Thermo Scientific FH Series
Peristaltic Pump Systems
The Thermo Scientific advantage

We are a leading manufacturer of peristaltic pump technology and a world-class innovator in fluid handling and flow control. We provide accurate, dependable tubing and hose pump solutions throughout the world. Our five decades of experience has culminated in the development of the FH Series pump systems. These highly durable, accurate pumps have proven ideal for a wide variety of fluid handling applications—from laboratory and research to plant and production floor.

The Thermo Scientific FH family of digital peristaltic pump systems offers superior performance with the precision and ease-of-use that’s long been the hallmark of the Thermo Scientific fluid handling product range. Designed to handle a wide range of fluids, from the highest purity to extremely caustic solutions, FH Series pumps are used in a broad range of critical applications—from agriculture to chemical processing; and from beverage dispensing to semiconductor polishing.
Peristaltic Pump Advantages

• Contamination free pumping—fluid contacts only the tubing or hose material
• High volumetric efficiency allows operation in metering or dosing applications where high accuracy is required
• Elimination of check valves prevents parts replacement and downtime
• Programmable, easy-to-use, low maintenance units
• Capable of running dry and pumping fluids with high quantities of entrained air, such as black liquor soap, sodium hypochlorite, or hydrogen peroxide
• Smooth inner tubing surfaces are easy to clean and prevent particle entrapment
• Tubing materials are available and approved to global pharmaceutical, sanitary and food standards (USP, EP, FDA and NSF)
• Elimination of priming requirements provides suction lift and self-priming capabilities up to 8 m WC (26 ft H20)
• Handles fluids ranging from glycerin to molasses, latex to cell suspensions, and from slurries to corrosive fluids

The FH Series Benefits

The Thermo Scientific FH series of pumps provides a wide selection of models to meet many applications of fluid handling from lab to process. Some of these benefits include:

• A unique rapid load pump head that allows fast tube loading and minimizes downtime
• Safety interlock powers down unit when changing tubing
• Robust design assures years of reliable service
• Integrated pump and drive systems are provided fully assembled reducing set-up time
• Compact housings conserve valuable space whether in the lab or process floor
• Intuitive controls and a simple menu available in seven languages (on FH100D and FH100M models)
• Integration with plant control systems allows automation of the fluid handling process
• Complies with stringent safety standards of UL, ETL, CE, C1 and with RoHS and WEEE directives

Markets/Applications

Ideal for a wide variety of life science and industrial applications:
• Sample prep
• General, media and reagent dispensing
• Filling
• Buffer recirculation
• Chromatography
• Fermenter recirculation
• Stem cell research
• Bio-reactor feed and chemistry control
• Cell Culture
• Cell Harvesting
• Spectroscopy
• Lab analyzers
• Reagent metering applications
• Chemical feed
• Filtration
• Tangential-flow or cross flow filtration
• Biopharmaceuticals
• Agrochemicals
• Oil analysis
• Sampling
• Pilot to process scale-up

Principle of Operation

1. A pump head consists of only two parts: the rotor and the housing. The tubing is placed in the tubing bed—between the rotor and housing—where it is occluded (squeezed).

2. The rollers on the rotor move across the tubing, pushing the fluid. Tubing behind the rollers recovers its shape, creating a vacuum and drawing in fluid behind it.

3. A “pillow” of fluid is formed between the rollers. This is specific to the ID of the tubing and the geometry of the rotor. Flow rate is determined by multiplying speed by the size of the pillow. This pillow stays fairly constant except with extremely viscous fluids.
Quality design in a compact package

Thermo Scientific FH10, FH15, and FH30 pumps offer enhanced and versatile performance in an ultra-compact, low-maintenance design. These highly innovative peristaltic pumps are ideal for meeting a wide range of fluid handling needs and provide long-term, reliable service.

