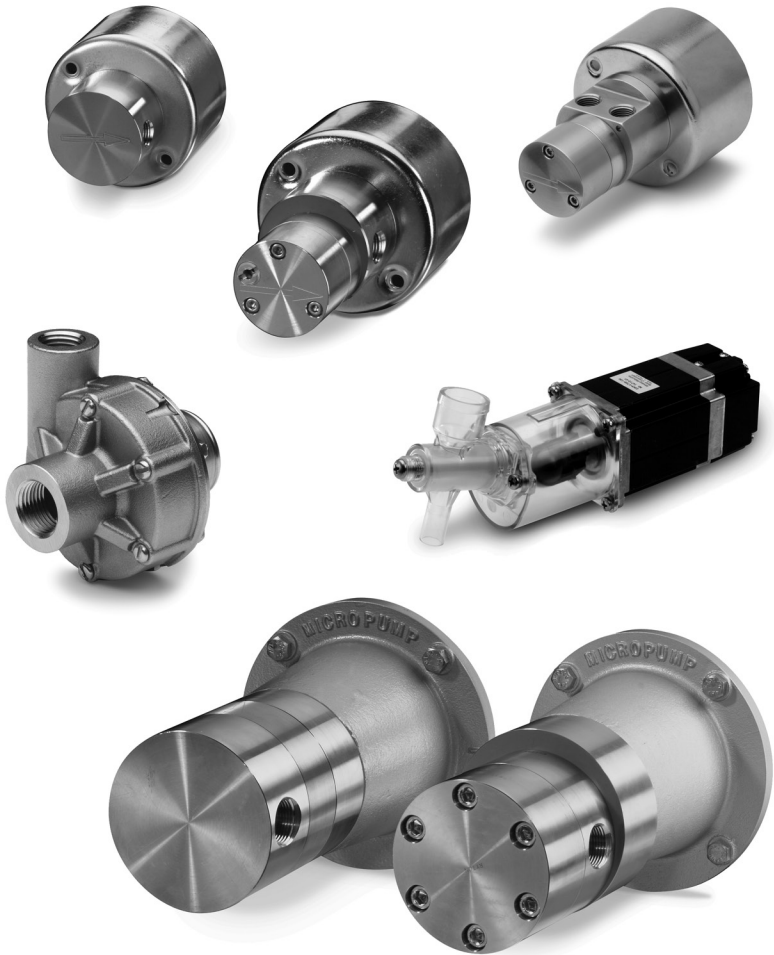


# **MICROPUMP®**

**INSTALLATION, OPERATION AND WARRANTY INFORMATION**



**IDEX**  
IDEX CORPORATION

## PUBLISHED BY

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### EC DECLARATION OF INCORPORATION EC DECLARATION OF CONFORMITY



Herewith we declare that the products described in this Installation, Operation, and Warranty Handbook complies with the following provisions applying to it:

Machinery Directive 2006/42/EC. Applied harmonized standards, in particular:

BS EN 809  
 ISO12100  
 ISO14847  
 BS EN12162  
 BS EN ISO 20361  
 BS EN ISO 13732-1

Manufacturer:

Micropump Vancouver  
 1402 NE 136<sup>th</sup> Avenue  
 Vancouver, WA 98684

Importer in country of use:

(Signature of Manufacturer)

(Signature of Importer)

The machinery described in this certificate must not be put into service until the machinery in which it is incorporated has been declared in conformity with the provisions of the Machinery Directive and their amendments.

## STANDARD LIMITED WARRANTY

The products manufactured by Micropump Incorporated are warranted to be free from defects in workmanship and material at the time of shipment from the place of manufacture. Micropump will repair or replace, at its option, any part or component which fails to conform to this warranty for a period of one year. Micropump's obligation under this warranty is limited to the repairs or replacement of defective equipment returned to Micropump on an F.O.B. destination and freight-prepaid basis. All normal wear and tear is excepted, and product is subject to examination at Micropump to verify that the parts or components were defective at the time of sale.

No warranty of any kind is made or shall be imposed with respect to any pump or parts (1) that have not been properly installed and tested in operation, (2) that have been subject to misuse, negligence, acts of God or the elements, or any other form of casualty, or (3) that have been repaired or altered outside Micropump's facility in a way, so as, in our judgment, to affect performance or reliability.

The parties agree that the buyer's sole and exclusive remedy against Micropump shall be for repair or replacement of defective parts under the conditions stated above. The buyer agrees that no other remedy (including but not limited to incidental or consequential damages for lost profits, lost sales, loss of use, injury to person or property, or any other incidental or consequential loss) shall be available to them.

This warranty shall not apply to prototype pumps, experimental pumps, or brush-type electric motors. Warranty of equipment or accessories from outside sources, purchased by Micropump and incorporated into Micropump's product is subject to the manufacturer's standard warranty, unless specifically agreed otherwise between Micropump and buyer. A copy of the warranty on the aforementioned equipment is available on request.

The adjustment or replacement of defective parts made under this warranty will not extend the original warranty period.

**THE WARRANTY DESCRIBED ABOVE IS THE EXCLUSIVE MICROPUMP WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY WARRANTY PREVIOUSLY ISSUED. WE NEITHER ASSUME NOR AUTHORIZE ANY PERSON TO ASSUME FOR US ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OR USE OF OUR EQUIPMENT.**

## Your Micropump Product...

represents years of fluid handling experience and we feel it is the finest product available of its type.

The product you have purchased was designed and constructed to handle compatible, clean fluids within designated limits and conditions. Staying within performance limits and following the guidelines given in this manual will result in excellent performance and maximum pump life.

Should you have a question or a problem, technical assistance is available worldwide. Micropump products are designed for easy field servicing with service kits and technical support available for all products.

## The Purpose of this Guide...

is to provide information to enable suitably qualified technicians and fitters to install, operate and maintain Micropump pumps.

## Use this Guide...

when you have purchased a pump, adaptor, or assembly including these components. This guide contains specific information for installation, operation, and maintenance of Micropump pumps. General information is given on installation within a system, but reference should always be made to instructions provided with ancillary equipment when installing the unit.

## Abbreviations

The following abbreviations are used in this guide:

PEEK - Polyetheretherketone      PPS - Polyphenylenesulfide  
 PTFE - Polytetrafluoroethylene      NPSH - Net Positive Suction Head  
 NPT - American National Standard  
     Taper Pipe Thread

## Product Labeling

Micropump products are labeled with a product code. The code describes the pump configuration and materials of construction. The first eight positions of the code describe the base configuration. The remaining ten positions in the code describe the optional features. Options that are not used are not shown in the code. For pumps equipped with adapter and/or motor the product code is truncated at the design modifier, later positions then describe the adapter and/or motor. Your Micropump distributor can provide additional information about the product code.

Base Code:

O/C	Pump Type	Series Modifier	Design Modifier	Gear Set	.	Gear Material	Seal Material	Base Material	.	Drive Mount
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Options Code:

Bypass	Driven Magnet	Driving Magnet	High System Pressure	Bushing Material	Shaft Material	Port Fittings	Port Orientation	Gear Trim	Other
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## Safety

The following are used throughout this guide to indicate procedure that, if not followed correctly, may result in injury to personnel or damage to equipment.



**Warnings are used to alert the reader to a procedure or practice, which if not followed correctly, could result in personal injury.**



**Warning - Hot Surface is used to alert the reader to a procedure or practice, which if not followed correctly, could result in personal injury due to contact with a hot surface.**



**Cautions are used to alert the reader to a procedure or practice, which if not followed correctly, could result in damage to the pump, motor, or ancillary equipment.**



**Notes are used to highlight important information that may assist the reader in carrying out a procedure or in understanding the text.**

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## Limits of Use

To achieve optimum performance and safe operation Micropump products must be operated with the limits given in the Technical Specification. Operation outside these limits is not recommended and may result in damage to the product and/or ancillary equipment.



**Temperature.** Operating beyond the maximum operating temperature given in the technical specification is not recommended and may result in damage to the product or compromise safety by creating high surface temperature.



**High Pressure Fluid Ejection.** When operated within its technical specification the product's seals will prevent high pressure fluid ejection. The system should include a pressure relief valve if the pump is capable of exceeding the maximum system pressure.



**Mechanical Danger.** The product must be installed in a location that exposes it to a low risk of external damage.



**Excessive wear.** Wear resulting from driven magnet rub on the magnet cup can generate high external surface temperatures or degrade the capability of the pressure boundary. Remove the product from service and replace or repair if performance degrades significantly or becomes noisy.



**Flammable Liquids.** The fluids to be pumped should be maintained below flash point temperature and there should be no possibility of explosive vapors being within the product.



**Hot Surfaces.** Under some operating conditions, surface temperatures can exceed 90°C (195°F.) Do not touch products while operating. Do not touch within 30 minutes of system shutdown to allow surfaces to reach safe handling temperature.



**Flooding and Water Immersion.** The products covered by this guide are not designed to operate immersed in water. Reference should always be made to the installation and operating instructions for the motor under such conditions.



