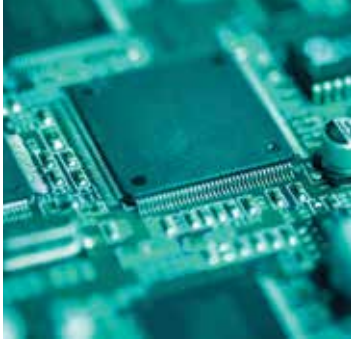
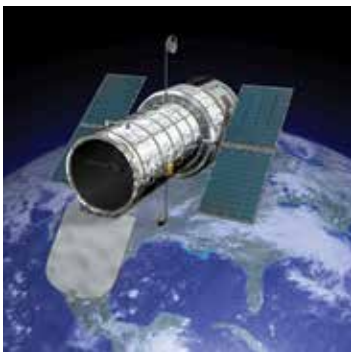
View Contents



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

Fluoropolymer Extrusions

Fluid Handling & Electrical Insulation Products



Parker

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FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS
DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

Table of Contents

Fluoropolymer Tubing

The Parflex Division's fluoropolymer tubing operation, located at Parker TexLoc® in Fort Worth, TX, specializes in the development and extrusion of fluoropolymer tubing for fluid handling applications. These products operate in high temperature applications up to 500°F (260°C) and in cryogenic applications with temperatures as low as -100°F (-75°C).

TexLoc® extrusions are resistant to UV radiation and moisture while offering the lowest coefficient of friction of any material available. Additionally, all of the tubing products are made from resins and colors that are certified to be free of mercury, heavy metals and other materials that are restricted in accordance with the RoHS directive. In fact, the quality engineered into our products makes them suitable for critical applications in the medical, pharmaceutical and instrumentation markets.

All of the tables in this catalog are supplied with inch and mm sizes.

Working pressure is calculated at 73°F (23°C) using a Design Factor of 4 to 1. Special sizes, profiles, cut lengths and minimum continuous lengths are also available upon request.

Thank you for allowing us to serve your fluoropolymer needs.

Parflex Division
Ravenna, Ohio

TexLoc® Facility
Fort Worth, Texas

Parflex PTFE, FEP, PFA and PVDF tubing complies with European Standard RoHs and are also FDA compliant to FDA regulation 21 CFR 177.1550, making these products suitable for use in food and beverage applications.

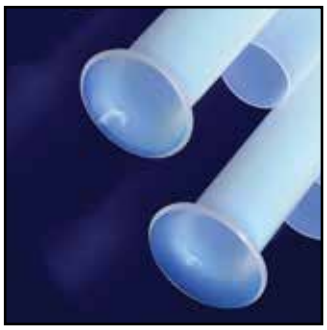
Parflex PTFE, FEP and PFA are listed VW-1 in the burning test for Underwriters Laboratories and pass the UL-83 vertical flame test. In a flame situation, PTFE, FEP and PFA tubing resist combustion and do not promote flame spread.

Catalog Overview

All of the tubing in this catalog features a low coefficient of friction and anti-stick properties, high temperature capabilities and the most corrosion and chemical resistance of all polymers. Within normal use temperatures, fluoropolymers are attacked by so few chemicals that it is easier to describe the exceptions rather than list the chemicals they are compatible with (see Chemical Resistance Summary, pg. F04). In addition, these chemically inert tubes are non-wetting and non-leaching making them ideal for a wide range of fluid and material handling applications.

Parker TexLoc® fluoropolymer tubing is available in PTFE, FEP, PFA, High Purity PFA (H.P. PFA), ETFE and PVDF with some materials operating at temperatures up to 500°F (260°C). Each material has specific dominant characteristics, but all operate in high-temperature, corrosive environments.

Each catalog product page outlines Features, Certifications, Typical Applications and the Dimensional Data for each product. In addition, the following icons are used for quickly identifying typical markets. For markets not listed, contact Customer Service.



Tubing Pressure Ranges

Tubing pressures are calculated at 73°F (23°C) and vary by material, tubing size and wall thickness. Please contact Customer Service for specific pressures.

Icon Identification


Fluid Handling


Life Science


Industrial Pneumatic


Industrial Hydraulics


Food & Beverage


Transportation


Electrical


Military


Semiconductor

All fluoropolymer tubing dimensions are continuosly monitored to ensure an overall quality product. Most tubing sizes are packaged in convenient 25-ft., 50-ft., 100-ft. and 1,000-ft. lengths. Custom lengths are available upon request.

Material Feature Overview

High Purity PFA pg. A02

- H.P. PFA (High Purity Perfluoroalkoxy) has the highest molecular weight available.
- Withstands corrosive surfactants for longer periods of time than standard products.
- Lowest level of extractables.

Fully Conductive and Conductive I.D. tubing in PTFE and PFA Full Conductive are available

PFA pg. A04

- PFA (Perfluoroalkoxy) - When temperature and clarity are both factors, PFA is the resin of choice, offering the high-temperature attributes of PTFE, long continuous lengths, and almost as much clarity as FEP.
- High purity resins available.
- Low permeability.

FEP pg. B02

- FEP (Fluorinated Ethylene Propylene) offers the highest clarity in the fluoropolymer market and is a close second to PTFE in chemical resistance.
- FEP is available in long, continuous lengths (1,000 feet and longer) , unlike PTFE, where the lengths range from 200 to 1,000 feet depending on size and wall thickness.

PTFE pg. C02

- PTFE (Polytetrafluorethylene) has the lowest coefficient of friction of any material known to man.
- PTFE tubing features unmatched chemical resistance and a non-stick surface that facilitates flow and eliminates media buildup.

PVDF pg. D02

- PVDF (Polyvinylidene Fluoride) offers a combination of properties beneficial for use in many critical applications requiring chemical resistance with low permeability.
- PVDF exhibits low extractable levels while providing high mechanical strength and abrasion resistance.

ETFE pg. E02

- ETFE (Ethylene Tetrafluoroethylene) has the best abrasion resistance in the fluoropolymer family.

Smoothbore Tubing

Smoothbore

Smoothbore is available in Fractional, Metric and AWG sizes in a variety of wall thicknesses.

Features

- Low coefficient of friction
- Resists moisture
- ROHS compliant
- USP Class VI compliant
- FDA compliant
- VW-1 flammability rating
- Review material properties for additional features

Options

- High Purity PFA, PFA, FEP, PTFE, PVDF
- Static Dissipative in Conductive I.D. or Fully Conductive
- Custom extrusions available
- Custom colors available
- Sizes range from .015" O.D. up to 4.0" O.D.

Beading/Monofilament

Unlike a tube, beading is a solid polymer fiber. Beading/Monofilament is available in PTFE. See pg. C13

Features

- Handles temperatures up to 500°F
- Non-stick surface
- Low coefficient of friction
- Excellent electrical insulator

Options

- Custom extrusions available
- Custom colors available
- Sizes range from .015" O.D. up to .188" O.D.

Colortrax™ (Custom order only)

Colortrax™ tubing provides instant - positive identification of lines without obstructing the view of the media flowing through the tube. Also, because the stripe runs the entire length of the tube, operators can easily distinguish one line from another without having to search for identification labels. Available in PTFE.

Features

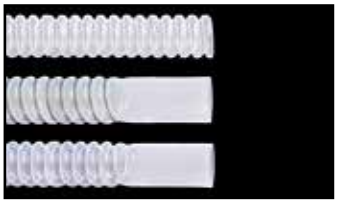
- Quick visual identification of lines
- Stripe is permanent, will not rub off
- Chemical resistant
- Handles temperatures up to 500°F
- Non-stick surface

Options

- Up to 10 striping colors per tube
- Sizes range from .062" O.D. up to 1" O.D.

Value Added Tubing Products

Convoluted



Product offerings include MIL Spec Convoluted (SAE AS81914), Convo-Tex®, Wire Wrapped Convoluted, Low Profile Convo (larger inside diameter for increased flow) and Heavy Wall Convo (thicker wall to handle more pressure).

Features

- Available in PTFE, FEP, PFA and ETFE
- Seamless
- Very flexible
- Self draining
- Chemically inert
- Non-wetting
- USP Class VI compliant
- VW-1 flammability rating
- Review material properties for additional features

Options

- Low Profile
- Heavy Wall
- Close convolution, reverse convolution and split loom available
- PTFE and PFA convoluted tubing are available as a conductive tube to dissipate static build-up and reduce the risk of discharge or explosion
- Wire wrapped tubing
- Cuffing is available to create an attachable end for adding fittings or flanges
- Colors are available on request
- Sizes range from 1/8" O.D. up to 4" O.D.

Convoluted Products	Page #	Continuous Use Temperature	Standard Color	Comment
PTFE Convo-Tex®	C24	-100° to 500°F -75° to 260°C	Natural/ Milky White	▪ Standard convoluted tubing ▪ Static-Dissipative material available ▪ Available with a variety of cuffing styles ▪ Wire wrap available for increased flexibility and crush resistance
PTFE Low Profile	C26	-100° to 500°F -75° to 260°C	Natural/ Milky White	▪ Larger inside diameter for increased flow ▪ Allows liquids to travel at a much faster rate ▪ Promotes easy cleaning
PTFE Heavy Wall	C26	-100° to 500°F -75° to 260°C	Natural/ Milky White	▪ Heavier wall - up to 33% more PTFE ▪ Handles higher vacuum and pressures ▪ Increased wall aids in the process of adding fittings, flanges or flaring
FEP Convoluted	B12	-100° to 400°F -75° to 204°C	Natural/ Clear	▪ Long continuous lengths ▪ Translucent ▪ Sized on the inside diameter
FEP Convo-Flon™	B10	-100° to 400°F -75° to 204°C	Natural/ Clear	▪ Long continuous lengths ▪ Translucent ▪ Sized on the outside diameter
SAE AS81914/1 SAE AS81914/2	C28	-100° to 500°F -75° to 260°C	Black	PTFE – /1 is standard convolution /2 is close convolution
SAE AS81914/3 SAE AS81914/4	B12	-100° to 400°F -75° to 204°C	Natural/ Clear	FEP – /3 is standard convolution /4 is close convolution Can be supplied in long, continuous lengths
SAE AS81914/5 SAE AS81914/6	E04	-148° to 348°F -100° to 176°C	Natural/ Clear	ETFE – /5 is close convolution /6 is standard convolution Extreme abrasion resistance

Value Added Tubing Products

Value-Added Capabilities for Convoluted Tubing

- Close convolutions
- Reverse convolutions
- Custom convolutions
- Bellows
- Cuffing
- Flanging
- Flaring
- Forming
- Tube slitting
- Prototyping
- Jacketing
- Slitting
- Wire reinforcement
- Assemblies with fittings

Cuffing Styles


As Manufactured


Standard Cuff


Expanded Cuff


Reduced Cuff


Specified Degree Flare


90° Flanged End


Vacuum Wire on I.D.


Vacuum Wire on O.D.

Property Comparison of Convoluted Tubing

Properties	PTFE	FEP	PFA	ETFE
Shore D Durometer Hardness	D50-65	D55	D55-D60	D75
Specific Gravity	2.17	2.15	2.15	1.70
Tensile Strength at Break (PSI)	2500	3400	3600	6200
Elongation at Break (%)	200-400	250-325	280-300	225-300
Min/Max Continuous Operating Temperature	-450° to 500°F -235° to 260°C	-100° to 400°F -75° to 205°C	-450° to 500°F -235° to 260°C	-88° to 302°F -67° to 150°C
Vacuum at Room Temp. – Every 2° rise in temperature vacuum drops 1% * Size 1/4" - 2"	*27 inch Hg at 73°F			
Flammability	Non-flammable			

Convoluted Tubing is available in colors.

Value Added Tubing Products

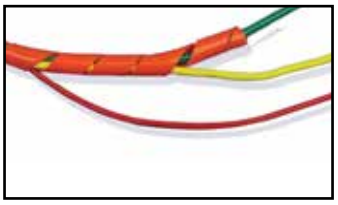
Fully Conductive & Conductive I.D. Tubing

For insulation purposes the high resistivity of plastics is an advantage but, in some cases, it can be a serious disadvantage as it results in high, static charge, build up; this in turn can result in dust pick-up and/or spark generation. The established way of improving conductivity is by adding a conductive filler such as a high structure, carbon black. The addition of lubricants can minimize the generation of static while the addition of some semi-incompatible liquids can cause static to leak away.

Parker TexLoc® offers a wide variety of anti-static and conductive convoluted tubing to fit each customer's specific needs. This tubing is supplied as a conductive liner or as a fully conductive tube.

Fully conductive tubes are available in PTFE and PFA. Industrial grade conductivity conforms to SAE AS81914 and MIL-DTL-27267C, having a minimum conductance of 10-20 micro amps with 1,000 vdc applied over a 14" length.

Spiral Wrap



PTFE Spiral Wrap tubing provides harnessing for wire and cable while allowing leads at various points. See pg. C14.

Features

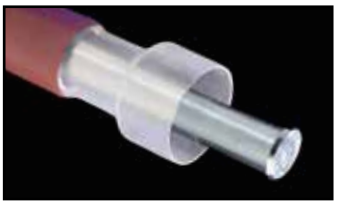
- Available in PTFE
- Extremely flexible
- Non-stick surface for easy cleaning
- VW-1 flammability rating

Options

- Available in Right or Left Hand cut
- Sizes range from 1/8" I.D. up to 1" I.D.

Value Added Tubing Products

Heat Shrinkable Tubing



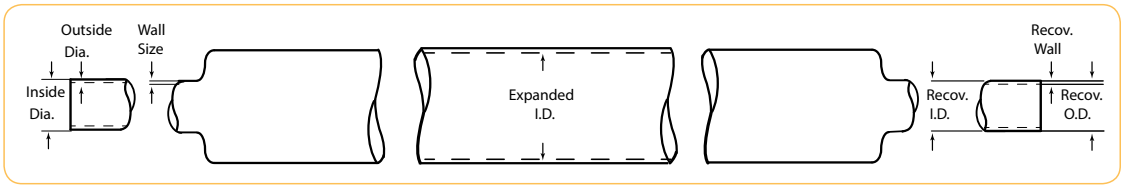
Texflour® Fluoropolymer Heat Shrinkable Tubing is supplied in an expanded state, allowing easy slippage over instruments, fittings and other protrusions. When heated, the tubing conforms to the size and shape of the original object, providing a protective covering.

Features

- Available in PTFE, FEP, ETFE and PFA
- Protects objects from abrasion, shock and high temperatures
- Most products meet AMS-DTL-23053
- Double shrink encapsulates objects to create a moisture barrier
- USP Class VI compliant

Options

- PTFE 2:1 PTFE 4:1
- FEP 1.3:1 FEP 1.67:1 FEP Roll Cover
- ETFE 1.5/1
- Double Shrink
- Custom heat shrink available
- Custom colors available
- Sizes range from .034" expanded I.D. up to 6" expanded I.D. depending on style



Standard Heat Shrink Products	Page #	Continuous Use Temperature	Shrink Temperature
PTFE 2:1 H.S., Standard Wall – Insulation PTFE 2:1 H.S., Thin Wall – Insulation PTFE 2:1 H.S., Light Wall – Insulation PTFE 2:1 H.S., Fractional Insulation, SW & TW PTFE 4:1 H.S., 4:1 Shrink	C19 C20 C21 C17 C22	-100°F to 500°F (-75°C to 260°C)	662°F (350°C) for 10/minutes
FEP H.S., 1.3:1 Shrink FEP H.S., 1.6:1 Shrink	B04 B06	-100°F to 400°F (-75°C to 205°C)	1" Dia. and below – 410°F (210°C) Over 1" Dia. – 430°F (221°C)
FEP Roll Cover	B08	-100°F to 400°F (-75°C to 205°C)	347°F (175°C) for 10/minutes
PTFE/FEP Double Shrink (PTFE Outside-FEP Inside)	B09	-100°F to 450°F(-75°C to 231°C)	680°F (360°C)
Custom Heat Shrink Products		**Continuous Use Temperature**	**Shrink Temperature**
PTFE 2:1 H.S., Heavy Wall, Quoted on Request	C17	-100°F to 500°F (-75°C to 260°C)	662°F (350°C) for 10/minutes
ETFE H.S., 1.5:1 Shrink, Quoted on Request	E02	-100°F to 302°F (-75°C to 150°C)	347°F (175°C) for 10/minutes
PFA Heat Shrink, Quoted on Request	*	-100°F to 500°F(-75°C to 260°C)	400°F (204°C)for 10/minutes

* Contact Customer Service

Value Added Products

Corrugated

Tex-Flex® FEP corrugated tubing from Parker TexLoc® is capable of turning sharp corners with very small bend diameters without kinking. The bend diameter is almost 4x smaller than a typical smoothbore tube of the same size. See pg. B14.

Features

- Available in FEP, PFA & High Purity PFA
- Extremely flexible
- Non-stick surface for easy cleaning
- Chemical resistant

Options

- Cuffing is available to create an attachable end for adding fittings or flanges
- Sizes range from 1/4" I.D. up to 2-1/2" I.D.

Retractable Coils (Custom order only)

Parker TexLoc® fluoroplastic coiled tubing is a spiral formed tube manufactured in FEP or PFA that consists of a single or double retractable coil in a single tube. FEP retractable tubes hold their shape and remain stable up to 200°F, PFA up to 300°F. See pg. B16.

Features

- Available in FEP, PFA & High Purity PFA Custom engineered to fit your application
- Chemical resistant
- >0.01% moisture absorption

Options

- Dual containment designs available
- lengths up to 4 feet compressed (12 feet expanded)
- Sizes range from 1/16" O.D. up to 2" O.D.

Paratubing (Custom order only)

Fluoroplastic Paratubing, from Parker TexLoc®, is a unique tube consisting of 2 to 4 tubes longitudinally thermally welded to create one conduit consisting of multiple individual tubes. Paratubing offers the ability to run several fluid lines as one entity and then split the tubes apart for branching to different connectors when needed.

Features

- Handles temperatures up to 500°F
- Reduces tangling and kinking
- Clear tubes allow for operator inspection

Options

- FEP or PFA
- Custom extrusions available
- Custom colors available
- Sizes range from 1/16" O.D. up to 3" O.D.

Value Added Services

Secondary operations are offered on-site are:

- Beading
- Convoluting
- Corrugating
- Cuffing
- Custom Assembly
- Custom Shrinking
- Cutting
- Drilling
- Etching
- Flanging
- Flaring
- Forming
- Heat Shrink
- Jacketing
- Kitting
- Marking
- Perforations
- Profiles
- Retractable Tubing
- Scoring
- Tube Slitting
- Tubing assemblies with fittings
- Welded Tubing
- Wire reinforcement


Etching


Assembling


Custom Shrinking


Convoluted Tubing


Corrugated Tubing


Forming

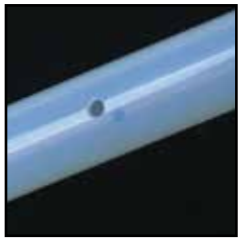

Tubing Assemblies


Scoring


Profiles


Welded Tubing

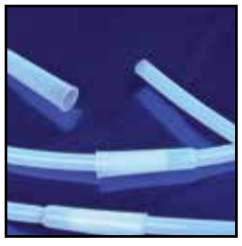
Marking


Drilling


Cutting


Retractable Tubing


Kitting


Flaring/Flanging

Applications

Product Family	Type	Page	Part Number Series	Typical Applications	Typical Markets
PFA	Smoothbore*	A05 A05	104 204	Air Sampling Gas Purge Wet bench Flow Monitoring Steam Plant	Chemical Laboratory Semiconductor Instrumentation Food Environmental Fluid Handling Gas Service Pharmaceutical Life Science
	Convoluted*	B10	Custom	Fluid Transfer Gas Sampling	Semiconductor Instrumentation Laboratory
	Retractable Coils	B16	704 705	Instrumentation Flow Monitoring System Chemical Dispensers Heat Exchangers	Semiconductor Instrumentation Laboratory
High Purity PFA	Smoothbore	A03 A03	105 205	High purity applications DI recirculators DI water dispensers Gas Transfer Wet bench	Chemical Laboratory Semiconductor Instrumentation Food Environmental Fluid Handling Gas Service Pharmaceutical Life Science
FEP	Smoothbore	B03 B03	103 203	Nitrogen Filling Downhole Pump Ozone Sampling Hearing Aid Optical Sensors	UV Applications Chemical Instrumentation Laboratory Food & Beverage Fluid Handling Gas Sampling Pharmaceutical Robotics Life Science
	Heat Shrink	B04 B06 B08	HS1.3 HS1.6 HS1.25	Protective Covering UV Light Covering Product Testing Paper Rollers Ink Rollers	
		B09	TSSS TSSL	Protective Covering Wire Splices Fitting Encapsulation	
	Convoluted	B10 B12	CV03 81914	Fluid Transfer Gas Sampling Wire Harnessing	
	Corrugated	B14	CR03	Robots Fluid Handling Automation	
	Retractable Coils	B16	703	DI Water Heat Exchangers Instrumentation Flow Monitoring System DI recirculators Pure Chemical Dispensers	
PTFE	Beading	C13	TFB	Pull Cord O-Ring Seals Spacers Woven Filter	Chemical Instrumentation Food & Beverage Electrical Insulation Industrial Equipment Military Laboratory Fluid Handling Gas Sampling Life Science
	Smoothbore	C08 C06	AWG TFH, TFS, TFT, TFL Fractional TFH, TFS, TFT, TFL	Electrical Insulation Protective Cover Circuit Board Wire Insulation	
	Smoothbore*	C02 C02	101 201	Electrical Insulation Fluid Transfer Gas Sampling Laboratory	
	Spiral Cut	C14	TSWTF	Electrical Insulation Harnessing	
	Convoluted*	C24 C26 C28	CV01 CVL01 & CVH01 81914	Electrical Insulation Fluid Transfer Wire Harnessing	
	Heat Shrink	C16 C18 C22	Fractional HS2T AWG HS2T HS4T	Electrical Insulation Laboratory	
PVDF	Smoothbore	D02 D02	110 111	Thermal Cycling Outdoor/Extreme Conditions Applications with long cycle life Water Systems	Chemical Gas Food Environmental
ETFE	Heat Shrink	E02	HS1.5	Protective Covering Ink Rollers	Chemical Instrumentation Laboratory Life Science Transportation Cryogenics
	Convoluted	E04	81914	Fluid Transfer Wire Harnessing	

* Also available in conductive (static-dissipative) option

Chemical Resistance Summary

Within normal use temperatures, fluoroplastics are attacked by so few chemicals that it is easier to describe the exceptions rather than list the chemicals they are compatible with.

DO NOT USE FLUOROPLASTICS WITH THE FOLLOWING:

- Alkali metals such as elemental sodium, potassium, lithium, etc. The alkali metals remove fluorine from the polymer molecule.
- Extremely potent oxidizers, fluorine (F2) and related compounds (e.g., chlorine trifluoride, ClF3). These can be handled by fluoropolymers, but only with great care, as fluorine is absorbed into the resins, and the mixture becomes sensitive to a source of ignition such as impact.
- 80% NaOH (Sodium Hydroxide) or KOH (Potassium Hydroxide), metal hydrides such as Borances (e.g., B2H6), Aluminum Chloride, Ammonia (NH3), certain Amines (R-NH2) and imines (R=NH) and 70% Nitric Acid at temperatures near the suggested service limit.

WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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Nomenclature

Smoothbore Fractional and Metric Tubing

105 - 0250 062 - N T - 100

Product Family
- 1 = Fractional
- 2 = Metric
- 7 = Retractable Coil
- 9 = Custom

Resin Family
- 01 = PTFE
- 03 = FEP
- 04 = PFA
- 05 = PFA High Purity
- 10 = PVDF: Flex™
- 11 = PVDF: Super-Flex™
- 12 = ETFE NONSTANDARD
- 13 = PEEK® NONSTANDARD

Outside Diameter
- 0250 = .250 inch
- 0700 = 7 mm

Wall Thickness
- 062 = .062 inch
- 100 = 1 mm

Tubing Color Options*
- N = Natural
- 0 = Black
- 1 = Brown
- 2 = Red
- 3 = Orange
- 4 = Yellow
- 5 = Green
- 6 = Blue
- 7 = Violet
- 8 = Gray
- 9 = White

Tube Packaging
- T = Bulk Default Configuration
- C = Tube Cut Job (followed by cut length in inches)

Configuration
- Blank = No color
- C = Colored Solid Tube
- S = Colored Stripe on Tube
- L = Laser Marked

Length
- 25 = 25 ft coil
- 50 = 50 ft coil
- 100 = 100 ft coil
- 1000 = 1000 ft coil
- Blank = No cut
- xx.xxx = Length (inch)

Convoluted and Corrugated Tubing

CV01 - 1/8ID - 88 - 1.5 - 2C

Convolution Profile
- CV = Convoluted
- CVW = Convoluted w/wire
- CR = Corrugated
- CVL = Low Profile
- CVH = Heavy Wall
- CVHW = Heavy Wall w/wire
- CVLW = Low Profile W/wire

Resin Family
- 01 = PTFE
- 03 = FEP
- 04 = PFA
- 05 = PFA High Purity

Tubing I.D. or O.D. Size
- x/x = below 1"
- x.xx = 1" and up

Overall Length in inches

Cuff Length in inches

Cuff and Options
- Blank = No cuffs
- XX.XXX-1C = 1 Cuff
- XX.XXX-2C = 2 Cuffs

Special Configuration
- Blank = Default
- FC = Fully Conductive
- CI = Conductive I.D.

Nomenclature

Heat Shrink, Electrical Insulation Tubing and Beading

HS2 T F T 1/8 - N T*****

Special Configurations

Blank if Smooth Bore
HS2 = 2:1 Ratio PTFE
HS4 = 4:1 Ratio PTFE
HS1.3 = 1.3.1:1 Ratio FEP
HS1.6 = 1.67:1 Ratio FEP
HS1.25 = 1.25:1 Ratio FEP
TSW = Spiral Wrap

Resin Family

TF = PTFE
FP = FEP
PF = PFA
ET = ETFE

Tubing Configurations

H = Heavy Wall
S = Standard Wall
T = Thin Wall
L = Light Wall
I = Industrial Wall
B = Beading

Tubing Sizes**

XX for AWG size 0-30
X/X for Fractional sizes 1/8 to 1.00 inch

Tubing Color Options*

N = Natural
0 = Black
1 = Brown
2 = Red
3 = Orange
4 = Yellow
5 = Green
6 = Blue
7 = Violet
8 = Gray
9 = White

Tube Packaging

T = Bulk Default Configuration
C = Tube Cut Job (followed by cut length in inches -if cut, go to Other Options)

Configuration

Blank = No color
C = Colored Solid Tube
S = Colored Stripe on Tube

Other Options

Blank = Not required
xx.xxx = add cut length in inches
L = Left Hand Cut
R = Right Hand Cut

*When ordering coiled tubing in colors, the color code is always followed by TC;
when ordering cut lengths, the color code is followed by CC....ie HS2TFT1/8-2TC ..ie HS1.3FEP24-0CC48.000.

**This first configuration is only used for heat shrinkable tubing or spiral wrap. For example, electrical insulation tubing part number would read TFT-1/8-NT.

***When changing to cut length, replace the T with C and specify the length in inches. If this part was cut to 4 feet, part number would read TFT-1/8-NC48.000.

Sizes for heat shrink designate the size of the heat shrink tube as stated by the applicable specification. The actual O.D. of the tubing does not always match the size. Review actual tables to see the true expanded dimension of the tube.

Notes

PFA PRODUCTS

High Purity PFA
- Fractional Industrial Wall
- Fractional Heavy Wall
- Metric

Standard PFA
- Industrial Wall
- Heavy Wall
- Metric

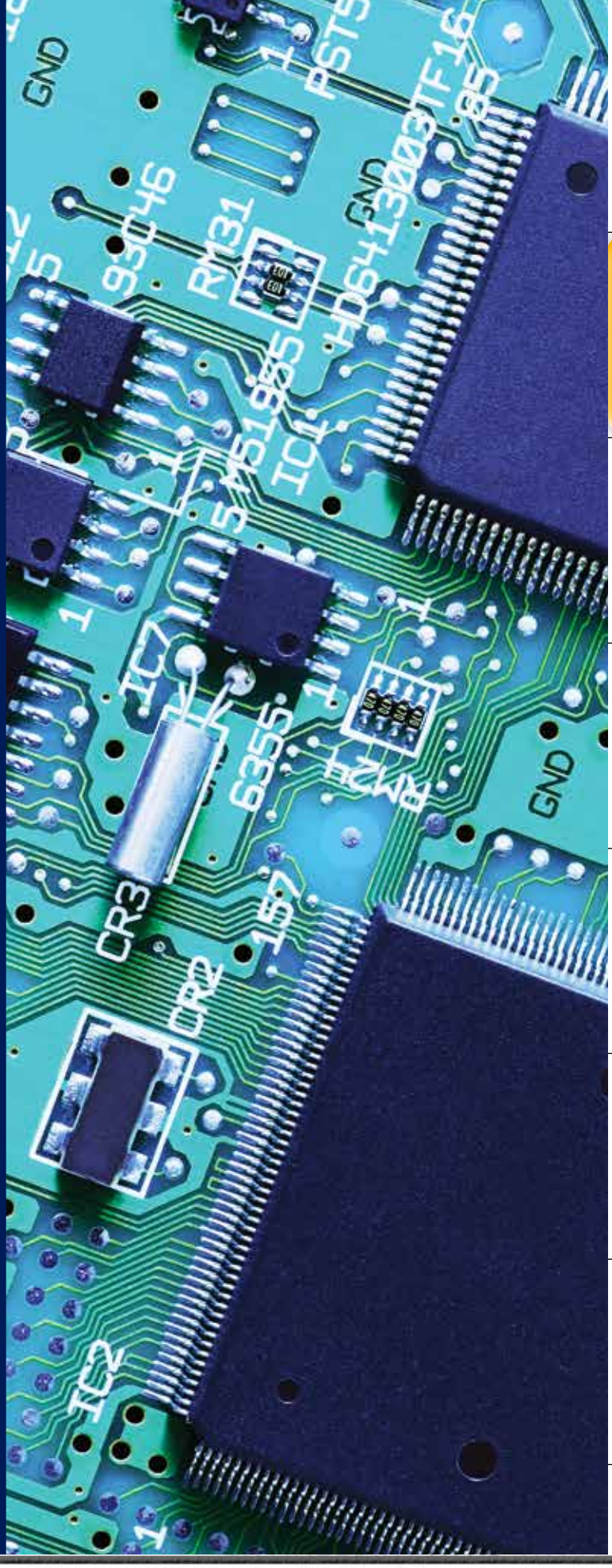
Retractable Coils, Convoluted and Corrugated are also available. Refer to FEP section.

