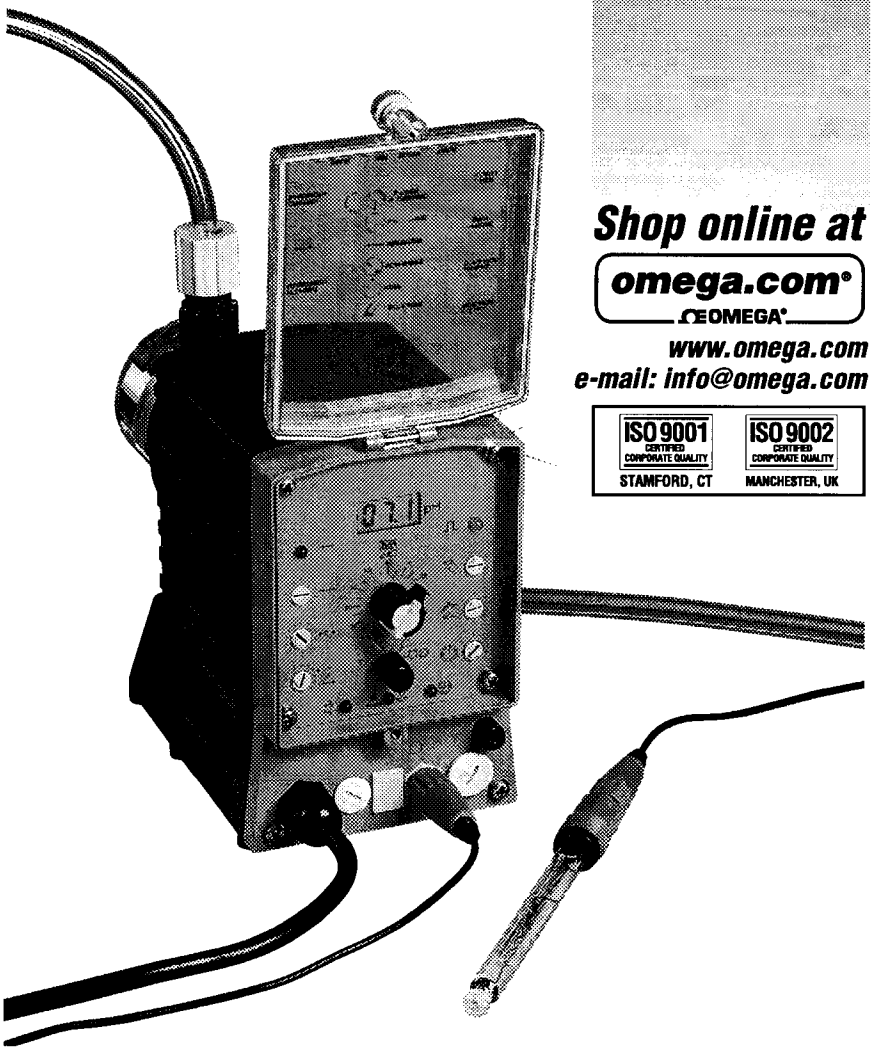
.1 YEAR
WARRANTY

User's Guide



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1 INTRODUCTION

SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® PHP-190 Series of chemical metering systems are unique instruments that combine a pulse frequency controller with a diaphragm-type pump in one compact unit. In the control mode, deviations from set point are converted to pulses which vary the stroke rate of the metering pump. As the set point is approached, the pump feed slows down to minimize chemical loss and overshoot of the endpoint. Variation of the stroke rate is controlled by a front panel potentiometer, or through process-controlled operation by external electric or mechanical pacing, or by closed loop control.

The Automatic Temperature Compensation (ATC) option corrects pH measurements for temperature variations, using a 100 ohm RTD for temperature measurement.

The units are supplied with foot valve, injection valve, power cord, level switch connector, and PVC models include 15 feet of PVC tubing.

