ITT

Residential Water

Goulds Pumps

5" and Larger Submersible Pump

Installation and Operation Instructions

GOULDS PUMPS

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

Table of Contents

Owner's Information

Pump Model Number: _____

Pump Serial Number: _____

Motor Model Number: _____

Motor Serial Number: _____

Dealer: _____

_____

Dealer Telephone: _____

Purchase Date: _____

Installation Date: _____

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.

This is a **SAFETY ALERT SYMBOL**. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

Important notice: Read safety instructions before proceeding with any wiring

⚠ WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void manufacturer's warranty.

⚠ WARNING Standard units are designed to pump potable water from wells and storage tanks. They are not designed for use in swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist. Well must be vented per local codes.

Only pumps specifically Listed for Class 1, Division 1 are allowable in hazardous liquids and where flammable gases may exist. *See specific pump catalog bulletins or pump nameplate for all agency Listings*.

⚠ WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment. Many pumps are equipped with automatic thermal overload protection which may allow an overheated pump to restart unexpectedly.

⚠ WARNING Do not lift, carry or hang pump by the electrical cables. Damage to the Electrical Cables can cause shock, burns or death.

⚠ WARNING Use only stranded copper wire to pump/motor and ground. The ground wire must be at least as large as the power supply wires. Wires should be color coded for ease of maintenance and troubleshooting.

⚠ DANGER Install wire and ground according to the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes.

⚠ WARNING Install an all leg disconnect switch where required by code.

⚠ WARNING The electrical supply voltage and phase must match all equipment requirements. Incorrect voltage or phase can cause fire, motor and control damage, and voids the warranty.

⚠ CAUTION All three phase (3Ø) controls for submersible pumps must provide Class 10, quick-trip, overload protection.

⚠ WARNING All splices must be waterproof. If using splice kits follow manufacturer's instructions.

⚠ WARNING Select the correct type and NEMA grade junction box for the application and location. The junction box must insure dry, safe wiring connections.

⚠ WARNING Failure to permanently ground the pump, motor and controls before connecting to power can cause shock, burns or death.

⚠ WARNING Insure proper motor cooling, see Table 3, minimum flow rates chart in Technical Section.

⚠ CAUTION This pump has been evaluated for use with Water Only.

⚠ DANGER Never over pressurize a storage tank to a pressure higher than the tank's maximum pressure rating. This will damage the tank, voids the warranty and may create a serious hazard.

1.0 PREPARING FOR INSTALLATION

The well should be developed (cleaned) and disinfected before the pump is installed.

Write the pump model number, pump serial number and motor serial number in the space provided in this Installation and Operation Manual (IOM). Leave the completed IOM attached to the tank or control box in a dry area or give it to the owner. Attach your business card.

Verify that motor voltage, control voltage, coil voltage (3 phase starters) and power supply voltage match. Electrical installation must be performed by qualified personnel.

Inspect all components for shipping damage and insure that you have all the components that are required: Pump Water End, Motor, 1Ø Motor Control Box or 3Ø Starter with Overloads, Pressure Tank, Pressure Switch, Copper Wire, Pressure Relief Valve (if required), Torque Arrestor (if required), Pipe and Fittings.

2.0 MECHANICAL ASSEMBLY – Pump and Piping

2.1 Typical Systems

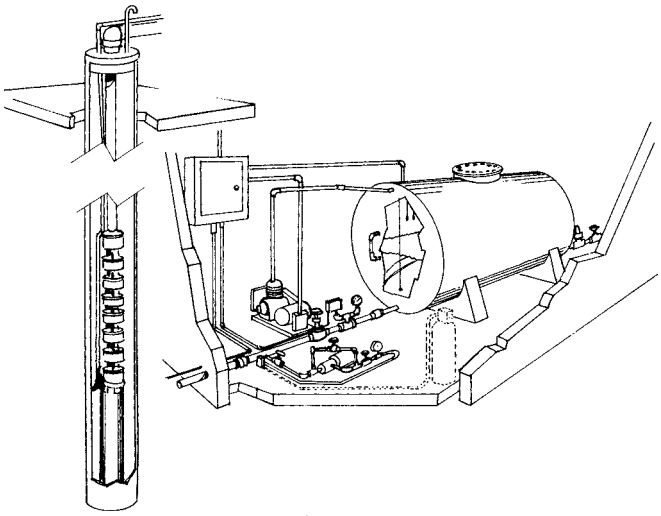


Figure 1

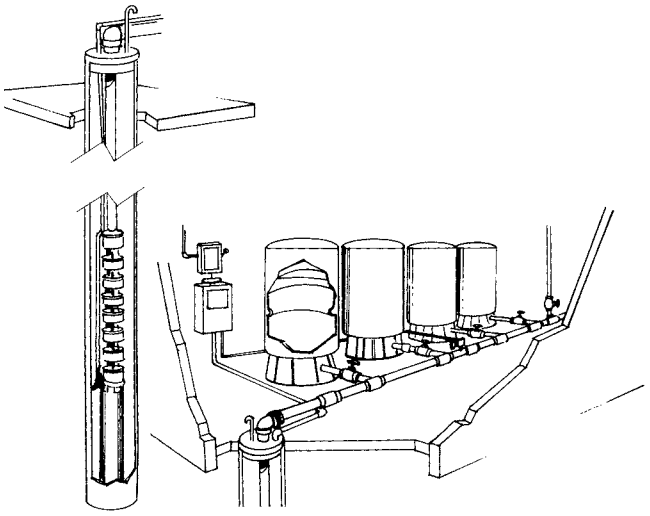
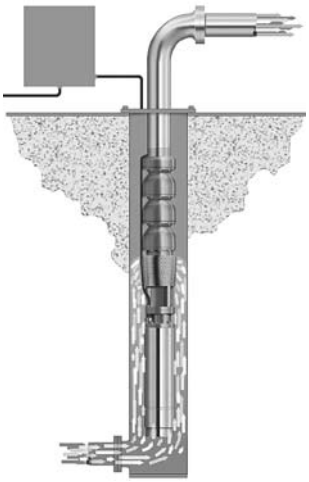
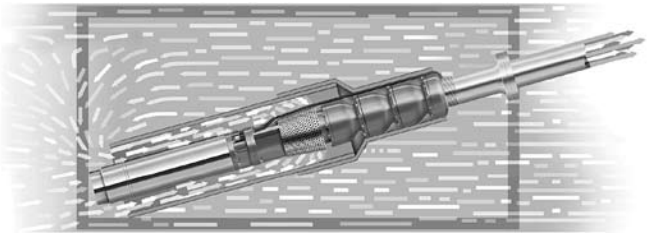


