

Installation, Operation, and Service Manual

1.1 THP Dual Voltage Series

Variable Speed Pool Pump



SPECK X
pumps

Technical Support:

Address: Speck Pumps
8125 Bayberry Road
Jacksonville, FL. 32256
USA

Hours: (Monday - Friday) 8:00 am to 5:00 pm EST

Toll Free: 800-223-8538

Phone: 904-739-2626

Fax: 904-737-5261

Website: www.usa.speck-pumps.com

Email: technical.usa@speck-pumps.com

Manufactured by Speck Pumps, Jacksonville Florida USA, ©2017 All Rights Reserved.

This document is subject to change without notice.

Date of Installation:	
Installed by:	
Serial Number:	
For Service Call:	

Table of Contents

1	<i>Important Safety Instructions</i>	4
	SwimJet Combination Fitting Manufacturers Warnings.	4
	General Safety Instructions.	5
2	<i>General Description</i>	6
3	<i>Installation Information</i>	7
	Preparation Guide	7
	Pump Location	7
	Pipe Sizing	7
	Plumbing Installation	8
	Bonding and Grounding	8
	Electrical Installation	8
	Voltage Checks	9
	Pressure Testing	9
4	<i>Operation</i>	10
	Start-Up guide	10
	Programming the Prime Time & Power Levels	11
	Adjusting the Preset Power Level	11
	Normal Operation	12
	User Interface	13
	User Interface Lockout	13
5	<i>Service and Maintenance</i>	13
	Routine Maintenance	13
	Winterizing	14
6	<i>Troubleshooting</i>	15
	Frequently Asked Questions	16
	Troubleshooting	16
	Blocked Impeller	16
	Mechanical Seal	16
	Motor Replacement	18
7	<i>Product Specification</i>	19
	Dimensional Drawings & Performance Curves	19
	Replacement Parts and Exploded View	20
8	<i>Limited Warranty</i>	23

1 Important Safety Instructions

WARNING: Before installing this product, read and follow all warning notices and instructions which are included. Failure to follow safety warnings and instructions can result in severe injury, death, or property damage. Call (800) 223-8538 or visit www.usa.speck-pumps.com for additional copies of these instructions.

Important Notice:

This manual contains important information about the installation, operation and safe use of this product. This information should be given to the owner and/or operator of this equipment.

WARNING: This product must be installed and serviced by a qualified pool professional, and must conform to all national, state, and local codes.

WARNING: Before installing this product, read and follow all warning notices and instructions which are included. Failure to follow safety warnings and instructions can result in severe injury, death, or property damage. Call 1-800-223-8538 or visit www.usa.speck-pumps.com for additional copies of these instructions.

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

READ AND FOLLOW ALL INSTRUCTIONS

WARNING: To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.

WARNING: Risk of Electrical Shock. Connect only to a grounding type receptacle protected by a ground-fault circuit-interrupter (GFCI). Contact a qualified electrician if you cannot verify that the receptacle is protected by a GFCI.

The unit must be connected only to a supply circuit that is protected by a ground-fault circuit-interrupter (GFCI). Such a GFCI should be provided by the installer and should be tested on a routine basis. To test the GFCI, push the test button. The GFCI should interrupt power. Push the reset button. Power should be restored. If the GFCI fails to operate in this manner, the GFCI is defective. If the GFCI interrupts power to the pump without the test button being pushed, a ground current is flowing, indicating the possibility of an electric shock. Do not use this pump. Disconnect the pump and have the problem corrected by a qualified service representative before using.

CAUTION: This pump is for use with permanently installed pools and may also be used with hot tubs and spas if so marked. Do not use with storable pools. A permanently installed pool is constructed in or on the ground or in a building such that it cannot be readily disassembled for storage. A storable pool is constructed so that it may be readily disassembled for storage and reassembled to its original integrity.

TO REDUCE THE RISK OF ELECTRICAL SHOCK, connect ground wires to grounding screw located in the motor. Use no smaller than a #12 AWG (3.3mm²) wire.

TO REDUCE THE RISK OF ELECTRICAL SHOCK, a bonding connector is provided for bonding to metal water pipes, metal rails, or other metal within 5 feet of the swimming pool. All local points should be bonded with a #8 AWG (8.4mm²) wire.

SAVE THESE INSTRUCTIONS.

General Safety Instructions

The following guidelines provide information to minimize the risk of injury to users of pools, spas, and hot tubs.

WARNING: TO REDUCE THE RISK OF ENTRAPMENT HAZARD



Pool and spa pumps produce high levels of suction, which can pose extreme danger if a person comes in close proximity to an open pool or spa drain or if a drain cover is loose, cracked, broken or missing. Pool and spa pumps move large volumes of water, which can pose extreme danger if a person's hair comes in close proximity to a drain that is not the proper size for the pump or pumps.

If not an approved single, unblockable outlet, a minimum of two functioning suction outlets per pump must be installed. Suction outlets in the same plane (i.e. floor or wall) must be installed a minimum of three (3) feet (1 meter) apart, as measured from center point to center point. Dual suction fittings shall not be located on seating areas or on the backrest for such seating areas. If any suction outlets are located closer they shall be located on two different planes (i.e. one on the bottom and one on the vertical wall, or one each on two separate vertical walls).

WARNING: Failure to keep suction outlet components clear of debris, such as leaves, dirt, hair, paper and other material can result in an increased potential for suction entrapment.

If not a single, unblockable outlet, in the event of one suction outlet being completely blocked, the remaining suction outlets serving the system shall have a flow rating capable of the full flow of the pump(s) or the specific suction system. If in doubt about the rating and/or head loss curve of your system, consult a qualified pool or spa professional and/or your respective equipment manufacturer(s). Also, double check with your local building/health authorities regarding single vs. multiple drain installations, etc.

Regularly inspect all drain covers for cracks, damage and advanced weathering. If a drain cover becomes loose, cracked, damaged, broken or is missing, close the pool or spa immediately, post a notice and keep the pool or spa closed until an appropriate VGB 2008 certified drain cover is properly installed.

WATER VELOCITY AND FLOW RATES

The maximum water velocity through drain covers is limited by some local regulations, for example some state health departments limit the velocity through public pool drain covers to 1.5 feet per second. This velocity limit is lower than the flow rating provided by the ANSI/APSP 16 certification; therefore local limit applies and must be followed. Never exceed the flow rating listed on the cover even if local code does not provide a velocity limit.

For additional information on proper installation refer to The Association of Pool & Spa Professionals ANSI/APSP-7 Standard and the US Consumer Product Safety Commission Guidelines for Entrapment Hazard.

General Safety Instructions - continued

WARNING - Risk of Electrical Shock or Electrocution



Pool pump must be installed by a licensed or certified electrician or a qualified pool serviceman in accordance with the National Electrical Code and all applicable local codes and ordinances. Improper installation will create an electric hazard which could result in death or serious injury to pool users, installers, or others due to electrical shock, and may also cause damage to property.

Always disconnect power to the pool pump at the circuit breaker before servicing the pump. Failure to do so could result in death or serious injury to serviceman, pool users, or others due to electric shock.

2 General Description

The ES90-II VSP, E71-II VHV, and A91-II VSP family of variable speed swimming pool pumps are both environmentally friendly and cost efficient. These pumps have three (3) adjustable power levels which provide the pool owner a simple three button control, greatly reducing the operating cost at a reasonable investment. The high performance, medium head pumps use a state of the art axial flux permanent magnet brushless-DC motor controlled by advance logic electronics - providing cooler and quieter operation at a fraction of the cost of a standard PSC motor.

The motor operates by keeping the power used by the pump at a constant level selected by the user. This is especially useful at lower speeds because as the filter gets dirty and pressure increases, the pump will automatically pick up a little speed to keep the programmed power level the same. This allows for longer periods of time before the filter needs to be cleaned, and the user knows exactly how much power the pump is using. In addition, the motor automatically detects either 115V or 230V power without the need for rewiring or a voltage switch.

