

**FlareStar®**

Ultra pure PFA tube and weld fittings

Product overview and technical data



THE RESULT OF  
RESEARCH, INNOVATION  
AND APPLICATION

MILESTONE IN HIGH PURITY

GEMÜ®



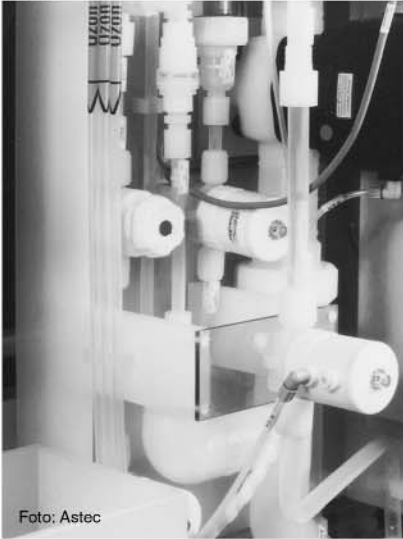
Since 1988, **GEMÜ®** has been an Industry leader in the production of high purity valves, actuators and control systems. Our dedication to quality has earned us many loyal customers in the semiconductor industry.

**GEMÜ® High Purity Products** are developed and produced specifically for use in process equipment, ultra pure water and chemical manufacturing and distribution systems, for microchip production. Production takes place under the strictest cleanroom conditions at our manufacturing site in Switzerland.



**CUSTOMER NEEDS  
ARE OUR MAIN AREA  
OF INTEREST**

THESE PROMPT US TO DEVELOP, PRODUCE AND SUPPLY NEW PRODUCTS



**FlareStar®** - PFA-HP tube and weld fittings

**CleanStar®** - PFA-UHP valves, measurement and control systems, accessories

**HydraLine®** - Pressure measurement devices with PFA transmitter, specifically designed for ultra high purity chemicals

**pureplus®** - A product range that includes PVDF-HP and PP-HP diaphragm valves as well as PVDF-HP flowmeters.



With these products, we offer the widest range of High Purity valves, control systems and accessory components for critical fluid management from a single source.

The ultra pure **FlareStar®** PFA fittings complete the GEMÜ High Purity range.



The **FlareStar®** range includes a wide variety of flare tube fittings and weld fittings.

Tube fittings are available in sizes 1/4", 3/8", 1/2", 3/4", 1" and 1 1/4".

Weld fittings are currently available in sizes 1/4", 1/2", 3/4" and 1".

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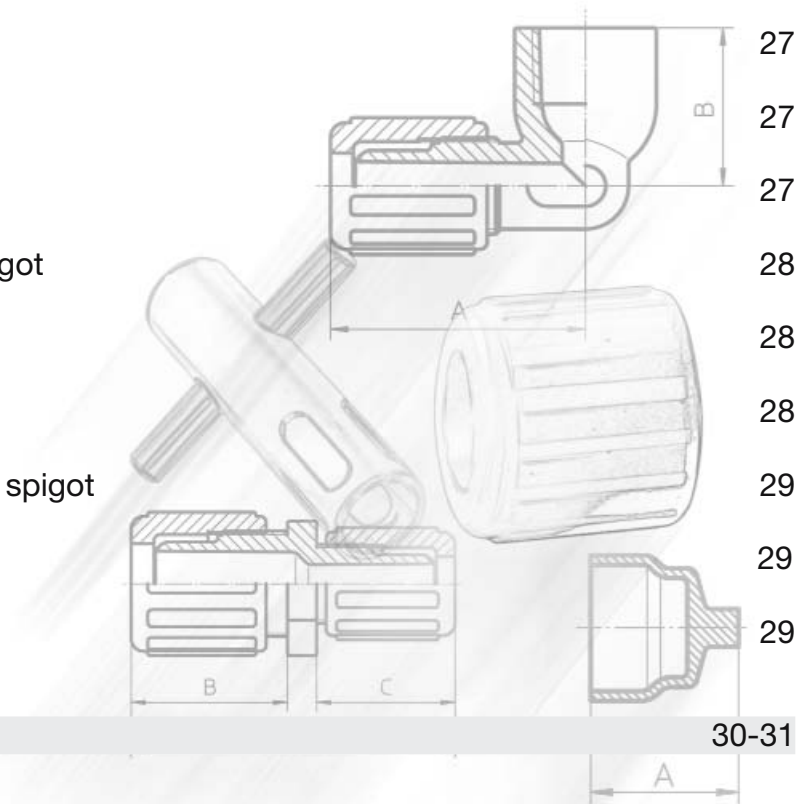
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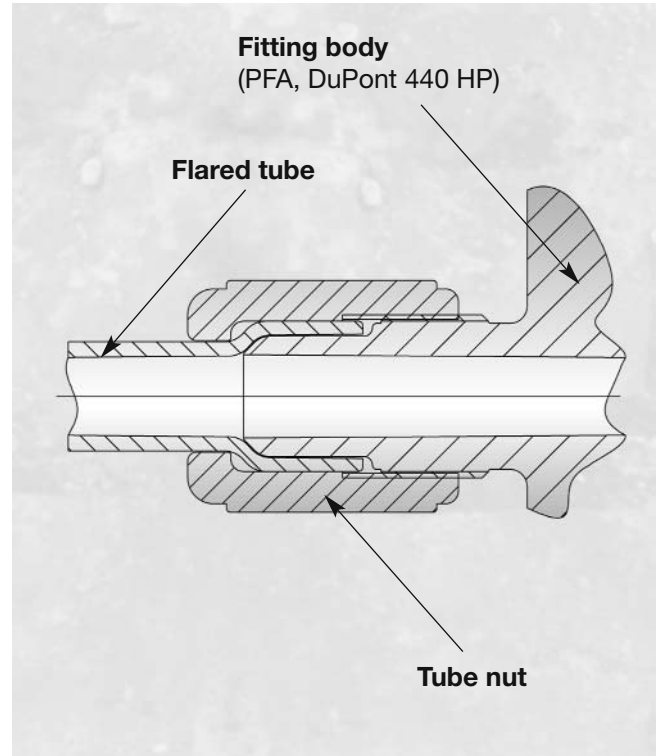
**GEMÜ clean room production 30-31**

