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SEE WHAT'S NEW!

NEW! Biocompatible

Biocompatible Tubing for UHPLC
PEEK-Lined Stainless Steel (PLS)

Page 63

NEW! Biocompatible

Four Independent Channels!
Reglo ICC Peristaltic Pump

Page 92

NEW! Biocompatible

High Pressure Manual Injection Valve
Active Flow-Splitter for LC/MS

Page 132

Biocompatible

Our Biocompatible logo indicates the use of materials anticipated to maintain the integrity and improve the analysis of biological samples in their intended application.

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Table of Contents

FITTINGS

SEE STARRED PRODUCTS FOR **TOP SELLERS!**

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Fittings Chapter

In this catalog, we've taken a new approach to presenting our extensive line of fittings. In one comprehensive chapter, you will find fittings for several applications — very high pressure (> 15,000 psi/1,034 bar), high pressure (> 1,000 psi/69 bar), and low pressure (< 1,000 psi/69 bar). There is also a separate section for micro and nano-scale applications.

You'll also find information on:

THREADS (10-32, 6-32, M6, etc.)

TUBING SIZE (1/16", 1/32", 360 µm, etc.)

PORT GEOMETRY (Coned, Flat-bottom)

Specification tables at the bottom of each page include:

- Part numbers
- Part description
- Materials of construction
- Standard size packages
- Pressure ratings
- Available colors

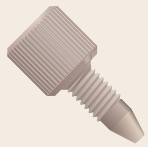
Additionally, you will find fitting-related application notes and, if available, special ordering options throughout the chapter.

Please Note: in the product descriptions, a "Fitting" refers to a complete product ready to assemble and connect tubing into a part. This could be a one-piece connector or a nut and ferrule packaged together. A "Nut" indicates the male or female threaded product sold separately, and a "Ferrule" is sold separately when indicated in the description. For your convenience we ship most Upchurch Scientific® Fittings and Ferrules in 10-packs, however, you may order individual pieces (an "x" in the product part number designates "10-pk").

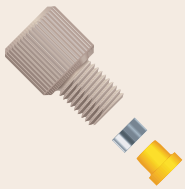
You may notice a change in some of our pressure ratings — be assured that the IDEX Health & Science team is dedicated to providing the most reliable, proven products on the market. We have implemented more stringent testing protocols and a generous safety margin to our ratings to ensure your safety.

Please Note: all testing is performed with water at room temperature unless otherwise specified. Results may vary depending on the material of the receiving port and tubing, actual tubing diameters (with stated tolerances), temperature and solvents used. If a pressure range is listed for a product's specification, the pressure rating depends on the tubing material used. The lower end of the range will represent testing performed on softer tubing such as FEP, and the higher end of the range will represent testing performed on harder tubing such as Stainless Steel. For more detail, please see the product specification sheets on our website, www.idex-hs.com, or contact us directly.

FINGERTIGHT FITTINGS
Found on pages 11–15



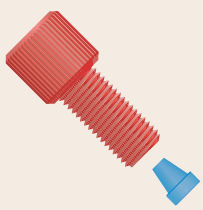
SUPER FLANGELESS™ FITTINGS
Found on pages 21–23



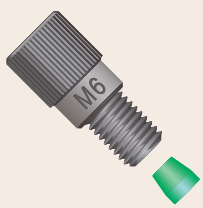
TUBING SLEEVES
Found on pages 19–20

MICROTIGHT® FITTINGS
Found on pages 18–19

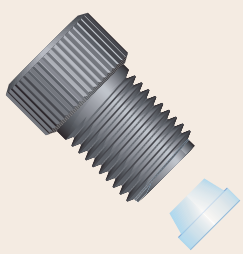
FLANGELESS FITTINGS
Found on pages 24–26



FLANGELESS FITTINGS FOR METRIC SIZED TUBING
Found on page 27



FITTINGS FOR 3/16" TO 5/16" OD TUBING
Found on page 30



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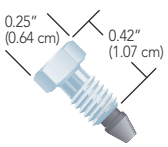
Reusable Very High Pressure (VHP) Fittings

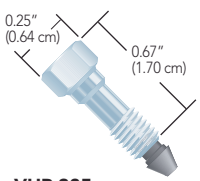
- Pressure rated up to 25,000 psi (1,720 bar)
- Patent pending innovative design
- Capable of up to ten repeat assembly cycles with no impact on pressure holding ability or carry-over
- Available in 10-32 threads for 1/16" OD tubing and M4 threads for 1/32" OD tubing
- Materials of construction: stainless steel and proprietary PEEK polymer blend (PK)

IDEX Health & Science introduces an innovative line of Upchurch Scientific® Very High Pressure (VHP) fittings, designed to withstand extreme pressures. This patent-pending line of ground-breaking fitting systems is perfect for use within the increasingly demanding requirements of today's high performance analytical systems.

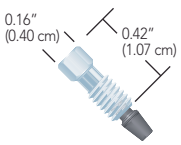
The Reusable VHP fittings can be reused when following the tightening torque specification listed below. With a polymer front ferrule, there is no damage to the tubing or receiving port, also increasing the life of these components.



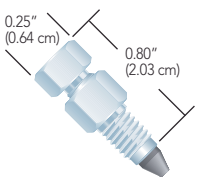
VHP-320
10-32 VHP Fitting
for 1/16" OD tubing



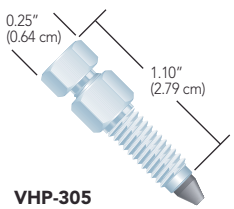
VHP-325
10-32 VHP Fitting, Long
for 1/16" OD tubing



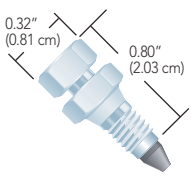
VHP-920
M4 VHP Fitting
for 1/32" OD tubing



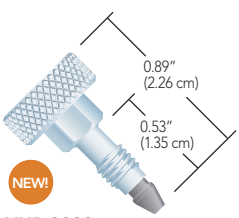
VHP-300
10-32 VHP Fitting
for 1/16" OD tubing



VHP-305
10-32 VHP Fitting, Long
for 1/16" OD tubing



VHP-310
10-32 VHP Fitting
for 1/16" OD tubing



VHP-3200
10-32 VHP Fitting
for 1/16" OD tubing

VHP-1001
VHP Fingertight
1/4" Hex Tool

APPLICATION NOTE

Reusability

- Using a reusable fitting eliminates the problems described on stainless steel fitting interchangeability on page 185 of the Technical Resources section. A reusable fitting will allow for quick column, sample loop, inline filter or tubing changes with minimal downtime.
- The VHP-300, VHP-305, and VHP-310 fittings can be used up to 30,000 psi (2,070 bar) if tightened to 14 in-lbs (1.6 N·m). This limits the reusability to 5 cycles. The stacked design of these fittings allows the user to lightly assemble the fitting before tightening into the port. Leaving the tubing extended at least half an inch beyond the end of the ferrule will ensure that the tubing is bottomed out in the port before the fitting is tightened down, avoiding any potential dead volume that could be introduced during fitting installation.

RELATED PRODUCTS

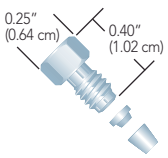
- Find tightening tools on page 8 designed to deliver the torque necessary for these fittings.

	Part No.	Description	Port	Pressure Rating	Required Torque	Head Style	Material	Qty.
	REUSABLE VHP FITTINGS							
	VHP-300x	VHP Fitting for 1/16" OD	10-32 Coned	20,000 psi (1,380 bar)	10 in-lbs (1.10 N·m)	1/4" Hex	SST/PK	10-pk
	VHP-305x	VHP Fitting for 1/16" OD, Long	10-32 Coned	20,000 psi (1,380 bar)	10 in-lbs (1.10 N·m)	1/4" Hex	SST/PK	10-pk
	VHP-310x	VHP Fitting for 1/16" OD	10-32 Coned	20,000 psi (1,380 bar)	10 in-lbs (1.10 N·m)	8 mm Hex	SST/PK	10-pk
	VHP-320x	VHP Fitting for 1/16" OD	10-32 Coned	25,000 psi (1,720 bar)	10 in-lbs (1.10 N·m)	1/4" Hex	SST/PK	10-pk
	VHP-325x	VHP Fitting for 1/16" OD, Long	10-32 Coned	25,000 psi (1,720 bar)	10 in-lbs (1.10 N·m)	1/4" Hex	SST/PK	10-pk
	VHP-920x	VHP Fitting for 1/32" OD	M4 Coned	25,000 psi (1,720 bar)	8 in-lbs (0.90 N·m)	4 mm Hex	SST/PK	10-pk
NEW!	**VHP-3200**	VHP Fitting for 1/16" OD	10-32 Coned	11,000 psi (760 bar)	3.5 in-lbs (0.40 N·m)	1/2" Knurl	SST/PK	10-pk
NEW!	**VHP-1001**	VHP Fingertight 1/4" Hex Tool	—	—	—	—	PPS	ea.

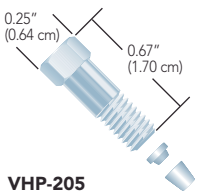
Stainless Steel VHP Fittings

- Pressure rated to 30,000 psi (2,070 bar)
- Double compression ferrule design
- Available with 10-32 threads for 1/16" OD tubing and M4 threads for 1/32" OD tubing

The all Stainless-Steel VHP Fittings include a unique ferrule system with two compression points to provide twice the grip of a standard ferrule. This design also allows the bite on the tubing to be less concentrated and does not restrict the inner diameter, as discussed in the Application Note. The ferrules for 1/16" OD tubing and 10-32 coned ports are two pieces, while the grooved ferrule for 1/32" OD tubing and M4 coned ports is a one-piece design for easier handling, but it will act as two pieces with double compression on the tubing as it is tightened down.

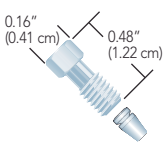


VHP-200
VHP 10-32 Fitting
for 1/16" OD tubing



VHP-205
VHP 10-32 Fitting, Long
for 1/16" OD tubing

VHP-700
VHP 6-40 Fitting
for 1/32" OD tubing

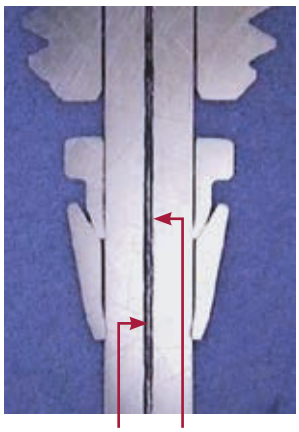


VHP-900
VHP M4 Fitting
for 1/32" OD tubing

APPLICATION NOTE

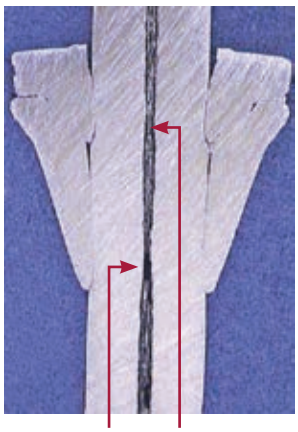
In order to seal up to the stated pressure rating, the VHP-200-01 ferrule requires 20 in-lbs (2.25 N·m) of torque. Similar ferrules on the market require tightening torque of at least 30 in-lbs (3.3 N·m), which can result in a restricted tubing passage, as shown in the picture below. This restriction can increase turbulence and add a 'throttling' effect to the fluid pathway, resulting in mixing and other potential chromatographic problems.

IDEX Health & Science VHP-200



Uniform Tubing Passage

Conventional Two Piece Ferrule Design



Constricted Tubing Passage

Part No.	Description	Port	Pressure Rating	Required Torque	Head Style	Material	Qty.
STAINLESS STEEL VHP FITTINGS (INCLUDES NUT AND FERRULE)							
VHP-200x	VHP Fitting for 1/16" OD	10-32 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	1/4" Hex	SST	10-pk
VHP-205x	VHP Fitting for 1/16" OD, Long	10-32 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	1/4" Hex	SST	10-pk
VHP-900x	VHP Fitting for 1/32" OD	M4 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	4 mm Hex	SST	10-pk
NEW! **VHP-700x**	VHP Fitting for 1/32" OD	6-40 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	4 mm Hex	SST	10-pk
STAINLESS STEEL VHP FERRULES							
VHP-200-01x	VHP Ferrule for 1/16" OD	10-32 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	—	SST	10-pk
VHP-900-01x	VHP Ferrule for 1/32" OD	M4 Coned	30,000 psi (2,070 bar)	20 in-lbs (2.25 N·m)	—	SST	10-pk

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Tightening Tools for VHP Fittings

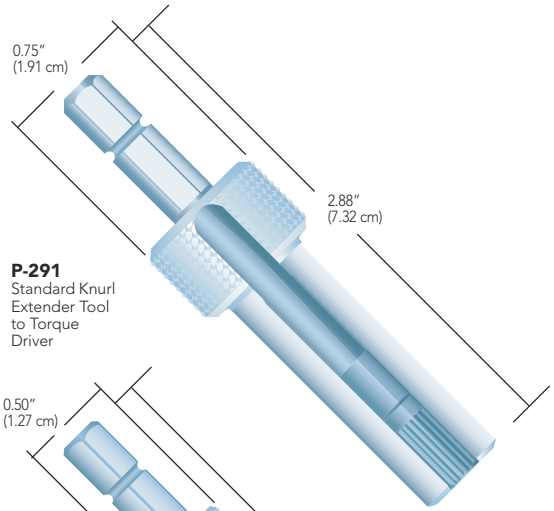
- Configured for the optimum torque to provide assurance of a strong connection
- Prolongs the lifetime of reusable fittings by not overtightening
- Available for multiple fitting head styles

This new line of tightening tools is designed for the VHP fittings and can also be used with any fitting in this chapter described to have a corresponding head style to the tool listed below. There are three styles of tightening tools available for various applications. The Torque Tools (VHP-1000, VHP-2000, and VHP-3000) are breakaway torque wrenches designed to deliver a precise amount of torque to the fitting system. These torque wrenches come calibrated according to ISO 6789:2003 (± 6% of setting) and have been tested extensively with the reusable VHP fittings on page 6. Choose the appropriate torque delivered and the proper head style to work with the VHP fittings, increasing the ease of use with these fittings.

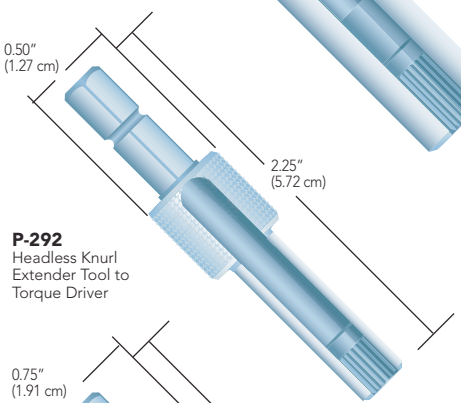
The VHP-4000 Torque Driver couples with the specially designed Extender Tools listed below and provides an externally adjustable torque setting. This tool along with the appropriate Extender Tools will tighten any Upchurch Scientific® knurled polymer fitting in your system. Reference the head style found in the tables at the bottom of each page for information on the proper Extender Tool to select.

Because of the small hex-head on the M4 fittings (VHP-900 and VHP-920), a custom wrench, the VHP-9000, is available below.

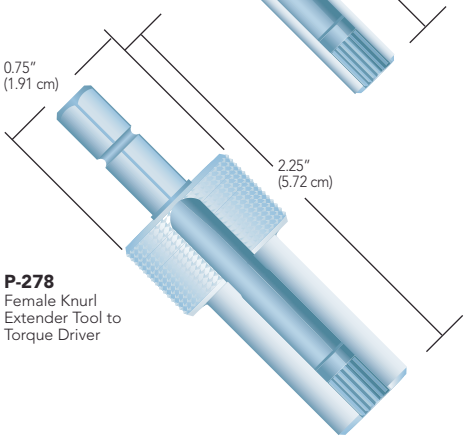
VHP-1000
VHP Wrench
1/4 in Hex
10 in-lbs (1.13 N·m)



P-291
Standard Knurl Extender Tool to Torque Driver



P-292
Headless Knurl Extender Tool to Torque Driver



P-278
Female Knurl Extender Tool to Torque Driver

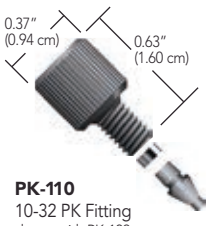
	Part No.	Description	Use With Head Style	Torque Delivered	Qty.
	VHP TIGHTENING TOOLS				
NEW!	**F-347**	Extender Tool to Torque Driver	FlushNut (1/4-28)	—	ea.
NEW!	**N-291**	Extender Tool to Torque Driver	Micro Headless	—	ea.
NEW!	**P-268**	Extender Tool to Torque Driver	1/4" Hex	—	ea.
	P-278	Extender Tool to Torque Driver	Female Nut Knurl	—	ea.
	P-279	Extender Tool to Torque Driver	Micro Nut Knurl	—	ea.
	P-291	Extender Tool to Torque Driver	Standard Nut Knurl	—	ea.
	P-292	Extender Tool to Torque Driver	Headless Nut Knurl	—	ea.
	P-1000	Standard Knurl Torque Tool	Standard Knurl	4 in-lbs (0.45 N·m)	ea.
	VHP-1000	VHP Torque Tool	1/4" Hex	10 in-lbs (1.13 N·m)	ea.
	VHP-2000	VHP Torque Tool	1/4" Hex	14 in-lbs (1.58 N·m)	ea.
	VHP-3000	VHP Torque Tool	8 mm Hex	10 in-lbs (1.13 N·m)	ea.
	VHP-4000	VHP Torque Driver	Extender Tool 1/4" Drive	Adjustable between 2–12 in-lbs (0.23–1.35 N·m)	ea.
	VHP-9000	4 mm Wrench	4 mm Hex	—	ea.

Very High Pressure PK Fittings

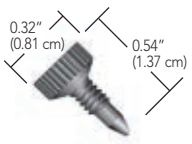
Upchurch Scientific® Ultra High Performance fittings are manufactured from a proprietary PEEK blend (PK) which allow them to be used at higher temperatures (up to 200 °C) and higher pressures.

The VHP PK One-Piece fittings are available for 10-32 coned, 6-32 coned, or M4 coned ports, and Two-Piece fittings are available to connect either 1/16" or 1/32" OD tubing into 10-32 coned ports in multiple styles.

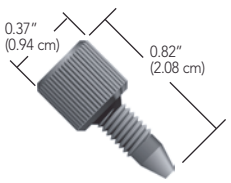
PK-110
10-32 PK Fitting
shown with PK-100
for 1/16" OD tubing



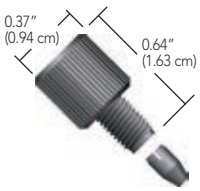
PK-110
10-32 PK Fitting
shown with PK-132
for 1/32" OD tubing



PK-126
6-32 PK MicroTight® Fitting
for 1/32" OD tubing

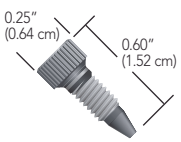


PK-120BLK
10-32 PK Fitting
for 1/16" OD tubing



PK-195
10-32 PK Fitting
with PK 192
for 1/16" OD tubing

PK-126H
6-32 PK MicroTight® Fitting
for 1/32" OD tubing

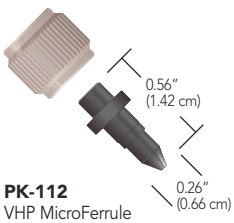


UH-904
M4, 1/32" Fitting
for Rheodyne® MX valves

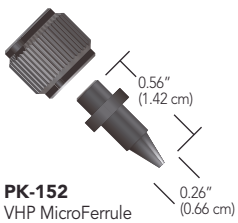
PK-124
6-32 PK MicroTight® Fitting
for 1/32" OD tubing

VHP MicroFerrules

VHP MicroFerrules are made from a proprietary high performance PEEK polymer blend, a material which is unique in its ability to enable the use of capillary tubing in UHPLC environments. The new high pressure MicroFerrules are available for use with 1/32" or 360 µm OD tubing, and they are incorporated into several of our VHP products for capillary tubing.



PK-112
VHP MicroFerrule
shown with P-416
for 1/32" OD tubing



PK-152
VHP MicroFerrule
shown with P-416BLK
for 360 µm OD tubing

APPLICATION NOTE

CAUTION: While the proprietary blend of the PK fittings will allow a fitting to attain a higher pressure and minimal cold flow properties relative to pure PEEK, some fittings molded of PK are known to be conductive. Use caution when employing PK fittings in high voltage applications.

NOTE

MicroTight fittings and MicroFerrules

While the MicroTight Female Nuts may be used with any of the separate MicroFerrules, the MicroFerrules themselves are port-specific and are thus not interchangeable. Additionally, the one-piece MicroTight fittings are also port-specific and should not be exchanged.

RELATED PRODUCTS

▶ Find unions, tees and crosses for VHP applications on pages 36, 37, and 42.

	Part No.	Description	Port	Pressure Rating	Required Torque	Head Style	Material	Qty.
	PK VHP ONE-PIECE FITTINGS							
★	**PK-120BLKx**	PK One-Piece Fitting for 1/16" OD Tubing	10-32 Coned	12,000 psi (827 bar)	8.0 in-lbs (0.90 N·m)	Standard Knurl	PK	10-pk
NEW!	**PK-124x**	PK One-Piece Fitting for 360 µm OD Tubing	6-32 Coned	15,000 psi (1,035 bar)	3.0 in-lbs (0.34 N·m)	Standard Micro Knurl	PK	10-pk
NEW!	**PK-126Hx**	PK One-Piece Headless Fitting for 1/32" OD Tubing	6-32 Coned	15,000 psi (1,035 bar)	3.0 in-lbs (0.34 N·m)	Headless Micro Knurl	PK	10-pk
	PK-126x	PK One-Piece Fitting for 1/32" OD Tubing	6-32 Coned	15,000 psi (1,035 bar)	3.0 in-lbs (0.34 N·m)	Standard Micro Knurl	PK	10-pk
	UH-904x	PK One-Piece Fitting for 1/32" OD Tubing	M4 Coned	15,000 psi (1,035 bar)	4.0 in-lbs (0.45 N·m)	Headless Knurl	PK	10-pk
	PK VHP FITTINGS (SEALTIGHT™ STYLE, FITTINGS INCLUDE PK-192X)							
	PK-192x	PK Ferrule for 1/16" OD Tubing	10-32 Coned	11,000 psi (760 bar)	—	—	PK	10-pk
	PK-195x	PK Fitting for 1/16" OD Tubing	10-32 Coned	11,000 psi (760 bar)	8.0 in-lbs (0.90 N·m)	Standard Knurl	PK	10-pk
	PK VHP FITTINGS (LITETOUCH® STYLE, NUTS AND FERRULES SOLD SEPARATELY)							
★	**PK-100x**	PK Ferrule for 1/16" OD Tubing	10-32 Coned	16,500 psi (1,140 bar)	—	—	PK	10-pk
	PK-110x	PK Nut for 1/16" OD Tubing	10-32 Coned	16,500 psi (1,140 bar)	8.0 in-lbs (0.90 N·m)	Standard Knurl	PK	10-pk
	PK-132x	PK Ferrule for 1/32" OD Tubing	10-32 Coned	16,500 psi (1,140 bar)	—	—	PK	10-pk
	PK MICRO FERRULES AND FEMALE NUTS							
	P-416	Female Nut for Microferrule	5/16-24 Coned	15,000 psi (1,035 bar)	4.0 in-lbs (0.45 N·m)	Female Knurl	PEEK, Natural	ea.
	P-416BLK	Female Nut for Microferrule	5/16-24 Coned	15,000 psi (1,035 bar)	4.0 in-lbs (0.45 N·m)	Female Knurl	PEEK, Black	ea.
★	**PK-112**	VHP MicroFerrule for 1/32" OD Tubing	5/16-24 Coned	15,000 psi (1,035 bar)	—	—	PK	ea.
	PK-152	VHP MicroFerrule for 360 µm OD Tubing	5/16-24 Coned	15,000 psi (1,035 bar)	—	—	PK	ea.

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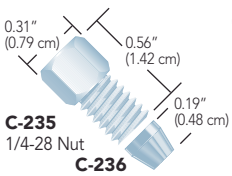
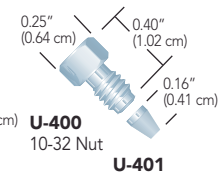
Stainless Steel Fittings

These 316 Stainless Steel Fittings are rated to 20,000 psi (1,380 bar) when wrench tightened. Choose Upchurch Scientific® Standard Fittings, or select from the Rheodyne® or other manufacturer-compatible offerings.

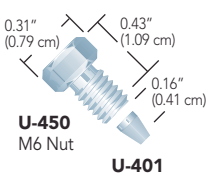
Standard Stainless Steel Fittings



C-235
1/4-28 Nut
C-236
Ferrule

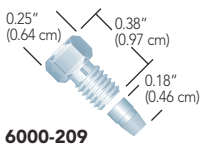


U-400
10-32 Nut
U-401
Ferrule

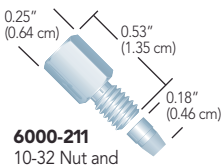


U-450
M6 Nut
U-401
Ferrule

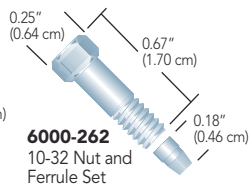
Rheodyne Fittings



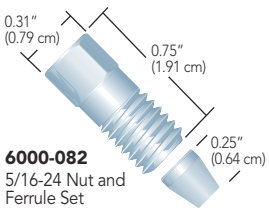
6000-209
10-32 Nut and Ferrule Set



6000-211
10-32 Nut and Ferrule Set

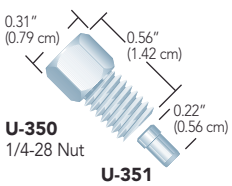


6000-262
10-32 Nut and Ferrule Set



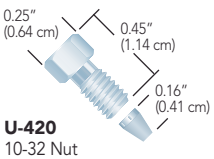
6000-082
5/16-24 Nut and Ferrule Set

SSI Compatible Fittings

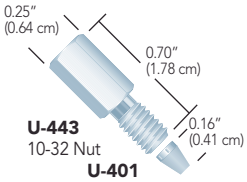


U-350
1/4-28 Nut
U-351
Ferrule

Beckman® Compatible Fittings

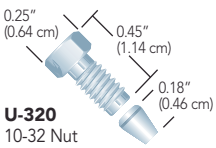


U-420
10-32 Nut
U-401
Ferrule



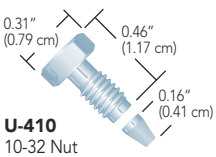
U-443
10-32 Nut
U-401
Ferrule

VICI® (Valco) Compatible Fittings



U-320
10-32 Nut
U-321
Ferrule

Waters® Compatible Fittings



U-410
10-32 Nut
U-401
Ferrule

NOTE

- Do not use metal fittings in plastic ports, as this can damage the port. Please see the "Material Structural Compatibility" chart on page 184 for more information about fittings compatibility with tubing and port materials.
- The recommended torque to tighten these fittings is 20 in-lbs (2.25 N·m).

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	STANDARD STAINLESS STEEL FITTINGS						
	C-235x	Nut for 1/8" OD Tubing	1/4-28 Coned	20,000 psi (1,380 bar)	5/16" Hex	SST	10-pk
	C-236x	Ferrule for 1/8" OD Tubing	1/4-28 Coned	20,000 psi (1,380 bar)	—	SST	10-pk
★	**U-400x**	Nut for 1/16" OD Tubing	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
★	**U-401x**	Ferrule for 1/16" OD Tubing	10-32 or M6 Coned	20,000 psi (1,380 bar)	—	SST	10-pk
	U-450x	Nut for 1/16" OD Tubing	M6 Coned	20,000 psi (1,380 bar)	5/16" Hex	SST	10-pk
	RHEODYNE FITTINGS						
	6000-082	Fitting for 1/8" OD Tubing	5/16-24 Coned	20,000 psi (1,380 bar)	5/16" Hex	SST	ea.
	6000-083	Ferrule for 1/8" OD Tubing	5/16-24 Coned	20,000 psi (1,380 bar)	—	SST	5-pk
	6000-209	Fitting for 1/16" OD Tubing	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
	6000-210	Ferrule for 1/16" OD Tubing	10-32 Coned	20,000 psi (1,380 bar)	—	SST	10-pk
	6000-211	Fitting for 1/16" OD Tubing, Long	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
	6000-262	Fitting for 1/16" OD Tubing, Extra Long	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
	MANUFACTURER COMPATIBLE FITTINGS						
★	**U-320x**	Nuts for 1/16" OD Tubing, Valco/VICI Compatible	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
★	**U-321x**	Ferrule for 1/16" OD Tubing, Valco/VICI Compatible	10-32 Coned	20,000 psi (1,380 bar)	—	SST	10-pk
	U-350x	Nuts for 1/16" OD Tubing, SSI Compatible	10-32 Coned	20,000 psi (1,380 bar)	5/16" Hex	SST	10-pk
	U-351x	Ferrule for 1/16" OD Tubing, SSI Compatible	10-32 Coned	20,000 psi (1,380 bar)	—	SST	10-pk
★	**U-410x**	Nuts for 1/16" OD Tubing, Waters Compatible	10-32 Coned	20,000 psi (1,380 bar)	5/16" Hex	SST	10-pk
	U-420x	Nuts for 1/16" OD Tubing, Beckman Compatible	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk
	U-443x	Nuts for 1/16" OD Tubing, Beckman Compatible, Long	10-32 Coned	20,000 psi (1,380 bar)	1/4" Hex	SST	10-pk

One-Piece Fingertight Fittings

- The original One-Piece Fingertight Fitting
- All polymer construction
- Versions available for 1/16", 1/32" or 1/8" OD tubing

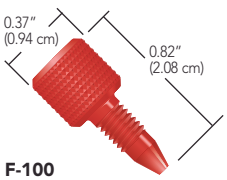
The Upchurch Scientific® One-Piece Fingertight Fittings provide convenience and ease of use because the ferrule will not stick in a receiving port and the fitting is more easily found if dropped. The fittings for 1/16" OD tubing and 10-32 coned ports are available in a variety of colors, materials and lengths to suit virtually every application.

Beyond the standard 10-32 fittings, also featured in this product family are specialty fittings for specific applications. Our M-645 Fitting is a direct replacement for the 6-40 threaded VICI® (Valco) fitting. The P-100 can be used in 1/4-28 coned ports for 1/8" OD tubing including some of the inlet filters starting on page 157.

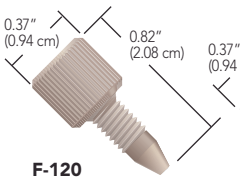
RheFlex® One-Piece Fittings are included in many of the Rheodyne® manual valves, starting on page 132. The One-Piece RheFlex M4 Fittings, for use with Rheodyne MX Nano-Scale Modules, are listed on page 12.

NOTE

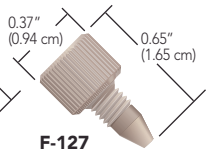
- For your convenience we ship most Upchurch Scientific Fingertight Fittings in 10-packs. However, you may order individual pieces (the letter "x" in the product part number simply designates "10-pk").
- Some of the Upchurch Scientific fittings on this page are available in additional colors. Please contact your distributor or us for more information.
- The F-120FUN PACK includes six F-120 Fittings in the following colors: natural, blue, black, green, red, and yellow.
- Fingertight is generally equal to 3–4 in-lbs (0.34–0.45 N·m).



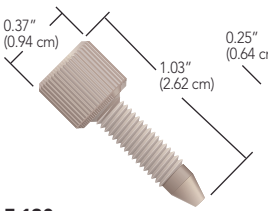
F-100
10-32 PCTFE Fitting



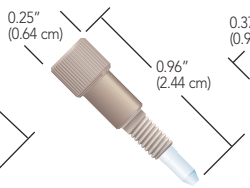
F-120
10-32 PEEK Fitting



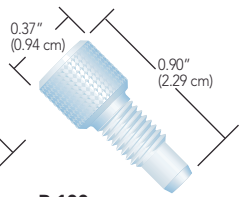
F-127
10-32 PEEK Fitting



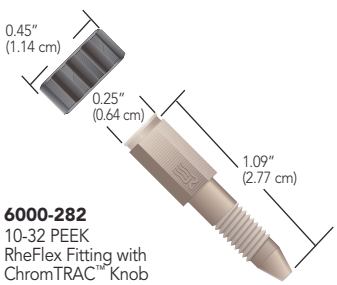
F-130
10-32 PEEK Fitting



M-645
6-40 PEEK/PCTFE Fitting
for 1/32" OD tubing



P-100
1/4-28 PCTFE Fitting
for 1/8" OD tubing



6000-282
10-32 PEEK
RheFlex Fitting with
ChromTRAC™ Knob

Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
ONE-PIECE FINGERTIGHT FITTINGS						
6000-282	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	5,000 psi (345 bar)	ChromTRAC knob	PEEK, Natural	10-pk
F-100x	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	4,000 psi (276 bar)	Diamond Knurl	PCTFE, Red	10-pk
F-100Nx	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	4,000 psi (276 bar)	Diamond Knurl	PCTFE, Natural	10-pk
★ **F-120x**	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	5,000 psi (345 bar)	Standard Knurl	PEEK, Natural	10-pk
F-120FUN PACK	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	5,000 psi (345 bar)	Standard Knurl	PEEK, Natural, Blue, Black, Green, Red, Yellow (one each color)	6-pk
F-127x	Fingertight Fitting for 1/16" OD Tubing, Short	10-32 Coned	5,000 psi (345 bar)	Standard Knurl	PEEK, Natural	10-pk
★ **F-130x**	Fingertight Fitting for 1/16" OD Tubing, Long	10-32 Coned	5,000 psi (345 bar)	Standard Knurl	PEEK, Natural	10-pk
M-645x	Fingertight Fitting for 1/32" OD Tubing	6-40 Coned	1,750–3,250 psi (121–224 bar)	Headless Knurl	PEEK, Natural/PCTFE, Natural	10-pk
P-100	Fingertight Fitting for 1/8" OD Tubing	1/4-28 Coned	1,000 psi (69 bar)	Diamond Knurl	PCTFE, Natural	ea.

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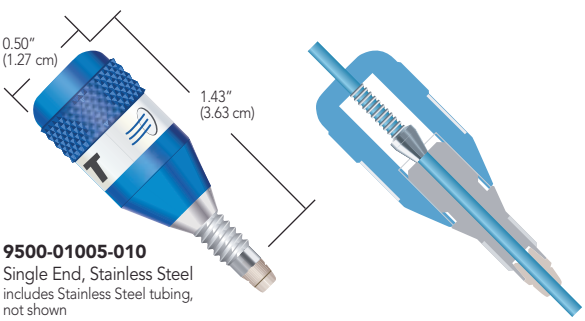
Sure-Fit™ Connector

- Self-adjusting to any port depth regardless of column manufacturer
- Fingertight to 6,000 psi (414 bar)
- Available in PEEK or stainless steel

Eliminating leaks and dead volume is critical to achieving good chromatographic results. The Sure-Fit connector gives you a perfect fit in nearly every 10-32 coned receiving port — every connection, every time. Typically leaks and dead volume are caused by an improperly plumbed system and can occur for many reasons, including switching columns. The problem occurs not only when switching from one manufacturer to another, it can also occur when changing columns from the same manufacturer. This is because internal port depths vary, even within the same manufacturing lot. Unless the connector is universal, eliminating leaks and dead volume cannot be guaranteed. The Sure-Fit connector has a unique internal spring-tensioned mechanism that automatically self-adjusts to virtually any port depth while maintaining constant pressure on the 1/16" OD tubing.

Sure-Fit connectors come with either PEEK tubing or stainless steel tubing, in varying lengths and internal diameters, pre-assembled for ease of use. Choose the 9502-01007-HP — a U-shaped Sure-Fit connector — for use in Agilent® 1100 systems, or select the 9504-01005-050 for micro-scale applications where biocompatibility is desired.



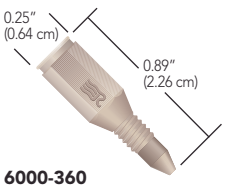
9500-01005-010
Single End, Stainless Steel
includes Stainless Steel tubing, not shown

RheFlex® M4 Fittings

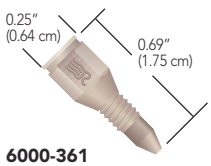
- Incorporates M4 coned threads for 1/32" OD tubing
- Pressure rated to 5,000 psi (345 bar)

The Rheodyne® RheFlex M4 Fitting is designed to connect 1/32" OD tubing in MX Series II™ valves (see Actuated Valves, starting on page 130). This PEEK fitting has a one piece design, which eliminates the need for a separate nut and ferrule. The M4 Fitting design provides dependable zero dead volume connections for micro and nano applications. Due to the unique RheFlex gripping design, the M4 Fitting will hold to 5,000 psi (345 bar) on PEEK or with a PEEK tubing sleeve on fused silica tubing. A PEEK M4 Plug is also available.

Use Rheodyne ChromTRAC™ knobs with the RheFlex M4 Fitting for fingertight convenience and to color-code connections.



6000-360
M4 Fitting
M4 threads
for 1/32" OD tubing



6000-361
M4 Plug
M4 threads

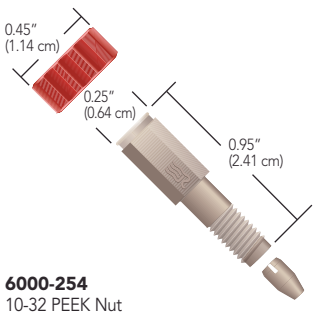
Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
SURE-FIT FITTINGS						
9500-01005-010	Single End Fitting, 1/16" x 0.005" x 10 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	SST	ea.
9500-01007-010	Single End Fitting, 1/16" x 0.007" x 10 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	SST	ea.
9500-01010-010	Single End Fitting, 1/16" x 0.010" x 10 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	SST	ea.
9500-01020-030	Single End Fitting, 1/16" x 0.020" x 30 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	SST	ea.
9502-01007-HP	Single End Fitting, 1/16" x 0.007", U-Shape for Agilent 1100 System	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	SST	ea.
9504-01005-050	Single End Fitting, 1/16" x 0.005" x 50 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	PEEK, Natural	ea.
9504-01007-050	Single End Fitting, 1/16" x 0.007" x 50 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	PEEK, Natural	ea.
9504-01010-050	Single End Fitting, 1/16" x 0.010" x 50 cm	10-32 Coned	6,000 psi (414 bar)	Diamond Knurl	PEEK, Natural	ea.
SURE-FIT FITTINGS REPLACEMENT PARTS						
9500-FP	Replacement Ferrule	10-32 Coned	6,000 psi (414 bar)	—	PEEK, Natural	ea.*
RHEFLEX ONE-PIECE FITTINGS						
6000-360	RheFlex Fitting for 1/32" OD Tubing	M4 Coned	5,000 (345 bar)	1/4" Hex	PEEK, Natural	10-pk
6000-361	RheFlex Plug	M4 Coned	5,000 (345 bar)	1/4" Hex	PEEK, Natural	10-pk

** Minimum order quantity of 100.*

Two-Piece RheFlex® Fingertight Fittings

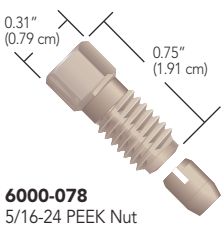
The Rheodyne® RheFlex Precision Two-Piece PEEK Fittings sets provide inert, biocompatible connections for instrumentation. These fittings have a reliable, time-tested design. Each 1/16" fittings set contains a 10-32 threaded nut and a specially-designed PEEK ferrule. Three lengths of the 1/16" nut are available: Standard, Short, and Extra Long. RheFlex Fingertight Fittings are rated for use up to 7,000 psi (483 bar). Also offered in this product line is the 6000-078 fitting, designed to connect 1/8" OD tubing into our manual preparative-scale injection valves. (See pages 128–134 for more information on these valves.)

View the online product bulletin at: www.idex-hs.com.



6000-254
10-32 PEEK Nut
with 6000-251 PEEK Ferrule
(RD ChromTRAC suffix)

6000-255
10-32 PEEK Nut
with 6000-251 PEEK Ferrule



6000-078
5/16-24 PEEK Nut
with 6000-079 PEEK Ferrule

Biocompatible

ChromTRAC™

- Brightly colored knobs to easily track inlets and outlets of valves, columns, and detectors

All ChromTRAC-compatible RheFlex fittings offer the ChromTRAC knob option. Specify the ChromTRAC two letter suffix for the color choice when ordering. Please see the ChromTRAC Suffix Codes table below. For example, to order red ChromTRAC knobs with the RheFlex One-Piece Fitting on this page, specify 6000-282RD. No suffix indicates black knobs.

View the online product bulletin for RheFlex fittings at: www.idex-hs.com.

CHROMTRAC SUFFIX CODES

CODE	COLOR
BL	Blue
GN	Green
GY	Gray
RD	Red
WH	White
YL	Yellow
MC	Multi-color (two each of blue, green, gray, red, and yellow)

Add these letter suffixes to the end of the seven-digit part numbers of the 10-32 and M4 threaded RheFlex Fittings on pages 11, 12, and 13.

RELATED PRODUCTS

- For PEEK tubing sleeves that can be used with these M4 RheFlex fittings, see page 20.
- For reusable fittings that both work in UHPLC applications and can help ensure the tubing is fully inserted into the receiving port, see the VHP-300 fitting shown earlier in this chapter on page 6.

Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
RHEFLEX TWO-PIECE FITTINGS (INCLUDES FERRULES)						
6000-078	RheFlex Fitting for 1/8" OD Tubing	5/16-24 Coned	5,000 psi (345 bar)	5/16" Hex	PEEK, Natural	ea.
6000-254	RheFlex Fitting for 1/16" OD Tubing	10-32 Coned	7,000 psi (483 bar)	ChromTRAC knob	PEEK, Natural	10-pk
6000-255	RheFlex Fitting for 1/16" OD Tubing, Short	10-32 Coned	7,000 psi (483 bar)	1/4" Hex	PEEK, Natural	10-pk
REPLACEMENT FERRULES						
6000-079	RheFlex Ferrule for 1/8" OD Tubing	5/16-24 Coned	7,000 psi (483 bar)	ChromTRAC knob	PEEK, Natural	5-pk
6000-251	RheFlex Ferrule for 1/16" OD Tubing	10-32 Coned	7,000 psi (483 bar)	ChromTRAC knob	PEEK, Natural	10-pk

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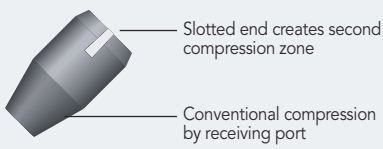
Two-Piece SealTight™ Fingertight Fittings

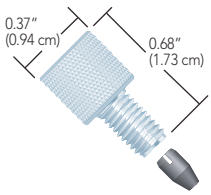
- Several nut lengths and head styles to fit into a variety of applications
- Designed to connect 1/16" OD tubing to 10-32 coned ports
- Hold up to 9,000 psi (620 bar)

The dual compression created by the specially designed nut and ferrule enables the Upchurch Scientific® SealTight Fittings system to outperform standard finger tightened fittings. The forward cone of the SealTight Ferrule provides gripping power and a leak-free seal via conventional compression by the receiving port. The slotted end creates the second compression zone in conjunction with a SealTight Nut. All SealTight Nuts are for use with 1/16" OD tubing and are designed to be used with the F-192 Ferrule. A wide variety of fitting head styles are available for various space constraints. This fittings system is also interchangeable with the Two-Piece RheFlex® Fittings System for 1/16" OD tubing, shown on the previous page.

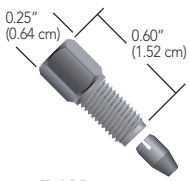


NOTE

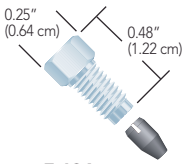
Overtightening these fittings on fluoropolymer (e.g., FEP, PFA, and ETFE) tubing can cause the ID of your tubing to collapse.



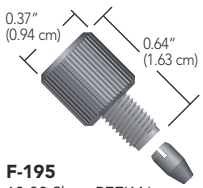
F-190
10-32 Standard Stainless Steel Nut, with F-192 Ferrule



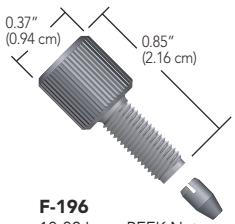
F-193
10-32 Short PEEK Hex Head Nut, with F-192 Ferrule



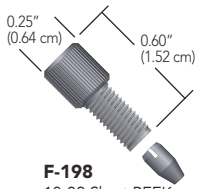
F-194
10-32 Short Stainless Steel Hex Head Nut, with F-192 Ferrule



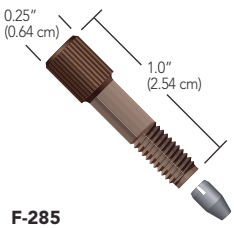
F-195
10-32 Short PEEK Nut, with F-192 Ferrule



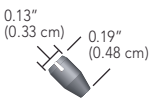
F-196
10-32 Long PEEK Nut, with F-192 Ferrule



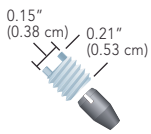
F-198
10-32 Short PEEK Headless Nut, with F-192 Ferrule



F-285
10-32 Long PPS Headless Nut, with F-192 Ferrule



F-192
SealTight Ferrule, for 1/16" OD tubing



F-350
10-32 Stainless Steel FlushNut, with F-192 Ferrule

RELATED PRODUCTS

- Find tightening tools for these fittings on page 33.
- Try the F-350 FlushNut™ for the ultimate streamline design. For more information on these innovative products, please see page 31.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	SEALTIGHT TWO-PIECE FITTINGS (INCLUDES F-192 FERRULES)						
	F-190x	SealTight Fitting for 1/16" OD Tubing	10-32 Coned	7,000–9,000 psi (483–620 bar)	Standard Knurl	SST	10-pk
★	**F-193x**	SealTight Fitting for 1/16" OD Tubing, Short	10-32 Coned	7,000–9,000 psi (483–620 bar)	1/4" Hex	PEEK Black	10-pk
	F-194x	SealTight Fitting for 1/16" OD Tubing, Short	10-32 Coned	7,000–9,000 psi (483–620 bar)	1/4" Hex	SST	10-pk
	F-195x	SealTight Fitting for 1/16" OD Tubing, Short	10-32 Coned	7,000–9,000 psi (483–620 bar)	Standard Knurl	PEEK Black	10-pk
★	**F-196x**	SealTight Fitting for 1/16" OD Tubing, Long	10-32 Coned	7,000–9,000 psi (483–620 bar)	Standard Knurl	PEEK Black	10-pk
	F-198x	SealTight Fitting for 1/16" OD Tubing, Short	10-32 Coned	3,000–9,000 psi (207–620 bar)	Headless Knurl	PEEK Black	10-pk
	F-284x	SealTight Fitting for 1/16" OD Tubing, Long	10-32 Coned	3,000–9,000 psi (207–620 bar)	Headless Knurl	PEEK Black	10-pk
	F-285x	SealTight Fitting for 1/16" OD Tubing, Long	10-32 Coned	3,000–9,000 psi (207–620 bar)	Headless Knurl	PPS Brown	10-pk
	F-287x	SealTight Fitting for 1/16" OD Tubing, Long	10-32 Coned	7,000–9,000 psi (483–620 bar)	Knurl-1/4" Hex	PEEK Black	10-pk
	F-350x	SealTight Fitting for 1/16" OD Tubing, FlushNut	10-32 Coned	7,000–9,000 psi (483–620 bar)	FlushNut	SST	10-pk
	REPLACEMENT FERRULES						
★	**F-192x**	SealTight Ferrule for 1/16" OD Tubing	10-32 or M6 Coned	7,000–9,000 (483–620 bar)	—	PEEK/Black	10-pk

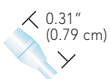
Two-Piece Fingertight Fittings

- Designed to connect tubing to 10-32 coned ports
- Ferrules available for directly connecting 1/16", 1/32", 360 µm, or 190 µm OD tubing

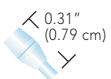
Two-Piece Fingertight Fittings feature a separate ferrule. With a two-piece design, you can replace just the ferrule instead of the entire unit, making these Fingertights more economical than the one-piece version. Use a standard knurled head fitting for traditional fingertight applications, or use a fitting with wings built into the head for extra tightening leverage. A stainless steel hex headed fitting can be used for applications where a wrench may be needed for added tightening torque.

To order the fittings as shown to the right, simply reference the part numbers as indicated. To exchange the ferrule typically packaged with our fittings with one of our specialty ferrules shown below, simply replace the letter "x" in the part number with a "-01", and then specify the ferrule needed on a separate line. For example, to order the F-140 fitting with the M-215 ferrule, specify F-140-01 and M-215 separately. *Please note: all "-01" fittings are packaged individually, not in 10-packs.*

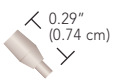
The M-215 Conductive Perfluoroelastomer Ferrule is designed for mass spectrometer electrospray applications. Unlike most graphite ferrules, the elastomeric properties of this ferrule let you use it through many tightening/retightening cycles. It also eliminates any possibility of graphite contamination in your system. Like graphite ferrules, you can apply voltage through a metallic port block or metallic nut, allowing voltage to translate to the flow path through the ferrule.



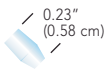
F-148
PCTFE Ferrule
for 190 µm OD tubing



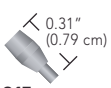
F-151
PCTFE Ferrule
for 360 µm OD tubing



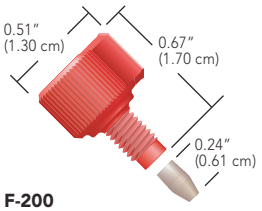
F-113
PEEK Ferrule
for 1/32" OD tubing



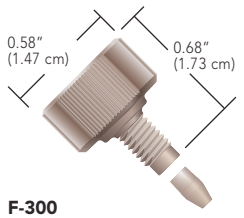
F-142N
ETFE Ferrule
for 1/16" OD tubing



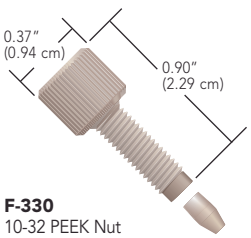
M-215
Conductive Perfluoroelastometer Ferrule
for 360 µm OD tubing



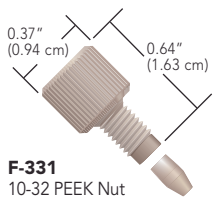
F-200
10-32 Delrin® Winged Nut
with F-142 PEEK Ferrule



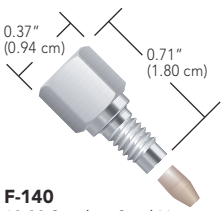
F-300
10-32 PEEK Double-Winged Nut
with F-142 PEEK Ferrule



F-330
10-32 PEEK Nut
with F-142 PEEK Ferrule



F-331
10-32 PEEK Nut
with F-142 PEEK Ferrule



F-140
10-32 Stainless Steel Nut
with F-142 PEEK Ferrule

APPLICATION NOTE

Some Upchurch Scientific® Fingertight Nuts feature wings in addition to a knurled head, which provide more leverage when tightening the fitting into a receiving port. Choose our single or double-winged design.

Please Note: customers can use the standard knurl head fittings with our tightening tools found on page 33.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	TWO-PIECE FINGERTIGHT FITTINGS (INCLUDES F-142 FERRULES)						
	F-140x	Fitting for 1/16" OD Tubing	10-32 Coned	6,000 psi (414 bar)	5/16" Hex	SST/PEEK Natural	10-pk
	F-200x	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	6,000 psi (414 bar)	Single Wing	Delrin Red/PEEK Natural	10-pk
★	**F-300x**	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	6,000 psi (414 bar)	Double Wing	PEEK Natural	10-pk
★	**F-330x**	Fingertight Fitting for 1/16" OD Tubing, Long	10-32 Coned	6,000 psi (414 bar)	Standard Knurl	PEEK Natural	10-pk
	F-331x	Fingertight Fitting for 1/16" OD Tubing	10-32 Coned	6,000 psi (414 bar)	Standard Knurl	PEEK Natural	10-pk
	REPLACEMENT FERRULES						
★	**F-113**	Ferrule for 1/32" OD Tubing	10-32 Coned	6,000 psi (414 bar)	—	PEEK Natural	ea.
	F-142x	Ferrule for 1/16" OD Tubing	10-32 Coned	6,000 psi (414 bar)	—	PEEK Natural	10-pk
	F-142Nx	Ferrule for 1/16" OD Tubing	10-32 Coned	4,000 psi (276 bar)	—	ETFE Natural	10-pk
	F-148	Ferrule for 190 µm OD tubing	10-32 Coned	6,000 psi (414 bar)	—	PCTFE Natural	ea.
	F-151	Ferrule for 360 µm OD Tubing	10-32 Coned	6,000 psi (414 bar)	—	PCTFE Natural	ea.
★	**M-215**	Conductive Ferrule for 360 µm OD tubing	10-32 Coned	1,500 psi (103 bar)	—	Conductive Perfluoroelastomer	ea.

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LiteTouch® Fittings

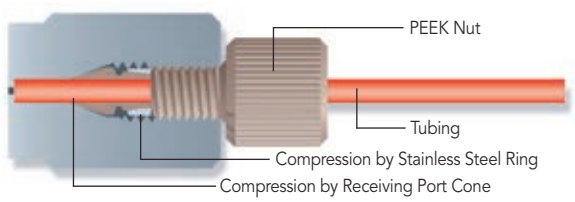
- Helps prevent twisting of polymer tubing
- High pressure with fingertight convenience
- Options available for 1/32", 1/16", or 1/8" OD tubing

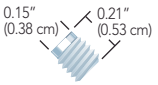
The LiteTouch Fittings System grips tubing at two compression points (see diagram), holding to high pressures with Fingertight convenience. It also prevents polymer tubing from twisting, a potential problem when using standard Fingertight fittings. LiteTouch Fittings are available for use with 1/32", 1/16", or 1/8" OD tubing sizes, and for 10-32 or 1/4-28 coned ports.

For those space-limited applications where nut heads interfere with each other, try the FlushNut™ Fittings. (FlushNut Fittings require a tightening tool. Please see page 31 for more information about these products.)

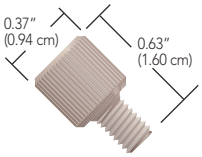
To avoid collapsing the ID of your tubing, the LiteTouch system can be used on hard tubing only, such as stainless steel and PEEK polymer tubing. The LiteTouch Ferrule System is not recommended for repeated use in plastic ports.

LiteTouch Fittings Systems

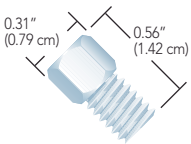




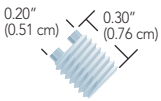
F-354
10-32 Stainless Steel FlushNut
for 1/32" and 1/16" OD tubing



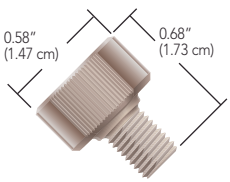
LT-110
10-32 PEEK Nut
for 1/32" and 1/16" OD tubing



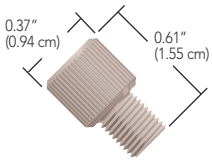
C-235
1/4-28 Stainless Steel Nut
for 1/8" OD tubing



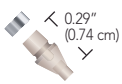
F-364
1/4-28 Stainless Steel FlushNut
for 1/8" OD tubing



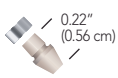
LT-210
1/4-28 PEEK Double-Winged Nut
for 1/8" OD tubing



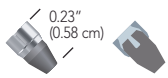
LT-215
1/4-28 PEEK Nut
for 1/8" OD tubing



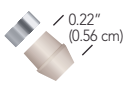
LT-132
PEEK Ferrule with Stainless Steel Lock Ring
for 1/32" OD tubing



LT-100
PEEK Ferrule with Stainless Steel Lock Ring
for 1/16" OD tubing



LT-135
One-Piece LiteTouch SealTight™ Ferrule with Stainless Steel Lock Ring
for 1/16" OD tubing



LT-200
PEEK Ferrule with Stainless Steel Lock Ring
for 1/8" OD tubing

RELATED PRODUCTS

- The stainless steel nuts on page 10 can also be used with the LiteTouch ferrules on this page.

Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
LITETOUCH NUTS						
C-235x	LiteTouch Nut for 1/8" OD Tubing	1/4-28 Coned	4,500 psi (310 bar)	5/16" Hex	SST	10-pk
F-354x	LiteTouch Nut for 1/16" or 1/32" OD Tubing, FlushNut	10-32 Coned	5,000 psi (345 bar)	FlushNut	SST	10-pk
F-364x	LiteTouch Nut for 1/8" OD Tubing, FlushNut	1/4-28 Coned	4,500 psi (310 bar)	FlushNut	SST	10-pk
LT-110x	LiteTouch Nut for 1/16" or 1/32" OD Tubing	10-32 Coned	5,000 psi (345 bar)	Standard Knurl	PEEK Natural	10-pk
LT-210x	LiteTouch Nut for 1/8" OD Tubing	1/4-28 Coned	4,500 psi (310 bar)	Double Wing	PEEK Natural	10-pk
LT-215x	LiteTouch Nut for 1/8" OD Tubing, Short	1/4-28 Coned	4,500 psi (310 bar)	Standard Knurl	PEEK Natural	10-pk
LITETOUCH FERRULES						
★ **LT-100x**	LiteTouch Ferrule for 1/16" OD Tubing	10-32 Coned	5,000 psi (345 bar)	—	PEEK Natural/SST	10-pk
★ **LT-132x**	LiteTouch Ferrule for 1/32" OD Tubing	10-32 Coned	5,000 psi (345 bar)	—	PEEK Natural/SST	10-pk
★ **LT-135x**	LiteTouch Ferrule for 1/16" OD Tubing	10-32 Coned	10,000 psi (690 bar)*	—	PEEK Black/SST	10-pk
LT-200x	LiteTouch Ferrule for 1/8" OD Tubing	1/4-28 Coned	4,500 psi (310 bar)	—	PEEK Natural/SST	10-pk

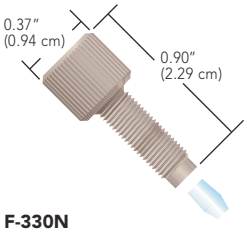
** When used with a stainless steel 10-32 nut from page 10.*

NanoTight™ Fittings & Sleeves

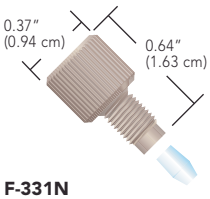
- For connecting 1/16" OD or capillary tubing using tubing sleeves to standard 10-32 coned ports
- Multiple nut styles available
- Nuts manufactured from PEEK polymer, ferrules manufactured from ETFE

Upchurch Scientific® NanoTight Fittings and Sleeves are designed to connect 70 µm–1 mm OD capillary tubing to any standard 10-32 coned port normally intended for 1/16" OD tubing using the NanoTight Tubing Sleeves on page 19. The fittings can also be used to connect any 1/16" OD tubing. The ETFE ferrule material is softer than PEEK, making it a good candidate for connecting thin walled semi-rigid tubing such as FEP and ETFE into 10-32 ports with minimal constricting to the inner diameter.

Select from our expansive line of PEEK NanoTight Fittings, featuring several head style and length options. Each 10-pack of nuts includes ten ETFE F-142N ferrules.



F-330N
Long Standard Head Nut
with F-142N Ferrule



F-331N
Short Standard Head Nut
with F-142N Ferrule

F-333N
Short Headless Nut
with F-142N Ferrule

RELATED PRODUCTS

- Find tightening tools for these head styles on page 33.
- NanoTight Tubing sleeves start on page 19.

	Part No.	Description	Port	Pressure Rating	Head Style	Material (Nut/Ferrule)	Qty.
	NANOTIGHT FITTINGS (INCLUDES F-142N FERRULES)						
★	**F-330Nx**	NanoTight Fitting for 1/16" OD Tubing and NanoTight Sleeves	10-32 Coned	4,000 psi (276 bar)	Standard Knurl	PEEK Natural/ETFE Natural	10-pk
	F-331Nx	NanoTight Fitting for 1/16" OD Tubing and NanoTight Sleeves, Short	10-32 Coned	4,000 psi (276 bar)	Standard Knurl	PEEK Natural/ETFE Natural	10-pk
★	**F-333Nx**	NanoTight Fitting for 1/16" OD Tubing and NanoTight Sleeves, Short	10-32 Coned	4,000 psi (276 bar)	Headless Knurl	PEEK Natural/ETFE Natural	10-pk
	REPLACEMENT FERRULES						
	F-142Nx	NanoTight Ferrule for 1/16" OD Tubing and NanoTight Sleeves	10-32 Coned	4,000 psi (276 bar)	—	ETFE Natural	10-pk

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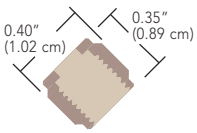
MicroTight® Fittings

- Comprehensive Fitting System for Connecting Capillary Tubing
- Made from PEEK Polymer

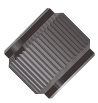
Upchurch Scientific® MicroTight One-Piece Fittings are designed for use with the NanoPort™ and MicroTight Unions, Adapters and Inline MicroFilters. Specifically made for 360 µm OD tubing, 1/32" OD tubing, or our MicroTight Tubing Sleeves (see page19), these fittings make superior fingertight connections with capillary tubing. MicroTight Fittings withstand temperatures up to 125 °C.

The MicroTight family also includes a female nut matched with one of five dedicated ferrules for connecting specific tubing ODs.

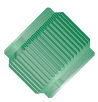
Use the P-277 Extender Tool to tighten standard micro knurl 6-32 fittings in hard-to-reach places. Tighten micro headless 6-32 fittings with our N-290 Tool. See page 33 for more information.



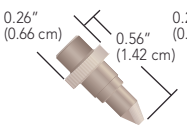
P-416
Female Nut
5/16-24
internal threads



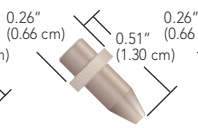
P-416BLK
Female Nut
5/16-24
internal threads



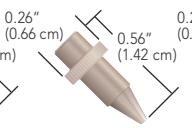
P-416G
Female Nut
5/16-24
internal threads



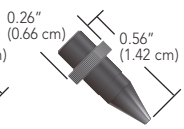
F-112
MicroFerrule
for 1/32" OD tubing



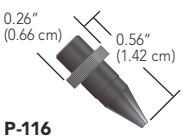
F-132
MicroFerrule
for 1/16" OD tubing



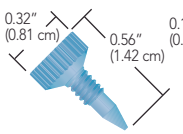
F-152
MicroFerrule
for 360 µm OD tubing



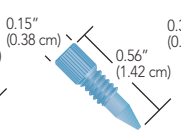
F-172
MicroFerrule
for 0.025" OD tubing



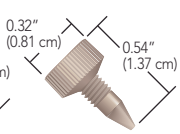
P-116
MicroFerrule Plug



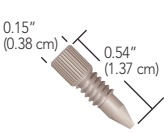
F-124S
Standard Head Fitting
for use with
360 µm OD tubing



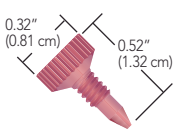
F-124H
Headless Fitting
for use with
360 µm OD tubing



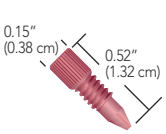
F-125
Standard Head Fitting
for use with
MicroTight Sleeves



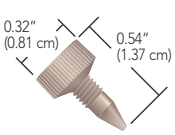
F-125H
Headless Fitting
for use with
MicroTight Sleeves



F-126S
Standard Head Fitting
for use with
1/32" OD tubing



F-126H
Headless Fitting
for use with
1/32" OD tubing



P-555
Standard Head Plug

RELATED PRODUCTS

- Connectors for Capillary Tubing can be found on pages 37–45.
- Very High Pressure fittings for capillary tubing can be found on page 9.
- Capillary tubing is featured on pages 67.

NOTE

MicroTight fittings and MicroFerrules

While the MicroTight Female Nuts may be used with any of the separate MicroFerrules, the MicroFerrules themselves are port-specific and are thus not interchangeable. Additionally, the one-piece MicroTight fittings are also port-specific and should not be exchanged.

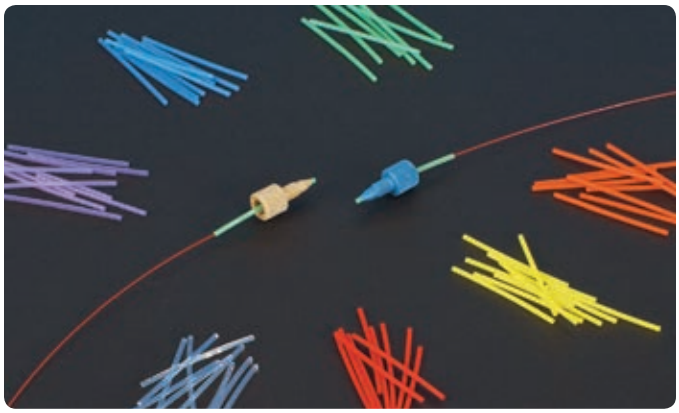
	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	MICROTIGHT FITTINGS						
	F-124Hx	MicroTight Fitting for 360 µm OD Tubing	6-32 Coned	5,000 psi (345 bar)	Micro Headless Knurl	PEEK Blue	10-pk
	F-124Sx	MicroTight Fitting for 360 µm OD Tubing	6-32 Coned	5,000 psi (345 bar)	Standard Micro Knurl	PEEK Blue	10-pk
	F-125Hx	MicroTight Fitting for MicroTight Tubing Sleeves	6-32 Coned	4,000 psi (276 bar)	Micro Headless Knurl	PEEK Natural	10-pk
	F-125x	MicroTight Fitting for MicroTight Tubing Sleeves	6-32 Coned	4,000 psi (276 bar)	Standard Micro Knurl	PEEK Natural	10-pk
★	**F-126Hx**	MicroTight Fitting for 1/32" OD Tubing	6-32 Coned	5,000 psi (345 bar)	Micro Headless Knurl	PEEK Red	10-pk
	F-126Sx	MicroTight Fitting for 1/32" OD Tubing	6-32 Coned	5,000 psi (345 bar)	Standard Micro Knurl	PEEK Red	10-pk
	P-555	MicroTight Plug	6-32 Coned	5,000 psi (345 bar)	Standard Micro Knurl	PEEK Natural	ea.
	MICROFERRULES AND FEMALE NUTS						
	F-112	MicroFerrule for 1/32" OD Tubing	5/16-24 Coned	5,000 psi (345 bar)	—	PEEK Natural	ea.
	F-132	MicroFerrule for 1/16" OD Tubing	5/16-24 Coned	5,000 psi (345 bar)	—	PEEK Natural	ea.
★	**F-152**	MicroFerrule for 360 µm OD Tubing	5/16-24 Coned	5,000 psi (345 bar)	—	PEEK Natural	ea.
	F-152BLK	MicroFerrule for 360 µm OD Tubing	5/16-24 Coned	5,000 psi (345 bar)	—	PEEK Black	ea.
★	**F-172**	MicroFerrule for MicroTight Tubing Sleeves	5/16-24 Coned	4,000 psi (276 bar)	—	PEEK Black	ea.
	P-116	MicroFerrule Plug	5/16-24 Coned	5,000 psi (345 bar)	—	PEEK Black	ea.
★	**P-416**	MicroTight Female Nut	5/16-24 Coned	4,000–5,000 psi (276–345 bar)	Female Knurl	PEEK Natural	ea.
	P-416BLK	MicroTight Female Nut	5/16-24 Coned	4,000–5,000 psi (276–345 bar)	Female Knurl	PEEK Black	ea.
	P-416G	MicroTight Female Nut	5/16-24 Coned	4,000–5,000 psi (276–345 bar)	Female Knurl	PEEK Green	ea.

MicroTight® Tubing Sleeves

- Manufactured from PEEK polymer
- Pressure rated to 4,000 psi (276 bar)
- Color-coded for easy inner diameter identification

Upchurch Scientific® MicroTight Tubing Sleeves feature an outer diameter of 0.025" and offer a wide assortment of inner diameters to help facilitate capillary tubing connections with our MicroTight accessories. Because the sleeves are manufactured from PEEK polymer, they carry an upper temperature threshold of 125 °C.

To use these sleeves properly, choose a sleeve with an inner diameter 0.001"–0.002" (25–50 µm) larger than the outer diameter of your capillary tubing. Then, slip the sleeve over your flow path tubing, such that your tubing extends all the way through the sleeve, but not beyond the end of the sleeve. Choose the correct fitting that corresponds with your receiving port, slide it over the sleeved flow path tubing and connect as normal.



NanoTight™ Tubing Sleeves

- Manufactured from FEP fluoropolymer
- Pressure rated to 4,000 psi (276 bar)
- Outer diameter of 1/16" — the most popular size used on most instrumentation

Upchurch Scientific NanoTight Tubing Sleeves are manufactured using FEP fluoropolymer and precisely cut to a 1.6" length. A wide assortment of sleeves is available, ensuring the availability of a NanoTight sleeve for most applications. Many of the sleeves feature a light color tint that can help more easily identify the inner diameter for future orders. Because FEP is the base polymer for these sleeves, there is a maximum recommended continuous operating temperature of 50 °C.

Upchurch Scientific NanoTight sleeves were designed primarily for use with the NanoTight fittings, found on page 17 and also work well with the Super Flangeless™ fittings for 1/16" OD tubing on pages 21. For tubing sleeves that can be used effectively with stainless steel fittings and at higher temperatures, consider using the Upchurch Scientific PEEK Tubing Sleeves, found on the next page.

	Part No.	ID	For Tubing OD Size	Color	Qty.
	MICROTIGHT PEEK TUBING SLEEVES AND KITS, 0.025" OD				
	F-180x	125 µm (0.005")	70–110 µm	Red	10-pk
	F-181x	180 µm (0.007")	125–165 µm	Yellow	10-pk
	F-182x	230 µm (0.009")	175–215 µm	Natural	10-pk
	F-183x	280 µm (0.011")	225–265 µm	Blue	10-pk
	F-184x	330 µm (0.013")	275–315 µm	Orange	10-pk
★	**F-185x**	395 µm (0.0155")	340–380 µm	Green	10-pk
	F-186x	455 µm (0.018")	400–440 µm	Black	10-pk
	F-187x	535 µm (0.021")	480–520 µm	Natural	10-pk
	F-188x	152 µm (0.006")	95–135 µm	Purple	10-pk
	1328	MicroTight Tubing Sleeve Kit contains (6) each of the sleeve sizes listed above			
	1356	MicroTight Connector Kit Kit contains: a 10-pack of each MicroTight Tubing Sleeve (F-180–F-187); (2) P-770 MicroTight Adapters; and (2) MicroTight P-720 Unions			
	NANOTIGHT FEP TUBING SLEEVES, 1/16" OD				
	F-237x	125 µm (0.005")	70–110 µm	Red	10-pk
	F-238x	180 µm (0.007")	125–165 µm	Yellow	10-pk
	F-239x	215 µm (0.0085")	160–200 µm	Natural	10-pk
	F-240x	280 µm (0.011")	225–265 µm	Blue	10-pk
	F-241x	330 µm (0.013")	275–315 µm	Orange	10-pk
★	**F-242x**	395 µm (0.0155")	340–380 µm	Green	10-pk
	F-243x	455 µm (0.018")	400–440 µm	Black	10-pk
	F-244x	535 µm (0.021")	480–520 µm	Natural	10-pk
	F-245x	610 µm (0.024")	555–595 µm	Red	10-pk
	F-246x	685 µm (0.027")	630–670 µm	Yellow	10-pk
	F-247x	840 µm (0.033")	785–825 µm	Green	10-pk
	F-252x	1.07 mm (0.042")	1 mm	Purple	10-pk

APPLICATION NOTE

Why use Sleeves?

Because most capillary tubing connections are made into coned receiving ports, where the port is not designed to be used with capillary tubing directly, special care must be used to ensure a good connection. While custom ferrules can help make these connections, they only offer a fixed-length nose — and because most tubing pockets will vary slightly in length, this can lead to leaking or dead volume.

To help save overall expense while maintaining a concentric connection with minimal dead volume, IDEX Health & Science recommends the use of sleeves. Because sleeves are not permanently attached to a ferrule, they can easily adapt to varying tubing pocket depths. Additionally, because they are manufactured using Upchurch Scientific extruded polymer tubing, you are assured of the concentricity of the resultant connection.

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1/16" OD PEEK Tubing Sleeves

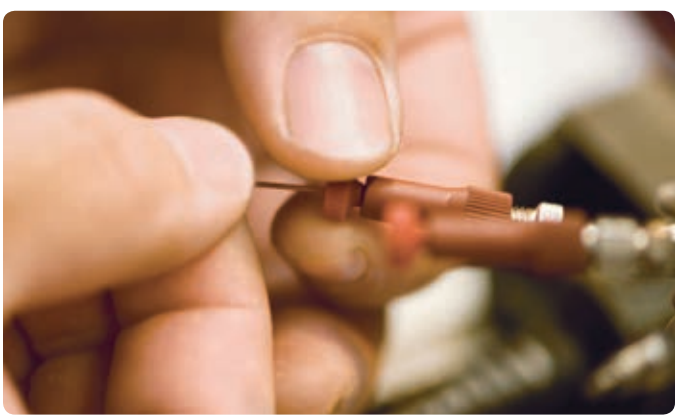
- For connecting capillary tubing to standard 10-32 ports
- Require the use of wrench tightened stainless steel nuts
- Pressure rated to 6,000 psi (414 bar)

Like the NanoTight™ FEP Sleeves on the previous page, these PEEK Tubing Sleeves are designed to be used with 1/16" OD, 10-32 threaded fittings to adapt capillary tubing to standard coned ports. Made of PEEK polymer, these 1.3" long sleeves can be used up to 125 °C.

These sleeves require a wrench tightened nut to achieve proper sealing. We recommend the F-140 Two-Piece Fingertight Fitting (page 15), which includes a PEEK ferrule or the hex-head SealTight™ fittings on page 14. Many researchers also use a stainless steel nut and ferrule with these sleeves, such as our U-400 and U-401 (page 10).

1/32" OD PEEK Tubing Sleeves

These 1.6" long Upchurch Scientific® 1/32" OD PEEK Tubing Sleeves can be used with any fitting designed for 1/32" OD tubing when smaller tubing must be connected. Select the appropriate sleeve from the product listing for your capillary tubing OD size. The 1/32" OD PEEK Tubing Sleeves have a maximum recommended temperature of 125 °C and have a pressure rating of 5,000 psi (345 bar).



1/32" OD FEP Tubing Sleeves

These 1.6" long sleeves facilitate connecting capillary tubing into ports designed for 1/32" OD tubing. Please refer to the product listing below to select the appropriate sleeve for your capillary OD size. These sleeves can be used at up to 50 °C and have a pressure rating of 1,750 psi (121 bar).

Clockwise, starting at top:

- 1/16" OD PEEK Tubing Sleeves, shown with F-140 Fitting
- 1/32" OD PEEK Tubing Sleeves, shown with F-126H Fitting
- 1/32" OD FEP Tubing Sleeves, shown with F-126S Fitting
- Fittings and tubing only shown to highlight how sleeves are designed to be used; they are not included with the sleeves

RELATED PRODUCTS

Use 1/32" OD PEEK or FEP Sleeves to connect capillary tubing with the following:

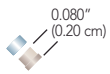
- The F-113 Ferrule and Two-Piece Fingertight Fittings for 10-32 ports (page 15).
- The F-112 and P-416BLK MicroTight® Fittings (page 18) — 1/32" OD PEEK Tubing Sleeves only.
- The 1/32" OD MicroTight Fittings on page 18.
- The Rheodyne® RheFlex M4 Fitting (page 12) for MX Module applications; the M-645 Valco®-Compatible Fitting (page 11) for Valco Nanovolume® valve applications.

	Part No.	ID	For Tubing OD Size	Color	Qty.
	PEEK TUBING SLEEVES FOR 1/16" OD FITTINGS				
	F-225	125 µm (0.005")	70–110 µm	Red	ea.
	F-226	180 µm (0.007")	125–165 µm	Yellow	ea.
	F-227	230 µm (0.009")	175–215 µm	Yellow	ea.
	F-228	250 µm (0.011")	225–265 µm	Blue	ea.
	F-229	330 µm (0.013")	275–315 µm	Natural	ea.
★	**F-230**	405 µm (0.016")	350–390 µm	Orange	ea.
	F-231	560 µm (0.022")	505–545 µm	Natural	ea.
	F-232	785 µm (0.031")	730–770 µm	Natural	ea.
	F-233	865 µm (0.034")	785–825 µm	Blue	ea.
	F-234	685 µm (0.027")	630–670 µm	Yellow	ea.
	PEEK TUBING SLEEVES FOR 1/32" OD FITTINGS				
	F-381x	180 µm (0.007")	125–165 µm	Yellow	10-pk
	F-382x	205 µm (0.008")	150–190 µm	Natural	10-pk
	F-384x	255 µm (0.010")	200–240 µm	Blue	10-pk
★	**F-385x**	380 µm (0.015")	325–365 µm	Natural	10-pk
	F-386x	510 µm (0.020")	455–495 µm	Orange	10-pk
	F-387x	250 µm (0.011")	225–265 µm	Red	10-pk
	F-388x	330 µm (0.013")	275–315 µm	Black	10-pk
	FEP TUBING SLEEVES FOR 1/32" OD FITTINGS				
	F-374x	280 µm (0.011")	225–265 µm	Blue	10-pk
	F-375x	330 µm (0.013")	275–315 µm	Orange	10-pk
★	**F-376x**	395 µm (0.0155")	340–380 µm	Green	10-pk

Super Flangeless™ Fittings

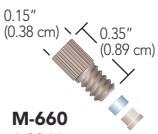
- Highest pressure holding flat-bottom fitting system we offer
- Eliminates loosening of fittings due to tubing twist
- Excellent for Tubing Assemblies
- Holds tight even through vibration

6-40 and 6-32 Options (for 1/16" OD Tubing)



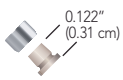
M-650
Super Flangeless Ferrule
for 1/16" OD tubing

M-644-03
6-40 Nut
shown with M-650 Ferrule
(not included)

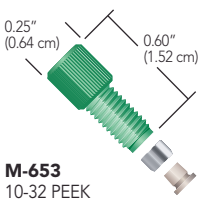


M-660
6-32 Nut
shown with M-650 Ferrule
(not included)

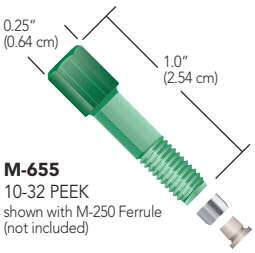
10-32 Options (for 1/16" OD Tubing)



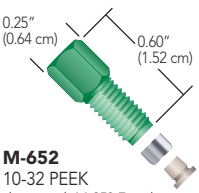
M-250
Super Flangeless Ferrule
for 1/16" OD tubing



M-653
10-32 PEEK
shown with M-250 Ferrule
(not included)

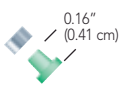


M-655
10-32 PEEK
shown with M-250 Ferrule
(not included)

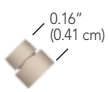


M-652
10-32 PEEK
shown with M-250 Ferrule
(not included)

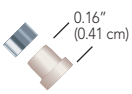
Ferrules for M6x1, 1/4-28, 5/16-24



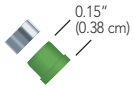
P-248 for 1/32" OD tubing
P-250 for 1/16" OD tubing
P-259 for 1/16" OD tubing



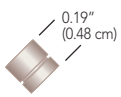
P-260
for 1/16" OD tubing



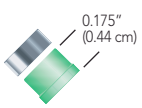
P-350, P-359
for 1/8" OD tubing



P-355 for 1.8 mm OD tubing
P-366 for 2.5 mm OD tubing
P-352 for 1/8" OD tubing

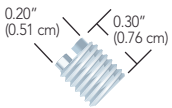


P-360
for 1/8" OD tubing

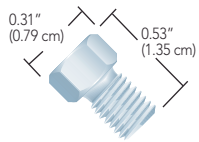


P-140
for 3/16" OD tubing

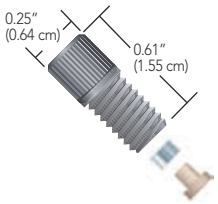
M6x1, 1/4-28, 5/16-24 Options for 1/32"–3/16" OD Tubing



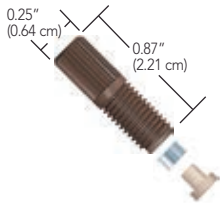
F-356 (1/4-28, ≤ 1/16" OD Tubing)
F-364 (1/4-28, > 1/16" OD Tubing)



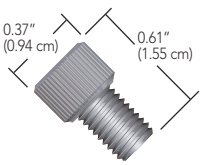
LT-105 (1/4-28, ≤ 1/16" OD Tubing)
C-235 (1/4-28, > 1/16" OD Tubing)



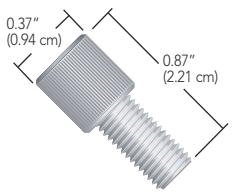
P-213 (M6X1, ≤ 1/16" OD Tubing)
P-337 (M6X1, > 1/16" OD Tubing)
P-232 (1/4-28, ≤ 1/16" OD Tubing)
P-336 (1/4-28, > 1/16" OD Tubing)



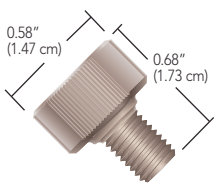
P-287 (1/4-28, ≤ 1/16" OD Tubing)
P-387 (1/4-28, > 1/16" OD Tubing)



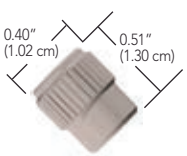
P-219 (M6X1, ≤ 1/16" OD Tubing)
P-319 (M6X1, > 1/16" OD Tubing)
LT-115 (1/4-28, ≤ 1/16" OD Tubing)
LT-215 (1/4-28, > 1/16" OD Tubing)



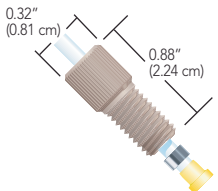
P-217 (M6X1, ≤ 1/16" OD Tubing)
P-317 (M6X1, > 1/16" OD Tubing)
P-246, P-252, P-255, P-281
(1/4-28, ≤ 1/16" OD Tubing)
P-331, P-332, P-381
(1/4-28, > 1/16" OD Tubing)



LT-210 (1/4-28, > 1/16" OD Tubing)



P-420 (1/4-28, ≤ 1/16" OD Tubing)
F-156 (1/4-28, > 1/16" OD Tubing)



P-141 (5/16-24, ≤ 1/16" OD Tubing)
P-131 (5/16-24, >1/16"– ≤ 1/8" OD Tubing)
P-137 (5/16-24, 3/16" OD Tubing)

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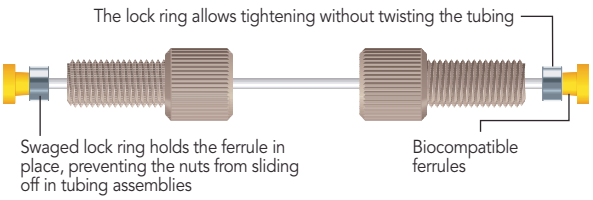
Super Flangeless™ Tubing OD / Thread Comparison

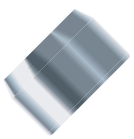
	1/32"	1/16"	1.8 mm	2.5 mm	1/8"	3/16"
6-40		•				
6-32		•				
10-32		•				
M6x1	•	•	•	•	•	
1/4-28	•	•	•	•	•	
5/16-24						•

SUPER FLANGELESS FITTINGS SYSTEM



TIP ASSEMBLY HINT

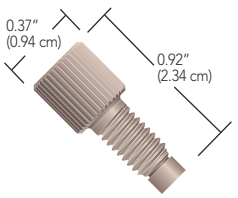
Make sure the locking ring is oriented correctly! The flattened end of the ring should face towards the nut with the narrow end of the ferrule towards the ring.



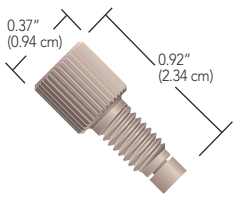
LT-100-02
Enlarged to show detail

New One-Piece Super Flangeless Fittings

- All-PEEK construction
- For 1/16" OD and 1/8" OD tubing
- M6x1 and 1/4-28 options
- Finger tight (2–3 in-lbs / 0.23–0.34 N·m)
- Extremely easy to use
- Reusable one piece design that requires no swaging



P-329 M6X1, for 1/8" OD Tubing
P-249 1/4-28, for 1/16" OD Tubing
P-349 1/4-28, for 1/8" OD Tubing



P-229 M6X1, for 1/16" OD Tubing

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	SUPER FLANGELESS™ FERRULES FOR 1/32", 1/16", 1/8", 3/16", 1.8MM, 2.0MM, 2.5MM						
	M-250x	Super Flangeless Ferrule for 1/16" OD Tubing	10-32 Flat-Bottom	1,000–5,000 psi (69–345 bar)	—	PEEK Natural/SST	10-pk
★	**M-650x**	Super Flangeless Ferrule for 1/16" OD Tubing	6-32 or 6-40 Flat Bottom	750–3,750 psi (52–259 bar)	—	PEEK Natural/SST	10-pk
	P-248x	Super Flangeless Ferrule for 1/32" OD Tubing	10-32 Flat-Bottom	2,500 psi (172 bar)	—	ETFE Green/SST	10-pk
★	**P-250x**	Super Flangeless Ferrule for 1/16" OD Tubing	1/4-28 or M6 Flat Bottom	2,500 psi (172 bar)	—	PEEK Natural/SST	10-pk
★	**P-259x**	Super Flangeless Ferrule for 1/16" OD Tubing	1/4-28 or M6 Flat Bottom	1,350 psi (93 bar)	—	ETFE Yellow/SST	10-pk
	P-260x	Super Flangeless Ferrule for 1/16" OD Tubing	1/4-28 or M6 Flat Bottom	1,850 psi (128 bar)	—	PEEK Natural/SST	10-pk
★	**P-350x**	Super Flangeless Ferrule for 1/8" OD Tubing	1/4-28 Flat Bottom	2,500 psi (172 bar)	—	PEEK Natural/SST	10-pk
	P-352x	Super Flangeless Ferrule for 1/16" OD Tubing	1/4-28 or M6 Flat Bottom	2,500 psi (172 bar)	—	PEEK Black/SST	10-pk
	P-355x	Super Flangeless Ferrule for 1.8 mm OD Tubing	1/4-28 or M6 Flat Bottom	2,500 psi (172 bar)	—	PCTFE Green/SST	10-pk
	P-357-2x	Super Flangeless Ferrule for 2.0 mm OD Tubing	M6 Flat Bottom	5,000 psi (345 bar)	—	PEEK Natural/SST	10-pk
★	**P-359x**	Super Flangeless Ferrule for 1/8" OD Tubing	1/4-28 Flat Bottom	1,000 psi (69 bar)	—	ETFE Yellow/SST	10-pk
	P-360x	Super Flangeless Ferrule for 1/8" OD Tubing	1/4-28 Flat Bottom	1,500 psi (102 bar)	—	PEEK Natural/SST	10-pk
NEW!	**P-366x**	Super Flangeless Ferrule for 2.5" OD Tubing	1/4-28 Flat Bottom	1,000 psi (69 bar)	—	PEEK Natural/SST	10-pk
	P-140x	Super Flangeless Ferrule for 3/16" OD Tubing	5/16-24 Flat Bottom	500 psi (34 bar)	—	ETFE Green/SST	10-pk
	6-40 AND 6-32 FITTINGS FOR 1/16" OD TUBING						
	M-660x	Super Flangeless Nut for 1/16" OD Tubing	6-32 Flat Bottom	750–3,750 psi (52–259 bar)	Micro Headless	PEEK Natural	10-pk
★	**M-644-03x**	Super Flangeless Nut for 1/16" OD Tubing	6-40 Flat Bottom	750–3,750 psi (52–259 bar)	Micro Headless	PEEK Green	10-pk
	10-32 FITTINGS FOR 1/16" OD TUBING						
	M-652x	Super Flangeless Nut for 1/16" OD Tubing	10-32 Flat Bottom	1,000–5,000 psi (69–345 bar)	1/4" Hex	PEEK Green	10-pk
	M-653x	Super Flangeless Nut for 1/16" OD Tubing	10-32 Flat Bottom	1,000–5,000 psi (69–345 bar)	Headless Knurl	PEEK Green	10-pk
	M-655x	Super Flangeless Nut for 1/16" OD Tubing, Long	10-32 Flat Bottom	1,000–5,000 psi (69–345 bar)	1/4" Hex	PEEK Green	10-pk
	M6X1 FITTINGS FOR 1/16" AND 1/32" OD TUBING						
	P-213	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Short	M6 Flat Bottom	*	Headless Knurl	PEEK Black	ea.
	P-217	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	M6 Flat Bottom	*	Standard Knurl	PPS Black	ea.
	P-219	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Short	M6 Flat Bottom	*	Standard Knurl	PEEK Black	ea.
	M6X1 FITTINGS FOR 1.8 MM, 20. MM, 2.5 MM, 1/8" OD TUBING						
	P-317	Super Flangeless For >1/16"–≤ 1/8" OD Tubing	M6 Flat Bottom	*	Standard Knurl	PPS Black	ea
	P-319	Super Flangeless Nut for 1/8" OD Tubing, Short	M6 Flat Bottom	*	Standard Knurl	PEEK Black	ea.
	P-337x	Super Flangeless For >1/16"–≤ 1/8" OD Tubing, Short	M6 Flat Bottom	*	Headless Knurl	PEEK Black	10-pk
	P-357x	Super Flangeless Fitting for 2.0 mm OD Tubing	M6 Flat Bottom	*	Standard Knurl	PEEK Black, Natural/SST	10-pk
	1/4-28 FITTINGS FOR 1/16" AND 1/32" OD TUBING						
	F-356x	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, FlushNut	1/4-28 Flat Bottom	*	FlushNut	SST	10-pk
	LT-105x	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Short	1/4-28 Flat Bottom	*	1/4" Hex	SST	10-pk
★	**LT-115x**	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Short	1/4-28 Flat Bottom	*	Standard Knurl	PEEK Natural	10-pk
★	**P-232**	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Short	1/4-28 Flat Bottom	*	Headless Knurl	PEEK Natural	ea.
	P-246x	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PFA Natural	10-pk
	P-252x	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	Delrin® Gray	10-pk
★	**P-255x**	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PEEK Natural	10-pk
	P-281	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PPS Natural	ea.
	P-287	Super Flangeless Nut for 1/16" or 1/32" OD Tubing	1/4-28 Flat Bottom	*	Headless Knurl	PPS Natural	ea.
	P-420	Super Flangeless Nut for 1/16" or 1/32" OD Tubing, Female	1/4-28 Flat Bottom	*	Female Knurl	PEEK Natural	ea.
	1/4-28 FITTINGS FOR 1.8MM, 2.5 MM, 1/8" OD TUBING						
	C-235x	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	1/4" Hex	SST	10-pk
	F-156	Super Flangeless Nut for 1/8" OD Tubing, Female	1/4-28 Flat Bottom	*	Female Knurl	PEEK Black	ea.
	F-364x	Super Flangeless Nut for 1/8" OD Tubing, FlushNut™	1/4-28 Flat Bottom	*	FlushNut	SST	10-pk
	LT-210x	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	Double Wings	PEEK Natural	10-pk
	LT-215x	Super Flangeless Nut for 1/8" OD Tubing, Short	1/4-28 Flat Bottom	*	Standard Knurl	PEEK Natural	10-pk
★	**P-331**	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PEEK Natural	ea.
	P-332x	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	Delrin Black	10-pk
★	**P-336**	Super Flangeless Nut for 1/8" OD Tubing, Short	1/4-28 Flat Bottom	*	Headless Knurl	PEEK Natural	ea.
★	**P-381**	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PPS Natural	ea.
	P-387	Super Flangeless Nut for 1/8" OD Tubing	1/4-28 Flat Bottom	*	Standard Knurl	PPS Natural	ea.
	5/16-24 FITTINGS FOR 1/16", 1/8", 3/16" OD TUBING						
NEW!	**P-131x**	Super Flangeless Fitting for 1/8" OD Tubing	5/16-24 Flat Bottom	*	Standard Knurl	PEEK Natural	10-pk
NEW!	**P-137x**	Super Flangeless Fitting for 3/16" OD Tubing	5/16-24 Flat Bottom	*	Standard Knurl	PEEK Black	10-pk
NEW!	**P-141x**	Super Flangeless Fitting for 1/16" OD Tubing	5/16-24 Flat Bottom	*	Standard Knurl	PEEK Natural	10-pk
	ONE-PIECE SUPER FLANGELESS FITTINGS FOR 1/16" AND 1/8" OD TUBING						
NEW!	**P-229x**	One Piece Super Flangeless Fitting for 1/16" OD Tubing	M6 Flat Bottom	1,000 psi (69 bar)	Standard Knurl	PEEK	10-pk
NEW!	**P-249x**	One Piece Super Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat Bottom	1,000 psi (69 bar)	Standard Knurl	PEEK	10-pk
NEW!	**P-329x**	One Piece Super Flangeless Fitting for 1/16" OD Tubing	M6 Flat Bottom	1,000 psi (69 bar)	Standard Knurl	PEEK	10-pk
NEW!	**P-349x**	One Piece Super Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat Bottom	1,000 psi (69 bar)	Standard Knurl	PEEK	10-pk

** Pressure rating of nut depends on the ferrule used.*

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Flangeless Fittings

Upchurch Scientific® Flangeless Fittings eliminate the need to flange tubing. This removable and reusable system provides several benefits:

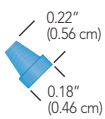
Convenience: Flangeless Fittings are easy to use. Just slip the nut and ferrule over the tubing and finger tighten the assembly into your receiving port. In tests, it is shown that the ideal amount of torque to achieve expected part performance should be approximately 3–4 in-lbs (0.34–0.45 N·m). Check out the line of special tightening tools designed to adapt to many standard torque wrenches, on page 33 and the adjustable torque driver, VHP-4000 on page 8.

