ALTAMIRA

INSTALLATION MANUAL

KOR SERIES

SUBMERSIBLE PUMPS

V1.0

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Abstract

INSTALLATION MANUAL

We appreciate your preference when purchasing our ALTAMIRA brand submersible pumps.

With the help of this instruction manual you will be able to correctly install and operate this product, which is why we recommend following the instructions included here. Keep this manual in a safe place for future reference.

Table of Contents

1. INTRODUCTION

The high-efficiency design and materials used in the manufacturing of the ALTAMIRA KOR series pumps make it your best option in deep well submersible pumping equipment.

Keep in mind that the life time and proper functioning of any mechanical unit is substantially improved with correct application, proper installation, periodic inspection and careful maintenance. This manual was prepared to help operators understand the construction and correct way to install, operate and maintain these pumps.

Keep this manual handy for reference. If you have any other questions, contact your local ALTAMIRA distributor.

2. SAFETY WARNINGS

CAUTION

- Wear insulated gloves when working with hot shaft bearings or when using a bearing heater.
- Wear heavy duty gloves when working with impellers.
- Wear safety glasses with visors to protect your eyes, especially in workshop areas.
- Steel-toed shoes should be worn when working with heavy parts, tools, etc.
- If harmful/toxic liquids are used, other personal protective equipment must be used to protect against them.

WARNING

- Never operate the pump unless the coupling guards are fully engaged.
- Never force pipes to make a pump connection. Use only bolts of the proper size and type.
- There should be no missing bolts. Check for worn or loose bolts.

3. PACKAGING CHECK

Make sure the pump is in good condition and complete when received from the carrier. It must be properly secured to maneuver and inspect it before unpacking it, in order to detect any possible damage. If any anomaly is found, it must be reported to the carrier.

3.1. MATERIALS AND EQUIPMENT NECESSARY

The equipment necessary to install and operate the pump depends on its size and type of installation, the following list is just an example.

1. Lubrication Material.
2. Hand tools.
3. Instruments: Megger, ohmmeter, hook multimeter.
4. Installation and Lifting Team.

4. STORAGE

ALTAMIRA KOR series pumps are adequately packaged to protect them during shipment. The preservation of the pump depends on the storage conditions, this must be as careful as possible, we list a series of tips for the proper storage of our ALTAMIRA pump, so that the properties of the precision components of the pump are not altered. Following these points does not alter the scope of our warranty policy.

A pump is considered stored when it has arrived at your job site and is waiting to be installed.

When a pump is installed and for some reason is not operating at its normal capacity, whether it is stopped for the rainy season or otherwise for a long period of time, it must be operated for at least 15 minutes every 2 weeks.

4.1. STORAGE PROCEDURE

A:) The place where the pump will be stored must be kept at a minimum temperature of 10.4 ºF (50 ºF) and with a relative humidity of less than 50%.

B:) If stored for periods of up to 6 months, the packaging should be inspected regularly to ensure that it remains undamaged.

4.2. LONG TERM STORAGE

If the warehouse time is longer than 6 months, you must follow the following steps:

A:) Periodically inspect the pump and change the pump packing to prevent corrosion.

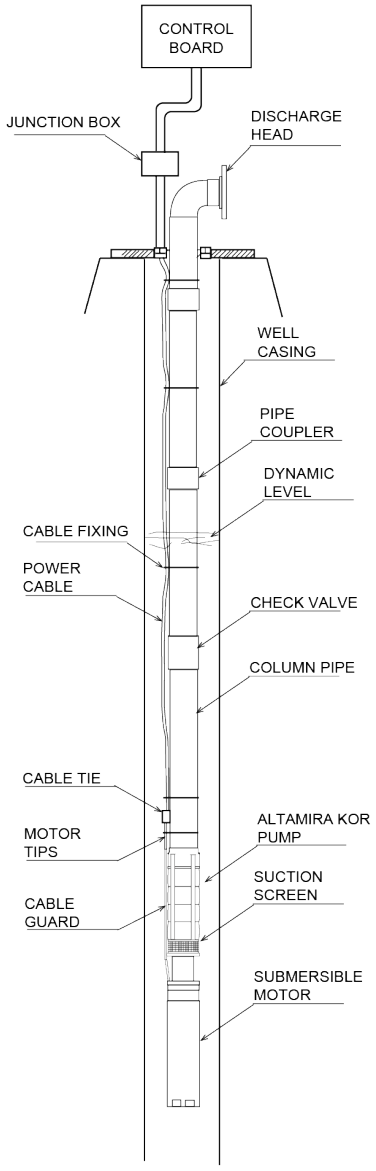
B:) Add desiccant or humidity inhibitor near the pump, in the center and discharge area.

