CE

User's Guide

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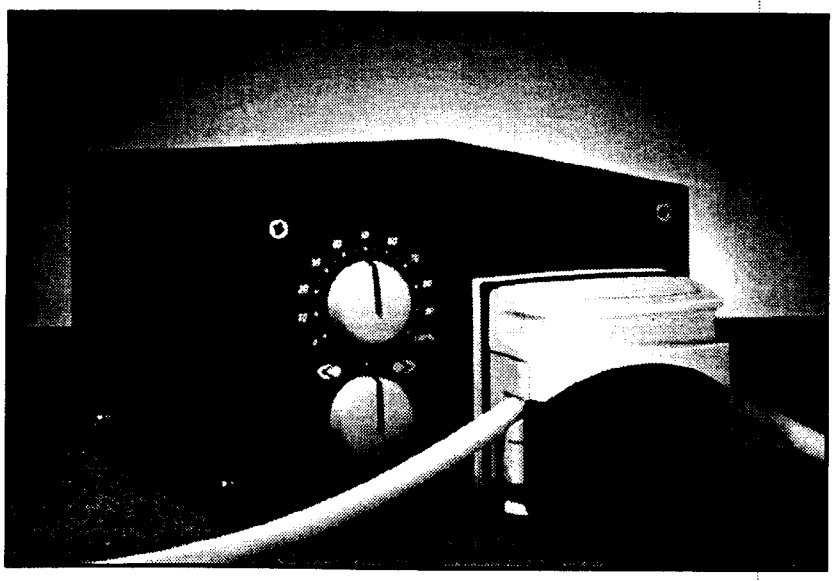


FPUM-300 Series Pumps

Contents

Recommended operating procedures

DO use the minimum number of bends in rigid pipe runs. If there must be a bend, use a swept bend and not a tight elbow.

DO use suction and delivery pipelines with a bore equal to or larger than the bore of the tube fitted in the pumphead. When pumping **viscous** fluids, the losses caused by increased friction can be overcome by using pipe runs with a cross sectional area several times greater than the pumping element.

DO use the largest possible bore tube running at slow speed for the longest tube life.

DO fit an extra length of pump tubing in the system so that you can move the tube through the pumphead occasionally, without needing to break the pumping circuit. This is particularly useful for extending tube life in long running sterile applications.

DO keep the track and rollers clean, and ensure that the rollers are free.

DO NOT fit valves in the suction or delivery lines without considering that peristaltic pumps are self priming and will hold their prime up to several meters, so there may be no need for non-return or foot valves, nor for the loading valves required on many other kinds of pumps.

Any valves fitted must cause no restriction. If electrically actuated valves are fitted, they should be interlocked so that the pump will only run when the valves are open. Fit an automatic by-pass if manual valves are installed.

When using Santoprene tubing, after the first 30 minutes of running, re-tension the tube in the pumphead by releasing the tube clamp on the delivery side a little and pulling the tube tight. This is to counteract the normal stretching that occurs with Marprene and Bioprene, which can go unnoticed and result in reduced tube life.

Tube selection The chemical compatibility list published in the Omega Handbook is only a guide. If in doubt about the compatibility of a tube material and the duty fluid, request a tube sample card for immersion trials. Remember the sample will be fully immersed, but the fluid when in use will only be in contact with the inside of the tube. If the material swells but does not lose its strength it could be worth considering.

Viscous dispensing To overcome the common problems of reduced accuracy, line leakage and pressure losses, the suction and delivery lines should be kept as short as possible. Use larger bore transmission tubing than that in the pumphead to keep the friction losses to a minimum. Rigid or semi-rigid piping installed on the delivery side will improve dispensing accuracy. The rigid tube is effective in reducing over-run because it does not expand during pumping.

Part 1: Drives

Installation

Pumps should be situated where there is free air to circulate around the them and where the tubing is allowed to enter the pumphead without kinking.

The FPUM-300 Series Pumps can be operated at ambient temperatures from 5C to 40C. Storage temperatures from -40C to 70C are permissible, but allow time for acclimatization before use.

Electrical connection

Power supply

The FPUM-300 Series Pumps are suitable for single phase power electricity supplies only. Set the voltage selector to either 120V for 100-120V 50/60Hz supplies or 240V for 220-240V 50/60Hz supplies.

A mains cable fitted with a moulded plug is supplied with the pump, but if another plug is to be fitted, the color coding of the mains lead must be observed.

The mains cable for 220-240V supplies is color-coded so that the live lead is brown, the neutral lead is blue, and the earth lead is green and yellow. The mains cable for 100-120V supplies is color-coded so that the live lead is black, the neutral lead is white, and the earth lead is green.

Failure to operate

Should the pump fail to operate, check that the power switch is **on**, that mains electricity is available at the unit, that the voltage selector switch is in the correct position, that the fuse located in the carrier beneath the mains connector is intact and that the pump is not stalled by incorrect fitting of tubing.

There are dangerous voltages (at mains potential) inside the drive. If access is required, isolate the drive from the power source before removing the cover.

Operation

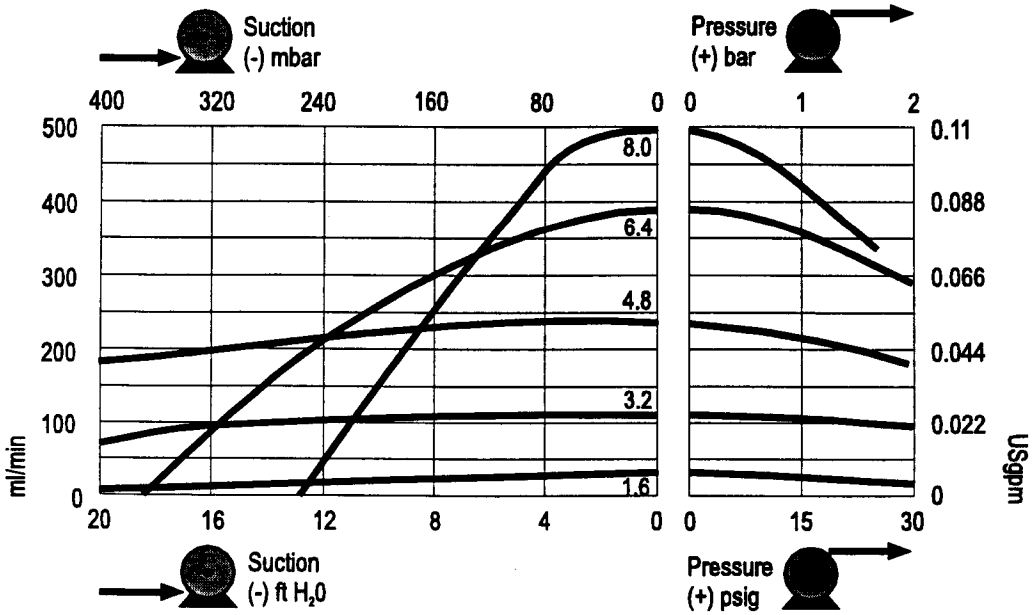
- Check that the voltage selector switch setting is correct for the power supply and turn the pump on using the power switch on the rear panel.
- Set the pump to the desired speed output using the front panel potentiometer which is calibrated to provide speed control within 5 to 100% of maximum speed.
- Start the pump operating by switching the reverse/start/forward knob to the desired direction of rotation.
- Stop the pump by turning the reverse/start/forward switch to its central position.