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at 1-800-622-2378 or 203-359-1660. We can also be reached on the Internet at www.omega.com e-mail: info@omega.com Upon receipt of the shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

2.2 TYPICAL PUMP INSTALLATION

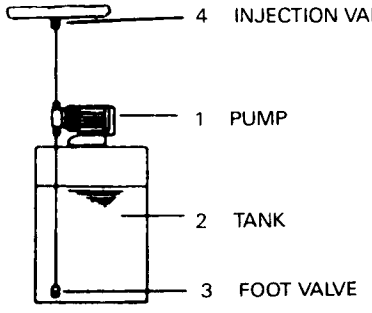


Figure 2-1 Typical Installation

3 OPERATION

SECTION 3 OPERATION

Section 3.1: Front Panel Controls (refer to Figure 3.1)

1. Power Supply input – 115 VAC
2. Optional relay output bushing
3. Level switch jack
4. pH probe connection jack (BNC)
5. Banana jack for solution ground
6. Optional 4-20 mA output
7. Sample reference potential input
8. Liquid crystal display
9. Green lamp (LED) indicates that set-point has been reached
10. Yellow lamp (LED) flashes to indicate when and how fast pump is pumping
11. Red lamp (LED) indicates various relay functions (optional)
12. Red lamp (LED)
    a. When a level switch is used with the pump, this red LED will light and stay lit until pump is put back into automatic mode
    b. If pump is not in the automatic mode, this red LED will flash until pump is put back into automatic mode
13. Green lamp (LED) lights when optional relay time runs out
14. Potentiometer used to adjust desired pH value
15. Potentiometer used to adjust probe zero (pH 7)
16. Potentiometer used to adjust probe span (pH 4 or pH 10)
17. Potentiometer used to adjust how fast the pump will respond to set-point
18. Potentiometer used to set time for optional alarm relay
19. Potentiometer used to simulate a desired pH value between 0-14 for manual op.
20. Automatic/Manual temperature compensation toggle switch

21. Six-position rotary switch for mode selection. Modes are as follows:
    a. Position 1: manual simulator
    b. Position 2: pump off
    c. Position 3: calibrate
    d. Position 4: display/adjust set-point
    e. Position 5: automatic mode/pump will operate off signal from pH probe
    f. Position 6: automatic mode plus optional timer delay
22. Stroke distance control, to select volume per stroke.
23. Toggle switch, to select acid or base operation.

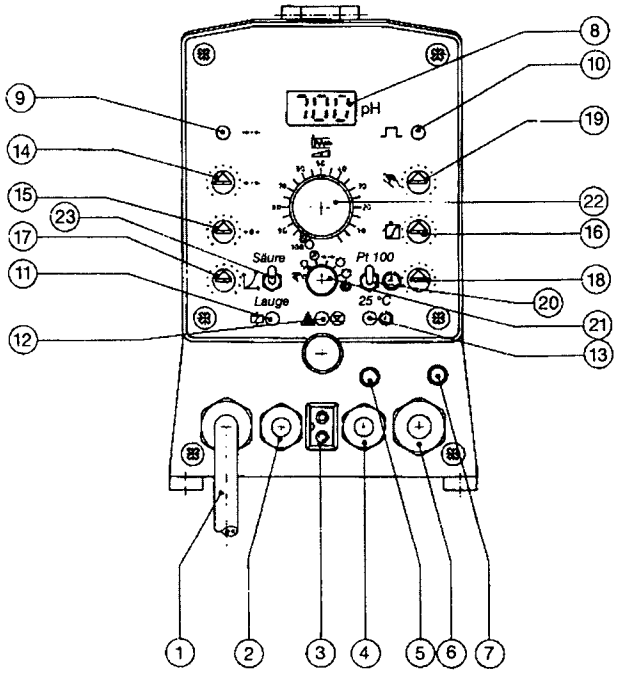


Figure 3-1 Front Panel Controls

3.2 CONNECTING pH/RTD

1. Connect pH probe to connector #4 in Figure. 3.1.
2. Connect PT100 RTD to SN6 connector, if used. If automatic temperature compensation is desired, set toggle switch (#20 on Figure 3.1) to "PT100". If no RTD is connected, set toggle switch to "20C".