C:) Install a humidity indicator near the pump. Cover the pump with polyethylene leaving an approximately 1/2" ventilation hole.

5. GENERAL DESCRIPTION.

The ALTAMIRA KOR pump is a submersible pump for deep wells, with capacities from 0.1 to 9.2 gallon per second and loads up to 984.2 ft.

The following figure shows an example of a typical installation.



MOTORS: Uses NEMA standard coupling motors designed for continuous use under any effort allowed by its operating curve.

DISCHARGE: Discharge bowl is supplied with NPT thread to connect to column tubing.

BODY: The bowls are assembled without threads or screws, only joined by tie rods along the pump, held from the suction and discharge,: The impellers are closed and joined to the shaft by lock and thread (6") or floating (4").

6. PREPARATION FOR INSTALLATION.

WELL:

1. The well must be previously calibrated with a test pump before installing the submersible pump. The pumping test has several purposes, one of them is to remove all excess sand during the initial pumping of the well, using the submersible pump with sand shortens its life time and may cancel the warranty.

> **WARNING**
> You should not install the pump with the motor in mud, sand or resting on the bottom of the well. It is important to prevent sand from the well from covering the motor, as this will cause the motor to generate hot spots.

> **NOTE**
> The pumping test provides an estimate of the well's flow capacity.

2. The well capacity must be equal to or greater than the pump capacity. If the pump extracts more flow than the well can replace, it will cause the dynamic level to drop causing the pump to begin to cavitate causing severe damage to the pump and motor.
3. The well must be deep enough to ensure that the suction is at least 9.8 ft below the expected dynamic level. If the mirror or water produced by the aquifer is above the pumping level then the required submergence of the pump suction must be greater than 19.6 ft.

> **WARNING**
> Never install the unit with the bottom of the motor less than 4.9 ft from the bottom of the well.

4. The motor must always be submerged in flowing water. The flow speed must be greater than 0.9 ft/s. If the pump is placed in open flows such as cisterns or other conditions in which flow can be provided from above the pump, then it is necessary to use a cooling jacket that forces water to pass through the outside of the motor to force cooling.
5. The inner diameter of the well must be large enough to accommodate the motor pump without damaging the power cable or connectors. This should be taken into account for wells in which more than one diameter of casing pipe is installed and the smaller diameter is different from the well entry diameter.

PREPARING THE DOWNLOAD BASE

The base must be rigid, level and adequately resistant to support the full weight of the pump, motor and pipe column, in addition to the weight of the water passing through it. It is recommended that it be solid concrete or a mixture like the following:

- A part of cement.
- 2 parts sand.
- 4 parts gravel.
- Enough water.

CABLE AND MOTOR CHECK.

> **CAUTION**
> Do not use the motor connector to lift or handle the motor. Connectors are easy to damage, so they should be protected and handled with care at all times.

MOTOR SERVICE.

Check your motor manual to see if any service is required before installing. Some motors need to be filled with oil or water.

MOTOR TO PUMP ASSEMBLY.

If the pump and motor have not been assembled, follow the detailed instructions in [APPENDIX A] at the end of this manual. In the case of long pumps, it is best to make the coupling in a vertical position at the installation site.

7. TESTING BEFORE CONNECTING THE POWER TO THE MOTOR

Make the following tests before connecting power to the motor.

TESTS:

- Measure the resistance between each motor line and ground with the motor submerged in water.
- Measure the resistance between the motor windings. Write down the values for future reference.
- Secure the pump and motor with chains, energize the motor momentarily (turn on and off immediately), to check rotation.

