

# 5004U



## **5004U Gear pump drive Installation and operating instructions**

PB 0170

## Contents

Introduction	Page 4
Safety	Page 4
Information for returning pumps	Page 4
Quick start-up guide	Page 5
5004U drive two year warranty	Page 5
Pumphead one year warranty	Page 5
What is gear pumping ?	Page 6
<b>Part 1: Installation</b>	
Drive installation	Page 7
Pumphead installation	Page 8
Flow rates	Page 10
<b>Part 2: Operation</b>	
Manual operation	Page 11
Automatic operation	Page 11
Calibration for auto-control	Page 12
Remote control	Page 13
Specification of 5004U drive	Page 15
<b>Part 3: Appendices</b>	
Care and maintenance	Page 16
Ordering information	Page 16
Pumphead servicing items	Page 16
Drive spares	Page 17
Outline drawing	Page 18
Decontamination certificate	Page 19

## **Introduction**

Thank you for choosing the Watson-Marlow 5004U gear pump drive. The 5004U is specially manufactured for the magnet-driven Fluid-o-Tech gear pumps. A precision direct current motor is controlled by Watson-Marlow's exclusive pulse-width-modulated circuitry which has three independent feedback loops for motor current, motor voltage and back-emf to ensure precise speed control regardless of load. The circuit provides black commutation to the motor, making brush wear negligible. This circuit gives a speed control ratio of better than 50:1 which means that the speed can be continuously varied between 70rpm and 3500rpm.

A sophisticated signal conditioner built in to the 5004U, allows the drive to be customer-programmed for automatic control from any process signal up to 60V or 32mA. A front panel switch allows instant switching between auto and manual control. Signal overload is indicated by an over-range led and, the motor runs at the maximum speed. The 5004U can be stopped, started or speed controlled from a remote switch or potentiometer and a rapid priming switch is fitted.

The 5004U accepts a range of gear pumps, giving flow rates up to 200l/h, system pressures up to 20 bar (300 psi) and differential pressures depending on the head selected up to 8 bar (120 psi).

## **Safety**

In the interests of safety, this pump and the tubing selected should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved.

Any person who is involved in the installation or maintenance of this equipment should be fully competent to carry out the work. In the UK this person should also be familiar with the Health and Safety at Work Act.

## **Information for returning pumps**

In the current situation of heightened concern over the handling of hazardous materials, any equipment which has been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health must be decontaminated before it is returned to Watson-Marlow or its distributor.

A certificate (a suitable blank form is included at the rear of these operating instructions), or signed statement, must be attached to the **outside** of the shipping carton.

This certificate is required even if the pump is unused. If the pump has been used, the fluids that have been in contact with the pump, the cleaning procedure and that the equipment has been decontaminated must be specified.

## **Warning!**

These products are not designed for use in, and must not be used for, patient connected applications.

## **Quick start-up guide**

The 5004U operates on single-phase mains electricity supplies only. It has a voltage selector switch in the rear panel which must be set for the local mains supply voltage. Set voltage selector switch to 120V for 100-120V 50/60Hz supplies, or 240V for 220-240V 50/60Hz supplies.

Set switch on front panel for manual or auto-control. Set running speed between 2% and 100% if drive is to be manually controlled. If drive is to be controlled from a process signal, make proper connections to 6 pin socket and set range and offset potentiometers on rear panel (see Part 2).

Turn power switch to ON (I) position to start the drive.

**Never run a gearpump dry.**

Prime pump with max switch on front panel.

Turn power switch to OFF (O) position to stop drive.

## **5004U drive two year warranty**

Watson-Marlow Limited warrants, subject to the conditions below, through either Watson-Marlow Limited, its subsidiaries, or its authorised distributors, to repair or replace free of charge, including labour, any part of this product which fails within two years of delivery of the product to the end user. Such failure must have occurred because of defect in material or workmanship and not as a result of operation of the product other than in accordance with the instructions given in this manual.

