

PV4 - PIV6 **Submersible multistage** **centrifugal electro-pumps** **Installation and maintenance**

PV4 - PIV6 electro-pumps

1 - GENERAL

PV4 and PIV6 series electro-pumps should be installed in accordance with the instructions in this manual. They must not be used in operating conditions other than those indicated in this document.

Should these instructions not be adhered to, or any modification be made to the equipment, without the agreement of LEROY-SOMER, the guarantee will be invalidated.

LEROY-SOMER accepts no responsibility if the instructions contained in this document have not been followed.

This manual does not take account of any existing safety recommendations and regulations which may be in force where the equipment is installed. It is the responsibility of the user to ensure that these are applied and followed.

2 - USE

The PV4 and PIV6 series multistage centrifugal electro-pumps are designed to pump water, oil or any other non-explosive clear liquids which are compatible with the material with which the pump is made.

For any other liquid: please consult LEROY-SOMER.

– maximum content of solid particles in suspension: 200 g/m³

– maximum viscosity of pumped liquid:

- 20 centistokes or 3° Engler with standard pump
- 75 centistokes or 10° Engler with pump with an oversized motor

– maximum temperature of pumped liquid:

- 70°C for hydraulic elements made of SAN (styro-acrylo-nitrile) on PV4 pumps
- 90°C for hydraulic elements made of PEI (poly-etherimide) on PV4 pumps and for PIV6 pumps

– minimum temperature of liquid conveyed: - 10 °C

– maximum ambient temperature: 40 °C

– maximum duty pressure of the pump (on lift):

- 10 bars on PV4 pumps with thermoplastic delivery head
- 20 bars on PV4 pumps with metal delivery head
- 25 bars on PIV6 pumps

– density of pumped liquid = 1


3 - CHARACTERISTICS

The pump mounting flanges comply with the standard NF E44-301 (DIN 5440).

Each electro-pump is fitted with two identification plates, one defining the hydraulics, the other defining the motor.


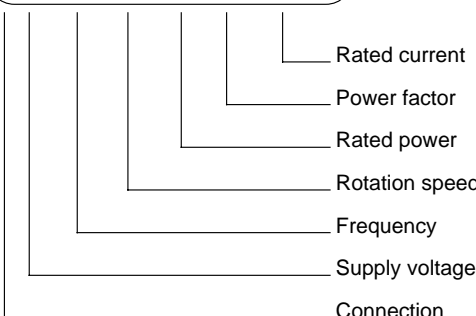
3.1 - Hydraulic characteristics

The hydraulic characteristics are guaranteed to conform to international standard ISO 2548 class C for mass-produced pumps.

	TYP	PV.4.2.24	Type of electro-pump
	N°	C94 0890	Electro-pump serial no.
	H max	140 m.	Maximum total manometric lift in meters

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3.2 - Electrical characteristics

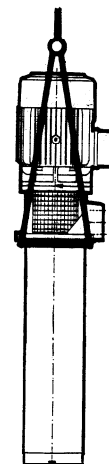
		Mot 3 ~ LS 80					Type of motor
		N° 820497EJ004 kg					Motor serial no.
IP 55	I.cl	F °C	40	S	S 1		
V	Hz	min ⁻¹	kW	cos φ	A		
Δ 230	50	2830	1,1	0,82	4,50		
Y 400	50	2830	1,1	0,82	2,60		
Δ 240	50	2850	1,1	0,78	4,50		
Y 415	50	2850	1,1	0,78	2,60		

LEROY-SOMER motors

4 - HANDLING

Electro-pumps should be handled and unpacked carefully.

We recommend that the unit is handled as shown in the sketch below.



5 - STORAGE

In good storage conditions, our electro-pumps are not at risk of deterioration.

They should be stored in dry, enclosed areas away from inclement weather conditions, dust, vibration and shocks.

If the storage area is not frostproof, ensure that the pump has been drained.

Do not rest electro-pumps on the motor fan cover.

Before commissioning or re-commissioning an electro-pump, follow the instructions given in this manual.

PV4 - PIV6 electro-pumps

6 - INSTALLATION

PV4 and PIV6 series electro-pumps have been designed to be mounted on tanks, vats, drain pans, etc.