## FITTING STYLE

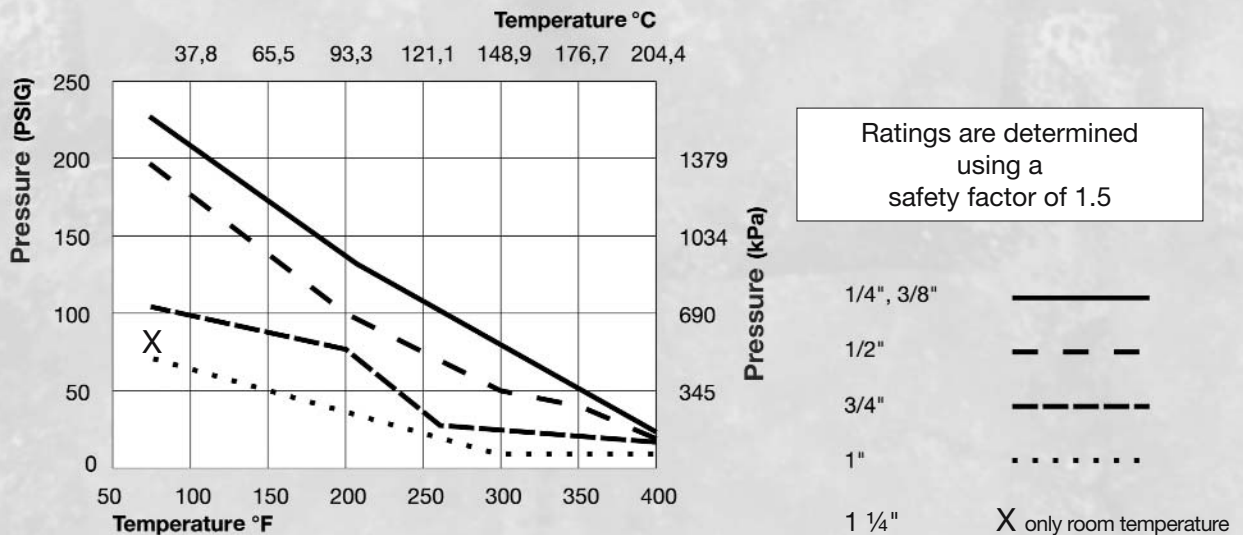
Fittings are designed for leak free performance with minimum dead space. They are ideal for ultra pure fluid applications.

- Reliable in high vibration applications
- Simple installation and access means compact piping and small cleanroom footprint. All HP parts are manufactured in a cleanroom (see page 31) and provide the highest purity and chemical resistance.

The **FlareStar®** range includes a variety of tube fittings and weld fittings. Tube fittings are available in sizes 1/4", 3/8", 1/2", 3/4", 1" and 1 1/4". Weld fittings are available in sizes 1/4", 1/2", 3/4" and 1". Materials include PFA body with PFA, PVDF or carbon-filled PFA (upon inquiry) nut options. GEMÜ offers over 100 configurations. Space saver flared ends and several adapters are also available.



## FlareStar® - Pressure vs. temperature diagram



## MAXIMUM PRESSURE CAPABILITIES

Maximum pressure capabilities of the different **FlareStar**® union nuts are listed below. (Tubing ratings are included as a reference).

The ratings are provided as a guide in system design. The component with the lowest maximum pressure rating determine the maximum system pressure rating.

Maximum pressure rating chart					
Size	Temperature °F (°C)	PFA tubing PSI (kPA)	PVDF nut PSI (kPA)	PFA nut PSI (kPA)	CPFA nut PSI (kPA)
1/4" (4)	75 (24)	273 (1882)	225 (1551)	225 (1551)	Delivery on request
	200 (93)	136 (938)	133 (917)	133 (917)	
	250 (121)	85 (586)	100 (689)	100 (689)	
	300 (150)	61 (421)	75 (517)	75 (517)	
	350 (175)	36 (248)	N/R	50 (345)	
	400 (200)	N/R	N/R	N/R	
3/8" (6)	75 (24)	234 (1613)	225 (1551)	225 (1551)	
	200 (93)	116 (800)	133 (917)	133 (917)	
	250 (121)	73 (503)	100 (689)	100 (689)	
	300 (150)	52 (359)	75 (517)	75 (517)	
	350 (175)	31 (214)	N/R	50 (345)	
	400 (200)	N/R	N/R	N/R	
1/2" (8)	75 (24)	168 (1158)	190 (1310)	190 (1310)	
	200 (93)	83 (572)	100 (689)	100 (689)	
	250 (121)	52 (359)	75 (517)	75 (517)	
	300 (150)	37 (255)	50 (345)	50 (345)	
	350 (175)	22 (152)	N/R	40 (276)	
	400 (200)	N/R	N/R	N/R	
3/4" (12)	75 (24)	107 (738)	110 (758)	110 (758)	
	200 (93)	53 (365)	76 (524)	76 (524)	
	250 (121)	33 (228)	35 (241)	35 (241)	
	300 (150)	24 (165)	27 (186)	27 (186)	
	350 (175)	14 (95,5)	N/R	20 (138)	
	400 (200)	N/R	N/R	N/R	
1" (16)	75 (24)	77 (531)	75 (517)	75 (517)	
	200 (93)	38 (262)	40 (276)	40 (276)	
	250 (121)	24 (165)	28 (193)	28 (193)	
	300 (150)	17 (117)	15 (103)	15 (103)	
	350 (175)	10 (68,9)	N/R	15 (103)	
	400 (200)	N/R	N/R	N/R	
1 1/4" (20)	75 (24)	80 (552)	80 (552)	on request	

## FLARE AND ASSEMBLY PROCEDURES

The flaring process provides a permanent expansion (flare) of the tubing end, allowing insertion of the **FlareStar®** fitting body. Proper tube flaring and **FlareStar®** fitting assembly results in a secure tubing connection.

These procedures are recommended for flaring standard wall PFA tubing only.

To ensure secure connections please read the instructions below carefully. After flaring, the heated tubing will cool down quickly.

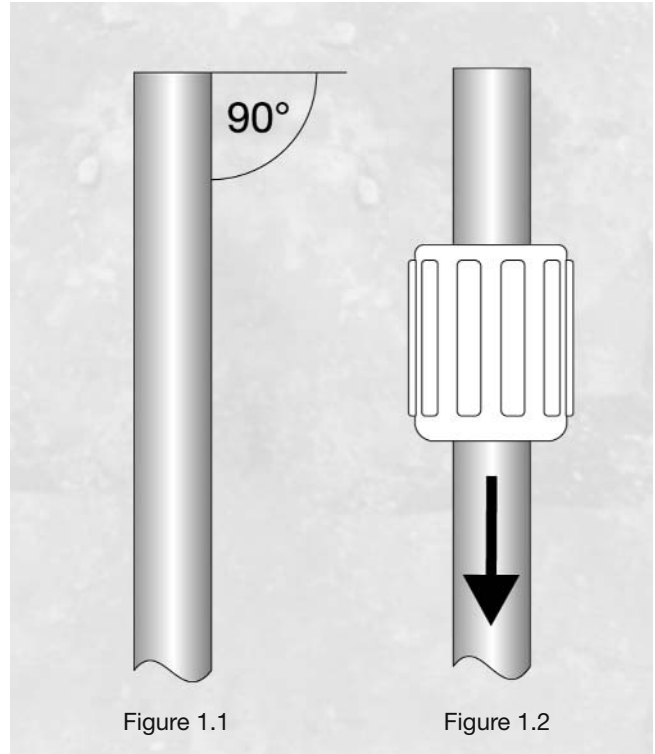


Figure 1.1

Figure 1.2

### I. Tubing preparation

1. Cut the required tubing length square using a tubing cutter. (Figure 1.1)
2. Insert the cut end of the tubing through the end of the nut. (Figure 1.2)