These units are provided as complete pumping systems, consisting of a pump, motor, and control in a stackable steel housing. With standard flow ranges from 0.002 mL/min to 105 mL/min and pressures to 2.5 bars, these instrument quality peristaltic pumps provide an ideal, cost-effective alternative to syringe pumps. A robust, fixed occlusion design allows for reliable, accurate pumping and dispensing with a wide variety of tubing materials and varying differential pressure applications.
FH10, FH15 and FH30 Pumps
Product Benefits and Features

**Easy to maintain**
- Simple, fast tubing changes
- Fixed occlusion eliminates adjustment after tubing changes and assures operation against pressure up to 30 PSIG

**Easy to use**
- Contamination free pumping—fluid contacts only the tubing material
- Controls are mounted on front panel with a separate single-turn speed control
- Flow direction switch with center “OFF” position
- Green LED power “ON” indicator
- “Prime” button runs pump at maximum speed to rapidly prime or flush tubing
- Reversible pump direction permits purging of tubing prior to use

**Diverse performance range**
- Flow rates less than 3 μL/min to 50 mL/min
- Pressure up to 2 bar (30 PSIG)
- Accurate and repeatable flow delivery
- Filtration, up to 60 PSIG
- Address a wide range of critical applications with tubing materials that are approved to USP class VI, FDA and NSF standards
- Accommodates all sizes and formulations of microbore flow rated tubing

**Ergonomic design**
- Space efficient—low profile, stackable design
- Remote capability—actuate unit with a foot switch or contact closure

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**Specifications and Ordering Information**

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<tr>
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<th>FH15</th>
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See page 13 for flow performance and tubing selection
Precision metering, worry free performance

Thermo Scientific FH100 and FH100X peristaltic pumps are ideal general purpose tubing pumps for high-repeatability, precision metering, and worry free performance in a variety of life science, industrial and process applications. The broad flow range capability of these units make them ideal for laboratory to pilot process scale-up requirements.

With the FH100 and FH100X units, our highly regarded peristaltic pump technology is combined with innovative digital control to provide robust performance at an economical value. These units offer a reliable alternative to lab piston metering pumps, gear pumps and small circulating pumps used in life science laboratory applications. These stackable, variable speed pumps are self priming, able to operate dry, and contain no valves or seals eliminating replacement needs. Fluid contacts only the tubing, providing for contamination-free pumping in high-purity applications.
**FH100 and FH100X Pumps**  
**Product Benefits and Features**

**Easy to maintain**  
- New loading pump head enables rapid tubing changes  
- Robust motor and drive system provides low-maintenance long-term operation  
- Contamination free pumping—the fluid contacts only the tubing material

**Easy to use**  
- Intuitive control keypad  
- Stop and start from the front panel  
- Easily increase/decrease flow through the membrane key-pad  
- Universal voltage and frequency capability allows operation world-wide—IEC320 socket provided  
- Reversible pump direction permits purging of tubing prior to use  
- Quick start guide included for fast easy set-up

**Diverse performance range**  
- Utilizes various tubing sizes to provide a broad flow range  
- Ability to pump against pressure up to 60 PSIG providing longer filtration cycles

**Ergonomic design**  
- Space efficient—low-profile, stackable design  
- Safety interlocks powers unit down when changing tubing  
- Remote control capability—ideal for automated process applications  
- Accurate, reliable control of flow and dosing—digital display of RPM for accurate control

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**Specifications & Ordering Information**

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<td>Shipping Weight</td>
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See page 14 and 15 for flow performance and tubing selection.
Pump, dispense and fill—all with one unit

Thermo Scientific FH100D and FH100DX peristaltic pumps are specifically designed for critical metering and dispensing applications—you can pump, dispense and fill—all with one unit.