High Purity PFA (Perfluoroalkoxy)
Working Temperature: 500°F (260°C)
Color: Clear with light blue or tint
See characteristics of PFA with these additional features:

- Lowest level of extractables
- Highest molecular weight available
- Withstands corrosive surfactants for longer periods of time
- Higher purity

PFA (Perfluoroalkoxy)
Working Temperature: 500°F (260°C)
Color: Clear with light blue or tint

- High purity resins available
- Low permeation resins available
- Use when you need the temperature range of PTFE and the clarity of FEP
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Good flexlife



High Purity PFA Tubing

Series Fractional & Metric: 105, 205

Features

- Withstands corrosive surfactants for longer periods of time
- Highest molecular weight available
- Lowest level of extractables
- Low permeability
- Exceptional heat resistance
- Chemically inert
- Long continuous lengths
- Low coefficient of friction
- Self extinguishing
- Non leaching

Certifications/Compliance

- ASTM D3307-10
- VW-1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Flow Monitoring
- Gas Transfer
- Food
- Wet Bench
- DI Water Dispensers
- DI Recirculators
- Heat Exchangers
- Pure Chemical Dispensers
- High Purity Applications

Order Information

Example: 105-0375031-N-100

105-0375031-N-100 – **Fractional**

105-0375031-N-100 – **High Purity PFA**

105-**0375**031-N-100 – **Tube O.D.** in millimeters **(3/8")**

105-0375**031**-N-100 – **Tube Wall Thickness** in millimeters **(.031")**

105-0375031-**N**-100 – **Natural**

105-0375031-N-**100** – **Package Quantity** in feet **(100')**

Notes

- Working Temperature: -100°F to 500°F (-75°C to 260°C)Working pressure calculated using a Design Factor of 4 at 73˚F (23°C)
- Custom packaging and sizes are quoted upon request
- Package quantities are not continuous

Options

- Smoothbore
- Convoluted
- Corrugated
- Retractable Coils

Colors

○ Natural, Translucent

Fittings

Fittings available for sizes 4mm up to 12mm

Parker Fittings available from:
Fluid System Connectors Division
Otsego, MI
(269) 694-2550
(269) 692-6634 FAX

FSC Product Families:

- Compression
- Compress-Align®
- Fast & Tite
- TrueSeal™

105 High Purity PFA Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
105-0125031	1/8	0.125	± 0.004	3.18	± 0.102	0.064	± 0.004	1.63	± 0.102	0.031	0.79	500	34	2000	138	0.500	13	28	0.009	0.013
105-0188031	3/16	0.188	± 0.005	4.78	± 0.127	0.125	± 0.005	3.18	± 0.127	0.031	0.79	320	22	1280	88	0.750	19	28	0.014	0.021
105-0250031	1/4	0.250	± 0.005	6.35	± 0.127	0.188	± 0.005	4.78	± 0.127	0.031	0.79	230	16	920	63	1.000	25	28	0.020	0.030
105-0375031	3/8	0.375	± 0.005	9.52	± 0.127	0.312	± 0.005	7.92	± 0.127	0.031	0.79	140	10	560	39	3.500	89	28	0.031	0.047

105 High Purity PFA Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
105-0250040	1/4	0.250	± 0.005	6.35	± 0.127	0.170	± 0.005	4.32	± 0.127	0.040	1.02	300	21	1200	83	0.938	24	28	0.025	0.037
105-0250047	1/4	0.250	± 0.005	6.35	± 0.127	0.156	± 0.005	3.96	± 0.127	0.047	1.19	370	26	1480	102	0.500	13	28	0.028	0.042
105-0250062	1/4	0.250	± 0.005	6.35	± 0.127	0.125	± 0.005	3.18	± 0.127	0.062	1.57	500	34	2000	138	0.625	16	28	0.034	0.051
105-0375062	3/8	0.375	± 0.005	9.52	± 0.127	0.250	± 0.005	6.35	± 0.127	0.062	1.57	320	22	1280	88	1.125	29	28	0.057	0.085
105-0500062	1/2	0.500	± 0.005	12.70	± 0.127	0.375	± 0.005	9.53	± 0.127	0.062	1.57	230	16	920	63	2.250	57	28	0.079	0.119
105-0750062	3/4	0.750	± 0.006	19.05	± 0.152	0.625	± 0.006	15.88	± 0.152	0.062	1.57	140	10	560	39	4.250	108	28	0.125	0.186
105-1000062	1	1.000	± 0.010	25.40	± 0.254	0.875	± 0.010	22.22	± 0.254	0.062	1.57	100	7	400	28	8.000	203	*	0.170	0.254

205 Metric High PFA Tubing

Part Number	Order Size	Nominal O.D.					Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																					
	mm	mm	tol.	inch	tol.		mm	tol.	inch	tol.	mm	inch	bar 23°C	psi 73°F	bar 23°C	psi 73°F	mm	inch	at 73°F	kg. per m.	lb. per ft.
205-0300100	3	3	± 0.11	0.118	± 0.004		1	± 0.11	0.039	± 0.004	1	0.039	47	680	188	2720	13	0.500	28	0.014	0.009
205-0400100	4	4	± 0.11	0.157	± 0.004		2	± 0.11	0.079	± 0.004	1	0.039	34	500	138	2000	13	0.500	28	0.020	0.020
205-0600100	6	6	± 0.11	0.236	± 0.004		4	± 0.11	0.157	± 0.004	1	0.039	22	320	88	1280	22	0.875	28	0.034	0.023
205-0800100	8	8	± 0.11	0.315	± 0.004		6	± 0.11	0.236	± 0.004	1	0.039	16	230	63	920	35	1.375	28	0.047	0.032
205-1000100	10	10	± 0.11	0.393	± 0.004		8	± 0.11	0.315	± 0.004	1	0.039	12	180	50	720	51	2.000	28	0.061	0.041
205-1200100	12	12	± 0.15	0.472	± 0.006		10	± 0.15	0.394	± 0.006	1	0.039	10	140	39	560	89	3.500	28	0.074	0.050

WARNING

PFA Tubing

Series Fractional & Metric: 104, 204

Features

- Virgin Perfluoroalkoxy
- Translucent
- High purity resins available
- Low permeability
- Exceptional heat resistance
- Chemically inert
- Long continuous lengths
- Low coefficient of friction
- Self extinguishing
- Non-wetting
- Non leaching

Certifications/Compliance

- ASTM D3307-10
- VW-1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Air Sampling
- Gas Sampling
- Fluid Transfer
- Laboratory
- Wet Bench
- Flow Monitoring
- Steam Plant

Order Information

Example: 104-0188062-NT-100

104-0188062-NT-100 – **Fractional**

104-0188062-NT-100 – **PFA**

104-**0188**062-NT-100 – **Tube O.D.** in inches **(3/16")**

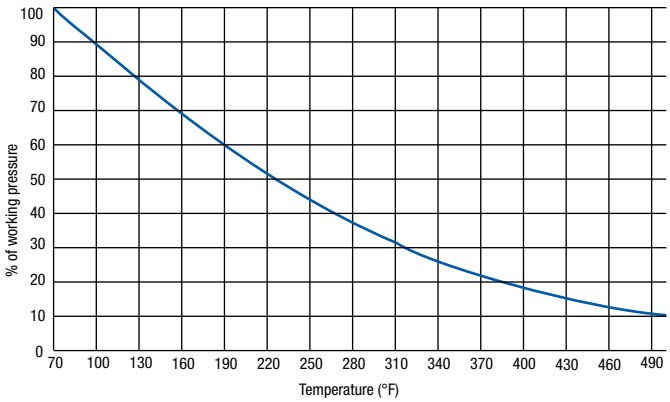
104-0188**062**-NT-100 – **Tube Wall Thickness** in inches **(.062")**

104-0188062-**NT**-100 – **Natural**

104-0188062-NT-**100** – **Package Quantity** in feet **(100')**

PFA Tubing (Series 104, 204)

Maximum Working Pressure (bar)



Fittings

Fittings available for sizes 3/32" up to 1"

Parker Fittings available from: Fluid System Connectors Division
Otsego, MI (269) 692-6555 (269) 692-6634 FAX

FSC Product Families:

- Compression
- Compress-Align®
- Metric Compression
- TrueSeal™

Notes

- Working Temperature: -100°F (-75°C) to +500°F (260°C)
- Working pressure calculated using a Design Factor of 4 at 73°F (23°C)
- Custom packaging and sizes are quoted upon request
- Package quantities are not continuous

Options

- Smoothbore
- Convoluted
- Corrugated
- Retractable Coils
- Heat Shrink

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

104 PFA Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73˚F	bar 23˚C	psi 73˚F	bar 23˚C	inch	mm	at 73˚F	lb. per ft.	kg. per m.
104-0094031	3/32	0.094	± 0.004	2.40	± 0.102	0.031	± 0.002	0.79	± 0.051	0.031	0.79	680	47	2720	188	0.250	6	28	0.006	0.009
104-0125031	1/8	0.125	± 0.004	3.18	± 0.102	0.064	± 0.004	1.63	± 0.102	0.031	0.79	500	34	2000	138	0.375	10	28	0.009	0.013
104-0156031	5/32	0.157	± 0.005	3.99	± 0.127	0.094	± 0.003	2.39	± 0.076	0.031	0.79	390	27	1560	108	0.625	16	28	0.011	0.017
104-0188031	3/16	0.188	± 0.005	4.78	± 0.127	0.125	± 0.005	3.18	± 0.127	0.031	0.79	320	22	1280	88	0.625	16	28	0.014	0.021
104-0250031	1/4	0.250	± 0.005	6.35	± 0.127	0.188	± 0.005	4.78	± 0.127	0.031	0.79	230	16	920	63	0.875	22	28	0.020	0.030
104-0312031	5/16	0.312	± 0.005	7.92	± 0.127	0.250	± 0.005	6.35	± 0.127	0.031	0.79	180	12	720	50	1.750	44	28	0.025	0.038
104-0375031	3/8	0.375	± 0.005	9.52	± 0.127	0.312	± 0.005	7.92	± 0.127	0.031	0.79	140	10	560	39	3.250	83	28	0.031	0.047
104-0438031	7/16	0.438	± 0.005	11.13	± 0.127	0.375	± 0.005	9.53	± 0.127	0.031	0.79	120	8	480	33	3.250	83	28	0.037	0.055
104-0500031	1/2	0.500	± 0.005	12.70	± 0.127	0.438	± 0.005	11.13	± 0.127	0.031	0.79	100	7	400	28	4.750	121	28	0.043	0.063
104-0563031	9/16	0.563	± 0.006	14.30	± 0.152	0.500	± 0.006	12.70	± 0.152	0.031	0.79	80	6	320	22	5.000	127	28	0.048	0.072

104 PFA Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73˚F	bar 23˚C	psi 73˚F	bar 23˚C	inch	mm	at 73˚F	lb. per ft.	kg. per m.
104-0188062	3/16	0.188	± 0.005	4.78	± 0.127	0.062	± 0.005	1.57	± 0.127	0.062	1.57	680	47	2720	188	0.500	13	28	0.023	0.034
104-0250040	1/4	0.250	± 0.005	6.35	± 0.127	0.170	± 0.005	4.32	± 0.127	0.040	1.02	300	21	1200	83	0.875	22	28	0.025	0.037
104-0250047	1/4	0.250	± 0.005	6.35	± 0.127	0.156	± 0.005	3.96	± 0.127	0.047	1.19	370	26	1480	102	1.000	25	28	0.028	0.042
104-0250062	1/4	0.250	± 0.005	6.35	± 0.127	0.125	± 0.005	3.18	± 0.127	0.062	1.57	500	34	2000	138	0.500	13	28	0.034	0.051
104-0312062	5/16	0.312	± 0.005	7.92	± 0.127	0.188	± 0.005	4.78	± 0.127	0.062	1.57	390	27	1560	108	0.750	19	28	0.045	0.068
104-0375062	3/8	0.375	± 0.005	9.52	± 0.127	0.250	± 0.005	6.35	± 0.127	0.062	1.57	320	22	1280	88	1.250	32	28	0.057	0.085
104-0438062	7/16	0.438	± 0.005	11.13	± 0.127	0.312	± 0.005	7.92	± 0.127	0.062	1.57	270	19	1080	74	2.625	67	28	0.068	0.102
104-0500062	1/2	0.500	± 0.005	12.70	± 0.127	0.375	± 0.005	9.53	± 0.127	0.062	1.57	230	16	920	63	3.000	76	28	0.079	0.119
104-0750062	3/4	0.750	± 0.006	19.05	± 0.152	0.625	± 0.006	15.88	± 0.152	0.062	1.57	140	10	560	39	6.000	152	28	0.125	0.186
104-1000062	1	1.000	± 0.010	25.40	± 0.254	0.875	± 0.010	22.22	± 0.254	0.062	1.57	100	7	400	28	8.000	203	28	0.170	0.254

204 Metric PFA Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	mm	mm	tol.	inch	tol.	mm	tol.	inch	tol.	mm	inch	bar 23˚C	psi 73˚F	bar 23˚C	psi 73˚F	mm	inch	at 73˚F	kg. per m.	lb. per ft.
204-0400100	4	4	± 0.11	.157	± 0.004	2	± 0.11	.079	0.250	1	0.039	34	500	138	2000	6	0.250	28	0.020	0.014
204-0600100	6	6	± 0.11	.236	± 0.004	4	± 0.11	.157	± 0.004	1	0.039	22	320	88	1280	25	1.000	28	0.034	0.023
204-0800100	8	8	± 0.11	.315	± 0.004	6	± 0.11	.236	± 0.004	1	0.039	16	230	63	920	51	2.000	28	0.047	0.032
204-1000100	10	10	± 0.11	.393	± 0.004	8	± 0.11	.315	± 0.004	1	0.039	12	180	50	720	70	2.750	28	0.061	0.041
204-1200100	12	12	± 0.15	.472	± 0.006	10	± 0.15	.393	± 0.006	1	0.039	10	140	39	560	89	3.500	28	0.074	0.050

WARNING

Notes

FEP PRODUCTS

Smoothbore
- Fractional Industrial Wall
- Fractional Heavy Wall
- Metric

Heat Shrink
- 1.3:1
- 1.67:1
- 1.25:1 Roll Cover
- Double Shrink

Convoluted
- FEP Convoluted
- Convo-Flon
- SAE AS81914/3

Corrugated

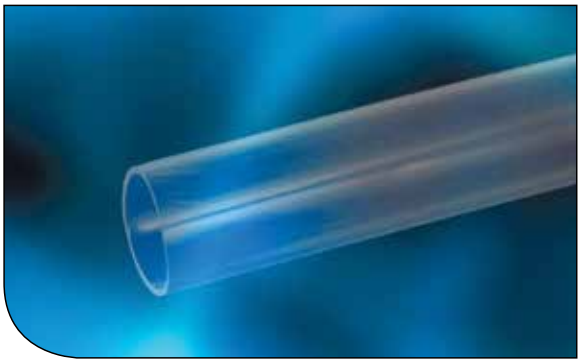
Retractable Coils

FEP (Fluorinated Ethylene Propylene)
Working Temperature: 400°F (204°C)
Color: Clear

- Excellent chemical resistance
- Non-wetting
- Weldable
- Tubes can be sealed by melting
- Long continuous lengths
- Low refractive index
- Improved clarity over PFA
- Lower cost alternative to PFA

FEP Tubing

Series Fractional & Metric: 103, 203



Features

- Virgin Fluorinated Ethylene Propylene resin
- Translucent
- Chemically inert
- Long continuous lengths
- Low coefficient of friction
- Self extinguishing
- Non-wetting
- Weldable

Certifications/Compliance

- ASTM D2116-07
- VW-1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Nitrogen Transfer
- Ozone Sampling
- Optical Sensor
- Laboratory
- Down Hole Pump
- Food & Beverage
- Catheter Repair
- Syringe Tips

Order Information

Example: 103-0250031-NT-100

103-0250031-NT-100 – **Fractional**

103-0250031-NT-100 – **FEP**

103-**0250**031-NT-100 – **Tube O.D.** in inches **(1/4")**

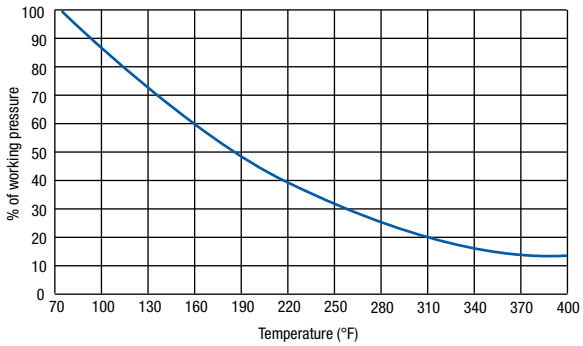
103-0250**031**-NT-100 – **Tube Wall Thickness** in inches **(.031")**

103-0250031-**NT**-100 – **Natural**

103-0250031-NT-**100** – **Package Quantity** in feet **(100')**

FEP Tubing (Series 103, 203)

Maximum Working Pressure (bar)



Fittings

Fittings available for sizes 1/8" up to 1"

Parker Fittings available from: Fluid System Connectors Division
Otsego, MI (269) 692-6555 (269) 692-6634 FAX

FSC Product Families:

- Compression
- Compress-Align®
- Metric Compression
- Flow-Controls
- Prestolok Composite
- Prestolok All-Metal
- Prestolok Stainless
- TrueSeal™

Notes

- Working Temperature: -100°F (-75°C) to +400°F (204°C)
- Working pressure calculated using a Design Factor of 4 at 73°F (23°C)
- Custom packaging and sizes are quoted upon request
- Package quantities are not continuous

Options

- Smoothbore
- Convoluted
- Corrugated
- Retractable Coils
- Paratubing

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

103 FEP Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73˚F	bar 23˚C	psi 73˚F	bar 23˚C	inch	mm	at 73˚F	lb. per ft.	kg. per m.
103-0094031	3/32	0.094	± 0.005	2.40	± 0.127	0.031	± 0.002	0.79	± 0.051	0.031	0.79	630	43	2520	174	0.500	13	28	0.006	0.009
103-0125031	1/8	0.125	± 0.003	3.18	± 0.076	0.062	± 0.003	1.57	± 0.076	0.031	0.79	470	32	1880	130	0.375	10	28	0.009	0.013
103-0156031	5/32	0.157	± 0.005	3.99	± 0.127	0.094	± 0.005	2.39	± 0.127	0.031	0.79	360	25	1440	99	0.375	10	28	0.011	0.017
103-0188031	3/16	0.188	± 0.005	4.78	± 0.127	0.125	± 0.005	3.18	± 0.127	0.031	0.79	290	20	1160	80	0.750	19	28	0.014	0.021
103-0250031	1/4	0.250	± 0.005	6.35	± 0.127	0.188	± 0.005	4.78	± 0.127	0.031	0.79	210	14	840	58	1.750	44	28	0.020	0.030
103-0312031	5/16	0.312	± 0.005	7.92	± 0.127	0.250	± 0.005	6.35	± 0.127	0.031	0.79	160	11	640	44	2.250	57	28	0.025	0.038
103-0375031	3/8	0.375	± 0.005	9.52	± 0.127	0.312	± 0.005	7.92	± 0.127	0.031	0.79	130	9	520	36	2.750	70	28	0.031	0.047
103-0438031	7/16	0.438	± 0.005	11.13	± 0.127	0.375	± 0.005	9.52	± 0.127	0.031	0.79	110	8	440	30	4.000	102	28	0.037	0.055
103-0500031	1/2	0.500	± 0.006	12.70	± 0.152	0.438	± 0.006	11.13	± 0.152	0.031	0.79	90	6	360	25	4.000	102	28	0.043	0.063
103-0563031	9/16	0.563	± 0.006	14.30	± 0.152	0.500	± 0.006	12.70	± 0.152	0.031	0.79	80	6	320	22	5.000	127	28	0.054	0.080

103 FEP Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73˚F	bar 23˚C	psi 73˚F	bar 23˚C	inch	mm	at 73˚F	lb. per ft.	kg. per m.
103-0188062	3/16	0.188	± 0.005	4.78	± 0.127	0.064	± 0.005	1.63	± 0.127	0.062	1.57	630	43	2520	174	0.250	6	28	0.023	0.034
103-0250040	1/4	0.250	± 0.005	6.35	± 0.127	0.170	± 0.005	4.32	± 0.127	0.040	1.02	280	19	1120	77	1.250	32	28	0.025	0.037
103-0250047	1/4	0.250	± 0.005	6.35	± 0.127	0.156	± 0.005	3.96	± 0.127	0.047	1.19	340	23	1360	94	0.750	19	28	0.028	0.042
103-0250062	1/4	0.250	± 0.005	6.35	± 0.127	0.125	± 0.005	3.18	± 0.127	0.062	1.57	470	32	1880	130	0.750	19	28	0.034	0.051
103-0312062	5/16	0.312	± 0.005	7.92	± 0.127	0.188	± 0.005	4.78	± 0.127	0.062	1.57	360	25	1440	99	1.375	35	28	0.045	0.068
103-0375062	3/8	0.375	± 0.005	9.52	± 0.127	0.250	± 0.005	6.35	± 0.127	0.062	1.57	290	20	1160	80	1.500	38	28	0.057	0.085
103-0438062	7/16	0.438	± 0.005	11.13	± 0.127	0.312	± 0.005	7.92	± 0.127	0.062	1.57	250	17	1000	69	2.625	67	28	0.068	0.102
103-0500062	1/2	0.500	± 0.005	12.70	± 0.127	0.375	± 0.005	9.53	± 0.127	0.062	1.57	210	14	840	58	2.125	54	28	0.079	0.119
103-0625062	5/8	0.625	± 0.006	15.88	± 0.152	0.500	± 0.006	12.70	± 0.152	0.062	1.57	160	11	640	44	3.000	76	28	0.102	0.152
103-0750062	3/4	0.750	± 0.006	19.05	± 0.152	0.625	± 0.006	15.88	± 0.152	0.062	1.57	130	9	520	36	6.000	152	28	0.125	0.186
103-1000062	1	1.000	± 0.010	25.40	± 0.254	0.875	± 0.010	22.22	± 0.254	0.062	1.57	90	6	360	25	8.000	203	28	0.170	0.254

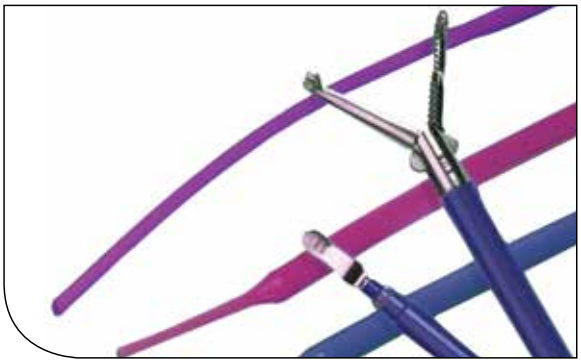
203 Metric FEP Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	mm	mm	tol.	inch	tol.	mm	tol.	inch	tol.	mm	inch	bar 23˚C	psi 73˚F	bar 23˚C	psi 73˚F	mm	inch	at 73˚F	kg. per m.	lb. per ft.
203-0300100	3	3	± 0.11	0.118	± 0.004	1	± 0.11	0.039	± 0.004	1	0.039	27	390	108	1560	6	0.250	28	0.014	0.009
203-0400100	4	4	± 0.11	0.157	± 0.004	2	± 0.11	0.079	± 0.004	1	0.039	20	290	80	1160	13	0.500	28	0.020	0.014
203-0500100	5	**5**	± 0.11	0.197	± 0.004	3	± 0.11	0.118	± 0.004	1	0.039	15	220	61	880	19	0.750	28	0.027	0.018
203-0600100	6	6	± 0.13	0.236	± 0.005	4	± 0.13	0.157	± 0.005	1	0.039	12	180	50	720	29	1.125	28	0.034	0.023
203-0700100	7	7	± 0.13	0.276	± 0.005	5	± 0.13	0.197	± 0.005	1	0.039	10	150	41	600	44	1.750	28	0.041	0.027
203-0800100	8	8	± 0.13	0.315	± 0.005	6	± 0.13	0.236	± 0.005	1	0.039	9	130	36	520	51	2.000	28	0.047	0.032
203-0900100	9	9	± 0.13	0.354	± 0.005	7	± 0.13	0.275	± 0.005	1	0.039	8	110	30	440	54	2.125	28	0.054	0.036
203-1000100	10	10	± 0.13	0.393	± 0.005	8	± 0.13	0.315	± 0.005	1	0.039	7	100	28	400	70	2.750	28	0.061	0.041
203-1200100	12	12	± 0.15	0.472	± 0.006	10	± 0.15	0.394	± 0.006	1	0.039	6	80	22	320	76	3.000	28	0.074	0.050

WARNING

FEP Heat ShrinkableTubing

Series 1.3:1 HS1.3FEP



Features

- Easier to shrink than PTFE
- Chemically inert
- Low coefficient of friction
- Superior dielectric strength
- Good heat resistance
- Self extinguishing
- Non-wetting

Certifications

- AMS-DTL-23053/11A, Class 1
- ASTM D2902 Type II
- ASTM D3296-03
- VW-1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Protective Cover
- UV Light Covering
- Product Testing
- Rollers

Order Information

Example: HS1.3FEP24-0CC48.000

HS1.3FEP24-0CC48.000 – **Heat Shrink**

HS**1.3**FEP24-0CC48.000 – **Shrink Ratio (1.3:1)**

HS1.3**FEP**24-0CC48.000 – **FEP**

HS1.3FEP**24**-0CC48.000 – **Heat Shrink Size** in AWG

(AWG 24) (For inch size use inch **(3/8")**

HS1.3FEP24-**0CC**48.000 – **Black**

HS1.3FEP24-0CC**48.000** – **Package Quantity** in feet **(48")**

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC
ie HS1.3FEP24-2TC
ie HS1.3FEP24-0CC48.000

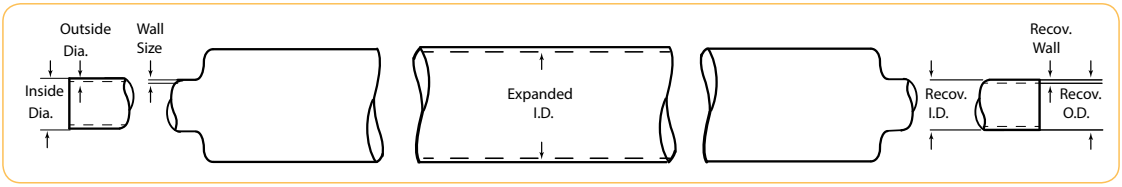
Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 400°F (204°C)
- Shrink Temperature:
  1" Dia. and below : 410°F (210°C)
  Over 1" Dia. : 430°F (221°C)
- *Dielectric Strength: ≥ 2,000 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

HS1.3FEP AWG Heat Shrink Tubing (1.3:1)

Part Number	Order Size AWG	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
			inch	mm	inch	mm	inch	mm
HS1.3FEP24	24	23053/11A-101	0.031	0.79	0.027	0.69	0.008 ± 0.002	0.20 ± 0.05
HS1.3FEP22	22	23053/11A-102	0.036	0.91	0.032	0.81	0.008 ± 0.002	0.20 ± 0.05
HS1.3FEP20	20	23053/11A-103	0.045	1.14	0.039	0.99	0.008 ± 0.002	0.20 ± 0.05
HS1.3FEP18	18	23053/11A-104	0.060	1.52	0.049	1.25	0.008 ± 0.002	0.20 ± 0.05
HS1.3FEP16	16	23053/11A-105	0.075	1.90	0.061	1.55	0.009 ± 0.002	0.23 ± 0.05
HS1.3FEP14	14	23053/11A-106	0.092	2.34	0.072	1.83	0.009 ± 0.002	0.23 ± 0.05
HS1.3FEP12	12	23053/11A-107	0.115	2.92	0.089	2.26	0.009 ± 0.002	0.23 ± 0.05
HS1.3FEP10	10	23053/11A-108	0.141	3.58	0.114	2.90	0.010 ± 0.003	0.25 ± 0.08
HS1.3FEP09	9	23053/11A-109	0.158	4.01	0.124	3.15	0.010 ± 0.003	0.25 ± 0.08
HS1.3FEP08	8	23053/11A-110	0.180	4.57	0.143	3.63	0.010 ± 0.003	0.25 ± 0.08
HS1.3FEP07	7	23053/11A-111	0.197	5.00	0.158	4.01	0.011 ± 0.004	0.28 ± 0.10
HS1.3FEP06	6	23053/11A-112	0.225	5.72	0.180	4.57	0.011 ± 0.004	0.28 ± 0.10
HS1.3FEP05	5	23053/11A-113	0.248	6.30	0.198	5.03	0.011 ± 0.004	0.28 ± 0.10
HS1.3FEP04	4	23053/11A-114	0.290	7.37	0.226	5.74	0.011 ± 0.004	0.28 ± 0.10
HS1.3FEP03	3	23053/11A-115	0.310	7.87	0.249	6.32	0.011 ± 0.004	0.28 ± 0.10
HS1.3FEP02	2	23053/11A-116	0.365	9.27	0.280	7.11	0.012 ± 0.004	0.31 ± 0.10
HS1.3FEP01	1	23053/11A-117	0.400	10.2	0.311	7.90	0.012 ± 0.004	0.31 ± 0.10
HS1.3FEP00	0	23053/11A-118	0.440	11.2	0.349	8.86	0.012 ± 0.004	0.31 ± 0.10



HS1.3FEP Fractional Heat Shrink Tubing (1.3:1)

Part Number	Order Size inch	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
			inch	mm	inch	mm	inch	mm
HS1.3FEP3/8	3/8	23053/11A-119	0.500	12.7	0.383	9.73	0.015 ± 0.004	0.38 ± 0.10
HS1.3FEP7/16	7/16	23053/11A-120	0.580	14.7	0.448	11.4	0.020 ± 0.004	0.51 ± 0.10
HS1.3FEP1/2	1/2	23053/11A-121	0.666	16.9	0.510	13.0	0.020 ± 0.004	0.51 ± 0.10
HS1.3FEP5/8	5/8	23053/11A-122	0.830	21.1	0.637	16.2	0.025 ± 0.004	0.64 ± 0.10
HS1.3FEP3/4	3/4	23053/11A-123	1.000	25.4	0.764	19.4	0.030 ± 0.004	0.76 ± 0.10
HS1.3FEP7/8	7/8	23053/11A-124	1.170	29.7	0.891	22.6	0.035 ± 0.004	0.89 ± 0.10
HS1.3FEP1.00	1	23053/11A-126	1.330	33.8	1.020	25.9	0.035 ± 0.004	0.89 ± 0.10
HS1.3FEP1.13	1-1/8	23053/11A-133	1.500	38.1	1.145	29.1	0.035 ± 0.004	0.89 ± 0.10
HS1.3FEP1.25	1-1/4	23053/11A-134	1.666	42.3	1.270	32.3	0.035 ± 0.004	0.89 ± 0.10
HS1.3FEP1.38	1-3/8	23053/11A-135	1.833	46.6	1.390	35.3	0.035 ± 0.004	0.89 ± 0.10
HS1.3FEP1.50	1-1/2	23053/11A-136	2.000	50.8	1.520	38.6	0.035 ± 0.004	0.89 ± 0.10