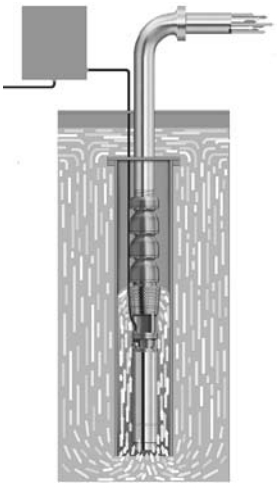
Figure 2



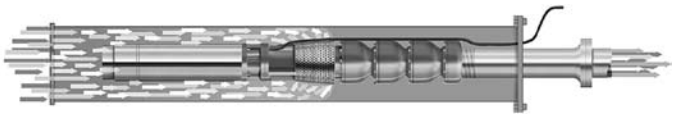
Pump in "Can"
Figure 3



Pump with Flow Sleeve in Tank
Figure 4



Pump with Flow Sleeve in Large Diameter Well
Figure 5



Horizontal Pump in "Can"
Figure 6

2.2 Assemble Pump End to Motor

Under no circumstance should the pump be run dry. Doing so may damage internal parts. We suggest you check the rotation on a three phase motor before assembling it to the water end (pump). All 4" and 6" single phase motors should rotate counterclockwise when viewed from the shaft end. Rotation on three phase motors should match pump specifications. Due to the high-starting torque the motor should be secured in such a way as not to damage the motor but to hold the motor from spinning.

Remove the cable guard from the pump (water end). Install the motor shaft sand slinger if included with the water end in the motor mounting hardware package. Attach the water end to the motor. Align the wires in the cable guard and reinstall it to the water end.

2.3 Install Check Valve(s)

Discharge heads are threaded with NPT pipe threads. All models, without built-in check valves, require a spring loaded check valve within 25' (7.5m) of the pump discharge and below the drawdown level of the water supply. Motor manufacturers recommend additional check valves every 200' to 250' (70m) in the vertical discharge line. Check valves are used to hold pressure in the system and to prevent backspin, water hammer and upthrust.

Backspin is allowing water to flow back through the pump to drain the system. It causes the impellers and motor rotor to rotate in a reverse direction. This can cause premature thrust bearing wear and if the motor starts during backspin the shaft can be twisted or broken.

Water Hammer occurs when the lowest check valve is more than 30' above the standing water level or the lower check valve leaks and the check valve above holds. This creates a partial vacuum (void) in the discharge piping. On the next start, water moving at a very high velocity fills the void and strikes the closed check valve and the stationary water in the pipe above it, causing a hydraulic shock. This shock (water hammer) can split pipes, break joints, and damage the pump and motor. Water hammer is an easily detected noise. When discovered the pump should be immediately shut down and the installer contacted to resolve the problem.

Upthrust is an upward movement of the impellers and motor shaft. It is caused by starting the pump at zero head due to no check valve or a leaking check valve; or very low system head due to a high static water level. Repeated upthrust can cause premature failure of either or both the pump and the motor. *See 4.2*

2.4 Installing Pump in Well

If you are using a torque arrestor, install it per the manufacturer's installation instructions. On top feeding wells or large diameter wells where water velocity will not cool the motor properly install a flow sleeve over the pump. *See Table 3 – Required Cooling Flow.*

Connect the discharge pipe to the pump discharge head. Submersible pumps are capable of very high discharge pressures, consult with your pipe supplier to determine the best pipe material and schedule for each installation.

Lower the pump into the well. Set the pump at least 10' off the bottom but above the screens. Protect the wires from chafing on the well casing. Install a pitless adapter or similar device at the wellhead. Consult the fitting manufacturer or pitless supplier for specific installation instructions.

Using waterproof electrical tape, or wire ties, fasten the wires to the drop pipe at 10' intervals. Make sure that the tape does not loosen as it will block the pump suction if it falls down the well.

2.5 Pressure Relief Valve

Pressure relief valves are mandatory (required) on any system that is capable of producing over 100 psi or 230' TDH. In an area where a water leak or blow-off may damage property connect a drain line to the pressure relief valve. Run it to a suitable drain or an area where the water will not damage property.

2.6 Pressure Tank and Pressure Switch (when used)

The pressure switch should be located at the tank cross tee on a single tank and as close to the center as possible on multiple tank installations. Multiple tank installations should have a manifold pipe 1½ to 2 times the size of the supply pipe from the pump. This is to reduce the friction head loss or pressure differential in the manifold. Excessive losses could cause switch chatter. There should be no filters, or high loss fittings between the switch and the tank(s). Wide open gate valves are allowed between the tank and switch.

2.7 Adjusting Tank Pre-Charge (when used)

Insure that the tank is empty of water. Use a high quality pressure gauge to check the tank pre-charge pressure. The pressure should be 2 psi below the pump cut-in (turn on) pressure. As an example, a 30-50 psi system would use a tank pre-charge of 28 psi.

Select an area where the temperature is above 34° F in which to install the tank, pressure switch, and pressure relief valve. The tank should be located in an area where a leak will not damage property.

3.0 ELECTRICAL INSTRUCTIONS

3.1 General

Note: Do not power the unit or run the pump until all electrical and plumbing connections are completed and the pump is filled with water.

Always follow the National Electric Code (N.E.C.) in the U.S., or the Canadian Electrical Code in Canada, as well as all state, provincial, or local codes.

All electrical work must be performed by qualified personnel. Some local laws require installation by only "licensed installers".

We suggest using only copper wire. Size wire from the charts found in our ITT MAID, Motor Application & Installation Manual, or an N.E.C.(National Electric Code) manual. If discrepancies exist the N.E.C. in the U.S., and in Canada the Canadian Electrical Code prevails.

3.2 Splice Drop Cable to Motor Leads

When the drop cable must be spliced or connected to the motor leads it is necessary that the splice be watertight. The splice can be done with heat shrink kits, compression fittings, or waterproof tape. Match motor leads and drop cable by color codes or identify drop cable wires to insure a proper connection at the control box.

A. Heat Shrink Splice Instructions

To use a typical heat shrink kit: strip ½" from the motor wires and drop cable wires, it is best to stagger the splices. Place the heat shrink tubes on the wires. Place the crimps on the wires and crimp the ends. Slide the heat shrink tubes over the crimps and heat from the center outward. The sealant and adhesive will ooze out the ends when the tube shrinks. The tube, crimps, sealant, and adhesive create a very strong, watertight seal. Overheating may burn the heat shrink tubes.

B. Taped Splice Instructions

1) Strip individual conductor of insulation only as far as necessary to provide room for a stake type connector. Tubular connectors of the staked type are preferred. If connector O.D. is not as large as cable insulation, build-up with rubber electrical tape.