Conditions of and specific exceptions to the above warranty are:

- Consumable items such as fuses and brushes are excluded.
- Products must be returned by pre-arrangement carriage paid to Watson-Marlow Limited, its subsidiaries, or its authorised distributor.
- All repairs or modifications must have been made by Watson-Marlow Limited, its subsidiaries, or its authorised distributors or with the express permission of Watson-Marlow Limited, its subsidiaries, or its authorised distributors.
- Products which have been abused, misused, or subjected to malicious or accidental damage or electrical surge are excluded.
- Warranties purporting to be on behalf of Watson-Marlow Limited made by any person, including representatives of Watson-Marlow Limited, its subsidiaries, or its distributors, which do not accord with the terms of this warranty shall not be binding upon Watson-Marlow Limited unless expressly approved in writing by a Director or Manager of Watson-Marlow Limited.

## **Pumphead one year warranty**

Watson-Marlow Limited warrants, subject to the conditions above, to repair or replace free of charge, including labour, any part of this product which fails within one year of delivery of the product to the end user. Such failure must have occurred because of defect in material or workmanship and not as a result of operation of the product other than in accordance with the instructions given in this manual.

## **What is gear pumping ?**

Two or more rotating gears mesh together. One of the gears is driven (via the magnetic coupling) and drives the other gear. The gaps between the gear teeth transfer the fluid from the inlet to the outlet. The meshing of the gears prevents the fluid from returning to the inlet, making the gear pump a positive displacement pump.



Gear pumps have the advantage of being self priming from between 150mm (6") and 600mm (24") of water depending on the pump type and system configuration. A major advantage is their ability to operate against high pressures, with total system pressures up to 20 bar (300 psi) and differential pressures up to 8 bar (120 psi).

Watson-Marlow is the world's peristaltic pump specialist. Many of the advantages of peristaltic pumps (which are self-priming, dry-running, non-contaminating and have a positive displacement action) are shared by gear pumps, but gear pumps become the preferred pump type when pressures higher than a continuous 1.5 bar (22 psi) are required at flow rates up to 180l/h or when chemical compatibility or temperature makes the use of a peristaltic pump impossible.

Conventional pumps require seals around the drive shaft which are a common focus of leaks and contamination. Gear pumps use a magnetic coupling to drive the pump gears which eliminates these problems, making them leak-free and non-contaminating.

When the pump load exceeds the coupling torque between the driven and driving magnets, the pump decouples from the motor, acting as a safety device to protect pump and motor. Stopping the motor and eliminating the cause of decoupling allows safe restarting.

All gear pump driven magnets are encapsulated in AISI316 stainless steel and Teflon. This ensures fluids are not contaminated by the magnet material. Within the gear pump range, there is a choice of materials for body, gears and seals. gear pumps have 316 stainless steel bodies, and gears are cut in Teflon or Ryton. Seals are made in Teflon.

All gear pump gears, magnets and seals can easily be replaced in the field. All gear pumps have externally adjustable bypass valves, which permit internal recirculation of the working fluid when the pre-set pressure is reached. The pressure level can be user adjusted, with the pump in operation, from 1 bar (15 psi) to the maximum pressure of the pump.

### ***Gear pump features***

## Part 1: Installation

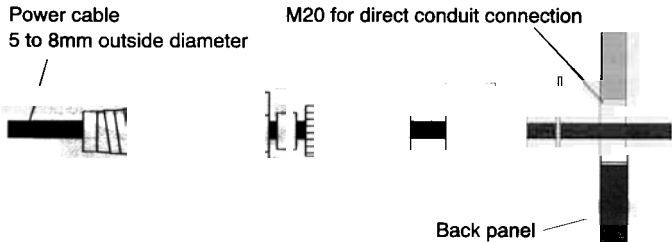
### Drive installation

There are dangerous voltages (at mains potential) inside the unit. If access is required, isolate the pump from the mains before removing the cover. Any person who is involved on installation or maintenance of this equipment should be fully competent to carry out the work. In the UK such persons should be familiar with the Health and Safety at Work Regulation 1989.

**Warning!**

Remove the transparent plate on the rear panel to gain access to the voltage selector and terminal block. Set the voltage selector to either 120V for 100-120V 50/60Hz supplies or 240V for 220-240V 50/60Hz supplies. Use either a M20 conduit system or a flying lead. The strain relief cable gland and adaptor that is supplied accepts three core 0.75 square millimetre PVC smooth sheathed mains cable with a diameter of 5mm to 8mm outside diameter.