Flow rates

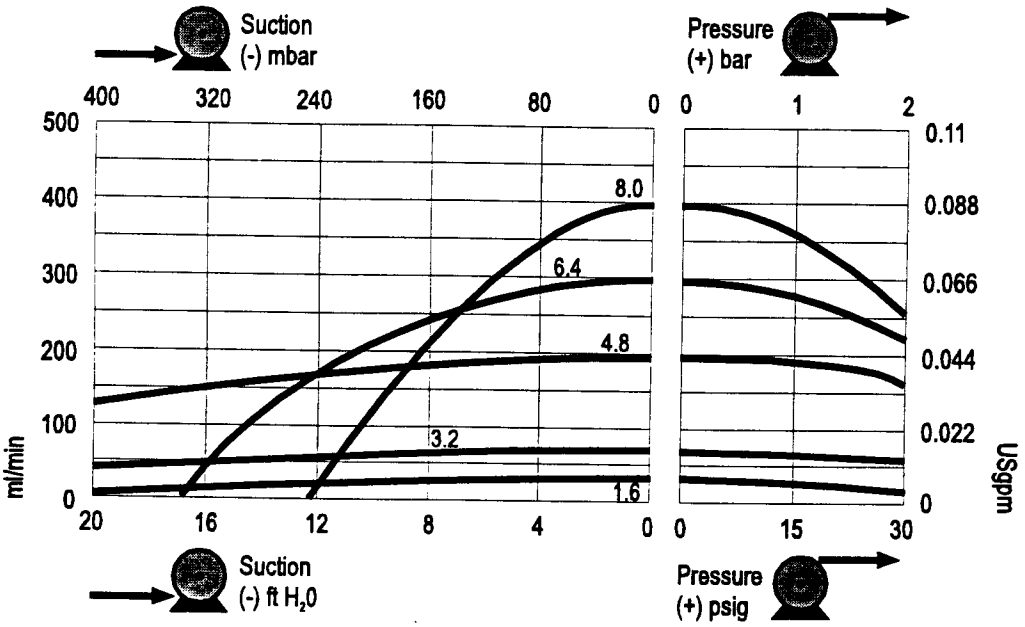
The FPUM-300 Series Pump Drives can only be fitted with FPU-330 three-roller or FPU-340 four-roller pumpheads. For the number of pumpheads that can be run at on a single pump refer to the section of this operating instruction covering the maximum number of extension pumpheads.

The flow rates given below were obtained using silicone tubing, with the pumphead rotating clockwise at 100rpm, pumping water at 20C with zero suction and delivery pressures (unless otherwise stated). Where an application is critical, the flow rate should be determined under operating conditions. The important factors are suction and delivery pressures, temperature, and fluid viscosity. Tube life will be reduced when pumping against pressure.

FPU-330 Flow Rates (ml/min)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm**	**0.8mm**	**1.6mm**	**3.2mm**	**4.8mm**	**6.4mm**	**8.0mm**
rpm	**1/50"**	**1/32"**	**1/16"**	**1/8"**	**3/16"**	**1/4"**	**5/16"**
5	0.15	0.33	1.3	5	11	18	25
50	1.5	3	13	50	110	180	250
200	6	14	54	200	440	720	1000
400	12	28	108	400	880	1440	2000
2.5-50	0.07-1.5	0.15-3	0.65-13	2.5-50	5.5-110	9-180	12.5-250
20-400	0.6-12	1.4-28	5.4-108	20-400	44-880	72-1440	100-1000



FPU-340 Flow Rates (ml/min)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm**	**0.8mm**	**1.6mm**	**3.2mm**	**4.8mm**	**6.4mm**	**8.0mm**
rpm	**1/50"**	**1/32"**	**1/16"**	**1/8"**	**3/16"**	**1/4"**	**5/16"**
5	0.15	0.3	1.2	4.2	9.5	15	20
50	1.5	3.0	12	42	95	150	200
200	6	12	50	170	330	600	800
400	12	24	100	340	760	1200	1600
2.5-50	0.07-1.5	0.15-3.0	0.6-12	2.1-42	4.8-95	7.5-150	10-200
20-400	0.6-12	1.2-24	5-100	17-340	38-760	60-1200	80-1600



Maximum number of FPU-330/FPU-340 extension pumpheads

Platinum Silicone tubing (up to 7 psi pressure)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm 1/50"**	**0.8mm 1/32"**	**1.6mm 1/16"**	**3.2mm 1/8"**	**4.8mm 3/16"**	**6.4mm 1/4"**	**8.0mm 5/16"**
5 rpm	6	6	6	6	6	5	4
50 rpm	6	6	6	6	6	5	4
200 rpm	6	6	6	4	4	2	2
400 rpm	6	6	6	4	4	2	2
Platinum Silicone tubing (up to 30 psi pressure)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm 1/50"**	**0.8mm 1/32"**	**1.6mm 1/16"**	**3.2mm 1/8"**	**4.8mm 3/16"**	**6.4mm 1/4"**	**8.0mm 5/16"**
5 rpm	6	6	6	5	5	3	2
50 rpm	6	6	6	5	5	3	2
200 rpm	6	6	5	3	2	1	1
400 rpm	6	6	5	3	2	1	1