FH100D and FH100DX peristaltic pumps are simple to set-up as dosing pumps, or dispensing systems by volume, time, or copy mode with a timed interval. The pump is also reversible, allowing for purging of transfer lines or emptying containers. The innovative FH100D and FH100DX systems provide a number of important advantages for users, including single-channel variable flow from 0.1 mL/min to 3000 mL/min at a variable speed range of 4-400 rpm. The unit’s powerful motor provides better than 0.25% percent speed control accuracy and repeatability as well as remote control operation.
FH100D and FH100DX Dispenser Pumps
Product Benefits and Features

Easy to maintain
- New rapid loading pump head allows tubing change in less than 30 seconds
- Robust motor and drive system provides low-maintenance long-term operation
- Contamination free pumping—the fluid contacts only the tubing material

Easy to use
- Programmable in seven languages—provides easy set-up in almost any global location
- Universal voltage and frequency capability allows operation world-wide—IEC320 socket provided
- Reversible pump direction permits purging of tubing prior to use
- Quick start guide included for fast, easy set-up

Diverse performance range
- Control capabilities include programmable dispensing by volume, time, or copy modes with a programmable delay between cycles for convenient, automated dispensing
- Each pump utilizes various tubing sizes providing a broad flow range
- Able to pump against pressure up to 60 PSIG providing longer filtration cycles

Ergonomic design
- Optimizes system accuracy by calibrating the pump system in process—the calibration is stored in memory—one calibration value per tubing size
- Safety interlock powers down unit when changing tubing
- Broad range of remote control options—ideal for automated process applications
- Space efficient—low-profile, stackable design
- Accurate, reliable control of flow and dosing—digital display of RPM for accurate control

Specifications & Ordering Information

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<td>Pump open door sensor</td>
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<tr>
<td>ELECTRICAL</td>
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<tr>
<td>External control – input</td>
<td>Remote / Local Indication</td>
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<td>Control type</td>
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<td>Speed resolution (repeatability)</td>
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<tr>
<td>Speed regulation</td>
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<td>PHYSICAL SPECIFICATIONS</td>
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<td>Housing materials</td>
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<td>Shipping weight</td>
<td>7 (kgs) 15 lbs</td>
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See page 14 and 15 for flow performance and tubing selection.
Accurate multichannel pumping

Thermo Scientific FH100M Series peristaltic pumps provide multichannel pumping with the accuracy of flow control and broad flow range to efficiently service most pumping applications, including bioassays, electrophoresis, chromatography, and pH control.

With flow ranges from 1.2 microliters per minute to 760 mL/min and three modes of operation: flow, timed flow and programmable cycle dispensing—FH100M Series multichannel pumps can save considerable time and resources while greatly improving process efficiency.

Featuring remote control of speed, pumping direction, and start/stop/purge, FH100M pumps are available with a wide range of interchangeable multichannel pump heads, drives, and tubing and can deliver up to 12 channels simultaneously. A configured FH100M pump system consists of a pump head, drive, and a full set of cassettes.
**FH100M Multichannel Pumps**

**Product Benefits and Features**

**Easy to maintain**
- Cassette design provides fast tubing changes, and eliminates hardware in other multi-channel designs
- Rugged motor and controls ensure long-term reliable operation
- Contamination free pumping—the fluid contacts only the tubing material

**Easy to use**
- Programmable in seven languages—provides easy set-up in almost any global location
- Universal voltage and frequency capability allows operation world-wide—IEC320 socket provided
- Quick start guide included for fast, easy set-up

**Diverse performance range**
- Three modes of operation—Flow, Timed Flow and Programmable Cycle Dispensing
- Lower pulsation flow and higher accuracy at low volumes and low flow rates
- High repeatability on all channels

**Ergonomic design**
- Digital display of pump speed or percent of maximum speed or number of dispense cycles
- Adjustable occlusion setting provides flow and pressure performance, and optimizes tubing life
- Valveless replacement alternative to diaphragm and piston pumps

**Specifications & Ordering Information**

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<th>72-320-048</th>
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<td>FH100M 4/8</td>
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<td>FH100M 12/6</td>
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**PERFORMANCE**
- Flow Capacity (mL/min): 0.006 to 760
- RPM: 2 to 200
- Reversible: Yes

**ELECTRICAL**
- External control—input: 0 to 20 mA, 4 to 20 mA, or 0 to 10V; Scalable
- External control—output: Remote / Local Indication
- Motor running logic: 4 to 20 mA, or 0 to 10 V
- Tachometer output: 5V, TTL pulse
- Voltage (50/60 Hz): 115/230V AC (auto selected)
- Motor type: 1/10 HP, (75 w) PMDC
- Control type: Phase-Controlled
- Speed resolution (repeatability): ±0.1 rpm @ 4 to 400 RPM
- Speed regulation: ±0.25% (full scale)