> **CAUTION**
> - Using your equipment in reverse rotation may cause damage from excessive overloads due to reverse rotation.
> - Ground the unit, ground fault of the unit can result in severe or fatal damage. Likewise, the high torque will cause it to hit or move abruptly when current is applied to it.

> **NOTE**
> - Rotation will be clockwise when viewed from the pump discharge.
> - On three-phase motors, if the rotation is incorrect, interchange 2 of the motor phases on the control board.

CABLE TEST.

- Measure the resistance between conductors and ground with the cable immersed in water.
- Tie the cable to the motor tips.
  The connection of the cable with the motor tips must be waterproof, a well made connection will last the life of the pump, a poorly made connection will cause service problems. The tie should be placed above the pump and should be as compact as possible [APPENDIX B].

TESTS AFTER TYING THE CABLE TO THE MOTOR TIPS.

Make this test after connecting the cable to the motor, but before lowering the pump into the well.

- Verify that the tie is waterproof by submerging it for 1 hour in a container of water and then taking readings between each wire and the water.

CAUTION
The minimum resistance reading between each tip to ground should be 50 MegaOhms.

8. PUMP INSTALLATION

- Check that both the pump and the motor rotate freely, on some pump models it is necessary to remove the screen to access the shaft, in case you remove it for this check, be sure to relocate it.
- Lift the previously assembled pump and motor with the help of the necessary tools and machinery according to its size. Begin lowering the pump into the well, leaving the pump near the surface.
- Once in the well, the pipes that will make up the column are lifted, placing them above the discharge bowl and sliding them in such a way that they engage with its thread without damaging it. Clean the threads with lubricant, thread the tube into the discharge and tighten using a chain wrench.

CAUTION
The motor generates a torque which tends to uncouple the pipes or unscrew the column pipes from their connections; For this reason the threaded column joints must be tightened.

- Install a cable clamp on each end of the tie. Take care not to damage the cable.
- Softly submerge the unit into the well adding couplings and tubes as you go. Tighten each of these securely. Add a cable tie approximately every 19.6 ft. For heavy caliber wire add double sujection. Be very careful not to damage the power cable, tie or ground when lowering the pump.
- If the pump does not have a check valve included, a check valve must be added in the column, approximately 22.9 ft from the pump discharge. It is recommended to add a straight check valve every 200 ft of column.

NOTE
A check valve should not be installed above the dynamic level.

- Once the tie is submerged, retake line-to-ground resistance readings to ensure that the insulation was not damaged during installation.
- Once the last section of pipe is installed, proceed to install the discharge head.
- After the discharge head has been properly placed and adjusted, the discharge must be oriented in the desired direction and adjusted to the flange provided for this purpose.

BEFORE CONNECTING POWER SUPPLY TO THE MOTOR:

- Retake the line-to-line and line-to-ground resistance values to verify that there is no damage to the insulation.
- Measure the resistance of the power cable and motor circuit and compare them with the preliminary test values.

9. PUMP START.

Initial start-up of the pump may require turning the pump on and off a few times. Be sure to allow adequate cooling time between each start and stop. Consult the engine manual, if information is not provided, a common rule is to allow 15 minutes between starts.

Use a hook ammeter to take amperage readings on each line, review the motor manual and obtain the rated amperage and service factor value.

Start the engine and take the amperage values, if the amperage values are equal to or greater than the service factor amperage, turn off the pump immediately. A high current is indicative that a fault exists, which can be:

- Incorrect rotation (three-phase motor).
- A very low voltage.
- The pump is blocked by sand.
- The selected cable size is incorrect.
- Mechanical damage.

In either case, the problem must be corrected before starting the pump.

If the motor is three-phase and the water has not left the well in 1 minute (approximately half a minute is required for the water to rise 98 ft). The motor may be turning backwards.

If you are in doubt about the correct direction of rotation, exchange 2 power phases twice, in each change start the pump and in the step in which the pump provides more pressure and flow, that is the correct connection.

Check the voltage, when the engine is on the voltage should be 5% lower than the data plate voltage.