2) Tape individual joints with rubber electrical tape, using two layers; the first extending two inches beyond each end of the conductor insulation end, the second layer two inches beyond the ends of the first layer. Wrap tightly, eliminating air spaces as much as possible.

3) Tape over the rubber electrical tape with #33 Scotch electrical tape, or equivalent, using two layers as in step "B" and making each layer overlap the end of the preceding layer by at least two inches.

C. Compression Splice Kits

Consult instructions supplied with compression splice kits or consult your local supplier.

3.3 Mounting the Motor Control Box

Single phase 3-wire control boxes are suitable for vertical mounting in indoor or outdoor locations. They will operate at temperatures between 14ºF (-10º C) and 122º F (50º C). Select a shaded, dry place to mount the box. Insure that there is enough clearance for the cover to be removed.

3.4 Verify Voltage

Insure that motor nameplate voltage and power supply voltage are the same. Three-phase starter coils are very voltage sensitive, always verify actual supply voltage with a voltmeter. High or low voltage will damage motors and controls and is not covered under warranty.

3.5 Turn Supply Power Off

Use a disconnect switch where required by code. Turn the circuit breaker OFF and lock-out the disconnect switch in the OFF position to prevent accidentally starting the pump before you are ready.

3.6 Make Connection to Single Phase (1Ø) Control Box or Three Phase (3Ø) Starter

⚠ DANGER

Do not power the unit or run the pump until all electrical and plumbing connections are completed. Exception – to verify 3 phase motor rotation, it is acceptable to power the motor before it is attached to the water end to verify correct rotation. After checking rotation lock-out disconnect or circuit breaker in OFF position!

Verify that the disconnect or breaker is OFF before making any connections to the power supply. Always follow the National Electric Code (N.E.C.) in the U.S., or the Canadian Electrical Code in Canada, as well as all state, provincial, or local codes.

A. Single Phase (1Ø) Three-Wire Control Box Wiring

⚠ CAUTION

Connect the color coded motor leads to the motor control box terminals –
Y (yellow), R (red), and B (black); and the Green or bare wire to the green ground screw.

Connect wires between the Load terminals on the pressure switch and control box terminals L1 and L2. Run a ground wire between the switch ground and the control box ground. *See Fig. 7 or 8*

B. Three Phase (3Ø) Starter Wiring

⚠ CAUTION

Connect the motor leads to T1, T2, and T3 on the 3 phase starter. Connect the ground wire to the ground screw in the starter box. Follow starter manufacturers instructions for connecting pressure switch (where used) to starter. *See Fig. 9 or 10*

3.7 Make Power Supply Connection

⚠ CAUTION

Provide a separate fused or circuit breaker protected branch circuit for the pump. Install a main disconnect switch in full view and easily accessible from the pressure switch and tank location.

Single phase:
With pressure switch – make the connection from the pressure switch Line terminals to the disconnect switch (where used) and then to the circuit breaker panel.

Without pressure switch – make the connection from the control box L1 and L2 terminals to the disconnect switch (where used) and then to the circuit breaker panel.

Three phase - make the connections between L1, L2, L3, and ground on the starter to the disconnect switch and then to the circuit breaker panel.

Three phase submersible motors require Class 10 Quick-Trip overload protection. Use Furnas Class 14 NEMA starters with ESP100 adjustable Class 10 overloads. You can also use Furnas Class 16 starters with ambient compensated "K" heaters (overloads) which you install in the starter. "K" heaters must be purchased separately. Consult the ITT MAID or F.E. AIM manual for other acceptable overload protection devices.

Note: when replacing a line shaft turbine or other above ground pump with a submersible you must change the Class 20 overloads in the starter to Class 10 quick-trip's for proper motor overload protection. Use of Class 20 overloads voids the submersible motor warranty.

Three phase installations must be checked for motor rotation and phase unbalance. To reverse motor rotation switch (reverse) any two power leads. See the instructions for checking three phase unbalance in the Technical Section of this manual. Failure to check and correct three phase unbalance can cause premature motor failure and nuisance overload tripping.

4.0 OPERATE PUMP

4.1 Throttling Discharge on Start-Up

If the pump will be started or operated with an "open" discharge you must throttle the discharge before start-up. Install a ball, globe, or Cla-valve® in the discharge line. Open the valve to approximately ⅓ open on system start-up. This will prevent upthrust damage to the pump and motor bearings. You can open the valve when you get a good steady stream of water. Do not exceed the maximum operating range in gpm shown on the pump curve. If you do not know the maximum gpm for the pump, call the distributor who sold you the pump. Starting or running a pump with little or no head is a major cause of premature failure.

4.2 Throttling a High Static Level Well to Prevent Upthrust

A high static water level well may allow a pump to operate off the right side of the curve or outside the "Recommended Range" shown on the pump curve. We recommend using a "Dole®" flow restrictor or throttling the discharge with a ball valve to prevent upthrust damage to the pump and motor. The maximum flow must be within the pumps recommended operating range. If you use a ball valve, set it and remove the handle, tape the handle to the pipe. Tag the valve with a note saying, "Do not open this valve or pump may be damaged". You can set the valve by installing a pressure gauge between the well and the valve and throttling the flow/head to a value within the recommended range. You can also throttle by determining the actual flow rate, see "Determining Flow Rates" in your catalog Technical Section.

4.3 Start the Pump

Partially open a valve (boiler drain or faucet) in the system and turn the breaker to the ON position. Allow the pump to run until the water is clear. On three phase systems verify rotation, correct rotation will yield the highest flow and pressure.

Check amps and insure they are within nameplate amp range from motor data sheet or motor nameplate. Amps should be between Rated Input and Service Factor Amps. High amps may be caused by low or high voltage. Enter the amp readings in this manual along with the pump and motor model numbers and serial numbers. On all three phase systems a three phase unbalance test must be performed to insure a balanced power supply. Leave a copy of the 3Ø unbalance worksheet with this IOM at the job site for future reference.

On pressure tank/switch systems only – close the valve when the water clears and allow the pressure to build. If properly adjusted the switch should turn the pump off at the preset pressure. Open a few outlets and allow the pump to run through a few cycles. Check switch operation and verify that pressure settings are correct. Check all fittings for leaks.

On manual systems, turn the pump off.

5.0 PAPERWORK AND IOM

Please give this IOM and your business card to the owner. A sticker with your name and phone number on the tank or control box is a great sales tool for future business!