3.3 CALIBRATION OF pH ELECTRODE

1. Move selector switch #21 on Figure 3-1 to "calibrate" position.
2. Apply power to pump.
3. Rinse pH electrode with water. Immerse electrode into pH 7 buffer solution. Adjust potentiometer #15 on Figure 3-1 until display reads 7.0.
4. Remove pH probe from pH 7 buffer solution. Rinse the probe. Immerse the probe into either pH 4 or pH 10 buffer solution. Adjust probe span potentiometer #16 on Figure 3-1 until display reads pH 4 or pH 10.
5. Remove and rinse pH probe. Repeat step 4, making sure display reads 7.0 when immersed in pH 7 buffer solution.

3.4 SETTING THE SET POINT

1. Move selector switch #21 on Figure 3-1 to position #4 to display set point (refer to Front Panel controls).
2. Adjust potentiometer #14 on Figure 3-1 to desired pH level
3. Move selector switch #21 on Figure 3-1 to position #5 (refer to Front Panel controls). When using optional timer relay, set the above selector switch to position #6.

3.5 MANUAL OPERATION

1. Move selector switch #21 on Figure 3-1 to position #1 (refer to Front Panel controls).
2. Adjust potentiometer #19 until display reads a value above the set point pH level for acid feed, or until the pump operates at the desired frequency. For caustic feed reading, the display must be lower than set point level.

3.6 CONTROL BANDWIDTH

Refer to potentiometer #17 on Figure 3-1. When potentiometer is in the clockwise position, the pump will reach maximum frequency, which is a change of 1 pH unit from desired pH level. With potentiometer in the counterclockwise position, maximum frequency does not occur until there is a change of 3 pH units from desired pH level.

3.7 PLACING IN OPERATION

1. Mount pump to container or console.

2. Connect suction tubing to suction valve. If a level switch is to be used, connect this by plugging into the socket on the backplate of the pump.
3. Cut the length of the suction line so as to suspend the foot value within 1" to 2" from the bottom of the container.
4. The pump is now ready for operation. Plug into power source. Set stroke length adjustment knobs to "100" while the pump is operating. Allow pump to prime until head is filled and no air bubbles are visible in the head or suction lines.

3.7.1 Pump Priming

The maximum suction lift for metering pumps is approximately 1.5m, depending on model, with the liquid end full. When the liquid is empty, the priming should be done with stroke length set to 100%. The pump cannot prime against a back pressure.

If the pump feeds into a pressurized system and has air in the liquid end, the discharge line must be disconnected, and air bled until the suction line and pump head are free of air bubbles. When a level switch is used, the pump switches off at minimum level so that no air can be drawn into the liquid end or suction lines.

3.7.2 Metering Accuracy

All references given are based on volume checks with water at 20°C. The nomograph adjustment accuracy is about ±5%. The reproducible metering accuracy is about ±2% at constant conditions and a minimum stroke length of 30%.

Best dosing is achieved when there is a constant back pressure of more than one (1) bar. When pumping to atmosphere, the discharge lines should always slope up from the pump. A valve should be provided to assure an artificial back pressure of approximately 1.5 bar. It should be installed directly on the dosing head.

Where the solution tank is installed above the pump in order to provide positive suction head, the back pressure should be sufficient to produce a differential of about 1.5 bar; otherwise, an "anti-syphon valve" and a spring-loaded "injection valve" are required.

