



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



## Portable Filter Carts

Models 5MFP & 10MFP with Moduflow™ *Plus*  
and Intelli-Cart™



ENGINEERING YOUR SUCCESS.

# Portable Filter Carts

## Applications

- **Filtering new fluid before putting into service**
- **Transferring fluid from drums or storage tanks to system reservoirs**
- **Conditioning fluid that is already in use**
- **Complimenting existing system filtration**
- **Removing free and emulsified water from a system**
- **For use with fluids such as hydraulic, gear and lube oils**

Parker portable filter carts are the ideal way to prefilter and transfer fluids into reservoirs or to clean up existing systems.

Fluid should always be filtered before being put into use. New fluid is not necessarily clean fluid. Most new fluids (right out of the drum) are unfit for use due to high initial contamination levels. Contamination, both particulate and water, may be added to a new fluid during processing, mixing, handling and storage.

Water is removed by installing Par-Gel™ elements in the outlet filter. Par-Gel™ elements are made from a polymer which has a very high affinity for free water.

Once water comes into contact with this material, it is removed from the system.

The Parker portable filter cart uses two high capacity ModuFlow™ Plus filters for long element life and better system protection. The first stage (inlet) filter captures larger particles, while the second stage (outlet) filter captures finer particles or removes water. A rugged industrial quality gear pump gets the job done fast.

Using a Parker portable filter cart is the most economical way to protect your system from the harm that can be caused by contamination.

| Features                                                                                                                    | Advantages                                                                                                    | Benefits                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Two filters instead of one w/ 2.5 times increased dirt holding capacity</li> </ul> | <ul style="list-style-type: none"> <li>• Pump protection and long element life</li> </ul>                     | <ul style="list-style-type: none"> <li>• Element cost savings and trouble-free service</li> </ul>      |
| <ul style="list-style-type: none"> <li>• Wide variety of particulate elements available</li> </ul>                          | <ul style="list-style-type: none"> <li>• Capable of getting a fluid to a desired cleanliness level</li> </ul> | <ul style="list-style-type: none"> <li>• Extends fluid life and system performance</li> </ul>          |
| <ul style="list-style-type: none"> <li>• Par-Gel™ water removal elements available</li> </ul>                               | <ul style="list-style-type: none"> <li>• Removes “free water” from a system</li> </ul>                        | <ul style="list-style-type: none"> <li>• Gets dirt and water out of system with one process</li> </ul> |
| <ul style="list-style-type: none"> <li>• Heavy duty frame</li> </ul>                                                        | <ul style="list-style-type: none"> <li>• Rugged and durable</li> </ul>                                        | <ul style="list-style-type: none"> <li>• Built to last</li> </ul>                                      |
| <ul style="list-style-type: none"> <li>• Lightweight and portable</li> </ul>                                                | <ul style="list-style-type: none"> <li>• Easy to move from place-to-place</li> </ul>                          | <ul style="list-style-type: none"> <li>• One person operation</li> </ul>                               |
| <ul style="list-style-type: none"> <li>• Two flow rates available: 5 gpm or 10 gpm</li> </ul>                               | <ul style="list-style-type: none"> <li>• Enables use in low or high viscosity applications</li> </ul>         | <ul style="list-style-type: none"> <li>• Matched to your needs</li> </ul>                              |
| <ul style="list-style-type: none"> <li>• Eleven-foot hose and wand assemblies included</li> </ul>                           | <ul style="list-style-type: none"> <li>• Additional hardware not necessary</li> </ul>                         | <ul style="list-style-type: none"> <li>• Ready to use as received</li> </ul>                           |

# Portable Filter Carts

## Applications

### Hose & wand assembly

- Ready to use; no additional hardware needed
- Flexible hoses for tight spots
- Kink-resistant hose prevents pump cavitation

### Visual indicator

- Tells you when to change element

### Heavy Duty frame

- Rugged and built to last

### Dual filters

- Two stage, double length filtration for long element life and pump protection

### Elements (not shown)

- Available for both particulate and Water Removal (WR) in double length w/ 2.5 times increased dirt holding capacity

### icountPD (Intelli-Cart™ option)

- Early warning LED or digital display indicators for Low, Medium and High contamination levels
- Self diagnostic software

### Service cover

- Top-accessible for easy changing of elements

### Electrical Cord

- 6 ft. with ON/OFF switch
- Optional 20 ft. cord with retractable reel & mounted power switch with thermal overload protection

### 110V/220V AC motor

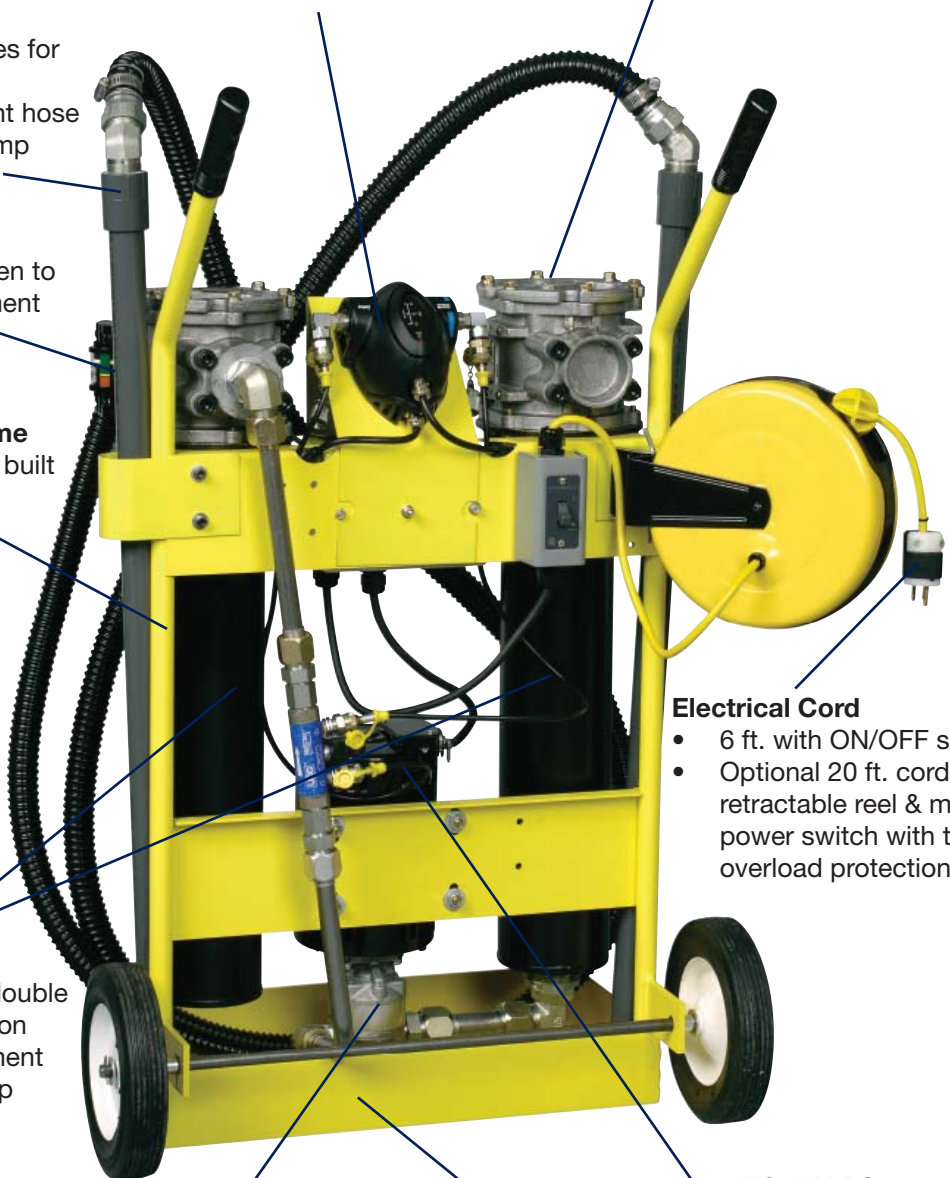
- Industrial brand name

### Gear pump

- Industrial quality
- Quiet operation
- Dependable, long life

### Drip tray

- Helps keep the work area safe and clean



# Portable Filter Carts

## Specifications

### Maximum Recommended Fluid

#### Viscosity:

5MFP – 3000 SUS (647cSt)  
0.85 specific gravity

10MFP – 500 SUS (108 cSt)  
0.85 specific gravity

### Visual Indicator (outlet filter):

Visual differential type  
3-band (clean, change, bypass)

### Filter Bypass Valve Settings

#### (Integral to Element):

Inlet – 3 psid (0.2 bar)  
Outlet – 35 psid (2.4 bar)

### Operating Temperature:

Seal option “B” (standard)  
-40°F to +150°F (-40°C to +66°C)

### Electrical Service Required:

5MFP – 110/220 volts, 60/50  
Hz, single phase, 8/4 amps  
10MFP – 110/220 volts, 60/50  
Hz, single phase, 10/5 amps

### Electrical Motor:

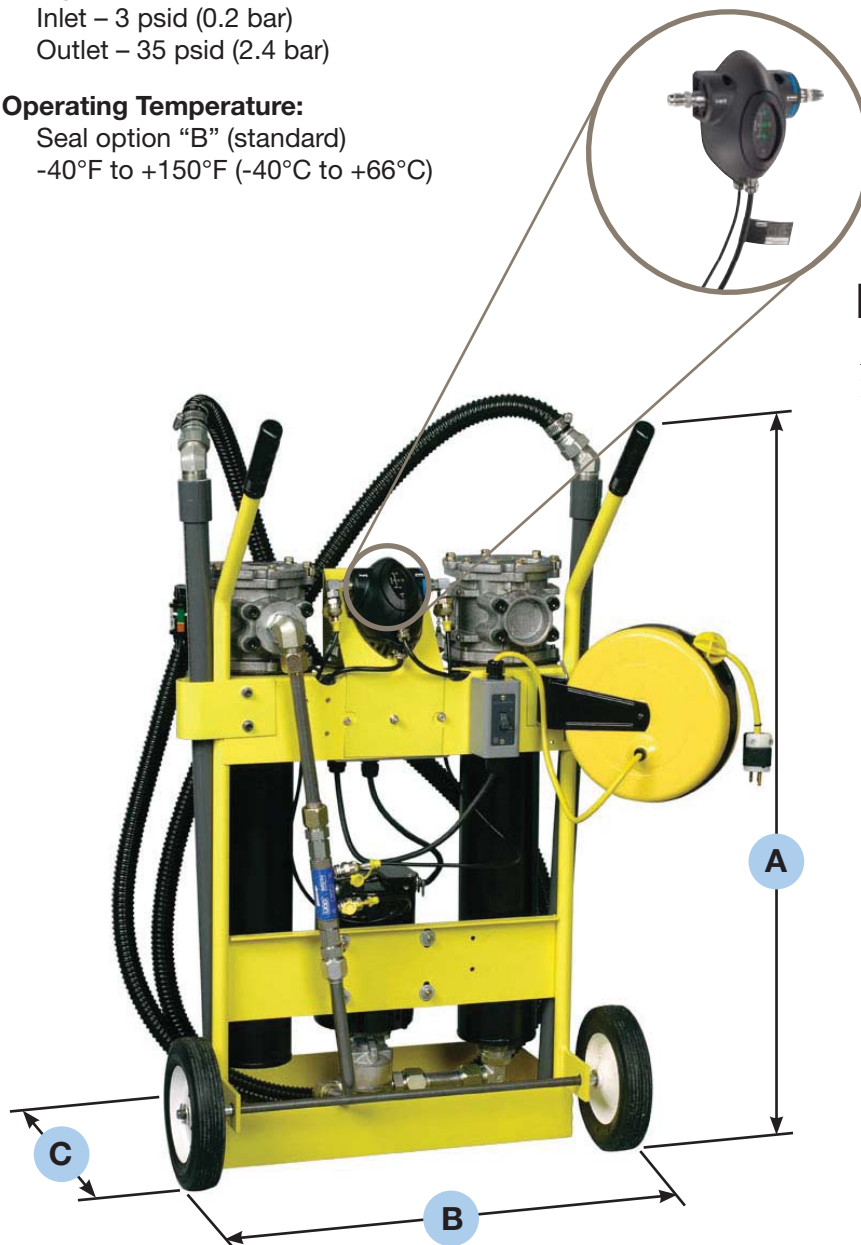
5MFP – ½ hp @ 1725 rpm,  
Open, Drip Proof  
10MFP – ¾ hp @ 3450 rpm,  
Open, Drip Proof  
Thermal overload protection

### Construction:

Cart frame – Steel  
Filter head – Aluminum  
Filter bowl – Steel  
Hoses – PVC (Std.)  
EPDM (high temp option)  
Wands – PVC (Std.)  
Steel tube (high temp  
option)

### Weight:

110 lbs. (45.4kg)



## Dimensions:

A = Height: 1034mm (40.7 in.)

B = Width: 648mm (25.5 in.)

C = Depth: 503mm (19.8 in.)

## New feature!

### Intelli-Cart™

Parker is pleased to announce its R&D effort to offer a diagnostic filter cart - the Intelli-Cart. The icountPD particle detector, the most up-to-date technology in solid particle detection, can be mounted to the standard frame of the filter cart for enhanced monitoring of your hydraulic system. The icountPD, coupled with the filter cart is a cost effective solution to fluid management and contamination control. Ask your sales representative today for more information.

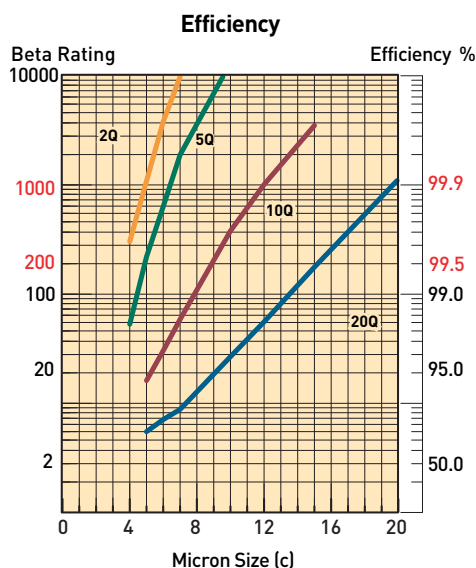
## Typical Fluid Cleanliness Level Requirements

Many manufacturers of hydraulic components have established fluid cleanliness levels for their components. Using a portable filter cart can be a very effective way to reach and maintain these cleanliness levels.

| Component                               | ISO Cleanliness Level |
|-----------------------------------------|-----------------------|
| Servo control valves                    | 16/14/11              |
| Proportional valves                     | 17/15/12              |
| Vane and piston pumps/motors            | 18/16/13              |
| Directional and pressure control valves | 18/16/13              |
| Gear pumps/motors                       | 19/17/14              |
| Flow control valves                     |                       |
| cylinders                               | 20/18/15              |
| New fluid                               | 20/18/15              |

## Filter Cart Element Performance

| Media Code | Filter Media   | Capacity (Grams) |
|------------|----------------|------------------|
| 40W        | Woven Wire     | *                |
| 40SA       | Synthetic      | *                |
| 20Q        | Microglass III | 140              |
| 10Q        | Microglass III | 135              |
| 05Q        | Microglass III | 130              |
| 02Q        | Microglass III | 110              |



Notes: Multipass test run @ 80 gpm to 50 psid terminal - 5 mg/l BUGL.

## Filter Cart Performance

Fluid cleanliness levels are a function of initial contamination levels, contamination ingress rates, reservoir size and filter element efficiency. The chart below lists approximate time requirements to achieve certain cleanliness levels based on the assumptions noted.

| Reservoir Capacity (Gallons) | Time Required (Hours) | Projected Cleanliness Level (ISO) |
|------------------------------|-----------------------|-----------------------------------|
| 50                           | 0.5                   | 20/18/15                          |
| 50                           | 1.0                   | 17/15/12                          |
| 50                           | 2.5                   | 16/14/11                          |
| 100                          | 1.5                   | 18/16/13                          |
| 100                          | 2.5                   | 17/15/12                          |
| 100                          | 4.0                   | 16/14/11                          |
| 200                          | 2.5                   | 19/17/14                          |
| 200                          | 3.5                   | 18/16/13                          |
| 200                          | 5.0                   | 17/15/12                          |

Notes:

The results in the chart are based on the following assumption:

1. Initial contamination level is 500,000 particles greater than 10 micrometers per 100 ml of fluid (10MFP cart).
2. Inlet filter fitted with 40SA element; outlet with 20Q element.
3. System ingress rate equal to  $1 \times 10^6$  particles greater than 10 micrometers entering the system per minute.

The Intelli-Cart™ with particle detector provides an excellent method for filtering and trending contamination levels.

For optimum particle detector performance results when monitoring contamination levels, fluid viscosity range should be 50 - 250 SUS.

## Par-Gel™ Media Water Capacity

| Model | Fluid Viscosity | Capacity |
|-------|-----------------|----------|
| 5MFP  | 75 SUS          | 600 ml   |
|       | 200 SUS         | 420 ml   |
| 10MFP | 75 SUS          | 500 ml   |
|       | 200 SUS         | 300 ml   |

Notes:

1. Par-Gel™ elements are designed to remove "free water", which is defined as water that is above a particular fluid's saturation level.
2. Capacity is very dependent on flow rate and viscosity. Not recommended with fluids in excess of 500 SUS.

## Assembly

1. Install hoses to inlet and outlet filters by threading the hose end with the straight thread o-ring seal fitting into the filter flange.
2. Connect the PVC tube wands to the swivel fitting on the hose end. When servicing the PVC tube wand, do not over-torque the metal fittings going into the PVC coupling. Over-torque will result in cracking the coupling. Generally, 1/4 turn beyond hand-tight is sufficient.
3. The Intelli-Cart™ is shipped with a bag that contains user manuals, iPD programming disk, and accessory parts.
4. The iPD is shipped with the factory default setting. Users can reprogram the iPD with the cable located in the attached bag, the program disk and the iPD owners manual.

## Operating Instructions

1. Insert the inlet wand assembly into the supply fluid receptacle (drum/reservoir). The RFP filter is the inlet filter.
2. Insert the outlet wand assembly into the clean fluid receptacle (drum/reservoir). The ILP filter is the outlet filter.
3. Verify that the ON/OFF switch is OFF and plug the cord into the proper grounded power source (3 wire).
4. Turn switch to ON position and check outlet wand for oil flow. Allow 30 to 60 seconds for filters to fill with oil. If repeated attempts to obtain oil flow fail, check pump inlet fittings for tightness, remove inlet filter access cover and verify the cover sealing o-ring is in place. For very viscous fluids it may be necessary to pour 1 or 2 quarts of fluid into the RFP inlet filter housing to prime pump initially.
5. The condition of the filter element should be monitored by observing the cleanliness indicator on the outlet filter. When the indicator is in the CHANGE position, both inlet

and outlet filter elements MUST be replaced to prevent fluid from going through the bypass in the filters.

6. The inlet filter element is provided with a 3PSI bypass spring, and prevents the pump from cavitating if the element is not changed. The outlet filter element is provided with a 35PSI bypass spring to prevent excessive pressure which may be harmful to personnel or to the filter cart.

**Warning:** The filter bypass spring acts as a relief valve for the pump. Do not restrict the outlet hose with a shut-off valve which will defeat the function of the bypass valve, causing excessive pressure, which may be harmful to personnel or to the filter cart.

7. The cleanliness indicator works on differential pressure and will indicate the condition of the element (CLEAN, CHANGE, or BYPASS).

**NOTE:** The filter cart must be in operation for the indicator to read properly.

## Maintenance Instructions

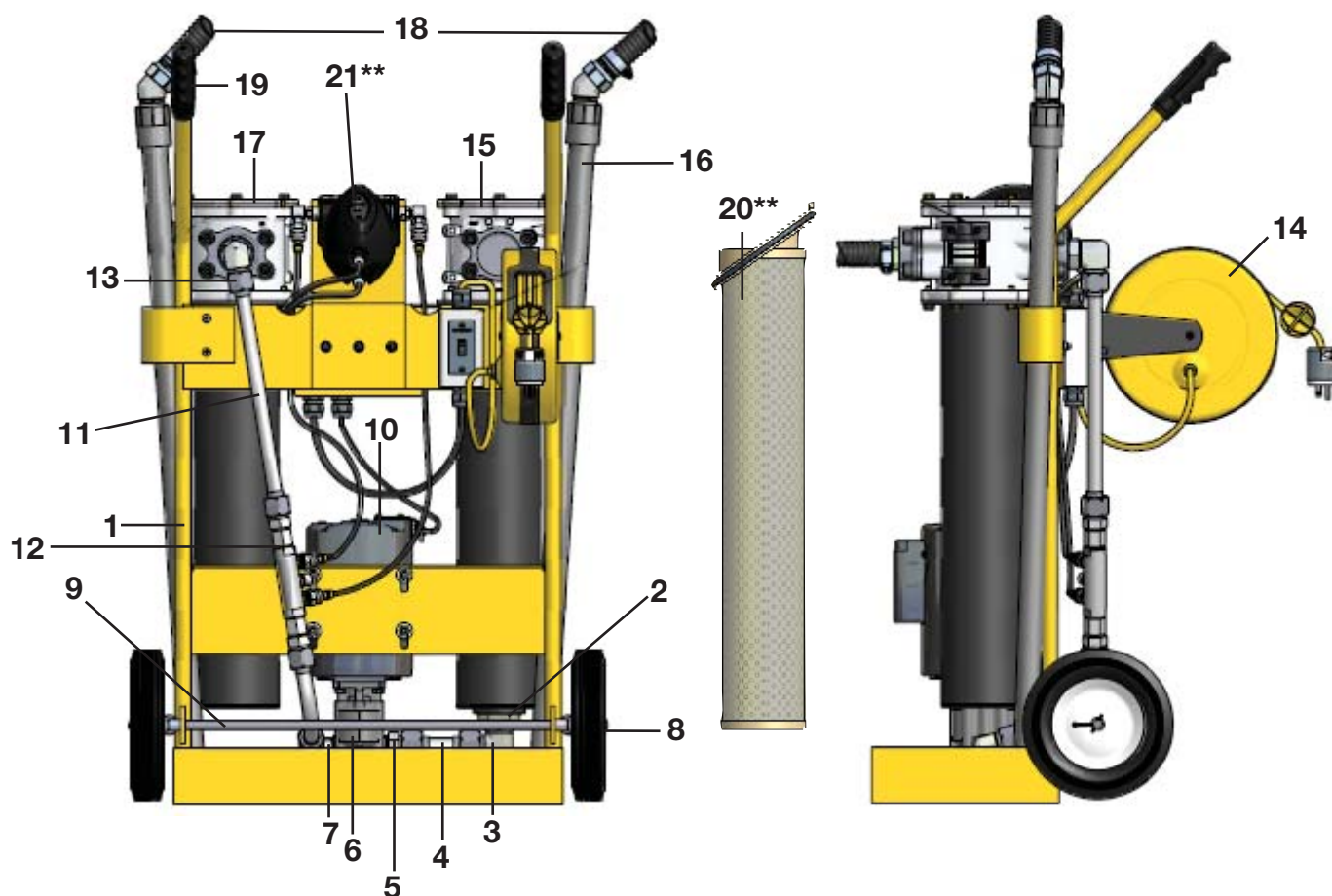
1. Turn switch to OFF position and unplug cord from electrical outlet.

2. Remove tube wands from oil to prevent siphoning.
3. Loosen hex head screws on filter cover. Turn cover to clear screws, remove cover.
4. Pull filter element from the filter head.
  - a) Replace the synthetic or Microglass III elements. Verify correct element replacement.
  - b) Wire mesh elements can be cleaned. Ultrasonic cleaners provide best results.
5. Install element in filter housing. Make sure element o-rings seat properly into the head, making sure that the notch on the element lines up with the notch in the head.
6. Inspect the cover o-ring and replace if necessary.
7. Replace cover and tighten hex head screws until they are snug. Do not over-torque (16 - 19 Ft. Lbs.) these screws. Do not interchange the inlet filter cover with the outlet filter cover. (The inlet filter has a "RFP" prefix, the outlet filter has a "ILP" prefix).
8. Contact the HFD service department at 419-644-0259 regarding iPD calibration.
9. iPD removal: remove oil lines from the iPD at the two fittings closest to the iPD. Disconnect the two cables from the iPD. Remove iPD from cart via two screws. The cart can be used without the iPD as long as the sample hoses are removed from the System 20. Protect sampling connectors from contamination.

## Trouble Shooting

| Problem                           | Cause                                                                    | Solution                                                                                                                                                                                                                 |
|-----------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does not start                    | ON/OFF Switch<br>No electrical power<br>Defective motor                  | Turn switch ON, replace switch if defective<br>Plug in cart<br>Replace                                                                                                                                                   |
| No oil flow or erratic pump noise | Filter housing not filled with oil<br>Suction leak<br><br>Defective pump | Allow pump to run 30 to 60 seconds<br>Check tightness of inlet fittings<br>Check o-ring in inlet filter cover for nicks<br>Kink or restriction in inlet hose<br>Add 1 or 2 quarts of oil to inlet filter<br>Replace pump |
| Indicator reads CHANGE or BYPASS  | Element dirty<br>Oil extremely cold or viscous                           | Replace or clean elements (both filters)<br>Change element to coarser micron rating                                                                                                                                      |
| Indicator does not seem to move   | No outlet element<br>40 micron element installed in outlet filter        | Install element<br>Check cart model number to verify correct element. The inlet filter has a rating RFP prefix; the outlet filter has an ILP prefix                                                                      |

## Filter Cart Replacement Parts



| Item No. | Part No.     | Description                           | Qty |
|----------|--------------|---------------------------------------|-----|
| 1        | 928690       | Frame                                 | 1   |
| 1        | 941468       | Frame (Intelli-Cart™)                 | 1   |
| 2        | 940980       | Pipe Reducer Fitting                  | 1   |
| 3        | 940979       | Tube Fitting                          | 1   |
| 4        | 937526       | Suction Tube Assy.                    | 1   |
| 5        | 928652       | Adapter Fitting                       | 1   |
| 6        | 928731       | Pump                                  | 1   |
| 7        | 940977       | Adapter Fitting                       | 1   |
| 8        | 928650       | Wheel                                 | 2   |
| 9        | 928653       | Axle                                  | 1   |
| 10       | 928678       | Motor 10MFP                           | 1   |
| 10       | 929692       | Motor 5MFP                            | 1   |
| 11       | 937527       | Discharge Tube Assy.                  | 1   |
| 12       | 941467       | Discharge Tube Top (Intelli-Cart™)    | 1   |
|          | 941466       | Discharge Tube Bottom (Intelli-Cart™) | 1   |
|          | STI.0144.100 | System 20 (Intelli-Cart™)             | 1   |
|          | 3/8-8F40HG5S | System 20 Fitting 1 (Intelli-Cart™)   | 2   |
|          | 12/8 F50X-S  | System 20 Fitting 2 (Intelli-Cart™)   | 2   |

| Item No. | Part No.     | Description                      | Qty |
|----------|--------------|----------------------------------|-----|
| 13       | 940978       | Tube Fitting                     | 1   |
| 14       | 928623       | Cord Reel                        | 1   |
| 15       | 940960       | Inlet Filter – Nitrile           | 1   |
| 15       | 941024       | Inlet Filter – Fluorocarbon      | 1   |
| 16       | 928784       | Tube Wand Assy. – Seal Option B  | 2   |
| 17       | 940961       | Outlet Filter – Nitrile          | 1   |
| 17       | 941025       | Outlet Filter – Fluorocarbon     | 1   |
| 18       | 928663       | Hose Assy. – Seal Option B       | 2   |
| 19       | 928651       | Handle Grip                      | 2   |
| 20       | See Chart**  | Element, (1) Inlet & (1) Outlet  | 2   |
| 21       | See Chart**  | icountPD (Intelli-Cart™)         | 1   |
|          | B84654       | icount Cable (Intelli-Cart™)     | 1   |
|          | B84224       | icount Hoses (Intelli-Cart™)     | 2   |
|          | 2/2A40EG4M-S | icount Fitting 1 (Intelli-Cart™) | 2   |
|          | EMA3/1/8ED   | icount Fitting 2 (Intelli-Cart™) | 2   |

\*\*Refer to chart on How to Order page.

# Portable Filter Carts

## How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

| BOX 1 | BOX 2 | BOX 3 | BOX 4 | BOX 5 | BOX 6 | BOX 7 | BOX 8 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| 10MFP | 2     | 40SA  | 10Q   | B     | VP    | I     | 1     |

| BOX 1: Basic Assembly |                       |
|-----------------------|-----------------------|
| Symbol                | Description           |
| 5MFP                  | 5 GPM (3000 SUS MAX.) |
| 10MFP                 | 10 GPM (500 SUS MAX.) |

| BOX 2: Length |             |
|---------------|-------------|
| Symbol        | Description |
| 2             | Double      |

| BOX 3: Inlet Filter Element |                                         |
|-----------------------------|-----------------------------------------|
| Symbol                      | Description                             |
| 40SA                        | Synthetic, 40 micron                    |
| 40W                         | Stainless Steel Mesh, 40 micron nominal |
| 20Q                         | Microglass III, 20 micron               |

Please note the bolded options reflect standard options with a reduced lead-time. Consult factory on all other lead-time options.

| BOX 4: Outlet Filter Element |                                  |
|------------------------------|----------------------------------|
| Symbol                       | Description                      |
| 02Q                          | Microglass III, 2 micron         |
| 05Q                          | Microglass III, 5 micron         |
| <b>10Q</b>                   | <b>Microglass III, 10 micron</b> |
| 20Q                          | Microglass III, 20 micron        |
| WR                           | Par-Gel™ Water Removal           |

| BOX 5: Seals |                      |
|--------------|----------------------|
| Symbol       | Description          |
| <b>B</b>     | <b>Nitrile (NBR)</b> |

| BOX 6: Indicator |                                                                    |
|------------------|--------------------------------------------------------------------|
| Symbol           | Description                                                        |
| <b>VP</b>        | <b>Visual indicator, 3-band</b><br>(mounted on Outlet Filter only) |

| BOX 7: Bypass |                                                     |
|---------------|-----------------------------------------------------|
| Symbol        | Description                                         |
| <b>I</b>      | <b>35 PSID (2.4 bar)</b><br>(outlet filter element) |

| BOX 8: Options |                                                        |
|----------------|--------------------------------------------------------|
| Symbol         | Description                                            |
| <b>1</b>       | <b>None</b>                                            |
| 6*             | 20' electrical cord<br>(retractable reel)              |
| 9              | Visual indicator on<br>Inlet Filter                    |
| PD**           | iPD with standard LED<br>Display                       |
| PDL**          | iPD with LCD display and<br>integrated Moisture Sensor |

\* standard with option PD or PDL  
\*\* only available in 10MFP configuration

## Replacement Elements

| Media | Nitrile Seals                            |                                            | Fluorocarbon Seals                       |                                            |
|-------|------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|
|       | Inlet Filter<br>(3 psid integral bypass) | Outlet Filter<br>(35 psid integral bypass) | Inlet Filter<br>(3 psid integral bypass) | Outlet Filter<br>(35 psid integral bypass) |
| 02Q   | N/A                                      | 937397Q                                    | N/A                                      | 937405Q                                    |
| 05Q   | N/A                                      | 937398Q                                    | N/A                                      | 937406Q                                    |
| 10Q   | N/A                                      | 937399Q                                    | N/A                                      | 937407Q                                    |
| 20Q   | 940971Q                                  | 937400Q                                    | 940974Q                                  | 937408Q                                    |
| 40SA  | 940802                                   | N/A                                        | 940972                                   | N/A                                        |
| 40W   | 940803                                   | N/A                                        | 940973                                   | N/A                                        |
| WR    | N/A                                      | 940734                                     | N/A                                      | 940736                                     |



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# Guardian®

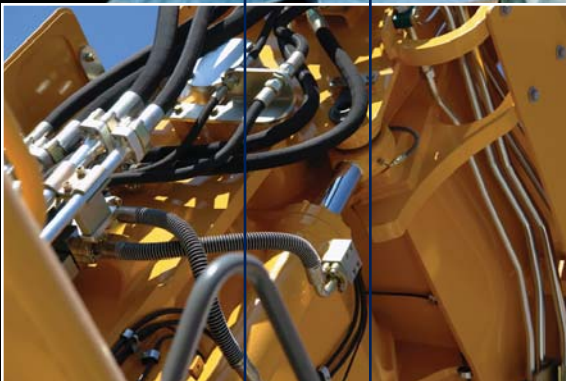
Portable Filtration System



ENGINEERING YOUR SUCCESS.



Ground Support



Hydraulic Service



Mining



The Guardian portable filtration system is a unique pump/motor/filter combination designed for conditioning and transferring petroleum-based and water emulsion fluids. It protects your system from contamination added with new fluid because new fluid is not necessarily clean fluid. Most new fluids right out of the drum are unfit for use due to high initial concentrations of contaminants. Contamination may be added to a new fluid during processing, mixing, handling, and storage.

The Guardian also circulates and “polishes” fluid in your existing systems to reduce the contamination to an acceptable level.

There are literally hundreds of applications that the Guardian is suited for, with more being discovered each day. If your system is sensitive to the harmful effects of contamination, then the Guardian may be ideal for you.

| Features                                                                                     | Advantages                                                                                           | Benefits                                                         |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Lightweight, hand held, compact design (less than 24 lbs 16" X 8" approximate foot print).   | Easy to carry and fits easily on top of 55 gallon drums.                                             | One person operation, capable of getting to hard to reach areas. |
| Flow rate to 4 gpm.                                                                          | Filters and transfers simultaneously.                                                                | One step operation.                                              |
| Powerful pump/motor combination with Carboxylated Nitrile seals standard.                    | Handles fluids up to 16,000 SUS viscosity (11,000 SUS -24 VDC).                                      | Reliable performance in a wide variety of operating conditions.  |
| Built-in relief valve with no downstream fluid bypass.                                       | Only filtered fluid reaches downstream components.                                                   | 100% filtration ensured, even when unattended.                   |
| Wide variety of filter elements available.                                                   | High capacity 2 micron absolute disposable microglass to 74 micron cleanable wire and water removal. | Maximizes element life between changes.                          |
| Clear, wire-reinforced 5' hose assemblies with wand attachments.                             | No additional hardware required.                                                                     | Ready to use and easy to maneuver.                               |
| Optional quick disconnect hose connections.                                                  | Fast, easy setup and tear-down.                                                                      | Eliminates messy drips.                                          |
| Heavy-duty ¼ HP, 115 VAC (230 VAC, 24 VDC- optional) motor with thermal overload protection. | UL recognized and CSA listed, with replaceable brushes.                                              | Safe, reliable performance; field serviceable.                   |
| Gerotor pump with visible serviceable inlet strainer.                                        | Dirt tolerant design with added protection.                                                          | Pump reliability in highly contaminated fluids.                  |
| Quiet operation.                                                                             | Less than 70dB noise level @ 3 feet.                                                                 | Can be used most anywhere with minimal disturbance.              |
| Convenient inlet-to-outlet hose connection.                                                  | Contains fluids when transporting.                                                                   | Clean and safe operation.                                        |
| Low center of gravity.                                                                       | Guardian stability.                                                                                  | Unattended reliability.                                          |
| Dual motor seals.                                                                            | Added motor protection.                                                                              | Longer motor life.                                               |
| Auxiliary inlet/outlet ports.                                                                | Used in place of, or in addition to, standard ports. The outlet can also be used as a sampling port. | Flexibility.                                                     |



Mobile



Industrial



Marine

# Guardian Series

## Installation and Specification Data

**Maximum Allowable Operating Pressure (MAOP):** 50 psi (3.4 bar)

**Flow Capacity:** Up to 4 gpm (15 lpm)

**Maximum Recommended Fluid Viscosity:** (.85 specific gravity)  
110-120 VAC and 24VDC  
16,000 SUS  
11,000 SUS

**Warning:** Explosion hazard. Do not pump flammable liquids such as gasoline, alcohol, solvents, etc.

**Operating Temperatures:**  
Unit: -15°F to 180°F (-26°C to 82°C)  
Wand/Hose: 25°F to 120°F (-4°C to 49°C)

**Visual Indicator:** Differential pressure type, set at 25 psid

**Recommended Fluids:** petroleum based oils, water emulsions, and diesel fuels

**Integral Relief Valve:** set at 50 psi for motor protection.

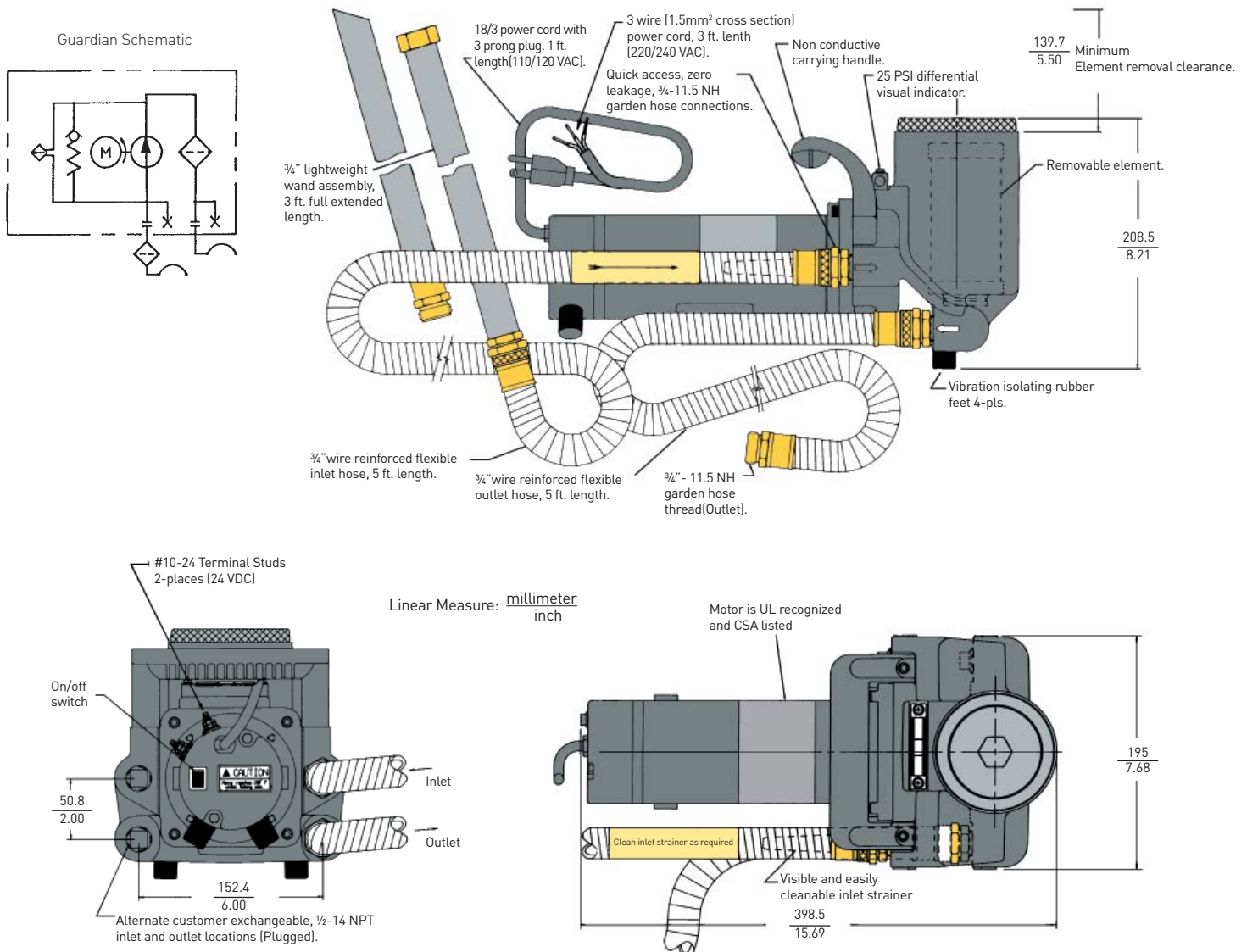
**Noise Level:** <70db at 3 ft.

