



INSTALLATION, OPERATION & MAINTENANCE MANUAL

A2H

A4L

A6

V2H

V4L

Electric Submersible Pumps

DS-C01-007

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www.flowsolutions.com

104 John W Murphy Drive, New Haven CT USA
860-631-3618 | sales@flowsolutions.com

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1. INTRODUCTION AND SAFETY

1.1 Introduction

This Installation, Operation and Maintenance manual provides important information on safety and the proper inspection, disassembly, assembly and testing of the BJM Pumps® submersible pump. This manual also contains information to optimize performance and longevity of your BJM Pumps® submersible pump.

If you have any questions regarding the inspection, disassembly, and assembly or testing please contact your BJM Pumps® distributor, or Industrial Flow Solutions Operating, LLC.

Industrial Flow Solutions Operating, LLC
104 John W Murphy Drive New Haven, CT 06513, USA
Phone: 860-399-5937
Fax: 860-399-7784

Information, including data sheets and performance curves, are available on our web site: www.flowsolutions.com

1.2 Safety Symbols

Please pay attention to the following alert notifications. They are used to notify operators and maintenance personnel to pay special attention to procedures, to avoid causing damage to the equipment, and to avoid situations that could be dangerous to personnel.

NOTICE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

	Immediate hazards that will result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure following the procedure.
	Hazards or unsafe practices that could result in severe personal injury or death. These instructions describe the procedure required, and the injury which could result from failure to follow the procedure.
	Hazards or unsafe practices could result in personal injury or product or property damage. These instructions describe the procedure required and the possible damage which could result from failure to follow the procedure.

1.3 General Safety

Pump installations are rarely identical; operating conditions and applications may vary due to numerous factors. It is the responsibility of the owner and/or service personnel to ensure that all repairs, maintenance, and testing are performed in accordance with this manual and that pump integrity is not compromised.

WARNING

Risk of electric shock: This pump has not been evaluated for use in swimming pools or similar aquatic environments.

DANGER

Do not pump flammable, combustible, or volatile liquids. Failure to comply may result in death or serious injury.

WARNING

Before opening, servicing, or performing maintenance on the pump:

- 1) Read and fully understand this manual.
- 2) Disconnect and lock out the power supply to ensure the pump remains inoperative.
- 3) Allow the pump to cool if it has been operating at elevated temperatures.

WARNING

Do not operate the pump with a worn, damaged, or improperly repaired power cable. Failure to comply may result in death or serious injury.

WARNING

Do not alter the length of the power cable or attempt to repair it using splices. The pump motor and power cable must remain completely watertight. Unauthorized modifications may result in equipment damage or personal injury.

WARNING

After installation, verify that the pump and all associated piping are properly supported and secured prior to operation.

WARNING

Do not lift or suspend the pump with the power cable, piping, or discharge hose. Use only the designated lifting handle or lifting rings provided on the pump.

WARNING

All electrical troubleshooting, testing, and servicing must be performed by a qualified electrician.

CAUTION

Pumps and associated equipment must be installed, operated, and maintained in compliance with all applicable national, local, and industry standards.

1.4 Biological & Chemical Hazards

These products are intended for use in liquids that may be hazardous to human health. Failure to follow proper safety procedures may result in infection or disease.

⚠ WARNING

Exposure to contaminated liquids may result in serious injury or illness.

To reduce the risk of injury or illness:

- 1) Ensure all personnel who may be exposed to biological hazards are properly vaccinated for potential diseases.
- 2) Always maintain strict personal hygiene when handling or servicing the product.
- 3) Thoroughly rinse the unit with clean water before performing inspection, maintenance, or service.

⚠ WARNING

Contact with hazardous liquids may cause serious injury.

Follow the procedures below immediately if chemicals or hazardous fluids come into contact with the eyes or skin.

Eye Contact:

- 1) Flush eyes immediately with an approved eyewash solution or clean running water.
- 2) Seek medical attention immediately.

Skin Contact:

- 1) Remove contaminated clothing immediately.
- 2) Wash affected skin thoroughly with soap and water for a minimum of 1 minute.
- 3) Seek medical attention if irritation or symptoms persist.

1.5 Environmental Protection

Improper handling of emissions or waste may result in environmental damage or regulatory non-compliance.

All activities involving this product shall comply with applicable local, state, and federal environmental regulations. This includes, but is not limited to, the following requirements:

- Reporting regulated emissions to the appropriate governing authorities.
- Proper segregation, recycling, and disposal of solid and liquid waste materials.

Immediate containment and cleanup of spills to prevent environmental contamination.

Failure to follow environmental regulations may result in fines, penalties, or environmental harm.

1.6 Radiation Exposure

⚠ CAUTION

Exposure to radioactive materials may present serious health and safety risks.

DO NOT return this product to Industrial Flow Solutions if it has been exposed to nuclear radiation. Products suspected of radioactive contamination must only be returned after Industrial Flow Solutions have been notified and written authorization has been provided outlining agreed-upon handling and mitigation procedures.

2. WARRANTY

The warranty and related terms and conditions can be found through our website:

<https://flowsolutions.com/terms-and-conditions/>

or contact us at sales@flowsolutions.com

3. NAME PLATE DETAILS


www.flowsolutions.com

MODEL

1

SERIAL #

2

3

VOLTS

6

kW

9

FLA

4

Hz

7

RPM

10

PH

5

GPM

8

FT

11

IMP

1	Pump Model
2	Serial Number
3	Voltage Rating
4	Frequency
5	Max Flow (GPM)
6	Rated Max Power (kW)
7	R.P.M.
8	Shut off head (ft)
9	Full Load Amperage
10	Phase
11	Impeller Diameter (mm)

4. APPLICATIONS

The BJM A2H, A4L, A6, V2H, and V4L series submersible electric motor pumps are intended for commercial, municipal, and industrial applications, including the pumping of raw and wastewater, agitated and raw sludge, sludge, and mixed liquids.