**Corrosive Liquids.** Corrosive liquids may eventually produce leak paths around the sealing surfaces of the pump. The product and system piping should be inspected for leaks on a regular basis.



**Condensation.** When pumping cold liquids ensure that condensation does not present a safety hazard. Condensation on the external surfaces of the magnet cup may result in motor seizure. Reference should always be made to the installation and operating instructions for the motor under such conditions.



**Freezing.** Fluid must not be allowed to freeze inside the product.

## Installation in Explosive and Fire Danger Zones

Micropump offers products designed and tested for installation in explosive or fire danger zones. Contact your local Micropump distributor or contact Micropump directly to determine if your product combination can be certified for this use.

In Addition to the warnings provided throughout this manual, the following must be considered in any explosion or fire danger zone installation:



**Ensure the pump head, motor, and any mounting adapter are suitable for area classification.**



**Ensure that pumping liquid temperature is maintained within acceptable range as specified by Micropump Certification of ATEX Conformity.**



**Neodymium Iron Boron hub magnets (Driving Magnet product codes N3 and N4) cannot be certified for use in potentially explosive atmospheres.**



**Leaking fluids may cause an unsafe condition. The product and system piping should be inspected for leaks on a regular basis.**

## Description

### **Cavity Style Gear Pumps - Series GAT, GJR, GD, GJ, GK, GL, GM, GN**

Cavity-style gear pumps are rotating positive displacement pumps. The main pump components are fabricated of a variety of machined metal components, the gears and bushings are molded or machined from plastics, and a variety of perfluoromers and elastomers are used for the static seals. There are no dynamic seals. These pumps are magnetically coupled to their drive. The driven magnet is fixed to the driving gear shaft. Rotation of the hub magnet by the drive causes the driven magnet and driving gear to rotate synchronously. The magnet cup provides a pressure boundary between the pumped fluid and the surrounding environment. Fluid enters the inlet port and is swept by the gears around the cavity to the outlet port. Pressure is developed in the pump by restrictions on the outlet, which load the gears against the cavity and the shafts against the bushings. In most cases, the pumped fluid provides the cooling and lubrication for the bushings. Some pumps are fitted with an internal bypass. By setting the spring tension in the bypass assembly, the discharge pressure can raise the bypass poppet recirculating fluid to the inlet side of the pump. Pumps without bypasses can be operated in reverse direction with degradation in performance and reduction in life. Contact your local Micropump distributor or contact Micropump directly for pumps designed to operated continuously in reverse direction.

### **Suction Shoe Gear Pumps - Series GA, GAH, GAF, GAP, GB, GC**

Suction shoe gear pumps are rotating positive displacement pumps. The main pump components are fabricated of a variety of machined metal components, the gears and suction shoes are molded or machined from plastics, and a variety of perfluoromers and elastomers are used for the static seals. There are no dynamic seals. These pumps are magnetically coupled to their drive. The driven magnet is fixed to the driving gear. Rotation of the hub magnet by the drive causes the driven magnet and driving gear to rotate synchronously around a non-rotating shaft. The magnet cup provides a pressure boundary between the pumped fluid and the surrounding environment. Fluid enters the inlet port and is swept by the gears around the cavity to the outlet port. Pressure is developed in the pump by restrictions on the outlet, which load the gears against the suction shoe and shafts. In most cases, the pumped fluid provides the cooling and lubrication for the bearing area. Initial start up of the pump is facilitated by a spring or ball that holds the suction shoe in place until differential pressure across the shoe dominates the load on the shoe. Some pumps are fitted with an internal bypass. By setting the spring tension in the bypass assembly, the discharge pressure can raise the bypass poppet recirculating fluid to the inlet side of the pump.

### **Centrifugal Pump – Series CA**

The Series CA are centrifugal pumps fabricated of 316 Stainless Steel or Hastelloy C. Bearings are Teflon, PPS or PEEK. Static seals are Teflon or Viton.

Centrifugal pumps are rotating, dynamic pumps. The pump is magnetically coupled to its driver. The driven magnet is fixed to the impeller. Rotation of the hub magnet by the drive causes the driven magnet and impeller to rotate synchronously around a non-rotating shaft. Fluid enters the axially located inlet port and is accelerated by the impeller to the tangentially located outlet port.

Pressure is developed in the pump by restrictions on the outlet, which causes the impeller to load against the thrust plate. The magnet cup, formed from 316 SS or Hastelloy C, provides a pressure boundary between the pumped fluid and the surrounding environment.



## Description (continued)

### Piston Pumps - Series PF

The Series PF pumps are reciprocating piston pumps. The Series PF uses a single reciprocating and rotating piston without valves to positively displace fluid. The main pump components are fabricated from a variety of machined metal and ceramic pistons, molded and machined plastics and elastomer seals. Piston seals are dynamic and other seals are static. Pumps are directly coupled to drive units. The series PF drive rotates an angled piston, generating a combined axial and rotational displacement. With the outlet port closed, fluid enters the inlet port as the piston is withdrawn. With the inlet port closed, fluid exits the outlet port as the piston is extended. Pressure is developed by restrictions in the outlet, causing the pistons to load against the drive shaft and pump body (Series PF).

### Motor Adaptors

If you have purchased a pump/motor combination this will be assembled ready for installation. If you have purchased a pump without a motor you may require a Micropump, NEMA, or IEC/ISO adaptor. If you have purchased an adaptor ensure you have suitable pump or motor for your system. Contact your local Micropump distributor or contact Micropump directly for assistance in selecting compatible components.



**Use of non-Micropump adaptors may adversely affect your product performance, installation category, and warranty. Contact your local Micropump distributor or contact Micropump directly for information.**



Mounting screws are provided with Micropump supplied motors and adaptors. Mounting screws are not provided with pumps or adaptors.

### Unpacking and Storage



**Inspect the magnet cup, hub, or adaptor (if present) before assembly with the motor. Replace or repair if there are signs of damage.**

Before installing the product ensure all transit packaging has been removed. Remove the blanks from the pump inlet and outlet ports. If the pump is to be stored prior to installation, re-pack the pump in its original packing, refit the blanks to the ports and store in a dry, covered environment.

Protect the pump head, hub, or adaptor from damage during unpacking and installation. Impacts to the magnet cup can cause internal damage or result in rub between the magnet cup and driving magnet upon assembly with the motor. Damage to the hub or adaptor may result in rub between the magnet cup and driving magnet upon assembly with the motor.

## Assembly



Proper assembly is required to prevent magnet rub due to misalignment.



Loose pump head or adaptor bolts may cause misalignment which may result in magnet hub rub on the magnet cup causing high surface temperatures or weakening the pressure boundary created by the magnet cup.

If the pump head housing assembly and motor are supplied separately they will need to be assembled prior to the installation. Align the housing flange so that it fits into the matching recessed flange on the motor assembly and tighten screws evenly. Align the pump head components with the housing flange and secure with the supplied screws. Tighten screws evenly and in an alternating pattern. Refer to the service instruction sheet for the specific pump model being used for proper torque values.

## Space Requirements

Refer to the Technical Specification for overall dimensions and weights of the pumps covered by this guide.

## Location



Pumphead or adaptor cannot support the weight of the motor. Ensure the motor is adequately supported by the foundation and/or mounting bracket.



The foundation must be capable of supporting the combined weight of the pump and motor and provide a rigid support.

The pump should be located with the inlet below or even with the liquid level of the fluid supply. The pump can be mounted in any position. Ensure that there is adequate space for operation, inspection and maintenance.

## Filtration



**The pump can be damaged if the fluid being pumped has abrasive suspended solids. Always install a suitable filter or strainer when these fluids are being pumped.**



All strainers and filters should have large surface areas to prevent excessive pressure drop.

For open systems the filter must be installed on the inlet side of the pump. For closed loop systems the filter can be installed on the inlet or discharge side.

Ensure filters are of the correct size for the pump being installed, refer to the table below for correct sizing:

RECOMMENDED FILTER			
Model	Size	Type	Max Pressure Drop
SERIES CA	50 micron	MESH	
SERIES GA	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)
SERIES GAF	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)
SERIES GAH	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)
SERIES GAP	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)
SERIES GAT	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)
SERIES GB	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GC	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GD	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GJ	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GJR	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GK	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GL	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GM	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES GN	40 micron SOFT PARTICLE 5 micron HARD PARTICLE	CANISTER	0.27 bar (4 psi)
SERIES PF	5 micron	FINE MESH OR CANISTER	0.14 bar (2 psi)

## Fittings

It is recommended that the pipe fittings are connected to the pump before the pump/motor is fitted into the installation. The following should be observed when connecting pipe fittings:

- Pipe sealing compound or PTFE tape should be applied to the threads to prevent leakage.
- Apply sealant or tape sparingly to prevent a build up of excess material which may dislodge and clog the pump. Two wraps of PTFE tape are usually sufficient.
- Secure the pump in a vice (use pads to protect the pump body) and support the motor when installing fittings.
- Ensure all joints are airtight.
- Ensure all fittings are of the correct size for the pump being installed, refer to the table below for correct sizing:

RECOMMENDED TUBING		
Model	Port	Minimum Tubing
SERIES CA	3/8" NPT	12.5mm (1/2")
SERIES GA	1/8" NPT	6.5mm (1/4")
SERIES GAF	1/8" NPT	6.5mm (1/4")
SERIES GAH	1/8" NPT	6.5mm (1/4")
SERIES GAP	MANIFOLD	6.5mm (1/4")
SERIES GAT	1/4"-28 UNF OR MANIFOLD	1.6mm (1/16") OR 6.5mm (1/4")
SERIES GB	1/4" NPT	10mm (3/8")
SERIES GC	3/8" NPT	12.5mm (1/2")
SERIES GD	3/8" NPT	12.5mm (1/2")
SERIES GJ	1/8" NPT	6.5mm (1/4")
SERIES GJR	1/8" NPT	6.5mm (1/4")
SERIES GK	1/4" NPT	10mm (3/8")
SERIES GL	3/4" NPT	12.5mm (1/2")
SERIES GM	3/4" NPT	25.4mm (1")
SERIES GN	3/4" NPT	25.4mm (1")
SERIES PF	1" BARB INLET 1/2" OUTLET	12.5mm (1/2")



Ensure that inlet and discharge pipes are connected correctly in relation to the direction of flow arrow marked on the pump.