Electro-pumps should be installed by personnel who are qualified to undertake this type of work.

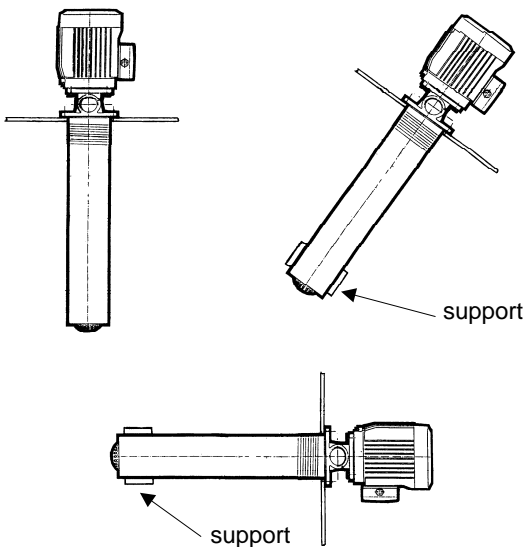
The delivery pipe should be fitted in such a way that no mechanical force is exerted on the body of the pump.

On PV4 pumps with thermoplastic delivery head, do not exceed a tightening torque of 20 Nm when screwing on the pipe fitting.

We recommend that the electro-pump should be mounted on its support.

The electro-pump can be installed in various positions from vertical (motor at the top) to horizontal (see drawing below).

When the electro-pump axis is tilted from the vertical, it will be necessary to support the suction unit so that it does not bend.



The electro-pump should be installed in a well-ventilated, weatherproof area.

6.1 - Delivery pipe

The diameter of the delivery pipe should be chosen after careful calculation of the installation pressure losses.

A flow-control valve should be placed on this pipe.

6.2 - Before commissioning

Make sure that the electro-pump rotates freely without sticking. To do this, remove the fan cover and rotate the fan a few times by hand.

– The minimum level of liquid in the pan should be 100 mm above the suction inlet filter.

– It is recommended that the electro-pump should have level detection control. Installed in the pan, this will prevent the pump starting when the water level is below the specified level.

7 - ELECTRICAL CONNECTION

Electrical connection must be performed by a qualified electrician taking all existing regulations into account.

If the electro-pump has been stored in damp conditions, check the motor insulation resistance before commencing any electrical connection. This should be a minimum of 10 megohms in cold state at 500 volts for a period of 60 seconds.

7.1 - Power supply

Make sure that the power supply indicated on the motor identification plate corresponds to the actual electricity supply.

Check that the diameter of the incoming and outgoing conductors of the meter is adequate to supply the electro-pump with the correct power.

7.2 - Connections

The motors are supplied with the following connections as standard:

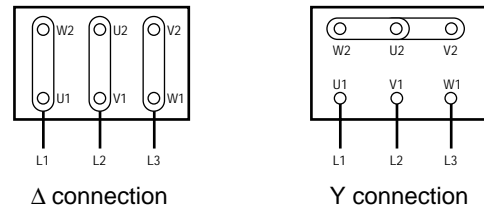
Three-phase

– Δ 230/Y 400V up to 5.5 kW inclusive at 50 Hz

– Δ 400V above 7.5 kW at 50 Hz

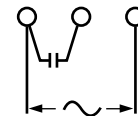
Make absolutely certain that the type of connection corresponds to the mains supply voltage.

It should be connected as shown in the diagram below, which appears on the terminal box lid.



Single phase

230V single phase at 50 Hz



7.3 - Protection

Connect to earth as required by existing regulations.

In order to benefit from the guarantee, it is essential to protect the motor electrically by placing a thermal magnetic circuit-breaker between the isolator and the motor. This circuit-breaker may also be fused.

Before starting up the electro-pump, the circuit-breaker should be set provisionally to the correct current (shown on the identification plate) for the corresponding mains supply voltage.

Definitive setting should be performed as instructed in paragraph 8.

So as not to subject the electro-pump to excessive temperature rises, do not exceed the maximum number of starts per hour indicated overleaf.

PV4 - PIV6 electro-pumps

Motor power	Max. number of starts per hour
≤ 0.55 kW	40
0.75 to 1.1 kW	35
1.5 to 3 kW	30
4 to 7.5 kW	20

The number of starts should be spread over the hour.