Santoprene, Tygon, Neoprene, Viton tubing (up to 7 psi pressure)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm 1/50"**	**0.8mm 1/32"**	**1.6mm 1/16"**	**3.2mm 1/8"**	**4.8mm 3/16"**	**6.4mm 1/4"**	**8.0mm 5/16"**
5 rpm	6	6	6	6	5	3	2
50 rpm	6	6	6	6	5	3	2
200 rpm	6	6	5	4	2	1	1
400 rpm	6	6	5	4	2	1	1
Santoprene, Tygon, Neoprene, Viton tubing (up to 30 psi pressure)							
Tube #	**112**	**13**	**14**	**16**	**25**	**17**	**18**
Tube bore	**0.5mm 1/50"**	**0.8mm 1/32"**	**1.6mm 1/16"**	**3.2mm 1/8"**	**4.8mm 3/16"**	**6.4mm 1/4"**	**8.0mm 5/16"**
5 rpm	6	6	6	5	3	2	2
50 rpm	6	6	6	5	3	2	2
200 rpm	6	6	5	3	2	1	1
400 rpm	6	6	5	3	2	1	1

Automatic operation

Never apply mains voltage across any pins on the 25D socket as permanent damage, not covered by warranty, will result. Up to 30V may be applied across pins 4 and 17, but no voltage should be applied across other pins as permanent damage, not covered by warranty, may result.

When setting the drive control mode with the V M I switch ensure that power to the drive is switched off using the mains switch on the rear panel.

Several methods of control can be used with the FPUM-300 Series Pump. For simple applications the pump can be remotely stopped/started by using a make/break switch. These can be used either in the manual or auto mode. Remote speed control can be obtained by using an analog signal or a potentiometer with the pump in the auto mode.

Definitions

The FPUM-300 Series Pump can provide a rising or falling flow rate against a rising signal. When the pump is set to provide a rising flow rate against a rising signal, this is defined as a ***non-inverted*** response.

When the pump is set to provide a falling flow rate against a rising signal, this is defined as an ***inverted*** response.

Signal range is the difference in the signal between that which is to produce maximum speed (flow rate) and that which is to produce minimum speed (flow rate). A 0V to 10V signal has a signal range of 10V. A 4mA to 20mA signal has a signal range of 16mA.

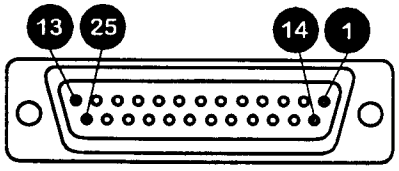
Signal offset is the signal level at which the pumphead is just about to start rotating. With a 4mA to 20mA signal (to provide a non-inverted response), the signal offset is 4mA. Note that if the same signal is to provide an inverted response, then the signal offset is 20mA, because that is the level at which the pump is just about to start. (It will be rotating fastest when the signal is 4mA).

For the pump to be controlled by a process signal, the **auto volts / manual / auto current** (**V M I**) slider switch on the rear panel should be set to either auto volts or auto current depending upon the type of control signal to be used. The process signal must be connected to the 25-way Dee plug provided, which must be inserted in the rear panel 25-way Dee connector.

If the process signal rises above the pre-calibrated input signal maximum of the drive, the signal overload LED will illuminate and the drive will limit to its maximum rpm.

Analog

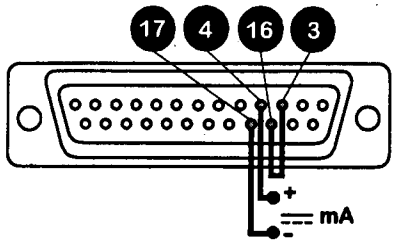
The FPUM-300 Series is shipped from Omega with the auto-control circuit calibrated to accept a 0-10V or 4-20mA process control signals. To use the pump under analog control, use the following wiring diagrams in relation to the 25-way Dee connector.



Current

Connections for current control

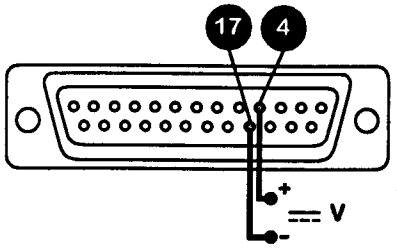
Circuit impedance 250Ω. Maximum current signal 20mA. Fit a link between pins 3 and 16 and connect the signal wires to pin 4(+) and pin 17(-) of the 25-way Dee connector. Reverse polarity for inverted response (falling flow rate against rising signal).



Voltage

Connections for voltage control

Circuit impedance 220kΩ. Maximum voltage signal 10V. Polarity shown for non-inverted response (rising flow rate against rising signal). Reverse polarity for inverted response (falling flow rate against rising signal).



Calibration for auto-control

Ensure that the 25-way Dee connector is wired correctly for the type of control signal being utilized.

Connect the process signal to the pump by inserting the 25-way Dee connector into its socket located on the rear panel of the pump.

Set the **auto volts / manual / auto current (V M I)** slider switch on the rear panel to depending upon the type of process signal to be used. When setting the pump control mode with this switch ensure that power to the pump is switched off using the mains switch on the rear panel.

If the process control signals are not set outputs of 0-10V or 4-20mA then set up a process signal manually.

Set the process signal to the required signal offset. If there is no signal offset this will be 0 volts or 0 milliamps. The signal offset will correspond to the starting speed of the pump depending on the pump response type required.

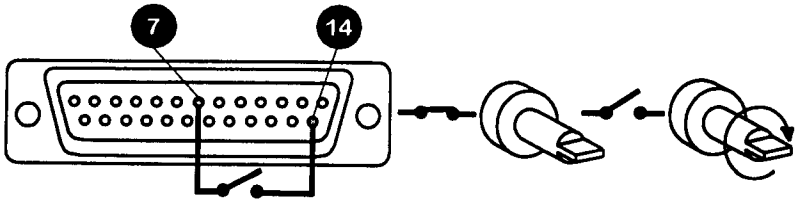
For example, with a 4-20mA signal and a non-inverted response requirement, the 4mA signal offset will correspond to the starting speed of the drive. If an inverted response is required then 20mA will be the signal offset and correspond to the starting speed of the drive.

The process signal should now be set to its signal range maximum.