WARNING

FEP Heat ShrinkableTubing

Series 1.67:1 HS1.6FEP

Features

- Easier to shrink than PTFE
- Chemically inert
- Low coefficient of friction
- Superior dielectric strength
- Good heat resistance
- Self extinguishing
- Non-wetting

Certifications

- AMS-DTL-23053/11A, Class 2
- ASTM 2902 Type II
- ASTM D3296-03
- VW-1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Protective Cover
- UV Light Covering
- Product Testing
- Rollers

Order Information

Example: HS1.6FEP3/32-NC48.000

HS1.6FEP3/32-NC48.000 – **Heat Shrink**
HS**1.6**FEP3/32-NC48.000 – **Shrink Ratio (1.67:1)**
HS1.6**FEP**3/32-NC48.000 – **FEP**
HS1.6FEP**3/32**-NC48.000 – **Heat Shrink Size** in inches **(3/32")**
HS1.6FEP3/32-**N**C48.000 – **Natural**
HS1.6FEP3/32-N**C**48.000 – **Cut Tubing**
HS1.6FEP3/32-NC**48.000** – **Package Quantity** in feet **(48")**

Notes

- Working Temperature: 400°F (204°C)
- Shrink Temperature:
  1" Dia. and below : 410°F (210°C)
  Over 1" Dia. : 430°F (221°C)
- *Dielectric Strength: ≥ 2,000 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

Colors

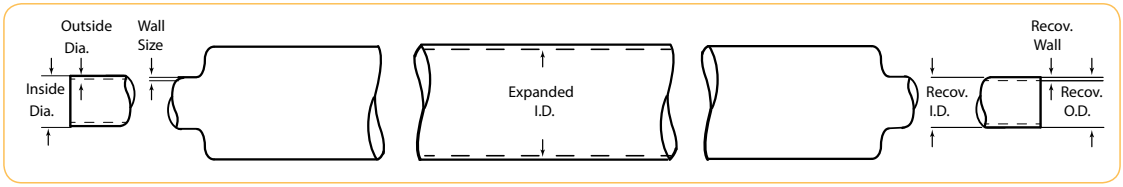
- ○ Natural, Translucent
- Colors available as custom run, see color code table

When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC
ie HS1.6FEP3/32-2TC
ie HS1.6FEP3/32-0CC48.000

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

HS1.6FEP Fractional Heat Shrink Tubing (1.67:1)

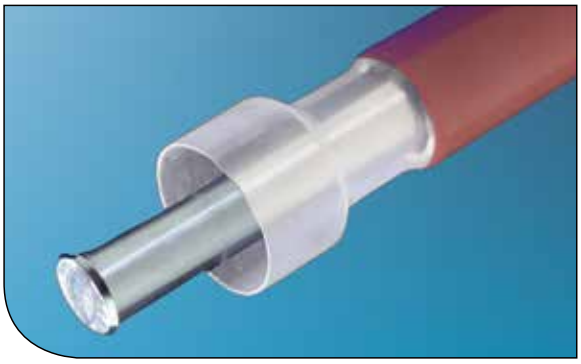
Part Number	Order Size inch	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
			inch	mm	inch	mm	inch	mm
HS1.6FEP3/32	3/32	23053/11A-201	0.093	2.36	0.056	1.42	0.008 ± 0.003	0.20 ± 0.08
HS1.6FEP1/8	1/8	23053/11A-202	0.125	3.18	0.075	1.90	0.010 ± 0.003	0.25 ± 0.08
HS1.6FEP3/16	3/16	23053/11A-203	0.188	4.78	0.115	2.92	0.010 ± 0.003	0.25 ± 0.08
HS1.6FEP1/4	1/4	23053/11A-204	0.250	6.35	0.150	3.81	0.010 ± 0.003	0.25 ± 0.08
HS1.6FEP3/8	3/8	23053/11A-205	0.375	9.52	0.225	5.72	0.012 ± 0.003	0.31 ± 0.08
HS1.6FEP1/2	1/2	23053/11A-206	0.500	12.7	0.300	7.62	0.015 ± 0.004	0.38 ± 0.10
HS1.6FEP3/4	3/4	23053/11A-207	0.750	19.1	0.450	11.4	0.020 ± 0.004	0.51 ± 0.10
HS1.6FEP1.00	1	23053/11A-208	1.000	25.4	0.600	15.2	0.025 ± 0.005	0.64 ± 0.13
HS1.6FEP1.25	1-1/2	23053/11A-209	1.500	38.1	0.900	22.9	0.030 ± 0.005	0.76 ± 0.13
HS1.6FEP1.50	2	23053/11A-210	2.000	50.8	1.200	30.5	0.030 ± 0.005	0.76 ± 0.13



WARNING

FEP Heat Shrinkable Roll Cover

Series 1.25:1 HS1.25FEP



Features

- Extends roller life
- Eliminates roller build up and picking
- Low coefficient of friction
- Flexible
- Good heat resistance

Certifications

- ASTM D2902 Type II
- VW-1, UL-83 (natural)

Applications/Markets

- Protective Cover
- Rollers

Order Information

Example: HS1.25FEP3.50-NC48.000

HS1.25FEP3.50-NC48.000 – **Heat Shrink**
HS**1.25**FEP3.50-NC48.000 – **Shrink Ratio (1.25:1)**
HS1.25**FEP**3.50-NC48.000 – **FEP**
HS1.25FEP**3.50**-NC48.000 – **Heat Shrink Expanded Size** inches **(3 1/2 in)**
HS1.25FEP3.50-**N**C48.000 – **Natural**
HS1.25FEP3.50-N**C**48.000 – **Cut Tubing**
HS1.25FEP3.50-NC**48.000** – **Package Quantity** in feet **(48")**

Notes

- Working Temperature: 347°F (175°C)
- Shrink Temperature: 347°F (175°C) for 10 minutes - For high temperatures 500°F (260°C), PFA roll covers are available
- Dielectric Strength: ≥ 2,000 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- Roll Cover is available in stock packaging of 4-ft. straight lengths
- Custom packaging, sizes, lengths and colors are quoted upon request
- For adhesion purposes, roll covers must be etched; Etching is available on the inside diameter, outside diameter or both
- Minimum quantities may apply

Colors

- ○ Natural, Translucent

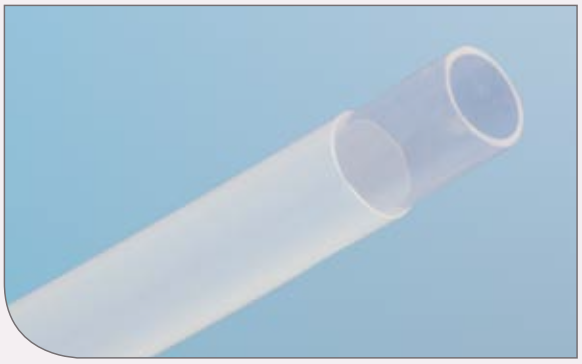
HS1.25.1 FEP Roll Cover

Part Number	Order Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	inch	inch	mm	inch	mm	inch	mm
HS1.25FEP1/2	1/2	0.550	14.0	0.440	11.2	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP5/8	5/8	0.700	17.8	0.540	13.7	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP3/4	3/4	0.800	20.3	0.640	16.3	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP7/8	7/8	0.950	24.1	0.760	19.3	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP1.00	1	1.100	27.9	0.880	22.4	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP1.25	1 1/4	1.300	33.0	1.000	25.4	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP1.50	1-1/2	1.700	43.2	1.300	33.0	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP2.00	2	2.100	53.3	1.700	43.2	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP2.25	2-1/4	2.260	59.7	2.000	50.8	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP2.50	2-1/2	2.600	66.0	2.100	53.3	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP3.00	3	3.100	78.7	2.600	66.0	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP3.50	3-1/2	3.500	88.9	3.100	78.7	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP4.00	4	4.300	109.2	3.500	88.9	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP5.00	5	5.200	132.1	4.300	109.3	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP6.00	6	6.200	157.5	5.200	132.1	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP7.00	7	7.200	182.9	6.200	157.5	0.020 ± 0.004	0.508 ±0.10
HS1.25FEP8.00	8	8.300	210.8	7.200	182.9	0.020 ± 0.004	0.508 ±0.10

WARNING

FEP/PTFE Heat Shrinkable Double Shrink

Series TSSS and TSSL



Features

- Double Shrink encapsulates your parts as the FEP melts during the PTFE shrinking process
- Protects cables, tubes and other objects from moisture and dirt
- Self extinguishing

Certifications

- VW-1, UL-83 (natural)

Applications/Markets

- Wire splices
- Encapsulates fittings

DISCONTINUED

FEP/PTFE Double Shrink Tubing

Part Number	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	inch	mm	inch	mm	inch	mm
Standard Wall						
TSSS036	0.036	0.91	0.00	0.00	0.023	0.584
TSSS060	0.060	1.52	0.00	0.00	0.028	0.711
TSSS130	0.130	3.30	0.00	0.00	0.032	0.813
TSSS160	0.160	4.06	0.00	0.00	0.032	0.813
TSSS190	0.190	4.83	0.061	1.55	0.035	0.889
TSSS250	0.250	6.35	0.125	3.18	0.035	0.889
TSSS350	0.350	8.89	0.190	4.83	0.035	0.889
TSSS450	0.450	11.4	0.312	7.92	0.055	1.400
TSSS700	0.700	17.8	0.440	11.2	0.055	1.400
TSSS950	0.950	24.1	0.680	17.3	0.065	1.650
Light Wall						
TSSL065	0.065	1.65	0.00	0.00	0.015	0.381
TSSL115	0.115	2.92	0.045	1.14	0.015	0.381
TSSL130	0.130	3.30	0.060	1.52	0.015	0.381
TSSL180	0.180	4.57	0.065	1.65	0.015	0.381
TSSL190	0.190	4.83	0.070	1.78	0.015	0.381
TSSL240	0.240	6.10	0.150	3.81	0.020	0.508
TSSL350	0.350	8.89	0.210	5.33	0.025	0.635
TSSL480	0.480	12.2	0.315	8.00	0.032	0.813
TSSL700	0.700	17.8	0.500	12.7	0.040	1.020
TSSL1000	1	25.4	0.700	17.8	0.045	1.140

Order Information

Example: TSSL036-NC48.000

TSSL036-NC48.000 – **Double Shrink**
TSSL036-NC48.000 – **Light Wall**
TSSL036-NC48.000 – **Size** in inches **(0.036")**
TSSL036-NC48.000 – **Natural**
TSSL036-NC48.000 – **Cut Tubing**
TSSL036-NC48.000 – **Package Quantity** in feet **(48")**

Notes

- Working Temperature: 450°F (231°C)
- Shrink Temperature: 680°F (360°C)
- Longitudinal Change: +/- 10%
- Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Custom packaging, sizes, lengths and colors are quoted upon request
- Minimum quantities may apply

Colors

- ○ Natural, Translucent

WARNING

FEP Convoluted Tubing

Series: CV03 and Convo-Flon™

Features

- Cuffs are sized on the I.D.
- Very flexible
- Long continuous lengths
- Translucent
- Chemically inert
- Good flexlife

Certifications/Compliance

- ASTM D3296-03
- VW-1, UL-83 (natural)

Applications/Markets

- Fluid Transport
- Vascular Graft
- Laboratory
- Robotics

Order Information

Example: CV03-1-1/2-NT

CV03-1-1/2-NT – **Convoluted Tubing**
CV**03**-1-1/2-NT – **FEP**
CV03-**1-1/2**-NT – **Tube Size** in inches **(1-1/2")**
CV03-1-1/2-**NT**– **Natural**

Notes

- Working Temperature: -100°F to 400°F (-75°C to 204°C)

Colors

- ○ Natural, Translucent

FEP Convoluted

(Standard tubing is natural)

Part Number	Order Size	Standard Cuff I.D. "A"		Standard Cuff Length "B"		Wall Thickness "C"		Min. Inside Diameter "D"		Max. Inside Diameter		Max. Outside Diameter "E"		**Min. Bend Radius	
	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CV03-1/4-NT	1/4	1/4	6.35	3/4	19.1	0.020	0.508	0.251	6.38	0.265	6.73	0.405	10.3	0.365	9
CV03-5/16-NT	5/16	5/16	7.94	1	25.4	0.023	0.584	0.273	6.93	0.281	7.14	0.424	10.8	0.500	13
CV03-3/8-NT	3/8	3/8	9.53	1	25.4	0.023	0.584	0.364	9.25	0.375	9.53	0.530	13.5	0.875	22
CV03-1/2-NT	1/2	1/2	12.7	1	25.4	0.025	0.635	0.485	12.3	0.500	12.7	0.660	16.8	0.625	16
CV03-5/8-NT	5/8	5/8	15.9	1-1/4	31.8	0.025	0.635	0.609	15.5	0.625	15.9	0.780	19.8	1.500	38
CV03-3/4-NT	3/4	3/4	19.1	1-1/2	38.1	0.025	0.635	0.730	18.5	0.750	19.1	0.975	24.8	3.500	89
CV03-1.00-NT	1	1	25.4	2	50.8	0.030	0.762	0.975	24.8	1.000	25.4	1.260	32.0	2.250	57
CV03-1.25-NT	1-1/4	1-1/4	31.8	2-1/2	63.5	0.040	1.02	1.210	30.7	1.250	31.8	1.540	39.1	2.500	64
CV03-1.50-NT	1-1/2	1-1/2	38.1	2-1/2	63.5	0.045	1.14	1.490	37.8	1.530	38.9	1.940	49.2	3.000	76
CV03-2.00-NT	2	2	50.8	2-1/2	63.5	0.045	1.14	1.990	50.5	2.020	51.3	2.370	60.2	4.250	108
CV03-2.50-NT	2-1/2	2-1/2	63.5	3	73.2	0.065	1.65	2.440	61.9	2.500	63.5	3.000	76.2	6.500	165
CV03-3.00-NT	3	3	76.2	3	73.2	0.065	1.65	2.92	74.2	3.02	76.7	3.74	95.0	7.50	191

** Minimum 36" length.

Standard Cuffs for **FEP Convo** are sized on the **I.D.**

Without Cuffs

With Cuffs

Standard Cuffs for **FEP Convo-Flon** are sized on the **O.D.**

Without Cuffs

With Cuffs

FEP Convo-Flon™ Convoluted

(Standard tubing is natural)

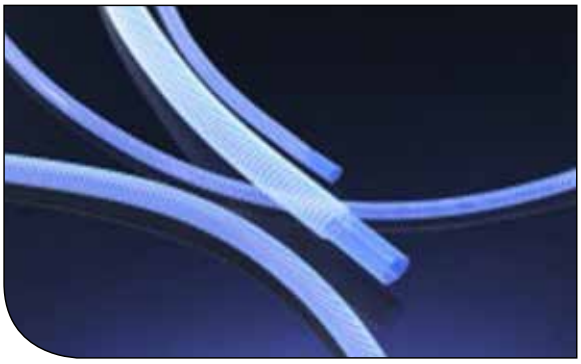
Part Number	Order Size	Standard Cuff O.D. "A"		Standard Cuff Length "B"		Wall Thickness "C"		Min. Inside Diameter "D"		Max. Inside Diameter		Max. Outside Diameter "E"		**Min. Bend Radius	
	inch	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
Contact Customer Service	1/4 x 3/8	1/4	6.35	3/4	19.1	0.020	0.508	0.251	6.38	0.265	6.73	0.375	9.53	0.625	16
	3/8 x 1/2	5/16	7.94	1	25.4	0.023	0.584	0.364	9.25	0.375	9.53	0.500	12.7	0.875	22
	1/2 x 5/8	3/8	9.53	1	25.4	0.025	0.635	0.480	12.2	0.500	12.7	0.625	15.9	1.250	32
	5/8 x 3/4	1	25.4	2	50.8	0.025	0.635	0.609	15.5	0.625	15.9	0.750	19.1	1.500	38
	3/4 x 7/8	1-1/4	31.8	2-1/2	63.5	0.025	0.635	0.730	18.5	0.750	19.1	0.875	22.2	1.750	44
	.800 x 1	1-1/2	38.1	2-1/2	63.5	0.030	0.762	0.800	20.3	0.820	2.80	1.000	25.4	2.250	57
	1-1/4 1-1/2	Contact Customer Service for actual dimensions.													

** Minimum 36" length.

WARNING

FEP Convoluted

Series SAE AS81914/3 and SAE AS81914/4



Features

- Longer lengths than PTFE
- Excellent clarity
- Chemically inert
- Low coefficient of friction
- Superior dielectric strength
- Good heat resistance
- Self extinguishing
- Non-wetting

Applications/Markets

- Fluid Handling
- Harnesses
- Lab Equipment
- Robotics

Certifications

- SAE AS81914/3
- SAE AS81914/4
- ASTM D3296-03
- FDA Compliant
- USP Class VI Compliant
- VW-1, UL-83 (natural)

Order Information

Example: 81914/3-1001-NT

81914/3-1001-NT – **SAE AS81914 Convoluted**
81914/**3**-1001-NT – **FEP**
81914/3-**10**01-NT – **Helical Convolutions**
81914/3-10**01**-NT – **Size (01=0.187")**
81914/3-1001-**NT** – **Color (N=Natural)**
81914/3-1001-N**T** – **"T" is bulk** (for cut tubing remove "T", add length, ie. 81914/3-1001-N1200 = 187" Convo, natural, cut 12" long)

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

When ordering convoluted tubing in colors, the "N" designation for natural should be replaced by the correct color designator;

ie 81914/3-1001-0T (black bulk tubing)
ie 81914/3-1001-01200 (black tubing - 12 inches long)

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 392°F (200°C)
- Tubing is provided in natural without cuffs direct from inventory
- Stock packaging is random coils
- Also availabe in close convolution 81914/4
- Minimum quantities may apply
- Custom packaging, sizes, lengths,cuffs and colors are quoted upon request

FEP Convoluted Tubing (SAE AS81914/3)

(Standard tubing is natural)

Part Number	MIL Spec	Maximum Inside Diameter		Minimum Inside Diameter		Maximum Outside Diameter		Maximum Wall Thickness		Minimum Bend Radius		Pitch	Weight	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	±1	lb./100 ft.	kg./100 mtr.
81914/3-1001-NT	-01	0.188	4.78	0.181	4.60	0.320	8.13	0.018	0.457	.500	13	8	1.5	2.23
81914/3-1002-NT	-02	0.281	7.14	0.273	6.93	0.414	10.5	0.018	0.457	.750	19	8	1.7	2.53
81914/3-1003-NT	-03	0.312	7.93	0.306	7.77	0.450	11.4	0.018	0.457	.750	19	8	1.9	2.83
81914/3-1004-NT	-04	0.375	9.53	0.364	9.25	0.510	13.0	0.018	0.457	.875	22	8	2.2	3.27
81914/3-1005-NT	-05	0.437	11.1	0.427	10.9	0.571	14.5	0.018	0.457	.875	22	8	3.1	4.61
81914/3-1006-NT	-06	0.500	12.7	0.485	12.3	0.650	16.5	0.023	0.584	1.250	32	7	4.0	5.95
81914/3-1007-NT	-07	0.625	15.9	0.608	15.4	0.770	19.6	0.023	0.584	1.500	38	7	4.8	7.14
81914/3-1008-NT	-08	0.750	19.1	0.730	18.5	0.930	23.6	0.023	0.584	1.750	44	6	6.1	9.07
81914/3-1009-NT	-09	0.875	22.2	0.860	21.8	1.073	27.3	0.023	0.584	2.000	51	5	7.0	10.4
81914/3-1010-NT	-10	1.000	25.4	0.975	24.8	1.226	31.1	0.023	0.584	2.375	60	5	8.5	12.7
81914/3-1011-NT	-11	1.125	28.6	1.105	28.1	1.390	35.3	0.023	0.584	2.375	60	5	9.3	13.8
81914/3-1012-NT	-12	1.250	31.8	1.210	30.7	1.539	39.1	0.023	0.584	2.750	70	4	10.9	16.2
81914/3-1013-NT	-13	1.500	38.1	1.437	36.5	1.832	46.5	0.023	0.584	3.375	86	4	12.6	18.8
81914/3-1014-NT	-14	1.750	44.5	1.688	42.9	2.082	52.9	0.023	0.584	3.875	98	4	14.8	22.0
81914/3-1015-NT	-15	2.000	50.8	1.937	49.2	2.332	59.2	0.023	0.584	4.250	108	4	16.8	25.0

FEP convoluted tubing is provided in NATURAL without cuffs direct from the factory. Natural part numbers are designated with “NT” after the Mil Spec number (ie 81914/3-1014-NT).

Standard Cuffs for **81914/3** are sized on the **I.D.**

Without Cuffs

With Cuffs

WARNING

FEP/PFA Corrugated

Extra Flexible Fluoropolymer Tubing, Series CR03

Features

- Capable of turning sharp corners without reducing the inside diameter of the tube
- Extremely flexible
- Kink resistant
- Non stick surface allows for easy cleaning
- Excellent clarity
- Chemically inert
- Available in FEP, PFA and High Purity PFA

Applications/Markets

- Vacuum Applications
- Robotics
- Instrumentation
- DNA Sequencer
- Fluid Transfer
- Pharmaceutical
- Wet Bench

Certifications

- FEP - ASTM D3296-03
- PFA - ASTM D3307-10
- FDA Compliant
- USP Class VI Compliant
- VW-1, UL-83 (natural)

Order Information

Example: CR03-3/4-NT

CR03-3/4-NT – **Corrugated Tubing**

CR**03**-3/4-NT – **FEP**

CR03-**3/4**-NT – T**ube I.D. when cuffed** in inches **(3/4")**

CR03-3/4-**N**T – **Color (N=Natural)**

CR03-3/4-N**T** – **"T" is bulk - for cuffed tubing add length, ie. CR03-3/4-N1200 = 1" Corr, natural, cut 12" long**

Colors

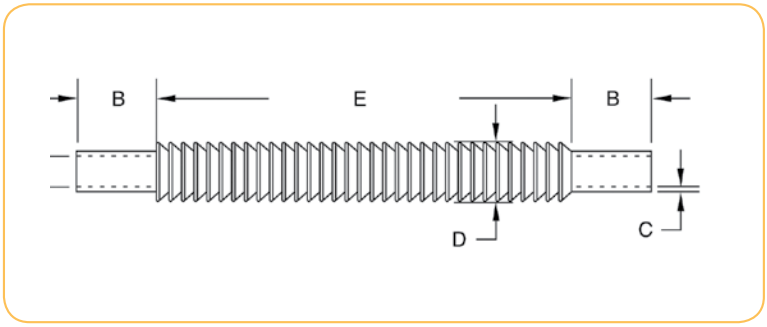
- ○ Natural, Translucent

Notes

- Working Temperature: 200°F (93°C) @ 0 pressure - For higher temperatures, request PFA Corrugated 300°F (148°C) @ 0 pressure
- Vacuum Service: 29.9 IN. Hg (759M Hg)
- Extension-Compression Length Ratio: Approximately 2:1
- Tubing is provided in natural without cuffs direct from inventory or with cuffs, as requested at time of order
- Stock packaging is random coils
- Minimum quantities may apply
- Corrugated tubing is also available in specialty configurations where corrugated and straight tubing run intermittently along the tube
- Custom packaging, sizes, lengths and colors are quoted upon request

FEP Tex-Flex® Corrugated

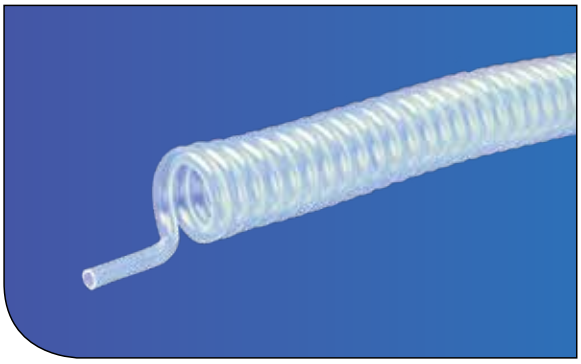
Part Number	Size To Order	Maximum Cuff I.D. "A"		Standard Cuff Length "B"		Wall Thickness "C"		Ref. Outside Diameter "D"		Corrugated Length "E"	Minimum Bend Radius	
		inch	mm	inch	mm	inch	mm	inch	mm	±1	inch	mm
CR03-1/4-NT	1/4	0.250	6.35	3/4	19.1	0.015	0.38	0.375	9.53	To be specified at time of order	0.125	3.18
CR03-3/8-NT	3/8	0.375	9.53	1	25.4	0.020	0.51	0.625	15.9		0.187	4.76
CR03-1/2-NT	1/2	0.500	12.7	1	25.4	0.025	0.64	0.750	19.0		0.250	6.35
CR03-5/8-NT	5/8	0.625	15.9	1	25.4	0.025	0.64	0.938	23.8		0.312	7.94
CR03-3/4-NT	3/4	0.750	19.1	1-1/2	38.1	0.030	0.76	1.063	26.9		0.375	9.53
CR03-7/8-NT	7/8	0.875	22.2	1-1/2	38.1	0.030	0.76	1.250	31.8		0.438	11.1
CR03-1.00-NT	1	1.000	24.8	2	50.8	0.035	0.89	1.438	36.5		0.500	12.7
CR03-1.25-NT	1-1/4	1.250	31.8	2	50.8	0.035	0.89	1.625	41.3		0.625	15.9
CR03-1.50-NT	1-1/2	1.500	38.1	2	50.8	0.035	0.89	1.813	46.1		0.750	19.1
CR03-2.00-NT	2	2.000	50.8	2	50.8	0.040	1.02	2.625	66.7		1.000	25.4
CR03-2.50-NT	2-1/2	2.5000	63.8	2-1/2	63.5	0.070	1.78	3.360	85.3		2.500	63.5



WARNING

Retractable Coiled Tubing

Single or Dual Containment, Series 703, 704, 705



Features

- Extremely flexible
- Excellent clarity
- Chemically inert
- Low coefficient of friction
- Self extinguishing
- Non-wetting
- Available in FEP, PFA and High Purity PFA

Certifications

- FEP - ASTM D3296-03
- PFA - ASTM D3307-10
- FDA Compliant
- USP Class VI Compliant
- VW-1, UL-83 (natural)

Applications/Markets

- Fluid Handling
- Wet Bench
- Lab Equipment
- Gas Dispensing
- Medical

Order Information

Example: 704-0312062-xx0012

704-0312062-xx0012 – **Retractable tubing**
704-0312062-xx0012 – **PFA**
704-0312062-xx0012 – **Tube O.D.** in inches **(3/16")**
704-0312062-xx0012 – **Wall (0.062")**
704-0312062-xx0012 – **Custom Options** (when needed)
704-0312062-xx0012 – **Length 12"**

Colors

- ○ Natural, Translucent

Fittings

Fittings available for sizes 3/16" up to 1/2"

Parker Fittings available from:
Fluid System Connectors Division
Otsego, MI
(269) 694-2550
(269) 692-6634 FAX

FSC Product Families:

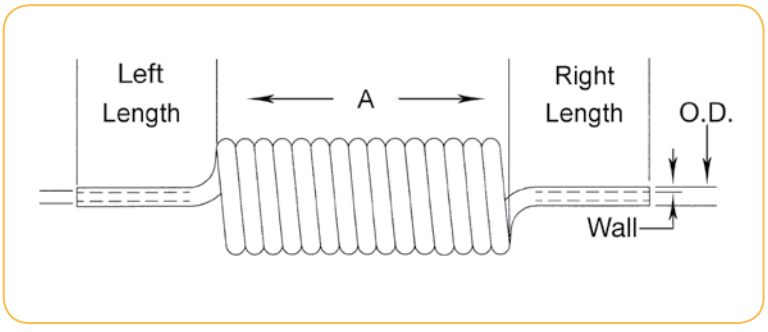
- Compression
- Compress-Align®
- Fast & Tite
- TrueSeal™

Notes

- Working Temperature: 200°F (93°C) @ 0 pressure - For higher temperatures, request PFA 300°F (148°C) @ 0 pressure; above these temperatures, the coils dimensions are not stable and the coils will lose their shape
- "X" denotes resin type - Replace "X" with 3 for FEP, 4 for PFA and 5 for HP PFA
- "xx" denotes custom options - Use when needed
- Standard left/right tail length is 6 inches
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

Retractable Tubing

Part Number	Size To Order O.D. x I.D.	Coil Inside Diameter		Retracted Length "A"		Extended Length	
		inch	mm	inch	mm	inch	mm
70X-0188062-xx0003	3/16" x 1/16"	0.750	19.1	3	76	12	305
70X-0188062-xx0006	3/16" x 1/16"	0.750	19.1	6	152	24	610
70X-0188062-xx0012	3/16" x 1/16"	0.750	19.1	12	305	48	1219
70X-0188062-xx0018	3/16" x 1/16"	0.750	19.1	18	457	72	1829
70X-0250062-xx0003	1/4" x 1/8"	1	25.4	3	76	12	305
70X-0250062-xx0006	1/4" x 1/8"	1	25.4	6	152	24	610
70X-0250062-xx0012	1/4" x 1/8"	1	25.4	12	305	48	1219
70X-0250062-xx0018	1/4" x 1/8"	1	25.4	18	457	72	1829
70X-0312062-xx0003	5/16" x 3/16"	1.625	41.3	3	76	12	305
70X-0312062-xx0006	5/16" x 3/16"	1.625	41.3	6	152	24	610
70X-0312062-xx0012	5/16" x 3/16"	1.625	41.3	12	305	48	1219
70X-0312062-xx0018	5/16" x 3/16"	1.625	41.3	18	457	72	1829
70X-0375062-xx0003	3/8" x 1/4"	1.625	41.3	3	76	12	305
70X-0375062-xx0006	3/8" x 1/4"	1.625	41.3	6	152	24	610
70X-0375062-xx0012	3/8" x 1/4"	1.625	41.3	12	305	48	1219
70X-0375062-xx0018	3/8" x 1/4"	1.625	41.3	18	457	72	1829
70X-0438062-xx0003	7/16" x 5/16"	3	76.2	3	76	12	305
70X-0438062-xx0006	7/16" x 5/16"	3	76.2	6	152	24	610
70X-0438062-xx0012	7/16" x 5/16"	3	76.2	12	305	48	1219
70X-0500062-xx0003	1/2" x 3/8"	3	76.2	3	76	12	305
70X-0500062-xx0006	1/2" x 3/8"	3	76.2	6	152	24	610
70X-0500062-xx0012	1/2" x 3/8"	3	76.2	12	305	48	1219