Minimal Down-Time: Component replacement is quick, taking only a few seconds — unlike the significant time required to flange tubing.

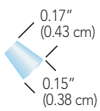
Cost-Effectiveness: Repairing a flanged tubing assembly requires a costly flanging tool or the purchase of a complete replacement assembly, including a new length of tubing and a set of fittings. The Flangeless Fittings system typically requires only one new ferrule at minimal cost when repairing a connection.

The 1/4-28 and M6 Flangeless Fittings for 1/16", 1/8", and metric sized OD tubing are summarized on the following page and listed on pages 25–27.

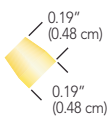
Ferrules



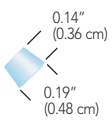
Standard 1/16"
P-200 P-200N



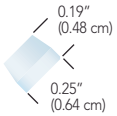
Small Valve 1/16"
P-240



Standard 1/8" and Metric Ferrules
P-300 P-300N P-342
P-353 P-363R P-343



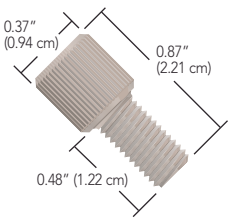
Small Valve 1/8"
P-340



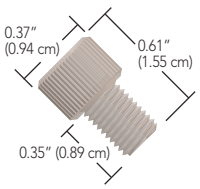
Standard 4.0 mm
P-344

Dimensions for 1/4-28 Flangeless Fittings (pages 24–27)

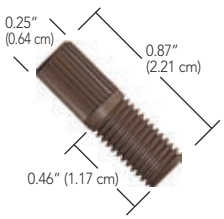
Nuts



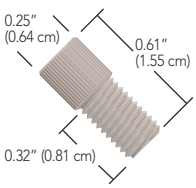
Standard
XP-201 XP-301–XP-305
XP-202 XP-330
XP-220
XP-230
XP-238
XP-245



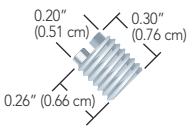
Short
XP-218 P-207S
XP-235 P-247
XP-308 P-307S
XP-335 P-347



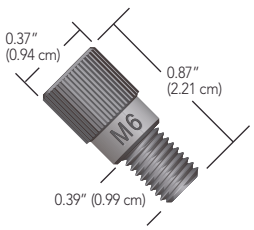
Headless
XP-286 XP-386



Short Headless
XP-283

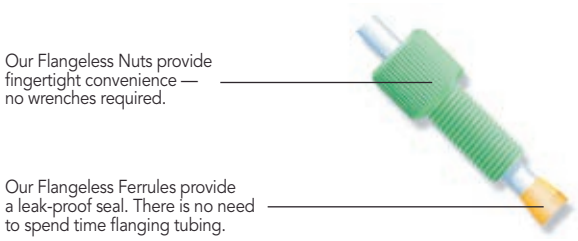


FlushNut™
XF-358 XF-368



Standard Metric
P-207 P-307

TIP THE CONVENIENCE OF FLANGELESS FITTINGS



RELATED PRODUCTS

▸ For the Large Bore Flangeless Fittings, please refer to page 30.

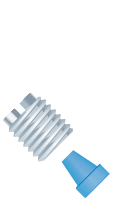
Flangeless Fittings for 1/16" OD Tubing

- Wide variety of materials and geometries to fit most applications
- Fittings and ferrules packaged together for easy ordering convenience

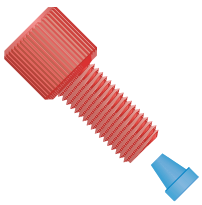
The Upchurch Scientific® Flangeless Fittings are excellent replacements for flanged fittings. Flangeless Fittings are dependable, easy to use and easy to replace.

Additionally, all fittings on this page come pre-packaged with appropriate ferrules (1/4-28 threaded fittings are packaged with P-200 ferrules; however, the XLT-111 — a 10-32 threaded fitting — is packaged with P-240 ferrules). Nuts are available in a wide variety of materials, and replacement ferrules are available in ETFE and polypropylene. The designs of many small, low pressure valves incorporate many shallow ports. The P-240 ferrule is designed to seal tightly in such ports and the special sealing rign on this ferrule helps ensure a minimum dead-volume seal between the tubing, ferrule, and port. (Please refer to our website, www.idex-hs.com for polymer chemical compatibility information.)

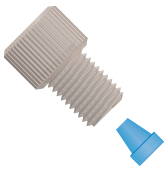
For higher pressure and temperature applications where a Flangeless connection is desired, consider the Flangeless SealTight™ Fitting System. Both fitting and ferrule are manufactured from PEEK polymer; additionally, the ferrule has been specially engineered to incorporate the dual-compression mechanism of the F-192 SealTight ferrule in a design that allows its use in a 1/4-28 flat-bottom port.



XF-358
Stainless Steel FlushNut™



XP-202
Delrin® Nut



XP-235
PEEK Nut

P-200
ETFE Ferrule

P-200N
ETFE Ferrule

P-240
ETFE Small Valve Ferrule

Please see page 24 for the dimensions of the products on this page.

Please Note: The nuts can be ordered separately — simply remove the preceding "X" from the part number to reference the nut separate from the pre-packaged ferrules.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	FLANGELESS FITTINGS (INCLUDES P-200 FERRULES)						
	XF-358x	Flangeless Fitting for 1/16" OD Tubing, FlushNut	1/4-28 Flat-Bottom	2,000 psi (138 bar)	FlushNut	SST/ETFE Blue	10-pk
	XLT-111x	Flangeless Fitting for 1/16" OD Tubing	10-32 Flat-Bottom	2,500 psi (172 bar)	Standard Knurl	PEEK Natural/ETFE Natural	10-pk
★	**XP-201x**	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	Delrin Black/ETFE Blue	10-pk
	XP-202x	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	Delrin Red/ETFE Blue	10-pk
★	**XP-218x**	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	ETFE Natural/ETFE Blue	10-pk
	XP-230x	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	PEEK Natural/ETFE Blue	10-pk
★	**XP-235x**	Flangeless Fitting for 1/16" OD Tubing, Short	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	PEEK Natural/ETFE Blue	10-pk
	XP-238x	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	Delrin Purple/ETFE Blue	10-pk
	XP-245x	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	PFA Natural/ETFE Blue	10-pk
★	**XP-286x**	Flangeless Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	Headless Knurl	PPS Natural/ETFE Blue	10-pk
	REPLACEMENT FERRULES						
★	**P-200x**	Flangeless Ferrule for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	—	ETFE Blue	10-pk
★	**P-200Nx**	Flangeless Ferrule for 1/16" OD Tubing	1/4-28 Flat-Bottom	2,000 psi (138 bar)	—	ETFE Natural	10-pk
	P-240x	Flangeless Ferrule for 1/16" OD Tubing, Small Valve	1/4-28 or 10-32 Flat-Bottom	2,500 psi (172 bar)	—	ETFE Natural	10-pk

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Flangeless Fittings for 1/8" OD Tubing

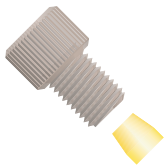
- Wide variety of materials and geometries to fit most applications
- Fittings and ferrules packaged together for easy ordering convenience

Upchurch Scientific® Flangeless Fittings for 1/8" OD tubing feature a wide assortment of nut geometries and materials from which to choose. Fittings shown on this page come in convenient 10-packs and also include P-300 Flangeless Ferrules. (The nuts can be ordered separately — simply remove the preceding "X" from the part number to reference the nut separate from the pre-packaged ferrules.)

All nuts on this page have 1/4-28 threads.

XF-368
Stainless Steel FlushNut™

XP-305
Delrin® Nut



XP-335
PEEK Nut

XP-386
PPS Nut

P-312
Lock Nut White Delrin

Lock Nut

The P-312 Lock Nut is for use with any 1/4-28 male Flangeless Fitting. Use this product in applications where vibrations can loosen fittings.

To Use: Thread the lock nut onto the male fitting. When the male fitting is firmly seated into the receiving port, tighten the lock nut down against the receiving port to securely hold the male fitting in place.

P-300
ETFE Ferrule

P-300N
ETFE Ferrule

P-340
ETFE Small Valve Ferrule

Please see page 24 for the dimensions of the products on this page.

NOTE

- The P-340 ferrule is designed for use with shallow receiving ports, such as those used on some low pressure valves.
- The XF-368 FlushNut is an excellent choice for applications where port-to-port spacing is limited; see page 31 for more information on this innovative product line. As an alternative, consider one of the "headless" fittings shown on this page.

RELATED PRODUCTS

- Nuts for M6 threaded ports are on page 27; nuts for 5/16-24 threaded ports are on page 30.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	FLANGELESS FITTINGS (INCLUDES P-300 FERRULES)						
	XF-368x	Flangeless Fitting for 1/8" OD Tubing, FlushNut	1/4-28 Flat-Bottom	500 psi (34 bar)	FlushNut	SST/ETFE Yellow	10-pk
★	**XP-301x**	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Black/ETFE Yellow	10-pk
	XP-302x	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Red/ETFE Yellow	10-pk
	XP-305x	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Green/ETFE Yellow	10-pk
★	**XP-308x**	Flangeless Fitting for 1/8" OD Tubing, Short	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Black/ETFE Yellow	10-pk
	XP-315x	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	ETFE Natural/ETFE Yellow	10-pk
★	**XP-330x**	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Natural/ETFE Yellow	10-pk
★	**XP-335x**	Flangeless Fitting for 1/8" OD Tubing, Short	1/4-28 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Natural/ETFE Yellow	10-pk
★	**XP-386x**	Flangeless Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	Headless Knurl	PPS Natural/ETFE Yellow	10-pk
	REPLACEMENT FERRULES						
★	**P-300x**	Flangeless Ferrule for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Yellow	10-pk
★	**P-300Nx**	Flangeless Ferrule for 1/8" OD Tubing	1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Natural	10-pk
★	**P-340x**	Flangeless Ferrule for 1/8" OD Tubing, Small Valve	1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Natural	10-pk
	P-312x	Lock Nut for Flangeless Nuts	1/4-28 Flat-Bottom	—	—	Delrin White	10-pk

Metric Flangeless Fittings

- For 1/16", 1.8 mm, 2.0 mm, 2.5 mm, 3.0 mm, 4.0 mm, or 1/8" OD tubing
- Convenience of flangeless fittings for metric tubing sizes and M6 flat-bottom ports

Upchurch Scientific® Metric Flangeless Ferrules are designed to connect 1.8, 2.0, 2.5, 3.0, or 4.0 mm OD tubing to flat-bottom ports when paired with the appropriate M6, 1/4-28, or 5/16-24 Flangeless Nuts. We also offer M6-threaded nuts to connect 1/16" or 1/8" OD tubing, plus a tubing sleeve to facilitate 1.0 mm OD tubing connections. Please refer to the "Metric Connections" chart on this page for information regarding which nuts and ferrules to use with your tubing.

P-342
ETFE Ferrule
for 1.8 OD tubing

P-363R
ETFE Ferrule
for 2.0 mm OD tubing

P-353
ETFE Ferrule
for 2.5 mm OD tubing

P-343
ETFE Ferrule
for 3.0 mm OD tubing

NEW!

P-344
ETFE Ferrule
for 4.0 mm OD tubing

P-207
Delrin® Nut
for 1/16" OD tubing

P-347
PEEK Nut
for 1.8, 2.0, 3.0 mm or 1/8" OD tubing

Please see page 24 for the dimensions of the products on this page.

TIP METRIC CONNECTIONS

Use this chart to determine the low pressure fittings needed to connect metric and English-sized tubing into the indicated ports.

Tubing Size	Port	Ferrules	Nuts
1.0 mm	M6 1/4-28	P-200 (w/F-252 sleeve, not included) P-200 (w/F-252 sleeve, not included)	P-207, P-207S, P-247 Any 1/4-28 nut from page 25[1]
1.8 mm	M6 1/4-28	P-342 P-342	P-307, P-307S, P-347 Any nut from page 26[1]
2.0 mm	M6 1/4-28	P-363R P-363R	P-307, P-307S, P-347 Any nut from page 26
2.5 mm	M6 1/4-28	P-353 P-353	P-307, P-307S, P-347 Any nut from page 26[1]
3.0 mm	M6 1/4-28	P-343 P-343	P-307, P-307S, P-347 Any nut from page 26[1]
4.0 mm	5/16-24	P-344	XP-132x from page 30
1/16"	M6 M6	P-200 P-840	P-207, P-207S, P-247, P-931, page 28
1/8"	M6 M6	P-300 P-940	P-307, P-307S, P-347, P-945, page 28

[1] *To order 1/4-28 threaded Flangeless Nuts separately from the Flangeless Ferrules, simply remove the preceding "X" from the appropriate part number — for example, order P-301x instead of XP-301x.*

RELATED PRODUCTS

More Metric–Sized Products

	Page
High Pressure Polymer Fittings	9, 12
High Pressure Stainless Steel Fittings	10
Luer Adapters	56
Metric Threaded Adapters	51
External NPT Adapters	52
VacuTight™ Fittings	28
Plugs and Caps	172
Low Pressure Unions	40
Bulkhead Unions	41
PEEK (1.8 mm OD and Capillary) and Fused Silica Tubing	65
PEEKsil™ Tubing	66
FEP Tubing (1.0–4.0 mm OD) and PFA Capillary Tubing	71
Frit-In-A-Ferrule™	166

In addition, many of our 1/4-28 threaded Filters, Valves and Flow Control Accessories can be converted to accept 1.8, 2.0, 2.5 and 3.0 mm tubing, using the ferrules listed for 1/4-28 ports in the "Metric Connections" table, this page.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	METRIC FLANGELESS NUTS						
	P-207x	Flangeless Nut for 1/16" OD Tubing	M6 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	Delrin Black	10-pk
	P-207Sx	Flangeless Nut for 1/16" OD Tubing, Short	M6 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	Delrin Black	10-pk
	P-247x	Flangeless Nut for 1/16" OD Tubing, Short	M6 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	PEEK Black	10-pk
	P-307x	Flangeless Nut for 1.8 mm, 2.0 mm, 3.0 mm, 1/8" OD Tubing	M6 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Black	10-pk
	P-307Sx	Flangeless Nut for 1.8 mm, 2.0 mm, 3.0 mm, 1/8" OD Tubing	M6 Flat-Bottom	500 psi (34 bar)	Standard Knurl	Delrin Black	10-pk
	P-347x	Flangeless Nut for 1.8 mm, 2.0 mm, 3.0 mm, 1/8" OD Tubing	M6 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Black	10-pk
	FLANGELESS FERRULES						
	F-252x	1/16" OD Tubing Sleeve for 1.0 mm ID Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	FEP Purple	10-pk
★	**P-200x**	Flangeless Ferrule for 1/16" OD Tubing	M6 or 1/4-28 Flat-Bottom	2,000 psi (138 bar)	—	ETFE Blue	10-pk
★	**P-300x**	Flangeless Ferrule for 1/8" OD Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Yellow	10-pk
★	**P-342x**	Flangeless Ferrule for 1.8 mm OD Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Green	10-pk
	P-343x	Flangeless Ferrule for 3.0 mm OD Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Orange	10-pk
NEW!	**P-344x**	Flangeless Ferrule for 4.0 mm OD Tubing	5/16-24	250 psi (17 bar)	—	ETFE Natural	10-pk
	P-353x	Flangeless Ferrule for 2.5 mm OD Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Natural	10-pk
	P-363Rx	Flangeless Ferrule for 2.0 mm OD Tubing	M6 or 1/4-28 Flat-Bottom	500 psi (34 bar)	—	ETFE Red	10-pk

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VacuTight™ Fittings

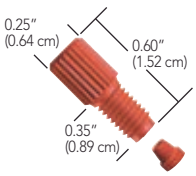
- For 1/16" or 1/8" OD tubing connections into 10-32, 1/4-28, or M6 flat-bottom ports
- Vacuum Rated to 25 in-Hg (84 kPa)
- Improve transfer volume consistency

Upchurch Scientific® VacuTight Fittings are designed to provide airtight, dependable connections under vacuum and low pressure conditions. Many of the VacuTight Nuts have streamlined profiles for use in systems requiring a large number of connections in a small area. Furthermore, the VacuTight Ferrule's small size ensures sufficient nut/thread engagement, even in shallow ports. These features make VacuTight Fittings ideal for "combichem" high throughput screening, clinical diagnostic, and other automated liquid handling applications.

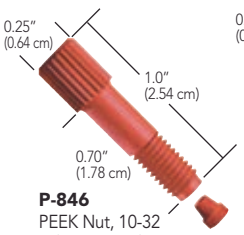
The configuration of the VacuTight flat-bottom ferrules prevents overcompression and tubing ID reduction that can occur with many coned fittings. The result is more consistent aspirating and dispensing volumes across all system connections.

The VacuTight fittings can also work well in some positive pressure applications. The pressure range for each fitting is listed below and depends upon the tubing used for the connection. Please contact your distributor or IDEX Health & Science for more information. Additionally, please note that some of the VacuTight fittings have changed in color from red to black; however, this color change does not affect product performance.

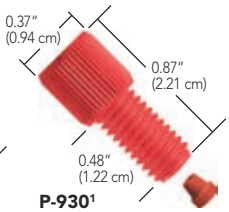
All VacuTight Nuts must be used exclusively with VacuTight Ferrules.



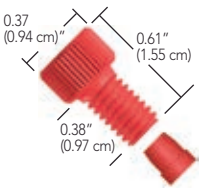
P-844
PEEK Nut, 10-32
with P-840 Ferrule



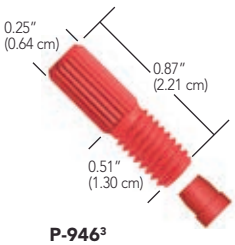
P-846
PEEK Nut, 10-32
with P-840 Ferrule



P-930[1]
Delrin® Nut, 1/4-28
with P-840 Ferrule



P-945[2]
Delrin Nut, M6
with P-940 Ferrule



P-946[3]
Delrin Nut, 1/4-28
with P-940 Ferrule

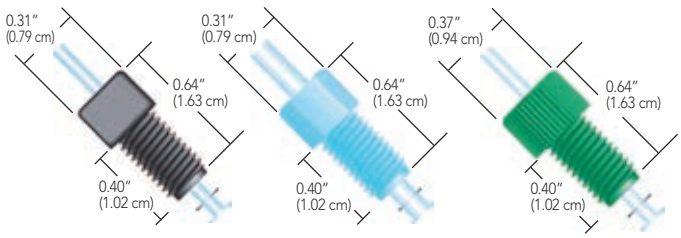
[1] The dimensions shown apply to P-930, P-931, P-938, P-942, and P-948.
[2] The dimensions shown apply to P-945.
[3] The dimensions shown apply to P-946.

	Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
	VACUTIGHT FITTINGS (INCLUDES P-840 OR P-940 FERRULES)						
★	**P-842x**	VacuTight Fitting for 1/16" OD Tubing, Short	10-32 Flat-Bottom	400–800 psi (27–55 bar)	1/4" Hex	PEEK Red	10-pk
★	**P-844x**	VacuTight Fitting for 1/16" OD Tubing, Short	10-32 Flat-Bottom	400–800 psi (27–55 bar)	Headless Knurl	PEEK Red	10-pk
	P-846x	VacuTight Fitting for 1/16" OD Tubing, Long	10-32 Flat-Bottom	400–800 psi (27–55 bar)	Headless Knurl	PEEK Red	10-pk
	P-930x	VacuTight Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	400–800 psi (27–55 bar)	Standard Knurl	Delrin Red	10-pk
	P-931x	VacuTight Fitting for 1/16" OD Tubing	M6 Flat-Bottom	400–800 psi (27–55 bar)	Standard Knurl	Delrin Red	10-pk
	P-938x	VacuTight Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	400–800 psi (27–55 bar)	Standard Knurl	PEEK Natural	10-pk
	P-942x	VacuTight Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500–1,000 psi (34–69 bar)	Standard Knurl	Delrin Red	10-pk
	P-945x	VacuTight Fitting for 1/8" OD Tubing, Short	M6 Flat-Bottom	500–1,000 psi (34–69 bar)	Standard Knurl	Delrin Red	10-pk
	P-946x	VacuTight Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500–1,000 psi (34–69 bar)	Headless Knurl	Delrin Red	10-pk
	P-948x	VacuTight Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	500–1,000 psi (34–69 bar)	Standard Knurl	PEEK Natural	10-pk
	REPLACEMENT FERRULES						
	P-840x	VacuTight Ferrule for 1/16" OD Tubing	M6 or 1/4-28 Flat-Bottom	400–800 psi (27–55 bar)	—	ETFE Red	10-pk
★	**P-940x**	VacuTight Ferrule for 1/8" OD Tubing	M6 or 1/4-28 Flat-Bottom	500–1,000 psi (34–69 bar)	—	ETFE Red	10-pk

Flanged Fittings

- Fittings for 1/16" or 1/8" OD tubing, supplied with nut and 316 stainless steel washer
- Multiple head styles and materials available
- For 1/4-28 and M6 flat-bottom ports
- All head styles, square, hex, and knurl are available in the following colors: black, red, white, green, and blue

Upchurch Scientific® Flanged Fittings are compatible with most standard 1/4-28 or M6 Flat-Bottom flanged fittings. The hard, inert Delrin® (acetal resin) nut resists cross threading or loosening during use, while the ETFE nuts work well in chemically aggressive environments.



P-401[1]
Flanged Fitting
for 1/16" OD tubing*

P-580B[2]
Flanged Fitting
for 1/8" OD tubing*

P-482G[3]
Flanged Fitting
for 1/16" OD tubing*

1 The dimensions shown apply to all square-head Flanged Fittings
2 The dimensions shown apply to all hex-head Flanged Fittings
3 The dimensions shown apply to all knurled-head Flanged Fittings
** Flanged tubing not included*

RELATED PRODUCTS

- For an alternative to flanging tubing, we highly recommend the Flangeless Fittings found on pages 24–27, the Super Flangeless™ Fittings found on pages 21–23, or the VacuTight™ Fittings on page 28.

Part No.	Description	Port Geometry	Head Style	Material (Nut/Washer)	Qty.
FLANGED FITTINGS (INCLUDES STAINLESS STEEL WASHERS)					
P-401x	Flanged Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	5/16" Square	Delrin Black/SST	10-pk
★ **P-480BLK**	Flanged Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	5/16" Hex	Delrin Black/SST	ea.
P-482BLK	Flanged Fitting for 1/16" OD Tubing	1/4-28 Flat-Bottom	Standard Knurl	Delrin Black/SST	ea.
P-501x	Flanged Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	5/16" Square	Delrin Black/SST	10-pk
P-580BLK	Flanged Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	5/16" Hex	Delrin Black/SST	ea.
P-582BLK	Flanged Fitting for 1/8" OD Tubing	1/4-28 Flat-Bottom	Standard Knurl	Delrin Black/SST	ea.
P-982BLKx	Flanged Fitting for 1/16" OD Tubing	M6 Flat-Bottom	Standard Knurl	Delrin Black/SST	10-pk
P-1082BLKx	Flanged Fitting for 1/8" OD Tubing	M6 Flat-Bottom	Standard Knurl	Delrin Black/SST	10-pk
REPLACEMENT WASHERS					
P-407x	Washer for 1/16" OD Tubing	1/4-28 Flat-Bottom	—	SST	10-pk
P-507x	Washer for 1/8" OD Tubing	1/4-28 Flat-Bottom	—	SST	10-pk
P-987x	Washer for 1/16" OD Tubing	M6 Flat-Bottom	—	SST	10-pk
P-1087x	Washer for 1/8" OD Tubing	M6 Flat-Bottom	—	SST	10-pk

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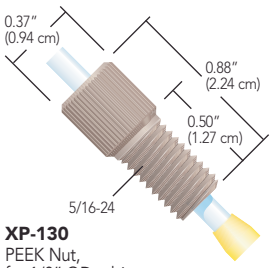
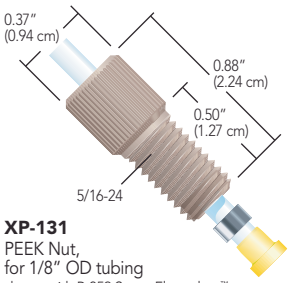
Large Bore Fittings

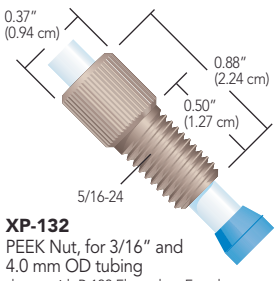
- 5/16-24 or 1/2-20 threads
- For use with 1/16", 1/8", 3/16", 1/4", 5/16", 3.0 mm, or 4.0 mm OD tubing



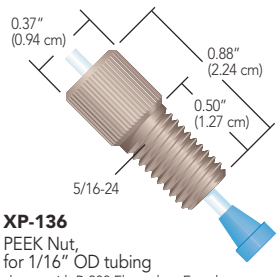
XP-130
PEEK Nut,
for 1/8" OD tubing
shown with P-300 Flangeless Ferrule
(page 26)



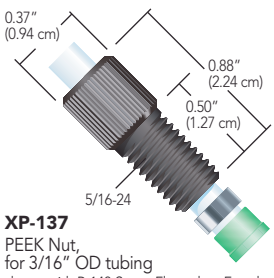
XP-131
PEEK Nut,
for 1/8" OD tubing
shown with P-359 Super Flangeless™
Ferrule (included and found on page 23)



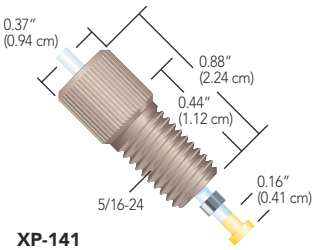
XP-132
PEEK Nut, for 3/16" and
4.0 mm OD tubing
shown with P-133 Flangeless Ferrule
(included and found on this page)



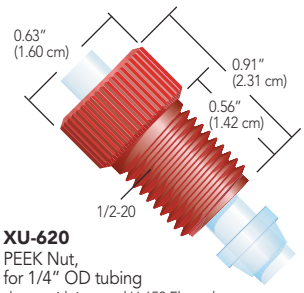
XP-136
PEEK Nut,
for 1/16" OD tubing
shown with P-200 Flangeless Ferrule
(included and found on page 25)



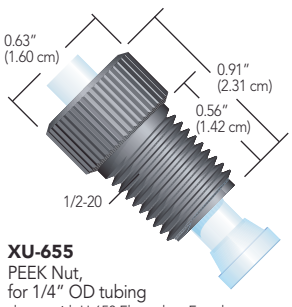
XP-137
PEEK Nut,
for 3/16" OD tubing
shown with P-140 Super Flangeless Ferrule
(included and found on this page)



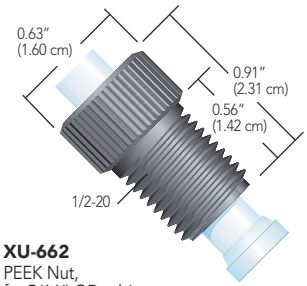
XP-141
PEEK Nut,
for 1/16" OD tubing
shown with P-259 Super Flangeless Ferrule
(included and found on page 23)



XU-620
PEEK Nut,
for 1/4" OD tubing
shown with inverted U-650 Flangeless
Ferrule for coned ports
(included and found on this page)



XU-655
PEEK Nut,
for 1/4" OD tubing
shown with U-650 Flangeless Ferrule
(included and found on this page)



XU-662
PEEK Nut,
for 5/16" OD tubing
shown with U-660 Flangeless Ferrule
(included and found on this page)

Please Note: Each of the Large Bore Fittings shown on this page comes in a convenient 10-pack and is packaged with the most popularly chosen Ferrule option. The Fittings can be ordered separately by removing the preceding letter "X" from the part number. Additionally, to connect metric-sized tubing with outer diameters less than 4.0 mm to 5/16-24 threaded ports, reference the chart on page 27 to choose the correct nut/ferrule combination.

RELATED PRODUCTS

More Large Bore Products

	Page
5/16-24 Coned Fittings	18
Barbed Adapters	58
Threaded Adapters	48
Plugs	32, 159
Y Connector	47
ETFE Tubing	73

	Page
FEP, PFA Tubing	71, 72
Tubing Cutter	74
Pressure Relief Valve	154
Solvent Inlet Filters	157
Bottle Caps	159
Semi-Prep Inline Filters	161

Part No.	Description	Port	Pressure Rating	Head Style	Material (Nut/Washer)	Qty.
LARGE BORE FITTINGS						
XP-130x	Flangeless Fitting for 1/8" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Natural/ETFE Yellow	10-pk
XP-131x	Super Flangeless Fitting for 1/8" OD tubing	5/16-24 Flat-Bottom	1,000 psi (69 bar)	Standard Knurl	PEEK Natural/ETFE Yellow/SST	10-pk
★ **XP-132x**	Flangeless Fitting for 3/16" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Natural/ETFE Blue	10-pk
XP-136x	Flangeless Fitting for 1/16" OD tubing	5/16-24 Flat-Bottom	2,000 psi (138 bar)	Standard Knurl	PEEK Natural/ETFE Blue	10-pk
XP-137x	Super Flangeless Fitting for 3/16" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Black/ETFE Green/SST	10-pk
XP-141x	Super Flangeless Fitting for 1/16" OD tubing	5/16-24 Flat-Bottom	1,350 psi (93 bar)	Standard Knurl	PEEK Natural/ETFE Yellow/SST	10-pk
XP-143x	Flangeless Fitting for 3.0 mm OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	Standard Knurl	PEEK Natural/ETFE Orange	10-pk
XU-620x	Flangeless Fitting for 1/4" OD tubing	1/2-20 Coned	250 psi (17 bar)	Large Knurl	PEEK Red/ETFE Natural	10-pk
XU-655x	Flangeless Fitting for 1/4" OD tubing	1/2-20 Flat-Bottom	250 psi (17 bar)	Large Knurl	PEEK Black/ETFE Natural	10-pk
XU-662x	Flangeless Fitting for 5/16" OD tubing	1/2-20 Flat-Bottom	250 psi (17 bar)	Large Knurl	PEEK Black/ETFE Natural	10-pk
REPLACEMENT FERRULES						
★ **P-133x**	Flangeless Ferrule for 3/16" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	—	ETFE Blue	10-pk
P-133Nx	Flangeless Ferrule for 3/16" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	—	ETFE Natural	10-pk
P-140x	Super Flangeless Ferrule for 3/16" OD tubing	5/16-24 Flat-Bottom	500 psi (34 bar)	—	ETFE Green	10-pk
U-650x	Flangeless Ferrule for 1/4" OD tubing	1/2-20 Flat-Bottom	250 psi (17 bar)	—	ETFE Natural	10-pk
U-660x	Flangeless Ferrule for 5/16" OD tubing	1/2-20 Flat-Bottom	250 psi (17 bar)	—	ETFE Natural	10-pk

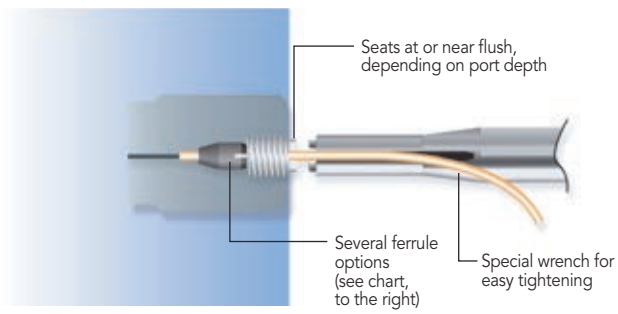
FlushNut™ Fittings

- Tightens flush with the top of the receiving port
- Several ferrule options

Upchurch Scientific® FlushNut Fittings are designed for those tight-space applications where nut heads often interfere with each other. When coupled with an appropriate ferrule and tightened into a receiving port, the FlushNut's slotted head seats at or near flush with the top of the port. This feature allows FlushNut Fittings to reside in closer proximity than any other option on the market. All FlushNut Fittings are manufactured from 316 stainless steel, except the P-321 Plug, which is made of PEEK polymer.

Tighten or remove FlushNut Fittings with our specially designed FlushNut Wrenches, available in 10-32 or 1/4-28 versions. For more information on the FlushNut wrenches, see page 33.

FlushNut Fittings System

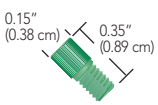


Lee Company "MINSTAC®" Compatible Fittings

- Super Flangeless™ style ferrules designed specifically to work with 6-40 nuts in Lee MINSTAC valve ports
- For 1/16" OD tubing

Upchurch Scientific TinyTight™ Fittings are easy-to-use alternatives for Lee Company 062 MINSTAC fittings systems. These fittings consist of a TinyTight Ferrule which works with the 6-40 threaded nut on this page, M-644-03. Choose from two ferrule options, with 0.020" (0.50 mm) or 0.030" (0.75 mm) thru-holes. To use, simply slide a fitting head-first onto your tubing, followed by the ring and ferrule, and thread this assembly into the solenoid valve receiving port, while making sure the tubing is bottomed out. No collets, colleting tools, or chamfering tools required; however, if needed for easier assembly of the TinyTight fittings, the M-150 tool is available. To use, first place the tool in a vise, then tighten tubing, fitting, and ferrule into the tool as you would into any port. Once removed, the swaged ferrule will be held in place on the tubing.

The TinyTight fittings have a pressure range that depends upon the tubing used for the connection. Please contact your distributor or IDEX Health & Science for more information.



M-644-03
Headless Nut
6-40 threads

M-647
TinyTight Ferrule
for 1/16" OD tubing
0.020" thru-hole

M-657
TinyTight Ferrule
for 1/16" OD tubing
0.030" thru-hole

RELATED PRODUCTS

FlushNut Ferrule Options

FlushNut	Threads/ Port*	For Tubing OD	Ferrule Options	Page
F-350	10-32 C	1/16"	SealTight™ F-192	14
F-354	10-32 C	1/32"	LiteTouch® LT-132	16
	10-32 C	1/16"	LiteTouch LT-100	16
	10-32 C	1/16"	LiteTouch SealTight LT-135	16
F-364	1/4-28 C	1/8"	LiteTouch LT-200	16
	1/4-28 FB	1/8"	Super Flangeless P-350, P-352, P-359, P-360	23
	1/4-28 FB	2.0 mm	Super Flangeless P-355	23
F-356	1/4-28 FB	1/32"	Super Flangeless P-248	23
	1/4-28 FB	1/16"	Super Flangeless P-250, P-259, P-260	23
XF-358	1/4-28 FB	1/16"	Flangeless P-200, P-200N, P-240	24
XF-368	1/4-28 FB	1/8"	Flangeless P-300, P-300N, P-340	24
	1/4-28 FB	1.8 mm	Flangeless P-342	24
	1/4-28 FB	2.0 mm	Flangeless P-363R	24
	1/4-28 FB	2.5 mm	Flangeless P-353	24
	1/4-28 FB	3.0 mm	Flangeless P-343	24
P-321	1/4-28 FB	N/A	Plug — No ferrule required	32

** C=Coned; FB=Flat-bottom*
To order FlushNuts separately from the included ferrules, simply remove the preceding "X" from the appropriate part number — for example, order F-358 instead of XF-358.

Part No.	Description	Port	Pressure Rating	Head Style	Material	Qty.
TINYTIGHT FITTINGS						
M-150	Swaging Tool for TinyTight Fittings	6-40 MINSTAC	—	—	SST	ea.
M-644-03x	Super Flangeless Nut for 1/16" OD Tubing	6-40 Flat Bottom or MINSTAC	750–3,750 psi (52–259 bar)	Micro Headless	PEEK Green	10-pk
M-647x	TinyTight Ferrule for 1/16" OD Tubing, 0.020" Thru-Hole	6-40 MINSTAC	750–3,750 psi (52–259 bar)	—	PEEK Natural/SST	10-pk
★ **M-657x**	TinyTight Ferrule for 1/16" OD Tubing, 0.030" Thru-Hole	6-40 MINSTAC	750–3,750 psi (52–259 bar)	—	PEEK Natural/SST	10-pk

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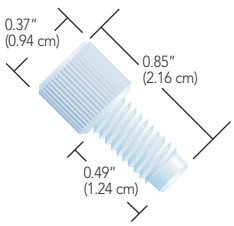
Plugs & Caps

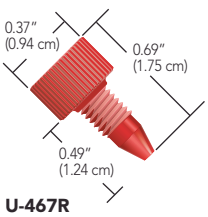
- Seal 6-32, 6-40, 10-32, 1/4-28, M6, or 5/16-24 threaded ports or fittings

Use Upchurch Scientific® plugs to close off unused ports in valves and multi-port connectors. Our color-coded 10-32 threaded plugs are perfect for identifying stored columns that have different packing materials, or in which different mobile phases have been utilized. Cap off tubing with one of the PEEK or ETFE caps presented on this page and the appropriate fittings from this chapter.

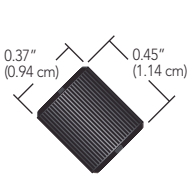
To help determine which plug or cap is best suited for your application, please visit www.idex-hs.com for detailed chemical compatibility data.



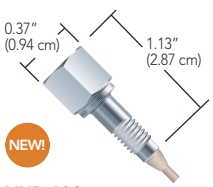
P-316
PFA Plug
for 1/4-28 flat-bottom ports



U-467R
Delrin® Column Plug
for 10-32 coned ports



P-755
ETFE Cap
for 1/4-28 flat-bottom fittings



VHP-600
VHP Plug
for 10-32 coned ports

	Part No.	Description	Head Style	Material	Qty.
	PLUGS				
	P-120	Plug for 1/4-28 Coned Ports for 1/8″ OD Tubing	Standard Knurl	PCTFE Natural	ea.
	P-123	Plug for 1/4-28 Flat-Bottom Ports	5/16″ Hex	ETFE Natural	ea.
★	**P-309x**	Plug for 1/4-28 Flat-Bottom Ports	Standard Knurl	Delrin Black	10-pk
★	**P-311**	Plug for 1/4-28 Flat-Bottom Ports	Standard Knurl	ETFE Natural	ea.
	P-314	Plug for M6 Flat-Bottom Ports	Standard Knurl	ETFE Black	ea.
★	**P-316**	Plug for 1/4-28 Flat-Bottom Ports	Standard Knurl	PFA Natural	ea.
	P-321	Plug for 1/4-28 Flat-Bottom Ports, FlushNut™	FlushNut	PEEK Natural	ea.
	P-520	Plug for 10-32 Coned Ports	5/16″ Hex	SST	ea.
	P-550	Plug for 10-32 Coned Ports, Extra Long	Standard Knurl	PEEK Natural	ea.
★	**P-551**	Plug for 10-32 Coned Ports	Standard Knurl	PEEK Natural	ea.
	P-552	Plug for 6-40 Coned Ports	Headless Knurl	PEEK Natural/PCTFE	ea.
	P-555	Plug for 6-32 Coned Ports	Standard Micro Knurl	PEEK Natural	ea.
	P-556	Plug for 5/16-24 Flat-Bottom Ports	Standard Knurl	PEEK Natural	ea.
	P-558	Plug for 6-40 Flat-Botton Ports	Micro Headless Knurl	PEEK Green	ea.
	P-559	Plug for 6-32 Flat-Bottom Ports	Micro Headless Knurl	PEEK Natural	ea.
	P-849	Plug for 10-32 Flat-Bottom Ports	Standard Knurl	Delrin Black	ea.
	U-467Rx	Plug for 10-32 Coned Ports	Standard Knurl	Delrin Red	10-pk
NEW!	**VHP-600**	VHP Plug for 10-32 Coned Ports	3/8″ Hex	PK-SST	ea.
	CAPS				
	P-754	Cap for 10-32 Coned Ports	Standard Knurl	ETFE Yellow	ea.
★	**P-755**	Cap for 1/4-28 Flat-Bottom Ports	Standard Knurl	ETFE Black	ea.
	P-756	Cap for M6 Flat-Bottom Ports	Standard Knurl	ETFE Blue	ea.

Extender Tools

These tools can be used to tighten most of our knurled nuts in hard to reach places. See the application note on this page for knurl size and corresponding extender tool.

For precise tightening, the extender tools listed with 1/4" hex drives are designed to adapt to any torque wrench with a female 1/4" socket, such as the VHP-4000 Torque Driver on page 8. The tools featured on this page also include the FlushNut™ wrenches, used to tighten the FlushNuts found throughout this chapter and described in detail on page 31.

Removal Tool

Use the LT-300 Removal Tool to detach LiteTouch® and Super Flangeless™ Ferrules from tubing. Simply slide the appropriate tool blade slot between the lock ring and the ferrule body. With a slight twist, the ring will pop off, releasing the ferrule from the tubing. *Please Note: This Removal Tool will not work with the LT-135 Ferrule System.*

Wrenches

For your convenience, we offer wrenches in three standard sizes. You will need two A-304 wrenches to tighten most nuts into unions found on page 36 (for union 1593, you need one A-304 and one A-320 wrench).

The IDEX Wrench is slotted to fit over 1/16" and 1/8" OD tubing, and has 1/4" and 5/16" internal hex ends, to engage with the heads of the hex-head fittings most commonly used with Rheodyne® valves and the stainless steel fittings listed on page 10.

APPLICATION NOTE

The drawings represent actual size of the various knurled head designs of the Upchurch Scientific® nuts featured in this chapter. Select the appropriate extender tool for the knurl pattern of the nut you've selected.

Female Knurl	Standard Knurl	Headless Knurl
		

Standard Micro Knurl	Micro Headless Knurl
	

Part No.	Description	Material	Qty.
EXTENDER TOOLS			
P-291	Extender Tool for Standard Head Nuts, with 1/4" Hex Drive	Aluminum	ea.
P-298	Extender Tool for Standard Head Nuts	Delrin®	ea.
P-299	Extender Tool for Standard Head Nuts	Aluminum	ea.
P-399	Extender Tool for Standard Head Nuts, Short	Aluminum	ea.
P-297	Extender Tool for Headless Nuts	Aluminum	ea.
P-292	Extender Tool for Headless Nuts, with 1/4" Hex Drive	Aluminum	ea.
P-277	Extender Tool for Standard Micro Nuts	Aluminum	ea.
N-290	Extender Tool for Micro Headless Nuts	Aluminum	ea.
P-278	Extender Tool for Female Nuts, with 1/4" Hex Drive	Aluminum	ea.
MISCELLANEOUS TOOLS			
A-304	Wrench, 1/4" x 5/16"	Steel	ea.
A-305	Wrench, 1/2" x 9/16"	Steel	ea.
A-320	Wrench, 3/8" x 7/16"	Steel	ea.
6810	IDEX Wrench, 1/4" x 5/16"	Steel	ea.
F-345	FlushNut Wrench for 10-32 Threaded Fittings	Steel/Plastic Handle	ea.
F-346	FlushNut Wrench for 1/4-28 Threaded Fittings	Steel/Plastic Handle	ea.
LT-300	Removal Tool for LiteTouch and Super Flangeless Ferrules	Steel/Plastic Handle	ea.

CONNECTORS

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Connectors Reference Chart

This chart offers suggestions for connecting two pieces of inline tubing. The required product numbers are listed, with the appropriate page numbers listed below them in respective order. In most cases other options exist. For more information, please contact IDEX Health & Science or your local distributor.

TUBING SIZE (OD)	CAPILLARY (<1/32" OD)	1/32"	1 mm	1/16"	1.8–3 mm	1/8"	4 mm, 3/16"	1/4"	5/16"
CAPILLARY (<1/32" OD)	P-720 + MTSlv or P-882 or P-772 or P-779 + (2) NTSlv Pages: 39, 19, 52, 39, 38, 19	P-779 + NTSlv + F-247 Pages: 38, 19	P-779 + NTSlv + F-252 Pages: 38, 19	P-770 + MTSlv Pages: 38, 19	P-627 + NTSys + MFF + XP-335 Pages: 48, 19, 27, 26	P-627 + NTSys + XP-335 Pages: 49, 19, 26	P-135 + P-259 + NTSys + LT-115 + LBFF + XP-132 Pages: 48, 23, 19, 23, 30	U-665 + P-259 + NTSlv + LT-115 Pages: 48, 23, 19, 23	U-665 + XU-662 + P-259 + NTSlv + LT-115 Pages: 48, 30, 60, 19, 23
1/32"	P-779 + NTSlv + F-247 Pages: 38, 19	P-771 Page: 39	P-779 + F-247 + F-252 Pages: 38, 19, 19	P-881 Page: 52	P-702 + P-248 + LT-115 + MFF + XP-335 Pages: 40, 23, 23, 27, 26	P-702 + P-248 + LT-115 + XP-335 Pages: 40, 23, 23, 26	P-135 + P-248 + LT-115 + LBFF + XP-132 Pages: 48, 23, 23, 30, 30	U-665 + P-248 + LT-115 Pages: 48, 23, 23	U-665 + XU-662 + P-248 + LT-115 Pages: 48, 30, 23, 23
1 mm	P-779 + NTSlv + F-252 Pages: 38, 19	P-779 + F-247 + F-252 Pages: 38, 19, 19	P-779+ (2) F-252 Pages: 38, 19	P-779 + F-252 Pages: 38, 19	P-702 + F-252 + MFF + XP-335 Pages: 40, 19, 27, 26	P-702 + F-252 + XP-335 Pages: 40, 19, 26	P-135 + XP-235 + F-252 + LBFF + XP-132 Pages: 48, 25, 19, 27, 30	U-665 + XP-235 + F-252 Pages: 48, 25, 19	U-665 + XU-662 + XP-235 + F-252 Pages: 48, 30, 25, 19
1/16"	P-770 + MTSlv Pages: 38, 19	P-881 Page: 52	P-779+ F-252 Pages: 38, 19	P-742 or P-702 Pages: 38, 40	P-702 + MFF + XP-335 Pages: 40, 27, 26	P-703 + XP-235 Pages: 40, 25	P-135 + XP-235 + LBFF + XP-132 Pages: 48, 25, 30, 30	U-665 + XP-235 Pages: 49, 25	U-665 + XU-662 + XP-235 Pages: 48, 30, 25
1.8–3 mm	P-627 + NTSys + MFF + XP-335 Pages: 48, 19, 27, 26	P-702 + P-248 + LT-115 + MFF + XP-335 Pages: 40, 23, 23, 27, 26	P-702 + F-252 + MFF + XP-335 Pages: 40, 19, 27, 26	P-702 + MFF + XP-335 Pages: 40, 27, 26	P-703 + (2) MFF Pages: 40, 27	P-703 + MFF Pages: 40, 27	P-135 + XP-335 + LBFF + XP-132 Pages: 48, 27, 26, 30	U-665 + MFF + XP-335 Pages: 48, 27, 26	U-665 + XU-662 + MFF + XP-335 Pages: 48, 30, 27, 26
1/8"	P-627 + NTSys + XP-335 Pages: 48, 19, 26	P-702 + P-248 + LT-115 + XP-335 Pages: 40, 23, 23, 26	P-702 + F-252 + XP-335 Pages: 40, 19, 26	P-703 + XP-235 Pages: 40, 25	P-703 + MFF Pages: 40, 27	P-703 Page: 40	P-135 + XP-335 + LBFF + XP-132 Pages: 48, 26, 30, 30	U-665 + XP-335 Pages: 48, 26	U-665 + XU-662 + X P-335 Pages: 48, 30, 26
4 mm, 3/16"	P-135 + P-259 + NTSys + LT-115 + LBFF + XP-132 Pages: 48, 23, 19, 23, 30	P-135 + P-248 + LT-115 + LBFF + XP-132 Pages: 48, 23, 23, 30, 30	P-135 + XP-235 + F-252 + LBFF + XP-132 Pages: 48, 25, 19, 27, 30	P-135 + XP-235 + LBFF + XP-132 Pages: 48, 25, 30, 30	P-135 + XP-335 + LBFF + XP-132 Pages: 48, 27, 26, 30	P-135 + XP-335 + LBFF + XP-132 Pages: 48, 26, 30, 30	P-134 + (2) LBFF + (2) XP-132 Pages: 41, 27, 30, 30	U-659 + LBFF + XP-132 Pages: 48, 30, 30	U-659 + XU-662 + LBFF + XP-132 Pages: 48, 30, 27, 30, 30
1/4"	U-665 + P-259 + NTSlv + LT-115 Pages: 48, 23, 19, 23	U-665 + P-248 + LT-115 Pages: 48, 23, 23	U-665 + XP-235 + F-252 Pages: 48, 25, 19	U-665 + XP-235 Pages: 48, 25	U-665 + MFF + XP-335 Pages: 48, 27, 26	U-665 + XP-335 Pages: 48, 26	U-659 + LBFF + XP-132 Pages: 48, 30, 30	Contact Us	U-665 + P-684 + XU-662 Pages: 48, 48, 30
5/16"	U-665 + XU-662 + P-259 + NTSlv + LT-115 Pages: 48, 30, 60, 19, 23	U-665 + XU-662 + P-248 + LT-115 Pages: 48, 30, 23, 23	U-665 + XU-662 + XP-235 + F-252 Pages: 48, 30, 25, 19	U-665 + XU-662 + XP-235 Pages: 48, 30, 25	U-665 + XU-662 + MFF + XP-335 Pages: 48, 30, 27, 26	U-665 + XU-662 + XP-335 Pages: 48, 30, 26	U-659 + XU-662 + LBFF + XP-132 Pages: 48, 30, 27, 30, 30	U-665 + P-684 + XU-662 Pages: 48, 48, 30	Contact Us

MTSlv *MicroTight® Sleeves. Select the appropriate MicroTight Sleeve(s) for your tubing OD size.*
NTSys *NanoTight™ System. Select the appropriate NanoTight Sleeve(s) for your tubing OD size, and NanoTight fitting(s).*
NTSlv *Select the appropriate NanoTight Sleeves for your tubing OD size.*

MFF *Select the appropriate Metric Flangeless Ferrule(s) for your tubing OD size. Choose from P-342, P-343, P-353, and P-363R.*
LBFF *Select from the following Large-Bore Flangeless Ferrules: P-133 (3/16" OD) or P-139 (4.0 mm OD).*

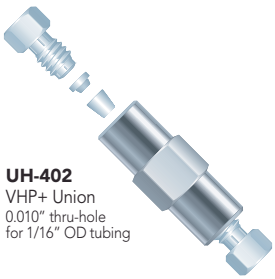
Biotech AB
info@biotech.se
www.biotech.se
+46 (0)300 56 91 80

VHP Stainless Steel ZDV Unions

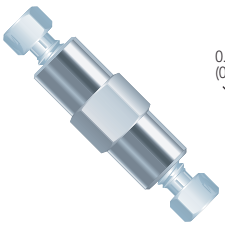
- Supplied with fittings for 1/16" OD or 1/8" OD tubing
- Manufactured from 316 stainless steel
- All union assemblies rated to 20,000 psi (1,380 bar) or higher

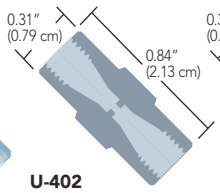
These Upchurch Scientific®, high pressure, zero-dead-volume (ZDV) unions, manufactured by IDEX Health & Science, are precision machined from 316 stainless steel, carefully passivated, then thoroughly rinsed. Each comes complete with stainless steel nuts and ferrules.

U-411
NanoTight™ Union
0.007" thru-hole
for 1/16" OD tubing

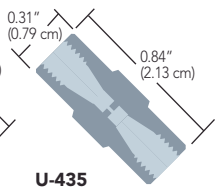


UH-402
VHP+ Union
0.010" thru-hole
for 1/16" OD tubing



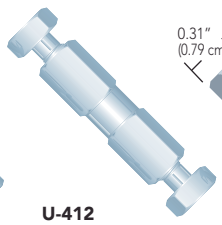


U-402
ZDV Union
0.020" thru-hole
for 1/16" OD tubing

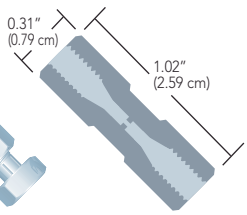


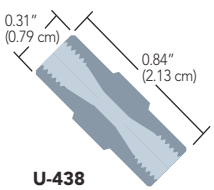
U-435
ZDV Union
0.010" thru-hole
for 1/16" OD tubing

U-322
VICI® (Valco) Compatible
ZDV Union
0.020" thru-hole
for 1/16" OD tubing

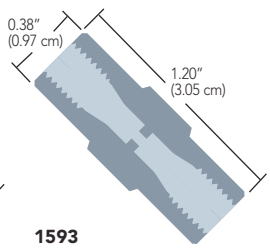


U-412
Waters Compatible
ZDV Union
0.020" thru-hole
for 1/16" OD tubing





U-438
True ZDV Union
0.067" thru-hole
for 1/16" OD tubing



1593
ZDV Union
0.050" thru-hole
for 1/8" OD tubing

NOTE

It is possible to order the products on this page without the fittings. Simply use a -01 at the end of the product number to order the union body without fittings.

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	VHP STAINLESS STEEL ZDV UNIONS						
	1593	Stainless Steel Union for 1/8" OD Tubing	1/4-28 Coned	(2) C-235/C-236	0.050" (1.25 mm)	1.48 µL	20,000 psi (1,380 bar)
★	**U-402**	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-400/U-401	0.020" (0.50 mm)	0.13 µL	20,000 psi (1,380 bar)
★	**U-411**	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-400/U-401	0.007" (178 µm)	13 nL	20,000 psi (1,380 bar)
★	**U-435**	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-400/U-401	0.010" (0.25 mm)	20 nL	20,000 psi (1,380 bar)
	U-438	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-400/U-401, (1) P-554 Gauge Plug	0.067" (1.70 mm)	Near 0 µL	20,000 psi (1,380 bar)
	UH-402	VHP+ Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) VHP-200	0.010" (0.25 mm)	20 nL	30,000 psi (2,070 bar)
	VICI (VALCO) COMPATIBLE ZDV UNION						
★	**U-322**	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-320/U-321	0.020" (0.50 mm)	0.15 µL	20,000 psi (1,380 bar)
	WATERS® COMPATIBLE ZDV UNION						
	U-412	Stainless Steel Union for 1/16" OD Tubing	10-32 Coned	(2) U-410/U-401	0.020" (0.50 mm)	0.10 µL	20,000 psi (1,380 bar)

VHP Unions for Capillary Tubing

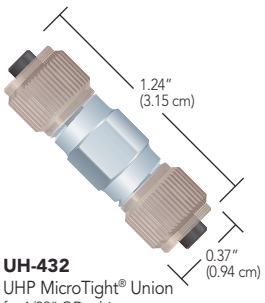
- Featuring stainless steel bodies and PK/PEEK fittings
- Pressure rated up to 15,000 psi (1,034 bar)
- Options to direct-connect both 1/32" OD tubing and 360 µm OD tubing

Upchurch Scientific® has expanded its line of specialized fittings and connectors for UHPLC applications to include several innovative unions and adapters.

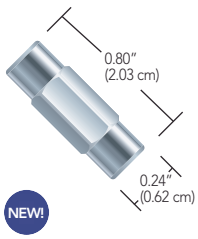
Two of these products — the UH-432 and UH-436 — follow the design of our popular Mini MicroFilters (see page 162) and allow a convenient union between either 1/32" OD tubing or 360 µm OD tubing. Each features a stainless steel union body and a unique stainless steel union capsule, enabling both excellent chemical compatibility as well as conductivity, making these a great choice for electrical interfacing in certain LC-MS applications. Each is also coupled with direct-connect ferrules made from our proprietary PEEK polymer blend (PK), allowing tubing connections up to 15,000 psi (1,034 bar). *(Please Note: While these connectors can be used at elevated pressures, they are not recommended for applications above 100 °C.)*

The UH-632 is a more traditionally designed connector, incorporating internally threaded ports. The union (UH-632) features a true ZDV (zero dead volume) connection between both tubes. This unique product is coupled with our one-piece Ultra-High Performance Fingertight fittings manufactured from our proprietary PEEK polymer blend, allowing them to be used in high temperature applications (up to 200 °C) at pressures up to 6,000 psi (414 bar) — or use these connectors at room temperature up to 15,000 psi (1,034 bar)!

The 1959-01 is a new VHP union designed to accept the popular M4x0.7 threaded fittings for 1/32" OD tubing, made popular by Rheodyne®. These unions will work nicely with both the VHP-900 fittings (found on page 7) as well as the reusable VHP-920 (found on page 6).

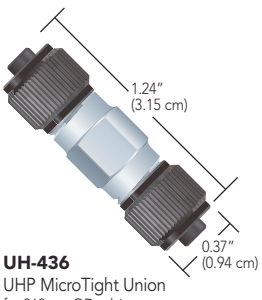


UH-432
UHP MicroTight® Union
for 1/32" OD tubing
with fittings and capsule union included

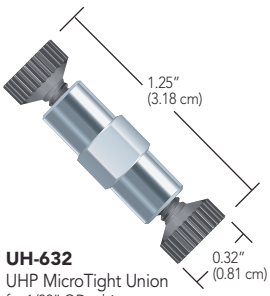


NEW!

1959-01
UHP MicroTight® Union
for 1/32" OD tubing



UH-436
UHP MicroTight Union
for 360 µm OD tubing
with fittings and capsule union included

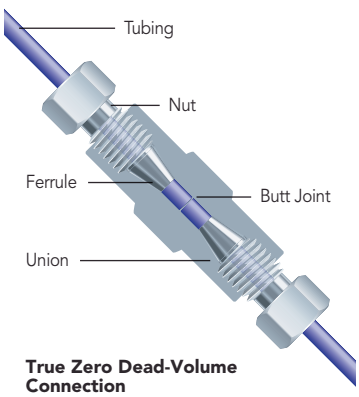


UH-632
UHP MicroTight Union
for 1/32" OD tubing
with fittings included

APPLICATION NOTE

What is a True ZDV Union?

True zero dead volume (ZDV) unions are designed so that the two joined pieces of tubing butt perfectly together as shown in the image to the right. These products have no swept volume contained within the union body. The fluid moves directly from one tube into another in this type of connector.



True Zero Dead-Volume Connection

When using true ZDV unions, it is important to take care to ensure connecting tubing has burr-free 90 degree ends. Find tubing cutters on page 74 to assist with cleanly cutting polymer and fused silica tubing. Gauge plugs are supplied with True ZDV Unions to assist with assembly. With the gauge plug inserted into one side of the union, a hard stop is created for the tubing to bottom out against as it is connected to the opposite port. The gauge plug is removed and then the second piece of tubing is connected, using the first piece of tubing to bottom out against resulting in the two tubes joined together in the center of the union.

ORDER ONLINE

RELATED PRODUCTS

- Find replacement VHP fittings on page 9.
- Find Fused Silica tubing on page 67.
- Find 1/32" OD Stainless Steel tubing on page 64–65.
- To achieve 15,000 psi (1,034 bar) with the female threaded fittings used with some of these products, use the P-278 extender tool found on page 8.

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	VHP UNIONS FOR CAPILLARY TUBING						
★	**UH-432**	VHP Union for 1/32" OD Tubing, PEEK/SST	5/16-24 Coned	(2) PK-112, (2) P-416	0.006" (0.150 mm)	5 nL	15,000 psi (1,034 bar)
	UH-436	VHP Union for 360 µm OD Tubing, PEEK/SST	5/16-24 Coned	(2) PK-152, (2) P-416BLK	0.006" (0.150 mm)	5 nL	15,000 psi (1,034 bar)
	UH-632	VHP True ZDV Union for 1/32" OD Tubing, PEEK/SST	6-32 Coned	(2) PK-126, (1) P-553 Gauge Plug	N/A	N/A	15,000 psi (1,034 bar)
NEW!	**1959-01**	VHP Union for 1/32" OD Tubing, SST	M4x0.7	N/A (Fittings must be ordered separately)	0.007" (178 µm)	16 nL	30,000 psi (2,070 bar)

Biotech AB
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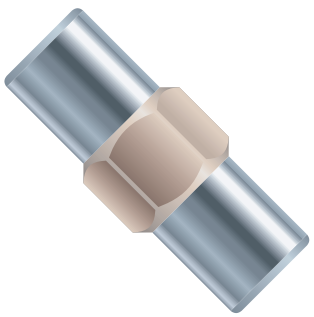
New Bio-Inert UHPLC Unions

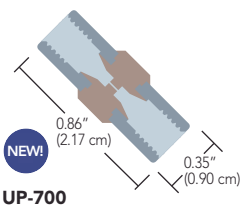
- Unique, Patent-Pending Process allows a fully-PEEK fluid contact area combined with the strength of stainless steel
- Pressure rated to 1,200 bar (17,400 psi)
- Two inner diameters available: 0.008" and 0.016"

Upchurch Scientific® introduces two new unions specifically engineered for Bio-Inert UHPLC applications. Combining the physical strength of 316 stainless steel with the inertness and biocompatibility of an all-PEEK fluid pathway, these unions will work well in applications where pressures reach up to 17,400 psi (1,200 bar) — without allowing metal contact by the fluid.

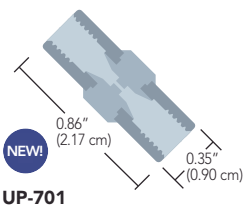
Neither union comes with fittings, but can be paired successfully with any 10-32 coned fitting that uses a polymer nose or ferrule.

Note: All-stainless steel fittings should NOT be used with these unions, as they will damage the internal conical seat.





UP-700
Bio-Inert UHPLC Union
0.008" thru-hole
for 1/16" OD tubing

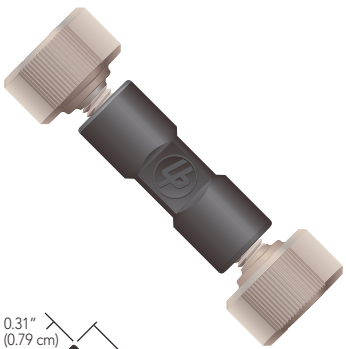


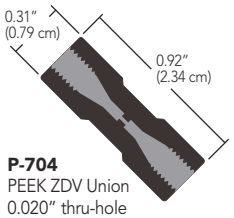
UP-701
Bio-Inert UHPLC Union
0.016" thru-hole
for 1/16" OD tubing

Biocompatible

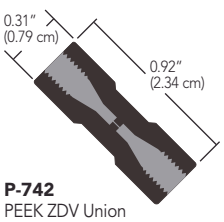
PEEK ZDV Unions

Upchurch Scientific PEEK zero-dead-volume (ZDV) Unions come complete with two F-300 Fingertight Fittings for 1/16" OD tubing and are pressure rated to 5,000 psi (344 bar).

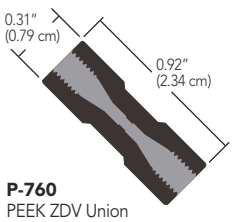




P-704
PEEK ZDV Union
0.020" thru-hole
with F-300 Fittings



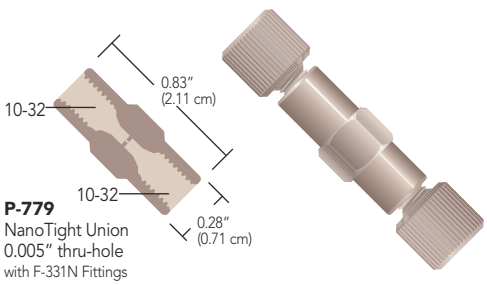
P-742
PEEK ZDV Union
0.010" thru-hole
with F-300 Fittings



P-760
PEEK ZDV Union
0.050" thru-hole
with F-300 Fittings

NanoTight™ Union

This Upchurch Scientific NanoTight Union improves capillary tubing connections in several ways. The internal design of the union greatly reduces the incidence of tubing misalignment. When using 1/16" OD tubing sleeves (found on page 19) to connect capillary tubing, the webbed thru-hole minimizes breaking of fused silica while adding only miniscule swept volume. The results are fewer blockages, fewer flow rate reductions and fewer back pressure problems.

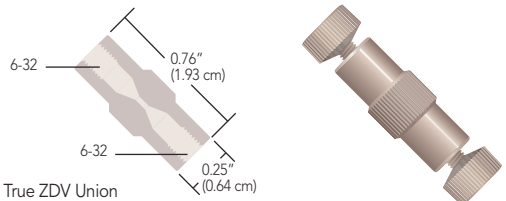


P-779
NanoTight Union
0.005" thru-hole
with F-331N Fittings

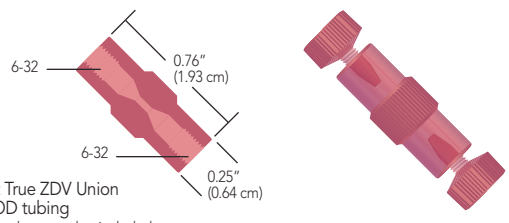
	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	BIO-INERT UHPLC UNIONS						
NEW!	**UP-700**	Bio-Inert UHPLC Union for 1/16" OD Tubing, Natural (Tan)	10-32 Coned	N/A	0.008" (0.20 mm)	0.05 µL	17,400 psi (1,200 bar)
NEW!	**UP-701**	Bio-Inert UHPLC Union for 1/16" OD Tubing, Gray	10-32 Coned	N/A	0.016" (0.40 mm)	0.20 µL	17,400 psi (1,200 bar)
	PEEK ZDV UNIONS						
★	**P-704**	PEEK Union for 1/16" OD Tubing	10-32 Coned	(2) F-300	0.020" (0.50 mm)	0.28 µL	5,000 psi (344 bar)
★	**P-742**	PEEK Union for 1/16" OD Tubing	10-32 Coned	(2) F-300	0.010" (0.25 mm)	0.07 µL	5,000 psi (344 bar)
★	**P-760**	PEEK Union for 1/16" OD Tubing	10-32 Coned	(2) F-300	0.050" (1.25 mm)	1.2 µL	5,000 psi (344 bar)
	NANOTIGHT UNION						
★	**P-779**	PEEK NanoTight Union for 1/16" OD Tubing and Tubing Sleeves	10-32 Coned	(2) F-331N	0.005" (125 µm)	8 nL	5,000 psi (344 bar)

MicroTight® Connectors for Capillary Tubing

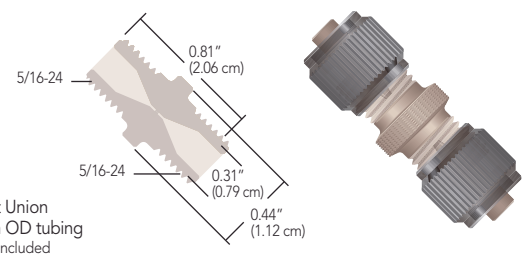
Connect two pieces of capillary tubing with these Upchurch Scientific® PEEK MicroTight Connectors. The True ZDV Unions allow two pieces of tubing to connect directly to each other — using the included gauge plug to ensure proper alignment. The standard union and elbow both feature a 0.006" (0.150 mm) thru-hole, adding only a small amount of additional flow-path volume to help ensure proper chromatographic results. For MicroTight unions designed for UHPLC applications, see page 37.



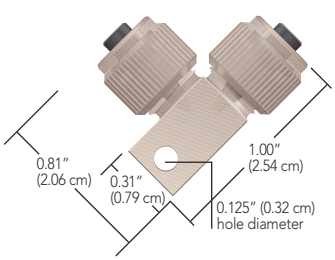
P-720
MicroTight True ZDV Union
for use with MicroTight Sleeves
with fittings and gauge plug included



P-771
MicroTight True ZDV Union
for 1/32" OD tubing
with fittings and gauge plug included



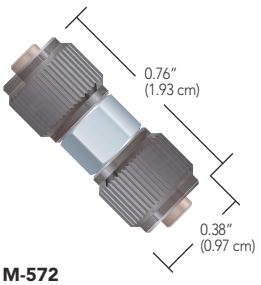
P-772
MicroTight Union
for 360 µm OD tubing
with fittings included



P-874
MicroElbow for
MicroTight Tubing Sleeves
with fittings included

Conductive MicroTight Union

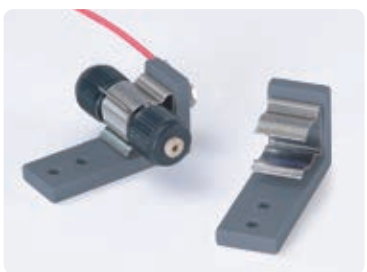
The Upchurch Scientific Conductive MicroTight Union manufactured by IDEX Health & Science provide an excellent opportunity to introduce voltage into an electrospray or capillary electrophoresis system. With an extremely low internal volume of 16 nL, this union can be placed inline with 360 µm OD capillary tubing. Mount and apply voltage to these unions using our Insulating Mounting Bracket below.



M-572
Conductive MicroTight Union
for 360 µm OD tubing
with fittings and Capsule Union included

Insulating Mounting Bracket

Use our Insulating Mounting Bracket to easily integrate the Conductive MicroTight Union (shown above) or our Conductive Mini MicroFilters (on page 162) into your system or lab.



Insulating Mounting Bracket, shown with lead wire and Conductive MicroTight Union, not included.

The product snaps into place. Voltage from your lead wire is conducted through the attaching stainless steel nut and screw (included), then onto the mounted product via the stainless steel clip.

The bracket's base includes two holes (#2 screw clearance) for easy mounting onto any lab surface. Dimensions are 1.25" L x 0.45" W x 0.63" H.

APPLICATION NOTE

For an example of using a Conductive MicroTight Union in a pressure driven ion preconcentration application see: "Self-Sealed Vertical Polymeric Nanoporous Junctions for High Throughput Nanofluidic Applications."

Sun Jae Kim and Jong Yoon Han. Analytical Chem. 2008, 80: 3507-3511.

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	MICROTIGHT UNIONS						
★	**P-720**	PEEK True ZDV Union for MicroTight Sleeves	6-32 Coned	(2) F-125, (1) P-553	N/A	N/A	4,000 psi (276 bar)
★	**P-771**	PEEK True ZDV Union for 1/32" OD Tubing	6-32 Coned	(2) F-126S, (1) P-553	N/A	N/A	5,000 psi (345 bar)
★	**P-772**	PEEK Union for 360 µm OD Tubing	5/16-24 Coned	(2) F-152, (2) P-416BLK	0.006" (0.150 mm)	5 nL	5,000 psi (345 bar)
	P-874	PEEK MicroElbow for MicroTight Sleeves	5/16-24 Coned	(2) F-172, (2) P-416	0.006" (0.150 mm)	20 nL	4,000 psi (276 bar)
	REPLACEMENT GAUGE PLUGS (TO ACHIEVE TRUE ZDV CONNECTIONS WITH OUR P-720 AND P-771 UNIONS)						
	P-553	Gauge Plug, Delrin®	6-32 Coned	N/A	N/A	N/A	N/A
	CONDUCTIVE MICROTIGHT UNIONS						
	M-572	Conductive Union for 360 µm OD Tubing, PEEK/SST	5/16-24 Coned	(2) F-152, (2) P-416BLK, (1) M-128NF	0.011" (0.279 mm)	16 nL	5,000 psi (345 bar)
	INSULATING MOUNTING BRACKET						
	M-447	Insulating Mounting Bracket	N/A	N/A	N/A	N/A	N/A

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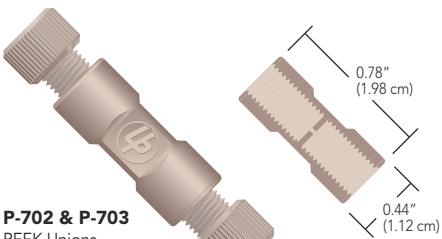
Low Pressure Unions

- Manufactured from PEEK, ETFE, Delrin®, polypropylene, or PCTFE
- Available with 1/4-28, M6, or 10-32 flat-bottom threads

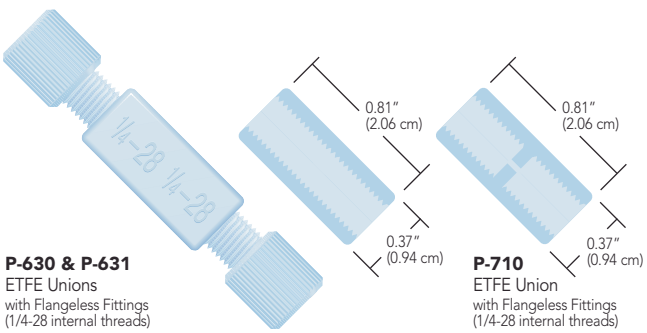
Upchurch Scientific® Low Pressure Unions are available in a variety of polymers, providing several low-cost and chemically-resistant options. The union assemblies below include fittings as shown in the table. The unions in the right column do not include fittings, allowing for customizing the fitting selection. In some cases, a union can be configured to connect two different tubing sizes—for example, if 1/4-28 Flangeless fittings for 1/16" and 1/8" OD tubing were selected from pages 25 and 26 they can be used with the P-603 union to connect the two different tubing sizes.

Low Pressure PEEK Union Assemblies



P-702 & P-703
PEEK Unions
with Flangeless Fittings
(1/4-28 internal threads)

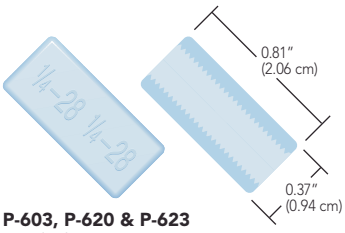
Low Pressure ETFE Union Assemblies



P-630 & P-631
ETFE Unions
with Flangeless Fittings
(1/4-28 internal threads)

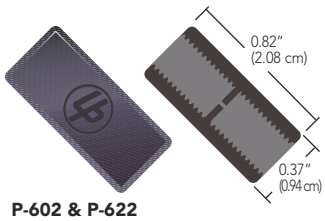
P-710
ETFE Union
with Flangeless Fittings
(1/4-28 internal threads)

Low Pressure Standard Unions



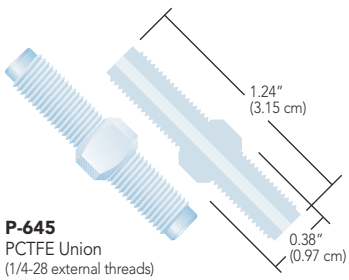
P-603, P-620 & P-623
Standard Unions
(1/4-28 internal threads)

Low Pressure Metric Unions



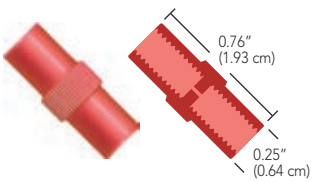
P-602 & P-622
Metric Unions
(M6 internal threads)

Low Pressure Male Union



P-645
PCTFE Union
(1/4-28 external threads)

VacuTight™ Union



P-845-01
PEEK Union
(10-32 internal threads)

Biocompatible

RELATED PRODUCTS

- To use connectors in higher pressure applications, simply replace the provided fittings with Super Flangeless™ Nuts and Ferrules, found on pages 21–23.
- Use any of the 10-32 flat-bottom fittings on page 21 and 28 to make an inline connection with our VacuTight Union. This product is designed for use with 1/16" OD tubing.

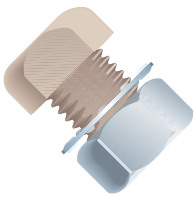
	Part No.	Description	Color	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	PEEK UNION ASSEMBLIES							
★	**P-702**	PEEK Union for 1/16" OD Tubing	Natural	1/4-28 FB	(2) XP-235	0.020" (0.50 mm)	0.41 µL	1,000 psi (69 bar)
★	**P-703**	PEEK Union for 1/8" OD Tubing	Natural	1/4-28 FB	(2) XP-335	0.050" (1.25 mm)	2.57 µL	1,000 psi (69 bar)
	ETFE UNION ASSEMBLIES							
	P-630	ETFE True ZDV Union for 1/16" OD Tubing	Natural	1/4-28 FB	(2) P-200N/P-245	N/A	N/A	1,000 psi (69 bar)
	P-631	ETFE True ZDV Union for 1/8" OD Tubing	Natural	1/4-28 FB	(2) P-300N/P-345	N/A	N/A	1,000 psi (69 bar)
	P-710	ETFE Union for 1/16" OD Tubing	Natural	1/4-28 FB	(2) XP-245	0.030" (0.75 mm)	0.93 µL	1,000 psi (69 bar)
	STANDARD UNIONS							
★	**P-603**	Delrin True ZDV Standard Union	Natural	1/4-28 FB	N/A	N/A	N/A	N/A*
★	**P-620**	Polypropylene True ZDV Standard Union	Natural	1/4-28 FB	N/A	N/A	N/A	N/A*
★	**P-623**	ETFE True ZDV Standard Union	Natural	1/4-28 FB	N/A	N/A	N/A	N/A*
	METRIC UNIONS							
	P-602	Delrin Metric Union	Black	M6 FB	N/A	0.020" (0.50 mm)	0.41 µL	N/A*
	P-622	ETFE Metric Union	Blue	M6 FB	N/A	0.020" (0.50 mm)	0.41 µL	N/A*
	MALE UNION							
★	**P-645**	PCTFE Male Union	Natural	1/4-28 FB	N/A	0.062" (1.60 mm)	61.3 µL	500 psi (34 bar)
	VACUTIGHT UNION							
	P-845-01	PEEK Union for 1/16" OD Tubing	Red	10-32 FB	N/A	0.020" (0.50 mm)	0.20 µL	N/A*

** Pressure Rating depends on Fittings selected. See pressure rating for fittings on appropriate page.*
FB = Flat-Bottom

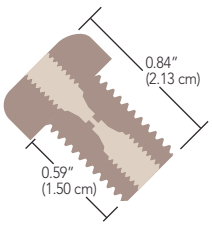
Bulkhead Unions

- Designed for plumbing tubing through equipment housing
- For use with standard 10-32 coned or 1/4-28 flat-bottom threaded fittings

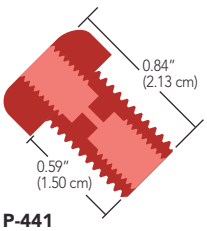
Thread Upchurch Scientific® PEEK Bulkhead Unions directly through your equipment housing to connect internal tubing to the outside. Each union has unique 3/8-24 external threads and comes complete with a stainless steel nut and lock washer to hold it in place. Requires a 3/8" hole to mount. The recommended torque limit for these unions is 15 in.– lbs (1.7 N·m).



Bulkhead Union
includes stainless steel nut/lock washer



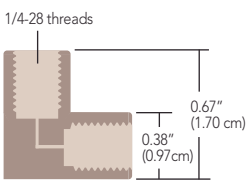
P-440
10-32 internal threads



P-441
1/4-28 internal threads

Elbow Connectors

Use these Elbow Connectors to easily navigate tight corners. One Elbow is designed for use with 1/16" OD tubing and has a 0.020" (0.50 mm) thru-hole. Use 1/8" OD tubing with the other Elbow, which has a 0.062" (1.6 mm) thru-hole. Both come complete with 1/4-28 PEEK nuts and ETFE ferrules, and are pressure rated to 1,000 psi (69 bar).

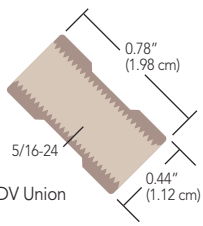


P-430
PEEK Elbow
comes with Flangeless Fittings

Large Bore Union

- 5/16-24 flat-bottom threads

Use any of the 5/16-24 fittings on page 55 and the appropriate ferrule to create a true zero dead volume (ZDV) connection with the P-134 Union.



P-134
PEEK ZDV Union

RELATED PRODUCTS

- Stainless Steel Bulkhead Unions are also available. Please contact us for more information.
- To use Elbows in higher pressure applications, simply replace the provided fittings with Super Flangeless™ Nuts and Ferrules, found on pages 21–23.

	Part No.	Description	Threads	Color	Includes	Thru-hole	Swept Volume
	BULKHEAD UNIONS						
★	**P-440**	PEEK Bulkhead Union	10-32 Coned	Natural	(1) SST Nut/Washer	0.020" (0.50 mm)	1.9 µL
★	**P-441**	PEEK Bulkhead Union	1/4-28 Flat-Bottom	Red	(1) SST Nut/Washer	0.040" (1.00 mm)	2.9 µL
★	**P-441N**	PEEK Bulkhead Union	1/4-28 Flat-Bottom	Natural	(1) SST Nut/Washer	0.040" (1.00 mm)	2.9 µL
	ELBOW CONNECTORS						
	P-430	PEEK Elbow for 1/16" OD Tubing	1/4-28 Flat-Bottom	Natural	(2) XP-235	0.020" (0.50 mm)	1.4 µL
	P-432	PEEK Elbow for 1/8" OD Tubing	1/4-28 Flat-Bottom	Natural	(2) XP-335	0.062" (1.60 mm)	13.6 µL
	LARGE BORE UNION						
	P-134	PEEK True ZDV Union	5/16-24 Flat-Bottom	Natural	N/A	N/A	N/A

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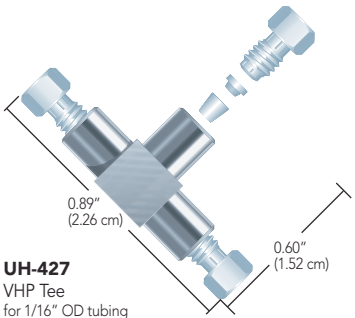
VHP Tee for 1/16" OD Tubing

IDEX Health & Science offers this Very High Pressure (VHP) Tee Connector, designed to bring three pieces of tubing together. The all-316 stainless steel connector is designed for 1/16" OD tubing and is pressure rated to 30,000 psi (2,070 bar).



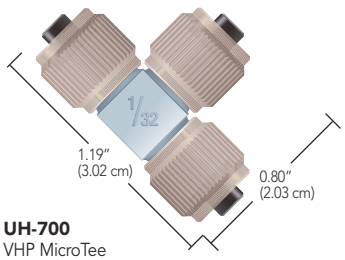
UH-427
VHP Tee
for 1/16" OD tubing
with fittings included

VHP Tees & Crosses for Capillary Tubing

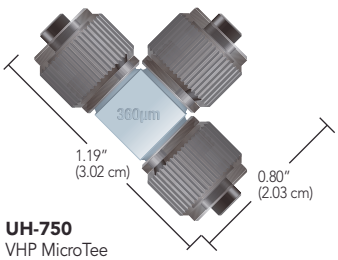
- Direct-connect either 360 µm or 1/32" OD tubing — no sleeves required!
- Available in both tee and cross configurations
- Pressure rated to 15,000 psi (1,034 bar)

To help facilitate multi-port connections in UHPLC applications, Upchurch Scientific® has developed a line of MicroTees and MicroCrosses, manufactured from stainless steel and featuring small thru-holes and very low internal volume. Additionally, the stainless steel construction allows these products to be used in applications where electrical conductivity is desired.

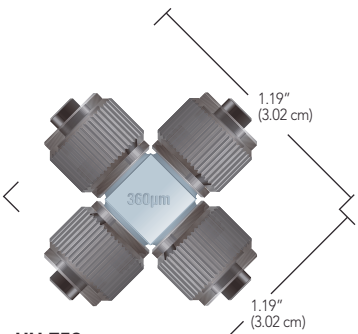
Included with the MicroTees and MicroCrosses are the VHP MicroFerrules found on page 9. The P-278 Extender Tool on page 33 can be used to tighten the female nuts that are included with these connectors.



UH-700
VHP MicroTee
for 1/32" OD tubing
with fittings included



UH-750
VHP MicroTee
for 360 µm OD tubing
with fittings included



UH-752
VHP MicroCross
for 360 µm OD tubing
with fittings included

APPLICATION NOTE

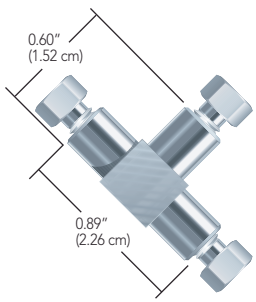
Why 1/32" OD Tubing and 360 µm OD Tubing?

IDEX Health & Science has focused strongly on the development of a variety of connectors and accessories for 1/32" OD tubing and 360 µm OD tubing. We have focused on these specific sizes due to their overwhelming popularity in analytical instruments, especially where micro and nano-scale analyses are being performed. By creating products designed for these popular sizes, the overall connection is easier to make and generally holds to increased pressures over connections where tubing sleeves are involved.

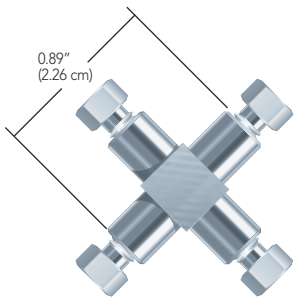
	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	VHP TEE FOR 1/16" OD TUBING						
	UH-427	VHP Tee for 1/16" OD Tubing, SST	10-32 Coned	(3) VHP-200	0.020" (0.50 mm)	0.57 µL	30,000 psi (2,070 bar)
	VHP TEES & CROSSES FOR CAPILLARY TUBING						
★	**UH-700**	VHP MicroTee for 1/32" OD Tubing, PEEK/SST	5/16-24 Coned	(3) PK-112, (3) P-416	0.010" (0.25 mm)	84 nL	15,000 psi (1,034 bar)
	UH-750	VHP MicroTee for 360 µm OD Tubing, PEEK/SST	5/16-24 Coned	(3) PK-152, (3) P-416BLK	0.010" (0.25 mm)	84 nL	15,000 psi (1,034 bar)
	UH-752	VHP MicroCross for 360 µm OD Tubing, PEEK/SST	5/16-24 Coned	(4) PK-152, (4) P-416BLK	0.010" (0.25 mm)	101 nL	15,000 psi (1,034 bar)

Stainless Steel Tees & Crosses

These 316 stainless steel connectors come complete with 10-32 stainless steel fittings for use with 1/16" OD tubing and are rated to 20,000 psi (1,380 bar). They are compatible with any 10-32 coned threaded fittings.



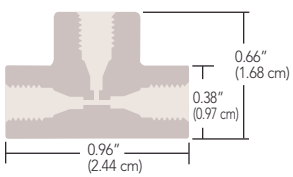
U-428 Stainless Steel Tee
0.020" thru-hole
with U-400 and U-401 Fittings



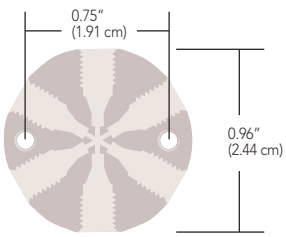
U-430 Stainless Steel Cross
0.020" thru-hole
with U-400 and U-401 Fittings

PEEK 7-Port Manifold

Combine several streams into one or split one fluid stream into several. This PEEK 7-Port Manifold comes complete with F-331 Fingertight Fittings for 1/16" OD tubing and offers a pressure rating of 5,000 psi (345 bar). Seal unused ports with any of our polymer 10-32 coned plugs on page 32.



Side View

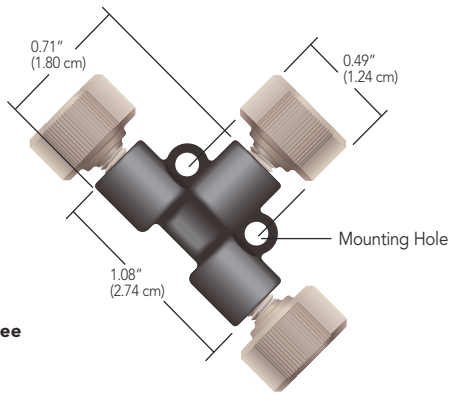


Top View

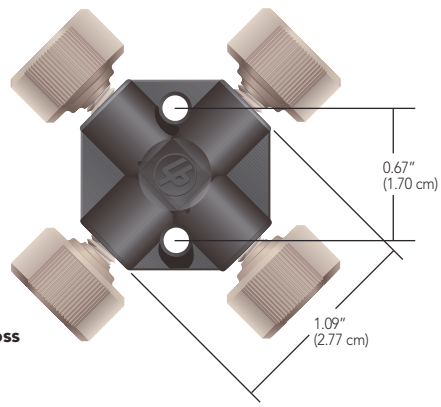
P-170
PEEK 7-Port Manifold
0.020" thru-holes
with F-331 Fittings

PEEK Tees & Crosses

Our PEEK Tees and Crosses include high pressure F-300 PEEK Fingertight Fittings — allowing maximum operating pressures to 3,500 psi (241 bar) when used with 1/16" OD PEEK or stainless steel tubing.