Do not overtighten fittings or leave them loose and susceptible to leaks. Refer to the fitting manufacturer's installation instructions for torque values.

## Piping



High system pressure may be experienced if the pump outlet is blocked, e.g. by a closed valve downstream. Ensure that a pressure relief valve is fitted to the system if the pump is capable of exceeding maximum system pressure.



Piping must not exceed flash point temperature of the area.



Misaligned piping may apply a load to the pump head pulling it out of alignment with the motor. Do not force piping into position. Pump/motor misalignment may result in magnet hub rub on the magnet cup causing high surface temperatures or weakening the pressure boundary created by the magnet cup.

Refer to the guidelines for piping given in the “Hydraulic Institute Standards” for questions relating to system piping. The following should be observed when piping the system:

- Pipes connected to the pump should be level or slope down towards the pump.
- Ensure that no part of the pipe extends below the level of the pump inlet port.
- Piping that handles hot liquid requires installation of expansion loops or joints to prevent misalignment from linear expansion.
- Never size inlet piping diameter smaller than the pump inlet port.
- Separate inlet lines are recommended when more than one pump is operating from the same medium source.



Ensure all piping is clean and flushed out prior to connection to the pump.



Restrictions in the inlet and discharge lines may cause a loss of pump performance. A restriction can be a valve, small bore tubing, long lengths of tubing or sharp turns/elbows in the line. Design piping runs to minimize these restrictions wherever possible.

## Mounting



Loose bolts may result in pump/motor misalignment. Tighten bolts appropriately. Pump/motor misalignment may result in magnet hub rub on the magnet cup causing high surface temperatures or weakening the pressure boundary created by the magnet cup.

Secure the pump/motor to the installation using suitable fixing bolts. Connect the inlet and discharge pipe work to the pump. Do not force piping into position.

## Electrical Connection (where applicable)

Refer to the installation instructions supplied with the motor for connection details.



**Electrical installation must be carried out by qualified personnel who are conversant with local electricity installation regulations.**



**Before starting any electrical installation work ensure that the main electrical supply is adequately isolated.**



**Ensure that the voltage and frequency of the supply are correct for the motor being connected, and that the source is Class 2 or a Limited Power Source.**



**Ensure that the pump motor is earthed. The pump may be electrically isolated from the motor depending on the mounting configuration. Some installations may also need an earthing connection on the pump head.**



**Pumping flammable fluids without a proper earthing connection may cause spontaneous ignition.**



**Ensure that all electrical connections use a common earth ground to avoid hazardous ground loops.**

## Compressed Air Connection (where applicable)

Refer to the installation instructions supplied with the motor for connection details.



**Compressed air connections must be carried out by qualified personnel who are conversant with the hazards associated with high pressure air supplies.**



**Ensure that the compressed air supply is suitable for the type of motor being used.**

## Operation



Starting or running the pump with the discharge valve closed will overload motor resulting in overpressure in the discharge pipe.



Extended periods of dry running may result in permanent damage to the pump and may cause surface temperature to exceed the operating temperature of the pump. Ensure that the pump head temperature does not exceed the flash point temperature of the fluid or area. Shut down pump for no fluid condition. Shut down pump for no flow condition.



Ensure the pump head temperature does not exceed the flash point temperature of the fluid or area.

### Start-up Procedure

Before starting the pump ensure that any valves in the inlet or discharge lines are open and that any inlet filters are clean and free from obstruction.

Once started the pump should prime if it has not already been filled with fluid. If the pump fails to prime, stop the pump and fill the pump head with liquid.

### Post Start-up Checks

Once the pump has started, carry out the following checks:

- Check that the pump and motor operate smoothly and are free from vibration.
- Check the inlet and discharge fittings are free from leaks.



Check that the pump is rotating in the correct direction. This should be clockwise when viewing the drive shaft of the drive unit. If the direction of rotation is incorrect check the motor electrical connections.



Flow rate should always be adjusted by controlling motor speed where possible. Ensure that overpressure does not occur in the discharge pipe. NEVER throttle flow by the inlet valve.



Series CA pumps do not have suction pull capability and will not pump without fluid supplied to the inlet.

### Shut-down Procedure

Switch off the motor and check that the unit runs down in a steady manner. Close the inlet and discharge valves. Drain the pump if it is to be shut-down for long periods or installed in areas where the liquid may freeze. Refer to the Maintenance section for instruction on draining.



Series CA centrifugal pumps cannot handle mixed phase (gas/fluid) pumping. Contact your local Micropump distributor or contact Micropump directly for alternate pump options.



Series CA, GA, GAF, GJ with bypass, GAH, GAP, GB, GC and GD pumps cannot operate conventionally in reverse.



Dry Running. Dry running for short intervals (i.e. when dry lifting to prime the pump) may not adversely affect pump performance.

## Bypass (Optional)



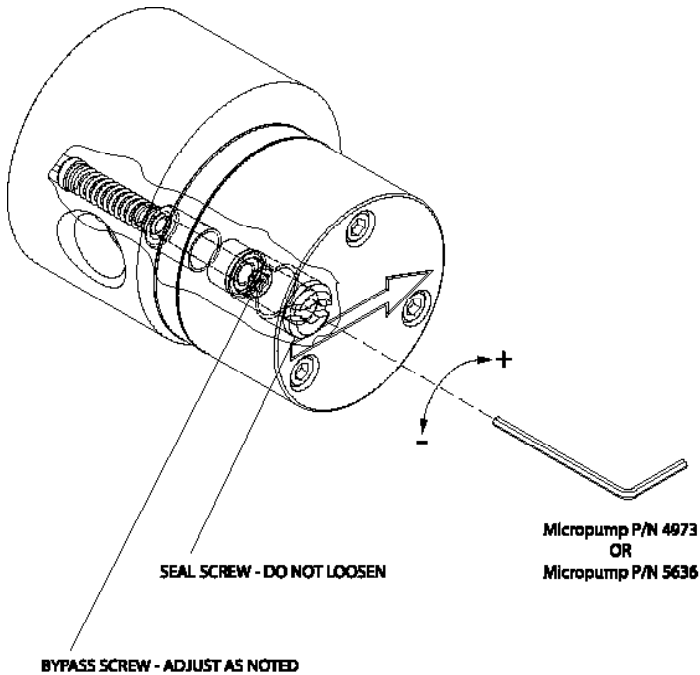
Pumps equipped with internal bypass will recirculate fluid increasing the amount of fluid through the bypass, which will increase the heat produced. Ensure when operating at bypass conditions that the pump does not exceed flash point temperature of area or pumping liquid.



Micropump recommends the pumps are not operated continuously with 100% bypass recirculation.

### Bypass Valve Adjustment

The optional bypass valve is an internal relief valve that permits recirculation of the working fluid when a pre-set pressure is reached. The bypass can be activated from 0.7 bar (10 psi) to the maximum differential pressure of the pump. The bypass can be adjusted in situ while the pump is operating by rotating the adjusting screw with the hex key provided. Turn the screw clockwise to increase the pre-set pressure and anti-clockwise to decrease the pre-set pressure.



Loosening the seal screw of the internal bypass will cause a leak, which may cause an unsafe condition. Do not loosen the seal screw.



## Magnet Decoupling

### How to Recognize Magnet Decoupling

Magnet decoupling occurs when the load on the pump exceeds the coupling torque between the magnets. The magnets are forced out of pole-to-pole alignment and are decoupled. When decoupling occurs, the driving magnet speed increases to motor no-load speed while the driven magnet and pumping parts remain motionless.



Decoupling is an inherent feature of magnetic couplings and DOES NOT indicate a pump failure. Decoupling should only occur when the magnet decoupling torque has been exceeded.