For example, with a 4-20mA signal and a non-inverted response requirement, 20mA will be the control signal value which corresponds to the maximum speed of the pump. With an inverted response requirement 4mA will correspond to the minimum speed of the pump. The pump will now operate under auto-control when the rear panel switch is set to the auto position, noting that power to the pump should be switched off using the rear panel mains switch whenever this switch is used. The front panel potentiometer is not in circuit when the pump is operating under auto-control and may be safely left at any setting.

Remote control

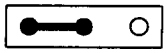
Stop/start



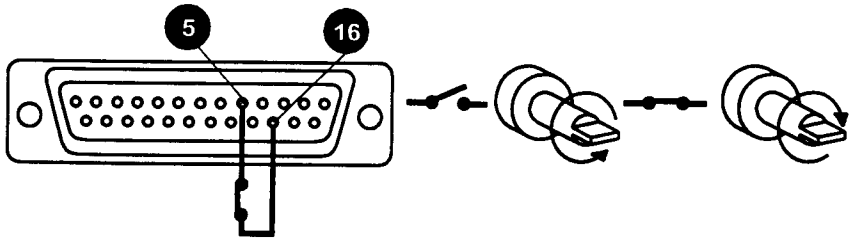
Connect remote switch between pins 7 and 16 of the 25-way Dee connector. When the circuit is open the pump will run, when the circuit is closed the pump will stop. With no connection, the pump will default to running. A remote stop/start signal will control the pump when running under manual operation.

To invert the signal output move the remote stop signal inverter link (see FPUM upgrade card) to the inverted pin positions on the signal inverter block.


Inverted

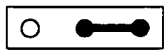

Non/inverted

Direction



The remote direction facility operates with the front panel direction switch set in the counter-clockwise direction only. Connect remote switch between pins 5 and 16. Open switch for counter-clockwise rotation, close for clockwise rotation. With no connection, the pump will default to counter-clockwise.

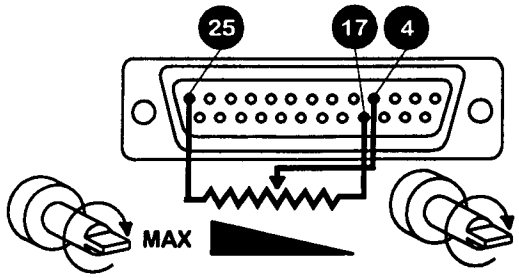
To invert the signal output move the remote direction signal inverter link (see FPUM upgrade card) to the inverted pin positions on the signal inverter block.


Inverted


Non/inverted

When the remote switch circuit is closed then the pump will run in an counter-clockwise direction. When set to open the pump will run in a clockwise direction only irrespective of the front panel setting.

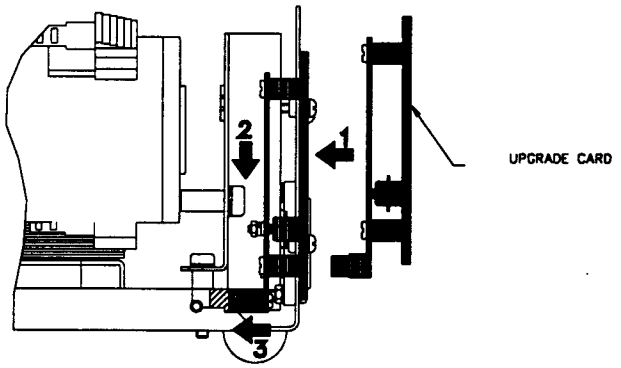
Speed



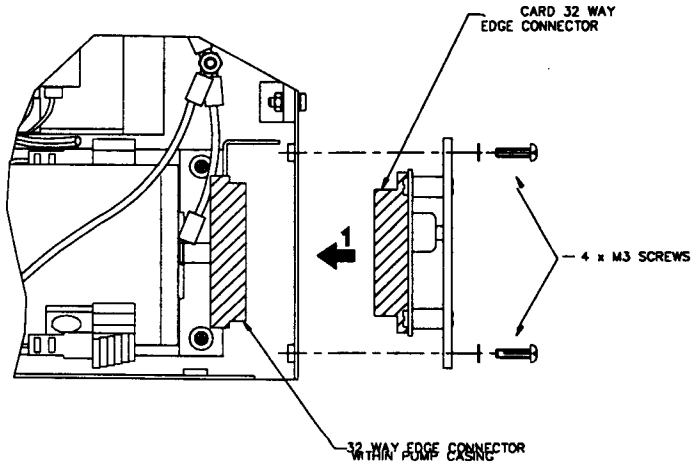
A remote potentiometer with a nominal value of between 1k and 10k with a minimum of 0.25W should be wired as shown. When using a remote potentiometer, do not apply a voltage/current control input signal at the same time. Set the drive control mode to **auto volts (0-10V)** ensuring that when changing the drive control mode, power to the drive is switched off using the rear panel mains switch. Further information concerning remote potentiometer speed control to is available through Omega Engineering.

FPUM upgrade card

To upgrade the manually controllable FPUM-310 Series into a remote or 0-10V/4-20mA analog controllable FPUM-320 Series an FPUM upgrade card will be required (part number "FPUM-Card"). To install the FPUM upgrade card undo the four M3 screws on the drive rear panel cover plate and remove. Slot the upgrade card into the rear panel hole, drop down to align the DIN edge connectors and push into position. Replace the four M3 screws on the new card ensuring that the drive ingress protection standard is retained.