P-727 PEEK Tee
0.020" thru-hole
with F-300 Fittings



P-729 PEEK Cross
0.020" thru-hole
with F-300 Fittings

Biocompatible

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	VHP TEE FOR 1/16" OD TUBING						
★	**U-428**	Stainless Steel Tee for 1/16" OD Tubing	10-32 Coned	(3) U-400, (3) U-401	0.020" (0.50 mm)	0.57 µL	20,000 psi (1,380 bar)
★	**U-429**	Stainless Steel Tee for 1/16" OD Tubing	10-32 Coned	(3) U-400, (3) U-401	0.040" (1.00 mm)	2.1 µL	20,000 psi (1,380 bar)
	U-430	Stainless Steel Cross for 1/16" OD Tubing	10-32 Coned	(4) U-400, (4) U-401	0.020" (0.50 mm)	0.72 µL	20,000 psi (1,380 bar)
★	**U-431**	Stainless Steel Cross for 1/16" OD tubing	10-32 Coned	(4) U-400, (4) U-401	0.040" (1.00 mm)	2.5 µL	20,000 psi (1,380 bar)
	PEEK MANIFOLD						
	P-170	PEEK 7-Port Manifold for 1/16" OD Tubing	10-32 Coned	(7) F-331	0.020" (0.50 mm)	2.2 µL	5,000 psi (345 bar)
	PEEK TEES AND CROSSES						
★	**P-727**	PEEK Tee for 1/16" OD Tubing	10-32 Coned	(3) F-300	0.020" (0.50 mm)	0.57 µL	3,500 psi (241 bar)
	P-728	PEEK Tee for 1/16" OD Tubing	10-32 Coned	(3) F-300	0.050" (1.25 mm)	3.0 µL	3,500 psi (241 bar)
	P-729	PEEK Cross for 1/16" OD Tubing	10-32 Coned	(4) F-300	0.020" (0.50 mm)	0.72 µL	3,500 psi (241 bar)

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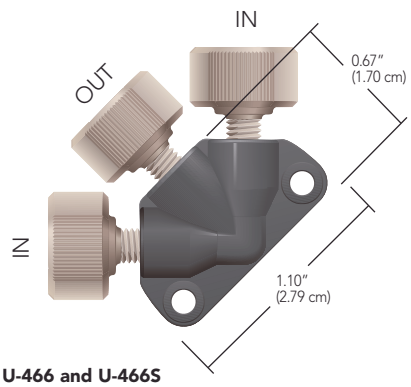
Static Mixing Tees

- PEEK body with two-piece fingertight fittings
- Low swept volume

Upchurch Scientific® Static Mixing Tees are ideal for microbore or analytical gradient HPLC. They have a low swept volume of 2.2 µL (includes frit volume) and are designed for flow rates of 0.5 to 3 mL/min and a maximum pressure of 5,000 psi (345 bar). The back pressure caused by the tee is typically only 10 to 20 psi (0.7 to 1.4 bar) at these flow rates. The thru-holes are 0.020" (0.50 mm) and the center port features a 10 µm UHMWPE or stainless steel frit that aids mixing.

NOTE

- Turbulent mixing of solvents often increases outgassing. To maintain a bubble-free fluid pathway, we recommend solvent degassing when using this product.
- The frit incorporated into our U-466 and U-466S Static Mixing Tees is not replaceable. If it becomes clogged, the Mixing Tee must be replaced.

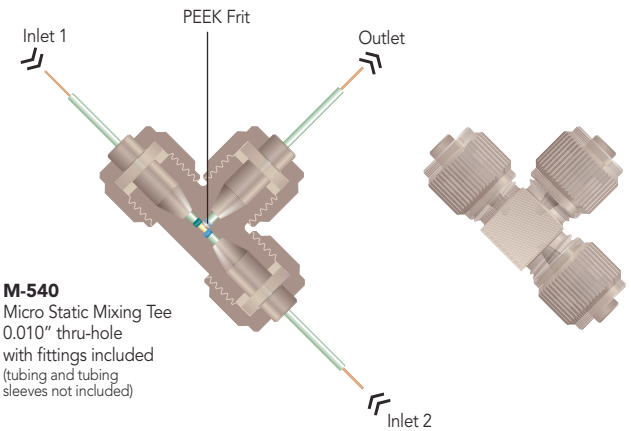


U-466 and U-466S Static Mixing Tees
with F-300 Fingertight Fittings for 1/16" OD tubing

Micro Static Mixing Tee

- Constructed of inert PEEK and PCTFE
- Low swept volume of 0.95 µL
- Designed for flow rates of 20–250 µL/min

The Upchurch Scientific® Micro Static Mixing Tee utilizes a specifically engineered internal geometry to efficiently mix two fluid streams into one combined stream. The center port also features a 0.5 µm porosity PEEK polymer frit to aid in mixing. This frit adds a maximum of 20 psi (1.4 bar) back pressure to most systems (within the stated flow rate range). The Mixing Tee handles a maximum pressure of 5,000 psi (345 bar) when directly connecting 1/16" OD tubing, or up to 4,000 psi (276 bar) with capillary tubing when using our NanoTight™ Fittings and Tubing Sleeves (pages 17 and 19).



M-540
Micro Static Mixing Tee
0.010" thru-hole
with fittings included
(tubing and tubing sleeves not included)

RELATED PRODUCTS

- See the Systec® Vacuum Degassing Systems on pages 178.
- Our standard Static Mixing Tees are designed for flow rates from 0.5 mL/min to 3 mL/min.

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	STATIC MIXING TEE						
	U-466	PEEK Static Mixing Tee for 1/16" OD Tubing, 10 µm UHMWPE Frit	10-32 Coned	(3) F-300	0.020" (0.50 mm)	2.2 µL	5,000 psi (345 bar)
★	**U-466S**	PEEK Static Mixing Tee for 1/16" OD Tubing, 10 µm SST Frit	10-32 Coned	(3) F-300	0.020" (0.50 mm)	2.2 µL	5,000 psi (345 bar)
	MICRO STATIC MIXING TEE						
★	**M-540**	PEEK Micro Static Mixing Tee, for 1/16" OD Tubing	5/16-24 Coned	(3) F-132/P-416	0.010" (0.250 mm)	0.95 µL	5,000 psi (345 bar)

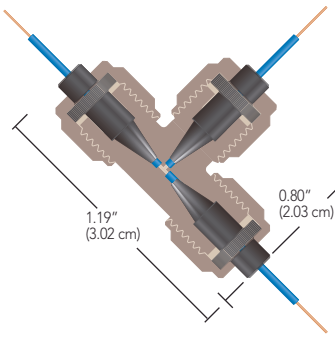
MicroTee & Cross for Capillary Tubing

- Direct connect 1/16", 1/32", 360 µm OD tubing, plus other capillary tubing
- Low swept volume

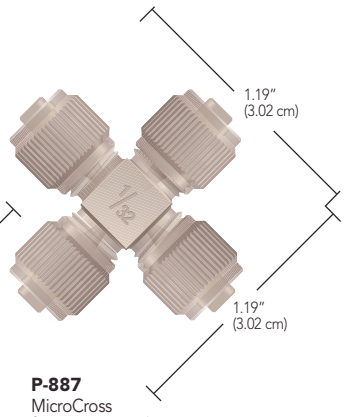
Use Upchurch Scientific® MicroTees and MicroCrosses to join capillary tubing. All of these products are made entirely of PEEK and have 0.006" (0.150 mm) thru-holes, with resulting swept volumes ranging from 29 to 81 nL.

NOTE

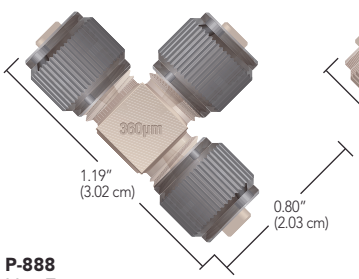
- Use only the ferrules supplied with each connector — they are not interchangeable. Replacement ferrules and female nuts are available on page 18. For MicroUnions, MicroTees, and MicroCrosses for UHPLC applications, see page 42.



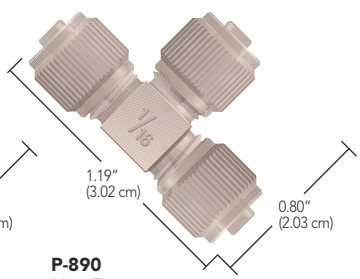
P-775
MicroTee for MicroTight® Tubing Sleeves
0.006" thru-holes
with fittings included
(tubing sleeves not included)



P-887
MicroCross
for 1/32" OD tubing
0.006" thru-holes
with fittings included



P-888
MicroTee
for 360 µm OD tubing
0.006" thru-holes
with fittings included



P-890
MicroTee
for 1/16" OD tubing
0.006" thru-holes
with fittings included

Biocompatible

APPLICATION NOTE

Several researchers use our PEEK MicroTee to introduce ionizing voltage to their fluid stream just prior to a Mass Spectrometer[1]. MicroTees are well suited for this application due to advantageous internal geometry and PEEK polymer's electrical resistance. The materials required for this setup are as follows: one gold or platinum conducting wire, one P-775 or P-875 MicroTee (this page), one MicroTight Tubing Sleeve (page 19) for the conducting wire (as needed to accommodate wire diameter), and at least two more MicroTight Tubing Sleeves (page 19) to connect your capillary tubing.

To set up a similar connection, first thread your wire through the appropriate tubing sleeve, if necessary, with the wire extending beyond both ends of the sleeve. Slip the female nut included with the MicroTee over the wire or sleeved wire, followed by the ferrule — ensuring the wire (and its sleeve) extends well past the end of the ferrule tip. Align the tip of the wire with the thru-hole of the MicroTee and gently insert the wire until it bottoms out. Now finger tighten the female nut into place. Attach your flow path tubing to the MicroTee's two other available ports, following the instructions provided with the MicroTee.

Begin fluid flow through the tee and apply voltage to the conducting wire lead. This setup typically provides effective electrospray ionization in applications having a flow rate of 100 µL/min or greater.

[1] *One such paper describing pioneering electrospray work:* ***Protein Identification at the Low Femtomole Level from Silver-Stained Gels Using a New Fritless Electrospray Interface for Liquid Chromatography-Microspray and Nanospray Mass Spectrometry.*** *Christine L. Gatlin, Gerd R. Kleemann, Lara G. Hays, Andrew J. Link, John R. Yates III (1998) Analytical Biochemistry 263, 93-101.*

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	MICROTEE, MICROCROSS AND MICROELBOW						
★	P-775	PEEK MicroTee for MicroTight Sleeves	5/16-24 Coned	(3) F-172, (3) P-416	0.006" (0.150 mm)	29 nL	4,000 psi (276 bar)
★	P-777	PEEK MicroCross for MicroTight Sleeves	5/16-24 Coned	(4) F-172, (4) P-416	0.006" (0.150 mm)	38 nL	4,000 psi (276 bar)
	P-875	PEEK MicroTee with Mounting Hole, for MicroTight Sleeves	5/16-24 Coned	(3) F-172, (3) P-416	0.006" (0.150 mm)	29 nL	4,000 psi (276 bar)
★	P-885	PEEK MicroTee for 1/32" OD Tubing	5/16-24 Coned	(3) F-112, (3) P-416	0.006" (0.150 mm)	29 nL	5,000 psi (345 bar)
	P-887	PEEK MicroCross for 1/32" OD Tubing	5/16-24 Coned	(4) F-112, (4) P-416	0.006" (0.150 mm)	38 nL	5,000 psi (345 bar)
★	P-888	PEEK MicroTee for 360 µm OD Tubing	5/16-24 Coned	(3) F-152, (3) P-416BLK	0.006" (0.150 mm)	29 nL	5,000 psi (345 bar)
	P-889	PEEK MicroCross for 360 µm OD Tubing	5/16-24 Coned	(4) F-152, (4) P-416BLK	0.006" (0.150 mm)	38 nL	5,000 psi (345 bar)
★	P-890	PEEK MicroTee for 1/16" OD Tubing	5/16-24 Coned	(3) F-132, (3) P-416	0.006" (0.150 mm)	58 nL	5,000 psi (345 bar)
	P-891	PEEK MicroCross for 1/16" OD Tubing	5/16-24 Coned	(4) F-132, (4) P-416	0.006" (0.150 mm)	81 nL	5,000 psi (345 bar)

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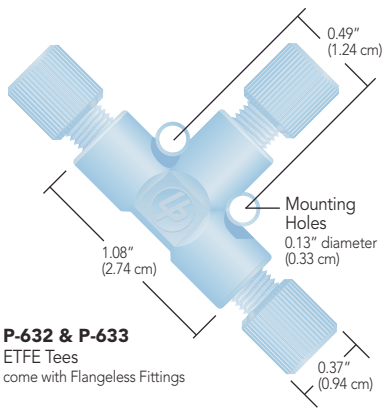
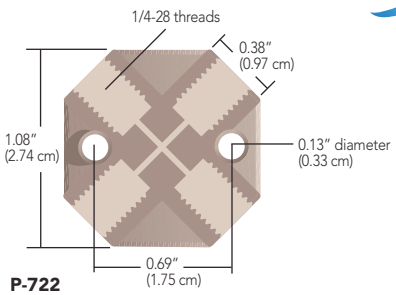
Low Pressure Tees & Crosses

Upchurch Scientific® Low Pressure Tees and Crosses manufactured by IDEX Health & Science are available in two inert polymers and can handle pressures to 500 psi (34 bar) or 1,000 psi (69 bar), depending upon the configuration of the products. Each is designed with handy mounting holes. All ETFE Tees and Crosses ship complete with 1/4-28 PFA Flangeless nuts and ETFE ferrules, while their PEEK polymer counterparts ship with 1/4-28 PEEK nuts and ETFE ferrules. Replacement fittings are located on pages 25 and 26.



P-632 & P-633
ETFE Tees
come with Flangeless Fittings

Biocompatible



P-722
PEEK Cross
comes with Flangeless Fittings

NOTE

- To order just the body of one of our tees and crosses without fittings, simply add a '-01' to the part number — e.g., P-632-01.

RELATED PRODUCTS

- Seal off unused ports with any of our 1/4–28 flat-bottom plugs found on page 32.
- To use the PEEK polymer versions of our Tees and Crosses in higher pressure applications, simply replace the provided fittings with Super Flangeless™ Nuts and Ferrules, found on pages 21–23.
- High Pressure Tees, Crosses, and a 7-Port Manifold (all with 10-32 threaded ports) are on page 43.

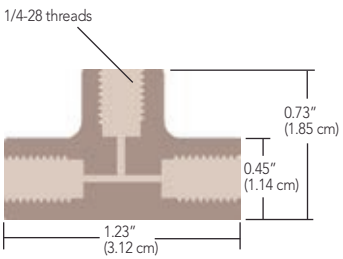
	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	LOW PRESSURE TEES AND CROSSES						
★	P-632	ETFE Tee for 1/16" OD Tubing	1/4-28 Flat-Bottom	(3) P-245, (3) P-200N	0.020" (0.50 mm)	2.9 µL	1,000 psi (69 bar)
★	P-633	ETFE Tee for 1/8" OD Tubing	1/4-28 Flat-Bottom	(3) P-345, (3) P-300N	0.050" (1.25 mm)	17.5 µL	500 psi (34 bar)
	P-634	ETFE Cross for 1/16" OD Tubing	1/4-28 Flat-Bottom	(4) P-245, (4) P-200N	0.020" (0.50 mm)	3.8 µL	1,000 psi (69 bar)
	P-635	ETFE Cross for 1/8" OD Tubing	1/4-28 Flat-Bottom	(4) P-345, (4) P-300N	0.050" (1.25 mm)	22.8 µL	500 psi (34 bar)
★	P-712	PEEK Tee for 1/16" OD Tubing	1/4-28 Flat-Bottom	(3) XP-235	0.020" (0.50 mm)	2.9 µL	1,000 psi (69 bar)
★	P-713	PEEK Tee for 1/8" OD Tubing	1/4-28 Flat-Bottom	(3) XP-335	0.050" (1.25 mm)	17.5 µL	500 psi (34 bar)
★	P-714	PEEK Tee for 1/16" OD Tubing	1/4-28 Flat-Bottom	(3) XP-235	0.040" (1.00 mm)	11.4 µL	1,000 psi (69 bar)
	P-722	PEEK Cross for 1/16" OD Tubing	1/4-28 Flat-Bottom	(4) XP-235	0.020" (0.50 mm)	3.8 µL	1,000 psi (69 bar)
	P-723	PEEK Cross for 1/8" OD Tubing	1/4-28 Flat-Bottom	(4) XP-335	0.050" (1.25 mm)	22.8 µL	500 psi (34 bar)

Manifolds

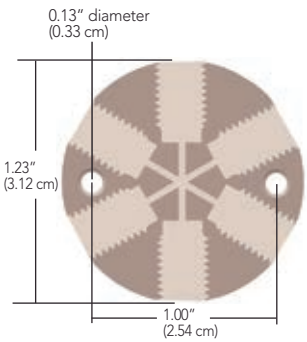
Choose a 5, 7, or 9 Port Manifold to combine several streams into one, or split one fluid stream into several. Each PEEK manifold comes complete with 1/4-28 Super Flangeless™ Fittings for either 1/16" or 1/8" OD tubing, with pressure ratings of 2,000 psi (138 bar) and 500 psi (34 bar), respectively.

A few useful applications include:

- Multiport mixing chamber
- Gas sparging splitting union
- Sample injection onto multi-well plates or a multiple direction flow path union



Side View



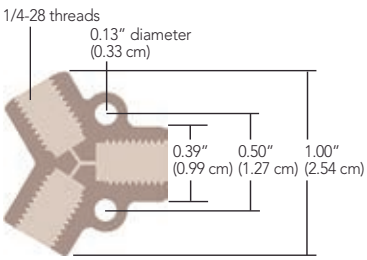
Top View

P-150
PEEK 7-Port Manifold
comes with Super Flangeless Fittings

Y Connectors

Upchurch Scientific® PEEK Y Connectors are designed to split a stream or join two streams together, just like a tee. However, the configuration of a tee can lead to turbulent flow and solvent outgassing, which increases baseline noise and reduces sensitivity. The geometry of a Y connector creates less turbulence and thus can improve analytical results.

All of these Y Connectors use 1/4-28 Flangeless fittings, except P-515 which uses 5/16-24 fittings (to accommodate larger tubing).



P-512
PEEK Y
comes with Flangeless Fittings

Biocompatible

	Part No.	Description	Threads	Includes	Thru-hole	Swept Volume	Pressure Rating
	MANIFOLDS						
	Standard						
★	**P-150**	PEEK 7-Port Manifold for 1/16" OD Tubing	1/4-28 FB	(7) P-255, (7) P-250	0.040" (1.00 mm)	42.0 µL	1,000 psi (69 bar)
	P-154	PEEK 5-Port Manifold for 1/16" OD Tubing	1/4-28 FB	(5) P-255, (5) P-250	0.040" (1.00 mm)	22.3 µL	1,000 psi (69 bar)
	P-155	PEEK 5-Port Manifold for 1/8" OD Tubing	1/4-28 FB	(5) P-331, (5) P-359	0.062" (1.60 mm)	53.8 µL	500 psi (34 bar)
★	**P-190**	PEEK 9-Port Manifold for 1/8" OD Tubing	1/4-28 FB	(9) P-331, (9) P-359	0.062" (1.60 mm)	160 µL	500 psi (34 bar)
	P-191	PEEK 9-Port Manifold for 1/16" OD Tubing	1/4-28 FB	(9) P-255, (9) P-250	0.040" (1.00 mm)	139 µL	1,000 psi (69 bar)
	Y CONNECTORS						
★	**P-512**	PEEK Y for 1/16" OD Tubing	1/4-28 FB	(3) XP-235	0.020" (0.50 mm)	1.7 µL	1,000 psi (69 bar)
	P-513	PEEK Y for 1/8" OD Tubing	1/4-28 FB	(3) XP-335	0.040" (1.00 mm)	6.0 µL	500 psi (34 bar)
★	**P-514**	PEEK Y for 1/8" OD Tubing	1/4-28 FB	(3) XP-335	0.060" (1.50 mm)	13.6 µL	500 psi (34 bar)
	P-515	PEEK Y for 3/16" OD Tubing	5/16-24 FB	(3) XP-132	0.125" (3.20 mm)	47.7 µL	500 psi (34 bar)

FB = Flat-Bottom

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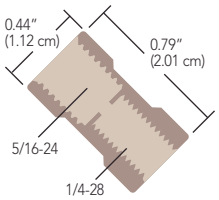
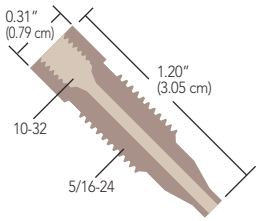
Threaded Adapters

- Threaded adapters in a variety of configurations
- Both English and Metric threaded adapters offered
- Bring together connectors with different threads
- Manufactured from inert polymers — PEEK, PCTFE, ETFE, and PTFE

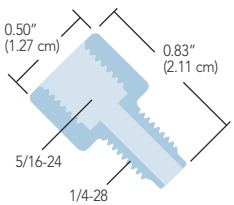
English Threaded Adapters



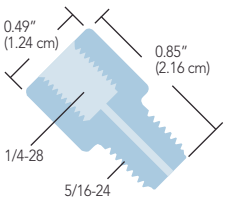
P-135
0.080" (2.05 mm) thru-hole



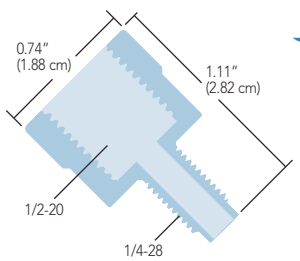
6000-076
0.066" (1.70 mm) thru-hole



P-681
0.125" (3.20 mm) thru-hole

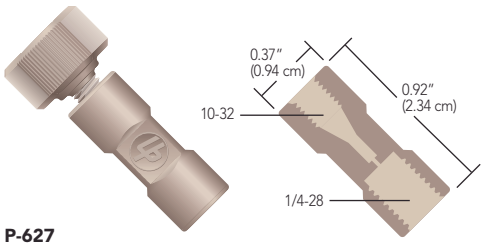


P-718
0.040" (1.00 mm) thru-hole

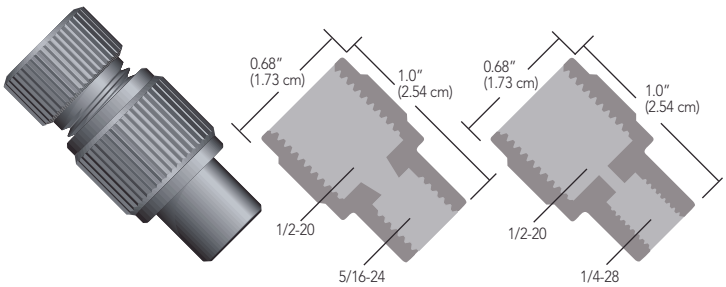


P-684
0.130" (3.30 mm) thru-hole

Biocompatible



P-627
0.020" (0.50 mm) thru-hole
Includes (1) F-300 for 1/16" OD tubing



U-659
Tapered thru-hole
Includes (1) U-650/U-655 for 1/4" OD tubing

U-665
0.063" (1.60 mm) thru-hole
Includes (1) U-650/U-655 for 1/4" OD tubing

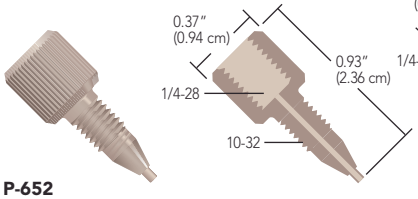
RELATED PRODUCTS

- Please refer to our Connections Reference Chart on page 35 for assistance with choosing the right product for your needs.
- Use the Rheodyne® 6000-076 Adapter to connect 1/16" OD tubing to the Rheodyne Preparative-Scale Injector Valve (page 132).

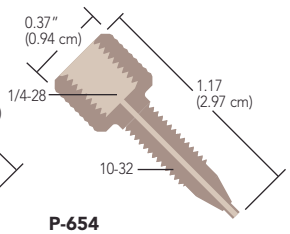
	Part No.	Description	Includes	Thru-hole	Swept Volume	Pressure Rating
	ENGLISH THREADED ADAPTERS					
	6000-076	PEEK Adapter, 5/16-24 C, M to 10-32 C, F	N/A	0.066" (1.70 mm)	49.8 µL	3,000 psi (207 bar)
	P-135	PEEK Adapter, 5/16-24 FB, F to 1/4-28 F	N/A	0.080" (2.05 mm)	4.1 µL	1,000 psi (69 bar)
★	**P-627**	PEEK Adapter, 10-32 C, F to 1/4-28 FB, F	(1) F-300	0.020" (0.50 mm)	0.30 µL	1,000 psi (69 bar)
★	**P-681**	PCTFE Adapter, 5/16-24 FB, F to 1/4-28 FB, M	N/A	0.125" (3.20 mm)	96.6 µL	1,000 psi (69 bar)
	P-684	PCTFE Adapter, 1/2-20 FB, F to 1/4-28 FB, M	N/A	0.130" (3.30 mm)	121.7 µL	250 psi (17 bar)
	P-718	PCTFE Adapter, 5/16-24 FB, M to 1/4-28 FB, F	N/A	0.040" (1.00 mm)	10.3 µL	1,000 psi (69 bar)
	U-659	PEEK Adapter, 5/16-24 FB, F to 1/2-20 FB, F	(1) XU-655	Tapered*	42.0 µL	250 psi (17 bar)
	U-665	PEEK Adapter, 1/2-20 FB, F to 1/4-28 FB, F	(1) XU-655	0.063" (1.60 mm)	6.6 µL	250 psi (17 bar)

F = Female (internal) threads; M = Male (external) threads; C = Coned; FB = Flat-Bottom
** Thru-hole tapers from 0.188" (4.80 mm) to 0.125" (3.20 mm).*

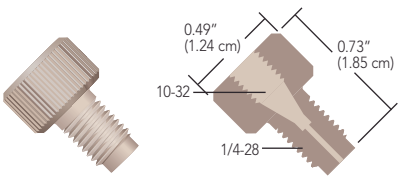
English Threaded Adapters, cont.



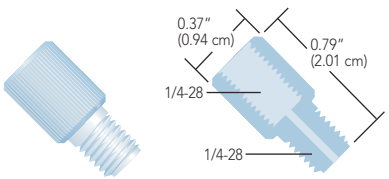
P-652
0.030" (0.75 mm) thru-hole
Note the new knurled design



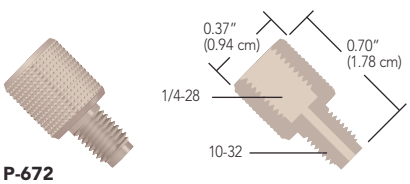
P-654
Extra Long, 0.030"
(0.76 mm) thru-hole



P-669-01
0.040" (1.00 mm) thru-hole



P-671
0.040" (1.00 mm) thru-hole



P-672
0.050" (1.25 mm) thru-hole

Biocompatible

APPLICATION NOTE

Here are application ideas using two of our popular adapters:

- Many injection valves used in HPLC systems have 10-32 coned ports designed to accept 1/16" OD tubing. However, this may be a problem if large injection volumes are required (in excess of 10 mL). The most popular loops for large volume samples are made from 1/8" OD tubing, making it impossible to connect these larger volume loops to your injection valve. The solution: use our P-654 Adapter and the appropriate fittings for your sample loop. This set-up allows connection of 1/8" OD sample loop leads to your injection valve.
- Another potential application is connecting tubing to low-pressure solenoid valves with 1/4-28 flat-bottom ports. Most low-pressure valves of this type have very shallow threaded ports, which typically preclude the use of our Flangeless Fittings. However, by first threading our P-671 Adapter into the valve port(s), you can effectively use standard 1/4-28 fittings to connect your tubing into the backside of the adapter body. This also saves "wear and tear" on the threads in the valve ports.

NOTE

- When using an adapter with male (external) threads, we recommend you first attach the adapter body into the receiving port, and then connect your tubing and fitting into the head of the adapter body.

RELATED PRODUCTS

- You may not need an adapter to connect 1/16" OD tubing into your flat-bottom port. A less expensive alternative is to use a Flangeless Nut and Ferrule starting on page 24 or a Super Flangeless™ Nut and Ferrule starting on page 21. Our Connections Reference chart on page 35 is also a good resource to consult when making connections.

	Part No.	Description	Includes	Thru-hole	Swept Volume	Pressure Rating
	ENGLISH THREADED ADAPTERS					
★	**P-652**	PEEK Adapter, 1/4-28 FB, F to 10-32 C, M	N/A	0.030" (0.75 mm)	6.7 µL	1,000 psi (69 bar)
★	**P-654**	PEEK Adapter, 1/4-28 FB, F to 10-32 C, M, Extra Long	N/A	0.030" (0.75 mm)	9.5 µL	1,000 psi (69 bar)
★	**P-669-01**	PEEK Adapter, 10-32 C, F to 1/4-28 FB, M	N/A	0.040" (1.00 mm)	6.6 µL	1,000 psi (69 bar)
	P-671	PTFE Adapter, 1/4-28 FB, F to 1/4-28 FB, M	N/A	0.040" (1.00 mm)	8.0 µL	1,000 psi (69 bar)
	P-672	PEEK Adapter, 1/4-28 FB, F to 10-32 FB, M	N/A	0.050" (1.25 mm)	11.4 µL	1,000 psi (69 bar)

F = Female (internal) threads; M = Male (external) threads; XL = extra long; C = Coned; FB = Flat-Bottom
** The pressure ratings of these adapters exceed the pressure holding ability of the fittings and tubing used with them.*

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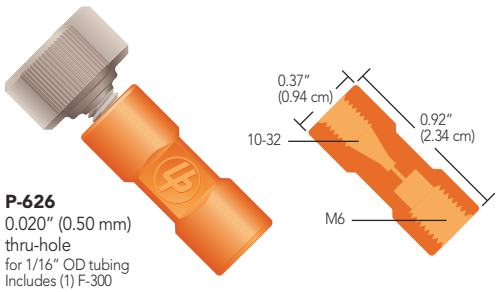
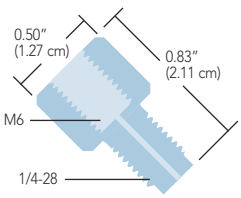
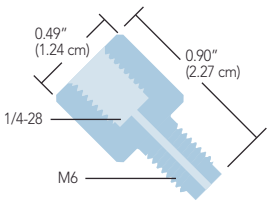
Metric Threaded Adapters



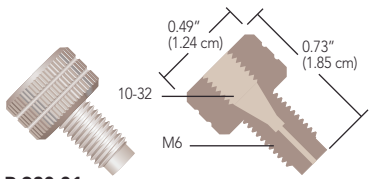
P-626
0.020" (0.50 mm) thru-hole
for 1/16" OD tubing
Includes (1) F-300



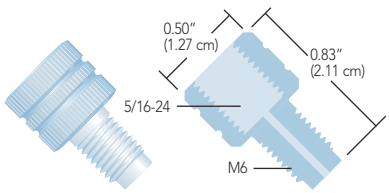
P-670
0.030" (0.75 mm) thru-hole



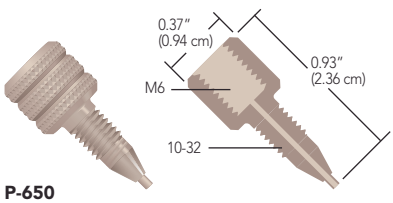
P-694
0.040" (1.00 mm) thru-hole



P-920-01
0.040" (1.00 mm) thru-hole



P-673
0.040" (1.00 mm) thru-hole



P-650
0.030" (0.75 mm) thru-hole

RELATED PRODUCTS

- For an alternative to the Female M6 Adapters presented in the left column of this page, try a P-602 or P-622 Low Pressure Metric Union from page 40, along with the appropriate Metric Flangeless Fittings on page 27.
- To direct connect your tubing into a flat-bottom port, find the appropriate Flangeless or Super Flangeless™ Fittings on pages 24–27 and 21–23 respectively.
- Need metric fittings for your connections? See page 27.

Part No.	Description	Includes	Thru-hole	Swept Volume	Pressure Rating
METRIC M6 THREADED ADAPTERS					
P-626	PEEK Adapter, 10-32 C, F to M6 FB, F	(1) F-300	0.020" (0.50 mm)	0.3 µL	1,000 psi (69 bar)
★ **P-650**	PEEK Adapter, M6 FB, F to 10-32 C, M Standard	N/A	0.030" (0.75 mm)	6.7 µL	1,000 psi (69 bar)
P-670	PCTFE Adapter, M6 FB, F to 1/4-28 FB, M	N/A	0.030" (0.75 mm)	2.6 µL	1,000 psi (69 bar)
P-673	PCTFE Adapter, 5/16-24 FB, F to M6 FB, M	N/A	0.040" (1.00 mm)	9.9 µL	1,000 psi (69 bar)
P-694	PCTFE Adapter, 1/4-28 FB, F to M6 FB, M	N/A	0.040" (1.00 mm)	11.3 µL	1,000 psi (69 bar)
P-920-01	PEEK Adapter, 10-32 C, F to M6 FB, M	N/A	0.040" (1.00 mm)	8.0 µL	1,000 psi (69 bar)

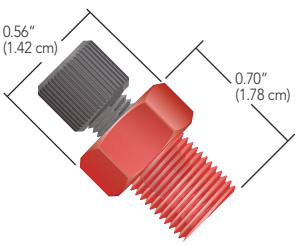
F = Female (internal) threads; M = Male (external) threads; C = Coned; FB = Flat-Bottom
** The pressure rating of this adapter exceeds the pressure holding ability of the fittings and tubing used with it.*

External National Pipe Thread Adapters

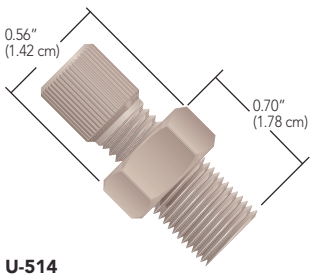
These adapters make connections to female 1/8" and 1/4" National Pipe Thread (NPT) ports.

Manufactured from PEEK polymer by IDEX Health & Science, Upchurch Scientific® NPT Adapters are durable and chemically resistant. We provide versions with either 1/4-28 or 5/16-24 flat-bottom threads, suitable for most low pressure applications.

Please Note: Wrap the threads on the NPT side of these adapters with thread seal tape (plumber's tape) to ensure a leak-free seal.



U-510
1/8" NPT to 1/4-28 Flat-Bottom Female Adapter
for 1/8" OD tubing
Includes (1) XP-308 Fitting



U-514
1/8" NPT to 5/16-24 Flat-Bottom Female Adapter
for 3/16" OD tubing
Includes (1) XP-132 Fitting

Biocompatible

APPLICATION NOTE

Our U-500 and U-510 NPT Adapters are great for attaching 1/8" OD fluoropolymer sparging lines to sparging gas tank regulating valves. Simply thread the appropriately-sized NPT Adapter into the valve's receiving port and then attach your sparging tubing to the adapter body using the fittings provided.

RELATED PRODUCTS

Replacement fittings for these adapters are located on the pages indicated below:

	Page(s)
1/4-28 for 1/8" OD tubing	26
5/16-24 for 1/8" OD tubing	23, 30
5/16-24 for 3/16" OD tubing	30

Other tubing/fitting combinations are available. For more information, please contact your local Distributor or IDEX Health & Science directly.

Part No.	Description	Color	Tubing OD	Includes	Thru-hole	Swept Volume	Pressure Rating
1/8" MALE NPT ADAPTERS							
★ **U-510**	PEEK 1/8" NPT, M to 1/4-28 FB, F Adapter	Red	1/8"	(1) XP-308	0.062" (1.60 mm)	17.3 µL	500 psi (34 bar)
U-514	PEEK 1/8" NPT, M to 5/16-24 FB, F Adapter	Natural	3/16"	(1) XP-132	0.125" (3.2 mm)	70.4 µL	500 psi (34 bar)
1/4" MALE NPT ADAPTERS							
U-500	PEEK 1/4" NPT, M to 1/4-28 FB, F Adapter	Red	1/8"	(1) XP-308	0.062" (1.60 mm)	17.3 µL	500 psi (34 bar)
U-504	PEEK 1/4" NPT, M to 5/16-24 FB, F Adapter	Natural	3/16"	(1) XP-132	0.125" (3.2 mm)	70.4 µL	500 psi (34 bar)

F = Female (internal) threads; M = Male (external) threads; FB = Flat-Bottom

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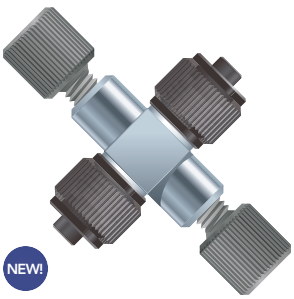
MicroTight Adapters

- Convenient adapters for common 1/16" OD to capillary tubing
- Direct connect to 1/32" OD or 360 µm OD tubing options available
- VHP adapters pressure rated to 12,000 psi (828 bar)

Create a true zero dead volume (ZDV) connection between 1/16" OD tubing and capillary tubing with these Upchurch Scientific® MicroTight Adapters.

For Very High Pressure applications the UH-630 will connect 1/16" OD to 1/32" OD tubing in an inline true ZDV connection with the ability to withstand 12,000 psi (828 bar)! The materials of construction also allow this product to be used up to 200 °C, which reduces the pressure rating to 8,000 psi (552 bar). For more information on the fittings used with the VHP adapter, please see page 9.



NEW!

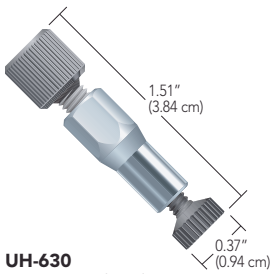
UH-906
VHP MicroTight Adapting Cross
10-32 Coned for 1/16" OD tubing and 5/16-24 Coned for 360 µm OD tubing

NEW!

UH-753
VHP MicroTight Adapting Tee
360 µm (2 ports) to 10-32 C for 1/16" OD tubing (1 port)

NEW!

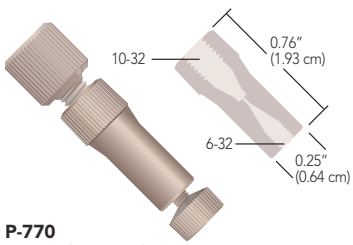
UH-631-01
VHP MicroTight Adapter
10-32 Coned for 1/16" OD tubing and 6-40 Coned for 1/32" OD tubing fittings not included



UH-630
VHP MicroTight Adapter
for 1/16" and 1/32" OD tubing with fittings included

NEW!

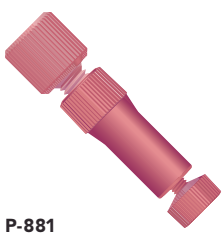
UH-634
VHP MicroTight Adapter
for 1/16" and 360 µm OD tubing with fittings included



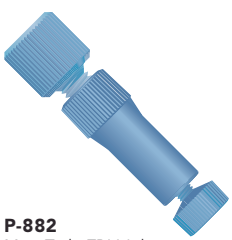
P-770
MicroTight ZDV Adapter
for 1/16" OD to MicroTight Sleeves with fittings included

NEW!

1958-01
VHP MicroTight Adapter
10-32 Coned for 1/16" OD tubing and M4x0.7 for 1/32" OD tubing



P-881
MicroTight ZDV Adapter
for 1/16" to 1/32" OD tubing with fittings included



P-882
MicroTight ZDV Adapter
for 1/16" to 360 µm OD tubing with fittings included

NOTE

While many 10-32 coned fittings are interchangeable, coned fittings using different threads are generally not interchangeable. As such, IDEX Health & Science recommends that only the style of coned fittings that accompanies these connectors be used for replacements.

RELATED PRODUCTS

- Replacement 6-32 fittings are on page 54.
- Replacement F-120 style nuts are on page 11 (when ordering, replace the "x" with an "R" or "B" to order either red or blue fittings).
- Use this list to find micro flow products outside this chapter.

	Part No.	Description	Threads	Includes	Color	Swept Volume	Pressure Rating
	MICROTIGHT ADAPTERS						
★	**P-770**	PEEK Micro Adapter, True ZDV, for 1/16" OD Tubing to MicroTight Tubing Sleeve	10-32 C to 6-32 C	(1) F-120, (1) F-125, (1) P-554	Natural	N/A	4,000 psi (276 bar)
	P-881	PEEK Micro Adapter, True ZDV, for 1/16" to 1/32" OD Tubing	10-32 C to 6-32 C	(1) F-120R, (1) F-126S, (1) P-554	Red	N/A	5,000 psi (345 bar)
★	**P-882**	PEEK Micro Adapter, True ZDV, for 1/16" to 360 µm OD Tubing	10-32 C to 6-32 C	(1) F-120B, (1) F-124S, (1) P-554	Blue	N/A	5,000 psi (345 bar)
	UH-630	Stainless Steel VHP Micro Adapter, for 1/16" to 1/32" OD Tubing	10-32 C to 6-32 C	(1) PK-120BLK, (1) PK-126, (1) P-554	SST/Black	N/A	12,000 psi (827 bar)
NEW!	**UH-634**	Stainless Steel VHP Micro Adapter, for 1/16" to 360 µm OD Tubing	10-32 C to 6-32 C	(1) PK-120BLK, (1) PK-124, (1) P-554	SST/Black	N/A	12,000 psi (827 bar)
NEW!	**UH-753**	Stainless Steel VHP Micro Adapting Tee, for 1/16" to 360 µm OD Tubing	10-32 C to 5/16-24 C	(2) P-416BLK, (2) PK-152	SST/Black	152 nL	15,000 psi (1,035 bar)*
NEW!	**1958-01**	Stainless Steel VHP Micro Adapter, for 1/16" to 1/32" OD Tubing	10-32 C to M4x0.7 C	N/A	SST	16 nL	30,000 psi (2,070 bar)*
NEW!	**UH-631-01**	Stainless Steel VHP Micro Adapter, for 1/16" to 1/32" OD Tubing	10-32 C to 6-40 C	N/A	SST	13 nL	30,000 psi (2,070 bar)*
NEW!	**UH-906**	Stainless Steel VHP Micro Adapting Cross, for 1/16" to 360 µm OD Tubing	10-32 C to 5/16-24 C	(2) PK-120BLK, (2) P-416BLK, (2) PK-152	SST/Black	0.11 µL	15,000 psi (1,035 bar)*
	REPLACEMENT GAUGE PLUGS (TO ACHIEVE TRUE ZDV CONNECTIONS WITH THE ABOVE ADAPTERS)						
	P-554	Delrin® Gauge Plug	10-32 C		White	N/A	N/A

C = Coned
** Pressure rating depends upon the fitting used.*

NanoPort Assemblies

- For lab-on-a-chip applications
- Options to connect 360 µm, MicroTight® tubing sleeves, 1/32" OD or 1/16" OD tubing
- Wetted materials: PEEK and perfluoroelastomer

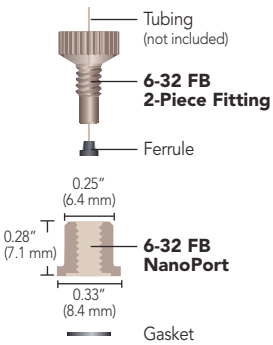
Upchurch Scientific® NanoPort Assemblies provide consistent fluid connections for chip-based analyses. Once attached, NanoPort connections can withstand pressures to 1,000 psi (69 bar).* NanoPorts will adhere to silicon, quartz, glass and some polymers.

All NanoPort components are made of inert, biocompatible PEEK polymer (nuts and ports) and Perlast® perfluoroelastomer (ferrules and gaskets). These products bond easily to chip surfaces with the provided Preformed Adhesive Rings (see Application Note below). Their unique design also prevents adhesive contamination of the fluid path. And NanoPort connections add no additional volume to the fluid path, virtually eliminating dead volume traditionally associated with chip-based fluid connections.

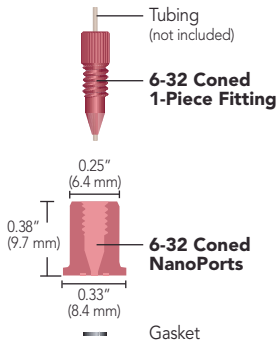
Our NanoPort Reservoir Assembly is designed for open well applications, such as CE.

**Except the N-333 NanoPort Assembly, which is rated to 500 psi (34 bar).*

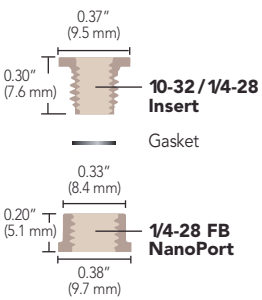
6-32 Flat-Bottom Assemblies



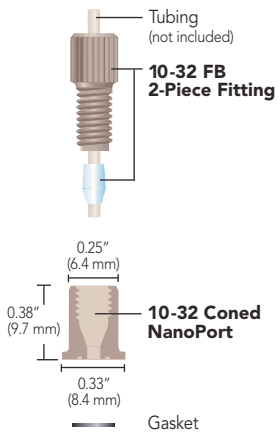
6-32 Coned Assemblies



Reservoir Assembly



10-32 Coned Assembly



APPLICATION NOTE

NanoPort Adhesive Cure Requirements

- Preformed Adhesive Rings (included with each order).

Cure Temperature	Cure Time
165–177 °C (330–350 °F)	1 hour

- Place clamped Ports in oven at a temperature of 165–177 °C (330–350 °F) for one hour to develop a complete bond between the Port and the substrate.
- Due to differences in thermal expansion rates, IDEX Health & Science does not recommend the use of the Preformed Adhesive Rings when connecting NanoPorts to metal substrates. For information on this, for information regarding the adherence of NanoPorts to other polymer substrates, or for information on other adhesive options, please contact us or your authorized Distributor directly.

NanoPort Reservoir Applications

- Sample reservoir.
- Open wells for capillary electrophoresis.
- Syringe injection or flushing/priming, using our P-604 Luer Adapter, page 55, and luer syringe (such as our B-310) on page 55.

See following page for replacement parts

Part No.	Nut	Ferrule	For Chip Hole (dia. x depth)	For Tubing OD	Qty.
NANOPORT ASSEMBLIES					
6-32 Flat-Bottom NanoPort Assemblies					
N-121S	F-123S	N-123-04	0.04" x 0.04" (1.0 mm x 1.0 mm)	360 µm	ea.
N-123H	F-123H	N-123-03	0.04" (1.0 mm) dia. or less	360 µm	ea.
N-123S	F-123S	N-123-03	0.04" (1.0 mm) dia. or less	360 µm	ea.
6-32 Coned NanoPort Assemblies					
N-124S	F-124S	None	Up to 0.063" (1.6 mm)	360 µm	ea.
N-125S	F-125	None	Up to 0.063" (1.6 mm)	70–520 µm[1]	ea.
N-126H	F-126H	None	Up to 0.063" (1.6 mm)	1/32"	ea.
N-126S	F-126S	None	Up to 0.063" (1.6 mm)	1/32"	ea.
10-32 Coned NanoPort Assembly					
★ **N-333**	F-333N	F-142N	Up to 0.063" (1.6 mm)	1/16"	ea.
NanoPort Reservoir Assembly					
N-131	80 µL Reservoir with Insert				ea.

[1] Designed to use our MicroTight® Tubing Sleeves (page 19) to connect tubing OD sizes from 70–520 µm.

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NanoPort Assemblies (cont.)

NOTE

To select the appropriate NanoPort assembly you will need to consider:

- Size of tubing you are connecting
- Dimensions of the chip hole
- Fitting style (one-piece or two-piece fittings)
- Nut head style (standard or headless nut)

Please Note: Each NanoPort Assembly includes a fitting (one- or two-piece), a NanoPort, gasket, a 2-pack of preformed adhesive rings, and a clamp for holding the port in place while the adhesive cures.

Full NanoPort Assemblies can be found on the previous page

	Part No.	Description	Threads	For Chip Hole	Tubing OD	Qty.
	NANOPORT REPLACEMENT PARTS					
	Fittings					
	F-123Hx	Headless Nuts	6-32 FB	N/A	360 µm	10-pk
	F-123Sx	Standard Head Nuts	6-32 FB	N/A	360 µm	10-pk
	F-124Sx	Standard Head Fittings	6-32 C	N/A	360 µm	10-pk
★	**F-125x**	Standard Head Fittings	6-32 C	N/A	70–520 µm[1]	10-pk
	F-126Hx	Headless Fittings	6-32 C	N/A	1/32"	10-pk
	F-126Sx	Standard Head Fittings	6-32 C	N/A	1/32"	10-pk
	F-333Nx	Headless Fittings	10-32 C	Up to 0.063" (1.6 mm)	1/16"	10-pk
	F-142Nx	Ferrules	10-32 C	Up to 0.063" (1.6 mm)	1/16"	10-pk
★	**N-123-03x**	Ferrules	6-32 FB	0.04" (1.0 mm) dia. or less	360 µm	10-pk
★	**N-123-04x**	Ferrules	6-32 FB	0.04" x 0.04" (1.0 mm x 1.0 mm)	360 µm	10-pk
	N-123-05x	Ferrules	6-32 FB	0.04" x 0.06" (1.0 mm x 1.5 mm)	360 µm	10-pk
	Gaskets					
	N-123-02	Gasket, For all assemblies *except* 6-32 Coned Assemblies		N/A	N/A	ea.
	N-124-02	Gasket, For 6-32 Coned Assemblies		N/A	N/A	ea.
	Adhesives and Clamp					
	N-006	Clamp		N/A	N/A	ea.
★	**N-100-01**	Preformed Adhesive Rings		N/A	N/A	2-pk

[1] *Designed to use our MicroTight® Tubing Sleeves (page 19) to connect tubing OD sizes from 70–520 µm.*
Abbreviation Definitions: FB = Flat-Bottom; C = Coned; N/A = Not Applicable

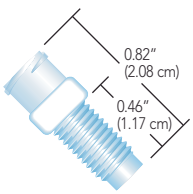
Quick Connect Luer Adapters

- Delrin®, polypropylene, ETFE, or PEEK Versions
- Adapts luers to 1/4-28, 10-32, 5/16-24, or M6 threaded ports

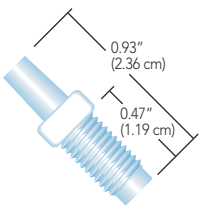
These luer adapters were designed to work in a variety of applications. By connecting any male luer to any female luer, you can create your own quick connect union or adapter. Each Upchurch Scientific® Quick Connect Luer Adapter conforms to ISO requirements for medical luer taper configuration and performance (45 psi/3.1 bar).

Find fittings to connect tubing to the threaded ports of these adapters in the Fittings chapter, starting on page 4.

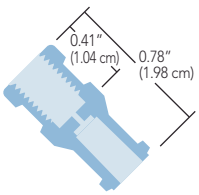
Please Note: Our Female Quick Connect Luer Adapters can be used with any of the Male Luers on this page, i.e., those with and without lock hubs.



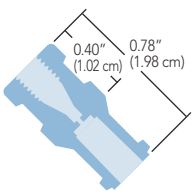
P-604, P-618, P-624
Female Luer to 1/4-28 Male
(luer end of P-604 different than shown)



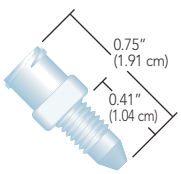
P-619, P-625
Male Luer to 1/4-28 Male



P-628
Female Luer to 1/4-28 Female

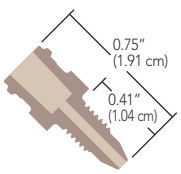


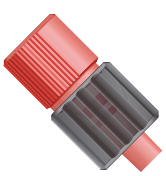
P-629
Female Luer to 10-32 Female



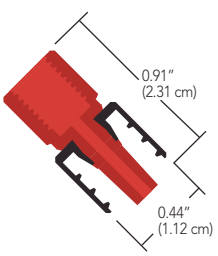
P-642
Female Luer to 10-32 Male

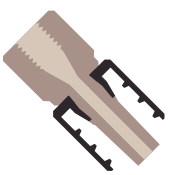
P-719
Female Luer to 10-32 Male



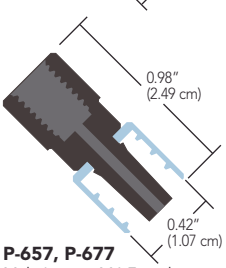


P-655, P-675
Male Luer to 1/4-28 Female

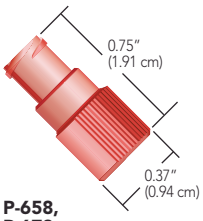




P-656
Male Luer to 10-32 Female

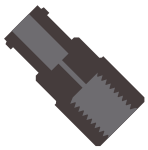


P-657, P-677
Male Luer to M6 Female

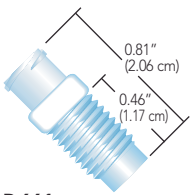


P-658, P-678
Female Luer to 1/4-28 Female

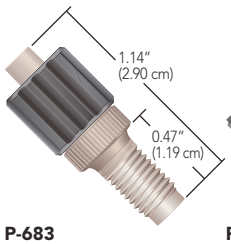
P-659
Female Luer to 10-32 Female



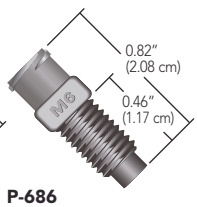
P-660, P-680
Female Luer to M6 Female



P-661
Female Luer to 5/16-24 Male



P-683
Male Luer to 1/4-28 Male



P-686
Female Luer to M6 Male

APPLICATION NOTE

- Our A-626 Bottle Cap Plug (page 159) can be used to plug any of the female luer adapters on this page.
- To prevent a chemical spill when disconnecting your solvent reservoir tubing from the pump, try our Quick-Stop Luer Check Valve on page 151.
- To economically prime an HPLC pump, simply remove the 10-32 fitting on the outlet check valve (standard on most models), insert a P-642 luer adapter, attach a syringe (such as our B-310) and draw the mobile phase through the pump head.

	Part No.	Description	Body Material	Lock Hub Material	Thru-hole
	QUICK CONNECT LUER ADAPTERS				
	P-604	F Luer to 1/4-28 FB, M	Nat. Delrin	N/A	0.05" (1.3 mm)
	P-618	F Luer to 1/4-28 FB, M	Nat. PP	N/A	0.05" (1.3 mm)
	P-619	M Luer to 1/4-28 FB, M	Nat. PP	None *	0.05" (1.3 mm)
★	**P-624**	F Luer to 1/4-28 FB, M	Nat. ETFE	N/A	0.05" (1.3 mm)
★	**P-625**	M Luer to 1/4-28 FB, M	Nat. ETFE	None *	0.04" (1.0 mm)
★	**P-628**	F Luer to 1/4-28 FB, F	Nat. ETFE	N/A	0.04" (1.0 mm)
	P-629	F Luer to 10-32 C, F	Nat. ETFE	N/A	0.04" (1.0 mm)
★	**P-642**	F Luer to 10-32 C, M	Nat. ETFE	N/A	0.05" (1.3 mm)
★	**P-655**	M Luer to 1/4-28 FB, F	Red PEEK	Black PEEK	0.04" (1.3 mm)
★	**P-656**	M Luer to 10-32 C, F	Nat. PEEK	Black PEEK	0.05" (1.3 mm)
	P-657	M Luer to M6 FB, F	Black PEEK	Black PEEK	0.05" (1.3 mm)
★	**P-658**	F Luer to 1/4-28 FB, F	Red PEEK	N/A	0.05" (1.3 mm)
★	**P-659**	F Luer to 10-32 C, F	Nat. PEEK	N/A	0.05" (1.3 mm)
	P-660	F Luer to M6 FB, F	Black PEEK	N/A	0.05" (1.3 mm)
	P-661	F Luer to 5/16-24 FB, M	Nat. ETFE	N/A	0.05" (1.3 mm)
★	**P-675**	M Luer to 1/4-28 FB, F	Red ETFE	Natural PP	0.05" (1.3 mm)
	P-677	M Luer to M6 FB, F	Black ETFE	Natural PP	0.05" (1.3 mm)
★	**P-678**	F Luer to 1/4-28 FB, F	Red ETFE	N/A	0.05" (1.3 mm)
	P-680	F Luer to M6 FB, F	Black ETFE	N/A	0.05" (1.3 mm)
★	**P-683**	M Luer to 1/4-28 FB, M	Nat. PEEK	Black PEEK	0.04" (1.0 mm)
★	**P-686**	F Luer to M6 FB, M	Black ETFE	N/A	0.05" (1.3 mm)
NEW!	**P-719**	F Luer to 10-32 C, M	Nat. PEEK	N/A	0.05" (1.3 mm)
	SYRINGE WITH MALE LUER LOCK				
	B-310	10 cc Disposable Luer-Lock Syringe For use with any Female Luer Adapter			0.05" (1.3 mm)

F = Female (internal) threads; M = Male (external) threads; Nat. = Natural; N/A = Not Applicable; PP = Polypropylene; FB = Flat-Bottom; C = Coned
** Slip-type male luer.*

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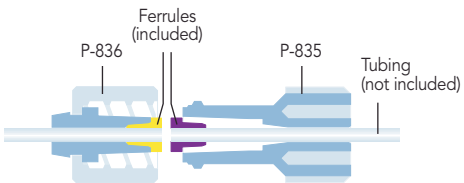
LuerTight™ Fittings

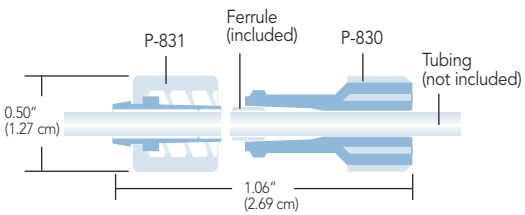
- Luer fittings for fluoropolymer tubing
- Quick disconnect and barbless
- For 1/16" and 1/8" OD tubing

Upchurch Scientific® LuerTight fittings are specifically designed to connect fluoropolymer tubing without barbs or nuts! By integrating ferrules into the luer bodies, LuerTights will reliably hold your tubing in place while giving you the convenience of a luer connection. An inline set of LuerTight fittings provides a quick and easy disconnection option. LuerTight connections are also less bulky and more economical than nut-to-luer style fittings.

The bodies of these products are manufactured from polypropylene and the ferrules, where used, are made of ETFE.



P-837
LuerTight Fittings System
for 1/16" OD tubing



P-838
LuerTight Fittings System
for 1/8" OD tubing

NOTE

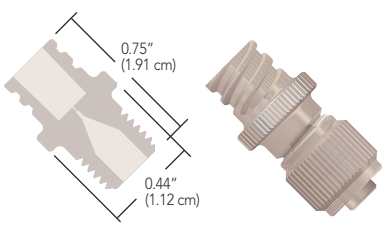
LuerTight fittings are designed to be used exclusively within the LuerTight family. Combining LuerTight fittings with non-LuerTight luer products may result in a poor connection.

Luer-To-MicroTight® Adapter

- Easily connect 360 µm OD tubing to a syringe

The Upchurch Scientific Luer-to-MicroTight Adapter is ideal for infusing sample into lab-on-a-chip devices. This product is made entirely of biocompatible PEEK polymer and introduces only 14 nL of additional volume to the flow path. Use it to directly connect a luer-tip syringe or other product that terminates with a standard male luer to 360 µm OD capillary tubing without tubing sleeves (see photo). MicroTight Fittings are included.

P-662 Luer-to-MicroTight Adapter, shown with a B-310 Syringe (page 55) and PEEK capillary tubing (page 67), not included.



P-662
Luer-To-MicroTight Adapter
for Luer to 360 µm OD tubing
with fittings included

Biocompatible

ORDER ONLINE

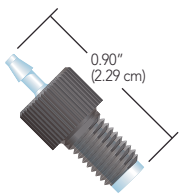
	Part No.	Description	Includes	Thru-hole	Pressure Rating
	LUERTIGHT FITTINGS SYSTEMS				
★	**P-837**	LuerTight System for 1/16" OD Tubing	(1) P-835, (1) P-836, (1) P-830T	N/A	100 psi (7 bar)
	P-838	LuerTight System for 1/8" OD Tubing	(1) P-830, (1) P-831, (1) P-830T	N/A	100 psi (7 bar)
	LUERTIGHT FITTING COMPONENTS				
	P-830	Female Fitting for 1/8" OD Tubing	(1) Ferrule	N/A	N/A
	P-830T	Set Plug to swage Ferrules into P-835 and P-830	N/A	N/A	N/A
	P-831	Male Fitting for 1/8" OD Tubing	No Ferrule Required	N/A	N/A
	P-835	Female Fitting for 1/16" OD Tubing	(1) Ferrule	N/A	N/A
	P-836	Male Fitting for 1/16" OD Tubing	(1) Ferrule	N/A	N/A
	LUER-TO-MICROTIGHT ADAPTER				
★	**P-662**	Luer-to-MicroTight Adapter	(1) F-152, (1) P-416	0.006" (0.150 mm)	45 psi (2.4 bar)

Female = internal receiving luer pocket; Male = external luer nose (surrounded by internally-threaded locking ring)

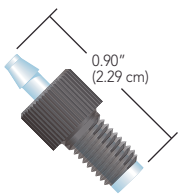
Swivel Barb Adapters

- Barb connection spins freely from the nut to prevent twist during installation
- Manufactured from polypropylene

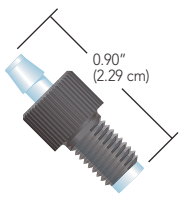
The new Swivel Barb Adapters from Upchurch Scientific® are made up of two captive pieces acting as a one-piece fitting for ease of use. Manufactured from polypropylene and available in three barb sizes, the Swivel Barb will facilitate connection between flexible tubing to a 1/4-28 flat-bottom port. The barbed insert spins freely from the threaded nut in order to prevent the tubing from twisting during installation.



D-646
1/4-28 to 1/16" ID tubing



D-647
1/4-28 to 3/32" ID tubing



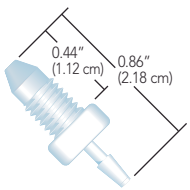
D-648
1/4-28 to 1/8" ID tubing

Biocompatible

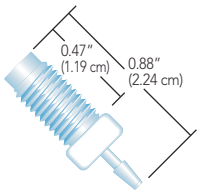
Thread to Barbed Adapters

- Three barb sizes, for 1/16", 1/8", and 3/16" ID flexible tubing
- Adapt to 1/4-28 flat-bottom, 5/16-24 flat-bottom, or 10-32 coned receiving ports

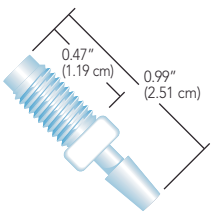
These Upchurch Scientific adapters make it easy to connect flexible tubing to any standard 1/4-28 flat-bottom or 10-32 coned receiving port. Simply thread the adapter into a receiving port and slip tubing over the barbed stem to create a reliable low pressure connection.



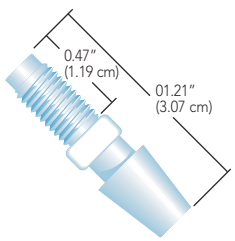
P-663
10-32 to 1/16" ID tubing



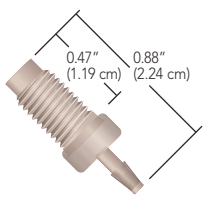
P-646
1/4-28 to 1/16" ID tubing



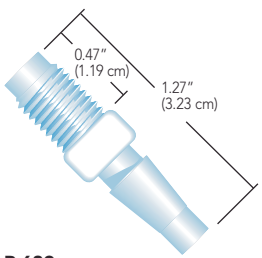
P-647
1/4-28 to 1/8" ID tubing



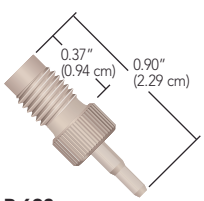
P-648
1/4-28 to 3/16" ID tubing



P-668
1/4-28 to 1/16" ID tubing



P-689
5/16-24 to 3/16" ID tubing



P-692
1/4-28 to 0.020"–1/32"ID tubing

RELATED PRODUCTS

- To connect low pressure fluoropolymer tubing, try the LuerTight™ Adapters on page 56.
- To connect peristaltic tubing to low pressure fluoropolymer tubing, see page 60.
- For peristaltic tubing, see pages 75–89.

	Part No.	Description	Material	Threads	Thru-hole
	SWIVEL BARB ADAPTERS				
	D-646	Swivel Barb Adapter, 1/16" (1.55 mm) ID Tubing	Polypropylene	1/4-28 Flat-Bottom	0.03" (0.75 mm)
	D-647	Swivel Barb Adapter, 3/32" (2.40 mm) ID Tubing	Polypropylene	1/4-28 Flat-Bottom	0.056" (1.5 mm)
	D-648	Swivel Barb Adapter, 1/8" (3.20 mm) ID Tubing	Polypropylene	1/4-28 Flat-Bottom	0.08" (2.0 mm)
	THREAD TO BARBED ADAPTERS				
★	**P-663**	Barb Adapter, 1/16" (1.55 mm) ID Tubing	ETFE	10-32 Coned	0.04" (1.0 mm)
★	**P-646**	Barb Adapter, 1/16" (1.55 mm) ID Tubing	ETFE	1/4-28 Flat-Bottom	0.04" (1.0 mm)
★	**P-647**	Barb Adapter, 1/8" (3.20 mm) ID Tubing	ETFE	1/4-28 Flat-Bottom	0.08" (2.0 mm)
	P-648	Barb Adapter, 3/16" (4.75 mm) ID Tubing	ETFE	1/4-28 Flat-Bottom	0.10" (2.5 mm)
★	**P-668**	Barb Adapter, 1/16" (1.55 mm) ID Tubing	PEEK	1/4-28 Flat-Bottom	0.04" (1.0 mm)
	P-689	Barb Adapter, 3/16" (4.75 mm) ID Tubing	ETFE	5/16-24 Flat-Bottom	0.10" (2.5 mm)
	P-692	Barb Adapter, 0.020" to 1/32" (0.50 to 0.80 mm) ID Tubing	PEEK	1/4-28 Flat-Bottom	0.02" (0.5 mm)

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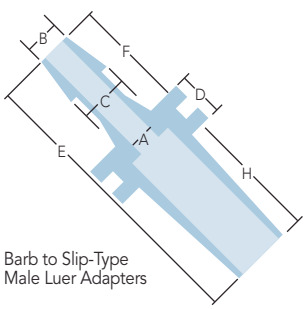
Barbed Adapters

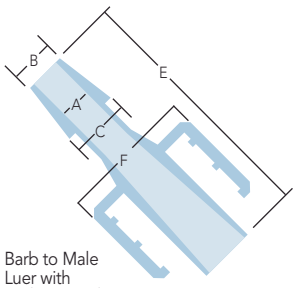
- Adapters on this page feature various luer to barb adaptations
- Adapters on the next page feature a variety of barb-to-barb connectors

Use these barbed adapters to connect peristaltic-type flexible tubing for general, low pressure applications, such as plumbing Ismatec® Peristaltic Pumps (listed on pages 92–108).

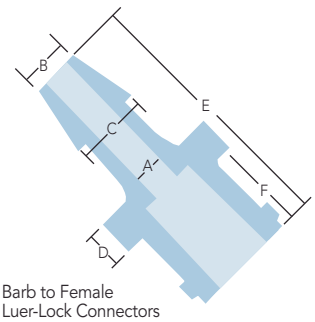
The polypropylene used to manufacture the majority of these products is a Class VI material. Due to the low melt point of polypropylene (PP), these adapters are not autoclavable, however, they can be sterilized via gamma radiation. There are also Barb to Female Luer-Lock connectors available from ETFE, which has superior solvent resistance and a higher temperature rating (80 °C).



Barb to Slip-Type
Male Luer Adapters



Barb to Male
Luer with
Lock Ring Adapters



Barb to Female
Luer-Lock Connectors

Part No.	Description	Material
BARB TO SLIP-TYPE MALE LUER ADAPTERS (10-PK)		
P-854x	Male Luers (Slip-type) for use with 1/16" ID (1.55 mm) Tubing A=0.046" B=0.064" C=0.090" D=0.129" E=0.711" F=0.198" H=0.384"	PP
These slip-type male luer fittings are for use in systems for which luer lock rings are not desired.		
BARB TO MALE LUER WITH LOCK RING ADAPTERS (10-PK)		
P-850x	Male Luers with Lock Ring for use with 1/16" ID (1.55 mm) Tubing A=0.049" B=0.065" C=0.090" E=0.583" F=0.434"	PP
P-851x	Male Luers with Lock Ring for use with 3/32" ID (2.40 mm) Tubing A=0.071" B=0.100" C=0.139" E=0.681" F=0.436"	PP
P-852x	Male Luers with Lock Ring for use with 1/8" ID (3.20 mm) Tubing A=0.099" B=0.132" C=0.184" E=0.777" F=0.436"	PP
BARB TO FEMALE LUER-LOCK CONNECTORS (10-PK)		
★ **P-857x**	Female Luer Connectors for use with 1/16" ID (1.55 mm) Tubing A=0.030" B=0.063" C=0.106" D=0.100" E=0.598" F=0.253"	PP
P-858x	Female Luer Connectors for use with 3/32" ID (2.40 mm) Tubing A=0.056" B=0.102" C=0.145" D=0.100" E=0.648" F=0.253"	PP
P-859x	Female Luer Connectors for use with 1/8" ID (3.20 mm) Tubing A=0.080" B=0.135" C=0.187" D=0.100" E=0.733" F=0.253"	PP
P-870	For use with 1/16" (1.55 mm) ID Tubing A=0.030" B=0.063" C=0.106" D=0.100" E=0.598" F=0.253"	ETFE
P-872	For use with 1/8" (3.20 mm) ID Tubing A=0.080" B=0.137" C=0.187" D=0.100" E=0.733" F=0.253"	ETFE
An "x" in the product part number designates "10-pk."		

Barbed Connectors

- Specifically designed for Ismatec® pump tubing
- Wide variety of unions, adapters and multi-port connectors in multiple material choices

There are several Ismatec connectors for connecting multiple pieces of peristaltic tubing. Reference the tubing size of the barb in the tables below to select from unions (to connect same tubing size), reducers (to connect two different tubing sizes) in both straight, tee, Y, elbow and cross configurations.

For very small peristaltic tubing, steel connectors are available to couple two pieces of the same size tubing together. Match the OD of the steel tubing connector to be slightly larger than the ID of the peristaltic tubing.

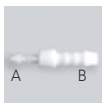
Standard Tube Connectors in Plastic

Type 1

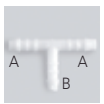
Type 2

Type 3

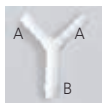
Reducer Tube Connectors in Plastic



Type 6

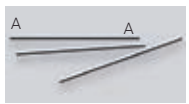


Type 7



Type 8

Steel 18/8 Standard Tube Connectors



Part No.	Tubing ID	Material	Qty.
STANDARD TUBE CONNECTORS IN PLASTIC			
Type 1			
P-801x	0.06″ (1.5 mm)	Polypropylene	10-pk
ISM557A	0.10″ (2.5 mm)	Polypropylene	10-pk
P-802x	0.12″ (3.0 mm)	Polypropylene	10-pk
ISM559	0.16″ (4.0 mm)	Nylon	10-pk
ISM560	0.20″ (5.0 mm)	Nylon	10-pk
ISM561	0.24″ (6.0 mm)	Nylon	10-pk
ISM562	0.31″ (8.0 mm)	Nylon	10-pk
ISM563	0.40″ (10.0 mm)	Nylon	10-pk
ISM564	0.47″ (12.0 mm)	Nylon	10-pk
ISM565	0.51″ (13.0 mm)	Nylon	10-pk
ISM566	0.55″ (14.0 mm)	Nylon	10-pk
ISM567	0.63″ (16.0 mm)	Nylon	10-pk
Type 2			
ISM693A	0.06″ (1.5 mm)	Polypropylene	10-pk
ISM694	0.10″ (2.5 mm)	Polypropylene	10-pk
ISM510	0.12″ (3.0 mm)	Polypropylene	10-pk
ISM511	0.16″ (4.0 mm)	Nylon	10-pk
ISM512	0.20″ (5.0 mm)	Nylon	10-pk
ISM513	0.24″ (6.0 mm)	Nylon	10-pk
ISM514	0.28″ (7.0 mm)	Nylon	10-pk
ISM515	0.31″ (8.0 mm)	Nylon	10-pk
ISM516	0.40″ (10.0 mm)	Nylon	10-pk
Type 3			
P-860x	0.06″ (1.5 mm)	Polypropylene	10-pk
P-861x	0.10″ (2.5 mm)	Polypropylene	10-pk
ISM524	0.12″ (3.0 mm)	Polypropylene	10-pk
ISM525	0.16″ (4.0 mm)	Polypropylene	10-pk
ISM526	0.20″ (5.0 mm)	Polypropylene	10-pk
ISM527	0.24″ (6.0 mm)	Polypropylene	10-pk
P-862x	0.12″ (3.0 mm)	Polypropylene	10-pk
P-863x	0.18″ (4.8 mm)	Polypropylene	10-pk
P-864x	0.25″ (6.4 mm)	Polypropylene	10-pk
ISM528	0.31″ (8.0 mm)	Polypropylene	10-pk
ISM529	0.40″ (10.0 mm)	Polypropylene	10-pk
ISM530	0.47″ (12.0 mm)	Polypropylene	10-pk

Part No.	Tubing ID		Material	Qty.
REDUCER TUBE CONNECTORS IN PLASTIC				
Type 6	**A**	**B**		
ISM569A	0.06″ (1.5 mm)	0.10″ (2.5 mm)	Polypropylene	10-pk
ISM570A	0.06″ (1.5 mm)	0.12″ (3.0 mm)	Polypropylene	10-pk
ISM571A	0.10″ (2.5 mm)	0.12″ (3.0 mm)	Polypropylene	10-pk
ISM572	0.12″ (3.0 mm)	0.16″ (4.0 mm)	Nylon	10-pk
ISM573A	0.16″ (4.0 mm)	0.24″ (6.0 mm)	Nylon	10-pk
ISM574	0.16″ (4.0 mm)	0.31″ (8.0 mm)	Nylon	10-pk
ISM575	0.24″ (6.0 mm)	0.31″ (8.0 mm)	Nylon	10-pk
ISM576	0.24″ (6.0 mm)	0.40″ (10.0 mm)	Nylon	10-pk
ISM577	0.31″ (8.0 mm)	0.40″ (10.0 mm)	Nylon	10-pk
ISM578	0.31″ (8.0 mm)	0.47″ (12.0 mm)	Nylon	10-pk
ISM579	0.40″ (10.0 mm)	0.47″ (12.0 mm)	Nylon	10-pk
Type 7	**A**	**B**		
ISM538	0.12″ (3.0 mm)	0.16″ (4.0 mm)	Polypropylene	10-pk
ISM539	0.16″ (4.0 mm)	0.24″ (6.0 mm)	Polypropylene	10-pk
ISM540	0.24″ (6.0 mm)	0.16″ (4.0 mm)	Polypropylene	10-pk
ISM541	0.31″ (8.0 mm)	0.16″ (4.0 mm)	Polypropylene	10-pk
ISM542	0.31″ (8.0 mm)	0.24″ (6.0 mm)	Polypropylene	10-pk
ISM544	0.40″ (10.0 mm)	0.24″ (6.0 mm)	Polypropylene	10-pk
ISM545	0.40″ (10.0 mm)	0.31″ (8.0 mm)	Polypropylene	10-pk
ISM546	0.40″ (10.0 mm)	0.51″ (13.0 mm)	Polypropylene	10-pk
ISM547	0.47″ (12.0 mm)	0.31″ (8.0 mm)	Polypropylene	10-pk
Type 8	**A**	**B**		
ISM553	0.16″ (4.0 mm)	0.24″ (6.0 mm)	Polypropylene	10-pk
ISM554	0.24″ (6.0 mm)	0.31″ (8.0 mm)	Polypropylene	10-pk

Part No.	Tubing ID	Tubing OD	Connector Length	Material	Qty.
STEEL 18/8 STANDARD TUBE CONNECTORS					
ISM580	0.01″ (0.30 mm)	0.02″ (0.63 mm)	0.59″ (15.0 mm)	SST	6-pk
ISM581	0.02″ (0.58 mm)	0.04″ (0.90 mm)	0.59″ (15.0 mm)	SST	6-pk
ISM582	0.02″ (0.58 mm)	0.04″ (0.90 mm)	0.43″ (11 mm)	SST	6-pk
ISM583	0.03″ (0.84 mm)	0.05″ (1.27 mm)	0.43″ (11 mm)	SST	6-pk
ISM584	0.03″ (0.84 mm)	0.05″ (1.27 mm)	0.63″ (16.0 mm)	SST	6-pk
ISM585A	0.01″ (0.30 mm)	0.02″ (0.63 mm)	0.98″ (25 mm)	SST	6-pk
ISM586A	0.02″ (0.58 mm)	0.04″ (0.90 mm)	0.98″ (25 mm)	SST	6-pk
ISM587	0.02″ (0.58 mm)	0.04″ (0.90 mm)	0.75″ (19.0 mm)	SST	6-pk

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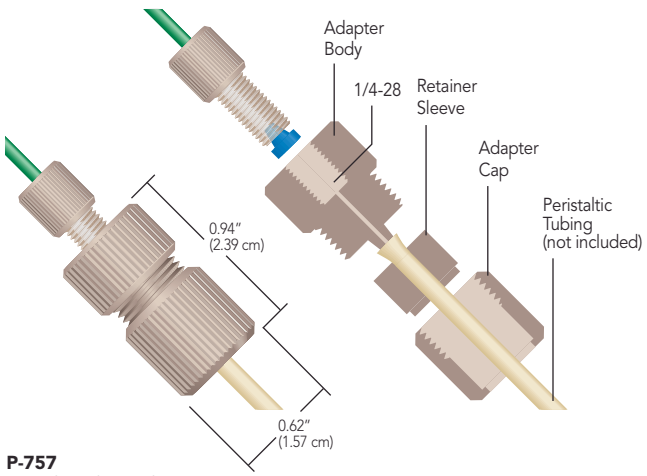
Peristaltic Tubing Adapters

These unique adapters connect peristaltic tubing to standard 1/16" or 1/8" OD tubing. A specially-designed nose allows the peristaltic tubing to simply press fit over the nose and then be held tightly in place by the retainer sleeve. Your 1/16" OD tubing may then be connected with the Flangeless Fittings supplied with the adapter. To connect your peristaltic tubing to tubing with a different OD, simply replace the supplied fittings with your choice of Flangeless Fittings from page 24.

One popular application for these adapters is to use them as "stops" for your peristaltic pump. By doing so, you can reduce the amount of peristaltic tubing required for your flow path, thus reducing cost.

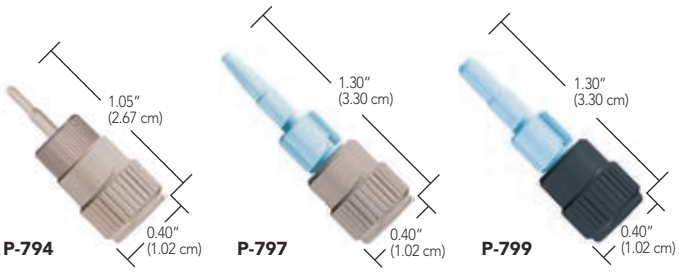


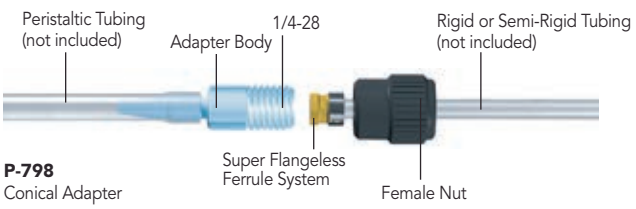
P-757
Peristaltic Tubing Adapter
includes P-200/P-235 Flangeless Fittings, and 3 sizes of retainer sleeves

Conical Adapters

- Direct connect 1/16" and 1/8" OD rigid and semi-rigid tubing to peristaltic tubing
- Accept 0.020"–1/8" (0.50–3.2 mm) ID peristaltic tubing
- Biocompatible flow path with excellent chemical compatibility

Upchurch Scientific® Conical Adapters manufactured by IDEX Health & Science provide a reliable connection between rigid/semi-rigid tubing and peristaltic-type flexible tubing, such as Tygon® and PharMed®. These adapters are composed of a PEEK polymer female nut, our Super Flangeless™ ferrule system and an ETFE or PEEK conical adapter body. The narrow coned end of the adapter body allows peristaltic tubing to slide on more easily than it does onto conventional barbed adapters. Peristaltic tubing is also easier to remove from our Conical Adapters, since no cutting or excessive pulling is required.





P-798
Conical Adapter

Biocompatible

RELATED PRODUCTS

- Use the adapters on this page to connect rigid and semi-rigid tubing (pages 63–69 and 70–73) to the peristaltic tubing on pages 75–89.

APPLICATION NOTE

To help secure peristaltic tubing more firmly to the Upchurch Scientific Conical Adapters, simply attach a cable tie to the outside of the peristaltic tubing once it has been placed onto the Adapter body.

	Part No.	Description	Peristaltic Tubing OD	Peristaltic Tubing ID	Thru-Hole
	PERISTALTIC TUBING ADAPTERS				
★	**P-757**	Standard Adapter	up to 0.180" (4.55 mm)	0.048"–0.110" (1.20–2.80 mm)	0.030" (0.75 mm)
	P-767	Large Bore Adapter	up to 0.250" (6.35 mm)	0.100"–0.150" (2.55–3.80 mm)	0.070" (1.78 mm)
	CONICAL ADAPTER ASSEMBLIES				
	Part No.	**Description**	**Rigid or Semi-Rigid Tubing OD**	**Peristaltic Tubing ID**	**Thru-Hole**
★	**P-794**	Conical Adapter	1/16"	0.020"–0.030" (0.50 mm–0.75 mm)	0.020" (0.50 mm)
	P-797	Conical Adapter	1/16"	1/16"–3/32" (1.55 mm–2.40 mm)	0.040" (1.0 mm)
	P-798	Conical Adapter	1/8"	1/16"–3/32" (1.55 mm–2.40 mm)	0.040" (1.0 mm)
	P-799	Conical Adapter	1/8"	3/32"–1/8" (2.40 mm–3.20 mm)	0.060" (1.5 mm)
	CONICAL ADAPTER REPLACEMENT PARTS				
	Part No.	**Description**	**Material**	**For Use With**	
	F-156	Female Nut, 1/8", 1/4-28	Black PEEK	P-798, P-799	
	P-420	Female Nut, 1/16", 1/4-28	Natural PEEK	P-794, P-797	
	P-259	Super Flangeless Ferrule, 1/16"	Yellow ETFE/SST	P-794, P-797	
	P-359	Super Flangeless Ferrule, 1/8"	Yellow ETFE/SST	P-798, P-799	
	P-691	Conical Adapter Body	Natural ETFE	P-799	
	P-692	Conical Adapter Body	Natural PEEK	P-794	

TUBING

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TUBING	PEEK-LINED STAINLESS STEEL (PLS)	STAINLESS STEEL	PEEK	CAPILLARY PEEK	FUSED SILICA	PEEKsil™	SPIRAL-LINK™	RADEL®
Page	63	64	66	67	67	68	69	69
Description	Biocompatible, chemically inert to most commonly-used solvents, PLS tubing offers a PEEK inner layer which serves as the fluid pathway, jacketed by stainless steel. • Ideal for bio-inert UHPLC applications • Can be bent into various shapes without affecting performance	Seamless, pre-cut 316 stainless steel tubing meets the exacting requirements of today's analyses. Thorough preparation guarantees that the tubing is truly ready-to-use, with flat-burr-free ends and a clean finish. • Wide selection of outside and inside diameters and lengths • Pre-cut to ensure burr-free, flat connections • Many sizes feature a color-coded band for easy ID identification	Biocompatible, chemically inert to most commonly used solvents, PEEK tubing is flexible, offers a very smooth internal surface, and can be easily cut to desired lengths. • Great alternative for stainless steel tubing in high pressure applications • Many sizes available in color scheme to help identify ID	All the benefits of larger sized PEEK tubing, while serving as an excellent alternative to more traditional fused silica and stainless steel capillary tubing. Capillary PEEK tubing is available in a wide range of micro and nano-scale inner diameters. • Available in common capillary tubing sizes with tight tolerances on OD and ID • Tubing sleeves available for capillary tubing connections	Because of the tight tolerances of fused silica's inner diameters, this tubing is used for micro-scale analyses such as micro and nano-HPLC and capillary electrophoresis. • Most commonly used OD and ID sizes available • High quality, polyimide-clad fused silica • Offered in convenient, two meter lengths	PEEKsil is mechanically strong and has ideal characteristics for sealing with metal or polymer fittings. • Comprised of high quality fused silica sheathed by PEEK tubing • Excellent chemical compatibility • Very tight manufacturing tolerances • Good replacement for stainless steel, PEEK, or standard fused silica	The PEEK Spiral Link coils expand and contract, allowing you to easily move your system components or even make equipment repairs whenever needed, without the hassle of breaking connections. • Available in several specific volumes • Includes two SealTight™ fittings	A mechanically strong and chemically resistant material, much like PEEK polymer, Radel is frequently used in medical applications where repeated autoclave sterilization is performed (tests show product stability after 1,000 cycles). Radel tubing is also transparent, allowing technicians to visually monitor flow through their instrument. Readily wetted surfaces help keep air bubbles from accumulating on inner surfaces as well. • Withstands up to 12,500 psi (862 bar) • Transparent and autoclavable
Specifications								
OD (outside diameter)	1/16" (1.6 mm)	0.020" (510 µm), 1/32" (785 µm), 1/16" (1.55 mm), 1/8" (3.2 mm)	1/16" (1.55 mm), 0.071" (1.8 mm), 0.079" (2.0 mm), 1/8" (3.2 mm)	0.0145" (360 µm), 1/32" (785 µm), 0.020" (0.5 mm)	0.0145" (360 µm)	0.0145" (360 µm), 1/32" (785 µm), 1/16" (1.55 mm)	1/16" (1.55 mm)	1/16" (1.55 mm), 1/8" (3.2 mm)
ID (inside diameter)	0.001" (25 µm)–0.010" (254 µm)	0.004" (100 µm)–0.080" (2.0 mm)	0.001" (25 µm)–0.080" (2.0 mm)	0.001" (25 µm)–0.020" (0.50 mm)	0.0008" (20 µm)–0.006" (150 µm)	0.001" (25 µm)–0.012" (300 µm)	0.005" (125 µm)–0.030" (0.75 mm)	0.010" (0.25 mm)–0.062" (1.55 mm)
Operating Temp	-51 to 100 °C	-51 to 289 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C
Pressure Rating	17,400 psi (1,200 bar)	N/A*	500–10,000 psi (34–690 bar)	2,000–5,000 psi (138–345 bar)	N/A*	10,000 psi (690 bar)	7,000 psi (484 bar)	5,500–12,500 psi (379–862 bar)
Typical Tolerances	±5 to 15 µm	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.0005" (12.5 µm)	±0.0004" (10 µm)	±0.0004" (10 µm)	±0.001" (25 µm) for 1/16" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing
Refractive Index (Clarity)	Opaque	Opaque	Opaque	Opaque	1.78	Opaque	Opaque	1.672
pH Range	0–14	1–14	0–14	0–14	0–10	0–10	0–14	1–14
Sterilization Techniques	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Ethylene oxide; thermal	Ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Thermal, gamma irradiation
Autoclavable?	Y	Y	Y	Y	Y	Y	Y	Y

**The manufacturer of this tubing or material does not publish this specification.*

Upchurch Scientific® Tubing OD Sizes

Please use this table as a reference tool to help quickly locate within this chapter the appropriate OD size tubing for your application.

Size	Tubing OD	Page(s)
.	360 µm	67, 68, 72
.	510 µm	65, 67
•	1/32"	65, 67, 68, 71
●	1/16"	63, 65, 66, 68, 69, 71, 72, 73, 77
●	1/8"	65, 66, 69, 71, 72, 73
●	3/16"	71, 72
●	1/4"	71, 72, 73

Size	Tubing OD	Page(s)
●	5/16"	71
•	1 mm	71
●	1.8 mm	66
●	2 mm	66, 71
●	3 mm	71
●	4 mm	71

Biocompatible UHPLC Tubing

- PEEK-Lined Stainless Steel (PLS)
- Pressures to 17,400 psi (1,200 bar)
- Bends with no loss of performance
- 6 different inner diameters in 4 pre-cut lengths available
- Pre-assembled with VHP-325 fittings

IDEX Health & Science introduces NEW PEEK-Lined Stainless Steel (PLS) Tubing for biocompatible UHPLC applications. The tubing combines the strength of industry-standard 316 Stainless Steel with the chemical inertness of PEEK polymer to enable more efficient bio-separations at pressures up to 17,400 psi (1,200 bar).

The unique design features of PLS Tubing allow it to be bent into shapes that may be required by the system equipment — including angled bends and even sample loops for the injection valve — all with no loss of performance. Even in a bent shape, the PEEK lining maintains its integrity along the entire length.

PLS Tubing achieves its maximum performance of 17,400 psi (1,200 bar) when used with Upchurch Scientific® VHP Fittings. The standard configuration of this tubing automatically pairs a length of tubing with two VHP-325 fittings, which allow repeat connections at UHPLC pressures.