**Mains connection**



Route the mains supply cable through the entry point to the right of the recess, and couple the cable to the terminal block in accordance with the instructions printed prominently on the rear panel. If the pump is to be used under manual control, ensure that the switch on the front panel is set to its manual position. If pump is to be used under automatic control, ensure switch on front panel is set to its auto position and that the range potentiometer and offset potentiometer in the rear panel recess are properly set (see Part 2) before securely replacing transparent plate.

The 5004U can be operated at ambient temperatures from 0C to 37C. Storage temperatures from -40C to 70C are permissible, but allow time for acclimatisation before use.

The drive should be positioned to allow a free flow of air around it.

**The ingress protection standard will be compromised if the mains cable is incorrectly attached or the transparent plate is not properly replaced.**

**Warning !**

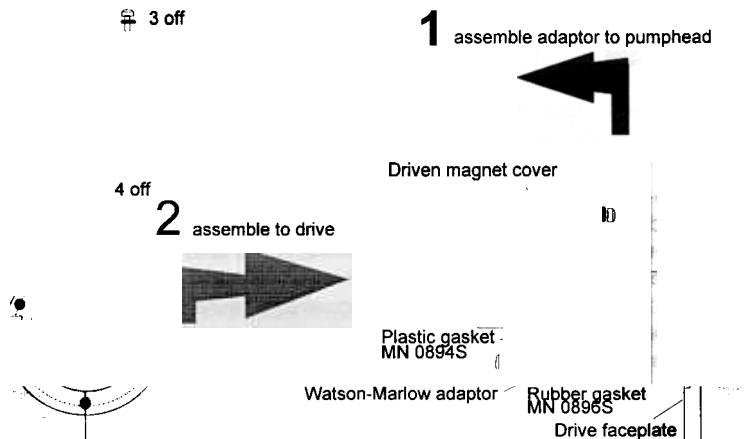
Should the pump fail to operate, check that mains electricity is available at the unit, that the voltage selector switch is in the correct position, that the fuse is intact and that the pump is not stalled by incorrect fitting of tubing. If the pump is to be used under manual control and fails to operate, check that the switch on the front panel is in its manual position. If the pump is to be used under automatic control and fails to operate, check that the switch on the front panel is set to its auto position, that the signal range and signal offset potentiometers are properly set, that connections (and link, if a current signal is being used) to the 6-pin socket are properly made, that the process signal is available at the unit, and that the process signal is not out of range causing the signal overload indicator to illuminate.

**Please check**

## Pumphead installation

Remove the sheet metal adaptor ring that is secured to the pumphead with three screws, replace it with the adaptor which is loosely fitted to the front of the 5004U drive. Ensure that the mating faces are clean, that the plastic gasket is fitted between the adaptor and the pumphead with the **grey side towards** the pumphead and that the gear pump is absolutely square to the adaptor. Check that the screw heads are in the counter bores and that the orientation selected will allow the pumphead to line up with the four mounting holes on the front panel. The screws must be tightened evenly and firmly. Incorrect assembly could result in the pumped fluid leaking.

The gear pump with the adaptor must then be assembled to the face plate. Check that the mating faces are clean and that rubber gasket supplied with the drive is not damaged. If it is, use the spare gasket supplied. Ensure that the adaptor ring is correctly located in the location counter bore. The screws must be tightened evenly and firmly. Incorrect assembly could result in the IP55 protection being jeopardised.



If, when the drive is turned on, there is any unusual noise, stop the drive immediately, investigate and cure the fault.

### Pipe work

Restrictions in the inlet and discharge lines may cause a loss of pump performance. A restriction can be a valve (some less restricting than others), small diameter tubing, long lengths of tubing and even elbows or sharp turns in the line can restrict the flow. It is important to avoid or limit these restrictions whenever possible.

Before installing fittings to pumps, whether hose or pipe fittings, pipe sealing compound or Teflon tape should be applied to the threads to prevent leakage. Apply sealant or tape sparingly to prevent excess material from dislodging and clogging the pump. Two wraps of Teflon tape is sufficient.