**Note:** If one tubing end has already been flared, put on the nut before flaring the other end.

### II. Flaring instructions

1. If using a hot air gun, set the hot air gun (see figure 1) on „high“. Hold the PFA tubing 1/2“ to 3/4“ above the heater. Rotate the tubing 360° for the approximate time specified in table 1 or until a fine, clear line appears around the tubing. (Figure 2)

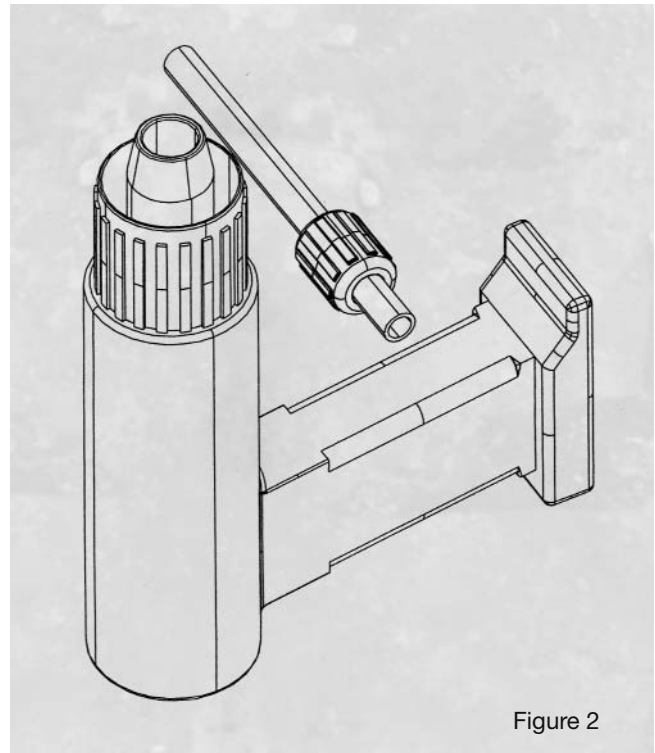


Figure 2



## FLARE AND ASSEMBLY PROCEDURES

Note: Make sure to fully rotate the tubing over the heat source so all surface areas receive an equal amount of heat. Uniform heating is essential in making a good flare.

Note: We advise against cold flaring to reduce the potential for stress cracking.

2. Remove the PFA tubing from the heat source, and push the flaring mandrel (see figure 3) into the tubing until the tube stop is reached. Refer to page 21 for available mandrel configurations.

Turn on the infrared heating tool (see figure 2). Center 1/2" to 3/4" of the PFA tubing between the heat rings. Slowly rotate the PFA tubing back and forth between your forefinger and thumb, while heating for the approximate time specified in table 1 (see page 10) or until a fine, clear line appears around the tubing. (Figure 3)

Note: Flaring 1/4" tubing is difficult because of its small size.

To get a firm grip on the small tube diameter, we recommend using a grip pad.

3. Hold the tubing firmly onto the flaring mandrel for the time specified in table 1 (see page 10). (Figure 4)

4. Now let the flared tubing continue to cool on the flaring mandrel for the time specified in table 1 (see page 10).

5. The flaring process is now complete and the flaring mandrel may be removed from the tube.

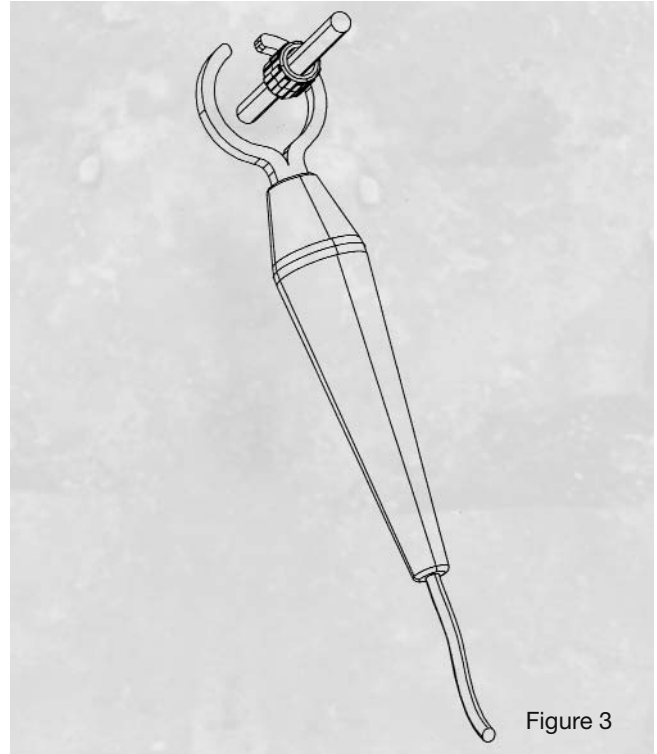


Figure 3

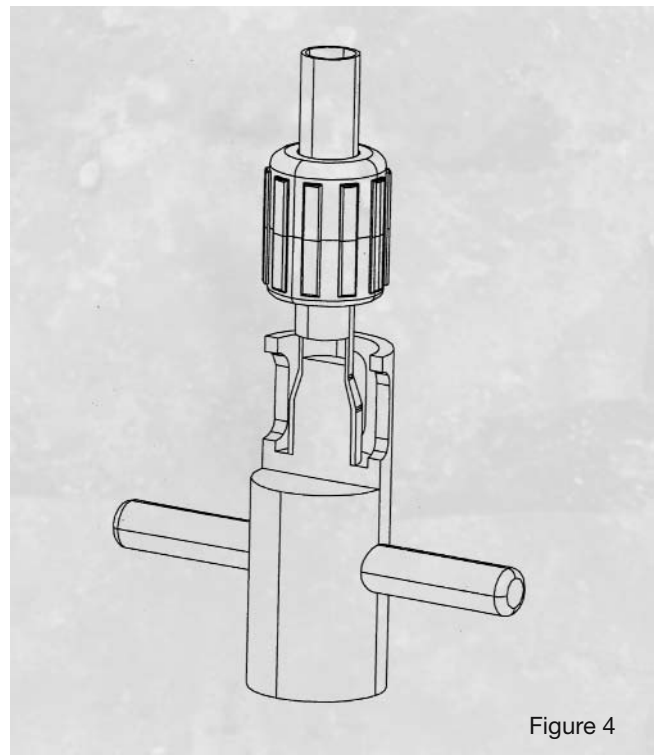
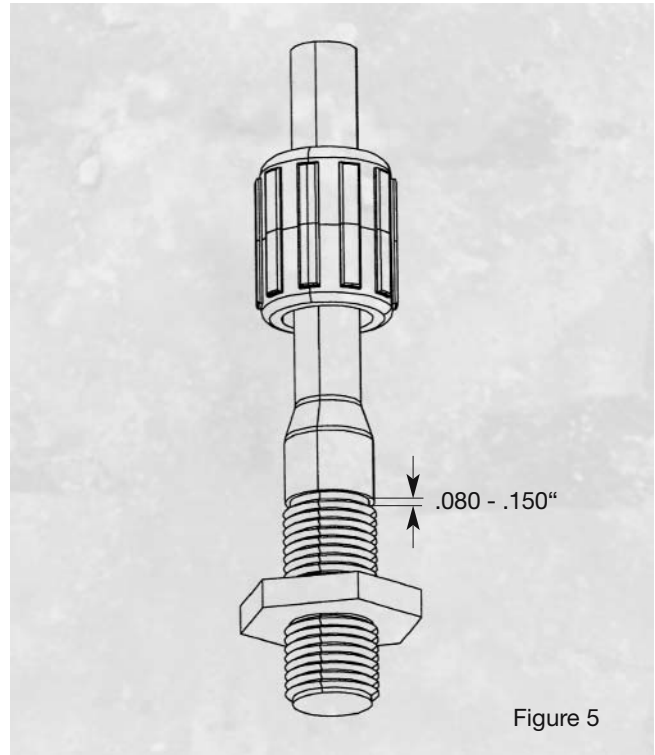


