

# FluoroLine<sup>®</sup> Ultrapure PFA Tubing

*High-purity, PFA tubing excels in ultrapure, chemically corrosive applications*

Entegris offers a complete line of tubing to satisfy your need for an ultraclean, leak-free fluid delivery network. Made from high-purity PFA material, our tubing withstands your harshest, chemically corrosive applications. Sizes range from 1/8" to 1 1/2" and 40 mm, and many material options provide flexibility to meet any fluid system design. For extreme purity needs, we offer an ultraclean (UC) tube product that has the lowest total metal extractables and least amount of surface contamination.

## APPLICATIONS

- High-purity, corrosive chemical handling
- Semiconductor applications including photolithography, bulk chemical delivery, CMP, WEC
- Chemical delivery in life sciences applications
- Solar, LED, flat panel display
- Excellent performance with low surface tension chemistries

## FEATURES & BENEFITS

<b>Made from high purity, 100% PFA material</b>	Resistant to highly corrosive, high-purity chemical environments
<b>Manufactured in an ISO certified, Class 7 clean environment</b>	Controls manufacturing process and maintains tubing cleanliness
<b>Meets SEMI<sup>®</sup> F57-0314 specifications</b>	Assures tubing cleanliness, maintaining process integrity in liquid chemical distribution systems
<b>Excellent optical clarity</b>	Allows visual inspection of chemical flowing in the system
<b>Optional ultraclean (UC) tubing available</b>	Provides the lowest metal extractable levels and the least amount of surface contamination, maintaining process purity



*Enables an ultraclean, leak-free fluid delivery network.*

## SPECIFICATIONS

Size	Tube size OD	Wall thickness	Material options
1/8"	0.125" $\pm$ 0.003" (3.18 mm $\pm$ 0.08 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
3/16"	0.188" $\pm$ 0.003" (4.76 mm $\pm$ 0.08 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
6 mm	6 mm $\pm$ 0.10 mm	1.20 mm $\pm$ 0.10 mm	Chemours 440
1/4"	0.250" $\pm$ 0.004" (6.35 mm $\pm$ 0.10 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
1/4"	0.250" $\pm$ 0.004" (6.35 mm $\pm$ 0.10 mm)	0.047" $\pm$ 0.004" (1.19 mm $\pm$ 0.10 mm) <sup>1</sup>	Chemours 440, 450, 950, Daikin AP231SH, 451, 951
1/4"	0.250" $\pm$ 0.004" (6.35 mm $\pm$ 0.10 mm)	0.062" $\pm$ 0.005" (1.57 mm $\pm$ 0.13 mm)	Chemours 440, 450
8 mm	8 mm $\pm$ 0.10 mm	1.20 mm $\pm$ 0.10 mm	Chemours 440
5/16"	0.312" $\pm$ 0.004" (7.92 mm $\pm$ 0.10 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
3/8"	0.375" $\pm$ 0.004" (9.52 mm $\pm$ 0.10 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
3/8"	0.375" $\pm$ 0.004" (9.52 mm $\pm$ 0.10 mm)	0.062" $\pm$ 0.005" (1.57 mm $\pm$ 0.13 mm) <sup>1</sup>	Chemours 440, 450, 950, Daikin AP231SH, 451, 951
10 mm	10 mm $\pm$ 0.10 mm	1.60 mm $\pm$ 0.13 mm	Chemours 440
12 mm	12 mm $\pm$ 0.10 mm	1.60 mm $\pm$ 0.13 mm	Chemours 440
1/2"	0.500" $\pm$ 0.005" (12.70 mm $\pm$ 0.13 mm)	0.030" $\pm$ 0.004" (0.76 mm $\pm$ 0.10 mm)	Chemours 440, 450
1/2"	0.500" $\pm$ 0.005" (12.70 mm $\pm$ 0.13 mm)	0.062" $\pm$ 0.005" (1.57 mm $\pm$ 0.13 mm) <sup>1</sup>	Chemours 440, 450, 950, Daikin AP231SH, 451, 951
3/4"	0.750" $\pm$ 0.005" (19.05 mm $\pm$ 0.13 mm)	0.062" $\pm$ 0.005" (1.57 mm $\pm$ 0.13 mm)	Chemours 440, 450, 950, Daikin AP231SH, 451, 951
1"	1.000" $\pm$ 0.005" (25.40 mm $\pm$ 0.13 mm)	0.062" $\pm$ 0.005" (1.57 mm $\pm$ 0.13 mm)	Chemours 440, 450, 950, Daikin AP231SH, 451, 951
1 1/4"	1.250" $\pm$ 0.007" (31.75 mm $\pm$ 0.18 mm)	0.075" $\pm$ 0.007" (1.90 mm $\pm$ 0.18 mm)	Chemours 440, 450, 451, 951
1 1/2"	1.500" $\pm$ 0.007" (38.10 mm $\pm$ 0.18 mm)	0.086" $\pm$ 0.007" (2.18 mm $\pm$ 0.18 mm)	Daikin AP231SH
40 mm	40 mm $\pm$ 0.18 mm	0.086" $\pm$ 0.007" (2.18 mm $\pm$ 0.18 mm)	Chemours 450, Daikin AP231SH, 451, 951