Gear pumps can operate in any position. With the 5004U drive, the pumphead be installed in two positions only, with the suction and delivery piping horizontal.

Gear pump gears will be rapidly and permanently damaged if there are any abrasive particles present in the fluid being pumped. A 20 micron filter should be installed on the inlet side, except in the case of a closed recirculating system, in which case the filter should be on the discharge side. It should be noted that such a filter is a restriction and may affect pump performance. All strainers and filters should have large surface areas to prevent excessive pressure drop.

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**Filtration**

All gear pumps are equipped with an externally adjustable bypass. This bypass is an internal relief valve that permits recirculation of the working fluid when the pre-set pressure is reached. The pressure level at which the bypass is activated can be adjusted in the field, from 1 bar (15 psig), to the maximum pressure capability of the pump, with no disassembly required. The adjustment is made externally with a hex key provided with the pump, and can be made while the pump is in operation.

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**Gear pump operation**

Because the bypass recirculates the fluid within the pump, heat can be produced as a result. The more fluid that is recirculated via the bypass, the more heat is produced. At full bypass the additional heat may result in the fluid temperature exceeding the temperature limit of the particular pump. Consequently, the gear pump manufacturer recommends that these pumps are not run at full bypass. Pumpheads are factory set with the bypass closed, which will therefore offer no pressure limit.

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**Warning**

Dry running is harmful to all gear pumps. Although dry running for short intervals (such as when dry lifting to prime a gear pump) may not effect pump performance, extended periods of dry running may cause permanent damage to the pump.

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**Dry running**

Gear pumps can dry lift fluid, however, dry lift capabilities will vary depending on the fluid and the system. Depending on the application, the gear pump can typically dry lift 150mm (6") of water. When dry lifting, wetting of the gears with the fluid will help lubricate the pump until it is primed. Once primed, gear pumps will lift 9.5m (32 feet) of water.

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**Priming**

Gear pumps can easily handle mixed phase (gas/fluid).

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**Mixed phase**

When a pump decouples there is a sudden drop to zero flow and zero pressure with the motor speed increasing to no-load speed. This occurs because the torque of the coupling has been exceeded. Once this slippage occurs, the driving magnet will run free while the driven magnet remains motionless. To re-engage the magnetic coupling, simply stop the drive for a few seconds and the two magnets will re-couple.

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**Decoupling**

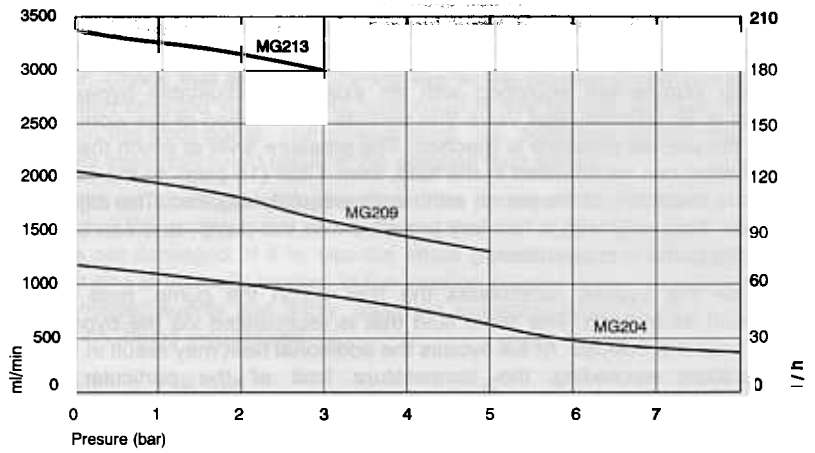
Decoupling can occur when the discharge is blocked or when maximum pressure has been reached or when something is preventing the gears from turning (something lodged in between gears or binding gears).

After decoupling, you must find and eliminate the cause of decoupling. Re-priming of the pump may also be necessary.



## Flow rates

The graph shows the flow obtained at 3500rpm



## Part 2: Operation

### Manual operation

Set the auto/manual/max switch on the front panel to its manual position. Start the pump by turning the on/off switch on front panel to the on position (I). The pump can be primed rapidly at its maximum speed by turning the auto/manual/max switch on the front panel to its max position. When released the switch will return to its manual position.

