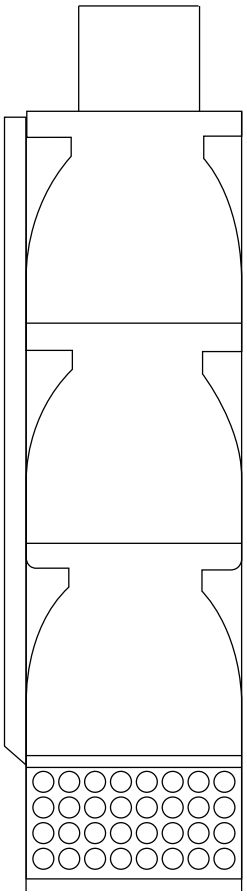
Franklin Electric

FPS T series

SUBMERSIBLE TURBINE PUMPS OWNER'S MANUAL



BEFORE INSTALLING PUMP, BE SURE TO READ THIS OWNER'S MANUAL CAREFULLY.

INSPECT THE SHIPMENT

Examine the pump when it is received to be sure there has been no damage in shipping. Should any be evident, report it immediately to the transportation company and ask to have it inspected. Check the pump nameplate to ensure you have received the correct pump unit.

READ AND FOLLOW SAFETY INSTRUCTIONS

This is the safety alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words and be alert to the potential for personal injury:

DANGER warns about hazards that **will** cause serious personal injury, death or major property damage if ignored.

WARNING warns about hazards that **can** cause serious personal injury, death or major property damage if ignored.

CAUTION warns about hazards that **will** or **can** cause minor personal injury or major property damage if ignored.

The label **NOTICE** indicates special instructions which are important but not related to hazards.

WARNING

Hazardous voltage. Can shock, burn, or cause death.

Ground motor before connecting to power supply. Disconnect power before working on pump, motor or tank.

Carefully read and follow all safety instructions in this manual and on pump.

Keep safety labels in good condition.

Replace missing or damaged safety labels.

SUBMERSIBLE TURBINE PUMPS

CONTENTS

A. INSPECTION-RECEIPT OF EQUIPMENT

Examine equipment at the time of receipt. Handle the pump, cable and motor carefully. This is very important because of the precise alignment of the assembly and the vulnerability of the cable. Report any **damages** or **shortages** immediately to the freight carrier agent and make notes on the freight bill of lading. This will facilitate a satisfactory and prompt processing of a claim adjustment.

B. EQUIPMENT AND INSTALLATION RECORD

*Record the following details at the time of the installation and retain for future references:

RMA No. _____

DISTRIBUTOR	INSTALLER	END USER
Name: _____	Name: _____	Name: _____
City: _____	City: _____	City: _____
State: _____ Zip: _____	State: _____ Zip: _____	State: _____ Zip: _____

Well ID or GPS: _____ _____ _____ Water Temperature: _____ ☐ °F ☐ °C

Application/Water Use (e.g. potable water, irrigation, municipal, fountain, etc.): _____

Date Installed (mm/yy): _____ Date Failed (mm/yy): _____ Motor Position Shaft-Up: ☐ Yes ☐ No

Operating Cycle: ON Time Per Start _____ ☐ Hrs. ☐ Mins. Time OFF Between Stop & Restart _____ ☐ Hrs. ☐ Mins.

MOTOR

Model: _____ Serial Number: _____ Date Code (if updated): _____

MOTOR OVERLOAD

System Typical Operating Current: _____ Amps @ _____ Volts

Overload: ☐ FE SubMonitor Input Amps _____ D3 Attached ☐ Yes ☐ No Fault Settings Attached ☐ Yes ☐ No

☐ Other Manufacturer Model: _____ Dial Set at: _____ or Heater# _____

NEMA Class: ☐ 10 ☐ 20 ☐ 30 Ambient Compensated: ☐ Yes ☐ No

Power to Motor by: ☐ Full Volt Starter ☐ VFD ☐ Soft Starter VFD or Soft Starter Mfr. & Model: _____

PUMP

Manufacturer: _____

Model: _____

Stages: _____

Design Rating: _____ gpm @ _____ ft TDH

Horsepower Required by Pump End: _____

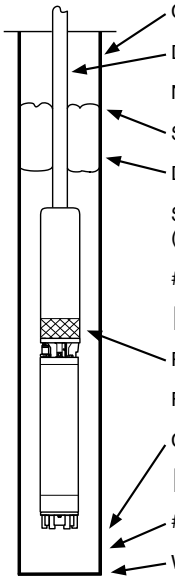
Actual Pump Delivery: _____ gpm @ _____ psi

What Controls When System Runs & Stops:

_____

(e.g. pressure, level, flow, manual on/off, timer, time clock etc.)

WELL DATA (All measurements from well head down.)