Maximum temperature of the pumped liquid: 104°F (40°C) with the pump completely submerged.

Maximum submersion depth: 65ft (20m)

Minimum submersion depth: Pump should stay completely submerged while in standard operation. For exact depth check the dimensional diagram for your pump series found on our website.

Allowable liquid density: Up to 1.1 specific gravity (SG).

Maximum starts per hour: 10 starts per hour.

The pumped liquid may contain suspended solid particles up to the maximum diameter permitted by the impeller design:

Model	Free Passage	
	(mm)	(in)
A2H-149	33	1.3
A2H-224, A2H-254	40	1.6
A2H-354, A2H-403, A2H-425	45	1.8
A4L-119, A4L-168	80	3.0
V4L-119, V4L-183, V4L-224, V4L-254	90	3.5
V2H-149, V2H-201, V2H-254, V2H-306, V2H-354, V2H-403, V2H-410, V2H-425	100	4.0
A4L-149, A4L-164, A4L-172, A4L-239, A4L-263, A4L-298, A6-56, A6-75	110	4.3
A4L-186, A4L-261, A4L-399	120	4.7
A4L-455, V4L-358, V4L-455, V4L-559	130	5.1
A4L-507	140	5.5

⚠ CAUTION

These pumps are not designed for operation in hazardous locations with a risk of explosion or fire, nor for the pumping of flammable liquids. For application specific guidance, contact Industrial Flow Solutions.

5. TECHNICAL CHARACTERISTICS

5.1 Materials of Construction

All components are manufactured from materials selected to ensure long-term reliability, corrosion resistance, and mechanical durability under continuous duty and high stress operating conditions.

- Motor casing, oil chamber, oil chamber cover, volute, suction cover, and impeller: Cast iron, EN 1561
- Motor shaft: Stainless steel, AISI 420
- Fasteners: Stainless steel, AISI 304
- O-rings: Nitrile rubber (BUNA-N), 70 Shore A hardness

Materials comply with applicable ASTM/EN standards for mechanical strength and service life in submerged pump applications.

5.2 Bearings

The motor is supported by upper cylindrical roller bearings and lower single-row radial ball bearings designed for submerged motor service. Bearings are permanently lubricated and sized for extended operational life under normal operating conditions. Replacement is required after prolonged service or when wear limits are reached, in accordance with recommended maintenance intervals.

5.3 Electric Motor

The pump is driven by an asynchronous (induction) electric motor with a squirrel-cage rotor configuration. Motors are available in 2-pole, 4-pole, and 6-pole designs and are supplied in single-phase or three-phase configurations.

- Rated frequency: 60 Hz (50 Hz available upon request)
- Voltage tolerance: $\pm 10\%$ of nominal voltage
- Frequency tolerance: $\pm 2\%$ of nominal frequency

All stators are constructed with Class F insulation (maximum winding temperature 155°C / 311°F) and feature an enclosure rating of IP68 per IEC 60529, suitable for continuous submersion. The maximum allowable surrounding liquid temperature is 40°C (104 °F).

All motors are equipped with integral thermal overload protection to prevent overheating:

- Type: Normally closed bimetallic thermal switches
- Trip temperature: 130 °C (266 °F)
- Reset temperature: Approximately 75 °C (167 °F)

Upon reaching the trip temperature, the thermal switch opens and interrupts power to the motor. The motor automatically restarts once the temperature falls below the reset threshold.

Motor cooling is provided by the surrounding pumped liquid.

5.4 Electric Power Cable

The pump is supplied with a heavy-duty flexible power cable suitable for submerged and industrial service conditions. The standard power cable type is either SOOW, SEOOW, or Type-G, selected for its resistance to oil, water, abrasion, and mechanical stress.

- Standard cable length: 50 ft (10 m)
- Cable construction: Oil-resistant thermoset rubber jacket with flexible stranded copper conductors
- Compliance:
 - UL-listed and CSA-certified for flexible cord usage
 - Suitable for wet locations and continuous duty in submersible pump applications

Supplied with unterminated cable leads for permanent connection to a customer provided disconnect switch or control panel. Electrical connections must be performed by a qualified electrician in accordance with applicable national and local electrical codes.

Proper grounding and strain relief are required to ensure safe and reliable operation.

5.5 Shaft Sealing System

All pumps are equipped with two single mechanical seals: one located within the oil chamber and the other positioned behind the impeller. Both seals utilize FKM elastomers and feature Carbon Graphite and Silicon Carbide sealing faces (CARB/SIC/FKM)

6. TRANSPORTATION, STORAGE, & DISPOSAL

6.1 Receiving and Inspection

Inspection Upon Delivery

Upon receipt of the product:

- Inspect the shipping container for visible damage or missing items.
- Record any damage or shortages on the delivery receipt and freight documentation.
- If damage or loss is identified, file a claim immediately with the carrier. If the product was collected from a distributor, submit the claim directly to the distributor.

Product Inspection

- Remove all packaging materials from the unit.
 - Dispose of packaging materials in accordance with local environmental regulations.
- Inspect the product for damage or missing components.
- If applicable, remove any shipping restraints such as screws, bolts, straps, or brackets.
 - Use caution when handling sharp fasteners, nails, or metal strapping.
- If any issues are identified, contact an authorized Industrial Flow Solutions representative before installation or operation.

6.2 Transportation and Handling

General Handling Precautions

CAUTION

Improper handling may result in equipment damage.

- **DO NOT** lift or carry the pump by the electric power cable or discharge hose.
- Always use the designated handle or lifting points provided on the unit.
- Disconnect the power supply before moving the pump to prevent accidental startup.