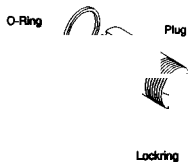
To stop the pump, turn the on/off switch to the off position (O).

The speed control ratio of the 5004U is 50:1. The speed setting dial is calibrated in percentage of maximum speed, and has a locking knob to prevent accidental speed changes. If the pump has been running under automatic control, and is now to run under manual control, it is only necessary for the auto/manual/max switch on the front panel to be moved to its manual position. It is not necessary for the process signal to be disconnected from the pump or for the calibration potentiometers to be adjusted.

### Automatic operation

For all auto and remote control operations, the drive is supplied with a 6 pin waterproof connector. Correct assembly of the connector plug is essential or the ingress protection standard will be compromised.

**Connector assembly**



Cup

Cover

The diagrams in the following sections refer to the plug viewed from the rear.

The 5004U can be controlled by any analogue process signal up to 60V or 32mA, and will 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.

**Analogue control**

Never apply mains voltage across any pins on the 6 pin socket as permanent damage, not covered by warranty, will result. Up to 60V may be applied across pins 2 and 3, but not across other pins because permanent damage, not covered by warranty, may result.

**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 12V signal has a signal range of 12V. A 4mA to 20mA signal has a signal range of 16mA.

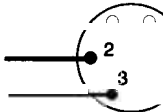
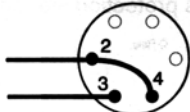
**Definitions**

**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/manual/max switch on the front panel must be switched to its auto position. The process signal must be connected to the 6-pin plug provided, which should then be inserted in the rear panel 6-pin socket. The diagrams and tables below show the minimum and maximum signal ranges and signal offsets available, and the connections and their polarity for non-inverted or inverted response.

If the signal rises above its proper maximum, the action of the signal conditioner will be to hold the motor speed at the MAX setting. If the signal rises above 60V, permanent damage, not covered by warranty, may result.

**Connections**

Voltage signal (V) (Input resistance 220 kohm)			Current signal (mA) (Input resistance 500 ohm)		
Response	Range	Offset	Response	Range	Offset
Inverted	5 to 24		Inverted	5 to 24	0 to 24
Non-inverted	5 to 30		Non-inverted	5 to 30	0 to 30
					
Sense	Pin 2	Pin 3	Sense	Pin 2	Pin 3
Non-inverted		+	Non-inverted	-	+
Inverted			Inverted	+	-

**Calibration for auto-control**

The process signal (or suitable signal from another source) can be used in the calibration procedure providing that it meets the requirements given here: For voltage modes, a stable, variable dc voltage source (for example, a laboratory power supply having a source resistance of 5kohm or less) can be used in conjunction with a dc voltmeter. The maximum voltage into the unit must not exceed 60V. For current modes, the same dc voltage source may be used, (provided that it will supply the current required) in conjunction with a dc milliAmpere meter. The maximum permissible current is 32mA.

When the signal has been connected to the pump through the 6-pin plug and socket, the signal conditioner must be calibrated using the two potentiometers for signal range and signal offset in the rear panel recess. As part of this calibration procedure, it will be necessary for the user to determine when the motor is just about to start rotating, and when the motor is running at maximum speed.

Determining when the motor is just about to start rotating is best done by listening to the drive. Adjust the signal offset potentiometer until the motor is

just rotating, and then turn the potentiometer in the opposite direction until the motor just stops.

Determining when the motor is running at maximum speed is done by observing the red light emitting diode in the rear panel recess which will illuminate when the pump light reaches maximum speed. Turn the signal range potentiometer until the light illuminates, and then turn the potentiometer back until the light just extinguishes.

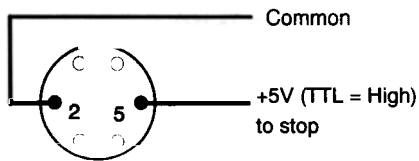
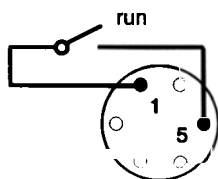
To calibrate the signal conditioner, first set the signal to the signal offset or, if there is no offset, to zero volts or zero milliAmperes. Adjust the signal offset potentiometer to give the required pump speed. If the response is to be non-inverted (rising flow rate against rising signal), adjust the signal offset potentiometer to the point where the motor has just ceased rotating. If the response is to be inverted (falling flow rate against rising signal), adjust the potentiometer to the point where the motor is running at minimum speed.