3.8 CHANGING CONTROL DIRECTION

1. Disconnect pump from power source.
2. Remove screws (6) that hold electronics onto pump.
3. Turn control hood over so that electronics are facing you.
4. Slide switch **S1** in opposite direction. **S1** is located between back of the orange plastic control hood and the front electronic circuit board.
5. Assemble in reverse order.

4 TROUBLESHOOTING

SECTION 4 TROUBLESHOOTING

pH Control Section

PROBLEM	STEPS TO CORRECT
A) No lights or indicators	1. Check power.
B) Incorrect solution reading	1. Check selector switch #21 on Figure #3-1 to make sure it is in automatic position. 2. Probe cable should be run at least 6" away from any A/C cables when runs are parallel to it. When crossing is necessary, it should be done at 90°. 3. Clean pH probe.
C) No frequency output	1. Check set-points.

Basic Hydraulic Section

PROBLEM	CAUSE	STEPS TO CORRECT
A) Pump operating, does not discharge product	Trapped air	1) Fix leaks in suction line and tighten all fittings. 2) Reprime, removing all gas bubbles by opening air vent valve. 3) Out of product.
B) Low pump output	Very low stroke	1) Stroke length setting set below ")" setting. When the solenoid is energized, the stroke spacer should be free to move.
	Air leak pass check valve	2) Check if valves are fouled or seats are worn. Clean or replace as necessary.
	Product too viscous	3) Dilute product or change to different product.
	Product crystallized around check valves and seats	4) Disassemble pump head and clean ball checks.

TROUBLE SHOOTING (cont'd)

PROBLEM	CAUSE	STEPS TO CORRECT
	Ruptured pumping diaphragm	5) Product will leak out bottom of backing plate behind pump head. Replace diaphragm.
	Clogged liquid end	6) Disassemble and clean liquid end components. Reassemble carefully after cleaning
	Injection point pressure in excess of pump rating.	7) Diaphragm may rupture. Check for chemical leaking out hole at spacer behind the pump head. If leaking occurs, replace the diaphragm.
C) Excessive pump output	Siphoning (Optional)	1) Check that anti-syphon spring is installed in pump discharge cartridge and/or in the injection valve assembly and free to travel. Also, check for corrosion and possible fracture. Note: Free length of each spring is 0.197 in. (5mm).
	Injection point pressure is less than 15 PSI	2) Same as 1.
D) Pump not Operating (no powe)	Blown power fuse (no lights)	1) Remove 6 (six) screws from control panel, fuse clips on circuit board behind control panel.
E) Yellow light pulses, but pump does not pump	Bad temperature fuse	1) Remove screws (6) from control panel. Disconnect clip with two gray wires from PC card.

PROBLEM	CAUSE	STEPS TO CORRECT
Yellow light pulses, but pump does not pump	Bad temperature fuse	2) With ohmmeter, measure resistance between the gray wires. Resistance should be 100 to 120 ohms. 3) If getting infinite resistance, temperature fuse needs replacing. 4) With ohmmeter, check solenoid resistance; it should be 100 to 120 ohms (110V)

SECTION 5 SPECIFICATIONS

RANGE:	pH control 0 to 14 pH
CONTROL BANDWIDTH:	1 to 3 pH units
CONNECTOR/pH SENSOR:	BNC Adapter standard
TEMPERATURE COMPENSATION/pH	100 ohm RTD
MAXIMUM STROKE LENGTH:	0.05" (1.25mm)
MAXIMUM STROKE RATE:	100 stokes per minute
MATERIALS OF CONSTRUCTION:	
HOUSING:	Glass-filled Luranyl™ (PPE)
DIAPHRAGM:	PTFE faced EPDM with steel core and Nylon reinforcement
LIQUID END OPTIONS:	PP (polypropylene), TT (PTFE), SS (316 SS)
ENCLOSURE RATING:	NEMA-4X (IP65), transparent cover standard
REPEATABILITY OF METERING:	±2%
AMBIENT TEMPERATURE RANGE:	14°F (-10°C) to 113°F (45°C)
MAX. FLUID OPERATING TEMPERATURE:	122°F (50°C)
DISPLAY:	3-digit liquid crystal display of measured value, set value or simulated measured value
SIGNAL CURRENT OUTPUT:	4-20 mA (internally changeable to 0-20 mA), 750-ohm load, proportional to measured variable
DIMENSIONS:	173 H x 112 W x 260 D (6.81" H x 4.41" W x 10" D)
WEIGHT:	PP and TT models, 7 lbs. SS models 13 lbs.
POWER CORD:	6 ft. (2m)