The unit may be transported in either a vertical or horizontal orientation, provided it is properly secured to prevent rolling, shifting, or tipping.

Lifting and Rigging

WARNING

Crush Hazard: Failure to use proper lifting methods may result in serious injury or death

- Always lift the unit using its designated lifting points.
- Use appropriate lifting equipment rated for the full weight of the assembly, including any retained liquid.
- Inspect all lifting equipment, hooks, slings, and anchors before use.
- Wear appropriate personal protective equipment (PPE).
- Always keep clear of suspended loads and tensioned cables.

WARNING

Never lift the unit by its electric cable or hose.

Lifting Equipment Requirements:

- Sufficient vertical clearance between the lifting hook and floor to allow safe lifting
- Capability to lift the unit vertically without repositioning the hook
- Proper anchoring and good mechanical condition
- Rated capacity adequate for the complete unit
- Use by authorized and trained personnel only

For repair or maintenance lifting operations, two independent lifting devices shall be used when required to ensure stability.

CAUTION

Crush Hazard: Undersized lifting equipment may create unsafe handling conditions. A site-specific risk assessment should be conducted prior to lifting.

6.3 Temperature Considerations

Temperature Limits During Transportation and Storage

If the unit remains in its original factory packaging and undisturbed condition, the acceptable temperature range for transportation, handling, and storage is 4 - 49 °C (40 - 120 °F)

If the unit has been exposed to freezing conditions, allow it to reach the ambient temperature of the installation environment before operation.

6.4 Storage

Short Term Storage (0 - 6 Months)

Store the unit in a location that is:

- Covered, dry, and well-ventilated
- Protected from humidity, heat sources, dirt, vibration, and mechanical damage
- Avoid storing pump in direct sunlight

Store the pump in a vertical position, ensuring it is stable and protected against rolling or falling.

CAUTION

Do not place heavy objects on the packaged product.

Medium Term Storage (0.5 - 3 Years)

If the unit is stored for more than six (6) months, the following measures shall be taken:

- Rotate the impeller every six months to prevent seal adhesion
- Before commissioning, inspect the unit with special attention to:
 - Mechanical seals
 - O-rings
 - Oil
 - Cable entry and strain relief
 - External damage or corrosion

Long Term Storage (> 3 Years)

If the unit is stored for more than three years, the following measures shall be taken:

- Disassemble the pump
 - Replace all the O-rings and seals.
 - Repack the Bearings.
- Rotate the impeller shaft by hand prior to startup

6.5 End-of-Life Disposal

NOTICE

Improper disposal may cause environmental harm or regulatory violations.

At the end of its service life, dispose of the product and all associated materials in accordance with applicable local, regional, and national regulations.

- Separate recyclable materials from general waste
- Dispose of oils, elastomers, and electrical components through approved waste streams
- Promote responsible recycling to support sustainable reuse of materials and minimize environmental impact

7. INSTALLATION

Before installation, record the model number and serial number of the pump and associated control panel in this manual. Upon completion of installation, provide this manual to the owner or permanently affix it to the control panel for future reference.

Installation and electrical connections shall be performed only by qualified personnel in accordance with applicable electrical codes and good engineering practice.

7.1 Safety Rules for Installation and Maintenance

⚠ WARNING

Failure to follow safety procedures may result in serious injury or death.

The following safety rules shall be observed during installation, inspection, and maintenance:

- Installation and service shall be performed only by qualified technicians.
- The pump shall not be operated by persons with reduced physical, sensory, or mental capabilities unless properly supervised and instructed.
- Children shall not be permitted to play with or operate the pump.
- Observe all applicable hygiene and sanitary precautions when working with contaminated liquids.
- Personnel working in wastewater or contaminated pumping stations shall be properly vaccinated against potential illnesses transmitted by contact, inhalation, or open wounds.
- Wear appropriate personal protective equipment (PPE), including protective clothing, footwear, gloves, safety glasses, helmet, and respiratory protection when required.

- Drowning Hazard:
 - Do not work alone.
 - Ensure another trained worker is present outside the tank at all times.
- Clearly mark and barricade the work area, especially in pedestrian or traffic zones.
- Measure oxygen levels and test for hazardous gases before entering the tank.
- Before any work inside the pumping station, verify that all electrical circuits are disconnected and locked out.
- Confirm that no explosive or flammable atmospheres are present before welding, soldering, or performing any operation that may generate sparks or open flames.

These instructions do not replace general safety regulations. All applicable laws, standards, and accepted engineering practices shall be followed.

7.2 Mechanical Installation

Pump Placement

NOTICE

Improper placement may reduce performance or damage the pump.

Never place the pump on loose, soft, or unstable ground.

- The pump may sink, restricting flow to the impeller.
- Install the pump on a solid, level base, or suspend it using an approved lifting chain.

The suction inlet shall be positioned at the lowest point of the tank to ensure effective drainage.

Discharge Piping

For optimal hydraulic performance:

- Use a properly sized non-collapsible discharge hose or rigid piping.
- Minimize bends and restrictions in the discharge line.
- A check valve (non-return valve) is recommended in the discharge line to prevent backflow when the pump is shut off.

8. ELECTRICAL CONNECTIONS

8.1 General Safety Precautions

⚠ DANGER

Electrical Hazard: Failure to isolate electrical power may result in death or serious injury.

Before performing any electrical work, ensure that the pump, control panel, and all associated control circuits are **completely disconnected from the power supply** and secured against accidental energization.

⚠ WARNING

Electrical Hazard: Risk of electric shock, burn, or explosion.

- All electrical work shall be performed and supervised by a qualified electrician.
- Comply with all applicable local, national, and site-specific electrical codes and regulations.
- Improper electrical connections or damaged components may result in electrical shock, fire, or equipment failure.

