

SYSTEM JAKOŚCI  
ISO 9001  
ZGODNY Z NORMĄ



USER MANUAL  
PUMP UNIT

TYPE **G**  
(all versions)

**Read this user manual before installation  
and operation of the unit.  
This manual includes general requirements  
for pump and pump unit installation,  
operation and repairs.  
Please keep this manual handy  
for future reference.**

# CONTENTS

## **1. GENERAL.**

- 1.1. Symbols
- 1.2. Personnel qualifications
- 1.3. Risks associated with failure to comply with safety requirements
- 1.4. Modifications and spare parts
- 1.5. Misuse

## **2. TRANSPORT AND STORAGE.**

- 2.1. Safety requirements
- 2.2. Unpacking
- 2.3. Maintenance
- 2.4. Storage
- 2.5. Transport

## **3. PUMP AND PUMP UNIT**

- 3.1. Pump
- 3.2. Motor
- 3.3. Dimensions, weight and power
- 3.4. Pump to motor coupling

## **4. INSTALLATION AND ASSEMBLY.**

- 4.1. Safety requirements for installation and assembly
- 4.2. Preparation
- 4.3. Installation
- 4.4. Wiring

## **5. ACCEPTANCE INCLUDING STARTUP, OPERATION AND SHUTDOWN.**

- 5.1. Performance requirements
- 5.2. Operation
- 5.3. Shutdown

## **6. MAINTENANCE AND OPERATION.**

- 6.1. Part replacement frequency
- 6.2. Maintenance and servicing

## **7. TROUBLESHOOTING.**

## **8. DOCUMENTATION.**

## **9. DISPOSAL.**

## 1. GENERAL

This user manual includes general guidelines for installation, operation and maintenance of a pump unit. Read this manual before installation and start-up to ensure a reliable and failure free operation.

This manual does not cover local codes and regulations which must be followed by the installation and service personnel.

Hydro-Vacuum S. A. pumps are manufactured with utmost care and with a continuous control of a production process in accordance with the quality system requirements. A reliable product operation is guaranteed with a correct installation, operation and maintenance only.

The product may not be misused, especially regarding physical and chemical medium properties, i.e. output, pressure, temperature, density, corrosive and abrasive properties, speed and other parameters as defined in the Data Sheet and the contract.

Pump and motor data plate includes a product name, device parameters and serial number (required when ordering spare parts). Compare the data with the order specification.

Hydro-Vacuum S.A. provides a warranty on all its products on terms and conditions detailed in the "Warranty card".

<b>CAUTION!</b>
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The manufacturer is not liable for any damage resulting from failure to comply with warranty terms and conditions.

In case of a damage or failure, contact your nearest service centre or Hydro-Vacuum S.A. service and sales department.

## 1.1. Symbols



Safety guidelines and instructions; failure to comply may affect operation safety



Electrical safety guidelines and instructions; failure to comply may affect operation safety.



Hazards which may affect operation safety



Guidelines and instructions for use in explosive hazardous areas

## 1.2. Personnel qualifications

Maintenance, inspection, service and assembly personnel must have verified qualifications.

## 1.3. Risks associated with failure to comply with safety requirements

Failure to comply with safety requirements may result in the following risks for:

- personnel - electrical or mechanical,
- pump, pump unit
- environment - substances used for cleaning and maintenance.

## 1.4. Modifications and spare parts

Any modifications of the pump unit or the system require manufacturer's authorization. For safety reasons and to ensure rated parameters and safety, use genuine spare parts and equipment recommended by the manufacturer only. Manufacturer is not liable for any damage resulting from use of non-genuine spare parts.

## 1.5. Misuse

The reliability of a pump unit operation is guaranteed if used as intended. Do not exceed the limit values as specified in the Data Sheet.

(operation outside the maximum efficiency range, due to a discharge line leakage).

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## 2. TRANSPORT AND STORAGE

### 2.1. Safety requirements

- Do not stand under lifted loads.
- Keep a safe distance when transporting heavy loads.
- Use proper slings and cranes in perfect working condition.
- The sling and rope length must ensure horizontal and stable position of the pump or pump unit.
- Do not use lugs on the pump or motor to handle assembled pump or pump unit. The lugs are for handling components during assembly or disassembly.
- Do not remove the documents included with the pump.
- Do not remove pump flange end caps.
- Carefully move the pump or pump unit on the foundation plate and avoid impacts.