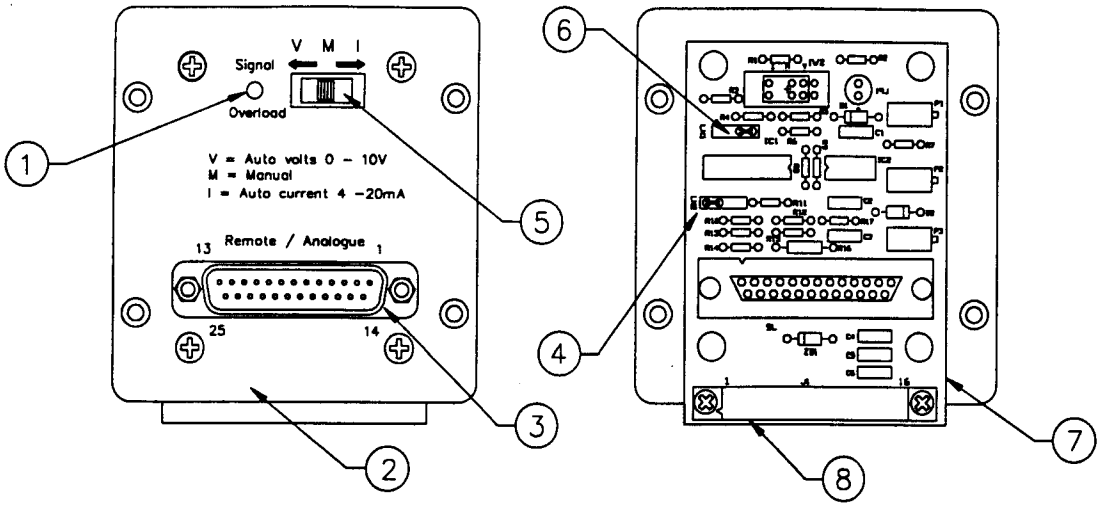


CUT AWAY SIDE VIEW OF PUMP



CUT AWAY PLAN VIEW OF PUMP

FPUM upgrade card spares



Item	Description	Part number
1	Signal overload LED indicator	SD 0087
2	Cover plate	DE 1645S
3	25-way Dee connector socket	US 0072
4	Remote direction signal inverter link	US 0047
5	Auto voltage / manual / auto current switch 50V 2A	SW 0160
6	Remote stop signal inverter link	US 0047
7	Analog PCB	PC 0147P
8	DIN edge connector	SL 0091

If it is required to upgrade a manual control FPUM-310 Series into a remote/analog control FPUM-320 Series please contact Omega Engineering for further advice.

Part 3: FPU-330/340 Pumphead

Description

The FPU-330 pumphead with three working rollers is designed to provide high flow rates while with four working rollers the FPU-340 pumphead provides the option of less pulsation and greater pumping precision.

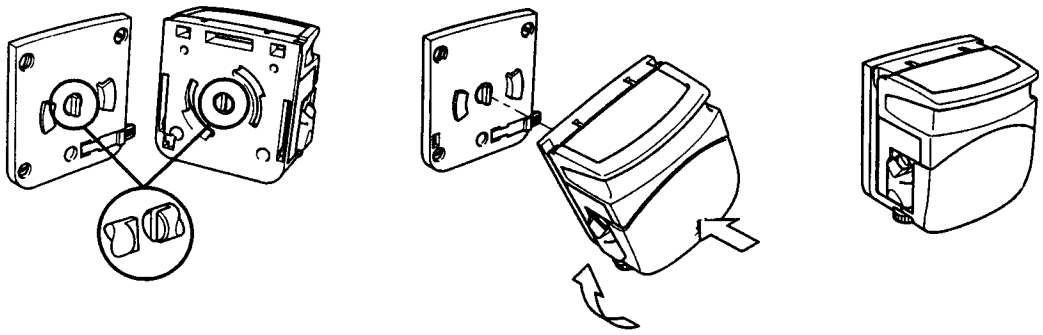
Both series of pumpheads employ a "clamp and stretch" tube clamping motion which ensures that the tube is held correctly in position with no unwanted tube slackness.

The flip lid of the pumphead provides easy front end tube loading with no removal of components, removing the necessity for maintenance.

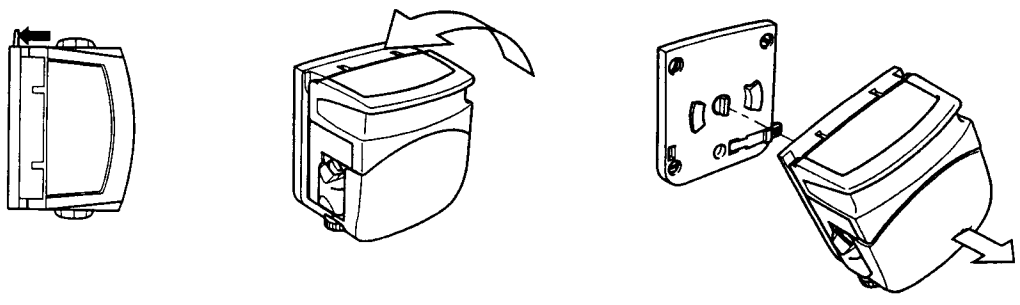
The simple bayonet mounting action for standard and extension pumphead fitting allows easy fast set ups of ganged installations.

Installation

All FPUM-300 Series drives are provided with bayonet plate fittings attached. To fit a FPU-330/340 pumphead, align the drive tang to the slot in the pumphead and using the bayonet fittings turn the pumphead counter-clockwise and snap into position.

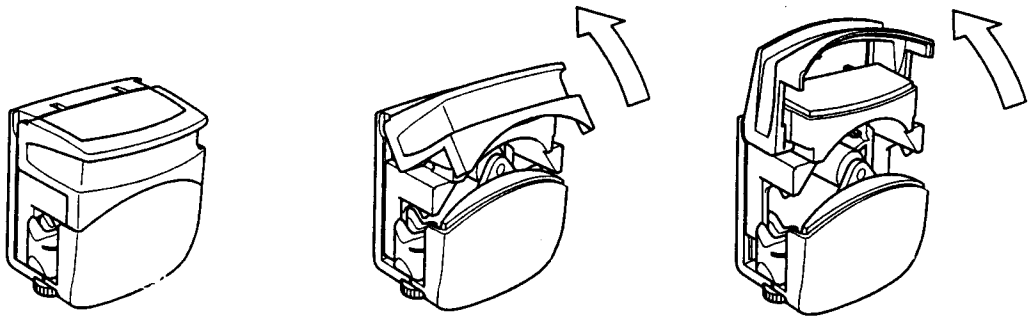


To remove the pumphead push the bayonet plate locking lever back towards the front of the drive and turn the pumphead clockwise until it is freed from the bayonet plate fittings.

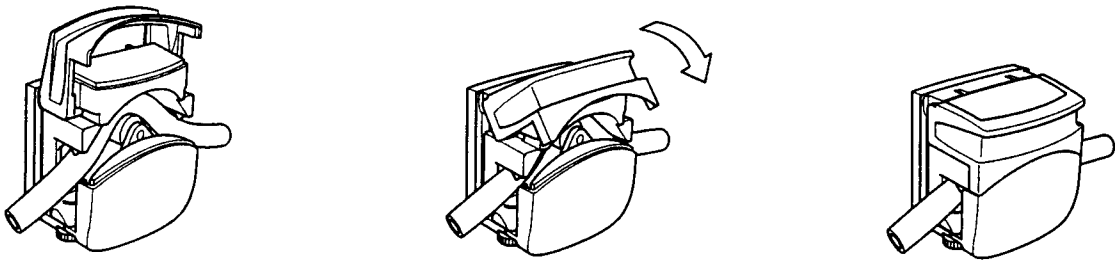


Tube loading

Switch off the pump before tube loading. Lift the flip lid of the pumphead until fully open. Set the pumphead tube clamps, with the lid open to the required tube size using the calibrations on each side of the pumphead. Select the length and bore size of tube required, ensuring the tube is long enough to cover the source to delivery distance and the curvature of the track.