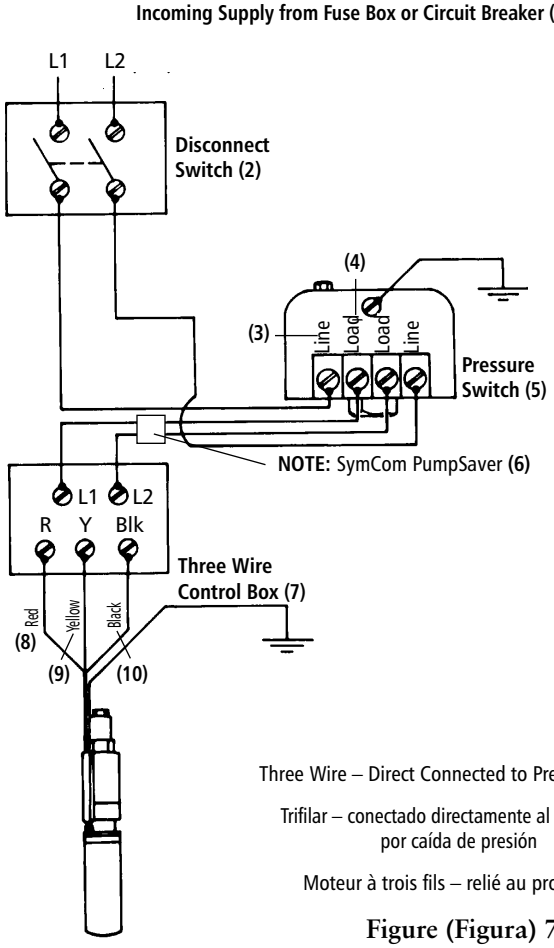
Congratulations on completing a professional installation of a submersible pump.

6.0 ACCESSORIES

Pressure Tanks
Tanks should be sized to allow pumps over two (2) hp to run at least 2 minutes. If the pump averages 80 GPM it requires tanks to provide a 160 gallon "drawdown". See your Water Products catalog for pressure tank data.

Low Water Protection
A low yield well should have low water protection added to the system. Contact your distributor for information on SymCom low water protection devices.

Electrical Panels
Customer Service will quote custom pump control panels. Please send written panel specifications to your authorized distributor. They will forward it to the Customer Service Group that supports their product line. Written specifications should include pump HP, Voltage, Phase, desired NEMA enclosure type, sequence of operation, special options needed, and a brief statement describing any special logic for alarms, timers, or duplexing features. The name and number of a contact person to answer questions is also appreciated and will speed your quote.

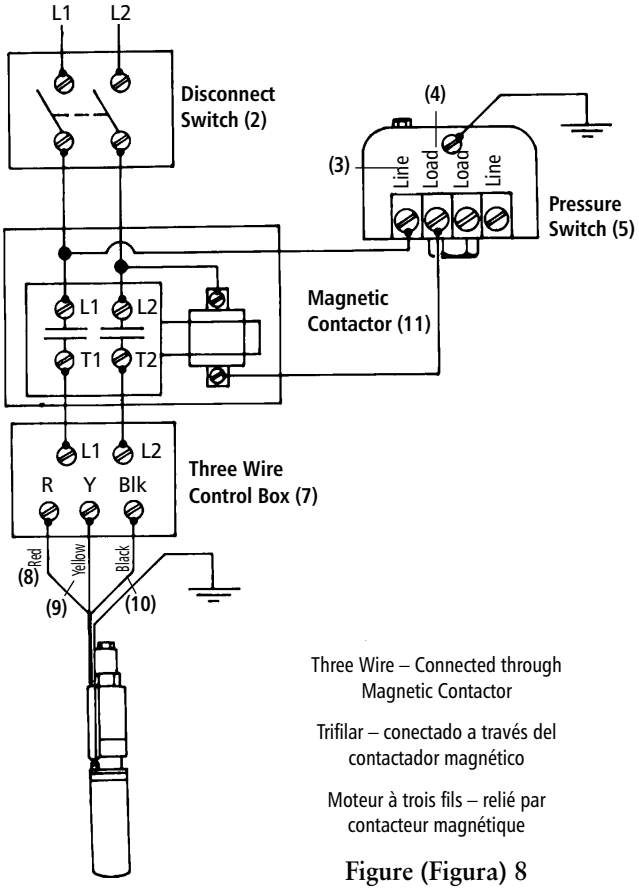


Three Wire – Direct Connected to Pressure Switch

Trifilar – conectado directamente al interruptor por caída de presión

Moteur à trois fils – relié au prossostat

Figure (Figura) 7



Three Wire – Connected through Magnetic Contactor

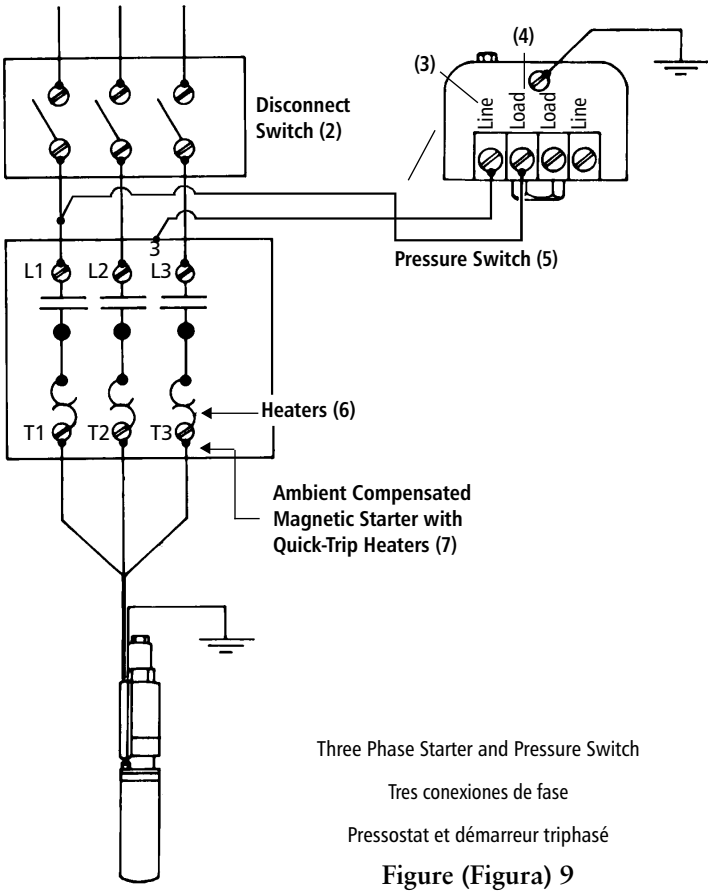
Trifilar – conectado a través del contactador magnético

Moteur à trois fils – relié par contacteur magnétique

Figure (Figura) 8

1. Suministro de entrada de la caja de fusibles o del cortacircuitos
2. Interruptor de desconexión
3. Línea
4. Carga
5. Interruptor por caída de presión
6. NOTA: PumpSaver
7. Caja de control trifilar
8. Rojo
9. Amarillo
10. Negro
11. Contactador magnético