WARNING

Notes

PTFE PRODUCTS

Smoothbore
- Fractional Industrial Wall
- Fractional Heavy Wall
- Metric
- Fractional Electrical Insulation
- AWG Electrical Insulation

Spiral Wrap

Beading

Convoluted
- Convo-Tex®
- Low Profle
- Heavy Wall
- SAE AS81914/1

Heat Shrink
- 2:1 AWG
- 2:1 Fractional
- 4:1 Fractional

PTFE (Polytetrafluoroethylene)
Working Temperature: 500°F (260°C)
Color: Opaque to translucent

- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

PTFE Tubing

Series Fractional & Metric: 101, 201

Features

- Virgin Polytetrafluoroethylene resin
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

Applications/Markets

- Cable Liner
- Electrical Insulation
- Oxygen Sensor
- Paint Transfer
- Gas Sampling
- Laboratory

Certifications/Compliance

- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Order Information

Example: 101-0188062-0TC-100

101-0188062-0TC-100 – **PTFE**
101-**0188**062-0TC-100 – **Tube O.D.** in inches **(3/16")**
101-0188**062**-0TC-100 – **Tube Wall Thickness** in inches **(.062")**
101-0188062-**0**TC-100 – **Black**
101-0188062-0**T**C-100 – **Bulk Tubing**
101-0188062-0T**C**-100 – **Solid Color Tube**
101-0188062-0TC-**100** – **Package Quantity** in feet **(100')**

Notes

- Working Temperature: 500°F (260°C)
- Working pressure calculated using a Design Factor of 4 at 73°F (23°C)
- Custom packaging and sizes are quoted upon request
- Package quantities are not continuous

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Fittings

Fittings available for sizes 3/32" up to 1.1"

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(269) 692-6634 FAX

FSC Product Families:

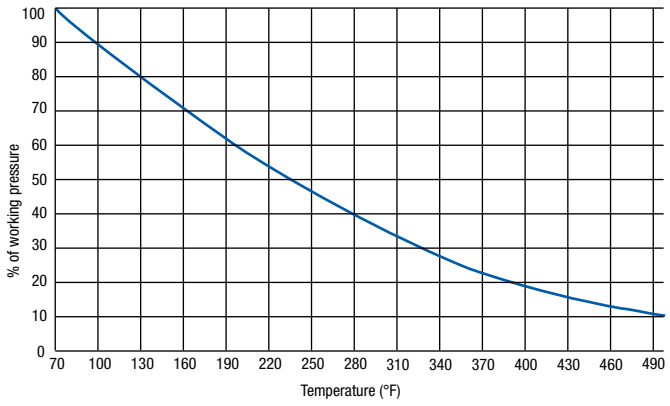
- Compression
- Compress-Align®
- Fast & Tite
- TrueSeal™

101 PTFE Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
101-0094031	3/32	0.094	± 0.005	2.40	± 0.13	0.031	± 0.002	0.79	± 0.05	0.031	0.79	390	27	1560	108	0.500	13	28	0.006	0.009
101-0125031	1/8	0.125	± 0.005	3.18	± 0.13	0.063	± 0.003	1.57	± 0.05	0.031	0.79	290	20	1160	80	0.500	13	28	0.009	0.013
101-0156031	5/32	0.156	± 0.005	3.99	± 0.13	0.094	± 0.004	2.39	± 0.08	0.031	0.79	220	15	880	61	0.625	16	28	0.011	0.017
101-0188031	3/16	0.188	± 0.005	4.78	± 0.13	0.125	± 0.005	3.18	± 0.13	0.031	0.79	180	12	720	50	0.750	19	28	0.014	0.021
101-0250031	1/4	0.250	± 0.005	6.35	± 0.13	0.190	± 0.005	4.83	± 0.13	0.031	0.79	130	9	520	36	1.000	25	28	0.020	0.030
101-0312031	5/16	0.312	± 0.005	7.92	± 0.13	0.250	± 0.007	6.35	± 0.18	0.031	0.79	100	7	400	28	2.250	57	28	0.026	0.038
101-0375031	3/8	0.375	± 0.005	9.52	± 0.13	0.312	± 0.006	7.92	± 0.15	0.031	0.79	80	6	320	22	2.750	70	28	0.032	0.047
101-0438031	7/16	0.438	± 0.005	11.13	± 0.13	0.375	± 0.007	9.52	± 0.18	0.031	0.79	70	5	280	19	4.000	102	28	0.037	0.056
101-0500031	1/2	0.500	± 0.006	12.70	± 0.15	0.438	± 0.008	11.13	± 0.20	0.031	0.79	60	4	240	17	4.000	102	28	0.043	0.064
101-0563031	9/16	0.563	± 0.007	14.30	± 0.18	0.500	± 0.010	12.70	± 0.25	0.031	0.79	55	4	220	15	5.000	127	28	0.049	0.073
101-0625031	5/8	0.625	± 0.007	15.88	± 0.18	0.563	± 0.010	14.30	± 0.25	0.031	0.79	50	3	200	14	5.500	140	28	0.054	0.081
101-0688031	11/16	0.688	± 0.010	17.48	± 0.25	0.625	± 0.012	15.88	± 0.31	0.031	0.79	45	3	180	12	6.250	159	28	0.060	0.090
101-0750032	3/4	0.750	± 0.010	19.05	± 0.25	0.688	± 0.012	17.48	± 0.31	0.032	0.81	40	3	160	11	6.500	165	28	0.068	0.101
101-0830040	0.830	0.830	± 0.014	21.08	± 0.36	0.750	± 0.014	19.05	± 0.36	0.040	1.02	45	3	180	12	8.000	203	28	0.093	0.139
101-0965045	0.965	0.965	± 0.016	24.51	± 0.41	0.875	± 0.016	22.22	± 0.41	0.045	1.14	45	3	180	12	12.000	305	28	0.122	0.182
101-1100050	1.100	1.100	±0 .020	27.94	± 0.51	1.000	± 0.020	25.40	± 0.51	0.050	1.27	40	3	160	11	18.000	457	28	0.155	0.231

PTFE Tubing (Series 101, 201)

Maximum Working Pressure (bar)



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WARNING

101 PTFE Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
101-0188062	3/16	.188	± .005	4.78	± 0.13	0.063	± 0.003	1.57	± 0.05	0.062	1.57	390	27	1560	108	0.250	6	28	0.023	0.034
101-0250047	1/4	.250	± .005	6.35	± 0.13	0.157	± 0.005	3.99	± 0.13	0.047	1.19	210	14	840	58	0.625	16	28	0.028	0.042
101-0250062	1/4	.250	± .005	6.35	± 0.13	0.125	± 0.005	3.18	± 0.13	0.062	1.57	290	20	1160	80	0.500	13	28	0.034	0.051
101-0312062	5/16	.312	± .005	7.92	± 0.13	0.188	± 0.006	4.76	± 0.15	0.062	1.57	222	15	888	61	0.875	22	28	0.046	0.068
101-0375062	3/8	.375	± .005	9.52	± 0.13	0.250	± 0.005	6.35	± 0.13	0.062	1.57	180	12	720	50	1.000	25	28	0.057	0.085
101-0438062	7/16	.438	± .005	11.13	± 0.13	0.312	± 0.007	7.92	± 0.18	0.062	1.57	150	10	600	41	2.250	57	28	0.069	0.103
101-0500062	1/2	.500	± .005	12.70	± 0.13	0.375	± 0.005	9.52	± 0.13	0.062	1.57	130	9	520	36	2.250	57	28	0.080	0.120
101-0563062	9/16	.563	± .007	14.30	± 0.18	0.437	± 0.008	11.13	± 0.20	0.062	1.57	110	8	440	30	2.750	70	28	0.092	0.137
101-0625062	5/8	.625	± .007	15.88	± 0.18	0.500	± 0.010	12.70	± 0.25	0.062	1.57	100	7	400	28	3.000	76	28	0.103	0.154
101-0688062	11/16	.688	± .010	17.48	± 0.25	0.563	± 0.010	14.30	± 0.25	0.062	1.57	90	6	360	25	5.000	127	28	0.115	0.171
101-0750062	3/4	.750	± .010	19.05	± 0.25	0.625	± 0.010	15.88	± 0.25	0.062	1.57	80	6	320	22	6.000	152	28	0.126	0.188
101-0875062	7/8	.875	± .014	22.22	± 0.36	0.750	± 0.014	19.05	± 0.36	0.062	1.57	70	5	280	19	7.250	184	28	0.149	0.222
101-1000062	1	1.000	± .016	25.40	± 0.25	0.875	± 0.016	22.22	± 0.36	0.062	1.57	100	6.9	400	28	8.000	203	28	0.172	0.256

WARNING

201 Metric PTFE Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	mm	mm	tol.	inch	tol.	mm	tol.	inch	tol.	mm	inch	bar 23°C	psi 73°F	bar 23°C	psi 73°F	mm	inch	at 73°F	kg. per m.	lb. per ft.
201-0300100	3	3	± 0.11	0.118	± 0.004	1	± 0.11	0.039	± 0.004	1	0.039	27	390	108	1560	13	0.500	28	0.014	0.009
201-0400100	4	4	± 0.11	0.157	± 0.004	2	± 0.11	0.074	± 0.004	1	0.039	20	290	80	1160	13	0.500	28	0.020	0.014
201-0500100	5	5	± 0.11	0.197	± 0.004	3	± 0.11	0.118	± 0.004	1	0.039	15	220	61	880	19	0.750	28	0.027	0.018
201-0600100	6	6	± 0.13	0.236	± 0.005	4	± 0.13	0.157	± 0.005	1	0.039	12	180	50	720	25	1.000	28	0.034	0.023
201-0700100	7	7	± 0.13	0.276	± 0.005	5	± 0.13	0.197	± 0.005	1	0.039	10	150	41	600	38	1.500	28	0.041	0.027
201-0800100	8	8	± 0.13	0.315	± 0.005	6	± 0.13	0.236	± 0.005	1	0.039	9	130	36	520	51	2.000	28	0.048	0.032
201-0900100	9	9	± 0.13	0.354	± 0.005	7	± 0.13	0.276	± 0.005	1	0.039	8	110	30	440	57	2.250	28	0.055	0.037
201-1000100	10	10	± 0.13	0.394	± 0.005	8	± 0.13	0.315	± 0.005	1	0.039	7	100	28	400	64	2.500	28	0.061	0.041
201-1200100	12	12	± 0.15	0.472	± 0.006	10	± 0.15	0.394	± 0.006	1	0.039	6	80	22	320	76	3.000	28	0.075	0.050
201-1400100	14	14	± 0.15	0.551	± 0.006	12	± 0.15	0.472	± 0.006	1	0.039	70	5	19	280	89	3.500	28	0.089	0.060
201-1600100	16	16	± 0.15	0.630	± 0.006	14	± 0.15	0.551	± 0.006	1	0.039	60	4	17	240	108	4.250	28	0.102	0.069

WARNING

PTFE Tubing

Series Fractional: TFL, TFS, TFT

Features

- Virgin Polytetrafluoroethylene resin
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

Applications/Markets

- Electrical Insulation
- Protective Cover
- Cable Liner
- Spacer

Certifications/Compliance

- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant
- **Light Wall** (TFL) – ASTM D3295 Class 1
- **Thin Wall** (TFT) – ASTM D3295 Class 2, AMS 3655B
- **Standard Wall** (TFS) – ASTM D3295 Class 3, MIL-I-22129C

Order Information

Example: TFS1/2-NT

TFS1/2-NT – **PTFE**
TF**S**1/2-NT – **Standard Wall**
TFS**1/2**-NT – **Tube O.D.** in inches **(1/2")**
TFS1/2-**N**T – **Natural**
TFS1/2-N**T** – **Bulk Tubing**

Notes

- Working Temperature: 500°F (260°C)
- Package quantities are not continuous - Fractional tubing is supplied in random length coils, with a minimum coil length of 15 feet.
- Custom packaging, sizes and lengths are quoted upon request.

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Fittings

Fittings available for sizes 3/32" up to 1.1"

Parker Fittings available from:
Fluid System Connectors Division
Otsego, MI
(269) 694-2550
(269) 692-6634 FAX

FSC Product Families:

- Compression
- Compress-Align®
- Fast & Tite
- TrueSeal™

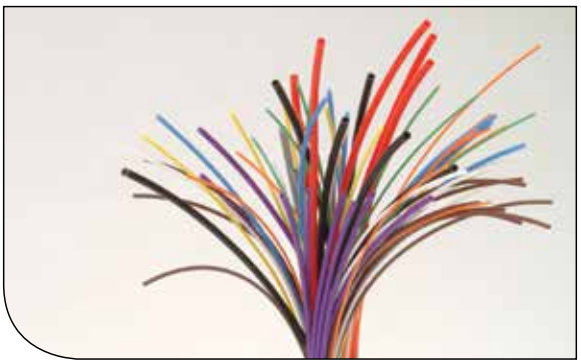
TFS, TFT & TFL PTFE Fractional Tubing

Size	Nominal I.D.		Standard Wall			Thin Wall			Light Wall			Standard Packaging
			Part Number	Nominal Wall		Part Number	Nominal Wall		Part Number	Nominal Wall		
			#			#			#			
inch	inch	mm	Natural	inch	mm	Natural	inch	mm	Natural	inch	mm	
1/8	0.125	3.18	TFS1/8	0.020	0.51	TFT1/8	0.015	0.38	TFL1/8	0.008	0.20	Random Length Coil
3/16	0.188	4.78	TFS3/16	0.020	0.51	TFT3/16	0.015	0.38	TFL3/16	0.010	0.25	Random Length Coil
1/4	0.250	6.35	TFS1/4	0.020	0.51	TFT1/4	0.015	0.38	TFL1/4	0.010	0.25	Random Length Coil
5/16	0.318	7.92	TFS5/16	0.020	0.51	TFT5/16	0.015	0.38	TFL5/16	0.012	0.30	Random Length Coil
3/8	0.381	9.52	TFS3/8	0.025	0.64	TFT3/8	0.015	0.38	TFL3/8	0.015	0.38	Random Length Coil
7/16	0.444	11.13	TFS7/16	0.025	0.64	TFT7/16	0.018	0.46	TFL7/16	0.018	0.46	Random Length Coil
1/2	0.507	12.70	TFS1/2	0.025	0.64	TFT1/2	0.018	0.46	TFL1/2	0.018	0.46	Random Length Coil
5/8	0.632	15.88	TFS5/8	0.025	0.64	TFT5/8	0.020	0.51	-	-	-	Random Length Coil
3/4	0.760	19.05	TFS3/4	0.030	0.76	TFT3/4	0.025	0.64	-	-	-	Random Length Coil
7/8	0.885	22.22	TFS7/8	0.035	0.89	-	-	-	-	-	-	Random Length Coil
1	1.010	25.40	TFS1.00	0.035	0.89	-	-	-	-	-	-	Random Length Coil

WARNING

PTFE Tubing

Series AWG: TFH, TFS, TFT, TFL



Features

- Virgin Polytetrafluoroethylene resin
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

Applications/Markets

- Electrical Insulation
- Protective Cover
- Circuit Board
- Wire Insulation
- Strain Relief
- Introducer
- Stent Delivery

Certifications/Compliance

- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant
- **Light Wall** (TFL) – ASTM D3295 Class 1, UL-224 150V 200°C
- **Thin Wall** (TFT) – ASTM D3295 Class 2, AMS 3655B, UL-224 300V 200°C, CSA 9032-01 300V
- **Standard Wall** (TFS) – ASTM D3295 Class 3, MIL-I-22129C, UL-224 600V 200°C, CSA 9032-01 600V
- **Heavy Wall** (TFH) – ASTM D3295, Class 4

Order Information

Example: TFH13-2TC

TFH13-2TC – **PTFE**
TF**H**13-2TC – **Heavy Wall**
TFH**13**-2TC – **AWG Size**
TFH13-**2**TC – **Red**
TFH13-2**T**C – **Bulk Tubing**
TFH13-2T**C** – **Solid Color Tube**

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 500°F (260°C)
- AWG Spaghetti tubing is supplied in random lengths with a minimum length of 25 feet
- Continuous lengths and colors quoted upon request
- AWG spaghetti tubing is also available in FEP and PFA
- Consult factory for pricing and minimum lengths

TFH PTFE AWG Heavy Wall

Part Number	Order Size	Nominal I.D.		Minimum I.D.		Maximum I.D.		Nominal Wall		Standard Packaging
#										
	AWG	inch	mm	inch	mm	inch	mm	inch	mm	
TFH24	24	0.022	0.56	0.020	0.51	0.026	0.66	0.016 ± 0.003	0.41 ± 0.08	1,000 ft. Spool
TFH23	23	0.026	0.66	0.023	0.58	0.029	0.74	0.016 ± 0.003	0.41 ± 0.08	1,000 ft. Spool
TFH22	22	0.028	0.71	0.025	0.64	0.032	0.81	0.016 ± 0.003	0.41 ± 0.08	1,000 ft. Spool
TFH21	21	0.032	0.81	0.029	0.74	0.035	0.89	0.016 ± 0.003	.0.41 ± 0.08	1,000 ft. Spool
TFH20	20	0.034	0.86	0.032	0.81	0.040	1.02	0.018 ± 0.003	0.46 ± 0.08	1,000 ft. Spool
TFH19	19	0.038	0.97	0.036	0.91	0.044	1.12	0.020 ± 0.004	0.51 ± 0.10	1,000 ft. Spool
TFH18	18	0.042	1.07	0.040	1.02	0.049	1.25	0.020 ± 0.004	0.51 ± 0.10	1,000 ft. Spool
TFH17	17	0.048	1.22	0.045	1.14	0.054	1.37	0.020 ± 0.004	0.51 ± 0.10	1,000 ft. Spool
TFH16	16	0.053	1.35	0.051	1.30	0.061	1.55	0.020 ± 0.004	0.51 ± 0.10	1,000 ft. Spool
TFH15	15	0.059	1.50	0.057	1.45	0.067	1.70	0.020 ± 0.004	0.51 ± 0.10	1,000 ft. Spool
TFH14	14	0.066	1.68	0.064	1.63	0.074	1.88	0.020 ± 0.004	0.51 ± 0.10	500 ft. Spool
TFH13	13	0.076	1.93	0.072	1.83	0.082	2.08	0.020 ± 0.004	0.51 ± 0.10	500 ft. Spool
TFH12	12	0.085	2.16	0.081	2.06	0.091	2.31	0.020 ± 0.004	0.51 ± 0.10	500 ft. Spool
TFH11	11	0.095	2.41	0.091	2.31	0.101	2.57	0.020 ± 0.004	0.51 ± 0.10	500 ft. Spool
TFH10	10	0.106	2.69	0.102	2.59	0.112	2.84	0.025 ± 0.005	0.64 ± 0.13	500 ft. Spool
TFH09	9	0.118	3.00	0.114	2.90	0.124	3.15	0.025 ± 0.005	0.64 ± 0.13	500 ft. Spool
TFH08	8	0.133	3.38	0.129	3.28	0.141	3.58	0.030 ± 0.005	0.76 ± 0.13	Random Length Coil
TFH07	7	0.148	3.76	0.144	3.66	0.158	4.01	0.030 ± 0.005	0.76 ± 0.13	Random Length Coil
TFH06	6	0.166	4.22	0.162	4.11	0.178	4.52	0.030 ± 0.005	0.76 ± 0.13	Random Length Coil
TFH05	5	0.185	4.70	0.182	4.62	0.196	4.98	0.032 ± 0.005	0.81 ± 0.13	Random Length Coil

Certifications

- ASTM D3295 Class 4
- AMS 3653E
- FDA Compliant
- USP Class VI Compliant

WARNING

PTFE Tubing

Series AWG: TFH, TFL, TFS, TFT (cont.)

TFS PTFE AWG Standard Wall

Part Number	Order Size	Nominal I.D.		Minimum I.D.		Maximum I.D.		Nominal Wall		Standard Packaging
#		◎		◎		◎		◎→		
	AWG	inch	mm	inch	mm	inch	mm	inch	mm	
TFS30	30	0.012	0.31	0.010	0.25	0.015	0.38	.009 ± .002	0.23 ± 0.05	1,000 ft. Spool
TFS28	28	0.015	0.38	0.013	0.33	0.018	0.46	.009 ± .002	0.23 ± 0.05	1,000 ft. Spool
TFS26	26	0.018	0.46	0.016	0.41	0.022	0.56	.009 ± .002	0.23 ± 0.05	1,000 ft. Spool
TFS24	24	0.022	0.56	0.020	0.51	0.026	0.66	.012 ± .003	0.31 ± 0.08	1,000 ft. Spool
TFS23	23	0.026	0.66	0.023	0.58	0.029	0.74	.012 ± .003	0.31 ± 0.08	1,000 ft. Spool
TFS22	22	0.028	0.71	0.025	0.64	0.032	0.81	.012 ± .003	0.31 ± 0.08	1,000 ft. Spool
TFS21	21	0.032	0.81	0.029	0.74	0.035	0.89	.012 ± .003	0.31 ± 0.08	1,000 ft. Spool
TFS20	20	0.034	0.86	0.032	0.81	0.040	1.02	.016 ± .003	0.41 ± .0.08	1,000 ft. Spool
TFS19	19	0.038	0.97	0.036	0.91	0.044	1.12	.016 ± .003	0.41 ± .0.08	1,000 ft. Spool
TFS18	18	0.042	1.07	0.040	1.02	0.049	1.25	.016 ± .003	0.41 ± .0.08	1,000 ft. Spool
TFS17	17	0.048	1.22	0.045	1.14	0.054	1.37	.016 ± .003	0.41 ± .0.08	1,000 ft. Spool
TFS16	16	0.053	1.35	0.051	1.30	0.061	1.55	.016 ± .003	0.41 ± .0.08	1,000 ft. Spool
TFS15	15	0.059	1.50	0.057	1.45	0.067	1.70	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS14	14	0.066	1.68	0.064	1.63	0.074	1.88	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS13	13	0.076	1.93	0.072	1.83	0.082	2.08	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS12	12	0.085	2.16	0.081	2.06	0.091	2.31	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS11	11	0.095	2.41	0.091	2.31	0.101	2.57	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS10	10	0.106	2.69	0.102	2.59	0.112	2.84	.016 ± .003	0.41 ± .0.08	500 ft. Spool
TFS09	9	0.118	3.00	0.114	2.90	0.124	3.15	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS08	8	0.133	3.38	0.129	3.28	0.141	3.58	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS07	7	0.148	3.76	0.144	3.66	0.158	4.01	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS06	6	0.166	4.22	0.162	4.11	0.178	4.52	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS05	5	0.185	4.70	0.182	4.62	0.196	4.98	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS04	4	0.208	5.28	0.204	5.18	0.224	5.69	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS03	3	0.234	5.94	0.229	5.82	0.249	6.32	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS02	2	0.263	6.68	0.258	6.55	0.278	7.06	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS01	1	0.294	7.47	0.289	7.34	0.311	7.90	.020 ± .004	0.51 ± .0.10	Random Length Coil
TFS00	0	0.330	8.38	0.325	8.25	0.347	8.81	.020 ± .004	0.51 ± .0.10	Random Length Coil

Certifications

- ASTM D3295 Class 3
- MIL-I-22129C
- AMS 3653E
- UL-224 600V 200°C
- CSA 9032-01 600V
- FDA Compliant

WARNING

TFT PTFE AWG Thin Wall

Part Number	Order Size	Nominal I.D.		Minimum I.D.		Maximum I.D.		Nominal Wall		Standard Packaging
#										
	AWG	inch	mm	inch	mm	inch	mm	inch	mm	
TFT32	32	.010	0.25	.008	0.20	.012	0.31	0.007 ± 0.002	0.18 ± 0.05	1,000 ft. Spool Only
TFT30	30	.012	0.31	.010	0.25	.015	0.38	0.009 ± 0.002	0.23 ± 0.05	1,000 ft. Spool
TFT28	28	.015	0.38	.013	0.33	.018	0.46	0.009 ± 0.002	0.23 ± 0.05	1,000 ft. Spool
TFT26	26	.018	0.46	.016	0.41	.022	0.56	0.009 ± 0.002	0.23 ± 0.05	1,000 ft. Spool
TFT24	24	.022	0.56	.020	0.51	.026	0.66	0.010 ± 0.003	0.25 ± 0.08	1,000 ft. Spool
TFT23	23	.026	0.66	.023	0.58	.029	0.74	0.010 ± 0.003	0.25 ± 0.08	1,000 ft. Spool
TFT22	22	.028	0.71	.025	0.64	.032	0.81	0.010 ± 0.003	0.25 ± 0.08	1,000 ft. Spool
TFT21	21	.032	0.81	.029	0.74	.035	0.89	0.010 ± 0.003	0.25 ± 0.08	1,000 ft. Spool
TFT20	20	.034	0.86	.032	0.81	.040	1.02	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT19	19	.038	0.97	.036	0.91	.044	1.12	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT18	18	.042	1.07	.040	1.02	.049	1.25	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT17	17	.048	1.22	.045	1.14	.054	1.37	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT16	16	.053	1.35	.051	1.30	.061	1.55	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT15	15	.059	1.50	.057	1.45	.067	1.70	0.012 ± 0.003	0.31 ± 0.08	1,000 ft. Spool
TFT14	14	.066	1.68	.064	1.63	.074	1.88	0.012 ± 0.003	0.31 ± 0.08	500 ft. Spool
TFT13	13	.076	1.93	.072	1.83	.082	2.08	0.012 ± 0.003	0.31 ± 0.08	500 ft. Spool
TFT12	12	.085	2.16	.081	2.06	.091	2.31	0.012 ± 0.003	0.31 ± 0.08	500 ft. Spool
TFT11	11	.095	2.41	.091	2.31	.101	2.57	0.012 ± 0.003	0.31 ± 0.08	500 ft. Spool
TFT10	10	.106	2.69	.102	2.59	.112	2.84	0.012 ± 0.003	0.31 ± 0.08	500 ft. Spool
TFT09	9	.118	3.00	.114	2.90	.124	3.15	0.015 ± 0.003	0.38 ± 0.08	500 ft. Spool
TFT08	8	.133	3.38	.129	3.28	.141	3.58	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT07	7	.148	3.76	.144	3.66	.158	4.01	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT06	6	.166	4.22	.162	4.11	.178	4.52	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT05	5	.185	4.70	.182	4.62	.196	4.98	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT04	4	.208	5.28	.204	5.18	.224	5.69	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT03	3	.234	5.94	.229	5.82	.249	6.32	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT02	2	.263	6.68	.258	6.55	.278	7.06	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT01	1	.294	7.47	.289	7.34	.311	7.90	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil
TFT00	0	.330	8.38	.325	8.25	.347	8.81	0.015 ± 0.003	0.38 ± 0.08	Random Length Coil

Certifications

- ASTM D3295 Class 2
- AMS 3653E
- AMS 3655B
- UL-224 300V 200°C
- CSA 9032-01 300V
- FDA Compliant
- USP Class VI Compliant

WARNING

PTFE Tubing

Series AWG: TFH, TFL, TFS, TFT (cont.)