Now set the signal to its maximum, and adjust the signal range potentiometer to give the required response. If the response is to be non-inverted, adjust the potentiometer to the point where the pumphead rotor is running at maximum speed. If the response is to be inverted, adjust the potentiometer to the point where the motor is at maximum speed.

Repeat these two calibration steps until any interaction between the adjustments is eliminated. With the front panel switch in the auto position, the pump will now operate under process control. Attach a label to the rear panel showing the signal and response for which the pump is set. The front panel potentiometer is not in circuit when the pump is operating under process control and may safely be left at any setting. When calibration has been completed, the cover over the rear panel recess must be securely replaced with its gasket in position.

### Remote control

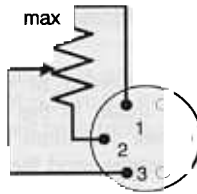
The 5004U can be stopped and started from a remote switch, or speed controlled from a remote potentiometer with a value between 4.7 kohm and 5 kohm. Connections for each function are shown below. Both functions may be used concurrently. The pump can also be remotely stopped and started when the pump speed is under process control.



**Remote stop/start**

The remote stop/start function can be achieved by switching external zero voltage contacts. Close contacts to stop, open to run. Alternatively a 5V, TTL compatible input may be applied to pin 5 (pin 2, common) with 5V (High) = stop, 0V (Low) = run.

## Remote potentiometer



When a remote potentiometer with a value of 5kohms 0.5W has been connected, set the switch on the front panel to its **Auto** position.

If the drive is in the state that it was manufactured no further calibration should be required. If the drive does not respond to give full speed range for the full sweep of the potentiometer re calibration will be required.

Remove the small panel covering the rear panel recess. Set the remote potentiometer to minimum and adjust for zero speed by turning the signal offset potentiometer until the motor begins to rotate, and then turn back until the rotor just stops. Set the remote potentiometer to maximum and adjust for maximum speed by turning the signal range potentiometer until the red indicator in rear panel recess illuminates, and then turn back until the indicator just extinguishes. Securely replace the panel over the rear panel recess with its gasket in position.

A remote potentiometer must be correctly connected. Incorrect connection may result in permanent damage, not covered by warranty.

## Tachometer output



Alternative tachometer outputs are provided. Select the desired output using the tachometer output switch located in the rear panel recess adjacent to the range and offset potentiometers. Move switch to the left for 0-5V DC output (0V= stop, 5V= maximum speed) or to the right for a 5V pulse train (frequency at maximum speed = 7k Hz).

## **Specification of 5004U drive**

Motor type	Permanent magnet direct current
Maximum speed	3500rpm
Operating voltages and frequencies	220-240V 50/60Hz 100-120V 50/60Hz
Fuse rating	Type T (anti-surge) 1.0A
Maximum power consumption	130VA
Control range	35rpm to 3500rpm
Operating temperature range	0C to 37C 32F to 99F
Storage temperature range	40C to 70C -40F to 150F
Dimensions Weight	9kg 19.8lbs
Standards	BS800, IEC 34-5 (IP55)
Port size	1/8 27 NPT

## **Part 3: Appendices**

### **Care and maintenance**

The only scheduled maintenance required for the 5004U is inspection of the motor brushes and their replacement before their length is less than 6mm (1/4"). The life of the brushes will depend on the duty of the pump, but is expected to be at least 10,000 hours at maximum speed.

When the pump needs cleaning, use a cloth dampened with water and mild detergent. Do not use strong solvents.

Sited just below the pumphead is a drain nozzle to protect the drive from flooding if the rear seal should fail. From time to time check that the nozzle is not blocked.

