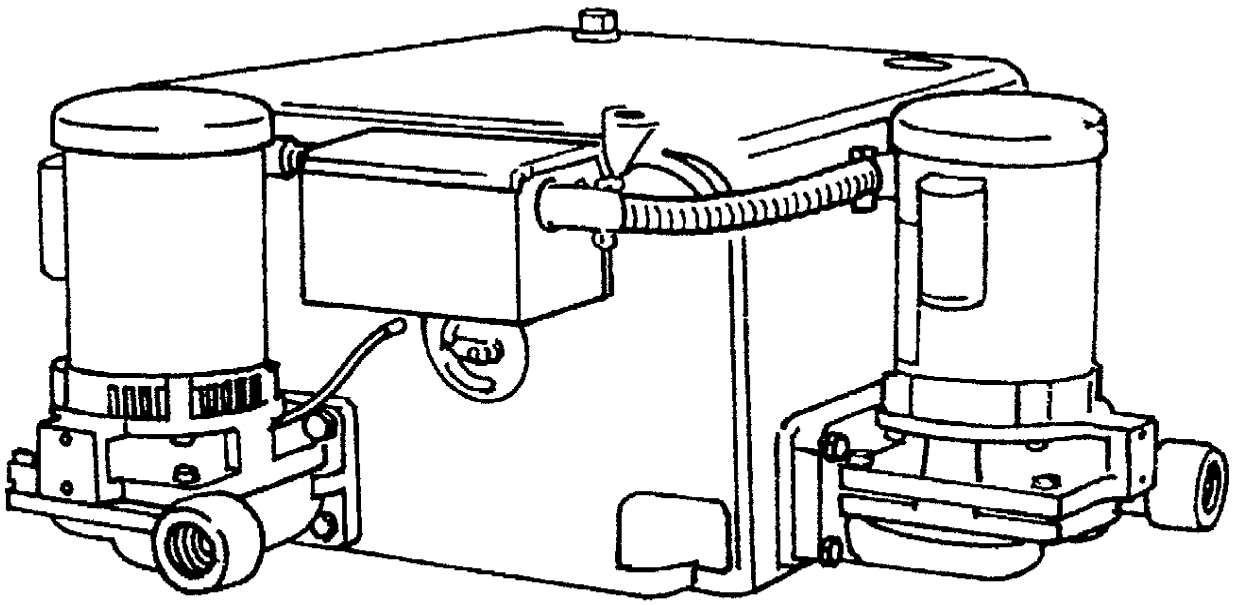
FLO FAB

Installation and Operation manual for Condensate Vertical Centrifugal Pumps

Series CVC



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FLO FAB pumps, when properly installed and given reasonable care and maintenance, will provide many years of trouble-free operation.

Pumps are carefully tested and inspected for mechanical defects before shipment, but should be carefully inspected for possible damage during transit immediately upon receipt. Contact your FLO FAB representative or the transport company immediately if there is any evidence of mishandling.

Although FLO FAB pumps are correctly aligned before shipment, alignment must be checked again by installer and adjusted if necessary before and after all pipe joints are made and base is grouted.

C A U T I O N

A PUMP IS A PRECISION MACHINE AND BY FOLLOWING PROPER INSTALLATION PROCEDURE AND STUDYING INSTRUCTIONS, PROBLEMS CAN BE AVOIDED.

INSTALLATION

LOCATION OF UNIT

1. Locate the pump in a dry place as near the liquid source as practical with a short, direct suction pipe and a minimum number of elbows and fittings on the discharge line.

2. Place the unit so that it will be accessible for inspection during operation and maintenance.

FONDATION

1. Foundation should be sufficiently substantial to absorb any vibration and to form a permanent rigid support for the base plate. This is important in maintaining alignment of a direct connected unit.

2. Foundation bolts of suitable size should be embedded in the concrete, located by a drawing or template of the pump baseplate.

3. Pipe sleeves about two and on-half diameter larger than the bolts should be used to allow movement for final positioning of the bolts.

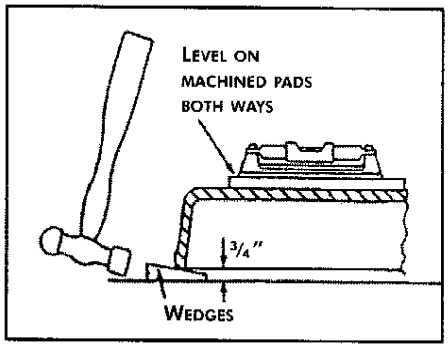


FIGURE I

GROUTING

1. Place pumping unit on foundation with wedges under base plate, leaving approximately 3/4" space for grouting.

2. Carefully level the unit by adjusting the wedges (see **FIGURE I**) until shafts of pump and driver are levelled.

3. Check coupling faces as well as suction and discharge flanges of pump for horizontal or vertical position by means of a level. Slight misalignment at this point may be corrected by adjusting the wedges.

4. Build a dam around base plate at least 2-1/2" high (see **FIGURE II**).

5. Mix the grout, using 1 part pure Portland cement and 2 parts building sand to avoid excessive shrinkage. This mix should require no more than 6 gallons of water per bag of cement. Let the mixture stand for several hours, remixing thoroughly before use without adding water.

6. Before grouting, surface of the rough concrete must be well saturated with water.

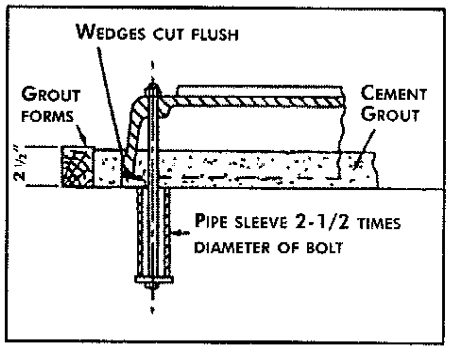


FIGURE II

7. Pour sufficient grout to fill entire space under base, using a rod through the grout hole to release any air pockets.

8. To prevent cracking, protect grout against rapid drying by covering exposed surfaces with wet burlap for 2 days.

9. Let grout harden for several days

10. Tighten anchor bolts and recheck alignment. Any misalignment, now and after pipe joints are made, must be corrected by placing shims between base and driver or pump feet.

PIPING (GENERAL)

1. Never connect a pump to piping. Always start piping from pump (except In-Line Pumps).

2. Use as few bends as possible and preferably log radius ones.

3. Install good supports under suction and discharge piping with anchors near but independent of the pump. Make sure piping exerts no strain on pump as this would throw the unit out of alignment or distort the casing.

4. Increase the size of both suction and discharge pipes at pump nozzle to suit pump capacity and particular conditions of installation.

5. Layout the suction line with a continual rise towards the pump without high points, thus eliminating possibility of air pockets.

6. Test suction line for air leaks before starting. This becomes essential with long suction line or high static lift.

7. Install, at pump suction, a straight pipe of a length equivalent to 4 or 5 times its diameter. This becomes essential when handling hot liquids, 120°F and above.

8. Install gate valve close to pump in both suction and discharge lines on flooded suction application. This is used mainly to isolate the pump for inspection or repair.

9. Install a check valve in discharge line between pump and gate valve to protect pump from excessive presssure and to prevent water running back through the pump in case of driver failure.

10. Install a foot valve at bottom of the suction pipe to facilitate priming of pump for operation under suction lift. A small by-pass line around the discharge check valve will compensate for foot valve leaks.

11. Install a suction strainer to protect pump against foreign matter in initial start-up as well as in normal operation. Size liberally.

12. Install pressure gauges on both sides of strainer to indicate pressure drop through the strainer. Stop pump and clean the strainer when pressure drop starts to climb.

13. Install vent valve at high point of pump casing to vent casing and suction piping of air and vapor before start-up. This valve is also used during priming of pump or later if pump becomes air or vapor bound.

14. Connect a compound gauge to the pump suction and a pressure gauge to the discharge. This ensures close check on pump performance.