Casing Diameter _____ in

Drop Pipe Diameter _____ in

Number of Sticks of Drop Pipe _____

Static Water Level _____ ft

Drawdown (pumping) Water Level _____ ft

Spring Assist Check Valves:
(Measured from Well Head Down)

#1 _____ #2 _____ #3 _____ #4 _____ ft

☐ Solid ☐ Drilled Poppet ☐ Break-Off Plug

Pump Inlet Setting _____ ft

Flow Sleeve ☐ No ☐ Yes, Dia. _____ in

Case Ends _____ ft

☐ Well Screen ☐ Perforated Casing

#1 from ____to____ft & #2 from ____to____ft

Well Depth _____ ft

B. EQUIPMENT AND INSTALLATION RECORD CON'T.

TRANSFORMERS

Number of Transformers: ☐ Two ☐ Three Transformers Supply Motor Only: ☐ Yes ☐ No ☐ Unsure

Transformer #1: _____ kVA Transformer #2: _____ kVA Transformer #3: _____ kVA

POWER CABLES & GROUND WIRE

1 **Service Entrance to Pump Control Panel:**

Length: _____ ft. & Gauge: _____ AWG/MCM

Material: ☐ Copper ☐ Aluminum Construction: ☐ Jacketed ☐ Individual Conductors ☐ Web ☐ Twisted

Temperature Rating of Cable: ☐ 60C ☐ 75C ☐ 90C ☐ 125C or Insulation Type: _____ (e.g. THHN)

2 **Pump Control Panel to Motor:**

Length: _____ ft. & Gauge: _____ AWG/MCM

Material: ☐ Copper ☐ Aluminum Construction: ☐ Jacketed ☐ Individual Conductors ☐ Web ☐ Twisted

Temperature Rating of Cable: ☐ 60C ☐ 75C ☐ 90C ☐ 125C or Insulation Type: _____ (e.g. THHN)

3 **Ground Wire Size:** From Control Panel to Motor: _____ AWG/MCM

Control Grounded to (mark all that apply):

☐ Well Head ☐ Metal Casing ☐ Motor ☐ Driven Rod ☐ Power Supply

INCOMING VOLTAGE

No Load L1-L2 _____ L2-L3 _____ L1-L3 _____

Full Load L1-L2 _____ L2-L3 _____ L1-L3 _____

RUNNING AMPS & CURRENT BALANCE

Full Load L1 _____ L2 _____ L3 _____

% Unbalance: _____

CONTROL PANEL

1 **Pump Panel Manufacturer/Fabricator:** _____

2 **Short Circuit Protection - Fuses or Circuit Breaker**

Option #1 - Fuse

Manufacturer: _____ Model: _____ Rating: _____ Amps

Type: ☐ Time-Delay ☐ Standard

Option #2 - Circuit Breaker

Manufacturer: _____ Model: _____ Rating: _____ Amps Setting: _____

3 **Starter - Full Voltage, Reduced Voltage, Soft-Starter or VFD (Variable Frequency Drive)**

Option #1 - Full Voltage

Manufacturer: _____ Model: _____ Size: _____ Contacts: ☐ NEMA ☐ IEC

Option #2 - Reduced Voltage

Manufacturer: _____ Model: _____ Ramp Time to Full Voltage: _____ sec.

Option #3 - Soft-Starter or VFD

Manufacturer: _____ Model: _____ Max. Continuous Amp Output Rating: _____

Min. Setting: _____ Hz & GPM: _____ Max. Setting: _____ Hz & GPM: _____

Start Ramp Time to 30 Hz: _____ sec. Stop Mode: ☐ Power Off Coast ☐ 30-0 Hz Ramp _____ sec.

Special Output Filter Purchased: ☐ Yes ☐ No

Output Filter Manufacturer: _____ Model: _____ % Reactance: _____

4 **Surge Arrestor:** ☐ No ☐ Yes, Manufacturer: _____ Model: _____

C. GENERAL INFORMATION

The submersible pump unit comprises of a vertical turbine pump assembly directly-coupled to a submersible electric motor. The connecting bracket accommodates the coupling between the pump and motor shafts and also serves as the water intake passage.

The pump unit is suspended in the well by the riser pipe, and the electric power is taken down from the well head to the motor by the submersible cable which is secured at intervals to the riser pipe.

Please read the manufacturer's separate instruction manual for the motor, and keep it for future reference.

D. SUITABILITY OF THE WELL

Submersible pumps, as well as all water pumps, are designed to handle clean, cool, clear water. Water from an undeveloped well often contains excessive amounts of sand, dirt and other abrasives which can cause damage to the pump.

Install the pump in a well which has already been properly developed with a test pump.