8 - STARTING THE PUMP UNIT

An electro-pump must never be run dry. This is very important to ensure the mechanical seal remains watertight.

- For three-phase units, make sure that the direction of rotation is that indicated by the arrow on the fan cover, by running the motor for a couple of turns.
- If the direction of rotation is reversed, modify the connection to the motor terminal block by reversing 2 power supply wires.
- After starting, once the motor has reached its operating speed, make sure that the back pressure is normal and not subject to significant fluctuations. If this is not the case, stop the electro-pump and check that the level of liquid in the pan is more than 100 mm above the suction inlet filter as indicated in section 6.2.
- If the motor is not running fast enough, check the connection.
- Take care not to leave the pressure valve closed for more than 5 minutes.
- With the electro-pump operating normally, measure the maximum current drawn on each phase. Set the circuit-breaker definitively, for a slightly higher current than the maximum measured. This must never exceed the current indicated on the motor identification plate.
- Check that the voltage between phases at the motor terminals is correct.
- Any disruption to operation indicates abnormal electro-pump operation (voltage drop, loss of phase, incorrect setting, foreign body in the pump, sludge, etc.).
- The electro-pump should turn smoothly without vibrating.
- Never run the electro-pump with the pressure valve closed.
- If difficulties are experienced with priming when the electro-pump is started, either there is insufficient liquid in the pan or the pump has been drained and an air pocket is blocking the top of the pump. In this case, drain the pump by unscrewing the plug (90) shown in the diagram at the end of this document.

Running the electro-pump on empty is absolutely prohibited.

- Motor. Drain holes: To drain condensates formed during cooling of the machines, there are holes in the lowest points in the motor housing or shields depending on the operating position. From time to time, the plastic plugs covering these holes should be removed and then replaced.

9 - STOPPING THE PUMP UNIT

- Switch off the electrical supply to the motor.
- In the event of a prolonged stop and/or where there is a risk of freezing, drain the pan and the delivery pipe or take appropriate precautions against freezing.

10 - SERVICING

PV4 and PIV6 series electro-pumps require very little servicing.

- The bearings are permanently greased.
- Only the mechanical seal may need to be changed if noticeably worn or leaking.
- Electro-pumps installed as backup equipment should be run for a short time once a week to ensure that they are working properly.

It is recommended that the current consumption should be checked occasionally. If this should rise without the flow increasing, this indicates an operating fault or particularly harsh operating conditions, which should be rectified. In any event, it is recommended that the electro-pump should be dismantled after 2 years or 10,000 hours of operation in order to examine parts subject to wear (mechanical seal, turbine, etc.)

11 - DISMANTLING - REASSEMBLY

An electro-pump must be dismantled and reassembled by personnel qualified to carry out this type of work.

Where one or more components of the electro-pump are being replaced (spare parts) it is essential that only parts supplied by LEROY-SOMER are used. Failure to comply with this instruction invalidates the guarantee and relieves the manufacturer of responsibility for any malfunction. Any person working on an electro-pump is responsible for the consequences.

Before commencing work on the electro-pump:

- Disconnect the electricity supply to the motor.
- Close the pressure valve.
- Check that the pump body is not under pressure.

11.1 - Removing the motor

The motor can be easily disconnected without removing the pump.

To do this, remove:

- the protective grille (69)
- the 4 coupling sleeve locking screws (2.88)
- the 4 screws (83) and their washers (3.83)

11.2 - Removing the hydraulic unit

After removing the delivery pipe and the fixing for mounting the pump on the pan, remove the pump from the pan, drain it and position it vertically with the delivery head at the bottom.