15. Connect drain pipe to drain pump base.

C A U T I O N

A. DISCHARGE VALVE MUST ONLY BE USED TO REDUCE THE FLOW OR SHUT-OFF THE PUMP.

B. CARE MUST BE TAKEN IN THE SUCTION LINE LAYOUT AND INSTALLATION , AS IT IS USUALLY THE MAJOR SOURCE OF TROUBLE ON CENTRIFUGAL PUMP OPERATION.

ALIGNMENT

Purpose of the flexible coupling is to compensate for temperature changes and to permit end movement of shafts without interfering with each other. It will not compensate for misalignment. Alignment should be checked as follows:

1. Place a straight edge across the coupling as shown in **FIGURE III**. This must rest evenly on both rims at top, bottom and both sides.

2. With a pair of inside calipers or thickness gauge, check distance between coupling halves at points where straight edge was used. Distance must be equal at all points.

C A U T I O N

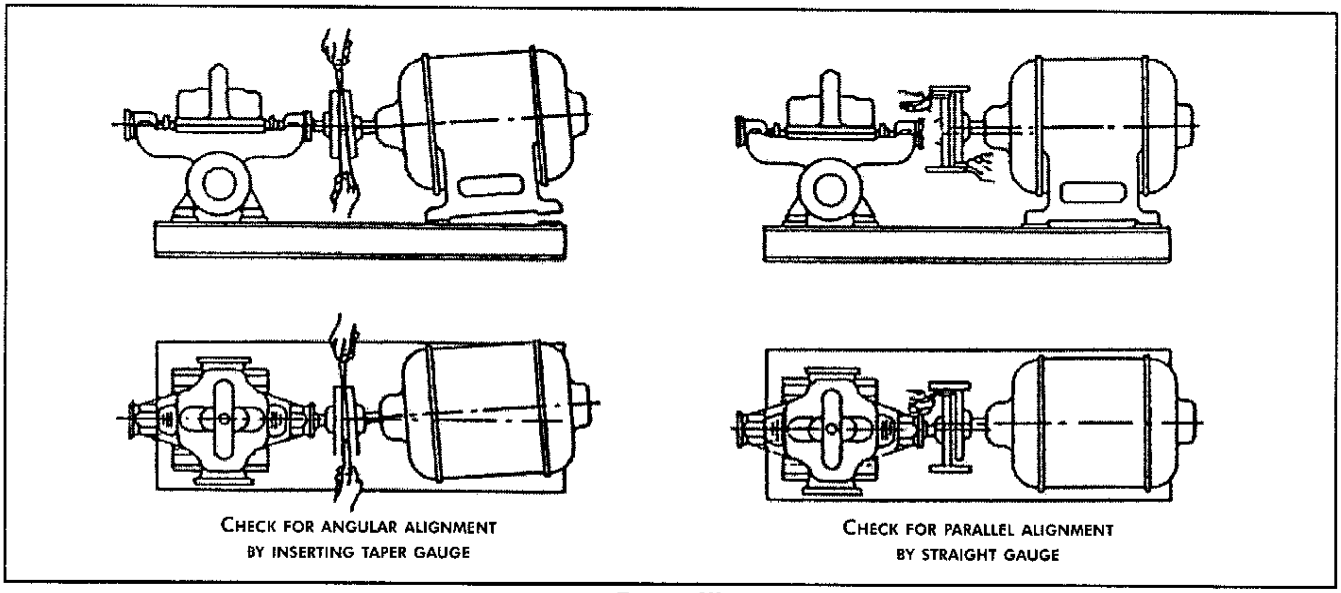
A. FOR PUMPS DRIVEN BY STEAM TURBINE OR HANDLING HOT LIQUIDS, ALIGNMENT SHOULD BE CHECKED AT OPERATING TEMPERATURE.

B. FLEXIBLE SHAFTS CAN ABSORB MOMENTARY ANGULAR MISALIGNMENT OF 15 TO 22 DEGREES DEPENDING UPON SIZE. PUMPS EQUIPPED WITH FLEXIBLE SHAFT DO NOT REQUIRE ANY SPECIAL ATTENTION AT TIME OF INSTALLATION. ALIGNMENT ON SITE IS NOT NECESSARY UNLESS BASE PLATE IS WARPED OUT OF PROPORTION.

C. FAULTY ALIGNMENT WILL RESULT IN NOISY PUMP OPERATION, REDUCED BEARING LIFE, EXCESSIVE COUPLING WEAR AND WASTE OF POWER. IT IS THEREFORE ESSENTIAL:

1. TO CHECK THE ALIGNMENT CAREFULLY AFTER THE FOUNDATION BOLTS HAVE BEEN PROPERLY THIGHTENED.

2. TO CHECK AGAIN THE ALIGNMENT AFTER PIPING IS INSTALLED AND UNIT HAS OPERATED UNDER NORMAL CONDITIONS AT OPERATING TEMPERATURE.



CHECK FOR ANGULAR ALIGNMENT BY INSERTING TAPER GAUGE

CHECK FOR PARALLEL ALIGNMENT BY STRAIGHT GAUGE

FIGURE III

V-BELT DRIVE

For V-Belt driven pumps proceed as follows:

1. Before bolting down, place a straight edge across face of belt sheaves to ensure pump and motor sheaves are parallel and in line, and, by the use of a spirit level, ensure they are parallel in the vertical plane.

2. Slide motor forward on rails to allow V-Belts to loop freely over sheave.

3. Fit V-Belts snuggly into sheave grooves.

4. Slide motor back until slack of V-Belts is taken-up.

5. Inspect belts periodically and maintain correct operating tension. Correct tension is just beyond the point of slippage when the unit is running at full speed and load. Slippage can be detected by belt squeal or heating of the small sheave grooves.

6. When it becomes necessary to replace one belt in a multi-belt drive, replace all belts at the same time. A new belt and an old one operating together will cause excessive stretching of the new belt and may cause it to break.