The test pump also provides a means to match the capacity and setting of the pump to the yield of the well. If the pump removes water at a higher rate than the well produces, the drawdown will be excessive and this will cause the pump to pump air, and result in damage to the pump or motor.

The well must be deep enough so that the pump suction is at least 10 ft. below the expected drawdown level.

The inside diameter of the well casing must be large enough to allow lowering the unit into the well without damage to the power cable and the splice between the power cable and the motor leads. Check that the well is large enough to allow installation of the pump at the required depth. Keep the bottom of the motor at least 10 ft. from the bottom of the well, particularly where there is a history of sand in the well. Do not install the pump or motor within the perforations in the well casing unless the well size permits the installation of a flow sleeve over-unit to ensure an adequate flow of water over the motor for cooling purposes.

Submersible motors require a minimum cooling flow. Please refer to the motor manufacturer's applications, installation, maintenance manual (AIM Manual) for motor cooling requirements.

⚠CAUTION

DO NOT INSTALL THE UNIT WITH THE MOTOR RESTING ON THE BOTTOM, OR CLOSER THAN 10 FT. FROM THE BOTTOM OF THE WELL.

E. INSTALLATION

SITE & SUPPORT EQUIPMENT

Equipment & Material Required:

The material and equipment necessary for the installation of the pump will vary with the pump size and type of installation. The following is a general list of needed tools and supplies.

Materials: Anti-galling lubricant, thread compound, lubricating oil, grease.

Tools & Instruments: Tripod with chain blocks, or rig with power hoist, pipe clamps, megger, pipe wrenches, and mechanical tools.

Be sure that the equipment is strong enough to lift the total weight of the pump and motor assembly, riser pipe and water in the riser pipes.

FOUNDATION

Construct a concrete foundation which must be RIGID, LEVEL and of adequate STRENGTH to support the complete weight of the pump, motor, column, plus the weight of the water pumping through it without exceeding the permissible bearing pressure for the subsoil.

Support the riser pipe at the well head with a well seal, surface plate, or other adapter which seals the well in accordance with local regulations. Make provisions for a conduit to carry the power cable into the well in accordance with local regulations.

RISER PIPE

Make up the riser pipe from random lengths of threaded and coupled pipe, and make arrangements to secure it at the well by a well seal, surface plate, or other adapter.

Take great care to keep pipes clean and free from pebbles, scale, and thread chips. Tighten each joint securely as recommended by the AIM Manual.

CHECK VALVES

It is recommended that one or more check valves always be used in submersible pump installations. If the pump does not have a built-in check valve, an in-line check valve should be installed in the discharge line within 25 feet of the pump and below the draw down level of the water supply. For deeper settings, check valves should be installed per the manufacturer's recommendations. More than one check valve may be required, but more than the recommended number of check valves should not be used.

F. PUMP INSTALLATION

Thread the first length of riser pipe into the pump discharge and raise the pump and pipe into a vertical position over the motor. Refer to the AIM Manual for installation recommendations. Be careful not to drag the pump and motor assembly along the ground, or let it strike other objects while placing the assembly over the well.

Lower the pump about 10 ft. into the well and fasten the cable to the riser pipe to prevent tangling and damage.

Continue to add lengths in the same manner until the required pump setting is reached. Secure the cable to the riser pipe at regular intervals.

⚠CAUTION

TAKE GREAT CARE TO PREVENT DAMAGE TO THE CABLE DURING INSTALLATION.

Where a bleeder type air charging kit is used with a hydro pneumatic tank, install the tee and bleeder valve before adding the last length of riser pipe. This will place the bleeder valve about 20 ft. below the well head.

Place the sanitary well seal, surface plate, or other adapter on the last length of riser pipe and pass the submersible cable through the opening provided. Then attach the discharge tee or elbow to the riser pipe. Lower the riser pipe to its final position and tighten the well seal or other device to support the installation in the well.

INITIAL START-UP & PERFORMANCE CHECK

Check the pump and well performance before making the final connection to the discharge system.

1. Install a pressure gauge and gate valve on the end of the pipe. Close the valve.

2. Start the pump, check the pressure developed against the closed valve. If the pressure is substantially less than expected (Please allow for the depth of the water level), the pump may be running backward. To change the rotation of a three-phase motor, interchange any two leads.

3. Open the gate valve to produce a low flow. Open the gate valve gradually until full flow is achieved.

4. Use a clamp-on amp meter to read the current, which should approximate the full-load current given on the motor nameplate, but must not exceed the service factor rating of the motor. The service factor varies with the model of the motor. Consult the factory if insufficient information is given about Service Factor performance.

Check that the currents in the individual phases of a three-phase system are approximately equal. Where there is considerable difference between them, change all 3 connections at the starter as shown below (so that rotation remains the same) to obtain the most consistent readings.