Figure 4

## FLARE AND ASSEMBLY PROCEDURES

### III. Assembly instructions

1. Push the flared tubing end onto the **FlareStar®** fitting body until the end of the fitting body contacts the flare shoulder of the tube.  
The maximum gap between the tube end and end of threads should be .080 - .150" (see figure 5).
2. Now tighten the nut onto the fitting body handtight (see table 1 for recommended minimum torque values).



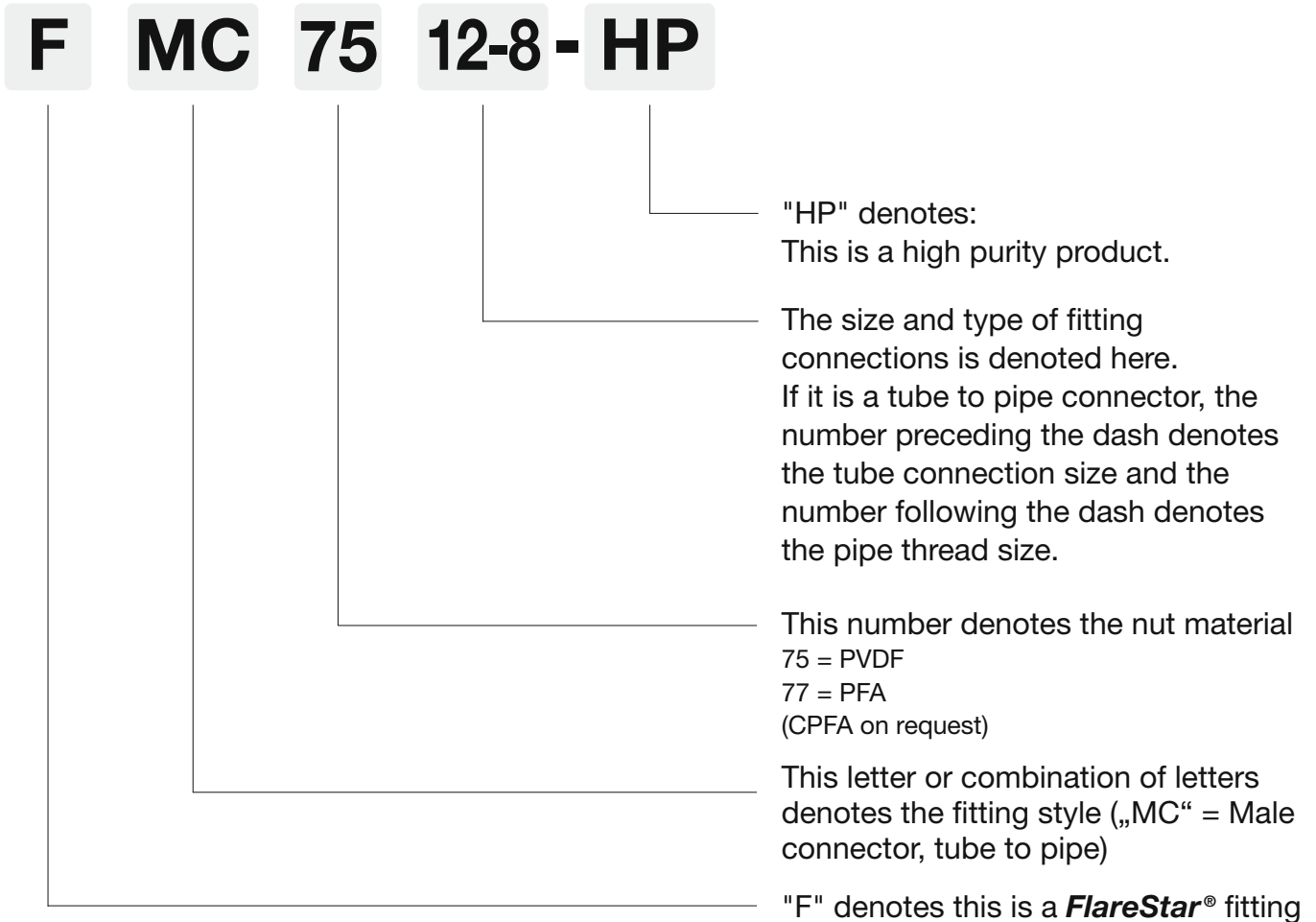
### IV. Re-tightening

"Space saver" fitting connections exposed to temperatures >165°F should be re-tightened after material has reached room temperature again. The minimum nut torque value is identified in table 1.