### Causes of Magnet Decoupling

Due to the quiet operation of magnetic pumps it is not always possible to detect, without disassembly of the pump, when the magnet coupling and pumping parts are operating incorrectly. It is therefore important to be able to recognize possible causes of magnet decoupling:

- Blockage or restriction in the discharge side of the system
- Discharge pressure exceeds decouple point
- Fluid viscosity too high
- Foreign particles jamming pumping parts
- Binding or stuck pumping parts - this may occur between pumping cycles as a result of dried residue of the fluid being pumped. Drain and flush the pump to remove the residue. Refer to the Maintenance section for instruction on draining.

### Magnet Recoupling

Before recoupling ensure that the cause of the decoupling has been identified and rectified. To recouple the magnets the motor must be stopped, allowing the magnets to re-align, and then restarted.

## Maintenance



Excessive wear to pump can result in driven magnet rub on the magnet cup. This can generate high surface temperatures or degrade the capability of the pressure boundary. Remove the pump from service and replace or repair if pump performance degrades significantly or the pump becomes noisy.



Excessive wear to motor can result in driving magnet rub on the magnet cup. This can generate high surface temperatures or degrade the capability of the pressure boundary. Ensure that the motor is serviced or replaced in accordance with manufacturer's guidelines. Motor hours must not exceed manufacturer's life specification. Remove the pump from service and replace or repair following motor failure.



Ensure that heavy deposits of dust are not allowed to accumulate. Clean the pump periodically.



The pump cannot be drained completely, a certain amount of liquid will remain in the magnet cup area. Ensure that the pump is either flushed with a suitable flushing agent or precautions are taken against the effect of any remaining liquid during servicing. When the pump has been handling flammable, toxic or hazardous fluid, the pump internals must be properly decontaminated by suitably qualified personnel. The Material Safety Data Sheet for the pumped liquid must be referred to for correct procedures and precautions to be followed when handling the liquid.



Ensure any service or replacement parts have been correctly specified, purchased from your local Micropump distributor or Micropump directly, and the pump has been correctly reassembled.

Micropump products are designed to be maintenance free and, apart from bypass models, require no adjustments. To ensure optimum performance maintain the fluid circuit to keep filters clean and prevent abrasive solids from passing through the product.

### Service

Like all pumps, Micropump products contain components that will wear over a period of time. This will be noticeable by a gradual deterioration in performance. You should contact your local Micropump distributor or contact Micropump directly for a service kit. Each service kit contains full fitting and service instructions.

### Draining

The pump should only require draining prior to disassembly for cleaning, service, changing the type of liquid being pumped, or to prevent frozen liquid damage.



A program that includes periodic monitoring of your Micropump pump is recommended to provide timely detection and assessment of any problem.

## Fault Isolation

If the pump does not meet its design performance or fails to operate correctly, refer to the following tables for assistance in identifying the cause and remedy:

PUMP PRODUCES NO LIQUID AT STARTUP	
Cause	Remedy
Inlet valve closed. Discharge valve closed.	Open inlet valve. Open discharge valve.
Pump does not reach speed. Magnets decouple.	Check motor is running. Open inlet & outlet valves.
PUMP SEIZES IMMEDIATELY AT STARTUP	
Cause	Remedy
Solids present in pump.	Clean pump, tank, and piping system. Replace any damaged parts before assembly.
PUMP DOES NOT ACHIEVE RATED FLOW OR PRESSURE AT STARTUP	
Cause	Remedy
Inlet valve not fully open.	Open inlet valve fully.
Inlet filter or strainer is blocked.	Clean inlet filter or strainer.
Internal Bypass adjusted incorrectly.	Adjust internal bypass.
Pump rotates in wrong direction.	Check motor electrical connections (refer to connection details supplied with motor.)
Pump is drawing air.	Check that inlet piping and fittings are air-tight.
Fluid viscosity too thick.	Contact your local Micropump distributor or contact Micropump directly.
Differential head of the system is higher than specified.	Reduce differential head or contact your local Micropump distributor or contact Micropump directly.
Pump cavitates, NPSH available is less than NPSH required.	Increase NPSH available.
MOTOR IS OVERLOADED	
Cause	Remedy
Differential head of the pump is higher than desired.	If pump capacity is greater than required, install additional bypass line from discharge to inlet.
Discharge valve is fully open, pump operates with reduced capacity and increased power consumption.	Adjust the capacity and differential head with a throttle valve in the bypass line.
Fluid density too high or viscosity too thick.	Contact your local Micropump distributor or contact Micropump directly.
PUMP PRODUCES NO LIFT OR DOES NOT SELF-PRIME	
Cause	Remedy
Pump is drawing air.	Check that inlet piping and fittings are air-tight.
Fluid viscosity is too thin or too thick, pump loses self-prime ability.	Install foot valve at bottom of the inlet line, fill inlet- line and pump with liquid before restart. Modify pipe layout.
Magnet coupling out of alignment. Signs of rubbing may be present on the magnet cup.	Check alignment. Ensure adapter/mount is of the correct type and is not damaged or distorted. Use only Micropump adapter/mounts.
Mounting base not rigid.	Ensure the base is adequately supported, particularly in the area of the motor attaching points. Ensure attachment bolts are of the correct size and tighten sufficiently.
Pump cavitates, NPSH available is less than NPSH required.	Increase NPSH available.

## Technical Specification



Operating temperature range of some configurations and material selections may be more narrow than those listed. Contact your local Micropump distributor or contact Micropump directly for information.



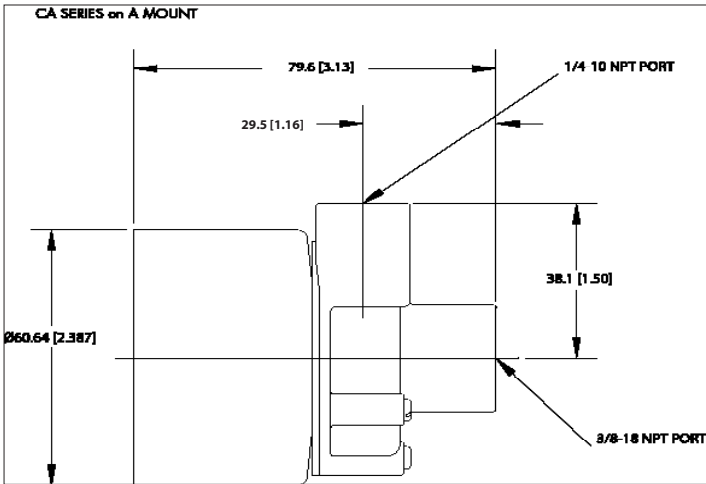
All Dimensions in mm.[inch]



Pump and drive dimensions may be summed to determine total unit dimensions.



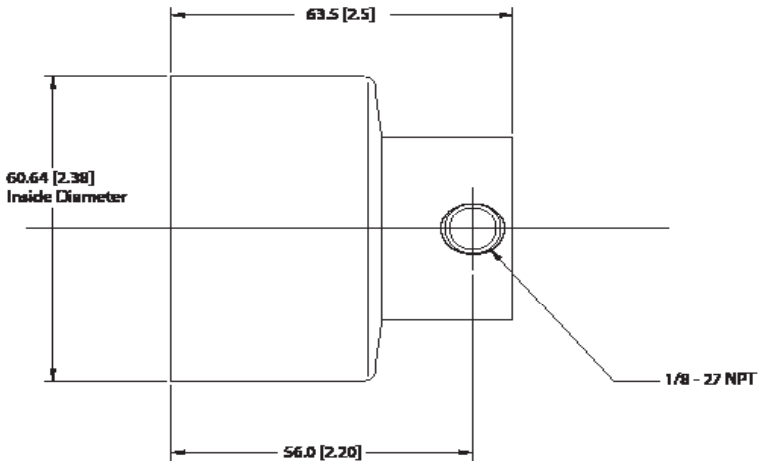
Not all mounting configurations are shown. Contact your local Micropump distributor or contact Micropump directly for additional versions.