1. Courant d'entrée provenant de la boîte à fusibles ou du disjoncteur
2. Sectionneur
3. Ligne
4. Charge
5. Pressostat
6. Protection PumpSaver
7. Boîte de commande à trois fils
8. Rouge
9. Jaune
10. Noir
11. Contacteur magnétique



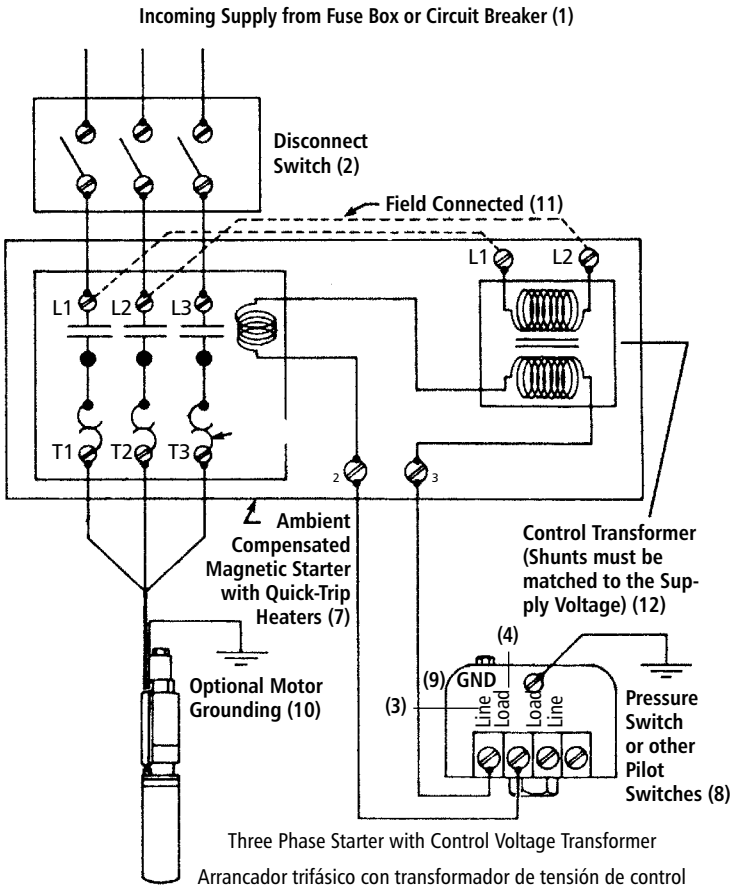
Three Phase Starter and Pressure Switch

Tres conexiones de fase

Pressostat et démarreur triphasé

Figure (Figura) 9

1. Suministro de entrada de la caja de fusibles o del cortacircuitos
2. Interruptor de desconexión
3. Línea
4. Carga
5. Interruptor por caída de presión
6. Calentadores
7. Arrancador magnético con compensación ambiental con calentadores de disparo rápido
8. Interruptor por caída de presión u otros interruptores pilotos
9. Tierra
10. Puesta a tierra opcional del motor
11. Conexión de campo
12. Transformador de control (Las derivaciones deben coincidir con la tensión de suministro)



Three Phase Starter with Control Voltage Transformer

Arrancador trifásico con transformador de tensión de control

Démarreur triphasé avec transformateur de tension de commande

Figure (Figura) 10

1. Courant d'entrée provenant de la boîte à fusibles ou du disjoncteur
2. Sectionneur
3. Ligne
4. Charge
5. Pressostat
6. Dispositifs de protection contre la surcharge (DPS)
7. Démarreur magnétique compensé (température ambiante) avec DPS à déclenchement rapide
8. Pressostat ou autre contacteur de commande
9. Terre
10. Mise à la terre optionnelle pour le moteur
11. Connexion sur place
12. Transformateur de commande (les circuits dérivés [*shunts*] doivent convenir à la tension d'alimentation)

MOTOR INSULATION RESISTANCE READINGS

Normal Ohm/Megohm readings, ALL motors, between all leads and ground

⚠CAUTION To perform insulation resistance test, open breaker and disconnect all leads from QD control box or pressure switch. Connect one ohmmeter lead to any motor lead and one to metal drop pipe or a good ground. **R x 100K Scale**

Condition of Motor and Leads	OHM Value	Megohm Value
New motor, without power cable	20,000,000 (or more)	20.0
Used motor, which can be reinstalled in well	10,000,000 (or more)	10.0
Motor in well – Readings are power cable plus motor		
New motor	2,000,000 (or more)	2.0
Motor in reasonably good condition	500,000 to 2,000,000	0.5 – 2.0
Motor which may be damaged or have damaged power cable *Do not pull motor for these reasons*	20,000 to 500,000	0.02 – 0.5
Motor definitely damaged or with damaged power cable *Pull motor and repair*	10,000 to 20,000	0.01 – 0.02
Failed motor or power cable *Pull motor and repair*	Less than 10,000	0 – 0.01

Generator Sizing

Note: Always consult the generator manufacturer when questions arise.

These sizing charts are recommendations based on motor service factor loading for typical continuous duty generators. If you need to call the generator manufacturer, be prepared to tell them the motor KVA code, the service factor amperage, locked rotor amperage, phase, hertz, motor type, etc.

You must know which type generator you have before using the charts as the required generator size varies by type. Internally regulated generators are also called self-excited. Externally regulated generators are the most common. In addition to the Kw/KVA rating, the generator frequency (Hertz, typically 60 HZ in USA) is very important when operating pumping equipment because frequency variations affect pump output in direct relation to the pump Affinity Laws. Operating under 60 hertz will reduce flow and head while operating over 60 hertz will increase flow, head, HP and amp draw and could overload the motor.

The generator should always be started before the pump/motor is started and always stop the pump/motor before shutting down the generator. Operating generators at higher elevations or using natural gas as fuel can affect performance, consult the generator manufacturer for their recommendations in these instances.

Generator Recommendations

Motor	HP	Externally Regulated		Internally Regulated	
		KW	KVA	KW	KVA
		Minimum Generator Rating			
3-Wire 1Ø and 3Ø Motors	.5	2	2.5	1.5	1.9
	.75	3	3.8	2	2.5
	1	4	5	2.5	3.2
	1.5	5	6.3	3	3.8
	2	7.5	9.4	4	5
	3	10	12.5	5	6.3
	5	15	18.8	7.5	9.4
	7.5	20	25	10	12.5
	10	30	37.5	15	18.8
	15	40	50	20	25
	20	60	75	25	31
	25	75	94	30	37.5
	30	100	125	40	50
	40	100	125	50	62.5
	50	150	188	60	75
	60	175	220	75	94
	75	250	313	100	125
	100	300	375	150	188
	125	375	469	175	219
	150	450	563	200	250
	175	525	656	250	313
	200	600	750	275	344

Transformer Capacity Required for Submersible Motors – Single or Three Phase

Distribution transformers must be adequately sized to satisfy the KVA requirements of the submersible motor. When transformers are too small to supply the load, there is a reduction in voltage to the motor.