5.1 CAPACITY NOMOGRAPHS FOR PHP-190 SERIES PUMPS

1. Determine correction factor.
2. Divide desired capacity by correction factor.
3. Select capacity on center scale. Pivot ruler from this point so that it intersects the other 2 scales in as close to a horizontal line as possible. Note that for highly viscous materials, a long stroke length and low frequency (SPM) should be used, whereas, for best mixing a high frequency - short stroke length is recommended. For delivery accuracy better than 2%, the stroke length should not be below 30%.
4. Set the pump control knobs to the % setting determined from the nomograph.

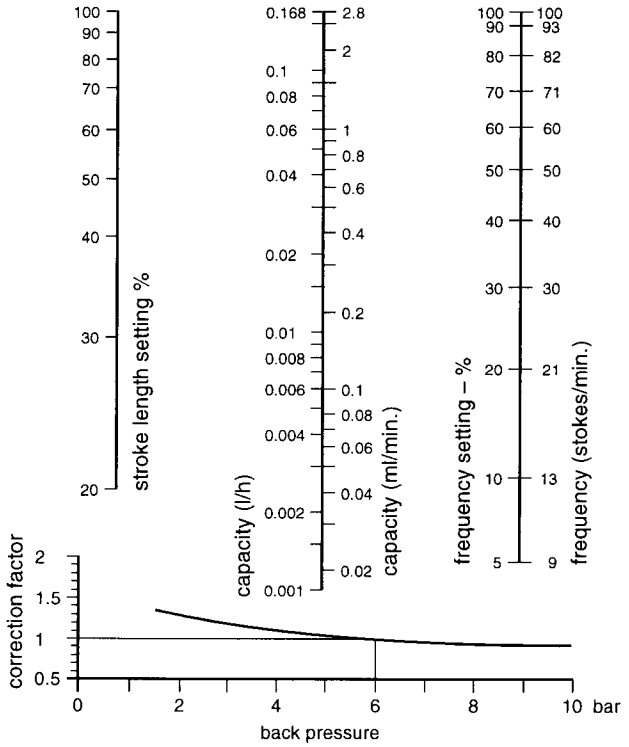
TO CONVERT:

Pressure (psi) = bar x 14.5 Usgph = l/h x 264
Bar = psi x .069 l/h = Usgph x 3.78

Maximum stroke rate: 6000 SPH

PHP-191

Max. capacity at 147 psi: 0.04 usgph at 10 bar: 0.156 l/h
Max. suction lift 4.9 ft W.C 1.5m W.C