<sup>1</sup>Standard for PrimeLock® and Flaretek® fittings

Size	Tube size OD	ID	Minimum bend radius	MOQ	Maximum roll length	Maximum reel length
1/8"	0.125" (3.18 mm)	0.065" (1.65 mm)	0.5" (13 mm)	500 ft	500 ft	5000 ft
3/16"	0.188" (4.76 mm)	0.127" (3.23 mm)	1.0" (25 mm)	500 ft	500 ft	3000 ft

## SPECIFICATIONS

Size	Tube size OD	ID	Minimum bend radius	MOQ	Maximum roll length	Maximum reel length
6 mm	6 mm	3.6 mm	40 mm	500 ft	500 ft	5000 ft
1/4"	0.250" (6.35 mm)	0.190" (4.83 mm)	2.0" (51 mm)	500 ft	500 ft	5000 ft
1/4"	0.250" (6.35 mm)	0.156" (3.96 mm)	1.5" (38 mm)	500 ft	500 ft	5000 ft
1/4"	0.250" (6.35 mm)	0.126" (3.20 mm)	1.5" (38 mm)	500 ft	500 ft	5000 ft
8 mm	8 mm	5.6 mm	40 mm	500 ft	500 ft	2000 ft
5/16"	0.312" (7.92 mm)	0.252" (6.40 mm)	2.2" (56 mm)	500 ft	500 ft	2000 ft
3/8"	0.375" (9.52 mm)	0.315" (8.00 mm)	3.5" (89 mm)	500 ft	500 ft	5000 ft
3/8"	0.375" (9.52 mm)	0.251" (6.38 mm)	2.0" (51 mm)	500 ft	500 ft	5000 ft
10 mm	10 mm	6.8 mm	50 mm	500 ft	500 ft	3500 ft
12 mm	12 mm	8.8 mm	70 mm	500 ft	500 ft	4000 ft
1/2"	0.500" (12.70 mm)	0.440" (11.18 mm)	5.0" (127 mm)	500 ft	500 ft	2000 ft
1/2"	0.500" (12.70 mm)	0.376" (9.55 mm)	2.3" (58 mm)	500 ft	500 ft	4000 ft
3/4"	0.750" (19.05 mm)	0.626" (15.90 mm)	9.0" (229 mm)	250 ft	250 ft	1500 ft
1"	1.000" (25.40 mm)	0.876" (22.25 mm)	11.0" (279 mm)	250 ft	250 ft	750 ft
1 1/4"	1.250" (31.75 mm)	1.100" (27.94 mm)	12.5" (318 mm)	500 ft	NA <sup>2</sup>	500 ft
1 1/2"	1.500" (38.10 mm)	1.328" (33.73 mm)	22.5" (572 mm)	500 ft	NA <sup>2</sup>	500 ft
40 mm	40 mm	1.398" (35.51 mm)	22.5" (572 mm)	500 ft	NA <sup>2</sup>	500 ft