Table 1

Tubing and fitting size	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"
<b>Heating time for PFA (sec.)</b>						
Air gun	15	25	25	25	25	25
Infrared heater	40	50	50	50	60	60
<b>Hold tubing on flaring mandrel (sec.)</b>	20	20	20	20	25	25
<b>Min. cooling time on mandrel (min.)</b>	2	2	3	3	3	3
<b>Min. nut torque (inch, lbs, (Nm))</b>						
PFA fitting/PVDF nut	5 (.57)	5 (.90)	11 (1.24)	14 (1.58)	30 (3.39)	35 (3.96)
PFA fitting/PFA nut	5 (.57)	8 (.90)	11 (.24)	14 (1.58)	30 (3.57)	on request
PFA fitting/CPFA nut	on request	on request	on request	on request	on request	

## ORDER EXAMPLE - PFA TUBE FITTINGS



### **FlareStar®** FITTING TYPES

<b>FMC</b>	Male connector	<b>FFC</b>	Straight adapter, flare/DIN flange adapter
<b>FFE</b>	Female elbow	<b>FPM</b>	Panel mount union
<b>FME</b>	Male elbow	<b>FSUT</b>	Straight union, tube
<b>FUSE</b>	Union space saver elbow	<b>FSA</b>	Straight adapter, flare/butt weld spigot
<b>FUE</b>	Union elbow	<b>FWSA</b>	Straight adapter, space saver/butt weld spigot
<b>FSE</b>	Union space saver elbow (both sides)	<b>FUT</b>	Union tee
<b>FRE</b>	Reducer elbow	<b>FRT</b>	Union reducer tee
<b>FSRE</b>	Space saver reducer elbow	<b>FUST</b>	Union space saver tee
<b>FWEA</b>	Union elbow, flare/butt weld spigot	<b>FRST</b>	Union space saver reducer tee
<b>FWES</b>	Union elbow, space saver/butt weld spigot	<b>LC</b>	Cap
<b>FSU</b>	Straight union	<b>CF</b>	Nut
<b>FSR</b>	Straight reducer union		
<b>FSSR</b>	Straight Space Saver reducer union		

## ULTRA PURE PFA TUBE FITTINGS



**Male connector**

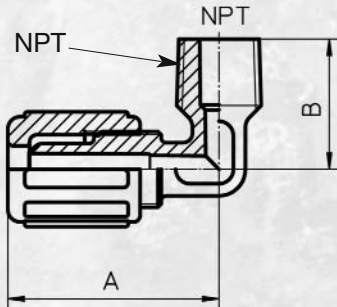
Fitting type **	O.D. Tube size	Male NPT size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	Hex
FMC 75 4-2 HP	1/4"	1/8"	3.30 (0.13")	51.50 (2.03")	30.50 (1.20")	14.00 (0.55")	5/8"
FMC 75 4-4 HP	1/4"	1/4"	3.30 (0.13")	49.70 (1.95")	28.70 (1.12")	14.00 (0.55")	5/8"
FMC 75 6-4 HP	3/8"	1/4"	6.35 (0.25")	52.20 (2.06")	30.90 (1.22")	14.30 (0.56")	15/16"
FMC 75 6-6 HP	3/8"	3/8"	6.35 (0.25")	52.20 (2.06")	30.90 (1.22")	14.30 (0.56")	15/16"
FMC 75 6-8 HP	3/8"	1/2"	6.35 (0.25")	55.00 (2.17")	30.90 (1.22")	17.10 (0.67")	15/16"
FMC 75 8-4 HP	1/2"	1/4"	5.84 (0.23")	55.50 (2.19")	34.50 (1.36")	14.00 (0.55")	15/16"
FMC 75 8-6 HP	1/2"	3/8"	7.85 (0.31")	55.30 (2.18")	34.50 (1.36")	13.80 (0.54")	15/16"
FMC 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	58.30 (2.30")	34.90 (1.37")	16.80 (0.66")	15/16"
FMC 75 12-8 HP	3/4"	1/2"	10.90 (0.43")	62.60 (2.46")	38.00 (1.50")	17.60 (0.69")	13/16"
FMC 75 12-8 HP	3/4"	1/2"	10.90 (0.43")	62.60 (2.46")	38.00 (1.50")	17.60 (0.69")	13/16"
FMC 75 12-12 HP	3/4"	3/4"	15.75 (0.62")	62.60 (2.46")	38.00 (1.50")	17.60 (0.69")	13/16"
FMC 75 16-12 HP	1"	3/4"	15.75 (0.62")	68.20 (2.68")	44.20 (1.74")	17.60 (0.69")	17/16"
FMC 75 16-16 HP	1"	1"	15.75 (0.62")	73.90 (2.91")	45.30 (1.78")	21.60 (0.85")	17/16"
FMC 75 20-16 HP	1 1/4"	1"	27.90 (1.09")	89.90 (3.50")	50.00 (1.97")	21.60 (0.85")	-



**Female elbow**

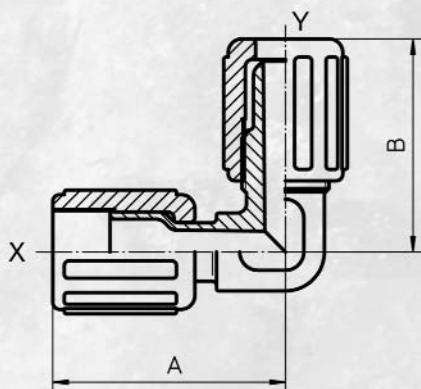
Fitting type **	O.D. Tube size	Female NPT size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FFE 75 8-8 HP	1/2"	1/2"	9.56 (0.38")	51.00 (2.01")	31.00 (1.22")

## ULTRA PURE PFA TUBE FITTINGS



**Male elbow**

Fitting type **	O.D. Tube size	Male NPT size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FME 75 4-4 HP	1/4"	1/4"	3.30 (0.13")	40.7 (1.60")	27.0 (1.06")
FME 75 6-4 HP	3/8"	1/4"	6.00 (0.23")	43.9 (1.73")	27.0 (1.06")
FME 75 6-6 HP	3/8"	3/8"	6.35 (0.25")	43.9 (1.73")	27.0 (1.06")
FME 75 6-8 HP	3/8"	1/2"	6.35 (0.25")	44.4 (1.75")	30.0 (1.18")
FME 75 6-12 HP	3/8"	3/4"	6.35 (0.25")	49.4 (1.95")	34.5 (1.36")
FME 75 8-6 HP	1/2"	3/8"	9.65 (0.38")	46.3 (1.82")	27.0 (1.06")
FME 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	46.3 (1.82")	30.0 (1.18")
FME 75 8-12 HP	1/2"	3/4"	9.65 (0.38")	50.8 (2.00")	34.5 (1.36")
FME 75 12-8 HP	3/4"	1/2"	10.80 (0.43")	55.2 (2.17")	35.0 (1.38")
FME 75 12-12 HP	3/4"	3/4"	16.00 (0.63")	55.2 (2.17")	35.0 (1.38")
FME 75 16-16 HP	1"	1"	22.10 (0.87")	68.6 (2.70")	45.7 (1.79")