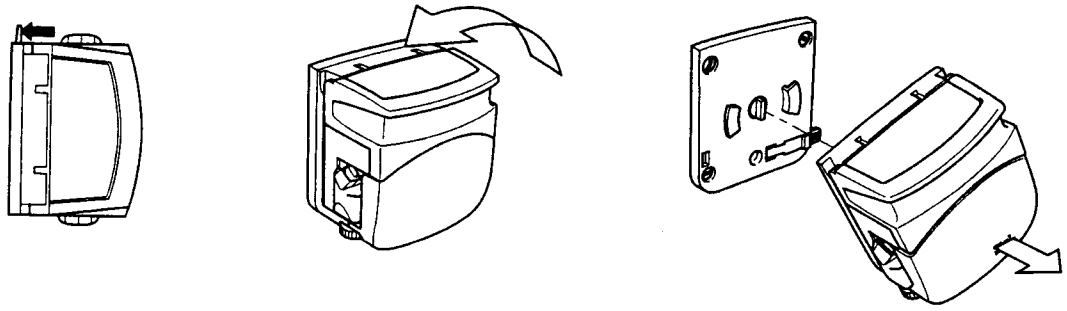


Fit the tubing across the pumphead rotor and lower the lid of the pumphead ensuring that the tubing is fitted correctly between the rollers and track, and that there is no pinching of the tubing by the tube clamps. The tubing must lie naturally against the track and must not be twisted or over stretched.

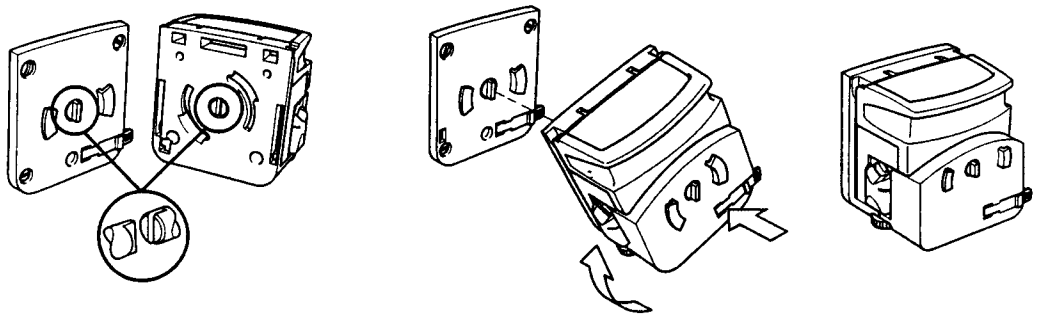


Fitting an extension pumphead

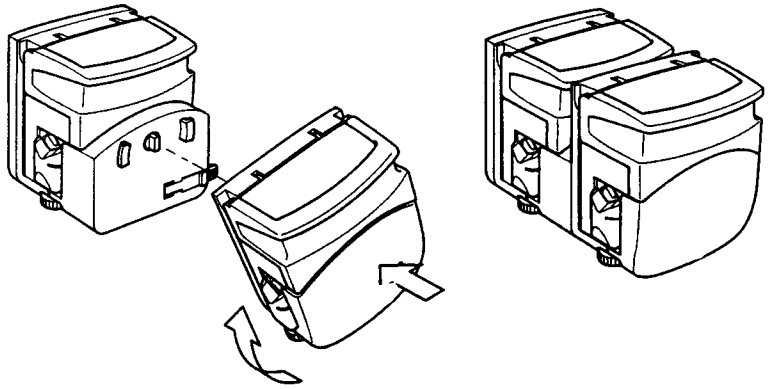
Remove the standard pumphead by pushing the bayonet plate locking lever back towards the front of the drive and turn the pumphead clockwise until it is freed from the bayonet plate fittings.



Align the drive tang to the slot in the extension pumphead and using the bayonet fittings turn the pumphead counter-clockwise and snap into position.



Align the drive tang of the extension pumphead to the drive slot of the standard pumphead, turn the pumphead counter-clockwise and snap into position.



Care and maintenance

If aggressive liquids are spilled onto the pumphead, the head should be removed and cleaned using a mild solution of detergent and water. Remove any tubing from the pumphead, and wash thoroughly.

Check moving parts of the rotor from time to time for freedom of movement. Lubricate pivot points and rollers occasionally with Teflon lubricating oil.

Part 3 : Appendices

Drive care and maintenance

Scheduled maintenance of the pumps is not required. When the pump needs cleaning, use a cloth dampened with water and mild detergent. Do not use strong solvents. If the gearbox is dismantled, it should be filled with a good quality grease such as Andersol 761.

Specification

Maximum rotor speeds	50rpm & 400rpm
Operating voltages and frequencies	110-240V 50/60Hz
Speed control ratio	20:1
Power rating	100VA
Operating temperature	5C to 40C
Storage temperature range	-40C to 70C
Weight	5.35kg, 12lb
Noise	<70dBA at 1m
Standards	IEC 335-1, EN60529 (IP31)
Machinery Directive:	89/392/EEC EN60204-1
Low Voltage Directive:	73/23/EEC EN61010-1
EMC Directive:	89/336/EEC EN50081-1/ EN50082-1