<sup>2</sup>Sold in full reels only

### Laser Marking Codes

ENTEGRIS 440 4 0123456789

Material	OD Size	Work Order Number
440 = FluoroLine AT high purity PFA	4 = 1/4" (6.4 mm)	Work order number traceable to a specific material lot number, date manufactured, and production inspection record
450 = FluoroLine UAT high purity PFA	5 = 5/16" (7.9 mm)	

## SPECIFICATIONS

950 = FluoroLine XAT high purity PFA	6 = 3/8" (9.5 mm)
231 = FluoroLine XKT high purity PFA	8 = 1/2" (12.7 mm)
	12 = 3/4" (19.1 mm)
	16 = 1" (25.4 mm)
	20 = 1 1/4" (31.8 mm)
	24 = 1 1/2" (38.1 mm)
	25 = 1.57" (40 mm)

### Maximum Pressure Rating Chart

#### FluoroLine Ultrapure PFA Tubing

Maximum pressure capabilities of various sizes are listed below. (Flaretek nut ratings are included as a reference.) These ratings are provided as a guide in system design. The component with the lowest maximum pressure rating determines your system maximum pressure rating.

Size (X)	Temperature °F (°C)	PVDF Nut FL(X)-1 psig (kPa)	PFA Nut FL(X)-3 psig (kPa)	CPFA Nut FL(X)-6 psig (kPa)	FlareLock® II PFA Nut FL(X)II-3 psig (kPa)	FluoroLine Ultrapure PFA Tubing psig (kPa)
1/4"	75 (24)	225 (1551)	225 (1551)	225 (1551)	225 (1551)	273 (1882)
	200 (93)	133 (917)	133 (917)	133 (917)	144 (993)	136 (938)
	250 (121)	100 (689)	100 (689)	100 (689)	120 (827)	85 (586)
	300 (150)	75 (517)	75 (517)	75 (517)	95 (655)	61 (421)
	350 (175)	N/R	50 (345)	50 (345)	70 (483)	36 (248)
	400 (200)	N/R	N/R	15 (103)	45 (310)	N/R
3/8"	75 (24)	225 (1551)	225 (1551)	225 (1551)	225 (1551)	234 (1613)
	200 (93)	133 (917)	133 (917)	133 (917)	144 (993)	116 (800)
	250 (121)	100 (689)	100 (689)	100 (689)	120 (827)	73 (503)
	300 (150)	75 (517)	75 (517)	75 (517)	95 (655)	52 (359)
	350 (175)	N/R	50 (345)	50 (345)	70 (483)	31 (214)
	400 (200)	N/R	N/R	15 (103)	45 (310)	N/R
1/2" (8)	75 (24)	190 (1310)	190 (1310)	190 (1310)	190 (1310)	168 (1158)
	200 (93)	100 (689)	100 (689)	100 (689)	105 (724)	83 (572)
	250 (121)	75 (517)	75 (517)	75 (517)	82 (565)	52 (359)
	300 (150)	50 (345)	50 (345)	50 (345)	58 (400)	37 (255)
	350 (175)	N/R	40 (276)	40 (276)	55 (379)	22 (152)
	400 (200)	N/R	N/R	15 (103)	35 (241)	N/R
3/4"	75 (24)	110 (758)	110 (758)	110 (758)	140 (965)	107 (738)
	200 (93)	76 (524)	76 (524)	76 (524)	100 (689)	53 (365)