⚠ WARNING

Automatic Restart Hazard: The pump may restart automatically after a thermal or control reset. Ensure all personnel are clear of the pump before restoring power.

⚠ CAUTION

Electrical Hazard: Prevent power cables from being sharply bent, pinched, or mechanically damaged.

NOTICE

Moisture intrusion into electrical components may result in equipment damage or blown fuses. Keep all cable ends dry at all times.

8.2 Electrical Supply Requirements

The following requirements apply to all electrical installations:

- The **supply voltage and frequency** shall match the values listed on the pump data plate.
- Where intermittent operation is expected, appropriate **monitoring and control equipment** shall be installed.
- If provided, motor thermal contacts **shall be connected and functional**. Failure to do so may result in damage and void the pump warranty.

8.3 Motor and Short-Circuit Protection

⚠ WARNING

Electrical Hazard: Improper protection settings may result in motor damage or fire.

- Motor protection devices (fuses, circuit breakers, and overload relays) shall be selected and set by a qualified electrician based on the motor's rated current and starting current.
- Short-circuit protection shall **not be over-dimensioned**, as oversized protective devices reduce effective motor protection.
- Fuse ratings and conductor sizes shall comply with applicable electrical codes.
- The overload protection device shall be set to the **rated current shown on the data plate**.

NOTICE

Direct-on-line (DOL) starting currents may reach up to **six times the rated current** and must be considered when selecting protective devices.

8.4 Cable Installation Requirements

The following requirements apply when installing or reconnecting power cables:

- Cables shall be in good condition, free of cuts, abrasions, or deformation.
- Avoid sharp bends and comply with the manufacturer's **minimum bending radius**.
- Cables shall not be pinched, crushed, or subjected to tensile stress.
- If a previously installed cable is reused, remove a short section of the outer jacket before reassembly so the seal does not compress the same area again.
- Replace the cable promptly if the outer sheath is damaged.

NOTICE

Voltage drop in long cable runs shall be considered. The motor's rated voltage is measured at the **pump cable connection point**, not at the supply source.

8.5 Grounding (Earthing)

⚠ DANGER

Electrical Hazard: Failure to properly ground the equipment may result in death or serious injury.

- All electrical equipment shall be **properly grounded (earthed)** in accordance with applicable electrical codes.
- Verify continuity of the grounding conductor to ensure an effective ground path.

8.6 Thermal Protection

All models are equipped with thermal detectors (T1–T2) embedded in the motor windings.

These thermal contacts:

- Are **normally closed**
- Open at **130°C (266°F)** to interrupt power when overheating occurs
- Automatically reset at **75°C (167°F)**

Thermal contacts **must be** connected to a control panel with suitable protective circuitry. Failure to do so may result in damage and void the pump warranty.

8.7 Seal Minder®

The Seal Minder® moisture detection system is designed to alert the operator to the presence of moisture within the oil chamber, providing early indication of possible mechanical seal failure. This early warning allows maintenance and inspection to be scheduled before significant pump damage occurs.

The Seal Minder® consists of a sensor probe located within the oil chamber and requires connection to a compatible seal failure relay circuit or monitoring panel to provide an alarm signal.

CAUTION

The Seal Minder® must only be connected to an appropriate seal failure monitoring circuit. Improper wiring or connection to line voltage may damage the monitoring equipment or pump components.

The pump can operate without the Seal Minder® connected; however, use of a seal monitoring system is strongly recommended.

8.8 Wiring Diagrams

DANGER

Electrical Hazard: Contact with energized electrical components may result in death or serious injury. Always disconnect, lock out, and verify isolation of the power supply before installing, inspecting, modifying, or servicing electrical wiring or components.

WARNING

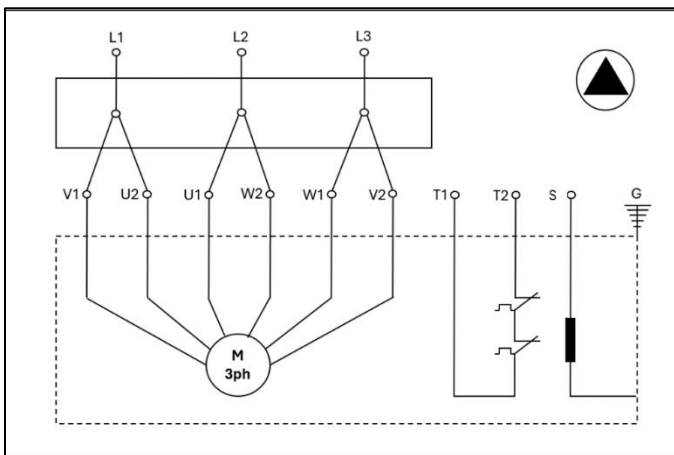
All electrical work shall be performed by a qualified electrician in accordance with applicable local, national, and international electrical codes and standards.

WARNING

Incorrect Wiring: Use of incorrect wiring diagrams, improper connections, or deviation from approved schematics may result in motor damage, control malfunction, unexpected startup, or fire hazard.

The wiring diagrams shown in this manual are provided for general reference only and illustrate typical wiring configurations. Failure to follow approved wiring diagrams and electrical procedures may result in improper operation, equipment damage, and voiding of warranty.

Three Phase (460V)



NOTICE

Do not rely solely on overview diagrams for installation or troubleshooting. Always use the complete, model-specific wiring diagrams applicable to the pump and control equipment being serviced. Complete wiring diagrams are available at www.flowsolutions.com. Applicable wiring diagram document numbers are listed in Section 16 – Document Reference Table.

8.9 Rotation Direction

WARNING

Mechanical Hazard: Unexpected movement during startup may cause injury.

After any new electrical connection, phase loss, or voltage interruption, verify the motor rotation direction.