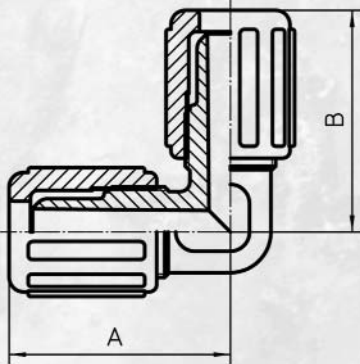


**Union space saver elbow**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FUSE 75 X6-6 HP	3/8"	9.65 (0.38")	44.50 (1.75")	47.30 (1.86")
FUSE 75 X8-8 HP	1/2"	16.00 (0.63")	47.00 (1.85")	51.00 (2.01")
FUSE 75 X12-12 HP	3/4"	16.00 (0.63")	56.00 (2.20")	60.50 (2.38")
FUSE 75 X16-16 HP	1"	22.10 (0.87")	78.60 (3.09")	68.60 (2.70")
FUSE 75 X20-20 HP	1 1/4"	27.90 (1.09")	81.20 (3.19")	81.40 (3.20")

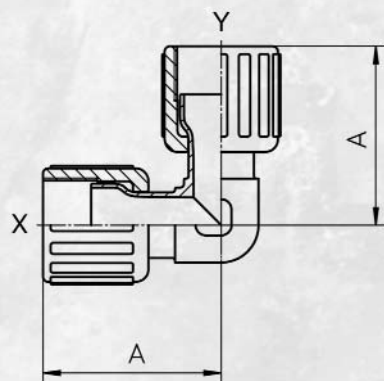
\*\* With PVDF nut (standard); with PFA nut = ref. no. 77 (except size 1 1/4").

## ULTRA PURE PFA TUBE FITTINGS



**Union elbow**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FUE 75 4 HP	1/4"	3.30 (0.13")	40.90 (1.61")	40.90 (1.61")
FUE 75 6 HP	3/8"	6.35 (0.25")	44.50 (1.75")	44.50 (1.75")
FUE 75 8 HP	1/2"	9.65 (0.38")	46.50 (1.83")	46.50 (1.83")
FUE 75 12 HP	3/4"	16.00 (0.63")	53.30 (2.10")	53.30 (2.10")
FUE 75 16 HP	1"	22.10 (0.87")	68.90 (2.71")	68.90 (2.71")
FUE 75 20 HP	1 1/4"	27.80 (1.09")	86.70 (3.41")	86.70 (3.41")



**Union space saver  
elbow (both sides)**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FSE 75 X4-Y4 HP	1/4"	3.30 (0.13")	40.20 (1.58")	40.20 (1.58")
FSE 75 X6-Y6 HP	3/8"	6.35 (0.25")	43.10 (1.69")	43.10 (1.69")
FSE 75 X8-Y8 HP	1/2"	9.65 (0.38")	49.90 (1.96")	49.90 (1.96")
FSE 75 X12-Y12 HP	3/4"	16.00 (0.63")	57.20 (2.25")	57.20 (2.25")
FSE 75 X16-Y16 HP	1"	22.10 (0.87")	69.30 (2.72")	69.30 (2.72")
FSE 75 X20-Y20 HP	1 1/4"	27.90 (1.09")	86.60 (3.40")	86.60 (3.40")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



**Reducer elbow**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FRE 75 6-4 HP	3/8" x 1/4"	3.30 (0.13")	44.50 (1.75")	40.50 (1.59")
FRE 75 8-6 HP	1/2" x 3/8"	6.35 (0.25")	46.40 (1.83")	44.50 (1.75")
FRE 75 12-6 HP	3/4" x 3/8"	6.35 (0.25")	56.90 (2.24")	48.70 (1.92")
FRE 75 12-8 HP	3/4" x 1/2"	9.65 (0.38")	51.00 (2.01")	51.00 (2.01")
FRE 75 16-12 HP	1" x 3/4"	16.00 (0.63")	68.90 (2.71")	62.80 (2.47")
FRE 75 20-16 HP	1 1/4" x 1"	22.10 (0.87")	85.70 (3.38")	70.00 (2.75")



**Space saver  
reducer elbow**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
FSRE 75 4-Y6 HP	1/4" x 3/8"	3.30 (0.13")	40.70 (1.60")	43.10 (1.69")
FSRE 75 4-Y8 HP	1/4" x 1/2"	3.30 (0.13")	40.70 (1.60")	49.90 (1.96")
FSRE 75 6-Y4 HP	3/8" x 1/4"	3.30 (0.13")	43.40 (1.70")	40.20 (1.58")
FSRE 75 6-Y8 HP	3/8" x 1/2"	6.35 (0.25")	44.40 (1.74")	49.90 (1.96")
FSRE 75 6-Y12 HP	3/8" x 3/4"	6.35 (0.25")	43.40 (1.70")	57.20 (2.25")
FSRE 75 8-Y6 HP	1/2" x 3/8"	6.35 (0.25")	46.30 (1.82")	43.10 (1.69")
FSRE 75 8-Y12 HP	1/2" x 3/4"	9.65 (0.38")	45.80 (1.80")	57.20 (2.25")
FSRE 75 8-Y16 HP	1/2" x 1"	9.65 (0.38")	45.80 (1.80")	71.10 (2.79")
FSRE 75 12-Y16 HP	3/4" x 1"	16.00 (0.63")	53.20 (2.09")	69.30 (2.72")
FSRE 75 16-Y12 HP	1" x 3/4"	16.00 (0.63")	60.60 (2.38")	57.50 (2.26")
FSRE 75 16-Y20 HP	1" x 1 1/4"	22.10 (0.87")	69.90 (2.75")	86.20 (3.39")
FSRE 75 20-Y16 HP	1 1/4" x 1"	22.10 (0.87")	85.30 (3.35")	79.30 (3.12")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



Union elbow adapter,  
flare/butt weld spigot

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FWEA 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	37.00 (1.45")	21.30 (0.83")	15.40 (0.60")	19.00 (0.75")	49.80 (1.96")
FWEA 75 12-12 HP	3/4"	3/4"	16.00 (0.63")	43.00 (1.69")	26.70 (1.05")	20.60 (0.81")	19.00 (0.75")	62.20 (2.44")



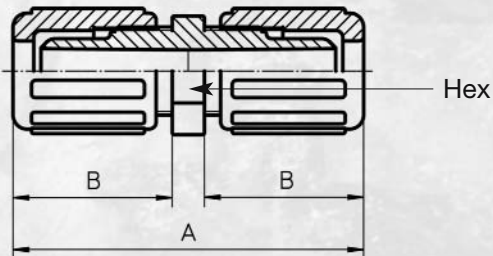
Union elbow adapter, space  
saver/butt weld spigot

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FWES 75 X8-8 HP	1/2" S	1/2"	9.65 (0.38")	37.00 (1.45")	21.30 (0.83")	15.40 (0.60")	19.00 (0.75")	50.90 (2.00")
FWES 75 X12-12 HP	3/4" S	3/4"	16.00 (0.63")	43.00 (1.69")	26.70 (1.05")	20.60 (0.81")	19.00 (0.75")	63.20 (2.48")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