C A U T I O N

A. BELTS ARE NEVER TO BE FORCED OVER THE SHEAVE AS THIS MAY CAUSE PERMANENT DAMAGE TO THE BELT MATERIAL.

B. EXCESSIVE TENSION WILL CAUSE WEAR ON BELTS AND UNDUE STRAIN ON MOTOR AND PUMP BEARINGS.

C. DO NOT ALLOW OIL TO GET ON THE BELTS.

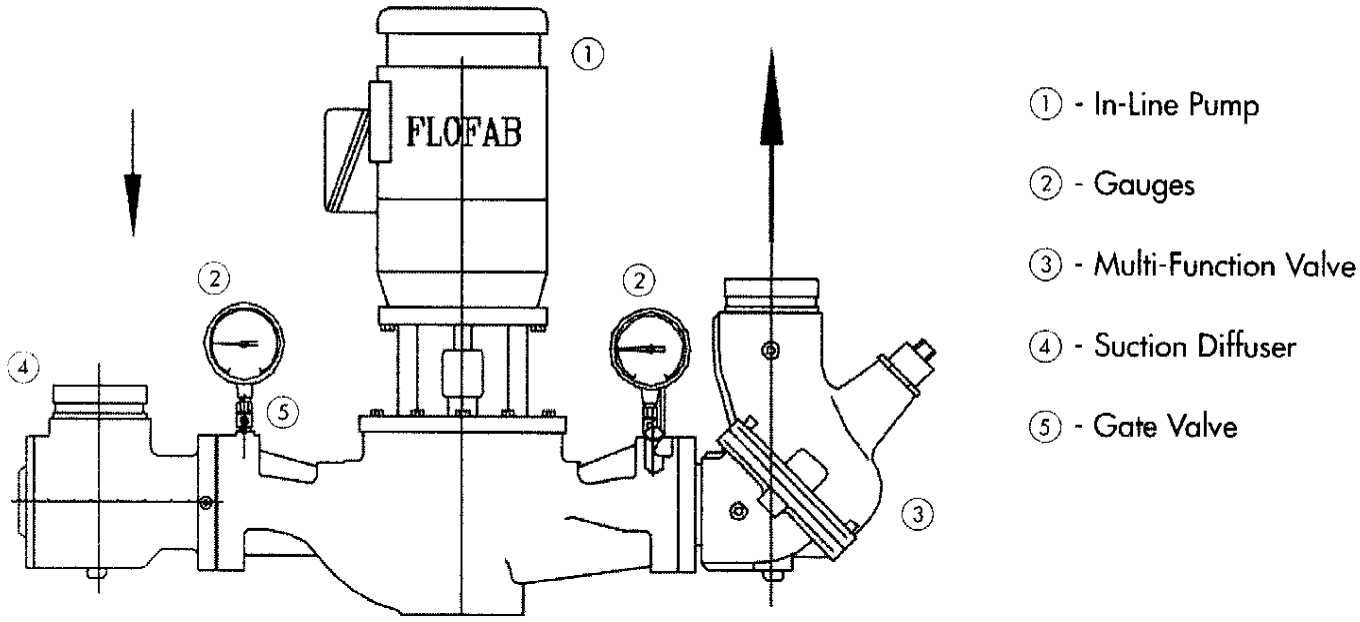


FIGURE IV - TYPICAL TYPE SC PUMP INSTALLATION

VERTICAL IN LINE PUMPS

FLO FAB In Line pumps are designed to be mounted vertically in the pipe line with the motor above the pump. Center line suction and discharge keep weight evenly balanced and directly down upon the piping. No flexible connections to take up pipe misalignement are necessary since pump is not permanently connected to anything but the piping and is free to move with the expansion and contraction of the piping system. Support of the piping at the pump may be made by two pipe hangers, floor saddles or floor flanges, placed on line close to the pump.

Selection of the actual type of support is determined after consideration of the structural characteristics at the location of the pump, size and weight of both the piping and the pump, expansion and contraction of the piping, etc. In other words, the same criteria and formula for selecting piping supports are used with the additional consideration that the weight of the pump is concentrated at one point in the piping. Otherwise, piping recommendations are the same as for other types of pumps. For example, gate valves should be installed at both the pump suction and discharge to permit servicing of the pump without draining the entire system. If vertical in-line pumps are mounted in a straight horizontal run of piping, then the weight of the piping and pump system is generally supported by pipe supports, or spring hangers, and experience has shown that no additional pump support, vibration or noise isolation devices are required.

C A U T I O N

A. INSTALL VERTICAL IN LINE PUMPS WITH MOTOR IN VERTICAL POSITION.

B. MAKE CERTAIN THE SPACE ABOVE THE PUMP IS SUFFICIENT TO GIVE CLEARANCE FOR LIFTING THE PUMP ASSEMBLY FROM THE CASING. ALSO THE SPACE AROUND THE PUMP SHOULD BE LARGE ENOUGH FOR GENERAL ACCESSIBILITY AND VENTILATION.

C. SUPPORT PUMP ONLY BY PIPING.

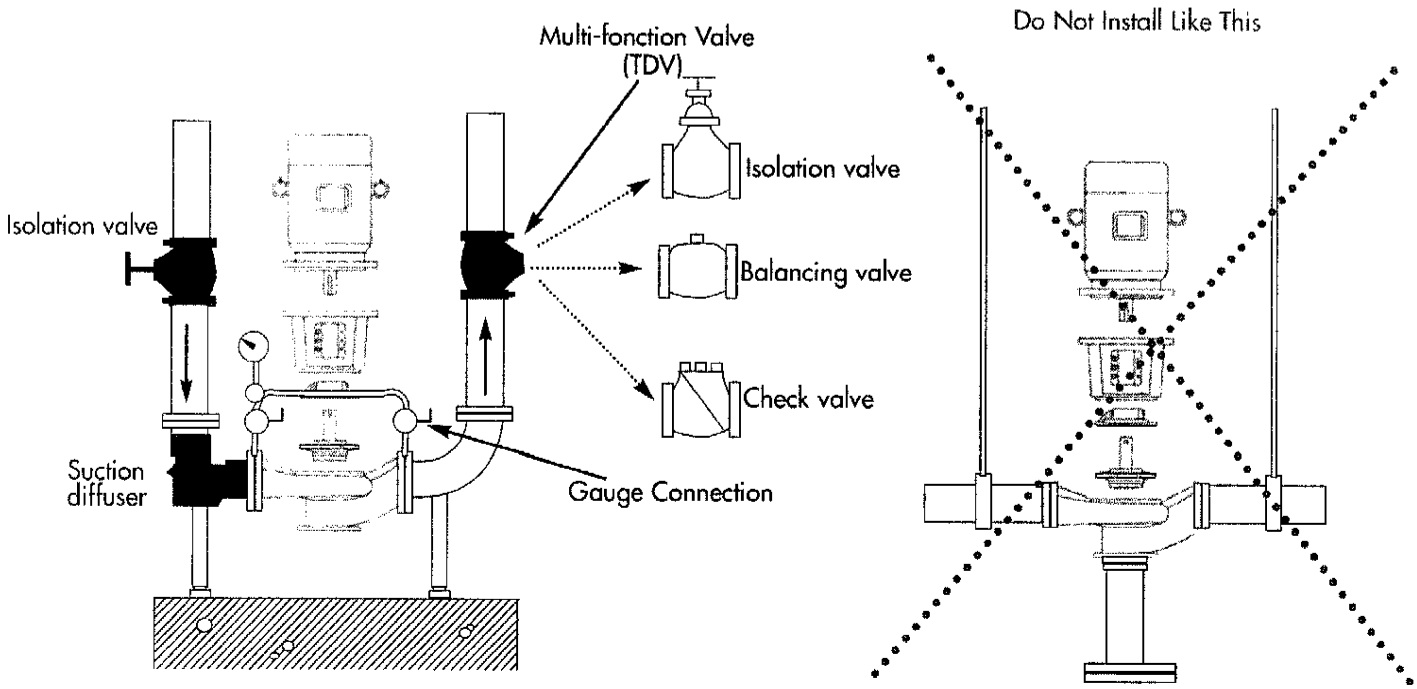
D. MANUALLY VENT ALL AIR FROM CASING.

E. MAKE SURE SUCTION VALVE IS WIDE OPEN BEFORE STARTING MOTOR.

F. CHECK MOTOR ROTATION (CLOCK WISE LOOKING DOWN FROM TOP OF MOTOR).

FLOOR MOUNTED TYPE VERTICAL IN LINE PUMPS

Larger FLO FAB Vertical In Line pumps and Split Coupled pumps have supporting floor plate under the casing. These pumps are to be floor mounted but otherwise piped-up the same way as shown. Although Vertical In Line pumps are vibration free, it is recommended for floor mounted pumping units to provide isolation between pedestal block and foundation structure and flexible members in pipes adjacent to pump. Typically, the natural rubber pad would have a hardness in the range of 50 durometres, a thickness of 0.375 inches and up, depending on the loading and site conditions, and be designed for a maximum deflection of 8 mm. This arrangement has been used, successfully, for many years on all types of flooring systems. The recommended arrangement diminishes noise transmission and provides adequate vibration isolation in the horizontal and vertical planes.



OPERATION

STARTING OF ELECTRIC MOTOR DRIVEN PUMPS

1. Before connecting motor and starter to the line:

   1.1. Check wiring information available inside the conduit box.

   1.2. Check voltage and frequency of power supply with what s shown on motor nameplate.

   1.3. Check current rating of overload relays and fuses against nameplate full load current value.

2. Check lubrication and packing (see MAINTENANCE).

3. Check if rotor is free to turn. It must be possible to revolve the rotor by hand. If the rotor drags even slightly, do not operate until the cause of trouble is located and corrected.