TFL PTFE AWG Light Wall

Part Number	Order Size	Nominal I.D.		Minimum I.D.		Maximum I.D.		Nominal Wall		Standard Packaging
#		◎		◎		◎		◎→←		
	AWG	inch	mm	inch	mm	inch	mm	inch	mm	
TFL32	32	0.010	0.25	0.008	0.20	0.012	0.31	0.005 ± 0.002	0.13 ± 0.05	1,000 ft. Spool Only
TFL30	30	0.012	0.31	0.010	0.25	0.015	0.38	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL28	28	0.015	0.38	0.013	0.33	0.018	0.46	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL26	26	0.018	0.46	0.016	0.41	0.022	0.56	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL24	24	0.022	0.56	0.020	0.51	0.026	0.66	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL23	23	0.026	0.66	0.023	0.58	0.029	0.74	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL22	22	0.028	0.71	0.025	0.64	0.032	0.81	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL21	21	0.032	0.81	0.029	0.74	0.035	0.89	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL20	20	0.034	0.86	0.032	0.81	0.040	1.02	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL19	19	0.038	0.97	0.036	0.91	0.044	1.12	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL18	18	0.042	1.07	0.040	1.02	0.049	1.25	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL17	17	0.048	1.22	0.045	1.14	0.054	1.37	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL16	16	0.053	1.35	0.051	1.30	0.061	1.55	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL15	15	0.059	1.50	0.057	1.45	0.067	1.70	0.006 ± 0.002	0.13 ± 0.05	1,000 ft. Spool
TFL14	14	0.066	1.68	0.064	1.63	0.074	1.88	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL13	13	0.076	1.93	0.072	1.83	0.082	2.08	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL12	12	0.085	2.16	0.081	2.06	0.091	2.31	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL11	11	0.095	2.41	0.091	2.31	0.101	2.57	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL10	10	0.106	2.69	0.102	2.59	0.112	2.84	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL09	9	0.118	3.00	0.114	2.90	0.124	3.15	0.008 ± 0.002	0.20 ± 0.05	500 ft. Spool
TFL08	8	0.133	3.38	0.129	3.28	0.141	3.58	0.008 ± 0.002	0.20 ± 0.05	Random Length Coil
TFL07	7	0.148	3.76	0.144	3.66	0.158	4.01	0.008 ± 0.002	0.20 ± 0.05	Random Length Coil
TFL06	6	0.166	4.22	0.162	4.11	0.178	4.52	0.010 ± 0.003	0.25 ± 0.08	Random Length Coil
TFL05	5	0.185	4.70	0.182	4.62	0.196	4.98	0.010 ± 0.003	0.25 ± 0.08	Random Length Coil
TFL04	4	0.208	5.28	0.204	5.18	0.224	5.69	0.010 ± 0.003	0.25 ± 0.08	Random Length Coil
TFL03	3	0.234	5.94	0.229	5.82	0.249	6.32	0.010 ± 0.003	0.25 ± 0.08	Random Length Coil
TFL02	2	0.263	6.68	0.258	6.55	0.278	7.06	0.010 ± 0.003	0.25 ± 0.08	Random Length Coil
TFL01	1	0.294	7.47	0.289	7.34	0.311	7.90	0.012 ± 0.003	0.31 ± 0.08	Random Length Coil
TFL00	0	0.330	8.38	0.325	8.25	0.347	8.81	0.012 ± 0.003	0.31 ± 0.08	Random Length Coil

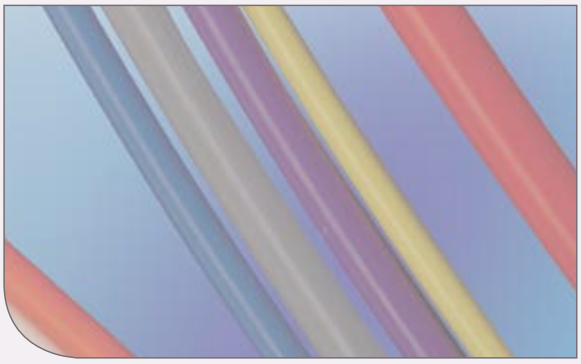
Certifications

- ASTM D3295 Class 1
- AMS 3653E
- UL-224 150V 200°C
- FDA Compliant
- USP Class VI Compliant

WARNING

PTFE Beading

Series Fractional: TFB



Features

- Virgin Polytetrafluoroethylene resin
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

Applications/Markets

- Pull Cord
- O-Ring Seals
- Spacers
- Woven Filter

Certifications

- ASTM D1710, Type 1, Grade 1, Class B
- ASTM D3295
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

TFB PTFE Beading

Part Number	Diameter		Tolerance		Standard Packaging
#	◎				
	inch	mm	inch	mm	
TFB015	0.015	0.38	± 0.002	± 0.05	1,000 ft. Spool
TFB020	0.020	0.51	± 0.002	± 0.05	1,000 ft. Spool
TFB025	0.025	0.64	± 0.002	± 0.05	1,000 ft. Spool
TFB028	0.028	0.71	± 0.002	± 0.05	1,000 ft. Spool
TFB031	0.031	0.79	± 0.002	± 0.05	1,000 ft. Spool
TFB035	0.035	0.89	± 0.002	± 0.05	1,000 ft. Spool
TFB039	0.039	0.99	± 0.002	± 0.05	1,000 ft. Spool
TFB043	0.043	1.09	± 0.002	± 0.05	1,000 ft. Spool
TFB047	0.047	1.19	± 0.002	± 0.05	1,000 ft. Spool
TFB050	0.050	1.27	± 0.002	± 0.05	1,000 ft. Spool
TFB055	0.055	1.40	± 0.003	± 0.08	1,000 ft. Spool
TFB060	0.060	1.52	± 0.003	± 0.08	1,000 ft. Spool
TFB062	0.062	1.57	± 0.003	± 0.08	1,000 ft. Spool
TFB070	0.070	1.78	± 0.003	± 0.08	1,000 ft. Spool
TFB072	0.072	1.83	± 0.003	± 0.08	1,000 ft. Spool
TFB078	0.078	1.98	± 0.004	± 0.10	500 ft. Spool
TFB080	0.080	2.03	± 0.004	± 0.10	500 ft. Spool
TFB084	0.084	2.13	± 0.004	± 0.10	500 ft. Spool
TFB090	0.090	2.29	± 0.004	± 0.10	500 ft. Spool
TFB094	0.094	2.39	± 0.004	± 0.10	500 ft. Spool
TFB100	0.100	2.54	± 0.004	± 0.10	500 ft. Spool
TFB109	0.109	2.77	± 0.004	± 0.10	500 ft. Spool
TFB115	0.115	2.92	± 0.004	± 0.10	500 ft. Spool
TFB125	0.125	3.18	± 0.004	± 0.10	Random Length
TFB150	0.150	3.81	± 0.004	± 0.10	Random Length
TFB188	0.188	4.78	± 0.004	± 0.10	Random Length

Notes

- Working Temperature: -100°F to 500°F (-75°C to 260°C)
- Package quantities are not continuous

Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Order Information

Example: TFB028-NT

TFB028-NT – **PTFE Beading**

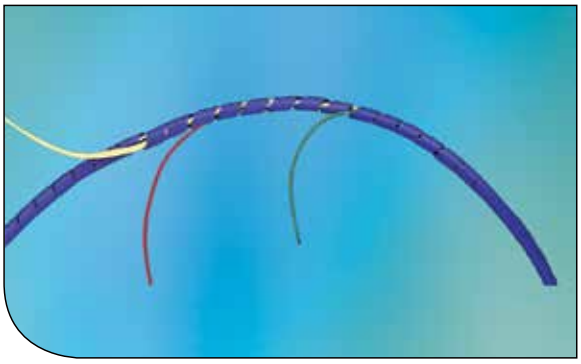
TFB**028**-NT – **Beading O.D.** in inches **(.028")**

TFB028-**NT** – **Natural**

TFB028-N**T** – **Bulk Tubing**

PTFE Spiral Cut Cable Wrap

Series: TSWTF



Features

- Provides harnessing for wires and cable while allowing leads at various points
- Exceptional heat resistance
- Self extinguishing
- Flexible
- Superior dielectric strength

Certifications

- A-A-59602
- AMS 3653E
- ASTM D3295
- VW1, UL-83 (natural)

Applications/Markets

- Cable harnessing
- Wiring closets
- Aerospace
- Automotive

Notes

- Available in left- or right-hand cut. Please specify with proper suffix at end of part number (i.e. TSWTF-18-NT-R)
- Working Temperature: 500°F (260°C)
- 100 ft. is the minimum item quantity sold
- Stock packaging for sizes 1/8" to 1/2" is 100- and 500-ft. non-continuous spools and, for sizes greater than 1/2", 100-ft. non-continuous spools
- Custom packaging, sizes and colors are available upon request
- Spiral cut cable wrap is also quoted in FEP upon request
- Package quantities are not continuous
- Colors available as custom run, see color code table

Order Information

Example: TSWTF-3/8-5T

TSWTF-3/8-5T – **Spiral Wrap**

TSW**TF**-3/8-5T – **Material (PTFE)**

TSWTF-**3/8**-5T – **O.D.** in inches **(.375")**

TSWTF-3/8-**5**T – **Green**

TSWTF-3/8-5**T** – **Bulk Tubing**

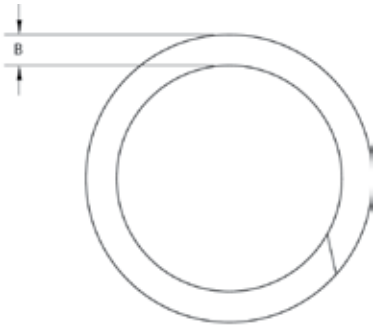
Colors

- ○ Natural, Translucent
- Colors available as custom run, see color code table

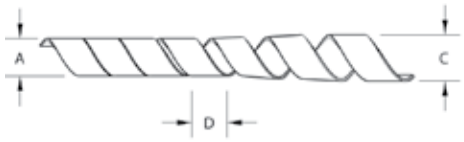
Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

PTFE Spiral Wrap

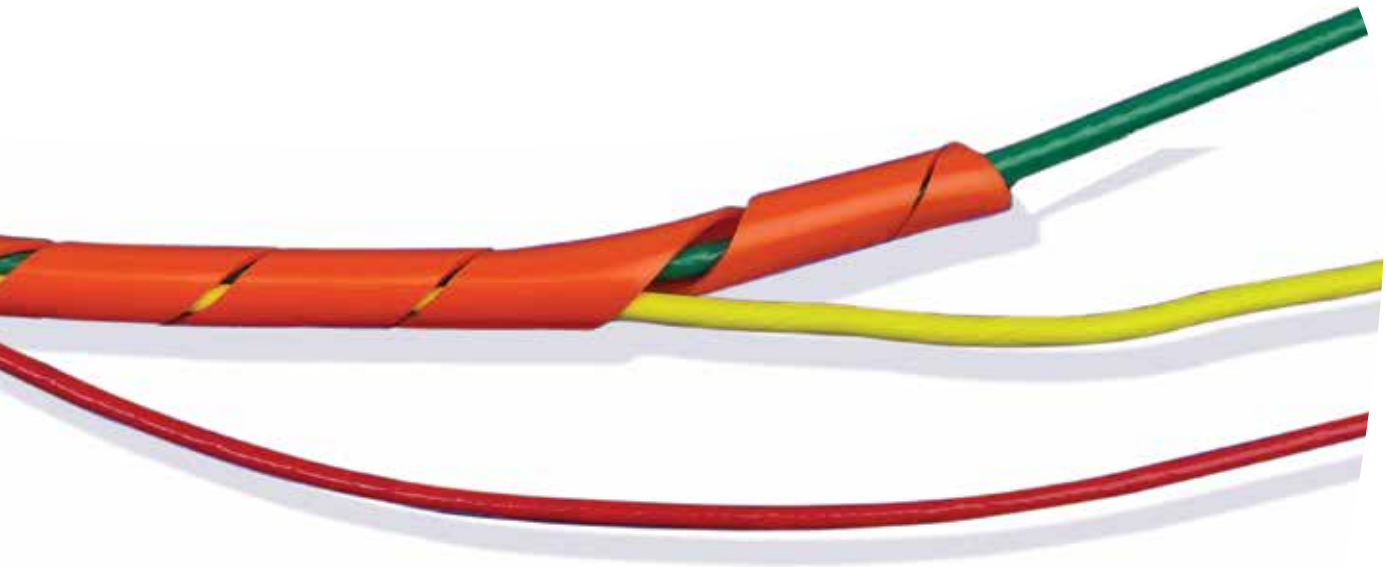
Part Number	O.D. "A"		tolerance O.D.		Wall "B"		tolerance Wall		Pitch "D"		tolerance Pitch		Max Bundle O.D. "C"	
#														
	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
TSWTF-1/8-NT	0.125	3.18	± 0.005	0.127	0.020	0.508	± 0.008	0.203	0.212	5.38	± 0.015	0.381	1/2	12.70
TSWTF-3/16-NT	0.188	4.78	± 0.005	0.127	0.030	0.762	± 0.008	0.203	0.312	7.92	± 0.015	0.381	1	25.40
TSWTF-1/4-NT	0.250	6.35	± 0.005	0.127	0.030	0.762	± 0.008	0.203	0.375	9.52	± 0.015	0.381	2	50.80
TSWTF-3/8-NT	0.375	9.52	± 0.005	0.127	0.030	0.762	± 0.008	0.203	0.437	11.10	± 0.015	0.381	2-1/2	63.50
TSWTF-1/2-NT	0.500	12.70	± 0.005	0.127	0.030	0.762	± 0.008	0.203	0.562	14.27	± 0.015	0.381	3	76.20
TSWTF-3/4-NT	0.750	19.05	± 0.005	0.127	0.040	1.02	± 0.008	0.203	0.875	22.22	± 0.015	0.381	4	101.60
TSWTF-1.00-NT	1	25.40	± 0.005	0.127	0.040	1.02	± 0.008	0.203	1	25.40	± 0.015	0.381	6	152.40



TOP SECTION CUT



DEPICTS RIGHT HAND CUT



WARNING

PTFE Heat ShrinkableTubing

Series 2:1 Fractional: HS2TFS, HS2TFT, HS2TFL, HS2TFI

Applications/Markets

- Electrical Insulation
- Protective Cover
- Electronic Harness
- Laboratory

Order Information

Example: HS2TFI7/8-NT

HS2TFI7/8-NT – **Heat Shrink**
HS2TFI7/8-NT – **Shrink Ratio (2:1)**
HS2TFI7/8-NT – **PTFE**
HS2TFI7/8-NT – **Wall Type (Industrial Wall)**
HS2TFI7/8-NT – **Heat Shrink Size** in inches **(7/8")**
HS2TFI7/8-NT – **Natural**
HS2TFI7/8-NT – **Bulk Tubing**

Notes

- Working Temperature: -100°F to 500°F (-75°C to 260°C)
- Shrink Temperature: 662°F (350°C) for 10 minutes per AMS-DTL-23053/12A
- *Dielectric Strength: ≥ 1,400 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- PTFE Fractional Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

Features

- Virgin Polytetrafluoroethylene resin
- 2:1 Shrink Ratio
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting

Certifications

- ASTM D2902 Type I
- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant
- **Light Wall** (HS2TFL) – AMS-DTL-23053/12A Class 4
- **Thin Wall** (HS2TFT) – AMS-DTL-23053/12A Class 3, AMS 3585
- **Standard Wall** (HS2TFS) – AMS-DTL-23053/12A Class 2, AMS 3586
- **Heavy Wall** (HS2TFH) – AMS-DTL-23053/12A Class 1 (Custom Order only)

Colors

- ○ Natural, Opaque to translucent
- Colors available as custom run, see color code table

When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC

ie HS2TFI7/8-2TC ie HS2TFI7/8-0CC48.000

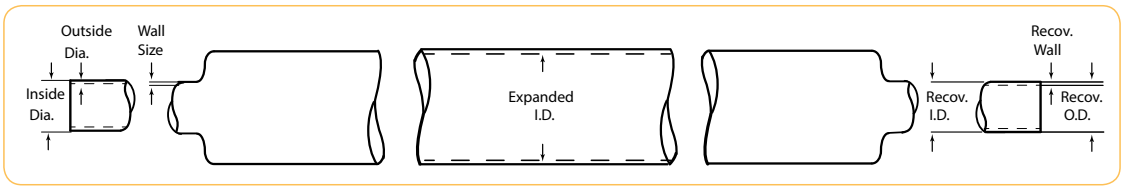
Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

HS2TFS & HS2TFT PTFE Fractional Heat Shrink Tubing (2:1) SW & TW

Order Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Standard Wall				Thin Wall			
					Mil Spec*	Part Number	Nominal Recovered Wall		Mil Spec*	Part Number	Nominal Recovered Wall	
inch	inch	mm	inch	mm			inch	mm			inch	mm
1/8	0.215	05.5	0.130	3.3	23053/12A-215	HS2TFS1/8	0.020 ± 0.004	0.51 ± 0.10	23053/12A-319	HS2TFT1/8	0.015 ± 0.003	0.38 ± 0.08
1/4	0.410	10.4	0.260	6.6	23053/12A-222	HS2TFS1/4	0.020 ± 0.004	0.51 ± 0.10	23053/12A-326	HS2TFT1/4	0.015 ± 0.004	0.38 ± 0.10
5/16	0.470	11.9	0.329	8.4	23053/12A-225	HS2TFS5/16	0.020 ± 0.004	0.51 ± 0.10	23053/12A-329	HS2TFT5/16	0.015 ± 0.004	0.38 ± 0.10
3/8	0.560	14.2	0.399	10.1	23053/12A-228	HS2TFS3/8	0.025 ± 0.006	0.64 ± 0.15	-	HS2TF 3/8	0.015 ± 0.004	0.38 ± 0.10
7/16	0.655	16.6	0.462	11.7	23053/12A-229	HS2TFS7/16	0.025 ± 0.006	0.64 ± 0.15	-	HS2TFT7/16	0.018 ± 0.004	0.46 ± 0.10
1/2	0.750	19.1	0.524	13.3	23053/12A-230	HS2TFS1/2	0.025 ± 0.006	0.64 ± 0.15	-	HS2TFT1/2	0.018 ± 0.004	0.46 ± 0.10
5/8	0.930	23.6	0.655	16.6	23053/12A-231	HS2TFS5/8	0.030 ± 0.006	0.76 ± 0.15	-	HS2TF 5/8	0.020 ± 0.004	0.51 ± 0.10
3/4	1.125	28.6	0.786	20.0	23053/12A-232	HS2TFS3/4	0.035 ± 0.008	0.89 ± 0.20	-	HS2TFT3/4	0.025 ± 0.004	0.64 ± 0.10
7/8	1.310	33.2	0.911	23.1	23053/12A-233	HS2TFS7/8	0.035 ± 0.008	0.89 ± 0.20	-	HS2TFT7/8	0.025 ± 0.004	0.64 ± 0.10
1	1.500	38.1	1.036	26.3	23053/12A-234	HS2TFS1.00	0.035 ± 0.008	0.89 ± 0.20	-	HS2TFT1.00	0.025 ± 0.004	0.64 ± 0.10

HS2TFL PTFE Fractional Heat Shrink Tubing (2:1) LW

Order Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Light Wall			
					Mil Spec*	Part Number	Nominal Recovered Wall	
inch	inch	mm	inch	mm			inch	mm
1/8	0.215	5.5	0.130	3.3	23053/12A-415	HS2TFL1/8	0.008 ± 0.002	0.20 ± 0.05
1/4	0.410	10.4	0.260	6.6	23053/12A-422	HS2TFL1/4	0.010 ± 0.003	0.25 ± 0.08
5/16	0.470	11.9	0.329	8.4	23053/12A-425	HS2TFL5/16	0.012 ± 0.003	0.31 ± 0.08



HS2TFI PTFE Fractional Heat Shrink Tubing (2:1), Ind. Heavy Wall

Part Number	Order Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	inch		inch	mm	inch	mm	inch	mm
HS2TFI1/8	1/8	23053/12A-101	0.166	4.2	0.130	3.3	0.030 ± 0.005	0.76 ± 0.13
HS2TFI3/16	3/16	23053/12A-102	0.250	6.4	0.193	4.9	0.030 ± 0.005	0.76 ± 0.13
HS2TFI1/4	1/4	23053/12A-103	0.333	8.4	0.257	6.5	0.030 ± 0.005	0.76 ± 0.13
HS2TFI5/16	5/16	23053/12A-104	0.415	10.5	0.320	8.1	0.030 ± 0.005	0.76 ± 0.13
HS2TFI3/8	3/8	23053/12A-105	0.498	12.6	0.383	9.7	0.030 ± 0.005	0.76 ± 0.13
HS2TFI7/16	7/16	23053/12A-106	0.580	14.7	0.448	11.4	0.030 ± 0.006	0.76 ± 0.15
HS2TFI1/2	1/2	23053/12A-107	0.666	16.9	0.510	13.0	0.030 ± 0.006	0.76 ± 0.15
HS2TFI9/16	9/16	23053/12A-108	0.748	19.0	0.572	14.5	0.030 ± 0.006	0.76 ± 0.15
HS2TFI5/8	5/8	23053/12A-109	0.830	21.1	0.637	16.2	0.030 ± 0.006	0.76 ± 0.15
HS2TFI11/16	11/16	23053/12A-110	0.915	23.2	0.700	17.8	0.032 ± 0.006	0.81 ± 0.15
HS2TFI3/4	3/4	23053/12A-111	1.000	25.4	0.764	19.4	0.040 ± 0.007	1.02 ± 0.18
HS2TFI7/8	7/8	23053/12A-112	1.170	29.7	0.891	22.6	0.045 ± 0.007	1.14 ± 0.18
HS2TFI1.00	1	23053/12A-113	1.330	33.8	1.020	25.9	0.050 ± 0.008	1.27 ± 0.20

WARNING

PTFE Heat ShrinkableTubing

Series 2:1 AWG: HS2TFS, HS2TFT, HS2TFL

Applications/Markets

- Electrical Insulation
- Protective Cover
- Electronic Harness
- Laboratory

Features

- Virgin Polytetrafluoroethylene resin
- 2:1 Shrink Ratio
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting

Certifications

- ASTM D2902 Type I
- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant
- **Light Wall** (HS2TFL) – AMS-DTL-23053/12A Class 4
- **Thin Wall** (HS2TFT) – AMS-DTL-23053/12A Class 3, AMS 3585
- **Standard Wall** (HS2TFS) – AMS-DTL-23053/12A Class 2, AMS 3586
- **Heavy Wall** (HS2TFH) – AMS-DTL-23053/12A Class 1 (Custom Order only)

Order Information

Example: HS2TFS15-4TC-500

HS2TFS15-4TC-500 – **Heat Shrink**
HS**2**TFS15-4TC-500 – **Shrink Ratio (2:1)**
HS2**TF**S15-4TC-500 – **PTFE**
HS2TF**S**15-4TC-500 – **Wall Type (Standard Wall)**
HS2TFS**15**-4TC-500 – **Heat Shrink Size** in AWG **(AWG15)**
HS2TFS15-**4**TC-500 – **Yellow**
HS2TFS15-4**T**C-500 – **Bulk Tubing**
HS2TFS15-4T**C**-500 – **Solid Color**
HS2TFS15-4TC-**500** – **Package Quantity** in feet **(500')**

Notes

- Working Temperature: -100°F to 500°F (-75°C to 260°C)
- Shrink Temperature: 662°F (350°C) for 10 minutes per AMS-DTL-23053/12A
- *Dielectric Strength: ≥ 1,400 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- PTFE AWG Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

Colors

- ○ Natural, Opaque to translucent
- Colors available as custom run, see color code table

When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC

ie HS2TFS15-2TC ie HS2TFS15-0CC48.000

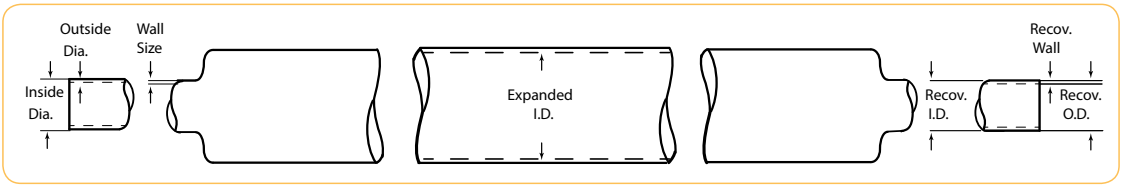
Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

HS2TFS Standard Wall (2:1)

Part Number	Order Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	AWG		inch	mm	inch	mm	inch	mm
HS2TFS24	24	23053/12A-201	0.050	1.27	0.027	0.69	0.012 ± 0.002	0.31 ± 0.05
HS2TFS22	22	23053/12A-202	0.055	1.40	0.032	0.81	0.012 ± 0.002	0.31 ± 0.05
HS2TFS20	20	23053/12A-203	0.060	1.52	0.039	0.99	0.016 ± 0.003	0.41 ± 0.08
HS2TFS19	19	23053/12A-204	0.065	1.65	0.043	1.09	0.016 ± 0.003	0.41 ± 0.08
HS2TFS18	18	23053/12A-205	0.076	1.93	0.049	1.25	0.016 ± 0.003	0.41 ± 0.08
HS2TFS17	17	23053/12A-206	0.085	2.16	0.054	1.37	0.016 ± 0.003	0.41 ± 0.08
HS2TFS16	16	-	0.093	2.36	0.061	1.55	0.016 ± 0.003	0.41 ± 0.08
HS2TFS15	15	23053/12A-207	0.110	2.79	0.067	1.70	0.016 ± 0.003	0.41 ± 0.08
HS2TFS14	14	23053/12A-208	0.120	3.05	0.072	1.83	0.016 ± 0.003	0.41 ± 0.08
HS2TFS13	13	23053/12A-210	0.140	3.56	0.080	2.03	0.016 ± 0.003	0.41 ± 0.08
HS2TFS12	12	23053/12A-211	0.150	3.81	0.089	2.26	0.016 ± 0.003	0.41 ± 0.08
HS2TFS11	11	23053/12A-212	0.170	4.32	0.101	2.57	0.016 ± 0.003	0.41 ± 0.08
HS2TFS10	10	23053/12A-213	0.191	4.85	0.112	2.84	0.016 ± 0.003	0.41 ± 0.08
HS2TFS09	9	23053/12A-214	0.205	5.21	0.124	3.15	0.020 ± 0.004	0.51 ± 0.10
HS2TFS08	8	23053/12A-216	0.240	6.10	0.141	3.58	0.020 ± 0.004	0.51 ± 0.10
HS2TFS07	7	23053/12A-217	0.270	6.86	0.158	4.01	0.020 ± 0.004	0.51 ± 0.10
HS2TFS06	6	23053/12A-218	0.302	7.67	0.178	4.52	0.020 ± 0.004	0.51 ± 0.10
HS2TFS05	5	23053/12A-219	0.320	8.13	0.198	5.03	0.020 ± 0.004	0.51 ± 0.10
HS2TFS04	4	23053/12A-220	0.370	9.40	0.224	5.69	0.020 ± 0.004	0.51 ± 0.10
HS2TFS03	3	23053/12A-221	0.390	9.91	0.249	6.32	0.020 ± 0.004	0.51 ± 0.10
HS2TFS02	2	23053/12A-223	0.430	10.9	0.278	7.06	0.020 ± 0.004	0.51 ± 0.10
HS2TFS01	1	23053/12A-224	0.450	11.4	0.311	7.90	0.020 ± 0.004	0.51 ± 0.10
HS2TFS00	0	23053/12A-226	0.470	11.9	0.347	8.81	0.020 ± 0.004	0.51 ± 0.10

Certifications

- AMS-DTL-23053/12A, Class 3
- AMS 3585
- ASTM D2902 Type I
- FDA Compliant
- USP Class VI Compliant



WARNING

PTFE Heat ShrinkableTubing

Series 2:1 AWG: HS2TFS, HS2TFT, HS2TFL (cont.)

HS2TFT Thin Wall (2:1)

Part Number	Order Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	AWG		inch	mm	inch	mm	inch	mm
HS2TFT30	30	23053/12A-301	0.034	0.86	0.015	0.38	0.009 ± 0.002	0.23 ± 0.05
HS2TFT28	28	23053/12A-302	0.038	0.97	0.018	0.46	0.009 ± 0.002	0.23 ± 0.05
HS2TFT26	26	23053/12A-303	0.046	1.16	0.022	0.56	0.010 ± 0.003	0.25 ± 0.08
HS2TFT24	24	23053/12A-304	0.050	1.27	0.027	0.69	0.010 ± 0.002	0.25 ± 0.08
HS2TFT22	22	23053/12A-305	0.055	1.40	0.032	0.81	0.012 ± 0.003	0.31 ± 0.08
HS2TFT20	20	23053/12A-306	0.060	1.52	0.039	0.99	0.012 ± 0.003	0.31 ± 0.08
HS2TFT19	19	23053/12A-307	0.065	1.65	0.043	1.09	0.012 ± 0.003	0.31 ± 0.08
HS2TFT18	18	23053/12A-308	0.076	1.93	0.049	1.25	0.012 ± 0.003	0.31 ± 0.08
HS2TFT17	17	23053/12A-309	0.085	2.16	0.054	1.37	0.012 ± 0.003	0.31 ± 0.08
HS2TFT16	16	23053/12A-310	0.093	2.36	0.061	1.55	0.012 ± 0.003	0.31 ± 0.08
HS2TFT15	15	23053/12A-311	0.110	2.79	0.067	1.70	0.012 ± 0.003	0.31 ± 0.08
HS2TFT14	14	23053/12A-312	0.120	3.05	0.072	1.83	0.012 ± 0.003	0.31 ± 0.08
HS2TFT13	13	23053/12A-313	0.140	3.56	0.080	2.03	0.012 ± 0.003	0.31 ± 0.08
HS2TFT12	12	23053/12A-314	0.150	3.81	0.089	2.26	0.012 ± 0.003	0.31 ± 0.08
HS2TFT11	11	23053/12A-316	0.170	4.32	0.101	2.57	0.012 ± 0.003	0.31 ± 0.08
HS2TFT10	10	23053/12A-317	0.191	4.85	0.112	2.84	0.012 ± 0.003	0.31 ± 0.08
HS2TFT09	9	23053/12A-318	0.205	5.21	0.124	3.15	0.015 ± 0.004	0.38 ± 0.10
HS2TFT08	8	23053/12A-320	0.240	6.10	0.141	3.58	0.015 ± 0.004	0.38 ± 0.10
HS2TFT07	7	23053/12A-321	0.270	6.86	0.158	4.01	0.015 ± 0.004	0.38 ± 0.10
HS2TFT06	6	23053/12A-322	0.302	7.67	0.178	4.52	0.015 ± 0.004	0.38 ± 0.10
HS2TFT05	5	23053/12A-323	0.320	8.13	0.198	5.03	0.015 ± 0.004	0.38 ± 0.10
HS2TFT04	4	23053/12A-324	0.370	9.40	0.224	5.69	0.015 ± 0.004	0.38 ± 0.10
HS2TFT03	3	23053/12A-325	0.390	9.91	0.249	6.32	0.015 ± 0.004	0.38 ± 0.10
HS2TFT02	2	23053/12A-327	0.430	10.9	0.278	7.06	0.015 ± 0.004	0.38 ± 0.10
HS2TFT01	1	23053/12A-328	0.450	11.4	0.311	7.90	0.015 ± 0.004	0.38 ± 0.10
HS2TFT00	0	23053/12A-330	0.470	11.9	0.347	8.81	0.015 ± 0.004	0.38 ± 0.10

*Dielectric Strength: ≥ 1,400 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)

Certifications

- AMS-DTL-23053/12A, Class 3
- AMS 3585
- ASTM D2902 Type I
- FDA Compliant
- USP Class VI Compliant

WARNING

HS2TFL Light Wall (2:1)

Part Number	Order Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	AWG		inch	mm	inch	mm	inch	mm
HS2TFL24	24	23053/12A-404	0.050	1.27	0.025	0.64	0.006 ± 0.002	0.15 ± 0.05
HS2TFL22	22	23053/12A-405	0.055	1.40	0.031	0.79	0.006 ± 0.002	0.15 ± 0.05
HS2TFL20	20	23053/12A-406	0.060	1.52	0.038	0.97	0.006 ± 0.002	0.15 ± 0.05
HS2TFL19	19	23053/12A-407	0.065	1.65	0.043	1.09	0.006 ± 0.002	0.15 ± 0.05
HS2TFL18	18	23053/12A-408	0.076	1.93	0.046	1.17	0.006 ± 0.002	0.15 ± 0.05
HS2TFL17	17	23053/12A-409	0.085	2.16	0.054	1.37	0.006 ± 0.002	0.15 ± 0.05
HS2TFL16	16	23053/12A-410	0.093	2.36	0.057	1.45	0.006 ± 0.002	0.15 ± 0.05
HS2TFL15	15	23053/12A-411	0.110	2.79	0.063	1.60	0.006 ± 0.002	0.15 ± 0.05
HS2TFL14	14	23053/12A-412	0.120	3.05	0.072	1.83	0.008 ± 0.002	0.20 ± 0.05
HS2TFL13	13	23053/12A-413	0.140	3.56	0.080	2.03	0.008 ± 0.002	0.20 ± 0.05
HS2TFL12	12	23053/12A-414	0.150	3.81	0.089	2.26	0.008 ± 0.002	0.20 ± 0.05
HS2TFL11	11	23053/12A-416	0.170	4.32	0.099	2.51	0.008 ± 0.002	0.20 ± 0.05
HS2TFL10	10	23053/12A-417	0.191	4.85	0.110	2.79	0.008 ± 0.002	0.20 ± 0.05
HS2TFL09	9	23053/12A-418	0.205	5.21	0.122	3.10	0.008 ± 0.002	0.20 ± 0.05
HS2TFL08	8	23053/12A-420	0.240	6.10	0.139	3.53	0.008 ± 0.002	0.20 ± 0.05
HS2TFL07	7	23053/12A-421	0.270	6.86	0.154	3.91	0.008 ± 0.002	0.20 ± 0.05
HS2TFL06	6	23053/12A-422	0.302	7.67	0.172	4.37	0.010 ± 0.003	0.25 ± 0.08
HS2TFL05	5	23053/12A-423	0.320	8.13	0.192	4.88	0.010 ± 0.003	0.25 ± 0.08
HS2TFL04	4	23053/12A-424	0.370	9.40	0.214	5.44	0.010 ± 0.003	0.25 ± 0.08
HS2TFL03	3	23053/12A-425	0.390	9.91	0.241	6.12	0.010 ± 0.003	0.25 ± 0.08
HS2TFL02	2	23053/12A-427	0.430	10.9	0.270	6.88	0.010 ± 0.003	0.25 ± 0.08
HS2TFL01	1	23053/12A-428	0.450	11.4	0.301	7.65	0.010 ± 0.003	0.25 ± 0.08
HS2TFL00	0	23053/12A-430	0.470	11.9	0.347	8.81	0.012 ± 0.003	0.31 ± 0.08