**PHYSICAL SPECIFICATIONS**
- Operating temperature: 0 to 40°C (32 to 104°F)
- Storage temperature: −25 to 65°C (−13 to 149°F)
- IP rating: IP31
- Agency approvals: ETL, cETL, CE, ROHS
- Controller dimensions (L × W × H): 31.7 x 27.9 x 15.2 (cm) 12.5 x 11 x 6 (in)
- Shipping weight: 7 (kgs) 15 lbs

See page 16 for flow performance and tubing selection.
The Therm o Scientific Advantage

We are a leading manufacturer of peristaltic pump technology with more than 35 years of experience. We provide tubing pump systems throughout the world. Therm o Scientific Masterflex P/S Series pump systems are known for durability and accuracy, and are ideal for a variety of fluid handling applications— from pilot plant to the production floor.

Our durable pumps handle a wide range of fluids, from the highest purity to extremely caustic solutions. They are used in a broad range of applications from agriculture to chemical processing, beverage dispensing to semiconductor polishing.

Tubing formulations to meet virtually any application

Thermo Scientific high precision peristaltic pump tubing is manufactured to exacting specifications to optimize accuracy, repeatability, and to provide enhanced tubing life. This tubing has been tested and quality assured to operate in Thermo Scientific peristaltic pumps.

We offer three grades of tubing to meet your specific requirements: General purpose; Precision tubing links, and HRT (High-Resilient Tube) elements. Each grade is offered in four different formulations allowing the broadest range of chemical compatibility and purity.

Precision tubing links optimize accuracy, life and pressure performance and they are easy to load. The HRT (High-Resilience Tube) elements can operate at the highest pressures (60 PSIG), provide the highest purity (eliminating spallation), and the longest life performance.
**FH10, FH15 and FH30 Peristaltic Pump Tubing**

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<th>Silicone (platinum)</th>
<th>Tygon® R-3603</th>
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<th>Bio-Pharm® (silicone)</th>
<th>PharMed® BPT</th>
<th>FDA Viton®</th>
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**Advantages**
- Excellent biocompatibility.
- No leachable additives, DOP, or plasticizers; phthalate and ketone free; odors and non-toxic, fungus-resistant.
- No taste imparted to transported fluids.
- Extremely good over a wide temperature range. Weather, ozone, corona, and radiation resistant.
- Minimal tendency to take a set.

**Limitations**
- Do not use with concentrated acids and bases; organic solvents, or oils; relatively high gas permeability.
- Limited pumping life.
- Potential leaching of plasticizer.
- Do not use with concentrated solvents, oils, acids. Relatively high gas permeability.
- Potential leaching of USP mineral oil or blend material.
- Limited pumping life.

**Application suitability**

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**Physical characteristics and composition**


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<td>0.85</td>
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</tbody>
</table>

**Cleaning and sterilization**

- Clean with hot water/salt solution; use a non-oily soap such as kony®, non-synthetic detergent or oil-based soap as they may be absorbed by the tubing and into the fluid. Please wash with distilled water. Ethylene oxide (ETO) sterilization is not recommended—sufficient data is not available about complete outgassing of residual ETO and other ETO products.

- Sterilize with ETO or autoclave. To autoclave: Tubing loosely coil tubing; allow to equilibrate at 121°C (250°F). 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 12 hours until clear.

- Sterilize with ETO or autoclave. To autoclave: Tubing loosely coil tubing: autoclave at 121°C (250°F). 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 12 hours until clear.

- Sterilize by ETO, autoclave, or gamma radiation up to 2.5 Mrad. To autoclave: coil loosely in non-laminating cloth or paper; autoclave at 121°C (250°F), 1 bar (15 psi) for 30 minutes. Repeated autoclaving will not affect overall life.