### 2.2. Unpacking

Check the packaging for damage before unpacking. Record any transport damage in the shipping documents. Immediately notify the carrier on any damage.

### 2.3. Maintenance

After testing, each pump is dried and the interior is protected against corrosion (except for bronze, stainless steel or special pumps). It provides protection for three months storage period.

### 2.4. Storage

#### 2.4.1. Requirements for storage area

- Storage area must be dry (air humidity 40-60%) and well ventilated.
- Storage temperature:
  - 25°C to 50°C for units with empty motor or factory filled motors
  - 0°C to 50°C for units with motor filled with water without a protection against freezing
- It is recommended to store the pump units in vertical position.

#### 2.4.2. Short time storage, up to 3 months

If the pump (unit) is not installed immediately following the delivery, store in a dry place, free from vibration for up to three months. It is recommended to manually rotate the shaft pump occasionally to prevent seizing.

#### 2.4.3 Long time storage

If the pump will be stored for over three months, apart from standard precautions (see item 2.4.1), clean the pump with clean water and apply anti-corrosion protection every three months. Make sure the protection is suitable for the pump material and conforms to environmental and safety requirements.



For long time storage, make sure the impeller rotates freely before initial start-up.



Do not use special tools to unlock the pump, since it may damage the impeller and the motor packing.

#### 2.4.4. Long time pump unit standstill.

The pump unit must be activated at least once every two months for 15 minutes.

#### 2.4.5. Storage after operation

If the pump unit is stored for a long time after operation, it is recommended to transport it to the factory or one of the authorized service centres for inspection. Cleaning and maintenance are also recommended for short time storage.

### 2.5. Transport

Pump and pump unit weights are specified in the Data Sheets included with the product documentation.

#### **CAUTION!**

The pump unit must be secured against deformation, impact and weather conditions. The pump unit with the length exceeding L dimension specified in the table must be fixed in a specific point to avoid damage. Use suitable reinforcement for horizontal transport to protect the pump unit against deflection.

Table 1

Pump unit dimensions (inch)	Length L (m)
6	1,5
8	2
10 – 12	3
16	4

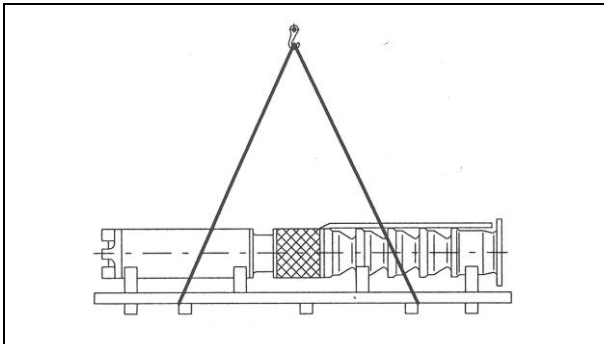
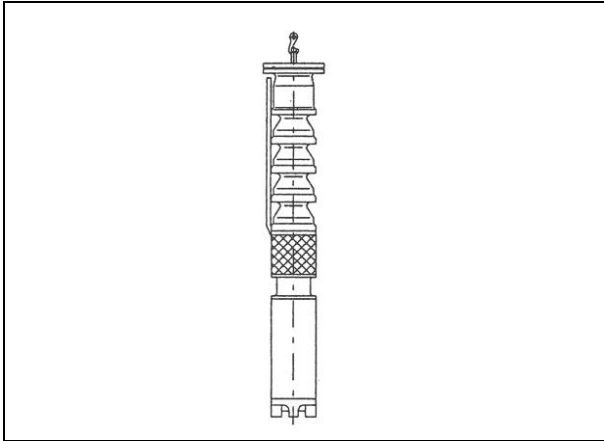


Fig. 3. Correct mounting

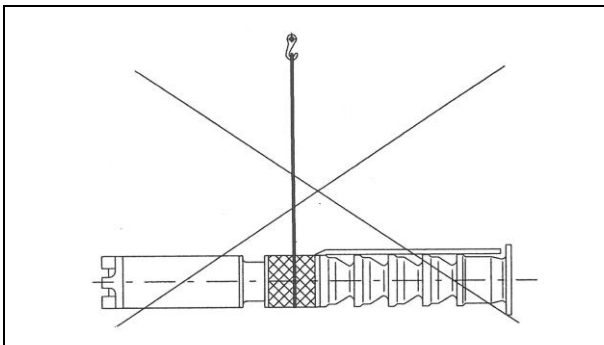


Fig. 4. Incorrect mounting



### 3. PUMP AND PUMP UNIT.

Before installation, check and compare data on a motor and pump rating plate with the order specification, and read the Operation and Maintenance Manual and the Data Sheet.