Starter	L1	L2	L3
cable (1)	black	yellow	red
cable (2)	red	black	yellow
cable (3)	yellow	red	black

Then subtract the average of the readings from the highest. The difference, expressed as a percent of the average, must not exceed 5%. Note that the highest reading must not exceed the maximum permissible for the motor.

EXAMPLE:

Phase 1 54.0 amp
Phase 2 55.0 amp
Phase 3 60.0 amp
Average: 56.3 amp

$$\textbf{\% Unbalance} = \frac{(60 - 56.3 \times 100)}{56.3}$$

$$= \frac{3.7 \times 100}{56.3} = 6.6\%$$

⚠WARNING

FAILURE TO GROUND THE UNIT PROPERLY CAN RESULT IN SERIOUS OR FATAL SHOCK. REFER TO ELECTRICAL CODE REQUIREMENTS.

Should the unbalance exceed 5%, consult the power company to improve the voltage balance between the incoming lines

5. Use a voltmeter to verify the voltage at the starter while the pump is running. The voltage must be within 10% of the motor rating, and the maximum variation of any phase of a three-phase system from the average should not exceed 1%.

6. Continue to run the pump until the drawdown of the water in the well becomes stable. Should the water level drop to the pump intake to admit air, use one or more of the following methods to protect installation.

(a) Install additional riser pipe to place pump lower in the well if possible.

(b) Use a gate valve in the discharge line to throttle the pump output to suit the yield of the well.

(c) Install floatless liquid level control.

(d) Use a pressure switch with a low water protection or a separate low-water cutout switch. Neither of these devices give as reliable protection as a floatless liquid level control and both require careful application.

(e) Replace the pump with smaller unit to avoid over-pumping the well.

⚠CAUTION

NEVER RUN THE PUMP UNLESS IT IS COMPLETELY SUBMERGED IN WATER.

G. ACCESSORIES WITH INSTALLATION

RELIEF VALVE

Always install a relief valve if the pump is capable of developing pressures in the discharge system greater than the pressure ratings of individual components. The relief valve must be large enough to handle the pump output at the relief pressure.

H. OPERATIONAL CHECKUP

The most reliable indications of the condition of a submersible pump are:

(a) Current drawn by the motor.

(b) Insulation resistance of the installation below ground.

As the pump wears, the motor current increases, until eventually the overloads trip to protect the motor. The overload is designed to protect the motor in an emergency situation. Proper care of a submersible installation should include periodic check-ups to avoid interruptions in the water supply. Use a megger to check the motor's insulation resistance every six months.

Record the insulation resistance and the running current for future reference. When the insulation resistance falls below 10 megohms, check it frequently for further deterioration and pull the pump when the resistance falls to 0.5 megohm or below.

When pulling the pump, either coil the cable on a reel or raise it from the ground to dry. Check the insulation again when the cable and splices are dry. If the insulation value between the line and motor casing increases to 50 megohms or more, isolate the fault in the cable or the splice and make the necessary repairs. However, if the insulation reading remains low, disconnect the motor from the cable and check the motor separately. Should the motor be defective, check the pump end for wear and obtain a replacement for either the motor alone, or the pump unit, as necessary.

I. TROUBLESHOOTING

1. Disconnect power unless required for testing.

2. Have electrical testing done by a qualified electrician.

3. Most problems occur above ground. Remove pump only as a last resort.

When troubleshooting or servicing the pump, use all precautions for the voltages involved.

⚠WARNING

HAZARDOUS VOLTAGE- CAN SHOCK, BURN OR EVEN KILL .

Problem	Possible Cause	Remedy
Unit fails to start	1. Electrical trouble	Check power source: starter and reset
		Check resistance: cable and motor
		Call Dealer or Electrician
	2. Pump sandlocked	Call Dealer: pull pump and clean
Pump fails to deliver water	1. Insufficient well yield: water level has dropped	Reset pump lower into well
		Restrict flow to yield
	2. Clogged intake screen	Pull pump
	3. Air lock in pump	Start and stop pump several times allowing 15 min. between starts and stops
	4. Leak in discharge	Raise pipe until leak is found
Reduced pump output	1. Screen or pump partly plugged	Pull pump and clean
	2. Insufficient well yield	Check water level: lower pump if permissible
	3. Worn pump - excessive wear due to abrasives	Replace worn parts
	4. Low voltage	Call Electrician
	5. Three-phase unit running backward	Reverse rotation
Overload trips	1. Worn pump or pump bound by sand	Pull pump and clean or replace worn parts
	2. Electrical troubles	Call Dealer or Electrician
Unit cycles too frequently	1. Pressure switch out of adjustment	Readjust to correct setting or replace
	2. Leaks in service line	Locate and correct
	3. Check valve leaking	Replace
	4. Waterlogged tank	Check tank for leaks: be sure fittings are functioning properly

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