Ideally suited for pools up to 36,000 gallons (24 hour operation), the pumps operate at a maximum system flow of 100 gallons per minute (GPM) at 1000 watts (3500 RPM). The pumps can operate from 50 watts (1000 RPM) to 1000 watts (3500 RPM) in increments of 10 watts. This allows you to select the most appropriate power level for your application. These variable speed pumps are designed to meet the needs of today's more environmentally friendly consumer. The pump parts are made of 100% recyclable "environment friendly" plastic.

The user interface provides manual power level controls for the pump. There are three fixed power level buttons that can be selected 1, 2, and 3. (See Figure 1)

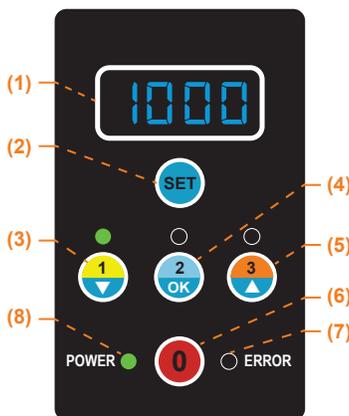


Figure 1

Controls and LEDs	Description
1) Power Level Display	Displays the current motor power level, or error code.
2) "SET" Button	Used to enter programming mode (press and hold for at least 3 seconds).
3) "1/▼" Button	Used to select fixed power level 1 or to decrease power level when in programming mode.
4) "2/OK" Button	Used to select fixed speed 2 or to confirm/save parameters when in programming mode.
5) "3/▲" Button	Used to select fixed power level 3 or to increase speed when in programming mode
6) "0" Button	Used to stop the motor.
7) Power LED	The green LED indicates the unit has power.
8) Error LED	The red LED indicates there is a fault.

3 Installation Information

Preparation Guide

1. Upon receipt of the pump, check the carton for damage. Open the carton and check the pump for concealed damage, such as cracks, dents, or a broken base. If damage is found, contact the shipper or distributor where the pump was purchased.
2. Inspect the contents of the carton and verify that all parts are included. See *Section 7, Parts List and Exploded View for details*.

Pump Location

NOTE: In Canada, the pump must be located a minimum of three (3) meters (approximately ten (10) feet) from the water (CSA C22.1).

1. For trouble-free self-priming, install the pump as close to the pool as practical. Consult local codes for minimum distance between pool and pump.

WARNING: *Some Safety Vacuum Release System (SVRS) devices are not compatible with the installation of check valves. If the pool has an SVRS device, be sure to confirm that it will continue to safely operate if check valves are installed.*

2. The piping should be as direct and free from turns or bends as possible, as elbows and other fittings greatly increase friction losses which reduce the flow of water.
3. Place pump on solid foundation which provides a rigid and vibration-free support so that it is readily accessible for service and maintenance.
4. Install the pump in a well ventilated location protected from direct sunlight and excessive moisture. (rain, sprinklers, etc.)
5. Protect the pump against flooding and excess moisture, and prevent foreign objects from clogging air circulation around motor. All motors generate heat that must be removed by providing proper ventilation.
6. **DO NOT** store or use gasoline or other flammable vapors or liquids in the vicinity of this pump. **DO NOT** store pool chemicals near the pump.
7. **DO NOT** remove any safety alert labels such as **DANGER**, **WARNING**, or **CAUTION**. Keep safety labels in good condition and replace any missing or damaged labels.
8. Provide access for future services by leaving a clear area around the pump. Allow plenty of space above the pump to remove lid and basket for cleaning.

Pipe Sizing

NOTE: All pipe sizes are able to withstand the pressures the pump will deliver, but not necessarily the flow. If the pipe is too small for the pump, or is elevated above water, the maximum gallons per minute (GPM) may not be delivered. If this happens, the pump will develop a pocket of air (cavitation) that makes noise. This may shorten the life of the pump.

SUCTION & DISCHARGE:

When the pump is located up to 50 feet from the pool, the recommended minimum pipe size for both the suction and discharge is 2" on the ES90-II VSP. On the A91-II VSP and E71-II VHV, the minimum pipe size for both suction and discharge is 1.5".

Plumbing Installation

1. When connecting pipework to pump with threaded ports, it is recommended that thread seal tape be used. Hard-plumbed pipes must have proper solvent-weld connections. Flexible hose connections must be tightened properly. If the suction line is not sealed correctly, the pump will not prime properly and will pump small volumes of water or none at all.
2. When installing the pump, care should be taken to see the suction line is below water level to a point immediately beneath the pump to ensure quick priming via a flooded suction line. The height between the pump and water level should not be more than five (5) feet. **NOTE: The E71-II VHV is NOT self-priming and must be installed below water level.**
3. Suction and discharge lines should be independently supported at a point near the pump to avoid strains being placed on the pump. Always use properly sized valves.
4. When installing the pump below water level, it is advisable to install a gate valve in both the suction and discharge line in the event that the pump must be removed for servicing.
5. Before starting the pump for the first time, remove the see-through lid. (Turn lid ring counter-clockwise to remove.) Fill strainer tank with water until it is level with the suction inlet. Replace lid with locking ring. Hand-tighten the lid to make an air-tight seal. **DO NOT** use any tools to tighten the lid.
6. Use the fewest number of fittings as possible. Each additional fitting has the effect of moving the equipment farther away from the water. **NOTE: If more than ten (10) suction fittings are needed, the pipe size must be increased.**

Bonding and Grounding

When installing and using the motor, basic safety precautions should always be followed. The wiring of the motor should be done by a licensed electrician in accordance with local codes.

BONDING AND GROUNDING

1. The motor frame must be grounded to a reliable grounding point using a solid copper conductor, No. 8 AWG or larger. In Canada, No. 6 AWG or larger must be used. If the pump is installed within five (5) feet of the inside walls of the swimming pool, spa, or hot tub, the motor frame must be bonded to all metal parts of the swimming pool, spa, or hot tub structure and to all electrical equipment, metal conduit, and metal piping within five (5) feet of the inside walls of the swimming pool, spa, or hot tub.
2. Bond the motor using the provided external lug.

WARNING: Always disconnect the power source before working on a motor or its connected load.

WARNING: In order to avoid the risk of property damage, severe personal injury, and/or death, make sure that the control switch, time clock, or control system is installed in an accessible location, so that in the event of an equipment failure or loose plumbing fitting, the equipment can be easily turned off.

CAUTION: The pump must be permanently connected to a dedicated electrical circuit. No other equipment, lights, appliances, or outlets may be connected to the pump circuit, with the exception of devices that may be required to operate simultaneously with the pump, such as a chlorinating device or heater.

WARNING: Motor is fitted with internal auto reset. May restart without warning!

Electrical Installation

1. The pump motor must be securely grounded inside the motor control box. (See Figure 2)

NOTE: **DO NOT** connect to electric power supply until unit is permanently grounded.

2. Wire size must be adequate to minimize voltage drop during the start-up and operation of the pump. See Table 1.0 for recommended wiring sizes.

Electrical Installation - continued

3. Insulate all connections carefully to prevent grounding or short-circuits. Sharp edges on terminals require extra protection. To prevent the wire nuts from loosening, tape them using suitable, listed (UL, ETL, CSA) electrical insulating tape. For safety, and to prevent entry of contaminants, reinstall all conduit and terminal box covers. Do not force connections into the conduit box.

Table 1.0

Recommended Wire Sizes			
Distance from Sub-panel	0 - 50 Feet	50 - 100 Feet	100 - 150 Feet
Voltage	115 / 230 VAC	115 / 230 VAC	115 / 230 VAC
Minimum Wire Size (AWG)	12 / 14	10 / 12	8 / 10

4. Remove the four screws holding the top control enclosure onto the motor. Carefully lift the top panel and turn it over to expose the inside terminal box. (See Figure 2)

5. The terminal box is supplied with a 1/2" -14 NPT threaded hole. Use only liquid tight fittings in order to protect the electronics and the motor. **CAUTION:** Failure to use liquid tight fittings will void the warranty.