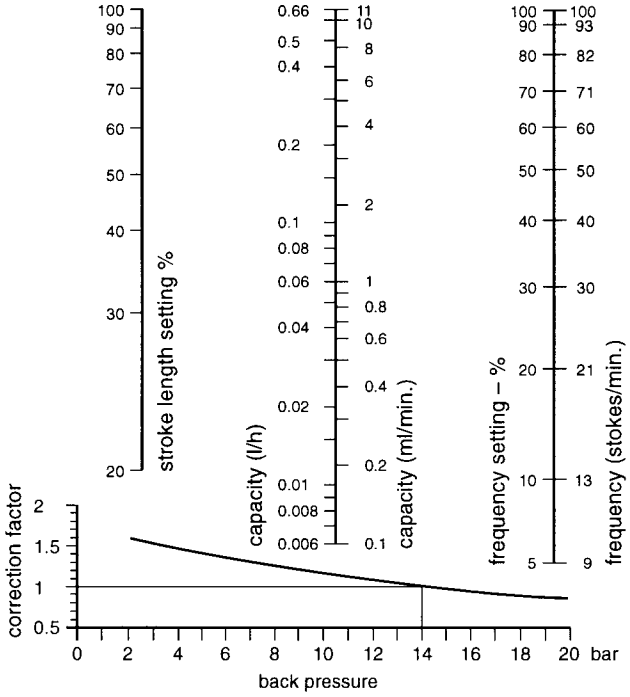


5 SPECIFICATIONS

PHP-192

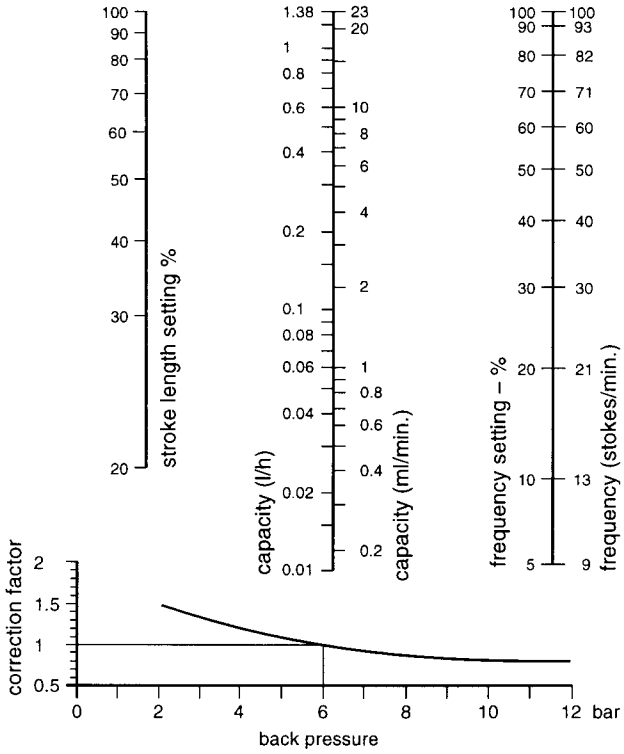
Max. capacity at 294 psi: .14 usgph at 20 bar: 0.54 l/h

Max. suction lift 9.8 ft W.C 3m W.C



PHP-193

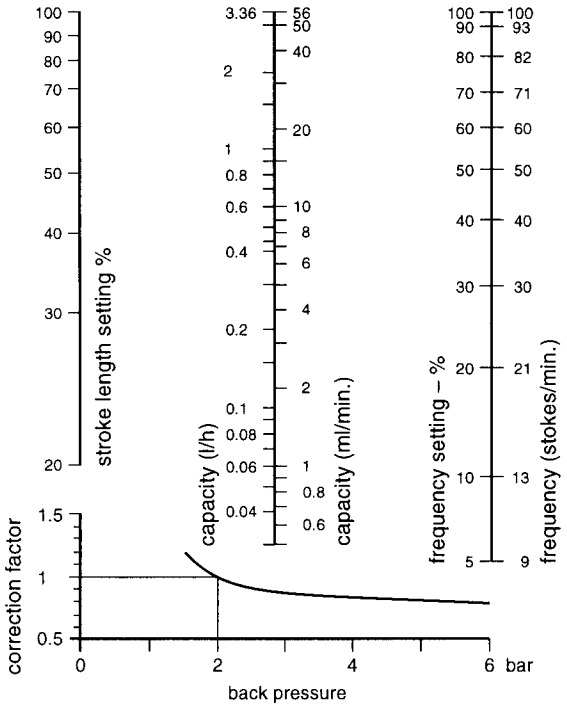
Max. capacity at 176 psi: .28 usgph at 12 bar: 1.08 l/h
Max. suction lift 13 ft W.C 4m W.C