4. For unit with fluid drive, refer to the maintenance instructions of fluid drives.

5. If unit is for high temperature application, refer to operating instructions for high temperature pumps.

6. Prime the pump. A pump is primed when casing and suction line are filled with liquid and when all the air contained in the pump has been allowed to escape. If pump is to operate under suction lift without foot valve, priming is done by pumping air out by means of an ejector, an exhauster or a vacuum pump.

7. Check direction of driver rotation. Proper direction is indicated by arrow on pump casing.

8. Check electric motor current as soon as motor is started to verify whether or not the mechanical load applied corresponds to the motor rating. The continuous full load current value should be within the electric motor nameplate rating with service factor taken into account.

C A U T I O N

A. MAKE SURE THE GATE VALVE ON PUMP SUCTION IS FULLY OPEN AS THROTTLING ON SUCTION SIDE IS HARMFUL TO THE PUMP.

B. MAKE SURE PUMP WILL NOT RUN DRY. MOST CENTRIFUGAL PUMPS HAVE CLOSE CLEARANCES AND CANNOT RUN DRY WITHOUT SERIOUS DAMAGE RESULTING.

STARTING OF ENGINE DRIVEN PUMPS

Before starting an engine driven pump, the engine manufacturers instruction manual must be carefully studied.

MAINTENANCE

A systematic inspection made at regular intervals, giving special attention to the following, will ensure years of trouble-free operation.

GENERAL CARE

1. Keep unit clean.
2. Avoid excessive belt tension.
3. Provide the motor with adequate overload protection.
4. Keep flying chips or other loose particles away from the ventilating openings of the motor.
5. Avoid operating the unit in overheated surroundings.
6. Guard three phase motor against single phasing which is frequently accompanied by an unusual humming soud, a drop in speed, and by excessive heating which, if continued, may burn out the motor windings.
7. Use thermometers when checking temperatures.
8. If pump is standing idle in freezing weather, pump casing and piping should be drained.

BEARINGS

1. LIFE LUBRICATED BEARINGS are heavy duty permanently lubricated, sealed type and require no maintenance.
2. GREASE LUBRICATED BEARINGS require very little attention. More trouble can be caused by overcharging than by undercharging with grease. Approximately every month, depending on service, inject a small quantity of grease (Esso Andok No. 280 or equal) into bearing container after removing the grease outlet plug so that old grease is flushed out and bearing is not overfilled.

STUFFING BOX WITH PACKING

1. Adjust pressure of packing gland so as to obtain slight leak of 6 to 8 drops per minute for suction pressures up to 20 PSIG (the increase in suction pressure causes proportional increase in leakage through the stuffing box).
2. When removing old packing, make sure bottom rings are completely removed. Thoroughly clean the stuffing box and check condition of shaft. A badly worn or corroded shaft will never seal properly.
3. Cut packing into lengths allowing 1/8" between ends when installed. Place first ring around shaft and press firmly and evenly into stuffing box. Continue in this manner staggering ring joints one quarter of a turn until stuffing box is filled. If lantern ring is fitted, make certain it is in correct position under pipe connection. Compress packing evenly with glad and leave gland nut finger tight.

C A U T I O N

PACKING SHOULD NOT BE PRESSED TOO TIGHT, AS THIS MAY RESULT IN BURNING THE PACKING AND SCORING THE SHAFT OR SHAFT SLEEVE. FOR COLD WATER (BELOW 100°F) USE CRANE NO. 810. FOR HOT WATER (ABOVE 100°F) USE CRANE SS NO. 1.

Stuffing Box with Mechanical Seal

1. Before installing seal, make certain there is 1/32" radius on the edge of the housing cavity which holds seat and seat ring. Oil the outer surface of the seat ring (use light oil, not grease) and push the assembly into the cavity, seating it firmly and squarely. Clean lapped face.

2. Clean, polish and oil shaft or sleeve over which seal is to pass, and make sure there is 1/32" minimum radius on the leading edge. Also make certain that all edges of any keyway or snap ring grooves are smooth and broken. Clean and oil lapped sealing faces using clean light oil. Place the sealing washer assembly on the shaft or sleeve and slide the assembly in until it meets the seat.

3. Make sure all flushing connections are properly attached. Bleed all air and vapor from unit prior to start up and make sure there is liquid in seal housing to ensure proper initial lubrication for seal faces.

4. If unit is fitted with a double mechanical seal, seal chamber must be supplied with clean liquid maintained at a pressure of 10 to 20 PSIG above suction pressure of pump.

Mechanical Shaft Seal Limitations

Standard FLO FAB pumps are equipped with mechanical seals. Standard mechanical seals have Ni-resist seat, carbon washer and Viton below. Maximum recommended operating temperatures and pressures are shown below.

Motor HP & Speed	Suction Pressure (PSIG)	Maximum Temperature (°F)
Up to 10HP 1750 RPM	60 85 125	250 225 160
15 - 50HP 1750 RPM	50 60 100	250 225 160
Up to 15HP 3500 RPM	20 125	180 120
20 - 60HP 3500 RPM	15 115	180 120

C A U T I O N

A. A MECHANICAL SEAL IS A PRECISION PRODUCT. HANDLE IT WITH CARE. SPECIAL CARE MUST BE TAKEN WITH THE SEALING WASHER AND SEAT. DO NOT LET THEM DROP AND TAKE PARTICULAR CARE NOT TO SCRATCH THE LAPPED FACES.

B. NEVER RUN SEALS DRY.

C. FOLLOW SEAL MANUFACTURER'S INSTRUCTIONS.

Preventive Maintenance

1. Protect pump with a suitable strainer.
2. Never pump a liquid for which the pump was not designed (check with your FLO FAB representative).
3. Keep the right amount of the right lubricant in bearings at all times, following lubrication instructions.
4. Check periodically pump and motor alignment.
5. Any down sloping towards the pump in suction piping should be corrected.
6. See that piping puts no strain on pump casing.
7. Never allow pump to run dry.
8. Examine wearing rings at regular intervals.
9. Packing should be replaced periodically using the packing recommended by FLO FAB.
10. Never tighen gland more than necessary.
11. If shaft sleeves are badly scored, replace them immediately.
12. If the liquid being pumped contains grit, a separate source of sealing liquid should be used.
13. A routine maintenance schedule should be set-up to ensure an optimum inspection and service operation in order to get the best service out of your pumping equipment.

Vertical In-Line Pump Maintenance and Service

Type V, VL, RI, SC pumps are built to operate without periodic maintenance with the exception of lubrication motor bearings with silicone grease such as Dow-Corning 44, Keystone #78 or Supermill ASU 06752 grease every 3 months. Good operational life will depend upon proper pump selection, installation and continuous water lubrication of the mechanical seals. The air vent plug must always be loosened to thoroughly vent casing before start-up and to insure water lubrication of mechanical seals. Impurities in the system will shorten the operational life of mechanical seals due to the generally abrasive characteristics of these impurities. Most common is black iron oxide which is highly magnetic and has a tendency to form hard coating on all surfaces in contact with water. Water treatment is also an important factor in seal life. It is recommended that the chromate content in water be limited to 250 ppm.

Type V, VL, Ri et SC Pumps Disassembly

It is unnecessary to disconnect piping or casing to service these pumps. All service and maintenance can be performed by removing pump assembly from casing.

1. Disconnect wiring to the motor.

2. Remove casing bolts, connecting casing and spacer and entire pump assembly can be withdrawn from casing by lifting the motor as shown.

3. Remove impeller bolt by turning it counter clockwise. Pull off the impeller by wedging around its periphery and slip out the impeller key from its shaft groove.

4. Slide spring loaded carbon rotating face off impeller shaft.

5. Remove bolts connection motor to adapter to lift off adapter.

6. If wear rings are to be replaced, split with cold chisel to remove from its recess. Replace ring after smoothing and lightly lubricating recess and tap the new ring with a lead hammer.