### SERIES CA

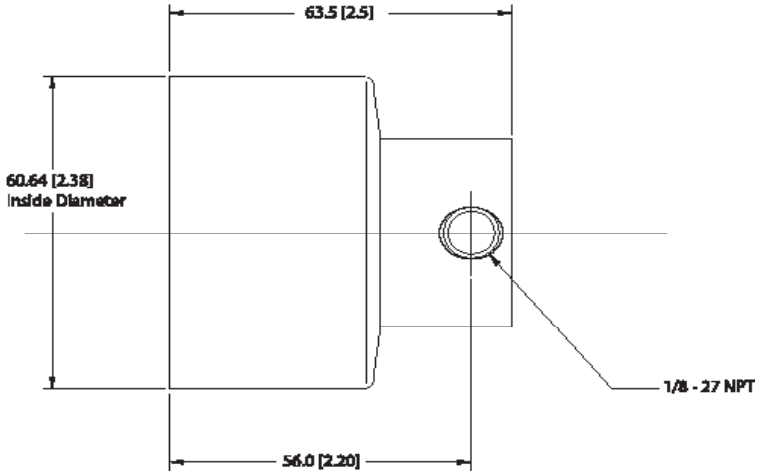
Flow Rate @3450/2850 rpm	9.8 l/min (2.6 gpm) / 8.1 l/min (2.1 gpm)
Max. Speed	10000 rpm
Max. System Pressure	13.6 bar (200 psi)
Max. Differential Pressure (Continuous Duty)	1.5 bar (21.8 psi)
Max. Differential Pressure (Intermittent Duty)	1.5 bar (21.8 psi)
Max. Differential Pressure (Blocked Outlet)	1.5 bar (21.8 psi)
Viscosity Range	Up to 100 cps
Fluid Temperature Range	-46 to +122°C (-50 to +250°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	0.37 kg (.82 lbs)

## GA SERIES on A MOUNT



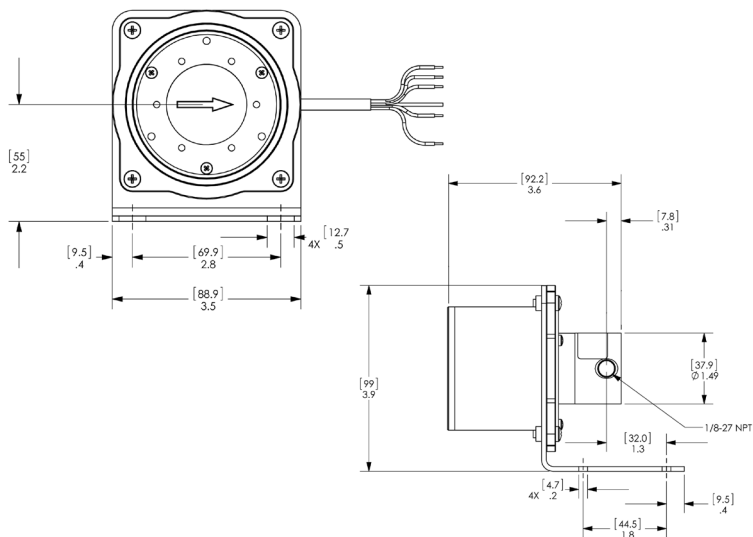
## SERIES GA

	X21 GEARS	V21 GEARS	V23 GEARS	T23 GEARS
Flow Rate @3450 rpm	0.06 l/min (0.016gpm)	0.145 l/min (0.038 gpm)	0.290 l/min (0.077 gpm)	0.322 l/min (0.085 gpm)
Flow Rate @2850 rpm	0.05 l/min (0.013gpm)	0.120 l/min (0.032 gpm)	0.245 l/min (0.065 gpm)	0.270 l/min (0.071 gpm)
Max. Speed	8000 rpm			
Max. System Pressure	21 bar (305 psi) standard			
Max. Differential Pressure (Continuous Duty)	2.8 bar (40.6 psi)			5.2 bar (75.4 psi) Hex 2.8 bar (40.6 psi) Pin
Max. Differential Pressure (Intermittent Duty)	2.8 bar (40.6 psi)			5.2 bar (75.4 psi) Hex 2.8 bar (40.6 psi) Pin
Max. Differential Pressure (Blocked Outlet)	27.6 bar (400.3 psi)		20.7 bar (300.2 psi)	
Max. De-Coupling Torque	21 mN*m (0.186 in*lbs) C-mount / 78 mN*m (0.69 in*lbs) A or B-mount Ferrite Magnets / 554 mN*m (4.9 in*lbs) Rare Earth Magnets			
Viscosity Range	0.2 to 1500 centipoise			
Fluid Temperature Range	-46 to +177°C (-51 to +351°F)			
Bypass Valve	Not Available			
Noise Level	Less than 70 dbA			
Weight	0.24 kg (0.53 lbs) A-mount / 0.27 kg (0.59 lbs) B-mount / 0.31 kg (0.68 lbs) C-mount			

**GAH SERIES on A MOUNT****SERIES GAH**

	X21 GEARS	V21 GEARS	V23 GEARS	T23 GEARS
Flow Rate @3450 rpm	0.06 l/min (0.016gpm)	0.145 l/min (0.038 gpm)	0.290 l/min (0.077 gpm)	0.322 l/min (0.085 gpm)
Flow Rate @2850 rpm	0.05 l/min (0.013gpm)	0.120 l/min (0.032 gpm)	0.245 l/min (0.065 gpm)	0.270 l/min (0.071 gpm)
Max. Speed	8000 rpm			
Max. System Pressure	138 bar (2000 psi) / 345 bar (5000 psi) CH50			
Max. Differential Pressure (Continuous Duty)	2.8 bar (40.6 psi)			5.2 bar (75.4 psi) Hex 2.8 bar (40.6 psi) Pin
Max. Differential Pressure (Intermittent Duty)	2.8 bar (40.6 psi)			5.2 bar (75.4 psi) Hex 2.8 bar (40.6 psi) Pin
Max. Differential Pressure (Blocked Outlet)	27.6 bar (400.3 psi)		20.7 bar (300.2 psi)	
Max. De-Coupling Torque	78 mN*m (0.69 in*lbs) A or B-mount Ferrite Magnets / 554 mN*m (4.9 in*lbs) Rare Earth Magnets			
Viscosity Range	0.2 to 1500 centipoise			
Fluid Temperature Range	-46 to +177°C (-51 to +351°F)			
Bypass Valve	Not Available			
Noise Level	Less than 70 dbA			
Weight	0.24 kg (0.53 lbs) A-mount / 0.27 kg (0.59 lbs) B-mount			

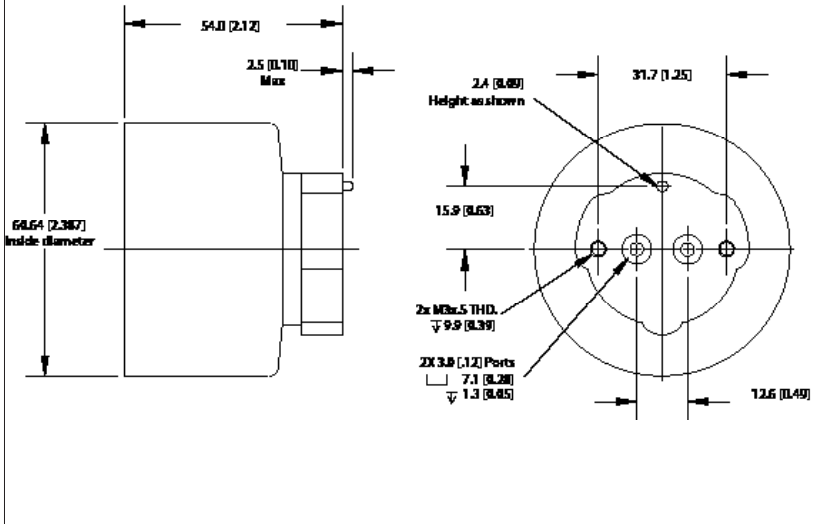
## GAF SERIES on A MOUNT



## SERIES GAF

SERIES GAF	
	T23 GEARS
Flow Rate @3450 rpm	0.322 l/min (0.085 gpm)
Flow Rate @2850 rpm	0.270 l/min (0.071 gpm)
Max. Speed	6000 rpm
Max. System Pressure	21 bar (300 psi)
Max. Differential Pressure (Continuous Duty)	17 bar (250 psi)
Max. Differential Pressure (Intermittent Duty)	17 bar (250 psi)
Max. Differential Pressure (Blocked Outlet)	17 bar (250 psi)
Max. De-Coupling Torque	Not Applicable
Viscosity Range	0.2 to 1500 centipoise
Fluid Temperature Range	-46 to +121°C (-51 to +250°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	1.96 kg (2.1 lbs)

## GAP SERIES on A MOUNT

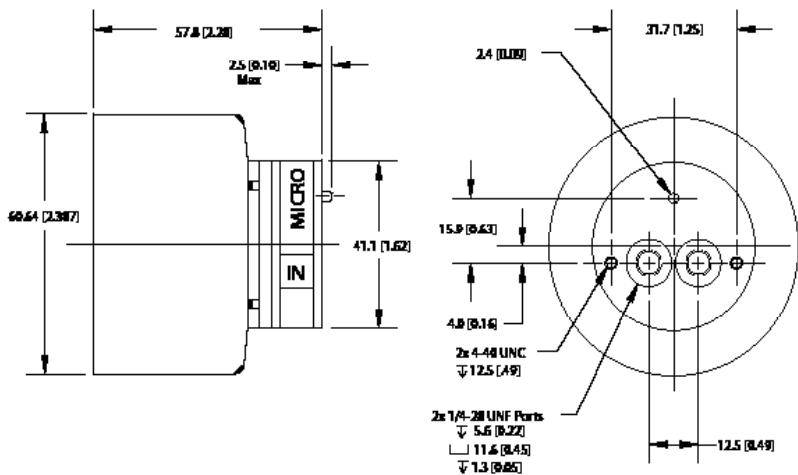


## SERIES GAP

SERIES GAP	
	T23 GEARS
Flow Rate @3450 rpm	0.322 l/min (0.085 gpm)
Flow Rate @2850 rpm	0.270 l/min (0.071 gpm)
Max. Speed	4000 rpm
Max. System Pressure	13.8 bar (200 psi) A- or B-mount / 8.3 bar (120 psi) C-mount
Max. Differential Pressure (Continuous Duty)	5.2 bar (75 psi)
Max. Differential Pressure (Intermittent Duty)	13.8 bar (200 psi) A or B-mount / 8.3 bar (120 psi) C-mount
Max. Differential Pressure (Blocked Outlet)	Differential pressure capability greater than maximum system pressure
Max. De-Coupling Torque	85 mNm (12 in*oz) A or B-mount / 21 mNm (3 in*oz) C-mount
Viscosity Range	0.2 to 1500 centipoise
Fluid Temperature Range	-46 to +121°C (-51 to +250°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	0.14 kg (.30 lbs) A-mount / 0.06 kg (0.14 lbs) C-mount