PLS Tubing

Part No.	ID	Length	Includes
PEEK-LINED STAINLESS STEEL (PLS) TUBING, 1/16" OD			
UP-6025100	25 µm (0.001")	100 mm (4")	(2) VHP-325
UP-6025200	25 µm (0.001")	200 mm (8")	(2) VHP-325
UP-6025300	25 µm (0.001")	300 mm (12")	(2) VHP-325
UP-6025500	25 µm (0.001")	500 mm (1.6')	(2) VHP-325
UP-6050100	50 µm (0.002")	100 mm (4")	(2) VHP-325
UP-6050200	50 µm (0.002")	200 mm (8")	(2) VHP-325
UP-6050300	50 µm (0.002")	300 mm (12")	(2) VHP-325
UP-6050500	50 µm (0.002")	500 mm (1.6')	(2) VHP-325
UP-6075100	75 µm (0.003")	100 mm (4")	(2) VHP-325
UP-6075200	75 µm (0.003")	200 mm (8")	(2) VHP-325
UP-6075300	75 µm (0.003")	300 mm (12")	(2) VHP-325
UP-6075500	75 µm (0.003")	500 mm (1.6')	(2) VHP-325
UP-6100100	100 µm (0.004")	100 mm (4")	(2) VHP-325
UP-6100200	100 µm (0.004")	200 mm (8")	(2) VHP-325
UP-6100300	100 µm (0.004")	300 mm (12")	(2) VHP-325
UP-6100500	100 µm (0.004")	500 mm (1.6')	(2) VHP-325
UP-6125100	125 µm (0.005")	100 mm (4")	(2) VHP-325
UP-6125200	125 µm (0.005")	200 mm (8")	(2) VHP-325
UP-6125300	125 µm (0.005")	300 mm (12")	(2) VHP-325
UP-6125500	125 µm (0.005")	500 mm (1.6')	(2) VHP-325
UP-6175100	175 µm (0.007")	100 mm (4")	(2) VHP-325
UP-6175200	175 µm (0.007")	200 mm (8")	(2) VHP-325
UP-6175300	175 µm (0.007")	300 mm (12")	(2) VHP-325
UP-6175500	175 µm (0.007")	500 mm (1.6')	(2) VHP-325
UP-6254100	254 µm (0.010")	100 mm (4")	(2) VHP-325
UP-6254200	254 µm (0.010")	200 mm (8")	(2) VHP-325
UP-6254300	254 µm (0.010")	300 mm (12")	(2) VHP-325
UP-6254500	254 µm (0.010")	500 mm (1.6')	(2) VHP-325

Custom lengths of tubing are available. Contact us for more information.

SPECIFICATIONS & DETAILS

PEEK-lined Stainless Steel (PLS) tubing carries a maximum pressure rating of 17,400 psi (1,200 bar). Additionally, inner diameter tolerances range from ±5–15 µm, depending upon the nominal inner diameter of the tubing.

Peek-lined Stainless Steel (PLS) Tubing "Smart" Numbering System

UP-{OD}{ID}{Length}

{OD}	{ID}	{Length}
6 (for 1/16")	025 (for 25 µm)	050 (for 50 mm)
	050 (for 50 µm)	100 (for 100 mm)
	075 (for 75 µm)	200 (for 200 mm)
	100 (for 100 µm)	300 (for 300 mm)
	125 (for 125 µm)	
	175 (for 175 µm)	
	254 (for 254 µm)	

Stainless Steel Tubing

- Precut 316 stainless steel*
- Available ODs include 0.020", 1/32", 1/16", and 1/8"
- Color-coded banding for easy identification of the inner diameter

IDEX Health & Science seamless, precut stainless steel tubing is designed to meet the exacting requirements of today's analyses. We machine cut and polish each end, deburr the inside and outside edges, and passivate the tubing (please see the passivation information on this page). Finally, we flush reagent-grade isopropanol through each piece.

Our thorough preparation and cleaning procedure guarantees tubing that is truly ready-to-use, with flat, burr-free ends and a clean finish. This care is important in achieving zero-dead-volume connections and good chromatographic results.

We offer a variety of precut lengths as well as longer lengths (5' and 25') of some sizes. Cutting the tubing disturbs and roughens the tubing's end surface, so we recommend using our precut tubing whenever possible. If you need to cut tubing to custom lengths, we suggest you then passivate the tubing. For a description of a cold passivation process, please contact IDEX Health & Science or visit our website at www.idex-hs.com and search for "stainless steel tubing."

** Except our 0.020" OD Stainless Steel Tubing, which is manufactured from 304 series stainless steel.*

APPLICATION NOTE

- Our 1/32" OD tubing is designed for enhanced flexibility in high pressure applications.
- Standard 1/16" and 1/8" OD stainless steel tubing is suited for most analytical applications.

SPECIFICATIONS & DETAILS

- Maximum Recommended Operating Temperature: 750 °F (399 °C).
- Rockwell Hardness (B): Maximum of 95.
- Meets ASTM A269 and A213.

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
0.020"	±0.0005" (12.5 µm)	All	±0.0005" (12.5 µm)
1/32"	+0.002"/-0.000" (+50 µm/-0 µm)	All, except 0.004" (0.10 mm)	+0.000"/-0.002" (+0 µm/-50 µm)
1/32"	+0.002"/-0.000" (+50 µm/-0 µm)	0.004" (0.10 mm)	+0.002"/-0.000" (+50 µm/-0 µm)
1/16"	+0.002"/-0.000" (+50 µm/-0 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)

RELATED PRODUCTS

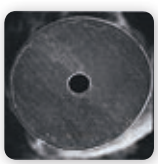
- Our 0.020" OD tubing is the size of choice for the Rheodyne® Model 8125 Micro-Scale Injector Valve (page 132).
- PEEK polymer tubing is available in all of these sizes, listed on pages 66–67.

NOTE

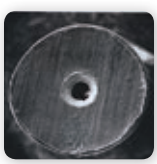
PEEK polymer tubing can be used to replace stainless steel tubing in most liquid analytical systems. Unlike stainless steel tubing, PEEK tubing is biocompatible, flexible, and can easily be cut to desired lengths. See pages 66–68.

All Stainless Steel tubing longer than 1 m is coiled.

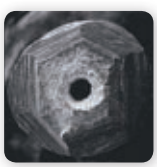
The Beauty of Precut Tubing



Precut tubing



Tubing cut by a commercially available tubing cutter



File cut tubing

Stainless Steel Tubing Passivation

Stainless steel is naturally self-passivating, forming an oxidized layer on newly created surfaces. IDEX Health & Science takes extra steps to ensure the chemical resistance of our stainless steel tubing by manually passivating before and after the tubing is cut into specified lengths (except in a few cases where size is prohibitive). In the precut stage, the internal wall is acid passivated and flushed. After the tubing is cut, deburred and polished, it is completely submerged in an acid passivation bath and again flushed clean. The table below summarizes the manual passivation steps performed for each size of our stainless steel tubing:

Tubing OD	Precut Passivation	Postcut Passivation
0.020"	All	All
1/32"	All	All
1/16"	All	All, ex. 25' lengths
1/8"	None	All, ex. 3 & 5 m lengths

NOTE

Understanding the Maximum Pressure Value of Stainless Steel Tubing

Stainless steel is unique as a material. The Maximum Pressure value listed for each part number is the safe, continuous working pressure limit that IDEX Health & Science has assigned for the tubing. It reflects a safety margin before the tubing begins to "yield" — which is well below the tubing's "burst" pressure. For more information, contact IDEX Health & Science or your authorized Distributor.

Part No.	ID	Length	Color	Maximum Pressure
STAINLESS STEEL, 0.020" OD				
U-119	0.005" (0.125 mm)	5 cm (2")	N/A	17,200 psi (1,186 bar)
U-120	0.005" (0.125 mm)	10 cm (4")	N/A	17,200 psi (1,186 bar)
U-121	0.005" (0.125 mm)	20 cm (8")	N/A	17,200 psi (1,186 bar)
U-122	0.005" (0.125 mm)	30 cm (12")	N/A	17,200 psi (1,186 bar)
U-123	0.005" (0.125 mm)	50 cm (1.6')	N/A	17,200 psi (1,186 bar)
U-124	0.005" (0.125 mm)	1 m (3.2')	N/A	17,200 psi (1,186 bar)
U-125	0.005" (0.125 mm)	1.5 m (5')	N/A	17,200 psi (1,186 bar)
STAINLESS STEEL, 1/32" OD				
U-1114	0.004" (0.10 mm)	5 cm (2")	Red	19,300 psi (1,331 bar)
U-1115	0.004" (0.10 mm)	10 cm (4")	Red	19,300 psi (1,331 bar)
U-1116	0.004" (0.10 mm)	20 cm (8")	Red	19,300 psi (1,331 bar)
U-1117	0.004" (0.10 mm)	30 cm (12")	Red	19,300 psi (1,331 bar)
U-1120	0.006" (0.15 mm)	5 cm (2")	Yellow	19,300 psi (1,331 bar)
U-1121	0.006" (0.15 mm)	10 cm (4")	Yellow	19,300 psi (1,331 bar)
U-1122	0.006" (0.15 mm)	20 cm (8")	Yellow	19,300 psi (1,331 bar)
U-1123	0.006" (0.15 mm)	30 cm (12")	Yellow	19,300 psi (1,331 bar)
U-1125	0.008" (0.20 mm)	5 cm (2")	Clear	17,800 psi (1,227 bar)
U-1126	0.008" (0.20 mm)	10 cm (4")	Clear	17,800 psi (1,227 bar)
U-1127	0.008" (0.20 mm)	20 cm (8")	Clear	17,800 psi (1,227 bar)
★ **U-1128**	0.008" (0.20 mm)	30 cm (12")	Clear	17,800 psi (1,227 bar)
U-1130	0.010" (0.25 mm)	5 cm (2")	Blue	16,200 psi (1,117 bar)
U-1131	0.010" (0.25 mm)	10 cm (4")	Blue	16,200 psi (1,117 bar)
U-1132	0.010" (0.25 mm)	20 cm (8")	Blue	16,200 psi (1,117 bar)
U-1133	0.010" (0.25 mm)	30 cm (12")	Blue	16,200 psi (1,117 bar)
U-1140	0.015" (0.40 mm)	5 cm (2")	Green	12,300 psi (848 bar)
U-1141	0.015" (0.40 mm)	10 cm (4")	Green	12,300 psi (848 bar)
U-1142	0.015" (0.40 mm)	20 cm (8")	Green	12,300 psi (848 bar)
U-1143	0.015" (0.40 mm)	30 cm (12")	Green	12,300 psi (848 bar)
U-1145	0.018" (0.45 mm)	5 cm (2")	Black	10,000 psi (689 bar)
U-1146	0.018" (0.45 mm)	10 cm (4")	Black	10,000 psi (689 bar)
U-1147	0.018" (0.45 mm)	20 cm (8")	Black	10,000 psi (689 bar)
U-1148	0.018" (0.45 mm)	30 cm (12")	Black	10,000 psi (689 bar)

Part No.	ID	Length	Color	Maximum Pressure
STAINLESS STEEL, 1/16" OD				
U-220	0.004" (0.100 mm)	5 cm (2")	N/A	22,100 psi (1,523 bar)
U-221	0.004" (0.100 mm)	10 cm (4")	N/A	22,100 psi (1,523 bar)
U-222	0.004" (0.100 mm)	20 cm (8")	N/A	22,100 psi (1,523 bar)
U-223	0.004" (0.100 mm)	30 cm (12")	N/A	22,100 psi (1,523 bar)
U-224	0.004" (0.100 mm)	0.5 m (1.6')	N/A	22,100 psi (1,523 bar)
U-225	0.004" (0.100 mm)	1 m (3.2')	N/A	22,100 psi (1,523 bar)
U-152	0.005" (0.125 mm)	5 cm (2")	Red	21,600 psi (1,489 bar)
U-153	0.005" (0.125 mm)	10 cm (4")	Red	21,600 psi (1,489 bar)
U-154	0.005" (0.125 mm)	20 cm (8")	Red	21,600 psi (1,489 bar)
U-155	0.005" (0.125 mm)	30 cm (12")	Red	21,600 psi (1,489 bar)
U-156	0.005" (0.125 mm)	0.5 m (1.6')	Red	21,600 psi (1,489 bar)
U-157	0.005" (0.125 mm)	1 m (3.2')	Red	21,600 psi (1,489 bar)
U-158	0.005" (0.125 mm)	1.5 m (5')	Red	21,600 psi (1,489 bar)
U-160	0.005" (0.125 mm)	7.6 m (25')	Red	21,600 psi (1,489 bar)
U-126	0.007" (0.175 mm)	5 cm (2")	Black	20,900 psi (1,441 bar)
U-127	0.007" (0.175 mm)	10 cm (4")	Black	20,900 psi (1,441 bar)
U-128	0.007" (0.175 mm)	20 cm (8")	Black	20,900 psi (1,441 bar)
U-129	0.007" (0.175 mm)	30 cm (12")	Black	20,900 psi (1,441 bar)
U-130	0.007" (0.175 mm)	0.5 m (1.6')	Black	20,900 psi (1,441 bar)
U-131	0.007" (0.175 mm)	1 m (3.2')	Black	20,900 psi (1,441 bar)
U-108	0.007" (0.175 mm)	1.5 m (5')	Black	20,900 psi (1,441 bar)
U-161	0.007" (0.175 mm)	7.6 m (25')	Black	20,900 psi (1,441 bar)
★ **U-111**	0.010" (0.25 mm)	5 cm (2")	Blue	19,700 psi (1,358 bar)
★ **U-112**	0.010" (0.25 mm)	10 cm (4")	Blue	19,700 psi (1,358 bar)
U-113	0.010" (0.25 mm)	20 cm (8")	Blue	19,700 psi (1,358 bar)
★ **U-114**	0.010" (0.25 mm)	30 cm (12")	Blue	19,700 psi (1,358 bar)
U-132	0.010" (0.25 mm)	0.5 m (1.6')	Blue	19,700 psi (1,358 bar)
U-133	0.010" (0.25 mm)	1 m (3.2')	Blue	19,700 psi (1,358 bar)
U-106	0.010" (0.25 mm)	1.5 m (5')	Blue	19,700 psi (1,358 bar)
U-162	0.010" (0.25 mm)	7.6 m (25')	Blue	19,700 psi (1,358 bar)
U-101	0.020" (0.5 mm)	5 cm (2")	Yellow	15,800 psi (1,089 bar)
U-102	0.020" (0.5 mm)	10 cm (4")	Yellow	15,800 psi (1,089 bar)
U-103	0.020" (0.5 mm)	20 cm (8")	Yellow	15,800 psi (1,089 bar)
U-104	0.020" (0.5 mm)	30 cm (12")	Yellow	15,800 psi (1,089 bar)
U-134	0.020" (0.5 mm)	0.5 m (1.6')	Yellow	15,800 psi (1,089 bar)
U-135	0.020" (0.5 mm)	1 m (3.2')	Yellow	15,800 psi (1,089 bar)
★ **U-105**	0.020" (0.5 mm)	1.5 m (5')	Yellow	15,800 psi (1,089 bar)
U-163	0.020" (0.5 mm)	7.6 m (25')	Yellow	15,800 psi (1,089 bar)
U-115	0.030" (0.75 mm)	5 cm (2")	White	12,000 psi (827 bar)
U-116	0.030" (0.75 mm)	10 cm (4")	White	12,000 psi (827 bar)
U-117	0.030" (0.75 mm)	20 cm (8")	White	12,000 psi (827 bar)
U-118	0.030" (0.75 mm)	30 cm (12")	White	12,000 psi (827 bar)
U-136	0.030" (0.75 mm)	0.5 m (1.6')	White	12,000 psi (827 bar)
U-137	0.030" (0.75 mm)	1 m (3.2')	White	12,000 psi (827 bar)
★ **U-107**	0.030" (0.75 mm)	1.5 m (5')	White	12,000 psi (827 bar)
★ **U-164**	0.030" (0.75 mm)	7.6 m (25')	White	12,000 psi (827 bar)
U-138	0.040" (1.0 mm)	5 cm (2")	N/A	8,100 psi (558 bar)
U-139	0.040" (1.0 mm)	10 cm (4")	N/A	8,100 psi (558 bar)
U-140	0.040" (1.0 mm)	20 cm (8")	N/A	8,100 psi (558 bar)
U-141	0.040" (1.0 mm)	30 cm (12")	N/A	8,100 psi (558 bar)
U-142	0.040" (1.0 mm)	0.5 m (1.6')	N/A	8,100 psi (558 bar)
U-143	0.040" (1.0 mm)	1 m (3.2')	N/A	8,100 psi (558 bar)
U-144	0.040" (1.0 mm)	1.5 m (5')	N/A	8,100 psi (558 bar)
★ **U-165**	0.040" (1.0 mm)	7.6 m (25')	N/A	8,100 psi (558 bar)
U-145	0.046" (1.15 mm)	5 cm (2")	N/A	5,800 psi (400 bar)
U-146	0.046" (1.15 mm)	10 cm (4")	N/A	5,800 psi (400 bar)
U-147	0.046" (1.15 mm)	20 cm (8")	N/A	5,800 psi (400 bar)
U-148	0.046" (1.15 mm)	30 cm (12")	N/A	5,800 psi (400 bar)
U-149	0.046" (1.15 mm)	0.5 m (1.6')	N/A	5,800 psi (400 bar)
U-150	0.046" (1.15 mm)	1 m (3.2')	N/A	5,800 psi (400 bar)
U-151	0.046" (1.15 mm)	1.5 m (5')	N/A	5,800 psi (400 bar)
STAINLESS STEEL, 1/8" OD				
U-815	0.080" (2.0 mm)	15 cm (6")	N/A	7,600 psi (524 bar)
U-825	0.080" (2.0 mm)	25 cm (10")	N/A	7,600 psi (524 bar)
U-800	0.080" (2.0 mm)	1 m (3.2')	N/A	7,600 psi (524 bar)
U-803	0.080" (2.0 mm)	3 m (9.8')	N/A	7,600 psi (524 bar)
U-805	0.080" (2.0 mm)	5 m (16')	N/A	7,600 psi (524 bar)

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PEEK Tubing

- 1/16", 1/8", 1.8 mm, or 2.0 mm outside diameter available
- Biocompatible, inert, and easily cut
- Great for high pressure applications
- Maximum continuous use temperature: 100 °C

Upchurch Scientific® PEEK (polyetheretherketone) polymer tubing is biocompatible, chemically inert to most solvents, and can be used to replace stainless steel tubing in most liquid analytical systems. Unlike stainless steel tubing, PEEK tubing is flexible and can be easily cut to desired lengths.

PEEK tubing has a very smooth internal surface, which causes less turbulence than similarly sized metal tubing, contributing to improved resolution of sample bands. Of all our polymer tubing materials, PEEK is the least permeable to gas (see material properties on our website: www.idex-hs.com).

In addition, much of our 1/16" OD tubing is color-coded so different IDs are easily identified. Our proprietary extrusion process ensures color permanence in our tubing.

Our 5' length tubing is rough cut to approximately 5'1". A trim cut should be made before use, especially for smaller ID tubing. PEEK tubing can be cut easily with a razor blade. However for an improved cut, try our Tubing Cutters on page 74.

	Part No.	ID	Color	Max. Pressure
	PEEK TUBING, 1/16" OD X 5' (1.5 M)			
	1559	0.001" (25 µm) ID	Natural	10,000 psi (690 bar)
	1560	0.0025" (65 µm) ID	Natural	7,000 psi (483 bar)
★	**1561**	0.004" (0.10 mm) ID	Black	7,000 psi (483 bar)
★	**1535**	0.005" (0.125 mm) ID	Red	7,000 psi (483 bar)
★	**1562**	0.006" (0.15 mm) ID	Purple	7,000 psi (483 bar)
	1536	0.007" (0.175 mm) ID	Yellow	7,000 psi (483 bar)
★	**1531**	0.010" (0.25 mm) ID	Natural	7,000 psi (483 bar)
★	**1531B**	0.010" (0.25 mm) ID	Blue	7,000 psi (483 bar)
★	**1565**	0.015" (0.40 mm) ID	Gray	7,000 psi (483 bar)
	1532	0.020" (0.50 mm) ID	Orange	7,000 psi (483 bar)
★	**1533**	0.030" (0.75 mm) ID	Green	7,000 psi (483 bar)
★	**1538**	0.040" (1.00 mm) ID	Natural	5,000 psi (345 bar)
★	**1537**	0.055" (1.40 mm) ID	Natural	500 psi (34 bar)
	PEEK TUBING, 1/8" OD X 5' (1.5 M)			
	1534	0.062" (1.55 mm) ID	Natural	4,000 psi (276 bar)
★	**1544**	0.080" (2.00 mm) ID	Natural	3,000 psi (207 bar)
	PEEK TUBING, 1.8 MM OD X 5' (1.5 M)			
	1539	0.055" (1.40 mm) ID	Natural	500 psi (34 bar)
	PEEK TUBING, 2.0 MM OD X 5' (1.5 M)			
	1590	0.042" (1.05 mm) ID	Natural	5,000 psi (345 bar)

APPLICATION NOTE

What Size PEEK Tubing Should I Use?

- It is usually safe to use 1/16" OD x 0.010" ID tubing throughout an analytical HPLC system. With a 0.010" ID, the pressure drop across most tubing lengths is negligible, and the ID is small enough to minimize band broadening.
- High pressure semi-prep LC systems will most likely use 1/8" OD tubing.
- Use 1.8 mm OD tubing to replace fluoropolymer tubing used in some Pharmacia®/GE Healthcare systems.
- Use our 1/32" OD tubing for the high pressure flow path of some microbore HPLC systems.
- Choose 360 µm OD tubing for most capillary systems.
- PEEK tubing is available in additional sizes and in 50' and 100' lengths. Contact your local Distributor or IDEX Health & Science directly for pricing information.

SPECIFICATIONS & DETAILS

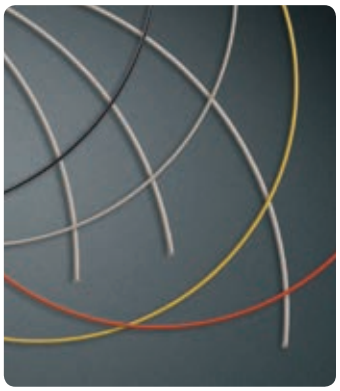
Tubing OD	OD Tolerance
1/16"	±0.001" (25 µm)
1.8 mm	±0.002" (50 µm)
2.0 mm	±0.002" (50 µm)
1/8"	±0.003" (75 µm)

Tubing ID	ID Tolerance
25 µm	±0.0005" (12.5 µm)
All	±0.001" (25 µm)
All	±0.001" (25 µm)
All	±0.003" (75 µm)

Capillary PEEK Tubing

- 360 µm, 510 µm, or 1/32" outside diameter available
- IDs as small as 25 µm (0.001")

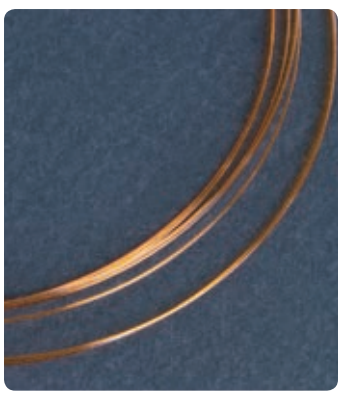
Capillary PEEK tubing offers all the benefits of larger sized PEEK tubing, while serving as an excellent alternative to more traditional fused silica and stainless steel capillary tubing (see Application Note, right). The capillary tubing can be coupled to many of the products in the Connectors chapter (starting on page 34) and to some of the valves in the Valves chapter (starting on page 124).



Fused Silica Tubing

- Five inner diameters with most common capillary outside diameter, 360 µm
- Cut in convenient lengths, up to 2 m

These products are manufactured from synthetic fused silica with a polyimide coating.



APPLICATION NOTE

- An independent study conducted by a major pharmaceutical company indicated LC-MS chromatographic performance could be improved in some cases by switching the post-column transfer line from fused silica to PEEK polymer tubing. The switch dramatically reduced peak tailing and eliminated the degradation of peak symmetry as injection volume was reduced. For more information, please contact us or order the "Improved LC-MS Results Study" from the "Request Literature" section of our website at www.idex-hs.com.
- To straighten PEEK polymer tubing, first choose a piece of stainless steel tubing with an inner diameter slightly larger than the OD of your tubing and with an appropriate length for the PEEK tubing you wish to straighten. For instance, for 1/16" OD PEEK tubing with a length of 10", choose our U-825 tubing (stainless steel, 1/8" OD x 0.080" ID x 25 cm long, page 64). Slip your PEEK tubing into the stainless steel tubing. Place this "sleeved" tubing into an oven and bake at 425 °F (218 °C) for 30 minutes or 350 °F (177 °C) for 60 minutes. Allow the sleeved tubing to return to room temperature naturally (i.e., do not quench it with water). Once cooled, remove the PEEK tubing from the stainless steel sleeve and inspect it for straightness. If needed, repeat the process until the desired straightness is achieved.

NOTE

Because the thru-hole of our 25 µm ID PEEK tubing is very small, it is possible for some fittings to cause the ID to become occluded. Please use caution, especially with wrench-tightened fittings. For more information, please contact IDEX Health & Science or your local Distributor directly.

	Part No.	ID	Color	Max. Pressure	Qty.
	CAPILLARY PEEK TUBING, 360 µm OD				
	1574	25 µm (0.001") ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1570	50 µm (0.002") ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	1573	75 µm (0.003") ID x 5' (1.5 m)	Black	2,000 psi (138 bar)	ea.
	1571	100 µm (0.004") ID x 5' (1.5 m)	Red	2,000 psi (138 bar)	ea.
	1572	150 µm (0.006") ID x 5' (1.5 m)	Yellow	2,000 psi (138 bar)	ea.
	CAPILLARY PEEK TUBING, 510 µm (0.020") OD				
	1543	0.0025" (65 µm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
★	**1541**	0.005" (0.125 mm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	1542	0.010" (0.254 mm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	CAPILLARY PEEK TUBING, 1/32" OD				
	1567	0.001" (25 µm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1579	0.0025" (65 µm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1578	0.0035" (90 µm) ID x 5' (1.5 m)	Black	5,000 psi (345 bar)	ea.
	1576	0.005" (0.125 mm) ID x 5' (1.5 m)	Red	5,000 psi (345 bar)	ea.
	1577	0.007" (0.175 mm) ID x 5' (1.5 m)	Yellow	5,000 psi (345 bar)	ea.
	1575	0.008" (0.20 mm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1580	0.009" (0.23 mm) ID x 5' (1.5 m)	Gray	5,000 psi (345 bar)	ea.
	1581	0.010" (0.25 mm) ID x 5' (1.5 m)	Blue	5,000 psi (345 bar)	ea.
	1568	0.015" (0.40 mm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
★	**1569**	0.020" (0.50 mm) ID x 5' (1.5 m)	Orange	3,000 psi (207 bar)	ea.
	787-KIT	1/32" OD x 12" Kit Kit contains (1) 10-pack of each 1/32" OD x 12" size listed above.			Kit
	FUSED SILICA TUBING, 360 µm OD				
★	**FS-120**	20 µm (0.0008") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
★	**FS-150**	50 µm (0.002") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-175	75 µm (0.003") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-110	100 µm (0.004") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-115	150 µm (0.006") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.

SPECIFICATIONS & DETAILS

Capillary PEEK Tubing Specifications

Tubing OD	Tubing ID	OD/ID Tolerances
360 µm	All	±0.0005" (12.5 µm)
510 µm	All	±0.001" (25 µm)
1/32"	All	±0.0005" (12.5 µm)

Fused Silica Tubing Specifications

Tubing OD	Tubing ID	OD Tolerance	ID Tolerance
360 µm	20 µm (0.0008")	±0.0004" (10 µm)	±0.00008" (2 µm)
360 µm	50 µm (0.002") and 75 µm (0.003")	±0.0004" (10 µm)	±0.00012" (3 µm)
360 µm	100 µm (0.004") and 150 µm (0.006")	±0.0004" (10 µm)	±0.00016" (4 µm)

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PEEKsil™ Tubing

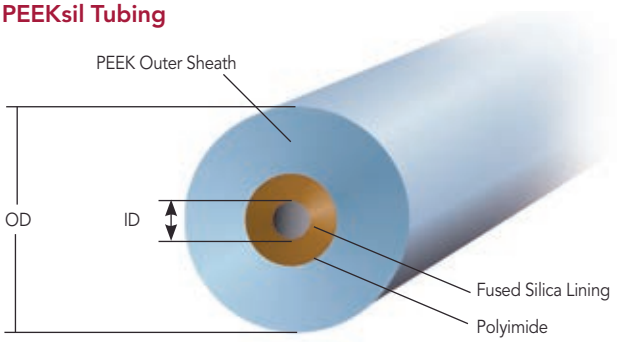
- PEEK covered fused silica
- 360 µm, 1/32", and 1/16" outside diameters with a wide variety of inside diameters
- Precut to numerous standard lengths

PEEKsil's sheathing is mechanically strong and has ideal characteristics for sealing with many styles of fittings. The fused silica core provides a consistent and rigid fluid pathway with very tight tolerances and industry-accepted chemical properties. Together, this makes PEEKsil tubing ideal for numerous applications. In fact, PEEKsil can be used as a direct replacement for conventional stainless steel or PEEK tubing in many analytical systems.

Like traditional fused silica tubing, PEEKsil has excellent chemical compatibility and extremely low adsorption characteristics, especially when compared with stainless steel.

Please Note: ***Do not cut this tubing.*** *It should be used at its precut lengths because of permanent damage caused by conventional cutters.*

PEEKsil Tubing



SPECIFICATIONS & DETAILS

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
360 µm	±0.0004" (10 µm)	25 µm	±0.00004" (1 µm)
1/32"	±0.0008" (20 µm)	50–100 µm	±0.00012" (3 µm)
1/16"	±0.0012" (30 µm)	0.15–0.30 mm	±0.0002" (5 µm)

Part No.	ID	Length	Color	Qty.
PEEKSIL TUBING, 360 µm OD				
360255	25 µm (0.001")	5 cm (2")	Orange	2-pk
3602510	25 µm (0.001")	10 cm (4")	Orange	2-pk
3602515	25 µm (0.001")	15 cm (6")	Orange	2-pk
3602525	25 µm (0.001")	25 cm (10")	Orange	2-pk
3602550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
360505	50 µm (0.002")	5 cm (2")	Natural	2-pk
3605010	50 µm (0.002")	10 cm (4")	Natural	2-pk
3605015	50 µm (0.002")	15 cm (6")	Natural	2-pk
3605025	50 µm (0.002")	25 cm (10")	Natural	2-pk
3605050	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
PEEKSIL TUBING, 1/32" OD				
3255	25 µm (0.001")	5 cm (2")	Orange	2-pk
32510	25 µm (0.001")	10 cm (4")	Orange	2-pk
32515	25 µm (0.001")	15 cm (6")	Orange	2-pk
32520	25 µm (0.001")	20 cm (8")	Orange	2-pk
32550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
3505	50 µm (0.002")	5 cm (2")	Natural	2-pk
35010	50 µm (0.002")	10 cm (4")	Natural	2-pk
35015	50 µm (0.002")	15 cm (6")	Natural	2-pk
35020	50 µm (0.002")	20 cm (8")	Natural	2-pk

SPECIFICATIONS & DETAILS

Because PEEKsil tubing has fused silica tubing at its core, the pressure rating for this tubing is determined by the inner diameter of the tubing. The following chart highlights the Maximum Pressure values for this tubing, as determined by SGE International Pty., Ltd., the manufacturer of this tubing:

Tubing ID	Maximum Pressure	Tubing ID	Maximum Pressure
25 µm	25,000 psi (1,723 bar)	150–175 µm	8,500 psi (586 bar)
50 µm	20,000 psi (1,379 bar)	200–300 µm	6,000 psi (414 bar)
75–100 µm	15,000 psi (1,034 bar)		

The pressure ratings provided are indicative of the performance capabilities of the tubing. The actual pressure limits achievable will depend upon the fittings used, the quality of the receiving port, and other factors. Contact IDEX Health & Science or your authorized Distributor for more information.

Part No.	ID	Length	Color	Qty.
PEEKSIL TUBING, 1/32" OD				
★ **35050**	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
3755	75 µm (0.003")	5 cm (2")	Black	2-pk
37510	75 µm (0.003")	10 cm (4")	Black	2-pk
37515	75 µm (0.003")	15 cm (6")	Black	2-pk
37520	75 µm (0.003")	20 cm (8")	Black	2-pk
37550	75 µm (0.003")	50 cm (1.6')	Black	2-pk
31005	100 µm (0.004")	5 cm (2")	Red	2-pk
310010	100 µm (0.004")	10 cm (4")	Red	2-pk
310015	100 µm (0.004")	15 cm (6")	Red	2-pk
310020	100 µm (0.004")	20 cm (8")	Red	2-pk
310050	100 µm (0.004")	50 cm (1.6')	Red	2-pk
31505	150 µm (0.006")	5 cm (2")	Purple	2-pk
315010	150 µm (0.006")	10 cm (4")	Purple	2-pk
315015	150 µm (0.006")	15 cm (6")	Purple	2-pk
315020	150 µm (0.006")	20 cm (8")	Purple	2-pk
★ **315050**	150 µm (0.006")	50 cm (1.6')	Purple	2-pk
PEEKSIL TUBING, 1/16" OD				
6255	25 µm (0.001")	5 cm (2")	Orange	5-pk
62510	25 µm (0.001")	10 cm (4")	Orange	5-pk
62515	25 µm (0.001")	15 cm (6")	Orange	5-pk
62520	25 µm (0.001")	20 cm (8")	Orange	5-pk
62550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
6505	50 µm (0.002")	5 cm (2")	Natural	5-pk
65010	50 µm (0.002")	10 cm (4")	Natural	5-pk
65015	50 µm (0.002")	15 cm (6")	Natural	5-pk
★ **65020**	50 µm (0.002")	20 cm (8")	Natural	5-pk
65050	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
6755	75 µm (0.003")	5 cm (2")	Black	5-pk
67510	75 µm (0.003")	10 cm (4")	Black	5-pk
67515	75 µm (0.003")	15 cm (6")	Black	5-pk
67520	75 µm (0.003")	20 cm (8")	Black	5-pk
67550	75 µm (0.003")	50 cm (1.6')	Black	2-pk
61005	100 µm (0.004")	5 cm (2")	Red	5-pk
610010	100 µm (0.004")	10 cm (4")	Red	5-pk
610015	100 µm (0.004")	15 cm (6")	Red	5-pk
610020	100 µm (0.004")	20 cm (8")	Red	5-pk
610050	100 µm (0.004")	50 cm (1.6')	Red	2-pk
61505	150 µm (0.006")	5 cm (2")	Purple	5-pk
615010	150 µm (0.006")	10 cm (4")	Purple	5-pk
615015	150 µm (0.006")	15 cm (6")	Purple	5-pk
615020	150 µm (0.006")	20 cm (8")	Purple	5-pk
615050	150 µm (0.006")	50 cm (1.6')	Purple	2-pk
61755	175 µm (0.007")	5 cm (2")	Yellow	5-pk
617510	175 µm (0.007")	10 cm (4")	Yellow	5-pk
617515	175 µm (0.007")	15 cm (6")	Yellow	5-pk
617520	175 µm (0.007")	20 cm (8")	Yellow	5-pk
617550	175 µm (0.007")	50 cm (1.6')	Yellow	2-pk
62005	200 µm (0.008")	5 cm (2")	Blue	5-pk
620010	200 µm (0.008")	10 cm (4")	Blue	5-pk
620015	200 µm (0.008")	15 cm (6")	Blue	5-pk
620020	200 µm (0.008")	20 cm (8")	Blue	5-pk
620050	200 µm (0.008")	50 cm (1.6')	Blue	2-pk
63005	300 µm (0.012")	5 cm (2")	Gray	5-pk
630010	300 µm (0.012")	10 cm (4")	Gray	5-pk
630015	300 µm (0.012")	15 cm (6")	Gray	5-pk
630020	300 µm (0.012")	20 cm (8")	Gray	5-pk
630050	300 µm (0.012")	50 cm (1.6')	Gray	2-pk

Spiral-Link™ Tubing

- Preformed PEEK tubing into a convenient spiral for a sample loop or to facilitate tubing movement
- Many volumes available

The coils of our 1/16" OD Spiral-Link tubing expand and contract, allowing you to more easily move your system components or even make equipment repairs whenever needed, without the hassle of breaking connections.

Upchurch Scientific® Spiral-Link tubing is made of PEEK polymer, a biocompatible, chemically inert material. Spiral-Links come in six different lengths. Our proprietary extrusion process ensures color permanence.

Each Spiral-Link ships with two F-287 SealTight™ Fittings.

NOTE

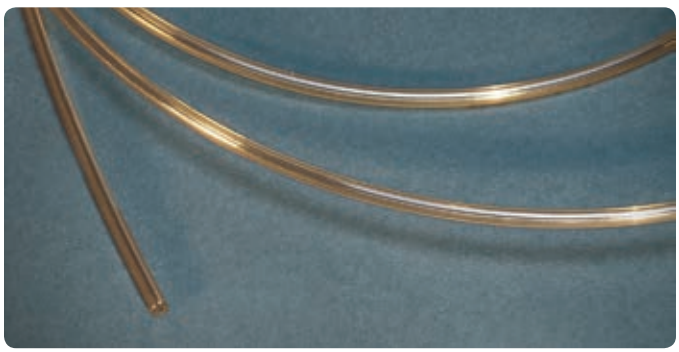
In addition to 0.010" ID shown in the price block below, Spiral-Link tubing is also available with the following IDs: 0.005" (125 µm), 0.020" (0.50 mm), and 0.030" (0.75 mm), all with 1/16" OD. Please contact us or an IDEX Health & Science Distributor for more information, or find these products at www.idex-hs.com.

Radel® Tubing

- Withstands up to 12,500 psi (862 bar)
- Transparent and autoclavable
- 1/16" and 1/8" outside diameters available
- Maximum continuous use temperature: 100 °C

Radel (polyphenylsulfone) is a mechanically strong and chemically resistant material, much like PEEK. Radel is frequently used in medical applications where repeated autoclave sterilization is performed (tests show product stability even after 1,000 cycles). Radel tubing is also transparent, allowing technicians to visually monitor flow through their instrument. Readily wetted surfaces help keep air bubbles from accumulating on inner surfaces.

Please visit our website, www.idex-hs.com, for more information regarding chemical compatibility of Radel.



SPECIFICATIONS & DETAILS

Tubing OD	OD Tolerance
1/16"	±0.001" (25 µm)
1/8"	±0.003" (75 µm)

Tubing ID	ID Tolerance
All	±0.001" (25 µm)
All	±0.003" (75 µm)

Part No.	ID	Length (Prior to Coiling)		Max coil span	Volume
SPIRAL LINK TUBING, 1/16" OD					
17202	0.25 mm (0.010")	20 cm (8")		1.3 cm (0.5")	10 µL
17204	0.25 mm (0.010")	40 cm (15.75")		6.1 cm (2.4")	20 µL
17205	0.25 mm (0.010")	50 cm (19.69")		7.6 cm (3.0")	25 µL
17210	0.25 mm (0.010")	100 cm (39.37")		17.8 cm (7.0")	51 µL
17220	0.25 mm (0.010")	200 cm (78.74")		33 cm (13.0")	101 µL
RADEL TUBING, 1/16" OD					
Part No.	**ID**	**Length**	**Color**	**Max Pressure**	**Volume**
1210	0.25 mm (0.010")	1.5 m (5')	Natural	12,500 psi (862 bar)	N/A
1210L	0.25 mm (0.010")	15 m (50')	Natural	12,500 psi (862 bar)	N/A
1210XL	0.25 mm (0.010")	30 m (100')	Natural	12,500 psi (862 bar)	N/A
1220	0.50 mm (0.020")	1.5 m (5')	Natural	7,500 psi (518 bar)	N/A
1220L	0.50 mm (0.020")	15 m (50')	Natural	7,500 psi (518 bar)	N/A
1220XL	0.50 mm (0.020")	30 m (100')	Natural	7,500 psi (518 bar)	N/A
1230	0.75 mm (0.030")	1.5 m (5')	Natural	5,500 psi (379 bar)	N/A
1230L	0.75 mm (0.030")	15 m (50')	Natural	5,500 psi (379 bar)	N/A
1230XL	0.75 mm (0.030")	30 m (100')	Natural	5,500 psi (379 bar)	N/A
RADEL TUBING, 1/8" OD					
1235	1.55 mm (0.062")	1.5 m (5')	Natural	4,500 psi (310 bar)	N/A
1235L	1.55 mm (0.062")	15 m (50')	Natural	4,500 psi (310 bar)	N/A
★ **1235XL**	1.55 mm (0.062")	30 m (100')	Natural	4,500 psi (310 bar)	N/A

RELATED PRODUCTS

- Some customers report using longer lengths of polymer tubing to add a little back pressure to their system. A more precise way to achieve this objective is to use one of our Back Pressure Regulators, found on page 152.

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TUBING	DuPont® FEP	DuPont PFA	DuPont HIGH PURITY PFA	360 µm DuPont HIGH PURITY PFA	ETFE
Page	**71**	**72**	**72**	**72**	**73**
Description	FEP tubing is a great alternative to traditional PTFE tubing, desirable for use because it is chemically inert to most solvents, easy to cut, and translucent for easy monitoring of solutions passing through. • Great for general, low pressure applications • Many sizes available in multiple colors for easy identification • Tight manufacturing tolerances to ensure product consistency	Offers excellent chemical compatibility, plus due to its inner surface smoothness, PFA tubing tends to be more translucent than PTFE tubing. • Offers higher purity and enhanced translucence when compared with other fluoropolymer tubes • Great for more critical, low pressure applications	This polymer tubing is manufactured from a premium grade of PFA — one of the most contaminant-free polymers on the market. • Offers chemical stability, mechanical strength, and purity for applications such as medical, diagnostic, pharmaceutical, biotechnology, and semiconductor • Excellent replacement for PTFE where gas permeability and surface texture are issues • Clarity of tubing makes PFA an excellent choice for monitoring fluid movement	This tubing offers excellent chemical compatibility, transparency, very low contaminant levels and is available in the most commonly-used outside diameter for capillary tubing applications. • Replacement for capillary tubing in low pressure applications where excellent chemical compatibility is required • Tubing sleeves available for capillary tubing connections	ETFE is chemically inert and more suitable for higher pressure applications (when using aqueous mobile phases) than PTFE, FEP, and PFA. Additionally, because ETFE is more rigid than PTFE, FEP, and PFA, this tubing better resists inner diameter collapse. • Excellent solvent resistance • More durable and less gas permeable than PTFE, FEP, and PFA • Operating temperatures up to 80 °C
Specifications					
OD (outside diameter)	1/32" (785 µm), 0.040" (1.0 mm), 1/16" (1.55 mm), 0.080" (2.0 mm), 0.118"(3.0 mm), 1/8" (3.2 mm), 0.157"(4.0 mm), 3/16" (4.8 mm), 1/4" (6.35 mm), 5/16" (7.94 mm)	1/16" (1.55 mm), 1/8" (3.2 mm)	1/16" (1.55 mm), 1/8" (3.2 mm), 3/16" (4.8 mm), 1/4" (6.35 mm)	0.0145" (360 µm)	1/16" (1.6 mm), 1/8" (3.2 mm), 1/4" (6.35 mm)
ID (inside diameter)	0.003" (0.075 mm) – 0.250" (6.35 mm)	0.020" (0.50 mm)– 0.062" (1.55 mm)	0.020" (0.50 mm)– 0.188" (4.80 mm)	0.002" (50 µm)– 0.006" (150 µm)	0.010" (0.25 mm)– 0.188" (4.80 mm)
Operating Temp	-51 to 50 °C	-51 to 80 °C	-51 to 80 °C	-51 to 80 °C	-51 to 80 °C
Pressure Rating	2,500–4,000 psi (172 - 276 bar)	500–2,000 psi (34–138 bar)	250–2,000 psi (17–138 bar)	1,750–3,500 psi (121–241 bar)	250–4,000 psi (17–276 bar)
Typical Tolerances	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing	±0.0005" (12.5 µm)	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing
Refractive Index (Clarity)	1.338	1.34	1.34	1.34	1.4
pH Range	0–14	0–14	0–14	0–14	0–14
Sterilization Techniques	Ethylene oxide; thermal	Ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Ethylene oxide
Autoclavable?	Y	Y	Y	Y	Y

Upchurch Scientific® Tubing OD Sizes

Please use this table as a reference tool to help quickly locate within this chapter the appropriate OD size tubing for your application.

Size	Tubing OD	Page(s)
.	360 µm	67, 68, 72
.	510 µm	65, 67
•	1/32"	65, 67, 68, 71
●	1/16"	63, 65, 66, 68, 69, 71, 72, 73, 77
●	1/8"	65, 66, 69, 71, 72, 73
●	3/16"	71, 72
●	1/4"	71, 72, 73

Size	Tubing OD	Page(s)
●	5/16"	71
•	1 mm	71
●	1.8 mm	66
●	2 mm	66, 71
●	3 mm	71
●	4 mm	71

DuPont® FEP Fluoropolymer Tubing

- Great for moderate-to-low pressure applications
- 1/32", 1/16", 1/8", 3/16", 1/4", or 5/16" outside diameter available
- 1 mm, 2 mm, 3 mm, or 4 mm outside diameter available
- Maximum continuous use temperature: 50 °C

With virtually identical chemical resistance to PFA at a lower price, FEP tubing is great for general, low pressure applications. Compared to PTFE, FEP (fluorinated ethylene propylene) tubing is held to tighter tolerances and has lower gas permeability (see material properties on our website: www.idex-hs.com).

Much of our FEP Tubing — even the color-tinted options — is translucent, making it possible to watch fluid flow. Using different colored tubing can help identify transfer lines in multisolvent systems. Color coding also allows easy identification of the tubing thru-hole size. Black FEP tubing is available for light-sensitive applications (such as enzymatic and chemi-luminescent reactions) and entering/exiting flow cells.

SPECIFICATIONS & DETAILS

Tubing Size	OD Tolerances	ID Tolerances
1/32" OD	±0.0005" (12.5 µm)	±0.0005" (12.5 µm)
1/16" OD	±0.001" (25 µm)	±0.001" (25 µm)
1/8" OD	±0.003" (75 µm)	±0.003" (75 µm)
3/16" OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)
5/16" OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)
1 mm OD	±0.001" (25 µm)	±0.001" (25 µm)
2 mm OD	±0.003" (75 µm)	±0.003" (75 µm)
3 mm OD	±0.003" (75 µm)	±0.003" (75 µm)
4 mm OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)

Part No.	ID	Length	Color	Max. Pressure
FEP TUBING, 1/32" OD				
1683	0.003" (75 µm)	5' (1.5 m)	Natural	4,000 psi (276 bar)
1684	0.004" (0.10 mm)	5' (1.5 m)	Black	3,000 psi (207 bar)
1685	0.005" (0.125 mm)	5' (1.5 m)	Red	3,000 psi (207 bar)
1686	0.006" (0.15 mm)	5' (1.5 m)	Violet	3,000 psi (207 bar)
1687	0.007" (0.175 mm)	5' (1.5 m)	Yellow	3,000 psi (207 bar)
1688	0.008" (0.20 mm)	5' (1.5 m)	Natural	2,500 psi (172 bar)
1689	0.009" (0.23 mm)	5' (1.5 m)	Blue	2,500 psi (172 bar)
1692	0.016" (0.405 mm)	5' (1.5 m)	Natural	1,500 psi (104 bar)
FEP TUBING, 1/16" OD				
1474	0.004" (0.10 mm)	10' (3 m)	Black	4,000 psi (276 bar)
1475	0.005" (0.125 mm)	10' (3 m)	Red	4,000 psi (276 bar)
1476	0.006" (0.150 mm)	10' (3 m)	Violet	4,00t0 psi (276 bar)
1477	0.007" (0.175 mm)	10' (3 m)	Yellow	4,000 psi (276 bar)
1478	0.008" (0.20 mm)	10' (3 m)	Natural	4,000 psi (276 bar)
1479	0.009" (0.23 mm)	10' (3 m)	Blue	4,000 psi (276 bar)
1526	0.010" (0.25 mm)	10' (3 m)	Natural	3,000 psi (207 bar)
1526B	0.010" (0.25 mm)	10' (3 m)	Blue	3,000 psi (207 bar)
1527	0.010" (0.25 mm)	20' (6 m)	Natural	3,000 psi (207 bar)
1527B	0.010" (0.25 mm)	20' (6 m)	Blue	3,000 psi (207 bar)
1518	0.020" (0.50 mm)	10' (3 m)	Black	2,000 psi (138 bar)
1549	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1549OR	0.020" (0.50 mm)	10' (3 m)	Orange	2,000 psi (138 bar)
1519	0.020" (0.50 mm)	20' (6 m)	Black	2,000 psi (138 bar)
★ **1548**	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1548OR	0.020" (0.50 mm)	20' (6 m)	Orange	2,000 psi (138 bar)
1522	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1522G	0.030" (0.75 mm)	10' (3 m)	Green	1,000 psi (69 bar)
★ **1520**	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1520G	0.030" (0.75 mm)	20' (6 m)	Green	1,000 psi (69 bar)

Part No.	ID	Length	Color	Max. Pressure
FEP TUBING, 1/8" OD				
★ **1521**	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1521BL	0.062" (1.55 mm)	50' (15 m)	Blue	500 psi (34 bar)
1521GL	0.062" (1.55 mm)	50' (15 m)	Green	500 psi (34 bar)
1521ORL	0.062" (1.55 mm)	50' (15 m)	Orange	500 psi (34 bar)
1521RL	0.062" (1.55 mm)	50' (15 m)	Red	500 psi (34 bar)
1521YL	0.062" (1.55 mm)	50' (15 m)	Yellow	500 psi (34 bar)
1523	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
FEP TUBING, 3/16" OD				
1524	0.125" (3.20 mm)	20' (6 m)	Natural	500 psi (34 bar)
1524L	0.125" (3.20 mm)	50' (15 m)	Natural	500 psi (34 bar)
★ **1524XL**	0.125" (3.20 mm)	100' (30 m)	Natural	500 psi (34 bar)
1525	0.125" (3.20 mm)	10' (3 m)	Natural	500 psi (34 bar)
FEP TUBING, 1/4" OD				
1651	0.156" (4.0 mm)	10' (3 m)	Natural	250 psi (17 bar)
1651L	0.156" (4.0 mm)	50' (15 m)	Natural	250 psi (17 bar)
1651XL	0.156" (4.0 mm)	100' (30 m)	Natural	250 psi (17 bar)
1650	0.188" (4.80 mm)	10' (3 m)	Natural	250 psi (17 bar)
1650L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
1650XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)
FEP TUBING, 5/16" OD				
1652	0.250" (6.35 mm)	10' (3 m)	Natural	250 psi (17 bar)
1652L	0.250" (6.35 mm)	50' (15 m)	Natural	250 psi (17 bar)
1652XL	0.250" (6.35 mm)	100' (30 m)	Natural	250 psi (17 bar)
FEP TUBING, 1.0 mm OD				
1671	0.020" (0.50 mm)	10' (3 m)	Natural	500 psi (34 bar)
1671L	0.020" (0.50 mm)	50' (15 m)	Natural	500 psi (34 bar)
1671XL	0.020" (0.50 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 2.0 mm OD				
1673	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1673L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1673XL	0.040" (1.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 3.0 mm OD				
1675	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1675L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1675XL	0.040" (1.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
1677	0.080" (2.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1677L	0.080" (2.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1677XL	0.080" (2.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 4.0 mm OD				
1679	0.120" (3.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1679L	0.120" (3.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1679XL	0.120" (3.0 mm)	100' (30 m)	Natural	500 psi (34 bar)

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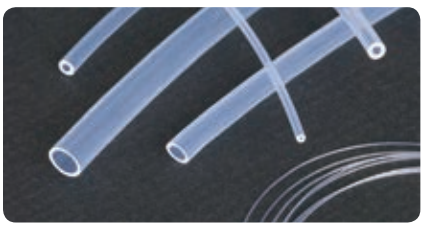
DuPont® PFA Tubing

- 1/16" and 1/8" ODs available
- Excellent solvent resistance and low gas permeability

PFA (perfluoroalkoxyalkane) tubing offers excellent solvent resistance (virtually identical to FEP and PTFE) while adding several advantages. These include smoother surface texture, higher continuous service temperature and superior polymer purity. The recommended maximum operating temperature for our PFA tubing is 80 °C.



DuPont High Purity PFA Tubing

- 360 µm, 1/16", 1/8", 3/16", and 1/4" outside diameters available
- PFA HP and PFA HP Plus Grades available
- Virtually contaminant free

PFA High Purity (HP) tubing offers all of the benefits of standard PFA tubing, with the additional benefit of being manufactured from a premium grade of PFA that is one of the most contaminant-free polymers available. In PFA HP, we offer tubing with the following outer diameters: 1/16", 1/8", 3/16", and 1/4".

PFA High Purity (HP) Plus tubing carries all of the benefits of PFA HP tubing, with the additional benefits of increased ability to withstand repeated flexing; improved resistance to stress cracking when exposed to aggressive fluorosurfactants; and smoother, clearer walls. In PFA HP Plus, we offer tubing with the following outer diameters: 360 µm, 1/16", and 1/8".

(Please Note: Due to the physical nature of the 360 µm OD tubing, we recommend using our A-350 Polymer Tubing Cutter from page 74 when cutting this tubing to length. Additionally, extra care should be taken to ensure fittings are not overtightened and to ensure the tubing is not stretched once secured in place, to ensure the dimensional stability of the tubing.)

SPECIFICATIONS & DETAILS

PFA Tubing Specifications

Tubing OD	OD Tolerances	Tubing ID	ID Tolerance
1/16"	±0.001" (25 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)

High Purity PFA Tubing Specifications

Tubing OD	OD Tolerances	Tubing ID	ID Tolerance
1/16"	±0.001" (25 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)
3/16"	±0.003" (75 µm)	All	±0.003" (75 µm)
1/4"	±0.004" (100 µm)	All	±0.004" (100 µm)

360 µm OD PFA HP Tubing Specifications

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
360 µm	±0.0005" (12.5 µm)	All	±0.0005" (12.5 µm)

Part No.	ID	Length	Color	Max. Pressure
PFA TUBING, 1/16" OD				
1500	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1511	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1512	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1512L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1502	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1513	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1514	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
★ **1514L**	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
1503	0.040" (1.0 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
1504	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1507	0.040" (1.0 mm)	20' (6 m)	Natural	500 psi (34 bar)
1507L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA TUBING, 1/8" OD				
1508	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
★ **1509**	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1509L	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA TUBING, 1/4" OD				
1649	0.156" (4.0 mm)	10' (3 m)	Natural	250 psi (17 bar)
1649L	0.156" (4.0 mm)	50' (15 m)	Natural	250 psi (17 bar)
1649XL	0.156" (4.0 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP TUBING, 1/16" OD				
1620	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1621	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1622	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1622L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1630	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1631	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1632	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1632L	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
PFA HP TUBING, 1/8" OD				
1640	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
1641	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
★ **1641L**	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA HP TUBING, 3/16" OD				
1642	0.125" (3.20 mm)	10' (3 m)	Natural	250 psi (17 bar)
1642L	0.125" (3.20 mm)	50' (15 m)	Natural	250 psi (17 bar)
1642XL	0.125" (3.20 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP TUBING, 1/4" OD				
1645	0.188" (4.80 mm)	10' (3 m)	Natural	250 psi (17 bar)
1645L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
1645XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP PLUS TUBING, 1/16" OD				
1900	0.010" (0.25 mm)	5' (1.5 m)	Natural	3,000 psi (207 bar)
1901	0.010" (0.25 mm)	10' (3 m)	Natural	3,000 psi (207 bar)
1902	0.010" (0.25 mm)	20' (6 m)	Natural	3,000 psi (207 bar)
1902L	0.010" (0.25 mm)	50' (15 m)	Natural	3,000 psi (207 bar)
1905	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1906	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1907	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1907L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1910	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1911	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1912	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1912L	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
PFA HP PLUS TUBING, 1/8" OD				
1920	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
1921	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1921L	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA HP PLUS TUBING, 360 µm OD				
1930	50 µm (0.002")	5' (1.5 m)	Natural	3,500 psi (241 bar)
1931	75 µm (0.003")	5' (1.5 m)	Natural	3,000 psi (207 bar)
1932	100 µm (0.004")	5' (1.5 m)	Natural	2,500 psi (172 bar)
1933	150 µm (0.006")	5' (1.5 m)	Natural	1,750 psi (121 bar)

ETFE Tubing

- Excellent chemical resistance
- Holds pressure up to 4,000 psi (276 bar)
- 1/16", 1/8", or 1/4" outside diameter available
- Maximum continuous operating temperature: 80 °C

Upchurch Scientific® ETFE (ethylene-tetrafluoroethylene) tubing is an excellent fluoropolymer product that offers several benefits over tubing manufactured from PTFE, FEP, or PFA. These benefits include enhanced pressure holding capabilities, increased mechanical stability and lower gas permeability.

Other tubing materials and dimensions may be available. Please contact IDEX Health & Science or your local representative directly.

APPLICATION NOTE

ETFE tubing is an ideal choice for the fluid pathway between the vacuum degasser and the system's pump. Its low gas permeability will help ensure the mobile phase solvents do not regas while in transit.

SPECIFICATIONS & DETAILS

ETFE Tubing Specifications

Tubing OD	Tubing ID	OD/ID Tolerances
1/16" OD	0.010" (0.25 mm), 0.020" (0.50 mm), 0.030" (0.75 mm)	±0.001" (25 µm)
1/16" OD	0.040" (1.0 mm)	±0.002" (50 µm)
1/8" OD	All	±0.003" (75 µm)
1/4" OD	All	±0.004" (100 µm)

	Part No.	ID	Length	Color	Max. Pressure
	ETFE TUBING, 1/16" OD				
	1529	0.010" (0.25 mm)	5' (1.5 m)	Natural	4,000 psi (276 bar)
	1529L	0.010" (0.25 mm)	50' (15 m)	Natural	4,000 psi (276 bar)
	1529XL	0.010" (0.25 mm)	100' (30 m)	Natural	4,000 psi (276 bar)
	1516	0.020" (0.50 mm)	5' (1.5 m)	Natural	3,000 psi (207 bar)
	1516L	0.020" (0.50 mm)	50' (15 m)	Natural	3,000 psi (207 bar)
★	**1516XL**	0.020" (0.50 mm)	100' (30 m)	Natural	3,000 psi (207 bar)
	1528	0.030" (0.75 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
	1528L	0.030" (0.75 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
★	**1528XL**	0.030" (0.75 mm)	100' (30 m)	Natural	2,000 psi (138 bar)
	1517	0.040" (1.00 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
	1517L	0.040" (1.00 mm)	50' (15 m)	Natural	500 psi (34 bar)
	1517XL	0.040" (1.00 mm)	100' (30 m)	Natural	500 psi (34 bar)
	ETFE TUBING, 1/8" OD				
	1515	0.062" (1.55 mm)	5' (1.5 m)	Black	1,000 psi (69 bar)
	1515L	0.062" (1.55 mm)	50' (15 m)	Black	1,000 psi (69 bar)
	1515XL	0.062" (1.55 mm)	100' (30 m)	Black	1,000 psi (69 bar)
★	**1530**	0.062" (1.55 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
	1530L	0.062" (1.55 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
★	**1530XL**	0.062" (1.55 mm)	100' (30 m)	Natural	1,000 psi (69 bar)
	1648	0.093" (2.40 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
	1648L	0.093" (2.40 mm)	50' (15 m)	Natural	500 psi (34 bar)
★	**1648XL**	0.093" (2.40 mm)	100' (30 m)	Natural	500 psi (34 bar)
	ETFE TUBING, 1/4" OD				
	1647	0.188" (4.80 mm)	5' (1.5 m)	Natural	250 psi (17 bar)
	1647L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
	1647XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)

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Fused Silica Tubing Cutters

We offer a precision cutter for fused silica tubing — SGT's Shortix™ Cutter (FS-315). This cutter ensures clean, trouble-free cutting of fused silica tubing, providing better cuts than any other product on the market. It also includes a built-in magnifying glass to examine the cut tubing ends. Order the FS-315-02 Maintenance Kit, as needed, to replace a worn or damaged cutting wheel.

FS-315
for fused silica tubing

When using traditional fused silica tubing cutters, only a small part of the tubing wall is scratched, then the tubing is snapped or pulled in two, often resulting in a jagged, uneven cut. With a Shortix Cutter, a clean cut is made every time, regardless of skill or experience, as the cut is made by rotating a diamond blade around the entire circumference of the tubing.

Please Note: The FS-315 Fused Silica Tubing Cutters are designed to cut only tubing with ODs of 350 µm–780 µm and IDs of 100 µm–350 µm.

Polymer Tubing Cutters

- For 1/16", 1/8", 3/16", 1/4", and 5/16" OD tubing

A flat, 90˚, burr-free cut is difficult to obtain with most commercial polymer tubing cutters. Upchurch Scientific® has designed several tubing cutters specifically to cut polymer tubing. This line of tubing cutters includes a standard cutter for 1/16" and 1/8" OD tubing (A-327), and another for large bore tubing (A-329). Each has guide holes to ensure precise cutting. These cutters are durable, reliable, and easy to operate. Five replacement blades are included with each tool.

A-329
for 3/16" - 5/16" OD tubing

A-327
for 1/16" and 1/8" OD tubing

NOTE

- The A-350 Capillary Polymer Tubing Cutter can be used to cut tubing OD sizes other than 360 µm, 510 µm, and 1/32". Simply use the proper NanoTight™ Tubing Sleeve found on page 17. Please note, however, that these sleeves are shorter than those listed on this page, and therefore will last through fewer cuts.
- Our tubing cutters are material specific: the A-327, A-329, A-350, and A-370 should only be used to cut polymer tubing, where as the FS-315 should only be used to cut fused silica tubing.

Capillary Polymer Tubing Cutters

The Upchurch Scientific A-350 Cutter is designed to cut capillary-sized polymer tubing. The cutter makes clean, perpendicular cuts without collapsing thin capillary walls. A set of ten tubing sleeves, required for cutting, are included with each cutter, along with five replacement blades. The included tubing sleeves are for cutting 360 µm OD polymer capillary tubing. Alternative sleeves are available for cutting 510 µm and 1/32" OD tubing. All tubing sleeves are 2" long and are made of DuPont® FEP.

Upchurch Scientific introduces a new tubing cutter specifically for cutting 2.0 mm OD polymer tubing. The A-370 tubing cutter is designed to cut in a similar method to the A-350 capillary polymer tubing cutter. The tubing slides through the cutter and the knob is rotated to spin the tubing as the razor blade circumscribes the tubing, providing a very clean, perpendicular cut.

A-350
for capillary polymer tubing

	Part No.	Description	Qty.
	FUSED SILICA TUBING CUTTERS		
	FS-315	Shortix Fused Silica Tubing Cutter	ea.
	CAPILLARY POLYMER TUBING CUTTER		
★	**A-350**	Capillary Polymer Tubing Cutter* for 360 µm–1/32" OD tubing Includes (1) F-262x 10-pack of sleeves and (1) M-438-03 wrench	ea.
	F-262x	Replacement Sleeves for A-350, 0.0155" ID, Green, for cutting 360 µm OD tubing	10-pk
	F-264x	Alternative Sleeves for A-350, 0.021" ID, Natural, for cutting 510 µm OD tubing	10-pk
	F-267Bx	Alternative Sleeves for A-350, 0.033" ID, Blue, for cutting 1/32" OD tubing	10-pk
★	**A-327**	Standard Polymer Tubing Cutter* for 1/16" and 1/8" OD tubing	ea.
	A-329	Large Bore Polymer Tubing Cutter* for 3/16"– 5/16" OD tubing	ea.
	A-328	Replacement Blades for A-350, A-370, A-327 and A-329	5-pk
NEW!	**A-370**	Polymer Tubing Cutter* for 2.0 mm OD tubing	ea.

** Includes (1) A-328 5-pack of replacement blades.*



TUBING	TYGON® LMT-55	TYGON E-LFL	ISMAPRENE (PHARMED®)	TYGON 3350 SI	SILICONE PEROXIDE
Page	78	78	79	79	80
Description	The inexpensive all-round tubing for general laboratory applications. • Transparent • Resistant to almost all inorganic chemicals • Smooth polished inner wall • Low gas permeability • Non-aging and non-oxidizing	The tubing with the longest service-life of any clear Tygon tubing. • Transparent • Broad chemical resistance • Tasteless • Extremely low particulate spallation • Meets USP Class VI and FDA criteria • Non-aging	The ideal tubing for pharmaceutical and medical applications, and for foodstuffs. • Recommended for cell cultures and tissue • Ideal for production filtration, fermentation, and bioreactor process lines • Very long service-life • Non-toxic and non-hemolytic • Impermeable to normal light and UV-radiation • Appropriate for medical products and foodstuffs • Low particulate spallation • Can be autoclaved repeatedly • Withstands repeated CIP and SIP cleaning and sterilization • Meets USP class VI, FDA, and NSF criteria	The platinum-cured silicone tubing with an ultra-smooth inner surface for sanitary transfer of sensitive fluids. • Can be autoclaved with steam • Excellent biological compatibility • Ultra-smooth inner-bore reduces potential for particle entrapment • Lower level of protein binding • Entirely non-toxic, non-hemolytic and non-pyrogenic • Weather, ozone, sunlight, and radiation resistant • Resistant to fungus • Odorless	Silicone tubing blended with organic peroxide for biological applications. • Can be autoclaved with steam • Excellent biological compatibility • Greater physical compression capability • Not prone to mold • Non-toxic • Waterproof and resistant to ozone, radiation, and sunlight • Resistant to fungus • Odorless
Specifications					
OD (outside diameter)	0.16–0.88" (4.0–22.3 mm)	0.19–0.75" (4.8–19.1 mm)	0.16–1.3" (4.0–33.4 mm)	0.16–1.3" (4.0–33.4 mm)	0.16–1.3" (4.0–33.4 mm)
ID (inside diameter)	0.03–0.61" (0.8–15.9 mm)	0.06–0.5" (1.6–12.7 mm)	0.03–1" (0.8–25.4 mm)	0.03–1" (0.8–25.4 mm)	0.03–1" (0.8–25.4 mm)
Operating Temp	-50 to 74 °C	-50 to 74 °C	-60 to 135 °C	-60 to +200 °C	-51 to 238 °C
Certification(s)		FDA 21 CFR 175.300; US Pharmacopoeia Class VI	FDA 21 CFR 177.2600; US Pharmacopoea Class VI, NSF listed (Standard 51)	FDA 21 CFR, 177.2600, Also exceeds 3A sanitary standards; US Pharmacopoea XXIII Cl.VI;	FDA 21 CFR 177.2600; US Pharmacopoea XXIII Cl.VI
Chemical Resistance					
Acids	Good	Fair	Good	Limited	Limited
Alkaline Solutions	Good	Fair	Good	Limited	Good
Solvents	Not Recommended	Not Recommended	Not Recommended	Limited	Not Recommended
Pressure	Fair	Good	Not Recommended	Not Recommended	Not Recommended
Vacuum	Good	Good	Excellent	Good	Good
Viscous Media	Excellent	Excellent	Good	Fair	Fair
Sterile Media	Limited	Limited	Excellent	Excellent	Excellent
Gas Permeability (at 25 °C)*					
CO_2	360	720	1200	25147	25147
H_2	—	—	—	—	—
0_2	80	160	200	4715	4715
N_2	40	80	80	2284	2284

** Permeability Coefficient =* $\frac{\text{Amount of Gas } (cm^3) \times \text{tubing wall thickness } (cm)}{\text{Surface Area of tubing ID } (cm^2) \times \text{time (sec)} \times \text{pressure drop across tubing wall (cm Hg)}} \times 10^{-10}$

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TUBING	TYGON 2001	TYGON MHLL	TYGON HC F-4040-A	NORPRENE® A-60-G	FLURAN® F-5500-A
Page	**80**	**81**	**81**	**82**	**82**
Description	The transparent, plasticizer-free tubing with superior pump-life. Especially designed for MEK and other aggressive solvents. • Plasticizer and oil-free • Smooth inner-bore • Low sorption maintains fluid and tube integrity • Does not impart anything into the pumping medium • No release of hazardous materials when properly incinerated	Chemically resistant to Acetone, MEK and other aggressive solvents. Long life tubing. • Plasticizer-free • Smooth inner-bore • Low sorption maintains fluid integrity • Minimal adhesion and diffusion • Suitable for MEK, Acetone and other corrosive solvents • Long life tubing	The special tubing for hydrocarbons, petroleum products and distillates. • Specially formulated to transport hydrocarbons, petroleum products and distillates • Ideal for gasoline, kerosene, heating oils, cutting liquids and coolants based on glycols • Low gas permeability	The high performance tubing for industrial use. • Offers longest service-life with good flow consistency • Good resistance to acids and alkaline chemicals • Superior weathering • Abrasion resistant • Non-aging and non-oxidizing • Outstanding flexural fatigue resistance • Low gas permeability versus rubber tubing • Ozone (300 pphm) and UV light resistant • Ideal for use in vacuum system	The special tubing for concentrated acids and corrosive solvents. • High chemical resistance • Low gas permeability • Wide temperature range
Specifications					
OD (outside diameter)	0.19–0.88" (4.8–22.3 mm)	0.09–0.18" (2.22–4.63 mm)	0.19–0.75" (4.8–19.1 mm)	0.16–0.9" (4.0–22.3 mm)	0.16–0.6" (4.0–15.9 mm)
ID (inside diameter)	0.06–0.61" (1.6–15.9 mm)	0.01–0.1" (0.38–2.79 mm)	0.06–0.5" (1.6–12.7 mm)	0.03–0.6" (0.8–15.9 mm)	0.03–0.4" (0.8–9.5 mm)
Operating Temp	-73 to 57 °C	-70 to 74 °C	-37 to 74 °C	-60 to 135 °C	-32 to 204 °C
Certification(s)	FDA 21 CFR 177.2600; FDA Approved for contact with foods	FDA 21 CFR 177.2600; US Pharmacopoea Class VI	None	None	GMP
Chemical Resistance					
Acids	Excellent	Excellent	Limited	Excellent	Excellent
Alkaline Solutions	Excellent	Excellent	Not Recommended	Excellent	Excellent
Solvents	Good	Excellent	Not Recommended	Not Recommended	Limited
Pressure	Good	Not Recommended	Good	Not Recommended	Not Recommended
Vacuum	Good	Good	Good	Good	Good
Viscous Media	Excellent	Good	Excellent	Excellent	Good
Sterile Media	Good	Good	Limited	Not Recommended	Fair
Permeability (at 25 °C)					
CO_2	1140	3800	100	1200	38
H_2	—	—	—	—	—
0_2	76	800	22	200	14
N_2	190	320	12	80	5

Peristaltic Pumps & Tubing

The pumps presented on pages 92–108 require peristaltic tubing to operate. Flow rate of a given fluid through a peristaltic tubing pump depends on two variables:

1. The speed of the pump, measured in revolutions per minute (rpm)
2. The volume held with the internal diameter (ID) of the selected tubing

Variable Speed Pump Flow Rates

For a variable speed pump, such as the products on pages 92, 93, and 95–104, the flow rate of a channel can be changed by varying the pump rpm, or by using tubing with different IDs, or a combination of both.

Ordering your Pump & Tubing

Follow these steps to complete your Ismatec® peristaltic tubing pump order:

1. Select the pump for your application from pages 92–104, determined by the requirements of your fluid delivery task(s):
    a. Level of accuracy
    b. Fluid streams (# of channels)
    c. Flow rate range(s)
    d. Need for constant flow, discrete dispensing, or both
    e. Need for variable speed
    f. Need for automation/programmability
2. Note whether the selected pump requires 2-stop, 3-stop, or standard tubing.
3. Review the tubing properties tables on pages 62, 70, 75, and 76 and select the tubing material best suited for your application.
4. Review the page that contains information and options for the tubing material you have selected.
5. Identify the correct part number for the tubing you need, based upon two factors: a) if your pump requires tubing with stops or not, and if so how many; and b) the correct inner diameter and wall thickness for the model pump you are using.
6. If required, order extension tubing that corresponds as closely as possible to the tubing material and ID of your 2-stop or 3-stop tubing.

RELATED PRODUCTS

- Connectors and adapters for peristaltic tubing are on pages 58, 59, and 60.

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Tygon® LMT-55 Tubing

- DEHP Free
- The Tygon blend of choice for general laboratory applications

Tygon LMT-55 offers an all-around, inexpensive option for general laboratory applications. Featuring transparent walls and low gas permeability — and with many different sizes from which to choose — this tubing material option is the option of choice for many less-critical applications. To determine the expected flow rates related to the tubing inner diameters, see the technical specifications for your pump model, listed here in this catalog or in your pump's operating manual.

Please Note: The low overall lifetime of this material will require tubing to replaced more frequently. For a longer life version of Tygon LMT-55, consider Tygon S3 E-LFL.

SPECIFICATIONS & DETAILS

Special Properties	The inexpensive all-round tubing for general laboratory applications	
Advantages	• Transparent • Resistant to almost all inorganic chemicals • Tasteless • Smooth polished inner wall	• Low gas permeability • Non-aging and non-oxidizing • High dielectric constant • LMT-55 will outlast R-3603 in most applications by 3 to 1
Limitations	• Potential leaching of plasticizers	• Short service-life
Physical Properties	• Thermoplastic • PVC-based material with phthalate-free plasticizer	• Flexible, firm, transparent
Service Temperature Range	-50 °C to +74 °C (-58 °F to + 165 °F)	
Applications		
Acids	Good	
Alkaline solutions	Good	
Solvents	Not recommended	
Pressure	Fair	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Limited	
Complies with the Following Standards		
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F); tubing will appear milky. Gas sterilization with Ethylene oxide. **Not recommended for sterilization with radiation.**	
Permeability		
CO_2	360	
O_2	80	
N_2	40	

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste	None	
Toxicity	Non-toxic	
Tubing life	at 0 bar	35 hrs
	at 0.7 bar	30 hrs

Tygon E-LFL Tubing

- DEHP Free
- Longest service life of any clear Tygon tubing material
- Excellent choice where transparency and good chemical resistance is needed

Tygon S3 E-LFL tubing is available in a broad range of sizes for use throughout our pump product line. Its good chemical resistance coupled with its durability makes it an excellent choice in those applications where longer-life tubing is desired (i.e., where tubes are not disposed of frequently).

In many cases, this tubing can withstand system pressures that are in excess of most peristaltic pumps' abilities, providing built-in safety precautions for your system flow path.

Choose tubing without stops for use with most single-channel pumps. *(Note: Ensure the wall thickness of the tubing you have selected matches the requirements for the pump you are using.)* Choose the 2-stop or 3-stop tubing for use with the versions of our pumps that incorporate cassettes into the pumphead design.

SPECIFICATIONS & DETAILS

Special Properties	The tubing with the longest service-life of any clear Tygon tubing	
Advantages	• Transparent • Broad chemical resistance • Tasteless • Extremely low particulate spallation • Meets USP Class VI and FDA criteria • Non-aging	
Limitations	• Potential leaching of plasticizers	
Physical Properties	• Thermoplastic • PVC-based material with phthalate-free plasticizer • Flexible, firm, transparent	
Service Temperature Range	-50 °C to +74 °C (-58 °F to + 165 °F)	
Applications		
Acids	Fair	
Alkaline solutions	Fair	
Solvents	Not recommended	
Pressure	Good	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Limited	
Complies with the Following Standards	FDA 21 CFR 175.300; US Pharmacopoea Class VI	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F); tubing will appear milky. Gas sterilization with Ethylene oxide. **Not recommended for sterilization with radiation.**	
Permeability		
CO_2	720	
O_2	160	
N_2	80	

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste	None	
Toxicity	Non-toxic	
Tubing life	at 0 bar	800 hrs
	at 0.7 bar	700 hrs

Ismaprene Tubing (PharMed®)

- Excellent chemical resistance for traditional peristaltic pump tubing
- Offers FDA and USP Class VI certification

PharMed Ismaprene tubing has long been the tubing of choice for many demanding applications where other polymer blends have been unsuitable for use.

With strong chemical resistance, excellent lifetime, and low gas permeability — coupled with industry-standard certifications — PharMed tubing is offered in options for standard pumps as well as for pumps requiring 2-stop and 3-stop tubing. Special versions are available with welded stops for applications where repeated autoclaving must take place.

SPECIFICATIONS & DETAILS

Special Properties	The ideal tubing for pharmaceutical and medical applications, and for foodstuffs	
Advantages	• Recommended for cell cultures and tissue • Ideal for production filtration, fermentation, and bioreactor process lines • Very long service-life • Non-toxic and non-hemolytic • Impermeable to normal light and UV-radiation • Appropriate for medical products and foodstuffs • Low particulate spallation • Can be autoclaved repeatedly • Withstands repeated CIP and SIP cleaning and sterilization • Meets USP Class VI, FDA, and NSF criteria	
Limitations	• Potential leaching of additives (lubricants)	
Physical Properties	• Thermoplastic elastomer based on polypropylene • Firm, opaque, beige color	
Service Temperature Range	-60 °C to +135 °C (-75 °F to +275 °F)	
Applications		
Acids	Good	
Alkaline solutions	Good	
Solvents	Not recommended	
Pressure	Not recommended	
Vacuum	Excellent	
Viscous media	Good	
Sterile media	Excellent	
Complies with the Following Standards	FDA 21 CFR Part 177.2600; US Pharmacopoea Class VI, NSF listed (Standard 51)	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 141 °C (250 °F) Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad. **Caution: Use special tubing version (welded stoppers) when autoclaving 2 or 3-stop color-coded tubing.**	
Permeability		
CO_2	1200	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	200	
N_2	80	
Odor and taste	Low	
Toxicity	Non-toxic and non-hemolytic	
Tubing life at 0 bar	1000+ hrs	
at 0.7 bar	1000 hrs	

Tygon® 3350 SI Tubing

- Platinum-cured silicone tubing
- Features ultra-smooth inner-bore
- Biocompatible for life science applications

Tygon 3350 SI tubing is a special silicone-based tubing that undergoes a special treatment with platinum to ensure a very smooth internal surface. This surface feature helps improve the material's use with biological applications where solid material may be present. Additionally, the material exhibits a low-level of protein-binding as well as being non-toxic, helping to make this material the top choice for many life science applications.

SPECIFICATIONS & DETAILS

Special Properties	The platinum-cured silicone tubing with an ultra-smooth inner surface for sanitary transfer of sensitive fluids	
Advantages	• Steam autoclavability • Excellent biological compatibility • Ultra-smooth inner-bore reduces potential for particle entrapment • Lower level of protein binding • Entirely non-toxic, non-hemolytic, and non-pyrogenic • Weather, ozone, sunlight, and radiation resistant • Resistant to fungus • Odorless	
Limitations	• Not suitable for concentrated solvents, oils, acids, or diluted sodium hydroxide • Relatively high gas permeability	
Physical Properties	• Thermal set rubber • Siloxane polymers and amorphous silica • Soft, translucent, clear to light amber • Excellent compression strength	
Service Temperature Range	-60 °C to +200 °C (-75 °F to +392 °F)	
Applications		
Acids	Limited	
Alkaline solutions	Limited	
Solvents	Limited	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Fair	
Sterile media	Excellent	
Complies with the Following Standards	US Pharmacopoea XXIII Cl.VI, FDA 21 CFR, Part 177.2600. Also exceeds 3A sanitary standards.	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F) Gas sterilization with Ethylene oxide Sterilization with radiation up to 2.5 mrad.	
Permeability		
CO_2	25147	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	4715	
N_2	2284	
Odor and taste	None	
Toxicity	Non-toxic	
Tubing life at 0 bar	200 hrs	
at 0.7 bar	100 hrs	

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Silicone Peroxide Tubing

- Non-toxic material great for biological applications
- Soft and translucent for applications requiring visual checks

SPECIFICATIONS & DETAILS

Special Properties	Silicone tubing blended with organic peroxide for biological applications	
Advantages	• Steam autoclavability • Excellent biological compatibility • Greater physical compression capability • Not prone to mold • Non-toxic • Waterproof and resistant to ozone, radiation, and sunlight • Resistant to fungus • Odorless	
Limitations	• Not recommended for concentrated solvents, oils, acids, or diluted sodium hydroxide • Relatively high gas permeability	
Physical Properties	• Polydimethylsiloxane with silica filter and silicone oil • Excellent resistance to compression • Soft, translucent, clear to light amber	
Service Temperature Range	-51 °C to +238 °C (-60 °F to +460 °F)	
Applications		
Acids	Limited	
Alkaline solutions	Good	
Solvents	Not recommended	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Fair	
Sterile media	Excellent	
Complies with the Following Standards	FDA 21 CFR 177.2600; US Pharmacopoea XXIII Cl.VI	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °C) Radiation: Irradiate at up to 2.5 mrad **Gas: Not recommended to sterilize with ethylene oxide**	
Permeability		
CO_2	25147	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	4715	
N_2	2284	
Odor and taste	—	
Toxicity	—	
Tubing life at 0 bar	—	
at 0.7 bar	—	

Tygon® 2001 Tubing for Aggressive Media

- High chemical resistance for broad application use
- Options available for single and multi-channel pump systems
- Ultra-pure tubing for peristaltic pumps

Tygon 2001 tubing features all of the benefits of most Tygon blends — including wall transparency and FDA approval. Added to this is strong chemical resistance for many solutions (excluding hydrocarbons), making Tygon 2001 a material of choice for many demanding applications where other blends may not be suitable.

Options are available in both Standard Tubing, up to 0.626" (15.9 mm) and Stopper Tubing up to 0.109" (2.79 mm).

SPECIFICATIONS & DETAILS

Special Properties	The transparent, plasticizer-free tubing with superior pump-life; especially designed for MEK and other aggressive solvents	
Advantages	• Plasticizer and oil-free • Smooth inner-bore • Low sorption maintains fluid and tube integrity • Does not impart anything into the pumping medium • No release of hazardous materials when properly incinerated	
Limitations	None	
Physical Properties	Polyolefin	
Service Temperature Range	-73 °C to +57 °C (-100 °F to +135 °F)	
Applications		
Acids	Excellent	
Alkaline solutions	Excellent	
Solvents	Good / Excellent	
Complies with the Following Standards	FDA certification for food contact	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 141 °C (250 °F). Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad.	
Permeability		
CO_2	1140	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	76	
N_2	190	
Odor and taste	No odor or taste	
Toxicity	–	
Tubing life at 0 bar	75 hrs	
at 0.7 bar	–	

Tygon® MHLL Tubing

- Dual-layered tubing material
- Pairs chemical resistance and long-life

Tygon MHLL is a unique tubing material, comprised of an inner layer of Tygon MH and an outer layer of PharMed®. This combination helps ensure excellent chemical resistance (except for hydrocarbons and strong ketones) as well as long service life. Available as Stopper Tubing for use with MS/CA cassettes.

Additionally, this material offers both FDA approval as well as USP Class VI approval, making it a material of choice for more demanding life-science applications.

SPECIFICATIONS & DETAILS

Special Properties		• The tubing can be used with acetone and MEK • Long life tubing
Advantages		• Plasticizer-free • Smooth inner-bore • Low sorption maintains fluid integrity • Minimal adhesion and diffusion • Suitable for MEK, Acetone and other corrosive solvents • Long life tubing
Limitations		• Cannot be repeatedly sterilized • Only available as stopper tubing
Physical Properties		• Special thermoplastic of high purity • Without additives • Without plasticizer • Environmental-friendly disposal • Flexible, firm, opaque
Service Temperature Range		-70 °C to +74 °C (-94 °F to + 165 °F)
Applications		
Acids		Excellent
Alkaline solutions		Excellent
Solvents		Excellent
Pressure		Not recommended
Vacuum		Good
Viscous media		Good
Sterile media		Good
Complies with the Following Standards		FDA 21 CFR, Part 177.2600; USP Pharmacopoea Class VI FDA certification for food contact
Sterilization		Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F). Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad **Caution: Can not be repeatedly sterilized.**
Permeability		$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$
	CO_2	—
	O_2	—
	N_2	—
Odor and taste		No odor or taste
Toxicity		—
Tubing life	at 0 bar	800+ hrs
	at 0.7 bar	800+ hrs

Tygon HC F-4040-A Tubing

- Specially formulated for hydrocarbon-based applications
- Features low gas permeability and good pressure resistance

Tygon F-4040-A tubing has been specially-formulated for use in petroleum (and similar) applications where other Tygon blends cannot be used successfully. The material offers some of the lowest gas permeability rates for atmospheric gases of all the Tygon blends, making it ideal for use in those applications where sensitivity to gas permeation is high or where vacuum may be applied.

In addition to being suitable for hydrocarbon-based applications, this material can also be used successfully with low-concentration acidic solutions as well as mineral salt solutions.

Yellow-tinted, the material offers some degree of translucency, however, it is not as transparent as many other Tygon blends.

SPECIFICATIONS & DETAILS

Special Properties		The special tubing for hydrocarbons, petroleum products and distillates
Advantages		• Specially formulated to transport hydrocarbons, petroleum products, and distillates • Ideal for gasoline, kerosene, heating oils, cutting liquids, and coolants based on glycols • High dielectric constant • Low gas permeability
Limitations		• Not recommended for strong acids and alkalies, foodstuffs, beverages, and medicines • Potential leaching of plasticizers
Physical Properties		• Thermoplastic • PVC-based material with plasticizer • Flexible, firm, translucent, yellow
Service Temperature Range		-37 °C to +74 °C (-35 °F to +165 °F)
Applications		
Acids		Limited
Alkaline solutions		Not recommended
Solvents		Not recommended
Pressure		Good
Vacuum		Good
Viscous media		Excellent
Sterile media		Limited
Complies with the Following Standards		None
Sterilization		Not recommended
Permeability		$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$
CO_2		100
O_2		22
N_2		12
Odor and taste		Must not be used for foodstuffs, beverages, and drugs
Toxicity		Must not be used for foodstuffs, beverages, and drugs
Tubing life	at 0 bar	60 hrs
	at 0.7 bar	60 hrs

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Norprene® A-60-G Tubing

- Long-life tubing with strong chemical resistance
- Excellent option for industrial applications

Norprene tubing is an excellent alternative to traditional rubber tubing in industrial applications where good chemical resistance is paired with a desire for longer service life.

This tubing material offers additional benefits, including low gas permeability and broad temperature range compatibility. Combined, this material's features help make this tubing the tubing of choice in many applications.

SPECIFICATIONS & DETAILS

Special Properties	The high performance tubing for industrial use	
Advantages	• Offers longest service-life with good flow consistency • Good resistance to acids and alkaline chemicals • Superior weathering • Abrasion resistant • Non-aging and non-oxidizing • Outstanding flexural fatigue resistance • Low gas permeability versus rubber tubing • Ozone (300 pphm) and UV light resistant • Ideal for use in vacuum system	
Limitations	• Potential leaching of blend material	
Physical Properties	• Thermoplastic elastomer based on polypropylene • Excellent tensile strength • Firm, opaque, black	
Service Temperature Range	-60 °C to +135 °C (-75 °F to +275 °F)	
Applications		
Acids	Excellent	
Alkaline solutions	Excellent	
Solvents	Not recommended	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Not recommended	
Complies with the Following Standards	None	
Sterilization	Not recommended	
Permeability	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]	x 10^{-10}
CO_2	1200	
O_2	200	
N_2	80	
Odor and taste	Must not be used for foodstuffs, beverages and drugs	
Toxicity	Must not be used for foodstuffs, beverages and drugs	
Tubing life at 0 bar	1000+ hrs	
at 0.7 bar	1000 hrs	

Fluran® F-5500-A Tubing

- Specially-formulated elastomer for use with strong acidic and basic solutions
- Very low gas permeability

Fluran tubing has been specially formulated for use in applications where strong acidic solutions or strong basic solutions are being used.

The material's very low gas permeability also makes this the choice material for applications where fluids can be transferred without being contaminated by atmospheric gases. Additionally, the low gas permeability and relative strength of this material make it a material of choice in vacuum based applications.

SPECIFICATIONS & DETAILS

Special Properties	The special tubing for concentrated acids and corrosive solvents	
Advantages	• High chemical resistance • Low gas permeability • Wide temperature range	
Limitations	• Limited service-life	
Physical Properties	• Fluoroelastomer • Firm, opaque, black	
Service Temperature Range	-31 °C to +204 °C (-25 °F to + 400 °F)	
Applications		
Acids	Excellent	
Alkaline solutions	Excellent	
Solvents	Limited	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Good	
Sterile media	Fair	
Complies with the Following Standards	None	
Sterilization	Not recommended	
Permeability	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]	x 10^{-10}
CO_2	38	
O_2	14	
N_2	5	
Odor and taste	—	
Toxicity	—	
Tubing life at 0 bar	150	
at 0.7 bar	90	

The next seven pages contain product numbers for ordering Standard, 2-Stop, 3-Stop, and Extension tubing in each material offered.