6. Connect L1, L2/N, and Ground to the terminal block as shown in Figure 2.

7. Carefully fold all wires inside the terminal box and place the top control panel back on top of the terminal box.

8. Tighten the four screws into the terminal box while applying light pressure to the top control enclosure. **DO NOT OVER TIGHTEN.**

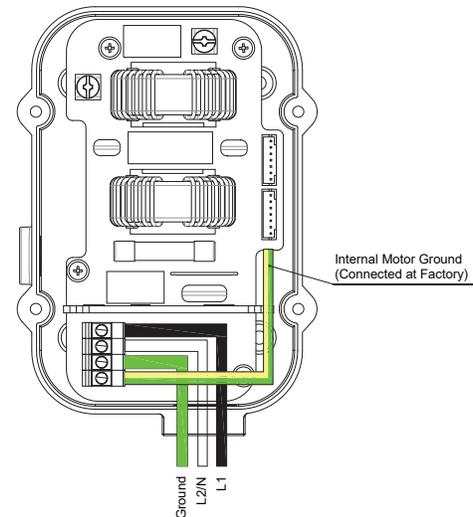


Figure 2

Voltage Checks

The correct voltage, as specified on the pump data plate, is necessary for proper performance and long motor life. Incorrect voltage will cause the error light to turn on and cause damage to the motor if not turned off immediately.

It is the responsibility of the electrical installer to provide data plate operating voltage to the pump by ensuring proper circuit sizes and wire sizes for this specific application.

CAUTION: Failure to provide data plate voltage during operation will cause the motor to overheat and void the warranty.

Pressure Test

WARNING: When pressure testing a system with water, air is often trapped in the system during the filling process. This air will compress when the system is pressurized. Should the system fail, this trapped air can propel debris at a high speed and cause injury. Every effort to remove trapped air must be taken, including opening the bleed valve on the filter and loosening the pump basket lid while filling the pump.

WARNING: Trapped air in the system can cause the filter lid to be blown off, which can result in death, serious injury, or property damage. Be sure all air is properly purged out of the system before operating. **DO NOT USE COMPRESSED AIR TO PRESSURE TEST OR CHECK FOR LEAKS.**

WARNING: When pressure testing the system with water, it is very important to make sure that the pump basket and lid is completely secure.

Pressure Test - continued

STEPS:

1. Fill the system with water, using care to eliminate trapped air.
2. Pressurize the system with water to no more than 35 PSI.

WARNING: DO NOT pressure test above 35 PSI. Pressure testing must be done by a trained pool professional. Circulation equipment that is not tested properly might fail, which would result in severe injury or property damage.

3. Close the valve to trap pressurized water in the system.
4. Observe the system for leaks and/or pressure decay.
5. If there are leaks, repeat Steps 1 -3. For technical support, call 800-223-8538. If calling from outside the U.S. dial +1 904-739-2626.

4 Operation

Start Up Guide

CAUTION: Never run the pump without water. Running the pump “dry” for any length of time can cause severe damage to both the pump and the motor and will void the warranty.

If this is a new pool installation, make sure all piping is clear of construction debris and has been properly pressure tested. The filter should be checked for proper installation, verifying that all connections and clamps are secure according to the manufacturer’s recommendations.

WARNING: To avoid risk of property damage, severe personal injury or death, verify that all power is turned off before starting this procedure.

1. Release all pressure from the system and open the filter pressure release valve.
2. Depending on the location of the pump, do one of the following:
 - If the pump is located below the water level of the pool, open the filter pressure valve to prime the pump with water.
 - If the pump is located above the water level of the pool, remove the lid and fill the basket with water before starting the pump.
3. Prior to replacing the lid, check for debris around the lid o-ring seat. Debris around the lid o-ring seat will make it difficult to prime the pump.
4. **Hand-tighten** the lid to make an air tight seal. **DO NOT** use any tools to tighten the lid: **hand-tighten only**. Make sure all valves are open and the unions are tight.
5. Once all the air has left the filter, close the pressure release valve.
6. Switch on power to the pump-motor to start. There will be a delay of six to twelve (6 to 12) seconds as the pump powers up.
7. Pump will run through the priming cycle before running on a selected power level. Default priming cycle is 2 minutes at 1000 watts (3500 RPM). Priming power level is adjustable from 50 watts (1000 RPM) to 1000 watts (3500 RPM) in increments of 10 watts, and priming time is adjustable from 0-10 minutes in 1 minute increments.

Start Up Guide - continued

Prime Sequence: If full prime has not been achieved after prime cycle (max. 10 minutes), press the “0” button to stop the pump. Refill the pump with water and restart. Allow the pump to run for up to 10 minutes to allow air trapped in the suction line to be purged.

8. The pump has three (3) adjustable power level settings. Each power level can be varied in 10 watt increments from 50 watts (1000 RPM) to 1000 watts (3500 RPM).

9. If the power is turned off or the pump is stopped, it will repeat the programmed priming cycle.

10. If the pump does not prime and all the instructions to this point have been followed, check for a suction leak. If there is a leak repeat Steps 2 through 6. *NOTE: It is normal for a few drops of water to escape from the mechanical seal from time to time. This is especially true during the break-in period. (Refer to section 5.2 - Mechanical Seal on page 16).*

11. *For technical support, call 800-223-8538. If calling from outside the U.S. dial +1 904-739-2626.*

Programming the Priming Time & Power Level

The pump is factory set with a default priming cycle of 1000 watts (3500 RPM) for two (2) minutes. The following steps show how to change these parameters:

1. With power applied to the pump, press the “0” button. This will stop the pump if it is running, and the LED window will display “OFF.”

2. Press and hold the “SET” button for at least three (3) seconds. The priming power level should start flashing in the LED window.

3. Press the “1/▼” button to decrease the power level or the “3/▲” button to increase the power level in increments of 10 watts. Priming speed range is 50 watts (1000 RPM) to 1000 watts (3500 RPM).

4. Press the “OK” button to save the priming power level setting. The priming time will then begin flashing in the LED window. To cancel and return to the previous mode, press the “SET” button.

5. Press the “1/▼” button to decrease the time or the “3/▲” button to increase the time in increments of 1 minute. Priming time range is 0-10 minutes. To cancel without changing the priming time, press the “SET” button.

6. Press the “OK” button to save the priming time setting and exit the programming sequence.

NOTE: Setting the priming time to 0 minutes will disable the priming cycle.

Adjusting the Preset Power Levels

The user interface provides manual speed controls for the pump. There are three (3) factory preset buttons that can be selected (1, 2, or 3). Speed 1 is preset to 100 watts (1500 RPM). Speed 2 is preset to 450 watts (2600 RPM). Speed 3 is preset to 1000 watts (3500 RPM). Once a button (1, 2, or 3) is pressed the LED above the selected speed will illuminate and the power level will be shown in the LED window. The three (3) power levels can be modified as required by minimum flow and pressure requirements of various pool side equipment/features as defined by the manufacturer specifications.

NOTE: During the priming cycle, the LED above the selected power level will be flashing. The priming power level will be flashing in the LED window.

Please follow all local/state regulations regarding pool motor and timer speeds settings when choosing the appropriate speeds.

Adjusting the Preset Power Levels

The following steps show how to change any of the preset power levels:

1. Press the button corresponding to the preset power level to be changed (1, 2, or 3). The pump will begin to run if it was stopped.
2. Allow the pump to go through the priming cycle (if button was pressed when pump was stopped).
3. Press and hold the "SET" button for at least three (3) seconds. The power level will begin to flash on the LED display.
4. Press the "1/▼" button to decrease the power level or the "3/▲" button to increase the power level in increments of 10 watts. Each preset power level can be set between 50 watts (1000 RPM) and 1000 watts (3500 RPM).
5. Press the "OK" button to save the selected speed and exit the programming sequence. To cancel and return to the original programmed speed, press the "SET" button.