7. If motor shaft sleeve is to be replaced, it is important that no pressure be placed upon the motor bearings. All force must be directly against the motor shaft only as the sleeve is removed and replaced.

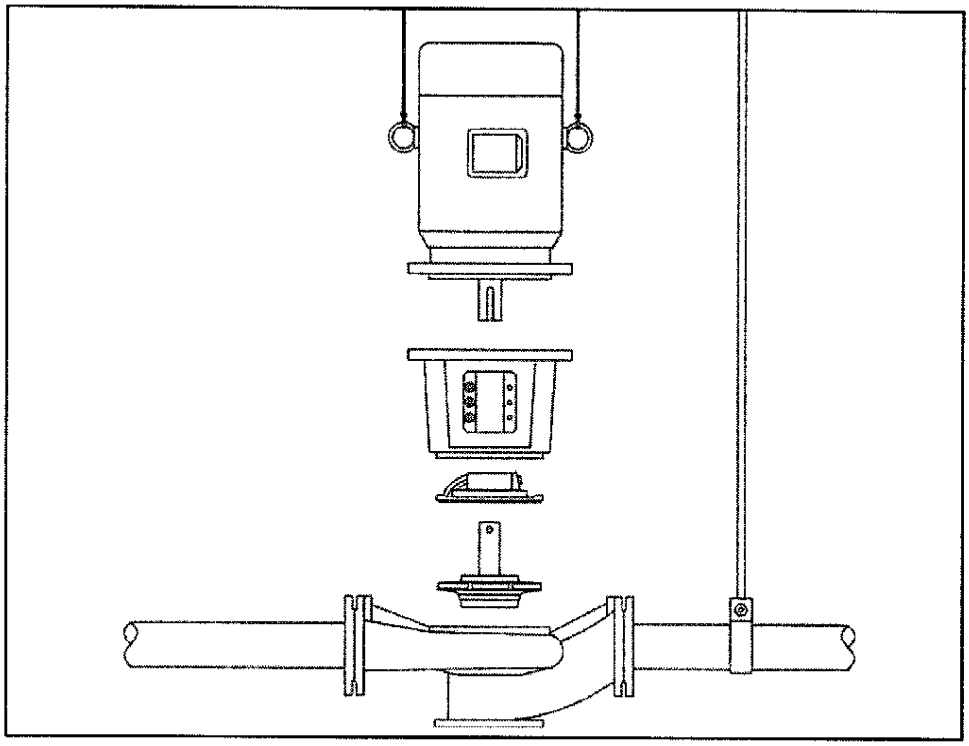


FIGURE V - TYPE SC

PUMP RE-ASSEMBLY

1. Clean seal recess of adapter. Lightly lubricate seat ring and press stationary seal assembly and adapter.

2. Bolt motor to adapter. Use caution not to bump the motor shaft against the mechanical seal.

3. Replace impeller key in shaft groove. Slip on spring loaded carbon seal and impeller on shaft.

4. Replace impeller cap screw and tighten by turning clockwise.

5. Remove old casing and adapter gasket and clean off any pieces that may have broken off on theses castings. Put new gasket on adapter.

6. Lower pump assembly into casing. Use caution to properly align impeller into casing so that it will not be damaged. Tighten-up cap screws evenly and in rotation.

7. Fill pump casing with water and vent all air by loosening air vent plug.

8. Re-connect motor wiring. Check motor rotation to insure proper operation.

TYPE SC PUMP DISASSEMBLY

Regular service and maintenance of Type SC Pumps can be performed without removing motor or rotating assembly.

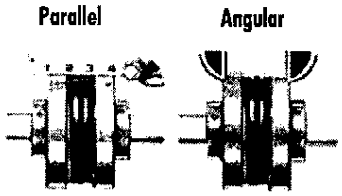
1. Loosen capscrews in each coupling hub and remove center part of spacer coupling.

2. Remove bottom hub of coupling, then bearing lock nut, washer and nuts and lift out bearing housing.

3. Remove seal gland. When mechanical seal only needs to be removed, complete bearing and seal gland can be removed as a cartridge by taking out the two nuts going through the gland.

4. Remove lower bearing container for inspection (if necessary) by taking off the bolts

5. On major overhauls where rotating assembly must be removed, disconnect coupling, remove motor coupling and cartridge bearing housing and seal gland. Remove motor steel and top cover and pull out the rotating assembly.



FLANGES ASSEMBLY

With a two-piece sleeve, do not move the wire ring to its final position; allow it to hang loosely in the groove adjacent to the teeth.

1. Slide the loose flange on th eshaft until the sleeve is completely seated in the teeth of each flange (the "Y" dimension is for reference and not critical). Secure the flange to the shaft. Different coupling sleeves require different degrees of alignment precision. Locate the alignment precision and check the value for your sleeve size and type in the table.

2. Check parallel alignment by placing a straight-edge across the two couplings flanges and measuring the maximum offset at various points around the coupling. If the maximum offset exceeds the figure shown under Parallel in the table, realign the shaft.

3. Check angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure shown under Angular in the table. If a correction is necessary, be sure to recheck the parallel alignment.

4. If the coupling employs the two-piece sleeve with the wire ring, force the ring intomits groove in the center of the sleeve. It may be necessary to pry the ring into position with a blunt screw-driver.

5. Install coupling guardsper OSHA requirements.

**** Caution: Coupling sleeves may be thrown from the coupling assembly with substantial force when the coupling is subjected to a severe shock load or abuse.****

MAXIMUM RPM AND ALLOWABLE MISALIGNMENT (DIMENSIONS IN INCHES)

		TYPES: JE, JN, JNS, E & N			TYPES: H & HS		
SLEEVE SIZES	MAX. RPM	PARALLEL	ANGULAR	Y	PARALLEL	ANGULAR	Y
3	9200	0.010	0.035	1.188	------	------	------
4	7600	0.010	0.043	1.500	------	------	------
5	7600	0.015	0.056	1.938	------	------	------
6	6000	0.015	0.070	2.375	0.010	0.016	2.375
7	5250	0.020	0.081	2.563	0.012	0.020	2.563
8	4500	0.020	0.094	2.938	0.015	0.025	2.938
9	3750	0.025	0.109	3.500	0.017	0.028	3.500
10	3600	0.025	0.128	4.063	0.020	0.032	4.063
11	3600	0.032	0.151	4.875	0.022	0.037	4.875
12	2800	0.032	0.175	5.688	0.025	0.042	5.688
13	2400	0.040	0.195	6.688	0.030	0.050	6.625
14	2200	0.045	0.242	7.750	0.035	0.060	7.750
16	1500	0.062	0.330	10.250	------	------	------

RENEWAL PARTS

The service for which centrifugal pump is used will determine, to a great extent, the minimum number of spare parts that should be carried in stock at the installation site (see details pages 15 to 26). The minimum for any centrifugal pump should include:

- One set of wearing rings
- One set of shaft sleeves (or a shaft if no sleeves are used)
- One set of bearings
- Sufficient stock of spare packing or mechanical seal
- Material for gasket

When ordering spare or repair parts, always give pump serial number and full description of part(s) required.

WARRANTY

FLO FAB pumps are guaranteed against defective workmanship and material for a period of twelve months from date of shipment from Manufacturing Plant. Should the pump fail within this warranty period, our responsibility is limited to the repair or replacement of defective parts, provided such are returned to our Plant, transportation prepaid. We do not accept liability for damage or break-down from causes beyond our control, or the result of reasonable wear nor for repair made, or attempted to be made without prior sanction, nor for any consequential damage resulting from the failure of a pump. The customer will assume all labour charges incurred in making the replacement or adjustment of the parts.

PLEASE NOTE THAT THERE IS **NO GUARANTEE** ON MECHANICAL SHAFT SEALS.