*Dielectric Strength: ≥ 1,400 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)

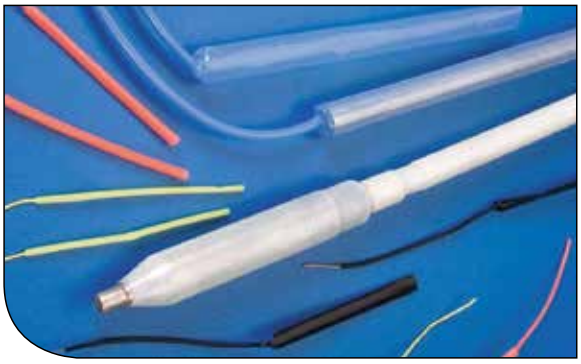
Certifications

- AMS-DTL-23053/12A, Class 4
- ASTM D2902 Type I
- FDA Compliant
- USP Class VI Compliant

WARNING

PTFE Heat ShrinkableTubing

Series 4:1 HS4TFI



Features

- Virgin Polytetrafluoroethylene resin
- 4:1 Shrink Ratio
- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting

Applications/Markets

- Electrical Insulation
- Protective Cover
- Rollers
- Bulb Protection

Certifications

- AMS-DTL-23053/12A, Class 5
- ASTM D2902 Type I
- AMS 3584A
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Order Information

Example: HS4TFI5/8-NT

HS4TFI5/8-NT – **Heat Shrink**
HS**4**TFI5/8-NT – **Shrink Ratio (4:1)**
HS4**TF**I5/8-NT – **PTFE**
HS4TFI5/8-NT – **Wall Type (Industrial Wall)**
HS4TFI**5/8**-NT – **Heat Shrink Size** in inches **(5/8")**
HS4TFI5/8-**NT** – **Natural**
HS4TFI5/8-N**T** – **Bulk Tubing**

Colors

- ○ Natural, Opaque to translucent
- Colors available as custom run, see color code table

When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC

ie HS4TFI5/8-2TC ie HS4TFI5/8-0CC48.0000

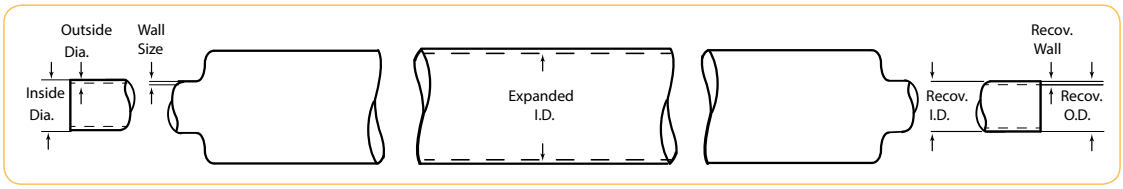
Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 500°F (260°C)
- Shrink Temperature: 662°F (350°C) for 10 minutes per AMS-DTL-23053/12A
- For full recovery, expanded diameter should be 50% larger than the diameter of the object to be recovered over
- *Dielectric Strength: ≥ 1,400 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- PTFE Fractional Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

HS4TFI PTFE Industrial Wall Heat Shrink Tubing (4:1)

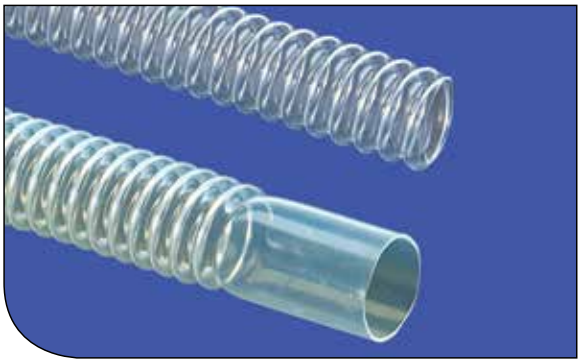
Part Number	Order Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	inch		inch	mm	inch	mm	inch	mm
HS4TFI5/64	5/64	23053/12A-501	0.078	1.98	0.025	0.64	0.009 ± 0.002	0.23 ± 0.05
HS4TFI1/8	1/8	23053/12A-502	0.125	3.18	0.037	0.94	0.012 ± 0.002	0.31 ± 0.05
HS4TFI3/16	3/16	23053/12A-503	0.187	4.75	0.050	1.27	0.012 ± 0.002	0.31 ± 0.05
HS4TFI1/4	1/4	23053/12A-504	0.250	6.35	0.063	1.60	0.012 ± 0.002	0.31 ± 0.05
HS4TFI5/16	5/16	23053/12A-505	0.312	7.92	0.078	1.98	0.012 ± 0.002	0.31 ± 0.05
HS4TFI3/8	3/8	23053/12A-506	0.375	9.52	0.096	2.44	0.012 ± 0.002	0.31 ± 0.05
HS4TFI7/16	7/16	23053/12A-507	0.438	11.1	0.112	2.84	0.012 ± 0.002	0.31 ± 0.05
HS4TFI1/2	1/2	23053/12A-508	0.500	12.7	0.144	3.66	0.015 ± 0.004	0.38 ± 0.10
HS4TFI5/8	5/8	23053/12A-510	0.625	15.9	0.178	4.52	0.015 ± 0.004	0.38 ± 0.10
HS4TFI3/4	3/4	23053/12A-512	0.750	19.1	0.224	5.70	0.015 ± 0.004	0.38 ± 0.10
HS4TFI7/8	7/8	23053/12A-513	0.875	22.2	0.244	6.20	0.015 ± 0.004	0.38 ± 0.10
HS4TFI1.00	1	23053/12A-514	1.000	25.4	0.278	7.06	0.015 ± 0.004	0.38 ± 0.10
HS4TFI1.25	1-1/4	23053/12A-515	1.250	31.8	0.347	8.81	0.015 ± 0.004	0.38 ± 0.10



WARNING

PTFE Convoluted

Series Convo-Tex®



Features

- Chemically inert
- Low coefficient of friction
- Very flexible
- Self extinguishing
- Non-wetting

Certifications

- AMS 3653E
- VW1, UL-83 (natural)
- FDA Compliant
- USP Class VI Compliant

Applications/Markets

- Fluid Transport
- Wire Harness
- Protection/Cable Core
- Robotics

Order Information

Example: CV01-1/8-NT

CV01-1/8-NT – **Convoluted**

CV**01-**1/8-NT – **PTFE**

CV01-**1/8**-NT – **Size to Order (1/8")**

CV01-1/8-**NT** – **Color (N=Natural)**

CV01-1/8-N**T**– **"T" is bulk (**for cuffed tubing, remove "T" and add length, ie. CV01-1/8-N1200 = 1" Convo, natural, cut 12" long)

Colors

- ○ Natural, Opaque to Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: -100°F to 500°F (-75°C to 260°C)
- Standard cuffs for Convo-Tex are sized on the Inside Diameter
- Wire wrap reinforcement can be added for increased pressure applications or when a tighter bend radius is needed
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

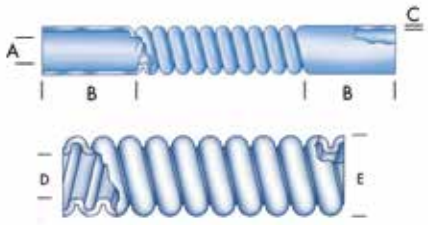
PTFE Convo-Tex® Convoluted

(Standard tubing is natural)

Part Number	Size To Order	Standard Cuff I.D. "A"		Standard Cuff Length "B"		Wall Thickness "C"		Min. Inside Diameter "D"		Max. Inside Diameter "D"		Max. Outside Diameter "E"		**Min. Bend Radius	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CV01-1/8-NT	CONV-2	1/8	3.18	3/4	19.1	0.010	0.25	0.130	3.3	0.140	3.6	0.235	5.9	3/8	9.5
CV01-1/4-NT	CONV-4	1/4	6.35	3/4	19.1	0.015	0.38	0.181	4.6	0.188	4.8	0.320	8.1	1/2	12.7
CV01-5/16-NT	CONV-5	5/16	7.94	1	25.4	0.020	0.51	0.273	6.9	0.281	7.1	0.414	10.5	3/4	19.1
CV01-3/8-NT	CONV-6	3/8	9.53	1	25.4	0.020	0.51	0.303	7.7	0.312	7.9	0.450	11.4	1-3/4	44.4
CV01-1/2-NT	CONV-8	1/2	12.7	1	25.4	0.020	0.51	0.425	10.8	0.437	11.1	0.590	15.0	1-1/4	31.2
CV01-5/8-NT	CONV-10	5/8	15.9	1-1/4	31.8	0.025	0.64	0.485	12.3	0.500	12.7	0.660	16.8	1-1/2	38.1
CV01-3/4-NT	CONV-12	3/4	19.1	1-1/2	38.1	0.023	0.58	0.608	15.4	0.625	15.9	0.780	19.8	1-3/4	44.4
CV01-1.00-NT	CONV-16	1	25.4	2	50.8	0.030	0.76	0.849	21.6	0.875	22.2	1.100	27.9	2-1/4	57.2
CV01-1.25-NT	CONV-20	1-1/4	31.8	2-1/2	63.5	0.035	0.89	1.150	29.2	1.190	30.2	1.560	39.6	2-3/4	69.9
CV01-1.50-NT	CONV-24	1-1/2	38.1	2-1/2	63.5	0.040	1.02	1.410	35.8	1.490	37.8	1.910	48.5	3	76.2
CV01-2.00-NT	CONV-32	2	50.8	2-1/2	63.5	0.043	1.09	1.955	49.7	1.985	50.4	2.450	62.2	4-1/4	107.9
CV01-2.50-NT	CONV-40	2-1/2	63.5	2-1/2	63.5	0.062	1.57	2.460	62.5	2.540	64.5	3.210	81.6	5	127
CV01-3.00-NT	CONV-48	3	76.2	2-1/2	63.5	0.070	1.78	2.940	74.7	3.060	77.7	3.750	95.3	7	177.8
CV01-4.00-NT	CONV-64	4	101.6	2-1/2	63.5	0.070	1.78	3.940	100.1	4.060	103.1	4.750	120.6	9	228.6

** Minimum 36" length.

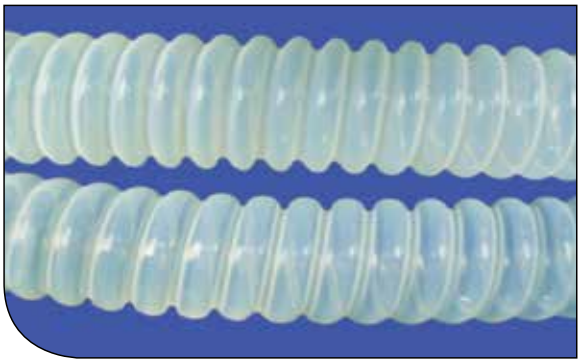
Standard Cuffs for **Convo-Tex®** are sized on the **I.D.**



WARNING

PTFE Convoluted

Series Low Profile and Heavy Wall



Applications/Markets

- Fluid Handling
- Harnesses
- Lab Equipment
- Robotics

Features

- Chemically inert
- Low coefficient of friction
- Very flexible
- Self extinguishing
- Non-wetting

Low Profile

- Larger inside diameter
- Increased Flow

Heavy Wall

- Reinforces the strength of the tube allowing for braiding or covering, flanging or flaring
- Handles higher vacuum

Certifications

- AMS 3653E
- VW1, UL-83
- FDA Compliant
- USP Class VI Compliant

Order Information

Example: CVH01-1/8-NT

CVH01-1/8-NT – **CVH - Heavywall Convoluted**
– **CVL Low Profile Convoluted**
CVH**01**-1/8-NT – **PTFE**
CVH01-**1/8**-NT – **Size to Order (1/8")**
CVH01-1/8-**NT** – **Color (N=Natural)**
CVH01-1/8-NT– **"T" is bulk** (for cuffed tubing, remove "T" and add length, ie. CVH01-1/8-N1200 = 1"Heavy Wall Convo, natural, cut 12" long)

Colors

- ○ Natural, Opaque to Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 500°F (260°C)
- Standard cuffs for Convo-Tex are sized on the Inside Diameter
- Wire wrap reinforcement can be added for increased pressure applications or when a tighter bend radius is needed
- Minimum quantities may apply
- Custom packaging, sizes, lengths, cuffs and colors are quoted upon request

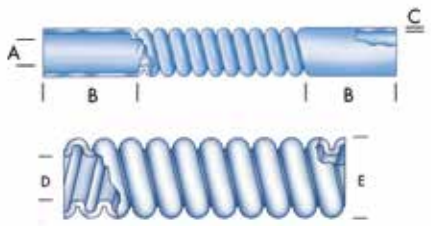
PTFE Low Profile Convoluted

(Standard tubing is natural)

Part Number	Size To Order	Min. Inside Diameter		Max. Inside Diameter		Max. Outside Diameter		Wall Thickness		**Min. Bend Radius	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CVL01-3/8-NT	3/8	0.394	10.0	0.406	10.3	0.560	14.2	0.023	0.58	1/2	13
CVL01-1/2-NT	1/2	0.490	12.5	0.510	13.0	0.700	17.8	0.025	0.64	3/4	19
CVL01-3/4-NT	3/4	0.740	18.8	0.760	19.3	0.980	24.9	0.035	0.89	1.88	48
CVL01-1.00-NT	1	0.990	25.1	1.010	25.7	1.260	32.0	0.035	0.89	2-1/4	57
CVL01-1.25-NT	1-1/4	1.210	30.7	1.250	31.8	1.539	39.1	0.035	0.89	3	76
CVL01-1.50-NT	1-1/2	1.520	38.6	1.540	39.1	1.870	47.5	0.044	1.12	3-1/2	89
CVL01-1.75-NT	1-3/4	1.690	42.9	1.750	44.5	2.100	53.3	0.040	1.02	4-1/4	108
CVL01-2.00-NT	2	2.010	51.1	2.030	51.6	2.370	60.2	0.043	1.09	4-3/4	121

** Minimum 36 length.

Standard Cuffs for **Low Profile** and **Heavy Wall** are sized on the **I.D.**



PTFE Heavy Wall Convoluted

(Standard tubing is natural)

Part Number	Size To Order	Min. Inside Diameter		Max. Inside Diameter		Max. Outside Diameter		Wall Thickness		**Min. Bend Radius	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
CVH01-1/4-NT	1/4	0.257	6.5	0.265	6.7	0.415	10.5	0.025	0.38	3/4	19
CVH01-3/8-NT	3/8	0.335	8.5	0.345	8.8	0.510	13.0	0.025	0.64	1	25
CVH01-1/2-NT	1/2	0.454	11.5	0.466	11.8	0.700	17.8	0.035	0.89	1-1/2	38
CVH01-3/4-NT	3/4	0.683	17.4	0.701	17.8	1.010	25.7	0.500	1.27	1.88	48
CVH01-1.00-NT	1	0.841	21.4	0.859	21.8	1.210	30.7	0.053	1.35	2-1/2	64
CVH01-1.25-NT	1-1/4	1.125	28.6	1.145	29.1	1.610	40.9	0.062	1.57	3.13	79
CVH01-1.50-NT	1-1/2	1.420	36.1	1.480	37.6	1.880	47.8	0.062	1.57	3-3/4	95
CVH01-1.75-NT	1-3/4	1.540	39.1	1.600	40.6	2.100	53.3	0.062	1.57	4-1/2	114
CVH01-2.00-NT	2	1.770	45.0	1.830	46.5	2.432	61.8	0.062	1.57	4-3/4	120
CVH01-2.50-NT	2-1/2	2.460	62.5	2.540	64.5	3.210	81.5	0.062	1.57	5	127
CVH01-3.00-NT	3	2.940	74.7	3.060	77.7	3.750	95.3	0.062	1.57	7	178
CVH01-4.00-NT	4	3.90	100	4.060	103	4.750	121	0.070	1.77	9	229

** Minimum 36 length.

WARNING

PTFE Convoluted

Series SAE AS81914/1 and SAE AS81914/2

Features

- Chemically inert
- Low coefficient of friction
- Very flexible
- Self extinguishing
- Non-wetting

Certifications

- AMS 3653E
- SAE AS81914/1
- SAE AS81914/2
- FDA Compliant

Applications/Markets

- Fluid Handling
- Harnesses
- Crush Resistant Cover
- Robotics

Order Information

Example: 81914/1-1010-0TC

81914/1-1010-0TC – **SAE AS81914 Convoluted**
81914/**1**-1010-0TC – **PTFE**
81914/1-**10**10-0TC – **Helical Convolutions**
81914/1-10**10**-0TC – **Size (10=1.000")**
81914/1-1010-**0**TC – **Color (0=Black)**
81914/1-1010-0**TC** – **"T" is bulk -** (for cuffed tubing, remove "T" and add length, ie. 81914/1-1010-01200 = 187" Convo, black, cut 12" long

Notes

- Working Temperature: 500°F (260°C)
- Tubing is provided in black without cuffs direct from inventory
- Stock packaging is random coils
- Also availabe in close convolution 81914/2
- Minimum quantities may apply
- Custom packaging, sizes, lengths, cuffs and colors are quoted upon request

Colors

- ● Black
- Colors available as custom run, see color code table

When ordering convoluted tubing in colors, the "N" designation for natural should be replaced by the correct color designator;

ie 81914/1-101-0T (black bulk tubing)
ie 81914/1-101-01200 (black tubing - 12 inches long)

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

PTFE Convoluted Tubing (SAE AS81914/1)

(Standard tubing is black)

Part Number	MIL Spec*	Maximum Inside Diameter		Minimum Inside Diameter		Maximum Outside Diameter		Maximum Wall Thickness		Minimum Bend Radius		Pitch	Weight	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	±1	lb./100 ft.	kg./100 mtr.
81914/1-1001-0TC	-1	0.188	4.78	0.181	4.6	0.320	8.13	0.023	0.584	1/2	13	8	2	2.98
81914/1-1002-0TC	-2	0.281	7.14	0.273	6.93	0.414	10.5	0.027	0.686	3/4	19	7.5	2.9	4.31
81914/1-1003-0TC	-3	0.312	7.93	0.303	7.7	0.450	11.4	0.027	0.686	7/8	22	7.5	3.6	5.36
81914/1-1004-0TC	-4	0.375	9.53	0.364	9.25	0.530	13.5	0.029	0.737	1	25	7	4.2	6.25
81914/1-1005-0TC	-5	0.437	11.1	0.425	10.8	0.590	15.0	0.029	0.737	1-1/4	32	7	4.9	7.29
81914/1-1006-0TC	-6	0.500	12.7	0.485	12.3	0.660	16.8	0.029	0.737	1-1/2	38	7	5.2	7.74
81914/1-1007-0TC	-7	0.625	15.9	0.608	15.4	0.780	19.9	0.035	0.889	1-3/4	44	7	6.9	10.3
81914/1-1008-0TC	-8	0.750	19.1	0.730	18.5	0.975	24.8	0.035	0.889	1.88	48	6	10.4	15.5
81914/1-1009-0TC	-9	0.875	22.2	0.850	21.6	1.100	27.9	0.035	0.889	2-1/4	57	6	11.3	16.8
81914/1-1010-0TC	-10	1.000	25.4	0.975	24.8	1.260	32.0	0.035	0.889	2-1/2	64	4.5	12.6	18.8
81914/1-1011-0TC	-11	1.125	28.6	1.100	27.9	1.390	35.3	0.035	0.889	2-3/4	70	4.5	13.8	20.5
81914/1-1012-0TC	-12	1.250	31.8	1.210	30.7	1.539	39.1	0.035	0.889	3	76	4	15.5	23.1
81914/1-1013-0TC	-13	1.500	38.1	1.440	36.6	1.810	46.0	0.040	1.020	3.75	95	4	21.7	32.3
81914/1-1014-0TC	-14	1.750	44.5	1.690	42.9	2.100	53.3	0.045	1.140	4.25	108	4	25.3	37.6
81914/1-1015-0TC	-15	2.000	50.8	1.940	49.3	2.350	59.7	0.045	1.140	4.75	121	4	29	43.2

*PTFE convoluted tubing is provided in BLACK without cuffs direct from the factory. Black part numbers are designated with “0T” and Natural part numbers are designated with "NT" after the Mil Spec number (ie 81914/1-1014-0T).

Standard Cuffs for **81914/1** are sized on the **I.D.**

Without Cuffs

With Cuffs

WARNING

Notes

PVDF
PRODUCTS

PVDF Smoothbore

Fractional Flex™ Industrial Wall
Fractional Flex™ Heavy Wall

Fractional SuperFlex™ Industrial Wall
Fractional SuperFlex™ Heavy Wall

PVDF (Polyvinylidene Fluoride)
Working Temperature: 265°F (130°C)
Color: Varies

- Very good chemical resistance
- Excellent resistance to creep and fatigue
- UV Resistant
- Weldable
- Exceptional corrosion resistance for chlorine, fluorine or bromine environments

DISCONTINUED

PVDF Tubing Polyvinylidene Fluoride

Series PVDF Flex™: 110, Series PVDF Super-Flex™: 111

Features

- Low extractable levels
- High mechanical strength
- Good chemical resistance
- High abrasion resistance
- Exceptional thermal stability
- Low permeability
- Self extinguishing
- Weather resistant

Certifications

- ASTM D3222
- FDA Compliant
- RoHS
- VW-1, UL-83

Applications/Markets

- Applications with long cycle life
- Gas
- Food
- Thermal cycling
- Outdoor/extreme conditions
- Water systems
- Ground water monitoring
- Fluid handling

Order Information

Example: 110-0312062-NT-100

110-0312062-NT-100 – **PVDF Flex**
110-**0312**062-NT-100 – **Tube O.D.** in inches **(5/16")**
110-0312**062**-NT-100 – **Tube Wall Thickness** in inches **(.062")**
110-0312062-**NT**-100 – **Natural**
110-0312062-N**T**-100 – **Bulk Tubing**
110-0312062-NT-**100** – **Package Quantity** in feet **(100')**

Notes

- Working Temperature: -80°F to 265°F (-62°C to 130°C)
- Vacuum rating is 28 inHg at 73°F
- Working pressure calculated using a Design Factor of 4 at 73°F (23°C) (Actual performance may vary with different media and working conditions) Working pressure is reduced with rising temperature. This effect is more pronounced with 111 SuperFlex®. See example below.
- Custom packaging and sizes are quoted upon request

Fittings

Fittings available for sizes 1/8" up to 1"

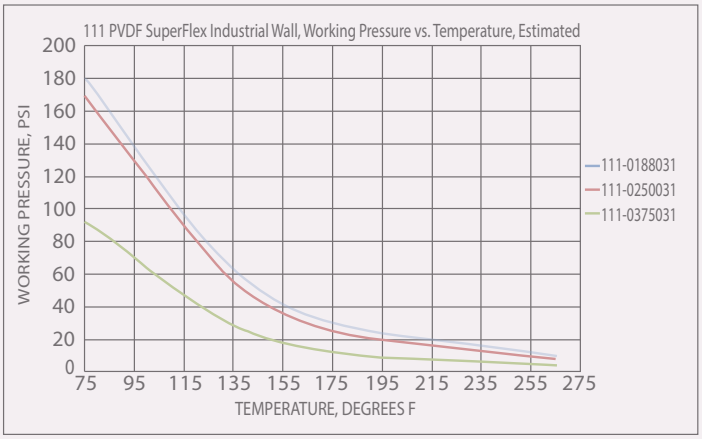
Parker Fittings available from: Fluid System Connectors Division Otsego, MI
(269) 694-2550 (269) 692-6634 FAX

FSC Product Families:

- Compression
- Compress-Align®
- TrueSeal™

Colors

- ○ Natural (off-white)



110 PVDF Flex™ Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
110-0125031	1/8	0.125	± 0.005	3.18	± 0.13	0.062	± 0.005	1.57	± 0.13	0.031	0.79	267	18.4	1068	73.6	0.500	13	28	0.007	0.011
110-0188031	3/16	0.188	± 0.005	4.78	± 0.13	0.125	± 0.005	3.18	± 0.13	0.031	0.79	180	12.4	720	49.6	0.750	19	28	0.012	0.018
110-0250031	1/4	0.250	± 0.005	6.35	± 0.13	0.188	± 0.005	4.78	± 0.13	0.031	0.79	170	11.7	680	46.8	1.000	25	28	0.016	0.025
110-0375031	3/8	0.375	± 0.005	9.52	± 0.13	0.312	± 0.005	7.92	± 0.13	0.031	0.79	92	6.34	459	31.6	2.500	64	28	0.026	0.039
110-0500031	1/2	0.500	± 0.005	12.70	± 0.13	0.438	± 0.005	11.13	± 0.13	0.031	0.79	83	5.7	332	22.9	4.000	102	28	0.035	0.053

110 PVDF Flex™ Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
110-0250047	1/4	0.250	± 0.005	6.35	± 0.13	0.156	± 0.005	3.96	± 0.13	.047	1.19	208	14.3	832	57.4	0.750	19	28	0.023	0.034
110-0250062	1/4	0.250	± 0.005	6.35	± 0.13	0.125	± 0.005	3.18	± 0.13	.062	1.57	330	22.8	1320	91.0	0.500	13	28	0.028	0.042
110-0312062	5/16	0.312	± 0.005	7.92	± 0.13	0.188	± 0.005	4.78	± 0.13	.062	1.57	224	15.4	896	61.8	0.875	22	28	0.038	0.056
110-0375062	3/8	0.375	± 0.005	9.52	± 0.13	0.250	± 0.005	6.35	± 0.13	.062	1.57	219	15.1	876	60.4	1.000	25	28	0.047	0.070
110-0500062	1/2	0.500	± 0.005	12.70	± 0.13	0.370	± 0.005	9.40	± 0.13	.062	1.57	169	11.7	676	46.6	2.000	51	28	0.066	0.098
110-0625062	5/8	0.625	± 0.005	15.88	± 0.13	0.500	± 0.005	12.70	± 0.13	.062	1.57	136	9.3	544	37.5	3.000	76	28	0.085	0.126
110-0750062	3/4	0.750	± 0.006	19.05	± 0.15	0.625	± 0.006	15.88	± 0.15	.062	1.57	114	7.9	456	31.4	6.000	152	28	0.103	0.154
110-1000062	1	1.000	± 0.010	25.40	± 0.25	0.875	± 0.008	22.22	± 0.25	.062	1.57	86	5.9	344	23.7	8.000	203	28	0.141	0.210

111 PVDF Super-Flex™ Industrial Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
111-0188031	3/16	0.188	± 0.005	4.78	± 0.13	0.125	± 0.005	3.18	± 0.13	0.031	0.79	180	12.4	720	50	0.750	19	28	0.012	0.018
111-0250031	1/4	0.250	± 0.005	6.35	± 0.13	0.188	± 0.005	4.78	± 0.13	0.031	0.79	170	11.7	680	47	0.750	19	28	0.016	0.025
111-0375031	3/8	0.375	± 0.005	9.53	± 0.13	0.312	± 0.005	7.92	± 0.13	0.031	0.79	93	6.4	372	26	2.500	64	28	0.026	0.039

111 PVDF Super-Flex™ Heavy Wall Fractional Size Tubing

Part Number	Order Size	Nominal O.D.				Nominal I.D.				Reference Wall		Working Pressure		Burst Pressure		Min. Bend Radius		Vac. Rating	Weight	
#																				
	inch	inch	tol.	mm	tol.	inch	tol.	mm	tol.	inch	mm	psi 73°F	bar 23°C	psi 73°F	bar 23°C	inch	mm	at 73°F	lb. per ft.	kg. per m.
111-0250062	1/4	0.250	± 0.005	6.35	± 0.13	0.125	± 0.005	3.18	± 0.13	0.062	1.57	330	22.8	1320	91	0.375	10	28	0.028	0.042
111-0375062	3/8	0.375	± 0.005	9.52	± 0.13	0.250	± 0.005	6.35	± 0.13	0.062	1.57	224	15.4	896	62	0.750	19	28	0.047	0.070
111-0500062	1/2	0.500	± 0.005	12.7	± 0.13	0.375	± 0.005	9.52	± 0.13	0.062	1.57	169	11.7	676	47	1.500	38	28	0.066	0.098

WARNING

Notes

ETFE PRODUCTS

ETFE Heat Shrink
1.5:1

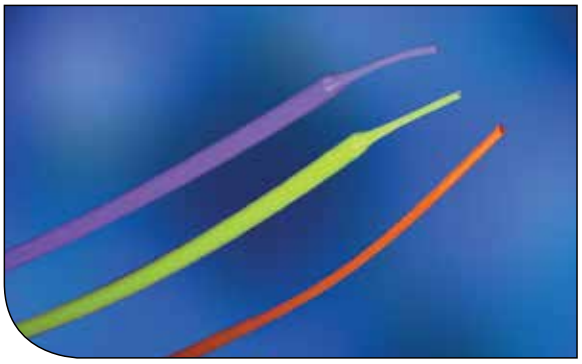
ETFE Convoluted
SAE AS81914/5

ETFE (Ethylene Tetrafluoroethylene)
Working Temperature: 302°F (150°C)
Color: Clear

- Best abrasion resistance
- Chemically inert
- Excellent tear resistance
- Low permeability
- Superior impact strength to PTFE
- Excellent for cryogenic applications

ETFE Industrial Wall Heat Shrink

Series HS1.5ETFE



Features

- Superior abrasion resistance
- Greater tensile strength than other heat shrink products
- Self extinguishing