**CAUTION!**

Read the Data Sheet before installation and start-up.

#### 3.1. Pump

Pump marking

##### GC.5.08.1.1110

- G** - type
- C** - version
- 5** - type series
- 08** - type dimensions (tag)
- 1** - material
- 1110** - design

A single stream deep-well pumps are multi-stage pumps in a series configuration. The pumps are coupled directly with a submersible motor, hence the name pump unit. The pump unit is installed in vertical configuration. A submersible electric motor and a submersible impeller pump are installed in the bottom and top section of the unit, respectively. A suction casing with an inlet mesh is coupled directly with a motor, and other pump stages including the casing and the guide vanes and radial or diagonal impeller. The pump ends with a discharge coupling with flanged or bolted port, with check poppet valve to connect the pump unit with the discharge line with flanged or bolted connection. A rotary unit is coupled with the motor shaft via a coupling. A correct position of the impeller in the stage and guide vane casing is set with spacer sleeves. The rotary unit is mounted on steel and rubber bearings.

The casings (pump stages) are joined depending on the pump type with:

- belts or ties (GAB; GB; GBC; GC and GCA,GH)
- stages with stud bolts (GDB, GFB)

A dual stream deep-well pumps (GH) are multi-stage pumps in series-parallel configuration with a common shaft.

The pumps are available in several material versions for optimum compatibility depending on water aggressiveness index.

### 3.2. Motor

Motor marking

#### SMV.6-22

**SM**- motor type

**V** - version

**6** - type series

**22** - power

The submersible motor is a three-phase asynchronous squirrel-cage motor. It is designed to work in wet conditions with stator winding with wound conductor in thermoplastic insulation. **The winding of the motors may be rewound.**

The motor is filled with glycerol and water mixture in 1:1 ratio providing frost resistance to  $-25^{\circ}\text{C}$ . The glycerol is a natural product, not harmful to humans and may be biologically neutralized (degradation). The motor may be filled with a fresh water.

SMV and SMH submersible motors are available in three-phase 50 Hz and 60 Hz versions for all available voltages up to 1000 V.

An electric energy is supplied to the motor with electrical submersible cables.

A dynamically balanced impeller is supported by liquid lubricated slide bearings. The axial forces in the pump and motor are transferred by a self-aligning bearing irrespective of the direction of rotation. Auxiliary axial bearing prevents rotary unit shifting up in case the direction of axial force changes.

High quality mechanical end face seal prevents ingress of medium to the motor. The change in volume of the motor filling liquid is compensated by the expansion tank in the bottom motor section. The motor is protected with a pressure relieve valve.

The motors are available in three material versions:

1 - cast iron,

2 - bronze,

3 - austenitic steel for optimum compatibility depending on water aggressiveness index.



Wiring and electrical system inspections must be carried out by an authorized electrician in accordance with local regulations

### 3.3. Dimensions, weight and power

Dimensions, weights and operating parameters of the product are specified in the data sheet.

### 3.4. Pump to motor coupling

The screws and nuts fixing the band to the pump must be tightened in an alternating pattern.

The required torques are specified in the table below.

Table 2

Dimension		M6	M8	M10	M12	M16	M20	M27
Tightening torque	Nm	9.3	23	45	77	190	385	980

The pump and motor must be coupled correctly. Follow the guidelines of the user manual included with the motor.



Do not run the pump unit if it is not submersed to a correct depth

## 4. INSTALLATION AND ASSEMBLY.

### 4.1. Installation and inspection safety requirements

Make sure all the installation and inspection works are carried out by an authorized and qualified personnel. Read this manual before use. Installation and maintenance should be done with power supply disconnected.

Installation errors may cause pump unit damage, premature wear or may be a hazard to the personnel.

All protective devices must be reinstalled and restarted before the compressor unit is reactivated in accordance with the procedure.

### 4.2. Preparation.

4.2.1. Check the direction of rotary unit rotation.

Make sure the rotary unit rotates freely. The pump unit must be installed if the rotary unit rotates freely. To rotate the unit, remove an inlet mesh to access a shaft sleeve hole. Install the inlet mesh.

4.2.2. Checking/priming with water.

Follow the procedure in the user manual.