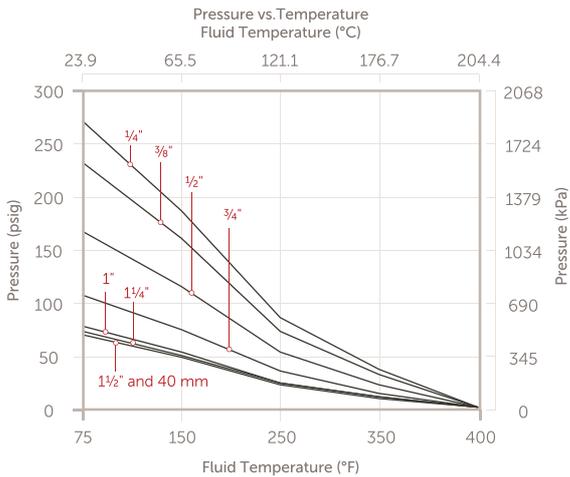
## SPECIFICATIONS

Size (X)	Temperature °F (°C)	PVDF Nut FL(X)-1 psig (kPa)	PFA Nut FL(X)-3 psig (kPa)	CPFA Nut FL(X)-6 psig (kPa)	FlareLock® II PFA Nut FL(X)II-3 psig (kPa)	FluoroLine Ultrapure PFA Tubing psig (kPa)
	250 (121)	35 (241)	35 (241)	35 (241)	47 (324)	33 (228)
	300 (150)	27 (186)	27 (186)	27 (186)	40 (276)	24 (165)
	350 (175)	N/R	20 (138)	20 (138)	34 (234)	14 (95.5)
	400 (200)	N/R	N/R	15 (103)	27 (186)	N/R
1"	75 (24)	75 (517)	75 (517)	75 (517)	90 (620)	77 (531)
	200 (93)	40 (276)	40 (276)	40 (276)	50 (345)	38 (262)
	250 (121)	28 (193)	28 (193)	28 (193)	34 (234)	24 (165)
	300 (150)	15 (103)	15 (103)	17 (117)	20 (138)	17 (117)
	350 (175)	N/R	15 (103)	15 (103)	17 (117)	10 (68.9)
	400 (200)	N/R	N/R	15 (103)	15 (103)	N/R
1 1/4"	75 (24)	80 (552)	80 (552)	*	N/A	80 (552)
1 1/2" and 40 mm	75 (24)	N/A	99 (682)	N/A	N/A	69 (476)

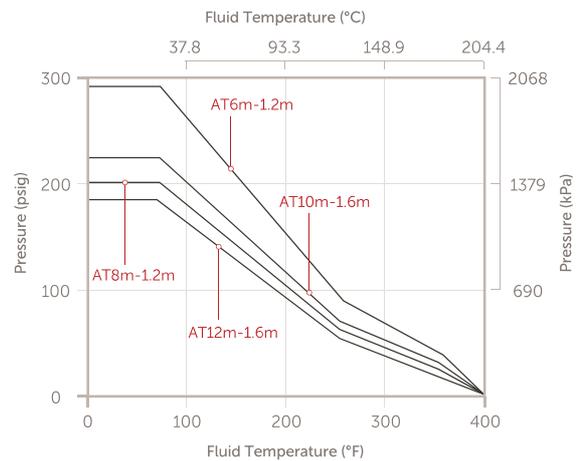
N/R = Not Rated  
 N/A = Not Available  
 \* = Contact Entegris