- Sterilize by using a circulating hot air oven at 249°C (480°F) for 16 hours.
## FH100 and FH100X Peristaltic Pump Tubing and Links

### FH100 and FH100DX Dispenser Pump Tubing and Links

<table>
<thead>
<tr>
<th>Pump tubing formulation</th>
<th>BioPharm® Silicone Tubing (platinum-cured)</th>
<th>PharMed® BPT</th>
<th>Norprene® Food (A 80 F)</th>
<th>Tygon® Lab (R-3003)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series number</strong></td>
<td>72-300-XXX</td>
<td>72-302-XXX</td>
<td>72-305-XXX</td>
<td>72-310-XXX</td>
</tr>
</tbody>
</table>

#### Advantages
- Ultra-smooth inner surface minimizes particle entrainment. Lower absorption; excellent biocompatibility; no leachable additive, DOP, or plasticizers. Very low extractables. Odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Weather, ozone, corona, and radiation resistant.
- Great for tissue and cell work—nontoxic and nonhemolytic. Long service life minimizes risk of fluid exposure; reduces tubing costs and pump downtime. Opaque to UV and visible light to protect light-sensitive fluids. Low gas permeability. High-pressure (100 psi) version available.

#### Limitations
- Do not use with concentrated solvents, oils, acids. Relatively high gas permeability.
- Potential leaching of USP mineral oil or blend material.

#### Application suitability:
- **Acids** Not recommended
- **Alkalies** Not recommended
- **Organic solvents** Not recommended
- **Pressure** Excels
- **Vacuum** Good
- **Viscous fluids** Good
- **Sterile fluids** Good

#### Physical characteristics and composition
- **Temperature Range**
  - From –60 to 232°C (–76 to 450°F)
  - From –51 to 132°C (–60 to 270°F)
  - From –59 to 135°C (–60 to 270°F)
  - From –50 to 74°C (–58 to 165°F)

#### Meets classifcations
- **USP Class VI**
- FDA 21 CFR 177.2600
- Exceeds 3A sanitary standards
- European Pharmacopoeia (EP)
- **USP Class VI**
- FDA 21 CFR 177.2600
- NSF-listed (Standard 51)
- European Pharmacopoeia (EP)
- **FDA 21 CFR 177.2600**
- NSF-listed (Standard 51)
- **FDA 21 CFR 177.2600**
- NSF-listed (Standard 51)

#### Gas permeability

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Gas permeability</th>
<th>Tubing I.D.</th>
<th>Flow rate by Tubing Size</th>
<th>1.6 mm Wall - Use in FH100 and FH100D</th>
<th>2.4 mm wall - Use in FH100X and FH100DX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BioPharm Silicone</strong></td>
<td>0.08 mm</td>
<td>1.6 mm</td>
<td>3.2 mm</td>
<td>4.8 mm</td>
<td>6.4 mm</td>
</tr>
<tr>
<td><strong>PharMed BPT</strong></td>
<td>72-300-014</td>
<td>72-300-016</td>
<td>72-300-025</td>
<td>72-300-017</td>
<td>72-300-018</td>
</tr>
<tr>
<td><strong>Norprene Food</strong></td>
<td>72-300-014</td>
<td>72-300-016</td>
<td>72-300-025</td>
<td>72-300-017</td>
<td>72-300-018</td>
</tr>
<tr>
<td><strong>Tygon</strong></td>
<td>72-310-014</td>
<td>72-310-016</td>
<td>72-310-025</td>
<td>72-310-017</td>
<td>72-310-018</td>
</tr>
</tbody>
</table>

#### Flow rates

<table>
<thead>
<tr>
<th>Flow rate by Tubing Size</th>
<th>Tubing Size</th>
<th>USP mineral oil or blend material</th>
<th>FOM mineral oil or blend material</th>
<th>USP mineral oil or blend material</th>
<th>USP mineral oil or blend material</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BioPharm Silicone</strong></td>
<td>1.6 mm</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td><strong>PharMed BPT</strong></td>
<td>1.6 mm</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Norprene Food</strong></td>
<td>2.4 mm</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td><strong>Tygon</strong></td>
<td>2.4 mm</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