Normal Operation

1. To start the pump from the stopped position, press one of the preset power level buttons (1, 2, or 3). The pump will run through the programmed priming cycle. The LED display and the green LED above the selected power level will flash during the priming cycle.
2. Once the priming cycle is complete, the watts for the selected power level will be shown in the LED display. (See Figure 3)
3. The pump will run as follows, depending on which power level is selected. For reference, Table 2 shows the approximate RPM at various power level settings.
 - If Power Level 1 is selected, the pump will run at that setting indefinitely until either the "0" button or one of the other preset power level buttons is pressed. Power Level 1 should be set for normal circulation.
 - If Power Level 2 is selected, the pump will run at that programmed setting for twenty-four (24) hours. After that time, the pump defaults back to Power Level 1. This 24 hour override is ideal when shocking the pool.
 - If Power Level 3 is selected, the pump will run at that programmed setting for two (2) hours. After that time, the pump defaults back to Power Level 1. This two-hour override is ideal for high bather loads or vacuuming the pool.

NOTE: To save power, the LED display will turn off after three minutes during normal operation.

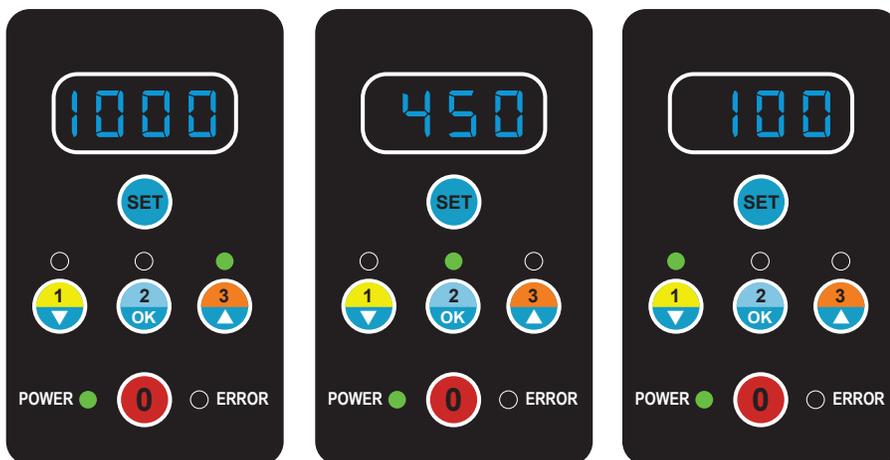


Figure 3

Power Level (Watts)	Approx. RPM
1000	3500
850	3250
750	3100
650	2950
550	2800
450	2600
350	2350
250	2050
150	1700
50	1000

Table 2

Normal Operation - continued

- To stop the pump at any time, press the "0" button. The pump will come to a stop and the LED display will read OFF.
NOTE: If the power is shut off or the pump is stopped using the "0" button, upon powering up the pump will run through the programmed priming cycle and then resume normal operation.

Reset to Factory Default Settings

- Verify that the pump is powered ON and the green power LED light is on.
- If the pump is running, press the "0" button to stop it.
- Press and hold the "SET" button for at least 15 seconds.
- The three preset power level LED lights and the POWER LED light will all illuminate simultaneously to indicate that factory default settings have been restored.

User Interface Lockout

The user interface can be locked to prevent unauthorized programming modifications:

- To lock the user interface, first press the "SET" button then immediately press the "0" button simultaneously.
- When the user interface is locked, there will be a dot "." in the lower right corner of the LED display. (See Figure 4)
- To unlock the user interface, press the "SET" button and "0" button in the same sequence as described above.

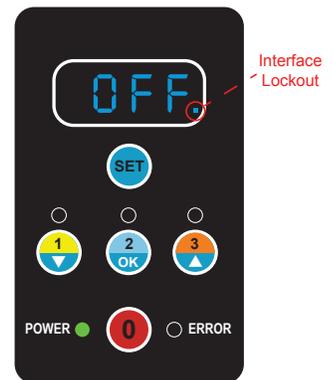


Figure 4

5 Service and Maintenance

Routine Maintenance

This pump requires little or no service other than reasonable care and periodic cleaning of the strainer basket. ***DO NOT*** strike basket to clean. When cleaning the basket inspect the lid o-ring for damage and replace if necessary.

1. Inspect the pump basket for debris by looking through the clear pump lid.
2. Turn OFF the power to the pump. If the pump is located below the water level, close isolation valves on the suction and discharge sides of the pump to prevent back flow of water.
3. Remove any debris, because as the debris accumulates, it will begin to block the flow of water through the pump. Keep the basket clean and clear to improve the performance of the pump.
4. Turn the lid ring counter-clockwise to remove. Carefully remove the lid and lock ring.
5. Remove the basket and properly dispose of the debris into the trash and rinse out the basket. Check basket for cracks, if crack is found replace basket.
6. Replace basket back into the pump, align the basket properly with the suction pipe. Then fill with water up to the suction pipe. Clean the clear lid, o-ring, and sealing surface of the pump of any debris.
7. Replace lid with lid ring. *Hand-tighten* the lid to make an air-tight seal. ***DO NOT use any tools to tighten the lid.***

Routine Maintenance - continued

8. Verify that all valves have been returned to the proper position for normal operation. Turn ON the power to the pump.

NOTE: It is normal for a few drops of water to escape from the mechanical seal from time to time. This is especially true during the break-in period.

The mechanical seal may become worn or loose over the course of time, depending on the running time and water quality. If water continually leaks out, a new mechanical seal should be fitted. After long periods of no operation (seasonal storage, etc.), the pump must be checked for ease of rotation while it is switched off. Detailed instructions for removing and replacing the mechanical seal begin on page 16.

WARNING: *Before servicing the pump, switch off the circuit breakers at the power source. Severe personal injury or death may occur if the pump starts while your hand is inside the pump.*

Winterizing

CAUTION: *The pump must be protected when freezing temperatures are expected. Allowing the pump to freeze will cause severe damage and void the warranty.*

There are two options when winterizing the pump

Option 1:

1. Drain all the water from the pump, system equipment, and piping.
2. Remove drain plugs. **DO NOT** replace plugs. Store the plugs in the empty strainer basket for winter.
3. Keep the motor covered and dry.

Option 2:

1. Drain all the water from the pump, system equipment, and piping.
2. Remove the pump and motor from the plumbing and store indoors in a warm and dry location.

NOTE: When the winter season is over the pump will need to be check and primed prior to start. Refer to Section 4 Operation, Start Up Guide.

CAUTION: DO NOT run the pump dry. If the pump is run dry, the mechanical seal will be damaged and the pump will start to leak at the seal. If this occurs, the mechanical seal will need to be replaced. **ALWAYS** maintain the proper water level in your pool. Continued operation in this manner could cause a loss of pressure, resulting in damage to the pump casing, impeller, and mechanical seal.

6 Troubleshooting

Controller Errors

WARNING: The pump must be serviced by a professional service technician qualified in pool/spa installation. The following procedures must be followed exactly. Improper installation and/or operation can create dangerous electrical hazards, which can cause high voltage to run through the electrical system. This can cause property damage, serious personal injury, and/or death. Improper installation and/or operation will void the warranty.

The controller errors are indicated by the red LED and an error code shown in the LED display (See Figure 5). List of error codes with their descriptions are listed in Table 2.0.

NOTE: In the event that an error code is shown and will not clear, the controller can be 'rebooted' by turning power to the pump OFF and waiting 10 minutes before turning the power back on. If this step does not clear the error code, contact your pool professional for service.