### 4.3. Installation.

4.3.1. Vertical installation.

- Required tools and devices:
  - lifting device with suitable load capacity and height,
  - 2 mounting clamps,
  - cable ties.
- Check the following when selecting a lifting device:
  - pump weight including cable,
  - pump riser pipe weight,

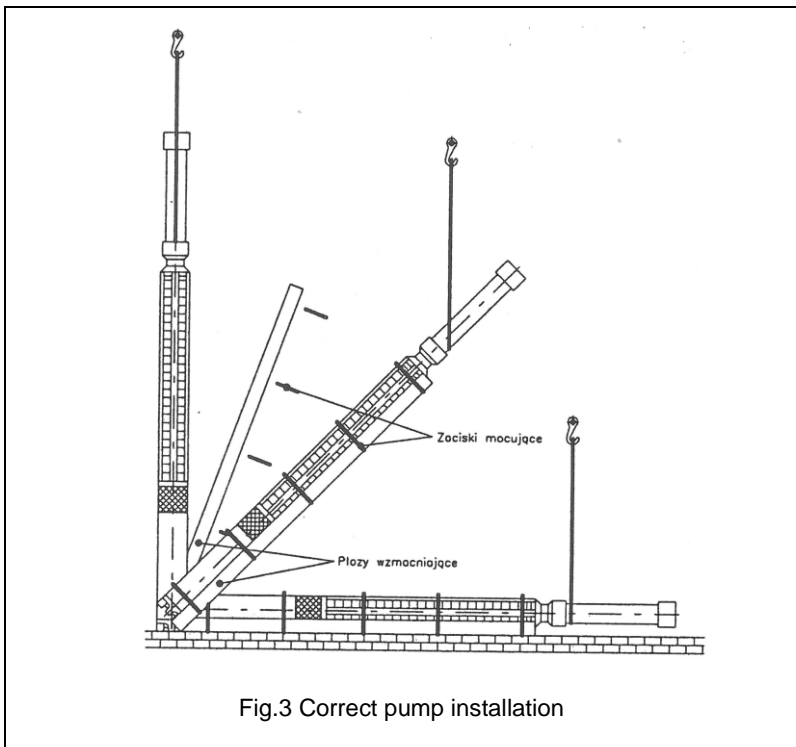
- additional weight of water filling the riser pipe.
- To detect supply cable damage, measure insulation resistance.
- If the pump is fitted with a threaded outlet port, install 1 meter pipe with a flange and installed check valve if not already installed on the pump.
- Secure the threaded joints to prevent damage during operation (torque during pump start-up).
- Use clamps for lowering the unit. Attach the first clamp to the pump casing under the flange and the second clamp to the first pipe section.
- Power supply and control cables must be positioned along the riser pipes.



**Make sure the cables are not a hazard to the personnel.**

### Lowering the pump:

Follow the installation procedure. It guarantees correct pump installation and facilitates service.



- Place the pump horizontally and attach the clamp to the system and install the pump riser pipe.
- Lower the pump until the first clamp does not contact a deep well seal any more.
- Attach the second clamp under the top end of the next riser pipe.
- Lift the pump, release the bottom clamp and lower the pump, until the clamp is supported by the deep well pump seal.
- Attach the cables to each riser pipe with clips or ties. Attach the cables every 3 meters or less, depending on size and weight. **Do not tighten the cables.**
- Use the same procedure for other riser pipes.
- During installation, a single pair of clamps must always be installed on the pipeline. To prevent pump from falling down the well in case of lifting device failure.
- Install a manometer at the discharge line, see installation example.
- Check installation depth to ensure correct flow height, and make sure the motor is installed over the filter, if no suction shell is installed.

#### 4.4. Wiring



- Wiring must be carried out by an authorized personnel in accordance with current regulations.
- The voltage must correspond to the data specified in the motor rating plate. Follow the motor manufacturer specification.
- The motor must be protected against damage as per motor manufacturer specification.



Use electrical devices designed for use in explosive hazardous areas.

**CAUTION!**

Earthing is required.



Incorrect wiring may result in health and life hazard or motor damage. Check if the mains parameters are compatible with starting current (5x □ 7x) higher than the rated current. If not possible, use soft-start or □/Δ configuration.

- Check motor direction.



Dry run is not allowed

Check the direction of rotation before start-up.

Check the discharge pressure with the gate valve almost completely closed. Higher pressure indicates correct direction of rotation. Change the direction of rotation by switching the phases of motor power supply. At first start-up synchronize phase sequence with the requirements of the protection and control devices.