Table 1 references the motor horsepower rating, single phase and three phase, total effective KVA required, and the smallest transformer required for open or closed three phase systems. Open systems require larger transformers since only two transformers are used.

Other loads would add directly to the KVA sizing requirements of the transformer bank.

Table 1 – Transformer Capacity

Motor HP	Total Effective KVA Required	Smallest KVA Rating – Each Transformers	
		Open WYE or DELTA 2 Transformers	Closed WYE or DELTA 3 Transformers
1½	3	2	1
2	4	2	1.5
3	5	3	2
5	7.5	5	3
7½	10	7.5	5
10	15	10	5
15	20	15	7.5
20	25	15	10
25	30	20	10
30	40	25	15
40	50	30	20
50	60	35	20
60	75	40	25
75	90	50	30
100	120	65	40
125	150	85	50
150	175	100	60
175	200	115	70
200	230	130	75

NOTE: Transformers shown are standard nominal KVA ratings. If power company experience and practice allows transformer loading higher than nominal rating under the specific operating conditions and maintains correct voltage and balance, such higher loading values may be used for transformer(s) to meet total effective KVA required.

Mounting Position

Motors are suitable for operation in mounting positions from vertical shaft up to horizontal. If 4 inch motors through 2 HP are started more than 10 times per day, it is recommended the shaft be tilted up at 15° from horizontal to minimize coast-down wear of the upthrust washer.

Frequency of Starts

The average number of starts per day over a period of months or years influences the life of a submersible pumping system. Excessive cycling affects the life of control components such as pressure switches, starters, relays and capacitors, plus splines and bearings. Rapid cycling can also cause motor overheating and winding failures.

The pump size, tank size and other controls should be selected to keep the starts per day as low as practical for longest life, based upon the maximum number of starts per 24 hour day, as shown in Table 2.

Motors over 2 HP should be allowed to run a minimum of 2 minutes to dissipate heat build up from starting current.

Table 2 – Number of Starts

Motor Rating	Maximum Starts per 24 hour day	
	Single Phase	Three Phase
½ HP through 5 HP	100	300
7½ HP through 30 HP	50	100
40 HP and over	—	100

Motor Cooling, Temperature and Time Ratings

All 4 inch CentriPro motors may be operated continuously in water up to 86° F. Optimum service life will be attained by maintaining a minimum flow rate past the motor of .25 feet per second. Use a Flow Sleeve if velocity is below the .25'/sec, if the well is top feeding or when the pump is used in a large body of water or large tank.

Six (6) inch canned design motors from 5 – 40 HP will operate in water up to 95° F (35° C), without any de-rating of horsepower, with a minimum flow rate of .5 ft./sec. past the motor. 6" – 50 HP and all 8" – 10" motors can operate in 77° F (25° C) water with .5'/sec velocity past the motor.

Table 3 – Minimum Flow Rates For Proper Motor Cooling

Well or Sleeve Diameter (inches)	3.75" Diameter 4" CP or FE Motor .25'/sec	CP = 5.5" Dia. 6" CP Motor .5'/sec.	CP = 7.52" Dia. 8" CP Motor .5'/sec.
	GPM Required		
4	1.2	–	–
5	7	–	–
6	13	7	–
7	20	23	–
8	30	41	9
10	50	85	53
12	80	139	107
14	110	198	170
16	150	276	313

Multiply gpm by .2271 for m^3/Hr.

Multiply gpm by 3.785 for l/min.

SINGLE PHASE – 60 HZ FRANKLIN ELECTRIC MOTOR DATA

Type	Goulds Model Number	Franklin Motor Model Prefix	HP	Volts	Hz	S.F.	Rated Input (2) Amps	Rated Input Watts	Maximum (S.F. Load) (2) Amps	Maximum (S.F. Load) Watts	(1) Line to Line Res. M = Main S = Start	Locked Rotor Amps	KVA Code	Inverse Time Breaker	Dual Element Time Delay Fuse	Single Phase Control Box
4 inch three wire with run cap	S09940	224302	3	230	60	1.15	Y14.0 B12.2 R4.7	3150	Y17.0 B14.5 R4.5	3650	.9-1.5M 3.0-4.9S	82.0	G	45	20	00094 or ①00094MC
	S10940	224303	5	230	60	1.15	Y23.0 B15.9 R11.0	5100	Y27.5 B19.1 R10.8	5900	.68-1.0M 1.8-2.8S	121.0	F	60	45	00104 or ①00104MC

SINGLE PHASE CENTRIPRO MOTOR DATA, 4" & 6" MOTORS

Order Number	Motor Diameter	Motor Type	HP	KW	Volts	SF	Full Load Amps	Service Factor Amps	Service Factor Watts	Locked Rotor Amps	Winding Resistance Main (Bl-Yel)	Winding Resistance Start (Red-Yel)	Required Control Box	KVACode
M15412	4"	3 Wire 1Ø	1.5	1.1	230	1.3	Y-9.7 B-9.5 R-1.4	Y-11.1 B-11.0 R-1.3	2187	47.8	1.9-2.4	7.4-9.1	CB15412CR or MC	J
M20412			2	1.5		1.25	Y-9.9 B-9.1 R-2.6	Y-12.2 B-11.7 R-2.6	2660	49.4	1.6-2.2	10.8-12.0	CB20412CR or MC	G
M30412			3	2.2		1.15	Call factory – motors will be released in Q1, 2008						CB30412CR or MC	TBD
M50412			5	3.7		1.15							CB50412CR or MC	
6M051	6"	3Ø	5	3.7	230	1.15	24	27.5	5735	124	0.512	2.172	CB05MC	G
6M071			7.5	5.5	230		36	41	8950	167	0.400	1.401	CB07MC	F
6M101			10	7.5	230		50	58	11830	202	0.316	1.052	CB10MC	E
6M151			15	11	230		72	85	18050	275	0.230	0.678	CB15MC	D