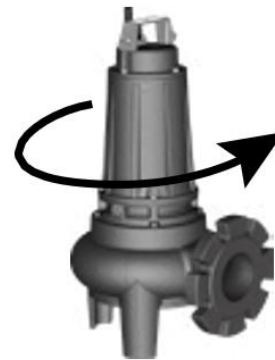
Incorrect rotation may cause:

- Motor overheating
- Excessive vibration
- Significantly reduced pump performance

Rotation Check Procedure

1. Slightly tilt the pump and briefly energize it.
2. Observe the startup reaction (kickback).
3. Correct rotation is confirmed if the pump produces a **counterclockwise kickback (viewed from above)**.
4. If rotation is incorrect, disconnect power and interchange any two of the conductors.

Starting Kickback



NOTICE

Viewed from the suction inlet, correct impeller rotation is **counterclockwise**.

9. OPERATIONAL SAFETY

9.1 Pre-Operation Safety Checks

WARNING

Electrical Hazard: Failure to follow proper safety procedures may result in serious injury or death.

Before placing the pump into operation, verify the following:

- All required safety devices and protective systems are properly installed and operational.
- The power cable and cable entry are free from damage.
- The pump, sump, and surrounding area are free of debris, foreign objects, and waste material.

NOTICE

Never operate the pump with the discharge line blocked or with the discharge valve closed. Doing so may result in equipment damage.

Before starting:

1. Verify the oil level in the motor oil chamber.
2. Disconnect power and confirm that the impeller rotates freely.

⚠ WARNING

Crush Hazard: Never place hands inside the pump housing.

3. Perform an insulation resistance test phase-to-ground.
 - Minimum acceptable value: **> 5 MΩ**

⚠ WARNING

Automatic Restart Hazard: The pump may start automatically. Ensure personnel are clear of the unit before energizing.

9.2 Electrical Safety During Operation

⚠ WARNING

Electrical Hazard: Risk of electric shock or burn.

Where persons may come into contact with liquids that are also in contact with the pump or pumped media, an **additional ground-fault protection device (GFCI/RCD)** should be installed.

This equipment has not been evaluated for use in swimming pool applications. If used in or near swimming pools, additional safety requirements and regulations apply.

9.3 Noise Emissions

Depending on installation conditions and operating point, the resulting sound pressure level may exceed 70 dB(A). Ensure compliance with all applicable workplace noise regulations.

⚠ WARNING

Hearing Hazard: Exposure to sound pressure levels exceeding 70 dB(A) may result in hearing loss.

Wear appropriate hearing protection and verify compliance with applicable occupational noise regulations before operating equipment.

9.4 Checking Impeller Rotation

⚠ CAUTION

Crush Hazard: The startup torque can be significant. Keep all personnel clear of the pump during startup.

To verify correct rotation:

1. Briefly start the motor.
2. Stop the motor after a few seconds.
3. Confirm that the impeller rotates in the correct direction.

Refer to Section 8.8 - Rotation Direction for additional details.

NOTICE

Incorrect rotation may cause reduced performance, excessive vibration, and motor overheating.

9.5 Operation at Freezing Temperatures

While submerged and operating, the pump is generally protected against freezing. If removed from the liquid and exposed to temperatures below **0°C (32°F)**, internal components may freeze.

NOTICE

Do not operate the pump if the impeller is frozen.

If freezing occurs:

- Submerge the pump in the pumped liquid and allow ice to melt naturally.
- **DO NOT** use open flames, heaters, or rapid warming methods.
- Avoid manual rotation of the impeller at freezing temperatures.

9.6 Standard Operating Conditions

The pump is designed for **fully or partially submerged operation**.

⚠ WARNING

Equipment Damage Hazard: Do not operate the pump dry.

Refer to the product data sheet for **minimum submersion depth requirements**. Data sheets are available at www.flowsolutions.com or from Industrial Flow Solutions Operating, LLC.

Maximum allowable pumped liquid temperature:

- 40 °C (104 °F)

Maximum allowable liquid density:

- 1.1 SG

10. INSPECTION AND MAINTENANCE

⚠ WARNING

Electrical Hazard: Failure to disconnect, lock out, and verify isolation of electrical power before inspection, maintenance, or service may result in serious injury or death. Always ensure the pump is completely de-energized before beginning any work.

⚠ WARNING

Biological and Chemical Hazard: Pumped liquids may contain substances hazardous to health. Thoroughly clean the pump with clean water or approved cleaning agents before inspection or disassembly. Wear appropriate personal protective equipment (PPE), including gloves, eye protection, and protective clothing.

NOTICE

Service and repair work shall only be performed by qualified personnel. Electrical servicing must be completed by a qualified electrician in accordance with applicable codes and standards.

10.1 Maintenance Philosophy & Inspection Intervals

Routine inspection and preventive maintenance are essential to ensure safe operation, maintain hydraulic performance, and extend pump service life.

- Inspect new pumps or pumps with replaced mechanical seals after the first week of operation.
- Perform a complete inspection after 2,000 operating hours or at least once per year, whichever occurs first.
- Pumps operating in harsh environments, abrasive fluids, or intermittent duty cycles require more frequent inspections.
- Maintenance should always be performed when removing the pump from service prior to storage.

10.2 Routine Inspection Checklist

Power Cable and Cable Entry

- Inspect the outer cable jacket for cuts, cracks, abrasions, or swelling.
- Ensure the cable is not sharply bent, pinched, or under mechanical strain.
- Inspect the cable entry and gland for signs of liquid infiltration; replace components if leakage is detected.

WARNING

Electrical Hazard: Never operate the pump with a cut, cracked, or damaged power cable. A damaged supply cord must be replaced by the manufacturer, an authorized distributor, or a similarly qualified person.