### **Ordering information**

#### **5004U gear pump drive**

100120V/220-240V 50/60Hz      Note no power cable      506.3001.000

#### **Stocked gear pumps**

Fluidotech MG204 SS314 body Teflon gears with bypass      503.2204.0TC

Fluidotech MG209 SS314 body Teflon gears with bypass      503.2209.0TC

Fluidotech MG213SS314 body Teflon gears with bypass      503.2213.0TC

#### **Non-stocked gear pumps**

Fluidotech MG204 SS314 body Ryton gears with bypass      503.2204.0RC

Fluidotech MG209 SS314 body Ryton gears with bypass      503.2209.0RC

Fluidotech MG213 SS314 body Ryton gears with bypass      503.2213.0RC

### **Pumphead servicing items**

Gear service kit for MG 204 PTFE      509.2204.00T

Gear service kit for MG 209 PTFE      509.2209.00T

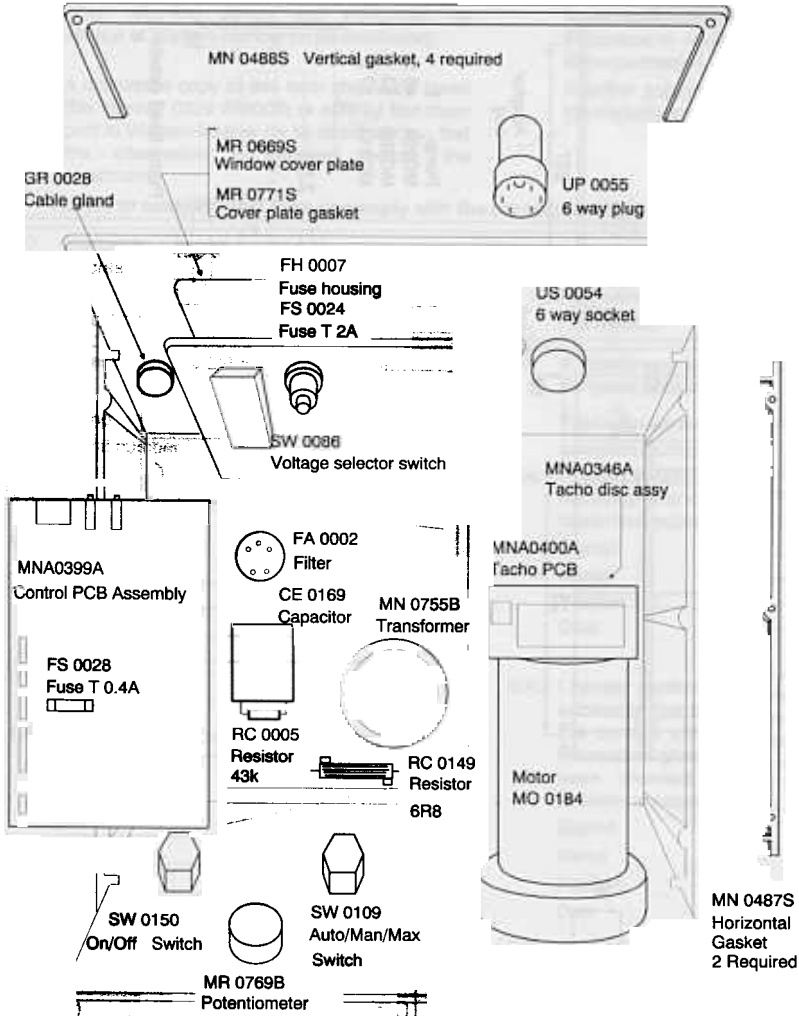
Gear service kit for MG 213 PTFE      509.2213.00T