Extension Tubing

ID (mm)	TYGON® LMT-55	TYGON R3603/ R3607*	ISMAPRENE (PHARMED®)	SILICONE PEROXIDE	TYGON 2001	TYGON HC F-4040-A	FLURAN® F-5500-A
	Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	SC0226T	SC0226*					
0.19	SC0025T	SC0025*					
0.25	SC0026T	SC0026*	SC0337			SC0173	
0.38	SC0027T	SC0027*	SC0338		SC0854	SC0174	
0.44	SC0028T	SC0028*					
0.51	SC0029T	SC0029*	SC0339			SC0175	SC0550
0.57	SC0030T	SC0030*					
0.64	SC0031T	SC0031*	SC0340	SC0448	SC0856	SC0176	SC0551
0.76	SC0032T	SC0032*	SC0341	SC0449		SC0177	SC0552
0.89	SC0033T	SC0033*	SC0342	SC0450		SC0120	SC0553
0.95	SC0034T	SC0034*					
1.02	SC0035T	SC0035*	SC0343	SC0451	SC0858	SC0121	SC0554
1.09	SC0036T	SC0036*					
1.14	SC0037T	SC0037*	SC0344	SC0452		SC0122	SC0555
1.22	SC0038T	SC0038*					
1.30	SC0039T	SC0039*	SC0345	SC0453		SC0123	SC0556
1.42	SC0040T	SC0040*	SC0346	SC0454		SC0124	SC0557
1.52	SC0041T	SC0041*	SC0347	SC0455	SC0860	SC0125	SC0558
1.65	SC0042T	SC0042*	SC0348	SC0456		SC0126	SC0559
1.75	SC0043T	SC0043*					
1.85	SC0044T	SC0044*	SC0349	SC0457		SC0127	SC0560
2.06	SC0045T	SC0045*	SC0350	SC0458	SC0862	SC0128	SC0561
2.29	SC0046T	SC0046*	SC0351	SC0459		SC0129	SC0562
2.54	SC0047T	SC0047*	SC0352	SC0460		SC0130	SC0563
2.79	SC0048T	SC0048*	SC0353	SC0461	SC0864	SC0131	SC0564
3.17	SC0223T	SC0223*					
Roll Length	10 m	10 m	3 m	15 m	10 m	3 m	10 m

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*

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2-Stop Tubing

ID (mm)	COLOR CODES	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	PHARMED BPT **	TYGON 3350 SI
		Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	Orange-black	SC0188T	SC0188*				
0.19	Orange-red	SC0001T	SC0001*				
0.25	Orange-blue	SC0002T	SC0002*		SC0320	SC0740**	
0.27	Orange-blue			SCE0414			
0.38	Orange-green	SC0003T	SC0003*	SCE0415	SC0321		
0.44	Green-yellow	SC0004T	SC0004*				
0.48	Orange-yellow			SCE0416			
0.51	Orange-yellow	SC0005T	SC0005*		SC0322	SC0741**	SC0620
0.57	White-yellow	SC0006T	SC0006*				
0.64	Orange-white	SC0007T	SC0007*	SCE0417	SC0323		SC0621
0.76	Black-black	SC0008T	SC0008*	SCE0418	SC0324		SC0622
0.89	Orange-orange	SC0009T	SC0009*	SCE0419	SC0325	SC0742**	SC0623
0.95	White-black	SC0010T	SC0010*				
1.02	White-white	SC0011T	SC0011*	SCE0420	SC0326	SC0747**	SC0624
1.09	White-red	SC0012T	SC0012*				
1.14	Red-red	SC0013T	SC0013*	SCE0421	SC0327		SC0625
1.22	Red-grey	SC0014T	SC0014*				
1.25	Grey-grey			SCE0422			
1.30	Grey-grey	SC0015T	SC0015*		SC0328	SC0743**	SC0626
1.37	Yellow-yellow			SCE0423			
1.42	Yellow-yellow	SC0016T	SC0016*		SC0329		SC0627
1.52	Yellow-blue	SC0017T	SC0017*	SCE0424	SC0330	SC0744**	SC0628
1.53	Yellow-blue						
1.60	Blue-blue			SCE0425			
1.65	Blue-blue	SC0018T	SC0018*		SC0331		SC0629
1.75	Blue-green	SC0019T	SC0019*				
1.85	Green-green	SC0020T	SC0020*	SCE0426	SC0332		SC0630
2.06	Purple-purple	SC0021T	SC0021*	SCE0427	SC0333	SC0745**	SC0631
2.20	Purple-black			SCE0428			
2.29	Purple-black	SC0022T	SC0022*		SC0334		SC0632
2.54	Purple-orange	SC0023T	SC0023*		SC0335		SC0633
2.62	Purple-orange			SCE0429			
2.79	Purple-white	SC0024T	SC0024*	SCE0430	SC0336	SC0746**	SC0634
3.17	Black-white	SC0222T	SC0222*				
Tube Length		400 mm	400 mm	400 mm	400 mm	400 mm	400 mm
Pack Size		12 pieces	12 pieces	12 pieces	6 pieces	6 pieces	6 pieces

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*
*** Welded stoppers for use in an autoclave.*

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SILICONE PEROXIDE	TYGON® 2001	TYGON MHLL	TYGON HC F-4040-A	FLURAN F-5500-A	COLOR CODES	ID (mm)	
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**			
					Orange-black	0.13	
					Orange-red	0.19	
			SC0156		Orange-blue	0.25	
					Orange-blue	0.27	
	SC0814	SC0716	SC0157		Orange-green	0.38	
					Green-yellow	0.44	
					Orange-yellow	0.48	
			SC0158	SC0132	Orange-yellow	0.51	
					White-yellow	0.57	
SC0092	SC0816		SC0159	SC0133	Orange-white	0.64	
SC0093		SC0717	SC0160	SC0134	Black-black	0.76	
SC0094			SC0161	SC0135	Orange-orange	0.89	
					White-black	0.95	
SC0095	SC0818		SC0162	SC0136	White-white	1.02	
					White-red	1.09	
SC0096		SC0718	SC0163	SC0137	Red-red	1.14	
					Red-grey	1.22	
					Grey-grey	1.25	
SC0097			SC0164	SC0138	Grey-grey	1.30	
					Yellow-yellow	1.37	
SC0098			SC0165	SC0139	Yellow-yellow	1.42	
SC0099	SC0820	SC0719	SC0166	SC0140	Yellow-blue	1.52	
					Yellow-blue	1.53	
					Blue-blue	1.60	
SC0100			SC0167	SC0141	Blue-blue	1.65	
					Blue-green	1.75	
SC0101			SC0168	SC0142	Green-green	1.85	
SC0102	SC0822	SC0720	SC0169	SC0143	Purple-purple	2.06	
					Purple-black	2.20	
SC0103			SC0170	SC0144	Purple-black	2.29	
SC0104			SC0171	SC0145	Purple-orange	2.54	
					Purple-orange	2.62	
SC0105	SC0824	SC0721	SC0172	SC0146	Purple-white	2.79	
					Black-white	3.17	
400 mm	381 mm	381 mm	400 mm	180 mm			**Tube Length**
6 pieces	6 pieces	6 pieces	12 pieces	12 pieces			**Pack Size**

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3-Stop Tubing

ID (mm)	COLOR CODES	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	PHARMED BPT **	TYGON 3350 SI
		Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	Orange-black	SC0189T	SC0189*				
0.19	Orange-red	SC0049T	SC0049*				
0.25	Orange-blue	SC0050T	SC0050*		SC0303	SC0730**	
0.27	Orange-blue			SCE0397			
0.38	Orange-green	SC0051T	SC0051*	SCE0398	SC0304		
0.44	Green-yellow	SC0052T	SC0052*				
0.48	Orange-yellow			SCE0399			
0.51	Orange-yellow	SC0053T	SC0053*		SC0305	SC0731**	SC0600
0.57	White-yellow	SC0054T	SC0054*				
0.64	Orange-white	SC0055T	SC0055*	SCE0400	SC0306		SC0601
0.76	Black-black	SC0056T	SC0056*	SCE0401	SC0307		SC0602
0.89	Orange-orange	SC0057T	SC0057*	SCE0402	SC0308	SC0732**	SC0603
0.95	White-black	SC0058T	SC0058*				
1.02	White-white	SC0059T	SC0059*	SCE0403	SC0309	SC0737**	SC0604
1.09	White-red	SC0060T	SC0060*				
1.14	Red-red	SC0061T	SC0061*	SCE0404	SC0310		SC0605
1.22	Red-grey	SC0062T	SC0062*				
1.25	Grey-grey			SCE0405			
1.30	Grey-grey	SC0063T	SC0063*		SC0311	SC0733**	SC0606
1.37	Yellow-yellow			SCE0406			
1.42	Yellow-yellow	SC0064T	SC0064*		SC0312		SC0607
1.52	Yellow-blue	SC0065T	SC0065*	SCE0407	SC0313	SC0734**	SC0608
1.53	Yellow-blue						
1.60	Blue-blue			SCE0408			
1.65	Blue-blue	SC0066T	SC0066*		SC0314		SC0609
1.75	Blue-green	SC0067T	SC0067*				
1.85	Green-green	SC0068T	SC0068*	SCE0409	SC0315		SC0610
2.06	Purple-purple	SC0069T	SC0069*		SC0316	SC0735**	SC0611
2.20	Purple-black			SCE0411			
2.29	Purple-black	SC0070T	SC0070*		SC0317		SC0612
2.54	Purple-orange	SC0071T	SC0071*		SC0318		SC0613
2.62	Purple-orange			SCE0412			
2.79	Purple-white	SC0072T	SC0072*	SCE0413	SC0319	SC0736**	SC0614
3.17	Black-white	SC0224T	SC0224*				
Tube Length		400 mm	400 mm	400 mm	400 mm	400 mm	400 mm
Pack Size		12 pieces	12 pieces	12 pieces	6 pieces	6 pieces	6 pieces

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*
*** Welded stoppers for use in an autoclave.*
**** These tubes are equipped with only 2 stoppers for use with MS/CA cassettes.*

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SILICONE PEROXIDE	TYGON® 2001***	TYGON MHLL***	TYGON HC F-4040-A	FLURAN F-5500-A	COLOR CODES	ID (mm)	
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**			
					Orange-black	0.13	
					Orange-red	0.19	
			SC0286		Orange-blue	0.25	
					Orange-blue	0.27	
	SC0802***	SC0710***	SC0287		Orange-green	0.38	
					Green-yellow	0.44	
					Orange-yellow	0.48	
			SC0288	SC0255	Orange-yellow	0.51	
					White-yellow	0.57	
SC0106	SC0804***		SC0289	SC0256	Orange-white	0.64	
SC0107		SC0711***	SC0290	SC0257	Black-black	0.76	
SC0108			SC0291	SC0258	Orange-orange	0.89	
					White-black	0.95	
SC0109	SC0806***		SC0292	SC0259	White-white	1.02	
					White-red	1.09	
SC0110		SC0712***	SC0293	SC0260	Red-red	1.14	
					Red-grey	1.22	
					Grey-grey	1.25	
SC0111			SC0294	SC0261	Grey-grey	1.30	
					Yellow-yellow	1.37	
SC0112			SC0295	SC0262	Yellow-yellow	1.42	
SC0113	SC0808***	SC0713***	SC0296	SC0263	Yellow-blue	1.52	
					Yellow-blue	1.53	
					Blue-blue	1.60	
SC0114			SC0297	SC0264	Blue-blue	1.65	
					Blue-green	1.75	
SC0115			SC0298	SC0265	Green-green	1.85	
SC0116	SC0810***	SC0714***	SC0299	SC0266	Purple-purple	2.06	
					Purple-black	2.20	
SC0117			SC0300	SC0267	Purple-black	2.29	
SC0118			SC0301	SC0268	Purple-orange	2.54	
					Purple-orange	2.62	
SC0119	SC0812***	SC0715***	SC0302	SC0269	Purple-white	2.79	
					Black-white	3.17	
	300 mm	300 mm	400 mm	400 mm			**Tube Length**
	6 pieces	6 pieces	12 pieces	12 pieces			**Pack Size**

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Standard Tubing

ID (mm)	OD (mm)	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	TYGON 3350 SI	SILICONE PEROXIDE
1.6 mm wall thickness (1/16") Standard Tubing		**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.8	4.0	SC0355T	MF0001*		MF0009	MF0291	MF0044
1.6	3.2						
1.6	4.8	SC0373T	MF0028*	SCE0389	MF0010	SC0580B	MF0035
2.4	5.6	SC0691T	SC0691*		SC1006	SC0590B	
3.2	6.4	SC0374T	MF0030*	SCE0390	MF0012	SC0581B	MF0037
4.0	7.2	SC0462T	SC0462*				
4.8	8.0	SC0379T	SC0379*	SCE0391	MF0011	SC0582B	MF0045
6.4	9.6	SC0375T	MF0031*	SC0E392	MF0013	SC0584B	MF0046
8.0	11.2	SC0376T	MF0032*	SC0E394	MF0014	SC0587B	MF0047
9.5	12.7	SC0383T	SC0383*			SC0387B	
11.1	14.3	SC0384T	SC0384*			SC0697B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m
2.4 mm wall thickness (3/32")							
4.8	9.6	SC0500T	MF0029*		MF0448	SC0583B	MF0288
6.4	11.2	SC0501T	MF0033*			SC0585B	MF0040
8.0	12.8	SC0502T	SC0502*			SC0515B	
9.5	14.3	SC0503T	SC0503*			SC0516B	
11.1	15.9	SC0504T	SC0504*			SC0517B	
12.7	17.5	SC0505T	SC0505*			SC0518B	
15.9	20.7	SC0506T	SC0506*			SC0519B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m
3.2 mm wall thickness (1/8")							
4.8	11.2	SC0694T	SC0694*				
6.4	12.8	SC0380T	SC0380*	SCE0393	MF0015	SC0586B	MF0314
8.0	14.4	SC0535T	SC0535*				
9.5	15.9	SC0381T	SC0381*	SCE0395	MF0016	SC0588B	MF0041
11.1	17.5	SC0534T	SC0534*				
12.7	19.1	SC0382T	SC0382*	SCE0396	MF0034	SC0589B	MF0315
15.9	22.3	SC0695T	SC0695*		SC0696	SC0532B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*

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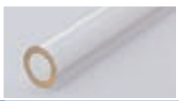



TYGON® 2001	TYGON HC F-4040-A	NORPRENE A-60-G	NORPRENE CHEMICAL	VITON®	OD (mm)	ID (mm)
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**1.6 mm wall thickness (1/16") Standard Tubing**	
		MF0017		MF0048	4.0	0.8
					3.2	1.6
SC0830	MF0002	SC0357		MF0049	4.8	1.6
					5.6	2.4
SC0831	MF0004	SC0358	SC1022	MF0051	6.4	3.2
					7.2	4.0
SC0832	MF0003	SC0359	SC1023	MF0322	8.0	4.8
SC0833	MF0005	SC0360	SC1024	MF0052	9.6	6.4
SC0834	MF0006	SC0361		MF0053	11.2	8.0
SC0835		SC0385	SC1025		12.7	9.5
		SC0386			14.3	11.1
15 m	15 m	15 m	15 m	7.5 m		**Roll Length**
						2.4 mm wall thickness (3/32")
	MF0476	SC0362		MF0050	9.6	4.8
	MF0007	SC0363		MF0054	11.2	6.4
		SC0511			12.8	8.0
		SC0512			14.3	9.5
					15.9	11.1
					17.5	12.7
					20.7	15.9
	15 m	15 m		7.5 m		**Roll Length**
						3.2 mm wall thickness (1/8")
					11.2	4.8
		SC0364		MF0323	12.8	6.4
					14.4	8.0
	MF0008	SC0365		MF0055	15.9	9.5
					17.5	11.1
SC0845	SC0725	SC0366	SC1026		19.1	12.7
SC0846		SC0698			22.3	15.9
15 m	15 m	15 m	15 m	7.5 m		**Roll Length**

LABORATORY PUMPS

SEE STARRED PRODUCTS FOR **TOP SELLERS!**

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IDEX Health & Science's Ismatec® pump drives are available with three pump types — peristaltic, gear, and piston — to make a complete pumping system. The chart below will help you choose the right pump technology. Once you find the desired pumping technology, proceed to the section pages listed and choose the pump/drive combination best suited for your application.

SELECTION CRITERIA		PERISTALTIC PUMPS	GEAR PUMPS	ROTARY PISTON PUMPS
Pages		**92**	**110**	**116**
Flow Rate Min. to Max.		< 0.001 mL/min to 13 L/min	1 mL/min to 7 L/min	0.025 mL/min–2.3 L/min
Number of Channels		1–24	1	1
Differential Pressure		Max. 2.5 bar (36 psi)	Max. 5.6 bar (81 psi)	Max. 6.9 bar (100 psi)
Suction Lift (water)		7–8 m	< 1 m	~5 m
Dead Volume		Practically None	5–45 mL	Very Small
Chemical Resistance		Depends on Tubing Material	High	Very High
Accuracy and Repeatability		High	High [1]	Very High
Self-Priming		Yes	Possible [4]	Possible
Sensitive to Dry-Running		No	Yes	Yes
Syphoning Effect		No	Yes	No
Pumping	Gently = Low Shearing Forces	Yes	No	No
	Under Sterile Conditions	Yes	No	No
	In Both Directions	Yes	Yes [4]	Yes
	Pulse-Free	[2]	Yes	[2]
	Contamination-Free	Yes	No	No
Media	Containing Particles	Very Good	No	Max. 0.8 mm Ø
	Viscous	Very Good	Possible	Good
	Containing Living Cells	Very Good	No	No
	Foaming	Very Good	No	No
	Corrosive/Aggressive	[3]	Good	Very Good
	Gas	[3]	No	[4]

[1] Requires non-return valve.
[2] Pumping with low pulsation possible; depends on the pump head.
[3] Depends on the tubing material.
[4] Depends on the pump head.

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Reglo ICC Independent-Channel Control Peristaltic Pump

- Continuous pumping or precision dispensing
- Flexibility of bi-directional flow in each channel
- Easy-to-use tubing cassettes allow quick changeovers
- Independent channel calibration minimizes the tube to tube differences resulting in the best calibration accuracy possible in a multichannel peristaltic pump
- New easy-to-use USB interface makes connections quickly
- Windows® software is included. Control up to eight Reglo ICC pumps. Time based routines allow for complex experiment development.

Expand the power of your peristaltic pumping application! By providing individually addressable control of each fluidic channel, the new Ismatec® Reglo ICC eliminates the clutter of multiple pumps on the bench top as well as allowing you, the scientist, to solve your application complexity in a single pump.

Long hailed in Europe as the gold standard of Swiss precision, Ismatec drives will now power up to four channels — flowing, dispensing, starting, stopping, reversing, aspirating, and calibrating — all working independently at the command of your PC or keypad. Plus the precision and accuracy of Ismatec's traditional peristaltic pumps for low-volume applications. For the first time, you'll be able to perform multiple precision fluidic tasks — at multiple flow rates — all from a single space-saving pump.

NEW!

ISM4408
Reglo ICC
4-Channel Pump

NEW!

ISM4308
Reglo ICC
3-Channel Pump

SPECIFICATIONS & DETAILS

Reglo ICC

Motor Type	Stepper Motor (1/channel)
Speed Range	0.1–100 rpm
Speed Setting	rpm (Resolution = 0.01 rpm)
Flow Rate Range	0.0002–35 mL/min/channel (tubing dependent)
Number of Channels	2-4
Number of Rollers	8 Ertalyte® rollers standard; 6 and 12-roller options also available
Cassettes	MS/CA Click'n'Go (POM-C; alternatives available)
Dimensions (HxWxD)	6.7" (170 mm) x 5" (125 mm) x 8.1" (205 mm)* (*=for 3-channel model)
Weight	6 lbs. (2.7 kg)
Power Consumption	30 W (Max.) Main Voltage: 100–264 V AC/50/60 Hz (Requires use of included power supply, cables)
Protection Rating	IP 30
Differential Pressure	1.0 bar/14.5 psi (Max.)

FLOW RATES & TUBING

Tubing ID (mm)	Flow Rate (mL/min per channel)	
	0.1 rpm	**100 rpm**
	Min.	**Max.**
0.13	0.0002	0.11
0.25	0.0005	0.41
0.51	0.0017	1.7
0.76	0.0036	3.6
1.02	0.0063	6.3
1.22	0.0088	8.8
1.52	0.013	13
1.85	0.017	17
2.54	0.027	27
3.17	0.035	35

Part No.	Description	Flow rates mL/min	Channels	Rollers	Speed rpm
REGLO ICC					
ISM4308	Reglo ICC	0.0002–35	3	8	100
ISM4408	Reglo ICC	0.0002–35	4	8	100

Peristaltic Pumps & Tubing

The pumps presented on pages 94–108 require peristaltic tubing to operate. Flow rate of a given fluid through a peristaltic tubing pump depends on two variables:

1. The speed of the pump, measured in revolutions per minute (rpm)

2. The volume held within the internal diameter (ID) of the selected tubing

Variable Speed Pump Flow Rates

For a variable speed pump, such as the products on pages 93–103, 112–115, and 117–118, the flow rate of a channel can be changed by varying the pump rpm, or by using tubing with different IDs, or a combination of both.

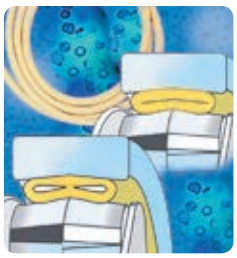
Fixed Speed Pump Flow Rates

Single-channel and multichannel peristaltic tubing pumps are available in this catalog. The number of channels refers to how many pieces of tubing that can be used simultaneously. Tubing with different IDs can be used in each channel to deliver varying flow rates at any given pump speed.

Convex Rollers and Concave Tube-Bed

- Treat the liquid gently (e.g. living cells)
- Improve the delivery stability
- Increase the repeatability
- Guarantee optimum tube centering

The tube is progressively closed, starting from the center outwards.



CELL SENSITIVE PUMPING

Pump heads with this sign are ideal for cell and media sensitive pumping.

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

NOTE

All microprocessor controlled drives are LabVIEW™ compatible and can easily be integrated into process control systems. The LabVIEW drivers can be downloaded from the website: www.idex-hs.com/ismatec

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PUMP SERIES		CHANNELS	FLOW RANGE	DRIVE OPTIONS	INTERFACE	PAGE
REGLO		1–4	0.001–230 mL/min	Variable	Digital = RS-232 only interface Analog = Analog only	**95**
FLOWMASTER®		Single channel only	37–13,000 mL/min	Variable	Analog	**98**
ECOLINE		1–8	0.005–5,400 mL/min	Variable	Analog	**99**
IP / IPC		4–24	0.001–44 mL/min	Variable	RS-232, Analog	**101**
BVP/MCP		1–24	0.001–3,700 mL/min	Variable	RS-232, Analog	**103**

Reglo Analog/Digital

The Smallest Dispensing Pump with Calibration Features

Reglo Analog
without dispensing functions
0.002–68 mL/min (per channel)
Variable speed drive

DISPENSING & CALIBRATING

Reglo Digital
with dispensing functions
0.001–68 mL/min (per channel)
Microprocessor controlled

SPECIFICATIONS & DETAILS

Reglo Analog

Motor Type	DC motor	
Speed	2-channel	3.2–160 rpm
	4-channel	2.0–100 rpm
Speed Setting	2–99%, resolution 1% 2-digit potentiometer	
Power Consumption	20 W	
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable	
Protection Rating	IP 30	
Depth/Width/Height	2-channel 178 x 100 x 143 mm 4-channel 190 x 100 x 143 mm	
Weight	2-channel 2.0 kg 4-channel 2.1 kg	

Reglo Digital

Motor Type	DC motor	
Speed	2-channel	1.6–160 rpm
	4-channel	1.0–100 rpm
Speed Setting	rpm, resolution 0.1 rpm	
Flow Rate Setting	µL/min or mL/min	
Power Consumption	75 W	
Mains Connection	100–230 V AC/50–60 Hz, selectable	
Protection Rating	IP 30	
Depth/Width/Height	2-channel 178 x 100 x 135 mm 4-channel 190 x 100 x 135 mm	
Weight	2-channel 2.0 kg 4-channel 2.1 kg	

Interfaces

RPM ANALOG

Reglo Analog

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output 2-channel: 0–8 kHz 4-channel: 0–5 kHz
- Start/Stop
- Rotation direction

Reglo Analog
2-digit potentiometer
2–99%, resolution 1% (for speed setting)

RS232

RPM ANALOG

Reglo Digital

- PC-controllable
- Digital is RS-232 only

Reglo Digital
6-button membrane key-pad, LED-display
Flow rate setting in µL/min and mL/min

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FLOW RATES & TUBING

Model		Reglo Analog+Digital		Reglo Analog+Digital		Reglo Analog+Digital		Reglo Analog+Digital		Reglo Analog+Digital		Reglo Analog+Digital	
Channels		2		2		2		4		4		4	
Rollers		6		8		12		6		8		12	
Speed rpm		1.61	160	1.61	160	1.61	160	1.0[1]	100	1.0[1]	100	1.0[1]	100
Tygon® ST R-3603/R-3607 Part No.	Tubing ID mm	mL/min per channel		mL/min per channel		mL/min per channel		mL/min per channel		mL/min per channel		mL/min per channel	
		min.[1]	max.[2]	min.[1]	max.[2]	min.[1]	max.[2]	min.[1]	max.[2]	min.[1]	max.[2]	min.[1]	max.[2]
SC0189	0.13	0.003	0.22	0.002	0.17	0.002	0.15	0.002	0.14	0.002	0.11	0.001	0.093
SC0050	0.25	0.008	0.76	0.007	0.65	0.007	0.61	0.005	0.48	0.005	0.41	0.004	0.38
SC0053	0.51	0.031	3.1	0.027	2.7	0.025	2.5	0.019	1.9	0.017	1.7	0.016	1.6
SC0056	0.76	0.067	6.7	0.058	5.8	0.053	5.3	0.042	4.2	0.036	3.6	0.033	3.3
SC0059	1.02	0.12	12	0.10	10	0.090	9.0	0.073	7.3	0.063	6.3	0.056	5.6
SC0062	1.22	0.16	16	0.14	14	0.12	12	0.10	10	0.088	8.8	0.075	7.5
SC0065	1.52	0.24	24	0.20	20	0.17	17	0.15	15	0.13	13	0.10	10
SC0068	1.85	0.34	34	0.28	28	0.21	21	0.21	21	0.17	17	0.13	13
SC0071	2.54	0.53	53	0.44	44	0.31	31	0.33	33	0.27	27	0.19	19
SC0224	3.17	0.68	68	0.57	57	0.38	38	0.43	43	0.35	35	0.24	24

Approx. values: determined with water, at 22 °C, no differential pressure, Tygon tubing.
[1] Min. flow rates shown are for the Reglo Digital. Min. flow rate for Reglo Analog =2% of max. flow rate.
[2] Max. flow rates shown are for both the Reglo Analog and Digital pumps.

APPLICATION NOTE

- Addition of a reagent to a reactor and simultaneous removal of the reaction product from the upper fraction. Ramp control combined with a thermostat to maintain the ΔT during the reaction.
- Simultaneous addition of both components of a 2-component adhesive in ratio 1:10 with two different tubing sizes.

Part No.	Model	Flow rates mL/min per channel	Channels	Rollers	Speed rpm
REGLO ANALOG					
ISM830	MS-2/06	0.005–68	2	6	1.6–160
ISM829	MS-2/08	0.004–57	2	8	1.6–160
ISM795	MS-2/12	0.003–38	2	12	1.6–160
ISM828	MS-4/06	0.003–43	4	6	1.0–100
ISM827	MS-4/08	0.003–35	4	8	1.0–100
ISM796	MS-4/12	0.002–24	4	12	1.0–100
REGLO DIGITAL					
ISM831	MS-2/06	0.003–68	2	6	3.2–160
ISM832	MS-2/08	0.002–57	2	8	3.2–160
ISM596	MS-2/12	0.002–38	2	12	3.2–160
ISM833	MS-4/06	0.002–43	4	6	2.0–100
ISM834	MS-4/08	0.002–35	4	8	2.0–100
ISM597	MS-4/12	0.001–24	4	12	2.0–100
ACCESSORIES					
Part No.	**Description**				
ISM891	Reglo Analog Foot switch, see page 109				
ISM894	Reglo Digital Foot switch, see page 109				
LabVIEW™ driver for Reglo Digital download for free: www.idex-hs.com/ismatec					

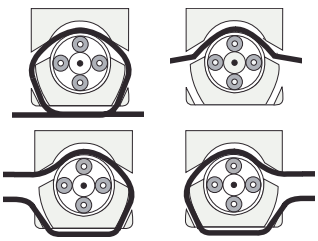
RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Reglo *Quick*™

Very Fast Tubing Change-Over

Reglo *Quick*
2.1–230 mL/min
Easily accessible tube-bed thanks to wide opening angle.



TIP Flexible layout for tubing appropriate to your application

APPLICATION NOTE

Single-channel delivery processes with variable flow rates where frequent tubing change-over is required e.g.:

- Addition of dye stuffs with tubing exchange after each dispensing process.
- Flushing cylinder heads of HPLC pumps.

SPECIFICATIONS & DETAILS

Reglo *Quick*

Motor Type	DC motor
Speed	3.2–160 rpm
Speed Setting	1–99 %, resolution 1% 2-digit potentiometer
Power Consumption	30 W
Mains Connection	230 V AC /50 Hz,115 V AC /60 Hz, selectable
Protection Rating	IP 30
Depth/Width/Height	178 x 100 x 143 mm (pump head closed)
Weight	2.2 kg

Interfaces

RPM
ANALOG

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–8 kHz)
- Start/stop
- Rotation direction

Reglo *Quick*
2-digit potentiometer
1–99%, resolution 1% (for speed setting)

FLOW RATES & TUBING

		Model/Type	Reglo *Quick*	
		Channels	1	
		Rollers	4	
		Speed rpm	3.2	160
Tygon® ST R-3603/R-3607 Part No.	**Wall (mm)**	**Tubing ID (mm)**	**mL/min minimum**	**mL/min maximum**
MF0030	1.6	3.2	2.1	103
SC0379	1.6	4.8	4.6	230

Approx. values: determined with water, at 22°C, no differential pressure, Tygon tubing.

Part No.	Flow rates mL/min per channel	Channels max.	Rollers	Speed rpm
REGLO QUICK				
ISM897	2.1–230	1	4	3.2–160

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Flowmaster®

Ideal for Heavy-Duty Processes

- Ideal for dispensing and filling applications in a dusty, humid or corrosive environment and in clean room areas
- Protection rating of IP 65

Optimized for Increased Hygienic Requirements

- Stainless steel housing
- Tube-loading under sterile conditions without aspirating air
- Easy disassembly of the pump head
- Thorough cleaning thanks to easy disassembly and reassembly of the pump head

Safety

- Pump Stops When Opening the Tube-Bed
- Multiple Overload Protection

Flowmaster FMT300

37 mL/min–13 L/min

- 1 channel
- 3 convex stainless steel rollers
- Automatic tube retention
- Standard tubing 6.4–15.9 mm ID, wall thickness 3.2 mm, differential pressure max. 2 bar (30 psi) — depends on tubing material used

TIP TUBE EXCHANGE IN 5 SECONDS!!

- Insert the Tube (Easily and Fast)
- Press Down the Lever (Automatically Correct Pressure Setting of the Tube)
- Start the Pump!

SPECIFICATIONS & DETAILS

Motor type	DC motor
Speed	5 to 500 rpm
Speed setting	Resolution 0.1 rpm membrane key-pad, LED display
Power consumption	500 W
Mains connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable
Protection rating	IP 65
Depth/Width/Height	500 x 220 x 262 mm
Weight	26 kg

Interfaces

PLC compatible interface with status information for process control systems (the level of the inputs can be configured: 5, 12, or 24 V).

RPM ANALOG

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Start/stop, rotation direction
- Autostart
- Speed output
- Digital output (potential free) (error, okay, busy)

Settings menu

- Configuration of analog interface
- Entry of basic settings, e.g. rpm, time, etc.
- Foot switch control
- Rotation speed (% or rpm)
- Service life of tubing
- Timer function, etc.

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No.	Description	Flow rates mL/min	Channels	Rollers	Speed rpm
FLOWMASTER					
ISM1020A	Flowmaster FMT300 230 V 50 Hz	37–13,000	1	3	5–500
ISM1022A	Flowmaster FMT300 115 V 60 Hz	37–13,000	1	3	5–500
ACCESSORIES					
IS10279	Foot switch, see page 109				

FLOW RATES & TUBING

Tubing Information				Flow Rates in L/min							
Tygon® E-LFL Part No.	PharMed® Part No.	Wall (mm)	Tubing ID (mm)	rpm 5	rpm 10	rpm 50	rpm 100	rpm 200	rpm 300	rpm 400	rpm 500
SCE0393	MF0015	3.2	6.4	0.037	0.074	0.37	0.74	1.5	2.2	3.1	3.7
SCE0395	MF0016	3.2	9.5	0.08	0.16	0.80	1.6	3.2	4.8	6.4	8.0
SCE0396	MF0034	3.2	12.7	0.10	0.20	1.0	2.0	4.0	6.0	8.0	10.0
	SC0696	3.2	15.9	0.13	0.26	1.3	2.6	5.2	7.8	10.4	13.0

Approx. values: determined with water, at 22 °C, no differential pressure, PharMed tubing.

Ecoline VC-MS/CA8-6

0.005–150 mL/min

- 8 channels
- 6 rollers
- 3-stop tubing
- Differential pressure 1.0 bar[1] (15 psi)

Ecoline VC-MS/CA4–12

0.003–83 mL/min

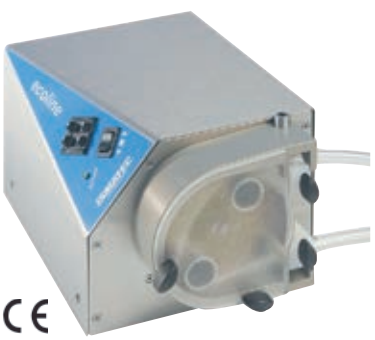
- 4 channels
- 12 rollers (low pulsation)
- Click'n'Go cassettes with automatic pressure setting
- 3-stop tubing
- Differential pressure 1.0 bar[1] (15 psi)

[1] Possible with appropriate tubing material; tubing with small ID's and/or cassettes with the pressure lever (see page 109) may enable higher pressures.

Ecoline VC-280 (1.7–5,400 mL/min) and Ecoline VC-380 (1.6–5,000 mL/min)

- 1 channel
- 2 or 3 convex rollers treat the liquid and tubing gently
- With exchangeable rotor e.g. for lower pulsation, higher flow rates, or elevated differential pressures
- Standard tubing 1.6 mm wall thickness (WT)
- Differential pressure 1.5 bar[1] (22 psi)

[1] Differential pressure depends on tubing material; tubing with small ID's may enable higher pressures.



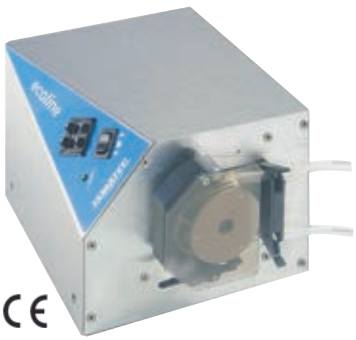
CELL SENSITIVE PUMPING

Ecoline VC-360

0.25–1,300 mL/min

- 1 channel
- 3 convex rollers treat the liquid and tubing gently
- Hinged tube-bed for easy and rapid tube change-over
- Standard tubing 1.6 mm WT
- Differential pressure 1.5 bar[1] (22 psi)

[1] Differential pressure depends on tubing material; tubing with small ID's may enable higher pressures.



CELL SENSITIVE PUMPING

APPLICATION NOTE

- **Ecoline VC-280**
  To apply protective lacquer to cartons
- **Ecoline VC-380**
  As recirculating pump for coolant in thermostat bath
- **Ecoline VC-360**
  Externally controlled spectrophotometer cuvette filling
- **Ecoline VC-MS/CA8-6**
  8-channel flushing of the tubing system of a digital fabric printing machine

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SPECIFICATIONS & DETAILS

Motor Type	DC motor
Speed	3.5–350 rpm
Speed Setting	1–99%, resolution 1% 2-digit potentiometer
Power Consumption	100 W
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable
Protection Rating	IP 30

Size and Weight

Model	Depth x Width x Height	Weight
Ecoline VC-280	256 x 169 x 138 mm	5.2 kg
Ecoline VC-380	256 x 169 x 138 mm	5.3 kg
Ecoline VC-360	238 x 169 x 138 mm	4.9 kg
Ecoline VC-Easy-Load™	285 x 169 x 138 mm	5.2 kg
Ecoline VC-MS/CA8-6	313 x 169 x 138 mm	5.5 kg
Ecoline VC-MS/CA4-12	281 x 169 x 138 mm	5.4 kg

Interfaces

RPM ANALOG

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Start/stop, rotation direction

FLOW RATES & TUBING

3-Stop Tubing

	Model Type	Ecoline VC-MS / CA8-6		Ecoline VC-MS / CA4-12	
	Channels	8		4	
	Rollers	6		12	
	Speed rpm	3.5	350	3.5	350
Tygon® ST R-3603/R-3607 Part No.	**Tubing ID (mm)**	**mL/min per channel**		**mL/min per channel**	
		min.	**max.**	**min.**	**max.**
SC0189	0.13	0.005	0.49	0.003	0.32
SC0050	0.25	0.017	1.7	0.013	1.3
SC0053	0.51	0.067	6.7	0.055	5.5
SC0056	0.76	0.15	15	0.12	12
SC0059	1.02	0.26	26	0.20	20
SC0062	1.22	0.36	36	0.26	26
SC0065	1.52	0.53	53	0.36	36
SC0068	1.85	0.73	73	0.47	47
SC0071	2.54	1.2	120	0.68	68
SC0224	3.17	1.5	150	0.83	83

Approx. values: determined with water at 22 °C, no differential pressure, Tygon ST tubing.

Standard Tubing

	Model Type	Ecoline VC-280		Ecoline VC-380		Ecoline VC-260	
	Channels	1		1		1	
	Rollers	2		3		3	
	Speed rpm	3.5	350	3.5	350	3.5	350
Tygon ST R-3603/R-3607 Part No.	**WT (mm)**	**Tubing ID (mm)**	**mL/min per channel**		**mL/min per channel**		**mL/min per channel**	
			min.	**max.**	**min.**	**max.**	**min.**	**max.**
MF0001	1.6	0.8					0.25	25
MF0028	1.6	1.6	1.7	170	1.6	160	0.9	90
MF0030	1.6	3.2	6.6	660	5.9	590	3.5	350
SC0379	1.6	4.8	5.1	1,500	13	1,300	7.7	770
MF0031	1.6	6.4	25	2,500	23	2,300	13	1,300
MF0032	1.6	8.0	37	3,700	34	3,400		
SC0383	1.6	9.5	48	4,800	44	4,400		
SC0384	1.6	11.1	54	5,400	50	5,000		

Approx. values: determined with water at 22 °C, no differential pressure, Tygon ST tubing.

Part No.	Model	Flow rates mL/min per channel	Channels max.	Rollers
COMPLETE ECOLINE PUMPS				
ISM1063	Ecoline VC-MS/CA8-6	0.005-150	8	6
ISM1076A	Ecoline VC-360	0.25–1,300	1	3
ISM1078B	Ecoline VC-280 WT 1.6	1.7–5,400	1	2
ISM1079B	Ecoline VC-380 WT 1.6	1.6–5,000	1	3
ISM1090	Ecoline VC-MS/CA4-12	0.003–82	4	12
ISM1091	Ecoline EasyLoad I	0.23–1,600	1	3
ISM1091B	Ecoline EasyLoad II	0.24–1,000	1	4

**For standard tubing 2.4 mm wall thickness 4.8–9.5 mm (3/16–3/8") inner diameter.*

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

IPC/IP & IPC-N/IP-N

IPC (and IP)

- 0.002–44 mL/min (Per Channel)

IPC-N (and IP-N)

- 0.4 µL/min–11 mL/min (Per Channel)

DISPENSING & CALIBRATING

SPECIFICATIONS & DETAILS

Specifications IPC and IPC-N

Motor Type	DC motor
Speed	IPC 0.4–44 rpm IPC-N 0.11–11.25 rpm
Speed Setting	1–100 %, resolution 0.1%
Flow Rate Setting	µL/min or mL/min
Power Consumption	30 W
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable
Protection Rating	IP 30

Specifications IP and IP-N

Motor Type	DC motor
Speed	IP 0.4–44 rpm IP-N 0.11–11.25 rpm
Speed Setting	1–100 %, resolution 0.1% IP rpm, resolution 0.1 rpm IP-N rpm, resolution 0.03 rpm
Power Consumption	30 W
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable
Protection Rating	IP 30

Dimensions/Weight

4 Channels	
Depth/Width/Height	180 x 175 x 130 mm
Weight	4.6 kg
8 Channels	
Depth/Width/Height	220 x 175 x 130 mm
Weight	5.1 kg
12 Channels	
Depth/Width/Height	260 x 175 x 130 mm
Weight	5.8 kg
16 Channels	
Depth/Width/Height	300 x 175 x 130 mm
Weight	6.5 kg
24 Channels	
Depth/Width/Height	380 x 175 x 130 mm
Weight	7.9 kg

Interfaces

RS232

RPM
ANALOG

IPC, IPC-N

- PC-controllable
- Analog: same as IP, IP-N

RPM
ANALOG

IP, IP-N

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V or 0–11 kHz)
- Start/stop
- Rotation direction
- Autostart

Standard Speed (IPC)

FLOW RATES & TUBING

	Model	IPC / IP		IPC-N / IP-N	
	Channels	4 / 8 / 12 / 16 / 24		4 / 8 / 12 / 16 / 24	
	Rollers	8		8	
	Speed rpm	0.4	44.0	0.11	11.25
Tygon® ST R-3603/R-3607 Part No.	**Tubing ID (mm)**	**mL/min per channel min.**	**mL/min per channel max.**	**mL/min per channel min.**	**mL/min per channel max.**
SC0188	0.13	0.002	0.15	0.0004	0.039
SC0002	0.25	0.005	0.41	0.001	0.10
SC0005	0.51	0.015	1.5	0.004	0.38
SC0008	0.76	0.032	3.2	0.009	0.81
SC0011	1.02	0.057	5.7	0.041	1.4
SC0014	1.22	0.079	7.9	0.020	2.0
SC0017	1.52	0.12	12	0.030	3.0
SC0020	1.85	0.17	17	0.043	4.3
SC0023	2.54	0.30	30	0.075	7.5
SC0222	3.17	0.44	44	0.11	11

Approx. values: determined with water, at 22 °C, no differential pressure, Tygon tubing.

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4 channels | 8 channels | 12 channels | 16 channels | 24 channels

Planetary Drive System

With the planetary drive system each roller is directly driven by the sun wheel. This prevents axial push-pull friction on the tubing.

Result: increased service-life of the tubing, lower pulsation, high repeatability.

APPLICATION NOTE

- Toxicological in-vitro use.
- Perfusion of animal tissue samples.
- Sampling from tablet dissolution systems.
- Environmental applications.

Part No.	Model	Flow rates mL/min per channel	Channels	Speed rpm
IPC AND IPC-N				
ISM930	IPC 4	0.002–44	4	0.4–45
ISM931	IPC 8	0.002–44	8	0.4–45
ISM932	IPC 12	0.002–44	12	0.4–45
ISM933	IPC 16	0.002–44	16	0.4–45
ISM934	IPC 24	0.002–44	24	0.4–45
ISM935	IPC-N 4	0.0004–11	4	0.11–11.25
ISM936	IPC-N 8	0.0004–11	8	0.11–11.25
ISM937	IPC-N 12	0.0004–11	12	0.11–11.25
ISM938	IPC-N 16	0.0004–11	16	0.11–11.25
ISM939	IPC-N 24	0.0004–11	24	0.11–11.25
IP AND IP-N				
ISM940	IP 4	0.002–44	4	0.4–45
ISM941	IP 8	0.002–44	8	0.4–45
ISM942	IP 12	0.002–44	12	0.4–45
ISM943	IP 16	0.002–44	16	0.4–45
ISM944	IP 24	0.002–44	24	0.4–45
ISM945	IP-N 4	0.0004–11	4	0.11–11.25
ISM946	IP-N 8	0.0004–11	8	0.11–11.25
ISM947	IP-N 12	0.0004–11	12	0.11–11.25
ISM948	IP-N 16	0.0004–11	16	0.11–11.25
ISM949	IP-N 24	0.0004–11	24	0.11–11.25

LabVIEW™ driver, download for free www.idex-hs.com/ismatec

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

BVP *Standard*

Economical

- Robust, powerful drive
- Variable speed

Without Dispensing Functions

- 3-digit potentiometer for speed setting
- 20 pump head configurations available
- Bayonet coupling system enables a system change without tools
- Flow rates, channels, rollers and differential pressure depend on the mounted pump head (see pages 105 to 108)

BVP *Standard* Drive
(pump heads on pages 105 to 108)

BVP *Process*

Washdown

- Protection rating of IP 65
- Extremely robust drive
- Microprocessor controlled
- Ideal for applications in a dusty, humid or corrosive environment and in clean room areas (IP 65, dust-tight and protected against water jets)

Without Dispensing Functions

Flow rates, channels, rollers and differential pressure depend on the mounted pump head (see pages 105 to 108)

- Membrane key-pad for speed setting, LED display
- Stainless steel housing
- More than 20 pump heads available
- Bayonet coupling system enables a system change without tools

BVP *Process* drive
(pump heads on pages 105 to 108)

SPECIFICATIONS & DETAILS

	BVP *Standard*	BVP *Process*
Motor Type	DC motor	DC motor
Speed	2.4–240 rpm	1–240 rpm
Speed Setting	1–99.9%, resolution 0.1% 3-digit potentiometer	rpm, resolution 0.1 rpm
Power Consumption	100 W	120 W
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable	230 V AC/50 Hz,115 V AC/60 Hz, selectable
Protection Rating	IP 30	IP 65
Depth/Width/Height	220 x 155 x 260 mm (without pump head)	220 x 155 x 260 mm (without pump head)
Weight	5.7 kg (without pump head)	6.9 kg (without pump head)

Interfaces

RPM ANALOG

BVP *Standard*

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–12 kHz)
- Start/stop, rotation direction

RPM ANALOG

BVP *Process*

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–7.2 kHz)
- Start/stop, rotation direction, autostart

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No.	Includes
THE COMPLETE PUMP SYSTEM BVP *PROCESS* CONSISTS OF:	
ISM920A	Drive, page 103
Order the Following to Complete the BVP *Process* Pump System	
	Pump head, pages 105–108
	Tubing, pages 61–89
	Accessories, page 109
IS10039	Foot switch, page 109
THE COMPLETE PUMP SYSTEM BVP *STANDARD* CONSISTS OF:	
ISM444B	Drive, page 103
Order the Following to Complete the BVP *Standard* Pump System	
	Pump head, pages 105–108
	Tubing, pages 61–89
	Accessories, page 109
IS10039	Foot switch, page 109

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MCP *Standard*

Multi-Purpose

- Saves individual application parameters
- Robust, powerful drive
- Ideal for dispensing and filling
- Pre-programmed tube sizes and pump heads allow you to work with flow rates
- Membrane key-pad, LED display
- 4 program memories for saving individual application parameters
- More than 20 pump heads available
- Bayonet coupling system enables a system change without tools
- Flow rates, channels, rollers and differential pressure depend on the pump head mounted (see pages 105 to 108)

MCP *Standard* Drive
(pump heads on pages 104–107)

DISPENSING & CALIBRATING

MCP *Process*

Programmable

- Programs can be carried out on the spot independently of a PC
- Protection rating of IP 65
- Extremely robust drive, suitable for industries
- Ideal for dispensing and filling applications in a dusty, humid or corrosive environment, and in clean room areas
- Pre-programmed tube sizes and pump heads allow you to work with flow rates
- Stainless steel housing, membrane key-pad, LED display
- 4 program memories for saving individual application parameters or PC programmed command sequences
- More than 20 pump heads available
- Bayonet coupling system enables a system change without tools
- Flow rates, channels, rollers and differential pressure depend on the pump head mounted (see pages 105 to 108)

MCP *Process* Drive
(pump heads on pages 105 to 108)

DISPENSING & CALIBRATING

SPECIFICATIONS & DETAILS

	MCP *Process*	MCP *Standard*
Motor Type	DC motor	DC motor
Speed	1–240 rpm	1–240 rpm
Speed Setting	rpm, resolution 0.1 rpm	rpm, resolution 0.1 rpm
Flow Rate Settings	µL/min, mL/min, L/min	µL/min, mL/min, L/min
Power Consumption	100 W	100 W
Mains Connection	100–230 V AC/50–60 Hz, selectable	230 V AC/50 Hz, 115 V AC/60 Hz, selectable
Protection Rating	IP 65	IP 30
Depth/Width/Height	220 x 155 x 260 mm (without pump head)	220 x 155 x 260 mm (without pump head)
Weight	6.9 kg (without pump head)	6.4 kg (without pump head)

Interfaces

RS232
RPM
ANALOG

MCP *Standard*

- PC controllable
- RS-232
- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–12 kHz)
- Start/stop, rotation direction, autostart

MCP *Process*

- PC controllable
- RS-232
- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–7.2 kHz)
- Start/stop, rotation direction, autostart
- 2 universal inputs
- 2 universal outputs

Part No.	Includes
THE COMPLETE PUMP SYSTEM MCP ***PROCESS*** CONSISTS OF:	
ISM915A	Drive, page 104
Order the Following to Complete the MCP *Process* Pump System	
	Pump head, pages 105 to 108
	Tubing, pages 61–89
	Accessories, page 109
IS10039	Foot switch, page 109
THE COMPLETE PUMP SYSTEM MCP ***STANDARD*** CONSISTS OF:	
ISM404B	Drive, page 104
Order the Following to Complete the MCP *Standard* Pump System	
	Pump head, pages 105 to 108
	Tubing, pages 62–89
	Accessories, page 109
IS10039	Foot switch, page 109

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Drive (MCP or BVP) + Pump Head + Tubing = Complete Pump System

BVP/MCP — an Investment for the Future

Instantly Interchangeable Pump Systems

BVP *Standard*
ISM444

MCP *Standard*
ISM404B

BVP *Process*
ISM920A
IP 65

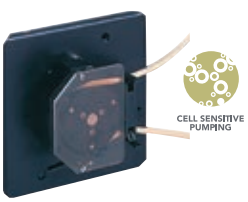
MCP *Process*
ISM915A
IP 65

Easy Interchangeable Pump Heads

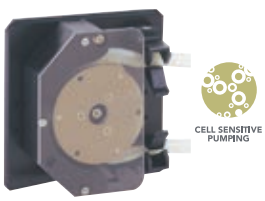
- Mount the pump head without using a tool

The MCP and BVP drives enable the user to choose individually from a large variety of different pump heads. These heads are interchangeable and can be mounted or exchanged within seconds.

Single-Channel



ISM719A
0.072–530 mL/min
Type 360



ISM718A
0.44–2,800 mL/min
Type 380

ISM785A
0.49–3,700 mL/min
Type Pro-280
For 1.6 mm Wall Thickness

ISM793A
3.6–3,100 mL/min
Type Pro-281
For 2.4 mm Wall Thickness

ISM791A
0.45–3,400 mL/min
Type Pro-380
For 1.6 mm Wall Thickness

ISM797A
3.3–2,900 mL/min
Type Pro-381
For 2.4 mm Wall Thickness

MF0313
0.07–1,100 mL/min
Type MF Easy-Load®

MF0446
0.24–1,000 mL/min
Type MF Easy-Load II
(with adjustable pressure setting)

Multi-Channel

SB 2V (2 channel)
ISM734B + ISM010A
1.1–1,100 mL/min

SB 3V (3 channel)
ISM734B + ISM011A
0.09–530 mL/min

ISM721A (4 channel)
ISM732B (8 channel)
ISM733A (12 channel)
0.002–230 mL/min
4–12 channels
Type CA 4, CA 8, and CA 12

ISM735A (4 channel)
(ISM737A 4 channel extension block)
0.001–57 mL/min
Type MS/CA 4–12
(Combine up to 3 extension blocks of 4 channels each)

ISM724B (8 channel)
(ISM185A 8 channel extension block)
0.002–100 mL/min
Type MS/CA 8-6
(Combine up to 2 extension blocks of 8 channels each)

Single-Channel for Corrosive Media

Rigid PTFE Tubing Pump Head

MF0330
0.07–15 mL/min
PTFE tubing 2 mm ID

0.19–45 mL/min
PTFE tubing 4 mm ID

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BVP/MCP Pump Heads

Pro-280

ISM785A

CELL SENSITIVE PUMPING

0.49–3,700 mL/min

- Coated aluminum pump head
- Can be dismantled for cleaning
- Self-centering tube-track thanks to concave tube-bed and convex rollers, which lengthens the tube-life
- 2 stainless steel rollers (higher max. flow rate but more pulsation than with 3 rollers)
- For tubing with 1.6 mm wall thickness
- 1.5 bar (22 psi) differential pressure[1]

Pro-281

ISM793A

3.6–3,100 mL/min

Same pump head as Pro-280, but

- For tubing with 2.4 mm wall thickness
- 2.5 bar (36 psi) differential pressure[1]

Pro-380

ISM791A

CELL SENSITIVE PUMPING

0.45–3,400 mL/min

Same pump head as Pro-280, but

- 3 stainless steel rollers (less pulsation but lower max. flow rate than with 2 rollers)

Pro-381

ISM797A

3.3–2,900 mL/min

Same pump head design as Pro-280, but

- 3 stainless steel rollers (less pulsation but lower max. flow rate than with 2 rollers)
- For tubing with 2.4 mm wall thickness
- 2.5 bar (36 psi) differential pressure[1]

[1] Differential pressure depends on tubing material; tubing with small ID's enable higher pressures.

The flow rates are based on a drive speed of 1 (or 2.4) to 240 rpm. For the BVP Standard drive the indicated min. flow rates must be multiplied by factor 2.4.

Approx. values: determined with water, at 22 °C, no differential pressure, Tygon tubing.

APPLICATION NOTE

- Chemical, biotechnological, and pharmaceutical applications.
- Food industry.
- Elevated differential pressures (Pro-281 and Pro-381).
- Viscous fluids.
- Fluids containing a high content of sensitive solids.
- Applications requiring hygienic conditions, durability, and reliability.
- Comparisons to gear, piston and centrifugal pumps proved that peristaltic pumps are the only suitable and sterilizable pump system for gently pumping media containing living cells.

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

FLOW RATES & TUBING

Tygon® ST R-3603/R-3607 Part No.	Wall (mm)	Tubing ID (mm)	mL/min min.	mL/min max.
MODEL PRO-280				
MF0028	1.6	1.6	0.49	120
MF0030	1.6	3.2	1.9	450
SC0379	1.6	4.8	4.2	1,000
MF0031	1.6	6.4	7.2	1,700
MF0032	1.6	8.0	11	2,600
SC0383	1.6	9.5	14	3,300
SC0384	1.6	11.1	16	3,700
MODEL PRO-281				
MF0029	2.4	4.8	3.6	870
MF0033	2.4	6.4	6.5	1,600
SC0502	2.4	8.0	9.9	2,400
SC0503	2.4	9.5	13	3,100
MODEL PRO-380				
MF0028	1.6	1.6	0.45	110
MF0030	1.6	3.2	1.7	400
SC0379	1.6	4.8	3.7	890
MF0031	1.6	6.4	6.5	1,600
MF0032	1.6	8.0	9.7	2,300
SC0383	1.6	9.5	13	3,000
SC0384	1.6	11.1	14	3,400
MODEL PRO-381				
MF0029	2.4	4.8	3.3	800
MF0033	2.4	6.4	5.8	1,400
SC0502	2.4	8.0	8.8	2,100
SC0503	2.4	9.5	12	2,900

BVP/MCP Pump Heads

360[1]

0.072–530 mL/min

- Easily accessible flip-up tube-bed guarantees easy and rapid tube change-over
- Transparent protection cover allows monitoring the tube and the revolving rotor
- Self-centering tube-track design thanks to the concave tube-bed and convex rollers (lengthens tube-life)
- Rotor accepts tubing ID from 0.8 to 6.4 mm with 1.6 mm wall thickness
- 3 stainless steel rollers
- 1.5 bar (22 psi) differential pressure[2]

ISM719A

380[1]

0.44–2,800 mL/min

Same design as pump head 360, but larger size

- For tubing ID from 1.6 to 9.5 mm with 1.6 mm wall thickness
- 1.5 bar (22 psi) differential pressure[2]
- Ideal for sterile media

ISM791A

[1] *An OEM version of this pump head is also available. Ask for the detailed data sheet.*

[2] *Differential pressure depends on tubing material; tubing with small ID's may enable higher pressures.*

NOTE

The flow rates are based on a drive speed of 1 (or 2.4) to 240 rpm. For the BVP Standard drive the indicated min. flow rates must be multiplied by factor 2.4. Approx. values: determined with water, at 22 °C, no differential pressure, and Tygon® tubing.

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BVP/MCP Pump Heads

Easy-Load®[1]

MF0313

0.07–1,100 mL/min

- Easily accessible pump head
- Allows rapid tube change-over
- PSF housing (polysulfone)
- Rotor designed for tubing with 1.6 mm wall thickness
- Rotor with 3 stainless steel rollers
- 0.7 bar (10 psi) differential pressure[2]

Easy-Load II[1]

MF0446

0.24–1,000 mL/min

Same specifications as Easy-Load, but

- Adjustable pressure setting
- Improved, automatic tubing retention
- PPS housing (polyphenylene sulfide)
- Rotor with 4 stainless steel rollers
- 0.7 bar (10 psi) differential pressure[2]

[1] Two pump heads can be mounted on one drive. (Special mounting sets must be ordered separately).

[2] Differential pressure depends on tubing material; tubing with small ID's may enable higher pressures.

FLOW RATES & TUBING

Tygon® ST R-3603/R-3607 Part No.	Wall (mm)	Tubing ID (mm)	mL/min min.	mL/min max.
MODEL 360				
MF0001	1.6	0.8	0.072	17
MF0028	1.6	1.6	0.26	62
MF0030	1.6	3.2	1.0	240
SC0379	1.6	4.8	2.0	530
MODEL 380				
MF0028	1.6	1.6	0.44	100
MF0030	1.6	3.2	1.7	400
SC0379	1.6	4.8	3.6	860
MF0031	1.6	6.4	6.0	1,400
MF0032	1.6	8.0	8.8	2,100
SC0383	1.6	9.5	12	2,800
MODEL 380AD				
MF0028	1.6	1.6	0.4	99
MF0030	1.6	3.2	1.5	370
SC0379	1.6	4.8	3.4	830
MF0031	1.6	6.4	6.2	1,500
MF0032	1.6	8.0	9.5	2,300
SC0383	1.6	9.5	13.0	3,000
SC0384	1.6	11.1	15.0	3,600
MF0029	2.4	4.8	3.4	830
MF0033	2.4	6.4	6.2	1,500
MODEL EASY-LOAD				
MF0001	1.6	0.8	0.066	16
MF0028	1.6	1.6	0.25	59
MF0030	1.6	3.2	0.91	220
SC0379	1.6	4.8	1.9	450
MF0031	1.6	6.4	3.1	730
MF0032	1.6	8.0	4.7	1,100
MODEL EASY-LOAD II				
MF0028	1.6	1.6	0.24	58
MF0030	1.6	3.2	0.92	220
SC0379	1.6	4.8	1.9	460
MF0031	1.6	6.4	3.0	730
MF0032	1.6	8.0	4.2	1,000

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Tubing Cassettes

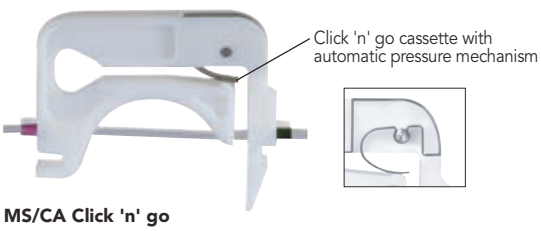
- Developed and consistently improved by Ismatec®

Click 'n' go Cassettes (Standard)[1]

Advantages:

- Automatic tubing pressure; no readjustment necessary
- Ideal for non-monitored, long-time use

Please Note: Click 'n' go cassettes are not suitable for differential pressure greater than 1 bar (15 psi). For these conditions you should choose the pressure lever cassettes.

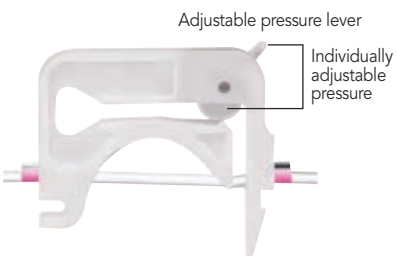


MS/CA Click 'n' go

CA Click 'n' go

Pressure Lever Cassettes (Optional)

The optional pressure lever allows you to set a different tubing pressure for each channel. Depending on the application, tubing material and diameter, an optimally adjusted tubing pressure can be set. To maintain constant flow rates it may be necessary to periodically adjust the tubing pressure.



MS/CA Pressure Lever (Optional)

CA Pressure Lever (Optional)

Foot Switch

The Ismatec foot switch for start/stop is very practical for use with pumps as dispensing systems, e.g. for filling tubes, bottles etc. A foot switch provides the start/stop signal required, allowing hands-free activation of the filling system. The switch's protection rating is IP21. A 6-foot (1.8 m) cable is included.

Part No.	Model	Material	Adapters Required?	Qty.
TUBING CASSETTES AND ADAPTERS				
Click'n' go Spare Cassettes[1]				
IS3510A	MS/CA Click 'n' go	POM-C[4]	No	1
IS3710A	CA Click 'n' go	POM-C[4]	Yes[2]	1
Pressure Lever Optional Cassettes				
IS0649A	MS/CA Pressure Lever	POM-C[4]	No	1
IS3629A	MS/CA Pressure Lever	PVDF[3, 4]	No	1
IS0122A	CA Pressure Lever	POM-C[4]	Yes[2]	1
IS3820A	CA Pressure Lever	PVDF[3, 4]	Yes[2]	1
Replacement Adapters for CA Cassettes[2]				
IS0123A	Adapter for CA Cassettes	POM-C[4]		1
IS0123A-4	Insert Adapter Packs	POM-C[4]		4-pk
IS0123A-8	Insert Adapter Packs	POM-C[4]		8-pk
IS0123A-12	Insert Adapter Packs	POM-C[4]		12-pk
IS3861A	Adapter for CA Cassettes	PVDF[3, 4]		
FOOT SWITCH				
Part No.	**Foot switch suitable for pump models:**			
ISM016	IPC and IPC-N (firmware version older than 4.00)			
IS10039	IPC and IPC-N (from firmware version 4.00)			
ISM891	Reglo Analog, Reglo *Quick*™			
ISM894	Reglo Digital			

[1] *One set is included with all Ismatec cassette-style pumps.*
[2] *When ordering replacement CA Cassettes, two Adapters per cassette must also be ordered.*
[3] *PVDF offers higher chemical resistance.*
[4] *POM-C = Polyoxymethylene Copolymer, PVDF = Polyvinylidene Fluoride*

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Gear Pumps

Pulsefree Pumping

- Gear pumps allow differential pressures up to max. 5.6 bar (81 psi)

Low Operation Costs

- Interchangeable, magnetically coupled pump heads
- Maintenance-free drives
- Only few wearing parts (gears, seals)
- Service kits allow the user to exchange worn parts
- High quality and precision for an optimum performance even after many years of intensive use

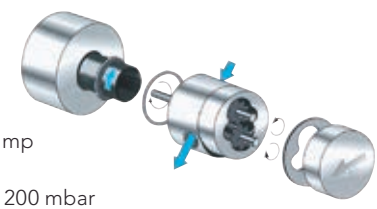
CLOCKWISE

Ismatec® gear pumps run only in the clockwise direction (Exception Reglo Z Digital).

CONTINUOUS DUTY

Cavity Style

Series GJ

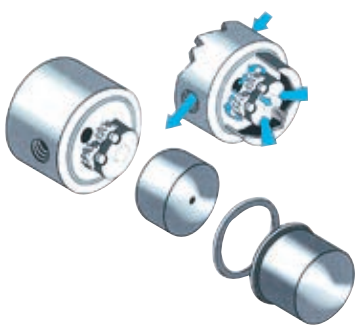


- Max. suction height with water and flooded pump head: 8 m, depending on pump head and tubing
- Pumping out of a vacuum of 200 mbar
- Based on the traditional gear pump technology
- For application with moderate differential pressure

In comparison to the Suction Shoe pump heads, the Cavity style pump heads can be used for viscous media and applications with a certain suction height.

Suction Shoe Style

Series GA and GB



- An exclusive Micropump® product featuring a patented technology
- Modified pump chamber compared to the conventional gear pump technique

This type of pump head design has a seal plate mounted with a deliberate play in the suction part of the pump chamber (hence the expression Suction Shoe). Discharge pressure keeps the Suction Shoe seated tightly on top of the gears which prevents flow from decreasing in high-pressure applications.

REVERSIBLE

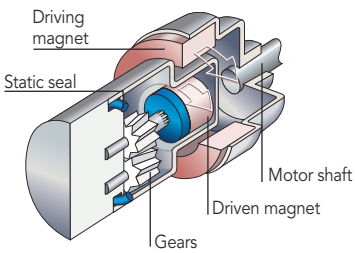
With Cavity Style pump head, rotation direction is reversible

CLOCKWISE

With Suction shoe pump head, run only in the clockwise direction

NOTE

The Magnetically Coupled Drive Principle



Consists of two magnets, a driving magnet that attaches to the motor shaft and a driven magnet that is completely sealed within the pump head and is connected to the driving gear. The driven magnet is a non-wetted component and is totally encapsulated.

The two magnets couple automatically such that the driving magnet turns the driven magnet and gears without physical contact.

Decoupling occurs when the pump load exceeds the coupling torque between the two magnets. This feature can act as a safety device to prevent damage to the pump and motor as well as associated piping. The magnets can be recoupled by bringing the motor to a complete stop, eliminating the cause of the decoupling and restarting.

Application Range of Gear Pumps

Industries	Applications	Special Media
Biotechnological	Sampling	Biozides
Chemical	Refrigeration Technology	Dye Stuffs
Food	Water Treatment	Thixotropic Products
Mining	Liquid Chromatography	Liquid Waxes
Power	Surface Treatment	Hydrogen Peroxide
Pulp and Paper	Distillation Systems	Flux
Semiconductor		Not suited for media containing particulates
Textile		

Pump Head Material Options

Enhance the chemical compatibility and application potential		
Base material	Standard:	Stainless Steel 316
	Options:	e.g., Hastelloy® B2,Hastelloy C-276, Alloy 20, and Titanium
Gears	Standard:	PPS, Graphite, PTFE (depends on pump head)
	Options:	e.g., PEEK, PPSKV
Static seals	Standard:	Viton®, PTFE (depends on pump head)
	Options:	EP, Buna N, Kalrez®
Magnets	Standard:	Ferrite
	Options:	e.g., SmCo, NdFeB

Further pump head options
Integral Drive
High System Pressure
Deck Ports
1/4-18 NPT Ports
Tri-clamp Fittings

PTFE = Polytetrafluoroethylene, PPS = Polyphenylenesulphide, PEEK = Polyetheretherketone

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PUMP SERIES		PUMP STYLE	FLOW RANGE*	GEAR MATERIALS	DRIVE OPTIONS	INTERFACE	PAGE
REGLO Z		Suction Shoe	1–466 mL/min	PEEK, PPS, Graphite	Digital and Analog	RS-232, Analog	**112**
		Cavity Style	33–3,290 mL/min	PEEK, PTFE, PPS			
REGLO ZS		Suction Shoe	1–466 mL/min	PEEK, PPS, Graphite	Digital and Analog	RS-232, Analog	**112**
		Cavity Style	33–3,290 mL/min	PEEK, PTFE, PPS			
BVP-Z		Suction Shoe	1–7,271 mL/min	PEEK, PPS, Graphite	Analog	Analog	**113**
		Cavity Style	40–5,480 mL/min	PEEK, PTFE, PPS			
MCP-Z STANDARD		Suction Shoe	1–7,271 mL/min	PEEK, PPS, Graphite	Digital and Analog	RS-232, Analog	**113**
		Cavity Style	40–5,480 mL/min	PEEK, PTFE, PPS			
MCP-Z PROCESS		Suction Shoe	1–7,271 mL/min	PEEK, PPS, Graphite	Digital and Analog	RS-232, Analog	**114**
		Cavity Style	40–5,480 mL/min	PEEK, PTFE, PPS			

**Depending on pump head.*

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Reglo Z, Reglo ZS

Reglo Z Analog

1–3,290 mL/min

- Variable speed
- Differential pressure of pump drive max. 3.0 bar (43.5 psi)

ISM895E

Reglo ZS Analog

1–3,290 mL/min

- Drive and pump head are separated by a 2 m long cable

ISM896B

Reglo Z Digital

1–3,290 mL/min with dispensing functions

- Membrane key-pad
- LED display with setting menu
- Differential pressure of pump drive max. 3.0 bar (43.5 psi)

ISM901B

Reglo ZS Digital

1–3,290 mL/min with dispensing functions

- Drive and pump head are separated by a 2 m long cable

ISM1143A

SPECIFICATIONS & DETAILS

	Reglo Z/ZS Analog	Reglo Z/ZS Digital
Motor Type	DC motor	DC motor
Speed	50–5,000 rpm	50–5,000 rpm
Speed Setting	1–99%, resolution 1% 2-digit potentiometer	For flow setting (mL/min) For dispensing volume (mL)
Flow Rate Setting		mL/min, L/min
Power Consumption	50 W	75 W
Mains Connection	230 V AC/50 Hz,115 V AC/60 Hz, selectable	100–230 V AC/50–60 Hz
Protection Rating	IP 30	IP 30
Depth/Width/Height		
Drive Reglo Z	178 x 100 x 143 mm	178 x 100 x 135 mm
Drive Reglo ZS	175 x 65 x 80 mm	175 x 65 x 80 mm
External Control Unit	178 x 100 x 143 mm	178 x 100 x 135 mm
Weight		
Drive Reglo Z	2.1 kg (without pump head)	1.7 kg (without pump head)
Drive Reglo ZS	0.7 kg (without pump head)	0.7 kg (without pump head)
External Control Unit	1.7 kg	1.2 kg

REVERSIBLE

With Cavity Style pump head, rotation direction is reversible

CLOCKWISE

With Suction shoe pump head, run only in the clockwise direction

Interfaces

RPM ANALOG

Reglo Z/ZS Analog

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output 0–10 KHz, start/stop
- Rotation direction

RS232

RPM ANALOG

Reglo Z Digital

- RS-232 PC-controllable
- Speed output 0–12 KHz, start/stop and autostart

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No.	Description
REGLO Z AND REGLO ZS	
ISM895E	Reglo Z Analog
ISM896B	Reglo ZS Analog
ISM901B	Reglo Z Digital
ISM1143A	Reglo ZS Digital
ISM891	Footswitch
	Pump Head, page 115
	2 Nozzles, page 115

LabVIEW™ drivers for Reglo Z Digital download for free: www.idex-hs.com/ismatec
Never use a gear pump for media containing particulates.
Max. differential pressure limited by pump drive, pump head capable of max. 5.2 bar (75 psi).

BVP-Z *Standard*

BVP-Z *Standard* without Dispensing Functions

- 3-digit potentiometer (for speed setting)
- Over 20 interchangeable Micropump® pump heads
- Flow rates and differential pressure depend on the pump head mounted

BVP-Z *Standard*
with interchangeable gear pump heads (see page 115)
(material options, see page 110)

ISM446B

MCP-Z *Standard*

MCP-Z *Standard* with Dispensing Functions

- Membrane key-pad, LED display
- 4 program memories for saving individual application parameters
- Over 20 interchangeable Micropump pump heads (pre-programmed)
- Flow rates and differential pressure depend on the pump head mounted

MCP-Z *Standard*
with interchangeable gear pump head (see page 115)
(material options, see page 110)

DISPENSING & CALIBRATING

ISM405A

SPECIFICATIONS & DETAILS

	BVP-Z *Standard*	MCP-Z *Standard*
Motor Type	DC motor	DC motor
Speed	60–6,000 rpm	60–6,000 rpm
Speed Setting	1–99.9%, resolution 0.1% 3-digit potentiometer	rpm, resolution 1 rpm
Flow Rate Setting		µL/min, mL/min, L/min
Power Consumption	150 W	150 W
Mains Connection	230 V AC/50 Hz, 115 V AC/60 Hz selectable	230 V AC/50 Hz, 115 V AC/60 Hz selectable
Protection Rating	IP 30	IP 30
Depth/Width/Height	220 x 155 x 260 mm (without pump head)	220 x 155 x 260 mm (without pump head)
Weight	5.7 kg (without pump head)	6.4 kg (without pump head)

Interfaces

BVP-Z *Standard*

RPM ANALOG

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–12 kHZ)
- Start/stop

MCP-Z *Standard*

RS232

RPM ANALOG

- PC-controllable
- RS-232
- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–12 kHZ)
- Start/stop
- Autostart

APPLICATION NOTE

BVP-Z *Standard*

- Single-channel delivery processes under pressure for particulate-free fluids, e.g.: addition of reagents/solvents in organic synthesis at laboratory scale.
- Pumping propylene oxide into a laboratory reactor with a dispensing precision of +/–1% and a differential pressure of up to max. 3 bar.

MCP-Z *Standard*

- Single-channel delivery and dispensing processes of particulate-free fluids under pressure.
- With pump heads GJ-N23 and GA-X21: Pulseless dispensing under pressure of different reagents with 2 pumps in different quantity ratios via a mixing valve into a reactor.

Part No.	Includes
THE COMPLETE PUMP SYSTEM BVP-Z *STANDARD* CONSISTS OF:	
ISM446B	Drive (magnet included), page 113
Order the Following to Complete the BVP-Z Standard Pump System	
	Pump head, page 115
	2 Nozzles, page 115
	Accessories, page 109
ISM891	Foot switch, page 109
THE COMPLETE PUMP SYSTEM MCP-Z *STANDARD* CONSISTS OF:	
ISM405A	Drive (magnet included), page 113
Order the Following to Complete the MCP-Z Standard Pump System	
	Pump head, page 115
	2 Nozzles, page 115
	Accessories, page 109
IS10039	Foot switch, page 109

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MCP-Z Process

Programmable

- Programs can be entered on the spot independently of a PC
- Protection rating of IP 65
- Suitable for industries, extremely robust gear pump drive
- For pulseless pumping up to 5.2 bar (75 psi)
- Stainless steel housing
- Membrane key-pad with LED display
- 4 program memories for saving individual application parameters or PC programmed command sequences
- Pre-programmed pump heads
- Over 20 interchangeable Micropump® pump heads
- Flow rates and differential pressure depend on the pump head mounted

ISM918A
MCP-Z Process
with interchangeable gear pump heads
(material options, see page 110)

DISPENSING & CALIBRATING

SPECIFICATIONS & DETAILS

Motor Type	DC motor
Speed	60–6,000 rpm
Speed Setting	rpm, resolution 1 rpm
Flow Rate Setting	µL/min, mL/min, L/min
Power Consumption	200 W
Mains Connection	100–230 V AC/50–60 Hz, selectable
Protection Rating	IP 65
Depth/Width/Height	260 x 160 x 262 mm (without pump head)
Weight	6.9 kg (without pump head)

Interfaces

RS232
- PC-controllable
- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–12 kHZ)

ANALOG
- Start/stop
- Autostart
- 2 universal inputs
- 2 universal outputs

APPLICATION NOTE

- Single-channel delivery and dispensing processes under pressure, for particulate-free solutions.
- Addition of various reagents in different quantity ratios via mixing valve into reactor.
- Ideal for dispensing and filling applications in a dusty, humid or corrosive environment, and in clean room areas (IP 65, dust-tight and protected against water jets).

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No.	Includes
THE COMPLETE PUMP SYSTEM MCP-Z *PROCESS* CONSISTS OF:	
ISM918A	MCP-Z Process Pump System
Order the Following to Complete the MCP-Z Process Pump System	
	Drive (magnet included), page 114
	Pump head, page 115
	2 Nozzles, page 115
	Accessories, page 109
IS10039	Foot Switch, page 109
LabVIEW™ driver download for free: www.idex-hs.com/ismatec	

Ordering Information Pump Heads for BVP-Z/ MCP-Z/Reglo Z/Reglo ZS

Suction Shoe Pump Heads

- Enhanced pumping performance at elevated differential pressures
- Suited for higher temperature ranges
- Not recommended for applications requiring suction lift

Ismatec® gear pumps run only in the clockwise direction
Never use a gear pump for media containing particulates

SUCTION SHOE	Part No.	Pump Head No.	Flow rate (mL/min) min.	Flow rate (mL/min) max.	Differential pressure max. bar	Gear material	Seals	Stainless steel housing	System pressure, max. (bar)	Temperature range °C	Internal Bypass
	MI0006	GA-X21.CFS.B	1	99	1.4 (20 psi)	Graphite	PTFE	SS316	21	-46–+177	–
	MI0007	GA-V21.CFS.B	3	252	2.8 (40 psi)	Graphite	PTFE	SS316	21	-46–+177	–
	MI0008	GA-V23.CFS.B	5	504	2.8 (40 psi)	Graphite	PTFE	SS316	21	-46–+177	–
	MI0131	GA-T23.PFS.B	6	560	5.2 (75 psi)	PPS	PTFE	SS316	21	-46–+177	–
	MI0280	GA-V23.JFS.B	6	560	5.2 (75 psi)	PEEK	PTFE	SS316	21	-46–+177	–
	MI0022	GB-P25.PVS.A.B	35	3,509	3.5 (51 psi)	PPS	Viton®	SS316	21	-29–+177	✓
	MI0306	GB-P25.JVS.A	35	3,480	3.5 (51 psi)	PEEK	Viton	SS316	21	-29–+177	–
	MI0023	GB-P35.PVS.A.B	70	7,020	3.5 (51 psi)	PPS	Viton	SS316	21	-29–+177	✓
Organic solvents	**MI0378**	GB-P35.JKS.B	73	7,241	3.5 (51 psi)	PEEK	Kalrez®	SS316	21	-29–+177	✓
For corrosive media	**MI0309**	GA-X21.CFC.B	1	99	1.4 (20 psi)	Graphite	PTFE	Hastelloy®-C276	21	-46–+177	–
	MI0310	GA-V23.CFC.B	5	504	2.8 (40 psi)	Graphite	PTFE	Hastelloy-C276	21	-46–+177	–

Ports (internal thread) 1/8"-27NPT.
Flow rates without differential pressure.
Operating temperature: with other seals up to 99 °C possible.

Cavity Style Pump Heads

- Excellent chemical resistance
- Smooth and precise flow
- Recommended for applications requiring a modest suction lift

CAVITY STYLE	Part No.	Pump Head No.	Flow rate (mL/min) min.	Flow rate (mL/min) max.	Differential pressure max. bar	Gear material	Seals	Stainless steel housing	System pressure, max. (bar)	Temperature range °C	Internal Bypass
	MI0013	GJ-N23.FFS.B.B1	40	3,950	3.5 (51 psi)	PTFE	PTFE	SS316	21	-46–+54	✓
	MI0016	GJ-N23.FFS.B	40	3,950	3.5 (51 psi)	PTFE	PTFE	SS316	21	-46–+54	–
	MI0313	GJ-N23.JFS.B	40	3,950	5.6 (81 psi)	PEEK	PTFE	SS316	21	-46–+54	–
	MI0018	GJ-N25.FFS.B	55	5,460	3.5 (51 psi)	PTFE	PTFE	SS316	21	-46–+54	–
	MI0019	GJ-N23.JFS.B.B1	40	3,950	5.2 (75 psi)	PPS	PTFE	SS316	21	-46–+54	✓
	MI0020	GJ-N23.JFS.B	40	3,950	5.2 (75 psi)	PPS	PTFE	SS316	22	-46–+54	–
For corrosive media	**MI0284**	GJ-N23.FFC.B	40	3,950	3.5 (51 psi)	PTFE	PTFE	Hastelloy-C276	21	-46–+54	–
	MI0311	GJ-N25.FFC.B	55	5,480	3.5 (51 psi)	PTFE	PTFE	Hastelloy-C276	21	-46–+54	–

Ports (internal thread) 1/8"-27NPT.
Flow rates without differential pressure.
Operating temperature: with other seals up to 99 °C possible.

Service Kits Available for all Micropump® Gear Pumps
Service Kits contain the wearing parts (brushings, seals, gears). For ordering information, contact your local distributor or IDEX Health & Science.

Part No.	External Thread	Tubing Adaptor	Tubing ID mm
TUBING ADAPTERS FOR GEAR PUMP HEADS			
Threaded stainless steel connectors			
AR0002	1/8" NPT	Tube nozzle	3
AR0004	3/8" NPT	Tube nozzle	12
AR0008	1/8" NPT	Tube nozzle	8
AR0009	1/8" NPT	Tube nozzle	9.5
AR0024	1/8" NPT	Pipe connection	6 (outside)
Threaded connectors in Hastelloy-C			
AR0001-HC	1/8" NPT	Tube nozzle	6

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Rotary Piston Pumps Introduction

For Corrosive Media and Very Accurate Dispensing

The pump heads are available with ceramic pistons and ceramic cylinder liners, which makes these components very resistant even to highly aggressive chemicals.

Inexpensive to Maintain

- Interchangeable pump heads
- No valves
- Only one moving part — the piston
- High quality and precision guarantee an optimum performance even after many years of intensive use

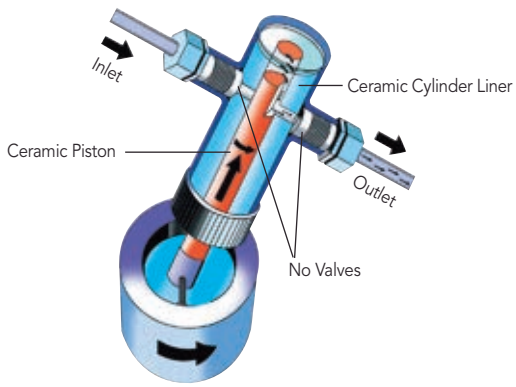
REVERSIBLE

CONTINUOUS DUTY

Valveless Pumping

The valveless pumping function is accomplished by the synchronous rotation and reciprocation of the ceramic piston in the precisely mated ceramic cylinder liner. One complete piston revolution is required for each suction/discharge cycle.

The piston always bottoms for maximum fluid and bubble clearing. Together with the drive speed the stroke volume, which can be preset by the adjustment of the pump head angle, determines the actual flow rate.



Only the Ismatec® Rotary Piston Pump MCP-CPF Process Features:

Carrying out programs independently of a PC

- Download the file data into the pump memory
- Disconnect the pump from the PC
- Carry out your application on the spot, using the pump as a stand-alone unit

APPLICATION NOTE

Application Range of Piston Pumps

Industries	Applications	Special Media
Biotechnology	Accurate dispensing e.g. into bioreactors	Biozides
Chemistry	Emulsion and slurry dosing	Dyes
Medical	Medical diagnostics production	Flux compound
Electronic	Milk and beverage enrichment	Hydrogen peroxide
Food and Diary	Plating bath replenishment	Liquid wax
Perfume/Cosmetics	Titration equipment	Thixotropic products
Rubber/Plastics		
Glass/Ceramic		Not suited for media containing particles larger than 0.8 mm
Pulp and Paper		

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

NOTE

All microprocessor controlled drives are LabVIEW™ compatible and can easily be integrated into process control systems.

PUMP SERIES		FLOW RANGE	PISTON MATERIAL	DRIVE OPTIONS	INTERFACE	PAGE
RH 00		0.025–45 mL/min	316 SST, Ceramic	Analog or Digital	RS-232 or Analog	**118**
RH 00		0.045–45 mL/min	316 SST, Ceramic	Digital	RS-232 and Analog	**118**
RH 0		0.09–90 mL/min	Ceramic	Analog or Digital	RS-232 or Analog	**118**
RH 0		0.05–90 mL/min	Ceramic	Digital	RS-232 and Analog	**118**
RH 1		0.1–180 mL/min	Ceramic	Analog or Digital	RS-232 and Analog	**119**
RH 1 & Q-SERIES		0.18–180 mL/min	Ceramic	Digital	RS-232 or Analog	**120**
		0.4–144 mL/min	316 SST	Digital	RS-232 or Analog	**122**
		0.13–576 mL/min	316 SST, Ceramic	Digital	RS-232 or Analog	**121**
		0.29–1,300 mL/min	316 SST, Ceramic	Digital	RS-232 or Analog	**121**
		0.51–2,300 mL/min	Ceramic	Digital	RS-232 or Analog	**121**

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RH Pump Heads

Pump Head RH 00

Stroke volumes 2.5–25 µL

Drives and flow rates:

- Reglo CPF Analog 0.045–45 mL/min
- Reglo CPF Digital 0.1–45 mL/min
- MCP-CPF *Process* 0.025–45 mL/min

Part No.	FMI009	FMI010A
TYPE	RH00.CKC-LF	RH00.SKY-LF
Piston	Ceramic	316 Stainless Steel
Cylinder Case	Kynar® (Fluorocarbon {PVDF})	Kynar (Fluorocarbon {PVDF})
Cylinder Liner	Ceramic	Carbon
Lip Seals	Rulon® AR	Rulon J
Gland Washers	PTFE	PTFE
Max. Temperature	100 °C	60 °C
Max. Differential Pressure	6.9 bar (100 psi)	6.9 bar (100 psi)
Flow Ports	Kynar UNF 1/4"–28 (female)	Kynar UNF 1/4"–28 (female)

PTFE TUBING FOR PUMP HEADS MENTIONED ABOVE (MUST BE ORDERED SEPARATELY)

1.6 mm ID, 3.2 mm OD with 2 fittings UNF 1/4"–28 male

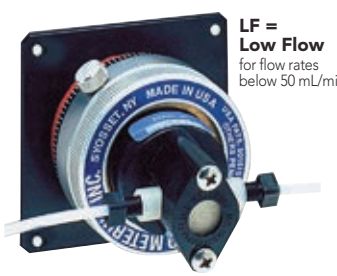
Part No.	Length	Part No.	Length
IC0053	0.25 m	IC0061	0.75 m

Pump Head RH 0

Stroke volumes 5–50 µL

Drives and flow rates:

- Reglo CPF Analog 0.09–90 mL/min
- Reglo CPF Digital 0.2–90 mL/min
- MCP-CPF *Process* 0.050–90 mL/min



LF = Low Flow
for flow rates below 50 mL/min

Part No.	FMI005A	FMI013
TYPE	RH0.CKC	RH0.CKC-LF
Piston	Ceramic	Ceramic
Cylinder Case	Kynar (Fluorocarbon {PVDF})	Kynar (Fluorocarbon {PVDF})
Cylinder Liner	Ceramic	Ceramic
Lip Seals	Rulon AR	Rulon AR
Gland Washers	PTFE	PTFE
Max. Temperature	100 °C	100 °C
Max. Differential Pressure	6.9 bar (100 psi)	6.9 bar (100 psi)
Flow Ports	2 fixed tube fittings for PTFE tubing 6 mm OD	Kynar UNF 1/4"–28 (female)

TUBING (MUST BE ORDERED SEPARATELY)

PTFE tubing 4 mm ID, 6 mm OD

Part No. MF0336
(For other tubing material; use tubing adapters, see page 123)

PTFE tubing 1.6 mm ID, 3.2 mm OD with 2 fittings UNF 1/4"–28 male

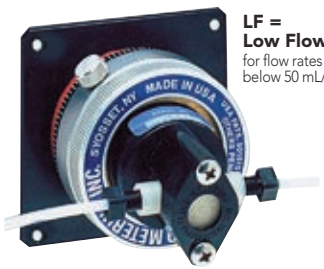
Part No.	Length
IC0053	0.25 m
IC0057	0.50 m
IC0061	0.75 m
IC0065A	1.00 m

Pump Head RH 1

Stroke volumes 10–100 µL

Drives and flow rates:

- Reglo CPF Analog 0.18–180 mL/min
- Reglo CPF Digital 0.4–180 mL/min
- MCP-CPF Process 0.1–180 mL/min



LF = Low Flow
for flow rates below 50 mL/min

Part No.	FMI007	FMI015	FMI008A
TYPE	**RH1.CKC**	**RH1.CKC-LF**	**RH1.CTC**
Piston	Ceramic	Ceramic	Ceramic
Cylinder Case	Kynar® (Fluorocarbon {PVDF})	Kynar (Fluorocarbon {PVDF})	ETFE
Cylinder Liner	Ceramic	Ceramic	Ceramic
Lip Seals	Rulon® AR	Rulon AR	Rulon AR
Gland Washers	PTFE	PTFE	PTFE
Max. Temperature	100 °C	100 °C	100 °C
Max. Differential Pressure	6.9 bar (100 psi)	6.9 bar (100 psi)	6.9 bar (100 psi)
Flow Ports	2 fixed tube fittings for PTFE tubing 6 mm OD	Kynar UNF 1/4"–28 (female)	2 fixed tube fittings for PTFE tubing 6 mm OD

TUBING (MUST BE ORDERED SEPARATELY)

PTFE tubing 4 mm ID, 6 mm OD	PTFE tubing 1.6 mm ID, 3.2 mm OD with 2 fittings UNF 1/4"–28 male		PTFE tubing 4 mm ID, 6 mm OD
Part No. SC1016B0	**Part No.**	**Length**	**Part No. SC1016B0**
(For other tubing material; use tubing adapters, see page 123)	**IC0053**	0.25 m	(For other tubing material; use tubing adapters, see page 123)
	IC0057	0.50 m	
	IC0061	0.75 m	
	IC0065A	1.00 m	

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Reglo CPF Analog

REVERSIBLE

Reglo CPF Analog
without dispensing functions
0.045–180 mL/min
Variable speed

Reglo CPF Analog
ISM1014B
with piston pump head RH 00.CKC-LF

Overview of piston pump heads on pages 118 to 119

Reglo CPF Digital

REVERSIBLE

Reglo CPF Digital
with dispensing functions
0.1–180 mL/min
Microprocessor controlled

DISPENSING & CALIBRATING

Reglo CPF Digital
ISM321C
with piston pump head RH 00.CKC-LF

Dispensing Pumps — Ideal for Corrosive Media

- Easy to calibrate
- High repeatability
- Differential pressure up to 6.9 bar (100 psi)
- 10 cm wide, 13.5 cm high
- Wide selection of ceramic piston pumps

Reglo CPF Analog
2-digit potentiometer
1–99%, resolution 1% (for speed)

Reglo CPF Digital
6-button membrane key-pad, LED display
Flow rate setting in µL/min and mL/min

SPECIFICATIONS & DETAILS

	Reglo CPF Analog	Reglo CPF Digital
Motor Type	DC motor	DC motor
Speed	18–1,800 rpm	40–1,800 rpm
Speed Setting	1–99%, resolution 1% 2-digit potentiometer	rpm, resolution 0.1 rpm
Flow Rate Setting		µL/min and mL/min
Power Consumption	50 W	75 W
Mains Connection	230 V AC/50 Hz, 115 V AC/60 Hz, selectable	100–230 V AC/50–60 Hz, selectable
Protection Rating	IP 30	IP 30
Depth/Width/Height	250 x 100 x 143 mm	250 x 100 x 135 mm
Weight	2.5 kg	2.1 kg

Interfaces

RPM
ANALOG

Reglo CPF Analog

- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output 0–9 kHz
- Start/stop
- Rotation direction

RS232

Reglo CPF Digital

- RS-232
- Speed output 0–9 kHz, Start/stop, autostart

APPLICATION NOTE

- Highly reproducible, single-channel dispensing processes of organic solvents or acids/bases.
- Dispensing of hydrogen fluoride and other highly corrosive acids with an X-Y-Z dispenser.
- Remotely controlling the pump in hazardous environments.