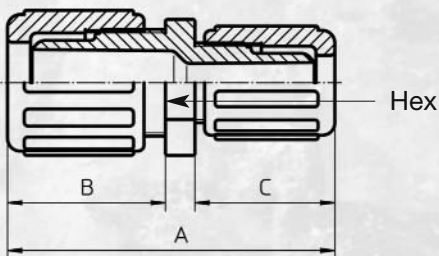


## ULTRA PURE PFA TUBE FITTINGS



**Straight union**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)	Hex
FSU 75 4 HP	1/4"	3.30 (0.13")	68.00 (2.68")	3.30 (0.13")	11/16"
FSU 75 6 HP	3/8"	6.35 (0.25")	69.00 (2.72")	3.30 (0.13")	13/16"
FSU 75 8 HP	1/2"	9.65 (0.38")	76.00 (2.99")	3.30 (0.13")	15/16"
FSU 75 12 HP	3/4"	16.00 (0.63")	83.00 (3.27")	3.30 (0.13")	13/16"
FSU 75 16 HP	1"	22.10 (0.87")	97.60 (3.84")	3.30 (0.13")	17/16"
FSU 75 20 HP	1 1/4"	27.80 (1.09")	126.00 (4.36")		-



**Straight reducer union**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	Hex
FSR 75 6-4 HP	3/8" x 1/4"	3.30 (0.13")	69.40 (2.73")	30.90 (1.22")	30.50 (1.20")	13/16"
FSR 75 8-4 HP	1/2" x 1/4"	3.30 (0.13")	73.00 (2.87")	34.50 (1.36")	30.50 (1.20")	15/16"
FSR 75 8-6 HP	1/2" x 3/8"	6.35 (0.25")	72.40 (2.85")	35.50 (1.40")	30.90 (1.22")	15/16"
FSR 75 12-4 HP	3/4" x 1/4"	3.30 (0.13")	73.50 (2.89")	36.50 (1.44")	30.00 (1.18")	13/16"
FSR 75 12-6 HP	3/4" x 3/8"	6.35 (0.25")	75.90 (3.00")	38.00 (1.50")	30.90 (1.22")	13/16"
FSR 75 12-8 HP	3/4" x 1/2"	9.65 (0.38")	79.50 (3.13")	37.00 (1.50")	34.50 (1.36")	1 3/16"
FSR 75 16-12 HP	1" x 3/4"	16.00 (0.63")	90.30 (3.56")	45.30 (1.78")	38.00 (1.50")	1 7/16"
FSR 75 20-16 HP	1 1/4" x 1"	21.10 (0.87")	113.00 (4.45")	50.00 (1.97")	47.50 (1.87")	-

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



**Straight „Space saver” reducer union**

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	Hex
FSSR 75 X 8-6 HP	1/2" S - 3/8"	6.35 (0.25")	74.60 (2.94")	31.40 (1.24")	36.20 (1.43")	13/16"



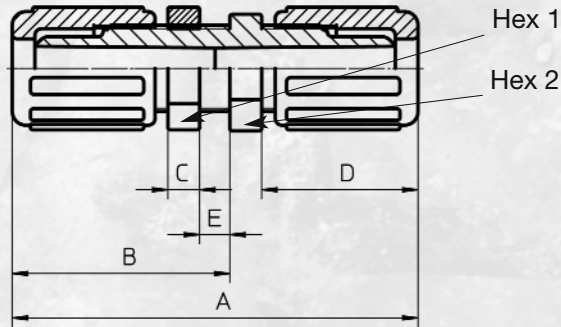
**Straight adapter, flare/  
DIN flange adapter**

Fitting type **	O.D. Tube size	DIN flange adapter	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FFC 75 16 25 HP	1"	DN 25	22,1 (0,87")	87 (3,42")	28 (1,10")	41 (1,61")	68 (2,67")	10 (0,39")

Machined from TFM 1700.

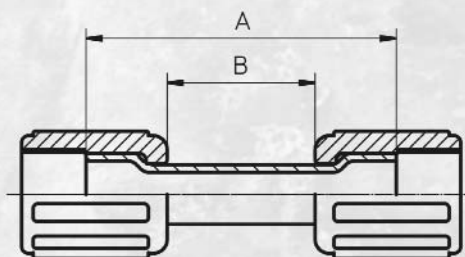
\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



Panel mount union

Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E max mm (inch)	Hex 1	Hex 2
FPM 75 4 HP	1/4"	3.30 (0.13")	76.80 (3.02")	43.80 (1.72")	7.00 (0.28")	26.00 (1.02")	9.30 (0.37")	11/16"	11/16"
FPM 75 6 HP	3/8"	6.35 (0.25")	77.90 (3.07")	44.50 (1.75")	7.00 (0.28")	26.14 (1.04")	9.50 (0.37")	15/16"	13/16"
FPM 75 8 HP	1/2"	9.65 (0.38")	84.50 (3.33")	48.00 (1.89")	7.00 (0.28")	29.50 (1.16")	9.00 (0.35")	1 1/16"	15/16"
FPM 75 12 HP	3/4"	16.00 (0.63")	98.50 (3.88")	52.50 (2.07")	7.00 (0.28")	38.00 (1.50")	9.50 (0.37")	1 5/16"	1 3/16"
FPM 75 16 HP	1"	22.10 (0.87")	104.10 (4.11")	58.70 (2.31")	7.00 (0.28")	38.80 (1.53")	9.70 (0.38")	1 3/4"	1 7/16"



Straight tube union

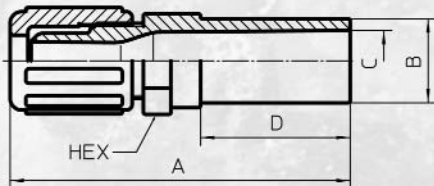
Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)
<b>Normal length</b>				
FSUT 75 8-8 N	1/2"	9.65 (0.38")	99.00 (3.9")	65.00 (2.6")
FSUT 75 12-12 N	3/4"	16.00 (0.63")	114.00 (4.5")	75.00 (3.0")
<b>Intermediate length</b>				
FSUT 75 8-8 J	1/2"	9.65 (0.38")	66.00 (2.6")	32.00 (1.2")
FSUT 75 12-12 J	3/4"	16.00 (0.63")	72.00 (2.8")	33.00 (1.3")
<b>Minimum length</b>				
FSUT 75 8-8 M	1/2"	9.65 (0.38")	51.00 (2.0")	17.00 (0.7")
FSUT 75 12-12 M	3/4"	16.00 (0.63")	53.00 (2.1")	14.00 (0.5")

Other tube sizes available.