**Electrical Motor:** ¼ hp@2500 rpm.  
24 VDC; 10A max.  
110-120 VAC; 50/60 Hz; 3A max.  
220-240 VAC; 50/60 Hz; 1.5A max.  
Thermal overload protected.  
Replaceable brushes (500 hours).

**Weight:** approximately 23 lbs. 5 oz.

### Materials:

Housing: cast aluminum  
Cover: die cast aluminum  
Handle and Indicator: nylon  
Wands and Hose: PVC  
Fittings: brass  
Seals: fluorocarbon/  
carboxylated nitrile



# Guardian Series

## Element Performance

| Media Code | Filter Media   | Time Averaged Beta x/y/z =2/20/75<br>Where x/y/z is: | Dirt Capacity (Grams) |
|------------|----------------|------------------------------------------------------|-----------------------|
| 74W        | Woven Wire     | 74 micron <sup>1</sup>                               | *                     |
| 40W        | Woven Wire     | 40 micron <sup>1</sup>                               | *                     |
| 25W        | Woven Wire     | 25 micron <sup>1</sup>                               | *                     |
| 20C        | Cellulose      | 20 micron <sup>1</sup>                               | *                     |
| 10C        | Cellulose      | 5/8/16                                               | 4                     |
| 20Q        | Microglass III | 7.1/13.7/17.3                                        | 16.2                  |
| 10Q        | Microglass III | 2.7/7.3/10.3                                         | 14.4                  |
| 05Q        | Microglass III | <2/2.1/4.0                                           | 14.9                  |
| 02Q        | Microglass III | <2/<2/<2                                             | 14.3                  |

Multipass test run at 4 gpm to 35 psid

<sup>1</sup>Reference ratings only. Not multipass tested due to coarseness.

\* Not applicable

| Beta Rating           | Efficiency at x Particle Size |
|-----------------------|-------------------------------|
| B <sub>x</sub> = 2    | 50.0%                         |
| B <sub>x</sub> = 20   | 95.0%                         |
| B <sub>x</sub> = 75   | 98.7%                         |
| B <sub>x</sub> = 200  | 99.5%                         |
| B <sub>x</sub> = 1000 | 99.9%                         |

## Estimated Guardian Element Life and Cleanliness Levels

The following chart shows typical element life (in gallons of oil passed) and cleanliness levels

achieved by standard Parker elements available with the Guardian. Some assumptions have been made.\*

| Media Code | New Oil ISO | ISO Achieved | Element Life | Elements Used per 250 gallons |
|------------|-------------|--------------|--------------|-------------------------------|
| 10C        | 22/20/16    | 21/19/15     | 120 gallons  | 2.08                          |
| 20Q        | 22/20/16    | 21/19/15     | 486 gallons  | .51                           |
| 10Q        | 22/20/16    | 19/16/14     | 407 gallons  | .61                           |
| 05Q        | 22/20/16    | 17/15/12     | 330 gallons  | .75                           |
| 02Q        | 22/20/16    | 15/13/10     | 316 gallons  | .79                           |

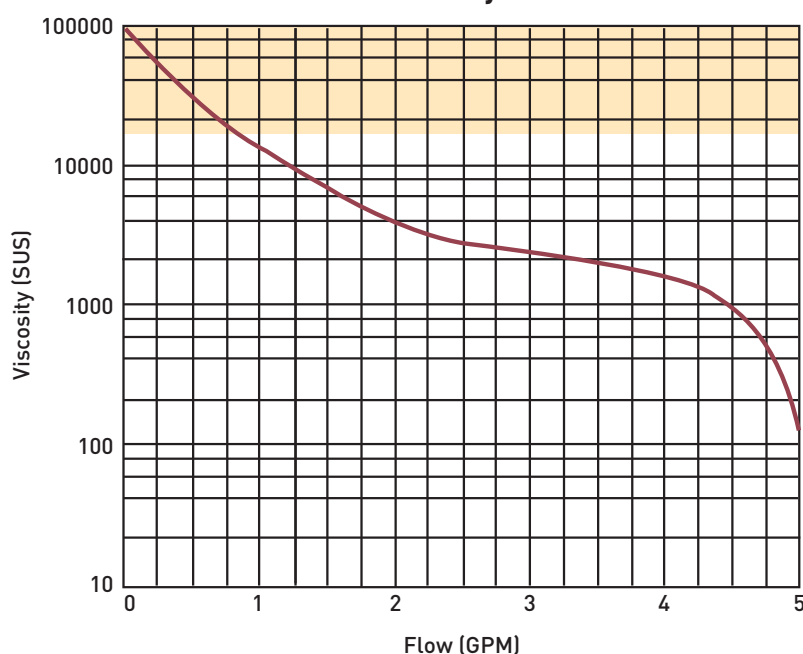
\* 1. New oil is at ISO 22/20/16.

2. No environment or work ingress.

3. Single pass oil transfer.

NOTE: Data for fluid transfer only. For continuous fluid polishing, lower ISO cleanliness levels will be achieved.

## Guardian Flow vs. Viscosity Performance



**Note 1:** Guardian not recommended for fluid viscosities greater than 16,000 SUS (11,000 SUS;24VDC)

**Note 2:** Flows based on Guardian with no element installed

## Guardian Operation

- A. Remove all shipping plugs from the hoses and fittings.
- B. Connect the inlet and outlet hose assemblies to the unit.
- C. Connect the wand assemblies, if required.
- D. Place the inlet hose wand assembly into the fluid to be filtered and/or transferred.
- E. Place the outlet hose/wand assembly into the container where the fluid discharge is desired.
- F. Plug in the unit.
- G. Flip the switch on the end of the unit to the “on” position.

NOTE: For no-mess transportation, the inlet and outlet hose assemblies can be screwed together by removing the wand assembly.

## Guardian Element Servicing

- A. Flip the switch on the end of the unit to the “off” position and disconnect the electrical plug.
- B. Rotate the cover counter-clockwise and remove.
- C. Remove the element from the housing. Discard all disposable elements. These elements are not cleanable.
- D. Place the new element in the housing, fitting the o-ring neck into the large hole at the bottom.
- E. Inspect the cover o-ring and replace if necessary.
- F. Replace the cover and hand-tighten.

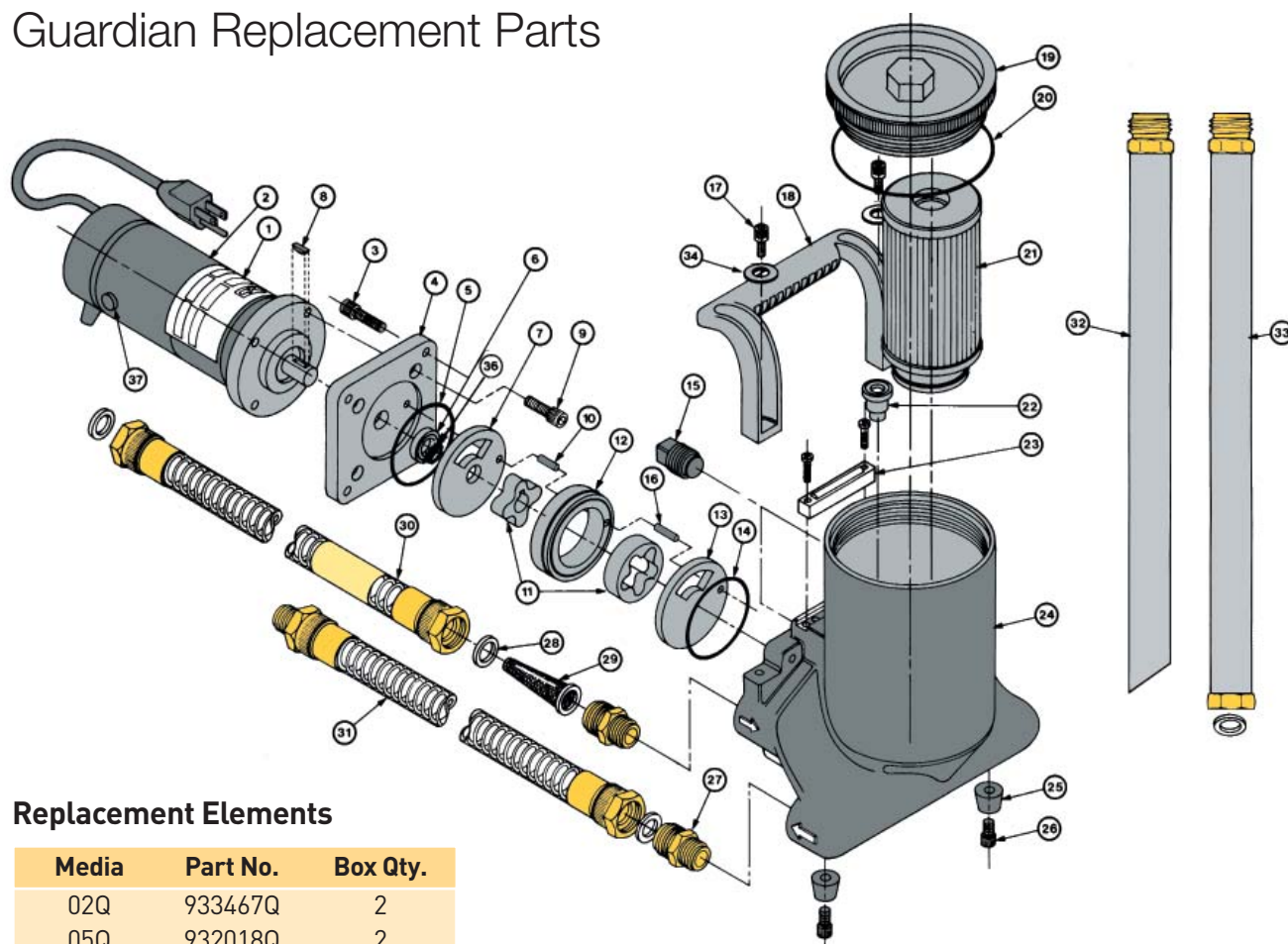
NOTE 1: It is recommended that the Guardian be cleaned and flushed between uses with dissimilar fluids to prevent fluid mixing.

NOTE 2: Motor brushes may require changeout every 500 service hours

## Troubleshooting Guide

| Problem                                       | Cause                                                                                                                                                            | Solution                                                                                                                                                                                                                                                            |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does not start.                               | ON/OFF switch.<br>No electrical power.<br>Rectifier.<br>Motor overheats (160°F).<br>Defective motor.                                                             | Turn switch on, replace switch if defective.<br>Plug in Guardian, check for tripped circuit breakers, check for blown fuses.<br>Replace if defective.<br>Allow motor to cool, thermal overload will automatically reset.<br>Replace motor.                          |
| Does not start or erratic motor noise.        | Worn motor brushes.                                                                                                                                              | Replace motor brushes.                                                                                                                                                                                                                                              |
| Intermittent start/stop operation.            | High viscosity fluids.<br>Worn motor brushes.<br>Defective motor.                                                                                                | High viscosity fluids can cause the motor to overheat and cycle intermittently.<br>Replace motor brushes.<br>Replace motor.                                                                                                                                         |
| Hot motor.                                    | Pumping under heavy load.<br>Defective motor.                                                                                                                    | It is normal, under a heavy pumping load for the motor to reach 160°F.<br>Replace motor if shell temperature reaches greater than 170°F.                                                                                                                            |
| No flow or erratic pump noise.                | Filter housing not filled with oil.<br>Suction leak.<br>Obstructed outlet.<br>Element dirty.<br>Sheared pump key.<br>Defective Guardian.                         | Allow Guardian to run a few seconds.<br>Check tightness of inlet fittings and hoses. Check gaskets are in place and are not damaged. Kink or restriction in the inlet hose.<br>Clear outlet.<br>Replace or clean element.<br>Replace woodruff key.<br>Replace unit. |
| No flow, erratic pump noise, motor overheats. | Gears binding.                                                                                                                                                   | Disassemble Guardian and thoroughly clean the gear set.<br>Always use the inlet strainer provided to protect the unit.<br>Replace defective gears.                                                                                                                  |
| No suction.                                   | Plugged strainer.                                                                                                                                                | Clean or replace the inlet strainer as required.<br>Clean relief valve. Check for damaged internal o-rings.                                                                                                                                                         |
| Reduced oil flow.                             | High viscosity fluids.<br>Element dirty.<br>Relief valve sticks or is lodged open.<br>Partially obstructed inlet or outlet hose.<br>Suction leak.<br>Worn gears. | High viscosity fluids can cause reduced flow, which is normal.<br>Replace or clean element.<br>Clean relief valve or replace if defective.<br>Clear the hose obstruction.<br>Check tightness of inlet fittings and hose.<br>Replace gear set.                       |
| Indicator moves to RED Area.                  | Element dirty.<br>Oil extremely cold or viscous.<br>Obstructed outlet.<br>Defective indicator.                                                                   | Replace or clean element.<br>Change element to coarser micron rating.<br>Clear outlet obstruction.<br>Replace indicator.                                                                                                                                            |
| Indicator does not seem to move.              | No element.<br>Defective indicator.                                                                                                                              | Install element.<br>Replace indicator.                                                                                                                                                                                                                              |
| Hoses discolor or are hard.                   | Fluid compatibility.                                                                                                                                             | Certain fluids, over time, will cause the hoses to discolor. This does not impair their performance. But, some fluids will cause the hoses to become brittle, requiring replacement.                                                                                |
| Oil formation under unit.                     | Defective shaft seal.                                                                                                                                            | Replace the motor shaft seal.                                                                                                                                                                                                                                       |

# Guardian Replacement Parts



## Replacement Elements

| Media | Part No. | Box Qty. |
|-------|----------|----------|
| 02Q   | 933467Q  | 2        |
| 05Q   | 932018Q  | 2        |
| 10Q   | 932017Q  | 2        |
| 20Q   | 933468Q  | 2        |
| 10C   | 932016   | 2        |
| 20C   | 932020   | 2        |
| 25W   | 922627   | 1        |
| 40W   | 922628   | 1        |
| 74W   | 922626   | 1        |
| WR    | 932019   | 2        |

## Parts List

|                                     |                                           |                                       |
|-------------------------------------|-------------------------------------------|---------------------------------------|
| 1. Label..... Consult Factory       | 12. Geroter Ring.....931903               | 25. Rubber Bumpers (2).....931888     |
| 2. Motor, 110-120 VAC.....931913    | 13. Outlet Plate.....931900               | 26. SHCS(2), 1/4-20 x 1/2.....902907  |
| 220-440 VAC.....932381              | 14. Geroter O-ring.....V72135             | 27. Brass Fitting (2).....931928      |
| 24 VDC.....932759                   | 15. Brass Pipe Plug (2) 1/2-14.....931920 | 28. Gasket (4).....931956             |
| 3. SHCS(4), 1/4-20x1.....902734     | 16. Roll Pin 1/8 x 5/8.....903426         | 29. Inlet Screen.....931927           |
| 4. Adapter Plate.....931890         | 17. SHCS (2), 1/4-20 x 5/8.....931889     | 30. Inlet Hose Assembly.....931936    |
| 5. Housing O-Ring.....V72041        | 18. Handle.....931897                     | 31. Outlet Hose Assembly.....931937   |
| 6. Polypak Seal.....931921          | 19. Cover.....931892                      | 32. Wand Crevice Assembly.....931965  |
| 7. Shadow Plate.....931899          | 20. Cover O-Ring.....V72237               | 33. Wand Adapter Assembly.....931966  |
| 8. Woodruff Key 1/8x3/8.....931877  | 21. Element.....                          | 34. Washer (2).....926106             |
| 9. SHCS(4), 1/4-20 x 3/4.....902679 | 22. Relief Valve.....928981               | 35. Quick Disconnect Kit.....932097   |
| 10. Roll Pin 1/8 x 3/4.....903630   | 23. Indicator Kit.....927422              | (Not Shown)                           |
| 11. Geroter Set.....931873          | 24. Housing.....931838                    | 36. Washer.....932085                 |
|                                     |                                           | 37. Brush Kit (110/120).....934329    |
|                                     |                                           | (220/240 VAC).....934327              |
|                                     |                                           | (24 VDC).....932761                   |
|                                     |                                           | <b>Seal Kit</b> .....932263           |
|                                     |                                           | <b>Bowl Extension Kit</b> .....932081 |

NOTE: SHCS denotes "socket head cap screw"

# Guardian Series

## How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

| BOX 1 | BOX 2      | BOX 3      | BOX 4    |
|-------|------------|------------|----------|
|       | <i>GT4</i> | <i>10C</i> | <i>1</i> |

### BOX 1: Seals

| Symbol      | Description                            |
|-------------|----------------------------------------|
| <b>None</b> | <b>Carboxylated Nitrile (Standard)</b> |

Note: Consult factory for fluids not compatible with fluorocarbon.

### BOX 2: Model

| Symbol     | Description                  |
|------------|------------------------------|
| <b>GT4</b> | <b>Guardian® 110/120 VAC</b> |
| GT4D       | 24VDC                        |
| GT4E       | 220/240 VAC                  |

### BOX 3: Media

| Symbol     | Description      |
|------------|------------------|
| 74W        | Wire Mesh        |
| 40W        | Wire Mesh        |
| 25W        | Wire Mesh        |
| <b>10C</b> | <b>Cellulose</b> |
| 20Q        | Microglass III   |
| 10Q        | Microglass III   |
| 05Q        | Microglass III   |
| 02Q        | Microglass III   |
| WR         | Water Removal    |

### BOX 4: Options

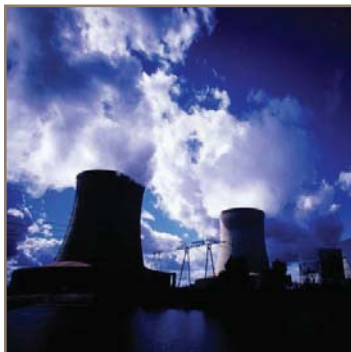
| Symbol   | Description                       |
|----------|-----------------------------------|
| <b>1</b> | <b>None</b>                       |
| 6        | Quick disconnect hose connections |

Please note the bolded options reflect standard options with a reduced lead-time. Consult factory on all other lead-time options.





aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# Portable Purification Systems

Models PVS 185, 600, 1200, 1800, 2700



ENGINEERING YOUR SUCCESS.

# PVS Series

## Principles of Operation

Contaminated oil is drawn into the Parker Portable Purification System by a vacuum of 25 In/Hg. The oil passes through the in-line low watt density heater where the oil is heated to an optimum temperature of 150° F (66°C).

The oil then enters the distillation column where it is exposed to the vacuum through the use of special dispersal elements. This increases the exposed surface area of the oil and converts the water to vapor form, which is then drawn through the condenser by the vacuum pump.

The water-free oil falls to the bottom of the column and is removed by a heavy duty lube oil pump. This pump forces the dry oil through a final particulate removal filter. Clean oil passes out of the unit, back to the reservoir — and into the system.

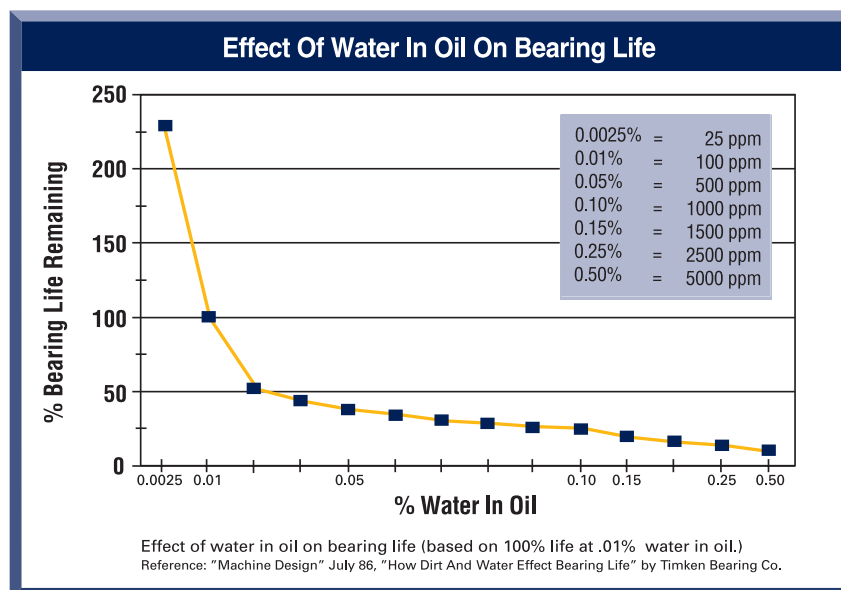
### Effects of Water Contamination

Water is one of the most common contaminants in a fluid system and one of the most damaging. When water contaminates a system, it can cause serious problems such as:

- Corrosion by etching metal
- Fluid breakdown, reduction of lubricating properties, additive precipitation, and oil oxidation
- Reduced dielectric strength
- Abrasive wear in hydraulic components

| Typical Saturation Points |     |       |
|---------------------------|-----|-------|
| Fluid Type                | PPM | %     |
| Hydraulic Fluid           | 300 | .03%  |
| Lubrication Fluid         | 400 | .04%  |
| Transformer Fluid         | 50  | .005% |

Free water occurs when oil becomes saturated and cannot hold any more water. This water is usually seen as cloudy oil or puddles of water at the bottom of an oil reservoir. Water which is absorbed into the oil is called dissolved water. At higher temperatures, oil has the ability to hold more water in the dissolved stage due to the expansion of oil molecules. As the oil cools, this ability reverses and free water will appear where not visible before. In addition to temperature, fluid type also determines the saturation point for your system (see chart above).



# PVS Series

## Applications

- Hydraulic Systems
- Lubrication Systems
- Turbine Oil
- Transformer Oil
- New Oil (oil storage)
- Seal Oil
- Explosion Proof

## Environments



NEMA 7 Explosion Proof

## Markets

- Power Generation
- Pulp and Paper
- Primary Metals
- Mining
- Plastic Injection Molding
- Oil Exploration
- Petrochemical
- Automotive
- Aerospace
- Refineries
- Transportation

| Standard Features                                                 | Advantages                                                                                                           | Benefits                                                                                                       |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Variable flow circuit                                             | <ul style="list-style-type: none"> <li>• Allows oil to heat more quickly so water is removed faster</li> </ul>       | <ul style="list-style-type: none"> <li>• Time savings</li> </ul>                                               |
| Moisture sensor                                                   | <ul style="list-style-type: none"> <li>• Real-time water content indication in % saturation</li> </ul>               | <ul style="list-style-type: none"> <li>• At-a-glance visual confirmation</li> </ul>                            |
| Automatic operation                                               | <ul style="list-style-type: none"> <li>• Unattended use</li> <li>• Designed for 24/7 operation</li> </ul>            | <ul style="list-style-type: none"> <li>• Reduces labor costs</li> <li>• Increases operation time</li> </ul>    |
| 316 Stainless steel used for primary wetted surfaces              | <ul style="list-style-type: none"> <li>• No corrosion</li> </ul>                                                     | <ul style="list-style-type: none"> <li>• Product reliability</li> </ul>                                        |
| Ecoglass particulate element                                      | <ul style="list-style-type: none"> <li>• Coreless, non-metallic construction</li> </ul>                              | <ul style="list-style-type: none"> <li>• Environmentally friendly, easy disposal</li> </ul>                    |
| Clear plexiglass covers on the condensate tank and vacuum chamber | <ul style="list-style-type: none"> <li>• See the vacuum dehydration process work</li> </ul>                          | <ul style="list-style-type: none"> <li>• Visual verification of water removal</li> </ul>                       |
| Desiccant breather                                                | <ul style="list-style-type: none"> <li>• Insures dry, clean intake air</li> </ul>                                    | <ul style="list-style-type: none"> <li>• More efficient operation</li> </ul>                                   |
| Reverse phase switch                                              | <ul style="list-style-type: none"> <li>• Enables easy changing of motor rotation if out-of-phase</li> </ul>          | <ul style="list-style-type: none"> <li>• Ease of maintenance</li> <li>• Prevents incorrect rotation</li> </ul> |
| Condensate holding tank with optional auto drain                  | <ul style="list-style-type: none"> <li>• Large volume for infrequent servicing intervals</li> </ul>                  | <ul style="list-style-type: none"> <li>• Reduces maintenance costs</li> </ul>                                  |
| Programmable thermostat                                           | <ul style="list-style-type: none"> <li>• Maintains oil within 1°F</li> <li>• Prevents overheating the oil</li> </ul> | <ul style="list-style-type: none"> <li>• Unattended operation</li> </ul>                                       |
| Forklift guides and lifting eyes                                  | <ul style="list-style-type: none"> <li>• Provides safe and secure method of lifting the unit</li> </ul>              | <ul style="list-style-type: none"> <li>• Employee safety</li> </ul>                                            |
| Coalescing or packed tower oil dispersal elements                 | <ul style="list-style-type: none"> <li>• Flexibility with various fluid viscosities</li> </ul>                       | <ul style="list-style-type: none"> <li>• Greater efficiency in removing moisture</li> </ul>                    |

# PVS Series

## Vacuum Dehydration Performance

| Potential Contaminant | PVS Performance                                                    |
|-----------------------|--------------------------------------------------------------------|
| Solid particulate     | ISO Cleanliness Code* 14/13/10 Attainable                          |
| Water                 | Removes 100% of free water, 90% of dissolved water                 |
| Air/Gases             | Removes 100% of free air and gases, 90% of dissolved air and gases |

\*When utilizing 02Q media.

| Typical Performance |                                                   |
|---------------------|---------------------------------------------------|
| Tank Size           | 60 Gallons (227 liters)                           |
| Run Time            | 62 minutes                                        |
| Parker Model        | PVS 600 (10 GPM)                                  |
| Water Content (ppm) | Start: 10,000 PPM (1.0%)<br>Stop: 50 PPM (0.005%) |
| Contamination Level | Start: ISO 21/18/16<br>Stop: ISO 16/14/11         |



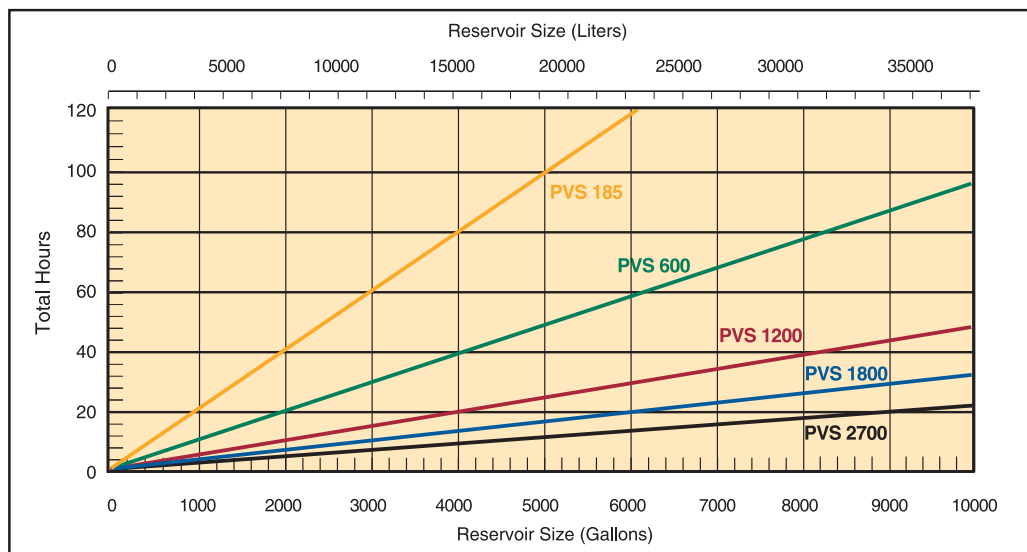
## PVS (Vacuum Dehydration) Compared to Other Technologies

**Centrifuge units** – Removes free water only; has difficulty breaking stable emulsions; larger envelope dimensions but lower flows; higher initial and operating costs.

**Desiccant units** – Have limited water removal capability due to absorbing material; only removes air ingressed particles; expensive compared to the volume of water removed.

**Coalescer units** – Removes free water only; has difficulty breaking stable emulsions; does not work well in viscous fluids (>100 sus); much larger in size compared to PVS.

**Estimated Water Removal Time  
5000 ppm (0.5%) to 150 ppm (0.015%)**



# PVS 185 Series

## Specifications

|                            |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Flow rate                  | 5 gpm (18.9 lpm)                                                |
| Dimensions                 | 65" H x 33" W x 48" L<br>(1651mm x 838mm x 1219mm)              |
| Weight                     | 650 lbs. (295 kg)                                               |
| Seal material              | Fluorocarbon (EPR optional)                                     |
| Condensate tank            | 4.1 gal (15.5 ltrs)                                             |
| Dispersal elements         | 1                                                               |
| Minimum operating capacity | 5 gal (18.9 ltrs)                                               |
| Vacuum (max)               | 25 In/Hg                                                        |
| Viscosity (max)            | 500 sus (108 cSt)-Disposable<br>2150 sus (460 cSt)-Packed Tower |
| Outlet pressure (max)      | 60 psi (4.1 bar)                                                |
| Ports                      | 3/4" JIC (male) inlet<br>3/4" JIC (male) outlet                 |
| FLA (full load amps)       | 15-41 amps<br>(Depending on options & voltages)                 |
| <b>Shipping Weight</b>     | 1400 lbs. (635 kg) maximum                                      |
| <b>Shipping Dimensions</b> | 70" H x 48" W x 60" L<br>(1778mm x 1219mm x 1524mm)             |



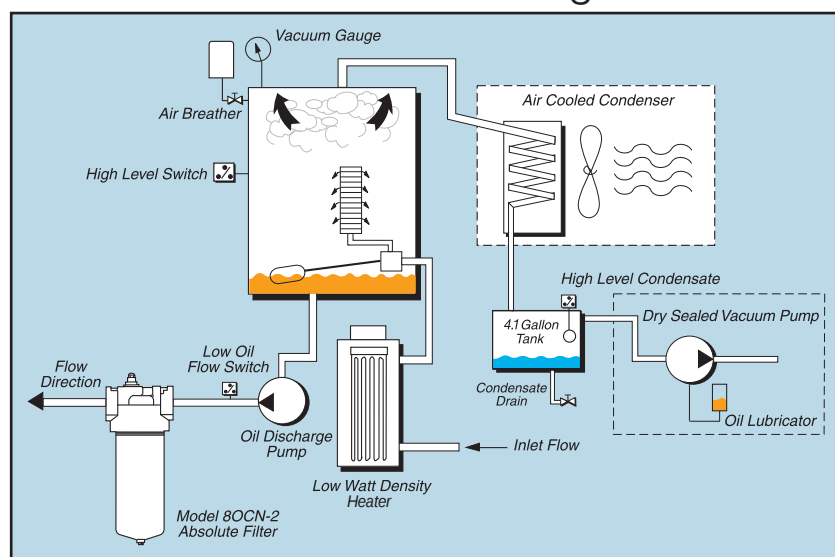
Note: Dimensions and weights are approximate and for reference only.

## Replacement Elements

| Standard Coreless Particulate (80CN-2) |         |
|----------------------------------------|---------|
| 02QE (2 micron)                        | 936716Q |
| 05QE (5 micron)                        | 936717Q |
| 10QE (10 micron)                       | 936718Q |
| 20QE (20 micron)                       | 936719Q |
| Optional Coreless Particulate (IL8-3)  |         |
| 02QE (2 micron)                        | 933734Q |
| 05QE (5 micron)                        | 933612Q |
| 10QE (10 micron)                       | 933735Q |
| 20QE (20 micron)                       | 933736Q |
| Dispersal                              |         |
| Disposable (Coalescing)                | 933180  |
| Packed tower (Cleanable)               | 933553  |

UL and CUL Marked

## PVS 185 Flow Diagram



# PVS 600 Series

## Specifications

|                            |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Flow rate                  | 10 gpm (37.9 lpm)                                               |
| Dimensions                 | 65" H x 33" W x 48" L<br>(1651mm x 838mm x 1219mm)              |
| Weight                     | 900 lbs. (408.2 kg)                                             |
| Seal material              | Fluorocarbon (EPR optional)                                     |
| Condensate tank            | 4.1 gal (15.5 ltrs)                                             |
| Dispersal elements         | 2                                                               |
| Minimum operating capacity | 6 gal (22.7 ltrs)                                               |
| Vacuum (max)               | 25 In/Hg                                                        |
| Viscosity (max)            | 500 sus (108 cSt)-Disposable<br>2150 sus (460 cSt)-Packed Tower |
| Outlet pressure (max)      | 60 psi (4.1 bar)                                                |
| Ports                      | 1" JIC (male) inlet<br>1" JIC (male) outlet                     |
| FLA (full load amps)       | 24-38 amps<br>(Depending on options & voltages)                 |
| <b>Shipping Weight</b>     | 1500 lbs. (680 kg) maximum                                      |
| <b>Shipping Dimensions</b> | 70" H x 48" W x 60" L<br>(1778mm x 1219mm x 1524mm)             |



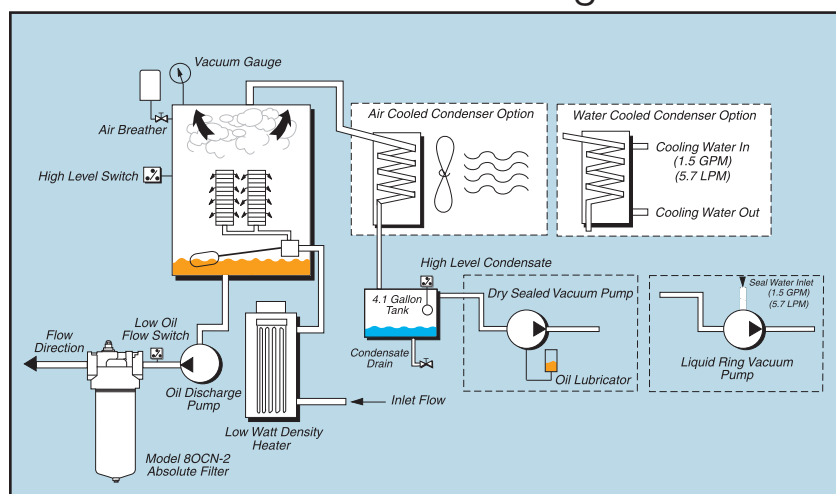
Note: Dimensions and weights are approximate and for reference only.