5 SPECIFICATIONS

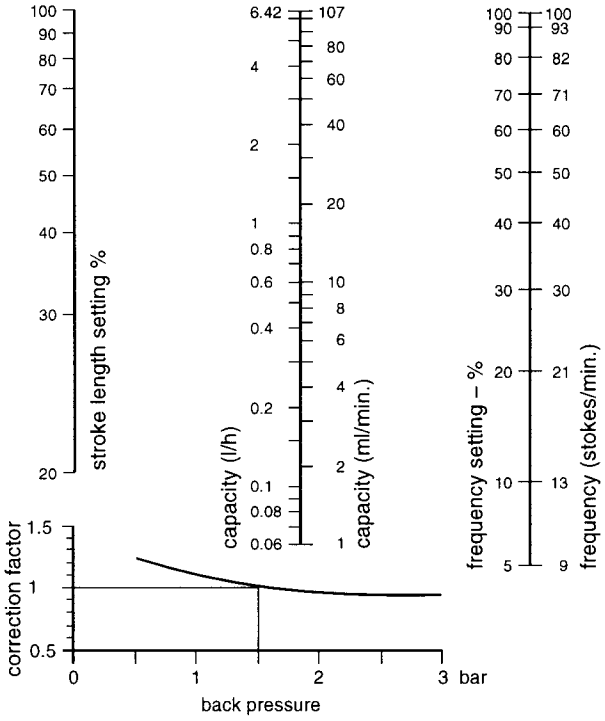
PHP-194

Max. capacity at 80 psi: .76 usgph at 5.5 bar: 2.881 l/h
Max. suction lift 16 ft W.C 5m W.C



PHP-195

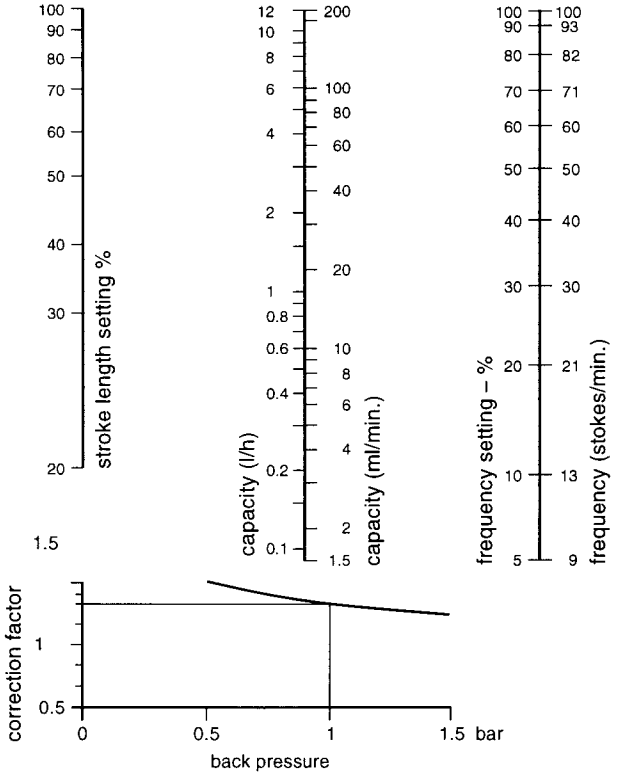
Max. capacity at 37 psi: 1.66 usgph at 2.5 bar: 6.3 l/h
Max. suction lift 8 ft W.C 2.5m W.C



5 SPECIFICATIONS

PHP-196

Max. capacity at 22 psi: 3.0 usgph at 1.5 bar: 11.4 l/h
Max. suction lift 5 ft W.C 1.5m W.C



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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

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2. Model and serial number of the product under warranty, and
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3. Repair instructions and/or specific problems relative to the product.

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