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No. (Drive Only)	Model (Drive Only)	Flow rates	Channels	Speed
REGLO CPF				
ISM1014B	Reglo CPF Analog	0.045–180	1	18–1,800
ISM321C	Reglo CPF Digital	0.1–180	1	40–1,800
FOOT SWITCH				
ISM891	Reglo CPF Analog, page 109			
ISM894	Reglo CPF Digital, page 109			
THE COMPLETE PUMP SYSTEM REGLO CPF CONSISTS OF:				
Select Drive, page 120				
Select Piston pump head, pages 118–119				

MCP-CPF *Process*

DISPENSING & CALIBRATING

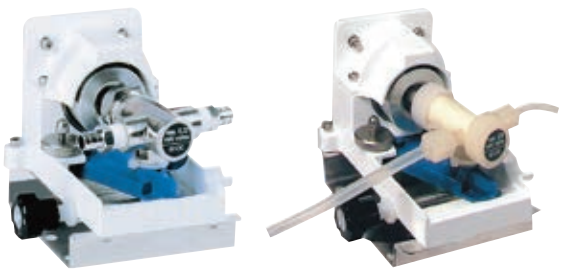
REVERSIBLE

Rotation direction reversible

MCP-CPF *Process*
ISM919A
with rotary piston pump head QP Q0.SSY-LF

'RH' pump heads (description see pages 118 to 119)

Type	Flow rates mL/min	Stroke volumes µL
RH 00	0.025–45	2.5–25
RH 0	0.050–90	5.0–50
RH 1	0.10–180	10.0–100



'Q' pump heads (description see pages 122 to 123)

Type	Flow rates mL/min	Stroke volumes µL
QP Q0	0.04–144	3.2–80
QP Q1	0.13–576	12.8–320
QP Q2	0.29–1,300	28.8–720
QP Q3	0.51–2,300	51.2–1,280

SPECIFICATIONS & DETAILS

Motor Type	DC motor
Speed	10.0–1,800 rpm
Speed Setting	rpm, resolution 0.1 rpm
Flow Rate Setting	µL/min, mL/min, L/min
Power Consumption	100 W
Mains Connection	100–230 V AC/50–60 Hz
Protection Rating	IP 65
Depth/Width/Height	220 x 155 x 260 mm (without pump head)
Weight	6.9 kg (without pump head)

Interfaces

RS232

- PC-controllable
- RS-232
- Speed control (0–5 or 0–10 V, 0–20 or 4–20 mA)
- Speed output (0–10 V DC or 0–7.2 kHZ)

RPM ANALOG

- Start/stop
- Rotation direction
- Autostart
- 2 universal inputs
- 2 universal outputs

APPLICATION NOTE

- Single-channel sterile delivery and dispensing processes under pressure for particulate-free solvents.
- Addition of various reagents in different volume ratios through mixing valve into reactor.

RELATED PRODUCTS

Accessories	Page 109
Tubing	Pages 75–89

Part No.	Description
THE COMPLETE PUMP SYSTEM MCP-CPF ***PROCESS*** CONSISTS OF:	
ISM919A	MCP-CPF Process Pump System
Order the Following to Complete the MCP-CPF Process Pump System	
	Drive, page 121
	Pump head and tubing, pages 122–123
IS10039	Foot switch, page 109
LabVIEW™ driver download for free: www.idex-hs.com/ismatec	

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Q-Type Pump Heads

Pump Head Q0 and Q3

- Q0 = stroke vol. 3.2–80 µL
- Q3 = stroke vol. 51.2–1,280 µL
- Q0 = flow rate 0.04–144 mL/min
- Q3 = flow rate 0.51–2,300 mL/min

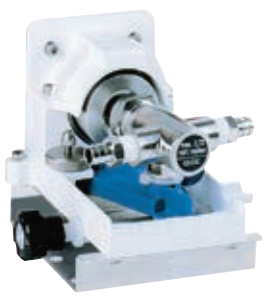
Part No.	FMI202	FMI217
TYPE QP	Q0.SSY	Q3.CKC
Piston	316 Stainless Steel	Ceramic
Cylinder Case	316 Stainless Steel	Kynar (Fluorocarbon {PVDF})
Cylinder Liner	Carbon	Ceramic
Lip Seals	Rulon® J	Rulon AR
Gland Washers	PTFE	PTFE
Cylinder Head Seal	PTFE	None
Max. Temperature	60 °C	100 °C
Max. Differential Pressure	6.9 bar	1.7 bar (to 1,600 rpm) 0.5 bar (from 1,600 rpm)
Flow Ports	1/4 NPT (female) Includes: 2 stainless steel adapters with thread 1/4 NPT (male) and fitting for tubing with 6.4 mm ID	For tubing up to 12.7 mm ID or PTFE tubing 6 mm OD Includes: 2 Kynar (PVDF) adapters for tubing with 6 mm OD

TUBING (MUST BE ORDERED SEPARATELY)

Part No.	Tubing ID	Part No.	Tubing ID
Tygon® ST R-3603		Tygon ST R-3603	
MF0031	6.4 mm	SC0382	12.7 mm
Accessories		PTFE Tubing	
FMI056A	Low Flow Kit R 479 (see below)	MF0336	4 mm/6 mm, 3.6 m long

Pump Heads Q1 and Q2

- Q1 = stroke vol. 12.8–320 µL
- Q2 = stroke vol. 28.8–720 µL
- Q1 = flow rates 0.13–576 mL/min
- Q2 = flow rates 0.29–1,300 mL/min



Part No.	FMI205	FMI212	FMI352
TYPE QP	Q1.CSC	Q2.CSC	Q1.CKC
Piston	Ceramic		Ceramic
Cylinder Case	316 Stainless Steel		Kynar®2
Cylinder Liner	Ceramic		Ceramic
Lip Seals	Rulon AR		Rulon AR
Gland Washers	PTFE		PTFE
Cylinder Head Seal	PTFE		none
Max. Temperature	177 °C		100 °C
Max. Differential Pressure	6.9 bar (100 psi)		4.1 bar (60 psi)
Main Flow Ports	1/4 NPT (female) Includes: 2 stainless steel adapters with thread 1/4 NPT (male) and fitting for tubing with 9.5 mm ID		For tubing up to 9.5 mm ID

TUBING (MUST BE ORDERED SEPARATELY)

Part No.	Tubing ID
Tygon ST R-3603	
SC0383A	9.5 mm
Accessories	
FMI056A	Low Flow Kit R 479

Other Materials for Wetted Parts for:

Pump Heads Q1 and Q2 (see table below)

- Q1 = stroke vol. 12.8–320 µL
- Q2 = stroke vol. 28.8–720 µL
- Q1 = flow rates 0.13–576 mL/min
- Q2 = flow rates 0.29–1,300 mL/min

Part No.	FMI355	FMI356	FMI357	FMI358	FMI353	FMI359	FMI360	FMI361	FMI362	FMI363	FMI364	FMI365	FMI366
QP TYPE PUMP HEADS	Q2.CKC	Q1.CKC-W	Q2.CKC-W	Q1.CKY	Q2.CKY	Q1.CSY	Q2.CSY	Q1.SKY	Q2.SKY	Q1.SSY	Q2.SSY	Q1.SAN[1]	Q2.SAN[1]
Piston	Ceramic	Ceramic		Ceramic		Ceramic		316 Stainless Steel		316 Stainless Steel		Ceramic	
Cylinder Case	Kynar®[2]	Kynar[2]		Kynar[2]		316 Stainless Steel		Kynar[2]		316 Stainless Steel		316 Stainless Steel	
Cylinder Liner	Ceramic	Ceramic		Carbon		Carbon		Carbon		Carbon		316 Stainless Steel	
Lip Seals	Rulon® AR	Rulon AR		Rulon AR		Rulon AR		Rulon J		Rulon J		PTFE	
Gland Washers	PTFE	PTFE		PTFE		PTFE		PTFE		PTFE		PTFE	
Cylinder Head Seal	None	None		None		PTFE		None		PTFE		PTFE	
Max. Temperature	100 °C	100 °C		100 °C		177 °C		60 °C		60 °C		177 °C	
Max. Diff. Pressure	4.1 bar (60 psi)	4.1 bar (60 psi)		4.1 bar (60 psi)		6.9 bar (100 psi)		4.1 bar (60 psi)		6.9 bar (100 psi)		6.9 bar (100 psi)	
Main Flow Ports	For tubing up to 9.5 mm ID	For tubing up to 9.5 mm ID With isolation gland Fittings for tubing with 3.2 mm ID		For tubing up to 9.5 mm ID		1/4 NPT (female)		For tubing up to 9.5 mm ID		1/4 NPT (female)		PTFE tubing adaptor	

[1] Designed for sanitary applications.
[2] Kynar = Fluorocarbon (PVDF).

Low Flow Kit R 479

Part No. FMI056

Suitable for the following pump heads:

- QP Q0.SSY
- QP Q2.CSY
- QP Q2.CSC
- QP Q1.CSY
- QP Q1.SSY
- QP Q1.CSC
- QP Q2.SSY

This Low Flow adaptor Kit enables the use of the above mentioned pump heads for flow rates below 50 mL/min or in case that a minimum dead volume or a maximum of chemical compatibility are required. The adaptor features a 1/4-28 inner thread. These threads are used with low flow tube fittings for small bore tubing of 3.2 mm OD or less. Hence, this Low Flow Kit is also very useful for chromatography applications.

Part No.	Length
PTFE TUBING FOR LOW FLOW KIT R 479	
1.6 mm ID/3.2 mm OD, with 2 fittings 1/4-28 (male)	
IC0053	0.25 m long
IC0057	0.50 m long
IC0061	0.75 m long
IC0065A	1.00 m long

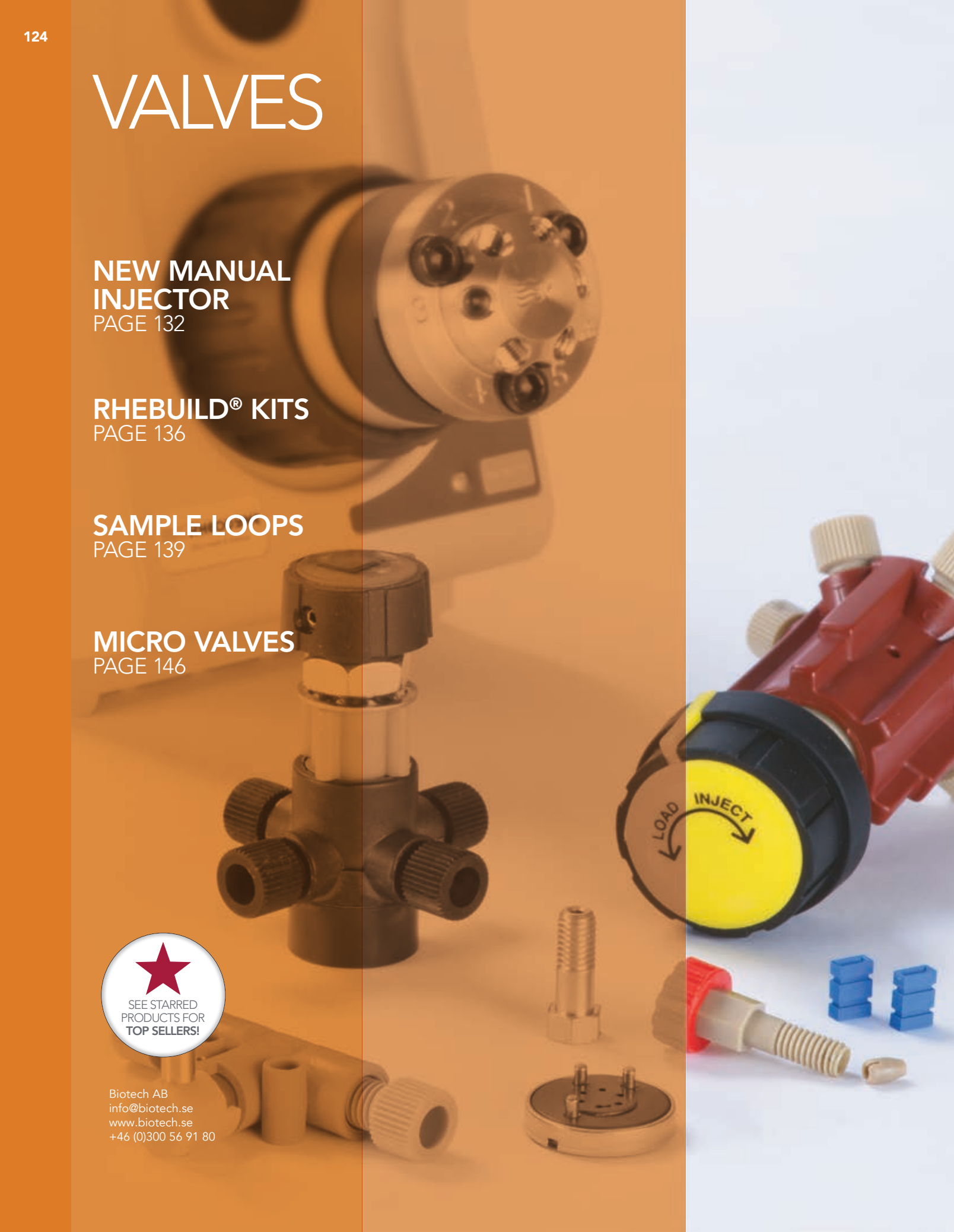
Tubing Adapters for Pump Heads with a Kynar Cylinder Case:

- Q0.SKY
- Q1.CKC
- Q1.CKY
- Q1.SKY
- Q2.CKC
- Q2.CKY
- Q2.SKY
- Q3.CKC

In addition to the tubing mentioned above, these adapters enable the use of other tubing.

Part No.	Description	
TUBING ADAPTERS		
FMI050	R412-0K	For tubing with 3.2 mm ID
FMI051	R412-1K	For tubing with 6.4 mm ID
FMI052	R412-2K	For tubing with 9.5 mm ID
FMI053	R412-5K	For tubing with 1/4–28 ferrule fittings
FMI054	H476K	For tubing with 3.2 mm OD

VALVES



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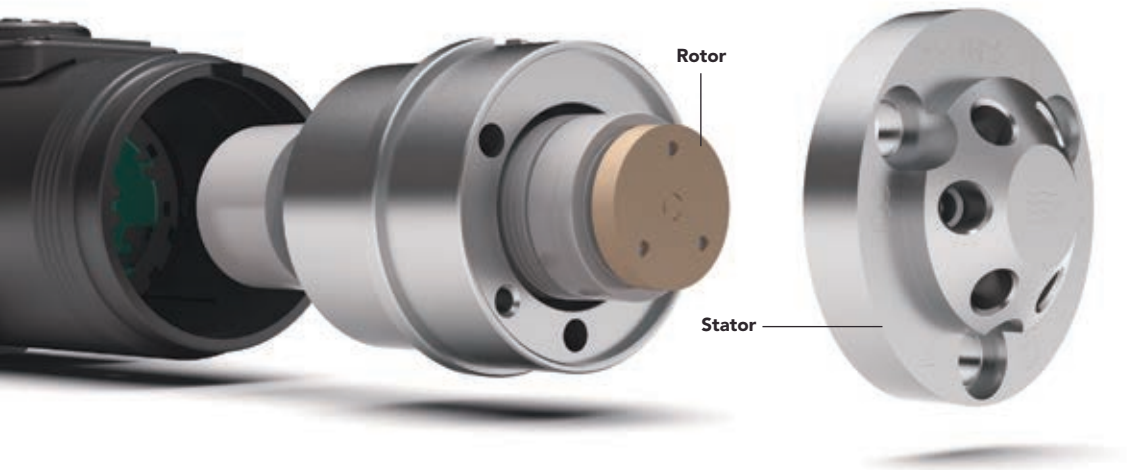
Rotary Shear Valves

Rheodyne® Rotary Shear Valves were developed in tandem with the evolution of liquid chromatography, where combinations of elevated system pressures, aggressive chemicals, and ever-diminishing fluid volumes continually challenged system manufacturers who required highly precise fluid control and delivery. Today, many other disciplines utilize Rotary Shear Valves for their versatility, reliability, repeatability, long system uptime, and easy preventive maintenance.



Valve Overview

Valve Module	Flow Configurations	Page
ACTUATED VALVES		
UP TO 15,000 PSI		
Switching	• 2-Position, 6-Port • 2-Position, 10-Port	130
Injection	• For Injection, add the appropriately sized Sample Loop to the Switching valves above	130
Selection	• 6-Position, 7-Port	130
UP TO 6,000 PSI		
Switching	• 2-Position, 6-Port (Analytical and Nano Scale) • 2-Position, 10-Port (Analytical and Nano Scale)	130
Injection	• For Injection, add the appropriately sized Sample Loop to the Switching valves above • 2-Position, 6-Port (vertical port)	130
Selection	• 6-Position, 7-Port	130
UP TO 125 PSI		
Switching	• 2-Position, 6-Port • 2-Position, 6-Port (Double 3-Way)	130
Selection	• 6-Position, 7-Port • 10-Position, 11-Port	130

Valve Module	Flow Configurations	Page
MANUAL VALVES		
UP TO 15,000 PSI		
NEW! **Injection**	• 2-Position, 6-Port (Front-Loading, 9,000 psi)	132
UP TO 6,000 PSI		
Switching	• 2-Position, 6-Port (Analytical and Micro Scale)	132
Injection	• 2-Position, 6-Port	132
Selection	• 6-Position, 7-Port	
UP TO 1,000 PSI		
Switching	• 2-Way, Right Angle 4-Position, 4-Port • 3-Way, T-Shape 4-Position, 4-Port • 4-Way, Diagonal Flow 4-Position, 4 Port	133
Injection	• 2-Position, 6-Port	133
Selection	• 6-Position, 7-Port	133

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Choosing a Rotary Shear Valve

Evaluating some simple variables will assist you in choosing the best valve for your needs.

Identify the Operating Pressure of Your Instrument or Application

Valves are designed to repeatedly deliver specific fluids to different locations in a fluidic circuit. Achieving fluidic precision at 15,000 psi requires different valve-design features than what's required to achieve fluidic precision at 100 psi. A wide variety of variables such as valve architectures, metals, polymers, coatings, actuation speeds, and manufacturing techniques have been tested to achieve the fluidic accuracy and precision required for the full array of pressure conditions in life science applications. In this catalog, we define four separate pressure groupings:

Up to 15,000 psi (1,035 bar)	UHPLC/Fast Chromatography
Up to 6,000 psi (410 bar)	HPLC
Up to 1,000 psi (69 bar)	Upchurch Scientific®
Up to 125 psi (8.5 bar)	Low Pressure/Atmospheric Pressure

Identify the Range of Flow Rates in Your System

Because Rotary Shear Valves have been used most often in chromatography systems, certain flow rate ranges have evolved functionally. However, these ranges can apply to any system, not just chromatography:

- Micro/Nano Scale — flow rates less than 100 µL per minute
- Analytical Scale — flow rates from 100 µL to 10 mL per minute
- Prep (or Semi-Prep) Scale — flow rates greater than 10 mL per minute

Decide What You Want the Valve to Do

In this chapter Rotary Shear Valves perform three functions:

- Switching one or more flow paths to a different destination under pressure
- Injection into a flowing stream under pressure
- Selection/distribution of a variety of system liquids by means of a common port
- Read more about valve functions on pages 128–129

Identify Whether You Want Automated or Manual Control

An automated valve offers more sophisticated functionality. Choose an automated valve if the application requires fast, consistent flow-stream switching. Some other advantages of automated valves include control options (PC- or instrument-triggered), higher torque operation, valve-position feedback, or very small flow paths.

Choose a manual valve if your application involves low frequency of use, demands operator control, or involves injection of smaller sample volumes. (See page 129 for more on Single Mode vs. Dual Mode operation.)

Identify the Chemical Compatibility Requirements Related to Your Fluids

Consulting the chemical compatibility chart in the Technical Resources section at the back of The IDEX Health & Science Laboratory Products catalog helps identify what valve materials to use—and avoid—in your application. You can also find Chemical Compatibility information at www.idex-hs.com under Materials and Tools.

Identify Fluidic Connection Requirements in Your System

The rotary shear valves in this catalog accommodate one or more of the following tubing outer diameters: 1/8", 1/16", or 1/32".

Effects of Valves and Tubing on Resolution

The effect of tubing on analytical and microscale analyses can be significant. Since dispersion caused by tubing is proportional to the fourth power of diameter, large bore tubing should be avoided when performing analytical scale or microscale analyses. Tubing ID size ≤ 0.25 mm (0.010") is recommended.

Consider a system with injection and column switching valves and analytical columns with small-bore connecting tubing. The chromatograms below, made using a typical analytical chromatograph, show these effects. Scheme A is the control (injection valve ➔ column ➔ detector) with no valve in the system. In Schemes B and C, two model 7060 Six-Position Switching Valves were placed side by side (injection valve ➔ valve #1 ➔ column ➔ valve #2 ➔ detector).

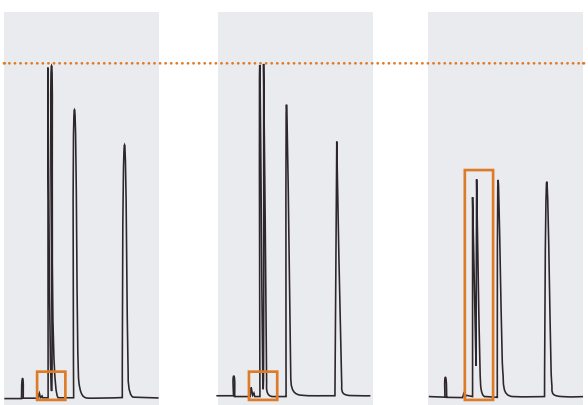
The injection valve and detector were connected to these valves by the same tubing used in the control. The extra tubing pieces required to connect the valves to the column were a 10 cm length for valve #1-to-column, and a 35 cm length for column-to-valve #2. The diameters of these tubes are indicated in the experimental details, below.

Comparison of Observed Column Plates of Rheodyne® Analytical and MicroScale Injection Valves

	7725	8125	Δ
k' = 0.6	2930	5054	72%
k' = 1.5	4653	6904	48%
k' = 7.9	7875	8305	5.0%

UV detector: 1 µL volume, 4 mm path. Sample volume: 2 µL, partial-filling method. Column: 2 mm ID x 100 mm long, 4 µm C-18. True plates of column = 11,570.

Effects of Valves and Tubing on Resolution



A Column Only

B Valve w/ 0.007" Tubing

C Valve w/ 0.020" Tubing

Conclusion: These sequential chromatograms show the effect of adding volume to the flow path through the addition of components.

(A) Establishes a baseline quality of separation with the minimum volume of liquid in the flow path.

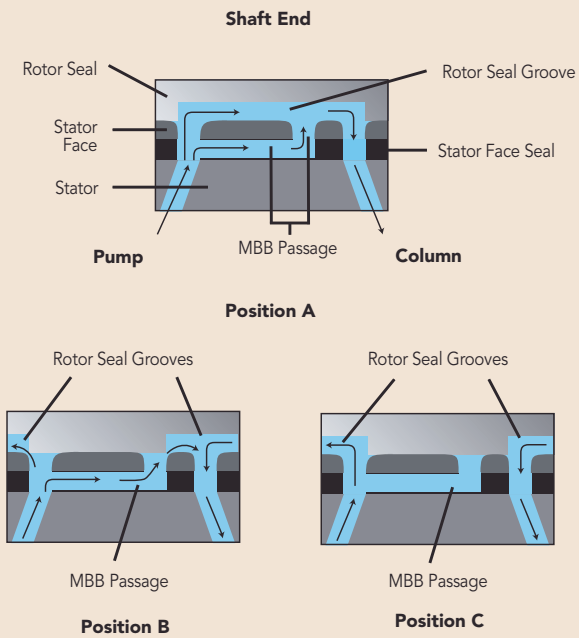
(B) Adding a valve plus smaller-ID tubing, and thereby increasing the liquid volume only marginally, barely affects the separation. However in

(C) Adding a valve plus larger-ID tubing, thereby increasing the liquid volume in the flow path to a greater degree, distinctly impairs the quality of the separation and the detectable sample.

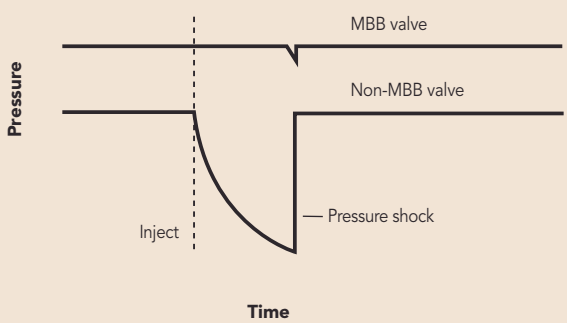
What is Make-Before-Break™, and When Does it Matter?

Make-Before-Break is a unique design feature of certain dual-mode manual injection valves.

Flow paths of model 7725(i) and 9725(i) with MBB design



To maintain a constant, desired high-pressure flow, Rheodyne's Make-Before-Break (MBB®) design creates continuous flow between the LOAD and INJECT positions that virtually eliminates pressure transient shock to the system. A passage in the stator face makes a new connection before old connections break. The MBB design — an improvement over bypass-style injectors — does not dilute the sample and is easy to maintain and troubleshoot.



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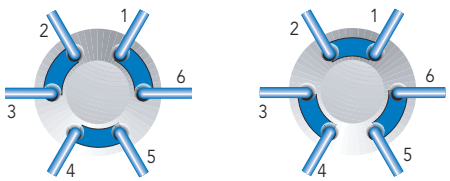
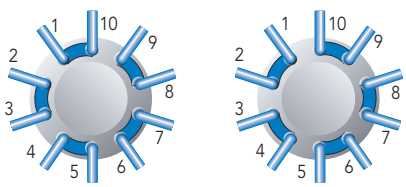
Switching Valves

Switching valves dynamically alternate between two fluid paths without manually disconnecting plumbing. In Chromatography, these valves can be used for column switching, backflushing, sample enrichment, and other techniques. In Diagnostic or Sequencing applications, the switching valve may alternate flow paths to enable back flushing or other fluidic tasks within the instrument.



Flow path of Two-Position, Six-Port Switching Valve

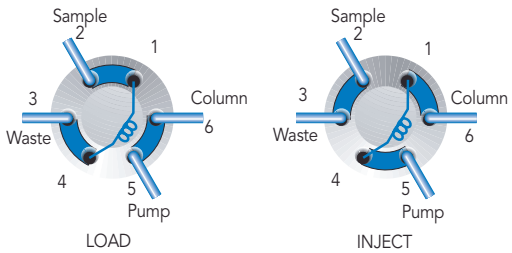


Flow path of Two-Position, Ten-Port Switching Valve

Rheodyne® switching valves operate between two positions, and may have 6 or 10 ports on the face of the stator (2/6 or 2/10). The flow paths connect ports around the circumference of the stator. The Upchurch Scientific® manual switching valves (to 1,000 psi) described on page 133 have different flow path geometry as noted.

Injection Valves

Rheodyne injection valves are a form of switching valve. Injection valves can be automated or manual, and they are generally utilized in the two-position, six-port (2/6) configuration and have a sample loop attached.



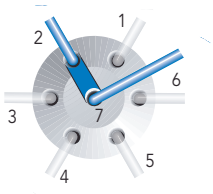
Flow path of Two-Position, Six-Port Injection Valve

The purpose of an Injection valve is to introduce a sample of a solution into a flowing stream of liquid. Some Switching valves become Injection valves by the addition of a Sample Loop (a defined length of tubing and fittings configured to match the angle of the valve ports). Sample is loaded and held in the loop until injection is triggered, either manually or mechanically.

Rheodyne injection valves are classified as either Single or Dual Mode, and either Front or Rear-loading, based on how the Sample Loop can be filled. A Single Mode Injection valve requires complete filling of the sample loop and is configured for Rear loading, generally in an auto-sample configuration. A Dual Mode Injection valve allows either partial or complete filling of the loop, and introduces sample by syringe through the needle port built into the valve shaft. Complete filling of the sample loop in both the Dual and Single Mode Injection valves provides greater repeatability injection to injection. (See the Application Note, page 129 for greater detail on partial vs. complete loop filling.)

Selection Valves

Selection valves enable discrete connections among multiple system liquids (mobile phase, reagents, buffers) by means of a common port (inlet or outlet) connected to a number of different reciprocal ports. In Diagnostic or Sequencing applications, the selection valve alternates between different reagents or sample streams. Selection valves also enable fractionation for multiple sample analyses.

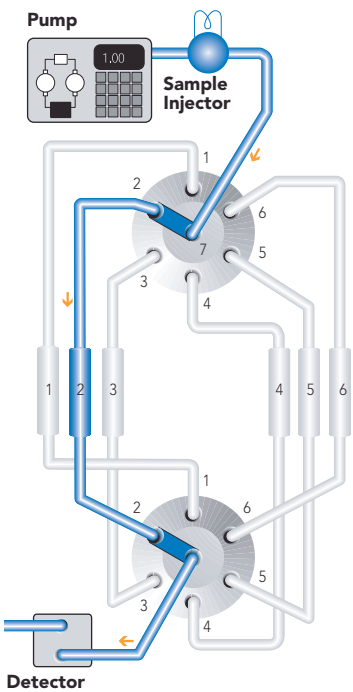


Flow path of Six-Position, Seven-Port Selector Valve

Numerous configurations exist among selection valves (e.g., 6-position 7-port, or 10-position 11-port), but these valves always operate between more than two positions. The ports are usually spaced radially, or outward in some manner around the center port of the stator.

APPLICATION NOTE

Six column selection using two selection valves.



APPLICATION NOTE

Dual Mode Sample Loop Loading: Partial-Filling vs. Complete-Filling

Partial-Filling

Use the partial-filling method if you need to conserve sample, or if you want to vary sample volume frequently.

In partial-filling, the syringe sets the volume injected onto the column. There is no sample waste, and the volume injected onto the column is equal to that dispensed from the syringe. Reproducibility is 1.0% relative standard deviation (RSD). The volume of the sample loaded is limited to half the sample loop volume. For example, the most you can load into a 200 µL sample loop is 100 µL.

Complete-Filling

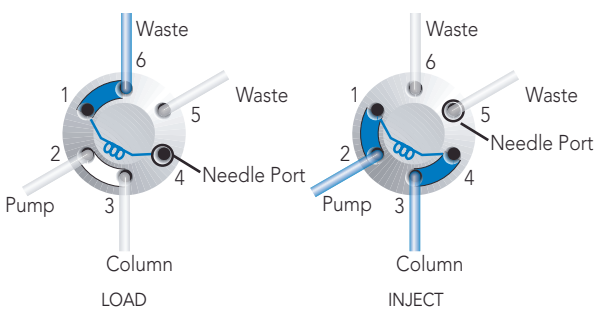
Use the complete-filling method if you have plenty of sample, if you do not vary sample volume, or if you need high reproducibility.

In complete-filling, the loop sets the volume loaded onto the column. Use excess sample (two to five loop volumes) to replace all the mobile phase in the loop. See Figure 2. Change the loop to vary the sample volume. Reproducibility is typically 0.1% RSD for loop sizes ≥ 5 µL. Accuracy is limited as loop volumes are nominal.

Q: "Which method should I use and which Rheodyne® sample injection valves use this method?"

A: There are two types of injection valves available: dual mode and single mode. Dual mode injection valves allow both partial- and complete-filling whereas single mode injection valves allow only complete-filling. See manual injection valves, page 132.

If you are collecting experimental data, sample is scarce, and/or you want to use different sample volumes, a dual mode injector with a large volume sample loop is appropriate. Only dual mode injection valves allow the partial-filling method for easily varying your volumes (up to half your sample loop volume) by setting the syringe volume. Once you begin routine analysis, and/or you have an abundance of sample, either a dual mode or single mode injector is appropriate. Both types of injection valves allow the complete-filling method in which you overfill the sample loop. Complete-filling maximizes the reproducibility of your results.



Flow path for the typical dual mode injector

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Actuated Valves

An automated valve offers more sophisticated functionality. Choose an automated valve if the application requires fast, consistent flow-stream switching. Some other advantages of automated valves include control options (PC- or instrument-triggered), higher torque operation, valve-position feedback, or very small flow paths.

Actuated Valves up to 15,000 psi

Part No.	Description	Ports, Connections	Wetted Material	Rapid Replacement Pod
UP TO 15,000 PSI (1,035 BAR)				
SWITCHING				
MXT715-000	2-Position, 6-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-000
MXT715-102	2-Position, 10-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-102
INJECTION	**For Injection, add the appropriately sized Sample Loop to the Switching valves above**			
SELECTION				
MXT715-105	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-105

All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

Actuated Valves up to 6,000 psi

Part No.	Description	Ports, Connections	Wetted Material	Rapid Replacement Pod
UP TO 6,000 PSI (410 BAR)				
SWITCHING				
MXP7900-000	2-Position, 6-Port	10-32 Ports for 1/16" OD Tubing	DuraLife®*	PD7900
MXP7960-000	2-Position, 10-Port	10-32 Ports for 1/16" OD Tubing	DuraLife	PD7960
MXP7980-000	2-Position, 6-Port, Nano, 5,000 psi (345 bar)	M4 Ports for 1/32" OD Tubing	DuraLife II	PD7980
MXP7986-000	2-Position, 10-Port, Nano, 5,000 psi (345 bar)	M4 Ports for 1/32" OD Tubing	DuraLife II	PD7986
MXP9900-000	2-Position, 6-Port, Biocompatible, 5,000 psi (345 bar)	10-32 Ports for 1/16" OD Tubing	PEEK	PD9900
MXP9960-000	2-Position, 10-Port, Biocompatible, 5,000 psi (345 bar)	10-32 Ports for 1/16" OD Tubing	PEEK	PD9960
INJECTION	**For Injection, add the appropriately sized Sample Loop to the Switching valves above**			
MXP7920-000	2-Position, 6-Port, Vertical Port	10-32 Ports for 1/16" OD Tubing	DuraLife	PD7920
SELECTION				
MXP7970-000	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	DuraLife II**	PD7970

** DuraLife is a proprietary material combination of SST and an advanced polymer.*
*** DuraLife II is a proprietary material combination consisting of Titanium and an advanced polymer.*
All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

Actuated Valves to 125 psi

Part No.	Description	Ports, Connections	Wetted Material	Ferrule Size
UP TO 125 PSI (8.5 BAR)				
SWITCHING				
MXX777-601	2-Position, 6-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7*	1/16" and 1/8"
MXX777-603	2-Position, Double Three Way	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX777-612	2-Position, 6-Port, Large Bore	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
SELECTION				
MXX777-605	6-Position, 7-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX777-616	6-Position, 7-Port, Large Bore	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX778-605	10-Position, 11-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"

** RPC-7 Proprietary Polymer Combination.*
All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

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MX Series II

Actuated Valves

- **MXT** to 15,000 psi (1,035 bar)
- **MXP** to 6,000 psi (410) bar)
- **MXX** to 125 psi (8.5 bar)

Add Rheodyne® MX Series II™ actuated valves to your existing instrument or use in stand-alone lab configurations. MX valves can be controlled remotely or operated manually using the push-button front panel with LED position indicator. MX valves connect to your instrument or PC through contact closure, BCD, serial port, or USB. Commands can be sent to the MX valves using your chromatography software or the included proprietary software for timed-events programmability.

Available flow rates include options for Analytical, Micro/Nano, or Semi-Prep in a range of pressure capabilities. Valve liquid ends are available in materials chosen to be chemically inert and biocompatible. Routine maintenance using authorized RheBuild® kits (page 136) or — for the higher-pressure MXP and MXP valves — the Rapid Replacement Pods™ (page 135) assures optimal performance.

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Manual Valves

Choose a manual valve if your application involves low frequency of use, demands operator control, or involves injection of smaller sample volumes.

NEW!

7725i-188
Manual Injection Valve
Up to 9,000 psi (600 bar)

7060
Manual Switching Valve
Up to 7,000 psi (483 bar)

SPECIFICATIONS & DETAILS

Part No.	Stator Passage Diameter	Factory Set Pressure	Maximum Field Set Pressure	Maximum Temperature (°C)
3000, 3030 (PEEK)	1.0 mm (0.040")	3,000 psi (207 bar)	4,000 psi (276 bar)	50°
3000-038 (SST)	1.0 mm (0.040")	4,000 psi (276 bar)	5,000 psi (340 bar)	50°
7000, 7010 (SST)	0.6 mm (0.024")	5,000 psi (340 bar)	7,000 psi (483 bar)	150°
7000L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	150°
7030 (SST)	0.6 mm (0.024")	5,000 psi (340 bar)	7,000 psi (483 bar)	150°
7030L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	150°
7060 (SST)	0.4 mm (0.016")	5,000 psi (340 bar)	7,000 psi (483 bar)	80°
7060L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	80°

SST = Stainless Steel

Manual Valves up to 15,000 psi

	Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration
	UP TO 15,000 PSI (1,035 BAR)				
	INJECTION				
NEW!	**7725i-188**	2-Position, 6-Port, 9,000 psi (600 bar)	10-32 Ports for 1/16" OD Tubing	Stainless Steel, PEEK, Ceramic	Front loading

Manual Valves up to 6,000 psi

	Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration
	UP TO 6,000 PSI (410 BAR)				
	SWITCHING				
	3000	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/8" Tubing	PEEK	—
	3000-038	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	—
	3030	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/8" OD Tubing	PEEK	Double 3-Way
	7000	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel®	—
	7000L	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	—
	7030	2-Position, 6-Port	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	Double 3-Way
	7030L	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	Double 3-Way
	INJECTION*				
	Part No.	**Description**	**Tubing/Fitting Size**	**Wetted Material**	**Sample Loop Volume**
	7010	2-Position, 6-Port Single Mode	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	20 µL*
	9010	2-Position, 6-Port Single Mode (Switching, Injection)	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
	3725-038	2-Position, 6-Port, Prep Scale Dual Mode	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	10 mL*
	3725i	2-Position, 6-Port, Prep Scale Dual Mode with Switch	5/16-24 Ports for 1/8" Tubing	PEEK	10 mL*
	3725i-038	2-Position, 6-Port, Prep Scale Dual Mode with Switch	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	10 mL*
★	**7725**	2-Position, 6-Port, Analytical Scale Dual Mode	10-32 Ports for 1/16" OD Tubing	Stainless Steel, Ceramic, Vespel	20 µL*
★	**7725i**	2-Position, 6-Port, Analytical Scale Dual Mode with Switch	10-32 Ports for 1/16" OD Tubing	Stainless Steel, Ceramic, Vespel	20 µL*
	8125**	2-Position, 6-Port, Micro Scale Dual Mode with Switch	10-32 Ports for 0.020" (0.5 mm) or 1/16" Tubing	Stainless Steel, Ceramic, Vespel	5 µL*
	9725	2-Position, 6-Port, Analytical Scale Dual Mode	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
★	**9725i**	2-Position, 6-Port, Analytical Scale Dual Mode with Switch	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
	SELECTION				
	7060	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	6-Way
	7060L	6-Position, 7-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	6-Way

** Ships with a sample loop attached to ports 1 and 4.*
*** The 8125 requires special ferrules for 0.020" (0.5 mm) tubing. 8125-084–0.5 mm ferrule for 8125; 8125-086–0.5 mm ferrule for 8125 — 4-pk.*

SPECIFICATIONS & DETAILS

Characteristics of Rheodyne® Manual Sample Injection Valves

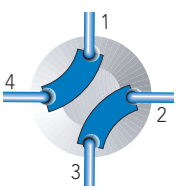
Type & Capabilities	Scale	Partial Filling Volumes (Range)	Sample Loop Sizes (Range)	Wetted Materials	Max. psi (bar)[1]	Max. T (°C)	MBB[2]	Model[3]
Dual Mode Can load the loop by two methods: 1) Partial filling–syringe determines volume without wasting sample 2) Complete filling–loop determines volume by over filling loop	Analytical	1 µL–2.5 mL 1 µL–5.0 mL	2 µL–5.0 mL 2 µL–10 mL	316 SST, Vespel® PEEK, ETFE, ceramic	7,000 (483) 5,000 (340)	80° 50°	Yes Yes	7725, 7725i 9725, 9725i
	Micro	0.1 µL–500 µL	5 µL–1.0 mL	316 SST, PEEK, Vespel, ceramic	7,000 (483)	80°	No	8125
	Preparative	100 µL–10 mL	2.0 mL–20 mL	316 SST, PEEK PEEK	5,000 (340) 4,000 (276)	50° 50°	Yes Yes	3725(i)-038, 3725i
Single Mode Can load the loop by one method: Complete filling — loop determines volume by over filling loop	Analytical	Not Applicable	5 µL–5.0 mL 5 µL–10 mL	316 SST, Vespel PEEK, ETFE, Ceramic	7,000 (483) 5,000 (340)	150° 50°	No No	7010 9010

SST = Stainless Steel

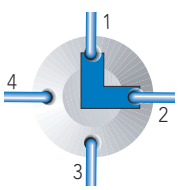
[1] This is the maximum pressure to which the valve can be adjusted. Some models are shipped from the factory set for lower pressures.
[2] MBB (Make-Before-Break™) is a design that provides uninterrupted flow when switching between LOAD and INJECT. MBB also greatly reduces transient pressure shocks.
[3] Models with an "i" suffix have a built-in position sensing switch. Models 8125 and 9010 also have a built-in switch.

NOTE

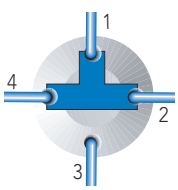
Upchurch Scientific® Switching Valve Options



4-Way Diagonal Flow Switching Valves
(V-100D, V-101D)

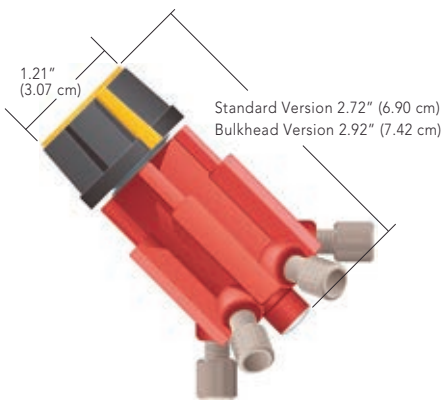


Right Angle Flow Switching Valves
(V-100L, V-101L)



3-Way Flow Switching Valves
(V-100T, V-101T)

V-101L
Manual Switching Valve
Up to 1,000 psi (69 bar)



V-540
Manual Injection Valve
Up to 1,000 psi (69 bar)

Manual Valves up to 1,000 psi

	Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration	Includes
	UP TO 1,000 PSI (69 BAR) UPCHURCH SCIENTIFIC					
	SWITCHING					
	V-100D	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Double Diagonal	*
★	**V-101D**	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Double Diagonal	*
★	**V-100L**	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Right-Angle "L"	**
★	**V-101L**	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Right-Angle "L"	**
	V-100T	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Single "T"	***
	V-101T	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Single "T"	***
	INJECTION	**For Injection, add the appropriately sized Sample Loop to the Switching valves above**				
	V-450	2-Position, 6-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Injection	(6) XP-235
★	**V-451**	2-Position, 6-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Injection	(6) XP-235
	V-540	2-Position, 6-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Injection	(6) XP-335
★	**V-541**	2-Position, 6-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Injection	(6) XP-335
	SELECTION					
	V-240	6-Position, 7-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-235
★	**V-241**	6-Position, 7-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-235
	V-340	6-Position, 7-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-335
★	**V-341**	6-Position, 7-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-335

** (4) P-218BLK, (4) P-240.*
*** (4) P-218BLK, (4) P-240, (1) P-309.*
**** (4) P-218BLK, (4) P-240, (1) P-309.*

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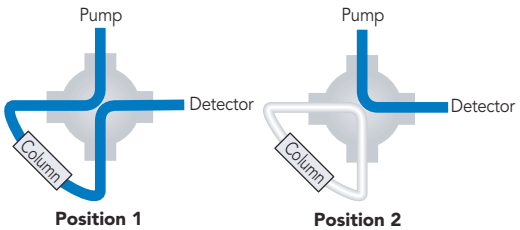
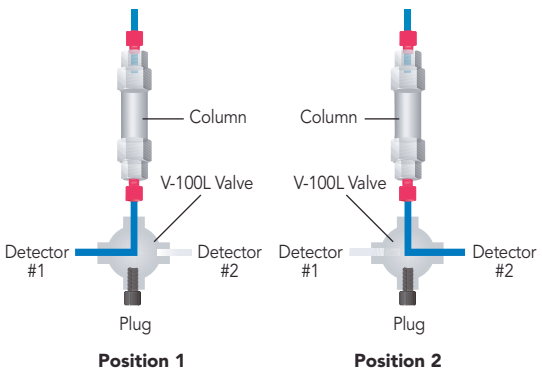
APPLICATION NOTE

Upchurch Scientific® Switching Valve Applications

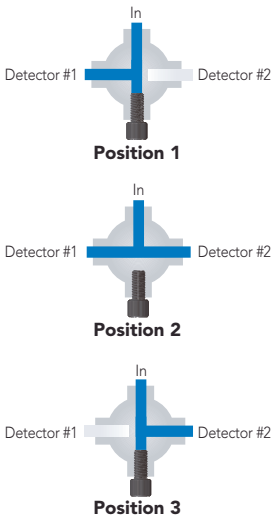
Protect sensitive system components (such as a column) during a cleaning cycle with our Diagonal Flow Switching Valve ("D"). This valve eliminates the need to remove, plug and reconnect a low pressure column (see below).



- A typical application for a Right Angle Flow Switching Valve ("L") is column switching, allowing two columns to use one detector. Detector switching is another common application for this valve (see below). Plug off the extra port with the included plug.



- Your detector switching application may require the flexibility of routing the column effluent to both detectors simultaneously while retaining the ability to isolate each detector. Use our 3-Way Flow Switching Valve ("T"), plugging off the fourth port with the included plug (see right).

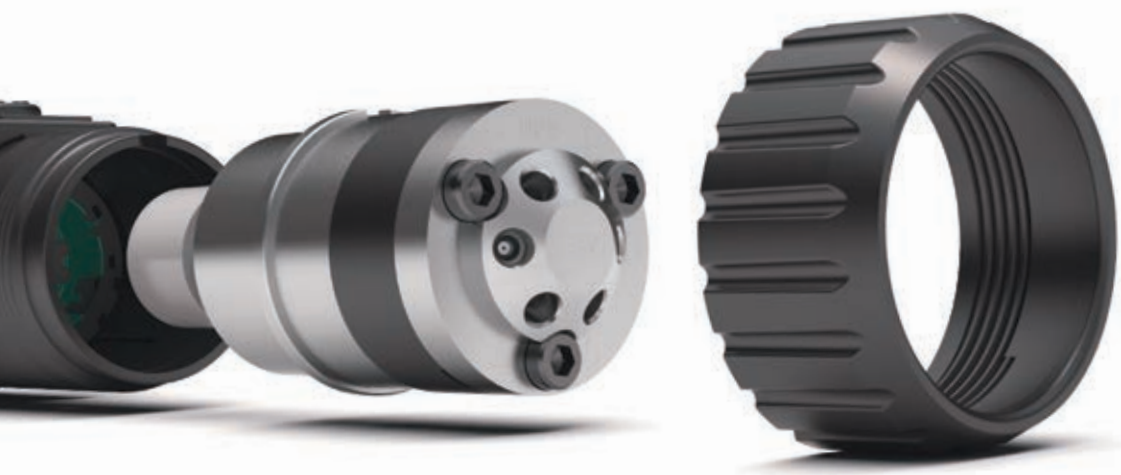


Rapid Replacement Pods™

For Rheodyne® Valves

- Zero downtime maintenance
- Improves lab throughput

To help keep your instrument online and performing at maximum precision, select the exact Rapid Replacement Pod for your higher pressure MX Series II valves. Replacement pods are easily exchanged as part of scheduled preventive maintenance, or in an emergency, a pod can be substituted quickly while the original is examined and cleaned at your convenience. The pod kit contains complete instructions for removal and replacement.



Part No.	Description	For Valve Part No.
TO 15,000 PSI (1,035 BAR)		
SWITCHING		
PD715-000	Rapid Replacement Pod	MXT715-000
PD715-102	Rapid Replacement Pod	MXT715-102
SELECTION		
PD715-105	Rapid Replacement Pod	MXT715-105
UP TO 6,000 PSI (410 BAR)		
SWITCHING		
PD7900	Rapid Replacement Pod	MXP7900-000
PD7960	Rapid Replacement Pod	MXP7960-000
PD7980	Rapid Replacement Pod	MXP7980-000
PD7986	Rapid Replacement Pod	MXP7986-000
PD9900	Rapid Replacement Pod	MXP9900-000
PD9960	Rapid Replacement Pod	MXP9960-000
INJECTION		
PD7920	Rapid Replacement Pod	MXP7920-000
SELECTION		
PD7970	Rapid Replacement Pod	MXP7970-000

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RheBuild® Kits

RheBuild Kits are available for all Rheodyne® brand products. Included in each individualized RheBuild Kit are all parts, tools, and instructions to maintain precision performance of your particular product. RheBuild Kits eliminate individual part ordering.

APPLICATION NOTE

How to Avoid Pressure Transients

Air in the sample loop can cause an instantaneous system pressure drop that eventually returns to a normal level. Air causes the pressure to drop when the injector moves from the LOAD to the INJECT position. When large sample loops (≥ 100 µL) are partially loaded, air present in the needle port tube is pushed into the sample loop (see Figure 1). Air can also enter the sample loop from siphoning which occurs when the vent line is higher than the injection port. In either case, upon injection, the system pressure collapses the air bubble, causing pressure to drop momentarily.

A pressure drop in the system caused by air results in changes in retention time, artifact peaks, and affects column performance.

Avoid pressure drops by removing the air in the needle port tube. Do this by flushing about 1 mL of mobile phase with a luer syringe with needle port cleaner. Keep the needle port tube filled with mobile phase by occasional flushing. Adjust the vent line(s) so the outlet is at the same horizontal level as the needle port (see Figure 2). For additional injection troubleshooting, refer to the Rheodyne Troubleshooting Guide for HPLC Injection Problems. You may download the Guide from the IDEX Health & Science web site: www.idex-hs.com under Support.

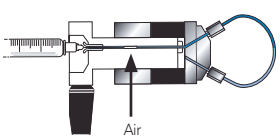


Figure 1 Air present in the needle port tube is pushed by the syringe during loading into the sample loop

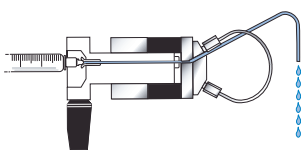


Figure 2 Pathway of the flushing mobile phase using the Needle Port Cleaner, Part # 7125-054 (see page 143) when the injector is in INJECT

Part No.	Description
RHEBUILD KITS FOR MX SERIES II™ VALVES	
7150-999	RheBuild Kit for MXT715-000 (includes 2 rotor seals)
7152-999	RheBuild Kit for MXT715-102 (includes 2 rotor seals)
7155-999	RheBuild Kit for MXT715-105 (includes 2 rotor seals)
7920-999	RheBuild Kit for MXP7920-000 and MXP7900-000
7960-999	RheBuild Kit for MXP9960-000 (includes rotor seal and stator face seal)
7961-999	RheBuild Kit for MXP7960-000
7970-999	RheBuild Kit for MXP7970-000
79801-999	RheBuild Kit for MXP7980-000
79861-999	RheBuild Kit for MXP7986-000
7900-999	RheBuild Kit for MXP9900-000 (includes rotor seal and stator face seal)
RHEBUILD KITS FOR MANUAL VALVES	
3725-999	RheBuild Kit for models 3725, 3725i, 3725-038, 3735i-038
7010-996	Conversion Kit including Stator Face Assembly for model 7010
7010-997	RheBuild Kit including Stator for model 7010
7010-998	RheBuild Kit, pH Upgrade Kit for model 7000
7010-999	RheBuild Kit for model 7010 and 7010-type Valves
7125-999	RheBuild Kit for models 7125 and 7126
7125Ti-999	RheBuild Kit for model 7125-081
7410-999	RheBuild Kit for model 7410
7520-999	RheBuild Kit for models 7520 and 7526 (includes inlet stator and seal)
7725-999	RheBuild Kit for models 7725 and 7725i
7788-999	RheBuild Kit for model 7725i-188
8125-999	RheBuild Kit for models 8125 and 8126
9010-999	RheBuild Kit for model 9010
9125-999	RheBuild Kit for models 9125 and 9126
9725-999	RheBuild Kit for models 9725 and 9725i; 7725(i) pH upgrade kit
RHEBUILD KITS FOR MX SERIES I™ VALVES	
7900-999	RheBuild Kit for models MX7900-000, MX7925-000, MX9900-000, MX9925-000
7960-999	RheBuild Kit for model MX7960-000
7980-999	RheBuild Kit for model MX7980-000
7984-999	RheBuild Kit for model MX7984-000
7986-999	RheBuild Kit for model MX7986-000
RHEBUILD KITS FOR LABPRO™ & EV AUTOMATED FLUIDIC INSTRUMENTS	
1006-999	RheBuild Kit for model PR/EV100-106
5001-999	RheBuild Kit for models PR/EV500-101 and PR/EV550-101
5100-999	RheBuild Kit for models PR/EV500-100 and PR/EV550-100
5104-999	RheBuild Kit for models PR/EV500-104 and PR/EV550-104
7004-999	RheBuild Kit for models PR/EV700-104 and PR/EV750-104
7112-999	RheBuild Kit for models PR/EV700-112 and PR/EV750-112
7501-999	RheBuild Kit for models PR/EV700-100 and PR/EV750-100
7502-999	RheBuild Kit for models PR/EV700-102 and PR/EV750-102
7507-999	RheBuild Kit for models PR/EV700-107 and PR/EV750-107
7531-999	RheBuild Kit for models PR703-100 and PR753-100

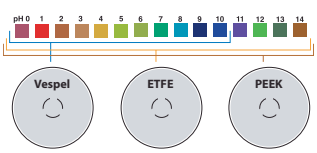
Rotor Seals & Stators

The rotor seal is the polymeric disc that makes a high pressure seal against the stator or stator face seal. The seal wears with use and is one of the only parts that may need routine replacement.

Stators are available in 316 stainless steel, PEEK and proprietary materials. Stators need replacement only if the ports or sealing surfaces become damaged. Avoid damage from use of improper injection needles by referring to the "Using Proper Syringe Needles" Application Note on page 142.

Please Note: Rotor seals for MX Series II™ Modules are available in RheBuild® Kits on page 136. Stators for MX Series II Modules are available on this page. MX (Series I) Module rotor seals are available in RheBuild Kits on page 136.

APPLICATION NOTE



How to Select the Right Rotor Seal

The standard rotor seal in many Rheodyne® manual valves is made from a Vespel® blend. This polyimide has low wear and high chemical resistance. Vespel tolerates a pH range of 0 to 10. Solutions more basic than pH 10 dissolve Vespel which damages the rotor seal. If you use any solutions above pH 10, Rheodyne recommends a PEEK blend rotor seal. PEEK offers a high chemical resistance and versatility, and will tolerate the entire pH range from 0 to 14. ETFE blend rotor seals are appropriate for use in applications where PEEK is not generally acceptable, such as when methylene chloride or DMSO in higher concentrations is being used.

Part No.	For Valve Model No.	Description
VESPEL BLEND ROTOR SEALS		
7000-016	7000L, 7040L	Vespel Rotor Seal
7010-039	7010, 7000, 7040	Vespel Rotor Seal
★ **7030-003**	7030, 9030	Vespel Rotor Seal
7030-014	7030L	Vespel Rotor Seal
7060-070	7060, 7066	Vespel Rotor Seal
7060-064	7060L	Vespel Rotor Seal
7125-047	7125, 7725, 9725	Vespel Rotor Seal
7410-038	7410	Vespel Rotor Seal
7413-013	7413	Vespel Rotor Seal
8125-038	8125	Vespel Rotor Seal

Part No.	For Valve Model No.	Description
ETFE BLEND ROTOR SEALS		
7000-017	7000L, 7040L	ETFE Rotor Seal
7010-071	7010, 7010-087, 7000, 7040	ETFE Rotor Seal
7030-015	7030, 9030	ETFE Rotor Seal
7060-074	7060, 7066, 9060	ETFE Rotor Seal
7060-067	7060L	ETFE Rotor Seal
7125-079	7125, 7125-081, 7725	ETFE Rotor Seal
7410-075	7410	ETFE Rotor Seal
8125-097	8125	ETFE Rotor Seal
9010-051	9010	ETFE Rotor Seal
9125-082	9125, 9725	ETFE Rotor Seal
PEEK BLEND ROTOR SEALS		
3030-005	3030, 3030-038	PEEK Rotor Seal
3710-008	3000, 3000-038, 3710, 3710-038	PEEK Rotor Seal
3725-018	3725, 3725-038	PEEK Rotor Seal
9010-065	7000, 7010, 9010	PEEK Rotor Seal
8125-119	8125	PEEK Rotor Seal
9125-095	7125, 7725, 9125, 9725	PEEK Rotor Seal
STATORS FOR MX SERIES II MODULES		
7123-548	MXT715-000	Stator
7123-550	MXT715-105	Stator
7123-568	MXT715-102	Stator
7770-229	MXP7920-000	Stator
7980-004	MXP7980-000	Stator
7986-004	MXP7986-000	Stator
7900-146	MXP9900-000	Stator
7900-179	MXP7900-000	Stator
7900-183	MXP7970-000	Stator
7960-014	MXP7960-000	Stator
9960-002	MXP9960-000	Stator
STATORS FOR OTHER RHEODYNE VALVES		
3725-006	3725, 3710-038, 3000-038 and 3030-038	Stator
3725-085	3725-038, 3710-038, 3000-038 and 3030-038	Stator
7010-069	7000L, 7030L, 7040L	Stator
7010-040	7010, 7125, 7000, 7030 and 7040	Stator
7010-066	7125-081 and 7010-087	Stator
7060-039	7060 and 7066	Stator
7060-065	7060L, EV501-100	Stator
7123-047	PR/EV500-100	Stator
7123-127	PR/EV750-107	Stator
7123-128	PR/EV700-107	Stator
7123-142	PR/EV500-104, EV501-104	Stator
7123-145	PR/EV550-104, EV551-104	Stator
7123-147	PR/EV550-100	Stator
7123-148	PR/EV500-101	Stator
7123-149	PR/EV550-101	Stator
7123-180	PR703-100 and EV700-105	Stator
7123-221	PR753-100 and EV750-105	Stator
7123-223	PR/EV700-112	Stator
7123-390	EV200-102	Stator
7410-041	7410 and 7413	Stator
7520-030 (inlet)	7520	Stator
7520-035 (outlet)	7520	Stator
7650-002	PR/EV700-102	Stator
7725-010	7725(i)	Stator
7750-070	7750	Stator
7750-038	PR/EV700-100	Stator
8125-098	8125	Stator
9060-016	9060	Stator
9125-043	9125, 9010, 9030 and 9725(i)	Stator
9650-009	PR/EV750-102	Stator
9750-021	PR/EV750-100	Stator

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Stainless Steel Sample Loops

These high quality stainless steel sample loops have burr-free, square-cut ends to ensure a flush connection to valve ports. The size designations of loops are nominal. The actual volumes can differ from the theoretical designations because of the 0.001" (± 0.025 mm) tolerance of the metal tubing bore.

Accuracy of large metal loops (1.0 mm, 0.040" bore) is about ±5%, intermediate loops (0.5 mm, 0.020" bore) ±10%, and small loops (0.2 mm, 0.007" bore) ±30%.

Since both standards and unknowns are usually analyzed using the same sample loop, knowledge of the actual, accurate volume is rarely needed. If the sample loop volume must be known, it is best to calibrate the loop in place on the valve so the flow passages in the valve are also taken into account. An alternative to calibration is to use a dual mode injector and partial-filling method of loading. See the "Sample Loop Loading" Application Note on page 129.

Model 7725 Injector loops are not interchangeable with loops for the model 7125. The port angle for the 7725 is 30° whereas the port angle for the 7125 is 20° requiring the loops to have a different shape.

Model 8125 Micro-Scale Sample Injector requires special loops in the 5.0 µL to 50 µL range. The 8125 sample loops are made with 0.5 mm (0.020") OD tubing.

APPLICATION NOTE

How to Properly Install Sample Loops: Stainless Steel

Stainless steel sample loops are supplied with fittings that are not swaged onto the tube. It is important that the loop be completely bottomed in the injector port before the ferrule is swaged onto the tube. The depth of the tubing holes may vary slightly from port to port and from valve to valve. A fitting made up in one port may leave a small cavity in another port. The cavity causes high dispersion and peak distortion such as fronting, tailing, or broadening. It is good practice to label loop ends so they will be replaced in the same, respective ports that were used in swaging the ferrules. Hint: swaging ferrules separately on each side, into each respective valve port makes loop installation easier.

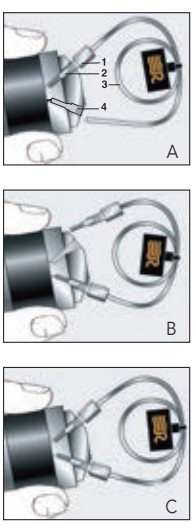

Figure 1 Cut-away view of stainless steel sample loop installation

To install the sample loop:

a) Take one end of the loop and place the nut (1) and ferrule (2) onto the tubing (3) with the threaded portion of the nut and tapered portion of the ferrule toward the end. See Figure A.

b) Insert the tubing into port (4). Confirm that the tubing is bottomed in the valve port as shown in Figure A.

c) While firmly pressing down on the tubing, hand-tighten the nut as tight as possible.

d) With the IDEX Wrench (see pages 33 and 144), designed especially for fittings, tighten one quarter turn past finger tight. Remove the loop to confirm the ferrule is swaged onto the tube.

e) Repeat steps a-d with the other end of the loop while the swaged end remains outside the valve port. See Figure B.

f) Reinstall each end of the loop to their respective ports. See Figure C.

Part No.	Volume	Tubing
RHEODYNE® STAINLESS STEEL LOOPS FOR MXT715-000		
7755-300	5 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7755-301	10 µL Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-302	20 µL Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-303	50 µL Sample Loop	0.51 mm (0.021") ID x 1/16" OD
7755-304	100 µL Sample Loop	0.51 mm (0.021") ID x 1/16" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 7125, 7010 INJECTION VALVES (DO NOT USE FOR 7725)		
7020	5 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7021	10 µL Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7022	20 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7023	50 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7024	100 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7025	200 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7026	500 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7028	2.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
7029	5.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
1876	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
1877	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 3725-038, 3725I-038 INJECTION VALVES		
3065-018	2.0 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-019	5.0 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-023	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-025	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 7725, 7725I, PR/EV700-100, PR/EV703-100, MX MODULE INJECTION VALVES (DO NOT USE FOR 7125)		
7755-020	5 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7755-021	10 µL Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-022	20 µL Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-023	50 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7755-024	100 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7755-025	200 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-026	500 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-028	2.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
7755-029	5.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
1876	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
1877	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 8125 INJECTOR (USE 7755-024 TO 7755-029 FOR VOLUMES > 50 µL)		
8020	5 µL Sample Loop	0.20 mm (0.008") ID x 0.020" OD
8021	10 µL Sample Loop	0.20 mm (0.008") ID x 0.020" OD
8022	20 µL Sample Loop	0.25 mm (0.010") ID x 0.020" OD
8023	50 µL Sample Loop	0.30 mm (0.012") ID x 0.020" OD
8125-084	Ferrules for 0.020" (0.5 mm) Tubing	
8125-086	Ferrules for 0.020" (0.5 mm) Tubing, 4-pk	

See page 140 for Valco-compatible stainless steel sample loops.

PEEK Sample Loops

Flexible PEEK sample loops are alternatives to stainless steel loops. PEEK loop ends are provided with clean, straight cuts for easy valve installation.

PEEK polymer is inert to almost all organic solvents and is biocompatible, giving PEEK loops added versatility. Natural PEEK is used for these sample loops. Like metal loops, the size designations of PEEK loops are nominal. The actual volumes can differ from the theoretical designations because of the ±0.05 mm (0.002") tolerance of the tubing bore. Accuracy of large PEEK loops (0.8 mm, 0.030" bore) is about ±14%, intermediate loops (0.5 mm, 0.020") ±21%, and small loops (0.2 mm, 0.007") ±65%.

PEEK loops are also supplied with unswaged RheFlex® fittings but do not require the same swaging precaution. The fittings can reposition along the loop tubing when the fitting reinserts in the ports for correct loop installation.

Please Note: Several of our PEEK Sample Loops can also be used with Valco/VICI® sample injection valves. Please refer to the product listing on this page to aid selection.

APPLICATION NOTE

PEEK Physical Strength Characteristics

Although PEEK material is compatible with virtually all solvents, there are many factors that affect burst pressure of PEEK tubing. Factors such as increases in inner diameter, temperature, exposure time, and concentration of organic solvents affect the degradation of PEEK. Other solvents such a THF, methylene chloride and DMSO cause PEEK tubing to swell while concentrated nitric acid and sulfuric acid weaken the tubing.

Part No.	Volume	Tubing	Valco No.
PEEK LOOPS FOR 3725, 3725I INJECTION VALVES			
3055-018	2.0 mL Sample Loop	1.6 mm (0.062") ID x 1/8" OD	N/A
3055-019	5.0 mL Sample Loop	1.6 mm (0.062") ID x 1/8" OD	N/A
3055-023	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD	N/A
3055-025	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD	N/A
PEEK LOOPS FOR 9725, 9010, PR/EV750-100, PR/EV753-100 INJECTION VALVES			
Part No.	**Volume**	**Bore / Tubing**	**Valco No.**
9055-020	5.0 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD	SL5CWPK
9055-021	10 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL10WPK
9055-022	20 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL20WPK
9055-023	50 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL50WPK
9055-024	100 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL100WPK
9055-025	200 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	N/A
9055-026	500 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL500WPK
9055-027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL1KCWPK
9055-028	2.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL2KCWPK
9055-029	5.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
9055-033	10 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
PEEK LOOPS FOR 7725, 7725I, PR/EV700-100			
7123-227	1 µL Sample Loop (models PR/EV700-100 and EV750-100 only)	Internal groove	N/A
7755-015	2 µL Sample Loop (models 7725, 7725i, and 9725(i) only)	Internal groove	N/A
REPLACEMENT RHEFLEX FITTINGS FOR PEEK LOOPS			
Part No.	**Description**		**Qty.**
6000-078	Nut/Ferrule Set, Natural PEEK, 5/16-24, for 1/8" OD loops		ea.
6000-079	Ferrules, Natural PEEK, for 1/8" OD loops		5-pk
6000-251	Ferrules, Natural PEEK, for 1/16" OD loops		10-pk
6000-254	Nut/Ferrule Sets, Natural PEEK, 10-32, for 1/16" OD loops		10-pk

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Valco/VICI-Compatible Stainless Steel Sample Loops

Valco-Compatible Stainless Steel Loops are manufactured by IDEX Health & Science. These loops are designed for use with Valco valve models CW6 and EC6W. Each loop has burr-free, polished ends and is passivated and flushed with reagent-grade methanol to ensure cleanliness.

Loops made with 1/16" OD tubing come complete with F-287 SealTight™ Fittings, which are pressure rated to 9,000 psi (620 bar)[1]. The fittings and adapters that accompany the 1/8" OD sample loops are rated to 1,000 psi (69 bar)[1]. Volumes are stated at ±10%.

[1] These pressure ratings reflect the performance of the fittings, not the port or valve in which they are used. IDEX Health & Science manufactures many products designed as direct replacements for OEM components. Reference to these manufacturers does not imply their endorsement of our products.

Part No.	Volume	Tubing	Valco No.
VALCO/VICI-COMPATIBLE STAINLESS STEEL LOOPS FOR C6W, EC6W INJECTION VALVES			
1750	5 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD	SL5CW
1751	10 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL10CW
1752	15 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL15CW
1755	20 µL Sample Loop	0.51 mm (0.010") ID x 1/16" OD	SL20CW
1758	25 µL Sample Loop	0.51 mm (0.010") ID x 1/16" OD	SL25CW
1759	50 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL50CW
1762	100 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL100CW
1778	200 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
1763	250 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL250CW
1764	500 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL500CW
1770	1 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL1KCW
1772	2 mL Sample Loop	1.02 mm (0.040") ID x 1/16" OD	SL2KCW
1775	5 mL Sample Loop	2.03 mm (0.080") ID x 1/8" OD	SL5KCW
1776	10 mL Sample Loop	2.03 mm (0.080") ID x 1/8" OD	SL10KCW

APPLICATION NOTE

Fluidic Movement in Tubes

Q: "Why can I load only up to half of the volume of the loop in partial-filling method?"

A: Sample occupies 2 µL of loop for every 1 µL loaded from the syringe. For example, 10 µL of sample spreads out over the entire length of a 20 µL loop. Any additional sample loaded will overflow the end of the loop and exit out to waste. Reproducibility is poor because the volume of sample in the loop is different from the known volume originally loaded by your syringe.

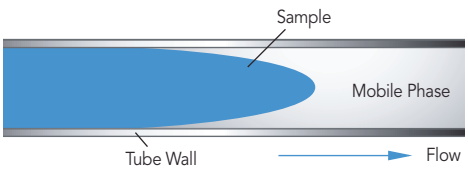

Figure 1 Schematic of sample flow through mobile phase between tubing walls

Fluid spreads in a parabolic shape through a tube instead of moving in one plug because the velocity is different at the center of the tube than at the walls. The velocity at the center of the tube is twice the average velocity, and near the wall the velocity is almost zero, creating a parabolic shape. This fluidic movement is called laminar flow. See Figure 1.

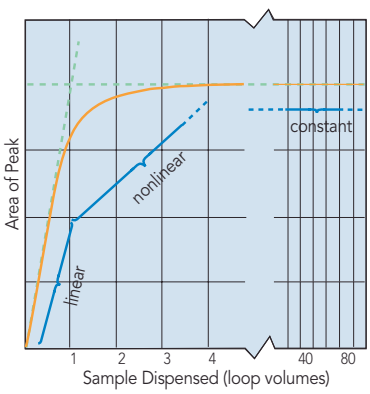

Figure 2 Sample mass (observed peak area) vs. volume of sample dispensed from the syringe, in units of loop volumes, injected onto the column from a Rheodyne® dual mode injector such as model 7725

In dual mode injection valves (see "Sample Loop Loading" Application Note on page 129) the sample from the syringe needle loads directly into the sample loop. The sample volume is known since there is no sample waste. The laminar flow phenomenon accounts for the shape of the plot as shown in Figure 2. Note that the plot has three regions:

a) Partial-Filling Region. When the volume dispensed is less than half the loop volume, the curve is linear. Sample has not reached the end of the loop. Within this region, performance depends on the syringe and operator.

b) Nonlinear Region. When the volume dispensed is between half the loop volume and about two loop volumes, the curve is nonlinear. Sample is lost from the loop, so reproducibility is poor. If you dispense a volume equal to the loop size, you are in this region of poor performance.

c) Complete-Filling Region. When the volume of sample dispensed is several loop volumes, the loop contains only pure sample, undiluted by residual mobile phase. Within this region, reproducibility is highest.

In the single mode injection valves the sample must pass through a connecting passage before it reaches the sample loop. Since some of the sample dispensed from the syringe remains in the connecting passageway, an unknown amount enters the sample loop. Therefore, single mode injection valves achieve high reproducibility only by using the complete-filling method.

APPLICATION NOTE

How to Find and Fix Common Sample Injector Leaks

Leaks cause valuable sample loss. Nobody wants that. The key to the valve holding pressure is the integrity of the sealing surfaces. If there is a scratch on the sealing surface, or the needle seal in the rotor seal is damaged, a leak may appear. It is also important to realize what appears to be a leak can instead be a result of siphoning. The following are the three most common situations in which fluid leaks occur.

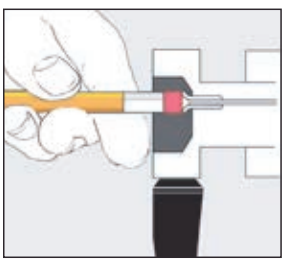

Figure 1 To reform the needle seal, push the eraser end of a pencil against the needle port

1. If fluid leaks out of the needle port only while loading the loop (i.e., while pushing down on the plunger of the syringe), the problem is most likely that the needle seal or the needle port fitting in the loop filler port is not gripping the syringe needle tightly enough. Tighten the needle seal grip by pushing with the eraser end of the pencil on the needle port (See Figure 1). The tightening reduces the hole diameter of the needle seal and port fitting.

2. If fluid leaks continuously from the needle port or vent lines and/or from the stator-to-stator ring interface, replace the rotor seal and/or stator face assembly. Scratches on the rotor seal or cracks in the stator face assembly allow mobile phase to escape and cause cross port leakage. Genuine Rheodyne replacement rotor seals are listed on page 137.

3. If fluid leaks from the needle port and/or vent lines but eventually stops, the cause is most likely siphoning and not a leak. Siphoning occurs if the vent lines are lower or higher than the needle port. Adjust the vent line(s) so that the outlet is at the same horizontal level as the needle port to prevent siphoning. (See Figure 2).

For other leakage or injection troubleshooting, refer to the Rheodyne Troubleshooting Guide for HPLC Injection Problems. You may download the Guide from the Rheodyne web site: www.idex-hs.com under Support.

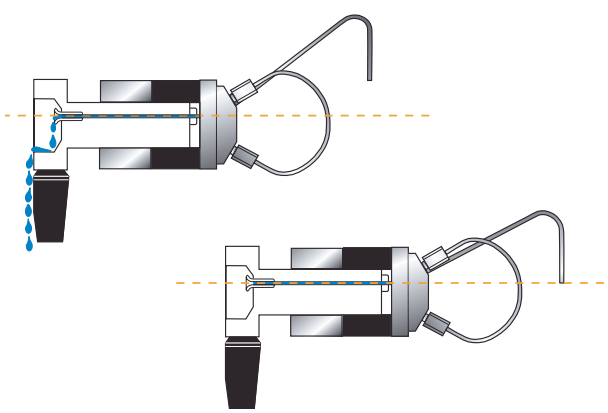

Figure 2 Needle port level compared to the level of vent line outlet:
(A) siphoning occurs when the vent line outlet is above the needle port level
(B) siphoning does not occur if the vent line outlet is the same horizontal level as the needle port

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APPLICATION NOTE

Using Proper Syringe Needles

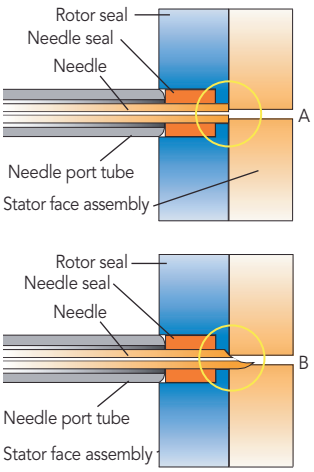


Figure 1 A square cut needle: (A) stops against the stator face assembly; The tip of a pointed needle (B) slips into the stator face and the tip breaks off as the valve rotates

With front-loading injection valves it is important to use the correct needle when loading the sample loop. An incorrect needle will damage the valve and can cause poor reproducibility. When the needle is too short the tip will not reach the needle seal. When the needle is too small in diameter the seal will not grip tightly enough. Needles with a beveled tip can damage the rotor seal and stator face assembly (see Figure 1). The needle should be #22 gauge (0.028"–0.0285"/ 0.72 mm), and 90° point style (square cut end). Model 3725 requires a #16 gauge (0.0645"–0.0655"/ 1.65 mm) needle. Never use a beveled, pointed, or tapered needle.

Needle specifications are not critical when using a Loop Filler Port to load the sample loop. However, it is important to tighten the needle port fitting around the needle if using a syringe needle with a slightly smaller diameter than 0.7 mm (0.028").

If the loading method used is complete-filling, a syringe without a needle can be used. A syringe fitted with a Needle Port Cleaner can be used with a front-loading valve (Figure 2A) or with a Loop Filler Port (Figure 2B).

Needle port accessories are listed on this page.

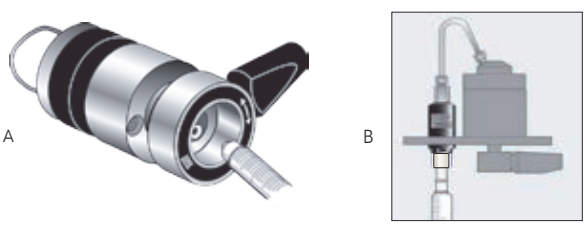


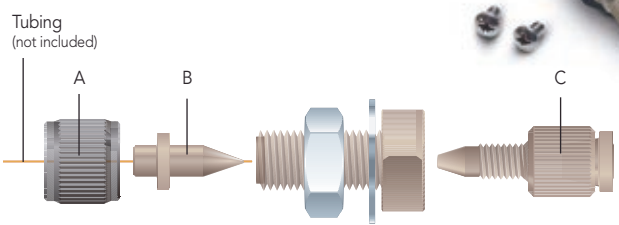
Figure 2
(A) Syringe fitted with Needle Port Cleaner (Part # 7125-054) loading a front-loading valve (model 7725); (B) loading a Loop Filler Port (Part # 7012)

Injection Port Adapters

- For 360 µm OD tubing
- Mount on bracket or bulkhead

To introduce sample, connect 360 µm OD capillary tubing to an Upchurch Scientific® Injection Port Adapter Assembly. This adapter accepts standard 22 gauge Hamilton-style injection syringe needles. No additional swept volume is added to the fluid pathway by this adapter, as the needle butts directly against the connecting tubing during injections. The adapter can be bulkhead mounted or mounted with the V-447 Kits.

To introduce a sample directly into a 10-32 port, purchase a M-432-03 separately.



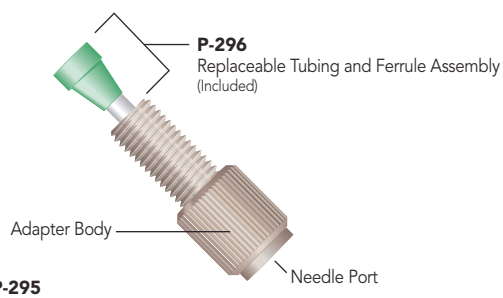
M-432
Micro Injection Port Adapter Assembly

RELATED PRODUCTS

	A	B	C
For 360 µm OD Tubing			
M-432 and V-447	P-416BLK	F-152	M-432-03

- For use with Upchurch Scientific Injection Valves on page 133

This simple, biocompatible adapter is designed specifically for the Upchurch Scientific Injection Valves on page 133 and can also convert any 1/4-28 flat-bottom port into a port that can accept a standard 22 gauge HPLC injection needle. This injection port adapter is adjustable, so you can create a snug fit around the needle to prevent any leaking of the analyte. In addition, this product features an internal stop that prevents you from inserting the needle too far, eliminating the possibility of damaging the valve with the needle tip.



P-295
1/4-28 Flat-Bottom Injection Port Adapter

Needle Port Accessories

The Rheodyne® adaptable Loop Filler Ports (Part #7012 and 9012) are used to load sample from syringe needles or luer tips. The Needle Port (Part #9013) conserves sample by minimizing the volume between the needle and the valve.

Part No.	Description
MICRO INJECTION PORT ADAPTER	
For 360 µm OD Tubing	
F-152	Replacement MicroFerrule for M-432, Natural PEEK
M-432	Micro Injection Port Adapter Assembly
M-432-03	Replacement Tubing/Fitting Assembly for M-432 & M-433
P-416BLK	Replacement Female Nut for M-432, Black PEEK
V-447	Micro Injection Port Adapter Assembly Actuator Mounting Kit Includes (1) M-432 with mini-actuator bracket and (2) mounting screws
1/4-28 FLAT-BOTTOM INJECTION PORT ADAPTER	
P-295	Adjustable Injection Port Adapter
P-296	Replacement Tubing/Ferrule Assembly
NEEDLE PORT ACCESSORIES	
7012	Stainless Steel Loop Filler Port
7125-054	Needle Port Cleaner
9012	PEEK Loop Filler Port
9013	PEEK Needle Port
9125-076	Suction Needle Adapter (for Model 9725)

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Valve Wrenches

- For convenient wrench-tightening of fittings on high pressure rotary shear valves
- For removal of knobs on Upchurch Scientific® Manual Valves

The smartly designed IDEX Wrench is a double-ended slotted socket wrench that fits over 1/16" and 1/8" OD tubing. It easily loosens and tightens 1/4" and 5/16" hex head stainless steel or PEEK fittings. The "Z" shape of the IDEX Wrench provides ideal leverage for changing sample loops and fittings, and keeps one end from restricting the use of the other.

The V-103 is an Allen (hex-key) wrench designed to remove the knob from Upchurch Scientific V-101 valves (page 133). The V-104 is an Allen wrench that can be used to remove the knob from Upchurch Scientific Medium Pressure Selection and Injection Valves (also found on page 133).

MXX Replacement Fittings

Use these replacement Ferrules and O-rings for 1/8" and 1/16" tubing with the MXX Series II valves shown on page 133. Please see the part number chart below for a list of individual part numbers.

Biocompatible

Mounting Brackets

Rheodyne® mounting brackets and panels of different shapes and sizes organize and provide a sturdy support for Rheodyne valves. The Ring Stand Mounting Bracket now allows the valves to mount onto common laboratory equipment.

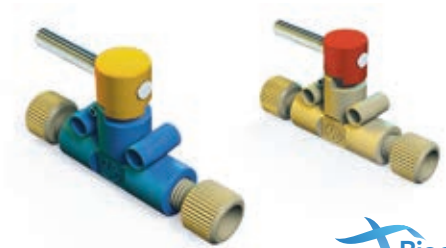
Part No.	Description	Qty.
VALVE WRENCHES		
6810	IDEX Wrench	
V-103	0.050" Allen Wrench (replacement)	
V-104	5/64" Allen Wrench (replacement)	
MOUNTING BRACKET ACCESSORIES		
7160	Mounting Panel	
7160-010	Valve Angle Bracket	
7160-029	Ring Stand Mounting Bracket	
VALVE BRACKET		
M-615-1	Mounting Bracket for Upchurch Scientific® Switching Valves	
M-615-2	Mounting Bracket for Upchurch Scientific Injection and Selection Valves	
REPLACEMENT FITTINGS		
Part No.	**Description**	**Qty.**
7770-039	Ferrules for 1/8" OD Tubing	25-pk
7770-040	Ferrules for 1/8" Tubing	50-pk
7770-041	Ferrules for 1/8" Tubing	100-pk
7770-044	Ferrules for 1/16" OD Tubing	25-pk
7770-045	Ferrules for 1/16" Tubing	50-pk
7770-046	Ferrules for 1/16" Tubing	100-pk
7770-124	O-rings for 1/16" OD Tubing	25-pk

Shut-Off Valves

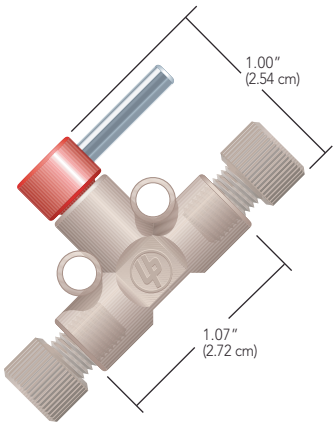
- Biocompatible, all-polymer flow path
- Available for 1/16" and 1/8" OD tubing
- Pressure rated to 500 psi (34 bar)

Stop a flow stream quickly with Upchurch Scientific® biocompatible Shut-Off Valves. The bodies are manufactured from either PEEK or ETFE, and both versions feature a PCTFE rotor, making them highly resistant to chemical attack. The blue colorant used in some valve configurations has proven not to leach out with common HPLC solvents.

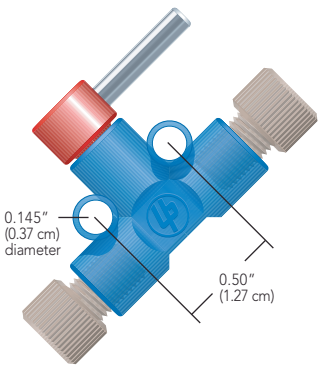
Connect semi-rigid or rigid tubing, such as PEEK, stainless steel or fluoropolymer, with the 1/4-28 Flangeless Fittings provided. Soft tubing, such as PharMed® or Tygon® (see pages 75–89), may be connected to these valves using our 1/4-28 barbed adapters, found on page 58.



Biocompatible



P-733
PEEK Shut-Off Valve



P-783
ETFE Shut-Off Valve

	Part No.	Material	OD Tubing	Thru-hole	Internal Volume*	Includes
	SHUT-OFF VALVES					
	P-721	ETFE, Natural	1/8"	0.040" (1.0 mm)	10.0 µL	(2) P-335, (2) P-300N
★	**P-732**	PEEK, Natural	1/16"	0.020" (0.5 mm)	2.5 µL	(2) XP-235
★	**P-733**	PEEK, Natural	1/8"	0.040" (1.0 mm)	10.0 µL	(2) XP-335
★	**P-782**	ETFE, Blue	1/16"	0.020" (0.5 mm)	2.5 µL	(2) XP-235
★	**P-783**	ETFE, Blue	1/8"	0.040" (1.0 mm)	10.0 µL	(2) XP-335

** Maximum internal volume, with valve fully open.*

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Micro-Splitter Valves

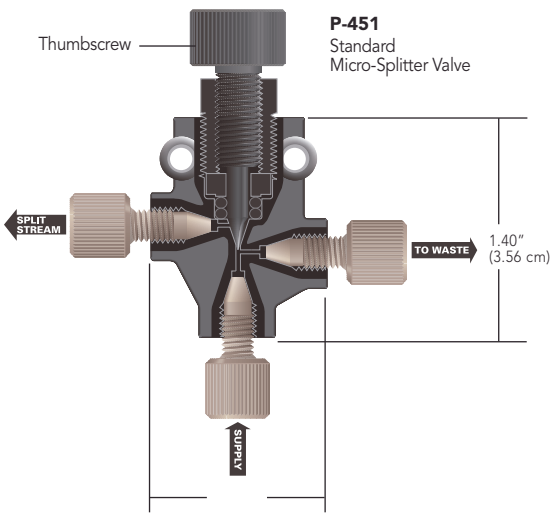
- For interfacing LC-MS systems
- Adjustable split stream flow rates
- Versions for up to 800 psi (55 bar) and up to 4,000 psi (276 bar)

The Upchurch Scientific® line of Micro-Splitter Valves is designed to accurately split and control a low-flow stream off a single incoming supply.

Choose between 1/4-28 flat-bottom and 10-32 coned threaded versions.

The High Pressure Micro-Splitter Valves are designed to operate successfully up to 4,000 psi (276 bar) and the standard Micro-Splitter valves are pressure rated to 800 psi (55 bar).

The Graduated Valve offers many of the benefits and features of Micro-Splitter Valves, plus the ability to adjust and set the split flow to repeatable settings. This allows documentation of settings and the resulting flow rates for easier method development. The graduations also make it easier to employ the valve in a system used to run multiple analyses that require different split flow rates.



APPLICATION NOTE

- With an incoming flow rate of 1 mL/min using room temperature water and equal pressures on both outlet lines, the minimum split flow rate is 2 µL/min for the standard micro-splitter valves and 4.8 µL/min for the high pressure micro-splitter valves.
- All Micro-Splitter Valves have been tested at flow rates to 100 mL/min, with a maximum resulting pressure drop of only 45 psi (3.1 bar) when the valve is fully opened.

SPECIFICATIONS & DETAILS

Part No.	Valve Type	Threads	Internal Volume[1] (closed/fully open)	Max. Operating Pressure
P-450	Standard	1/4-28	2.1 / 4.1 µL	800 psi (55 bar)
P-451	Standard	10-32	1.2 / 2.8 µL	800 psi (55 bar)
P-460S, T	High Pressure	10-32	1.2 / 2.8 µL	4,000 psi (276 bar)
P-470	High Pres. Graduated	10-32	1.2 / 2.8 µL	4,000 psi (276 bar)

[1] The supply and waste port thru-holes have IDs of 0.020" (0.50 mm). The ID for the split-stream port thru-hole is 0.020" (0.50 mm) in standard versions; in capillary versions it is 0.010" (0.25 mm).

Part No.	Description	Includes
MICRO-SPLITTER VALVES		
P-450	Standard, 1/4-28, Biocompatible	(3) XP-235
P-451	Standard, 10-32, Biocompatible	(3) F-120
P-460S	High Pressure, 10-32, with Stainless Steel Needle	(3) F-120
P-460T	High Pressure, 10-32, with Titanium Needle	(3) F-120
GRADUATED MICRO-SPLITTER VALVES		
★ **P-470**	High Pressure Graduated, 10-32, with Stainless Steel Needle	(3) F-120

** Use with the MicroTight Tubing Sleeves, found on page 19.*

Micro-Metering Valves

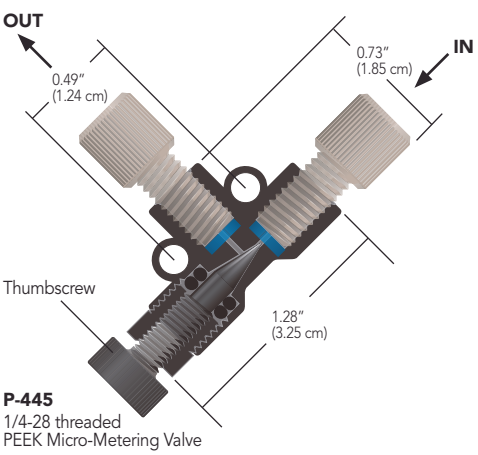
- Flow rates as low as 3.5 µL/min*
- 1/4-28 flat-bottom and 10-32 coned designs available
- Materials of construction: PEEK, PTFE

For fine control of fluid flow rates, Micro-Metering Valves can reduce outgoing flow to as low as 3.5 µL/min*. These needle valves are perfect for use with peristaltic pump fluid-transfer applications, mass spectrometry, and fraction collection.

Upchurch Scientific® Micro-Metering Valves can also be used to regulate gas flow in helium sparging lines and as a flow-dependent variable back pressure regulator. For flow independent regulation of back pressure, please see pages 152–153.

Flow path materials are PEEK polymer and PTFE. All versions of this valve have 0.020" (0.50 mm) thru-holes.

**At 1.0 mL/min incoming flow rate with room temperature water.*



P-445
1/4-28 threaded
PEEK Micro-Metering Valve

APPLICATION NOTE

Back Pressure Considerations

The Micro-Splitter Valves are designed to work when both effluent flow path pressures are nearly identical. However, the split flow path will often have higher back pressure than the waste flow path, making it hard to achieve any split flow at all. There are two possible solutions. Place a back pressure regulator (see pages 152–153) on the waste flow path that is equal to or slightly greater than the pressure on the split flow path. Or, switch the two effluent pathways such that the split flow pathway is attached to the "waste" port on the valve and the waste flow pathway is attached to the "split" port on the valve. *(Please Note: This second method may result in a loss of adjustment sensitivity.)*

Prime/Purge Valve

Air within the pump head can cause noisy pump operation and flow instability. Solve this problem by placing a High Pressure Micro-Splitter Valve (page 146) inline between the pump and the injector valve. You can then safely divert pump flow to a waste container at a sufficient rate to dislodge the air. Remove air from the solvent line leading to the pump with a Prime/Purge Valve (page 155).

Multi-Column and Detector Systems

Does your work require analyses with multiple columns and detectors that use the same mobile phase? If so, install one of our High Pressure Micro-Splitter Valves after your injector. A single injection can then be split to two separate columns and detector systems, at two different flow rates. This economical set-up eliminates the need for an additional pump and injector valve, while allowing data to be obtained simultaneously.