Open the control valve (throttling). If a flow meter is connected, open the valve until the pump provides the rated flow. If sand appears in the water, close the valve until the flow is 80% of the total until the water appears clean. If excessive noise, pressure fluctuations, or white bubbles appear in the water, then the pump is likely cavitating and flow may be restricted until the noise decreases, the pressure remains stable, and the water appears clean.

In three-phase motors, check the current unbalance.

The maximum imbalance value allowed is 5%. If the current imbalance persists after rotating the phases, the pump must be shut down and corrective action taken. An imbalance of 5% or greater can cause excessive motor heating and premature failure.

Operation with an imbalance greater than 5% invalidates the guarantee.

Water hammer occurs when the lowest check valve is more than 29.5 ft above static level or if one of the valves is leaking and causes a partial vacuum in the discharge pipe. At the next start, high velocity water fills the space and hits the closed check valve and the stationary water above it, producing a hydraulic shock. This phenomenon produces a noise that is easily detected, as soon as it is discovered, the pump must be turned off immediately.

UPWARD THRUST: It is an upward movement of the impellers and the motor shaft. It occurs when starting the pump with a low system load, one cause is the high static level, if this is recurrent it can cause premature failure of the pump and motor.

10. PUMP ASSEMBLY AND DISASSEMBLY.

Prepare and clean the area near the well where the pump will be disassembled. In case the column is very long, place parallel supports on the floor, on which you can place the pipes.

NOTE
Be sure to mark the pump components to keep in mind the order of assembly and disassembly.

10.1. PROCEED TO REMOVE ELECTRICAL CONNECTIONS FROM THE JUNCTION BOX OR THE CONTROL PANEL

CAUTION

- Before opening the junction box of an electric motor, make sure the power has already been interrupted, failure to do so will cause serious damage or even death.
- Be sure to install safety locks on the electrical controls before starting any operation on the panels and box.

10.2. DISCONNECT COLUMN TUBE FROM DISCHARGE HEAD

CAUTION
Do not work under suspended objects unless there is a lower support holding them which protects personnel from falling objects.

10.3. PUMP DISASSEMBLY.

A:) Remove all pipe sections.

B:) Remove the pump from the well. Remove the motor tips from the cable guard.

C:) Disconnect the motor from the pump by removing the bolts.

10.4. BOWL DISASSEMBLY

A:) Remove the nuts from the tie rod bolts that hold them to the suction. Remove the discharge straps, taking care not to hit them as they have a spring effect.

B:) Remove the discharge out of the pump.

C:) For 4" pumps you must loosen the shaft screw and its washer, since these fix the hydraulic body. Then proceed to remove the impeller-bowl assembly. See figure Complete 4" Pump Stage. [12]

In the case of 6" pumps, remove the impellers by turning the nut that tightens the Cone and tapping it out so that it comes out of its position, remove the cone and remove the impeller; Next, remove the upper bowl. See figure Complete 6" Pump Stage.

D:) Repeat the above steps to remove all bowls and disassemble the pump completely.

10.5. PARTS INSPECTION

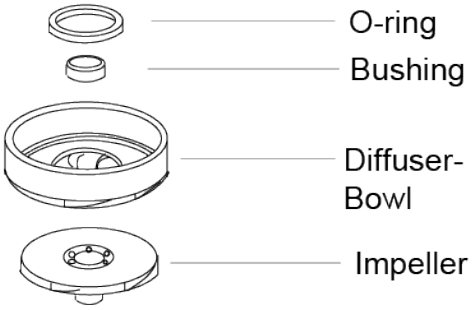
A:) Carefully clean all parts.

B:) Check the bushings for deformations or excessive wear.

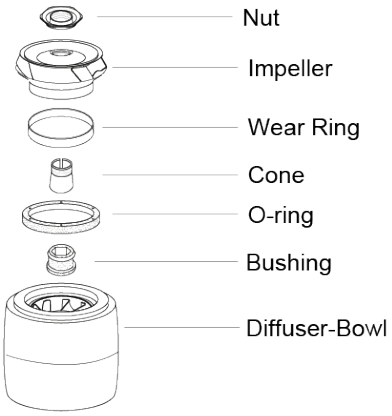
C:) Check the imbalance of the shaft and that it does not have excessive wear in the bushing area. The unbalance must be less than 0.0005 "/ft.