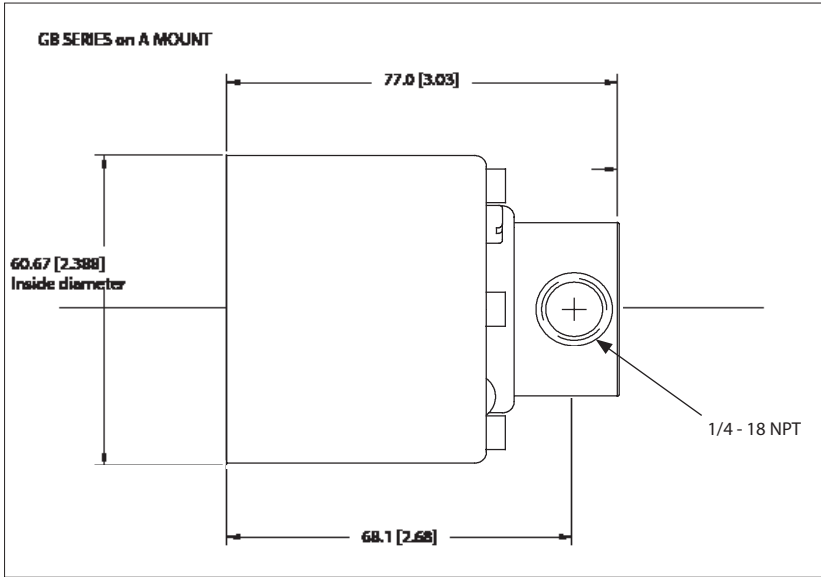


## GAT SERIES on A MOUNT



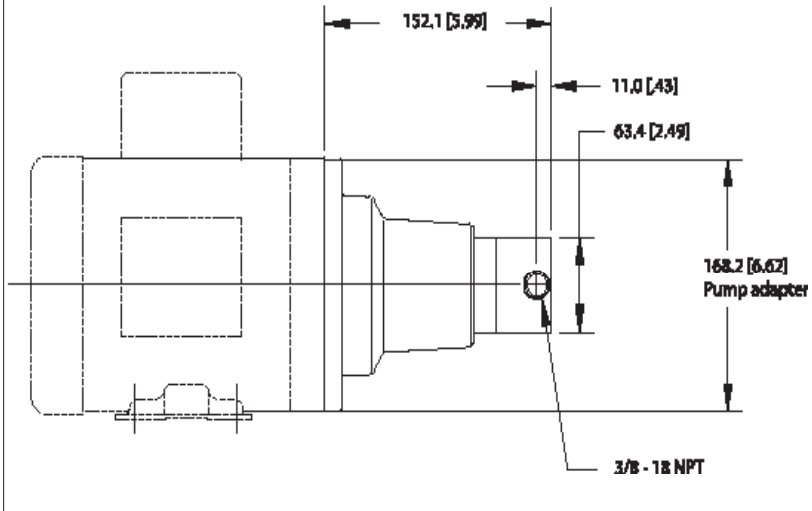
## SERIES GAT

SERIES GAT	
	T23 GEARS
Flow Rate @3450 rpm	0.322 l/min (0.085 gpm)
Flow Rate @2850 rpm	0.270 l/min (0.071 gpm)
Max. Speed	4000 rpm
Max. System Pressure	13.8 bar (200 psi) A/B-mount / 8.3 bar (120 psi) C-mount
Max. Differential Pressure (Continuous Duty)	5.2 bar (75 psi)
Max. Differential Pressure (Intermittent Duty)	13.8 bar (200 psi) A or B-mount / 8.3 bar (120 psi) C-mount
Max. Differential Pressure (Blocked Outlet)	Differential pressure capability greater than maximum system pressure
Max. De-Coupling Torque	185 mNm (12 in*oz) A or B-mount / 21 mNm (3 in*oz) C-mount
Viscosity Range	0.2 to 1500 centipoise
Fluid Temperature Range	-46 to +77°C (-51 to +170°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	0.15 kg (.34 lbs) A-mount / 0.07 kg (0.16 lbs) C-mount


**SERIES GB**

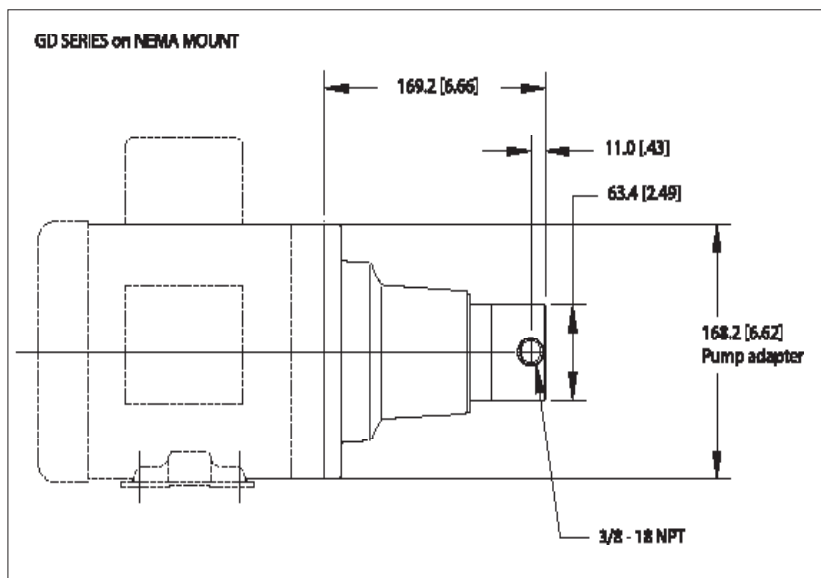
	P23 GEARS	P25 GEARS	P35 GEARS
Flow Rate @3450 rpm	0.946 l/min (0.25 gpm)	2.0 l/min (0.53 gpm)	4.2 l/min (1.11 gpm)
Flow Rate @2850 rpm	0.750 l/min (0.20 gpm)	1.7 l/min (0.45 gpm)	3.3 l/min (0.87 gpm)
Max. Speed	10000 rpm		
Max. System Pressure	21 bar (304.6 psi)		
Max. Differential Pressure (Continuous Duty)	5.2 bar (75.4 psi) PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Intermittent Duty)	5.2 bar (75.4 psi) PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi)		
Max. De-Coupling Torque	155 mN*m (1.4 in*lbs) standard / 777 mN*m (6.9 in*lbs) Rare Earth		
Viscosity Range	0.2 to 1500 centipoise		
Fluid Temperature Range	-46 to +122°C (-51 to +252°F)		
Bypass Valve	Optional		
Noise Level	Less than 70 dbA		
Weight	0.36 kg (0.8 lbs)		

## GC SERIES on NEMA MOUNT



## SERIES GC

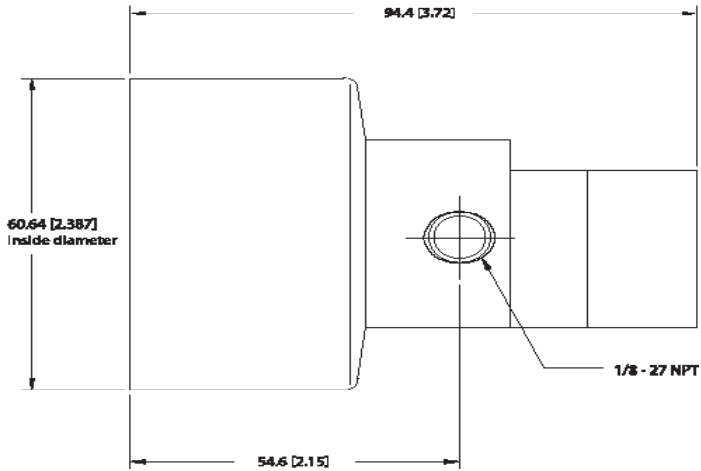
	M23 GEARS	M25 GEARS	M35 GEARS
Flow Rate @3450 rpm	2.8 l/min (0.74 gpm)	6.4 l/min (1.7 gpm)	12.0 l/min (3.2 gpm)
Flow Rate @2850 rpm	2.3 l/min (0.61 gpm)	5.2 l/min (1.4 gpm)	10.0 l/min (2.6 gpm)
Max. Speed	6000 rpm	4000 rpm	4000 rpm
Max. System Pressure	69 bar (913.7 psi) F or 12-mount / 103 bar (1493.9) All Other Mounts		
Max. Differential Pressure (Continuous Duty)	5.2 bar (75.4 psi) PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Intermittent Duty)	5.2 bar (75.4 psi) PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi)		
Max. De-Coupling Torque	643 mN*m (5.7 in*lbs) standard / 1780 mN*m (15.8 in*lbs) Rare Earth		
Viscosity Range	0.2 to 1500 centipoise		
Fluid Temperature Range	-46 to +177°C (-51 to +351°F)		
Bypass Valve	Not Available		
Noise Level	Less than 70 dbA		
Weight	1.63 kg (3.6 lbs)		