PV4 - PIV6 electro-pumps

11.2.1 - PV4 pump

See diagram on page 8

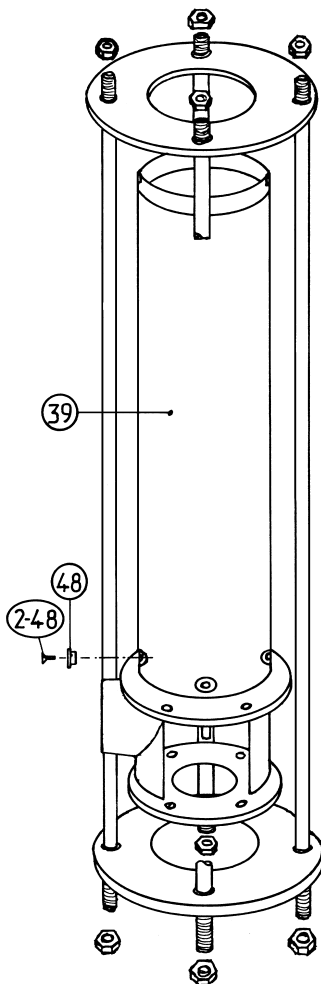
Remove:

- the tube (39) after having:
 - unscrewed the 2 tube clamping nuts (2.39) on the delivery head (21), for pumps with a thermoplastic body
 - stopped the rotation of the delivery head (21) (use a strap spanner to do this), for pumps with a metal body
- Warning: This has a left hand thread.
- the hydraulic unit (impellers, diffusers, ferrules, cover plates, bearing, shaft, mechanical seal)
- the impeller tightening screw (84) by locking the shaft so as not to damage it at the other end
- the first cover plate (16-2)
- the first impeller (28)
- the first diffuser (29)
- the first ferrule (67)
- the bearing (11)
- the sleeve (07)
- Remove the other stages in the same way.

11.2.2 - PIV6 pump

See diagram on page 9

Position the pump vertically, with the delivery head at the bottom, on a compression mounting, as shown below.



Tighten the 4 tie rods, then remove:

- the 4 screws (2.48)
- the 4 locknuts (48) (tightening a screw or M6 screw rod in the locknut will enable them to be removed more easily)
- Unscrew and remove the compression mounting, then remove:
 - the suction unit (tube) (39)
 - the hydraulic unit (cell body, impellers, diffusers, shaft, mechanical seal)
 - the impeller tightening screw (84) by locking the shaft so as not to damage it at the other end.
 - the first cell body (13)
 - the first impeller (28)
 - the second cell body (13) with its diffuser (29)
 - the second impeller (28)
 - the bearing assembly (11) and (62)
- Remove the other stages in the same way.

11.3 - Changing the mechanical seal

After dismantling the hydraulic unit as indicated in paragraph 2, remove:

- the ring (71) (after unscrewing the locking screw (2.71) on PV4 pumps)
- the spacer ring (72) located in the delivery head (21)

Refitting a new seal:

- The housing for the spacer ring must be clean. Clean it and fit a new spacer ring by lubricating the rubber ring and its housing with a 10% solution of Teepol in clean water.
 - Push the spacer ring into its housing using a plastic cylindrical mandrel.
 - Make sure that the friction surface is clean and dry, as well as the part of the shaft on which the revolving joint (71) slides.
 - Fit a revolving joint (71) which has been previously lubricated with the same solution as the spacer ring, using a torque tube to locate it.
- For PV4 pumps, slide it on until it rests on the shoulder of the shaft and lock the screws (2.71).
- Take care not to damage the friction surfaces of the mechanical seal during these operations.

11.4 - Reassembling the hydraulic unit

- Before reassembly ensure that the parts are clean and not worn.
 - Reassemble the unit by carrying out the dismantling procedure in reverse.
 - Use silicon grease to lubricate the thread (PV4 pumps with metal delivery head) or spigot (PIV6 pumps) of the delivery head (21) as well as the O ring seal (81), before refitting the tube.
- Note: After dismantling, we recommend fitting a new mechanical seal.

11.5 - Motor-hydraulic unit connection

When connecting the motor to the hydraulic unit, correct compression of the mechanical seal should be obtained and the movable hydraulic assembly should be set in the centre of its axial play.

Proceed as follows:

PV4 - PIV6 electro-pumps

11.5.1 - PV4 hydraulic unit

- Mount the motor on the hydraulic unit.
- Replace and tighten the 4 screws (83) with their washers (3.83).
- Fit the pin (95) into one of the two halves of the coupling sleeve (88).
- Mount the coupling sleeve (88) taking care to locate the pin (95) in the groove in the shaft (24) of the hydraulic unit.
- Bring into contact, without tightening, the 4 coupling sleeve screws (2.88).
- Slide a 2.5 mm wide shim under the coupling sleeve, between the sleeve and the delivery head (21).
- Lock the 4 sleeve screws (2.88).
- Remove the shim.
- Fit the protective grille (69).