Certifications

- AMS DTL 23053/14A, Class 1

Applications/Markets

- Wire splices
- Rollers
- Protective covering
- Robotics

Order Information

Example: HS1.5ETFE3/32-NC48.000

HS1.5ETFE3/32-NC48.000 – **1.5:1 Heat Shrink**
HS1.**5ETFE**3/32-NC48.000 – **ETFE**
HS1.ETFE**3/32**-NC48.000 – **Size** in inch **(0.094")**
HS1.ETFE3/32-**N**C48.000 – **Natural**
HS1.5ETFE3/32-N**C**48.000 – **Cut Tubing**
HS1.5ETFE3/32-NC**48.000** – **Package Quantity** in inch **(48")**

Notes

- Working Temperature: 302°F (150°C)
- Shrink Temperature 347°F (175°C) for 10 minutes
- *Dielectric Strength: ≥ 2,000 V/M, per ASTM D 149 short term test of 10 MIL thickness (Volts/MIL)
- Heat Shrink tubing is available in stock packaging of 4-ft. straight lengths
- Minimum quantities may apply
- Custom packaging, sizes, lengths and colors are quoted upon request

Colors

- ○ Natural, Opaque to translucent
- Colors available as custom run, see color code table

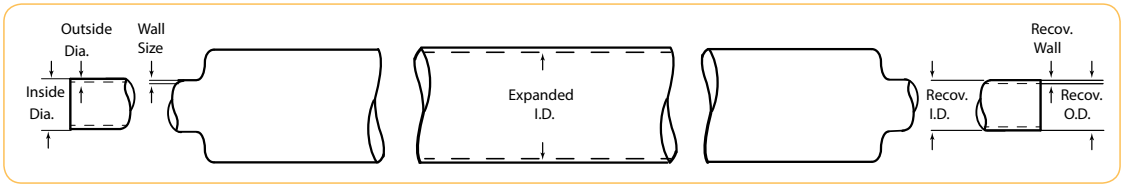
When ordering coiled tubing in colors, the color code is always followed by TC; when ordering cut lengths, the color code is followed by CC

ie HS1.ETFE3/32-2TC ie HS1.ETFE3/32-0CC48.0000

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

HS1.5ETFE HEAT SHRINK

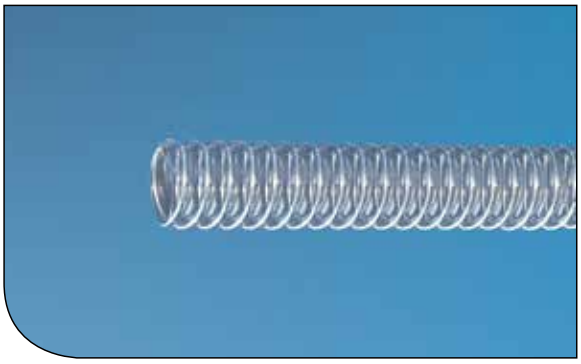
Part Number	Size	Mil Spec*	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
			inch	mm	inch	mm	inch	mm
HS1.5ETFE3/32	3/32	23053/14-001	0.093	2.36	0.062	1.57	0.010 ± 0.003	0.25 ± 0.08
HS1.5ETFE1/8	1/8	23053/14-002	0.125	3.18	0.083	2.11	0.010 ± 0.003	0.25 ± 0.08
HS1.5ETFE3/16	3/16	23053/14-003	0.188	4.78	0.125	3.18	0.011 ± 0.003	0.25 ± 0.08
HS1.5ETFE1/4	1/4	23053/14-004	0.250	6.35	0.166	4.22	0.013 ± 0.003	0.33 ± 0.08
HS1.5ETFE3/8	3/8	23053/14-005	0.375	9.52	0.250	6.35	0.013 ± 0.003	0.33 ± 0.08
HS1.5ETFE1/2	1/2	23053/14-006	0.500	12.7	0.345	8.76	0.013 ± 0.003	0.33 ± 0.08
HS1.5ETFE3/4	3/4	23053/14-007	0.750	19.1	0.500	12.7	0.018 ± 0.004	0.46 ± 0.10
HS1.5ETFE1.00	1	23053/14-008	1.000	25.4	0.665	16.9	0.022 ± 0.004	0.51 ± 0.10
HS1.5ETFE1.25	1-1/4	23053/14-009	1.250	31.8	0.835	21.2	0.030 ± 0.004	0.76 ± 0.10
HS1.5ETFE1.50	1-1/2	23053/14-010	1.500	38.1	1.000	25.4	0.030 ± 0.004	0.76 ± 0.10



WARNING

ETFE Convoluted

Series SAE AS81914/6 and SAE AS81914/5



Features

- Chemically inert
- Increased abrasion resistance
- Low coefficient of friction
- Very flexible
- Self extinguishing
- Non-wetting

Certifications

- SAE AS81914/6
- SAE AS81914/5
- FDA Compliant

Applications/Markets

- Fluid Handling
- Harnesses
- Crush Resistant Cover
- Robotics

Order Information

Example: 81914/6-1006-NT

81914/6-1006-NT – **SAE AS81914 Convoluted**
81914/**6**-1006-NT – **ETFE**
81914/6-**10**06-NT – **Helical Convolutions**
81914/6-10**06**-NT – **Size (6=0.625")**
81914/6-1006-**N**T – **Color (N=Natural)**
81914/6-1006-N**T** – **"T" is bulk - for cut tubing add length, ie. 81914/6-1006-N1200 = .625" Convo, natural, cut 12" long**

Colors

- ○ Translucent
- Colors available as custom run, see color code table

Color Code					
○	N	Natural	●	5	Green
●	0	Black	●	6	Blue
●	1	Brown	●	7	Violet
●	2	Red	●	8	Gray
●	3	Orange	○	9	White
●	4	Yellow			

Notes

- Working Temperature: 302°F (150°C)
- Tubing is provided in black without cuffs direct from inventory
- Stock packaging is random coils
- Also availabe in close convolution 81914/5
- Minimum quantities may apply
- Custom packaging, sizes, lengths, cuffs and colors are quoted upon request

ETFE Convoluted Tubing (SAE AS81914/6)

(Standard tubing is natural)

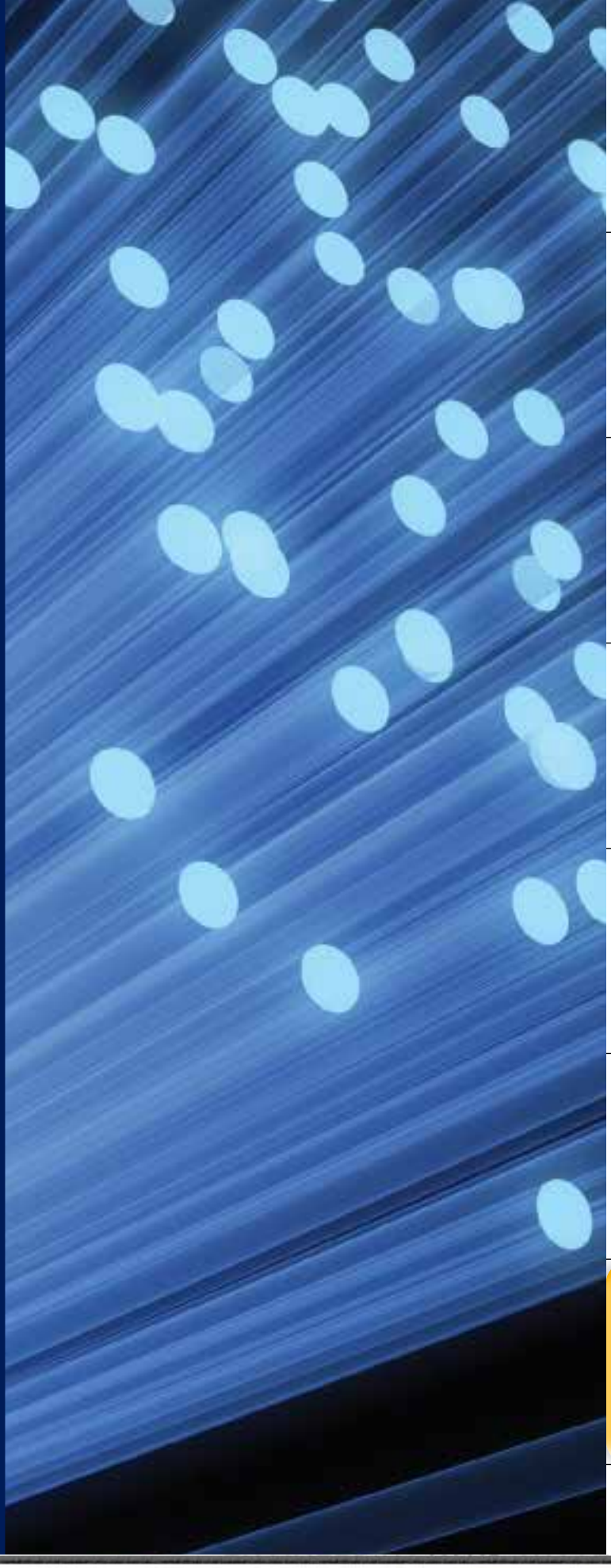
Part Number	MIL Spec*	Maximum Inside Diameter		Minimum Inside Diameter		Maximum Outside Diameter		Maximum Wall Thickness		Minimum Bend Radius		Pitch	Weight	
		inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	±1	lb./100 ft.	kg./100 mtr.
81914/6-1001-NT	-1	0.188	4.78	0.181	4.60	0.320	8.13	0.018	0.457	.500	31	8	1.2	1.79
81914/6-1002-NT	-2	0.281	7.14	0.273	6.93	0.414	10.5	0.018	0.457	.750	19	8	1.4	2.08
81914/6-1003-NT	-3	0.312	7.93	0.306	7.77	0.450	11.4	0.018	0.457	.750	19	8	1.5	2.23
81914/6-1004-NT	-4	0.375	9.53	0.359	9.12	0.510	13.0	0.018	0.457	.880	22	8	1.8	2.68
81914/6-1005-NT	-5	0.437	11.1	0.427	10.9	0.571	14.5	0.018	0.457	.880	22	8	2.5	3.72
81914/6-1006-NT	-6	0.500	12.7	0.485	12.3	0.650	16.5	0.023	0.584	1.250	32	7	3.2	4.76
81914/6-1007-NT	-7	0.625	15.9	0.608	15.4	0.770	19.6	0.023	0.584	1.500	38	7	3.9	5.8
81914/6-1008-NT	-8	0.750	19.1	0.730	18.5	0.930	23.6	0.023	0.584	1.750	44	6	4.9	7.29
81914/6-1009-NT	-9	0.875	22.2	0.860	21.8	1.073	27.3	0.023	0.584	2.000	51	5	5.6	8.33
81914/6-1010-NT	-10	1.000	25.4	0.975	24.8	1.226	31.1	0.023	0.584	2.370	60	5	6.8	10.12
81914/6-1011-NT	-11	1.125	28.6	1.105	28.1	1.390	35.3	0.023	0.584	2.370	60	5	7.5	11.16
81914/6-1012-NT	-12	1.250	31.8	1.205	30.7	1.539	39.1	0.023	0.584	2-.750	70	4	8.8	13.09
81914/6-1013-NT	-13	1.500	38.1	1.437	36.5	1.832	46.5	0.023	0.584	3.380	86	4	10.2	15.18
81914/6-1014-NT	-14	1.750	44.5	1.688	42.9	2.082	52.9	0.023	0.584	3.880	99	4	11.9	17.71
81914/6-1015-NT	-15	2.000	50.8	1.937	49.2	2.332	59.2	0.023	0.584	4.250	108	4	13.5	20.01

*ETFE convoluted tubing is provided in NATURAL without cuffs direct from the factory. Natural part numbers are designated with “NT” after the Mil Spec number (ie 81914/6-1014-NT)

WARNING

Notes

TECHNICAL INFO



Property Quick Reference

PFA (Perfluoroalkoxy)
Working Temperature: 500°F (260°C)
Color: Clear with light blue or tint

- High purity resins available
- Low permeation resins available
- Use when you need the temperature range of PTFE and the clarity of FEP
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Good flexlife

PTFE (Polytetrafluoroethylene)
Working Temperature: 500°F (260°C)
Color: Opaque to translucent

- Chemically inert
- Lowest coefficient of friction
- Superior dielectric strength
- Exceptional heat resistance
- Self extinguishing
- Non-wetting
- Excellent flexlife
- Laser markable

High Purity PFA (Perfluoroalkoxy)
Working Temperature: 500°F (260°C)
Color: Clear with light blue or tint
See characteristics of PFA with these additional features:

- Lowest level of extractables
- Highest molecular weight available
- Withstands corrosive surfactants for longer periods of time
- Higher flow
- Higher purity

PVDF (Polyvinylidene Fluoride)
Working Temperature: 265°F (130°C)
Color: Varies

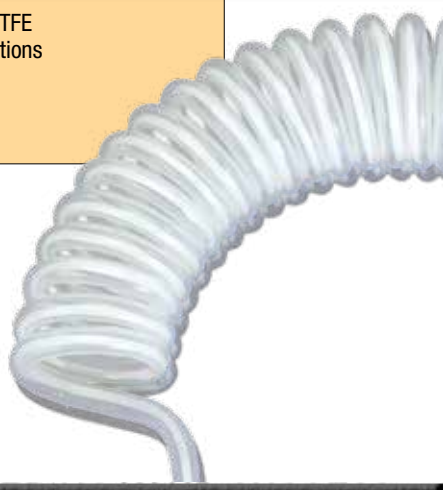
- Very good chemical resistance
- Excellent resistance to creep and fatigue
- UV Resistant
- Weldable
- Exceptional corrosion resistance for chlorine, fluorine, or bromine environments

FEP (Fluorinated Ethylene Propylene)
Working Temperature: 400°F (204°C)
Color: Clear

- Excellent chemical resistance
- Non-wetting
- Weldable
- Tubes can be sealed by melting
- Long continuous lengths
- Low refractive index
- Improved clarity over PFA
- Lower cost alternative to PFA

ETFE (Ethylene Tetrafluoroethylene)
Working Temperature: 302°F (150°C)
Color: Clear

- Best abrasion resistance
- Chemically inert
- Excellent tear resistance
- Low permeability
- Superior impact strength to PTFE
- Excellent for cryogenic applications



Property Comparison

The table below lists a generally accepted summary of properties that we believe to be reliable. Please note that many of these resins are produced in several varieties and property characteristics may vary. Therefore, determination of resin is dependent on the application and this table is only meant to serve as a general guideline.

Properties*	ASTM or Unit	PTFE	FEP	PFA	High Purity PFA	PVDF	ETFE
MECHANICAL PROPERTIES							
Specific Gravity	D792 D3307	2.13-2.22 -	2.12-2.17 -	2.12-2.17 -	- 2.14-2.16	1.76-1.82 -	1.74 -
Elongation %	D638 D3307	200-450 -	250-330 -	280-400 -	- 370	100-800 -	430 -
Tensile Strength (psi)	D638(psi) D3307(psi)	2500 -	3400 -	3600 -	- 3600	3200 -	5000 -
Flexural Strength (psi)	D790	no break	no break	no break	no break	1500-5000	5500
Compressive Strength (psi)	D695	700-900	725-2200	725-810	na	2000-6000	2500
Tensile Elastic Modulus (Young's Modulus) (psi)	D638	57,000 -	50,000 -	72,500- 87,000	na	35,000-220,000	116,030
Flexural Modulus	D790(psi) D790 103MPa (103kgf/cm2)	71,000-85,000 0.5-0.6 (5.0-6.0)	78,000-92,000 0.5-0.6 (5.5-6.4)	94,000-99,000 0.6-0.7 (6.6-7.0)	- 647-686 -	90,000-168,000 280,00-110,000	130,534 - -
Flex Life (MIT cycles)	D2176	>1,000,000	5,000-80,000	10,000-500,000	2000 x 10^3	na	na
Hardness Durometer Shore D	D2240	D50-65	D55	D55-D60	D60	D55-D75	D67
Coefficient of Friction	(on steel)	0.02	0.05	0.04-0.06	0.05	0.33-0.49	0.20
Abrasion Resistance 1000 cycles	Taber	8-90	14-20	0.00-96.75	na	16-33	0.005
Impact Strength IZO.D. 73°F (23°C) notched ft/lbs/in	D256	3	no break	no break	no break	4	no break
THERMAL PROPERTIES							
Melting Point	°C °F	327 621	260 500	305 582	305 582	125 257	260 500
Upper Service Temperature(20000h)	°C °F	260 500	204 400	260 500	260 500	130 260	180 356
Flammability	UL 94	V-0	V-0	V-0	V-0	V-0	V-0
Thermal Conductivity BTU-in/hr-ft^2, ºF		1.7-2.08	1.4	1.3	na	1.00-1.25	1.65
Thermal Conductivity Cal-cm/sec-cm^2, ºC		6 x 10-4	6 x 10-4	6 x 10-6	na	na	5.7 x 10-4
Linear Coefficient of Thermal Expansion Min/inºF 73.4-140ºF	D696	55.6	46.1-58.3	66.7	na	7.00-10.8	9.4 (10^{-5}/°C)
Heat of Fusion	BTU/LB	29-37	4-35	13	na	0.28-0.36	20
Heat of Combustion	BTU/LB °F	2200	2200	2300	na	na	8100
Low Temperature Embrittlement	°C °F	-268 -450	-268 -450	-268 -450	-268 -450	-62 -80	-76 -105
ELECTRICAL PROPERTIES							
Dielectric Constant	D150/10^3Hz D150/10^6Hz	2.1 2.1	2.1 2.1	2.1 2.1	2.1 2.1	3.5 10.6	2.6
Dielectric Strength	D149/125 MIL D149/10 MIL	500 ≥1400	508 >610	500 ≥1400	500 - 600 na	0.8 1.5	na
Volume Resistivity	D257/ohm-cm	>10^{18}	>10^{18}	>10^{18}	na	2 x 10^{14}	10^{17}
Surface Resistivity	D257/ohm-cm	>10^{18}	>10^{17}	>10^{17}	na	5 x 10^{14}	>10^{15}
GENERAL PROPERTIES							
Chemical/Solvent Resistance	D543	Excellent	Excellent	Excellent	Excellent	Very Good	Excellent
Refractive Index		1.35	1.338	1.34	1.34	1.42	1.447
Limiting Oxygen Index, %	D2868	>95	>95	≥95	na	42/75[2]	31
Water Contact Angle	Angle to Level	110	114	115	na	92	na
Water Absorption 24h,%	D570	<0.01	<0.01	<0.03	<0.01	0.03-0.05	0.03
Weatherability		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent

*General resin properties; Tubing properties may vary.

Working pressures are at 73°F (23°C). Pressure ratings are also effected by diameter of tubing and wall thickness. Actual performance may vary with different media and working conditions. Use this information for comparison only.

Chemical Resistance Guide

PTFE, FEP, PFA Chemical Resistance Guide

This chart is intended to be used as a general guide only. Since each pair of ratings listed is for ideal conditions, all factors affecting chemical resistance must be considered. First letter of each pair applies to conditions at 68°F (20°C), the second to those at 122°F (50°C).

Chemical	LDPE	HDPE	PP/PA	PMP	FEP PFA PTFE	PC	PVC	PSF
Acetaldehyde	GN	GF	GN	GN	EE	FN	GN	NN
Acetamide, Sat.	EE	EE	EE	EE	EE	NN	NN	NN
Acetic Acid, 5%	EE	EE	EE	EE	EE	EG	EE	EE
Acetic Acid, 50%	EE	EE	EE	EE	EE	EG	EG	GG
Acetone	EE	EE	EE	EE	EE	NN	NN	NN
Acetonitrile	EE	EE	FN	FN	EE	NN	NN	NN
Acrylonitrile	EE	EE	FN	FN	EE	NN	NN	NN
Adipic Acid	EG	EE	EE	EE	EE	EE	GG	EG
Alanine	EE	EE	EE	EE	EE	NN	NN	NN
Allyl Alcohol	EE	EE	EE	EG	EE	GF	GF	GF
Aluminum Hydroxide	EG	EE	EG	EG	EE	FN	EG	GG
Aluminum Salts	EE	EE	EE	EE	EE	EG	EE	EE
Amino Acids	EE	EE	EE	EE	EE	EE	EE	EE
Ammonia	EE	EE	EE	EE	EE	NN	EG	GF
Ammonium Acetate, Sat.	EE	EE	EE	EE	EE	EE	EE	EE
Ammonium Glycolate	EG	EE	EG	EG	EE	GF	EE	GG
Ammonium Hydroxide, 5%	EE	EE	EE	EE	EE	FN	EE	GG
Ammonium, Hydroxide, 30%	EG	EE	EG	EG	EE	NN	EG	GG
Ammonium Oxalate	EG	EE	EG	EG	EE	EE	EE	EE
Ammonium Salts	EE	EE	EE	EE	EE	EG	EG	EE
n-Amyl Acetate	GF	EG	GF	GF	EE	NN	NN	NN
Amyl Chloride	NN	FN	NN	NN	EE	NN	NN	NN
Aniline	EG	EG	GF	GF	EE	FN	NN	NN
Benzaldehyde	EG	EE	EG	EG	EE	FN	NN	FF
Benzene	FN	GG	GF	GF	EE	NN	NN	NN
Benzoic Acid, Sat.	EE	EE	EG	EG	EE	EG	EG	FF
Benzyl Acetate	EG	EE	EG	EG	EE	FN	NN	NN
Benzyl Alcohol	NN	FN	NN	NN	EE	GF	GF	NN
Bromine	NN	FN	NN	NN	EE	FN	GN	NN
Bromobenzene	NN	FN	NN	NN	EE	NN	NN	NN
Bromoform	NN	NN	NN	NN	EE	NN	NN	NN
Butadiene	NN	FN	NN	NN	EE	NN	FN	NN
n-Butyl Acetate	GF	EG	GF	GF	EE	NN	NN	NN
n-Butyl Alcohol	EE	EE	EE	EG	EE	GF	GF	GF
sec-Butyl Alcohol	EG	EE	EG	EG	EE	GF	GG	GF
tert-Butyl Alcohol	EG	EE	EG	EG	EE	GF	EG	GF
Butyric Acid	NN	FN	NN	NN	EE	FN	GN	GG
Calcium Hydroxide, Conc.	EE	EE	EE	EE	EE	NN	EE	GG
Calcium Hypochlorite, Sat.	EE	EE	EE	EG	EE	FN	GF	EE
Carbazole	EE	EE	EE	EE	EE	NN	NN	NN
Carbon Disulfide	NN	NN	NN	NN	EE	NN	NN	NN
Carbon Tetrachloride	FN	GF	GF	NN	EE	NN	GF	NN
Cedarwood Oil	NN	FN	NN	NN	EE	GF	FN	FF
Cellosolve Acetate	EG	EE	EG	EG	EE	FN	FN	NN
Chlorine, 10% in Air	GN	EF	GN	GN	EE	EG	EE	NN
Chlorine, 10% (Moist)	GN	GF	FN	GN	EE	GF	EG	NN
Chloroacetic Acid	EE	EE	EG	EG	EE	FN	FN	NN
p-Chloroacetophenone	EE	EE	EE	EE	EE	NN	NN	NN
Chloroform	FN	GF	GF	NN	EE	NN	NN	NN
Chromic Acid, 10%	EE	EE	EE	EE	EE	GF	EG	NN
Chromic Acid, 50%	EE	EE	GF	GF	EE	FN	EF	NN
Cinnamon Oil	NN	FN	NN	NN	EE	GF	NN	FF
Citric Acid, 10%	EE	EE	EE	EE	EE	EG	GG	EE
Cresol	NN	FN	GF	NN	EE	NN	NN	NN
Cyclohexane	FN	FN	FN	NN	EE	EG	GF	NN
Decalin	GF	EG	GF	FN	EE	NN	EG	NN
o-Dichlorobenzene	FN	FF	FN	FN	EE	NN	NN	NN
p-Dichlorobenzene	FN	GF	GF	GF	EE	NN	NN	NN
Diethyl Benzene	NN	FN	NN	NN	EE	FN	NN	NN
Diethyl Ether	NN	FN	NN	NN	EE	NN	FN	NN

LDPE = Low Density Polyethylene
HDPE = High Density Polyethylene
PP/PA = Polypropylene/Polyallomer
PMP = Polymethylpentene

FEP
PFA =Fluoroplastics /Fluoropolymers
PTFE

PC = Polycarbonate
PVDC = Polyvinylchloride
PSF = Polysulfone

E = Excellent
F = Fair
G = Good
N = Not recommended

Chemical Resistance Guide (cont.)

PTFE, FEP, PFA Chemical Resistance Guide

This chart is intended to be used as a general guide only. Since each pair of ratings listed is for ideal conditions, all factors affecting chemical resistance must be considered. First letter of each pair applies to conditions at 68°F (20°C), the second to those at 122°F (50°C).

Chemical	LDPE	HDPE	PP/PA	PMP	FEP PFA PTFE	PC	PVC	PSF
Diethyl Ketone	GF	GG	GG	GF	EE	NN	NN	NN
Diethyl Malonate	EE	EE	EE	EG	EE	FN	GN	FF
Diethylene Glycol	EE	EE	EE	EE	EE	GF	FN	GG
Diethylene Glycol Ethyl Ether	EE	EE	EE	EE	EE	FN	FN	FF
Dimethyl Formamide	EE	EE	EE	EE	EE	NN	FN	NN
Dimethylsulfoxide	EE	EE	EE	EE	EE	NN	NN	NN
1,4-Dioxane	GF	GG	GF	GF	EE	GF	FN	GF
Dipropylene Glycol	EE	EE	EE	EE	EE	GF	GF	GG
Ether	NN	FN	NN	NN	EE	NN	FN	NN
Ethyl Acetate	EE	EE	EE	EG	EE	NN	NN	NN
Ethyl Alcohol (absolute)	EG	EE	EG	EG	EE	EG	EG	EG
Ethyl Alcohol, 40%	EG	EE	EG	EG	EE	EG	EE	EG
Ethyl Benzene	FN	GF	FN	FN	EE	NN	NN	NN
Ethyl Benzoate	FF	GG	GF	GF	EE	NN	NN	NN
Ethyl Butyrate	GN	GF	GN	FN	EE	NN	NN	NN
Ethyl Chloride	FN	FF	FN	FN	EE	NN	NN	NN
Ethyl Cyanoacetate	EE	EE	EE	EE	EE	FN	FN	FF
Ethyl Lactate	EE	EE	EE	EE	EE	FN	FN	FF
Ethylene Chloride, Liquid	GN	GF	FN	NN	EE	NN	NN	NN
Ethylene Glycol	EE	EE	EE	EE	EE	GF	EE	EE
Ethylene Glycol Methyl Ether	EE	EE	EE	EE	EE	FN	FN	FF
Ethylene Oxide	FF	GF	FF	FN	EE	FN	FN	EE
Fluorides	EE	EE	EE	EE	EE	EE	EE	EE
Fluorine	FN	GN	FN	FN	EG	GF	EG	NN
Formaldehyde, 10%	EE	EE	EE	EG	EE	EG	GF	GF
Formaldehyde, 40%	EG	EE	EG	EG	EE	EG	GF	GF
Formic Acid, 3%	EG	EE	EG	EG	EE	EG	GF	GG
Formic Acid, 50%	EG	EE	EG	EG	EE	EG	GF	GG
Formic Acid, 98-100%	EG	EE	EG	EF	EE	EF	FN	FF
Fuel Oil	FN	GF	EG	GF	EE	EG	EE	EG
Gasoline	FN	GG	GF	GF	EE	FF	GN	FF
Glacial Acetic Acid	EG	EE	EG	EG	EE	NN	EG	FN
Glycerin	EE	EE	EE	EE	EE	EE	EE	EE
n-Heptane	FN	GF	FF	FF	EE	EG	GF	EG
Hexane	NN	GF	GF	FN	EE	FN	GN	EG
Hydrochloric Acid, 1-5%	EE	EE	EE	EG	EE	EE	EE	EE
Hydrochloric Acid, 20%	EE	EE	EE	EG	EE	GF	EG	EE
Hydrochloric Acid, 35%	EE	EE	EG	EG	EE	NN	GF	EE
Hydrofluoric Acid, 4%	EG	EE	EG	EG	EE	GF	GF	GF
Hydrofluoric Acid, 48%	EE	EE	EE	EE	EE	NN	GF	FN
Hydrogen Peroxide, 3%	EE	EE	EE	EE	EE	EE	EE	EE
Hydrogen Peroxide, 30%	EG	EE	EG	EG	EE	EE	EE	EE
Hydrogen Peroxide, 90%	EG	EE	EG	EG	EE	EE	EG	EE
Isobutyl Alcohol	EE	EE	EE	EG	EE	EG	EG	EG
Isopropyl Acetate	GF	EG	GF	GF	EE	NN	NN	NN
Isopropyl Alcohol	EE	EE	EE	EE	EE	EE	EG	EE
Isopropyl Benzene	FN	GF	FN	NN	EE	NN	NN	NN
Kerosene	FN	GG	GF	GF	EE	EE	EE	GF
Lactic Acid, 3%	EG	EE	EG	EG	EE	EG	GF	EE
Lactic Acid, 85%	EE	EE	EG	EG	EE	EG	GF	EE
Methoxyethyl Oleate	EG	EE	EG	EG	EE	FN	NN	NN
Methyl Alcohol	EE	EE	EE	EE	EE	GF	EF	GF
Methyl Ethyl Ketone	EG	EE	EG	NN	EE	NN	NN	NN
Methyl Isobutyl Ketone	GF	EG	GF	FF	EE	NN	NN	NN
Methyl Propyl Ketone	GF	EG	GF	FF	EE	NN	NN	NN
Methylene Chloride	FN	GF	FN	FN	EE	NN	NN	NN
Mineral Oil	GN	EE	EE	EG	EE	EG	EG	EE
Nitric Acid, 1-10%	EE	EE	EE	EE	EE	EG	EG	EF
Nitric Acid, 50%	GG	GN	FN	GN	EE	GF	GF	GF
Nitric Acid, 70%	FN	GN	NN	GF	EE	NN	FN	NN

Chemical Resistance Guide (cont.)

PTFE, FEP, PFA Chemical Resistance Guide

This chart is intended to be used as a general guide only. Since each pair of ratings listed is for ideal conditions, all factors affecting chemical resistance must be considered. First letter of each pair applies to conditions at 68°F (20°C), the second to those at 122°F (50°C).