## Replacement Elements

| Standard Coreless Particulate (80CN-2) |         |
|----------------------------------------|---------|
| 02QE (2 micron)                        | 936716Q |
| 05QE (5 micron)                        | 936717Q |
| 10QE (10 micron)                       | 936718Q |
| 20QE (20 micron)                       | 936719Q |
| Optional Coreless Particulate (IL8-3)  |         |
| 02QE (2 micron)                        | 933734Q |
| 05QE (5 micron)                        | 933612Q |
| 10QE (10 micron)                       | 933735Q |
| 20QE (20 micron)                       | 933736Q |
| Dispersal                              |         |
| Disposable (Coalescing)                | 933180  |
| Packed tower (Cleanable)               | 933553  |

UL and CUL Marked

## PVS 600 Flow Diagram



# PVS 1200 Series

## Specifications

|                            |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Flow rate                  | 20 gpm (75.7 lpm)                                               |
| Dimensions                 | 65" H x 44" W x 61" L<br>(1651mm x 1118mm x 1549mm)             |
| Weight                     | 1550 lbs. (703 kg)                                              |
| Seal material              | Fluorocarbon (EPR optional)                                     |
| Condensate tank            | 8.3 gal (31.4 ltrs)                                             |
| Dispersal elements         | 4                                                               |
| Minimum operating capacity | 11 gal (41.6 ltrs)                                              |
| Vacuum (max)               | 25 In/Hg                                                        |
| Viscosity (max)            | 500 sus (108 cSt)-Disposable<br>2150 sus (460 cSt)-Packed Tower |
| Outlet pressure (max)      | 60 psi (4.1 bar)                                                |
| Ports                      | 1½" JIC (male) inlet<br>1" JIC (male) outlet                    |
| FLA (full load amps)       | 30-48 amps<br>(Depending on options & voltages)                 |
| <b>Shipping Weight</b>     | 2300 lbs. (1043 kg) maximum                                     |
| <b>Shipping Dimensions</b> | 70" H x 48" W x 65" L<br>(1778mm x 1651mm x 1524mm)             |



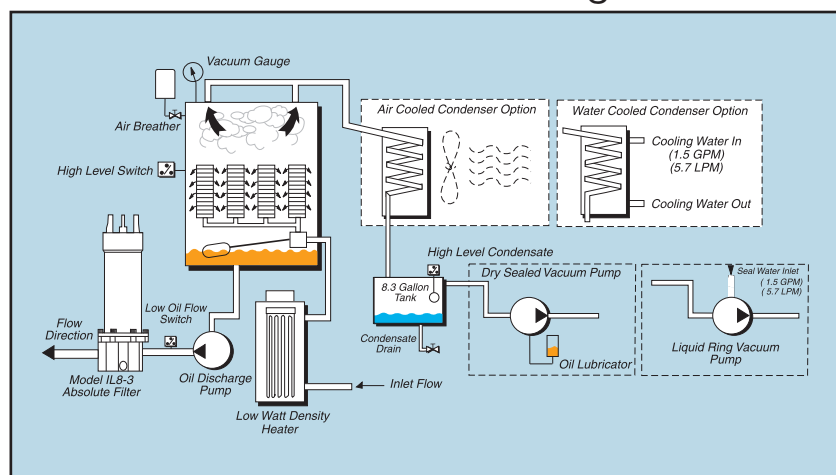
Note: Dimensions and weights are approximate and for reference only.

UL and CUL Marked

## Replacement Elements

| Standard Coreless Particulate (IL8-3) |         |
|---------------------------------------|---------|
| 02QE (2 micron)                       | 933734Q |
| 05QE (5 micron)                       | 933612Q |
| 10QE (10 micron)                      | 933735Q |
| 20QE (20 micron)                      | 933736Q |
| Dispersal                             |         |
| Disposable (Coalescing)               | 933180  |
| Packed tower (Cleanable)              | 933553  |

## PVS 1200 Flow Diagram



# PVS 1800 Series

## Specifications

|                            |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Flow rate                  | 30 gpm (113.6 lpm)                                              |
| Dimensions                 | 68" H x 42" W x 75" L<br>(1727mm x 1067mm x 1905mm)             |
| Weight                     | 2550 lbs. (1157 kg)                                             |
| Seal material              | Fluorocarbon (EPR optional)                                     |
| Condensate tank            | 8.3 gal (31.4 ltrs)                                             |
| Dispersal elements         | 8                                                               |
| Minimum operating capacity | 18 gal ( 68.1 ltrs)                                             |
| Vacuum (max)               | 25 In/Hg                                                        |
| Viscosity (max)            | 500 sus (108 cSt)-Disposable<br>2150 sus (460 cSt)-Packed Tower |
| Outlet pressure (max)      | 60 psi (4.1 bar)                                                |
| Ports                      | 2" JIC (male) inlet<br>1.5" JIC (male) outlet                   |
| FLA (full load amps)       | 40-65 amps @ 460 V/60hz                                         |
| <b>Shipping Weight</b>     | 3000 lbs. (1361 kg) maximum                                     |
| <b>Shipping Dimensions</b> | 70" H x 48" W x 80" L<br>(1778mm x 1219mm x 2032mm)             |

Note: Dimensions and weights are approximate and for reference only.

## Replacement Elements

| Standard Coreless Particulate (IL8-3) |         |
|---------------------------------------|---------|
| 02QE (2 micron)                       | 933734Q |
| 05QE (5 micron)                       | 933612Q |
| 10QE (10 micron)                      | 933735Q |
| 20QE (20 micron)                      | 933736Q |
| Dispersal                             |         |
| Disposable (Coalescing)               | 933180  |
| Packed tower (Cleanable)              | 933553  |



UL and CUL Marked

# PVS 2700 Series

## Specifications

|                            |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| Flow rate                  | 45 gpm (170.3 lpm)                                              |
| Dimensions                 | 65" H x 42" W x 75" L<br>(1727mm x 1067mm x 1905mm)             |
| Weight                     | 2550 lbs. (1157 kg)                                             |
| Seal material              | Fluorocarbon (EPR optional)                                     |
| Condensate tank            | 8.3 gal (31.4 ltrs)                                             |
| Dispersal elements         | 8                                                               |
| Minimum operating capacity | 18 gal ( 68.1 ltrs)                                             |
| Vacuum (max)               | 25 In/Hg                                                        |
| Viscosity (max)            | 500 sus (108 cSt)-Disposable<br>2150 sus (460 cSt)-Packed Tower |
| Outlet pressure (max)      | 60 psi (4.1 bar)                                                |
| Ports                      | 3" JIC (male) inlet<br>2" JIC (male) outlet                     |
| FLA (full load amps)       | 50-70 amps @ 460 V/60hz                                         |
| <b>Shipping Weight</b>     | 3000 lbs. (1361 kg) maximum                                     |
| <b>Shipping Dimensions</b> | 70" H x 48" W x 80" L<br>(1778mm x 1219mm x 2032mm)             |

## Replacement Elements

| Standard Coreless Particulate (IL8-3) |         |
|---------------------------------------|---------|
| 02QE (2 micron)                       | 933734Q |
| 05QE (5 micron)                       | 933612Q |
| 10QE (10 micron)                      | 933735Q |
| 20QE (20 micron)                      | 933736Q |
| Dispersal                             |         |
| Disposable (Coalescing)               | 933180  |
| Packed tower (Cleanable)              | 933553  |

Note: Dimensions and weights are approximate and for reference only.



UL and CUL Marked

# PVS Series

## Specification Worksheet

1. Application: \_\_\_\_\_
2. Fluid Type: \_\_\_\_\_ Brand: \_\_\_\_\_  
Grade: \_\_\_\_\_ Specific Gravity: \_\_\_\_\_
3. Viscosity:   Min \_\_\_\_\_ SUS/cSt @ \_\_\_\_\_ °F/°C  
                  Max \_\_\_\_\_ SUS/cSt @ \_\_\_\_\_ °F/°C  
                  Normal \_\_\_\_\_ SUS/cSt @ \_\_\_\_\_ °F/°C
4. Contamination level:   Current ISO level \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
                                  Desired ISO level \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_
5. Water concentration:   Current PPM level \_\_\_\_\_  
                                  Desired PPM level \_\_\_\_\_
6. Suction head:   Positive/Negative \_\_\_\_\_ Ft./meters \_\_\_\_\_
7. Operating distance: \_\_\_\_\_ Ft./meters \_\_\_\_\_
8. System fluid operating temperature: \_\_\_\_\_ °F/°C   Is there a cooler? \_\_\_\_\_
9. Operating environment air temperature: (air cooled model)  
                                  Min \_\_\_\_\_ °F/°C  
                                  Max \_\_\_\_\_ °F/°C  
                                  Normal \_\_\_\_\_ °F/°C
10. Water supply temperature: (liquid ring model)  
                                  Min \_\_\_\_\_ °F/°C  
                                  Max \_\_\_\_\_ °F/°C  
                                  Normal \_\_\_\_\_ °F/°C
11. Operating environment above/below sea level: \_\_\_\_\_ Ft./meters
12. Voltage options:   • 230VAC, 3P, 60Hz (185, 600)  
                              • 380VAC, 3P, 50Hz (185, 600, 1200, 1800, 2700)  
                              • 460VAC, 3P, 60Hz (185, 600, 1200, 1800, 2700)  
                              • 575VAC, 3P, 60Hz (185, 600, 1200, 1800, 2700)
13. Available amperage: \_\_\_\_\_
14. Reservoir volume: \_\_\_\_\_
15. Special requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
16. Any previous filtration problems with the application: \_\_\_\_\_
17. PVS model selected: \_\_\_\_\_

**NOTE: Specification sheet must be completed before order can be entered.**

# PVS Series

## How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

| BOX 1 | STD | BOX 2 | BOX 3 | BOX 4 | BOX 5 | BOX 6 | BOX 7 | BOX 8 | BOX 9         |
|-------|-----|-------|-------|-------|-------|-------|-------|-------|---------------|
|       | PVS | 600   | 460   | DS    | D     | 10QE  | 12    | AC    | ACD<br>DFL CR |

| BOX 1: Seals |              |
|--------------|--------------|
| Symbol       | Description  |
| None         | Fluorocarbon |
| E8           | EPR          |

| BOX 2: Base Unit Flow rate |                    |
|----------------------------|--------------------|
| Symbol                     | Description        |
| 185                        | 5 GPM (18.9 lpm)   |
| 600                        | 10 GPM (37.9 lpm)  |
| 1200                       | 20 GPM (75.7 lpm)  |
| 1800                       | 30 GPM (113.6 lpm) |
| 2700                       | 45 GPM (170.3 lpm) |

| BOX 3: POWER SUPPLY * |        |                  |
|-----------------------|--------|------------------|
| Model                 | Symbol | Description      |
| 185                   | 230    | 230VAC, 3P, 60HZ |
|                       | 380    | 380VAC, 3P, 50HZ |
|                       | 460    | 460VAC, 3P, 60HZ |
|                       | 575    | 575VAC, 3P, 60HZ |
| 600                   | 380    | 380VAC, 3P, 50HZ |
|                       | 460    | 460VAC, 3P, 60HZ |
|                       | 575    | 575VAC, 3P, 60HZ |
| 1200                  | 380    | 380VAC, 3P, 50HZ |
|                       | 460    | 460VAC, 3P, 60HZ |
|                       | 575    | 575VAC, 3P, 60HZ |
| 1800                  | 380    | 380VAC, 3P, 50HZ |
|                       | 460    | 460VAC, 3P, 60HZ |
|                       | 575    | 575VAC, 3P, 60HZ |
| 2700                  | 380    | 380VAC, 3P, 50HZ |
|                       | 460    | 460VAC, 3P, 60HZ |
|                       | 575    | 575VAC, 3P, 60HZ |

\*Consult factory for special voltages.

| BOX 4: Vacuum Pump |             |
|--------------------|-------------|
| Symbol             | Description |
| DS                 | Dry sealed  |
| LR                 | Liquid ring |

| BOX 5: Dispersal Element |                          |
|--------------------------|--------------------------|
| Symbol                   | Description              |
| D                        | Coalescing (disposable)  |
| P                        | Packed tower (cleanable) |

| BOX 6: Particulate Element |                         |
|----------------------------|-------------------------|
| Symbol                     | Pressure Setting        |
| 02QE                       | Ecoglass III, 2 micron  |
| 05QE                       | Ecoglass III, 5 micron  |
| 10QE                       | Ecoglass III, 10 micron |
| 20QE                       | Ecoglass III, 20 micron |

Note: Above elements are rated for Beta 200+ (99.5% efficiency)

| BOX 7: Heater |        |               |
|---------------|--------|---------------|
| Model         | Symbol | Description   |
| 185           | 12     | 12 KW/3 phase |
|               | 24     | 24 KW/3 phase |
|               | 36     | 36 KW/3 phase |
| 600           | 12     | 12 KW/3 phase |
|               | 24     | 24 KW/3 phase |
|               | 36     | 36 KW/3 phase |
| 1200          | 24     | 24 KW/3 phase |
|               | 36     | 36 KW/3 phase |
|               | 48     | 48 KW/3 phase |
| 1800          | 36     | 36 KW/3 phase |
|               | 48     | 48 KW/3 phase |
| 2700          | 48     | 48 KW/3 phase |

| BOX 8: Condenser |                      |
|------------------|----------------------|
| Symbol           | Description          |
| AC               | Air cooled           |
| LC               | Liquid cooled        |
| BC               | Air and water cooled |

| BOX 9: Options* |                                                          |
|-----------------|----------------------------------------------------------|
| Symbol          | Description                                              |
| 3HP             | 3HP High Viscosity Circuit                               |
| 5DW             | 5" Diameter Wheels                                       |
| ACD             | Auto Condensate Drain                                    |
| CDC             | Condensate Drain Counter                                 |
| CE              | CE Marked                                                |
| CF              | Carbon Exhaust Filter                                    |
| CR              | Cable Reel                                               |
| DFL             | Dirty Filter Light                                       |
| DPG             | Differential pressure gauge                              |
| EX1             | Explosion Proof<br>(Class I, Division I, Zone I and II)  |
| EX2             | Explosion Proof<br>(Class I, Division II, Zone I and II) |
| NM7             | NEMA 7 Explosion Proof                                   |
| ICV             | Inlet Control Valve                                      |
| IL8             | Upgrade to IL8-3 coreless filter                         |
| PNW             | Pneumatic Wheels                                         |
| RHM             | Resetable Hour Meter                                     |
| SFI             | Sight Flow Indicator                                     |
| PD              | LED Particle Detector                                    |
| PDL             | LCD Particle Detector                                    |
| NYM             | No Yellow Metals                                         |

\* Consult factory for other options.

Global products as identified are offered worldwide through all Parker locations and utilize a common ordering code.



[illegible]



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# SMR Series

Submicronic Removal  
Fluid Purification Systems



ENGINEERING YOUR SUCCESS.

# SMR Series

## Applications

The SMR Series is the smart purification solution for fluid flow in the 2-10 GPM (8 - 38 LPM) range. The SMR contains patented Balanced Charge Agglomeration (BCA™) technology, which maintains hydraulic and lubricating fluids in optimum condition while preventing/removing the build-up of sludge and varnish. The system is available in a PLC or simplified control version.

Balanced Charge Agglomeration (BCA™) technology does not remove water, however with the removal of thousands of sub-micron particles, the majority of sites where water can readily attach are mitigated. Water is more easily separated and removed, improving demulsibility.

- **Power Generation**

- Steam & Gas Turbine
- hydraulics & lubrication

- **Oil & Gas**

- Compressor/Turbine hydraulics & lubrication

- **Pulp & Paper**

- Lube oil
- Hydraulics

- **Manufacturing**

- Hydraulics
- Lubrication
- EDM
- Injection molders

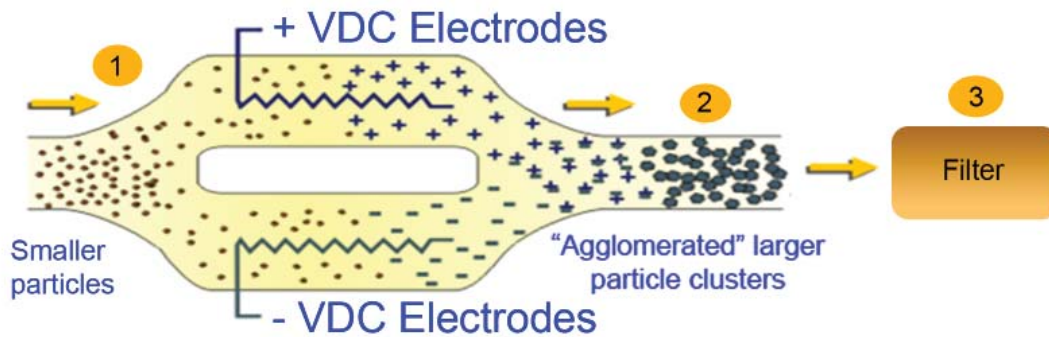
- **Others**

- Cooking oil
- Gear oil
- Fuels
- Bio fuels
- Steel
- Military



# SMR Series

## Balanced Charge Agglomeration (BCA™) - How the Technology Works



- 1** Particles are passed across high-voltage electrodes, inducing a charge on the particles (+) and (-) in separate paths.
- 2** Oppositely charged particles are mixed and are attracted to each other, forming larger particle clusters.
- 3** Particle clusters are more efficiently filtered.

## Evaluation of the SMR Process - Actual Test Results

- Varnish is stripped from the hydraulic or lubrication system as fluid is processed through the SMR.
- The varnish is suspended in the hydraulic fluid as sub-micron particulate.
- BCA™ develops larger particles (see graphic above).
- The particulate is effectively removed from the hydraulic or lubrication fluid by high efficiency filters.



Result 1



Result 2



Result 3



Result 4



Result 5



Result 6



Result 7



Result 8



Result 9



Result 10

Results from a 10 month field trial

# SMR Series

## Features and Benefits

- Contaminant Removal to the Sub-Micron Level
- Prevention and Removal of Sludge and Varnish
- Removal of Oxidation Byproducts and Biological Contamination
- Removal of Ferrous and Non-Ferrous Contaminants

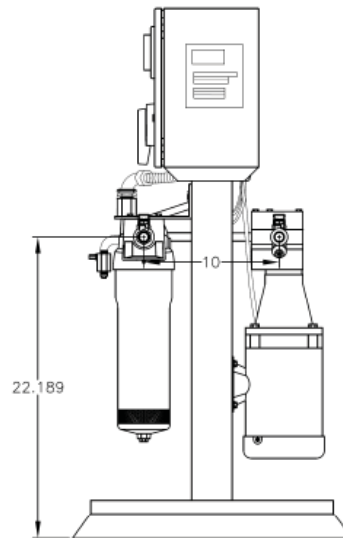
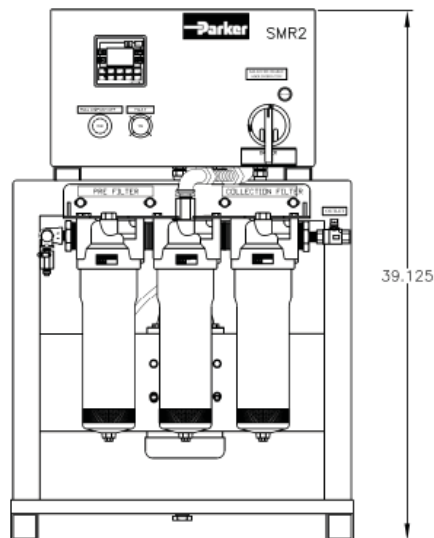
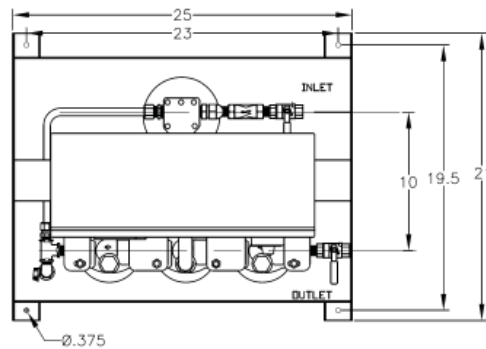
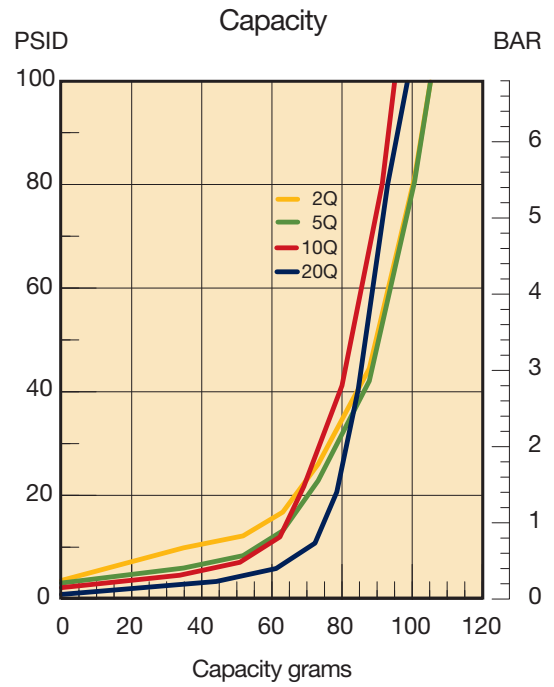
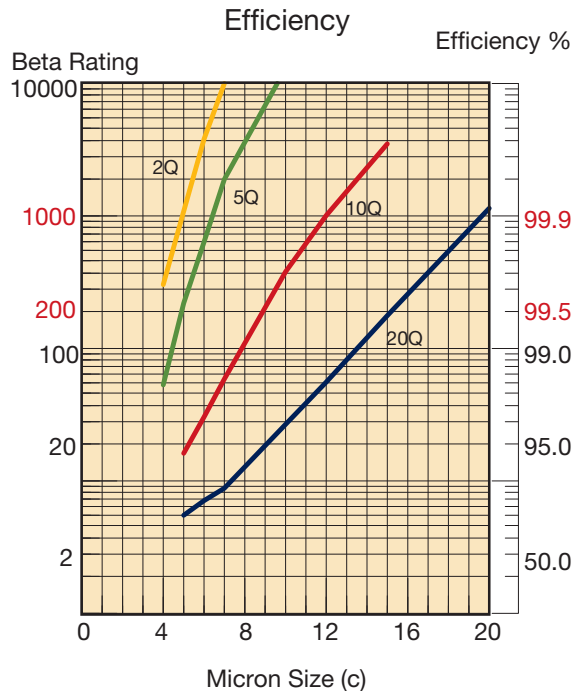
### The Parker SMR Benefit

- Unmatched Fluid Purification & System Polishing
- Proven Varnish Removal
- PLC Control & Data Tracking
- OEM Approvals



# SMR2

## Element Performance



Dimensions are in inches.

Drawings are for reference only.  
Contact factory for current version.

# SMR2

## Specifications

### Fluid

Viscosity: 1,020 SUS (220 cSt) maximum  
Maximum Pressure: 50/80 PSI (operating/static)  
Minimum Fluid Temperature: 65° F (18° C)  
Maximum Fluid Temperature: 200° F (93° C)  
Minimum Fluid Flash Point: >140° F (60° C)

### Power

Customer Provided  
Voltage: 110VAC/1Ph/60Hz, 230VAC/3Ph/60Hz, 460VAC/3Ph/60Hz  
Phase: 1/3  
Frequency 60Hz

### Motor

Power: 0.5 HP  
Voltage/Ph/Freq: 0-230/460/3/variable  
RPM: 0 to 2000

### Pump

Positive Displacement - Variable Frequency Drive (VFD)  
Design Flow Rate: 0.5 - 2.5 GPM

| <b>Parameter Settings</b>               |                          |                   |                    |
|-----------------------------------------|--------------------------|-------------------|--------------------|
| Parameter                               | Default                  | Minimum           | Maximum            |
| Flow                                    | <b>2 GPM [7.58 LPM]</b>  | 0.5 GPM [1.9 LPM] | 2.5 GPM [9.45 LPM] |
| Shutdown Pressure                       | <b>70 psi [4.82 bar]</b> | 0 psi/bar         | 75 psi [5.17 bar]  |
| Max Operating Pressure                  | <b>50 psi [3.4 bar]</b>  | 0 psi/bar         | 60 psi [4.13 bar]  |
| Min Operating Pressure                  | <b>0 psi [0.0 bar]</b>   | 0 psi/bar         | 5 psi [0.34 bar]   |
| Maximum Temperature                     | <b>200° F [93.3°C]</b>   | 35° F [1.6°C]     | 200° F [93.3°C]    |
| Minimum Temperature                     | <b>35° F [1.5°C]</b>     | 35° F [1.6°C]     | 200° F [93.3°C]    |
| Upstream Filter Delta-P                 | <b>15 psi [1.0 bar]</b>  | 5 psi [0.34 bar]  | 25 psi [1.7 bar]   |
| Downstream Filter Delta-P               | <b>10 psi [0.67 bar]</b> | 5 psi [0.34 bar]  | 25 psi [1.7 bar]   |
| Auto-Restart after power loss           | <b>OFF</b>               | n/a               | n/a                |
| Auto-Restart after temperature shutdown | <b>OFF</b>               | n/a               | n/a                |
| US or Metric units                      | <b>US</b>                |                   |                    |

# SMR2

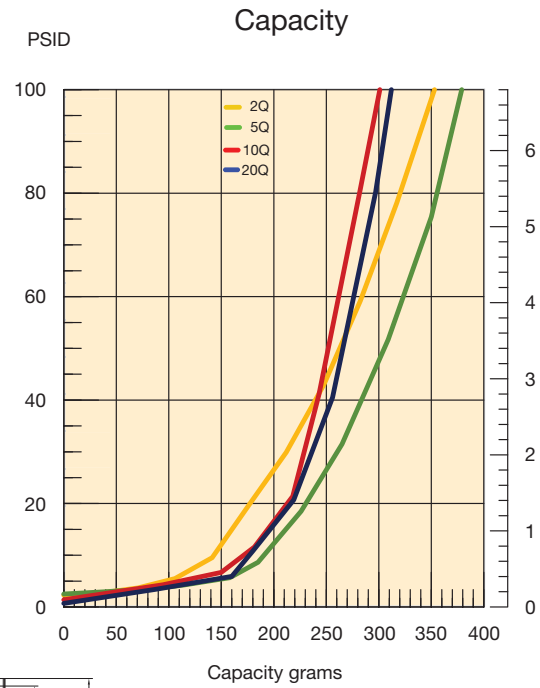
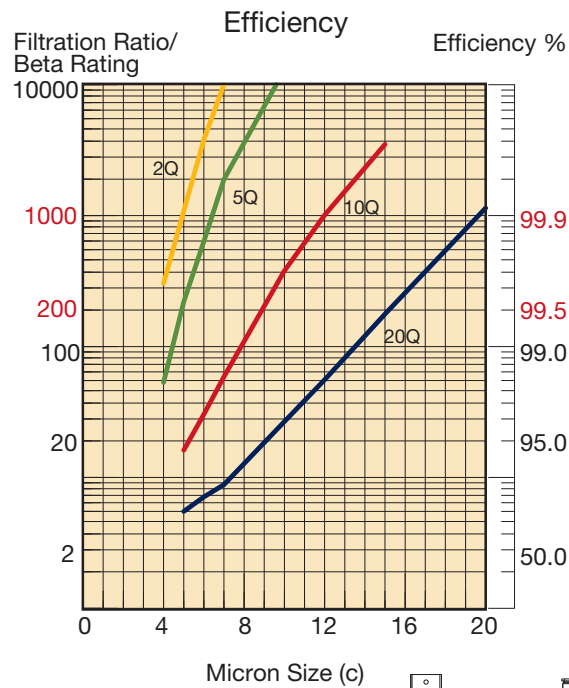
## Parts List

| Quantity | Parker Part # | Description                                |
|----------|---------------|--------------------------------------------|
| 1        | 165-00002     | Drive, AC, A/B .5 HP 240V 1 PH             |
|          | 165-00001     | Drive, AC, A/B .5 HP 480V 3 PH             |
|          | 165-00011     | Drive, Line Filter, .5 HP 120V & 240V 1 PH |
|          | 165-00014     | Drive, Line Filter, .5 HP 460V 3 PH        |
| 1        | 270-00006     | PLC/HMI                                    |
| 1        | 275-00007     | Power Supply, H.V.                         |
| 1        | 275-00002     | Power Supply, A/B 24V 110-240V             |
| 1        | 275-00006     | Power Supply, C/H 24V 380-480V             |
| 1        | 290-00001     | Relay, H.V., A/B                           |
| 1        | 245-00006     | Light Module, A/B, Green                   |
| 1        | 245-00005     | Light Module, A/B, Yellow                  |
| 1        | 250-00005     | Motor, .5 HP, 230-380 STD                  |
| 1        | 280-00014     | Pump/Bypass, 2 GPM, STD                    |
| 1        | 255-00016     | O-Ring, vessel 1, 2 or 3                   |
| 1        | 936623Q       | 5 Micron Filter, Upstream                  |
| 1        | 936622Q       | 2 Micron Filter, Downstream                |
| 1        | 195-00003     | Feedthru, H.V.                             |
| 4        | 350-00001     | Transducer, pressure                       |

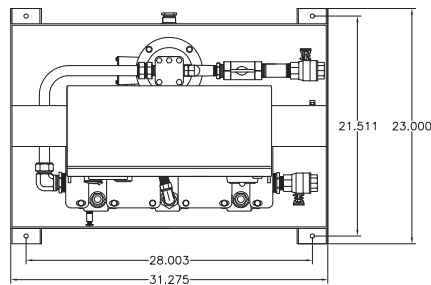


# SMR10

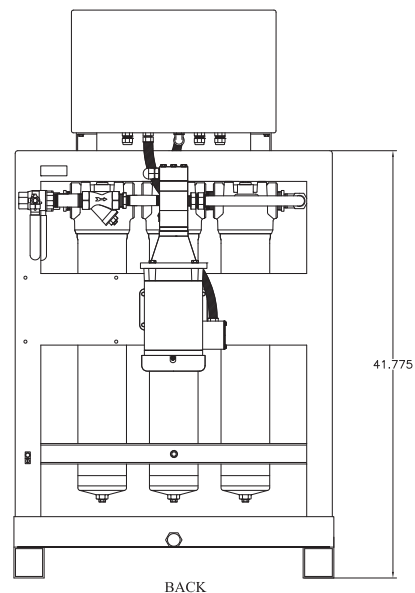
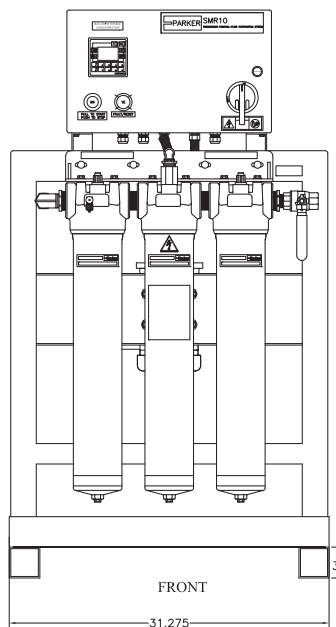
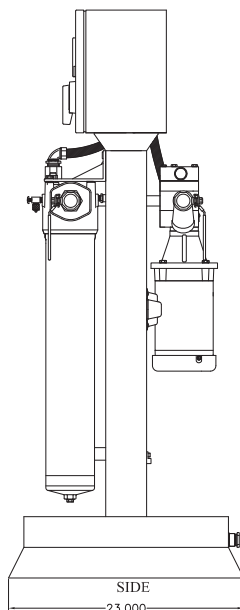
## Element Performance



Dimensions are in inches.



Drawings are for reference only.  
Contact factory for current version.



# SMR10

## Specifications

### Fluid

Viscosity: 1,020 SUS (220 cSt) maximum  
Maximum Pressure: 50/80 PSI (operating/static)  
Minimum Fluid Temperature: 65° F (18° C)  
Maximum Fluid Temperature: 200° F (93° C)  
Minimum Fluid Flash Point: >140° F (60° C)

### Power

Customer Provided  
Voltage: 110VAC/1Ph/60Hz, 230VAC/3Ph/60Hz,  
460VAC/3Ph/60Hz  
Phase: 1/3  
Frequency 60Hz

### Motor

Power: 0.5 HP  
Voltage/Ph/Freq: 0-230/460/3/variable  
RPM: 0 to 2000

### Pump

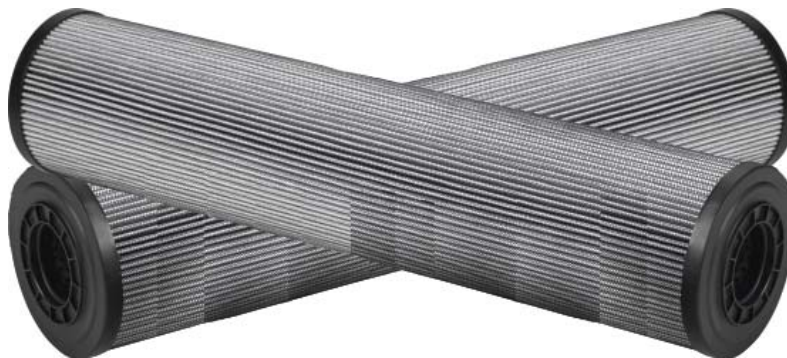
Positive Displacement - Variable Frequency Drive (VFD)  
Design Flow Rate: 2.5 - 10 GPM

| <b>Parameter Settings</b>               |                          |                    |                    |
|-----------------------------------------|--------------------------|--------------------|--------------------|
| Parameter                               | Default                  | Minimum            | Maximum            |
| Flow                                    | <b>10 GPM [37.9 LPM]</b> | 2.5 GPM [9.45 LPM] | 10 GPM [37.85 LPM] |
| Shutdown Pressure                       | <b>70 psi [4.82 bar]</b> | 0 psi/bar          | 75 psi [5.17 bar]  |
| Max Operating Pressure                  | <b>50 psi [3.4 bar]</b>  | 0 psi/bar          | 60 psi [4.13 bar]  |
| Min Operating Pressure                  | <b>0 psi [0.0 bar]</b>   | 0 psi/bar          | 5 psi [0.34 bar]   |
| Maximum Temperature                     | <b>200°F [93.3°C]</b>    | 35°F [1.6°C]       | 200°F [93.3°C]     |
| Minimum Temperature                     | <b>35°F [1.5°C]</b>      | 35°F [1.6°C]       | 200°F [93.3°C]     |
| Upstream Filter Delta-P                 | <b>15 psi [1.0 bar]</b>  | 5 psi [0.34 bar]   | 25 psi [1.7 bar]   |
| Downstream Filter Delta-P               | <b>10 psi [0.67 bar]</b> | 5 psi [0.34 bar]   | 25 psi [1.7 bar]   |
| Auto-Restart after power loss           | <b>OFF</b>               | n/a                | n/a                |
| Auto-Restart after temperature shutdown | <b>OFF</b>               | n/a                | n/a                |
| US or Metric units                      | <b>US</b>                |                    |                    |

# SMR10

## Parts List

| Quantity | Parker Part # | Description                                |
|----------|---------------|--------------------------------------------|
| 1        | 165-00002     | Drive, AC, A/B .5 HP 240V 1 PH             |
|          | 165-00001     | Drive, AC, A/B .5 HP 480V 3 PH             |
|          | 165-00011     | Drive, Line Filter, .5 HP 120V & 240V 1 PH |
|          | 165-00014     | Drive, Line Filter, .5 HP 460V 3 PH        |
| 1        | 270-00006     | PLC/HMI                                    |
| 1        | 275-00007     | Power Supply, H.V.                         |
| 1        | 275-00002     | Power Supply, A/B 24V 110-240V             |
| 1        | 275-00006     | Power Supply, C/H 24V 380-480V             |
| 1        | 290-00001     | Relay, H.V., A/B                           |
| 1        | 245-00006     | Light Module, A/B, Green                   |
| 1        | 245-00005     | Light Module, A/B, Yellow                  |
| 1        | 250-00005     | Motor, .5 HP, 230-380 STD                  |
| 1        | 280-00014     | Pump/Bypass, 2 GPM, STD                    |
| 1        | 255-00016     | O-Ring, vessel 1, 2 or 3                   |
| 1        | 933219Q       | 5 Micron Filter, Upstream                  |
| 1        | 933218Q       | 2 Micron Filter, Downstream                |
| 1        | 195-00003     | Feedthru, H.V.                             |
| 4        | 350-00001     | Transducer, pressure                       |



# SMR Series

## How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

| BOX 1 | BOX 2 | BOX 3 | BOX 4 | BOX 5 | BOX 6 | BOX 7 | BOX 8 | BOX 9 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| SMR   | 2     | 460   | 20QE  | V     | M2    | X     | N08   | MS    |

| BOX 1: Basic Assembly |                               |
|-----------------------|-------------------------------|
| Symbol                | Description                   |
| SMR                   | Submicronic Filtration System |

| BOX 2: Flow Rate |                 |
|------------------|-----------------|
| Symbol           | Description     |
| 2                | 2 GPM (7.6 LPM) |
| 10               | 10 GPM (38 LPM) |

| BOX 3: Power |                   |
|--------------|-------------------|
| Symbol       | Description       |
| 120          | 120VAC, 1Ph, 60Hz |
| 230          | 230VAC, 3Ph, 60Hz |
| 380          | 380VAC, 3Ph, 50Hz |
| 460          | 460VAC, 3Ph, 60Hz |
| 575          | 575VAC, 3Ph, 60Hz |

| BOX 4: Element Media <sup>1</sup> |                           |
|-----------------------------------|---------------------------|
| Symbol                            | Description               |
| <b>SMR2</b>                       |                           |
| 02QE                              | Ecoglass III, 2 micron    |
| 05QE                              | Ecoglass III, 5 micron    |
| 10QE                              | Ecoglass III, 10 micron   |
| 20QE                              | Ecoglass III, 20 micron   |
| <b>SMR10</b>                      |                           |
| 02Q                               | Microglass III, 2 micron  |
| 05Q                               | Microglass III, 5 micron  |
| 10Q                               | Microglass III, 10 micron |
| 20Q                               | Microglass III, 20 micron |

| BOX 5: Seals |                          |
|--------------|--------------------------|
| Symbol       | Description              |
| V            | Fluorocarbon (FKM)       |
| E            | Ethylene Propylene (EPR) |

| BOX 6: Indicator |                         |
|------------------|-------------------------|
| Symbol           | Description             |
| P                | No Indicator            |
| M2               | Analog Visual Indicator |

| BOX 7: Bypass |             |
|---------------|-------------|
| Symbol        | Description |
| X             | No Bypass   |

| BOX 8: Ports |                       |
|--------------|-----------------------|
| Symbol       | Description           |
| <b>SMR2</b>  |                       |
| N08          | ½" NPT threaded ports |
| <b>SMR10</b> |                       |
| N16          | 1" NPT threaded ports |

| BOX 9: Options   |                                              |
|------------------|----------------------------------------------|
| Symbol           | Description                                  |
| SS               | Stainless steel wetted parts                 |
| EXP              | Explosion proof (Class 1, Div. 2, Gp. C & D) |
| MS               | Moisture Sensor                              |
| PD <sup>2</sup>  | Particle Detector                            |
| PDM <sup>2</sup> | Particle Detector with Moisture Sensor       |

Note:

1. Outlet polishing filter is always fitted with 02QE/02Q element.

2. icountPD not available when EXP option is selected.