Table 2.0

Error Code	Error Description
01	DC-link over-voltage
02	DC-link under-voltage
03	DC-link voltage is too low
04	IPM (Intelligent Power Module) over-current software protection
05	IPM (Intelligent Power Module) over-current hardware protection
10	Thermal overload has tripped
11	Motor speed too high
13	IPM (Intelligent Power Module) temperature too high
16	Motor out of step
20	Short circuit to ground
21	Motor phase short circuit
22	Output phase lack
31	Communication error with master
41	Current sampling sensor error
42	Inrush current preventing relay error
43	Voltage sensor error, AC voltage and DC voltage do not match
51	IPM (Intelligent Power Module) temperature sensor error
60	Motor rotor locked
61	DSP ROM error
62	DSP RAM error
63	DSP watchdog error
66	Internal communication error

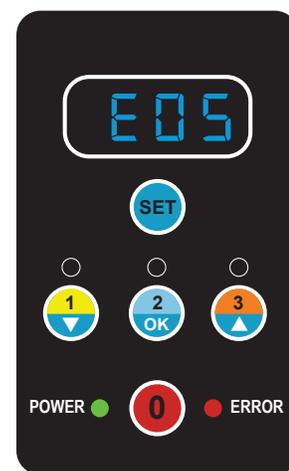


Figure 5

General Pump Troubleshooting

Table 3.0

Problem	Possible Cause	Solution
1. Pump will not prime.	A. Suction air leak	Make sure see-through lid and o-rings are clean and properly positioned. Hand tighten see-through lid. Tighten all pipes and fittings on suction side of pump. Be sure water in pool is high enough to flow through skimmer.
	B. No water in pump.	Make sure strainer tank is full of water.
	C. Closed valves or blocked lines.	Open all valves in system. Clean skimmer and strainer tank. Open pump and check for clogging of impeller.
	D. Low voltage to motor.	Check voltage at motor. If too low, pump will not run.
2. Motor does not turn	A. No power to motor.	Check that all power switches are on. Be sure fuse or circuit breaker is properly set. Time set properly? Check motor wiring at terminal.
	B. Pump jammed	With power off, turn shaft. It should spin freely. If not, disassemble and repair.
3. Low flow	A. Dirty filter	Back wash filter when filter pressure is high, or clean cartridges.
	B. Suction Leak	See Problem 2

Blocked Impeller

WARNING: Before servicing the pump, switch off the circuit breakers at the power source. Severe personal injury or death may occur if the pump starts while your hand is inside the pump.

1. Turn OFF the pump. Switch off the circuit breaker to the pump motor.
2. Remove the pump lid and strainer basket.
3. Look inside pump for debris. Remove any debris found inside.
4. Replace the strainer basket and lid.
5. Switch on the circuit breaker to the pump motor.
6. Turn ON the pump, see if the problem is solved.
7. If the impeller is still blocked with debris and it is not possible to remove the debris using Steps 2 - 4, the pump will need to be disassembled in order to access the inlet and outlet of the impeller.

Removal and Replacement of the Impeller and/or Mechanical Seal

WARNING: Before servicing the pump, switch off the circuit breakers at the power source. Severe personal injury or death may occur if the pump starts while your hand is inside the pump.

1. Turn OFF the pump. Switch off the circuit breaker to the pump motor. If you are not replacing the motor, do not disconnect the electrical wiring.

Removal and Replacement of the Impeller and/or Mechanical Seal

2. Turn OFF any valves to prevent pool water from reaching the pump. Drain water from the pump by loosening the unions or removing the drain plugs.

3. Remove the eight (8) screws connecting the pump casing/strainer tank to the flange.

4. Pull the motor and flange/seal housing out from the pump casing/strainer tank. Remove the pump casing o-ring. The impeller is connected to the motor shaft.

5. Remove the diffuser by gently pulling the diffuser (the diffuser is the cover over the impeller) horizontally until the pins clear the seal housing. *NOTE: Only Model ES90-II VSP and Model E90-II VSP have a diffuser.*

6. Place a flat head screwdriver through the center hole of the fan cover and into the screwdriver slot on the motor shaft.

7. While holding the motor shaft, turn the impeller counter-clockwise.

8. Gently pull the mechanical seal from the impeller shaft noting the way it was originally installed.

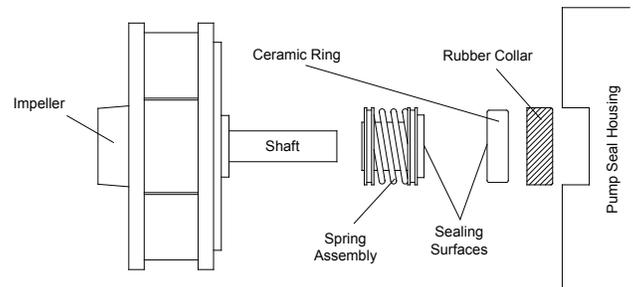


Figure 3

CAUTION: DO NOT damage the ceramic or carbon sealing surfaces of the seal. If the sealing surfaces are damaged, leaks will occur.

9. Using water with a small amount of dish soap, brush the impeller shaft for ease of assembly.

10. With the carbon side up, push the mechanical onto the impeller shaft and wipe carbon surface with a clean cloth. **CAUTION: DO NOT** use grease or lube to install seal. It will damage the seal and cause failure.

11. The ceramic side of the seal can be pushed out from the rear of the seal housing. Please note its position before removing.

12. Using water only, wet the ceramic side of the seal and using your thumbs push into the seal housing. Clean surface with a clean cloth.

13. Wipe the motor shaft of all debris and apply a single drop of Loc-tite to the motor shaft threads.

14. Install impeller by spinning it clockwise onto the motor shaft. Continue to turn clockwise until the carbon and ceramic sides make contact and the seal spring slightly compresses.

15. Install the diffuser by aligning the diffuser pin with the holes in the seal housing and pressing together.

16. Make sure the diffuser and casing o-rings are in place and free of debris. Slide the motor flange into the casing.

17. Install the eight casing through bolts and nuts using a cross pattern from side to side and top to bottom. **CAUTION: DO NOT** over-tighten.

Motor Replacement

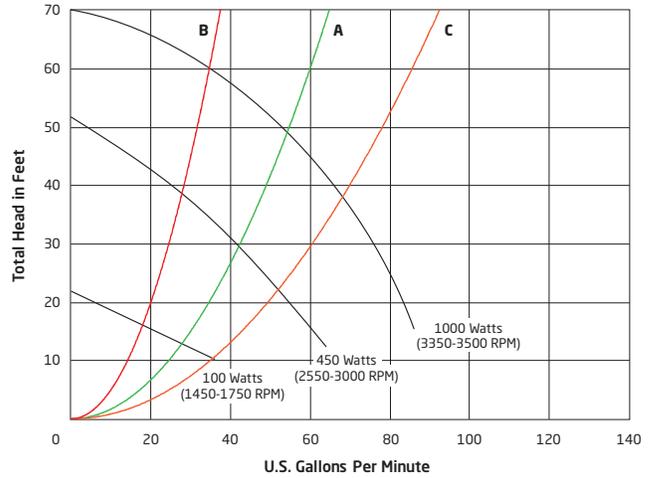
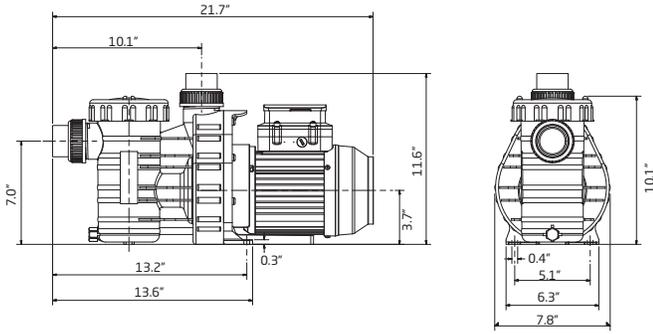
WARNING: *The pump must be serviced by a professional service technician qualified in pool/spa installation. The following procedures must be followed exactly. Improper installation and/or operation can create dangerous electrical hazards, which can cause high voltage to run through the electrical system. This can cause property damage, serious personal injury, and/or death. Improper installation and/or operation will void the warranty.*

1. Disconnect the wiring from the side of the motor. *(Refer to the Electrical Installation)*
2. Remove the eight (8) screws holding the flange/seal housing to the pump casing/strainer tank.
3. Slide the motor and flange/seal housing away from the casing/strainer tank.
4. Remove the diffuser by gently pulling the diffuser horizontally until the pins are clear from the flange/seal housing.
5. Remove the fan cover (3 Phillips head screws) and place a flat heat screwdriver into the screwdriver slot on the rear of the motor shaft.
6. While holding the motor shaft, turn the impeller counter-clockwise.
7. Using a 1/4" socket, remove the four thru-bolts from the rear of the motor.
8. Remove one-piece flange/seal housing from the front of the motor.
9. Remove the slinger from the old motor and install on to the new motor.
10. Clean the surfaces of the seal *(Refer to the Removal and Replacement of the Impeller and/or Mechanical Seal Section page 16 steps 9-17)*.