#### Cleaning/sterilization
- Sterilize by ETO, autoclave, or gamma radiation up to 2.5 Mrad. To autoclave: coil loosely in nonliniting cloth or paper; autoclave at 121°C (250°F); 1 bar (15 psi) for 30 minutes.
- Sterilize by ETO, autoclave, or gamma radiation up to 2.5 Mrad. Sterilized autoclaving will not affect overall life.
- Sterilize by ETO. autoclave. To autoclave: Coil tubing loosely in nonliniting cloth or paper; autoclave at 121°C (250°F); 1 kg/cm² (15 psi) for 30 minutes (tubing will appear milky); air dry at max 60°C (140°F) for 2 to 21/2 hours until clear.
FH100 and FH100X HRT Peristaltic Pump Elements

FH100D and FH100DX Dispenser Pump Elements

<table>
<thead>
<tr>
<th>Pump tubing formulation</th>
<th>PHARMACEUTICAL GRADE</th>
<th>INDUSTRIAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GORE® STA-PURE® PCS</td>
<td>GORE® STA-PURE® PFL</td>
</tr>
<tr>
<td>Series number</td>
<td>96211-XX</td>
<td>96212-XX</td>
</tr>
<tr>
<td>Advantages</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long life, even under pressures up to 60 psi (4 bar). Excellent flow stability; &lt;1% change in flow rate as tubing wears. No break-in period required. Spallation-free. Excellent biocompatibility. Very low extractables</td>
<td>Similar to STA-PURE PCS tubing but with enhanced chemical resistance. Resistant to many organic and inorganic fluids. Long life at pressure up to 60 psi (4 bar). Spallation-free. Excellent biocompatibility. Low gas permeability.</td>
</tr>
<tr>
<td>Limitations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sold as tube elements only; no continuous lengths available.</td>
<td>Sold as tube elements only; no continuous lengths available</td>
</tr>
<tr>
<td>Application suitability:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acids</td>
<td>Not recommended</td>
<td>Excellent</td>
</tr>
<tr>
<td>Alkalis</td>
<td>Not recommended</td>
<td>Good</td>
</tr>
<tr>
<td>Organic solvents</td>
<td>Not recommended</td>
<td>Good</td>
</tr>
<tr>
<td>Pressure</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Viscous fluids</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Sterile fluids</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td>Physical characteristics and composition</td>
<td>ePTFE (expanded PTFE) and platinum-cured silicone. Excellent tensile strength. Firm (stiff) material. Opaque, white.</td>
<td>ePTFE (expanded PTFE) and per-fluoroelastomer (FFKM). Excellent tensile strength. Firm (stiff) material. Opaque, off-white.</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>–40 to 200°C (–40 to 392°F)</td>
<td>–80 to 200°C (–112 to 392°F)</td>
</tr>
<tr>
<td>Meets classifications</td>
<td>USP Class VI</td>
<td>USP Class VI</td>
</tr>
<tr>
<td>Gas permeability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(cm² x sec x cm Hg) x 10^-10</td>
<td>CO₂: 20,132</td>
<td>CO₂: 76 to 79</td>
</tr>
<tr>
<td></td>
<td>H₂: 1579</td>
<td>H₂: 13 to 15</td>
</tr>
<tr>
<td></td>
<td>N₂: 2763</td>
<td>N₂: 4.3</td>
</tr>
<tr>
<td>Cleaning/sterilization</td>
<td>Sterilize by ETO, autoclave or SIP (steam in place). Repeated autoclaving will not affect overall life.</td>
<td>Sterilize by ETO, autoclave or SIP (steam in place). Repeated autoclaving will not affect overall life.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow rate by Tubing Size</th>
<th>FH100 and FH100X Flow Rates</th>
<th>FH100D and FH100DX Flow Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubing Size</td>
<td>mL/min</td>
<td>Flow Rate per mL/min</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>0.50 – 40</td>
<td>2.0 – 150</td>
</tr>
<tr>
<td></td>
<td>1/32</td>
<td>1/16</td>
</tr>
<tr>
<td></td>
<td>0.08 mm</td>
<td>1.6 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.6 mm Wall - Use in FH100 and FH100D</th>
<th>2.4 mm Wall - Use in FH100DX and FH100DX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulation</td>
<td>Size 13</td>
</tr>
<tr>
<td>Style 100 SC</td>
<td>X</td>
</tr>
<tr>
<td>Sta Pure PCS</td>
<td>X</td>
</tr>
<tr>
<td>Sta Pure PFL</td>
<td>X</td>
</tr>
<tr>
<td>Style 400 FKM</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High Resilience</th>
<th>Size 13</th>
<th>Size 14</th>
<th>Size 16</th>
<th>Size 25</th>
<th>Size 17</th>
<th>Size 18</th>
<th>Size 15</th>
<th>Size 24</th>
<th>Size 35</th>
<th>Size 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style 100 SC</td>
<td>X</td>
<td>96200-14</td>
<td>96200-16</td>
<td>96200-25</td>
<td>96200-17</td>
<td>96200-18</td>
<td>96200-15</td>
<td>96200-24</td>
<td>96200-35</td>
<td>96200-36</td>
</tr>
<tr>
<td>Sta Pure PCS</td>
<td>X</td>
<td>96211-14</td>
<td>96211-16</td>
<td>96211-25</td>
<td>96211-17</td>
<td>96211-18</td>
<td>96211-15</td>
<td>96211-24</td>
<td>96211-35</td>
<td>X</td>
</tr>
<tr>
<td>Sta Pure PFL</td>
<td>X</td>
<td>96212-14</td>
<td>96212-16</td>
<td>96212-25</td>
<td>96212-17</td>
<td>96212-18</td>
<td>96212-15</td>
<td>96212-24</td>
<td>96212-35</td>
<td>96212-36</td>
</tr>
<tr>
<td>Style 400 FKM</td>
<td>X</td>
<td>X</td>
<td>6439-16</td>
<td>X</td>
<td>6439-15</td>
<td>6439-24</td>
<td>6439-35</td>
<td>X</td>
<td>6439-35</td>
<td>X</td>
</tr>
</tbody>
</table>