## Replacement Elements

Note: "CF" = Consult Factory

| SMR2               |              |                    | SMR10                |              |                    |
|--------------------|--------------|--------------------|----------------------|--------------|--------------------|
| Ecoglass III Media | Fluorocarbon | Ethylene Propylene | Microglass III Media | Fluorocarbon | Ethylene Propylene |
| 02QE               | 936622Q      | 940848Q            | 02Q                  | 933218Q      | CF                 |
| 05QE               | 936623Q      | 940847Q            | 05Q                  | 933219Q      | CF                 |
| 10QE               | 936720Q      | 940846Q            | 10Q                  | 933220Q      | CF                 |
| 20QE               | 936721Q      | 940845Q            | 20Q                  | 933221Q      | CF                 |

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**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# Stationary Offline System

SOS for Indoor/Outdoor Fluid Filtration Needs



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# Stationary Offline System

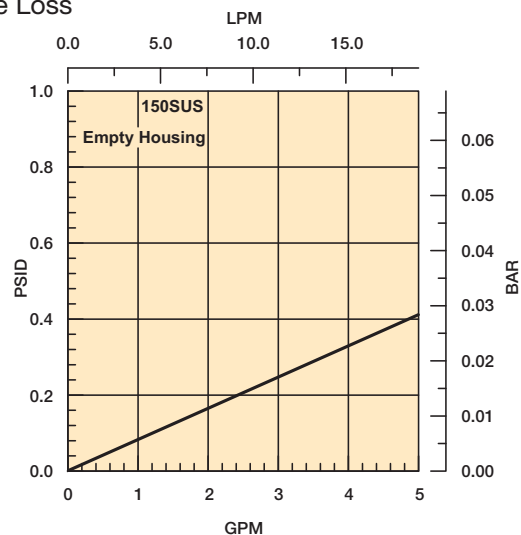
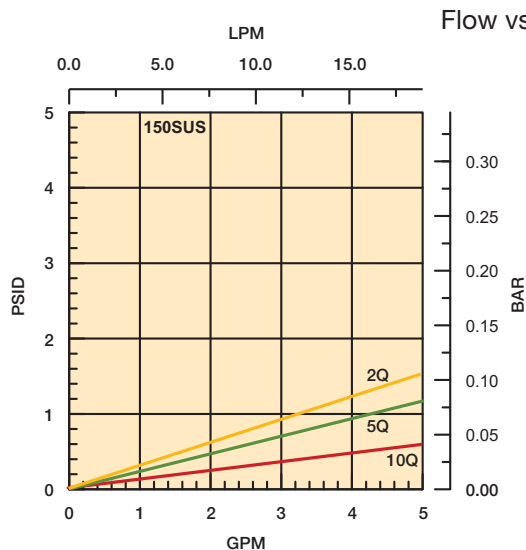
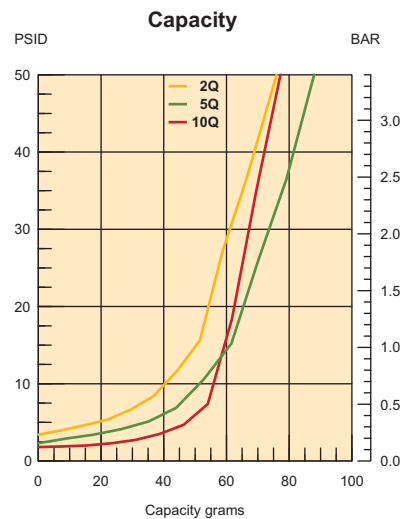
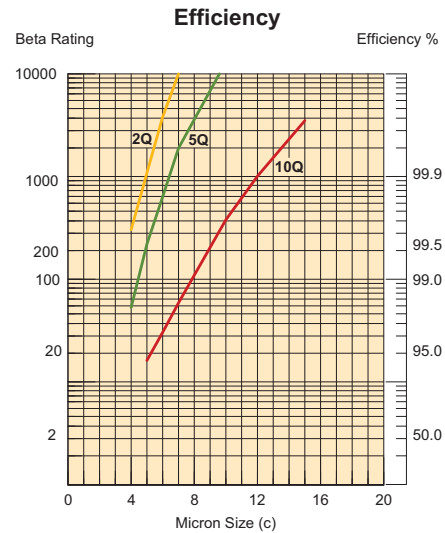
## Performance Data



Parker's new patented Moduflow™ Plus element was designed with built-in diverter cone and bypass valve, to meet your application needs.

### Applications

- Oil & Gas
- Plastic Injection Molding
- Die Casting
- Steel
- General Industrial
- Power Generation
  - Load Tap Changer
  - Wind Turbines
  - Transformer
- Mining
- Off-highway Equipment
- Food Processing
- Refining
- Paper Mills
- Aircraft Ground Support



# Stationary Offline System

## Specifications

**Flow rate:** 5 gpm

**Filtration:** High efficiency Microglass III  
( $B_x = 200+$ ).

**Enclosure:** Weatherproof NEMA 4 IP 65 with sealed safety glass window.

**Electrical service required:** 115V, 10A, single phase, 60 Hz

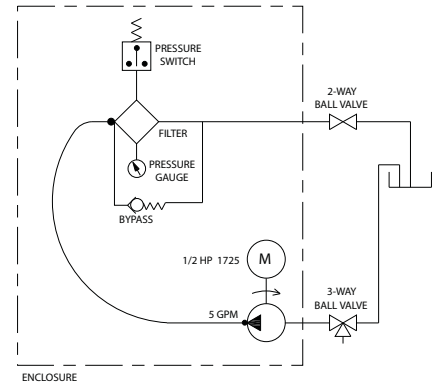
**Electrical motor:** 1/2 HP @ 1725 rpm w/ thermal overload protection.

**Filter bypass alarm:** Red strobe light indicates at 20 psid filter element pressure drop. Auto shut-down at 40 psid.

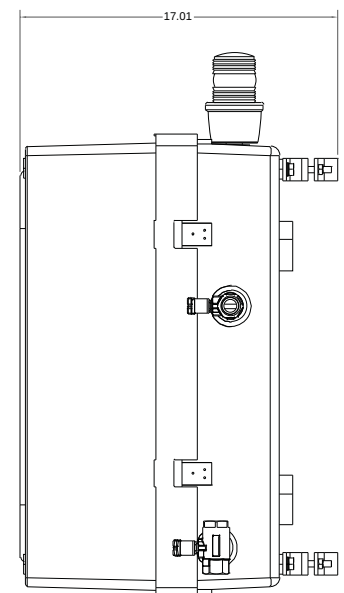
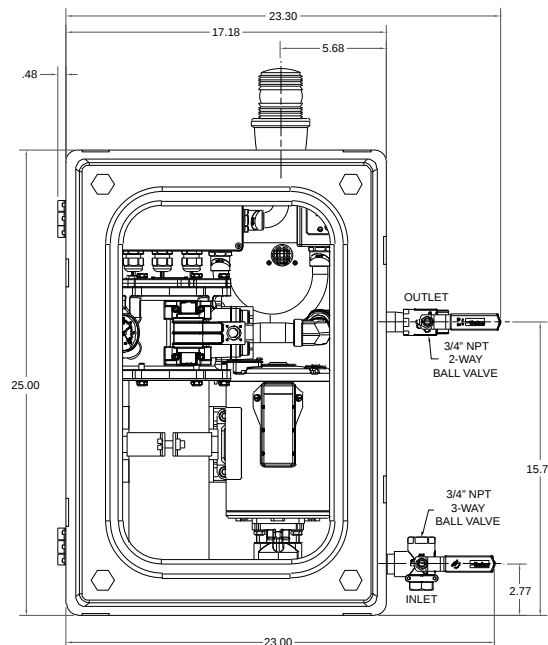
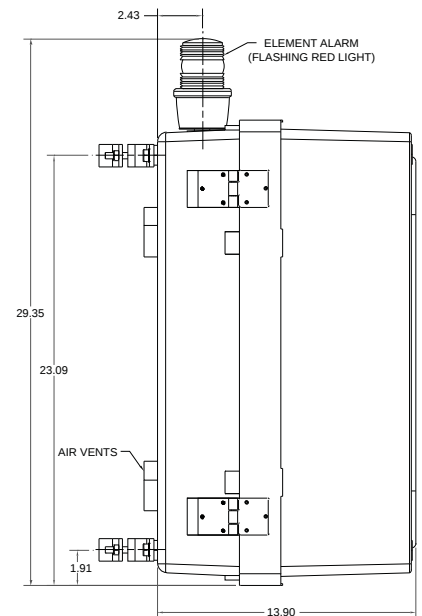
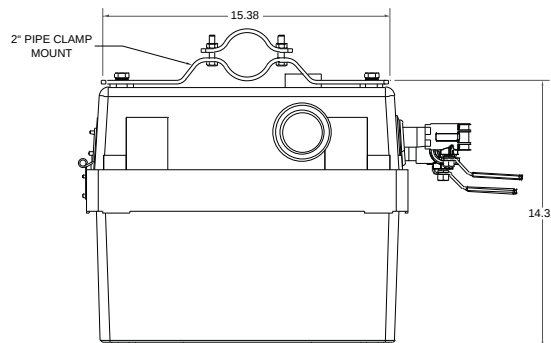
**Seals:** Nitrile

**Weight:** Approximately 80 lbs.

**Compatible with most petroleum based fluids, including dielectric oils. Rated for continuous duty.**



The Moduflow™ Plus filter is known for its performance and durability. It has been engineered to provide the highest level of performance for today's demanding filtration requirements.



Drawings are for reference only.  
Contact factory for current version.

Dimensions are in inches.

# Stationary Offline System

## How to Order

Select the desired symbol (in the correct position) to construct a model code.

Example:

| BOX 1 | BOX 2 | BOX 3 | BOX 4 | BOX 5 | BOX 6 | BOX 7 | BOX 8 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| SOS   | 5     | 02Q   | B     | E     | I     | N12   | 1     |

| BOX 1: Filter Series |                           |
|----------------------|---------------------------|
| Symbol               | Description               |
| SOS                  | Stationary Offline System |

| BOX 2: Model |                 |
|--------------|-----------------|
| Symbol       | Description     |
| 5            | 5 gpm flow rate |

| BOX 3: Media Code |                           |
|-------------------|---------------------------|
| Symbol            | Description               |
| 02Q               | Microglass III, 2 micron  |
| 05Q               | Microglass III, 5 micron  |
| 10Q               | Microglass III, 10 micron |
| WR                | Water removal             |

| BOX 4: Seals |                    |
|--------------|--------------------|
| Symbol       | Description        |
| B            | Nitrile (NBR)      |
| V            | Fluorocarbon (FKM) |

| BOX 5: Indicator |                                                                    |
|------------------|--------------------------------------------------------------------|
| Symbol           | Description                                                        |
| E                | Electrical with visual gauge<br>(includes external lighted beacon) |

| BOX 6: Bypass |             |
|---------------|-------------|
| Symbol        | Description |
| I             | 35 PSID     |

| BOX 7: Ports |                           |
|--------------|---------------------------|
| Symbol       | Description               |
| N12          | 3/4" NPT integral threads |

| BOX 8: Options |                          |
|----------------|--------------------------|
| Symbol         | Description              |
| 1              | With Bypass              |
|                | Heater (consult factory) |

Please note the bolded options reflect standard options with a reduced lead-time. Consult factory on all other lead-time options.

## Replacement Elements

| Media | Nitrile Seals<br>Part Number | Fluorocarbon Seals<br>Part Number |
|-------|------------------------------|-----------------------------------|
| 02Q   | 937393Q                      | 937401Q                           |
| 05Q   | 937394Q                      | 937402Q                           |
| 10Q   | 937395Q                      | 937403Q                           |
| WR    | 940733                       | —                                 |



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## icountBS - Bottle Sampler

The Bench Top Solution to Fluid Contamination  
Bottle Sampling



ENGINEERING YOUR SUCCESS.

# The Complete Solution - Industrial Design Combined with State of the Art Technology

The icountBS - Bottle Sampler from Parker, with its innovative industrial design, has been developed for customers looking for state of the art technology, attention to detail and the compactness of a permanent laboratory particle analysis instrument.

Combine this with on-board, laser based, leading edge technology to bring to all industries a truly revolutionary Particle Counter. The innovative icountBS is a product from the next generation of Parker's fluid particle analysis and monitoring solutions.

The IBS features an easy to use interactive touch screen, environmentally controlled pressurized bottle chamber, an internal compressor pump, automated door locking mechanism, sample tube cleaning sleeve that minimizes cross contamination, and an internal printer.

The icountBS benefits from Parkers knowledge and experience of providing fluid analysis equipment to the market for over 15 years.

## icountBS - Bottle Sampler Features & Benefits

- Customer programmable number of sample runs/sample bottle averaging and pre-test flush volumes from 10ml min. to 100ml max.
- Input via fluid resistant touch screen display.
- Repeatable and reproducible performance to ISO4406:1999 and NAS1638 particle count distributions. For other calibration standards consult Parker Hydraulic Filter Division.
- On-board compressor and 'shop' air capable.
- Design concept allowing for portability. DC and rechargeable battery pack options built in.
- Sample tube self cleaning sleeve minimizing cross contamination.
- 500 test sample memory.
- Data download via USB jump drive included.
- Internal printer.

Bottle ID: FILTERED 1

Bottle No : 157  
Tested at : 12:24 PM  
on : 05/26/2009  
Standard : ISO 4406 : 1999  
Dust : MTD  
icountBS : IC6NW004

Result : 16/13/9  
Volume : 30 ml

| Size     | Counts | Code |
|----------|--------|------|
| >4um(c)  | 41850  | 16   |
| >6um(c)  | 4150   | 13   |
| >14um(c) | 276    | 9    |
| >21um(c) | 20     | >5   |
| >38um(c) | 6      | >3   |
| >70um(c) | 0      | >0   |

Particle counts are per 100ml





Home Screen



Sample ID Input



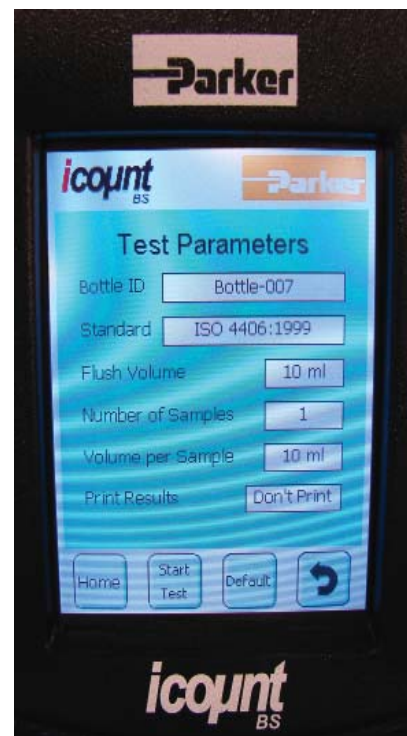
Number of Sample Runs



Sample Volume



Flush Volume



Start Test

# Analyzing the Test Results

## Once the automatic oil sample test has been completed, what next?

Solid contaminants in fluid power systems vary in size, shape, form and quantity. The most harmful contaminants are normally between 6 microns and 14 microns. The ISO code is the preferred method of reporting quantity of contaminants.

The ISO code number corresponds to contamination levels relating to three sizes.

The first scale number represents the number of particles that are equal to and greater than 4µm (c) per 100 milliliters of fluid, the second number for particles that are equal to and greater than 6 µm(c) per 100 milliliters of fluid and the third number for particles that are equal to and greater than 14 µm(c) per 100 milliliters of fluid.

For example: An ISO code 20/18/14 indicates that there are between 500,000 and 1,000,000 particles that are equal to and

greater than 4µm(c), between 130,000 and 250,000 particles that are equal to and greater than 6µm(c), and between 8,000 and 16,000 particles that are equal to and greater than 14µm(c).



## Component Cleanliness Guide

Suggested acceptable contamination levels for various hydraulic systems

| Target Contamination Class to ISO 4406: 1999 |         |          | Suggested Maximum Particle Level |           |          | Sensitivity     | Type of System                                                                                 | Typical Components                                           |
|----------------------------------------------|---------|----------|----------------------------------|-----------|----------|-----------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 4 µm(c)                                      | 6 µm(c) | 14 µm(c) | 4 µm(c)                          | 6 µm(c)   | 14 µm(c) |                 |                                                                                                |                                                              |
| 15                                           | 13      | 9        | 16,000                           | 4,000     | 250      | Super critical  | Silt-sensitive control systems with very high reliability. Laboratory or aerospace             | High performance servo valves                                |
| 17                                           | 15      | 11       | 64,000                           | 16,000    | 1,000    | Critical        | High performance servo and high pressure long life systems, e.g. aircraft, machine tools, etc. | Industrial servo valves                                      |
| 18                                           | 16      | 13       | 130,000                          | 32,000    | 4,000    | Very Important  | High quality reliable systems. General machine requirements                                    | Piston pumps, proportional valves, compensated flow controls |
| 20                                           | 18      | 14       | 500,000                          | 130,000   | 8,000    | Important       | General machinery and mobile systems. Medium pressure, medium capacity                         | Vane pumps, spool valves                                     |
| 21                                           | 19      | 15       | 1,000,000                        | 250,000   | 16,000   | Average         | Low pressure heavy industrial systems, or applications where long life is not critical         | Gear pumps, manual and poppet valves, cylinders              |
| 23                                           | 21      | 17       | 4,000,000                        | 1,000,000 | 64,000   | Main protection | Low pressure systems with large clearances                                                     | Ram pumps                                                    |

### Notes:

Tables have been generated by organizations in various industries.

Some of the tables are defined in cumulative counts, e.g. '>6µm' and others are represented as differential counts e.g. '6-14µm'.

All µm(c) refer to MTD distributions. All µm references will refer to ACFTD distributions.

All standards are in counts per 100ml and provide easy methods for converting particle counts into limits that are simple to interpret. By noting the requirements of the standard, particle counts can be accurately converted to contamination levels.

# icountBS Product Specification

|                                                     |                                                                                                                                          |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Principle of Operation</b>                       | Laser based light obscuration                                                                                                            |
| <b>Calibration Dust</b>                             | MTD or ACFTD                                                                                                                             |
| <b>Dimensions</b>                                   | H=20.9" x W=7.48" (8.27" Door) x D=16.1"                                                                                                 |
| <b>Weight</b>                                       | 39.7 lb. (18kg)                                                                                                                          |
| <b>Mechanical Composition</b>                       | Stainless steel 316, plated mild steel and aluminum                                                                                      |
| <b>Plastics Composition</b>                         | Precision polyurethane RIM moldings and ABS plastic                                                                                      |
| <b>Environmental Operating Temperature (Tested)</b> | 41°F to 140°F (+5°C to +60°C)                                                                                                            |
| <b>Operating RH Range</b>                           | 20 - 85% [Tested at 86°F (30°C), no condensation]                                                                                        |
| <b>Storage Temperature</b>                          | 40°F to 194°F (-40°C to +90°C)                                                                                                           |
| <b>Storage RH Range</b>                             | 10 - 90% (Tested at 30°C, no condensation)                                                                                               |
| <b>Channel Sizes</b>                                | MTD - >4µ(c), >6µ(c), >14µ(c), >21µ(c), >38µ(c), >70µ(c), ACFTD - >2µ(c), >5µ(c), >15µ(c), >25µ(c), >50µ(c), >100µ(c)                    |
| <b>Analysis Range</b>                               | ISO 7 to 21, NAS 0 to 12                                                                                                                 |
| <b>Contamination Standards</b>                      | MTD - ISO 4406:1999 & NAS 1638 ACFTD - ISO 4406:1987, ISO 4406:1991 & NAS 1638<br>For further contamination standards consult Parker CMC |
| <b>Calibration Standard</b>                         | ISO MTD and ACFTD calibration to traceable ISO Standards. (Contact Parker CMC for further details)                                       |
| <b>Fluid Management</b>                             | Maximum single sample = 100ml, Minimum single sample = 10ml                                                                              |
| <b>Possible Test Configurations</b>                 | User selectable from single test up to 5 tests per run (eg. 1 x 100ml up to 5 x 50ml per run)                                            |
| <b>Pre-Test Flush Volume</b>                        | Minimum = 10ml, Maximum = 100ml                                                                                                          |
| <b>Viscosity Range</b>                              | 5 to 400 cSt                                                                                                                             |
| <b>Fluid Compatibility</b>                          | Mineral oils, petroleum and hydrocarbon based fluids (consult manufacturer) and some esters (consult manufacturer)                       |
| <b>Sample Bottle Size</b>                           | No specific bottle required. Maximum size = 2.95" (Dia.) x 5.90" (H). Maximum volume = 250ml                                             |
| <b>Memory Storage</b>                               | 500 tests (capacity warning after 450 tests)                                                                                             |
| <b>Output Display</b>                               | Backlight 256 color STN transmissive                                                                                                     |
| <b>Output Display Resolution</b>                    | 320 x 3 (RGB) (H) x 240 (W) dots                                                                                                         |
| <b>Display Active Area</b>                          | 115 (H) x 86 (W) mm                                                                                                                      |
| <b>Data Input</b>                                   | Via icon driven resistive touch screen                                                                                                   |
| <b>Printer</b>                                      | Thermal dot-line printing                                                                                                                |
| <b>Printer Paper</b>                                | Ø50mm - (57mm x 25mm)                                                                                                                    |
| <b>Test Certification</b>                           | Calibration & Certificate of Conformity                                                                                                  |
| <b>Power Supply</b>                                 | DC output - 12V @ 6.60Amps, 80 watts max. AC input - 100 to 240V @ 1.2Amps (50 - 60 Hz)                                                  |
| <b>Battery Power</b>                                | 2 hours (recommended to be fully charged every 3 months)                                                                                 |
| <b>Battery Stand-By Time</b>                        | 1 month (then 1 hour of operation)                                                                                                       |
| <b>Battery Fuse</b>                                 | 6.3 Amps (anti-surge)                                                                                                                    |
| <b>Air Pressure Source</b>                          | 50 psi (3.5 bar) internal mini-compressor or 101 psi (7 bar) shop air                                                                    |



# icountBS - Bottle Sampler Ordering Information

| Key | Fluid Type |         | Calibration |       | Future Option |          | Future Option | Future Option | Future Option | Transportation Case |         | Power Supply Region |        |
|-----|------------|---------|-------------|-------|---------------|----------|---------------|---------------|---------------|---------------------|---------|---------------------|--------|
| IBS | 1          | Mineral | 1           | ACFTD | 0             | Lab Unit | 0             | 0             | 1             | 0                   | No Case | 0                   | UK     |
|     |            |         | 2           | MTD   |               |          |               |               |               | 1                   | Case    | 1                   | USA    |
|     |            |         |             |       |               |          |               |               |               |                     |         | 2                   | Europe |

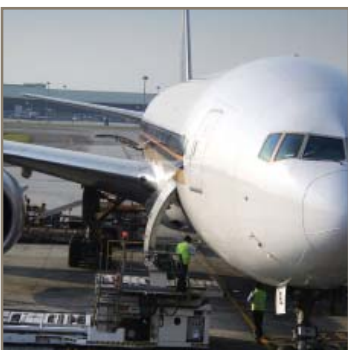
| Accessories                | Part Number | Included   |
|----------------------------|-------------|------------|
| 250ml Sample Bottle (2/pk) | ACC6NW001   | * (2 pks.) |
| Sample Bottle Pack (50)    | ACC6NW002   |            |
| Vapour/Waste Bottle        | ACC6NW003   | *          |
| Waste Bottle Folder        | ACC6NW004   |            |
| Printer Paper Reel (x1)    | ACC6NW005   | *          |
| UK Power Supply            | ACC6NW006   |            |
| USA Power Supply           | ACC6NW007   | *          |
| European Power             | ACC6NW008   |            |
| Transport Case             | P893865     | *          |
| 1m Waste Tube (Clear)      | ACC6NW009   | *          |
| 1m Vapour Hose (Blue)      | ACC6NW010   | *          |
| USB Memory Stick           | ACC6NW011   | *          |
| icountBS CD Manual         | ACC6NW012   | *          |

\* These items included with IBS unit within a transportation case.





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# icountPD

Online Particle Detector



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# icountPD

The icountPD from Parker represents the most up-to-date technology in solid particle detection.



The design dynamics, attention to detail, and small size of the permanently mounted, on-line particle detector brings a truly innovative product to all industry. The laser based, leading-edge technology is a cost effective market solution to fluid management and contamination control.

## 3 Versions Available

**Standard icountPD** is designed for test stand, flushing skids, filter carts and other industrial applications.

**icountPDR** is designed for mobile equipment or any outside use other than hazardous environment.

**icountPDZ** is intended for applications that require a zone 2 safety such as off-shore platforms or any other hazardous environment.

For Zone 1 applications the standard icountPD can be used within a NEMA7 enclosure.

Features and benefits of the icountPD include:

- Independent monitoring of system contamination trends.
- Early warning LED or digital display indicators for Low, Medium and High contamination levels.
- Moisture % RH LED indicator (optional).
- Cost effective solution in prolonging fluid life and reducing machine downtime.
- Visual indicators with power and alarm output warnings.
- Continuous performance for dependable analysis.
- Hydraulic, phosphate ester & fuel fluid compatible construction.
- Self diagnostic software.
- Fully integrated PC/PLC integration technology such as:

RS232 and 0-5 Volt, 4-20mA, and CANBUS J1939.

## Typical Applications

### Mobile Equipment

- Earth Moving Machinery
- Harvesting
- Forestry
- Agriculture

### Industrial Equipment

- Production Plants
- Fluid Transfers
- Pulp & Paper
- Refineries

### Power Generation

- Wind Turbines
- Gearboxes
- Lubrication Systems

### Maintenance

- Test Rigs
- Flushing Stands



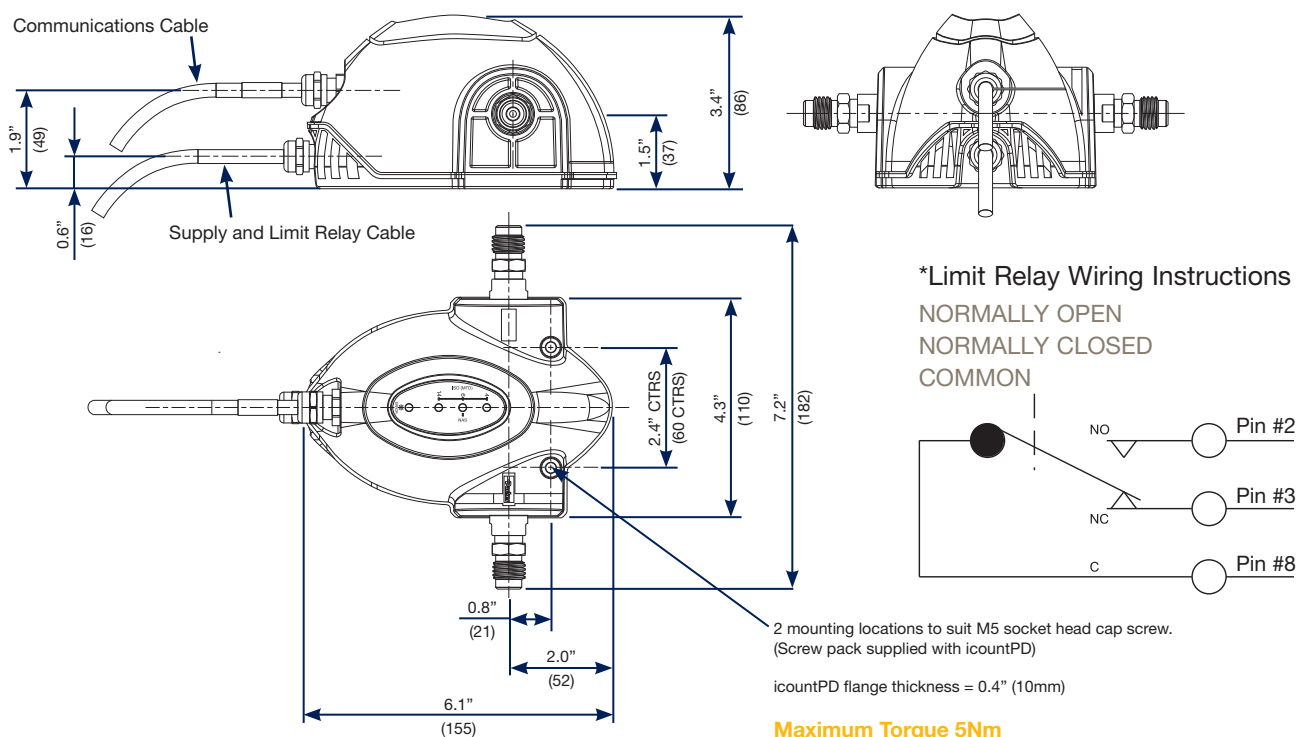
# icountPD

## Features and Benefits

|                                                         |                                                                                                                                                                                                                                        |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diagnostic self check start-up time                     | 5 seconds                                                                                                                                                                                                                              |
| Measurement period                                      | 5 to 180 seconds                                                                                                                                                                                                                       |
| Reporting interval through RS232                        | 0 to 3600 seconds                                                                                                                                                                                                                      |
| Digital LED display update time                         | Every second                                                                                                                                                                                                                           |
| Limit relay output                                      | Changes occur +/- 1 ISO code at set limit (Hysteresis ON)<br>or customer set (Hysteresis OFF)                                                                                                                                          |
| 4-20mA output signal                                    | Continuous                                                                                                                                                                                                                             |
| Principle of operation                                  | Laser diode optical detection of actual particulates                                                                                                                                                                                   |
| Reporting codes                                         | ISO 7 – 21, NAS 0 – 12, (AS 00 – 12 contact Parker)<br>Icount will also report less than ISO 7, subject to the statistical uncertainty defined in ISO4406:1999, which is shown in the RS232, reporting results as appropriate e.g “>6” |
| Calibration                                             | By recognized on-line methods, confirmed by the relevant International Standards Organization procedures                                                                                                                               |
| Calibration recommendation                              | 12 months                                                                                                                                                                                                                              |
| Performance                                             | +/- 1 ISO Code (dependant on stability of flow)                                                                                                                                                                                        |
| Reproducibility / Repeatability                         | Better than 1 ISO Code                                                                                                                                                                                                                 |
| Power requirement                                       | Regulated 9 to 40Vdc                                                                                                                                                                                                                   |
| Maximum current draw                                    | 150mA                                                                                                                                                                                                                                  |
| Hydraulic connection                                    | M16 x 2 hydraulic test points (5/8” BSF for aggressive version)                                                                                                                                                                        |
| Flow range through the device                           | 40 to 140 ml/min (optimum flow = 60ml/min)                                                                                                                                                                                             |
| Online flow range via System 20<br>Inline Sensors       | Size 0 = 6 to 25 l/min - (optimum flow = 15 l/min)<br>Size 1 = 24 to 100 l/min - (optimum flow = 70 l/min)<br>Size 2 = 170 to 380 l/min - (optimum flow = 250 l/min)                                                                   |
| Required differential pressure<br>across Inline Sensors | 5.8 psi (0.4 bar) minimum                                                                                                                                                                                                              |
| Viscosity range                                         | 10 to 500 cSt                                                                                                                                                                                                                          |
| Temperature                                             | Operating environment: -4°F to +140°F (-20°C to +60°C)<br>Storage: -40°F to +176°F (-40°C to +80°C)<br>Operating fluid: +32°F to +185°F (0°C to +85°C)                                                                                 |
| Working pressure                                        | 30 to 6,000 PSI (2 to 420 bar)                                                                                                                                                                                                         |
| Moisture sensor calibration                             | ±5% RH (over compensated temperature range of +10°C to +80°C)                                                                                                                                                                          |
| Operating humidity range                                | 5% RH to 100% RH                                                                                                                                                                                                                       |
| Moisture sensor stability                               | ±0.2% RH typical at 50% RH in one year                                                                                                                                                                                                 |
| Certification                                           | IP66 rated<br>EMC/RFI – EN61000-6-2:2001<br>EN61000-6-3:2001                                                                                                                                                                           |
| Materials                                               | User friendly construction<br>Stainless Steel hydraulic block<br>Viton seals                                                                                                                                                           |
| Dimensions                                              | 7.2” x 6.1” x 3.4” (182mm x 155mm x 86mm)                                                                                                                                                                                              |
| Weight                                                  | 2.9 lbs. (1.3 kg)                                                                                                                                                                                                                      |

# icountPD

## Dimensions / Installation Details



## M12 Communication Cable: Wiring Configuration for Standard iPD

| Pin | 4-20mA option connections                    | 0-5V/0-3V option connections                 |
|-----|----------------------------------------------|----------------------------------------------|
| 1   | NOT USED                                     | NOT USED                                     |
| 2   | RS232 Ground (pin 5**)                       | RS232 Ground (pin 5**)                       |
| 3   | Channel A, ISO 4µm (c)*                      | Channel A, ISO 4µm (c)*                      |
| 4   | Channel B, ISO 6µm (c)* or NAS (if selected) | Channel B, ISO 6µm (c)* or NAS (if selected) |
| 5   | RS232 Receive (Pin 3**)                      | RS232 Receive (Pin 3**)                      |
| 6   | RS232 Transmit (Pin 2**)                     | RS232 Transmit (Pin 2**)                     |
| 7   | Moisture sensor channel (if fitted)          | Moisture sensor channel (if fitted)          |
| 8   | Channel C, ISO 14µm (c)*                     | Channel C, ISO 14µm (c)*                     |

Note: It is the responsibility of the end user to ensure that the cable's braided screen is terminated to a suitable earth bonding point.

\* Optional – refer to the icountPD part number specifier section in the manual.

\*\* A standard USB serial adaptor can be used with the recommended 9-way D-type connector to convert RS232 to USB.