Post-Detector Interfacing

Use a Standard Micro-Splitter Valve to route fluid exiting an initial detector to other devices, such as a mass spectrometer and a fraction collector. The valve will split and reduce the flow rate to that required for MS interfacing, while diverting the remainder of the flow to the collector (a back pressure regulator may also be required for this set up, available on pages 152–153).

Other Applications

These valves are also suited for other applications, such as adapting a standard HPLC system to handle microbore analyses. For more information and plumbing diagrams for this application and those listed above, please contact your local distributor or IDEX Health & Science directly.

	Part No.	Material	OD Tubing	Thru-hole	Internal Volume*	Includes
	MICRO-METERING VALVES					
	P-445	PEEK, Black	1/16"	0.020" (0.50 mm)	7.7 µL	(2) XP-230
★	**P-446**	PEEK, Black	1/16"	0.020" (0.50 mm)	7.2 µL	(2) F-120
	P-447	PEEK, Black	1/8"	0.020" (0.50 mm)	7.7 µL	(2) XP-330

** Maximum internal volume, with valve fully open.*

CHECK VALVES & PRESSURE REGULATORS

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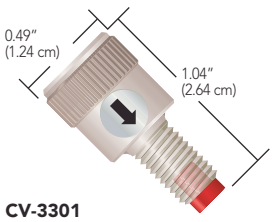
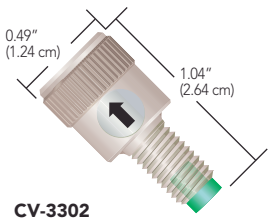
Standard 1/4-28 Inline Check Valves

- Add back-flow protection to any 1/4-28 flat-bottom port
- 15 psi (1 bar) and 3 psi (0.2 bar) cracking pressure versions
- Excellent chemical resistance
- Materials of construction: PEEK; PCTFE; perfluoroelastomer; PTFE (CV-3301 and CV-3302); stainless steel (CV-3301 and CV-3302); or gold-plated stainless steel (CV-3315 and CV-3316)

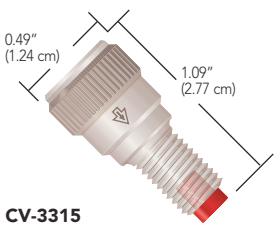
Connect these Upchurch Scientific® Inline Check Valves to any 1/4-28 flat-bottom port. Then thread your 1/4-28 flat-bottom fitting into the check valve to connect the tubing. Once installed, the spring-actuated sealing system eliminates back flow, helping to prevent upstream contamination or damage. In addition, the unique design of this product eliminates the additional tubing cuts and connections required to install conventional inline check valves.



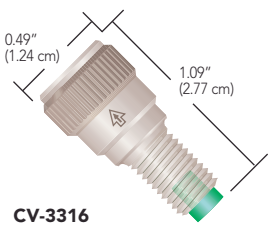
CV-3301
Standard, Inlet
1/4-28 FB Male to 1/4-28 FB Female
15 psi (1 bar) cracking pressure



CV-3302
Standard, Outlet
1/4-28 FB Male to 1/4-28 FB Female
15 psi (1 bar) cracking pressure



CV-3315
Standard, Inlet
1/4-28 FB Male to 1/4-28 FB Female
3 psi (0.2 bar) cracking pressure

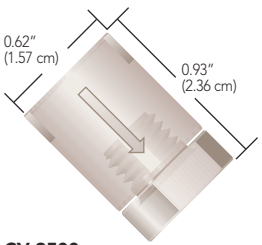


CV-3316
Standard, Outlet
1/4-28 FB Male to 1/4-28 FB Female
3 psi (0.2 bar) cracking pressure

Nonmetallic 10-32 Micro-Volume Inline Check Valve

- Cracking pressure of 8 psi (0.6 bar)
- Excellent chemical resistance
- Materials of construction: PEEK and perfluoroelastomer, suitable for biological applications

With a swept volume of only 7.4 µL, the Upchurch Scientific Inline Micro-Volume Check Valve is perfect for applications where low flow path volume is critical, such as delivery to lab-on-a-chip, single-cell analysis and micro- or nano-LC post-column derivatization. Once installed, this check valve helps prevent back flow and the potential for contamination or damage to sensitive upstream equipment.



CV-3500
Micro-Volume Inline
10-32 C Female to 10-32 C Female

NOTE

Check valves are specified by:

- **Cracking Pressure:** the pressure required for the valve to open in the direction of the arrow.
- **Maximum Pressure:** the maximum pressure the valve can experience in the reverse direction without leaking backwards.
- **Back Pressure Created:** the amount of back pressure generated by the check valve with 50 mL/min room temperature water flowing in the direction of the arrow.

SPECIFICATIONS & DETAILS

	Swept Volume	Thru-Hole	Max. Pressure Rating	Back Pressure Created	Cracking Pressure Tolerance
Standard 1/4-28 FB					
CV-3301, CV-3302	20 µL	0.020" (0.50 mm)	2,000 psi (138 bar)	45 psi (3.1 bar)	± 5 psi (0.34 bar)
CV-3315, CV-3316	16 µL	0.020" (0.50 mm)	2,000 psi (138 bar)	10 psi (0.7 bar)	± 1.5 psi (0.10 bar)
Nonmetallic 10-32 Coned Micro-Volume					
CV-3500	7.4 µL	0.010" (0.25 mm)	3,000 psi (207 bar)	25 psi (1.7 bar)	± 5 psi (0.34 bar)

Part No.	Description	Cracking Pressure
STANDARD 1/4-28 INLINE CHECK VALVES		
CV-3301	Inlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	15 psi (1 bar)
CV-3302	Outlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	15 psi (1 bar)
★ **CV-3315**	Inlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	3 psi (0.2 bar)
CV-3316	Outlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	3 psi (0.2 bar)
NONMETALLIC 10-32 MICRO-VOLUME INLINE CHECK VALVE		
CV-3500	Inlet/Outlet Check Valve, 10-32 C, F to 10-32 C, F*	8 psi (0.6 bar)

** M = Male (external) threads; F = Female (internal) threads; C = Coned; FB = Flat-Bottom*

RELATED PRODUCTS

- 1/4-28 Inline Check Valves and Non-Metallic Check Valves with 1/4-28 flat-bottom ports (next page) can be used with any 1/4-28 Flangeless, Super Flangeless™, and VacuTight™ fitting on pages 21–28 of the Fittings Chapter.
- Micro-Volume Inline Check Valves and Non-Metallic Check Valves with 10-32 coned ports (next page) can be used with any 10-32 polymer Fingertight or SealTight™ fitting on pages 11–15. Connect capillary tubing using the optional ferrules listed on page 15 or the NanoTight™ Fittings and Tubing Sleeves on page 17.

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Nonmetallic 1/4-28 & 10-32 Inline Check Valves

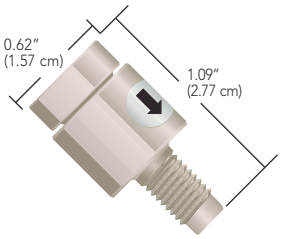
- Low cracking pressure of 1 psi (0.07 bar)
- Multiple configurations for different applications
- Excellent chemical resistance
- Materials of construction: PEEK and perfluoroelastomer

Upchurch Scientific® Nonmetallic Inline Check Valves provide excellent backflow protection for sensitive equipment along with outstanding chemical resistance guaranteed by the PEEK polymer and perfluoroelastomer construction. Metal-free composition makes these check valves perfect for use with corrosive fluids or biological samples.

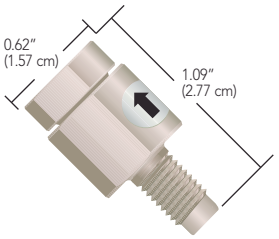
These check valves function well up to moderately-high pressure applications. Low internal volume also allows them to be used in areas where flow path volume is important; however, higher flow rates can pass through with minimal pressure drop.

NOTE

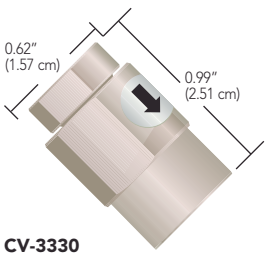
Upon initial use — or following a period of extended inactivity — the cracking pressure for these check valves may be somewhat higher than the stated cracking pressure.



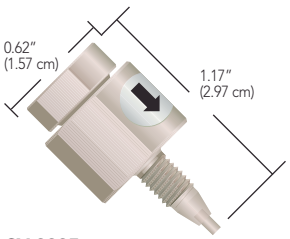
CV-3320, CV-3322, CV-3324
Nonmetallic, Inlet
1/4-28 FB Male to 1/4-28 FB Female



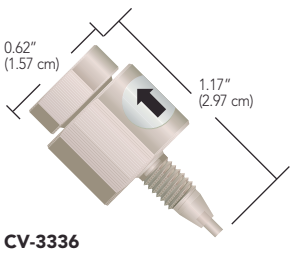
CV-3321, CV-3323, CV-3325
Nonmetallic, Outlet
1/4-28 FB Male to 1/4-28 FB Female



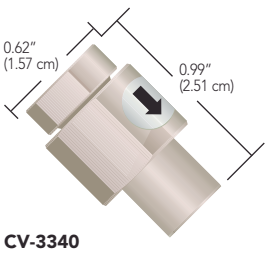
CV-3330
Nonmetallic, Inline
1/4-28 FB Female to 1/4-28 FB Female



CV-3335
Nonmetallic, Inlet
1/4-28 FB Female to 10-32 C Male



CV-3336
Nonmetallic, Outlet
1/4-28 FB Female to 10-32 C Male



CV-3340
Nonmetallic, Inline
10-32 C Female to 10-32 C Female

APPLICATION NOTE

- The CV-3320 or CV-3321 style can be connected to any 1/4-28 flat-bottom port for trouble-free back flow protection.
- When using a pump after the analytical column, consider placing a CV-3330 Check Valve after the column to prevent fluid from the post-column pump from flowing backwards through the column. This product also serves as an excellent nonmetallic alternative to our CV-3010 (page 151) in sparging applications where the mobile phase may be corrosive to the stainless steel or ethylene propylene components inside the CV-3010 assembly.
- The CV-3335 Inlet and CV-3336 Outlet Check Valves allow tubing larger than 1/16" OD (up to 1/8") to be connected into a 10-32 coned internal port. Use both of these check valves when attaching a larger-volume sample loop to an analytical-scale injection valve. This setup limits the flow of the sample into the loop to one direction, minimizing back flow and sample carry-over.
- The CV-3340 is useful in virtually any high pressure fluid pathway using 1/16" or smaller OD tubing, where limiting the direction of flow is desirable.

SPECIFICATIONS & DETAILS

	Swept Volume	Max. Pressure Rating	Back Pressure Created	Cracking Pressure Tolerance
CV-3320, CV-3321	37 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)
CV-3330	34 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)
CV-3335, CV-3336	49 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)
CV-3340	34 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)
CV-3322, CV-3323	49 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)
CV-3324, CV-3325	182 µL	2,000 psi (138 bar)	30 psi (2.1 bar)	± 0.5 psi (0.03 bar)

	Part No.	Description	Cracking Pressure	Thru-Hole
	NONMETALLIC 1/4-28 AND 10-32 INLINE CHECK VALVES			
★	**CV-3320**	Inlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.020" (0.50 mm)
★	**CV-3321**	Outlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.020" (0.50 mm)
	CV-3322	Inlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.040" (1.0 mm)
	CV-3323	Outlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.040" (1.0 mm)
	CV-3324	Inlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.060" (1.60 mm)
★	**CV-3325**	Outlet Check Valve, 1/4-28 FB, M to 1/4-28 FB, F*	1 psi (0.07 bar)	0.060" (1.60 mm)
	CV-3330	Inlet/Outlet Check Valve, 1/4-28 FB, F to 1/4-28 FB, F*	1 psi (0.07 bar)	0.020" (0.50 mm)
	CV-3335	Inlet Check Valve, 1/4-28 FB, F to 10-32 C, M*	1 psi (0.07 bar)	0.020" (0.50 mm)
★	**CV-3336**	Outlet Check Valve, 1/4-28 FB, F to 10-32 C, M*	1 psi (0.07 bar)	0.020" (0.50 mm)
	CV-3340	Inlet/Outlet Check Valve, 10-32 C, F to 10-32 C, F*	1 psi (0.07 bar)	0.020" (0.50 mm)

** M = Male (external) threads; F = Female (internal) threads; C = Coned; FB = Flat-Bottom*

Quick-Stop Luer Inline Check Valve

- Check valve protection with luer convenience
- Remains open when engaged
- Materials of construction: PEEK, perfluoroelastomer, and gold-plated stainless steel spring

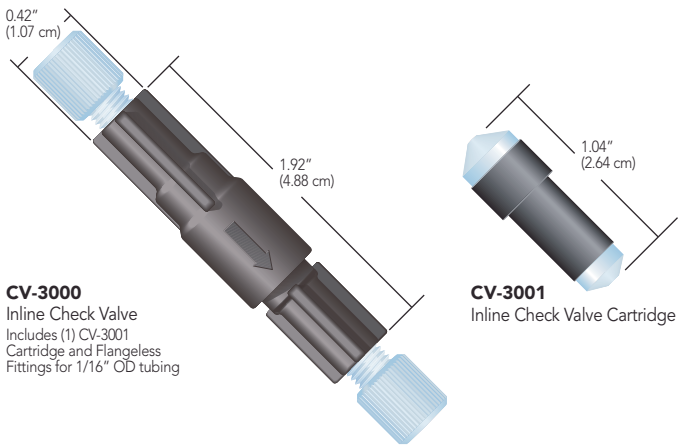
The Quick-Stop Luer Check Valve is designed to provide inline luer connect/disconnect convenience without the mess and hazard of spills. Just connect the valve assembly to your inline tubing using standard 1/4-28 flat-bottom fittings (see pages 22–29). The check valve is automatically opened once the luer connection is engaged, allowing flow in either direction. Disconnecting the luer union causes the check valve to close. Please see the "Application Note" on this page for specific ideas regarding use of this valve.

P-696 Quick-Stop Luer Check Valve Assembly.

Inline Cartridge Check Valves

- Low cracking pressures
- Less than 150 µL internal volume
- Materials of construction: PEEK; perfluoroelastomer (CV-3001); gold-plated stainless steel spring (CV-3001); ethylene propylene (CV-3011); and stainless steel spring (CV-3011)

Upchurch Scientific® cartridge-style Inline Check Valves are designed to limit flow to one direction. These assemblies withstand system pressures of 1,000 psi (69 bar). The cracking pressures for the Inline Check Valve Cartridges are 1.5 psi (0.1 bar) for the CV-3001 and 3 psi (0.2 bar) for the CV-3011. Tolerance on the cracking pressure for CV-3001 is ± 0.5 psi (0.03 bar) and ± 1.5 psi (0.1 bar) on CV-3011.



CV-3000
Inline Check Valve
Includes (1) CV-3001 Cartridge and Flangeless Fittings for 1/16" OD tubing

CV-3001
Inline Check Valve Cartridge

APPLICATION NOTE

Inlet Solvent Reservoir:

Quickly change your solvent on the low pressure end of an HPLC system, while preventing potentially hazardous spills! Just install a Quick-Stop Luer Check Valve Assembly between your solvent reservoir and the pump, with the valve towards the bottle. The valve will prevent solvent leakage from the line coming from the reservoir, while the check valves in your pump prevent spills from the line leading to the pump. With both lines still full of solvent, this system also helps reduce the need to reprime your pump.

FIA Sample Injection:

The Quick-Stop Luer Check Valve provides a practical means to introduce a sample into FIA and other low pressure systems, when used in conjunction with a P-612 Pressure Relief Valve Tee (page 154). Simply connect the Tee into the appropriate flow path line with the included fittings and thread the P-697 Quick-Stop Luer Valve onto the 1/4-28 male end of the Tee. Sample can then be introduced conveniently by using a standard luer-tipped syringe. The check valve is automatically opened when the syringe is attached and closed when the syringe is removed.

Post Column Derivitization:

For post-column derivitization, place a CV-3000 Inline Check Valve on the effluent side of your column to prevent derivatizing agents from flowing backwards and poisoning the column. Placement on the post-column reagent line will also prevent mobile phase from contaminating the reagent if the auxiliary pump fails.

Helium Sparging Tank Protection:

Try the CV-3010 Assembly, designed specifically for degassing (sparging) lines to prevent solvent backup if the sparging gas runs out. This check valve will help prevent potential solvent cross-contamination and damage to the gas regulating valve.

	Part No.	Description	Includes	Swept Volume
	QUICK-STOP LUER CHECK VALVE			
	P-696	Quick-Stop Luer Check Valve Assembly	(1) P-697, (1) P-655	127 µL
★	**P-697**	Quick-Stop Luer Check Valve		107 µL
	P-698	Bulkhead Quick-Stop Luer Valve Assembly	(1) P-699, (1) P-655, (1) nut/lock washer set	127 µL
	P-699	Bulkhead Quick-Stop Luer Valve	(1) nut/lock washer set	107 µL
	INLINE CARTRIDGE CHECK VALVES			
★	**CV-3000**	Inline Check Valve Assembly for 1/16" OD tubing	(1) CV-3001, (2) XP-215	96 µL
	CV-3001	Inline Check Valve Cartridge for CV-3000		91 µL
	CV-3010	Inline Check Valve Assembly for 1/8" OD tubing	(1) CV-3011, (2) XP-315	100 µL
	CV-3011	Inline Check Valve Cartridge for CV-3010		92 µL

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Back Pressure Regulators (BPRs)

- Proven outgassing protection
- Flow-independent pump preload for greater pump efficiency
- 5 to 1,000 psi cartridges and assemblies available

Back Pressure Regulators are designed to enhance system performance through outgassing prevention and improved pump check valve efficiency.

Upchurch Scientific® back pressure regulators include:

- 5 and 20 psi assemblies (replacement cartridges not available)
- 40, 75, 100, 250, 500, 750, and 1,000 psi cartridges and assemblies
- PEEK and stainless steel BPR holders
- High pressure adjustable BPR for pressures between 2,000 and 5,000 psi
- Ultra low volume BPRs set to 100 and 500 psi (page 154)

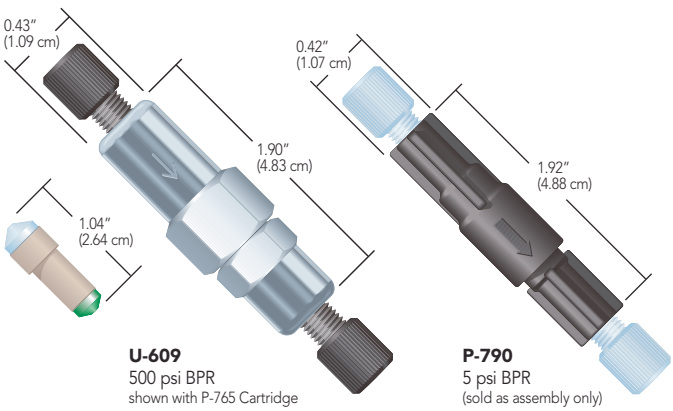
For flow control options try the Micro-Metering Valves found on page 147.

Biocompatible Back Pressure Regulator Holder, shown with available Cartridges

BPR Assemblies

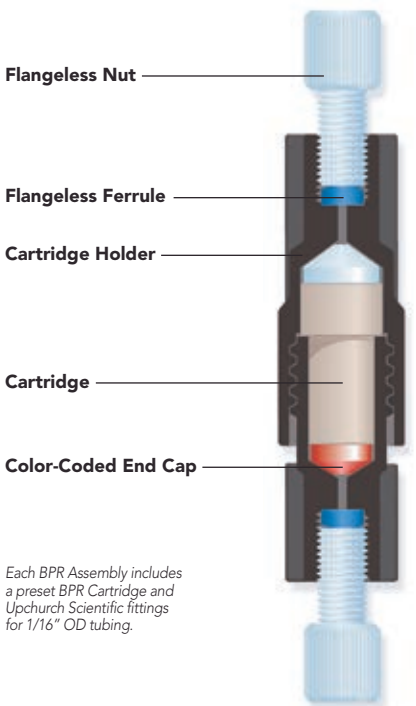
Choose from our line of Biocompatible and Stainless Steel BPR Assemblies, each complete with a replaceable, factory preset cartridge (except the 5 and 20 psi versions).

Upchurch Scientific BPR Assemblies create incremental back pressures ranging from 5 to 1,000 psi (0.3 to 69 bar). The Biocompatible BPR Assemblies feature a PEEK holder; polymer-based fittings; biocompatible BPR cartridges and wrenches for tightening. Stainless Steel BPR Assemblies feature the same biocompatible BPR cartridges with a 316 stainless steel holder and polymer fittings.



U-609
500 psi BPR
shown with P-765 Cartridge

P-790
5 psi BPR
(sold as assembly only)



Each BPR Assembly includes a preset BPR Cartridge and Upchurch Scientific fittings for 1/16" OD tubing.

APPLICATION NOTE

Small gas bubbles often form as solvent moves from the high pressure of an HPLC column to the low pressure environment leading to the detector. This outgassing can cause erratic baseline readings and loss of sensitivity. Placing an Upchurch Scientific BPR (usually a 40–100 psi) after the detector provides an excellent, low-cost method for reducing this problem by maintaining enough back pressure on the mobile phase to keep gases dissolved in solution.

A back pressure regulator can also be used as a pump preload for low and fluctuating pressure applications. Many of today's pumps require a steady back pressure to function properly. Install an Upchurch Scientific BPR (usually 500–1,000 psi) between the pump and the injector to enhance pump performance.

Caution: Do not exceed the maximum operating pressure of your system — please refer to the operating manuals for your system components before choosing the appropriate BPR.

Replacement Back Pressure Regulator (BPR) Cartridges

- Materials of construction: PEEK, ETFE, perfluoroelastomer, and gold-plated stainless steel

These replacement cartridges will operate in any of the standard BPR holders shown on this page. These cartridges create back pressures from 40 to 1,000 psi (2.8 to 69 bar)—all independent of flow except as noted below.

The recommended operating flow rate range for our BPR Cartridges is 0.1 mL–10 mL/min. Within this range, the amount of back pressure created by the BPR Cartridges and Assemblies will not vary more than ±10%. Lower or higher flow rates may result in larger pressure fluctuations.

P-761
40 psi BPR Cartridge

P-796
1,000 psi BPR Cartridge

BPR Holders

Upchurch Scientific® P-465 PEEK and U-469 Stainless Steel BPR Holders work with any of our replacement BPR Cartridges. Each holder comes with fittings for 1/16" OD tubing (see below). The U-469 Holder is surface-treated to prevent galling, a potential problem with large, threaded metal parts.

Please Note: These Back Pressure Regulator Holders are designed to allow each cartridge to operate at its stated pressure setting when tightened to 20 in–lbs. of torque. To approximate this level of torque, first finger tighten the Holder, then tighten an additional 1/8–1/4 turn with the supplied wrenches.

Pressure Rating 3,000 psi (207 bar)*

* *Using PEEK tubing and supplied fittings.*

Pressure Rating 4,000 psi (276 bar)**

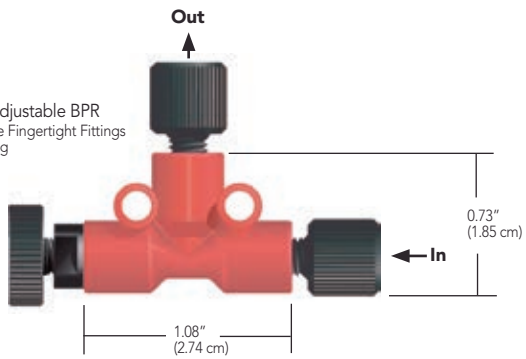
** *Using stainless steel tubing and supplied fittings.*

High Pressure Adjustable BPR

- Materials of construction: PEEK, perfluoroelastomer, and PTFE

The biocompatible P-880 High Pressure Adjustable BPR offers the flexibility to adjust your system back pressure between 2,000 and 5,000 psi (138 and 345 bar), independent of the flow. Only 10% fluctuation in pressure generally occurs with flow rates of 0.1–10 mL/min. Lower or higher flow rates will lead to greater fluctuations in pressure. To achieve the desired back pressure setting, simply turn the thumbscrew while monitoring your system pressure. Because this product creates such high back pressure, please check system component specifications prior to using to avoid damaging any sensitive components.

P-880
High Pressure Adjustable BPR
Includes One-Piece Fingertight Fittings for 1/16" OD tubing



	Part No.	Pressure Setting	Holder Material	Includes	Swept Volume
	BPR ASSEMBLIES				
	P-790	5 psi (0.3 bar)	PEEK	(2) XP-215	134 µL
★	**P-791**	20 psi (1.4 bar)	PEEK	(2) XP-215	134 µL
★	**P-785**	40 psi (2.8 bar)	PEEK	(1) P-761, (2) XP-215	131 µL
★	**P-786**	75 psi (5.2 bar)	PEEK	(1) P-762, (2) XP-215	131 µL
★	**P-787**	100 psi (7 bar)	PEEK	(1) P-763, (2) XP-215	131 µL
	P-788	250 psi (17 bar)	PEEK	(1) P-764, (2) XP-235	102 µL
	P-789	500 psi (34 bar)	PEEK	(1) P-765, (2) P-250, (2) LT-115	96 µL
	P-455	1,000 psi (69 bar)	PEEK	(1) P-796, (2) P-250, (2) LT-115	89 µL
	U-605	40 psi (2.8 bar)	SST	(1) P-761, (2) XP-201	129 µL
	U-606	75 psi (5.2 bar)	SST	(1) P-762, (2) XP-201	129 µL
★	**U-607**	100 psi (7 bar)	SST	(1) P-763, (2) XP-201	129 µL
	U-608	250 psi (17 bar)	SST	(1) P-764, (2) XP-201	99 µL
	U-609	500 psi (34 bar)	SST	(1) P-765, (2) XP-201	93 µL
	U-610	750 psi (52 bar)	SST	(1) P-795, (2) P-250, (2) LT-115	91 µL
	REPLACEMENT CARTRIDGES				
			COLOR CODING		
	Part No.	**Pressure Setting**	**Body**	**End-Cap**	**Swept Volume**
	P-761	40 psi (2.8 bar)	Tan	Blue	125 µL
	P-762	75 psi (5.2 bar)	Tan	Yellow	125 µL
★	**P-763**	100 psi (7 bar)	Tan	Red	125 µL
	P-764	250 psi (17 bar)	Tan	White	95 µL
	P-765	500 psi (34 bar)	Tan	Green	89 µL
	P-795	750 psi (52 bar)	Black	Blue	87 µL
	P-796	1,000 psi (69 bar)	Black	Green	83 µL
	BPR HOLDERS				
	Part No.	**Holder Style**	**Holder Material**	**Includes**	**Swept Volume**
	P-465	Biocompatible BPR	PEEK	(2) P-250, (2) LT-115	7 µL
	U-469	High Pressure BPR	SST	(2) F-300	4 µL
	HIGH PRESSURE ADJUSTABLE BPR ASSEMBLY				
★	**P-880**	2,000–5,000 psi (138-345 bar)		(2) F-120BLK	9 µL

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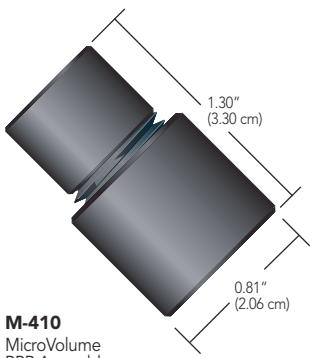
Ultra-Low Volume Back Pressure Regulators (BPR)

- Wetted flow path materials: PEEK, perfluoroelastomer, and ETFE
- Available pressure settings of 100 or 500 psi (7 or 34 bar)
- Low swept volume of only 6 µL

Ultra-Low Volume Back Pressure Regulators (BPRs) were developed to minimize swept volume, which is especially important for multi-detector applications. With a maximum swept volume of only 6 µL*, it is nearly impossible to detect these BPRs as part of your fluid pathway. To minimize the swept volume added to your flow path, we recommend trimming the length of the attached tubing. And because the flow path is completely polymeric, you are assured of biocompatibility.

Please Note: Our Ultra-Low Volume Back Pressure Regulators cannot be used as check valves due to their unique internal design. Try our Micro-Volume Inline Check Valve on page 149.

** The maximum internal swept volume listed above is for the back pressure regulator only and does not include the volume of the attached tubing lines.*



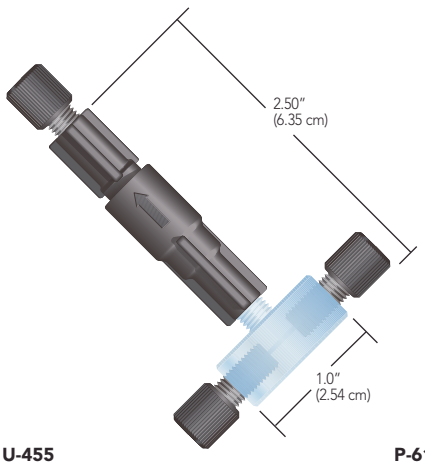
M-410
MicroVolume
BPR Assembly
Attached tubing not shown

Pressure Relief Valves

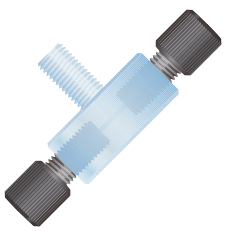
- Prevent system over-pressurization

Upchurch Scientific® Pressure Relief Valves are ideal for preventing system over-pressurization. These products protect system components by diverting fluid flow automatically when inline pressure exceeds the set limit. Choose between preset 100 psi (7 bar) and 5 psi (0.3 bar) assemblies, both shipped with Flangeless Fittings. The 100 psi version is a good, general purpose valve, while the 5 psi version is perfect for protecting syringe and peristaltic pump systems (see pages 93–108). The void volume of both relief valves is low due to the small 0.020" (0.50 mm) thru-holes in the valve tee body.

If you wish to have the Pressure Relief Valve open at a different pressure than 5 or 100 psi, simply combine one of the other replacement Back Pressure Regulator Assemblies listed on page 152 with the P-612 Pressure Relief Valve Tee. Choose the P-612S for larger bore tubing and higher flow applications.



U-455
Pressure Relief Valve
Includes Flangeless Fittings
for 1/16" OD tubing
(Drawing is not actual size)



P-612
Pressure Relief Valve Tee
Includes Flangeless Fittings
for 1/16" OD tubing
(Drawing is not actual size)

SPECIFICATIONS & DETAILS

	Back Pressure Setting psi (bar)	Flow Rate Recommendations	Recommended Pressure Range psi (bar)	1/16" OD Tubing
M-410	100 [2] (7)[2]	Optimal: 100 µL–1 mL/min Max.: 4 mL/min	40–150 (3–10)	PEEK, 0.010" ID
M-412	500 [2] (34)[2]	Optimal: 100 µL–1 mL/min Max.: 4 mL/min	250–525 (17–36)	PEEK, 0.010" ID
M-420	100 [3] (7)[3]	Optimal: 3–8 mL/min Max.: 10 mL/min	40–150 (3–10)	PEEK, 0.020" ID

[1] All data generated using water at room temperature.
[2] Set at a flow rate of 0.5 mL/min.
[3] Set at a flow rate of 5 mL/min.

	Part No.	Description	Pressure Setting	Tubing OD	Includes	Swept Volume
	ULTRA-LOW VOLUME BPRs					
	M-410	Low Flow	100 psi (7 bar)	1/16"	XP-230	6 µL
★	**M-412**	Low Flow	500 psi (34 bar)	1/16"	XP-230	6 µL
	M-420	High Flow	100 psi (7 bar)	1/16"	XP-230	6 µL
	PRESSURE RELIEF VALVES					
	U-455	Pressure Relief Assembly	5 psi (0.3 bar)	1/16"	XP-201	148 µL
★	**U-456**	Pressure Relief Assembly	100 psi (7 bar)	1/16"	XP-201, wrenches	139 µL
★	**P-612**	Pressure Relief Tee		1/16"	XP-201	14 µL
	P-612S	Pressure Relief Tee		3/16"	XP-201	348 µL

Prime/Purge Valve for Waters® Pumps

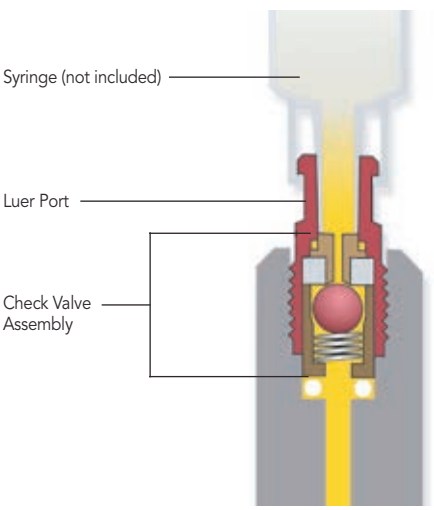
- Automatic valve operation with a simple twist of a luer lock syringe
- No tubing to cut or ferrules to swage
- No wear on the internal seal
- Materials of construction: ruby, sapphire, PEEK, PTFE, and stainless steel

The Upchurch Scientific® Prime/Purge Valve for Waters pumps automatically opens when a luer syringe is attached and closes when the syringe is removed. No valve rotation is required after the initial installation, so wear on the internal seal is eliminated.

In addition, our Waters-compatible Prime/Purge Valve is simpler to operate and more economically priced than alternative valves available for Waters systems.

A Waters-compatible internal PTFE seal is included with the valve. This seal can also be purchased separately. It can be used both with the Upchurch Scientific valve and the original valve supplied with the pump.

Attaching/Removing the Syringe Automatically Opens and Closes the Valve

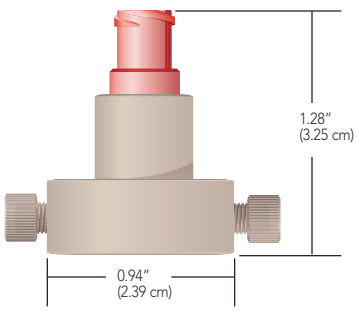


Universal Prime/Purge Valve

- For any style HPLC system
- Automatic luer syringe operation
- Featuring handy mounting holes
- Materials of construction: ruby, sapphire, PEEK, PTFE, and stainless steel

The Upchurch Scientific Universal Prime/Purge Valve is easy to operate. Simply install a valve along the flow path with the included fittings and attach a luer-tipped syringe. Then, withdraw the plunger and watch as solvent and residual bubbles are removed from the solvent line. The valve automatically closes when the syringe is removed.

The valve is designed to be used with 1/8" OD tubing. Optional mounting is made easy by the handy holes in the body of each unit.



V-321
Universal Prime/Purge Valve
Mounting holes are 0.75" (1.91 cm) apart

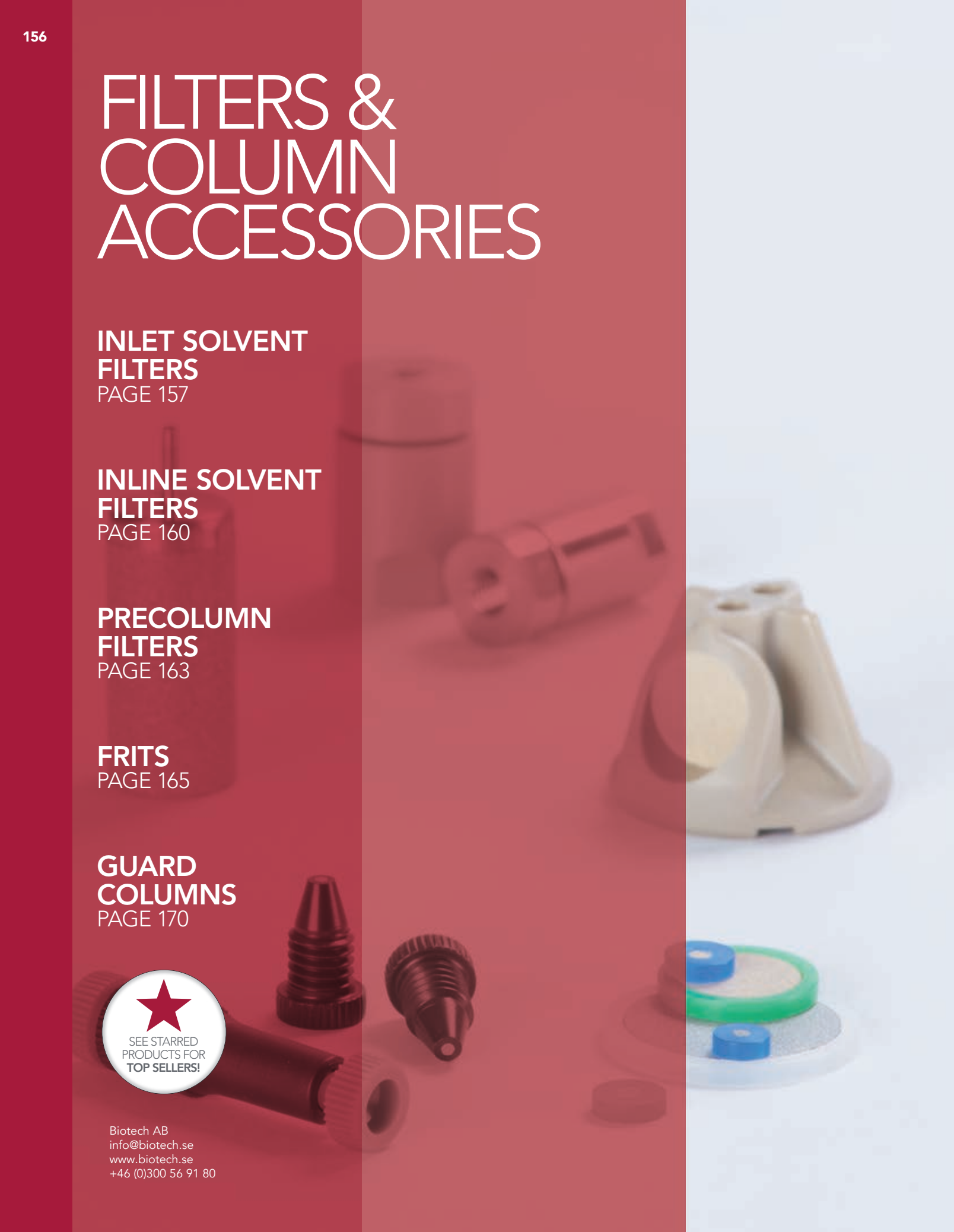
APPLICATION NOTE

Air in the Inlet Solvent Line

Install the Low Pressure Universal Prime/Purge Valve along the inlet solvent path near the pump to remove bubbles from the inlet solvent line. The valve can also be used to rapidly "wet" your solvent inlet filter. When a new filter is installed, it often contains a substantial amount of air within its pores. At standard flow rates, it may require several minutes before the inlet fluid pathway is completely free of gas. Using this valve you are able to rapidly draw solvent through the inlet filter, dislodging the gas and minimizing downtime.

Part No.	Description	Includes
PRIME/PURGE VALVES		
B-310	10 cc Disposable Luer-Tipped Syringe	
V-320	Prime/Purge Valve for Waters Pumps	(1) V-320-06
V-320-06	Replacement PTFE Seal (for V-320)	
V-321	Universal Prime/Purge Valve	(2) P-300N, (2) P-335

FILTERS & COLUMN ACCESSORIES



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General Use Inlet Solvent Filters

- Large surface areas prevent pump cavitation
- Disposable
- 2 µm, 10 µm, and 20 µm pore sizes available
- General use and prep filters for higher flow applications

It is good practice to filter your solvents to prevent pump damage. Upchurch Scientific® 316 stainless steel filters provide that protection.

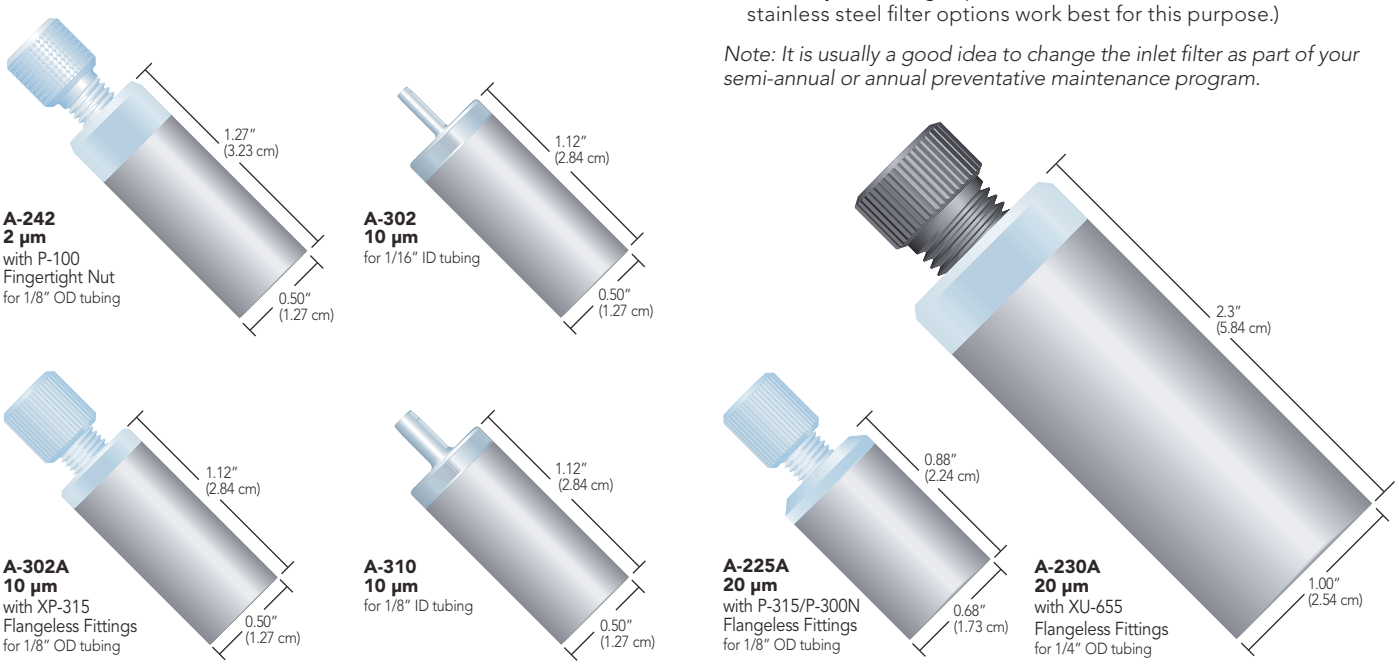
Because filters should be changed periodically, we make it easy to replace them without tools. For those filters using a plastic fitting, the tubing can be reconnected by finger tightening the fitting into the new filter. The filters with stems allow easy insertion into the inlet tubing.

APPLICATION NOTE

Why Use An Inlet Solvent Filter?

- To filter out particulate matter from the solvent that may otherwise damage expensive hardware. (Use a 10 µm or 20 µm version for this purpose. The A-309 and A-230A filters have an added "Bottom of the Bottle™" feature to help draw solvent to within 1/8" of the bottom of your solvent bottle.)
- To prevent particulates originating from the sparging system from entering the mobile phase reservoir and to help disperse the sparging gas efficiently. (Use a 2 µm filter for this purpose.)
- To hold your tubing in place at the bottom of the bottle. (Most stainless steel filter options work best for this purpose.)

Note: It is usually a good idea to change the inlet filter as part of your semi-annual or annual preventative maintenance program.



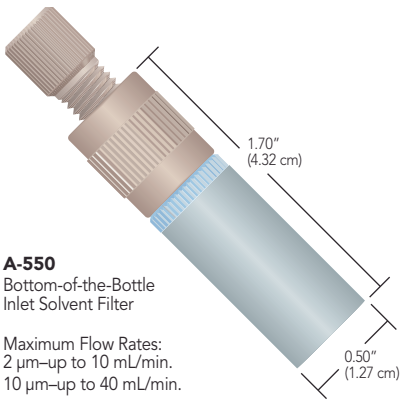
	Part No.	Description	Porosity	Material	For Tubing Size	Includes	Max. Suggested Flow Rate*
	GENERAL USE INLET SOLVENT FILTERS						
	For Analytical HPLC						
	A-242	Inlet Solvent Filter with One-Piece Fitting	2 µm	PCTFE, SST	1/8" OD	(1) P-100	10 mL/min
	A-243	A-242, 5-pack	2 µm	PCTFE, SST	1/8" OD	(5) P-100	10 mL/min
	A-228	Inlet Solvent Filter with stem	2 µm	SST	1/8" ID	—	80 mL/min
★	**A-302**	Inlet Solvent Filter with stem	10 µm	SST	1/16" ID	—	40 mL/min
★	**A-302A**	Inlet Solvent Filter with Flangeless Fittings	10 µm	PCTFE, SST	1/8" OD	(1) XP-315	40 mL/min
	A-309	Inlet Solvent Filter with stem	10 µm	SST	1/16" ID	—	40 mL/min
	A-231A	Inlet Solvent Filter with Flangeless Fittings	20 µm	PCTFE, SST	3/16" OD	(1) XP-132	100 mL/min
★	**A-310**	Inlet Solvent Filter with stem	10 µm	SST	1/8" ID	—	40 mL/min
	For Preparative HPLC Systems						
	A-225	Inlet Solvent Filter with stem	20 µm	SST	1/16" ID	—	100 mL/min
★	**A-225A**	Inlet Solvent Filter with Flangeless Fittings	20 µm	PCTFE, SST	1/8" OD	(1) P-315, (1) P-300N	100 mL/min
	A-227A	Inlet Solvent Filter with Flangeless Fittings	10 µm	PCTFE, SST	1/4" OD	(1) XU-655	100 mL/min
	A-230A	Inlet Solvent Filter with Flangeless Fittings	20 µm	PCTFE, SST	1/4" OD	(1) XU-655	100 mL/min
	A-311	Inlet Solvent Filter with stem	10 µm	SST	1/16" ID	—	100 mL/min
	A-311A	Inlet Solvent Filter with Flangeless Fittings	10 µm	PCTFE, SST	1/8" OD	(1) XP-315	100 mL/min

** Maximum suggested flow rates are determined by porosity and surface area.*

Stainless Steel Bottom-of-the-Bottle™ Solvent Filters

- Draws solvent from within 1/8" of the bottom of the bottle
- Replaceable stainless steel filter cups
- Versions for 1/8" and 3/16" OD tubing
- Materials of construction: PEEK, ETFE, and 316 Stainless Steel

Patented Stainless Steel Bottom-of-the-Bottle Solvent Filter Assemblies feature a 2 µm or 10 µm replaceable stainless steel filter cup and a design that allows solvent to be drawn from within 1/8" of the bottom of your solvent bottle. The filter cups are inexpensive and easy to replace, making this an economical, trouble-free choice.



A-550
Bottom-of-the-Bottle
Inlet Solvent Filter

Maximum Flow Rates:
2 µm–up to 10 mL/min.
10 µm–up to 40 mL/min.

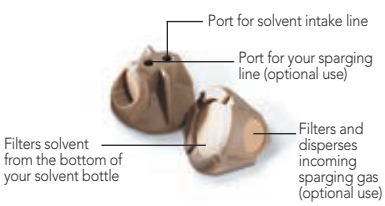
All-PEEK Bottom-of-the-Bottle Solvent Filters

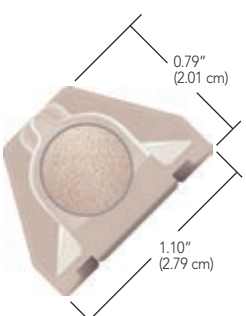
- Most recommended filtering unit
- 100% PEEK polymer construction
- Easy operation — no fittings required

Biocompatible

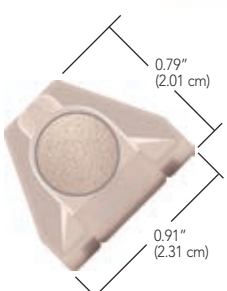
These biocompatible filters are made from 100% PEEK polymer, including the two built-in PEEK frits. The bottom frit (2 µm or 10 µm) will draw solvents from within 0.080" (2.0 mm) of the bottom of the solvent bottle. The 2 µm frit on the side may be used for a 1/8" OD helium sparging line.

To use, simply press fit your appropriately sized fluoropolymer tubing firmly into the top holes. That's it!





A-435
Bottom-of the-Bottle Filter



A-438
Bottom-of the-Bottle Filter
(for small neck bottles)

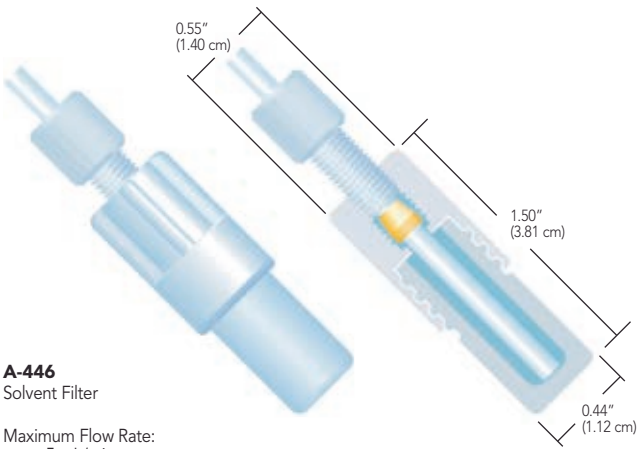
Maximum Flow Rate: up to 30 mL/min

UHMWPE Bottom-of-the-Bottle Solvent Filters

- Replaceable filter cup
- Economical
- Materials of construction: UHMWPE, ETFE
- Versions for 1/16" and 1/8" OD tubing

The design of the UHMWPE solvent filters allows tubing to pass through to the bottom of the filter cup, enabling the filter to draw solvent from within 0.10" (2.5 mm) of the bottom of your solvent bottle.

Please Note: UHMWPE is a hydrophobic material. To establish proper surface wetting, you may need to prime the filter with methanol or acetonitrile.



A-446
Solvent Filter

Maximum Flow Rate:
up to 5 mL/min

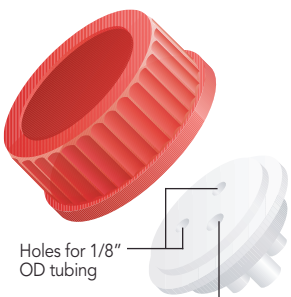
	Part No.	Description	Porosity	For Tubing Size	Includes
	STAINLESS STEEL BOTTOM-OF-THE-BOTTLE SOLVENT FILTERS				
★	**A-550**	SST Filter Assembly, with A-520 filter cup	10 µm	1/8" OD	(1) XP-130
	A-551	SST Filter Assembly, with A-522 filter cup	2 µm	1/8" OD	(1) XP-130
	A-520x	SST Replacement Solvent Filter Cups, 10-pk	10 µm	—	—
	A-522x	SST Replacement Solvent Filter Cups, 10-pk	2 µm	—	—
	ALL-PEEK BIOCOMPATIBLE BOTTOM-OF-THE-BOTTLE SOLVENT FILTERS				
	A-435	PEEK Filter	2 µm	1/8" OD	—
	A-437	PEEK Filter, for small-neck (GL-38) bottles	2 µm	1/8" OD	—
	A-438	PEEK Filter, for small-neck (GL-38) bottles	10 µm	1/8" OD	—
★	**A-440**	PEEK Filter	10 µm	1/8" OD	—
	A-441	PEEK Filter	10 µm	3/16" OD	—
	A-451	PEEK Filter	10 µm	1/16" OD	—
	UHMWPE BIOCOMPATIBLE BOTTOM-OF-THE-BOTTLE SOLVENT FILTERS				
	A-445	UHMWPE Filter Assembly	10 µm	1/16" OD	(1) XP-245
★	**A-446**	UHMWPE Filter Assembly	10 µm	1/8" OD	(1) XP-345
	A-427	UHMWPE Replacement Solvent Filter Cups, 5-pk	10 µm	—	—

Bottle Caps

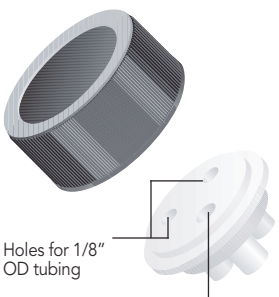
- Extremely simple — no threaded ports or fittings
- Manufactured from ETFE and Polypropylene

If you are looking for a bottle cap that is quick and easy to use, but still allows many connection options, we have just what you need! The Bottle Caps fit standard GL-45 (1 L) or smaller-neck GL-38 (4 L) glass bottles.

Each cap has three holes. With two of the holes you simply push your tubing straight through. The third hole, with a luer taper, can be used for a number of options. Any male luer (such as a luer-lock syringe) will fit snugly in this hole, or you can use the A-626 or A-627 Plug. Exceptions are the A-610 and A-610B Bottle Caps. Please see the note below.



A-620
GL-45 Bottle Cap
for 1/8" tubing



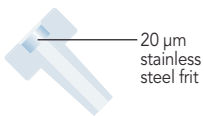
A-622
GL-38 Bottle Cap
for 1/8" tubing

Bottle Cap Plugs & Adapters

Use the A-626 Bottle Cap Plug to seal the third "tapered" luer hole found in most Upchurch Scientific® Bottle Caps. Or, use the A-628 Plug to seal any unused 1/16" or 1/8" bottle cap holes.

Alternatively, try the A-627 or A-629 Filter Bottle Cap Plug to cap an unused hole in your bottle cap. The 20 µm stainless steel frit in these products prevents foreign matter from contaminating your solvent while leaving the bottle open to the atmosphere, thus allowing fluid to be pulled out without creating a vacuum (generally not used with sparging applications). All plug bodies are manufactured from ultra-high molecular weight polyethylene (UHMWPE).

A-626
Bottle Cap Plug



A-629
Filter Bottle Cap Plug

APPLICATION NOTE

- A self-regulating sparging system can help reduce helium consumption and improve pump performance. Set this up by pressing your tubing through the appropriate holes in your bottle cap and attaching each line to a filter. Sparge your mobile phase with an inert gas (preferably helium) for 15–20 minutes. Then reduce the outlet pressure of the sparging gas to a maximum of 5 psi (0.34 bar) and insert a plug (A-626 or A-628) into the remaining port of the cap. The sparging gas will shut off once the incoming pressure equals the pressure inside the reservoir. As the mobile phase is consumed and the internal pressure lowers, sparging gas will enter to keep the system pressurized and degassed. Please Note: If gas leaks while pressurizing the bottle, try removing the sealing ring from the bottle, as it sometimes interferes with the sealing of these bottle caps.
- One concern with sparging systems is the possibility of solvent backing up the sparging inlet line. This can occur if the gas tank completely evacuates with the regulating valves open, creating a vacuum in the tubing. Solvent backup may damage sparging system components and cause cross-contamination of mobile phase reservoirs. To help prevent solvent backup, install the CV-3010 Inline Check Valve (page 151) along the tubing line that runs between the gas supply and the solvent bottle.
- For a more efficient degassing system, please see the Systec® HPLC Vacuum Degassing Systems on page 178.
- Please see the Quick-Stop Luer Check Valve on page 151 for another solvent inlet Application Note.

NOTE

The A-610 and A-610B Bottle Caps have a slightly different configuration than the other caps. One hole accepts 3/16" OD tubing, the typical size used with some Waters® systems. The remaining two holes accept 1/8" OD tubing. Unlike the other caps, the A-610 does not have a tapered luer hole. If desired, use our A-628 Plug or A-629 Filter Plug for one of the 1/8" holes.

RELATED PRODUCTS

To ensure a tight seal, use Upchurch Scientific fluoropolymer tubing with these bottle caps (pages 70–73).

	Part No.	Description
	BOTTLE CAPS FOR GL-45, 1 L BOTTLES	
	A-610	for 3/16" OD tubing, Red
	A-610B	for 3/16" OD tubing, Blue
★	**A-620**	for 1/8" OD tubing, Red
★	**A-620B**	for 1/8" OD tubing, Blue
	A-630	for 1/16" OD tubing, Red
	A-630B	for 1/16" OD tubing, Blue
	BOTTLE CAPS FOR GL-38, 4 L BOTTLES	
★	**A-622**	for 1/8" OD tubing, Black
	BOTTLE CAP PLUGS AND ADAPTER	
★	**A-626**	Bottle Cap Plug for luer hole, UHMWPE
	A-627	Filter Bottle Cap Plug for luer hole, UHMWPE with 20 µm stainless steel frit
★	**A-628**	Bottle Cap Plug for 1/16", 1/8" or 3/16" hole, UHMWPE
	A-629	Filter Bottle Cap Plug for 1/16", 1/8" or 3/16" hole, UHMWPE with 20 µm stainless steel frit

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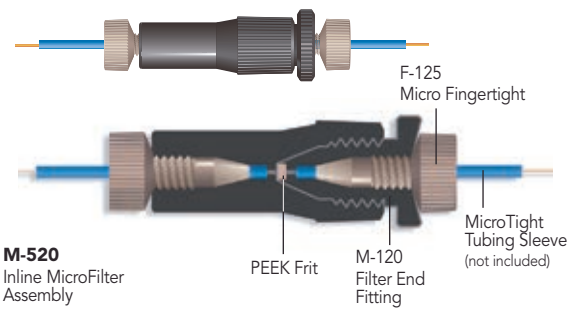
Inline Solvent Filters

- Specially engineered for inline filtration
- Versions include Micro, Standard, and Semi-Preparative
- Bio-inert and stainless steel options offered
- Variety of porosities, application appropriate

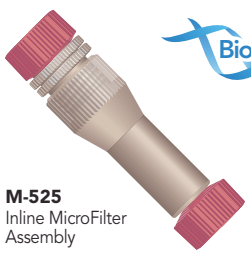
Inline MicroFilters

- 100% biocompatible PEEK polymer option available
- Miniscule 240 nL void volume
- Two versions: direct connect 1/32" OD tubing or use MicroTight® tubing sleeves for 70–520 µm OD capillary tubing

Upchurch Scientific® Inline MicroFilters protect your column from particles originating in the mobile phase or sample, or from pump seal and sample injection valve wear. These filters have a 0.006" (150 µm) thru-hole. Choose the M-520 with a 0.5 µm 100% PEEK frit to connect to capillary tubing using the MicroTight tubing sleeves (page 19). You may also directly connect 1/32" OD tubing using the M-525 which contains a 0.5 µm PEEK frit.



M-520
Inline MicroFilter Assembly



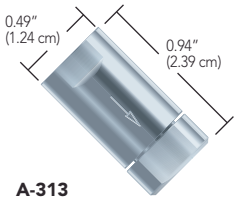
Biocompatible

M-525
Inline MicroFilter Assembly

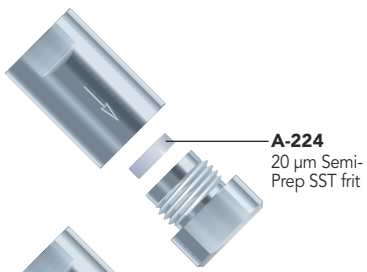
Standard Inline Solvent Filters

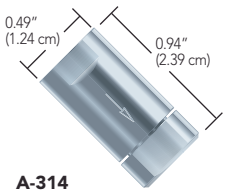
- For 1/16" OD tubing
- Versions for Standard HPLC (6,000 psi/414 bar) and UHPLC (25,000 psi/1,725 bar)
- Replacement frits available
- Help prevent particulate contamination from clogging sensitive equipment
- Ideally suited for placement along the flow path line between the pump and injection valve/autosampler

Inline filter assemblies that begin with the letter "A" are engineered for standard HPLC applications (up to 6,000 psi/414 bar). Inline Filter Assemblies that begin with the "VHP" prefix are suitable for use in UHPLC systems, where pressures can reach 25,000 psi (1,725 bar).

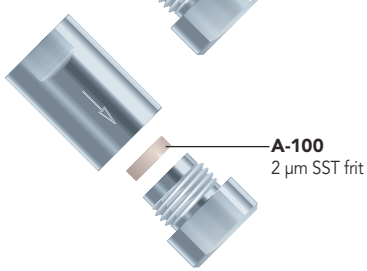


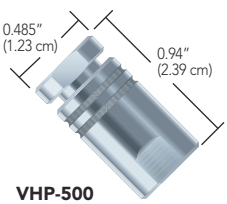
A-313
Inline Solvent Filter





A-314
Inline Solvent Filter





VHP-500
Inline VHP Filter

RELATED PRODUCTS

Fittings

All Standard Inline Solvent Filters have 10-32 threads for 1/16" OD tubing, allowing the use of most standard chromatography high pressure fittings.

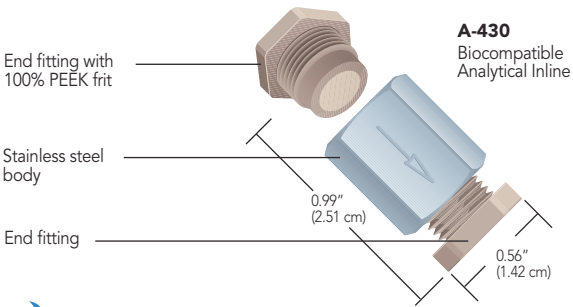
	Part No.	Description	Porosity	For Tubing Size	Threads	Includes	Swept Volume	Pressure Rating	Qty.
	INLINE MICROFILTERS								
★	**M-520**	Inline MicroFilter Assembly, PEEK Frit	0.5 µm	MicroTight Tubing Sleeve	MicroTight Tubing Sleeve	(5) M-120, (2) F-125	240 nL	4,000 psi (276 bar)	ea.
	M-525	Inline MicroFilter Assembly, PEEK Frit	0.5 µm	1/32" OD	1/32" OD	(5) M-140, (2) F-126	240 nL	4,000 psi (276 bar)	ea.
	REPLACEMENT INLINE MICROFILTER END-FITTINGS								
★	**M-120x**	End-Fittings, Black, with PEEK Frit	0.5 µm	MicroTight Tubing Sleeve	MicroTight Tubing Sleeve	N/A	216 nL	N/A	10-pk
	M-140x	End-Fittings, Natural, with PEEK Frit	0.5 µm	1/32" OD	1/32" OD	N/A	216 nL	N/A	10-pk
	INLINE SOLVENT FILTERS								
	A-313	Solvent Filter Assembly	20 µm	1/16" OD	10-32 Coned	(1) A-224	12.3 µL	6,000 psi (414 bar)	ea.
★	**A-314**	Solvent Filter Assembly	2 µm	1/16" OD	10-32 Coned	(1) A-100	4 µL	6,000 psi (414 bar)	ea.
	A-100x	Replacement Frits, Stainless Steel, 10-pk	2 µm	N/A	—	—	1.4 µL	N/A	10-pk
	A-224	Replacement Frits, Stainless Steel, ea.	20 µm	N/A	—	—	9.7 µL	N/A	ea.
	VHP-500	Inline VHP Filter	0.5 µm	1/16" OD	10-32 Coned	(5) VHP-501	1.2 µL	25,000 psi (1,725 bar)	ea.
	VHP-505	Inline VHP Filter	0.2 µm	1/16" OD	10-32 Coned	(5) VHP-506	1.1 µL	25,000 psi (1,725 bar)	ea.
	VHP-501x	Replacement Inline VHP Frit	0.5 µm	N/A	N/A	N/A	0.60 µL	N/A	10-pk
	VHP-506x	Replacement Inline VHP Frit	0.2 µm	N/A	N/A	N/A	0.54 µL	N/A	10-pk

**Swept volumes include/reflect theoretical frit volume values.*
SST = Stainless Steel

Biocompatible Standard Inline Filters

- 0.5 µm and 2 µm versions available
- Features 100% PEEK flow path

Upchurch Scientific® A-430 and A-431 Inline Filters consist of a stainless steel body and two PEEK end fittings. Maximum recommended flow rate is 25 mL/min for the A-430 Filter and 10 mL/min for the A-431 Filter. And, you get the added benefit of biocompatibility since all wetted surfaces are PEEK. When you need to replace the frit, simply dispose of the end fitting that contains the frit and replace it with a new one.

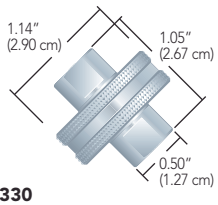


A-430
Biocompatible
Analytical Inline Filter

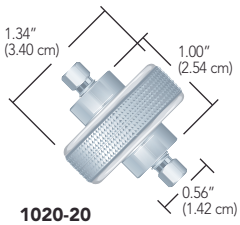
Biocompatible

Semi-Prep Inline Filters

- Designed for high-flow applications
- Economical protection for larger columns and injections
- SFC and HPLC compatible



A-330
High Pressure Semi-Prep Inline Filter

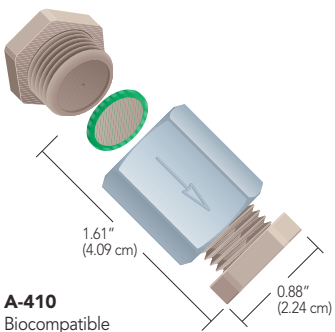


1020-20
Iso-Prep Filter
Shown with standard 10-32 stainless steel nuts and ferrules (not included)

Biocompatible Semi-Prep Inline Filters

- Versions for 1/16", 1/8", 3/16", 1/4", and 5/16" OD tubing
- 100% PEEK flow path

Biocompatible Semi-Prep Filters consist of a stainless steel body, two PEEK end fittings, and a separate PEEK frit. These filters are ideal for many higher flow analytical, semi-prep and preparative applications. Best of all, if the filter becomes clogged, simply unscrew the assembly, remove the frit and replace it. The frits are interchangeable.



A-410
Biocompatible
Semi-Prep Inline Filter

	Part No.	Description	Porosity	Threads	Includes	Swept Volume*	Pressure Rating	Qty.
	BIOCOMPATIBLE INLINE FILTERS							
★	**A-430**	Biocompatible Filter Assembly	2 µm	10-32 Coned	(1) A-429	7.1 µL	6,000 psi (414 bar)	ea.
	A-431	Biocompatible Filter Assembly	0.5 µm	10-32 Coned	(1) A-428	5.9 µL	6,000 psi (414 bar)	ea.
	A-428x	PEEK Filter End Fittings, Black PEEK body, 10-pk	0.5 µm	10-32 Coned	—	5.7 µL	N/A	10-pk
★	**A-429x**	PEEK Filter End Fittings, Natural PEEK body, 10-pk	2 µm	10-32 Coned	—	6.9 µL	N/A	10-pk
	SEMI-PREP INLINE FILTERS							
★	**A-330**	Semi-Prep Filter Assembly	10 µm	10-32 Coned	(1) A-331	223 µL	7,500 psi (517 bar)	ea.
	A-360	Semi-Prep Filter Assembly	10 µm	5/16-24 Flat Bottom	(1) A-331	235 µL	3,500 psi (207 bar)	ea.
	A-331x	Stainless Steel Frits, Natural ETFE ring	10 µm	N/A	N/A	142 µL	N/A	10-pk
	A-332x	Stainless Steel Frits, Natural ETFE ring	2 µm	N/A	N/A	122 µL	N/A	10-pk
	A-337x	Stainless Steel Frits, Natural ETFE ring	20 µm	N/A	N/A	152 µL	N/A	10-pk
	ISO-PREP FILTERS							
	1020-05	21.2 mm Filter Holder	0.5 µm	10-32 Coned	(1) 7031-05	203 uL	8,000 psi (552 bar)	ea.
	1020-20	21.2 mm Filter Holder	2 µm	10-32 Coned	(1) 7031-20	196 uL	8,000 psi (552 bar)	ea.
	7031-05	21.2 mm Replacement Filter	0.5 µm	N/A	N/A	122 uL	8,000 psi (552 bar)	ea.
	7031-20	21.2 mm Replacement Filter	2 µm	N/A	N/A	115 uL	8,000 psi (552 bar)	ea.
	BIOCOMPATIBLE SEMI-PREP INLINE FILTERS							
★	**A-410**	Biocompatible Filter Assembly	2 µm	10-32 Coned	(1) OC-802	89 µL	6,000 psi (414 bar)	ea.
	A-411	Biocompatible Filter Assembly	10 µm	10-32 Coned	(1) OC-803	103 µL	6,000 psi (414 bar)	ea.
	A-510	Biocompatible Filter Assembly	5 µm	5/16-24 Flat Bottom	(1) OC-805	89 µL	500 psi (34 bar)	ea.
	OC-802	PEEK Frit, Green PCTFE ring	2 µm	N/A	N/A	46 µL	N/A	ea.
	OC-803	PEEK Frit, Natural PCTFE ring	10 µm	N/A	N/A	57 µL	N/A	ea.
	OC-805	PEEK Frit, Natural PCTFE ring	5 µm	N/A	N/A	50 µL	N/A	ea.

**Swept volumes include/reflect theoretical frit volume values.*

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Mini MicroFilters

- Total volume as low as 10 nL
- Conductive version for CEC and mass spectrometry applications
- Three styles available: direct connect 1/32" OD or 360 µm OD tubing and a variety of capillary sizes using MicroTight® tubing sleeves (70–520 µm)

Upchurch Scientific® Inline Mini MicroFilter Assemblies filter effectively with internal volumes low enough to ensure reliable chromatographic results — even at nanoliter per minute flow rates! Internal volumes of these encapsulated filters are as low as 85 nL with the micro-screen and 10 nL to 22 nL with the frit disc option.

Apply voltage to the stainless steel filter holder body of the Conductive Mini MicroFilter for applications such as mass spectrometry and CEC analysis. The voltage is conducted through to the stainless steel portion of the 1 µm NanoFilter™ Capsule and on to the fluid stream. Try our Insulating Mounting Bracket on page 39 to apply voltage easily and more safely.

M-530
Mini MicroFilter Assembly

M-534
Conductive Mini MicroFilter Assembly

APPLICATION NOTE

The Mini MicroFilters can be used to pack capillary tubing. Simply place one of these filters on the effluent side of the capillary tubing, then slurry pack. Once packed, place a filter at the head of the tubing. This creates a reliable capillary column without fusing the silica to make frits or pressing filter paper inside the capillary tubing.

Increase the Life of Your Column

Why use a Precolumn Filter when there is a frit at the head of the column itself? Changing the column frit is extremely difficult to do without disturbing the column packing. A Precolumn Filter provides relatively inexpensive insurance against column damage, and changing its frit is easy. A Precolumn Filter placed between the sample injection valve and the HPLC column protects the column from particles originating in the sample and from pump and valve seal wear.

SPECIFICATIONS & DETAILS

Because of the size-specific nature of the ferrules included with each Mini MicroFilter assembly, please note that these ferrules are not interchangeable with other MicroFerrules for different tubing sizes.

Filter Capsule Color Identification

M-121 **M-122** **M-124** **M-125** **M-126**
M-128 **M-131** **M-132** **M-133** **M-134**

What's the Difference Between Precolumn & Inline Filters?

You may have noticed that the bodies of Precolumn and Inline Filters look similar, and as such, you may have wondered what the differences are. Because Precolumn Filters, by definition, are typically placed in a volume-sensitive area immediately preceding the column, these filters usually feature smaller thru-holes and smaller frit diameters. In contrast, Inline Filters are often placed where the internal volume is not as critical and where longer life and less fluid restriction is more important.

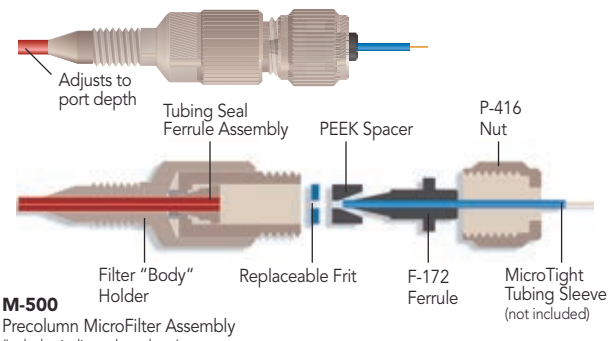
Part No.	Description	Porosity	Frit Type	For use with Tubing	Includes	Swept Volume	Pressure Rating
MINI MICROFILTER ASSEMBLY							
M-530	Mini MicroFilter Assembly	2 µm	SST Screen	MicroTight tubing sleeves	(5) M-122, (2) F-172, (2) P-416	85 nL	4,000 psi (276 bar)
M-531	Mini MicroFilter Assembly	1 µm	SST Screen	MicroTight tubing sleeves	(5) M-121, (2) F-172, (2) P-416	85 nL	4,000 psi (276 bar)
M-532	Mini MicroFilter Assembly	2 µm	SST Screen	360 µm OD	(5) M-124, (2) F-152, (2) P-416BLK	85 nL	4,000 psi (276 bar)
M-537	Mini MicroFilter Assembly	1 µm	SST Frit	360 µm OD	(5) M-125, (2) F-152, (2) P-416BLK	10 nL	4,000 psi (276 bar)
★ **M-538**	Mini MicroFilter Assembly	1 µm	Ti Frit	360 µm OD	(5) M-126, (2) F-152, (2) P-416BLK	10 nL	4,000 psi (276 bar)
M-543	Mini MicroFilter Assembly	1 µm	SST Screen	1/32" (790 µm) OD	(5) M-131, (2) F-112, (2) P-416	97 nL	4,000 psi (276 bar)
M-547	Mini MicroFilter Assembly	1 µm	SST Frit	1/32" (790 µm) OD	(5) M-133, (2) F-112, (2) P-416	22 nL	4,000 psi (276 bar)
M-548	Mini MicroFilter Assembly	1 µm	Ti Frit	1/32" (790 µm) OD	(5) M-134, (2) F-112, (2) P-416	22 nL	4,000 psi (276 bar)
M-534	Conductive Mini MicroFilter Assembly	1 µm	SST Frit	360 µm OD	(5) M-128, (2) F-152, (2) P-416BLK	10 nL	4,000 psi (276 bar)
REPLACEMENT MINI MICROFILTER CAPSULES							
Part No.	**Description**	**Porosity**	**Frit Type**	**For Use With**	**Material**	**Swept Volume**	**Qty.**
M-121	Filter Capsule	1 µm	SST Screen	M-530 and M-531	PEEK	85 nL	2-pk
M-122	Filter Capsule	2 µm	SST Screen	M-530 and M-531	PEEK	85 nL	2-pk
M-124	Filter Capsule	2 µm	SST Screen	M-532	PEEK	85 nL	2-pk
M-125	NanoFilter Capsule	1 µm	SST Frit	M-537 and M-538	PEEK	10 nL	2-pk
★ **M-126**	NanoFilter Capsule	1 µm	Ti Frit	M-537 and M-538	PEEK	10 nL	2-pk
M-131	Filter Capsule	1 µm	SST Screen	M-543	PEEK	85 nL	2-pk
M-132	Filter Capsule	2 µm	SST Screen	M-543	PEEK	85 nL	2-pk
M-133	NanoFilter Capsule	1 µm	SST Frit	M-547 and M-548	PEEK	10 nL	2-pk
M-134	NanoFilter Capsule	1 µm	Ti Frit	M-547 and M-548	PEEK	10 nL	2-pk
M-128	Conductive NanoFilter Capsule	1 µm	SST Frit	M-534	SST/PEEK	10 nL	2-pk

SST = Stainless Steel; Ti = Titanium

Precolumn MicroFilters

- Direct connects to columns with 10-32 threads
- Total void volume of 0.5 µL
- Two versions: direct connect 1/16" OD tubing or use MicroTight® tubing sleeves for 70–520 µm OD capillary tubing

The Precolumn MicroFilters directly connect into your microbore or analytical column. Total theoretical void volume is only 0.5 µL (includes frit volume) and the PEEK tubing used in the assembly of these units has a 0.005" (125 µm) ID, virtually eliminating any mixing of the sample with the mobile phase.



M-500
Precolumn MicroFilter Assembly
(Includes indicated products)

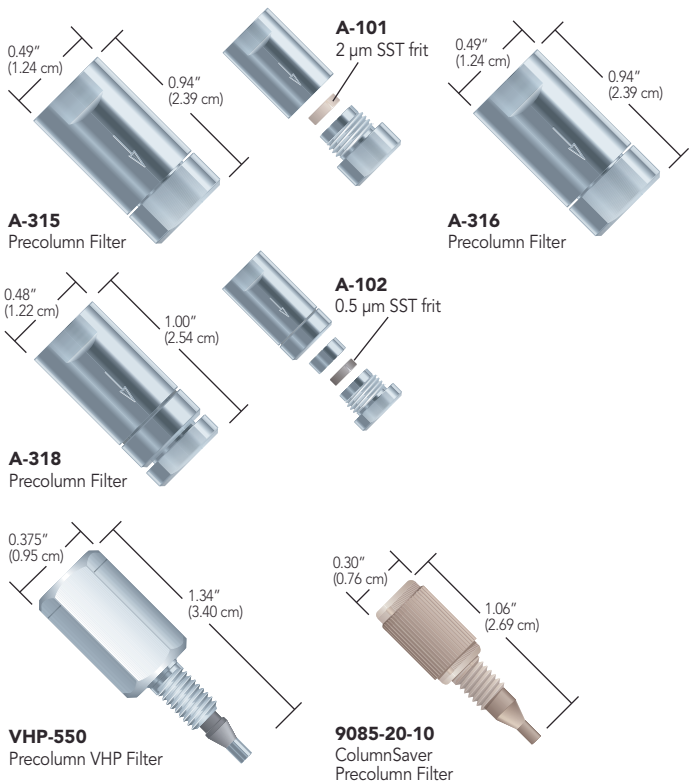
VHP-550 and VHP-551
VHP Precolumn Filter Assembly and replaceable frit assembly

Standard Precolumn Filters

- Economical protection for analytical columns in HPLC and UHPLC
- Traditional versions connect tubing on both sides
- Direct-connect versions attach to the inlet port of most standard columns
- All versions feature 10-32 coned ports for 1/16" OD tubing

These are designed to protect columns by filtering out particulate matter originating from the sample or from rotor seal wear.

- Assemblies that begin with the letter "A" are traditional versions for standard HPLC
- Assemblies that begin with "VHP" are direct-connect versions for UHPLC applications
- Versions that begin with "9085" are direct-connect for standard HPLC and must be used with polymer fittings



A-315
Precolumn Filter

A-316
Precolumn Filter

A-318
Precolumn Filter

VHP-550
Precolumn VHP Filter

9085-20-10
ColumnSaver Precolumn Filter

	Part No.	Description	Porosity	For Tubing Size	Threads	Includes	Swept Volume*	Pressure Rating	Qty.
	PRECOLUMN MICROFILTER ASSEMBLIES								
	M-500	Precolumn MicroFilter Assembly, SST Frit	0.5 µm	MicroTight Tubing Sleeve	10-32 Coned	(5) C-425, (1) F-172, (1) P-416	0.5 µL	4,000 psi (276 bar)	ea.
	M-510	Precolumn MicroFilter Assembly, PEEK Frit	0.5 µm	MicroTight Tubing Sleeve	10-32 Coned	(5) A-735, (1) F-172, (1) P-416	0.5 µL	4,000 psi (276 bar)	ea.
	M-550	Precolumn MicroFilter Assembly, SST Frit	0.5 µm	1/16" OD	10-32 Coned	(5) C-425, (1) F-132, (1) P-416	0.5 µL	4,000 psi (276 bar)	ea.
★	**M-560**	Precolumn MicroFilter Assembly, PEEK Frit	0.5 µm	1/16" OD	10-32 Coned	(5) A-735, (1) F-132, (1) P-416	0.5 µL	4,000 psi (276 bar)	ea.
	REPLACEMENT PRECOLUMN MICROFILTER FRITS (FRIT DIAMETER X FRIT THICKNESS X OVERALL DIAMETER)								
★	**A-735x**	PEEK Frits, 0.045" x 0.031" x 0.192"	0.5 µm	N/A	N/A	N/A	216 nL	N/A	10-pk
	C-420x	SST Frits, 0.038" x 0.028" x 0.192"	2 µm	N/A	N/A	N/A	101 nL	N/A	10-pk
	C-425x	SST Frits, 0.038" x 0.028" x 0.192"	0.5 µm	N/A	N/A	N/A	101 nL	N/A	10-pk
	PRECOLUMN FILTERS								
★	**A-315**	Solvent Filter Assembly	2 µm	1/16" OD	10-32 Coned	(1) A-101	1.4 µL	6,000 psi (414 bar)	ea.
★	**A-316**	Solvent Filter Assembly	0.5 µm	1/16" OD	10-32 Coned	(1) A-102	1.3 µL	6,000 psi (414 bar)	ea.
★	**A-318**	Solvent Filter Assembly	0.5 µm	1/16" OD	10-32 Coned	(1) A-102	0.84 µL	6,000 psi (414 bar)	ea.
	A-101x	Replacement Frits, Stainless Steel, 10-pk	2 µm	N/A	—	—	0.74 µL	N/A	10-pk
	A-102x	Replacement Frits, Stainless Steel, 10-pk	0.5 µm	N/A	—	—	0.61 µL	N/A	10-pk
	VHP-550	Precolumn VHP Filter	0.5 µm	1/16" OD	10-32 Coned	(5) VHP-551	1.9 µL	20,000 psi (1,380 bar)	ea.
	VHP-555	Precolumn VHP Filter	0.2 µm	1/16" OD	10-32 Coned	(5) VHP-556	1.8 µL	20,000 psi (1,380 bar)	ea.
	VHP-551x	Replacement Precolumn VHP Frit Assembly	0.5 µm	N/A	N/A	N/A	1.9 µL	N/A	10-pk
	VHP-556x	Replacement Precolumn VHP Frit Assembly	0.2 µm	N/A	N/A	N/A	1.8 µL	N/A	10-pk
	9085-05-10	ColumnSaver Precolumn Filter, with SST frit	0.5 µm	1/16" OD	10-32 Coned	N/A	3.1 µL	6,000 psi (414 bar)	10-pk
	9085-20-10	ColumnSaver Precolumn Filter, with SST frit	2 µm	1/16" OD	10-32 Coned	N/A	3.1 µL	6,000 psi (414 bar)	10-pk

SST = Stainless Steel
**Swept volumes include/reflect theoretical frit volume values.*

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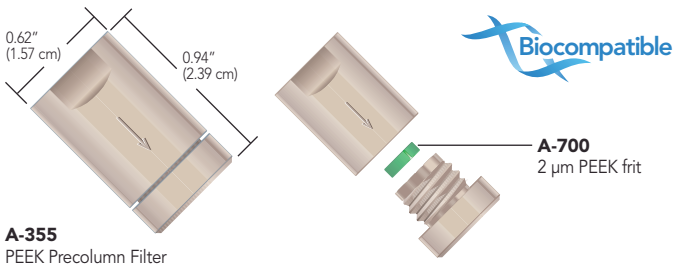
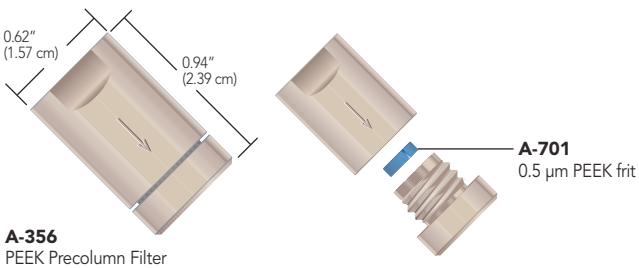
Biocompatible Precolumn Filters

- Pre-assembled with either 0.5 µm or 2 µm porosity frits
- Great column protection
- Feature PEEK bodies and PCTFE-surrounded PEEK frits

Upchurch Scientific® Biocompatible Precolumn Filters have 0.020" (0.50 mm) diameter thru-holes and 8° distribution cones for minimal band spreading and mixing. The bodies of these filters are manufactured from biocompatible PEEK polymer and are pressure rated to 5,000 psi (345 bar). These filters are designed for use with 1/16" OD tubing, which can be connected to these filters using standard Fingertight fittings.



A-355
PEEK Precolumn Filter



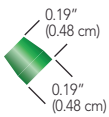
A-356
PEEK Precolumn Filter

Frit-In-A-Ferrule™

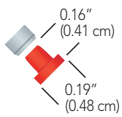
- Seals and filters simultaneously
- Less expensive and more convenient than traditional inline filter systems
- Available in both Flangeless and Super Flangeless™ versions

Now you can filter at any point in your system where 1/16" or 1/8" OD tubing is used in a flat-bottom 1/4-28, M6 or 5/16-24 connection.

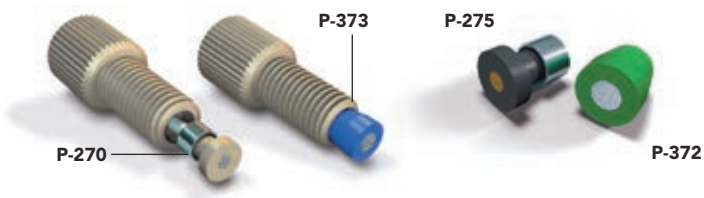
The Upchurch Scientific® Frit-In-A-Ferrule product line is designed to seal and filter simultaneously by incorporating a frit into the body of a flat-bottom ferrule. This simple design allows you to eliminate traditional inline filters and reduce the number of additional connections in your system.



P-372
Flangeless Frit-In-A-Ferrule
for 1/8" OD tubing



P-276
Super Flangeless Frit-In-A-Ferrule
for 1/16" OD tubing



Disposable Sample Filters

- Excellent system protection
- Ultra-low hold-up volume
- 0.5 µm and 2 µm porosity

B-100 and B-101
Disposable Sample Filters

These Disposable Sample Filters are designed to remove particles from analytical HPLC samples. The polypropylene holder incorporates a 1/32" thick, 1/8" diameter stainless steel frit, which causes very little back pressure. To use, just attach one of these filters onto the end of any standard luer syringe, such as our B-310 found on page 155.

	Part No.	Description	Porosity	Threads	Includes	Swept Volume*	Pressure Rating		
	BIOCOMPATIBLE PRECOLUMN FILTERS								
★	**A-355**	Solvent Filter Assembly, Biocompatible	2 µm	10-32 Coned	(1) A-700	1.4 µL	5,000 psi (345 bar)		
★	**A-356**	Solvent Filter Assembly, Biocompatible	0.5 µm	10-32 Coned	(1) A-701	1.3 µL	5,000 psi (345 bar)		
	A-700	Replacement Frit, PEEK Polymer, ea.	2 µm	—	—	0.74 µL	N/A		
	A-701	Replacement Frit, PEEK Polymer, ea.	0.5 µm	—	—	0.61 µL	N/A		
	FRIT-IN-A-FERRULE FOR 1/16" OD TUBING								
	Part No.	**Description**	**Porosity**	**Frit Material**	**Frit Diameter**	**Frit Thickness**	**Swept Volume**	**Maximum Pressure**	**Qty.**
	P-270x	Super Flangeless, Natural PEEK, SST lock ring	2 µm	SST	0.062"	0.062"	0.74 µL	2,500 psi (172 bar)	10-pk
	P-272x	Flangeless, Green PCTFE	2 µm	SST	0.062"	0.062"	0.74 µL	2,000 psi (138 bar)	10-pk
	P-273x	Flangeless, Blue PCTFE	0.5 µm	SST	0.062"	0.062"	0.61 µL	2,000 psi (138 bar)	10-pk
	P-274x	Super Flangeless, Natural PEEK, SST lock ring	2 µm	PEEK	0.046"	0.030"	0.20 µL	2,500 psi (172 bar)	10-pk
★	**P-275x**	Super Flangeless, Black PEEK, SST lock ring	0.5 µm	PEEK	0.046"	0.030"	0.16 µL	2,500 psi (172 bar)	10-pk
	P-276	Super Flangeless, Red ETFE, SST lock ring	10 µm	SST	0.062"	0.062"	0.90 µL	2,500 psi (172 bar)	ea.
	FRIT-IN-A-FERRULE FOR 1/8" OD TUBING								
★	**P-372x**	Flangeless, Green PCTFE	2 µm	SST	0.094"	0.062"	1.69 µL	500 psi (34 bar)	10-pk
	P-373x	Flangeless, Blue PCTFE	0.5 µm	SST	0.094"	0.062"	1.41 µL	500 psi (34 bar)	10-pk
	P-374x	Super Flangeless**, Natural PEEK, SST lock ring	2 µm	PEEK	0.094"	0.042"	1.15 µL	2,500 psi (172 bar)	10-pk
	DISPOSABLE HPLC SAMPLE FILTERS								
	B-100	Disposable Filters	2 µm	SST	0.125"	0.031"	15.8 µL	N/A	100-pk
★	**B-101**	Disposable Filters	0.5 µm	SST	0.125"	0.031"	15.6 µL	N/A	100-pk

** Swept volumes include/reflect theoretical frit volume values.*
*** The 1/8" Super Flangeless versions cannot be used in M6 ports.*

PEEK Frits

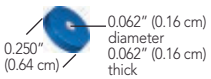
- Inert, biocompatible, and metal-free
- Uniform porosity, longer filtration life
- Sealing rings manufactured from PCTFE

Patented Upchurch Scientific® PEEK Frits offer exceptionally uniform porosity. This property ensures longer filtration life and consistent frit-to-frit swept volumes. The PEEK polymer frit discs are biocompatible and inert to most solvents, making them well-suited for bioanalytical applications. PEEK's robust properties make these products suitable for low and high pressure applications.

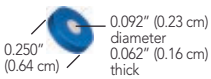
Disc rings, included on most PEEK frits, are made of PCTFE and are slightly thicker than the frit disc, providing enhanced sealing and excellent chemical resistance. PCTFE surrounded PEEK frits can be used up to 80 °C, and PEEK frits alone are a good choice for applications up to 100 °C.

0.5 µm PEEK Frits

A-701

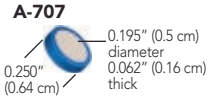


A-703

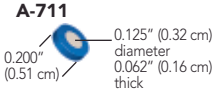


A-705

A-707

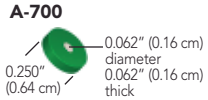


A-711

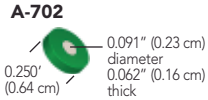


2 µm PEEK Frits

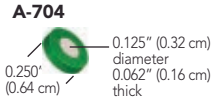
A-700



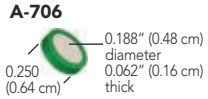
A-702



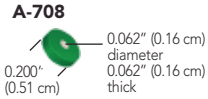
A-704



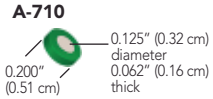
A-706



A-708

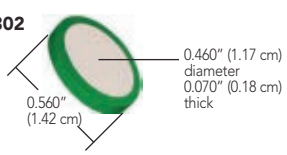


A-710



2 µm Semi-Prep PEEK Frits

OC-802

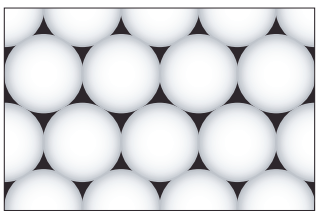


Biocompatible

APPLICATION NOTE

Frit Volume

The term "frit volume" refers to the volume of the various fluid pathways that comprise the matrix of a frit. A standard frit is a mass of small particles fused together through a controlled process of compression and heat. Because of their shape, there are gaps between the fused particles. Fluid makes its way through these gaps, creating a pathway from one side of the frit to the other (see the diagram, below, where the white circles represent frit particles, and the black area represents the void between the particles.)