## PERFORMANCE DATA

Ratings for Standard Wall FluoroLine Tubing

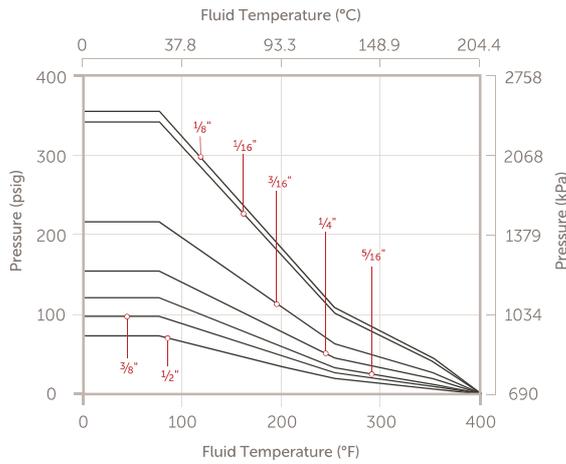


Ratings for Standard Wall FluoroLine Tubing Metric Size

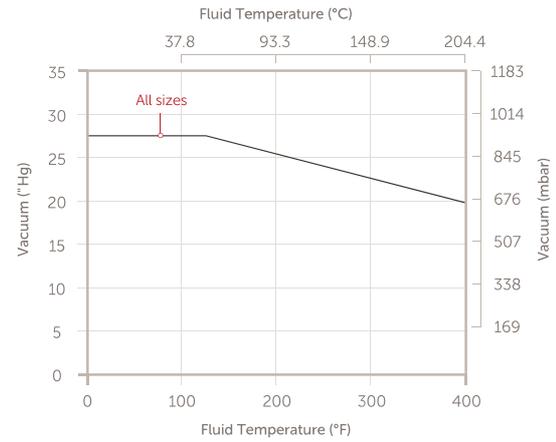


## PERFORMANCE DATA

Ratings for Thin Wall FluoroLine PFA Tubing



Vacuum Limitations on Thin (0.030") Wall FluoroLine PFA Tubing

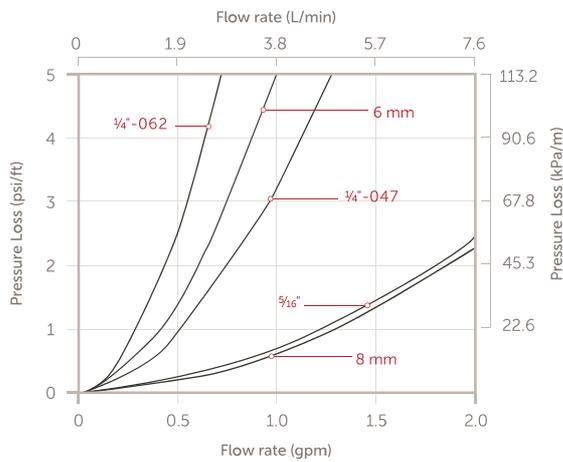


### PRESSURE/TEMPERATURE RATINGS

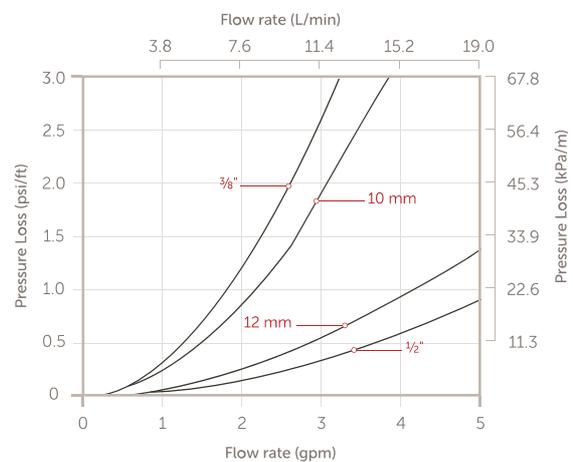
FluoroLine PFA tubing pressure ratings were established using ASTM D2837. This test exposes the tubing to long-term, constant pressures at various temperature settings. Our test took 22 months to complete. From the analysis, a hydrostatic design basis (HDB) value is multiplied by a safety design factor to obtain a hydrostatic design stress. The HDB value is used to determine the tubing operating parameters. FluoroLine PFA tubing completed this extensive testing.

All FluoroLine tubing products are fully characterized and all performance ratings are derived from quantifiable data. Our design and process expertise allow you to confidently design your fluid systems reliably and safely.

Standard Wall Tubing – 1/4", 6 mm, 5/16", 8 mm



Standard Wall Tubing – 3/8", 10 mm, 12 mm, 1/2"



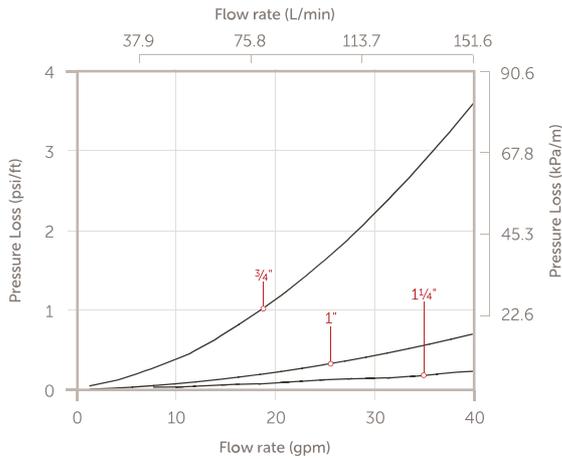
### PRESSURE LOSS VS. FLOW

This data is for water (fluid with s.g. = 1.0).