## \*M12 Limit Relay & Alarm Levels: Wiring Configuration

| Pin | Current loop option connections        | 0-5V/0-3V option connections           |
|-----|----------------------------------------|----------------------------------------|
| 1   | Product supply 9-40Vdc                 | Product supply 9-40Vdc                 |
| 2   | 4-20mA supply 12-20Vdc                 | 0-5 / 0-3V supply 12-24Vdc             |
| 3   | Relay (Normally Closed)*** (if fitted) | Relay (Normally Closed)*** (if fitted) |
| 4   | Relay (Normally Open)*** (if fitted)   | Relay (Normally Open)*** (if fitted)   |
| 5   | NOT USED                               | NOT USED                               |
| 6   | NOT USED                               | 0-5 / 0-3V supply 0Vdc                 |
| 7   | Main supply 0Vdc                       | Product supply 0Vdc                    |
| 8   | Relay (Common)*** (if fitted)          | Relay (Common)*** (if fitted)          |

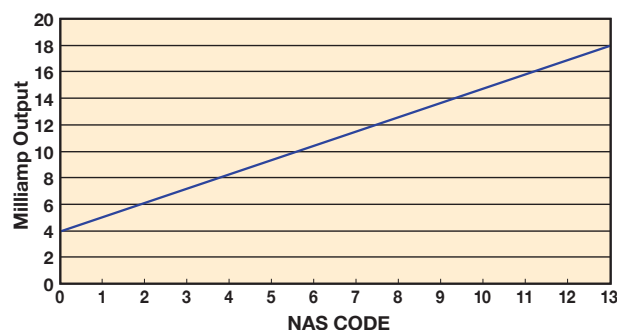
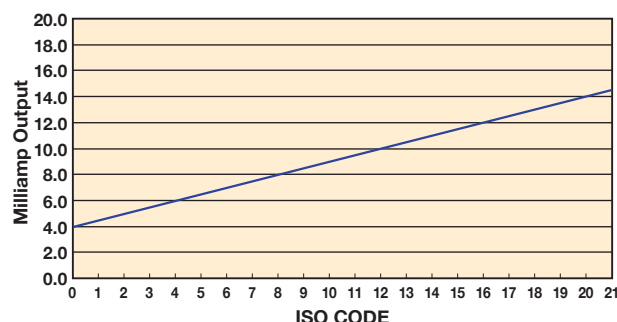
Note: If the moisture sensor is fitted without either option, then the output is RS232.

Parker recommends that the mating M12 connector cables are screened. These cables are available from Parker through the ordering information section.

\*\*\* Optional – refer to ordering information section.

# icountPD

## Variable mA Output Settings



The following table can be used to equate the analogue output to an ISO or NAS Code.

Example: ISO code 12 is equal to 10mA.

| mA   | ISO       | mA | NAS   |
|------|-----------|----|-------|
| 4.0  | 0         | 4  | 00    |
| 4.5  | 1         | 5  | 0     |
| 5.0  | 2         | 6  | 1     |
| 5.5  | 3         | 7  | 2     |
| 6.0  | 4         | 8  | 3     |
| 6.5  | 5         | 9  | 4     |
| 7.0  | 6         | 10 | 5     |
| 7.5  | 7         | 11 | 6     |
| 8.0  | 8         | 12 | 7     |
| 8.5  | 9         | 13 | 8     |
| 9.0  | 10        | 14 | 9     |
| 9.5  | 11        | 15 | 10    |
| 10.0 | 12        | 16 | 11    |
| 10.5 | 13        | 17 | 12    |
| 11.0 | 14        | 18 | **    |
| 11.5 | 15        | 19 | **    |
| 12.0 | 16        | 20 | ERROR |
| 12.5 | 17        |    |       |
| 13.0 | 18        |    |       |
| 13.5 | 19        |    |       |
| 14.0 | 20        |    |       |
| 14.5 | 21        |    |       |
| 15.0 | **        |    |       |
| 15.5 | **        |    |       |
| 16.0 | **        |    |       |
| 16.5 | **        |    |       |
| 17.0 | **        |    |       |
| 17.5 | **        |    |       |
| 18.0 | **        |    |       |
| 18.5 | **        |    |       |
| 19.0 | OVERRANGE |    |       |
| 19.5 | OVERRANGE |    |       |
| 20.0 | ERROR     |    |       |

### 4-20mA output settings

#### ISO Setting

mA current = (ISO Code / 2) +4

eg. 10mA = (ISO 12 / 2) +4

or

ISO Code = (mA current - 4) \*2

eg. ISO 12 = (10mA -4) \*2

#### NAS Setting

mA current = NAS Code +5

eg. 15mA = NAS 10 +5

or

NAS Code = mA current -5

eg. NAS 10 = 15mA - 5

## Variable Voltage Output Settings

The variable voltage output option has the capability of two different voltage ranges: a 0-5Vdc range as standard, and a user-selectable 0-3Vdc range.

The full list of commands on how to change the voltage output is available from Parker.

The following tables can be used to relate the analog output to an ISO or NAS code.

For example, in a 0-5Vdc range, ISO code 16 is equal to an output of 3.5Vdc. In a 0-3Vdc range, ISO code 8 is equal to an output of 1.0Vdc.

Table relating ISO codes to voltage output

| ISO    | Err   | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
|--------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0-5Vdc | <0.2  | 0.3 | 0.5 | 0.7 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.5 |
| 0-3Vdc | <0.15 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 |

| ISO    | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | Err   |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| 0-5Vdc | 2.7 | 2.9 | 3.1 | 3.3 | 3.5 | 3.7 | 3.9 | 4.1 | 4.3 | 4.5 | 4.7 | >4.8  |
| 0-3Vdc | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | >2.45 |

Table relating NAS codes to voltage output

| ISO    | Err  | 00   | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | Err  |
|--------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 0-5Vdc | <0.4 | 0.6  | 0.9 | 1.2 | 1.5 | 1.8 | 2.1 | 2.4 | 2.7 | 3.0 | 3.3 | 3.6 | 3.9 | 4.2 | 4.5 | >4.6 |
| 0-3Vdc | <0.2 | N.S. | 0.3 | 0.5 | 0.7 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.5 | 2.7 | >2.8 |

# icountPD

## Display Parameters (ISO 4406/NAS 1638)

### Digital display indication

The digital display will show the actual measured codes, the channel ( $\mu$ ) size and the user defineable limits. Visible display of the channel size and user definable limits will alternate.

The moisture sensor reading (%RH) will also be shown – if the moisture sensor option is fitted.

The order of trigger for both of the codes and moisture sensor option is:

- Solid digit(s) = code(s) that are at or below the set point (limit)

- Flashing digit(s) = code(s) that are above the set point (limit)

The display for ISO4406 and NAS1638 are identical. The ISO display is shown below.



### LED display indication

The LED display uses 3 sets of LED for the indication of ISO 4406 and NAS1638 code figures. Individual code lights will trigger based on the customer settings.

The order of trigger will be:

- Solid green = one ISO code, or better, below the set point (limit)
- Blinking green = ISO code at the set point (limit)
- Solid red = one ISO code above the set point (limit)
- Blinking red = two ISO codes, or more, above the set point (limit)

### Error detection

In the unlikely event of an error occurring, the digital display on the icountPD will simply display the actual error code only – i.e. ERROR 13 (a full list of error codes is detailed in the icountPD user manual).

### Moisture sensor output settings

The moisture sensor is an option that can be included when specifying the icountPD. The moisture sensor reports on the saturation levels of the fluid passing through the icountPD sensing cell. The output is a linear scale, reporting within the range of 5% saturation to 100% saturation.

| Saturation | 4-20mA | 0-3Vdc | 0-5Vdc |
|------------|--------|--------|--------|
| 5%         | 4.8    | 0.15   | 0.25   |
| 25%        | 8      | 0.75   | 1.25   |
| 50%        | 12     | 1.50   | 2.50   |
| 75%        | 16     | 2.25   | 3.75   |
| 100%       | 20     | 3.00   | 5.00   |

# icountPD

## Auxiliary Flow Device

This simple to use flow control device fits on the downstream (outlet) side of the icountPD and is fitted with a differential pressure valve that adjusts the system flow to a range inside the icountPD specifications.

Note: The flow control device will still operate correctly even with the high pressure side at 2900 psi (200 bar) and the return back to an open system of 0 psi (0 bar) (DP = 2900 psi, 200 bar). Minimum system pressure of 150 psi (2.5 bar) needed to function properly.



P/N ACC6NN019

### icountPD Installation Checklist

- Determine Power Supply Requirements
- Determine Appropriate Cable Termination
- Determine Fluid Connection Requirements
- Fluid Connectors need Mating Hoses
- Determine Length of Hose
- Determine Flow Control Requirements
- Determine Electrical Cable Requirements
- Select a Pressure Compensated Flow Control Device for Cyclical System
- Insure Constant Delta P for Steady State System

## Communication Options

The icountPD may be configured using the icountPD Setup Utility. For more direct control of the device using its communications protocol, you may also use the Microsoft Windows® HyperTerminal program (this program is not currently supplied with the Windows Vista™ operating system, and is not available in Windows 7).

### Communication protocol

The communication protocol for the serial communication link is to be used with Microsoft Windows HyperTerminal. The settings are as follows:

Baud rate . . . . . 9600  
Data bits . . . . . 8  
Parity . . . . . None  
Stop bits . . . . . 1  
Flow control . . . . . None

Note: A full list of commands is detailed in the user manual.

| Optional Accessories                           |              |                  |     |      |      |
|------------------------------------------------|--------------|------------------|-----|------|------|
| Description                                    | Part Number  |                  |     |      |      |
|                                                | Mineral/Fuel | Phosphate Esters | IPD | IPDR | IPDZ |
| 1 Meter Hose Length                            | ACC6NN001    | ACC6NN002        | X   |      |      |
| 2 Meter Hose Length                            | ACC6NN003    | ACC6NN004        | X   |      |      |
| 5 Meter Hose Length                            | ACC6NN005    | ACC6NN006        | X   |      |      |
| 1/4" BSP Test point                            | ACC6NN007    | ACC6NN008        | X   |      |      |
| 1/8" BSP Test point                            | ACC6NN009    | ACC6NN010        | X   |      |      |
| 1/8" NPT Test point                            | ACC6NN011    | ACC6NN012        | X   |      |      |
| Single Point Sampler                           | SPS2021      | SPS2061          | X   | X    | X    |
| External Flow Device                           | ACC6NN019    |                  | X   | X    | X    |
| Power Supply                                   | ACC6NN013    |                  | X   | X    | X    |
| 5 meter, M12, 8-pin plug and socket cable kit* | ACC6NN014    | ACC6NN015        | X   |      |      |
| Deutsch 12-pin connector kit                   | ACC6NN016    |                  | X   | X    |      |
| RS232 to USB converter                         | ACC6NN017    |                  | X   | X    | X    |
| 12" long M12 8-way RS232 & power cable kit     | ACC6NN018    |                  | X   |      | X    |
| M12, 12 way cable                              | ACC6NN024    |                  |     | X    |      |

\* Cable Kit consists of two 5 meter cables to enable all output options (Communications cable and Relay/Power Supply cable).

# icountPD

## Online Particle Detector

| BOX 1 | BOX 2 | BOX 3 | BOX 4 | BOX 5 | BOX 6 | BOX 7 | BOX 8 |
|-------|-------|-------|-------|-------|-------|-------|-------|
| IPD   | 1     | 2     | 2     | 2     | 2     | 1     | 30    |

| BOX 1: Basic Assembly |                                         |
|-----------------------|-----------------------------------------|
| Symbol                | Description                             |
| IPD                   | Standard Particle Detector              |
| IPDR                  | Particle Detector - Robust Construction |
| IPDZ                  | Particle Detector - Hazardous (Zone 2)  |

| BOX 5: Limit Relay |                |
|--------------------|----------------|
| Symbol             | Description    |
| 1                  | No (iPDR only) |
| 2                  | Yes            |

| BOX 2: Fluid Type <sup>1,2</sup> |                                            |
|----------------------------------|--------------------------------------------|
| Symbol                           | Description                                |
| 1                                | Mineral Oil                                |
| 2                                | Phosphate Ester (iPD, iPDR only)           |
| 3                                | Aviation Fuel (4 channel) (iPD, iPDZ only) |

| BOX 6: Communication <sup>3,4</sup> |                               |
|-------------------------------------|-------------------------------|
| Symbol                              | Pressure Setting              |
| 2                                   | RS232 / 4-20mA                |
| 3                                   | RS232 / 0-5V (iPD, iPDR only) |
| 5                                   | RS232 / CAN-bus (J1939)       |

| BOX 3: Calibration |             |
|--------------------|-------------|
| Symbol             | Description |
| 2                  | MTD         |

| BOX 7: Moisture |             |
|-----------------|-------------|
| Symbol          | Description |
| 1               | No          |
| 2               | Yes         |

| BOX 4: Display |                        |
|----------------|------------------------|
| Symbol         | Description            |
| 1              | None (iPDR, iPDZ only) |
| 2              | LED (iPD only)         |
| 3              | Digital (iPD only)     |

| BOX 8: Cable Connector <sup>5</sup> |                                            |
|-------------------------------------|--------------------------------------------|
| Symbol                              | Description                                |
| 10                                  | Deutsch DT Series (iPD, iPDR only)         |
| 30                                  | M12, 8-pin plug connector (iPD, iPDZ only) |
| 40                                  | M12, 12-pin plug connector (iPDR only)     |

### Notes:

- When "3" is selected in Box 2, "1" must be selected in Box 7.
- Aviation Fuel option can also be used for diesel fluids.
- For iPD and iPDR units, when "3" is selected in Box 6, "10" must be selected in Box 8.
- Contact Parker for additional communication options (RS485, GPRS, LAN, WiFi, Sat, etc.)
- The required connecting cables are available as a kit. The kit consists of two 5 meter cables (Communications cable and Relay/Power Supply cable) to enable all output options. See Accessory table on page 7 for applicable part number.



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# Par-Test<sup>TM</sup>

Fluid Analysis



ENGINEERING YOUR SUCCESS.

# Fluid Analysis

## Par-Test™

Fluid analysis has proven to be a critical tool for any preventive maintenance program. Fluid analysis is able to identify potential problems that cannot be detected by human senses.

A comprehensive fluid analysis program can help prevent major hydraulic or lube oil system failures.

Par-Test is a complete laboratory analysis, performed on a small volume of fluid. The report you receive is a neatly organized three page format. One may quickly analyze the test results of an individual sample and/or look at a trend analysis for up to five different samples. Two types of services are offered through Par-Test, a water base fluid analysis kit or a petroleum base fluid analysis kit. For both types of services the Par-Test kit includes a pre-cleaned glass bottle, mailing container with pre-addressed label, sample information data sheet (to be completely filled out by end user) and the

following analysis:

Fluid sampling for Par-Test involves important steps to insure you are getting a representative sample. Often, erroneous sample procedures will disguise the true nature of the system fluid. A complete sampling procedure is detailed on the back of this brochure. There also is a National Fluid Power Association standard (NFPA T2.9.1-1972) and an American National Standards Institute Standard (ANSI B93.13-1972) for extracting samples from a fluid power system.



**Petroleum Base Kit**  
Particle Count  
Photomicrograph  
Free Water Analysis  
Spectrometric Analysis  
Viscosity Analysis  
Water Analysis (PPM)  
Neutralization Analysis

**Water Base Kit**  
Particle Count  
Photomicrograph  
Spectrometric Analysis  
Viscosity Analysis  
Neutralization Analysis

| How to Order<br>Description                             | Part Number |
|---------------------------------------------------------|-------------|
| Petroleum base fluid kit<br>(single test bottle)        | 927292      |
| Petroleum base fluid kit<br>(Carton of 10 test bottles) | 927293      |
| Water base fluid kit<br>(single test bottle)            | 932995      |

# Fluid Analysis

Par-Test™

| FLUID ANALYSIS REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------|-------------------------------------------------------------------------------|------------|----------------|----------------------|----------|---------|----------|----------|---------|-----------|--------|-----------|--------|-----------|--------|-----------|-------|-----------|------|-----------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------|
| <b>SAMPLE CODE:</b> 93844<br><b>DATE:</b> 09/01/04<br><b>Parker Hannifan</b><br>16810 Fulton Rd. Co #2<br>Metamora, OH, 43540<br>ATTN: Kevin Noe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                | <br><b>PARTEST Fluid Analysis Service</b><br>Parker Hannifan Corporation<br>1016 E. Airport Rd.<br>Stillwater, OK 74075<br>Tele: (405)624-0400<br>Fax: (405)624-0401                  |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| <b>COMPANY NAME:</b> ABC Corporation<br><b>SYSTEM TYPE:</b> Hydraulic<br><b>EQUIPMENT TYPE:</b> Press<br><b>MACHINE ID:</b> Machine #1<br><b>FILTER ID:</b> Parker 10 micron                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                | <b>SAMPLE DATE:</b> 7/12/2004<br><b>HOURS:</b> (on oil) 948 (on unit) 2000<br><b>SYSTEM VOLUME:</b> 200 Gallons<br><b>FLUID TYPE:</b> AW 46<br><b>ANALYSIS PERFORMED:</b> N2,S,T,V4,W |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center; background-color: #e0f0ff;">AUTOMATIC PARTICLE COUNT ISO 11171</th> </tr> <tr> <th style="width: 20%;">Size</th> <th style="width: 40%;">Counts per ml.</th> <th style="width: 40%;">ISO Code</th> </tr> </thead> <tbody> <tr> <td>&gt;4 µm(c)</td> <td>35000.0</td> <td rowspan="8" style="text-align: center; vertical-align: middle;">22/21/19</td> </tr> <tr> <td>&gt;6 µm(c)</td> <td>15498.0</td> </tr> <tr> <td>&gt;10 µm(c)</td> <td>6000.0</td> </tr> <tr> <td>&gt;14 µm(c)</td> <td>2600.0</td> </tr> <tr> <td>&gt;21 µm(c)</td> <td>1468.0</td> </tr> <tr> <td>&gt;38 µm(c)</td> <td>754.0</td> </tr> <tr> <td>&gt;50 µm(c)</td> <td>58.0</td> </tr> <tr> <td>&gt;70 µm(c)</td> <td>3.0</td> </tr> </tbody> </table> |                |                                                                                                                                                                                       | AUTOMATIC PARTICLE COUNT ISO 11171 |                |                                                                               | Size       | Counts per ml. | ISO Code             | >4 µm(c) | 35000.0 | 22/21/19 | >6 µm(c) | 15498.0 | >10 µm(c) | 6000.0 | >14 µm(c) | 2600.0 | >21 µm(c) | 1468.0 | >38 µm(c) | 754.0 | >50 µm(c) | 58.0 | >70 µm(c) | 3.0 | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #e0f0ff;">FREE WATER PRESENT</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"> <input type="checkbox"/> YES<br/> <input checked="" type="checkbox"/> NO           </td> </tr> </tbody> </table> | FREE WATER PRESENT | <input type="checkbox"/> YES<br><input checked="" type="checkbox"/> NO |
| AUTOMATIC PARTICLE COUNT ISO 11171                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| Size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Counts per ml. | ISO Code                                                                                                                                                                              |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >4 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 35000.0        | 22/21/19                                                                                                                                                                              |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >6 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 15498.0        |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >10 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6000.0         |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >14 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2600.0         |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >21 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1468.0         |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >38 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 754.0          |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >50 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 58.0           |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| >70 µm(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3.0            |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| FREE WATER PRESENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| <input type="checkbox"/> YES<br><input checked="" type="checkbox"/> NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
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| PHOTO ANALYSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| Mag.: 160x                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vol 20ml       | Scale: 1 div = 20 µm                                                                                                                                                                  |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #e0f0ff;">ALARMS/REMARKS</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">           *The red line in the ISO chart graph indicates recommended cleanliness level.         </td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                                                                                                                                                                                       |                                    | ALARMS/REMARKS | *The red line in the ISO chart graph indicates recommended cleanliness level. |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| ALARMS/REMARKS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |
| *The red line in the ISO chart graph indicates recommended cleanliness level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                                                                                                                                                                                       |                                    |                |                                                                               |            |                |                      |          |         |          |          |         |           |        |           |        |           |        |           |       |           |      |           |     |                                                                                                                                                                                                                                                                                                                                                  |                    |                                                                        |

For our Par-Test™ customers, the analysis report is available online for your ease and convenience. Historical data is also available. Visit [www.partestlab.com](http://www.partestlab.com)



## Sample Data

Information supplied by the user regarding the fluid to be analyzed. Complete and accurate information is crucial for a useful analysis.

## Particle Count

Results are reported over 6 different particle size ranges and expressed as an ISO code (modified). The counts are per milliliter of fluid and the reporting is cumulative; ie. The particle count in the >2 micron row includes the number of particles greater than 5, 10, 15, 25 and 50 microns as well as particles between 2-5 microns in size. Particle resuspension method is utilized for water based fluid samples.

## Free Water Analysis

Determines if the water present is beyond the saturation point of the fluid. At the saturation point, the fluid can no longer dissolve or hold any more water. Its appearance becomes cloudy or "milky". Many hydraulic oils saturate between 500 and 1000 PPM of water.

## Photo Analysis

A photomicrograph of a small volume of fluid (20 ml) magnified 100X. This analysis gives a quick glance at the contamination present in the fluid. Each line of the graduated scale represents 20 microns in size.

The full color photomicrograph helps identify particles which would otherwise be grouped by class.

## ISO Chart

Graphically illustrates the particle count on a graph. The recommended cleanliness code level, if given on the submittal form, is shown by a broken line on the ISO chart.

# Fluid Analysis

Par-Test™

| FLUID ANALYSIS REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAMPLE CODE: 93844<br>Parker Hannifan<br>16810 Fulton Rd. Co #2<br>Metamora, OH, 43540<br>ATTN: Kevin Noe                                                                                                                                                                                                                                                                                                                                                                          |                 | DATE: 09/01/04<br><br>PARTEST Fluid Analysis Service<br>Parker Hannifin Corporation<br>1016 E. Airport Rd.<br>Stillwater, OK 74075<br>Tele: (405)624-0400<br>Fax: (405)624-0401 |
| <b>SPECTROMETRIC ANALYSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                                                                                                                                                                                                                                                                  |
| WEAR METALS AND ADDITIVES                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PPM BY WEIGHT   | STATUS*                                                                                                                                                                                                                                                          |
| IRON                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 120.0           | H                                                                                                                                                                                                                                                                |
| COPPER                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 510.0           | H                                                                                                                                                                                                                                                                |
| CHROMIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | < 1.0           | N                                                                                                                                                                                                                                                                |
| LEAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | < 1.0           | N                                                                                                                                                                                                                                                                |
| ALUMINUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1.0             | N                                                                                                                                                                                                                                                                |
| TIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | < 1.0           | N                                                                                                                                                                                                                                                                |
| SILICON                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | < 1.0           | N                                                                                                                                                                                                                                                                |
| ZINC                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 423.0           | N                                                                                                                                                                                                                                                                |
| MAGNESIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | < 1.0           | N                                                                                                                                                                                                                                                                |
| CALCIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 540.0           | H                                                                                                                                                                                                                                                                |
| PHOSPHORUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.0            | L                                                                                                                                                                                                                                                                |
| BARIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1.0             | N                                                                                                                                                                                                                                                                |
| BORON                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | < 1.0           | N                                                                                                                                                                                                                                                                |
| SODIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | < 1.0           | N                                                                                                                                                                                                                                                                |
| MOLYBDENUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | < 1.0           | N                                                                                                                                                                                                                                                                |
| SILVER                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | < 1.0           | N                                                                                                                                                                                                                                                                |
| NICKEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | < 1.0           | N                                                                                                                                                                                                                                                                |
| TITANIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | < 1.0           | N                                                                                                                                                                                                                                                                |
| MANGANESE                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | < 1.0           | N                                                                                                                                                                                                                                                                |
| ANTIMONY                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | < 1.0           | N                                                                                                                                                                                                                                                                |
| L = LOW N = NORMAL H= HIGH                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                  |
| The Spectrometric Analysis reports the ppm level of 20 different wear metals and additives in the sample. Generally the first 7 and last 5 elements are considered wear elements not normally present in hydraulic oil. Zinc through molybdenum (shaded) represent some common additives in oil. If a baseline oil sample (new oil out of a drum) is provide, then comments on the analyzed sample can be provided on whether the status of the elements are low, normal, or high. |                 |                                                                                                                                                                                                                                                                  |
| <b>Viscosity Analysis - ASTM D445</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |                                                                                                                                                                                                                                                                  |
| CST@100C:                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | SSU@210F:       |                                                                                                                                                                                                                                                                  |
| CST@40C: 46.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SSU@100F: 215.0 |                                                                                                                                                                                                                                                                  |
| Viscosity at 40C (100F) is reported in Centistokes (cSt) and SUS (Saybolt Universal Seconds). The test is conducted in accordance with ASTM D445 procedures for determining the kinematic viscosity of fluids                                                                                                                                                                                                                                                                      |                 |                                                                                                                                                                                                                                                                  |
| <b>Neutralization Analysis - ASTM D794</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                                                                                                                                                                                                  |
| TAN:                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 | 0.44                                                                                                                                                                                                                                                             |
| The Total Acid Number (TAN) test measures the acidity of a hydraulic fluid. The higher the number, the more acidic the fluid. Over time this may mean the fluid is becoming oxidized.                                                                                                                                                                                                                                                                                              |                 |                                                                                                                                                                                                                                                                  |
| <b>Water Analysis - ASTM D6304</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                                                                                                                                                                                                  |
| WATER CONTENT (PPM):                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 | 410.0                                                                                                                                                                                                                                                            |
| The water analysis test shows the actual parts per million of water in a sample. This is known as the Karl Fischer titration test and is conducted in accordance with ASTM D6304.                                                                                                                                                                                                                                                                                                  |                 |                                                                                                                                                                                                                                                                  |
| <b>Comments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |                                                                                                                                                                                                                                                                  |
| *Please check spectrometric status for abnormal conditions.                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                                                                                                                                                                                                                                                  |

## Viscosity Analysis

Viscosity is a very important property of a fluid in terms of system performance. Viscosity expresses the internal friction between molecules in the fluid. Typically a breakdown in viscosity will be seen as an increase. Both SSU at 100° F and cSt at 40° C are reported.

## Neutralization Analysis

Referred to as the Total Acid Number (TAN) this titration test measures the acid level of the sample fluid. The production of acidic material causes oxidation degradation or aging of most fluids. This activity is promoted by elevated temperatures, presence of entrained metal particles, and intimate contact with air. It is the rate of increase of the TAN during any given time period that is significant, not just the absolute value.

## Water Analysis

Karl Fischer test gives accurate measure of water concentration in the sample fluid. The results are reported in parts per million (PPM) and allow for detection of water levels well below the saturation point.

## Remarks

Quick statements or alerts about any unusual results from one of the tests reported on this page.

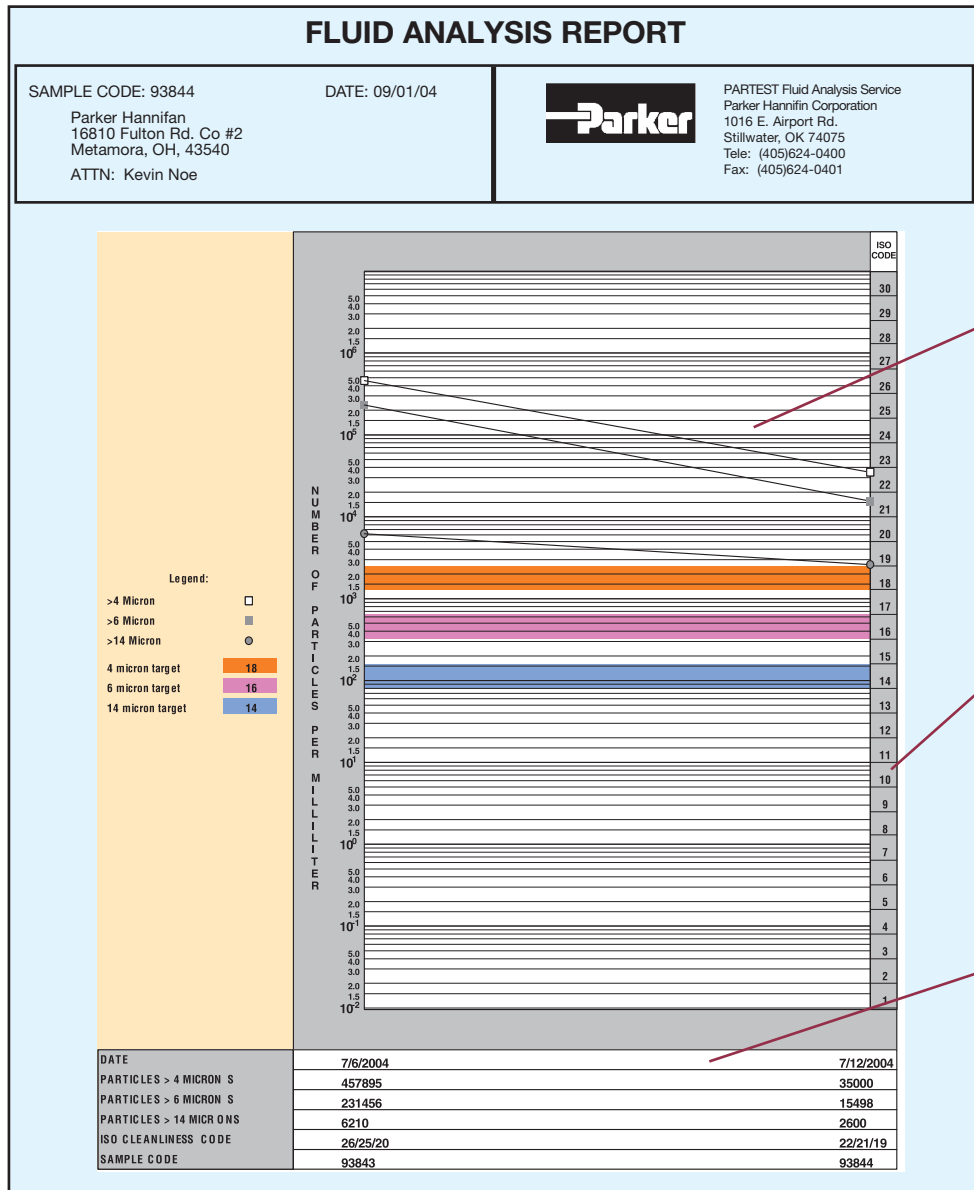
## Spectrometric Analysis

Results obtained by Rotating Disk Electrode (ROE) Spectrometer and reported in terms of parts per million (PPM). Twenty different wear metals and additives are analyzed to help determine the condition of the fluid. The spectrometric test is limited to identifying particles below 5-7 micron in size. Base line (new) fluid samples should be sent in for each different fluid to be analyzed. This will be used to determine the status.

| WEAR METALS AND ADDITIVES                                                                     |                                                            |
|-----------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Iron: Ferrous wear particle typically from pumps, gears, cylinders, or rust                   | Calcium: Dispersant additive or acid neutralizer           |
| Copper: Brass (copper/zinc) and bronze (copper/tin) in bearings and bushings                  | Phosphorous: Anti-wear or fire resistant additive in fluid |
| Chromium: (white non ferrous metal) Chrome from cylinder rods, bearings, valve spools         | Barium: Corrosion, rust inhibitor additive in oil          |
| Lead: Babbitt or copper lead bearings                                                         | Boron: Detergent, dispersive additive in oil               |
| Aluminum: White nonferrous metal from pump bodies, bushings, bearings, and grinding compounds | Sodium: Detergent or coolant additive                      |
| Tin: Babbitt bearings, plating                                                                | Molybdenum: Alloy metal or anti friction additive          |
| Silicon: Sand/dirt contamination or antifoaming additive in oil                               | Silver: White non ferrous metal                            |
| Zinc: Plating or anti-wear additive in oil                                                    | Nickel: Alloy metal                                        |
| Magnesium: Detergent, dispersive additive in oil, bearings, water                             | Titanium: White non ferrous metal                          |
|                                                                                               | Manganese: White non ferrous metal                         |
|                                                                                               | Antimony: Babbit bearings, greases                         |

# Fluid Analysis

Par-Test™



For our Par-Test™ customers, the analysis report is available online for your ease and convenience. Historical data is also available. Visit [www.partestlab.com](http://www.partestlab.com)



## Trend Analysis

Graphical history for up to 5 samples plotted for 2, 5 and 15 micron and greater size particles. This analysis is a valuable tool for tracking the progress of a system over a given time period.

## ISO Range Code

Index Number that is associated with a range of particles. Below is a list of the range numbers and the corresponding particle quantities.

## Sample Code

Assigned to the test kit form for a ready reference. This code can be used to track the sample from start to finish.

| NUMBER OF PARTICLES PER ML |           |                     |            |           |                     |
|----------------------------|-----------|---------------------|------------|-----------|---------------------|
| Range Code                 | More than | Up to and including | Range Code | More than | Up to and including |
| 30                         | 5,000,000 | 10,000,000          | 18         | 1,300     | 2,500               |
| 29                         | 2,500,000 | 5,000,000           | 17         | 640       | 1,300               |
| 28                         | 1,300,000 | 2,500,000           | 16         | 320       | 640                 |
| 27                         | 640,000   | 1,300,000           | 15         | 160       | 320                 |
| 26                         | 320,000   | 640,000             | 14         | 80        | 160                 |
| 25                         | 160,000   | 320,000             | 13         | 40        | 80                  |
| 24                         | 80,000    | 160,000             | 12         | 20        | 40                  |
| 23                         | 40,000    | 80,000              | 11         | 10        | 20                  |
| 22                         | 20,000    | 40,000              | 10         | 5         | 10                  |
| 21                         | 10,000    | 20,000              | 9          | 2.5       | 5                   |
| 20                         | 5,000     | 10,000              | 8          | 1.3       | 2.5                 |
| 19                         | 2,500     | 5,000               | 7          | .64       | 1.3                 |
|                            |           |                     | 6          | .32       | .64                 |

# Fluid Analysis

Par-Test™

## SAMPLING PROCEDURE

Obtaining a fluid sample for analysis involves important steps to make sure you are getting a representative sample. Often erroneous sampling procedures will disguise the true nature of system cleanliness levels. Use one of the following methods to obtain a representative system sample.

### I. For systems with a sampling valve

- A. Operate system for at least 1/2 hour.
- B. With the system operating, open the sample valve allowing 200 ml to 500 ml (7 to 16 ounces) of fluid to flush the sampling port. (The sample valve design should provide turbulent flow through the sampling port.)
- C. Using a wide mouth, pre-cleaned sampling bottle, remove the bottle cap and place in the stream of flow from the sampling valve. Do NOT "rinse" out the bottle with initial sample.
- D. Close the sample bottle immediately. Next, close the sampling valve. (Make prior provision to "catch" the fluid while removing the bottle from the stream.)
- E. Tag the sample bottle with pertinent data; include date, machine number, fluid supplier, fluid number code, fluid type, and time elapsed since last sample (if any).

### II. Systems without a sampling valve

There are two locations to obtain a sample in a system without a sampling valve: in-tank and in the line. The procedure for both follows:

#### A. In the Tank Sampling

1. Operate the system for at least 1/2 hour.
2. Use a small hand-held vacuum pump to extract sample. Insert sampling device into the tank to one half of the fluid height. You will probably have to weight the end of the sampling tube. Your objective is to obtain a sample in the middle portion of the tank. Avoid the top or bottom of the tank. Do not let the syringe or tubing come in contact with the side of the tank.
3. Put extracted fluid into an approved, pre-cleaned sample bottle as described in the previous sampling valve method.
4. Cap immediately.
5. Tag with information as described in sampling valve method.

#### B. In-line Sampling

1. Operate the system for at least 1/2 hour.
2. Locate a suitable valve in the system where turbulent flow can be obtained (ball valve is preferred). If no such valve ex-

ists, locate a fitting which can be easily opened to provide turbulent flow (tee or elbow).

3. Flush the valve or fitting sample point with a filtered solvent. Open valve or fitting and allow adequate flushing. (Take care to allow for this step. Direct sample back to tank or into a large container. It is not necessary to discard this fluid.)
  4. Place in an approved, pre-cleaned sample bottle under the stream of flow per sampling valve methods.
  5. Cap sample bottle immediately.
  6. Tag with important information per the sampling valve method.
- Note: Select a valve or fitting where the pressure is limited to 200 PSIG (14 bar) or less.

## ON-SITE FLUID ANALYSIS PRODUCT





aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# Hydraulic Fluid

DuraClean™ Brand



ENGINEERING YOUR SUCCESS.

# Parker DuraClean™

## Starts Clean. Stays Clean.

DuraClean™ is an ultra premium hydraulic oil provided exclusively by Parker. The fluid has a unique additive chemistry designed to maximize oil life while providing optimum anti-wear protection for the components of today's advanced hydraulic systems.