TROUBLE CHART

(SEE **KEY** IN THE NEXT PAGE)

SYMPTOMS	POSSIBLE CAUSES
Pump does not deliver water	1, 2, 3, 4, 6, 11, 14, 16, 17, 22, 23
Insufficient capacity delivered	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 17, 20, 22, 23, 29, 30, 31
Insufficient pressure developed	5, 14, 16, 18, 19, 20, 23, 24, 26, 27, 29, 33, 34, 37
Pump loses prime after starting	2, 3, 5, 6, 7, 8, 11, 12, 13
Pump requires excessive power	15, 16, 18, 19, 20, 23, 24, 26, 27, 29, 33, 34, 37
Stuffing box leaks excessively	24, 26, 32, 33, 34, 35, 36, 38, 39, 40
Packing has short life	12, 13, 24, 26, 28, 32, 33, 34, 35, 36, 37, 38, 39, 40
Pump vibrates or is noisy	2, 3, 4, 9, 10, 11, 21, 23, 24, 25, 26, 27, 28, 30, 35, 36, 41, 42, 43, 44, 45, 46, 47
Bearings have short life	24, 26, 27, 28, 35, 36, 41, 42, 43, 44, 45, 46, 47
Pump overheats and seizes	1, 4, 21, 22, 24, 27, 28, 35, 36, 41

KEY

SUCTION TROUBLES

1. Pump not primed.
2. Pump or suction pipe not completely filled with liquid.
3. Suction lift too high.
4. Insufficient margin between suction pressure and vapor pressure (available NPSH too low).
5. Excessive amount of air or gas in liquid.
6. Air pocket in suction line.
7. Air leakage into suction line.
8. Air leakage into pump through stuffing boxes.
9. Foot valve too small.
10. Foot valve partially clogged.
11. Inlet of suction pipe insufficiently submerged.
12. Water seal pipe plugged.
13. Seal cage improperly located in stuffing box, preventing sealing fluid entering space to form the seal.

SYSTEM TROUBLES

14. Speed too low.
15. Speed too high.
16. Wrong direction of rotation.
17. Total head of system higher than pump design head.
18. Total head of system lower than pump design head.
19. Specific gravity of liquid different than design.
20. Viscosity of liquid differs from that for which designed.
21. Operation at very low capacity.
22. Parallel operation of pumps unsuitable for such operation.

MECHANICAL TROUBLES

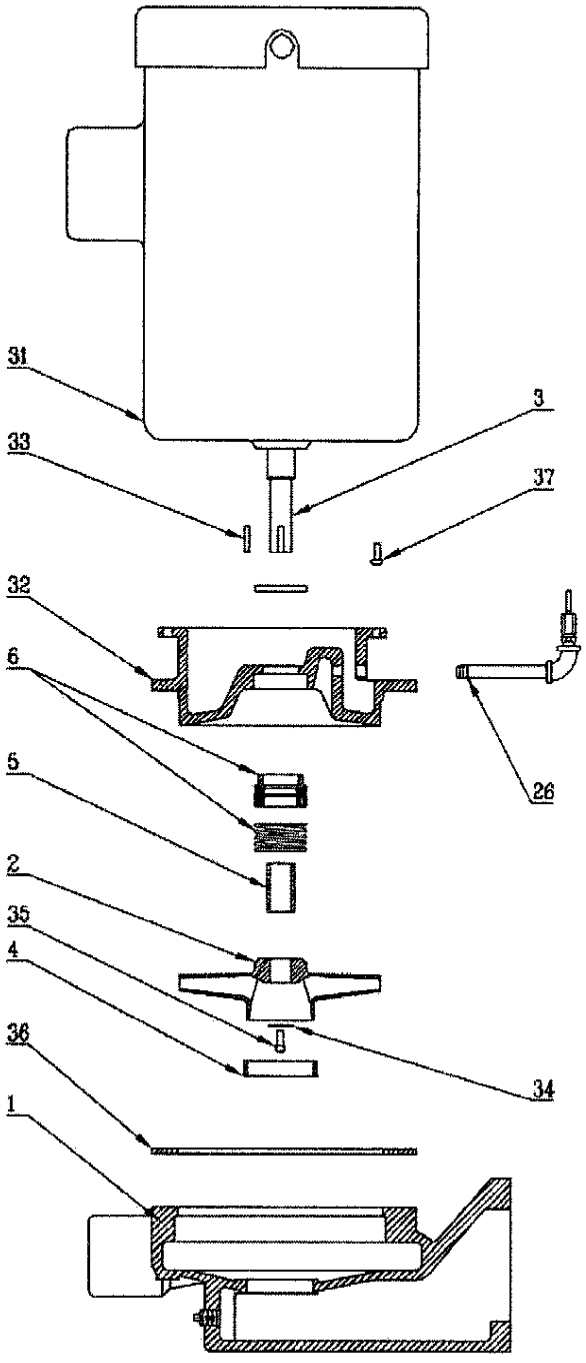
23. Foreign matter in impeller.
24. Misalignment.
25. Foundation not rigid.
26. Shaft bent.
27. Rotating part rubbing on stationary part.
28. Bearing worn.
29. Wearing rings worn.
30. Impeller damaged.
31. Casing gasket defective, permitting internal leakage.
32. Shaft or shaft sleeves worn or scored at the packing.
33. Packing improperly installed.
34. Incorrect type of packing for operation conditions.
35. Shaft running off-center due to worn bearings or misalignment.
36. Rotor out of balance resulting in vibration.
37. Gland too tight, resulting in no flow of liquid to packing.
38. Failure to provide cooling liquid to water-cooled stuffing boxes.
39. Excessive clearance at bottom of stuffing box between shaft and casing, causing packing to be forced into pump interior.
40. Dirt or grit in sealing liquid, leading to scoring of shaft or shaft sleeve.
41. Excessive thrust caused by a mechanical failure inside the pump or by the failure of the hydraulic balancing device, if any.
42. Excessive amount of grease or oil in the housing of an antifriction bearing or lack of cooling, causing excessive bearing temperature.
43. Lack of lubrications.
44. Improper installation of antifriction bearings (damage during assembly).
45. Dirt getting into bearings.
46. Rusting of bearings due to water getting into housing.
47. Excessive cooling of water-cooled bearing resulting in condensation in the bearing housing of moisture from the atmosphere.

PARTS LIST FOR GV TYPE PUMPS

CVC SERIES

VERTICAL CENTRIFUGAL PUMP PARTS LIST		
**	Part Number	Description
	1	Volute casing
x	2	Impeller
x	3	Pump shaft
x	4	Casing wear ring
x	5	Shaft sleeve
x	6	Mechanical seat
	26	Sealing flush pipe
	31	Motor
	32	Bracket
	33	Motor shaft key
	34	Impeller washer
x	35	Impeller bolt
x	36	Casing gasket
	37	Motor bolt
	49	Water slinger

** Recommended Spare Parts



Serial #: _____ Model: _____ ID.: _____

CHECK-UP CHART

This Check-Up Chart has been put at your disposal for regular verification of your pump(s). Indicate the date of the verification and also the name of the person that inspected it. It is recommended to inspect the pump regularly, since it could avoid serious failures.

Thank you .

Date:	Done by:	INITIALS:	Date:	Done by:	INITIALS:

Date:	Done by:	INITIALS:	Date:	Done by:	INITIALS:

UQK float ball liquid level controller

BUQK-01

UQK-02

UQK-03

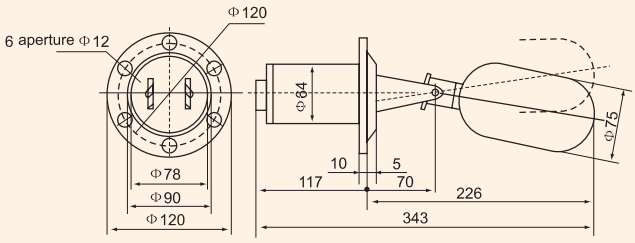
Application Description

The controller is suitable for controlling the position of liquid in open or pressurized container by the process of manufacturing. When liquid position reach to its limtits,the contact of relay will be used as the alam equipment or the swich of electricl pump.