Electrical Components

- Verify that all electrical connections are properly secured.
- Ensure junction boxes and electrical cabinets are clean, dry, and free of corrosion.
- Check terminal blocks or closed-end splices for tightness and proper connection.

Oil Chamber (Where Applicable)

- Check seal oil condition **at least once per year**.
- Inspect oil for discoloration, contamination, or the presence of water.
- With the pump laid on its side, the correct oil level is approximately 1–1.5 cm (0.4–0.6 in.) below the oil fill opening.

Milky or water-contaminated oil indicates potential mechanical seal failure and requires corrective action.

10.3 Cleaning Procedure

If the pump has operated in liquids containing solids:

1. After removal of pump from application, briefly operate the pump in clean water to flush internal passages.
2. Remove accumulated debris such as mud, grit, or stones.
3. Prevent residue from drying, as hardened deposits may block the impeller or damage mechanical seals.

10.4 Motor Insulation Testing

Perform motor insulation testing **every two years** or after **4,000 operating hours**.

Procedure:

- Disconnect the pump from the power supply at the control panel.
- Measure insulation resistance at the cable ends using a megohmmeter.
- Maximum test voltage: **1000 V DC (continuous)**.

Acceptance Criteria:

- Resistance between windings and ground (earth) must exceed 5 MΩ.

If insulation resistance is below 5 MΩ:

- Disconnect the cable from the motor and test the cable and motor separately.
 - Low cable insulation indicates cable damage.
 - Low motor insulation indicates winding damage.

10.5 Inspection Schedule

	Annually or every 2,000 hours	Annually or after electrical work	Annually or if reduced output	Every two years or every 4,000 hours
External Inspections				
Cable & Cable Entries	X			
Electrical Inspections	X			
Fasteners & External Components	X			
Internal Inspections				
Oil Level & Oil Condition	X			
Mechanical Seal Condition	X			
Grounding (Earthing) Continuity		X		
Impeller Wear / Damage			X	
Motor Insulation Resistance Test				X

11. SPARE PARTS AND TOOLS

Replacement parts and proper tools are essential to maintain pump performance, safety, and reliability. Use of genuine parts and approved tools ensures proper fit, function, and compliance with all applicable standards.

WARNING

Equipment and Electrical Hazard: Always disconnect the pump from all electrical power sources before performing maintenance, inspection, or service. Use appropriate personal protective equipment (PPE) to prevent injury and follow the maintenance procedures outlined in Section 10 to avoid equipment damage.

NOTICE

Use of non-approved spare parts or tools may result in improper operation, reduced service life, or voided warranty coverage. Proper use of recommended tools is required to maintain warranty compliance.

11.1 Spare Parts

Model-Specific Parts Identification

Pump spare parts vary by model and configuration. To ensure correct part selection:

- Identify the pump model and serial number from the nameplate.
- Consult the model-specific spare parts documentation in [Section 16 \(Document Reference Table\)](#), which provides cross-references to exploded views, part numbers, and technical drawings for each pump model.

Ordering Spare Parts

Spare parts and related purchasing information are available through the following channels:

- Website: www.flowsolutions.com
- Email: sales@flowsolutions.com
- Phone: 860-631-3618

When ordering, provide:

- Pump model and serial number
- Part description and reference number
- Quantity required

11.2 Recommended Tools

The minimum set of tools necessary for routine inspection, maintenance, and minor repairs includes:

- Hexagonal wrenches: 14 mm, 17 mm, 24 mm, 30 mm
- Phillips head screwdriver
- Flat (slot) head screwdrivers: 2 sizes
- Retaining ring pliers

Additional or specialized tools may be required for specific repairs, overhauls, or mechanical seal replacement. Refer to Sections 10 (Inspection and Maintenance) and 16 (Document Reference Table) for model-specific tool requirements.

11.3 Tool Safety and Handling

- Inspect all tools for wear or damage prior to use.
- Avoid using excessive force that may damage fasteners or pump components.
- Use lifting equipment and PPE as required when handling heavy pump components or assemblies.

12. IMPELLER REPLACEMENT

⚠ WARNING

Crush and Electrical Hazard: Before performing any maintenance, ensure the pump is disconnected from the electrical power supply. Use appropriate personal protective equipment (PPE) and follow all safety procedures outlined in Sections 7–10.

Only qualified personnel should perform impeller replacement. Use proper tools to avoid damage to the impeller, shaft, or pump housing. Ensure that replacement impellers are genuine parts to maintain warranty coverage.

1. Drain the oil chamber in accordance with Section 13 – Oil Replacement.
2. Remove the socket head screws securing the volute to the oil chamber.
3. Separate the volute from the oil chamber.
4. Using an appropriate wrench, remove the screw securing the impeller to the motor shaft.
5. Remove impeller washer and lock washer.
 - Models V4L-358, V4L-455, and V4L-559, require a 2-Pin spanner wrench to remove impeller washer
6. Carefully remove the impeller from the motor shaft.
7. Before installing the replacement impeller:
 - Ensure the shaft end is clean and free from burrs, corrosion, or other imperfections.
 - Inspect the shaft and impeller mounting surfaces for damage or wear.
 - Verify that the impeller key/keys are properly seated in the shaft.
8. Install the replacement impeller, impeller washer, and lock washer, and tighten the retaining screw to 120 Nm (89 ft-lb).
 - Models V4L-358, V4L-455, and V4L-559, require a 2-Pin spanner wrench to install impeller washer
9. Reinstall the volute onto the oil chamber and tighten the mounting screws to 120 Nm (89 ft-lb).
 - Be mindful that O-ring between the volute and the seal chamber is properly seated.

13. OIL REPLACEMENT

The pump oil provides lubrication for the mechanical seal and rotating components. To ensure reliable operation, prevent premature wear, and maintain warranty coverage, only use **ISO 32 NSF Food Grade Mineral oil** or, when EPDM elastomers are present, an approved **vegetable-based oil**.