Generally, when the frit particles increase in size, the frit's porosity increases as well. The larger the particles, the larger the gaps between particles. Cumulatively, these gaps comprise what is known as "frit volume." Using gravimetric determination, it has been experimentally shown that the total volume of any given frit may range from 18%–30%, depending upon the porosity of the frit.

Frit volume is calculated by determining what the mass of the frit would be if it were a solid block of material of equal size. Then the solid mass of the frit is multiplied by the percentage assigned to the porosity to determine the theoretical frit volume.

18% for 0.2 µm frits
20% for 0.5 µm frits
24% for 2 µm frits
26% for 5 µm frits
28% for 10 µm frits
30% for 20 µm frits

From a chromatographic perspective, it's important to know the volume of the frit used in your system. It is possible for a frit to negatively impact your chromatography if the total frit volume is too large and if it is placed in an area through which the sample will pass. To avoid frit-related problems like band broadening and loss of resolution, most inline filters placed after the sample introduction point (e.g., between the injection valve and the column) are smaller in size and porosity than inline filters that are placed in areas before the sample is introduced into the flow path (e.g., between the pump and the injection valve).

	Part No.	Porosity	Disc Diameter	Disc Thickness	Ring OD	Ring Material	Frit Volume	Qty.
	PEEK FRITS							
★	A-700	2 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	0.7 µL	ea.
★	A-701	0.5 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	0.6 µL	ea.
	A-702	2 µm	0.091" (0.23 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	1.7 µL	ea.
	A-703	0.5 µm	0.092" (0.23 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	1.4 µL	ea.
	A-704	2 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	3.0 µL	ea.
	A-705	0.5 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	2.4 µL	ea.
★	A-706	2 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	7.1 µL	ea.
★	A-707	0.5 µm	0.195" (0.5 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	6.1 µL	ea.
	A-708	2 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.200" (0.51 cm)	PCTFE	0.7 µL	ea.
	A-710	2 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.200" (0.51 cm)	PCTFE	3.0 µL	ea.
	A-711	0.5 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.200" (0.51 cm)	PCTFE	2.5 µL	ea.
	SEMI-PREP PEEK FRITS							
★	OC-802	2 µm	0.460" (1.17 cm)	0.070" (0.18 cm)	0.560" (1.42 cm)	PCTFE	46.4 µL	ea.

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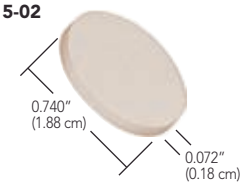
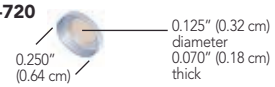
PEEK Frits (cont.)

5 µm and 10 µm PEEK Frits

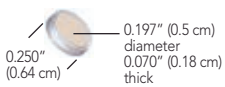
A-715-02



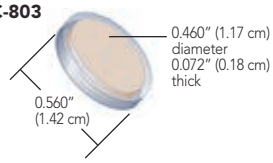
A-720



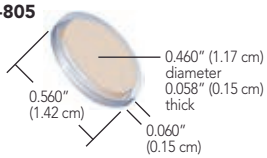
A-722



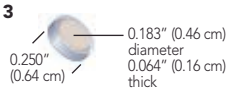
OC-803



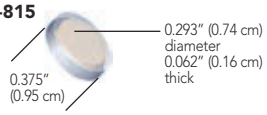
OC-805



OC-813



OC-815



NOTE

- The thickness dimension in the part drawings and the pricing tables represents the thickness of the frit disc not the frit ring. Frit rings are often slightly thicker to ensure a proper seal. When tightened into a filter holder the ring compresses to nearly match the thickness of the frit disc.
- The manufacturing process may cause some slight color variance in our PEEK frits. This does not affect their quality or performance. Frit dimensions are approximate. Actual batch-to-batch frit dimensions may vary slightly.

RELATED PRODUCTS

Any 0.247" to 0.254" diameter frit (including polymer ring) can be used with the Standard HPLC Inline Solvent Filters on page 160 and the Standard Precolumn Filters on page 163.

	Part No.	Porosity	Disc Diameter	Disc Thickness	Ring OD	Ring Material	Frit Volume	Qty.
	SEMI-PREP PEEK FRITS							
	A-715-02	10 µm	0.740" (1.88 cm)	0.072" (0.18 cm)	N/A	N/A	142.1 µL	ea.
★	**A-720**	10 µm	0.125" (0.32 cm)	0.070" (0.18 cm)	0.250" (0.64 cm)	PCTFE	4.2 µL	ea.
★	**A-722**	10 µm	0.197" (0.5 cm)	0.070" (0.18 cm)	0.250" (0.64 cm)	PCTFE	9.9 µL	ea.
	OC-803	10 µm	0.460" (1.17 cm)	0.072" (0.18 cm)	0.560" (1.42 cm)	PCTFE	57.2 µL	ea.
	OC-805	5 µm	0.460" (1.17 cm)	0.058" (0.15 cm)	0.560" (1.42 cm)	PCTFE	41.1 µL	ea.
	OC-813	5 µm	0.183" (0.46 cm)	0.064" (0.16 cm)	0.250" (0.64 cm)	PCTFE	7.2 µL	ea.
	OC-815	5 µm	0.293" (0.74 cm)	0.062" (0.16 cm)	0.375" (0.95 cm)	PCTFE	17.8 µL	ea.

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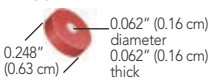
Titanium Frits

- Excellent alternative to stainless steel
- PEEK or PCTFE polymer rings

Titanium is a biocompatible alternative to stainless steel. Our 0.2 µm, 0.5 µm, and 2 µm porosity titanium frits are surrounded by PEEK or PCTFE polymer rings for enhanced sealing. The dimensions of most of these frits make them suitable replacement frits for most Upchurch Scientific® standard inline and precolumn filters.

0.2 µm Titanium Frits

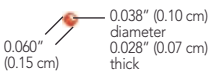
A-501



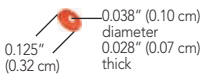
A-503

A-504

A-505

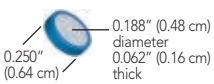


A-507



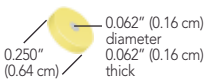
0.5 µm Titanium Frit

A-131

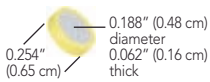


2 µm Titanium Frits

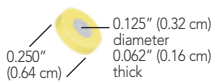
A-108



A-110



A-111



A-342-02

NOTE

- While all of the frits listed in this chapter are capable of withstanding high pressures (> 5,000 psi or 345 bar), the actual pressure holding capability of each frit is usually dependent on the filter body in which it is placed.

Part No.	Porosity	Disc Diameter	Disc Thickness	Ring OD	Ring Material	Frit Volume	Qty.
TITANIUM FRITS							
A-108x	2 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	0.7 µL	10-pk
A-110x	2 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PCTFE	7.1 µL	10-pk
A-111	2 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	2.7 µL	ea.
A-131	0.5 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	5.6 µL	ea.
A-342-02	2 µm	0.730" (1.85 cm)	0.062" (0.16 cm)	N/A	N/A	93.6 µL	ea.
A-501	0.2 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.248" (0.63 cm)	PEEK	0.6 µL	ea.
A-503	0.2 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.247" (0.63 cm)	PCTFE	5.1 µL	ea.
A-504	0.2 µm	0.118" (0.30 cm	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	2 µL	ea.
A-505	0.2 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.060" (0.15 cm)	PCTFE	0.1 µL	ea.
A-507	0.2 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.125" (0.32 cm)	PCTFE	0.1 µL	ea.

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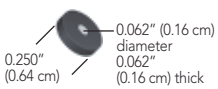
Stainless Steel Frits

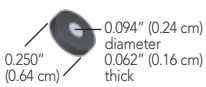
Upchurch Scientific® Analytical-scale 316 Stainless Steel Frits are available in 0.5 µm or 2 µm porosity—the most common HPLC filtration ratings. Each frit includes a PCTFE or PEEK polymer sealing ring. Many of the frits shown have the common 0.250" (0.64 cm) and 0.254" (0.64 cm) ODs, which allow them to be used in many of the Precolumn and Inline Filters found starting on page 160. Choose the larger diameter faces and/or larger porosity frits for faster flow rates. Choose frits with a smaller diameter face and/or smaller porosity for applications sensitive to extra flow path volume.

0.5 µm Stainless Steel Frits

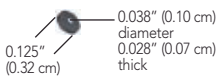
A-102



A-103

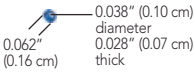


C-128-31

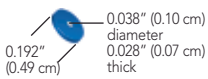


C-140-30

C-409

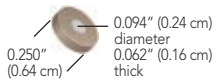


C-425

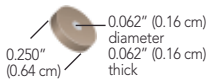


2 µm Stainless Steel Frits

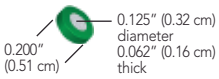
A-100



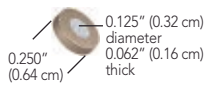
A-101



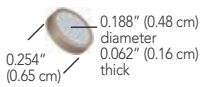
A-420



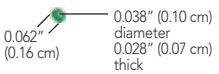
C-401



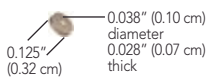
C-402



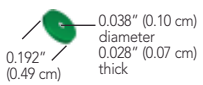
C-407



C-408



C-420



APPLICATION NOTE

To Clean Or Not To Clean?

It is rarely worth the time and effort to clean frits, given the relatively low cost of replacements. Furthermore, cleaning may leave some debris embedded in the frit pores. If the washed frit is accidently returned to your instrument in a reverse orientation, any remaining debris could be flushed out and deposited further down the fluid path. If this frit is being used as a column head frit, the debris may be washed directly onto the column bed.

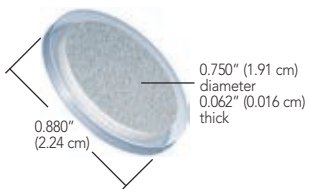
	Part No.	Porosity	Disc Diameter	Disc Thickness	Ring OD	Ring Material	Frit Volume	Qty.
	STAINLESS STEEL FRITS							
★	**A-100x**	2 µm	0.094" (0.24 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PEEK	1.7 µL	10-pk
★	**A-101x**	2 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PEEK	0.7 µL	10-pk
★	**A-102x**	0.5 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PEEK	0.6 µL	10-pk
★	**A-103x**	0.5 µm	0.094" (0.24 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PEEK	1.4 µL	10-pk
	A-420	2 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.200" (0.51 cm)	PCTFE	3.0 µL	ea.
	C-128-31	0.5 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.125" (0.32 cm)	PEEK	0.1 µL	ea.
	C-140-30x	0.5 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PCTFE	6.5 µL	10-pk
	C-401x	2 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PEEK	3.0 µL	10-pk
	C-402x	2 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PEEK	7.8 µL	10-pk
	C-407x	2 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.062" (0.16 cm)	PCTFE	0.1 µL	10-pk
	C-408x	2 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.125" (0.32 cm)	PEEK	0.1 µL	10-pk
	C-409x	0.5 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.062" (0.16 cm)	PCTFE	0.1 µL	10-pk
	C-420x	2 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.192" (0.49 cm)	PCTFE	0.1 µL	10-pk
	C-425x	0.5 µm	0.038" (0.10 cm)	0.028" (0.07 cm)	0.192" (0.49 cm)	PCTFE	0.1 µL	10-pk

Stainless Steel Semi-Prep Frits

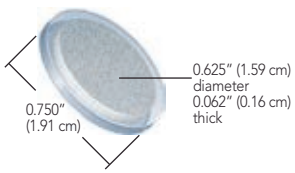
Many of these frits come complete with a PCTFE, ETFE, or PTFE sealing ring. Choose from 2 µm, 5 µm, 10 µm, and 20 µm filtration porosities and a range of diameters to match your intended flow rate and filtration requirements.

2 µm Semi-Prep Stainless Steel Frits

A-332

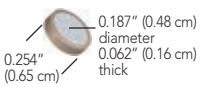


A-343



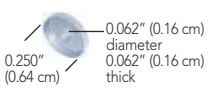
5 µm Semi-Prep Stainless Steel Frits

C-417

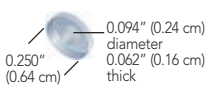


10 µm Semi-Prep Stainless Steel Frits

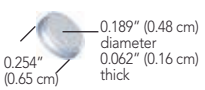
A-105



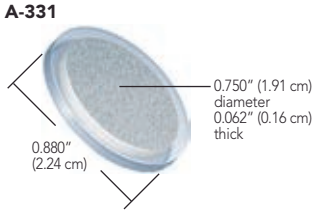
A-106



A-107

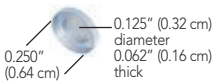


A-331

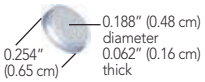


20 µm Semi-Prep Stainless Steel Frits

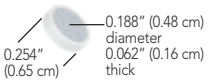
A-120



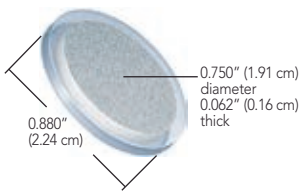
A-122



A-224

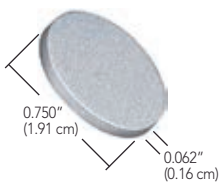


A-337

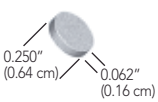


Stainless Steel Frit Discs

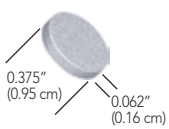
A-337-02



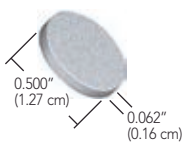
C-413



C-414



C-415



NOTE

Frits without the polymer rings cannot be used with our standard Precolumn and Inline Filter assemblies.

	Part No.	Porosity	Disc Diameter	Disc Thickness	Ring OD	Ring Material	Frit Volume	Qty.
	SEMI-PREP STAINLESS STEEL FRITS							
	A-105x	10 µm	0.062" (0.16 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	0.9 µL	10-pk
	A-106x	10 µm	0.094" (0.24 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	2.0 µL	10-pk
	A-107x	10 µm	0.189" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PCTFE	9.1 µL	10-pk
	A-120x	20 µm	0.125" (0.32 cm)	0.062" (0.16 cm)	0.250" (0.64 cm)	PCTFE	3.7 µL	10-pk
	A-122x	20 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PCTFE	9.7 µL	10-pk
	A-224	20 µm	0.188" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PTFE	9.7 µL	ea.
★	**A-331x**	10 µm	0.750" (1.91 cm)	0.062" (0.16 cm)	0.880" (2.24 cm)	ETFE	141.9 µL	10-pk
★	**A-332x**	2 µm	0.750" (1.91 cm)	0.062" (0.16 cm)	0.880" (2.24 cm)	ETFE	141.9 µL	10-pk
	A-337x	20 µm	0.750" (1.91 cm)	0.062" (0.16 cm)	0.880" (2.24 cm)	ETFE	152 µL	10-pk
	A-343	2 µm	0.625" (1.59 cm)	0.062" (0.16 cm)	0.750" (1.91 cm)	PCTFE	112.6 µL	ea.
	C-417	5 µm	0.187" (0.48 cm)	0.062" (0.16 cm)	0.254" (0.65 cm)	PEEK	7.2 µL	ea.
	STAINLESS STEEL FRIT DISCS (NO POLYMER RINGS)							
	A-337-02	20 µm	0.750" (1.91 cm)	0.062" (0.16 cm)	N/A	N/A	134.7 µL	ea.
	C-412	5 µm	0.250" (0.64 cm)	0.062" (0.16 cm)	N/A	N/A	13 µL	ea.
	C-413	10 µm	0.250" (0.64 cm)	0.062" (0.16 cm)	N/A	N/A	14 µL	ea.
	C-414	2 µm	0.375" (0.95 cm)	0.062" (0.16 cm)	N/A	N/A	26.9 µL	ea.
	C-415	2 µm	0.500" (1.27 cm)	0.062" (0.16 cm)	N/A	N/A	47.9 µL	ea.

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Iso-Prep™ Guard

- 21.2 mm and 30 mm ID column protection
- Improves plate count and symmetry
- New anti-rotation feature aids guard holder assembly

Iso-Prep Guard is a guard cartridge system designed to protect valuable prep columns. It offers superior column protection for adsorptive samples and a proven sample distribution mechanism via a precision machined holder. Iso-Prep Guard is ideal for protecting prep columns with no degradation of peak shape or plate count.

The high-performance guard protects columns in two ways. First, it acts as a filter, trapping particles in the frits. Second, when the guard cartridge is packed with the same material as the prep column, it removes compounds that irreversibly adsorb to the packing material.

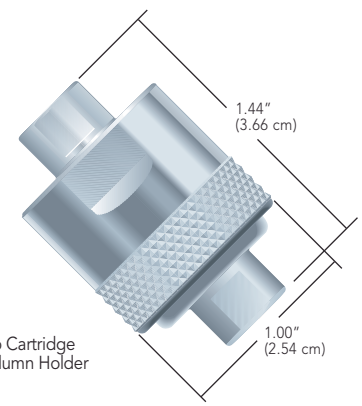
Unpacked Semi-Prep Guard Column

- 10 mm ID column protection
- Convenient cartridge system
- Easy to pack

The internal volume of this Upchurch Scientific® semi-prep guard column is just 780 µL, which only requires approximately 1.50 g of packing material — ideally the same material used in your semi-prep column. The C-1000 Holder will hold to high pressures, and is specially treated to prevent galling.* Use standard 10-32 coned fittings (not included) to connect your 1/16" OD tubing.

** Galling is a form of "cold welding." When two fittings manufactured from the same metal are wrench-tightened too tightly, they can "weld" together, making it virtually impossible to separate the two components.*

C-1000 Semi-Prep Guard Column
Fittings, tubing and column shown are not included.



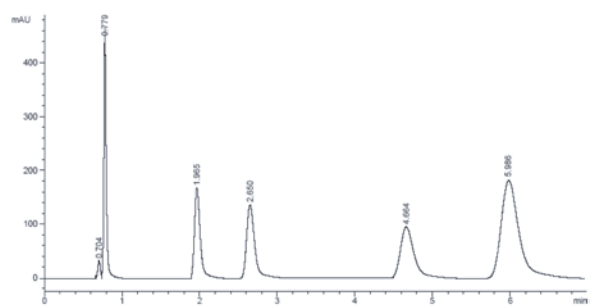
C-1000
Semi-Prep Cartridge Guard Column Holder

APPLICATION NOTE

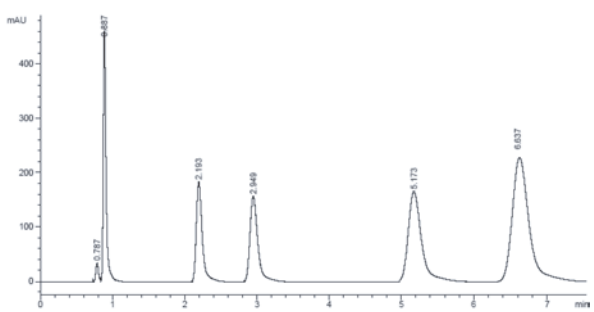
Low Pressure Drop

- 60:40 Acetonitrile:Water
- 50 mL/min
- Kromasil 10 µm C18
- Backpressure: 100 psi

10 µ C18 100 x 21.2 mm, 60:40 Acetonitrile:Water, 20 mL/min



Without Iso-Prep Guard — 38,150 Plates/M 1.24 As



With Iso-Prep Guard — 41,920 Plates/M 1.20 As

Part No.	Description
ISO-PREP GUARD ORDERING INFORMATION	
9197-P	Iso-Prep Guard Holder
9197-P-AR	Iso-Prep Guard Holder, 21.2mm, Anti Rotation
9197-20	Iso-Prep Guard Cartridge, 21.2 mm x 1 cm, 1 Frit
8056-MOD	Iso-Prep Guard, 21.2 mm Frit, 2 µm
9197-S	Iso-Prep Guard Finishing Tool
9196-P	Iso-Prep Guard Holder, 30 mm
9196-P-AR	Iso-Prep Guard Holder, 30 mm, Anti Rotation
9196-20	Iso-Prep Guard Cartridge, 30 mm x 1 cm, 2 µm Frit
8083-MOD	Iso-Prep Guard, 30 mm Frit, 2 µm
9196-S	Iso-Prep Guard Finishing Tool, 30 mm
SEMI-PREP GUARD COLUMN	
10 mm ID x 1 cm	
C-1000	Semi-Prep Cartridge Guard Column Holder
C-1035	Semi-Prep Cartridge
REPLACEABLE CARTRIDGE GUARD COLUMN FRIT CAPS	
C-1030	Threaded Frit Cap with 2 µm Stainless Steel Frit
C-1031	Threaded Frit Cap with 2 µm Titanium Frit

Cartridge Guard Columns

- 100% biocompatible flow path
- Pressure rated to 4,000 psi (276 bar)
- Wetted materials are Titanium and PEEK
- Reusable holder complete with fingertight fittings

Insert one of these Upchurch Scientific® analytical guard columns between the injection valve and column of your HPLC system to extend the life of your column and help ensure reproducible results. Convenient, prepacked PEEK polymer cartridges complete the system and are available in a variety of bonded phases to match your column chemistry held in place by Titanium frits.

The C-270 Stainless Steel Guard Column Holder is engineered for high-pressure applications to 4,000 psi (276 bar). Each of these holders is surface treated to prevent galling*, a potential problem with threaded metal parts.

The flow path of the C-270 Guard Column Holder is biocompatible. Each comes complete with fittings for 1/16" OD tubing, and can be used with any of the C-28X or C-7XX guard column cartridges listed on this page.

** Galling is a form of "cold welding." When two fittings manufactured from the same metal are wrench-tightened too tightly, they can "weld" together, making it virtually impossible to separate the two components.*

Biocompatible

APPLICATION NOTE

Why Use A Guard Column?

A guard column can increase the life of your analytical column up to five-fold[1]. Use a guard column with the same packing as your column — it will act as a chemical filter, removing strongly retained materials in your sample that might otherwise contaminate your analytical column. And, it is more economical to replace a guard column cartridge than to buy a new analytical column.

[1]Uwe D. Neue, HPLC Troubleshooting – Column Durability, American Laboratory, 1999; 22:44-7.

SPECIFICATIONS & DETAILS

Packing Material Specifications: The cartridges on this page are packed with 5 µm or 10 µm base-deactivated 80 Å spherical silica.

	Part No.	Description	
	CARTRIDGE GUARD COLUMN KITS		
	C-281	2.0 mm ID C18 Cartridges (6-pk) with (1) C-270 Assembly	
	C-751	4.3 mm ID C18 Cartridges (6-pk) with (1) C-270 Assembly	
	GUARD COLUMN CARTRIDGE HOLDERS, BIOCOMPATIBLE		
	C-270	High Pressure, Stainless Steel, with (2) F-200 Fittings	
	GUARD COLUMN CARTRIDGES, BIOCOMPATIBLE		
	2.0 mm ID x 1 cm, 10 µm Silica		**Qty.**
	C-280	Reversed Phase C18	3-pk
★	**C-282**	Reversed Phase C18	10-pk
	C-753	Adsorption Silica	3-pk
	4.3 mm ID x 1 cm, 5 µm Silica		
	C-750	Reversed Phase C18	3-pk
★	**C-752**	Reversed Phase C18	10-pk
	C-759	Adsorption Silica	3-pk
	C-760	Adsorption Silica	10-pk
	C-763	Cyano Phase CN	3-pk
	C-764	Cyano Phase CN	10-pk

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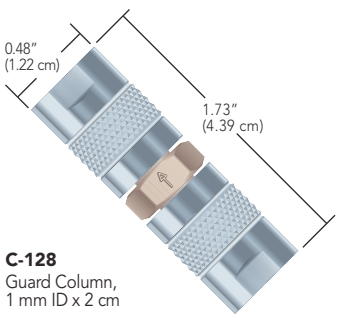
Microbore Guard Columns

- Ideal for Microbore HPLC
- Easily dry packed (or slurry packed with adapter)
- Made of PEEK polymer and stainless steel

This Upchurch Scientific® ultralow volume guard column (1.0 mm ID x 2 cm length) is ideal for narrow-bore chromatography. The unpacked guard column allows you to exactly match the chemistry of your column, resulting in optimum column protection. The total packing volume of 16.2 µL ensures maximum column efficiency and analytical column protection. The column can be easily dry packed using the specially designed funnel (C-128-20). A 3 g bottle of our C18 packing material will pack this column more than 120 times.

Frits often become plugged before a guard column is contaminated. The two 0.5 µm frits included with this guard column can be changed in minutes. Optional 2 µm frits may be purchased separately (C-408).



C-128
Guard Column,
1 mm ID x 2 cm

APPLICATION NOTE

Signs Indicating the Guard Column Needs to be Changed

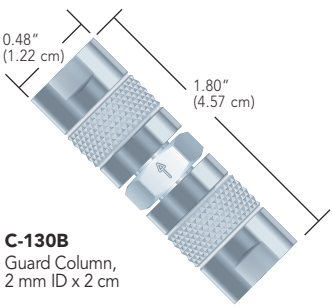
- System pressure build-up
- Faster than usual retention times
- Reduced resolution

Analytical Guard Columns

- Easy to pack
- Available as a kit with funnel and extra frits

The C-130B is our most popular guard column. HPLC users find this column easy to pack and extremely economical. This narrow-bore short column (2.0 mm ID x 2 cm length) creates only a slight pressure increase with virtually no detectable theoretical plate loss when used with a 3 mm ID or larger column. The 2 µm frits are easy to change, prolonging the life of the guard column. With only 62 µL packing volume per guard column, a 3 g bottle of packing material will pack about 30 guard columns.

For convenience, we offer the C-135B kit with two unpacked guard columns and a ten pack of frits. With two guard columns, there is always a back-up available to help eliminate downtime.



C-130B
Guard Column,
2 mm ID x 2 cm

Analytical Guard Column Kit

For complete convenience, try the Upchurch Scientific guard column kit with packing material. This kit contains 10 replacement frits, a packing funnel and 3 g of C18 reversed phase.

Part No.	Description	Includes
MICROBORE GUARD COLUMNS		
1.0 mm ID x 2 cm Unpacked		
C-128	Guard Column	(2) C-128-31
C-128-20	Packing Funnel	
C-128-31	0.5 µm Stainless Steel Replacement Frit	
C-408	2 µm Stainless Steel Replacement Frit	
C-128-40	Slurry Packing Adapter	
C-128-50	Guard Column Kit	(2) C-128, (1) C-128-20, (10) C-128-31
ANALYTICAL GUARD COLUMNS		
2.0 mm ID x 2 cm Unpacked		
C-130B	Guard Column	(2) A-100
C-130-20	Packing Funnel	
A-100	2 µm Stainless Steel Replacement Frit	
A-103	0.5 µm Stainless Steel Replacement Frit	
C-130-40	Slurry Packing Adapter	
C-135B	Guard Column Kit	(2) C-130B, (1) C-130-20, (10) A-100
1602	Guard Column Kit with Reversed Phase C18	(2) C-130B, (1) C-130-20, (10) A-100, 3 g C18 packing material
PACKING MATERIAL		
Part No.	**Particle Size**	**Qty.**
C-603	Reversed Phase C18, 30–40 µm pellicular	3 g

RELATED PRODUCTS

- All Guard Columns featured on this page include 10-32 Coned threads. Use any of the 10-32 coned fittings on pages 9–17 to connect tubing to these guard columns.

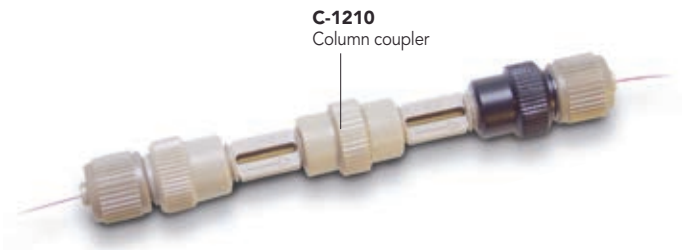
Capillary Sample Trap Columns

- Packed and unpacked columns
- Pressure rated to 5,000 psi (345 bar)
- Direct connect 360 µm OD capillary tubing

Upchurch Scientific® Capillary Sample Trap Columns are ideal for separating and concentrating and/or purifying biological samples.

Capillary Sample Trap Column Assemblies include one or more 1 µm NanoFilter™ Capsules, each containing either a stainless steel (SST) or biocompatible titanium (Ti) frit. The swept volume of these unique filters is only 10 nL each. Connect your 360 µm OD capillary tubing directly to our Sample Trap Column Assemblies using the fittings provided. The maximum flow rate for these products is 10 µL/min; 250 nL is the optimal flow rate.

Please Note: Reversing flow in these columns can result in loss of packing material. For more information regarding the proper setup involving these Sample Trap Columns, please contact your local distributor or IDEX Health & Science customer service.



SPECIFICATIONS & DETAILS

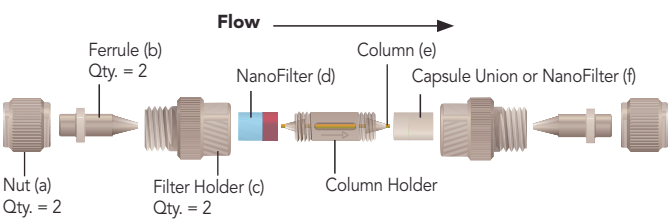
- Packing material specifications: C18, high carbon load, 5 µm/300A spherical silica and SCX, 5 µm 85A material.
- Maximum sample loading capacity of 0.1 µg and capillary bed volume of 0.19 µL or less.

RELATED PRODUCTS

- Use the P-116 MicroFerrule Plug on page 18 to plug a Sample Trap Column for storage.
- Find 360 µm OD PEEK polymer and fused silica tubing on page 67.

Components Chart

Please refer to the drawing and part numbers below when ordering replacement components:



Column Assembly	Nuts (a)	Ferrules (b)	Filter Holder Color(c)	NanoFilter (d)	Column (e)	Capsule Union or NanoFilter (f)
C-1200	P-416	F-152	Tan	M-125 (SST)	C-1250 (C18)	M-124NF (no frit)
C-1300	P-416BLK	F-152	Tan	M-126 (Ti)	C-1250 (C18)	M-124NF (no frit)
C-1500	P-416	F-152	Tan	M-125 (SST)	FS-1000-25 (unpacked)	M-125 (SST)
C-1600	P-416BLK	F-152	Tan	M-126 (Ti)	FS-1000-25 (unpacked)	M-126 (Ti)

All nuts, ferrules, and column holders are made of PEEK polymer. Filter holders are made of PEEK polymer (non-conductive) or stainless steel (conductive). NanoFilter Capsule bodies are made of PEEK polymer (non-conductive) or stainless steel and PEEK (conductive). See page 162 for NanoFilter Capsule color coding. Abbreviation Key: SST = stainless steel; Ti = titanium; SCX = Strong Cation Exchange

	Part No.	Description	Frit Material	Includes
	CAPILLARY SAMPLE TRAP COLUMNS			
	Assemblies			
	C-1200	C18 Column	SST	(1) 2-pk C-1250, (1) M-125, (2) P-416, (2) F-152, (1) M-124NF
	C-1300	C18 Column	Ti	(1) 2-pk C-1250, (1) M-126, (2) P-416BLK, (2) F-152, (1) M-124NF
	C-1500	Unpacked Column	SST	(1) FS-1000-25, (2) M-125, (2) P-416, (2) F-152
★	**C-1600**	Unpacked Column	Ti	(1) FS-1000-25, (2) M-126, (2) P-416BLK, (2) F-152

Column Coupler and Replacement Parts

	Part No.	Description	Swept Volume	Qty.
	C-1210	Column Coupler, PEEK	—	ea.
	C-1250	C18 Columns, 100 µm ID x 2.5 cm x 360 µm OD	—	2-pk
★	**F-152**	MicroFerrule for 360 µm OD tubing, PEEK	—	ea.
	FS-1000-25	Unpacked Column, 100 µm ID x 2.5 cm x 360 µm OD	—	ea.
	M-124NF	Capsule Union, no Frit, PEEK	9.5 nL	ea.
	M-125	1 µm NanoFilter Capsules, with SST Frits	10 nL	2-pk
★	**M-126**	1 µm NanoFilter Capsules, with Ti Frits	10 nL	2-pk
★	**P-416**	Female Nut, Natural PEEK	—	ea.
	P-416BLK	Female Nut, Black PEEK	—	ea.
	P-416G	Female Nut, Green PEEK	—	ea.

DEBUBBLERS & DEGASSERS

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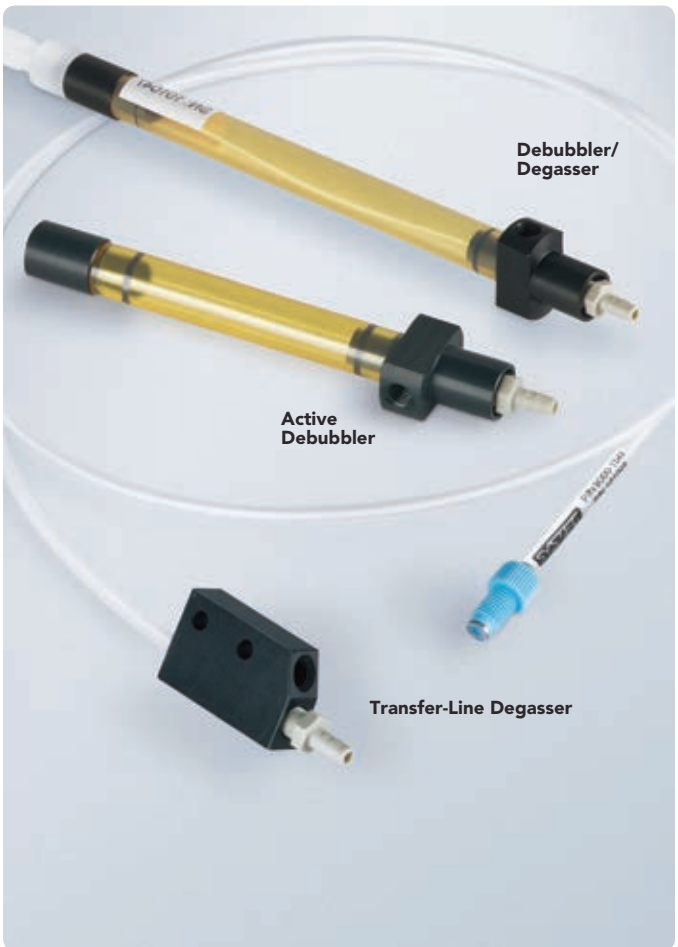
Systec® Debubbler Series

Remove Bubbles, Dissolved Gas, or Both!

Dissolved gases and bubbles in system liquids cause dispense volume anomalies in many instruments, negatively affecting both dispense precision and analytical accuracy. Now you have a choice of components for actively removing bubbles with or without also removing dissolved system gases. Online Vacuum Degassing offers operating convenience, high efficiency and low operating costs compared to other common degassing technologies.



Debubbler/Degasser

Combines Vacuum Degassing with Active Bubble Removal

- Improves instrument performance — reduces downtime due to bubble formation.
- Fewer false positives due to reduction of partial reagent dispenses.
- Easily integrates into any pump, degassing tray, or stand-alone degassing application.

Active Debubbler

Remove Bubbles in Fluid Stream Before or After the Pump

- Improves instrument performance — reduces downtime due to bubble formation.
- Fewer false positives due to reduction of partial reagent dispenses.
- Easily integrates into any pump, degassing tray, or stand-alone degassing application.

Transfer-Line Degasser

Removes Dissolved Gases During Fluid Transfer

- Eliminates baseline fluctuations for improved detector sensitivity.
- Coaxial design reduces number of connections, improves reliability.
- Single lumen design increases degassing reliability.

APPLICATION NOTE

- Liquid handling
- IVD
- HPLC/UHPLC
- O_2 and CO_2 removal

In medical analyzers, bubbles interfere with critical volumetric reagent dispenses and cause sample failures, wasting time and money. Because bubbles adhere to nearly every part of a dispensing system, high velocity or induced turbulent flow is often used to displace and discharge bubbles from the flow stream and into a waste area. These alternative processes waste reagents and are time consuming, unpredictable, and may additionally require designing the system to recognize bubbles are present. Regardless of how the systems are designed, aqueous systems will always be subject to the laws of physics that cause out-gassing during changes in fluid temperature, pressure, or chemicals mixture. In fluid applications like these, debubblers are the optimal solution to capture and remove formed bubbles to prevent sample dispense inaccuracies, and degassing is ideal to prevent downstream bubble formation from recurring.

Part No.	Description	Standard Bubble Trap Size	Transfer Line Length	Internal Volume	Max Bubble Capacity
DEBUBBLER SERIES – AVAILABLE STANDARD CONFIGURATION					
9000-1540	2.5 mL Active Debubbler	2.5 mL	—	2.5 mL	2.5 mL
9000-1541	5 mL Active Debubbler	5 mL	—	5 mL	5 mL
9000-1544	2.5 mL Debubbler/ Degasser	2.5 mL	17.5" (444.5 mm)	2.5 mL in transfer line + 2.5 mL in bubble trap	2.5 mL
9000-1545	5 mL Debubbler/ Degasser	5 mL	34" (863.6 mm)	5 mL in transfer line + 5 mL in bubble trap	5 mL
★ **9000-1549**	1.1 m Transfer-Line Degasser	—	1.1 m (43")	4 mL	N/A

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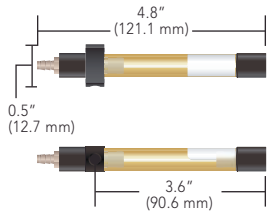
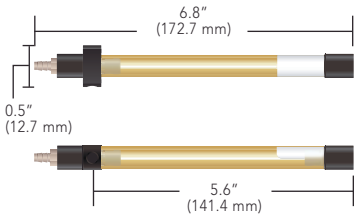
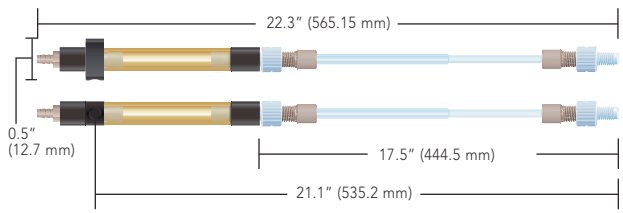
Overall Dimensions



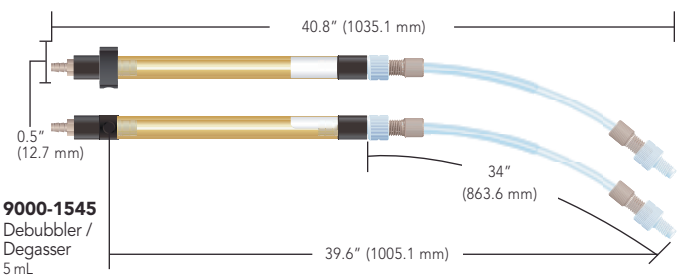
9000-1540
Active Debubbler
2.5 mL



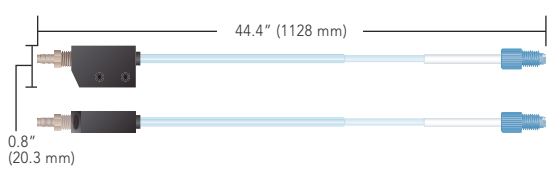
9000-1541
Active Debubbler
5 mL



9000-1544
Debubbler / Degasser
2.5 mL



9000-1545
Debubbler / Degasser
5 mL



9000-1549
Transfer-Line Debubbler
1.1 meter

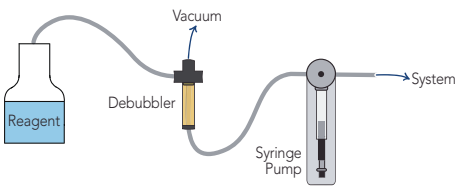
Please note: These drawings are not actual size.

BENEFITS

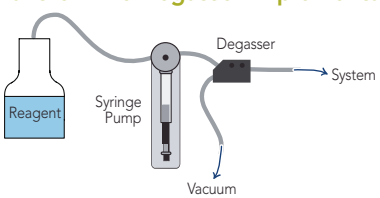
	Active Debubbler	Debubbler/ Degasser	Transfer-Line Degasser
Perfect for applications that require dissolved gas like oxygen for reaction kinetics	✓		
Improves dispense precision by capturing and removing bubbles	✓	✓	
Eliminates false positives and reduces reagent waste by improving instrument performance	✓	✓	
Easily integrates into fluidic path	✓	✓	✓
Creates stable instrument performance across system and environmental fluctuations	✓	✓	✓
Prevents the formation of bubbles downstream of the degasser		✓	✓
Eliminates fluctuations for improved detector sensitivity and accuracy by preventing bubble formation		✓	✓
Improves fluidic system reliability because coaxial design reduces the number of connections			✓
Flexible design can be implemented as transfer line in new instruments or existing instruments that don't have space available			✓
Minimizes fluidic system internal volumes to reduce reagent cost			✓

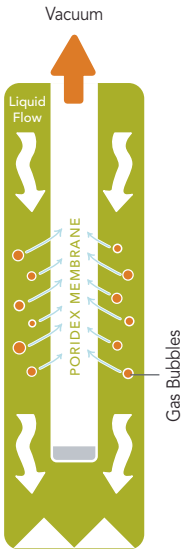
IMPLEMENTATIONS

Typical Debubbler Implementation



Transfer-Line Degasser Implementation





Gas bubbles are actively removed from a flowing liquid stream by vacuum via the PORIDEX membrane.

NOTE

Degassing tubing is flexible and therefore can be coiled to shorten the overall length or used to transfer the fluid within an instrument to the next desired location.

SPECIFICATIONS (ALL PLATFORMS)

	Active Debubblers	Degasser/ Debubblers	Transfer-Line Degasser
Bubble Removal (volume of air removed/min @ 10 mL/min H_2O)	Up to 30 cc	Up to 30 cc	N/A
Degassing Efficiency† @ 1 mL/min H_2O	N/A	2.5 mL size: 36% O_2 removal 5.0 mL size: 55% O_2 removal	< 4 ppm dissolved O_2 at 5 mL/min
Membrane Material	PORIDEX®	PORIDEX	PORIDEX
Wetted Materials	PORIDEX, Polyolefin, FEP, ETFE, Ultem®	PORIDEX, Polyolefin, FEP, ETFE, Ultem	PORIDEX, Polyolefin, FEP, ETFE
Solvent Compatibility	Solutions > 50% aqueous. Not compatible with detergent concentrations > 0.05%.		
Standard Bubble Trap Volume	2.5 / 5.0 mL	2.5 / 5.0 mL	N/A
Transfer-Line Volume	N/A	2.5 / 5.0 mL	< 4 mL
Maximum Operating Pressure	200 kPa (30 psi) @ 25 °C		
Maximum Operating Temperature	40 °C		
Recommended Vacuum Level	Minimum 16 kPa absolute		
Liquid Connection	1/4-28 fitting system		
Vacuum Connection	Tubing vacuum port(s) for 1/8" (3 mm) ID elastomeric tubing		
Pressure Drop	0.8 mm Hg / mL / min (assumes laminar flow and viscosity of 1 cP)		

† Debubbling / degassing efficiency can be optimized based on flow rate, fluid to be degassed, and gas to be removed.

APPLICATION NOTE

Why Degas Your Mobile Phase?

Dissolved air in HPLC mobile phases can result in flow rate instability and baseline disturbance.

Flow rate instability: Non-degassed mobile phase can outgas in the pump head, causing bubbles to be formed and trapped inside the head or check valves. These bubbles can cause flow disturbances and pressure fluctuations, resulting in flow rate instability.

Baseline disturbance: As the mobile phase passes through the column, it experiences a large pressure drop. Non-degassed mobile phase can outgas due to this pressure differential, causing air bubbles to form. Air bubbles passing through or lodging in the flow cell cause detection disturbances, exhibited as baseline noise.

Why Use a Degassing System?

Helium sparging is a common means of degassing HPLC solvents. This method has its drawbacks, however. Helium tanks are expensive and bulky, and solvent backup and contamination are concerns. In addition, helium sparging can change the composition of a premixed mobile phase over time, due to the difference in the evaporation rates of mobile phase components.

In contrast, the Systec® Degassing System has none of these drawbacks, and it is extremely fast and efficient at removing dissolved gases — more efficient than helium sparging or PTFE-based degassing systems.

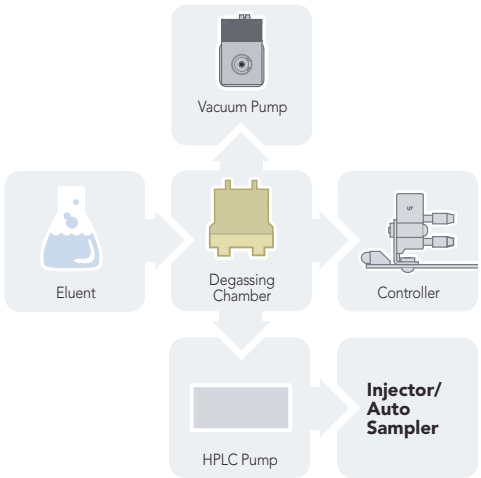
Tubing Connections

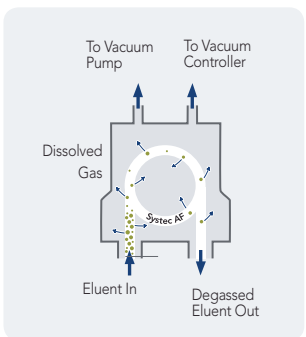
We recommend ETFE tubing (page 73) be used to limit regassing of mobile phase between the degasser and your pump. ETFE is recommended because of its superior impermeability to gases (compared to PTFE, FEP, and PFA tubing). Applicable flangeless fittings for 1/8" OD tubing are found on page 26.

GPC and HFIP Applications

Standard degassing chambers, with PEEK bulkhead unions, are not recommended for GPC applications or for use with HFIP (hexafluoroisopropanol). Special GPC "hardened" versions are available. Please contact us for more information.

TYPICAL DEGASSER IMPLEMENTATION





Dissolved gases are actively removed from a flowing liquid stream by vacuum via the Systec AF® membrane.

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Systec® Stand Alone MINI & Prep Scale Vacuum Degassing Systems

- Analytical and Prep scale models
- Ultra-high degassing efficiency
- Low volume, easy to prime
- Patented control eliminates baseline fluctuations
- Inert flow path
- 5+ year lifetime

The Systec Stand-Alone MINI and Prep-Scale HPLC vacuum degassing systems are high-efficiency, in-line modules that remove dissolved gases from the mobile phase. Their unique design assures reliable continuous operation and the highest level of performance available without the need for helium sparging. Up to five solvent lines may be degassed simultaneously by one unit.

ZHCR® Control with Built-in Test Diagnostics

- Microcontroller self-test vacuum sensor validation on power-up
- Continuous vacuum system monitoring to ensure optimum operational conditions are maintained
- Vacuum system fault detection and shutdown function indicators

AF / ZHCR Degassing Technology

Flow-through vacuum degassing chamber with a single amorphous perfluorinated copolymer (Systec AF®) degassing membrane, enabling degassing efficiency 50 times that of PTFE.

The ZHCR (Zero Hysteresis / Constant Run) vacuum pump employs a patented closed-loop, micro-stepping rpm control strategy permitting the pump to run with continuously variable speed, providing quick pull-down at high rpm, and then sustaining a consistent vacuum level at low rpm.

Fluctuations in detector baseline due to changes in vacuum level are eliminated by not having to repeatedly stop and start a single-speed pump. This also greatly reduces wear and noise.

The brushless motor enables quiet operation and is appropriate for environments where solvent vapors may be present.

SPECIFICATIONS

Stand-Alone Degassing Modules	
Maximum Number of Degassing Channels	5
Degassing Efficiency† @ 1 mL / min MeOH	> 70% O_2 Removal
Membrane Material	SYSTEC AF
Other Wetted Materials	PEEK, PPS(GF), PTFE(GF), FEP
Solvent Compatibility	Not compatible with fluorinated solvents. Special version available for GPC solvents.
Flow Path ID	1.14 mm (0.045")
Internal Volume	480 µL (standard)
Maximum Pressure (@ 25 °C)	0.5 MPa (70 psi)
Pressure Drop	0.18 kPa/mL/min

† Degassing efficiency can be optimized based on flow rate, fluid to be degassed, and gas to be removed.
[1] Standard ID; other sizes available.

NOTE

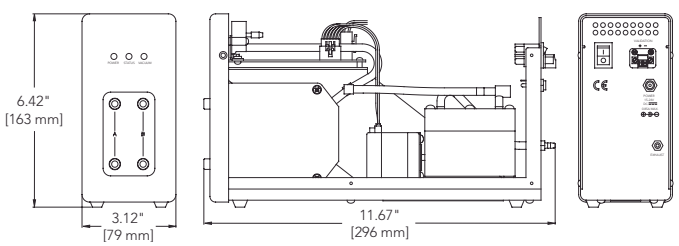
Power Requirement

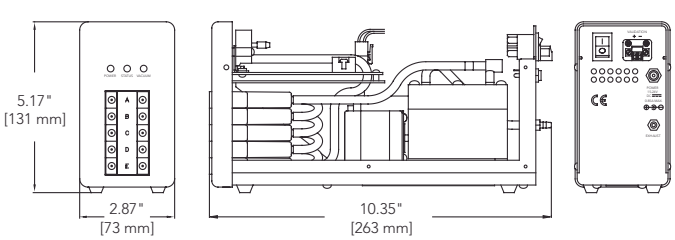
Input Power required with AC Adapter (included): 100 to 240 V AC (±10%), 1A, 50 to 60 Hz (±3 Hz). Four interchangeable wall sockets are supplied with the AC Adapter: North America/Japan, U.K., Continental Europe, Australia.

CE Certification

This product has been certified under the following CE testing standards: EN61326-1; EN55011; EN61300-3-2; EN61300-3-3, & EN61010-1.

Overall Dimensions





	Part No.	Number of Channels	Channel Volume	Max HPLC Gradient Flow Capability	Pressure Drop[E]	Degassing Flow Path ID
	SYSTEC STAND ALONE MINI VACUUM DEGASSING SYSTEMS — AVAILABLE CONFIGURATIONS[A]					
★	**0001-6500**	2	480 µL	2.0 mL/min[C]	0.18 kPa/mL/min	0.045" (1.14 mm)
★	**0001-6501**	4	480 µL	2.0 mL/min[C]	0.18 kPa/mL/min	0.045" (1.14 mm)
	SYSTEC STAND ALONE PREP SCALE VACUUM DEGASSING SYSTEMS — AVAILABLE CONFIGURATIONS[A, B]					
	0001-6482	2	8.4 mL	20 mL/min[D]	0.04 kPa/mL/min	0.065" (1.65 mm)
★	**0001-6484**	2	13.8 mL	40 mL/min[D]	0.06 kPa/mL/min	0.065" (1.65 mm)

A. Custom configurations are available. Consult us for your own OEM solution to your specific application.
B. The standard prep scale chambers are not recommended for GPC applications or for use with HFIP (hexafluoroisopropanol).
C. The flow rates given are for a gradient mixture of 50/50 MeOH/H_2O, with a typical low pressure gradient mixing valve. Higher flow rates are possible with high pressure mixing.
D. The flow rates given are for a gradient mixture of 60/40 MeOH/H_2O, with a typical low pressure gradient mixing valve. Higher flow rates are possible with high pressure mixing.
E. Estimated tubing pressure per unit change in flow assuming laminar flow with a viscosity of 1.0 cP

TECHNICAL RESOURCES

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Technical Resources available at www.idex-hs.com

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Fittings Primer

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- Describe the fittings needed for your application
- Classify your fitting needs

Visit **www.idex-hs.com/fittings_primer**

Materials Guide

- Material Properties Guide
- Chemical Compatibility
- Polymer Information Summary

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Conversion Tools

- Calculator to help determine volumes and tubing sizes to achieve specific volume requirements
- Conversion calculators for pressure, temperature and length

Visit **www.idex-hs.com/conversions**

Standard Port Drawings

- 6-40 flat-bottom
- 6-32 coned
- 10-32 coned and flat-bottom
- 1/4-28 coned and flat-bottom
- 5/16-24 flat-bottom
- 1/2-20 flat-bottom
- M6 flat-bottom

Visit **www.idex-hs.com/standard_ports**

Visit our column hardware website with interactive column selector guides!

www.idexcolumnhardware.com

Please Note: For more information regarding the properties of the polymers listed below, please refer to www.idex-hs.com/materials. Find refractive index data on pages 62 and 70; gas permeability data on pages 75–76.

Delrin® (acetal). Delrin exhibits excellent chemical resistance to most organic solvents as well as to most neutral-pH aqueous solvents. However, it is not suitable for use with acids, bases or oxidizing agents. This polymer's high tensile strength yields superior, highly wear-resistant threads and excellent thread strength.

FEP (fluorinated ethylene-propylene) and **PFA** (perfluoroalkoxy alkane). Both of these polymers are in the same family as PTFE, and as such are inert to virtually all chemicals used in HPLC. However, because of their relative softness and low durability, these polymers are generally used for low pressure applications. Choose PFA for high purity applications, or choose FEP as a general, all-purpose material. Both FEP and PFA have good thread strength.

Halar® ECTFE (ethylene-chlorotrifluoroethylene). Halar is a member of the fluoropolymer family. It offers excellent chemical resistance coupled with a mechanical strength superior to many other fluoropolymers. Halar also outperforms PTFE and similar fluoropolymers in ability to withstand radiation, making it an attractive alternative for medical applications. Its exceptionally smooth surface enhances optical clarity while also helping prevent the shedding of microparticles into the fluid stream.

PCTFE (polychloro-trifluoroethylene). PCTFE has excellent chemical resistance. In general, only THF and a few halogenated solvents will react with it. This resilient fluoropolymer is ideal for fittings and sealing surfaces and also has good thread strength.

PEEK (polyetheretherketone). PEEK polymer is the flagship member of the poly(aryl)ether ketone family of polymers. It has excellent chemical resistance to virtually all commonly used solvents. However, the following solvents are usually not recommended for use with PEEK: nitric acid; sulfuric acid; halogenated acids, such as hydrofluoric acid and hydrobromic acid (hydrochloric acid is approved for use in most applications); and pure halogenated gases. Additionally, due to a swelling effect, be cautious in using the following solvents with PEEK tubing: methylene chloride, THF, and DMSO in any concentration and acetonitrile in higher concentrations. Excellent thread strength.

PK A proprietary polymer blend comprised mainly of polyether-etherketone (PEEK). PK demonstrates all of the superior chemical resistance of PEEK (see PEEK above). The proprietary blend however, will allow a fitting to attain a higher pressure while reducing the cold flow properties of pure PEEK. CAUTION: some fittings molded of PK are known to be conductive. Use caution when employing PK fittings in high voltage applications.

Polypropylene Polypropylene is a relatively soft polymer commonly used in low pressure applications, and is especially prevalent in IVD and similar equipment. Polypropylene is excellent for aqueous solutions; however, it should not be used with chlorinated, aromatic, and some organic solvents. Fair thread strength.

PPS (polyphenylene sulfide). PPS is a resilient polymer known for its high tensile strength and excellent chemical resistance. PPS may be safely used at room temperature with most organic solvents and neutral-to-high pH aqueous solvents. However, it is not recommended for use with chlorinated solvents, inorganic acids, or any solvent at elevated temperatures.

Radel® (polyphenylsulphone). Radel is an amorphous thermopolymer that is mechanically strong and offers good chemical resistance. This polymer withstands repeated autoclave sterilization cycles without suffering thermal breakdown. This property, coupled with its optical clarity, makes Radel tubing an excellent choice for medical and other applications where visual monitoring is essential. Radel is also a readily wetted material, minimizing air bubble accumulation on the inner walls of tubing manufactured with this polymer.

ETFE (ethylene-tetrafluoroethylene). As a member of the fluoropolymer family, ETFE has excellent solvent resistance. Its physical properties make it ideal for demanding sealing applications. While most commonly used solvents do not interact with ETFE, take caution when using some chlorinated chemicals. ETFE has good thread strength.

UHMWPE (ultra-high molecular weight polyethylene). UHMWPE is a well-known and durable manufacturing polymer. Its physical properties make it ideal for general, aqueous-based environments. Take caution when using this polymer in heavily organic-based applications. Good thread strength.

Ultem® PEI (polyetherimide). An amorphous thermoplastic offering high heat resistance, high strength, and broad chemical resistance. Tubing made from Ultem offers a high degree of transparency. This polymer withstands various sterilization methods, such as repeated autoclaving as well as gamma radiation, ethylene oxide gas, and dry heat. Ultem meets the criteria for ISO10993, FDA, and USP Class VI certification.

Vespel® (polyimide). Vespel thermoplastic offers high heat resistance, high mechanical strength, and broad chemical resistance in most common liquid chromatography applications. However, it is particularly susceptible to attack by high pH chemical environments. Vespel can be autoclaved and sterilized using gamma radiation. Vespel offers inherent lubricity, making it ideal as a chemically resistant bearing surface.

RoHS Compliance Search for RoHS at www.idex-hs.com. For items not included in the catalog, please contact IDEX Health & Science directly.

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The fluid transfer community uses both the International System of Units (Metric System) and the U.S. Customary System. To access automatic conversion calculation tools, please go to **www.idex-hs.com/conversions**.

Dimensions — Inches to Metric

Decimal Inches	Fractional Inches	Metric
0.031″	1/32″	0.79 mm
0.062″	1/16″	1.57 mm
0.125″	1/8″	3.18 mm
0.188″	3/16″	4.78 mm
0.250″	1/4″	6.35 mm
0.313″	5/16″	7.95 mm
0.375″	3/8″	9.53 mm
0.438″	7/16″	11.13 mm
0.500″	1/2″	12.70 mm
0.563″	9/16″	14.30 mm
0.625″	5/8″	15.88 mm
0.688″	11/16″	17.48 mm
0.750″	3/4″	19.05 mm
0.813″	13/16″	20.65 mm
0.875″	7/8″	22.23 mm
0.938″	15/16″	23.83 mm
1″	1″	2.54 cm
2″	2″	5.08 cm
3″	3″	7.62 cm
4″	4″	10.16 cm
5″	5″	12.70 cm
6″	6″	15.24 cm
7″	7″	17.78 cm
10″	10″	25.40 cm

Dimensions — Metric to Inches

Metric	Decimal Inches
1.0 mm	0.039″
1.8 mm	0.071″
2.0 mm	0.079″
3.0 mm	0.118″
3.2 mm	0.126″
4.0 mm	0.157″
4.3 mm	0.169″
4.6 mm	0.181″
5.0 mm	0.197″
6.0 mm	0.236″
7.0 mm	0.276″
8.0 mm	0.315″
9.0 mm	0.354″
1.0 cm	0.394″
2.0 cm	0.787″
3.0 cm	1.181″
4.0 cm	1.575″
5.0 cm	1.969″
6.0 cm	2.362″
7.0 cm	2.756″
8.0 cm	3.150″
9.0 cm	3.543″
10.0 cm	3.937″

Conversion Factors

Conversion Desired	Formula
Inches to millimeters	Inches x 25.4 mm/in.
Inches to centimeters	Inches x 2.54 cm/in.
Inches to microns	Inches x 25.4 mm/in. x 1,000 µm/mm
Diameter in inches to linear volume (µL/inch)*	12870.4 (d2)
Diameter in µm to linear volume (µL/cm)*	7.85 x 10-6 (d2)
Celsius to Fahrenheit	(Celsius x 9/5) + 32
Fahrenheit to Celsius	(Fahrenheit - 32) x 5/9
psi to bar	psi x 0.06894757
psi to MPa	psi x 0.00689476
psi to torr	psi x 51.7150733
psi to ATM	psi x 0.06804596
**d = internal diameter*	

Temperature

Celsius (°C)	Fahrenheit (°F)
0	32
1	34
5	41
10	50
15	59
20	68
25	77
30	86
35	95
40	104
45	113
50	122
55	131
60	140
65	149
70	158
75	167
80	176
85	185
90	194
95	203
100	212
105	221
110	230
115	239
120	248
125	257
130	266
135	275
140	284
145	293
150	302
155	311
160	320
165	329
170	338
175	347
180	356
185	365
190	374
195	383
200	392
205	401
210	410
215	419

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What Threads Do I Have?

Hold your fitting over the thread silhouettes below to identify the threads.

U.S. Customary Threads

6-40

6-32

10-32

1/4-28

5/16-24

1/2-20

Metric Threads

M4 x 0.7

M6 x 1

Refer to page 223 for an explanation of thread nomenclature.

Pressure Conversion

psi	bar	MPa	ATM
100	6.9	0.7	6.8
500	34.5	3.4	34.0
1,000	68.9	6.9	68.0
1,500	103.4	10.3	102.1
2,000	137.9	13.8	136.1
2,500	172.4	17.2	170.1
3,000	206.8	20.7	204.1
3,500	241.3	24.1	238.2
4,000	275.8	27.6	272.2
4,500	310.3	31.0	306.2
5,000	344.7	34.5	340.2
5,500	379.2	37.9	374.3
6,000	413.7	41.4	408.3
6,500	448.2	44.8	442.3
7,000	482.6	48.3	476.3
7,500	517.1	51.7	510.3
8,000	551.6	55.2	544.4
8,500	586.1	58.6	578.4
9,000	620.5	62.1	612.4
10,000	689.5	68.9	680.5

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Fittings Primer

Fittings

Fittings — typically comprised of a nut and ferrule — are designed to connect and seal tubing. While simple in function, fittings can be complex in description and use. General descriptive terms include: the geometry of the receiving port (coned or flat-bottom); the tubing size for which the fitting is designed; and a description of the threads on the nut, e.g., 10-32, 1/4-28, etc. Fittings may also be classified by dimensions and by the type of material from which they are manufactured. Additional information — such as tubing and port material, solvent(s) to be used, and expected system pressure — is required to determine which fittings are best suited for a particular application.

Threads

Several thread sizes are commonly used in analytical fluid transfer. The most common sizes are 1/4-28, 10-32, and M6. The first two are U.S. Customary System measurements. The third, M6, is measured in the Metric System.

U.S. Customary System Two numbers are used to describe a thread size. The first number indicates the diameter of the threaded portion of the nut. Thread diameter numbers range from gauge 1 (0.073") to gauge 12 (0.216"). Beyond 0.216" the thread diameter is given as the actual diameter in fractions of an inch. The second number indicates the threads-per-inch count. Thus, a 1/4-28 nut (Figure 1) has a 1/4" (0.250") diameter thread barrel and 28 threads-per-inch. A 10-32 male nut (Figure 2) has a gauge 10 (0.190") thread barrel with 32 threads-per-inch.

Metric System The Metric System also uses a two number system to describe the threads. The first number, preceded by the letter M (for metric), indicates the diameter of the threads in millimeters. The second number indicates how many millimeters between each thread. When the spacing between threads is 1 mm, the callout for the thread often excludes that second number. Thus, an M6x1 thread is often denoted by a simple M6 (Figure 3).

Please see the previous page for a visual comparison of common threads.

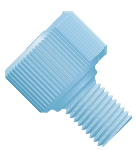


Figure 1
1/4-28 Nut

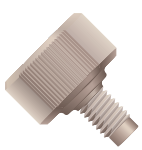


Figure 2
10-32 Nut

Figure 3
M6 Nut

MATERIAL STRUCTURAL COMPATIBILITY

Fitting	Tubing	Port	Recommended?
Plastic	Plastic	Plastic	Yes
Plastic	Steel	Plastic	Yes
Plastic	Steel	Steel	Yes
Plastic	Plastic	Steel	Yes
Steel	Steel	Steel	Yes
Steel	Plastic	Steel	Sometimes
Steel	Plastic	Plastic	No
Steel	Steel	Plastic	No

Stainless Steel Fittings

Although restrictive in use and application (see the Fittings Applications table, bottom left), stainless steel fittings remain popular for many analytical applications due to their chemical inertness and high pressure-holding capabilities.

The dimensions and shapes of stainless steel fittings vary and can be manufacturer specific (Figures 4 and 5). Even so, the most commonly-used stainless steel fittings for chromatography employ 10-32 threads, allowing many stainless steel fittings to be paired with a variety of receiving ports prior to being swaged onto a tube.

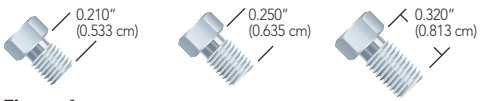


Figure 4

Figure 5

To be used properly stainless steel fittings must be swaged (permanently attached) to the tubing they are connecting. To do this correctly, IDEX Health & Science recommends the following procedure:

Place the nut and ferrule, in that order, on the tubing. Place this loose assembly into a mating port and tighten the nut finger tight, while ensuring the tubing is bottomed out inside the port. Now wrench tighten the nut an additional 3/4 turn. ***Please Note:*** *The ferrule is now permanently attached to the tubing and should only be used in the port into which it was swaged. Attempting to use a pre-swaged ferrule in a receiving port that is different from the one into which it was initially swaged may result in dead volume or leaks (see the Interchangeability section, next page).*

To properly tighten a pre-swaged stainless steel fitting, IDEX Health & Science recommends wrench tightening only an additional 1/4 to 1/2 turn past finger tight. Should any leaking occur, continue tightening the fitting a little at a time until the leak stops. If the fitting requires more than one complete revolution past finger tight, we recommend it be replaced, as excessive tightening typically indicates a damaged product.

Polymer-Based Fittings

Unlike their stainless steel counterparts, polymer fittings are nearly universal in application (see the Fittings Applications table) and are comparatively easy to use. Polymer fittings do not permanently attach to tubing, and they usually do not require any tool (besides your fingers!) to properly tighten. Additionally, these fittings come in a variety of polymers, providing several cost, pressure and chemical-resistance options.

Fittings Primer

Interchangeability

Because swaged stainless steel ferrules are permanently attached to the tubing, interchangeability is almost impossible with stainless steel fittings. The key factor that limits interchangeability of stainless steel fittings is "Dimension X"—the length of tubing that extends past a swaged ferrule (Figure 6; see page 184 for details on swaging a ferrule into place).

Dimension X varies among manufacturers (Figure 7). Dimension X can also vary for the same manufacturer due to production tolerances. Because of these differences, if you are using all stainless steel fittings we recommend you only use swaged fittings in the port where they were initially swaged (Figure 8a). Interchanging fitting assemblies and receiving ports can introduce leaks and/or dead-volume chambers to the flow path (Figure 8b). Therefore, for stainless steel fittings, we generally recommend new fittings, new ferrules, and new connections each time receiving ports are changed.

Even though interchangeability is a problem with stainless steel fittings, it is generally not a problem with polymer fittings. Because polymer ferrules don't permanently attach to the tubing wall, Dimension X can be adjusted each time the fitting assembly is connected to a receiving port. This helps ensure a good connection with minimal dead volume.

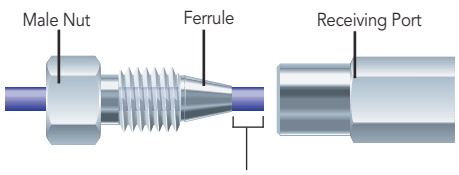
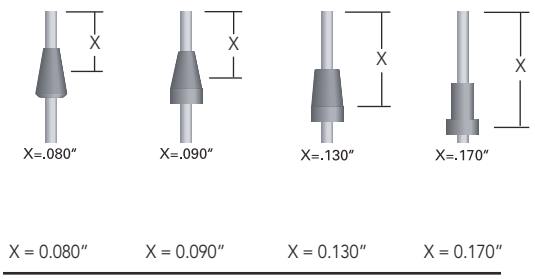


Figure 6



Dimension X can range from 0.080" to 0.170" among various manufacturers.

Figure 7

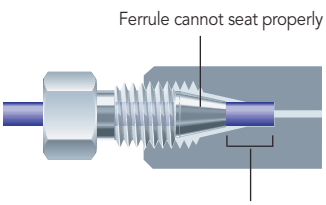


Figure 8a

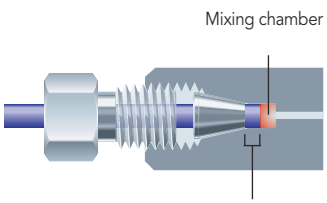


Figure 8b

If Your Fittings Leak

1. Check to make sure your tubing is seated properly. When using universal Fingertight fittings, the tubing must bottom out in the receiving port before the nut and ferrule are tightened. If a gentle tug disengages your tubing after the fittings have been tightened, loosen the nut and ferrule and try again.

2. The fitting may not be tightened enough. Stainless steel nuts and ferrules require a wrench to tighten them, even after repeated use. Fingertight fittings also require a good turn; however, using tools may lead to over-tightening and damage to the fitting, and as such, tools should be used with caution on Fingertight fittings.

3. You may be using incompatible fittings. Make sure you are using a nut and ferrule that are compatible with each other and with the components of your system. To avoid this problem and ensure compatibility, use IDEX Health & Science universal Fingertight fittings. Because the ferrule does not permanently swage onto your tubing, a Fingertight can be used repeatedly for several cycles in most systems.

4. Check the condition of the sealing area. After repeated use, a fitting's "sealing area" (at the tip of the fitting or ferrule), will gradually become deformed to the point of being incapable of creating a seal. As such, it is a good idea to keep an extra supply of the fittings you are using so you can replace them quickly and avoid unnecessary downtime.

5. Check the receiving port for damage. Sometimes a leaking connection has nothing at all to do with the nut and ferrule, but with the receiving port. Ports that have had stainless steel fittings swaged into them are especially susceptible to damage. Check the receiving port for visible burrs or scratches and replace if necessary.

6. Evaluate chemical compatibility. Using fittings made of material incompatible with your mobile phase is a sure way of creating leaks. Please visit the IDEX Health & Science website, www.idex-hs.com, for more information about chemical compatibility.

TELLTALE SIGNS OF SYSTEM LEAKS

Before you see the first drip of mobile phase, your system can warn you that a problem exists. The most common signs of system leaks are:

1. No flow or pressure
2. Pump pressures up, but there is no flow
3. Noisy baseline
4. Baseline drift

While all of these symptoms could also indicate problems unrelated to leaking connections, it is always easiest to start there. Not only are leaking connections usually easy to repair, they are also typically the least expensive option.

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Adapters & Unions

With all the different tubing sizes and threaded port configurations, scientists frequently use adapters to make connections. However, adapters are not always the only choice, or even the best choice, when making connections between dissimilar components.

Adapters have two different thread configurations, such as 1/4-28 flat-bottom to 10-32 coned, or 1/4-28 male flat-bottom to luer. Unions have the same thread on both sides, such as 10-32 coned to 10-32 coned. Please refer to Figure 9 for examples of adapters and unions.

Unions are typically less expensive than adapters while performing equally as well. Thus, it is often advantageous to use a union wherever possible. To determine whether a union or an adapter is appropriate for a particular connection, first determine if the connection is designed for low pressure or high pressure. This is not always obvious, but you can make some assumptions.

(For example, when connecting 1/16" OD PEEK tubing to 1/8" OD FEP or PFA tubing, you likely have a low pressure connection since the connection pressure is limited by the amount of pressure the fluoropolymer tubing can withstand.)

Once you know the pressure classification for your connection, determine what connectors are available for that classification. For the low pressure example given, there are a number of unions available with 1/4-28 internal flat-bottom geometry on both sides (see pages 40 – 41). Other options with matching M6 and 5/16-24 internal threads are also available (pages 40 and 50, respectively).

After you identify the connector needed, the focus turns to finding fittings that work with your tubing sizes to mate with each side of the selected union. In our example, the connection is between 1/16" OD and 1/8" OD tubing, and there are several 1/4-28 flat-bottom fittings for both 1/16" and 1/8" OD tubing, such as those on pages 22 – 28.

Of course, a number of cases remain where only an adapter will do. For recommendations on making typical threaded connections, please see the "Connections Reference" on page 35.

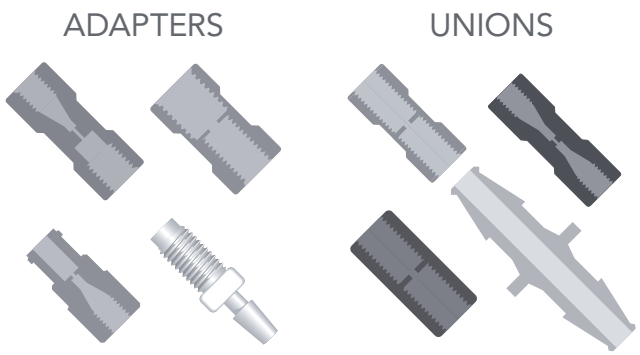

Figure 9 — Adapters and Unions

Connectors

Void, Dead, and Swept Volume

When making connections, in most instances, what is of primary importance is how much internal volume exists within a connection and how that internal volume will impact chromatographic results.

Three terms describe the internal volume of a product: void volume, dead volume, and swept volume. Void volume is simply another way of describing the total internal space within a connection into which fluid can flow. Dead volume is that portion of the void volume that is out of the intended flow path, while swept volume is that portion of the void volume which is in the intended flow path (see Figure 10). Therefore, Void Volume = Dead Volume + Swept Volume.

Dead volume, particularly in capillary connections, can cause undesirable chromatographic effects, including:

- Analysis delays
- Broadened peaks
- Poor resolution
- Sample carry-over
- Split peaks
- Gas collection

Because of the negative impact of dead volume in a connection, all dead volume should be removed from the connection if possible.

To keep most of the void volume truly swept volume, match the tubing ID as closely as possible with the diameter of the holes in your equipment. This ensures the fluid runs completely through the entire passageway. Matching internal diameters also helps reduce turbulence as the fluid passes through the connection.

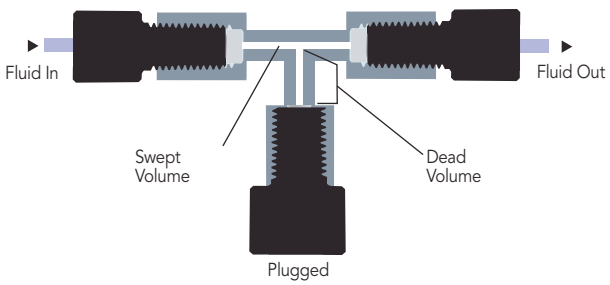

Figure 10 — Internal Volume Defined

Differential Pressure Per 5–Foot Length

Which ID is best for your application? Refer to flow rates (using water as the solvent) and tubing IDs below and the corresponding differential pressure per 5-foot length.

These theoretical data are presented in psi with the bar equivalent in parentheses, and were calculated using the formula presented to the right.

	Tubing ID						
Flow Rate	**0.0025"**	**0.005"**	**0.007"**	**0.010"**	**0.020"**	**0.030"**	**0.062"**
0.1 mL/min	923	58	15	4	0	0	0
	(64)	(4.0)	(1.0)	(0.3)	(0)	(0)	(0)
1.0 mL/min	NR*	577	150	36	2	0	0
		(40)	(10)	(2.5)	(0.1)	(0)	(0)
2.0 mL/min	NR*	1,154	300	72	5	1	0
		(80)	(21)	(5.0)	(0.3)	(0.1)	(0)
10.0 mL/min	NR*	5,770	1,502	361	23	5	0
		(398)	(103)	(25)	(1.6)	(0.3)	(0)
25.0 mL/min	NR*	NR*	3,755	902	56	11	0
			(259)	(62)	(3.9)	(0.8)	(0)

**Not Recommended — Exceeds the pressure rating of the tubing.*

Theoretical Pressure Drop Along a Length of Tubing

$$\Delta P = \left(9.86 \times 10^{-8}\right)\left(\frac{F\,L\,V}{d^4}\right)$$

Where: ΔP = pressure drop in psi
F = flow rate in mL/min
L = tubing length in cm
V = viscoscity in centipoise (cp)
d = tubing inside diameter in cm

(See table above for data calculated using this formula.)

Tubing Internal Diameters & Volumes

Tubing Internal Diameter (d) in inches to Linear Volume (µL/inch): 12870.4 (d2)

Tubing Internal Diameter (d) in µm to Linear Volume (µL/cm): 7.85 x 10-6 (d2)

Internal Diameters				Linear Volumes	
Inches	**Wire Gauge***	**Millimeters**	**Microns**	**µL/in**	**µL/cm**
0.0008	—	0.020	20	0.008	0.003
0.001	—	0.025	25	0.013	0.005
0.002	—	0.051	51	0.051	0.020
0.0025	—	0.064	64	0.081	0.032
0.003	—	0.076	76	0.116	0.046
0.004	36	0.102	102	0.206	0.081
0.005	35	0.127	127	0.322	0.127
0.006	—	0.152	152	0.463	0.182
0.007	34	0.178	178	0.631	0.248
0.008	33	0.203	203	0.824	0.324
0.009	32	0.229	229	1.042	0.410
0.010	31	0.254	254	1.287	0.507
0.012	30	0.305	305	1.853	0.730
0.014	28	0.356	356	2.523	0.993
0.015	—	0.381	381	2.896	1.140
0.018	26	0.457	457	4.170	1.642
0.020	25	0.508	508	5.148	2.027
0.028	22	0.711	711	10.090	3.973
0.030	—	0.762	762	11.583	4.560
0.032	21	0.813	813	13.179	5.189
0.040	—	1.016	1016	20.593	8.107
0.042	19	1.067	1067	22.703	8.938
0.046	—	1.168	1168	27.234	10.722
0.055	—	1.397	1397	38.933	15.328
0.062	—	1.575	1575	49.474	19.478
0.080	14	2.032	2032	82.370	32.429
0.093	—	2.362	2362	111.316	43.825
0.120	9	3.048	3048	185.333	72.966
0.125	—	3.175	3175	201.099	79.173

** Wire Gauge numbers are referencing Birmingham or Stub's Iron Wire Gauge values, which are commonly used by most stainless steel syringe manufacturers.*

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Rating Comparison

All information has been supplied to IDEX Health & Science by the tubing manufacturers. It is for your guidance only. We recommend that you test the tubing before use.

Rating: + meets the stated property
± meets the stated property to limited extent
– does not meet the stated property
1 not recommended
10 excellent

Properties	Tygon® LMT-55	Tygon E-LFL	Pharmed®	Tygon 2001	Tygon MHLL
FDA	+	+	+	+	+
US Pharmacopoeia Class VI	–	+	+	–	+
Transparency	+	+	–	+	–
Long Life	1	7	10	3	10
Gas Permeability CO_2	7	8	5	5	5
O_2	9	9	8	9	8
N_2	9	10	8	6	8
Temperature, above 0 °C	2	2	7	1	7
Temperature, below 0 °C	4	3	8	7	8
Pressure	5	9	1	1	1
Absorption / Adsorption	6	6	9	10	9
Chemical Resistance					
Acids (H2SO4) 10%	10	10	10	10	10
30%	10	7	10	10	10
95–98%	1	1	1	7	1
Bases (NaOH) 10–15%	10	10	10	10	10
30–40%	4	2	10	10	10
Hydrocarbons (aliphatic)	1	1	1	1	1
Mineral Salts	10	10	10	10	10
Alcohols	1	1	10	10	10
Ketones (Acetone)	1	1	1	7	1

Maximum recommended operating pressure

Wall Thickness	Inner Diameter	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
1.6 mm	0.8 mm	8.7 (126)	8.7 (126)	3.7 (54)	N/A	N/A
1.6 mm	1.6 mm	4.8 (70)	4.8 (70)	2.1 (30)	3.1 (45)	N/A
1.6 mm	2.4 mm	3.8 (55)	3.8 (55)	1.6 (23)	N/A	N/A
1.6 mm	3.2 mm	3.0 (44)	3.0 (44)	1.3 (19)	2.0 (29)	N/A
1.6 mm	4.8 mm	2.2 (32)	2.2 (32)	0.9 (13)	1.5 (22)	N/A
1.6 mm	6.4 mm	1.8 (26)	1.8 (26)	0.8 (12)	1.1 (16)	N/A
1.6 mm	8.0 mm	1.5 (22)	1.5 (22)	0.6 (9)	0.9 (13)	N/A
1.6 mm	9.5 mm	1.3 (19)	1.3 (19)	0.5 (7)	0.8 (12)	N/A
1.6 mm	11.1 mm	1.2 (17)	1.2 (17)	0.5 (7)	N/A	N/A
1.6 mm	12.7 mm	1.1 (16)	1.1 (16)	0.5 (7)	N/A	N/A
1.6 mm	15.9 mm	1.0 (15)	1.0 (15)	0.4 (6)	N/A	N/A
2.4 mm	4.8 mm	3.0 (44)	3.0 (44)	1.3 (19)	N/A	N/A
2.4 mm	6.4 mm	2.4 (35)	2.4 (35)	1.0 (15)	N/A	N/A
2.4 mm	8.0 mm	2.0 (29)	2.0 (29)	0.8 (12)	N/A	N/A
2.4 mm	9.5 mm	1.8 (26)	1.8 (26)	0.8 (12)	N/A	N/A
2.4 mm	11.1 mm	1.5 (22)	1.5 (22)	0.6 (9)	N/A	N/A
2.4 mm	12.7 mm	1.3 (19)	1.3 (19)	0.6 (9)	N/A	N/A
2.4 mm	15.9 mm	1.2 (17)	1.2 (17)	0.5 (7)	N/A	N/A
3.2 mm	6.4 mm	3.0 (44)	3.0 (44)	1.3 (19)	N/A	N/A
3.2 mm	9.6 mm	2.2 (32)	2.2 (32)	0.9 (13)	N/A	N/A
3.2 mm	12.7 mm	1.8 (26)	1.8 (26)	0.8 (12)	1.1 (16)	N/A
3.2 mm	15.9 mm	1.5 (22)	1.5 (22)	0.6 (9)	0.9 (13)	N/A

N/A = Not applicable

Rating Comparison

All information has been supplied to IDEX Health & Science by the tubing manufacturers. It is for your guidance only. We recommend that you test the tubing before use.

Rating: + meets the stated property
± meets the stated property to limited extent
– does not meet the stated property
1 not recommended
10 excellent

Properties	Tygon® HC F-4040-A	Tygon 3350	Silicone Peroxide	Norprene® A-60-G	Fluran® F-5500-A
FDA	–	+	+	–	–
US Pharmacopoeia Class VI	–	+	+	–	–
Transparency	±	±	±	–	–
Long Life	2	4	4	10	3
Gas Permeability CO_2	9	1	1	5	10
O_2	10	1	1	8	10
N_2	10	1	1	8	10
Temperature, above 0 °C	2	10	10	7	9
Temperature, below 0 °C	1	10	10	8	4
Pressure	7	1	1	1	1
Absorption / Adsorption	6	1	1	9	7
Chemical Resistance					
Acids (H2SO4) 10%	10	10	10	10	10
30%	7	7	8	10	10
95–98%	1	1	1	1	10
Bases (NaOH) 10–15%	1	10	10	10	10
30–40%	1	10	10	10	10
Hydrocarbons (aliphatic)	7	1	1	1	7
Mineral Salts	10	7	7	10	10
Alcohols	7	7	10	10	1
Ketones (Acetone)	1	4	1	1	1

Maximum recommended operating pressure

Wall Thickness	Inner Diameter	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)
1.6 mm	0.8 mm	10.9 (158)	1.9 (28)	1.9 (28)	3.7 (54)	3.7 (54)
1.6 mm	1.6 mm	6.1 (88)	1.0 (15)	1.0 (15)	2.1 (30)	2.1 (30)
1.6 mm	2.4 mm	4.8 (70)	0.8 (12)	0.8 (12)	1.6 (23)	1.6 (23)
1.6 mm	3.2 mm	3.8 (55)	0.6 (9)	0.6 (9)	1.3 (19)	1.3 (19)
1.6 mm	4.8 mm	2.7 (39)	0.5 (7)	0.5 (7)	0.9 (13)	0.9 (13)
1.6 mm	6.4 mm	2.2 (32)	0.4 (6)	0.4 (6)	0.8 (12)	0.8 (12)
1.6 mm	8.0 mm	1.8 (26)	0.3 (4)	0.3 (4)	0.6 (9)	0.6 (9)
1.6 mm	9.5 mm	1.6 (23)	0.3 (4)	0.3 (4)	0.5 (7)	0.5 (7)
1.6 mm	11.1 mm	1.5 (22)	0.3 (4)	0.3 (4)	0.5 (7)	0.5 (7)
1.6 mm	12.7 mm	1.4 (20)	0.2 (3)	0.2 (3)	0.5 (7)	0.5 (7)
1.6 mm	15.9 mm	1.2 (17)	0.2 (3)	0.2 (3)	0.4 (6)	0.4 (6)
2.4 mm	4.8 mm	3.8 (55)	0.6 (9)	0.6 (9)	1.3 (19)	1.3 (19)
2.4 mm	6.4 mm	3.0 (44)	0.5 (7)	0.5 (7)	1.0 (15)	1.0 (15)
2.4 mm	8.0 mm	2.5 (36)	0.4 (6)	0.4 (6)	0.8 (12)	0.8 (12)
2.4 mm	9.5 mm	2.2 (32)	0.4 (6)	0.4 (6)	0.8 (12)	0.8 (12)
2.4 mm	11.1 mm	1.8 (26)	0.3 (4)	0.3 (4)	0.6 (9)	0.6 (9)
2.4 mm	12.7 mm	1.7 (25)	0.3 (4)	0.3 (4)	0.6 (9)	0.6 (9)
2.4 mm	15.9 mm	1.5 (22)	0.3 (4)	0.3 (4)	0.5 (7)	0.5 (7)
3.2 mm	6.4 mm	3.8 (55)	0.6 (9)	0.6 (9)	1.3 (19)	1.3 (19)
3.2 mm	9.6 mm	2.7 (39)	0.5 (7)	0.5 (7)	0.9 (13)	0.9 (13)
3.2 mm	12.7 mm	2.2 (32)	0.4 (6)	0.4 (6)	0.8 (12)	0.8 (12)
3.2 mm	15.9 mm	1.8 (26)	0.3 (4)	0.3 (4)	0.6 (9)	0.6 (9)

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Pumps Reference

Part No.	Pump ID	Model Description	Min*	Max*	Differential Pressure Max bar*	Gear Material	Seals	Housing Material	Temp Min	Temp Max	System Pressure Max bar	Type	Cross Reference Part Number
MI0006	Z-186	GA-X21.CFS.B	1	99	1.4	Graphite	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	82092
MI0007	Z-181	GA-V21.CFS.B	2	252	2.8	Graphite	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	82114
MI0008	Z-183	GA-V23.CFS.B	4	504	2.8	Graphite	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	82115
MI0013	Z-120	GJ-N23.FF1S.B.B1	32	3950	3.5	PTFE	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	82004
MI0015	Z-122	GJ-N25.FF1S.B.B1	455	5460	3.5	PTFE	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	82006
MI0016	Z-140	GJ-N23.FF1S.B	32	3950	3.5	PTFE	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	82001
MI0018	Z-142	GJ-N25.FF1S.B	455	5460	3.5	PEEK	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	82003
MI0019	Z-130	GJ-N23.PF1S.B.B1	32	3950	5.2	PPS	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	81529
MI0020	Z-150	GJ-N23.PF1S.B	32	3950	5.2	PPS	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	81531
MI0022	Z-200	GB-P25.PVS.A.B1	292	3509	3.5	PPS	Viton®	SS - 316	- 29	+ 177	21	Suction Shoe	81281
MI0023	Z-201	GB-P35.PVS.A.B1	585	7020	3.5	PPS	Viton	SS - 316	- 29	+ 177	21	Suction Shoe	81282
MI0131	Z-1830	GA-T23.PFS.B	5	460	5.2	PPS	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	81473
MI0280	Z-1830	GA-T23.JFS.B	5	460	5.2	PEEK	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	L18489
MI0284	Z-140 HC	GJ-N23.FF1C.B	32	3950	3.5	PTFE	PTFE	Hastelloy®-C276	- 46	+ 54	21	Cavity Style	L20284
MI0306	Z-200	GB-P25.JVS.B	35	3480	3.5	PEEK	Viton	SS - 316	- 29	+ 177	21	Suction Shoe	220004
MI0310	Z-183	GA-V23.CFC.B	4	504	2.8	Graphite	PTFE	Hastelloy-C276	- 46	+ 177	21	Suction Shoe	L2383
MI0311	Z-142 HC	GJ-N25.FF1C.B	55	5480	3.5	PTFE	PTFE	Hastelloy-C276	- 46	+ 54	21	Cavity Style	L21812
MI0312	Z-186	GA-X21.JFS.B	1	99	2.3	PEEK	PTFE	SS - 316	- 46	+ 177	21	Suction Shoe	L20820
MI0313	Z-140	GJ-N23.JF1S.B	32	3950	5.6	PEEK	PTFE	SS - 316	- 46	+ 54	21	Cavity Style	L197735
MI0378	Z-201	GB-P35.JKS.B	73	7241	3.5	PEEK	Kalrez®	SS - 316	- 29	+ 177	21	Suction Shoe	L22609

** Absolute flow rates dependent on the drive used.*

Index by Part Number

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ChromTRAC™	IDEX Health & Science LLC
Delrin®	E.I. du Pont de Nemours and Company
DuPont®	E.I. du Pont de Nemours and Company
Ecoline VC-Easy-Load™	IDEX Health & Science LLC
FlowMaster®	IDEX Health & Science LLC
Fluran®	Saint-Gobain Performance Plastics Corporation
FlushNut™	IDEX Health & Science LLC
Frit-In-A-Ferrule™	IDEX Health & Science LLC
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Kalrez®	E.I. du Pont de Nemours and Company
Kynar®	Arkema, Inc.
LabPro™	IDEX Health & Science LLC
LabVIEW™	National Instruments Corporation
LiteTouch®	IDEX Health & Science LLC
LuerTight™	IDEX Health & Science LLC
Make-Before-Break™	IDEX Health & Science LLC
Mastercard®	Mastercard International, Inc.
MicroTight®	IDEX Health & Science LLC
MINSTAC®	The Lee Company
MX Series II™	IDEX Health & Science LLC
NanoFilter™	IDEX Health & Science LLC
NanoPort™	IDEX Health & Science LLC
NanoTight™	IDEX Health & Science LLC
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Norprene®	Norton Company Corporation
PEEKsil™	SGE International Pty. Ltd.
Perlast®	Precision Polymer Engineering, Ltd.
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