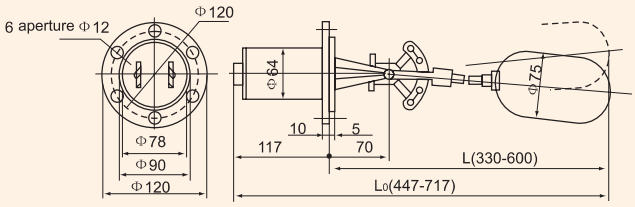
Main Technology Data

Type	UQK–01	UQK–02	UQK–03	BUQK–01	BUQK–02	BUQK–03
Explodeproof grade						
MpaMediea pressure	1Mpa	1Mpa	1Mpa	1Mpa	1Mpa	1Mpa
Mediea temperature ℃	150℃					
activity ambit (mm)	10	25 ~ 550	8 ~ 1000	10	25 ~ 550	8 ~ 1000
Adjust model	can't tune up	be step tune up	no step tune up	can't tune up	be step tune up	no step tune up
Install model	level	level	plumb	level	level	plumb
Power and the outlet volume	AC 220V 220VA DC 100 150VA					

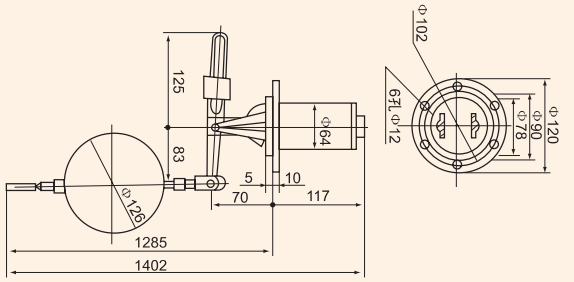
Overall Dimendions



UQK-01



UQK-02



UQK-03

SQUARE D
Instruction Bulletin

Reference No. 9037-891
Bulletin No. 65013-013-90C
Raleigh NC, USA, April, 1995
Supersedes 65013-013-90B dated 10/94

Closed Tank Float Switch
Class 9037 Type HG, Series A

INTRODUCTION

This document contains installation, operation, adjustment and parts replacement information for Class 9037 Type HG Series A Closed Tank Float Switches. These float switches are used to automatically control the liquid level in closed tanks.

⚠CAUTION

EQUIPMENT DAMAGE HAZARD.

Remove shipping bracket from mounting plate before installing switch.

Failure to observe this precaution can result in equipment damage.

EXCESSIVE PRESSURE.

Avoid using the float switch where pressure within the closed tank exceeds 50 psi.

Failure to observe this precaution can result in seal leakage and equipment damage.

MOUNTING

To mount the float switch (refer to Figure 1):

1. The float switch is shipped with a bracket attached to the mounting plate. This bracket prevents the float and rod from moving in the tank during shipment. Remove and discard this clearly-marked shipping bracket before installing the float switch.
2. Loosen the nut (item C) so that the 2-1/2 inch I.P.S. threaded fitting (item D) rotates freely in the switch bracket.
3. Mount the float switch by screwing the threaded fitting directly to the tank.
4. Tighten the threaded fitting so no fluid from the tank leaks past the threads.
5. Rotate the switch case until it is horizontal and tighten the nut.

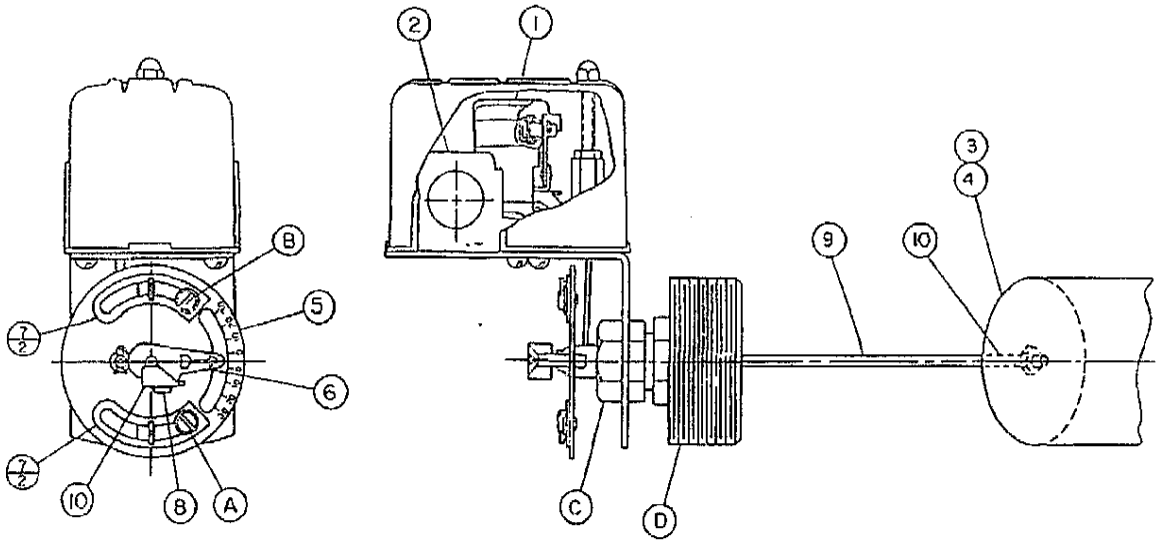


Figure 1 Class 9037 Type HG Series A Float Switch

ENCLOSURE RATING

NEMA 1 enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment in locations where unusual service conditions do not exist.

ADJUSTMENT

⚠ DANGER

HAZARDOUS VOLTAGE.

Disconnect all power before working on equipment.

Failure to observe this precaution will result in severe injury or death.

Float switches are shipped from the factory set for a specified float travel. Some adjustment of float travel can be made in the field. Float travel is adjusted by moving one or both of the adjusting strips (item 7 in Figure 1), held in place by screws (items A and B).

To change the upper limit of float travel:

1. Loosen screw (item B).
2. Move the upper adjusting strip (item 7) clockwise to reduce the upper limit or counter-clockwise to increase the upper limit.
3. Tighten the screw (item B).

To change the lower limit of float travel:

1. Loosen screw (item A).
2. Move the lower adjusting strip (item 7) counter-clockwise to reduce the lower limit or clockwise to increase the lower limit.
3. Tighten the screw (item A).

Reverse Action

Standard float switches are shipped from the factory with the float and link positioned for contacts to close on liquid rise. Form R float switches are shipped with the float and operating link positioned for contacts to open on liquid rise. To reverse the switch action, relocate the operating link to the opposite slot in the base plate and to the corresponding hole in the adjusting plate (refer to Figure 2).

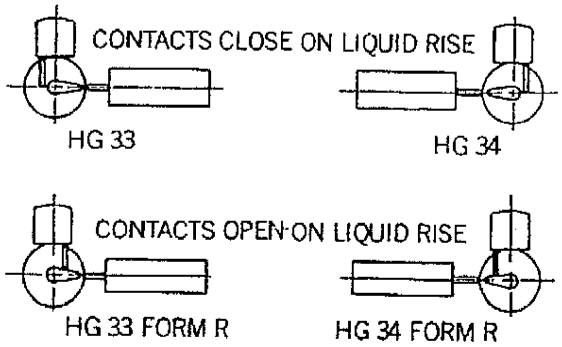


Figure 2 Float and Link Positions

MOTOR PROTECTION

This type of float switch does not provide motor protection but is frequently used as a pilot to operate a motor protective starter. For more information on the complete line of motor protective switches, contact your local Square D Sales Office.

WIRING AND ELECTRICAL RATINGS

Figure 3 shows typical single phase and polyphase wiring diagrams for the float switch. The switch contact control circuit has an A600 rating. Horsepower ratings for the switch contacts are listed in Table 1.