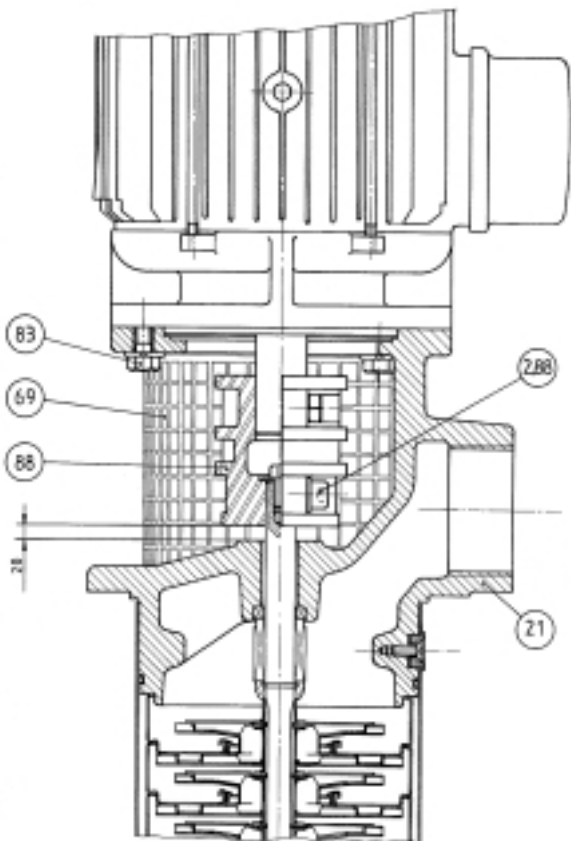
11.5.2 - PIV6 hydraulic unit

- Mount the motor on the hydraulic unit.
 - Replace and tighten the 4 screws (83).
 - Mount the coupling sleeve (88) on the motor and hydraulic unit shaft ends.
 - Bring into contact, without tightening, the 4 coupling sleeve screws (2.88).
 - Lift the movable assembly and slide 20 mm wide shim under the coupling sleeve, between the sleeve and the delivery head (21).
- (See diagram below).

12 - SPARE PARTS

To order spare parts, please specify:

- the type of electro-pump
- the electro-pump serial number
- the description of the part with its part number, as shown on the diagram and on the parts list in this document