For pressure loss vs. flow capability outside of these calculations, please contact Entegris.

## PERFORMANCE DATA

### Standard Wall Tubing – 3/4", 1", 1 1/4"



### PRESSURE LOSS VS. FLOW

This data is for water (fluid with s.g. = 1.0).

For pressure loss vs. flow capability outside of these calculations, please contact Entegris.

## ORDERING INFORMATION

Not all combinations are available. Please visit our website for all valid combinations (products/fluid management/tubing and pipe).

FluoroLine Ultrapure PFA Tubing: part number

<p><b>Tube material</b></p> <p>AT = Chemours 440          UAT = Chemours 450          XAT = Chemours 950          XKT = Daikin AP231SH</p>	<p><b>Outside tube diameter*</b></p> <table border="0"> <tr> <td>015 = 1/16"</td> <td>1000 = 1"</td> </tr> <tr> <td>125 = 1/8"</td> <td>1250 = 1 1/4"</td> </tr> <tr> <td>187 = 3/16"</td> <td>1500 = 1 1/2"</td> </tr> <tr> <td>250 = 1/4"</td> <td>6M = 6 mm</td> </tr> <tr> <td>312 = 5/16"</td> <td>8M = 8 mm</td> </tr> <tr> <td>375 = 3/8"</td> <td>10M = 10 mm</td> </tr> <tr> <td>500 = 1/2"</td> <td>12M = 12 mm</td> </tr> <tr> <td>750 = 3/4"</td> <td>1570 = 40 mm</td> </tr> </table>	015 = 1/16"	1000 = 1"	125 = 1/8"	1250 = 1 1/4"	187 = 3/16"	1500 = 1 1/2"	250 = 1/4"	6M = 6 mm	312 = 5/16"	8M = 8 mm	375 = 3/8"	10M = 10 mm	500 = 1/2"	12M = 12 mm	750 = 3/4"	1570 = 40 mm	<p><b>Wall thickness</b></p> <table border="0"> <tr> <td>047 = 1.19 mm (0.047")</td> </tr> <tr> <td>1.2M = 1.20 mm (0.47")</td> </tr> <tr> <td>062 = 1.57 mm (0.062")</td> </tr> <tr> <td>1.6M = 1.60 mm (0.063")</td> </tr> <tr> <td>075 = 1.90 mm (0.075")</td> </tr> <tr> <td>086 = 2.18 mm (0.086")</td> </tr> <tr> <td>015 = 0.38 mm (0.015")</td> </tr> <tr> <td>030 = 0.76 mm (0.030")</td> </tr> </table>	047 = 1.19 mm (0.047")	1.2M = 1.20 mm (0.47")	062 = 1.57 mm (0.062")	1.6M = 1.60 mm (0.063")	075 = 1.90 mm (0.075")	086 = 2.18 mm (0.086")	015 = 0.38 mm (0.015")	030 = 0.76 mm (0.030")	<p><b>Options</b></p> <p>(blank) = Standard          UC = Ultrapure**</p> <p><b>Package***</b></p> <p>X = 10' straight          (blank) = Roll/Reel</p>
015 = 1/16"	1000 = 1"																										
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\* XKT tube material is only available in 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", and 40 mm outside tube diameters.

\*\* Ultrapure (UC) option is only available with Chemours 450 LM (UAT) and Daikin AP231SH (XKT) tube materials.

\*\*\* Quantities between roll and reel length maximums will be packaged on a reel.

### Notes:

- Quantities between roll and reel length maximums will be packaged on a roll.
- Tight and consistent tolerances, along with lot-to-lot consistency are maintained using continuous online measurements of the FluoroLine tubing OD and wall thickness.

#### FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit [entegris.com](http://entegris.com) and select the [Contact Us](#) link to find the customer service center nearest you.

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