Tubing range

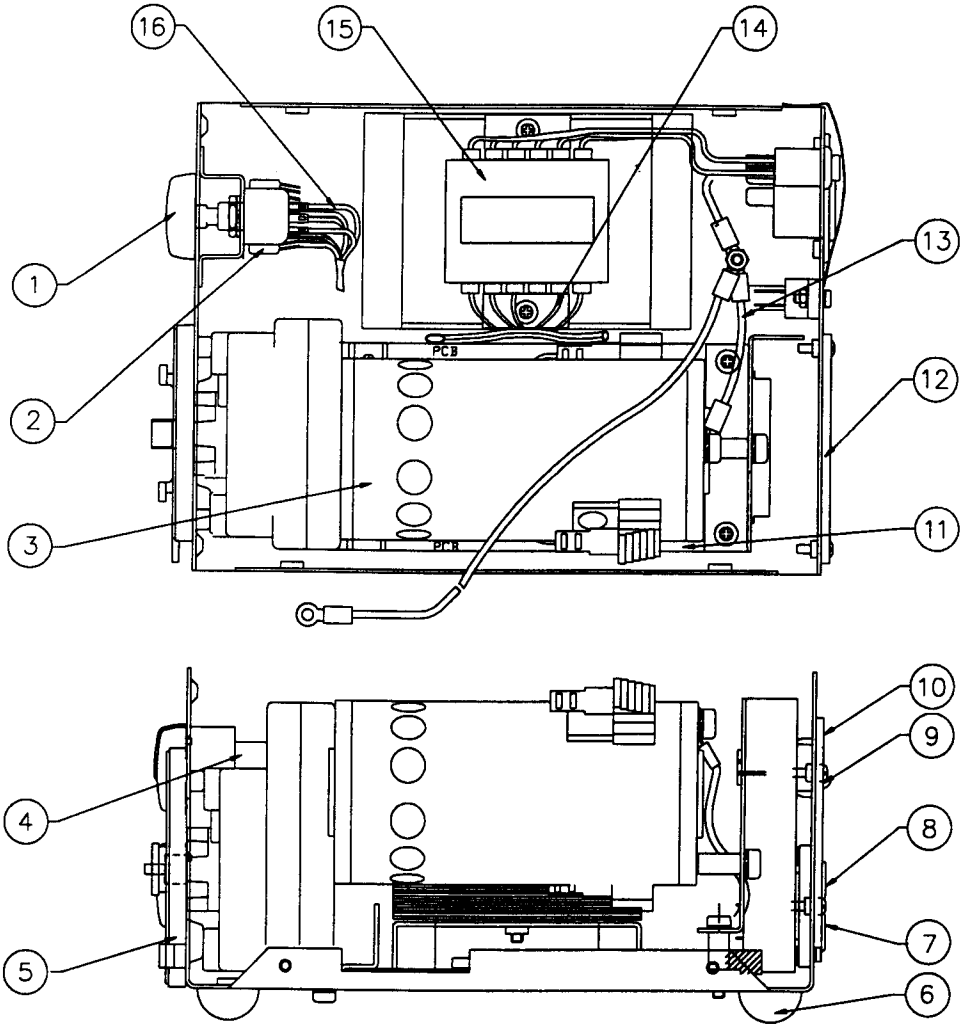
All Omega tubing is formulated, manufactured and quality controlled to rigorous specifications. Peristaltic pumping performance and tube life will be affected unless tubing specifically designed for the task is used.

1.6 Wall tubing for FPU-330/340 Pumpheads

Bore mm	Bore "	PVC	Platinum Silicone	Peroxide Silicone	Santoprene
0.5	1/50	-	TYSC-PT-964150-50	TYSC-964150-50	TYSP(6)F-964150-50
0.8	1/32	-	TYSC-PT-532132-50	TYSC-532132-50	TYSP(6)F-532132-50
1.6	1/16	TYVY-316116-50	TYSC-PT-316116-50	TYSC-316116-50	TYSP(6)F-316116-50
3.2	1/8	TYVY-1418-50	TYSC-PT-1418-50	TYSC-1418-50	TYSP(6)F-1418-50
4.8	3/16	TYVY-516316-50	TYSC-PT-516316-50	TYSC-516316-50	TYSP(6)F-516316-50
6.4	1/4	TYVY-3814-50	TYSC-PT-3814-50	TYSC-3814-50	TYSP(6)F-3814-50
8.0	5/16	TYVY-716516-50	TYSC-PT-716516-50	TYSC-716516-50	TYSP(6)F-716516-50

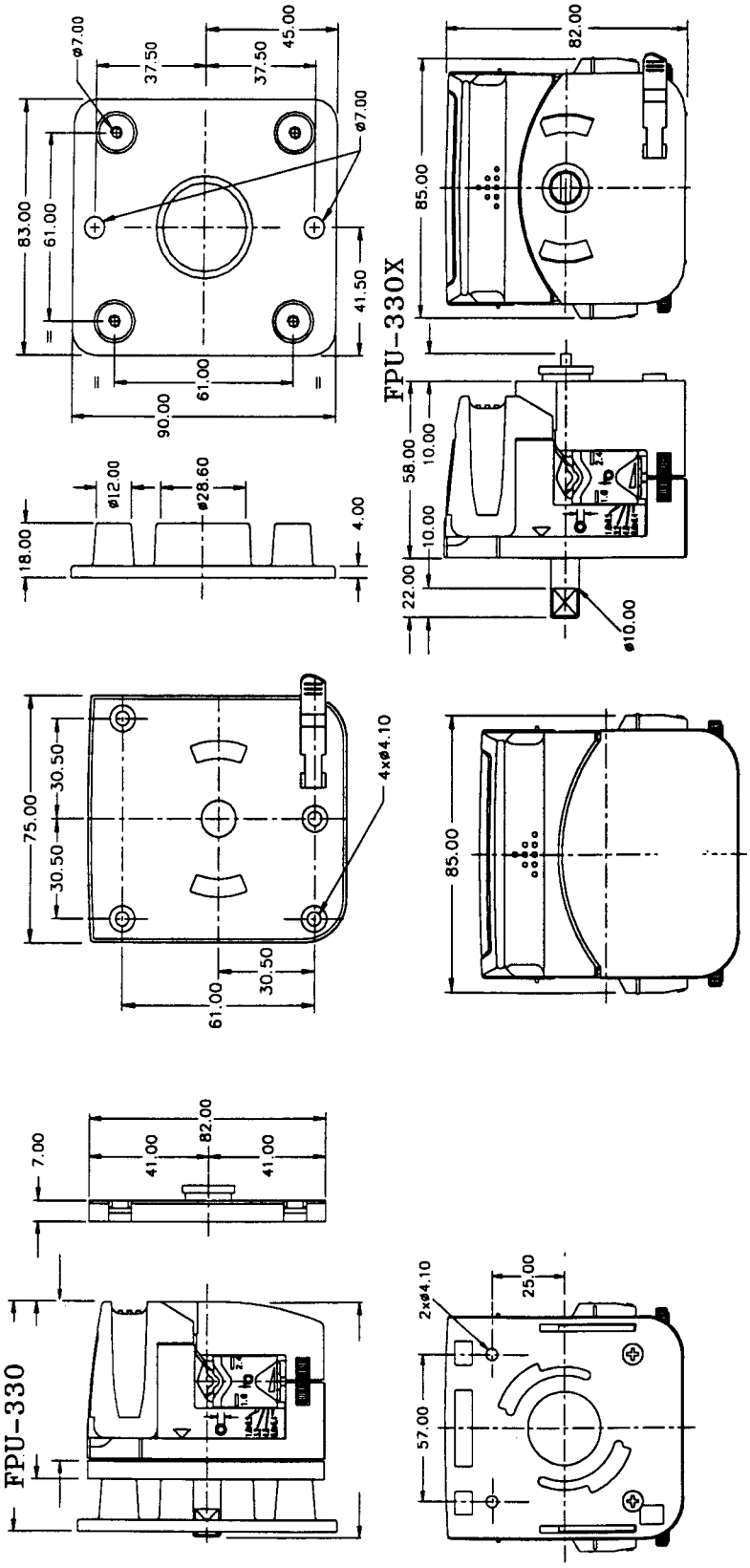
Bore mm	Bore "	Butyl	Viton
0.5	1/50	-	-
0.8	1/32	-	TYVT-532132-25
1.6	1/16	TYBU-316116-50	TYVT-316116-25
3.2	1/8	TYBU-1418-50	TYVT-1418-25
4.8	3/16	TYBU-516316-50	TYVT-516316-25
6.4	1/4	TYBU-3814-50	TYVT-3814-25
8.0	5/16	TYBU-716516-50	TYVT-716516-25