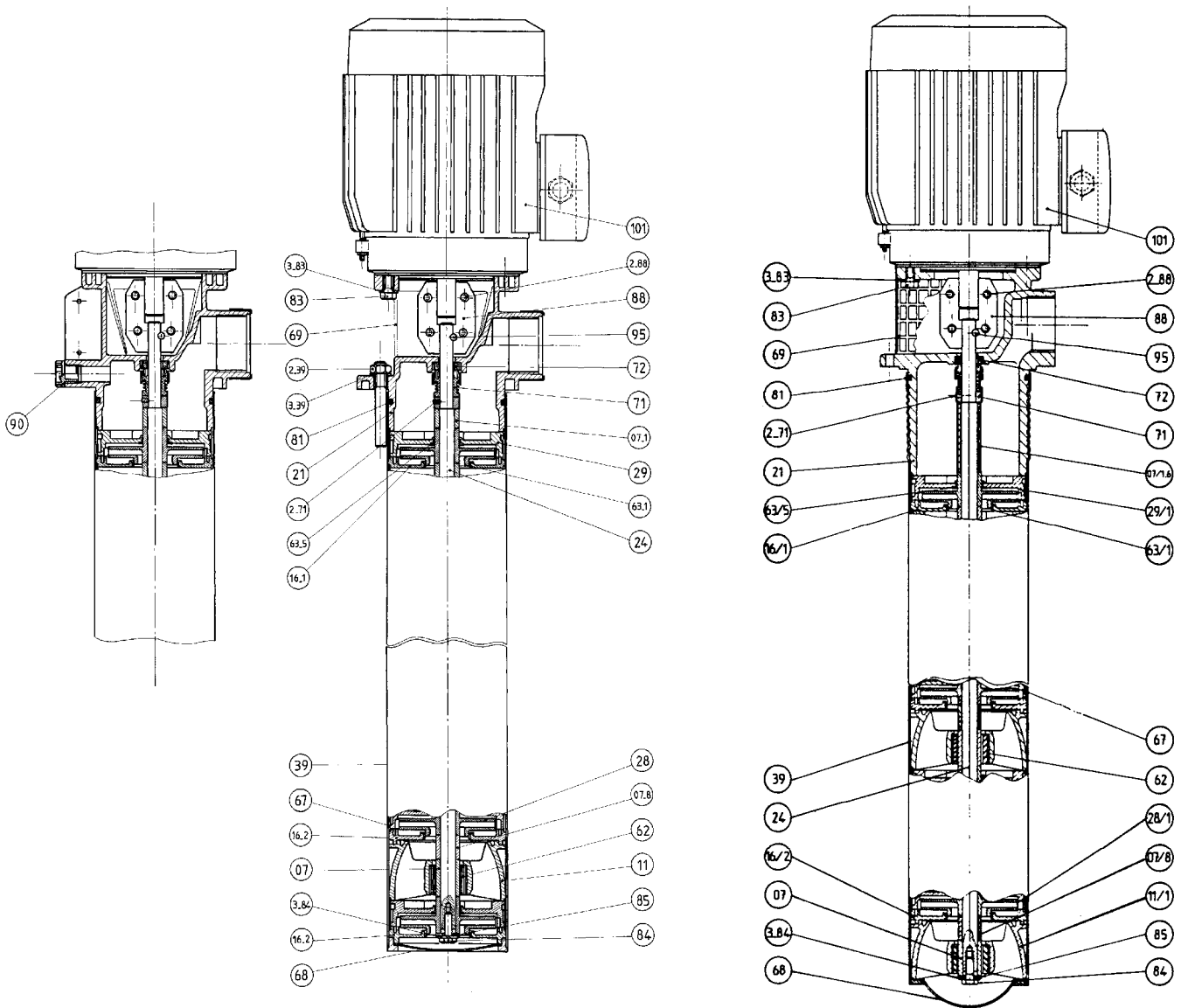


- Tighten the 4 sleeve screws (2.88) firmly.
- Remove the shim.
- Fit the protective grille (69).

PV4 - PIV6 electro-pumps

Fault	Cause	Remedy
The motor will not start.	<ul style="list-style-type: none"> – Circuit-breaker faulty or incorrectly set. – The supply voltage is correct but the voltage at the motor terminals is too low. – The motor is not properly connected. 	<ul style="list-style-type: none"> – Check the circuit-breaker. – Redo the electro-pump power supply line, increasing the diameter of the wires. – Comply with the wiring diagram (connection to the motor).
The pump will not start.	<ul style="list-style-type: none"> – The inlet filter is not sufficiently immersed. – Direction of rotation reversed (3-phase motor). – Delivery pipe closed by valve or other and an air pocket has formed in the upper part of the pump. 	<ul style="list-style-type: none"> – Check the immersion depth. – Reverse 2 cables on the motor terminal block. – Open the drain plug on the delivery head by unscrewing it several turns.
Inadequate performance.	<ul style="list-style-type: none"> – Direction of rotation reversed (3-phase motor). – Total manometric lift is higher than specified. – The pump or inlet filter are partially obstructed. – Air entering on intake. 	<ul style="list-style-type: none"> – Reverse 2 cables on the motor terminal block. – Use an electro-pump with better performance or reduce the pressure losses. – Clean them and remedy the problem. – Check the immersion depth of the inlet filter valve.
The circuit-breaker trips.	<ul style="list-style-type: none"> – Permanent overload due to inadequate TML, resulting in too high a flow. – Permanent overload due to excessive viscosity or density of the liquid being pumped. – Excessive voltage drop. – Operation with 2 phases (3-phase motor). 	<ul style="list-style-type: none"> – Fit a control valve on the pump delivery pipe to slow down the flow. – Please consult LEROY-SOMER. – Increase the voltage or increase the diameter of the conductors. – Inspect the supply cables and connection terminals.
Leaking mechanical seal.	<ul style="list-style-type: none"> – Faulty mechanical seal. 	<ul style="list-style-type: none"> – Check and replace all the components of the mechanical seal (never run on empty).
Electro-pump vibrating.	<ul style="list-style-type: none"> – In accordance with the various points above. – Abnormal restriction on the flanges. – Faulty motor bearings. 	<ul style="list-style-type: none"> – Check. – Check the connection of the pump on its support and the connection of the delivery pipe. They should not cause any mechanical stress. This should be eliminated by flexible collars, etc. – Check and change the bearings (same size and type).