### *Performance Features*

- ISO 46, all season, multigrade hydraulic fluid
- Replaces ISO 32, 46, and 68 monogrades
- API Group II base oil extends oil life
- High viscosity index for wide operating temperature ranges
- Outstanding oxidation life to maximize component life
- Prevents varnish formation
- Clean, as packaged, to ISO 17/15/12 cleanliness standard
- Special formulation that allows for rapid air release and water separation
- Excellent filterability to minimize filter blockage
- Outstanding acrylate anti-foam agent contains no silicones, which can lead to inaccurate particle counts
- Excellent shear stability for stable viscosity over time
- Superior thermal stability for uncompromised performance at high temperatures
- Parker gold dye for easy identification
- Formulated to help extend the life of hoses and seals

### *Applications*

- Drain-and-change for most industrial and mobile hydraulic systems specifying mineral-based oil
- Top-treat for replenishing hydraulic systems already using VG 32, 46, and 68 hydraulic oils
- Wide operating temperature range requirements
- High performance hydraulic power units and equipment
- Systems with high pressures and temperatures

### *Performance Approvals*

- Parker Hannifin HF-0 (Denison HF-0)
- Eaton Vickers brochure 03-401-2010 (M-2950-S and I-286-S)
- Cincinnati Machine P-70
- Meets DIN 51524 Part 3 requirements
- Meets US Steel 127

| Package Size    | Part Number | Minimum Order Qty. |
|-----------------|-------------|--------------------|
| Pail (5 gal.)   | 941907      | 24                 |
| Drum (55 gal.)  | 942125      | 4                  |
| Tote (275 gal.) | 942126      | 1                  |



# Parker DuraClean™

## DuraClean™ vs. Varnish

DuraClean™ hydraulic fluid was developed with a totally unique 'Clean Technology.' This fluid innovation keeps harmful deposits from settling on components. These deposits can lead to system damage, component replacement, unanticipated downtime and compromised performance. Parker

DuraClean™ makes it possible for hydraulic systems to 'Start Clean and Stay Clean.' Durable performance allows the formulation to provide excellent protection of components even after the fluid has been used extensively. Varnish protection solutions provide

proven performance and viscosity retention in wide temperature range, setting Parker DuraClean™ apart from competitive fluids.

|                    | Without DuraClean™                                                                                                                              | With DuraClean™                                                                                  |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Oil Flow           | Leaves critical system components starved for lubrication and leads to part failure                                                             | Keeps system protected and extends component life                                                |
| Filters            | Develops plugged filters which forces fluids to bypass filters increasing contaminants and excessive wear and necessitates extra filter changes | Protects system from contaminants and plugged filters                                            |
| Valves             | Creates loss of system control which has a negative impact on productivity and results in downtime for cleaning and repairs                     | Maintains system cleanliness and keeps valves free from damaging varnish                         |
| Friction           | Creates higher friction causing increases in fuel and energy consumption, component wear and lower productivity                                 | Improves system efficiency, extends component life and maintains productivity                    |
| Thermal Stability  | Promotes oxidation of fluid and thermal breakdown, creating varnish and increasing wear                                                         | Keeps system operating at cooler temperatures allowing the oil and the components to last longer |
| Varnish Protection | Increases the need for frequent cleaning and repairs                                                                                            | Minimizes the need for frequent cleaning and repairs                                             |
|                    | Varnish                                                                                                                                         | No Varnish                                                                                       |

# Parker DuraClean™

## DuraClean™ vs. Varnish

### Without Parker DuraClean™ – Varnish

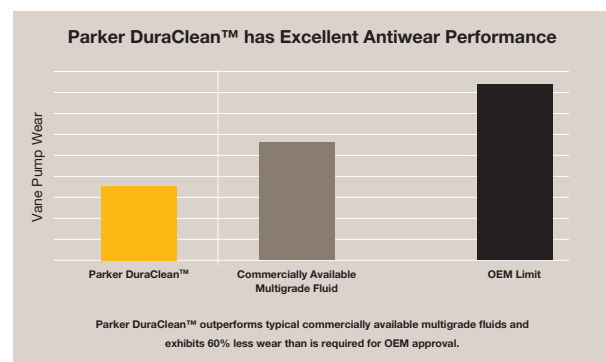
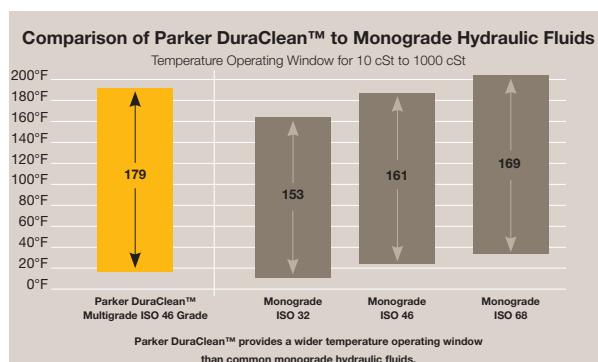


Varnish is attracted to metal surfaces, this results in an overall decrease in productivity.

### With Parker DuraClean™ – No Varnish



Parker DuraClean™ prevents the harmful build-up of varnish, keeping systems clean and operating at peak efficiency.



If a hydraulic system is dirty, simply using Parker DuraClean will not clean it up, but it will effectively prevent the formation of varnish in a clean system and keep the delicate balance of additive performance intact.



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



## Reservoir Accessories

Filler Breathers, Strainers, Diffusers,  
Fluid Level/Temperature Gauges



ENGINEERING YOUR SUCCESS.

# Reservoir Accessories

## Non-Metallic Filler Breathers

### Specifications:

#### Materials:

Body: Non-corrodible glass filled nylon.

Valve: Nylon/Nitrile.

Dipstick: ABS, acetal Hi/Lo indicators.

**Filtration Element:** Expanded polyurethane foam, 10 micron.

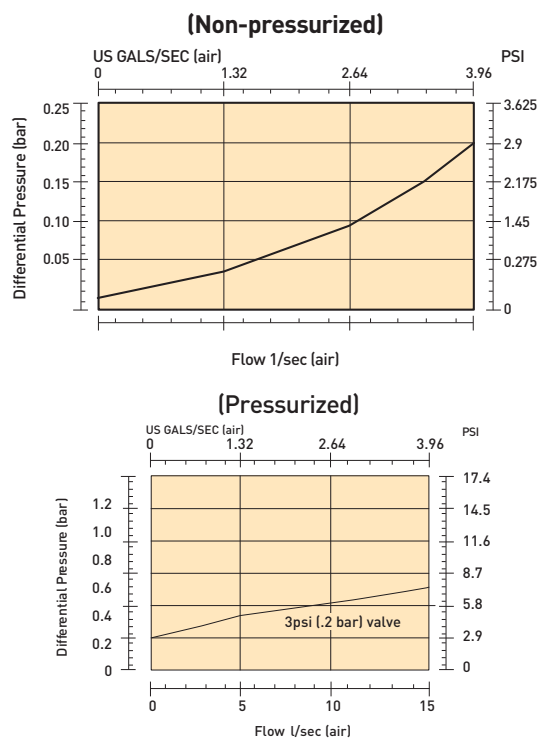
**Operating Temperatures:** -22°F (-30°C) to 195°F (90°C).

**Seals:** Nitrile (single-hole), cork gasket (six-hole).

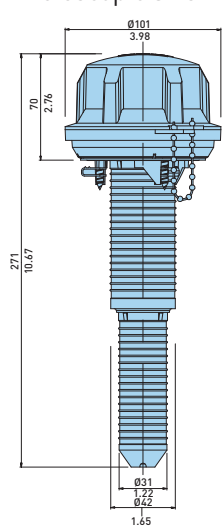
**Pressurization Options:** 3 psi (0.2 bar).

**Dipstick:** (optional) 7.9 in. (200 mm) or 15.8 in. (400 mm) lengths with adjustable Hi/Lo indicators.

### Anti-Splash Design!

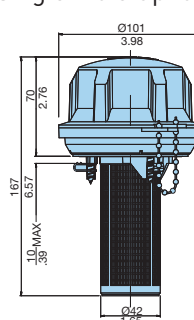


Telescopic Strainer

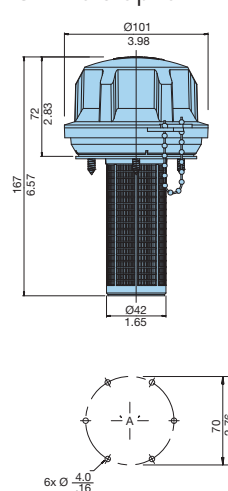


TANK MOUNTING HOLE Ø63  
NOTE: REFER TO UCC PRODUCTION  
INSTRUCTIONS FOR ASSEMBLY DETAILS  
AND PACKING REQUIREMENTS

Single-Hole Option



Six-Hole Option



Linear Measurement =  $\frac{\text{mm}}{\text{in}}$

### Non-pressurized

| Single-Hole<br>New Part No. | Single-Hole<br>Obs. Part No. | Six-Hole<br>New Part No. | Six-Hole<br>Obs. Part No. | Micron Rating | Description                       | Screws*    |
|-----------------------------|------------------------------|--------------------------|---------------------------|---------------|-----------------------------------|------------|
| AB.98210011.UC              | FB1.A1A1B2P                  | AB.98810011.UC           | FB1.D1A1B2P               | 10            | Filler breather with 3.7" [95 mm] | (6)-#10x.5 |
| AB.98210021.UC              | FB1.A1A1C2P                  | AB.98810021.UC           | FB1.D1A1C2P               | 10            | strainer                          | (6)-#10x.5 |

Filler breather with telescopic strainer

### Pressurized

| Single-Hole<br>Part No. | Six-Hole<br>New Part No. | Six-Hole<br>Obs. Part No. | Micron Rating | Description                             | Screws*    |
|-------------------------|--------------------------|---------------------------|---------------|-----------------------------------------|------------|
| Not Available           | AB.98812021.UC           | FB1.D1B1C2P               | 10            | 3 psi (.2 bar) with telescopic strainer | (6)-#10x.5 |

### Dipsticks

| New Part Number | Obsolete Part Number | Description          |
|-----------------|----------------------|----------------------|
| B.68.206        | DIP.FB2              | Pack of (10) x 7.9"  |
| B.68.207        | DIP.FB4              | Pack of (10) x 15.8" |

\*Mounting screws for six-hole only

Drawings are for reference only.  
Contact factory for current version.

# Reservoir Accessories

## Non-Metallic Breathers

### Non-Metallic Breathers

#### Threaded Type

#### Specifications:

##### Materials:

Body: Nylon 66.

Valve: Nylon/Nitrile.

Dipstick: ABS, acetal Hi/Lo indicators.

**Filtration Element:** Expanded polyurethane foam, 10 micron.

**Operating Temperatures:** -22°F (-30°C) to 195°F (90°C).

**Seals:** Nitrile.

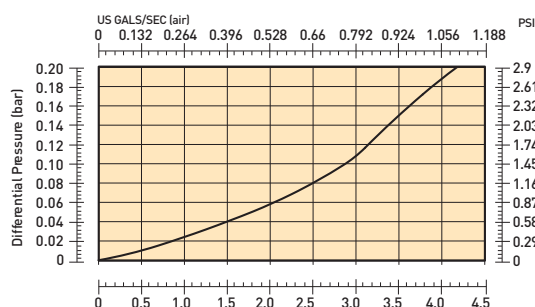
**Pressurization Options:** 3 psi [0.2 bar].

**Dipstick:** (optional) 7.9 in. (200 mm) or 15.8 in. (400 mm) lengths with adjustable Hi/Lo indicators.

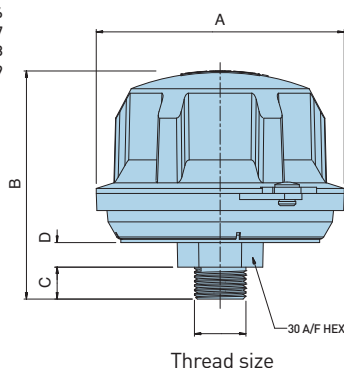
#### Anti-Splash Design!



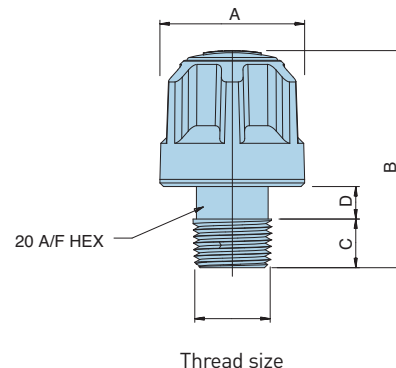
COMPACT THREADED



Standard Threaded



Compact Threaded



#### Compact Threaded

| New Part Number | Obs. Part Number | Micron Rating | Thread   | Pressure        | "A"          | "B"          | "C"            | "D"         |
|-----------------|------------------|---------------|----------|-----------------|--------------|--------------|----------------|-------------|
| AB.683102.UC*   | SB1.A1A2P*       | 10            | 1/4" NPT | non-pressurized | 1.6" [40 mm] | 2.2" [57 mm] | .55" [14 mm]   | .24" [6 mm] |
| AB.68Y102.AA*   | SB1.C1A2P*       | 10            | 1/2" NPT | non-pressurized | 1.6" [40 mm] | 2.4" [60 mm] | .53" [13.5 mm] | .35" [9 mm] |
| AB.68Z102.UC*   | SB1.D1A2P*       | 10            | 3/4" NPT | non-pressurized | 1.6" [40 mm] | 2.4" [60 mm] | .55" [14 mm]   | .35" [9 mm] |
| SB1.B1A2A       |                  | 10            | 3/8" NPT | non-pressurized |              |              |                |             |

\*Pack of [10] pieces.

#### Standard Threaded

| New Part Number | Obs. Part Number | Micron Rating | Thread   | Pressure        | "A"           | "B"          | "C"          | "D"          |
|-----------------|------------------|---------------|----------|-----------------|---------------|--------------|--------------|--------------|
| AB.98410201.UC  | FB1.B1A3A2P      | 10            | 3/4" NPT | non-pressurized | 4.0" [101 mm] | 3.8" [95 mm] | .63" [16 mm] | .39" [10 mm] |
| AB.98412201.UC  | FB1.B1B3A2P      | 10            | 3/4" NPT | 3 psi [.2 bar]  | 4.0" [101 mm] | 3.8" [95 mm] | .63" [16 mm] | .39" [10 mm] |

#### Dipsticks

| New Part Number | Obs. Part Number | Description          |
|-----------------|------------------|----------------------|
| B.68.206        | DIP.FB2          | Pack of [10] x 7.9"  |
| B.68.207        | DIP.FB4          | Pack of [10] x 15.8" |

Drawings are for reference only.  
Contact factory for current version.

# Reservoir Accessories

## Metal Filler Breathers

### Flange Type

#### Specifications:

##### Materials:

Cap & Plate: Nickel chrome plated steel.

Valve: Nylon/Nitrile.

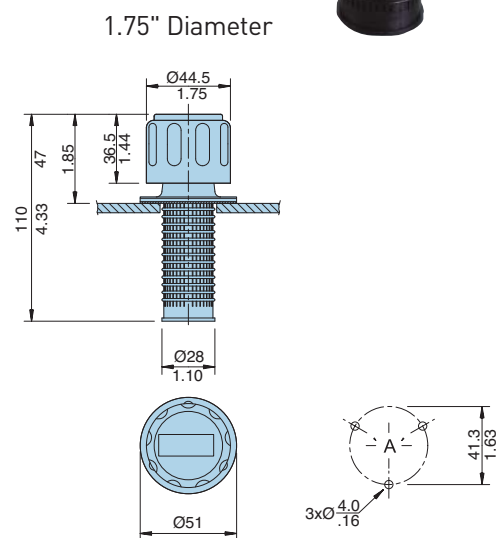
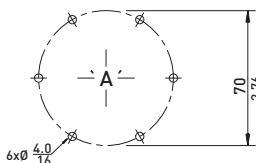
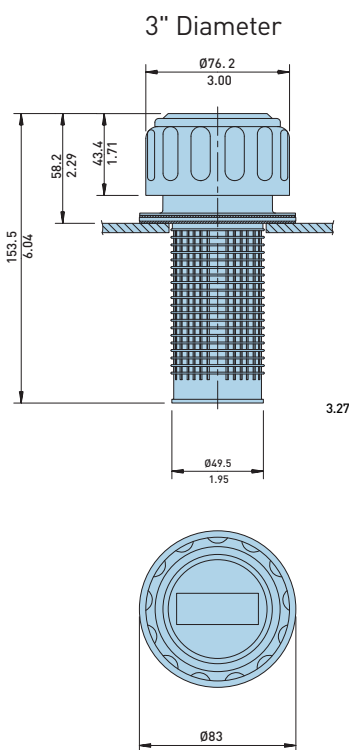
Gasket: Cork.

**Filtration Element:** Expanded polyurethane foam, 10 micron.

**Operating Temperatures:** -22°F (-30°C) to 195°F (90°C).

**Seals:** Nitrile.

**Pressurization Options:** none, 5 psi (0.35 bar).



Linear Measurement=  $\frac{\text{mm}}{\text{in}}$

Drawings are for reference only.  
Contact factory for current version.

### Flange Type, Non-pressurized

| New Part No. | Obs. Part No. | New Part (Cap As.) | Obs. Part (Cap As.) | Micron Rtg | Air Flow                 | Description                | Screws     |
|--------------|---------------|--------------------|---------------------|------------|--------------------------|----------------------------|------------|
| AB.1163.10   | MB1.D1A1B1P   | CAP.1163.10        | CP1.D1A1A1P         | 10         | 2 gal./sec. [7.5 l/sec.] | 3" [76 mm] dia.            | (6)-#10x.5 |
| 5561         | MB1.D1A1B2P   | Not Available      | Not Available       | 10         | 2 gal./sec. [7.5 l/sec.] | 3" [76 mm] dia., w/lck lug | (6)-#10x.5 |
| AB.1380.10   | MB1.A1A1B1P   | CAP.1380.40        | CP1.A2A1A1P         | 10         | 1.3 gal./sec. [5 l/sec.] | 1.75" [44.5 mm] dia.       | (6)-#10x.5 |

### Flange Type, Pressurized

| New Part No.  | Obs. Part No. | New Part (Cap As.) | Obs. Part (Cap As.) | Micron Rtg. | Air Flow                 | Description                      | Screws     |
|---------------|---------------|--------------------|---------------------|-------------|--------------------------|----------------------------------|------------|
| PAB.1730.10.5 | MB1.D1C1B1P   | CAP.1730.40.5      | CP1.D1C1A1P         | 10          | 2 gal./sec. [7.5 l/sec.] | 5 psi (.35 bar), 3" [76 mm] dia. | (6)-#10x.5 |

# Reservoir Accessories

## Metal Breathers

### Threaded Type

#### Specifications:

##### Materials:

Cap & Plate: Nickel chrome plated steel.

Valve: Nylon/Nitrile.

Gasket: Cork.

Filtration Element: Expanded polyurethane foam, 10 micron.

Operating Temperatures: -22°F (-30°C) to 195°F (90°C).

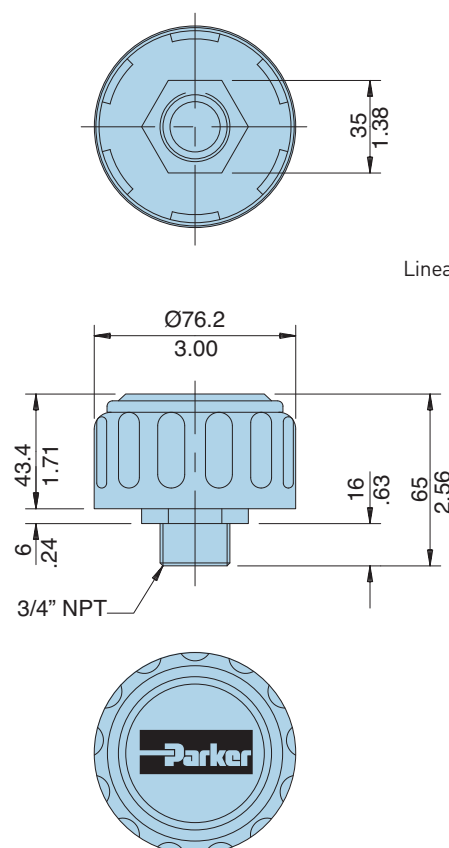
Seals: Nitrile.

Pressurization Options: none, 5 psi [0.35 bar].

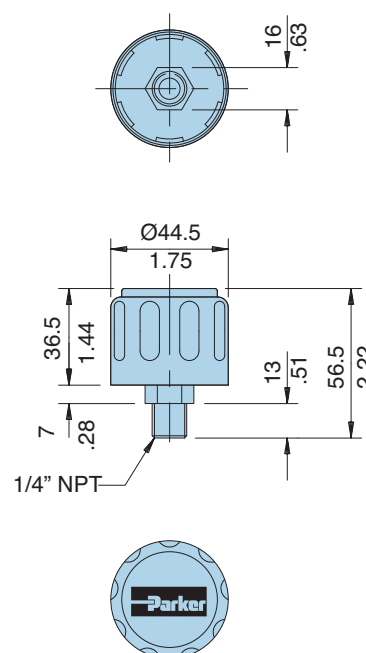


3/4" Threaded

1/4" Threaded



Linear Measurement=  $\frac{\text{mm}}{\text{in}}$



Drawings are for reference only.  
Contact factory for current version.

#### Threaded, Non-pressurized

| New Part Number | Obs. Part Number | Micron Rating | Air Flow                    | Thread   | Description              |
|-----------------|------------------|---------------|-----------------------------|----------|--------------------------|
| SAB.1562.10.NPT | MB1.B1A3A1P      | 10            | 1.3 gallon/sec. [5 l/sec.]  | 3/4" NPT | 3" [76 mm] diameter      |
| SAB.1563.10.NPT | MB1.C1A3A1P      | 10            | .7 gallon/sec. [2.5 l/sec.] | 1/4" NPT | 1.75" [44.5 mm] diameter |

# Reservoir Accessories

## Breathers

### Desiccant Type

#### Specifications:

##### Materials:

Casing: Clarified copolymer polypropylene.

Cap: Copolymer polypropylene.

Stand pipe: PVC.

**Filtration Element:** Polyester, silica gel.

**Operating Temperatures:** -20°F (-29°C) to 250°F (121°C).

**Seals:** None.

##### Maximum Allowable

**Operating Pressure (MAOP):** 5 psi (.34 bar).

##### Particle Removal Efficiency:

98.7% (beta 75) @ 3 micron

99.5% (beta 200) @ 4 micron

99.9% (beta 1000) @ 5.3 micron

##### Weight:

934330T 1.25 lbs. (.57 kg) each.

934331T 1.75 lbs. (.79 kg) each.

934332T 2.25 lbs. (1.02 kg) each.



### Features

#### Foam Pads

Isolates the removal materials from contact with heavy reservoir mist and securely holds materials in place.

#### Filter Pads

Specially designed filter pads remove solid particulate on upstream side and then regenerate by releasing those particles when air flow reverses direction. Lower pad removes airborne contamination and second pad protects against any migration of desiccant.

#### Air Intakes

A total of eight air intakes may be exposed to allow air to freely flow in and out of the TriCeptor.

#### Silica Gel Desiccant

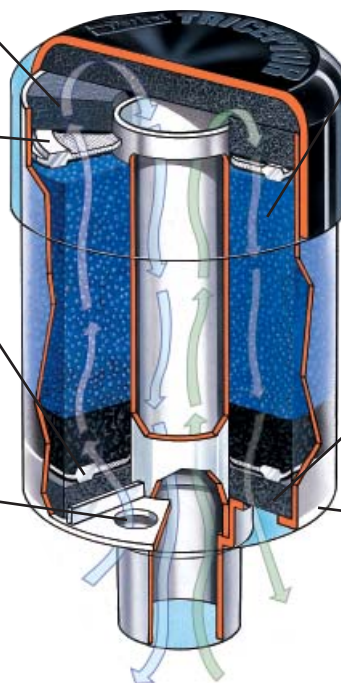
Has the highest removal capability by volume of any adsorption method. Indicates condition by changing color.

#### Foam pad

Insures filter pad is properly positioned and protects it from external damage.

#### Molded Housing

Durable shock absorbing casing provides reliable service and simple press in mounting.



# Reservoir Accessories

## Breathers

### Installation

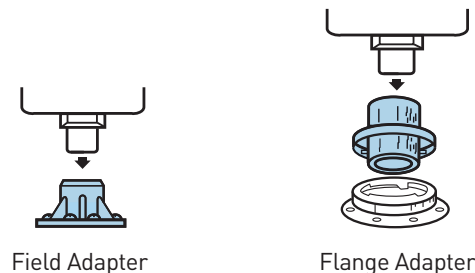
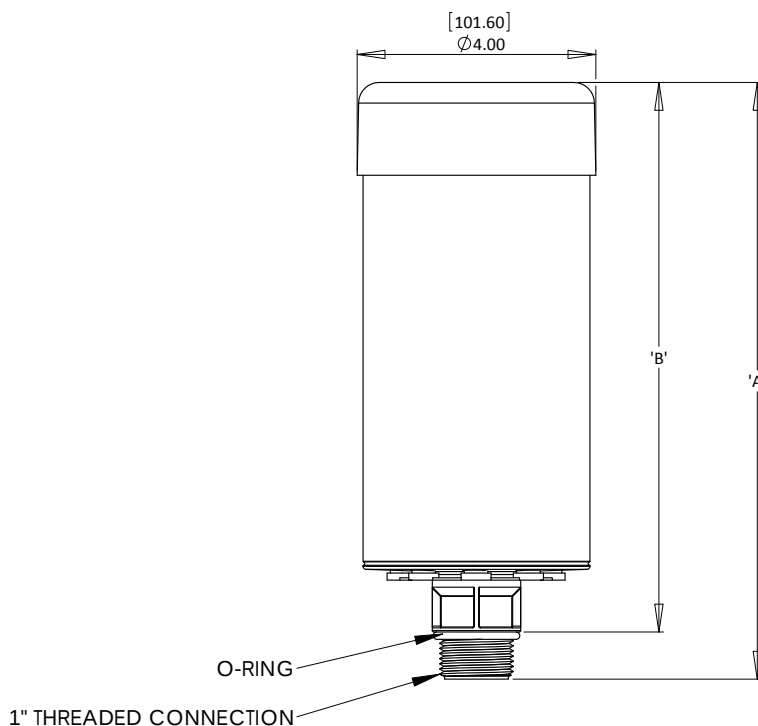
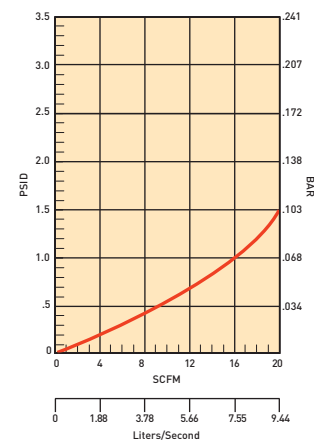
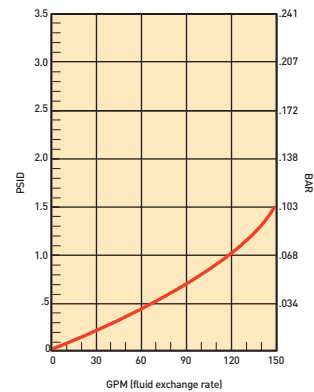
TriCeptor breathers are designed for simple installation on most equipment, regardless of mounting connection. Since TriCeptor breathers are disposable, the threaded connection allows for quick and easy maintenance. Several mounting adapters (shown below) are available to provide the desired mounting. The installation/replacement process consists of four easy steps:

1. Remove from protective plastic wrap.
2. Remove 1" blue cap from standpipe.
3. Remove foil label to expose the necessary amount of air intake holes.
4. Twist TriCeptor into mounting adapter.

Servicing the TriCeptor breather is also very easy. When the silica gel changes color from blue to a pink, the breather is no longer active and needs to be replaced. Simply remove the unit and discard properly.

### Air Flow Performance

The curves below show the air flow performance of the three TriCeptor breathers. To insure the longest life possible, the initial clean pressure drop should not exceed 1.5 psid (.103 bar).



$$\text{Linear Measurement} = \frac{\text{mm}}{\text{in}}$$

Drawings are for reference only.  
Contact factory for current version.

| Part Number | 'A' (mm/in)    | 'B' (mm/in)   | Quantity |
|-------------|----------------|---------------|----------|
| 934330T     | 155.58/6.125   | 135.256/5.325 | 6 pcs.   |
| 934331T     | 206.38/8.125   | 186.06/7.325  | 6 pcs.   |
| 934332T     | 257.18/10.125  | 236.86/9.325  | 6 pcs.   |
| 937546      | Field Adapter  | 937546        | 1 pc.    |
| 937463      | Flange Adapter | 937463        | 1 pc.    |

# Reservoir Accessories

## Mobile Triceptor

### New Design in Mobile Triceptor:

Parker's new mobile Triceptor desiccant filter breather incorporates a design that replaces both the spin-on can and the optional check valve adaptor.

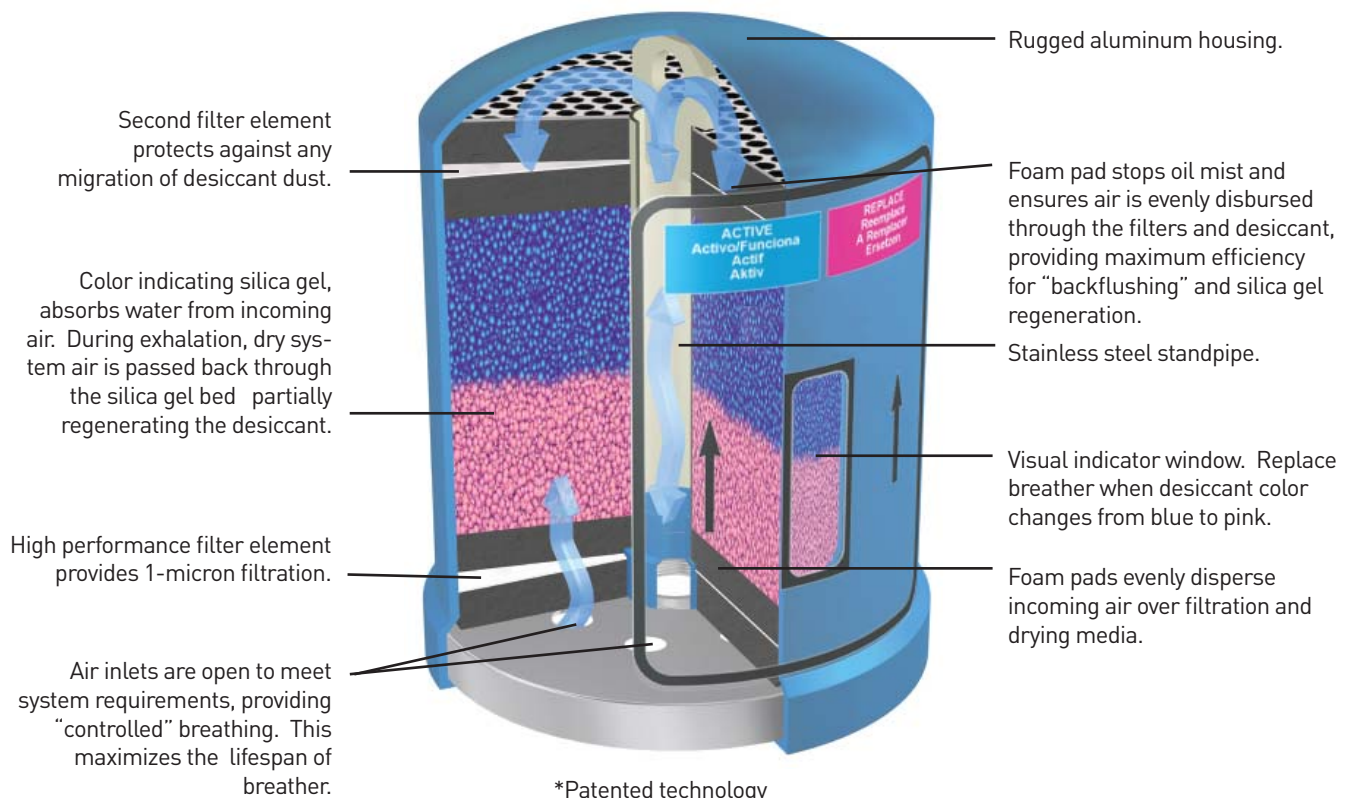
Optimized for mobile applications, the mobile Triceptor is equipped to handle high air flow surges as cylinders unload, while providing reliable protection from ingressed contaminants. Controlling rust-forming water vapor and airborne particulates, the breather protects against sludge deposits and water-contaminated oil resulting in longer oil and filter life while reducing operating costs.



941655



941747



# Reservoir Accessories

## Mobile Triceptor

### General Data

|                             |                                           |
|-----------------------------|-------------------------------------------|
| Amount of Silica Gel        | 0.79 kg                                   |
|                             | 1 lb. 12 oz.                              |
| Adsorption Capacity         | 318 mL                                    |
|                             | 1.34 cups                                 |
| Net Weight of Unit          | 1.8 kg                                    |
|                             | 4 lbs. 3 oz.                              |
| Filtration Area             | 31.1 in <sup>2</sup> / 79 cm <sup>2</sup> |
| Direction of Flow           | Bidirectional                             |
| Operating Temperature Range | -20°F to 300°F /<br>-29°C to 148.89°C     |

### Unit Material Data

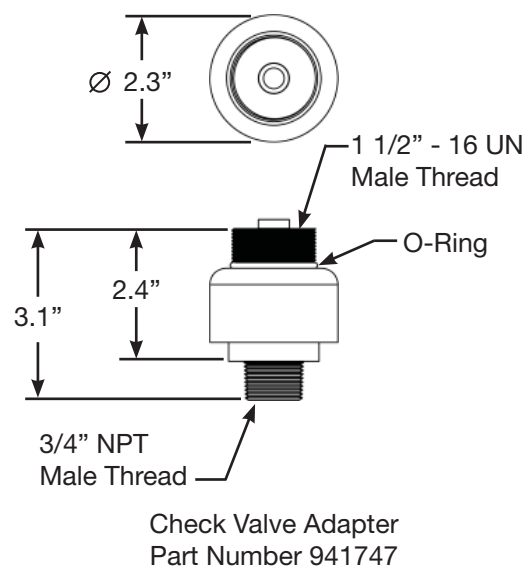
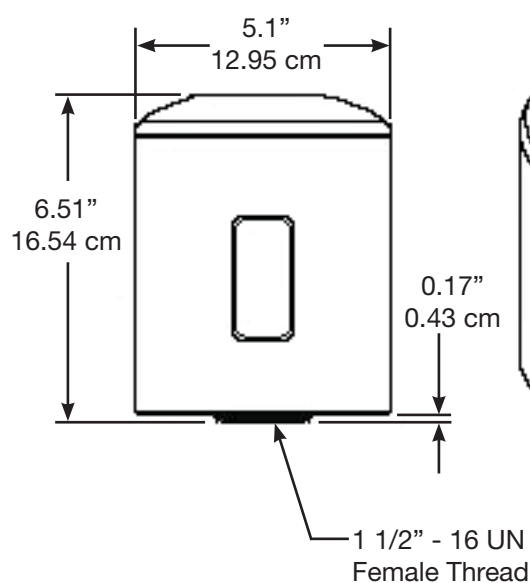
|                               |                   |
|-------------------------------|-------------------|
| Material                      | Nylon and MXD6    |
| Maximum Operating Temperature | 300°F / 148.89°C  |
| Melting Point                 | 320°F / 160°C     |
| Check Valve Adapter           | Zinc Plated Steel |

### Filter Media

|                       |                                                                    |
|-----------------------|--------------------------------------------------------------------|
| Material              | EPTFE                                                              |
| Porosity              | 3.5 - 7.5 Ft./min.<br>@ 0.5 in. - H <sub>2</sub> O<br>(ASTM D 737) |
| Filtration Efficiency | 99.97% @ 0.3μ<br>(IES-RP-CC021.1)                                  |

### Hygroscopic Agent (Silica Gel)

|                           |                             |
|---------------------------|-----------------------------|
| Apparent Bulk Density     | 700 - 800 kg/m <sup>3</sup> |
| Average Particle Diameter | 0.145" / 3.68 mm            |
| Specific Heat             | 0.25 BTU/lb. F              |
| Nominal Mesh Range        | 4 x 8                       |
| Average Crush Strength    | 35 lbs. / 15.9 kg           |



Note: Element removal clearance = 1"

# Reservoir Accessories

## Breathers - Spin-on Type

### Specifications:

**Materials:** Low carbon steel.

**Filtration Element:** Cellulose.

### Operating Temperatures:

-40°F (-40°C) to 225°F (107°C).

**Seals:** Nitrile.

**Weight:** 12AT - 1.2 lbs(.54 kg) each.

50AT - 2.3 lbs. (1.0 kg) each.