**CAUTION!**

Incorrect direction of rotation will prevent the pump from reaching required parameters (Q and H). The product may be damaged.

## 5. ACCEPTANCE INCLUDING STARTUP, OPERATION AND SHUTDOWN.

### 5.1. Performance requirements

**CAUTION!**

The following terms and conditions apply. Any damages resulting from failure to observe the terms and conditions are not covered by the warranty. Do not use the pump unit to deliver products with corrosive properties exceeding the corrosion resistance parameters of materials used for its construction.

- Start the pump up with a slightly open outlet valve, gradually open to set correct performance parameters (Q and H).



Dry run is not allowed  
The entire pump unit must be submersed

- The pump unit must be fitted with a check valve.
- The content of mechanical impurities in water may not exceed 100 mg per litre, and for pump units with plastic impellers - 50 mg per litre.
- The pump unit may not operate with the discharge valve closed, since water is required for cooling. Recommended minimum continuous performance must be at least  $0.2 Q_{max}$ .
- Impurities which may deposit inside the pump or motor are not acceptable. If they cannot be avoided, remove the deposits if the thickness exceeds 0.5 mm. Install a temperature sensor for monitoring permissible motor temperature.
- Do not pump liquids which may cause pump material corrosion and erosion.



Do not use the gate valve (at the suction side) to adjust pump performance

**CAUTION!**

Do not start the pump with a discharge line valve fully closed. Run the pump with the discharge line valve partially closed. The higher the pump efficiency, the higher the power input.

**CAUTION!**

Before leaving the factory, pump units are filled with an inhibitor, readily soluble in water. Do not use water for the first 5 minutes of initial pumping for food purposes.

## 5.2. Operation

The pump unit is a maintenance free device. Observe and record readouts of the measuring equipment. In case of deviations from preset rated values, identify the cause and decide on future operation.

## 5.3. Shutdown

Follow the guidelines of the user manual included with the motor.

**CAUTION!**

Before pump unit shutdown, throttle the flow to  $0.2 Q_{\max}$  with a valve installed on the discharge line.

## 6. MAINTENANCE AND OPERATION

No special maintenance is required during the pump unit operation. Keep the pump and its vicinity clean.

**CAUTION!** Mechanical seal does not require maintenance. Dry run is not allowed.

For screw joints, do not exceed permissible torques specified in table 7. Most of the threaded joints are secured with Loctite threadlocker. It is recommended to heat the threaded joints with hot air (temp. 200°C) before removing.

Do not use excessive loads, especially dynamic loads when installing. Before disassembly, mark the position and order of parts. Follow the casing and impeller installation procedure.

### 6.1. Part replacement frequency

**CAUTION!** The following data are guidelines only, the frequency depends on operating conditions. Considering a complexity of the pump unit, the information include the following components, i.e. pump and motor bearings, mechanical seal, axial bearing and motor winding.

Table 3

Wear parts		Mechanical seal slide bearing	Motor bearings SMV4	Motor winding
Durability		10,000 h to 20,000 h	20,000 h to 30,000 h	20,000 h at ambient temperature up to 20°C
Replacement frequency at load	Continuous	1 to 2 years	2 to 3 years	3 years
	15 h day 9 months year	2 to 5 years	4 to 8 years	6 years



## 6.2 Maintenance and servicing.

The pumps are maintenance free.

Regular inspections will ensure reliable and failure free operation.

To ensure failure free operation, observe and record the readouts of measuring instruments, i.e. ammeter, manometer and flow meter.

*Also a measurement of internal motor temperature is recommended, especially if water contains significant quantities of soluble minerals and iron, which may deposit on internal motor surfaces and hydraulic ducts, causing the decrease in Q and H hydraulic parameters. The deposits are a significant hazard for motor as they reduce heat transfer capabilities, may cause temperature increase in motor winding and as a result damage the winding insulation. The deposit layer may not exceed 0.5 mm.*

*User must determine the inspection schedule based on observations.*

*For liquids with high deposit content use of motors with a reserve rated power is recommended.*

When using our services, contact Hydro-Vacuum S.A. before shipment. Include information on pumped liquid, otherwise Hydro-Vacuum S.A. may refuse service repairs.

The customer covers the shipping charges.

### CAUTION!

*If the pump have been used for pumping hazardous or toxic liquids, it is treated as contaminated.*

*Contact the service centre before shipment and specify the contamination type, otherwise the product will not be accepted for repairs.*

## 7. TROUBLESHOOTING.

Any works on the pump unit in the warranty period without manufacturer's authorization will void the warranty.