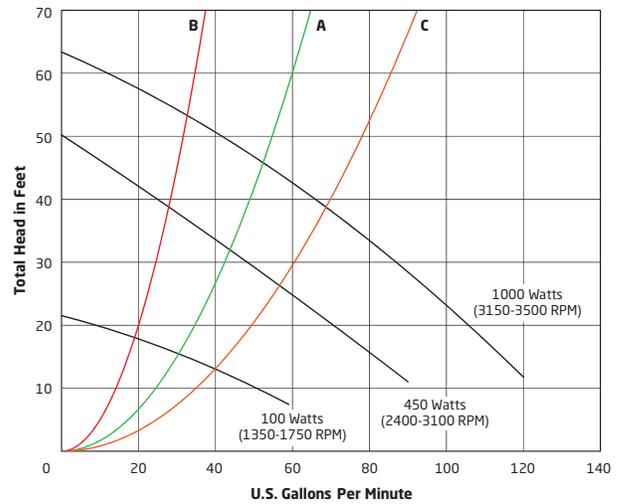
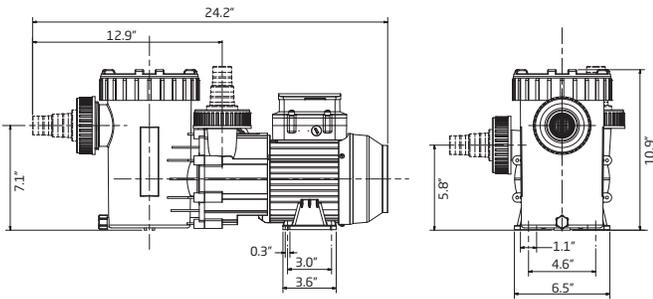
7 Product Specifications

Dimensional Drawings & Performance Curves

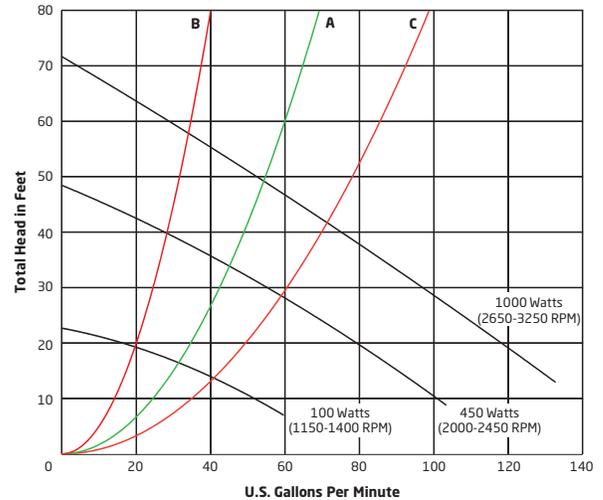
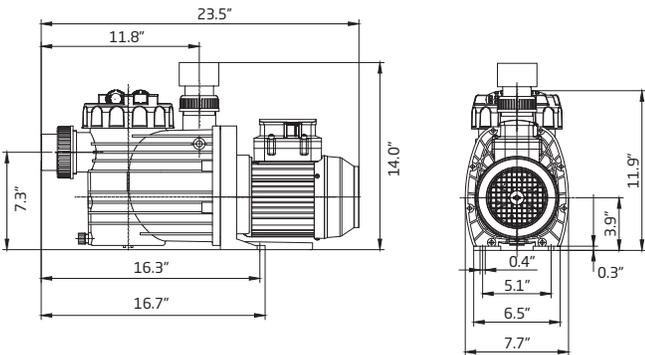
Model A91-II VSP



Model E71-II VHV



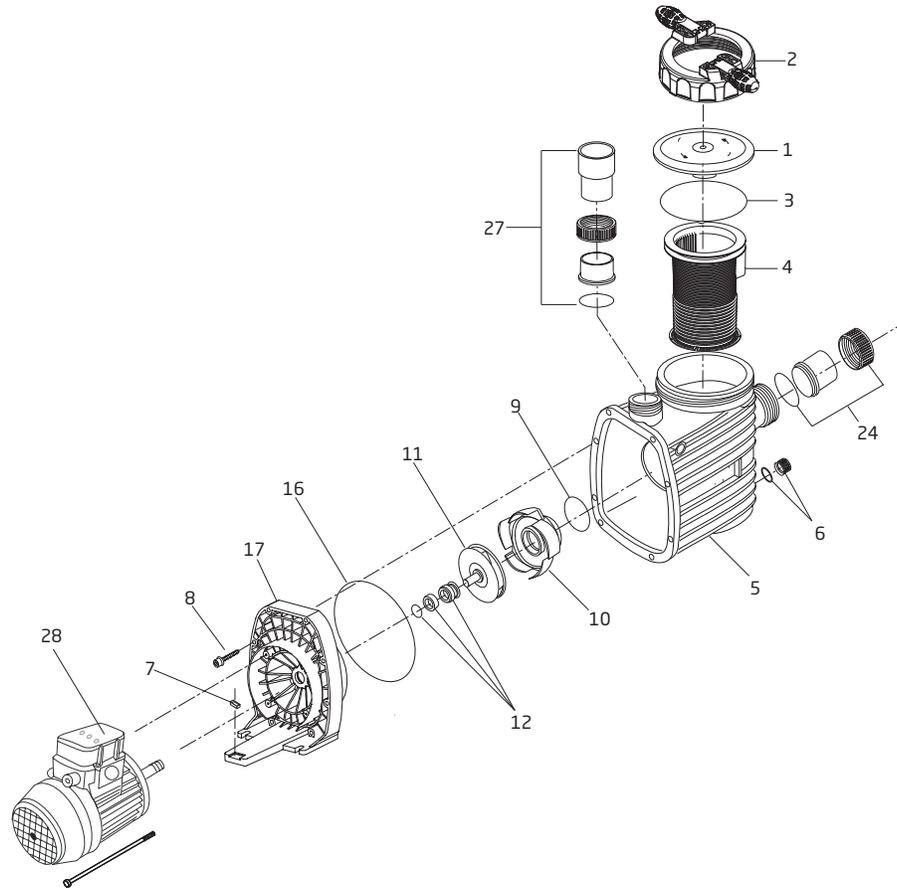
Model ES90-II VSP



B, A, and C represent average system curves for pools with the pipe diameter mentioned below.
 B = 1.5" pipe A = 2.0" pipe C = 2.5" pipe