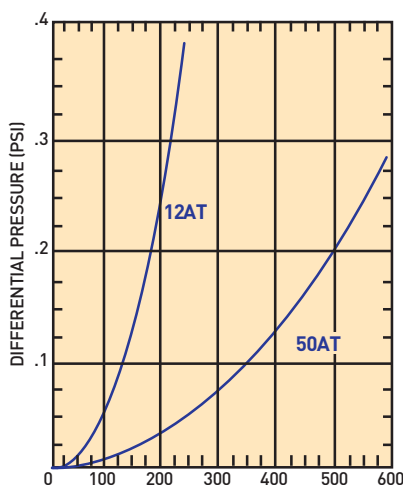
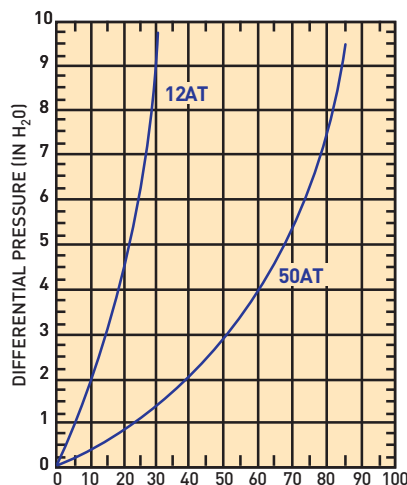
### Sizing

Select the proper size cannister for the maximum rate of reservoir draw down or air exchange rate. As a rule of thumb, clean pressure drop should be limited to 0.18 psid [5" H<sub>2</sub>O].

Recommended cannister change out is after 500 hours of operation. More frequent replacement may be required when operated in heavily contaminated areas such as grinding operations, primary metal mills, and on mobile equipment. Under such conditions, increase replacement frequency to every 250 hours.

Graphs are for 03C cannisters only. Total pressure drop across cannister, adaptor, and pipe may be found by adding pressure drops below:

- + 1.5% for each inch of 12AT adapter or 3/4" pipe used.
- + 3.0% for each 3/4" elbow used.
- + 1.0% for each inch of 50AT adapter or 1-1/4" pipe used.
- + 2.0% for each 1-1/4" elbow used.

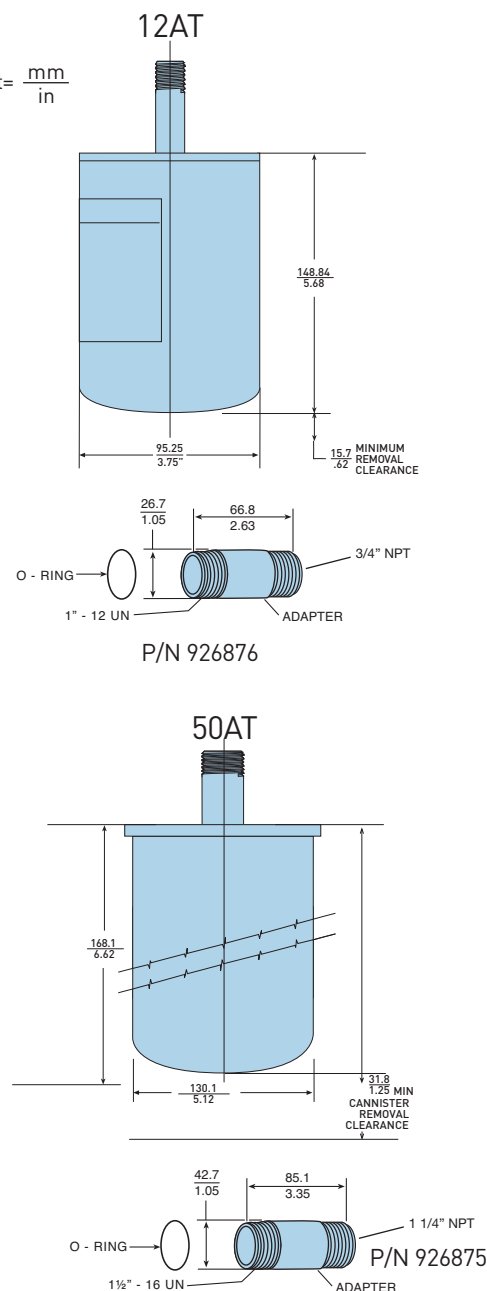


| Element | Air Rating* | Diameter | Adaptor Kit |
|---------|-------------|----------|-------------|
| 926543  | 1 micron    | 3.75"    | 926876      |
| 921999  | 2 micron    | 3.75"    | 926876      |
| 925023  | 5 micron    | 3.75"    | 926876      |
| 926541  | 1 micron    | 5.1"     | 926875      |
| 926169  | 2 micron    | 5.1"     | 926875      |
| 926170  | 5 micron    | 5.1"     | 926875      |

\*99% removal efficiency for particles larger than stated size in air.



$$\text{Linear Measurement} = \frac{\text{mm}}{\text{in}}$$



# Reservoir Accessories

## Diffusers

### Specifications:

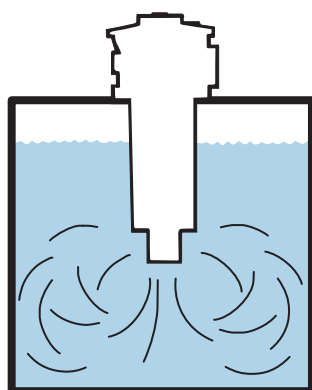
**Operating Temperatures:** 195°F (90°C) maximum.

**Materials:** Body & end cap: Zintec.  
Head: glass-filled nylon.

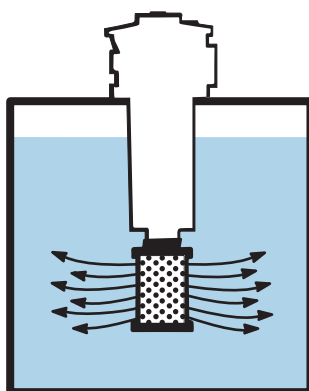
**Weight:** See chart below.

### Benefits:

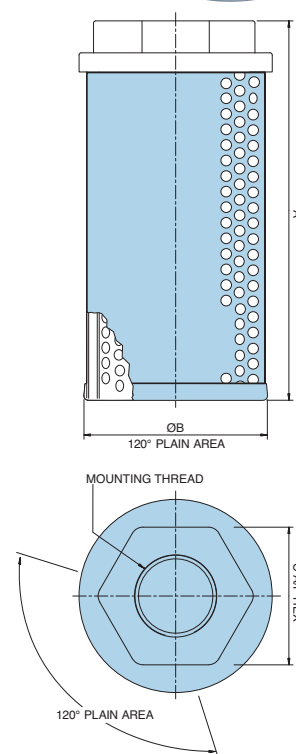
Installing a diffuser in a hydraulic reservoir is a simple change that can make a dramatic difference in system efficiency. With special concentric tubes designed with discharge holes 180° opposed, fluid aeration, foaming and reservoir noise are reduced. Pump life is also extended by reducing cavitation to the pump inlet. The effects of fitting a system with a diffuser are shown below.



Flow without diffuser



Flow with diffuser fitted



| New Part Number | Obs. Part Number | Thread (NPT) | Nominal Flow GPM (LPM) | Length "A" Inch (mm) | Diameter "B" Inch (mm) | HEX "C" Inch (mm) | Weight Lbs. (kg) |
|-----------------|------------------|--------------|------------------------|----------------------|------------------------|-------------------|------------------|
| 2250            | DF1.A2BP         | 3/4"         | 13 (50)                | 4.7 (120)            | 2.4 (62)               | 1.81 (46)         | .60 (0.27)       |
| 2251            | DF1.B4BP         | 1"           | 30 (114)               | 5.0 (127)            | 3.4 (86)               | 2.17 (55)         | .93 (0.42)       |
| 2252            | DF1.B6BP         | 1 1/2"       | 60 (227)               | 7.0 (178)            | 3.4 (86)               | 2.56 (65)         | 1.23 (0.56)      |
| 2253            | DF1.B9BP         | 2"           | 120 (454)              | 9.5 (242)            | 3.4 (86)               | 2.95 (75)         | 1.52 (0.69)      |

# Reservoir Accessories

## Fluid Level/Temperature Gauges

### Specifications:

#### Materials:

Lens: Transparent polyamide.

Lens base: Nylon 66.

Shroud: High impact polystyrene (no aluminum content).

Seals: Nitrile.

**Maximum Operating Pressure:** 14.7 psi (1 bar).

**Operating Temperatures:** -22°F (-30°C) to 195°F (90°C).

**Thermometer Range:** 90°F to 210°F (30°C to 90°C).

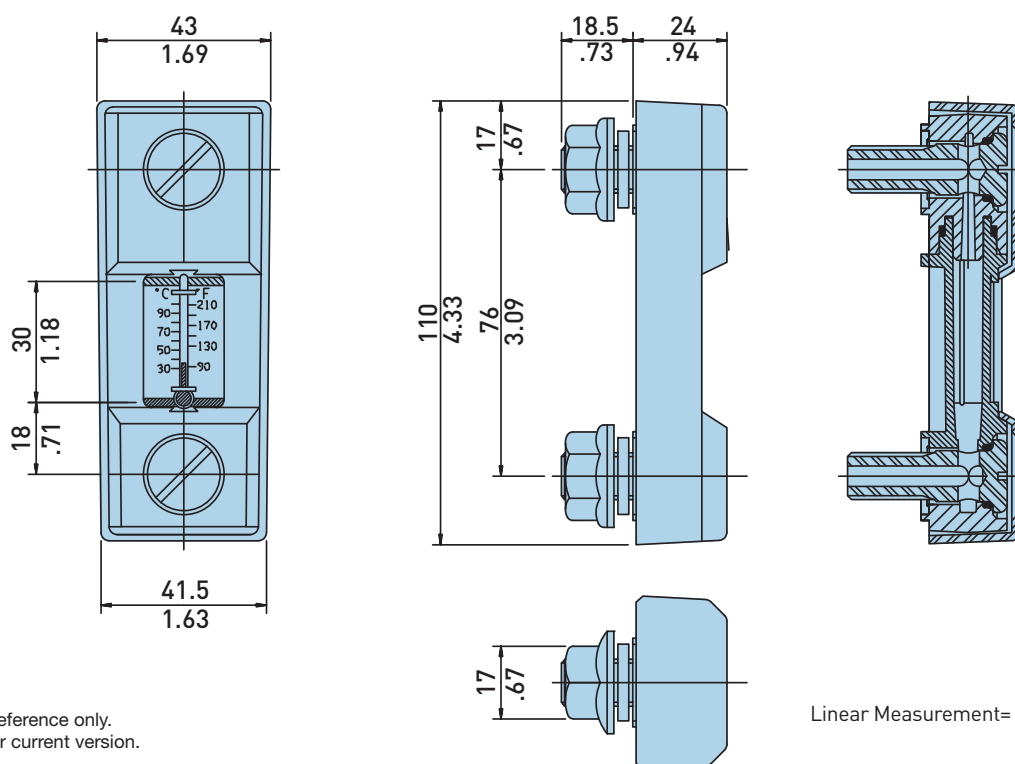
**Indicator:** Blue alcohol.

**Fluid Compatibility:** Mineral and petroleum based fluids.

**Mounting:** Front or rear fixing, two holes (M10).



### Length 3



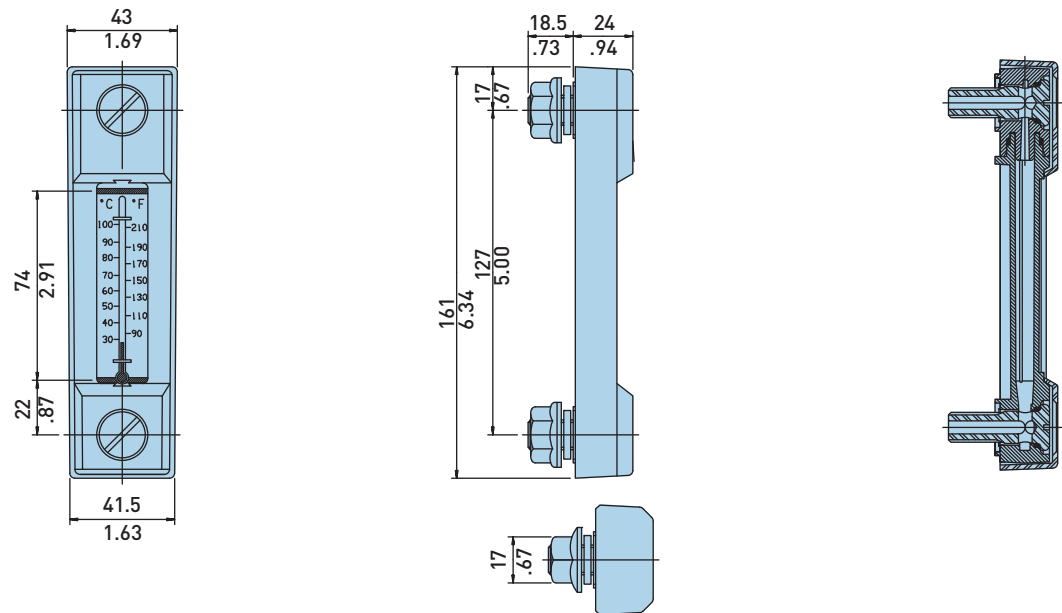
Drawings are for reference only.  
Contact factory for current version.

| Part Number | Thread | Length | Description                 |
|-------------|--------|--------|-----------------------------|
| FL.69121    | M10    | 3      | Fluid level and temperature |
| FL.69221    | M10    | 5      | Fluid level and temperature |
| FL.69321    | M10    | 10     | Fluid level and temperature |

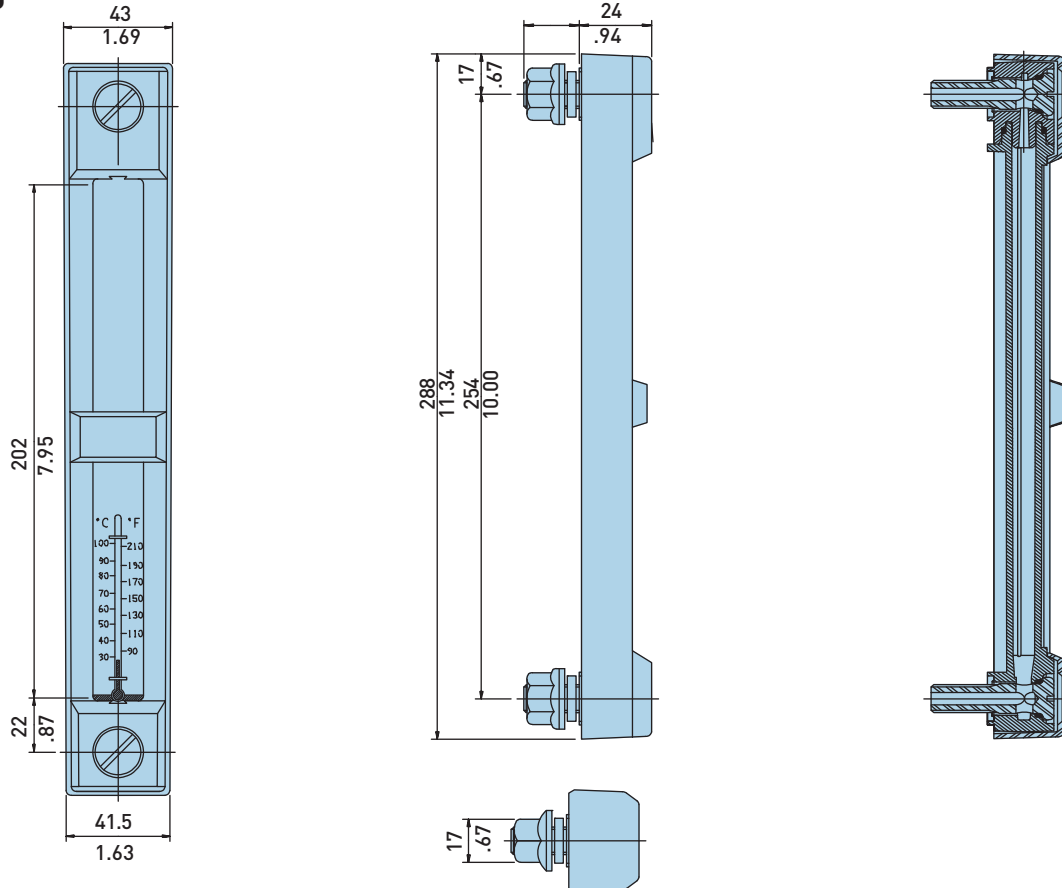
# Reservoir Accessories

Fluid Level/Temperature Gauges

## Length 5



## Length 10



Linear Measurement=  $\frac{\text{mm}}{\text{in}}$

Drawings are for reference only.  
Contact factory for current version.

# Reservoir Accessories

## Suction Strainers

### Specifications:

#### Materials:

Media: Stainless steel.

Tube and endcap: Zintec.

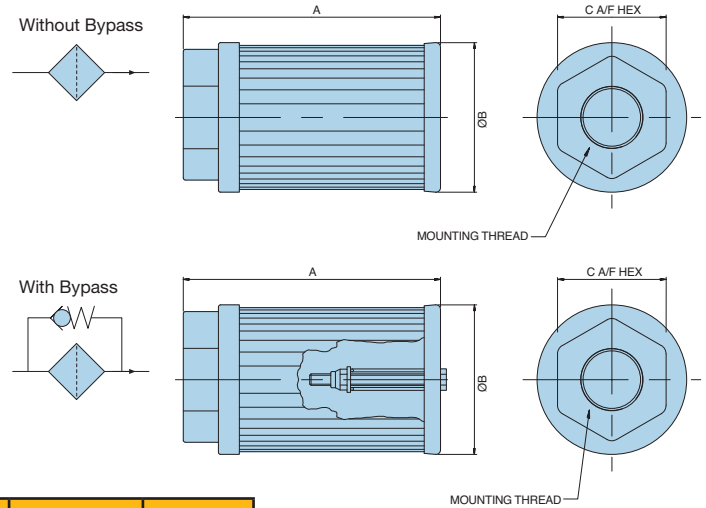
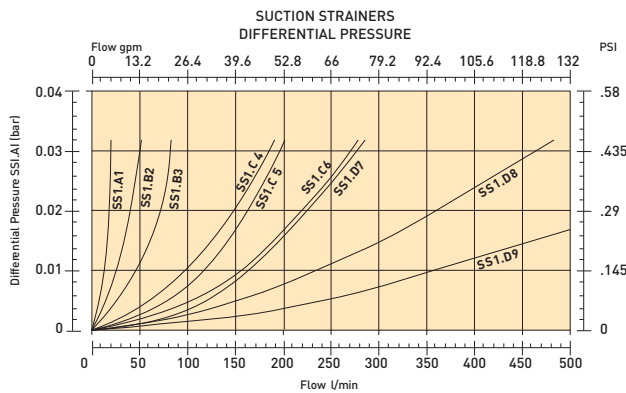
Head: glass filled nylon.

**Filtration Element:** 100 mesh (149 micron).

**Operating Temperatures:** 195°F (90°C) maximum.

**Bypass:** None, 3 psi (0.2 bar).

**Weight:** See chart below.



| New Part No.<br>With Bypass | Bypass | Port (NPT) | Nominal Flow<br>GPM (LPM) | Length "A"<br>Inch (mm) | Diameter "B"<br>Inch (mm) | BSPP Fitting |
|-----------------------------|--------|------------|---------------------------|-------------------------|---------------------------|--------------|
| 937480                      | No     | 1/2"       | 5(19)                     | 4.125                   | 1.90                      | No           |
| 937481                      | Yes    | 1/2"       | 5(19)                     | 4.125                   | 1.90                      | No           |
| 937482                      | No     | 3/4"       | 8(30)                     | 3.55                    | 2.67                      | No           |
| 937483                      | Yes    | 3/4"       | 8(30)                     | 3.55                    | 2.67                      | No           |
| 937484                      | No     | 1"         | 10(38)                    | 5.25                    | 2.67                      | No           |
| 937485                      | Yes    | 1"         | 10(38)                    | 5.25                    | 2.67                      | No           |
| 937488                      | No     | 1-1/2"     | 30(114)                   | 8.01                    | 3.47                      | No           |
| 937489                      | Yes    | 1-1/2"     | 30(114)                   | 8.01                    | 3.47                      | No           |
| 937490                      | No     | 1-1/2"     | 50(189)                   | 9.85                    | 4.00                      | No           |
| 937491                      | Yes    | 1-1/2"     | 50(189)                   | 9.85                    | 4.00                      | No           |
| 937492                      | No     | 2"         | 50(189)                   | 9.85                    | 4.00                      | No           |
| 937493                      | Yes    | 2"         | 50(189)                   | 9.85                    | 4.00                      | No           |
| 937494                      | No     | 2-1/2"     | 75(284)                   | 10.10                   | 5.17                      | No           |
| 937495                      | Yes    | 2-1/2"     | 75(284)                   | 10.10                   | 5.17                      | No           |
| 937496                      | No     | 3"         | 100(378)                  | 11.50                   | 5.17                      | No           |
| 937497                      | Yes    | 3"         | 100(378)                  | 11.50                   | 5.17                      | No           |

# Reservoir Accessories

## Magnetic Suction Strainers

### Magnetic Suction Strainers

**Now offer dual protection, without cavitation!**

Parker's new magnetic suction strainers offer dual protection to the pump inlet without risk of cavitation.

Powerful ceramic magnets located parallel to the pleated mesh attract and protect against damaging ferrous particles of all sizes.

The pleated stainless steel screen provides additional filtration protection for larger particles that would result in catastrophic failure.

The generous open area of the stainless steel pleated mesh screen eliminates the possibility of pump cavitation.

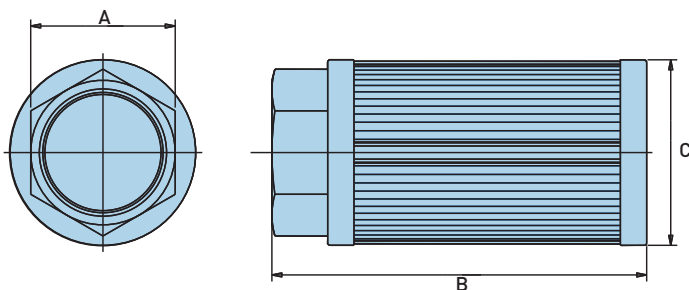
#### Ordering Information

The information below shows the part numbers, specifications and dimensions of available suction strainers, to help you meet the needs of your specific application.

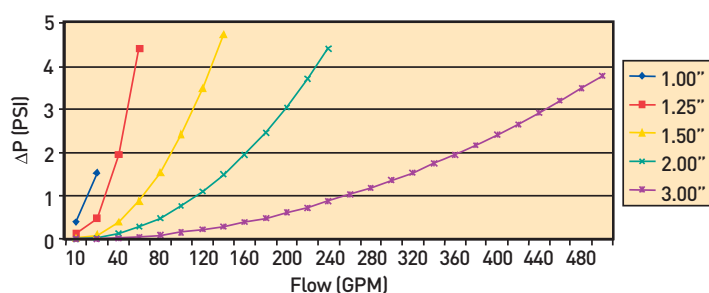
NOTE: All sizes are standard with 30 mesh screen (560 micron).

| Part Number | NPT Connection | Flow GPM (LPM) | Dimensions    |               |               | Approx. Shipping Weight lbs. (kg) |
|-------------|----------------|----------------|---------------|---------------|---------------|-----------------------------------|
|             |                |                | A inches (mm) | B inches (mm) | C inches (mm) |                                   |
| 936547      | 1.00"          | 15 (55)        | 1.88 (47.75)  | 5.19 (131.83) | 3.09 (78.49)  | 1.59 (0.72)                       |
| 936548      | 1.25"          | 25 (95)        | 2.38 (60.45)  | 7.39 (187.71) | 3.53 (89.66)  | 3.16 (1.43)                       |
| 936549      | 1.50"          | 35 (135)       | 2.38 (60.45)  | 7.39 (187.71) | 3.53 (89.66)  | 2.88 (1.31)                       |
| 936550      | 2.00"          | 50 (190)       | 2.75 (69.85)  | 7.39 (187.71) | 3.53 (89.66)  | 2.22 (1.01)                       |
| 936551      | 3.00"          | 100 (380)      | *             | 9.35 (237.49) | 4.47 (113.54) | 3.91 (1.77)                       |

\*Part number 936551 features a 3" half coupling, not a hex nut.



Flow Vs. Pressure Loss



Parker's magnetic suction strainers are available in sizes ranging from one to three inches.



The rugged steel construction, combined with the generous filtration area, ensures reliable performance for suction applications.

[illegible]

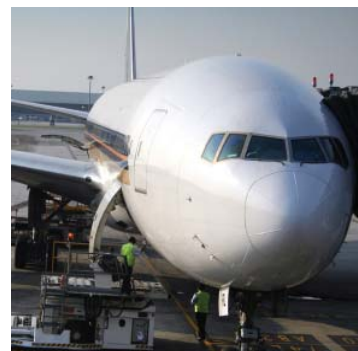


aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# PAR◇GEL<sup>TM</sup>

Water Removal Filter Elements



ENGINEERING YOUR SUCCESS.



## Water Removal Filter Elements

**Par-Gel filter elements are an effective tool in controlling water related problems in hydraulic power and lubrication systems.**

There is more to proper fluid maintenance than just removing particulate matter. You need to remove water as well. Parker has developed Par-Gel water removal elements to be used in combination with particulate filters to provide significant benefits.

Less component wear, consequently less component generated contaminants.

Significant reduction of costly downtime and replacement of failed components.

Increased efficiency of the system, thereby improving machine productivity.

Less frequent replacement and disposal of contaminated fluid.

Reduced chance of catastrophic failure.

### **Water as a contaminant.**

Whether you use a mineral-base or synthetic fluid, each will have a water saturation point. Above this point, the fluid cannot dissolve or hold any more water. This excessive water is referred to as 'free' or emulsified water. As little as .03% (300 ppm) by volume can saturate a hydraulic fluid.

Many mineral-base and synthetic fluids, unless specifically filtered or treated in some way, will contain levels of water above their saturation point.

### **Water is everywhere!**

**Storage and handling.** Fluids are constantly exposed to water and water vapor while being handled and stored. For

instance, outdoor storage of tanks and drums is common. Water settles on top of tanks and drums and infiltrates the container, or is introduced when the container is opened to add or remove fluid.

**In-service.** Water can get by worn cylinder and actuator seals, or through reservoir openings. Water can come in contact with these entry points through water based cutting fluids or when water and/or steam are used for cleaning.





## Water Removal Filter Elements



Typical results of wear due to presence of particulate and water contamination.

Condensation is also a prime water source. As fluid cools in a reservoir, temperature drop condenses water vapor on inside surfaces, which in turn causes rust. Rust scale in the reservoir eventually becomes particulate contamination in the system.

### Microbial growth as a contaminant.

Once water enters a system, growth of microorganisms begins. Since water is one of the end products of the breakdown of hydrocarbon fluid, once started, the process is somewhat self-sustaining.

Slime is evidence of microbial growth, as is the apparent increase in viscosity of the fluid, obnoxious odor and discolored fluid. The results are: short fluid life, degraded surface finish and rapid corrosion.

### Water generated damage and operating problems

- Corrosion
- Accelerated abrasive wear
- Bearing fatigue
- Additive breakdown
- Increased acid level
- Viscosity variance
- Electrical conductivity

### Forms of water in fluid

- Dissolved water— below saturation point.
- Free water—emulsified or in droplets\*.

Water in the system creates oxides, slimes and resins. Corrosion is an obvious by-product and creates further contaminants in the system.

The effect is compounded, as you now have both particulate contaminant and water working together.

The particulate contamination can be as simple as rust flaking from reservoir walls. Anti-wear additives break down in the presence of water and form acids. The combination of water, heat and dissimilar metals encourages galvanic action. Pitted and corroded metal surfaces and finishes result.

Further complications occur as temperature drops and the fluid has less ability to hold water. As the freeze point is reached, ice crystals form, adversely affecting total system function. Operating functions may become slowed or erratic.

Electrical conductivity becomes a problem when water contamination weakens insulating properties of fluid (decreases dielectric kV strength).

### Testing your fluid for water.

A simple 'crackle test' will tell you if there is water in your fluid. Simply take a metal dish or spoon with a small amount of fluid. Apply a flame under the container with a match. If bubbles rise and 'crackle' from the point of applied heat, you have free water.

**ParTest™** fluid analysis. For complete analysis,



Parker offers Par-Test fluid analysis. Your Parker representative can supply you with a fluid container, mailing carton and appropriate forms to identify your fluid and its use. An independent lab performs complete spectrometric analysis, particle counts, viscosity and water content.

Results are sent directly to the requester.

\* Excessive free water must be removed from the system before filtering is attempted. In systems with gross amounts of water (1% to 2% by volume), settling or vacuum dehydration should be considered before using Par-Gel filter elements.



## Water Removal Filter Elements

**Removing water.** Using a Par-Gel water removal element is an effective way of removing free water contamination from your hydraulic system. It is highly effective at removing free water from mineral-base and synthetic fluids.

The Par-Gel filter media is a highly absorbent copolymer laminate with an affinity for water. However, hydraulic or lubrication fluid passes freely through it. The water is bonded to the filter media and forever removed from the system. It cannot even be squeezed out.

### Parker technology and



Photo above shows 'dry' Par-Gel filter media and the same media swollen with absorbed water.

### expertise at your disposal.

Choosing the correct filters can save money and minimize problems caused by particulate and water contaminants in hydraulic and lubricating fluids.

Parker provides hard data and advice on choosing from a wide range of filter configurations, flow patterns and flow pressure capabilities.

**How many filter elements will I need?** Suppose you would like to remove water from contaminated oil stored in a 200 gallon tank. The tank is found to have 1000 ppm of water (very contaminated). The circulation rate will be 10 gpm for the 200 SUS fluid.

Example: How many single length Moduflow™ elements will be needed to reduce the water to normal saturation levels. To find the answer, use the conversion charts and capacity curves for the Moduflow element.

1. 1000ppm start - 300ppm finish = 700ppm removed
2. 700ppm water x .0001 = .07%  
.07% x 200 gallons = .14 gallons water total
3. Use the capacity curve for Moduflow element P/N 927584. Capacity = 80cc at 200 SUS & 10 gpm to pressure drop of 25 psid. (See graph)  
 $80\text{cc} \times 0.000264 \frac{\text{gal}}{\text{cc}} = 0.02 \text{ gallons/element}$
4.  $\frac{0.14 \text{ gallons total water}}{0.02 \text{ gallons/element}} = 7 \text{ elements}^*$

\*The replacement value of this fluid may range from \$600.00 to \$1400.00 (\$3 to \$7 gallon). At an estimated element cost of \$50.00 each, the savings realized would be from \$250.00 to \$1050.00!

Using Par-Gel filter elements saves money in fluid and replacement component costs. Also, the frequency of fluid disposal and the problems associated with it are greatly reduced.

**Filter capacity.** There are no accepted and approved water capacity testing or reporting standards. Consequently, there is virtually no way to compare one element capacity with another. It is also difficult to simulate a specific application in testing . . . making it hard to predict field performance.

Why the discrepancies? Water removal media capacity is the result of the interplay among four variables: flow rate, viscosity, bypass setting and the media itself.

Here's an example: two identical elements, testing the same fluid, varying only the flow rate.

This is a 15% reduction in capacity, due to changing only the flow rate! Now, look at what happens when the test flow rate is the same and the viscosity is changed.

|                | Element A | Element A' |
|----------------|-----------|------------|
| Flow Rate:     | 3 gpm     | 10 gpm     |
| Viscosity:     | 75 SUS    | 75 SUS     |
| Test Capacity: | 425 ml    | 360 ml     |

Twice the capacity can be achieved just by manipulating the test viscosity!

Naturally, having a lower bypass valve setting limits the capacity. Since the life

|                | Element B | Element B' |
|----------------|-----------|------------|
| Flow Rate:     | 20 gpm    | 20 gpm     |
| Viscosity:     | 200 SUS   | 75 SUS     |
| Test Capacity: | 250 ml    | 550 ml     |

of the element is measured in pressure drop, using higher bypass valve settings will increase apparent life (all other conditions equal).

We recommend 25 psid bypass valves to get adequate life from Par-Gel filter elements.

Capacity also depends on the media itself. That's why Parker spent two years researching the media used in Par-Gel filter elements. We tested all known media, and worked closely with our suppliers to achieve maximum water absorbency.



## Water Removal Filter Elements

**How we report:** Our goal is to give our customers usable data. Why show test results at a lower viscosity (65 SUS for example), if the typical application uses 200 SUS fluid? So, we report at 200 SUS to give typical field application capacity, and 75 SUS for competitive comparisons. But keep in mind when comparing, you still have to consider flowrate.

**What it all means:** You deserve to know how an element will work for you in your applications. So, we test and report our data in such a way that it helps you predict element performance and life.

Be wary of claims that say... "this element holds one quart (or one gallon) of water." What was the test flow rate? fluid viscosity? bypass valve setting? Was it run as a 'single pass' or 'multipass' test?

Rely on Parker to give you the facts and data you need. Our goal is to better protect your systems and components... and we start up-front by telling you what you need to know. Is there any other way to do business?

**Add it all up.** Broad selection, competitive prices, off-the-shelf availability, on-time delivery, high-efficiency filter media, reduced system contaminant and longer component life. When you add it all up, we think you'll agree...

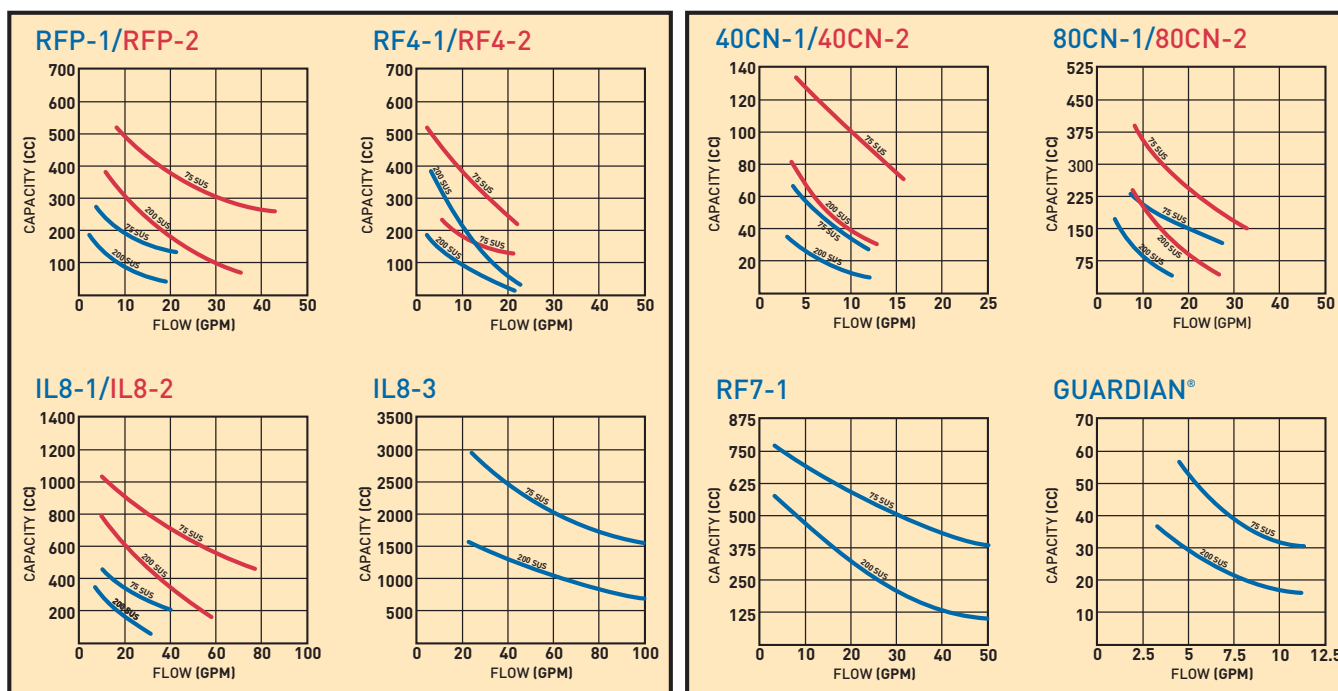
### Conversion Factors

| If you Have: | Multiply By: | To Get:      |
|--------------|--------------|--------------|
| mg/l         | 0.00009      | %            |
| ppm          | 0.0001       | %            |
| ml           | 1.0          | cc           |
| cc           | 0.0338       | fluid ounces |
| cc           | 0.00106      | quarts       |
| cc           | 0.000264     | gallons      |

### Typical Saturation Points

| Fluid       | PPM | %      |
|-------------|-----|--------|
| Hydraulic   | 300 | 0.03%  |
| Lubrication | 400 | 0.04%  |
| Transformer | 50  | 0.005% |

## MULTI-PASS WATER CAPACITY





## Water Removal Filter Elements

Parker Par-Gel water removal filter elements are available in these standard Parker filter housings:

| Filter Model Series | Length | Element Part Number |
|---------------------|--------|---------------------|
| RFP-1               | Single | 927584              |
| RFP-2               | Double | 927585              |
| RF4-1               | Single | 930156              |
| RF4-2               | Double | 928557              |
| RF7-1               | Single | 933853              |
| RF7-2               | Double | 932506              |
| IL8-1               | Single | 929103              |
| IL8-2               | Double | 929109              |
| IL8-3               | Triple | 932006              |
| 40CN-1              | Single | 931412              |
| 40CN-2              | Double | 931414              |
| 80CN-1              | Single | 931416              |
| 80CN-2              | Double | 931418              |
| Guardian®           | Single | 932019              |

### Ideal applications for Par-Gel filter elements:



Guardian® Portable Filtration System



Filter Cart



aerospace  
climate control  
electromechanical  
**filtration**  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



# PAR◊FIT™ Elements

Competitive Interchanges



ENGINEERING YOUR SUCCESS.