THREE PHASE – 60 HZ FRANKLIN ELECTRIC MOTOR DATA

Type	Goulds Model Number	Franklin Motor Model Prefix	HP	Volts	Hz	S.F.	Rated Input Amps	Rated Input Watts	Maximum (S.F. Load) Amps	Maximum (S.F. Load) Watts	Line to Line Res.	Locked Rotor Amps	KVA Code	Inverse Time Breaker	Dual Element Time Delay Fuse
4 inch 3450 RPM	S09978	234306	3	200	60	1.15	11.3	2980	12.4	3420	1.3-1.7	71	K	30	20
	S09970	234316	3	230	60	1.15	9.8	2980	10.8	3420	1.8-2.2	62	K	25	20
	S09975	234326	3	460	60	1.15	4.9	2980	5.4	3420	7.0-8.7	31	K	15	10
	S09979	234336	3	575	60	1.15	3.9	2980	4.3	3420	10.9-13.6	25	K	15	8
	S10978	234307	5	200	60	1.15	18.4	5050	20.4	5810	.70-.94	122	K	50	35
	S10970	234317	5	230	60	1.15	16.0	5050	17.7	5810	.93-1.2	106	K	40	30
	S10975	234327	5	460	60	1.15	8.0	5050	8.9	5810	3.6-4.4	53	K	20	15
	S10979	234337	5	575	60	1.15	6.4	5050	7.1	5810	5.6-6.9	43	K	20	15
	S119784	234308	7½	200	60	1.15	27.1	7360	29.9	8450	.46-.57	188	K	70	50
	S119704	234318	7½	230	60	1.15	23.6	7360	26.0	8450	.61-.75	164	K	60	45
	S119754	234328	7½	460	60	1.15	11.8	7360	13.0	8450	2.4-3.4	82	K	30	25
	S119794	234338	7½	575	60	1.15	9.4	7360	10.4	8450	3.5-5.1	66	K	25	20

THREE PHASE CENTRIPRO 4", 230 VOLT MOTOR DATA

Electrical Data, 60 Hertz, 3450 RPM, 4" Motors					Full Load		Service Factor		L. R. Amps	Line - Line Resistance	KVA Code
CP #	HP	kW	Volts	SF	Amps	Watts	Amps	Watts			
M10432	1.0	0.75	230	1.4	4.0	1090	4.7	1450	26.1	4.1-5.1	M
M15432	1.5	1.1		1.3	5.2	1490	6.1	1930	32.4	2.8-3.4	K
M20432 *	2	1.5		1.25	6.5	1990	7.6	2450	44.0	1.8-2.4	K
M30432 *	3	2.2		1.15	9.2	2880	10.1	3280	58.9	1.3-1.7	J
M50432 *	5	3.7		1.15	* Call factory – motors will be released in Q1, 2008						TBD
M75432 *	7.5	5.5		1.15							

THREE PHASE CENTRIPRO 6"-10", 200, 230, 460 & 575 VOLT MOTOR DATA

Order No.	HP	kW	Volts	Motor Dia. / Flange Dia.	S.F.	F. L. Amps	Service Factor		L.R. Watts	KVA Code	Line - Line Resistance	Class 14 Starter
							Amps	Amps				
6M058	5	3.7	200	6" x 6"	1.15	17.5	19.5	5610	124	K	0.618	DSFD
6M052	5	3.7	230	6" x 6"	1.15	15.0	17.0	5520	110	K	0.806	DSFC
6M054	5	3.7	460	6" x 6"	1.15	7.5	8.5	5520	55	K	3.050	DSDC
6M059	5	3.7	575	6" x 6"	1.15	6.0	6.8	5520	44	K	4.792	DSDE
6M078	7.5	5.5	200	6" x 6"	1.15	25.4	28.5	8230	158	J	0.504	ESGD
6M072	7.5	5.5	230	6" x 6"	1.15	22.0	26.0	8140	144	J	0.651	DSFC
6M074	7.5	5.5	460	6" x 6"	1.15	11.0	13.0	8140	72	J	2.430	DSEC
6M079	7.5	5.5	575	6" x 6"	1.15	8.8	10.0	8080	56	J	3.760	DSEE
6M108	10	7.5	200	6" x 6"	1.15	33.3	37.2	10700	236	K	0.315	ESGD
6M102	10	7.5	230	6" x 6"	1.15	29.0	33.0	10730	208	K	0.448	ESGC
6M104	10	7.5	460	6" x 6"	1.15	14.5	16.5	10730	104	K	1.619	DSEC
6M109	10	7.5	575	6" x 6"	1.15	11.5	13.0	10520	82	K	2.425	DSEE
6M158	15	11	200	6" x 6"	1.15	47.4	53.5	15710	347	K	0.213	GSJD
6M152	15	11	230	6" x 6"	1.15	42.0	46.0	15800	320	K	0.312	FSHC
6M154	15	11	460	6" x 6"	1.15	21.0	23.0	15800	160	K	1.074	ESFC
6M159	15	11	575	6" x 6"	1.15	17.0	19.0	15820	125	K	1.657	ESFE
6M208	20	15	200	6" x 6"	1.15	61.2	69.5	20820	431	J	0.189	HSKD
6M202	20	15	230	6" x 6"	1.15	54.0	60.0	20650	392	J	0.258	GSGC
6M204	20	15	460	6" x 6"	1.15	27.0	30.0	20650	196	J	0.861	FSHC
6M209	20	15	575	6" x 6"	1.15	22.0	24.0	20630	155	J	1.278	FSFE
6M258	25	18.5	200	6" x 6"	1.15	77.3	87.5	26190	578	K	0.146	HSKD
6M252	25	18.5	230	6" x 6"	1.15	68.0	76.0	25800	530	K	0.210	HSKC
6M254	25	18.5	460	6" x 6"	1.15	34.0	37.0	25800	265	K	0.666	FSHC
6M259	25	18.5	575	6" x 6"	1.15	28.0	31.0	25760	213	K	0.948	FSHE
6M308	30	22	200	6" x 6"	1.15	91.8	104.0	31120	674	J	0.119	ISLD
6M302	30	22	230	6" x 6"	1.15	82.0	94.0	31160	610	K	0.166	ISLC
6M304	30	22	460	6" x 6"	1.15	41.0	47.0	31160	305	K	0.554	HSJC
6M309	30	22	575	6" x 6"	1.15	32.0	36.0	31070	235	J	0.838	GSHE
6M404	40	30	460	6" x 6"	1.15	53.0	60.0	41100	340	H	0.446	HSKC
6M409	40	30	575	6" x 6"	1.15	41.3	47.1	41200	272	H	0.634	HSJE
66M504	50	37	460	6" x 6"	1.15	70.0	79.0	52380	465	J	0.388	HSKC
66M509	50	37	575	6" x 6"	1.15	56.0	63.0	52480	372	J	0.486	HSKE
86M504	50	37	460	8" x 6"	1.15	65.0	73.0	51000	435	H	0.331	HSKC
86M509	50	37	575	8" x 6"	1.15	55.0	60.0	Call factory		H	0.849	HSKE
86M604	60	45	460	8" x 6"	1.15	80.0	90.0	60900	510	H	0.278	ISLC
86M609	60	45	575	8" x 6"	1.15	62.0	69.0	Call factory		H	0.757	ISLE
8M754	75	55	460	8" x 8"	1.15	96.0	109.0	76100	650	H	0.218	ISLC
8M759	75	55	575	8" x 8"	1.15	85.0	93.0	Call factory		H	0.518	ISLE
8M1004	100	75	460	8" x 8"	1.15	127.0	145.0	101300	795	H	0.164	NA
8M1009	100	75	575	8" x 8"	1.15	110.0	120.0	Call factory		H	0.402	NA
8M1254	125	90	460	8" x 8"	1.15	160.0	180.0	126000	980	G	0.132	NA
8M1259	125	90	575	8" x 8"	1.15	130.0	144.0	Call factory		G	0.385	NA
8M1504	150	110	460	8" x 8"	1.15	195.0	220.0	152000	1060	G	0.115	NA
8M1509	150	110	575	8" x 8"	1.15	155.0	172.0	Call factory		G	0.287	NA
10M2004	200	150	460	10 " x 10"	1.15	235.0	270.0	198600	1260	F	0.0929	NA
10M2009	200	150	575	10 " x 10"	1.15	200.0	225.0	Call factory		F	0.269	NA