15
**Tubing Size Inside Dia.**

<table>
<thead>
<tr>
<th>Links</th>
<th>Series number</th>
<th>Tube size</th>
<th>PharMed® BPT</th>
<th>Silicone</th>
<th>Platinum Cured</th>
<th>Tygon® R-3603</th>
<th>Viton® Fluoroelastomer</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>72-47X-XXX</td>
<td>0.03</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>72-47X-XXX</td>
<td>0.06</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>72-47X-XXX</td>
<td>0.12</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>72-47X-XXX</td>
<td>0.19</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>72-47X-XXX</td>
<td>0.25</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>72-47X-XXX</td>
<td>0.31</td>
<td>72-46X-XXX</td>
<td>72-45X-XXX</td>
<td>72-48X-XXX</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Advantages**

Thermoplastic elastomer: Polypropylene-based material with USP mineral oil.

Excellent tensile strength. Firm stiffer material.

Opaque, beige.

Thermal set rubber: Siloxanes polymers and amorphous silica.

Excellent compression strength. Soft material.

Translucent, clear to light amber.

Thermal set rubber: Viton B (67% Fluorine).

Firm stiffer material.

Opaque, black.

**Temperature Range**

(-50 to 135°C (-75 to 275°F)

(-51 to 232°C (-60 to 450°F)

(-50 to 74°C (-58 to 165°F)

(-50 to 20°C (-25 to 400°F)

**Meets classifications**

USP Class VI

FDA 21 CFR 177.2600 NSF Listed (Standard 51)

USP Class VI

FDA 21 CFR 177.2600 NSF Listed (Standard 51)