⚠ DANGER

Equipment and Personal Hazard: Always disconnect the pump from the electrical power supply before performing oil replacement.

⚠ WARNING

Oil Pressure Hazard: Be aware that the oil chamber may be under pressure if there is seepage through the mechanical seal. Protect yourself and others from sprays, and prevent environmental contamination.

- Do not use oils containing harmful additives or contaminants.
- Oil replacement must be performed during routine maintenance, after **2000 operating hours**, or at the time of a mechanical overhaul.

13.1 Indications for Oil Replacement

Replace the oil under the following conditions:

1. **Contamination:** Oil appears milky, cloudy, or contains water or foreign fluids.
2. **Scheduled Maintenance:** During annual inspections or at overhaul.

13.2 Oil Replacement Procedure

1. Place the pump on its side with the **oil plug facing upwards**.
2. Unscrew the oil plug carefully.

⚠ WARNING

Oil Pressure Hazard: If seepage is present through the mechanical seal, the oil chamber may be pressurized. Protect yourself and surrounding personnel from spray.

3. Slowly tilt the pump to allow all oil to drain from the chamber. Allow residual oil to drip for several minutes.
4. Clean the oil chamber with a small amount of fresh oil to remove deposits or debris.
5. Position the pump with the **oil plug facing upwards** for refilling.
6. Refill the chamber with **ISO 32 NSF Food Grade Mineral Oil** or **approved vegetable oil** for pumps with EPDM elastomers.
7. Fill until the oil level reaches **20 mm below the oil plug thread**. (Refer to **DS-C01-012 Oil Fill Quantity** on our website www.flowsolutions.com for exact oil volume.)
8. Inspect the **oil plug O-ring** and replace it if damaged or worn.
9. Carefully screw the oil plug back into position, ensuring a secure, leak-free seal.

13.3 Safety and Environmental Considerations

- Always handle and dispose of used oil in compliance with local regulations.
- Avoid skin contact; use gloves and eye protection.
- Prevent spills from reaching drains, soil, or waterways.

NOTICE

Proper oil replacement and handling is essential to maintain mechanical seal integrity, pump reliability, and warranty compliance.

14. MECHANICAL SEAL REPLACEMENT

⚠ DANGER

Electrical Hazard: Disconnect the pump from the power supply before performing any maintenance. Ensure the pump cannot be energized during work.

⚠ WARNING

Crush and Equipment Hazard: Do not place hands near the impeller or rotating components. Improper handling may cause injury or damage to the pump.

NOTICE

Mechanical seal replacement must be performed by qualified personnel. Proper installation and handling are required to maintain pump reliability, seal integrity, and warranty compliance.

14.1 Lower Mechanical Seal

1. Remove the impeller in accordance with Section 12 - Impeller Replacement.

2. Using two slot-headed screwdrivers, carefully remove the old mechanical seal by prying first on the rotating component, then the fixed ring.
3. Inspect the seal housings and shaft seat. Ensure they are clean, free of burrs, scratches, or damage that could compromise sealing performance.
4. Wet both the fixed and rotating components of the new seal with a water-soap solution to facilitate installation.
5. Carefully press the new seal components into place, ensuring the stationary and rotating components remain properly aligned with the shaft.

⚠ WARNING

When seating the fixed ring, use a bushing matching the shaft diameter to prevent jamming or breakage. Insert the rotating part afterward.

6. Reinstall and secure the impeller. Reassemble the pump in accordance with Section 12 – Impeller Replacement.

14.2 Upper Mechanical Seal

1. Remove the lower mechanical seal in accordance with Section 14.1
2. Remove the oil chamber cover and O-ring between the oil chamber cover and bearing housing.
3. Using retaining ring pliers, carefully remove the retaining ring securing the upper bearing.
- 4.

⚠ WARNING

Retaining rings are spring-loaded and may release unexpectedly during removal or installation. Always wear eye protection and use properly sized retaining ring pliers. Failure to follow proper procedures may result in serious injury or equipment damage.

5. Using two slot-headed screwdrivers, carefully remove the old seal, prying first on the rotating part, then on the fixed ring.
6. Inspect the housing for cleanliness, burrs, or damage that could impair the new seal.
7. Wet both components of the new seal with a soap-and-water solution to ease installation.
8. Carefully press the new seal components into place, ensuring the stationary and rotating components remain properly aligned with the shaft..

⚠ WARNING

When seating the fixed ring, use a bushing matching the shaft diameter to prevent jamming or breakage. Insert the rotating part afterward.

9. Reinstall the retaining ring to secure the mechanical seal assembly.
10. Reinstall the oil chamber cover and O-ring, making sure the O-ring is seated correctly.

⚠ CAUTION

Improper seating of this O-ring will result in an oil leak and/or water penetration into the oil cavity.

11. Reassemble the impeller in accordance with Section 12 – Impeller Replacement.
12. Refill the oil chamber as described in Section 13 – Oil Replacement.

15. TROUBLESHOOTING

⚠ DANGER

Electrical Hazard: Troubleshooting live electrical equipment exposes personnel to hazardous voltages. Electrical troubleshooting must be performed only by a qualified electrician. Always disconnect and lock out the power supply except when conducting measurements that require voltage. Ensure no personnel are near the pump when power is applied.

⚠ DANGER

Crush Hazard: Moving parts can entangle or crush. Failure to follow these precautions may result in death or serious injury.

NOTICE

Do not override motor protection repeatedly if it has tripped, as doing so may cause equipment damage.

Always record the pump serial number when contacting support.