Gear service kit for MG 204 Ryton      509.2204.00R

Gear service kit for MG 209 Ryton      509.2209.00R

Gear service kit for MG 213 Ryton      509.2213.00R

# Drive spares

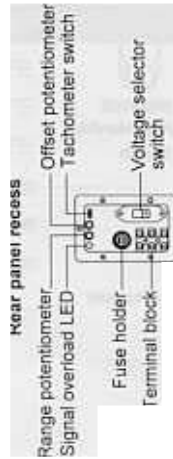
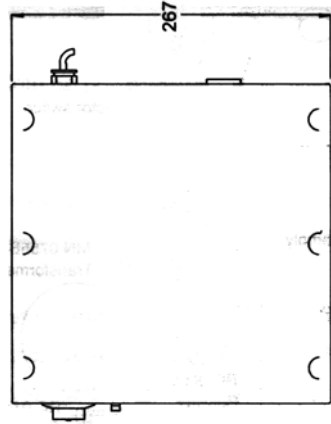
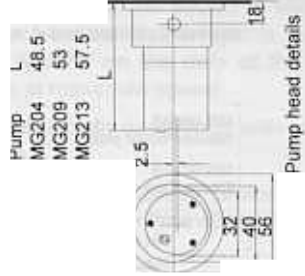
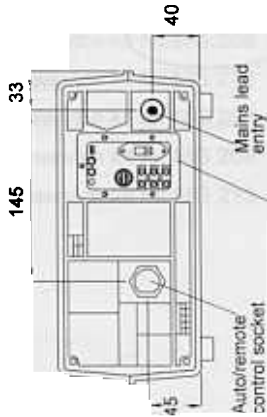
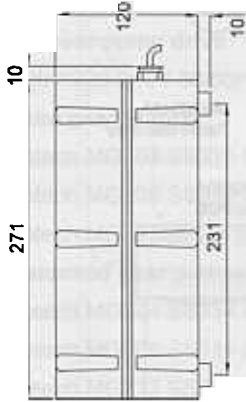
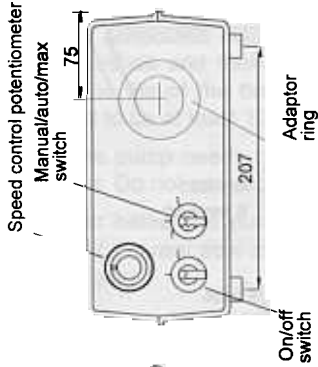


## Wiring harnesses

- MN 0485H DC High voltage
- MN 0820H DC Low voltage
- MN 0494H Input/output (includes 6 way socket)
- MN 0821H AC



# Outline drawing



## Decontamination certificate

- 1.0 This procedure is a legal requirement in the UK, and this form or a facsimile of it **must** be used when returning pumps and equipment for service at Watson-Marlow (or its distributor).
- 2.0 A completed copy of this form should be faxed (fax number 0326 376009) or sent by first class post to Watson-Marlow (or its distributor) so that the information is received before the equipment.
- 3.0 Pumps returned for service must be clean. If they have been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health, you are responsible for their decontamination.  
A further copy **must** be attached to the outside of the shipping case.

**Failure to complete this form or comply with the procedure will delay the servicing of the equipment.**

4.0 Company \_\_\_\_\_  
Address \_\_\_\_\_  
Telephone \_\_\_\_\_ Post code \_\_\_\_\_  
Fax number \_\_\_\_\_

- 5.0 Please complete the following sections
- 5.1 Pump \_\_\_\_\_
- 5.2 Serial number \_\_\_\_\_
- 5.3 Details of substances pumped
- 5.3.1 Chemical names:
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- (d) \_\_\_\_\_
- 5.3.2 Precautions to be taken in handling these substances:
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- (d) \_\_\_\_\_
- 5.3.3 Action to be taken in the event of human contact:
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- 5.3.4 Cleaning fluids to be used if residues of chemicals are found during servicing:
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- 5.4 If substances are not hazardous or toxic, please complete section 5.4.1.
- If substances are hazardous or toxic, please complete section 5.4.2.
- 5.4.1 I hereby confirm that the equipment specified has not pumped or come into contact with any toxic or hazardous substances.
- Signed \_\_\_\_\_
- Name \_\_\_\_\_
- Position \_\_\_\_\_
- Date \_\_\_\_\_
- 5.4.2 I hereby confirm that the only toxic or hazardous substance that the equipment specified has come into contact with are those named, and that the information given is correct, and the carrier has been informed if the consignment is of a hazardous nature.
- Signed \_\_\_\_\_
- Name \_\_\_\_\_
- Position \_\_\_\_\_
- Date \_\_\_\_\_
- 5.5 Carrier to be used \_\_\_\_\_
- Delivery date \_\_\_\_\_
- 5.6 Any further relevant information:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Before returning any product for service, this form must be completed and sent to Watson-Marlow, or its subsidiary, or the distributor undertaking the work.**