THREE PHASE POWER UNBALANCE

A full three phase supply consisting of three individual transformers or one three phase transformer is recommended. "Open" delta or wye connections using only two transformers can be used, but are more likely to cause poor performance, overload tripping or early motor failure due to current unbalance.

Check the current in each of the three motor leads and calculate the current unbalance as explained below.

If the current unbalance is 2% or less, leave the leads as connected.

If the current unbalance is more than 2%, current readings should be checked on each leg using each of the three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.

To calculate percent of current unbalance:

A. Add the three line amp values together.
B. Divide the sum by three, yielding average current.
C. Pick the amp value which is furthest from the average current (either high or low).
D. Determine the difference between this amp value (furthest from average) and the average.
E. Divide the difference by the average. Multiply the result by 100 to determine percent of unbalance.

Current unbalance should not exceed 5% at service factor load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the power source.

Contact your local power company to resolve the imbalance.

	Hookup 1			Hookup 2			Hookup 3		
Starter Terminals	L1	L2	L3	L1	L2	L3	L1	L2	L3
Motor Leads	R	B	Y	Y	R	B	B	Y	R
	T3	T1	T2	T2	T3	T1	T1	T2	T3
Example:	T3-R = 51 amps			T2-Y = 50 amps			T1-B = 50 amps		
	T1-B = 46 amps			T3-R = 48 amps			T2-Y = 49 amps		
	T2-Y = 53 amps			T1-B = 52 amps			T3-R = 51 amps		
	Total = 150 amps			Total = 150 amps			Total = 150 amps		
	÷ 3 = 50 amps			÷ 3 = 50 amps			÷ 3 = 50 amps		
	— 46 = 4 amps			— 48 = 2 amps			— 49 = 1 amps		
	4 ÷ 50 = .08 or **8%**			2 ÷ 50 = .04 or **4%**			1 ÷ 50 = .02 or **2%**		

Furnas Class 16 Definite Purpose starter and heater sizing; and Class 14, NEMA starter information may be found in our catalog Electrical Section and on our website, www.goulds.com.

DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE. FAILURE TO DO SO CAN CAUSE SHOCK, BURNS OR DEATH.

Symptom	Probable Cause	Recommended Action
PUMP MOTOR NOT RUNNING	1. Motor thermal protector tripped a. Incorrect control box b. Incorrect or faulty electrical connections c. Faulty thermal protector d. Low voltage e. Ambient temperature of control box/starter too high f. Pump bound by foreign matter g. Inadequate submergence	1. Allow motor to cool, thermal protector will automatically reset a – e. Have a qualified electrician inspect and repair, as required f. Pull pump, clean, adjust set depth as required g. Confirm adequate unit submergence in pumpage
	2. Open circuit breaker or blown fuse	2. Have a qualified electrician inspect and repair, as required
	3. Power source inadequate for load	3. Check supply or generator capacity
	4. Power cable insulation damage 5. Faulty power cable splice	4 – 5. Have a qualified electrician inspect and repair, as required
LITTLE OR NO LIQUID DELIVERED BY PUMP	1. Faulty or incorrectly installed check valve	1. Inspect check valve, repair as required
	2. Pump air bound	2. Successively start and stop pump until flow is delivered
	3. Lift too high for pump	3. Review unit performance, check with dealer
	4. Pump bound by foreign matter	4. Pull pump, clean, adjust set depth as required
	5. Pump not fully submerged	5. Check well recovery, lower pump if possible
	6. Well contains excessive amounts of air or gases	6. If successive starts and stops does not remedy, well contains excessive air or gases
	7. Excessive pump wear	7. Pull pump and repair as required
	8. Incorrect motor rotation – three phase only.	8. Reverse any two motor electrical leads

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Residential Water

GOULDS PUMPS LIMITED WARRANTY

This warranty applies to all water system products manufactured by Goulds Pumps.

Any part or parts found to be defective within the warranty period shall be replaced at no charge to the dealer during the warranty period. The warranty period shall exist for a period of twelve (12) months from date of installation or eighteen (18) months from date of manufacture, whichever period is shorter.

A dealer who believes that a warranty claim exists must contact the authorized Goulds Pumps distributor from whom the pump was purchased and furnish complete details regarding the claim. The distributor is authorized to adjust any warranty claims utilizing the Goulds Pumps Customer Service Department.

The warranty excludes:

(a) Labor, transportation and related costs incurred by the dealer;
(b) Reinstallation costs of repaired equipment;
(c) Reinstallation costs of replacement equipment;
(d) Consequential damages of any kind; and,
(e) Reimbursement for loss caused by interruption of service.

For purposes of this warranty, the following terms have these definitions:

(1) "Distributor" means any individual, partnership, corporation, association, or other legal relationship that stands between Goulds Pumps and the dealer in purchases, consignments or contracts for sale of the subject pumps.
(2) "Dealer" means any individual, partnership, corporation, association, or other legal relationship which engages in the business of selling or leasing pumps to customers.
(3) "Customer" means any entity who buys or leases the subject pumps from a dealer. The "customer" may mean an individual, partnership, corporation, limited liability company, association or other legal entity which may engage in any type of business.

THIS WARRANTY EXTENDS TO THE DEALER ONLY.

GOULDS PUMPS

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

IM103R02 October, 2007

Engineered for life