FDA 21 CFR 175.300 None

**Flow Rates in ml/min with Microbore Tubing**

- Use with Small Cartridges

**Model Number**

- FH100 4/8
- FH100 6/8
- FH100 12/8

**Number of Rollers**

- 8
- 4
- 6

**Silicone**

- 0.006 to 0.6
- 0.012 to 0.12
- 0.012 to 0.12

**Platinum Cured**

- 0.010 to 1.0
- 0.012 to 0.12
- 0.012 to 0.12

**PVC**

- 0.10 to 10
- 0.14 to 14
- 0.02 to 2

**Fluoroelastomer**

- 0.24 to 24
- 0.36 to 36
- 0.04 to 4.6

**Viton®**

- 0.44 to 44
- 0.74 to 74
- 0.08 to 6.6

**Temperature Range**

(-50 to 74°C (-58 to 165°F)

(-50 to 74°C (-58 to 165°F)

-32 to 20°C (-25 to 400°F)

**Flow Rates in ml/min with Precision Tubing Links**

- Use with Large Cartridges

**Model Number**

- FH100 4/8
- FH100 6/8
- FH100 12/8

**Number of Rollers**

- 3
- 6

**Silicone**

- 0.12 to 1
- 0.019 to 1.9

**Platinum Cured**

- 0.42 to 42
- 0.08 to 6.6

**PVC**

- 0.16 to 160
- 0.20 to 20

**Fluoroelastomer**

- 3.4 to 340
- 0.04 to 4.6

**Viton®**

- 5.6 to 580
- 0.08 to 6.6

**Temperature Range**

(-50 to 74°C (-58 to 165°F)

(-50 to 74°C (-58 to 165°F)

-32 to 20°C (-25 to 400°F)

**Microbore Tubing Links and Transfer Tubing Ordering Information**

- Series number: 72-47X-XXX
- Tube size: 0.03 to 1/6

**Tubing ID (mm)**

- PVC
- Silicone
- Santoprene
- Viton

- 0.19
- 0.25
- 0.89
- 1.42
- 2.06
- 2.79

**Links**

- 12/pk
- 6/pk
- 12/pk
- 12/pk

**Flow Rates in ml/min with Microbore Tubing**

- Use with Small Cartridges

**Model Number**

- FH100M 4/8
- FH100M 6/8
- FH100M 12/8

**Number of Rollers**

- 6
- 3
- 6

**Silicone**

- 0.11 to 10
- 0.3 to 30
- 0.06 to 6.6

**Platinum Cured**

- 1.1 to 108
- 0.1 to 30
- 0.2 to 20

**PVC**

- 2 to 200
- 3.4 to 340
- 0.4 to 40

**Fluoroelastomer**

- 2.8 to 280
- 5.6 to 580
- 0.58 to 56

**Viton®**

- 3.6 to 360
- 7.8 to 760
- 0.74 to 74

**Flow Rates in ml/min with Precision Tubing Links**

- Use with Large Cartridges

**Model Number**

- FH100M 4/8
- FH100M 6/8
- FH100M 12/8

**Number of Rollers**

- 6
- 3
- 6

**Silicone**

- 0.10 to 10
- 0.12 to 1
- 0.019 to 1.9

**Platinum Cured**

- 0.3 to 30
- 0.42 to 42
- 0.08 to 6.6

**PVC**

- 1.1 to 108
- 0.16 to 160
- 0.20 to 20

**Fluoroelastomer**

- 2 to 200
- 3.4 to 340
- 0.4 to 40

**Viton®**

- 2.8 to 280
- 5.6 to 580
- 0.58 to 56

**Temperature Range**

(-50 to 74°C (-58 to 165°F)

(-50 to 74°C (-58 to 165°F)

-32 to 20°C (-25 to 400°F)

**Microbore Tubing Links and Transfer Tubing Ordering Information**

- Tube size: 0.19 to 1/6

**Tubing ID (mm)**

- Links
- 12/pk
- 6/pk
- 12/pk

**Microbore Tubing Links and Transfer Tubing Ordering Information**

- Tube size: 0.19 to 1/6

**Tubing ID (mm)**

- Links
- 12/pk
- 6/pk
- 12/pk

**Preference Pump Tubing Links and Transfer Tubing Ordering Information**

- Tube size: 0.19 to 1/6

**Tubing ID (mm)**

- Links
- 12/pk
- 6/pk
- 12/pk

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