#### SERIES GD

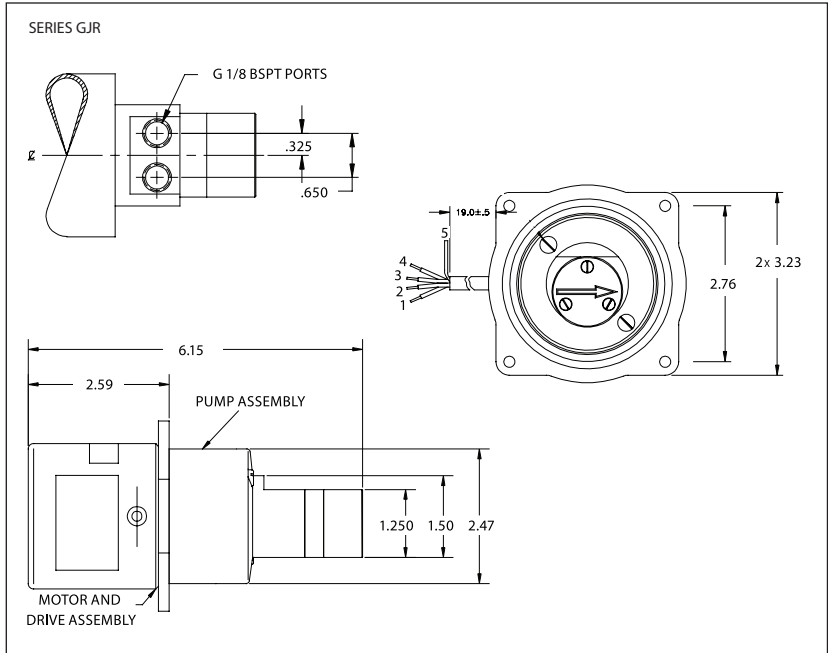
	M35 GEARS
Flow Rate @3450 rpm	12.0 l/min (3.2 gpm)
Flow Rate @2850 rpm	10.0 l/min (2.6 gpm)
Max. Speed	4000 rpm
Max. System Pressure	69 bar (913.7 psi) F or 12-mount / 103 bar (1493.9) All Other Mounts
Max. Differential Pressure (Continuous Duty)	5.2 bar (75.4 psi) A10 or PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS
Max. Differential Pressure (Intermittent Duty)	5.2 bar (75.4 psi) A10 or PPS GEARS / 8.7 bar (126.2 psi) PEEK GEARS
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi)
Max. De-Coupling Torque	643 mN*m (5.7 in*lbs) standard / 1780 mN*m (15.8 in*lbs) Rare Earth
Viscosity Range	0.2 to 1500 centipoise
Fluid Temperature Range	-46 to +177°C (-51 to +351°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	1.63 kg (3.6 lbs)

## GJ SERIES on A MOUNT



## SERIES GJ

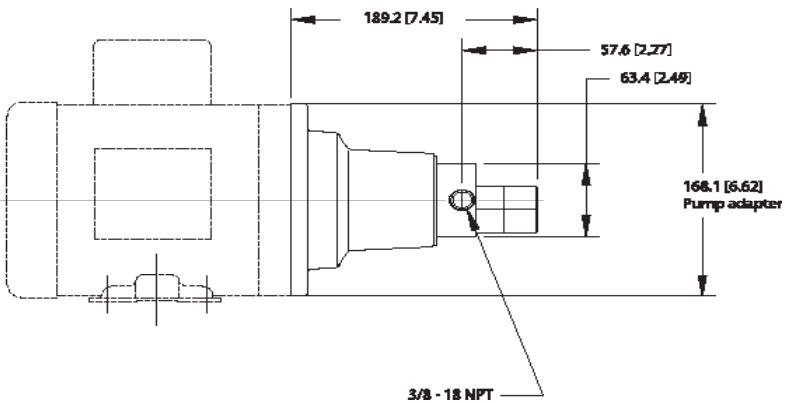
	N21 GEARS	N23 GEARS	N25 GEARS	N27 GEARS
Flow Rate @3450 rpm	1.1 l/min (0.29 gpm)	2.3 l/min (0.61 gpm)	3.2 l/min (0.85 gpm)	4.4 l/min (1.16 gpm)
Flow Rate @2850 rpm	0.9 l/min (0.24 gpm)	1.8 l/min (0.48 gpm)	2.6 l/min (0.69 gpm)	3.6 l/min (0.95 gpm)
Max. Speed	10000 rpm			
Max. System Pressure	21 bar (304.6 psi)			
Max. Differential Pressure (Continuous Duty)	3.5 bar (50.8 psi) PTFE GEARS / 5.2 bar (75.4 psi) PPS GEARS / 5.6 bar (81.2 psi) PEEK GEARS			
Max. Differential Pressure (Intermittent Duty)	3.5 bar (50.8 psi) PTFE GEARS / 5.2 bar (75.4 psi) PPS GEARS / 5.6 bar (81.2 psi) PEEK GEARS			
Max. Differential Pressure (Blocked Outlet)	5.6 bar (81.2 psi) PEEK GEARS			
Max. De-Coupling Torque	113 mN*m (1.0 in*lbs) C-mount / 134 mN*m (1.2 in*lbs) A or B-mount 932 mN*m (8.2 in*lbs) Rare Earth			
Viscosity Range	0.2 to 1500 centipoise			
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F) PEEK or PPS / -46 to +99°C (-51 to +210°F) PTFE			
Bypass Valve	Optional			
Noise Level	Less than 70 dbA			
Weight	0.43 kg (0.95 lbs)	0.46 kg (1.0 lbs)	0.47 kg (1.0 lbs)	0.49 kg (1.1 lbs)



## SERIES GJR

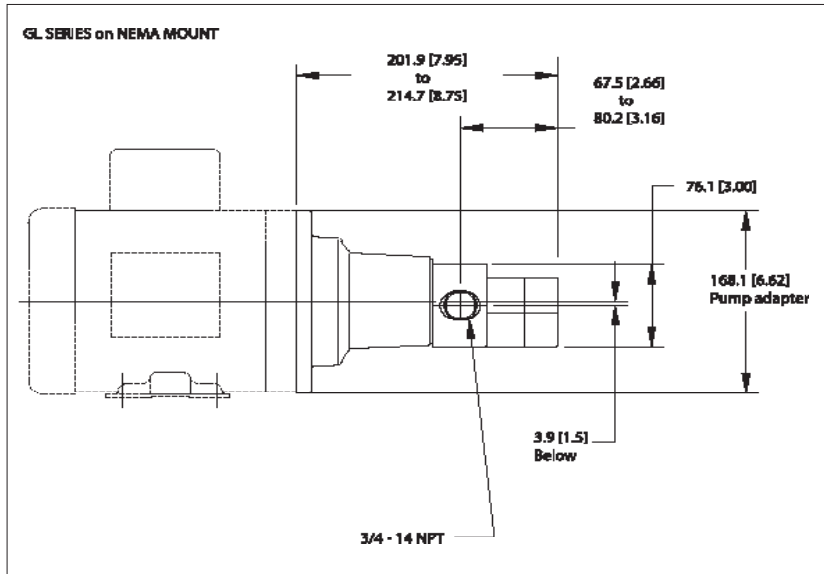
	N21 GEARS	N23 GEARS
Flow Rate @4000 rpm	1100 ml/min (0.29 gpm)	2400 ml/min (0.63 gpm)
Max. Speed	5000 rpm	
Max. System Pressure	21 bar (300 psi)	
Max. Differential Pressure (Continuous Duty)	4.0 bar (58 psi)	
Max. Differential Pressure (Intermittent Duty)	4.0 bar (58 psi)	
Max. Differential Pressure (Blocked Outlet)	4.0 bar (58 psi)	
Max. De-Coupling Torque	Not Applicable	
Viscosity Range	0.2 to 1500 centipoise	
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F)	
Bypass Valve	Optional	
Noise Level	Less than 70 dbA	
Weight	0.43 kg (0.95 lbs)	0.46 kg (1.0 lbs)