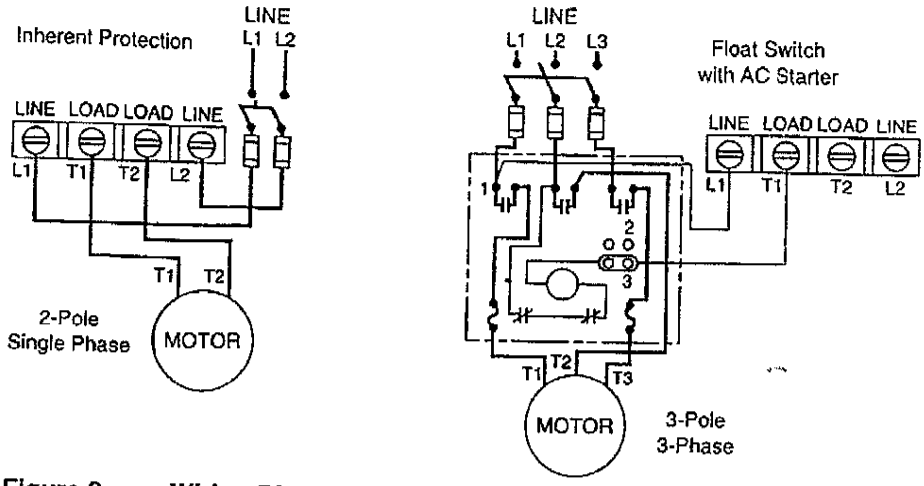


Figure 3 Wiring Diagrams

Table 1 Switch Contact Horsepower Ratings

Voltage	Horsepower Ratings		
	Single Phase AC	Polyphase AC	DC
115	2 hp	3 hp	1/2 hp
230	3 hp	5 hp	1/2 hp
460/575	—	1 hp	—
32	—	—	1/4 hp

REPLACEMENT PARTS

Replacement parts for the Class 9037 Type HG Float Switch are listed in Table 1. For parts locations, see Figure 1 on page 1. When ordering parts, always give Class, Type and Form of switch.

Table 1 Replacement Parts

Item No.	Description			Quan.	Part No.
1	Set of Moveable and Stationary Contacts			2	9998 PC-242
2	Switch Mechanism[1]			1	65079-502-51
3	Float (304 SS)			1	9049 HF3
4	Float (316 SS)			1	9049 HF4
5	Adjusting Plate Assembly			1	2810-D7-G1
6	Operating Lever			1	2810-C4-X2
7	Adjusting Strip			2	2810-X8
8	Screw			1	21911-14161
9	Connector and Rod Assy.	45°	—	1	2810-C3-G9
		90° Offset	3"	1	2810-C3-G15
		90° Offset	4-1/4"	1	2810-C3-G19
		90° Offset	5"	1	2810-C3-G18
		90° Offset	7"	1	2810-C3-G6
10	Clamp			1	2810-D4-X1
—	Seal and Installation Kit (BUNA-N)			1	9998 PC-337
—	Seal and Installation Kit (VITON®)			1	9998 PC-338

[1] Orders for mechanisms must show Class and Type so nameplate on replacement can be correctly stamped.

FLO FAB

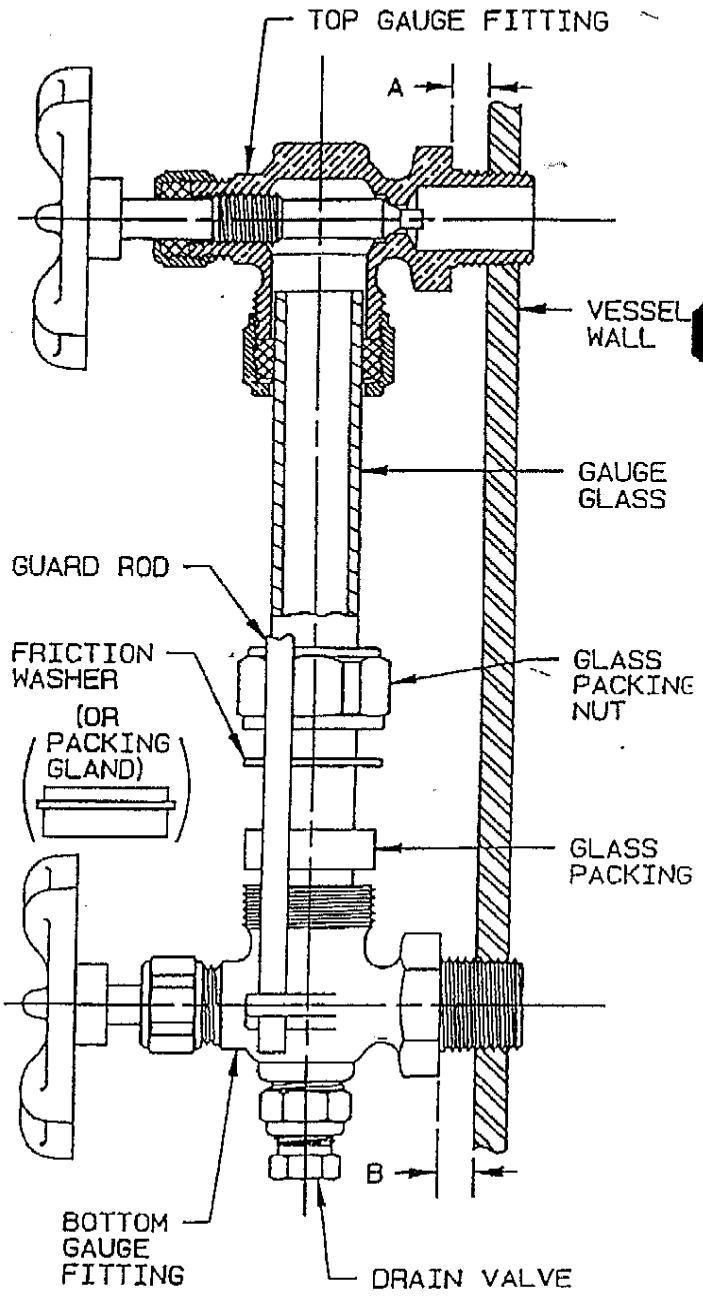
CUSTOM CONDENSATE RETURN UNIT
TYPE "CVC"

WATER GAUGE & GAUGE GLASS INSTALLATION INSTRUCTIONS

INSTALLATION

Only properly trained personnel should install and maintain water gauge glass and connections. Remember to wear safety gloves and glasses during installation. Before installing, make sure all parts are free of chips and debris.

1. Apply Teflon tape or pipe dope to pipe threads. Install top gauge fitting (fitting without a drain valve) into the uppermost tapping. Wrench tighten the fitting until it is snug and the glass outlet is pointing at five o'clock (about 1/8 turn from its final downward vertical position).
2. Install the bottom gauge fitting (the fitting with a drain valve) until it is snug and the glass outlet is pointing directly upward. Verify top and bottom fittings are threaded into the tappings the same number of turns (distance A=distance B).
3. Remove glass packing nut, friction washer (or packing gland, depending upon the model), and glass packing from the fittings, and place them, in the same order, on to both ends of the gauge glass. Push both packings about an inch up the gauge glass.
4. Gently insert one end of the glass into the top gauge fitting. Keeping the glass inside the top fitting, gently rotate the top gauge fitting clockwise until vertically aligned with the bottom gauge fitting, then insert glass into bottom fitting until glass bottoms out on the shoulder inside the bottom fitting.
5. Carefully raise glass bout 1/16" and slide lower glass packing down until the glass packing contacts the lower gauge fitting. DO NOT allow the metal to remain in contact with any metal!
6. Carefully slide upper glass packing up as far as possible.
7. Hand tighten both glass packing nuts, then tighten 1/2 turn more by wrench. Tighten only enough to prevent leakage. DO NOT OVER TIGHTEN! If any leakage should occur, tighten slightly, a quarter turn at a time, checking for leakage after each turn.



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