PV4 electro-pumps



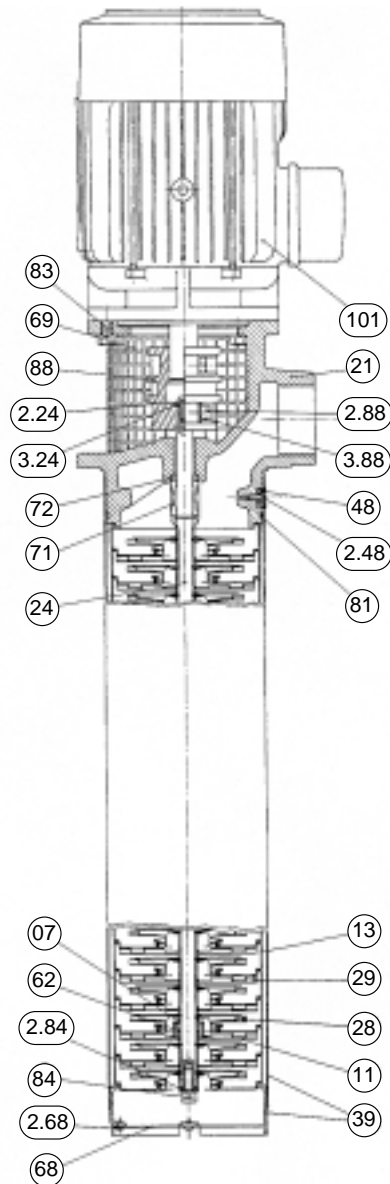
Pump with thermoplastic delivery head

Pump with metal delivery head

Part No.	Description
7	Sleeve
7.1	Spacer
7.2	Spacer
7.8	Bearing spacer
11	Bearing
16.1	Cover plate
16.2	Suction plate
21	Delivery head
24	Shaft
28	Turbine
29	Diffuser
39	Tube
2.39	Tube clamping nut
3.39	Tube clamping washer
62	Bearing bush
67	Ferrule

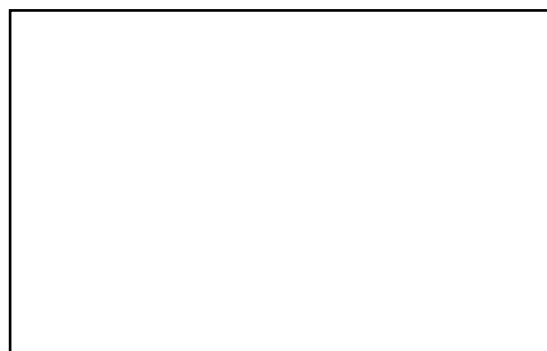
Part No.	Description
68	Inlet filter
69	Protective grille
71	Revolving joint
2.71	Revolving joint screw
72	Spacer ring
81	O ring seal
83	Screw
3.83	Washer
84	Turbine screw
3.84	Brake washer
88	Coupling sleeve
2.88	Coupling sleeve screw
90	Draining plug
95	Pin
101	Motor

PIV6 electro-pumps



Part No.	Description
7	Shaft spacer
11	Bearing cell
13	Cell
21	Delivery head
24	Pump shaft
2.24	Shaft end screw
3.24	Shaft end washer
28	Turbine
29	Diffuser
39	Suction unit
48	Bolt
2.48	Locknut fixing screw
62	Bearing assembly

Part No.	Description
68	Inlet filter
2.68	Inlet filter fixing screws
69	Protective grille
71	Revolving joint
72	Fixed plug
81	O ring seal
83	Motor fixing screw
84	Turbine locking screw
2.84	Turbine locking washer
88	Coupling sleeve
2.88	Coupling sleeve screw
3.88	Coupling sleeve washer
101	Motor



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