Replacement Parts and Exploded View

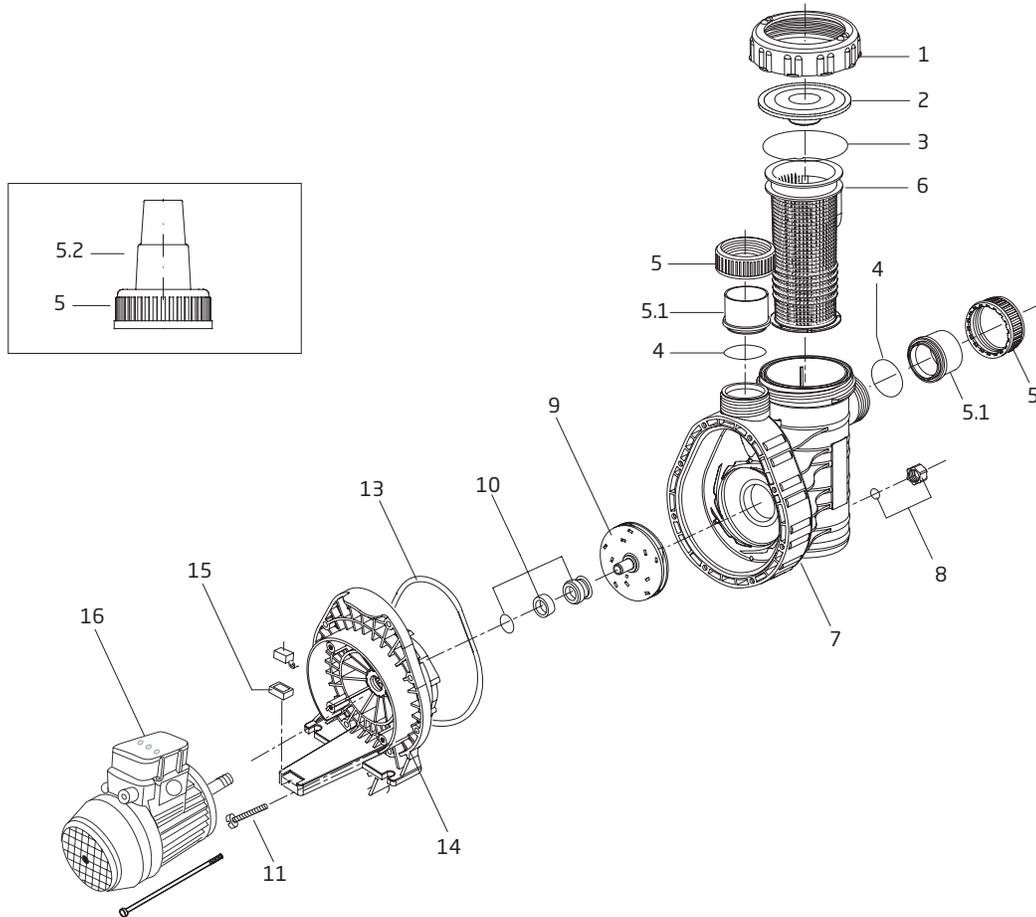
Model ES90



Order #	Drawing Number	Qty Required	Description
2901116010	1	1	LID - CLEAR
2901116010B	NOT SHOWN	1	LID - CLEAR with LED LIGHT
2921116022	2	1	LOCK RING WITH HANDLES - LID
2921141210	3	1	O-RING - LID 137 x 5mm
2901114300	4	1	BASKET - ONE PIECE
2921110130	5	1	CASING
2901158200	6	1	DRAIN CAP 3/8" WITH GASKET - CASING
2920889410	7	3	LEGO SPACER
2991000091	8	8	SCREW - CASING HEX/SLOT M7 x 48mm SS
2920141210	9	1	O-RING - DIFFUSER 90 x 5mm
2921117412	10	1	DIFFUSER
2921223040	11	1	IMPELLER (-II) 1.1 THP 115/9mm (3/8") 6V
2921606204	12	1	MECHANICAL SEAL (5/8") - CARBON/CERAMIC
2921141222	16	1	O-RING - CASING 190 x 6mm
2921116112	17	1	FLANGE/SEAL HOUSING
2921770005	24	1	SET - SUCTION UNION COMPLETE
2500300902	27	1	SET - DISCHARGE UNION COMPLETE
2500300914	24 & 27	1	SET - SUCTION/DISCHARGE UNION COMPLETE
ECPM750011	28	1	MOTOR - 1.0 HP S.F. 1.1 DUAL VOLTAGE

Replacement Parts and Exploded View - continued

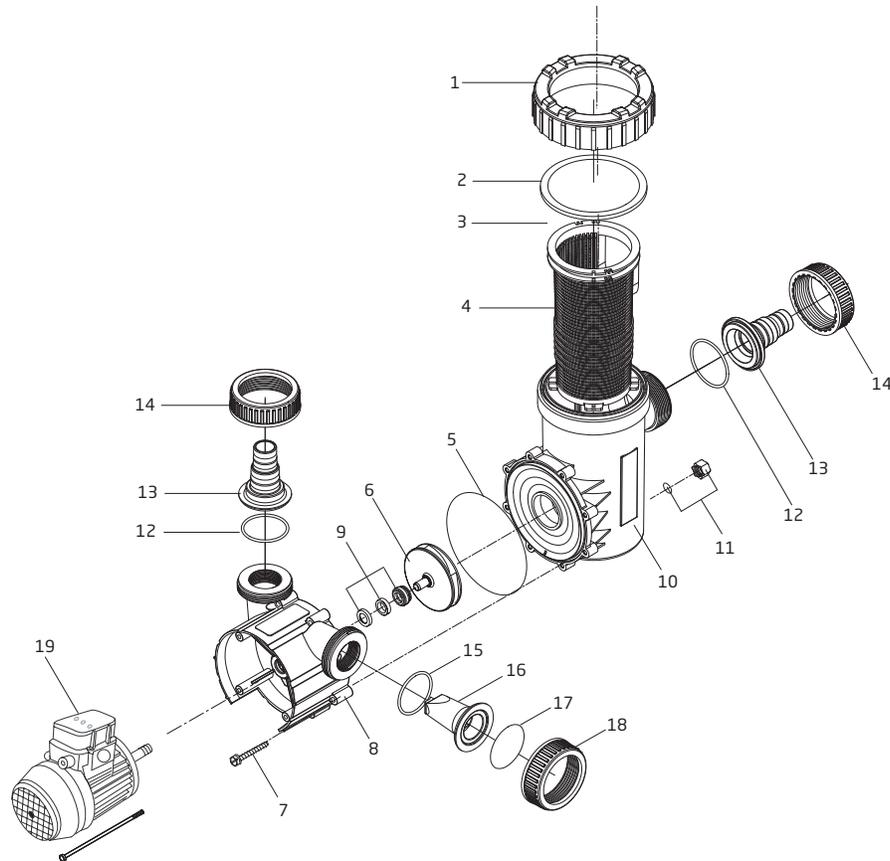
Model A91



Order #	Drawing Number	Qty Required	Description
2901316020	1	1	LOCK RING - LID
2901316010	2	1	LID - CLEAR
2901341220	3	1	O-RING - LID 105 x 5mm
2500300912	4, 5, 5.1 & 5.2	1	COMPLETE UNION PACKAGE - SUCTION/DISCHARGE - SLIP/HOSE
2500300915	4, 5, & 5.2	1	COMPLETE UNION PACKAGE - SUCTION/DISCHARGE - HOSE
2500300916	4, 5, & 5.1	1	COMPLETE UNION PACKAGE - SUCTION/DISCHARGE - SLIP
2500300913	4, 5, & 5.1	1	COMPLETE UNION PACKAGE - SUCTION/DISCHARGE - NPT
2500300909	4, 5, & 5.1	2	HALF UNION SET - NPT (INCLUDES NUT, THREADED UNION END & O-RING)
2500300910	4, 5, & 5.1	2	HALF UNION SET - SLIP (INCLUDES NUT, UNION END & O-RING)
2500300911	4, 5, & 5.2	2	HALF UNION SET - HOSE (INCLUDES NUT, HOSE ADAPTOR & O-RING)
2901314300	6	1	BASKET - ONE PIECE
2901310101	7	1	CASING
2901158200	8	1	DRAIN CAP 3/8" WITH GASKET - CASING
2921623034	9	1	IMPELLER (-II) 98 / 9mm
2921606204	10	1	MECHANICAL SEAL (5/8") - CARBON/CERAMIC
2991000091	11	8	SCREW - CASING, HEX/WASHER/SLOT M7 x 48mm
2921641223	13	1	O-RING - CASING 165 x 6mm
2901316101	14	1	FLANGE/SEAL HOUSING
2920889410	15	1	LEGO (FOOT)
ECPM750011	16	1	MOTOR - 1.0 HP S.F. 1.1 DUAL VOLTAGE