## GK SERIES on NEMA MOUNT



## SERIES GK

	K23 GEARS
Flow Rate @3450 rpm	10.9 l/min (2.9 gpm)
Flow Rate @2850 rpm	9.0 l/min (2.4 gpm)
Max. Speed	4000 rpm
Max. System Pressure	21 bar (304.6 psi) D-mount / 69 bar (1000.8 psi) 12-mount /103 bar (1493.9) All Other Mounts
Max. Differential Pressure (Continuous Duty)	3.5 bar (50.8 psi)
Max. Differential Pressure (Intermittent Duty)	3.5 bar (50.8 psi)
Max. Differential Pressure (Blocked Outlet)	4.2 bar (60.9 psi)
Max. De-Coupling Torque	417 mN*m (3.7 in*lbs)
Viscosity Range	0.2 to 1500 centipoise
Fluid Temperature Range	-46 to +54°C (-51 to +129.2°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	1.63 kg (3.6 lbs)

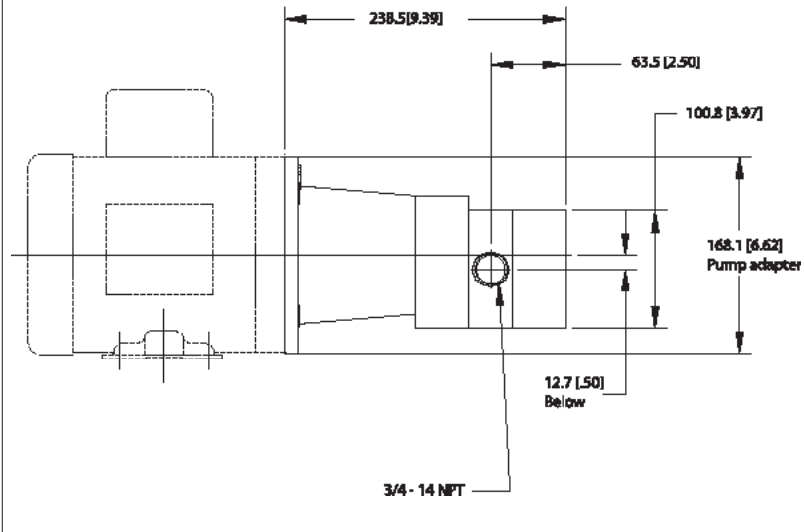


#### SERIES GL

	H21 GEARS	H23 GEARS	H25 GEARS
Flow Rate @3450 rpm	15.9 l/min (4.2 gpm)	21.6 l/min (5.7 gpm)	26.9 l/min (7.1 gpm)
Flow Rate @2850 rpm	13.2 l/min (3.5 gpm)	17.7 l/min (4.7 gpm)	22.0 l/min (5.8 gpm)
Max. Speed	3450 rpm		
Max. System Pressure	21 bar (304.6 psi) standard / 103 bar (1493.9) CH15 / 345 bar (5003.8 psi) CH50		
Max. Differential Pressure (Continuous Duty)	3.5 bar (50.8 psi) PTFE GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Intermittent Duty)	3.5 bar (50.8 psi) PTFE GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi) PEEK GEARS		
Max. De-Coupling Torque	634 mN*m (5.6 in*lbs) standard / 3298 mN*m (29.2 in*lbs) Rare Earth		
Viscosity Range	0.2 to 2500 centipoise		
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F)		
Bypass Valve	Not Available		
Noise Level	Less than 70 dbA		
Weight	3.9 kg (8.6 lbs)		

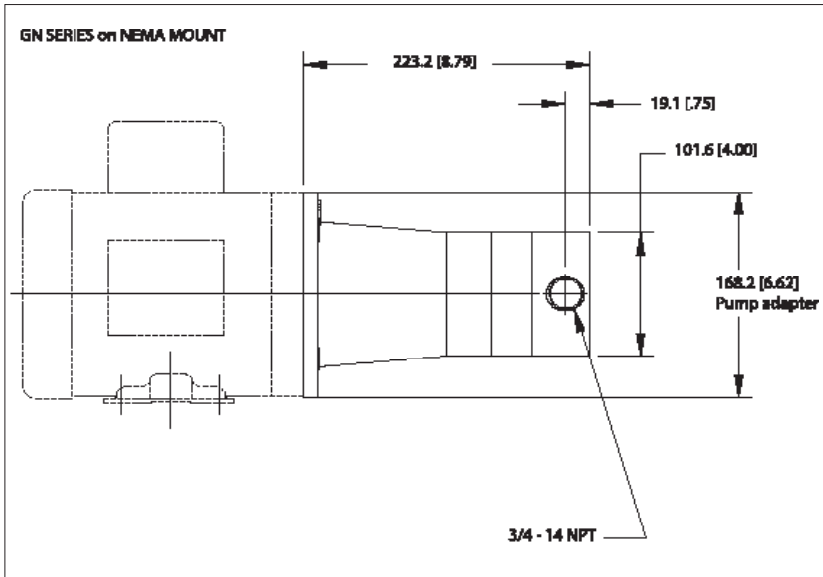


## GM SERIES on NEMA MOUNT



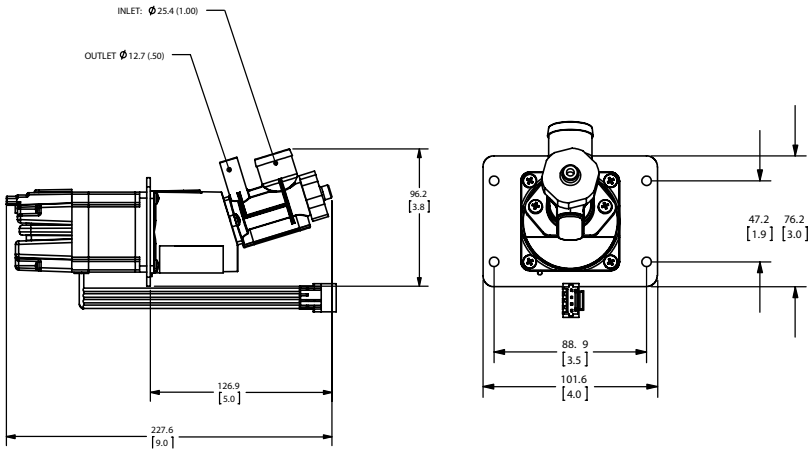
## SERIES GM

	G21 GEARS	G23 GEARS	G25 GEARS
Flow Rate @3450 rpm	25.4 l/min (6.7 gpm)	34.1 l/min (9.0 gpm)	42.4 l/min (11.2 gpm)
Flow Rate @2850 rpm	20.9 l/min (5.5 gpm)	28.0 l/min (7.4 gpm)	34.8 l/min (9.2 gpm)
Max. Speed	1750 rpm		
Max. System Pressure	41 bar (594.7 psi) standard / 103 bar (1493.9) CH15		
Max. Differential Pressure (Continuous Duty)	3.5 bar (50.8 psi) PTFE GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Intermittent Duty)	3.5 bar (50.8 psi) PTFE GEARS / 8.7 bar (126.2 psi) PEEK GEARS		
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi) PEEK GEARS		
Max. De-Coupling Torque	5650 mN*m (50.0 in*lbs)		
Viscosity Range	0.2 to 2500 centipoise		
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F)		
Bypass Valve	Not Available		
Noise Level	Less than 70 dbA		
Weight	10.9 kg (23.9 lbs)		

**SERIES GN**

	G35 GEARS
Flow Rate @3450 rpm Flow Rate @2850 rpm	84.8 l/min (22.4 gpm) / 69.9 l/min (18.5 gpm)
Max. Speed	1750 rpm
Max. System Pressure	21 bar (304.6 psi) standard / 69 bar (1000.8 psi) CH10 / 103 bar (1493.9) CH15
Max. Differential Pressure (Continuous Duty)	3.5 bar (50.8 psi) PTFE GEARS 8.7 bar (126.2 psi) PEEK GEARS
Max. Differential Pressure (Intermittent Duty)	3.5 bar (50.8 psi) PTFE GEARS 8.7 bar (126.2 psi) PEEK GEARS
Max. Differential Pressure (Blocked Outlet)	8.7 bar (126.2 psi) PEEK GEARS
Max. De-Coupling Torque	5650 mN*m (50.0 in*lbs)
Viscosity Range	0.2 to 2500 centipoise
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	8.4 kg (18.5 lbs)

## PF SERIES



## SERIES PF

Flow Rate @1000 rpm	0.94 l/min (0.248 gpm)
Max. Speed	1000 rpm
Max. System Pressure	6.89 bar (100 psi)
Max. Differential Pressure (Continuous Duty)	6.89 bar (100 psi)
Max. Differential Pressure (Intermittent Duty)	6.89 bar (100 psi)
Max. Differential Pressure (Blocked Outlet)	6.89 bar (100 psi)
Max. De-Coupling Torque	N/A
Viscosity Range	1 to 5000 centipoise
Fluid Temperature Range	-46 to +121°C (-51 to +249.8°F)
Bypass Valve	Not Available
Noise Level	Less than 70 dbA
Weight	2.0 kg (4.4 lbs)

**To purchase pumps, parts or receive further information contact your local Micropump distributor or contact Micropump directly.**

**Micropump, Inc.**

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