15.1 Electrical Troubleshooting

When troubleshooting electrical circuits:

- Use a multimeter, test lamp, and follow the wiring diagram.
- Verify power supply and fuses.
- Check for phase loss, damaged cables, or tripped protection devices.
- Inspect the control switch (Man/Auto), relays, and contactor coils.

15.2 Pump Does Not Start

Cause	Remedy
Alarm triggered on control panel	Verify that sensors indicate no alarm, impeller rotates freely, and overload protection is not tripped.
Start level regulator malfunction	Clean or replace level regulators.
Power supply loss	Check main switch, fuses, voltage in all phases, and motor cable integrity.
Impeller blocked	Clean impeller and sump. Contact authorized service if problem persists.

15.3 Pump Does Not Stop (Level Sensor Used)

Cause	Remedy
Pump cannot empty sump to stop level	Verify piping and discharge connections for leaks, check impeller for clogging, and ensure non-return valves function properly.
Malfunctioning level sensor	Clean and inspect level regulators. Replace defective components.
Stop level set too low	Adjust stop level. Contact authorized service if issue persists.

15.4 Pump Starts and Stops in Rapid Sequence

Cause	Remedy
Backflow fills sump to start level	Ensure sufficient distance between start and stop levels, check non-return valves, and confirm discharge pipe length is appropriate.
Contactor self-holding malfunction	Check contactor connections and control voltage. Verify stop-level regulator operation.

15.5 Motor Protection Trips

Cause	Remedy
Motor protection set too low	Adjust according to data plate and cable chart.
Impeller difficult to rotate	Clean impeller and sump; verify proper impeller diameter.
Voltage or phase issues	Check fuses; notify certified electrician if necessary.
Large phase current variations	Contact authorized service.
Defective insulation	Use a 1000 V DC megger; ensure insulation >5 MΩ. Contact service if below threshold.
Fluid density too high (>1100 kg/m ³)	Change to suitable pump.

15.6 Pump Delivers Too Little or No Water

Cause	Remedy
Wrong impeller rotation	Transpose two phase leads for 3-phase pumps; contact service for 1-phase pumps.
Air pocket in volute	Rotate the pump while submerged to allow air to escape
Valves incorrectly positioned	Reset or replace valves; ensure correct installation and operation.
Impeller difficult to rotate	Clean impeller and sump; verify trimming.
Obstructed pipes	Clear pipes and joints.
Leaks in piping or joints	Seal leaks.
Worn hydraulic components	Inspect and replace impeller, pump casing, or other worn parts.

15.7 Quick Reference – Common Causes

- Loss of electrical power or blown fuses
- Selection switch turned OFF
- Phase loss or incorrect wiring
- Blocked or seized impeller
- Mechanical seal or bearing failure
- Wrong impeller rotation (three-phase motors only)
- Air pockets in pump or delivery pipe
- Partially closed or obstructed valves

NOTICE

Always provide the pump serial number when contacting Industrial Flow Solutions or authorized service representatives.

16. Document Reference Table

Series	Model	Datasheet	Performance Curve	Wiring Diagram Code
A2H	A2H-149	DS-C49-005	DS-C49-004	1
	A2H-224	DS-C49-007	DS-C49-006	1
	A2H-254	DS-C49-009	DS-C49-008	1
	A2H-354	DS-C49-011	DS-C49-010	1
	A2H-403	DS-C49-013	DS-C49-012	1
	A2H-425	DS-C49-015	DS-C49-014	1
A4L	A4L-119	DS-C64-004	DS-C64-003	1
	A4L-149	DS-C64-006	DS-C64-005	1
	A4L-164	DS-C64-008	DS-C64-007	1
	A4L-168	DS-C64-010	DS-C64-009	1
	A4L-172	DS-C64-012	DS-C64-011	1
	A4L-239	DS-C64-016	DS-C64-015	1
	A4L-261	DS-C64-018	DS-C64-017	1
	A4L-263	DS-C64-020	DS-C64-019	1
	A4L-298	DS-C64-022	DS-C64-021	1
	A4L-399	DS-C64-024	DS-C64-023	1
	A4L-455	DS-C64-026	DS-C64-025	1
	A4L-507	DS-C64-028	DS-C64-027	1
A6	A6-56	DS-C67-005	DS-C67-004	1
	A6-75	DS-C67-007	DS-C67-006	1
V2H	V2H-149	DS-C63-005	DS-C63-004	1
	V2H-201	DS-C63-007	DS-C63-006	1
	V2H-254	DS-C63-009	DS-C63-008	1
	V2H-306	DS-C63-011	DS-C63-010	1
	V2H-354	DS-C63-013	DS-C63-012	1
	V2H-403	DS-C63-015	DS-C63-014	1
	V2H-410	DS-C63-017	DS-C63-016	1
	V2H-425	DS-C63-019	DS-C63-018	1
V4L	V4L-119	DS-C65-004	DS-C65-003	1
	V4L-183	DS-C65-008	DS-C65-007	1
	V4L-224	DS-C65-010	DS-C65-009	1
	V4L-254	DS-C65-012	DS-C65-011	1
	V4L-358	DS-C65-014	DS-C65-013	1
	V4L-455	DS-C65-016	DS-C65-015	1
	V4L-559	DS-C65-018	DS-C65-017	1

Series	Family Curve	Dimensional Drawing	Parts List
A2H	DS-C49-002	DS-C49-001	DS-C49-003
A4L	DS-C64-029	DS-C64-002	DS-C64-001
A6	DS-C67-001	DS-C67-003	DS-C67-002
V2H	DS-C63-001	DS-C63-003	DS-C63-002
V4L	DS-C65-019	DS-C65-002	DS-C65-001

Wiring Diagrams			
Code	Phase	Voltage	Document Number
1	Three	460	DS-C01-018

17. Interventions Recording

Serial #	Date	Working Hours	Notes	Signature