Replacement Parts and Exploded View - continued

Model E71



Order #	Drawing Number	Qty Required	Description
2901116020	1	1	LOCK RING - LID
2901116010	2	1	LID - CLEAR
2901141201	3	1	O-RING - LID 137 x 5mm
2901114300	4	1	BASKET - ONE PIECE
2901141200	5	1	O-RING - CASING 144 x 4mm
2921923193	6	1	IMPELLER (-II) 1.1THP 106/9mm W/INSERT
2991000091	7	8	SCREW - CASING (HEX/WASHER/SLOT) M7 x 48mm
2901172115	8	1	CASING - DUAL DISCHARGE
2921606204	9	1	MECHANICAL SEAL (5/8") - CARBON/CERAMIC
2901110100B	10	1	STRAINER TANK
2901158201	11	1	ORANGE DRAIN CAP 3/8" WITH GASKET - CASING
2901172114	(12-14)	1	UNION PACKAGE - SUCTION/DISCHARGE - HOSE ADAPTOR KIT
2901141215	15	1	O-RING - DISCHARGE PORT 60 x 3.5mm
2901191600	16	1	PLUG - DISCHARGE PORT ABS
2901191601	17	1	PLUG COVER - DISCHARGE PORT ABS
2901172111	18	1	NUT - DISCHARGE PORT 1.5"/2" ABS
ECPM750011	19	1	MOTOR - 1.0 HP S.F. 1.1 DUAL VOLTAGE

8 Limited Warranty

Speck Pumps-Pool Products, Inc. grants solely to the original consumer purchaser ("Buyer") of the pump and motor the following personal, non-transferable and limited warranty on the following terms and conditions (the "Limited Warranty"): the pump and motor is warranted to be free of material defects in materials or workmanship under normal use for a period of two (2) year beginning on the date of the Buyer's purchase of the pump and motor. Notwithstanding any provisions herein to the contrary, the warranties and obligations hereunder shall not in any event extend for more than three (3) years beyond the date of shipment of the pump and motor from the factory (the "Limited Warranty Period"). The Limited Warranty is subject to each of the following additional terms and conditions:

1. IN THE EVENT OF ANY BREACH OF THE LIMITED WARRANTY, SPECK PUMPS - POOL PRODUCTS, INC.'S ENTIRE OBLIGATION AND LIABILITY TO BUYER, AND BUYER'S SOLE AND EXCLUSIVE REMEDY SHALL BE AS FOLLOWS: Speck Pumps - Pool Products, Inc. will, at its option, either repair or replace the pump and motor or refund to Buyer the purchase price actually paid by Buyer for the pump and motor subject to the Limited Warranty. Speck Pumps - Pool Products, Inc. shall have no obligations under the Limited Warranty unless Buyer delivers timely written notice to Speck Pumps - Pool Products, Inc. of the Limited Warranty claim within the Limited Warranty Period and returns the pump and motor to Speck Pumps - Pool Products, Inc. if requested. To the fullest extent permitted by law, Speck Pumps - Pool Products, Inc. expressly disclaims any liability for, and the Limited Warranty does not include or cover, any labor, costs or other expenses in connection with the removal, transportation, shipment, insurance, replacement, repair, or installation of repaired or replaced parts or for any other costs or expenses or damages to property or things including, but not limited to, those arising in connection with the use of, or inability to use, the pump and motor.

2. To the fullest extent permitted by law, the Limited Warranty will be void and of no force or effect and Speck Pumps - Pool Products, Inc. will have no liability, responsibilities or obligations to Buyer or with respect to the pump and motor in the event of the occurrence of any one or more of the following:

- (a) Any damage to the pump and motor caused by Buyer, any third party, ground movement, other natural forces, acts of God or any other sources or causes not arising from a breach of the Limited Warranty, excluding ordinary wear and tear;
- (b) Any replacement, modification, alteration or repair of any parts or components of the pump and motor by anyone other than Speck Pumps - Pool Products, Inc.;
- (c) Any abuse, misuse, accident, tampering with, improper installation or modification of the pump and motor or any other actions, inactions or failures to act that violate the terms and conditions of this Limited Warranty;
- (d) Buyer's failure or inability to present an invoice, bill, receipt or other documentation clearly evidencing that the pump and motor was installed and maintained in strict compliance with this Limited Warranty and that the claim was timely submitted within the Limited Warranty Period; and/or
- (e) Buyer's failure to comply with the conditions and contingencies set forth in paragraph 3 below.

3. The Limited Warranty is expressly conditioned and contingent upon Buyer's strict compliance with each of the following:

- (a) Installation of the pump and motor by an experienced and qualified pool industry professional and a licensed electrician who is licensed within the jurisdiction in which the pump and motor is installed and will be used; and
- (b) Buyer's operation and maintenance of the pump and motor in strict accordance with Speck Pumps - Pool Products, Inc.'s printed operator/maintenance manuals delivered with the pump and motor.

4. DISCLAIMER: THE LIMITED WARRANTY IS THE ONLY WARRANTY MADE AND IS IN LIEU OF ALL OTHER WARRANTIES, AND ANY AND ALL IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, THE IMPLIED WARRANTY AGAINST INFRINGEMENT, AND THE IMPLIED WARRANTY OR CONDITION OF FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN THEIR SCOPE AND DURATION TO THE TWO YEAR TERM OF THE LIMITED WARRANTY SET FORTH HEREIN. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO THE BUYER.

Limited Warranty - continued

5. TO THE FULLEST EXTENT PERMITTED BY LAW, IN NO EVENT SHALL SPECK PUMPS - POOL PRODUCTS, INC. OR ITS OFFICERS, DIRECTORS, EMPLOYEES, SHAREHOLDERS, AGENTS, OR REPRESENTATIVES BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES OR LOSS, INCLUDING TIME, MONEY, GOODWILL, AND LOST PROFITS IN ANY WAY WHICH MAY ARISE HEREUNDER OR FROM THE USE OF OR INABILITY TO USE THE PUMP AND MOTOR OR THE PERFORMANCE OR NONPERFORMANCE OF ANY OBLIGATION UNDER THIS LIMITED WARRANTY. THIS PARAGRAPH, THE WARRANTY DISCLAIMERS IN PARAGRAPH 4 ABOVE, AND THE SOLE AND EXCLUSIVE REMEDY SET FORTH IN PARAGRAPH 1 ABOVE SHALL APPLY EVEN IF SPECK PUMPS - POOL PRODUCTS, INC. HAS BEEN NOTIFIED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH DAMAGES OCCURRING, WHETHER SUCH LIABILITY IS BASED ON CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, PRODUCTS LIABILITY OR OTHERWISE, AND EVEN IF ANY REMEDY STATED HEREIN FAILS OF ITS ESSENTIAL PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF SPECIAL, INDIRECT, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES OR LOSS, SO THE ABOVE EXCLUSIONS AND LIMITATIONS MAY NOT APPLY.

6. This Limited Warranty gives the Buyer specific legal rights, and the Buyer may also have other rights, which vary from state to state.

7. A return merchandise authorization ("RMA") must be obtained from Speck Pumps - Pool Products, Inc. before returning any product. Products returned without an RMA will be refused and returned, unopened, to the Buyer. All returned products are to be sent freight prepaid and insured for Buyer's protection to the manufacturer at 8125 Bayberry Road, Jacksonville, Florida 32256. Under no condition will products be accepted after the expiration of the Limited Warranty Period. Speck Pumps - Pool Products, Inc. shall not bear any costs or risks incurred by Buyer in shipping a defective pump and motor to Speck Pumps - Pool Products, Inc. or in shipping a repaired or replaced pump and motor to Buyer.