Drive spares

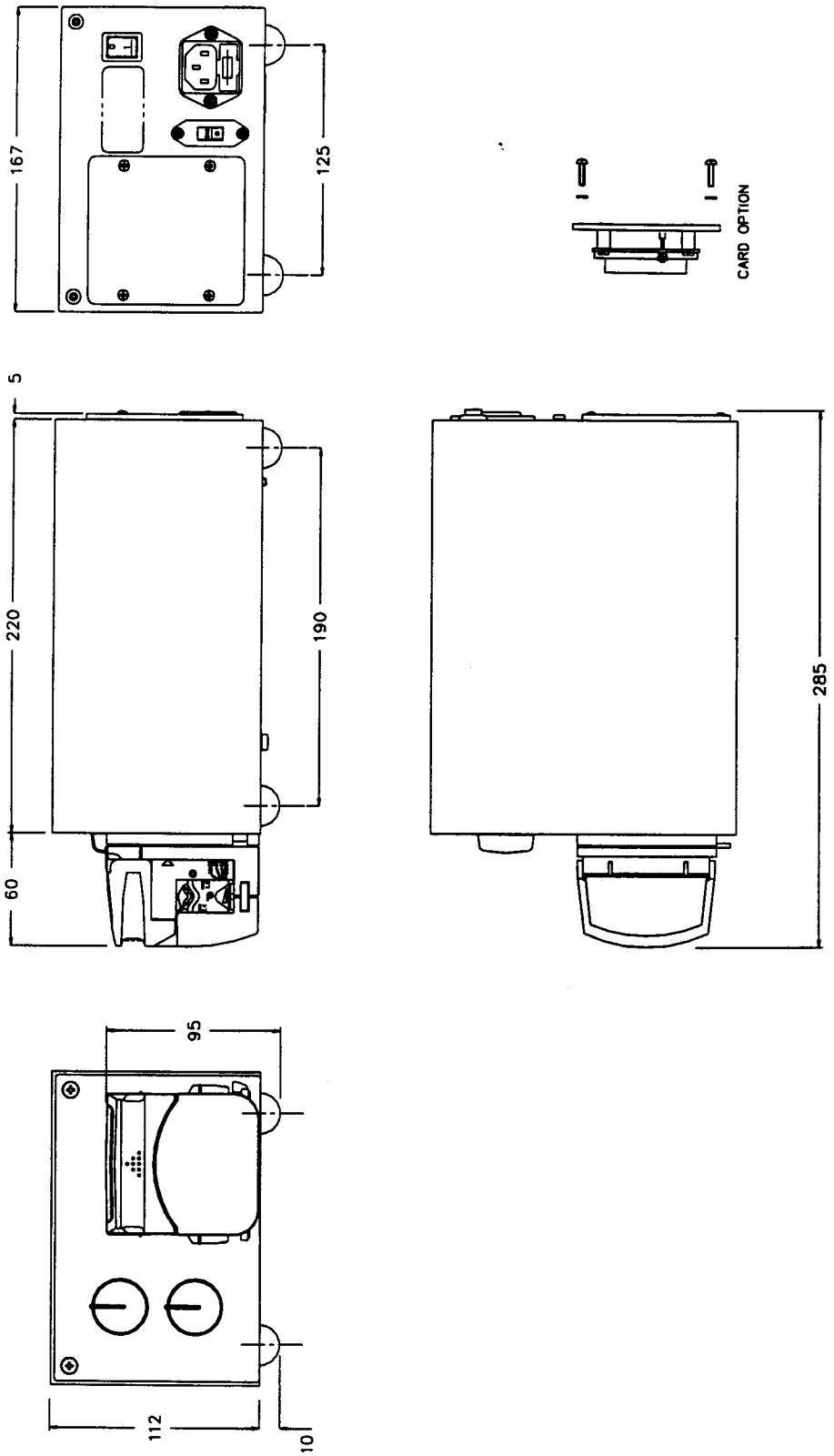


Item	Description
1	Soft touch knob
2	Rotary switch
3	Motor gearbox 50rpm
	Motor gearbox 400rpm
4	Potentiometer
5	Adaptor
6	Foot
7	Fuse 1.0 amp T type
8	Switch (slider) 250VAC
9	Switch (rocker) 250VAC
10	Control PCB
11	FPUM-310 Series PCB cover
12	Earth lead
13	LT/AC harness
14	Transformer
15	Control harness

FPU-330 pumphead outline drawings



FPUM-300 Series pump outline dimensions



Note: Pump drive and pumphead sold separately.

-- NOTES --

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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