Chemical	LDPE	HDPE	PP/PA	PMP	FEP PFA PTFE	PC	PVC	PSF
Nitrobenzene	NN	FN	NN	NN	EE	NN	NN	NN
n-Octane	EE	EE	EE	EE	EE	GF	FN	GF
Orange Oil	FN	GF	GF	FF	EE	FF	FN	FF
Ozone	EG	EE	EG	EE	EE	EG	EG	EE
Perchloric Acid	GN	GN	GN	GN	GF	NN	GN	NN
Perchloroethylene	NN	NN	NN	NN	EE	NN	NN	NN
Phenol, Crystals	GN	GF	GN	FG	EE	EN	FN	FF
Phosphoric Acid, 1-5%	EE	EE	EE	EE	EE	EE	EE	EE
Phosphoric Acid, 85%	EE	EE	EG	EG	EE	EG	EG	EE
Pine Oil	GN	EG	EG	GF	EE	GF	FN	FF
Potassium Hydroxide, 1%	EE	EE	EE	EE	EE	FN	EE	EE
Potassium Hydroxide, Conc.	EE	EE	EE	EE	EE	NN	EG	EE
Propane Gas	NN	FN	NN	NN	EE	FN	EG	FF
Propylene Glycol	EE	EE	EE	EE	EE	GF	FN	GG
Propylene Oxide	EG	EE	EG	EG	EE	GF	FN	GG
Resorcinol, Sat.	EE	EE	EE	EE	EE	GF	FN	NN
Resorcinol, 5%	EE	EE	EE	EE	EE	GF	GN	NN
Salicylaldehyde	EG	EE	EG	EG	EE	GF	FN	FF
Salicylic Acid, Powder	EE	EE	EE	EG	EE	EG	GF	EE
Salicylic Acid, Sat.	EE	EE	EE	EE	EE	EG	GF	EE
Salt Solutions, Metallic	EE	EE	EE	EE	EE	EE	EE	EE
Silver Acetate	EE	EE	EE	EE	EE	EG	GG	EE
Silver Nitrate	EG	EE	EG	EE	EE	EE	EG	EE
Sodium Acetate, Sat.	EE	EE	EE	EE	EE	EG	GF	EE
Sodium Hydroxide, 1%	EE	EE	EE	EE	EE	FN	EE	EE
Sodium Hydroxide,50% to Sat.	GG	EE	EE	EE	EE	NN	NN	EG
Sodium Hypochlorite, 15%	EE	EE	EE	EE	EE	GF	EE	EE
Stearic Acid, Crystals	EE	EE	EE	EE	EE	EG	EG	GG
Sulfuric Acid, 1-6%	EE	EE	EE	EE	EE	EE	EG	EE
Sulfuric Acid, 20%	EE	EE	EG	EG	EE	EG	EG	EE
Sulfuric Acid, 60%	EG	EE	EG	EG	EE	GF	EG	EE
Sulfuric Acid, 98%	GG	GG	FN	GG	EE	NN	GN	NN
Sulfuric Dioxide, Liq., 46psi	NN	FN	NN	NN	EE	GN	FN	GG
Sulfuric Dioxide, wet or dry	EE	EE	EE	EE	EE	EG	EG	GG
Sulfur Salts	FN	GF	FN	FN	EE	FN	NN	GG
Tartaric Acid	EE	EE	EE	EE	EE	EG	EG	EE
Tetrahydrofuran	FN	GF	GF	FF	EE	NN	NN	NN
Thionyl Chloride	NN	NN	NN	NN	EE	NN	NN	NN
Toluene	FN	GG	GF	FF	EE	FN	NN	NN
Tributyl Citrate	GF	EG	GF	GF	EE	NN	FN	FF
Trichloroethane	NN	FN	NN	NN	EE	NN	NN	NN
Trichloroethylene	NN	FN	NN	NN	EE	NN	NN	NN
Triethylene Glycol	EE	EE	EE	EE	EE	EG	GF	EE
Tripropylene Glycol	EE	EE	EE	EE	EE	EG	GF	EE
Turpentine	FN	GG	GF	FF	EE	FN	GF	NN
Undecyl Alcohol	EF	EG	EG	EG	EE	GF	EF	FF
Urea	EE	EE	EE	EG	EE	NN	GN	NN
Vinylidene Chloride	NN	FN	NN	NN	EE	NN	NN	NN
Xylene	GN	GF	FN	FN	EE	NN	NN	NN
Zinc Stearate	EE	EE	EE	EE	EE	EE	EG	EE

FEP, PFA, PTFE = Fluoroplastics / Fluoropolymers

LDPE = Low Density Polyethylene
HDPE = High Density Polyethylene
PP/PA = Polypropylene/Polyallomer
PMP = Polymethylpentene
PC = Polycarbonate
PVDC = Polyvinylchloride
PSF = Polysulfone

E = Excellent
F = Fair
G = Good
N = Not recommended

Parker Safety Guide

Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings, Connectors, Conductors, Valves and Related Accessories

⚠ Parker Safety Guide for Selecting and Using Hose, Tubing, Fittings and Related Accessories
Publication No. 4400-B.1
Revised: October 2015, Rev A

WARNING: Failure or improper selection or improper use of hose, tubing, fittings, assemblies, valves, connectors, conductors or related accessories ("Products") can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of these Products include but are not limited to:

- Fittings thrown off at high speed.
- High velocity fluid discharge.
- Explosion or burning of the conveyed fluid.
- Electrocution from high voltage electric powerlines.
- Contact with suddenly moving or falling objects that
- are controlled by the conveyed fluid.
- Injections by high-pressure fluid discharge.
- Dangerously whipping Hose.
- Tube or pipe burst.
- Weld joint fracture.
- Contact with conveyed fluids that may be hot, cold, toxic or
- otherwise injurious.
- Sparking or explosion caused by static electricity buildup or other sources of electricity.
- Sparking or explosion while spraying paint or flammable liquids.
- Injuries resulting from inhalation, ingestion or exposure to fluids.

Before selecting or using any of these Products, it is important that you read and follow the instructions below. No product from any division in Parker Fluid Connectors Group is approved for in-flight aerospace applications. For hoses and fittings used in in-flight aerospace applications, please contact Parker Aerospace Group.

1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) these Products. For convenience, all rubber and/or thermoplastic products commonly called "hose" or "tubing" are called "Hose" in this safety guide. Metallic tube or pipe are called "tube". All assemblies made with Hose are called "Hose Assemblies". All assemblies made with Tube are called "Tube Assemblies".

All products commonly called "fittings", "couplings" or "adapters" are called "Fittings". Valves are fluid system components that control the passage of luid. Related accessories are ancillary devices that enhance or monitor performance including crimping, flaring, flanging, presetting, bending, cutting, deburring, swaging machines, sensors, tags, lockout handles, spring guards and associated tooling. This safety guide is a supplement to and is to be used with the specific Parker publications for the specific Hose, Fittings and Related Accessories that are being considered for use. Parker publications are available at www.parker.com. SAE J1273 (www.sae.org) and ISO 17165-2 (www.ansi.org) also provide recommended practices for hydraulic Hose Assemblies, and should be followed.

1.2 Fail-Safe: Hose, Hose Assemblies, Tube, Tube Assemblies and Fittings can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of the Hose, Hose Assembly, Tube, Tube Assembly or Fitting will not endanger persons or property.

1.3 Distribution: Provide a copy of this safety guide to each person responsible for selecting or using Hose, Tube and Fitting products. Do not select or use Parker Hose, Tube or Fittings without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the Products.

1.4 User Responsibility: Due to the wide variety of operating conditions and applications for Hose, Tube and Fittings. Parker does not represent or warrant that any particular Hose, Tube or Fitting is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

• Making the final selection of the Products.

• Assuring that the user's requirements are met and that the application presents no health or safety hazards.

• Following the safety guide for Related Accessories and being trained to operate Related Accessories.

• Providing all appropriate health and safety warnings on the equipment on which the Products are used.

• Assuring compliance with all applicable government and industry standards.

1.5 Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information.

See the Parker publication for the Products being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate tec hnical service department.

2.0 HOSE, TUBE & FITTINGS SELECTION INSTRUCTIONS

2.1 Electrical Conductivity: Certain applications require that the Hose be nonconductive to prevent electrical current flow. Other applications require the Hose and the Fittings and the Hose/Fitting interface to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting Hose, Tube and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor.

The electrical conductivity or nonconductivity of Hose, Tube and Fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the Hose and the Fittings, Fitting finish (some Fitting finishes are electrically conductive while others are nonconductive), manufacturing methods (including moisture control), how the Fittings contact the Hose, age and amount of deterioration or damage or other changes, moisture content of the Hose at any particular time, and other factors.

The following are considerations for electrically nonconductive and conductive Hose. For other applications consult the individual catalog pages and the appropriate industry or regulatory standards for proper selection.

2.1.1 Electrically Nonconductive Hose: Certain applications require that the Hose be nonconductive to prevent electrical current flow or to maintain electrical isolation. For applications that require Hose to be electrically nonconductive, including but not limited to applications near high voltage electric lines, only special nonconductive Hose can be used. The manufacturer of the equipment in which the nonconductive Hose is to be used must be consulted to be certain that the Hose, Tube and Fittings that are selected are proper for the application. Do not use any Parker Hose or Fittings for any such application requiring nonconductive Hose, including but not limited to applications near high voltage electric lines or dense magnetic fields, unless (i) the application is expressly approved in the Parker technical publication for the product, (ii) the Hose is marked "nonconductive", and (iii) the manufacturer of the equipment on which the Hose is to be used specifically approves the particular Parker Hose, Tube and Fittings for such use.

2.1.2 Electrically Conductive Hose: Parker manufactures special Hose for certain applications that require electrically conductive Hose. Parker manufactures special Hose for conveying paint in airless paint spraying applications. This Hose is labeled "Electrically Conductive Airless Paint Spray Hose" on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in all airless paint spraying applications. Do not use any other Hose for airless paint spraying, even if electrically conductive. Use of any other Hose or failure to properly connect the Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. All hoses that convey fuels must be grounded.

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with the requirements of ANSI/IAS NGV 4.2;CSA 12.52, "Hoses for Natural Gas Vehicles and Dispensing Systems" (www.ansi.org). This Hose is labeled "Electrically Conductive for CNG Use"

on its layline and packaging. This Hose must be properly connected to the appropriate Parker Fittings and properly grounded in order to dissipate dangerous static charge buildup, which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other Hose for CNG applications where static charge buildup may occur, even if electrically conductive. Use of other Hoses in CNG applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against CNG permeation through the Hose wall. See section 2.6, Permeation, for more information. Parker CNG Hose is intended for dispenser and vehicle use within the specified temperature range. Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding the specified temperature range. Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per ANSI/IAS NGV 4.2; CSA 12.52.
Parker manufactures special Hose for aerospace in-flight applications. Aerospace in-flight applications employing Hose to transmit fuel, lubricating fluids and hydraulic fluids require a special Hose with a conductive inner tube. This Hose for in-flight applications is available only from Parker's Stratoflex Products Division. Do not use any other Parker Hose for in-flight applications, even if electrically conductive. Use of other Hoses for in-flight applications or failure to properly connect or ground this Hose can cause a fire or an explosion resulting in death, personal injury and property damage. These Hose assemblies for in-flight applications must meet all applicable aerospace industry, aircraft engine and aircraft requirements .

2.2 Pressure: Hose, Tube and Fitting selection must be made so that the published maximum working pressure of the Hose, Tube and Fittings are equal to or greater than the maximum system pressure. The maximum working pressure of a Hose, or Tube Assembly is the lower of the respective published maximum working pressures of the Hose, Tube and the Fittings used. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose, Tube and Fitting. Surge pressures and peak pressures can usually only be determined by sensitive electrical instrumentation that measures and indicates pressures at millisecond intervals. Mechanical pressure gauges indicate only average pressures and cannot be used to determine surge pressures or peak transient pressures. Published burst pressure ratings for Hose is for manufacturing test purposes only and is no indication that the Product can be used in applications at the burst pressure or otherwise above the published maximum recommended working pressure.

2.3 Suction: Hoses used for suction applications must be selected to insure that the Hose will withstand the vacuum and pressure of the system. Improperly selected Hose may collapse in suction application.

2.4 Temperature: Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the Hose, Tube, Fitting and Seals. Temperatures below and above the recommended limit can degrade Hose, Tube, Fittings and Seals to a point where a failure may occur and release fluid. Tube and Fittings performances are normally degraded at elevated temperature. Material compatibility can also change at temperatures outside of the rated range. Properly insulate and protect the Hose Assembly when routing near hot objects (e.g. manifolds). Do not use any Hose in any application where failure of the Hose could result in the conveyed fluids (or vapors or mist from the conveyed fluids) contacting any open flame, molten metal, or other potential fire ignition source that could cause burning or explosion of the conveyed fluids or vapors.

2.5 Fluid Compatibility: Hose, and Tube Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, Tube, Plating and Seals with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis.

Hose, and Tube that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals. Flange or flare processes can change Tube material properties that may not be compatible with certain requirements such as NACE

2.6 Permeation: Permeation (that is, seepage through the Hose or Seal) will occur from inside the Hose or Fitting to outside when Hose or Fitting is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, diesel fuel, gasoline, natural gas, or LPG). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong Hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use Hose or Fitting if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a Hose or Fitting even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose or Tube Assembly. Permeation of moisture from outside the Hose or Fitting to inside the Hose or Fitting will also occur in Hose or Tube assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly, but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used. The sudden pressure release of highly pressurized gas could also result in Explosive Decompression failure of permeated Seals and Hoses.

2.7 Size: Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.

2.8 Routing: Attention must be given to optimum routing to minimize inherent problems (kinking or flow restriction due to Hose collapse, twisting of the Hose, proximity to hot objects or heat sources). For additional routing recommendations see SAE J1273 and ISO 17165-2. Hose Assemblies have a finite life and should be installed in a manner that allows for ease of inspection and future replacement. Hose because of its relative short life, should not be used in residential and commercial buildings inside of inaccessible walls or floors, unless specifically allowed in the product literature. Always review all product literature for proper installation and routing instructions.

2.9 Environment: Care must be taken to insure that the Hose, Tube and Fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals and air pollutants can cause degradation and premature failure.

2.10 Mechanical Loads: External forces can significantly reduce Hose, Tube and Fitting life or cause failure. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type Fittings or adapters may be required to insure no twist is put into the Hose. Use of proper Hose or Tube clamps may also be required to reduce external mechanical loads. Unusual applications may require special testing prior to Hose selection.

2.11 Physical Damage: Care must be taken to protect Hose from wear, snagging, kinking, bending smaller that minimum bend radius and cutting, any of which can cause premature Hose failure. Any Hose that has been kinked or bent to a radius smaller than the minimum bend radius, and any Hose that has been cut or is cracked or is otherwise damaged should be removed and discarded. Fittings with damages such as scratches on sealing surfaces and deformation should be replaced.

2.12 Proper End Fitting: See instructions 3.2 through 3.5. These recommendations may be substantiated by testing to industry standards such as SAE J517 for hydraulic applications, or MIL-A-5070, AS1339, or AS3517 for Hoses from Parker's Stratoflex Products Division for aerospace applications.

2.13 Length: When determining the proper Hose or Tube length of an assembly, be aware of Hose length change due to pressure, Tube length change due to thermal expansion or contraction, and Hose or Tube and machine tolerances and movement must be considered. When routing short hose assemblies, it is recommended that the minimum free hose length is always used. Consult the hose manufacturer for their minimum free hose length recommendations. Hose assemblies should be installed in such a way that any motion or flexing occurs within the same plane.

2.14 Specifications and Standards: When selecting Hose, Tube and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.

2.15 Hose Cleanliness: Hose and Tube components may vary in cleanliness levels. Care must be taken to insure that the Hose and Tube Assembly selected has an adequate level of cleanliness for the application.

2.16 Fire Resistant Fluids: Some fire resistant fluids that are to be conveyed by Hose or Tube require use of the same type of Hose or Tube as used with petroleum base fluids. Some such fluids require a special Hose, Tube, Fitting and Seal, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose, Tube, Fitting or Seal may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

2.17 Radiant Heat: Hose and Seals can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The same heat source may then initiate a fire. This can occur despite the presence of cool air around the Hose or Seal. Performance of Tube and Fitting subjected to the heat could be degraded.

2.18 Welding or Brazing: When using a torch or arc welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the Hose or Seal and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including Hose Fittings and adapters, above 450°F (232°C) such as during welding, brazing or soldering may emit deadly gases. Any elastomer seal on fittings shall be removed prior to welding or brazing, any metallic surfaces shall be protected after brazing or welding when necessary. Welding and brazing filler material shall be compatible with the Tube and Fitting that are joined.

2.19 Atomic Radiation: Atomic radiation affects all materials used in Hose and Tube assemblies. Since the long-term effects may be unknown, do not expose Hose or Tube assemblies to atomic radiation. Nuclear applications may require special Tube and Fittings.

2.20 Aerospace Applications: The only Hose, Tube and Fittings that may be used for in-flight aerospace applications are those available from Parker's Stratoflex Products Division. Do not use any other Hose or Fittings for in-flight applications. Do not use any Hose or Fittings from Parker's Stratoflex Products Division with any other Hose or Fittings, unless expressly approved in writing by the engineering manager or chief engineer of Stratoflex Products Division and verified by the user's own testing and inspection to aerospace industry standards.

2.21 Unlocking Couplings: Ball locking couplings or other Fittings with quick disconnect ability can unintentionally disconnect if they are dragged over obstructions, or if the sleeve or other disconnect member, is bumped or moved enough to cause disconnect. Threaded Fittings should be considered where there is a potential for accidental uncoupling.

3.0 HOSE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1 Component Inspection: Prior to assembly, a careful examination of the Hose and Fittings must be performed. All components must be checked for correct style, size, catalog number, and length. The Hose must be examined for cleanliness, obstructions, blisters, cover looseness, kinks, cracks,cuts or any other visible defects. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion or other imperfections. Do NOT use any component that displays any signs of nonconformance.

3.2 Hose and Fitting Assembly: Do not assemble a Parker Fitting on a Parker Hose that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Do not assemble a Parker Fitting on another manufacturer's Hose or a Parker Hose on another manufacturer's Fitting unless (i) the engineering manager or chief engineer of the appropriate Parker division approves the Assembly in writing or that combination is expressly approved in the appropriate Parker literature for the specific Parker product, and (ii) the user verifies the Assembly and the application through analysis and testing. For Parker Hose that does not specify a Parker Fitting, the user is solely responsible for the selection of the proper Fitting and Hose Assembly procedures. See instruction 1.4.

To prevent the possibility of problems such as leakage at the Fitting or system contamination, it is important to completely remove all debris from the cutting operation before installation of the Fittings. The Parker published instructions must be followed for assembling the Fittings on the Hose. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at www.parker.com.

3.3 Related Accessories: Do not crimp or swage any Parker Hose or Fitting with anything but the listed swage or crimp machine and dies in accordance with Parker published instructions. Do not crimp or swage another manufacturer's Fitting with a Parker crimp or swage die unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.4 Parts: Do not use any Parker Fitting part (including but not limited to socket, shell, nipple, or insert) except with the correct Parker mating parts, in accordance with Parker published instructions, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division.

3.5 Field Attachable/Permanent: Do not reuse any field attachable Hose Fitting that has blown or pulled off a Hose. Do not reuse a Parker permanent Hose Fitting (crimped or swaged) or any part thereof. Complete Hose Assemblies may only be reused after proper inspection under section 4.0. Do not assemble Fittings to any previously used hydraulic Hose that was in service, for use in a fluid power application.

3.6 Pre-Installation Inspection: Prior to installation, a careful examination of the Hose Assembly must be performed. Inspect the Hose Assembly for any damage or defects. DO NOT use any Hose Assembly that displays any signs of nonconformance.

3.7 Minimum Bend Radius: Installation of a Hose at less than the minimum listed bend radius may significantly reduce the Hose life. Particular attention must be given to preclude sharp bending at the Hose to Fitting juncture. Any bending during installation at less than the minimum bend radius must be avoided. If any Hose is kinked during installation, the Hose must be discarded.

3.8 Twist Angle and Orientation: Hose Assembly installation must be such that relative motion of machine components does not produce twisting.

3.9 Securement: In many applications, it may be necessary to restrain, protect, or guide the Hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

3.10 Proper Connection of Ports: Proper physical installation of the Hose Assembly requires a correctly installed port connection insuring that no twist or torque is transferred to the Hose when the Fittings are being tightened or otherwise during use.

3.11 External Damage: Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion,thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

3.12 System Checkout: All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Hose maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

3.13 Routing: The Hose Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

3.14 Ground Fault Equipment Protection Devices (GFEPDs): WARNING! Fire and Shock Hazard. To minimize the danger of fire if the heating cable of a Multitube bundle is damaged or improperly installed, use a Ground Fault Equipment Protection Device. Electrical fault currents may be insufficient to trip a conventional circuit breaker.

For ground fault protection, the IEEE 515: (www.ansi.org) standard for heating cables recommends the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres".

4.0 TUBE AND FITTINGS ASSEMBLY AND INSTALLATION INSTRUCTIONS

4.1 Component Inspection: Prior to assembly, a careful examination of the Tube and Fittings must be performed. All components must be checked for correct style, size, material, seal, and length. Inspect the Fitting and sealing surfaces for burrs, nicks, corrosion, missing seal or other imperfections. Do NOT use any component that displays any signs of nonconformance.

4.2 Tube and Fitting Assembly: Do not assemble a Parker Fitting with a Tube that is not specifically listed by Parker for that Fitting, unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. The Tube must meet the requirements specified to the Fitting. The Parker published instructions must be followed for assembling the Fittings to a Tube. These instructions are provided in the Parker Fitting catalog for the specific Parker Fitting being used, or by calling 1-800-CPARKER, or at www.parker.com.

4.3 Related Accessories: Do not preset or flange Parker Fitting components using another manufacturer's equipment or procedures unless authorized in writing by the engineering manager or chief engineer of the appropriate Parker division. Tube, Fitting component and tooling must be check for correct style, size and material. Operation and maintenance of Related Accessories must be in accordance with the operation manual for the designated Accessory.

4.4 Securement: In many applications, it may be necessary to restrain, protect, or guide the Tube to protect it from damage by unnecessary flexing, pressure surges, vibration, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

4.5 Proper Connection of Ports: Proper physical installation of the Tube Assembly requires a correctly installed port connection insuring that no torque is transferred to the Tube when the Fittings are being tightened or otherwise during use.

4.6 External Damage: Proper installation is not complete without insuring that tensile loads, side loads, flattening, potential abrasion, thread damage or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

4.7 System Checkout: All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Tube Assembly maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

4.8 Routing: The Tube Assembly should be routed in such a manner so if a failure does occur, the escaping media will not cause personal injury or property damage. In addition, if fluid media comes in contact with hot surfaces, open flame or sparks, a fire or explosion may occur. See section 2.4.

5.0 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS

5.1 Even with proper selection and installation, Hose life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a possible Hose failure, and experience with any Hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the Products so that Products are replaced before any failure occurs. Certain products require maintenance and inspection per industry requirements. Failure to adhere to these requirements may lead to premature failure. A maintenance program must be established and followed by the user and, at minimum, must include instructions 5.2 through 5.7

5.2 Visual Inspection Hose/Fitting: Any of the following conditions require immediate shut down and replacement of the Hose Assembly:

• Fitting slippage on Hose;

• Damaged, cracked, cut or abraded cover (any reinforcement exposed);

• Hard, stiff, heat cracked, or charred Hose;

• Cracked, damaged, or badly corroded Fittings;

• Leaks at Fitting or in Hose;

• Kinked, crushed, flattened or twisted Hose; and

• Blistered, soft, degraded, or loose cover.

5.3 Visual Inspection All Other: The following items must be tightened, repaired, corrected or replaced as required:

• Leaking port conditions;

• Excess dirt buildup;/

• Worn clamps, guards or shields; and

• System fluid level, fluid type, and any air entrapment.

5.4 Functional Test: Operate the system at maximum operating pressure and check for possible malfunctions and leaks. Personnel must avoid potential hazardous areas while testing and using the system. See section 2.2.

5.5 Replacement Intervals: Hose assemblies and elastomeric seals used on Hose Fittings and adapters will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Hose Assemblies and elastomeric seals should be inspected and replaced at specific replacement intervals, based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See section 1.2. Hose and Fittings may be subjected to internal mechanical and/or chemical wear from the conveying fluid and may fail without warning. The user must determine the product life under such circumstances by testing. Also see section 2.5.

5.6 Hose Inspection and Failure: Hydraulic power is accomplished by utilizing high pressure fluids to transfer energy and do work. Hoses, Fittings and Hose Assemblies all contribute to this by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure and handling the Hoses transporting the fluids. From time to time, Hose Assemblies will fail if they are not replaced at proper time intervals. Usually these failures are the result of some form of misapplication, abuse, wear or failure to perform proper maintenance. When Hoses fail, generally the high pressure fluids inside escape in a stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by “feeling” with their hands or any other part of their body. High pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated immediately by a physician with knowledge of the tissue damaging properties of hydraulic fluid.

If a Hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the Hose Assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the Hose Assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a Hose Assembly even when pumps or equipment are not operating. Tiny holes in the Hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the Hose Assembly may be examined safely.

Once the pressure has been reduced to zero, the Hose Assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a Hose Assembly that has failed. Consult the nearest Parker distributor or the appropriate Parker division for Hose Assembly replacement information. .

Never touch or examine a failed Hose Assembly unless it is obvious that the Hose no longer contains fluid under pressure. The high pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

5.7 Elastomeric seals: Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.

5.8 Refrigerant gases: Special care should be taken when working with refrigeration systems. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.

5.9 Compressed natural gas (CNG): Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per instructions provided on the Hose Assembly tag. The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage and to perform an electrical resistance test.

Caution: Matches, candles, open flame or other sources of ignition shall not be used for Hose inspection. Leak check solutions should be rinsed off after use.

6.0 HOSE STORAGE

6.1 Age Control: Hose and Hose Assemblies must be stored in a manner that facilitates age control and first-in and first-out usage based on manufacturing date of the Hose and Hose Assemblies. Unless otherwise specified by the manufacturer or defined by local laws and regulations:

6.1.1 The shelf life of rubber hose in bulk form or hose made from two or more materials is 28 quarters (7 years) from the date of manufacture, with an extension of 12 quarters (3 years), if stored in accordance with ISO 2230;

6.1.2 The shelf life of thermoplastic and polytetrafluoroethylene hose is considered to be unlimited;

6.1.3 Hose assemblies that pass visual inspection and proof test shall not be stored for longer than 2 years.

6.1.4 Storage: Stored Hose and Hose Assemblies must not be subjected to damage that could reduce their expected service life and must be placed in a cool, dark and dry area with the ends capped. Stored Hose and Hose Assemblies must not be exposed to temperature extremes, ozone, oils, corrosive liquids or fumes, solvents, high humidity, rodents, insects, ultraviolet light, electromagnetic fields or radioactive materials.

Offer of Sale

PARKER-HANNIFIN CORPORATION
OFFER OF SALE

1. **Definitions**. As used herein, the following terms have the meanings indicated.

   Buyer: means any customer receiving a Quote for Products from Seller.

   Goods: means any tangible part, system or component to be supplied by the Seller.

   Products: means the Goods, Services and/or Software as described in a Quote provided by the Seller.

   Quote: means the offer or proposal made by Seller to Buyer for the supply of Products.

   Seller: means Parker-Hannifin Corporation, including all divisions and businesses thereof.

   Services: means any services to be supplied by the Seller.

   Software: means any software related to the Products, whether embedded or separately downloaded.

   Terms: means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at www.parker.com/saleterms.

2. **Terms**. All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic date interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

3. **Price; Payment**. The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

4. **Shipment; Delivery; Title and Risk of Loss**. All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

5. **Warranty**. The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of twelve (12) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer:

   DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".

6. **Claims; Commencement of Actions**. Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

7. **LIMITATION OF LIABILITY.** IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. **IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON- DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THEREOF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS**.

8. **Loss to Buyer's Property**. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which are or become Buyer's property, will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. **Special Tooling**. Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. Such Special Tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.

10. **Security Interest**. To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. **User Responsibility**. The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.

12. **Use of Products, Indemnity by Buyer**. Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. Unauthorized Uses. If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-

1. compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tooling, equipment, plans, drawings, designs or specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing or tampering with the Products for any reason; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

2. **Cancellations and Changes**. Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.

3. **Limitation on Assignment**. Buyer may not assign its rights or obligations without the prior written consent of Seller.

4. **Force Majeure**. Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

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

6. **Termination**. Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

7. **Ownership of Software**. Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

8. **Indemnity for Infringement of Intellectual Property Rights**. Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.

9. **Governing Law**. These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

10. **Entire Agreement.** These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

11. **Compliance with Laws.** Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti- Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Product from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws.

Index by Part Number

Index by Keyword

Technical Index

Parker's Motion & Control Product Groups

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 1 800 C-Parker (1 800 272 7537).

Aerospace

Key Markets

Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

Key Products

Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes

Automation

Key Markets

Alternative energy
Conveyor & material handling
Factory automation
Food & beverage
Life sciences & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery
Primary metals
Safety & security
Semiconductor & electronics
Transportation & automotive

Key Products

AC/DC drives & systems
Air preparation
Electric actuators, gantry robots & slides
Human machine interfaces
Inverters
Manifolds
Miniature fluidics
Pneumatic actuators & grippers
Pneumatic valves & controls
Rotary actuators
Stepper motors, servo motors, drives & controls
Structural extrusions
Vacuum generators, cups & sensors

Climate & Industrial Controls

Key Markets

Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

Key Products

Accumulators
Advanced actuators
CO_2 controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves

Filtration

Key Markets

Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

Key Products

Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems

Fluid Connectors

Key Markets

Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

Key Products

Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings

Hydraulics

Key Markets

Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

Key Products

Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors

Instrumentation

Key Markets

Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

Key Products

Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/ controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves

Seal

Key Markets

Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

Key Products

Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

Parker Fluid Connectors Group
North American Divisions & Distribution Service Centers

Your complete source for quality tube fittings, hose & hose fittings, brass & composite fittings, quick-disconnect couplings, valves and assembly tools, locally available from a worldwide network of authorized distributors.

Fittings:
Available in inch and metric sizes covering SAE, BSP, DIN, GAZ, JIS and ISO thread configurations, manufactured from steel, stainless steel, brass, aluminum, nylon and thermoplastic.

Hose, Tubing and Bundles:
Available in a wide variety of sizes and materials including rubber, wire-reinforced, thermoplastic, hybrid and custom compounds.

Worldwide Availability:
Parker operates Fluid Connectors manufacturing locations and sales offices throughout North America, South America, Europe and Asia-Pacific.

For information, call toll free...

1-800-C-PARKER
(1-800-272-7537)

North American Divisions

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fax 269 694 4614

Hose Products Division
Wickliffe, OH
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fax 440 943 3129

Industrial Hose Division
Wickliffe, OH
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fax 440 833 2230

Parflex Division
Ravenna, OH
phone 330 296 2871
fax 330 296 8433

Quick Coupling Division
Minneapolis, MN
phone 763 544 7781
fax 763 544 3418

Tube Fittings Division
Columbus, OH
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Distribution Service Centers

Buena Park, CA
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