D:) Visually inspect the bowls and impellers for cracks, excessive wear or corrosion.

Complete 4" pump stage



Complete 6" pump stage



11. POSSIBLE FAULTS, CAUSES AND SOLUTIONS

FAILURE	CAUSE	SOLUTION
The motor pump does not start.	1. The engine is protected by: a.- Incorrect control box. b.- Incorrect connections. c.- Overload protection failure d.- Low Voltage e.- Control box or starter temperature too low. f.- Pump outside the water mirror. 2. A fuse blows, connections are lost. 3. The control box or starter are not positioned correctly. 4. Damaged cable insulation. 5. The tie is open or damaged. 6. Pressure switch fails. 7. Low level of the water mirror.	1. Allow the motor to cool, the overload will reset automatically. Research the cause of the overload. ae) Allow a qualified electrician to check and repair, if necessary. Raise the pump, examine and clean it, adjust depth if required. 2. Check the fuses, relays and other elements for the correct sizing of the capacitors and electrical connections. 3. Place the control correctly. 4. Locate it and repair the fault. 5. Check the resistance between phases with the ohmmeter, if it is open or grounded, turn up the pump and replace it. 6. Repair or replace it. 7. Check the reelevator, cables and electrodes.
The pump starts but does not provide water.	1. Check valve incorrectly positioned. 2. The pump has air. 3. The load is too large for the pump. 4. The suction screen is clogged or an impeller is blocked or the pump is clogged with sand. 5. The pump is not submerged. 6. The well may contain excessive amounts of air or gas. 7. The engine runs backwards.	1. Exchange check valve. 2. Start and stop the pump until the water flows normally. 3. Review the operating curve. 4. Remove the pump and clean it, check the depth of the well, plug it again if necessary. 5. Check the water level, lower the pump further if necessary. 6. Start and stop the pump many times. If this does not remedy the situation, the pump will not be able to operate because there is too much gas in the well. 7. Reverse the rotation.
Little capacity or insufficient pressure.	1. Load too large for the pump. 2. Partially blocked mesh or impellers. 3. Damaged discharge or column where there are leaks. 4. Well with excessive air or gas. 5. Excessive pressure losses due to parts with high friction. 6. The motor rotates in reverse.	1. Check pump capacity. 2. Take out the pump and clean it. 3. Replace pipe and leaking parts. 4. Start and stop the pump many times. If this does not remedy the situation the pump will not be able to operate because there is too much gas in the well. 5. Replace obsolete or old parts. 6. Reverse the rotation.
The Pressure Switch does not cut off the pump operation.	1. Incorrect calibration. 2. Switch contacts open. 3. Leaks somewhere in the system. 4. The motor rotates in reverse.	1. Correct the switch calibration. 2. Clean the contacts or replace the switch. 3. Repair leaks. 4. Reverse the rotation.
The pump starts very frequently.	1. The prefilled tank leaks air. 2. Check valve leak. 3. Poorly adjusted pressure switch. 4. Service line leaks.	1. Inspect the tank for leaks. 2. Replace check valve. 3. Recalibrate the switch or replace it. 4. Locate and correct leaks.

12. USES AND PROHIBITIONS

USES

The submersible pump for deep wells is designed for the efficient handling of clean water in a variety of applications. Permitted uses include:

1. Extraction of clean water from deep wells, in compliance with the maximum depth specified by the manufacturer.
2. Potable water supply systems in residential, agricultural, commercial, or industrial facilities.
3. Pressurization of hydraulic systems and filling of elevated tanks or cisterns.
4. Agricultural irrigation systems, including drip, sprinkler, or gravity irrigation.
5. Continuous or intermittent applications, provided that the duty cycles and specified operating conditions are observed.
6. Installation in cased wells with a cooling sleeve, if required by the motor design.