### CAUTION!

Switch the pump unit off before commencing any operations.

<b>Fault</b>	<b>Cause</b>	<b>Solution</b>
<i>1</i>	<i>2</i>	<i>3</i>
1. Pump unit will not start.	<ul style="list-style-type: none"> <li>a) Installation circuit breaker open.</li> <li>b) Faulty fuses.</li> <li>c) No mains voltage.</li> <li>d) Compressor overload protection activated.</li> <li>e) Faulty motor contactor.</li> <li>f) Faulty starter.</li> <li>g) Control circuit fault or damage.</li> <li>h) Dry run protection activated.</li> <li>i) Power supply cable, motor or pump damage.</li> </ul>	<ul style="list-style-type: none"> <li>a) Close the installation circuit breaker.</li> <li>b) Check power supply cable and motor. Replace fuses.</li> <li>c) Contact energy supplier.</li> <li>d) Check voltage supply. Check e) and h) if voltage supply is correct. Close.</li> <li>e) Replace contactor.</li> <li>f) Repair or replace starter.</li> <li>g) Check wiring.</li> <li>h) Check water level; if correct check protections.</li> <li>i) Repair or replace.</li> </ul>
2. Pump operates, no water discharge.	<ul style="list-style-type: none"> <li>a) Valve closed.</li> <li>b) No water or low water level.</li> <li>c) Check valve locked in closed position.</li> <li>d) Pump inlet mesh clogged.</li> <li>e) Pump unit damaged.</li> </ul>	<ul style="list-style-type: none"> <li>a) Open valve.</li> <li>b) See item 3a</li> <li>c) Disassemble pump unit and clean or replace check valve.</li> <li>d) Disassemble pump unit and clean inlet mesh or pump.</li> <li>e) Repair or replace the pump unit.</li> </ul>
3. Pump operates with reduced performance .	<ul style="list-style-type: none"> <li>a) Dynamic water level too low.</li> <li>b) Incorrect direction of rotation.</li> <li>c) Discharge line valve partially closed.</li> <li>d) Discharge line partially clogged.</li> <li>e) Pump check valve partially clogged.</li> <li>f) Pump partially clogged.</li> <li>g) Pump or flow meter malfunction.</li> <li>h) Leakage in the pipes or between the flanges.</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace pump unit with a smaller one or reduce capacity.</li> <li>b) Change direction of rotation - see item 4.4.</li> <li>c) Open, repair or replace valve.</li> <li>d) Clean or replace pipes.</li> <li>e) Disassemble pump unit and clean or replace check valve.</li> <li>f) Clean and repair pump or replace flow meter.</li> <li>g) Check, repair or replace pipes or flange seals.</li> </ul>

4. Frequent starts and stops.	<ul style="list-style-type: none"> <li>a) Pressure range at start and stop too low.</li> <li>b) Water level sensor or level switch in the tank incorrectly set.</li> <li>c) Check if valve is leaking or partially open.</li> </ul>	<ul style="list-style-type: none"> <li>a) Adjust pressure range. Stop pressure should not exceed working pressure in the tank, and start pressure must be sufficient to ensure required water pressure in the system.</li> <li>b) Adjust electrode/level switch position to ensure sufficient time between pump start and stop.</li> <li>c) Disassemble pump and clean, replace or repair check valve.</li> </ul>
5. Motor stops automatically	<ul style="list-style-type: none"> <li>a) Incorrect overload relay setting (too low).</li> <li>b) Voltage too low.</li> <li>c) Faulty relay.</li> <li>d) Difficult rotation of the rotary unit caused by seizure due to dry run.</li> </ul>	<ul style="list-style-type: none"> <li>a) Set value as read on the data plate.</li> <li>b) Check cable cross-section and check for excessive voltage drop.</li> <li>c) Replace.</li> <li>d) Check if the rotary unit rotates by hand, repair if necessary.</li> </ul>

## 8. DOCUMENTATION.

To be agreed upon by the Client and the Manufacturer. The following documents are included with the pump: User Manual, Data Sheet, Warranty Card.

## 9. DISPOSAL

The product and all components must be disposed of in accordance with the environmental regulations. Use local, public or private company authorized to dispose of wastes and raw materials.

If not possible, contact Hydro-Vacuum S.A. company or its nearest authorized service centre.



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