# PAR♦FIT™ Elements

## Competitive Interchanges

An extensive range of competitively priced Parker quality replacement filter elements, PAR♦FIT interchange elements allow the users to acquire all their replacement elements from one quality source regardless of the original equipment manufacturer.

PAR♦FIT competitive interchange elements must conform to all the same rigorous tests as the standard Parker replacement elements. The elements meet or exceed all specifications for the following tests:

|                  |                                   |
|------------------|-----------------------------------|
| IS02941          | Element Collapse/Burst Resistance |
| IS02942          | Fabrication Integrity             |
| IS02943          | Material Compatibility            |
| IS03724          | Flow Fatigue Resistance           |
| IS04572/ISO16889 | Multipass Test                    |

In addition to price and quality, the range of interchange elements available is key to a successful program for the user. Parker has worked diligently over the years to develop a range of elements that will meet this challenge. You can view the current list of PAR♦FIT interchange elements at [www.parker.com/parfit](http://www.parker.com/parfit) or [www.parkerhfde.com/parfit](http://www.parkerhfde.com/parfit).

The screenshot shows the Parker website's ParFit Interchangeable Element Selector tool. At the top, there's a Parker logo, a language selection dropdown, and search fields for keywords and part numbers. A navigation bar includes links for Home, Products, Division | Brand, Technologies, Literature, Distributors, Careers, and About Us. The main content area is titled 'ParFit Interchangeable Element Selector' and provides instructions for using the tool. It features two search sections: one for finding a Parker ParFit part number by manufacturer part number, and another for finding a Parker element that supercedes a specific part number. Both sections include input fields and search buttons.

**26,000+ interchanges for a variety of competitors, including:**

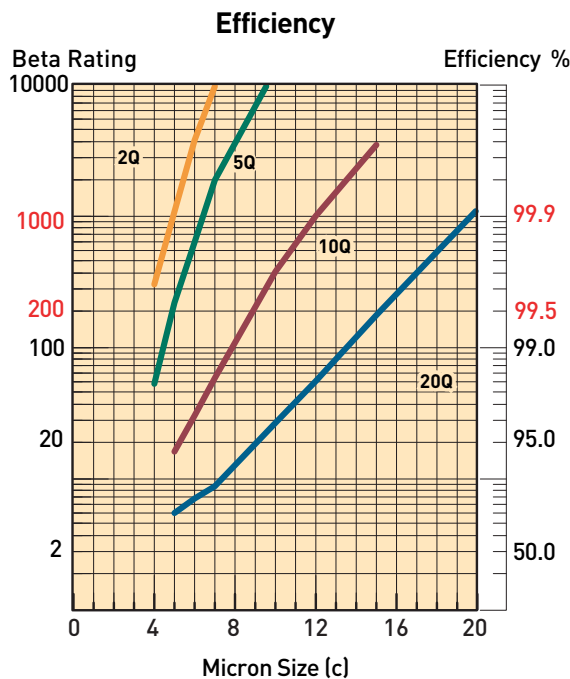
- Pall
- Hydac
- Schroeder
- MP Filtri
- Donaldson
- Stauff
- Cummins Filtration
- EPE
- Fleetguard
- Hy-Pro
- Internorman
- Mahle
- PTI
- Separation Technologies
- Eaton Vickers
- Zinga
- Many Others

# Appendix

## Interpreting Data

### Element Efficiency

For each configuration Parker reports on a log micron chart the actual test results for each Microglass III media grade available. The information that can be obtained from reporting in this manner far exceeds previous methods. To read the charts simply follow a few quick steps as shown below.



#### To determine efficiency/beta rating at a Particular micron size:

1. Choose micron size from horizontal axis.
2. Follow line upward until it intersects the media grade of interest.
3. For the beta rating move left perpendicular until you intersect the vertical beta rating axis and record number.
4. For the efficiency rating just follow line across to the right until it intersects the efficiency axis and record number.

#### To determine which media can provide a particular beta rating:

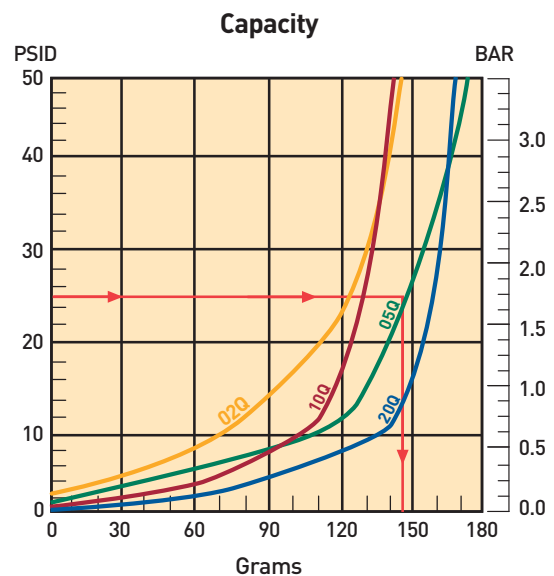
5. Choose beta rating desired on left vertical axis
6. Follow line horizontally across until it intersects media grade.
7. Move downward perpendicular until you intersect the horizontal "Micron Size" axis and record value. If micron value is too low repeat steps until a desired value is achieved.

### Element Capacity

Typically element capacities have been plotted on a differential vs grams chart to allow for best comparisons between different indicator/bypass settings and also other manufacturers. Although the construction of a given element remains constant, the actual capacity obtained in a application depends on several variables

- Viscosity
- Flow rate
- Contaminant Type
- Changeout pressure

Since it is not possible to test every possible combination, Parker tests per ISO4572 and ISO16889 which specifies fluid type, contaminant type and flow rate. Therefore the only variable that can be accounted for by the specifier would be changeout pressure. To accomplish this simply determine what indicator setting will be used to signal service is required. If no indicator will be used then use the bypass value for the specified filter.



#### To determine element capacity

1. Starting along the vertical differential pressure axis choose changeout setting.
2. Move horizontally across until line intersects the media grade desired.
3. Move perpendicular downward until line intersects horizontal axis "Grams" and record value .

# Appendix

## Interpreting Data

### Flow vs Pressure Loss

All performance curves are reported at a standard viscosity of 150 SUS (30 cSt) with element pressure curves independent of the housing. The purpose of reporting individually is to allow for adjustment to other operating viscosities. To adjust for a operating viscosity other than 150 SUS (30 cSt) please use the correction formula below.

| Viscosity Correction Formula |                                                                                                            |
|------------------------------|------------------------------------------------------------------------------------------------------------|
| PSID Element =               | PSID from catalog $\times \frac{\text{New Viscosity}}{150} \times \frac{\text{New Specific Gravity}}{.90}$ |
| PSID Housing =               | PSID from catalog $\times \frac{\text{New Specific Gravity}}{.90}$                                         |
| PSID Assembly =              | PSID Element + PSID Housing                                                                                |

### High Collapse Elements

In most cases, filter assemblies are equipped with an internal bypass valve to limit the differential pressure across the element. In some critical applications it may be necessary to equip the filter with a “no bypass” valve which forces all fluid flow to pass through the element. When a filter is equipped with a “no bypass” valve, the element must be able to withstand much higher differential pressures in the event it is not serviced when indicated. Parker high collapse elements are able to withstand 2000 psid (“H” option) or 3000 psid (“X” option) due to their special construction. The high collapse elements are rated for the same efficiencies as the standard elements but also have a higher clean pressure loss.

The increase in pressure loss from standard collapse “Q” elements to high collapse “Q” elements varies from media grade and series. To insure adequate element life, a correction factor should be applied to the standard pressure loss curves. Below are the factors that should be applied to the standard element performance curves shown in this catalog. The pressure loss of “H” option elements (2000 psid collapse) may increase as much as 40% over the standard, and the “X” option 3000 psid collapse) as much as 90%.

### High Collapse Correction Factors

“QH” Elements (2000 psid) = 1.4 times reported loss

“QX” Elements (3000 psid) = 1.9 times reported loss

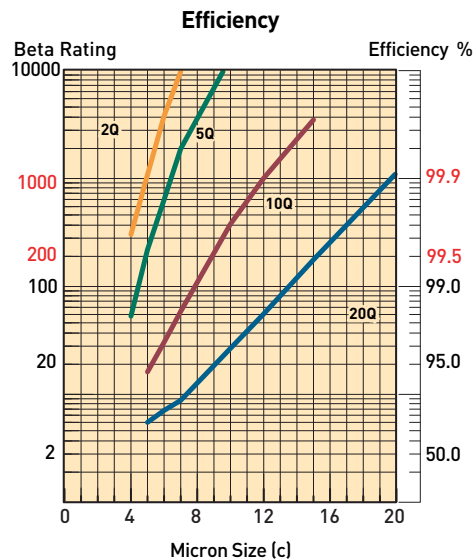
# Appendix

## Filter Media Types

### Microglass III

The latest of our media lines, these elements have the highest capacity and efficiency available. The Microglass III is referenced by a "Q" after the micron size ( i.e. 5Q ). Complete information is available for each element size in the catalog. The efficiency is plotted on a beta value versus micron size chart to enable one to find the rating at a specific micron size. The capacity is plotted on a pressure differential versus grams capacity chart. This allows one to find the capacity of the element at the filter's specific bypass or indicator setting.

Flow data is performed at 150 SUS (32cSt) and plotted separately for the element and housing . Pressure loss for different viscosities can be calculated by using the formula on the opposite page.



### Cellulose

An economical type of media (denoted by a "C") that provides nominal efficiency and capacity. The pore structure of paper media is not efficient for fine filtration or high capacity applications. The data provided for each individual element is limited to flow versus pressure loss. To the left is an efficiency chart which plots what would be considered typical for the various grades of cellulose media.

As shown in the chart, cellulose elements are not nearly as efficient as Microglass III elements. They are rated for nominal filtration, typically 50% efficient at rated size. Due to the low particle capture efficiency of 20C cellulose elements, it is not practical to plot on the chart. The 20C elements could be considered a  $\text{Beta}_{20} = 2$  (50% efficient at 20 micron). The same limitations exist with the stainless steel mesh elements.

### Stainless Steel Woven Wire

Commonly referred to as "wire mesh" this filtration medium is typically used in suction filters due to the low flow restriction. Wire mesh elements are unique in that they are designed to be cleaned and reused. These elements are rated for efficiency based on the pore size diameter of the mesh and are denoted by a "W" after the micron rating. For example a 74W element would have a nominal rating of 74 micron based on the diameter of the mesh pores. This should not be confused with "mesh" ratings which are the number of wire strands per inch. Mesh ratings can be correlated to micron ratings, see "Micrometer Conversions" on page 224.

| General Comparison Of Filter Media |                    |                       |                       |                  |              |
|------------------------------------|--------------------|-----------------------|-----------------------|------------------|--------------|
| Media Material                     | Capture Efficiency | Dirt Holding Capacity | Differential Pressure | Life In a System | Initial Cost |
| Fiberglass                         | High               | High                  | Moderate              | High             | Moderate     |
| Cellulose                          | Moderate           | Moderate              | High                  | Moderate         | Low          |
| Wire Mesh                          | Low                | Low                   | Low                   | Moderate         | High         |

# Appendix

## Definitions

### Absolute Rating:

The diameter of the largest hard spherical particle that will pass through a filter under specified test conditions. This is an indication of the largest opening in the filter element. Hydraulic Filter Division defines absolute as 99.5% removal (beta 200) at a given particle size.

### Absorb/Absorption:

The process of a fluid being taken into the pores of a solid.

### Adsorb/Adsorption:

To collect and hold a fluid on the surface of a solid.

### Beta Ratio:

The ratio of the number of particles of a given size and larger of a filter to the number of particles of the same size and larger downstream.

| Beta Ratios/Efficiencies                 |                                               |
|------------------------------------------|-----------------------------------------------|
| Beta Ratio<br>(at a given particle size) | Capture Efficiency<br>(at same particle size) |
| 1.01                                     | 1.0%                                          |
| 1.1                                      | 9.0%                                          |
| 1.5                                      | 33.3%                                         |
| 2.0                                      | 50.0%                                         |
| 5.0                                      | 80.0%                                         |
| 10.0                                     | 90.0%                                         |
| 20.0                                     | 95.0%                                         |
| 75.0                                     | 98.7%                                         |
| 100                                      | 99.0%                                         |
| 200                                      | 99.5%                                         |
| 1000                                     | 99.9%                                         |

### Bubble Point:

Pressure drop in inches of water required to expel the first steady (continuous) stream of bubbles from a horizontal disc of wetted filter medium or a filter cartridge immersed in a liquid (usually alcohol). A bubble point test is used to test the integrity of cartridge construction to compare relative porosities of a filter media or monitor product consistency as a quality control method.

### Bypass:

Fluid flowing through a passage other than the filter medium and/or leakage around filter media seals.

### Burst:

An outward structural failure of the filter element caused by excessive differential pressure.

### Cleanliness Codes:

A representation of a fluids contamination level based on a series of index numbers that refer to a table of concentration values.

| Cleanliness Level Correlation Table |                      |                |                 |                    |                               |
|-------------------------------------|----------------------|----------------|-----------------|--------------------|-------------------------------|
| ISO Code                            | Particles/Millilitre |                |                 | NAS 1638<br>(1964) | Disavowed SAE<br>Level (1963) |
|                                     | ≥2 Micrometers       | ≥5 Micrometers | ≥15 Micrometers |                    |                               |
| 23/21/18                            | 80,000               | 20,000         | 2,500           | 12                 |                               |
| 22/20/18                            | 40,000               | 10,000         | 2,500           |                    |                               |
| 22/20/17                            | 40,000               | 10,000         | 1,300           | 11                 |                               |
| 22/20/16                            | 40,000               | 10,000         | 640             |                    |                               |
| 21/19/16                            | 20,000               | 5,000          | 640             | 10                 |                               |
| 20/18/15                            | 10,000               | 2,500          | 320             | 9                  | 6                             |
| 19/17/14                            | 5,000                | 1,300          | 160             | 8                  | 5                             |
| 18/16/13                            | 2,500                | 640            | 80              | 7                  | 4                             |
| 17/15/12                            | 1,300                | 320            | 40              | 6                  | 3                             |
| 16/14/12                            | 640                  | 160            | 40              |                    |                               |
| 16/14/11                            | 640                  | 160            | 20              | 5                  | 2                             |
| 15/13/10                            | 320                  | 80             | 10              | 4                  | 1                             |
| 14/12/9                             | 160                  | 40             | 5               | 3                  | 0                             |
| 13/11/8                             | 80                   | 20             | 2.5             | 2                  |                               |
| 12/10/8                             | 40                   | 10             | 2.5             |                    |                               |
| 12/10/7                             | 40                   | 10             | 1.3             | 1                  |                               |
| 12/10/6                             | 40                   | 10             | .64             |                    |                               |

### Collapse Pressure:

An inward structural failure of the filter element caused by excessive differential pressure.

### Contaminant:

Undesirable insoluble solid or gelatinous particles present in fluid.

### Crest:

The outer fold of a pleat.

### Differential Pressure/Pressure Drop:

Difference in pressure between two points in a system. In filters, this is typically measured between the inlet and outlet of the filter housing.

### Dissolved Water:

Water capable of being held by the fluid in solution. The amount held must be below the saturation point.

### Duplex Filter:

An assembly of two filters with valving for the selection of either element.

### Efficiency:

The ability of the filter element to remove particles from the filter stream. Efficiency = (1-1/beta)100.

# Appendix

## Definitions

**Effluent:**

The fluid that has passed through the filter.

**Filter Medium:**

The permeable material used for a filter that separates particles from a fluid passing through it.

**Flow Fatigue:**

The ability of a filter element to withstand structural failure of the filter medium due to flexing of the pleats caused by cyclic differential pressure.

**Free Water:**

Water droplets or globules in a system that tend to accumulate at the bottom of a system's fluid because it exceeds the solubility of the fluid.

**Influent:**

Fluid entering the inlet of a filter.

**In-Line Filter:**

A filter in which the inlet, outlet and element are in a straight axis.

**L-Type Filter:**

A filter in which the inlet and outlet port axis are at right angles, and the filter element axis is parallel to either port axis.

**Laminar Flow:**

Flow rate at which liquid is in a nonturbulent state (10ft/sec) and should not exceeded to maintain filtration integrity and consistency.

**Media Migration:**

Contamination of the effluent by fibers or other material of which the filter is constructed.

**Micron:**

A unit of length. Correct term is micrometer ( $\mu\text{m}$ ), which is .000039 inch. Human eye can see a 40 micrometer particle.

**Neutralization Number:**

A measure of the acidity or basicity of a fluid, this includes organic and inorganic acids or bases, or combination thereof.

**Nominal Rating:**

Micron size removed at a given efficiency under a manufacturer's defined test condition. An arbitrary term assigned by manufacturers which varies and has therefore depreciated in value.

**Pinched Pleat:**

A pleat closed off by excessive differential pressure or crowding, thus reducing the effective area of the filter element.

**Pleats:**

A series of folds in the filter medium usually of uniform height and spacing designed to maximize effective area.

**Pressure Line Filter:**

A filter located in a line conducting working fluid to a working device or devices.

**Return Line Filter:**

A filter located in the line which is conducting working fluid from working devices to a reservoir.

**Root:**

The inside fold of a pleat.

**Suction Filter:**

A filter located in the intake line of a pump where the fluid is below atmospheric pressure.

**T-Type Filter:**

A filter in which the inlet and outlet port axes are in a straight line, and the filter element axis is perpendicular to this line.

**Varnish:**

Materials generated by the hydraulic fluid due to oxidation, thermal instability, or other reactions. These materials are insoluble in the hydraulic fluid and are generally found as brownish deposits in the work surfaces.

**Y-Type Filter:**

A filter in which the inlet and outlet port axes are in a straight line, and the filter element is at an acute angle to this line.

# Appendix

## Micrometer Conversions

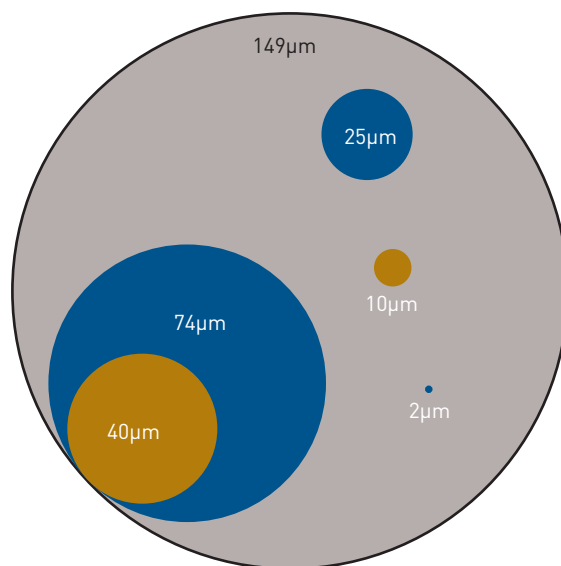
| US and ASTM Std Sieve Number | Actual Opening (in) | ( $\mu\text{m}$ ) |
|------------------------------|---------------------|-------------------|
| 10                           | 0.0787              | 2000              |
| 12                           | 0.0661              | 1680              |
| 14                           | 0.0555              | 1410              |
| 16                           | 0.0469              | 1190              |
| 18                           | 0.0394              | 1000              |
| 20                           | 0.0331              | 840               |
| 25                           | 0.0280              | 710               |
| 30                           | 0.0232              | 590               |
| 35                           | 0.0197              | 500               |
| 40                           | 0.0165              | 420               |
| 45                           | 0.0138              | 350               |
| 50                           | 0.0117              | 297               |
| 60                           | 0.0098              | 250               |
| 70                           | 0.0083              | 210               |
| 80                           | 0.0070              | 177               |
| 100                          | 0.0059              | 149               |
| 120                          | 0.0049              | 125               |
| 140                          | 0.0041              | 105               |
| 170                          | 0.0035              | 88                |
| 200                          | 0.0029              | 74                |
| 230                          | 0.0024              | 62                |
| 270                          | 0.0021              | 53                |
| 325                          | 0.0017              | 44                |
| 400                          | 0.00142             | 36                |
| 550                          | 0.00099             | 25                |
| 625                          | 0.00079             | 20                |
| 1,250                        | 0.000394            | 10                |
| 1,750                        | 0.000315            | 8                 |
| 2,500                        | 0.00097             | 5                 |
| 5,000                        | 0.000099            | 2.5               |
| 12,000                       | 0.0000394           | 1                 |

### Micrometer Comparisons

| Substance                | ( $\mu\text{m}$ ) |
|--------------------------|-------------------|
| Table Salt               | 100               |
| Human Hair (average dia) | 50-70             |
| White Blood Cell         | 25                |
| Talcum Powder            | 10                |
| Cocoa                    | 8-10              |
| Red Blood Cell           | 8                 |
| Bacteria (cocci)         | 2                 |

Note: Lower limit of visibility (naked eye)—40 $\mu\text{m}$

Relative Size of Particles  
Magnification 500x



### Linear Equivalents

|                 |                              |                        |
|-----------------|------------------------------|------------------------|
| 1in             | = 25.4 mm                    | = 25,400 $\mu\text{m}$ |
| 1mm             | = 0.0394 in                  | = 1,000 $\mu\text{m}$  |
| 1 $\mu\text{m}$ | = 1/25,400 in                | = 0.001 mm             |
| 1 $\mu\text{m}$ | = 3.94 x 10 <sup>-5</sup> in | = 0.000039 in          |

### Formulas

$$\text{Velocity (ft per sec)} = \frac{0.4085 \times \text{gpm}}{d^2 \text{ (ID in)}}$$

### Conversion Rates

|                      |                                  |
|----------------------|----------------------------------|
| 1 cu ft              | = 7.48 gal                       |
| 1 gal                | = 231 cu in                      |
| 2 cu ft water        | = 62.42 lb                       |
| 1 gal water          | = 8.34 lb                        |
| 1 US gal             | = 0.833 lmp gal                  |
| 1 lb/in <sup>2</sup> | = 2.31 ft of water = 2.036 in Hg |
| °F                   | = 9/5°C+32                       |

### Metric Conversion Formulas

|                 |                  |
|-----------------|------------------|
| mm              | = inches x 25.4  |
| m               | = feet x 0.3048  |
| cm <sup>3</sup> | = cu in x 16.39  |
| m <sup>3</sup>  | = cu ft x 0.028  |
| kg              | = pounds x 0.454 |
| kPa             | = psi x 6.895    |
| lpm             | = gpm x 3.785    |
| °C              | = 5/9 (°F-32)    |

# Appendix

## Measurement Conversion Tables

| To Convert          | Multiply by | To Obtain            |
|---------------------|-------------|----------------------|
| <b>A</b>            |             |                      |
| atmospheres         | 33.9        | ft of water (at 4×C) |
| atmospheres         | 29.92       | in mercury (at 0×C)  |
| <b>B</b>            |             |                      |
| barrels (US liquid) | 31.5        | gallons              |
| barrels (oil)       | 42          | gallons (oil)        |
| bars                | 0.9869      | atmospheres          |
| bars                | 14.5        | pounds/sq in         |
| <b>C</b>            |             |                      |
| centimeters         | 0.03281     | feet                 |
| centimeters         | 0.3937      | inches               |
| centimeters         | 0.00001     | kilometers           |
| centimeters         | 0.01        | meters               |
| centimeters         | 0.01094     | yards                |
| centimeters         | 10,000      | microns              |
| cubic centimeters   | 0.00003531  | cubic feet           |
| cubic centimeters   | 0.06102     | cubic inches         |
| cubic centimeters   | 0.000001    | cubic meters         |
| cubic centimeters   | 0.001       | liters               |
| cubic centimeters   | 0.002113    | pints (US liquid)    |
| cubic centimeters   | 0.001057    | quarts (US liquid)   |
| cubic feet          | 28,320      | cubic centimeters    |
| cubic feet          | 1,728       | cubic inches         |
| cubic feet          | 0.02832     | cubic meters         |
| cubic feet          | 0.03704     | cubic yards          |
| cubic feet          | 7.48052     | gallons (US liquid)  |
| cubic feet          | 28.32       | liters               |
| cubic feet          | 59.84       | pints (US liquid)    |
| cubic feet          | 29.92       | quarts (US liquid)   |
| cubic feet/min      | 62.43       | pounds water/min     |
| cubic feet/min      | 1.698       | cubic meters/hr      |
| cubic feet/sec      | 448.831     | gallons/min          |
| cubic inches        | 16.39       | cubic centimeters    |
| cubic inches        | 0.0005787   | cubic feet           |
| cubic inches        | 0.00001639  | cubic meters         |
| cubic inches        | 0.00002143  | cubic yards          |
| cubic inches        | 0.004329    | gallons              |
| cubic inches        | 0.01639     | liters               |
| cubic meters        | 35.31       | cubic feet           |
| cubic meters        | 61,023      | cubic inches         |
| cubic meters        | 264.2       | gallons (US liquid)  |
| cubic meters        | 1000        | liters               |
| cubic meters/hour   | 4.4         | gallons (US)/min     |
| cubic meters/hour   | 0.588       | cubic feet/min       |

| To Convert           | Multiply by | To Obtain           |
|----------------------|-------------|---------------------|
| <b>F</b>             |             |                     |
| feet                 | 30.48       | centimeters         |
| feet                 | 0.0003048   | kilometers          |
| feet                 | 0.3048      | meters              |
| feet                 | 304.8       | millimeters         |
| feet of water        | 0.0295      | atmospheres         |
| feet of water        | 0.8826      | inches of mercury   |
| feet of water        | 62.43       | pounds/sq ft        |
| feet of water        | 0.4335      | pounds/sq in        |
| feet/minute          | 0.01667     | feet/second         |
| <b>G</b>             |             |                     |
| gallons              | 3,785       | cubic centimeters   |
| gallons              | 0.1337      | cubic feet          |
| gallons              | 231         | cubic inches        |
| gallons              | 3.785       | liters              |
| gallons (liq br imp) | 1.20095     | gallons (US liquid) |
| gallons (US)         | 0.83267     | gallons (Imp)       |
| gallons of water     | 8.337       | pounds of water     |
| gallons/min          | 0.002228    | cubic feet/sec      |
| gallons/min          | 0.06308     | liters/sec          |
| gallons/min          | 8.0208      | cubic feet/hr       |
| grams                | 0.001       | kilograms           |
| grams                | 0.002205    | pounds              |
| grams/cm             | 0.0056      | pounds/in           |
| grams/sq in          | 45.71       | ounces/sq yd        |
| <b>I</b>             |             |                     |
| inches               | 2.540       | centimeters         |
| inches               | 0.02540     | meters              |
| inches               | 25.4        | millimeters         |
| inches of mercury    | 0.03342     | atmospheres         |
| inches of mercury    | 1.133       | feet of water       |
| <b>K</b>             |             |                     |
| kilograms            | 2.2046      | pounds              |
| kilograms            | 0.009842    | tons (long)         |
| kilograms            | 0.001102    | tons (short)        |
| kilograms/sq cm      | 2,048       | pounds/sq ft        |
| kilograms/sq cm      | 14.22       | pounds/sq in        |
| kilograms/sq meter   | 0.00009678  | atmospheres         |
| kilograms/sq meter   | 0.00009807  | bars                |
| kilograms/sq meter   | 0.003281    | feet of water       |
| kilograms/sq meter   | 0.002896    | inches of mercury   |
| kilograms/sq meter   | 0.2048      | pounds/sq ft        |
| kilograms/sq meter   | 0.001422    | pounds/sq in        |

# Appendix

## Measurement Conversion Tables

| To Convert        | Multiply by  | To Obtain           |
|-------------------|--------------|---------------------|
| <b>L</b>          |              |                     |
| liters            | 0.2642       | gallons (US liquid) |
| liters            | 2.113        | pints (US liquid)   |
| liters            | 1.057        | quarts (US liquid)  |
| liters/min        | 0.0005886    | cubic ft/sec        |
| liters/min        | 0.004403     | gallons/sec         |
| liters/hour       | 0.004403     | gallons (US)/min    |
| <b>M</b>          |              |                     |
| meters            | 3.281        | feet                |
| meters            | 39.37        | inches              |
| meters            | 0.001        | kilometers          |
| meters/min        | 3.281        | feet/min            |
| meters/min        | 0.05468      | feet/sec            |
| microns           | 0.000001     | meters              |
| mils              | 0.00254      | centimeters         |
| mils              | 0.000083333  | feet                |
| mils              | 0.001        | inches              |
| mils              | 0.0000000254 | kilometers          |
| <b>O</b>          |              |                     |
| ounces            | 28.349       | grams               |
| ounces            | 0.0625       | pounds              |
| ounces (fluid)    | 1.805        | cubic inches        |
| ounces (fluid)    | 0.02957      | liters              |
| ounces/sq in      | 0.0625       | pounds/sq in        |
| ounces/sq yard    | 20.83        | pounds/3000 sq ft   |
| <b>P</b>          |              |                     |
| pints (liquid)    | 0.125        | gallons             |
| pints (liquid)    | 0.4732       | liters              |
| pints (liquid)    | 0.5          | quarts (liquid)     |
| pounds            | 453.59       | grams               |
| pounds            | 16           | ounces              |
| pounds/sq ft      | 0.0004725    | atmospheres         |
| pounds/sq ft      | 0.01602      | feet of water       |
| pounds/sq ft      | 0.01414      | inches of mercury   |
| pounds/sq in      | 0.06804      | atmospheres         |
| pounds/sq in      | 2.307        | feet of water       |
| pounds/sq in      | 2.036        | inches of mercury   |
| pounds/sq in      | 0.0145       | kilo pascals (kPa)  |
| pounds/sq in      | 27.684       | inches water column |
| pounds/3000 sq in | 0.048        | ounces/sq yard      |

| To Convert         | Multiply by | To Obtain     |
|--------------------|-------------|---------------|
| <b>Q</b>           |             |               |
| quarts (liquid)    | 0.03342     | cubic feet    |
| quarts (liquid)    | 57.75       | cubic inches  |
| quarts (liquid)    | 0.0009464   | cubic meters  |
| quarts (liquid)    | 0.25        | gallons       |
| quarts (liquid)    | 0.9463      | liters        |
| <b>S</b>           |             |               |
| square centimeters | 0.001076    | square feet   |
| square centimeters | 0.1550      | square inches |
| square centimeters | 0.0001      | square meters |
| square feet        | 144         | square inches |
| square feet        | 0.0929      | square meters |
| square inches      | 0.006944    | square feet   |
| square inches      | 0.0007716   | square yards  |
| square meters      | 10.76       | square feet   |
| square meters      | 155         | square inches |
| square meters      | 1.196       | square yards  |
| square yards       | 9           | square feet   |
| square yards       | 1,296       | square inches |
| square yards       | 0.8361      | square meters |

# Appendix

## Changes to ISO Standards and their impact on Filter Performance Reporting and the Contamination Code.

The recent changes to ISO contamination and filtration standards were brought about to solve accuracy, traceability, and availability issues. It is important to remember that both real world hydraulic system cleanliness levels and actual system filter performance remain unchanged. However, the reporting of cleanliness levels and filter performance has changed due to the new particle counter calibration and multi-pass test procedures.

**ISO 11171** is the new particle counter calibration method and utilizes calibration fluid made from ISO Medium Test Dust (ISO MTD) suspended in MIL-H-5606. The calibration fluid is traceable to the National Institute of Standards and Technology (NIST) and is designated by NIST as Standard Reference Material (SRM)2806. ISO 11171 is replacing ISO 4402 which is based on obsolete AC Fine Test Dust (ACFTD).

It is important to note that the ISO 11171 calibration method is based on a distribution of particles measured by their equivalent area diameter, whereas ISO 4402 is based on a distribution of particles measured by their longest chord. Also, the NIST work utilized scanning electron microscopy for particles below 10 um in size, whereas the sizing distribution on ACFTD utilized optical microscopy.

The new calibration method and resulting ISO code will typically produce a one to two level increase in the first digit (the >4um size range) of the three digit code. This is due to the greater number of particles in the small size range. The remaining two digits will typically remain unchanged between old and new calibration methods, and should not impact previously established ISO cleanliness standards.

Table 1 below shows the approximate particle size relationship between the calibration methods.

| ACTFD size<br>(per ISO 4402:1991)<br>um | NIST size<br>(per ISO 11171:1999)<br>um (c) |
|-----------------------------------------|---------------------------------------------|
| 1                                       | 4.2                                         |
| 2                                       | 4.6                                         |
| 3                                       | 5.1                                         |
| 5                                       | 6.4                                         |
| 7                                       | 7.7                                         |
| 10                                      | 9.8                                         |
| 15                                      | 13.6                                        |
| 20                                      | 17.5                                        |
| 25                                      | 21.2                                        |
| 30                                      | 24.6                                        |
| 40                                      | 31.7                                        |

The ISO cleanliness code reporting method will also be affected.

Example: Former two-digit ISO 4406:1987  
5 um / 15 um  
14 11

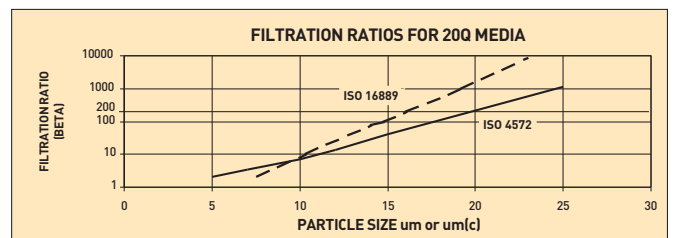
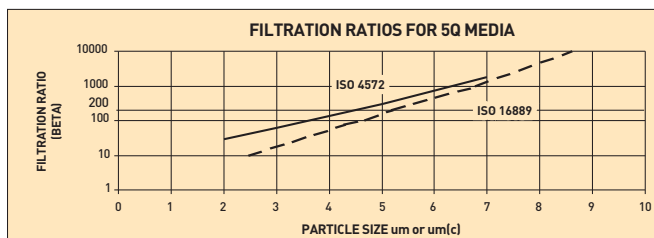
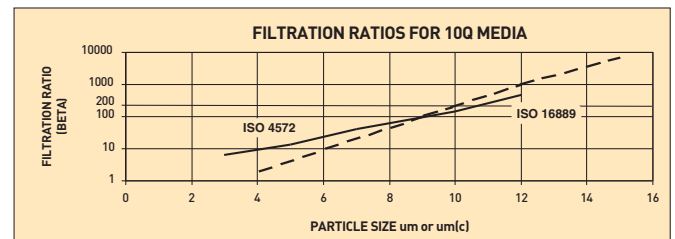
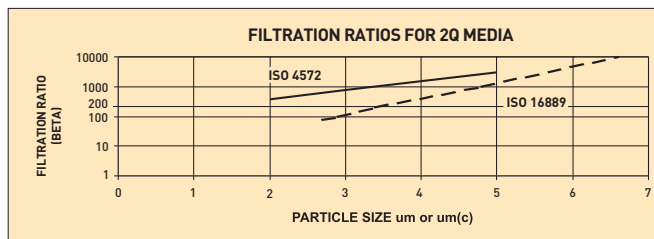
Former three-digit ISO code  
2 um / 5 um / 15 um  
17 14 11

New three-digit **ISO 4406:1999**  
4 um (c) / 6 um (c) / 14 um (c)  
18 14 11

# Appendix

## Changes to ISO Standards and their impact on Filter Performance Reporting and the Contamination Code, continued.

**ISO 16889** is the new multi-pass test standard for measuring filter performance and utilizes ISO MTD as the contaminant challenge. This standard is replacing ISO 4572 which utilized ACFTD. See the following graphs below for filtration beta ratio comparisons on our 2Q, 5Q, 10Q, and 20Q Microglass III media. The graphs reflect multi-pass test results using ISO 4572 with ACFTD and the revised ISO 16889 using ISO MTD.



# Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at [www.parker.com/saleterms/](http://www.parker.com/saleterms/). Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.

2. Price Adjustments; Payments. Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

5. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.

6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

7. Contingencies. Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.

8. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

9. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

10. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

11. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.

12. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

13. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

14. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

15. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

# Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

16. **Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

17. **Termination.** This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

18. **Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

19. **Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

20. **Taxes.** Unless otherwise indicated, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of Products.

21. **Equal Opportunity Clause.** For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.

# Parker Hannifin Corporation

## About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 12,000 distributors serving our customers around the world.

## Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

## Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In the UK, a similar service is available by calling 0500-103-203.

### The Aerospace Group

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