PROHIBITIONS

To ensure the correct operation of the equipment and the safety of the user, it is prohibited:

1. Using the pump in water containing sediments, sand, mud, organic matter, or solid particles is prohibited.
2. Do not operate the pump with corrosive liquids, sewage water, or incompatible chemical fluids.
3. Start the pump out of the water or without it being completely submerged.
4. Exceeding the maximum immersion depth or the maximum water temperature allowed by the manufacturer is prohibited.
5. Using the equipment without dry running protection or without adequate level control.
6. Handle the electrical system without disconnecting the power supply or without following safety regulations.
7. Modify, repair or alter pump components without the manufacturer's authorization.
8. Using damaged, uncertified, or unsuitable power cables for submerged installations.
9. Install the pump in wells without sufficient diameter for adequate water circulation and motor cooling.

13. APPENDIX A

ELECTRICAL TESTS

1.- MEASUREMENT OF INSULATION RESISTANCE (GROUND TEST).

The insulation status of a conductor can be determined by the electrical resistance between the conductor and ground.

This measurement can be done with the Megger or the Ohmeter. High resistance values indicate good insulation

The measurement is carried out as follows:

a) Turn off the power and disconnect the tips from the board. Put a lock on the board to avoid mistakes.

b) Move the megger scale selector to the 100K or 100000 position and set the meter to zero.

c) Place one of the meter tips on one of the power cables and the other on ground.

d) If the needle goes to the end of the graduated scale, then we must select another reading scale.

The readings obtained from the power cables and motor leads must be within the readings specified in the table MOTOR INSULATION RESISTANCE READINGS [16]. Low readings indicate that the motor windings are grounded or that the cable or its insulation is damaged. This must be corrected before proceeding with the installation.

2.- MEASUREMENT OF RESISTANCE BETWEEN PHASES (WINDING RESISTANCE)

a) Always check the condition of the motor windings by measuring the resistance between them.

b) Turn off the power and disconnect the tips from the board. Place a lock on the Dashboard to avoid errors.

c) Move the megger scale selector to the Rx1 position and set the meter to zero.

d) Join the tips of the meter with the tips of the motor. The resistance measured between the motor lines must be within the values specified by the motor manufacturer.

14. APPENDIX B

THREE-PHASE POWER UNBALANCE.

A complete three-phase supply is recommended including three individual transformers or one three-phase transformer. Open Star or Delta connections can be used using only 2 transformers, but there is a greater chance of inadequate performance, overload tripping, or premature motor failure due to current unbalance.

Measure the current in each of the three motor conductors and calculate the current unbalance as explained below. If the current imbalance is 2% or less, leave the conductors as connected.

If the current imbalance is more than 2%, the current readings in each branch must be verified using each of the 3 possible connections. Wind the motor leads on the starter in the same direction to prevent motor reversal. To calculate % current unbalance:

A:) Add the 3 values of the line current

B:) Divide the sum by 3, to get the average.

C:) Select the current value furthest from the average current (either high or low).

D:)Determine the difference between this current value (farthest from the average and the average)

E:) Divide the difference by the average and multiply that result by 100 to determine the percentage of imbalance.

Current unbalance should not exceed 5% at service factor load or 10% at rated load. If the unbalance cannot be corrected by winding the conductors, the cause of the unbalance must be determined and corrected. If in the 3 possible connections, the tap furthest from the average is on the same power conductor, then the majority of the unbalance comes from the power source. In this case, contact the local electricity company to resolve the imbalance.

MOTOR INSULATION RESISTANCE READINGS.

Motor and drivers condition	Value in Ohms / MegaOhms
1.- New motor without power cable.	20,00,000(or greater) / 20.0
2.- Used motor, which can be reinstalled in the well.	10,000,000(or greater) /10.0
MOTOR IN THE WELL, POWER CABLE PLUS MOTOR.	
3.- New Motor	2,000,000 (or greater) /2.0
4.- Motor in relatively good condition.	500,000 to 2,000,000 / 0.5 to 2.0
5.- The motor could be damaged or the power cable damaged, (Do not remove the motor for this reason)	20,000 to 500,000 / 0.02 to 0.5
6.- Damaged Motor or damaged Power Cable. (Remove and repair engine)	10,000 to 20,000 / 0.01 to 0.02
7.- Failure of the motor or power cable. (Remove and repair the engine)	Less than 10,000 / 0 - 0.01