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

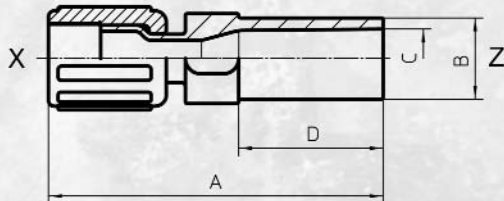
## ULTRA PURE PFA TUBE FITTINGS

**Straight adapter,  
flare/butt weld spigot**



Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	Hex
FSA 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	85.80 (3.37")	21.30 (0.83")	15.40 (0.60")	38.00 (1.50")	15/16"
FSA 75 12-12 HP	3/4"	3/4"	16.00 (0.63")	90.20 (3.55")	26.70 (1.05")	20.60 (0.81")	38.00 (1.50")	1 3/16"
FSA 75 16-16 HP	1"	1"	22.10 (0.87")	97.10 (3.82")	33.40 (1.31")	26.30 (1.04")	38.00 (1.50")	1 7/16"
FSA 75 20-16 HP	1 1/4"	1"	25.40 (1.00")	105.00 (4.13")	33.40 (1.31")	26.30 (1.04")	38.00 (1.50")	-

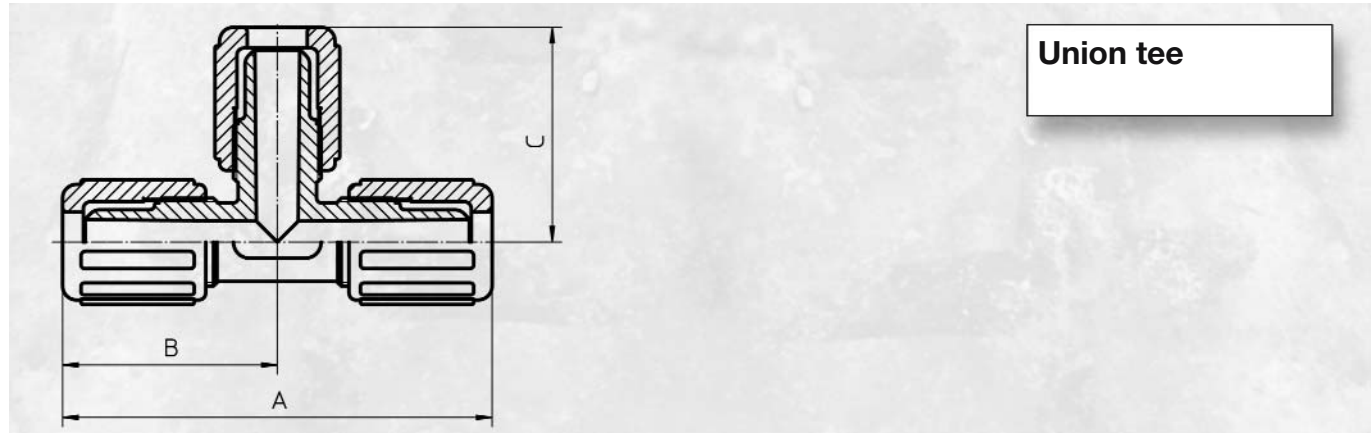
**Straight adapter, space  
saver/butt weld spigot**



Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
FWSA 75X8-8 HP	1/2" S	1/2"	9.65 (0.38")	88.00 (3.46")	21.30 (0.83")	15.40 (0.60")	38.00 (1.49")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



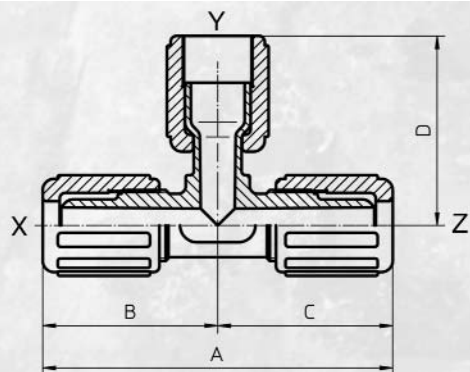
Fitting type **	O.D. Tube size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)
FUT 75 4 HP	1/4"	3.30 (0.13")	81.80 (3.22")	40.90 (1.61")	40.90 (1.61")
FUT 75 6 HP	3/8"	6.35 (0.25")	89.00 (3.50")	44.50 (1.75")	44.50 (1.75")
FUT 75 8 HP	1/2"	9.65 (0.38")	93.00 (3.66")	46.50 (1.83")	46.50 (1.83")
FUT 75 12 HP	3/4"	16.00 (0.63")	106.50 (4.19")	53.30 (2.10")	53.30 (2.10")
FUT 75 16 HP	1"	22.10 (0.87")	138.00 (5.43")	69.00 (2.72")	69.00 (2.72")
FUT 75 20 HP	1 1/4"	27.90 (1.10")	173.00 (6.81")	86.50 (3.40")	87.00 (3.43")



Fitting type **	O.D. Tube size			Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
	X	Y	Z					
FRT 75 4-6-6 HP	1/4"	3/8"	3/8"	3.30 (0.13")	85.30 (3.36")	44.40 (1.75")	40.90 (1.61")	44.40 (1.75")
FRT 75 6-4-6 HP	3/8"	1/4"	3/8"	3.30 (0.13")	87.80 (3.45")	43.90 (1.73")	43.90 (1.73")	40.70 (1.60")
FRT 75 6-12-6 HP	3/8"	3/4"	3/8"	6.25 (0.25")	96.30 (3.79")	48.15 (1.89")	48.15 (1.89")	56.20 (2.25")
FRT 75 8-4- 8 HP	1/2"	1/4"	1/2"	3.30 (0.13")	94.30 (3.70")	47.00 (1.85")	47.00 (1.85")	40.90 (1.61")
FRT 75 8-6- 6 HP	1/2"	3/8"	3/8"	6.35 (0.25")	90.20 (3.55")	46.30 (1.82")	46.30 (1.78")	43.90 (1.78")
FRT 75 8-6- 8 HP	1/2"	3/8"	1/2"	6.35 (0.25")	94.00 (3.70")	47.00 (1.85")	47.00 (1.85")	44.50 (1.75")
FRT 75 12-4-12 HP	3/4"	1/4"	3/4"	3.30 (0.13")	112.00 (4.41")	56.00 (2.20")	56.00 (2.20")	45.50 (1.79")
FRT 75 12-8-4 HP	3/4"	1/2"	1/4"	3.30 (0.13")	98.50 (3.87")	53.80 (2.11")	44.70 (1.75")	50.80 (2.00")
FRT 75 12-8- 8 HP	3/4"	1/2"	1/2"	9.65 (0.38")	106.00 (4.17")	55.20 (2.12")	50.80 (2.00")	50.80 (2.00")
FRT 75 12-12- 8 HP	3/4"	3/4"	1/2"	9.65 (0.38")	107.00 (4.19")	56.00 (2.20")	51.00 (2.01")	56.20 (2.21")
FRT 75 12-8-12 HP	3/4"	1/2"	3/4"	9.65 (0.38")	106.50 (4.21")	53.30 (2.10")	53.30 (2.10")	51.00 (2.01")
FRT 75 16-8-16 HP	1"	1/2"	1"	9.65 (0.38")	134.20 (5.28")	67.10 (2.69")	67.10 (2.69")	61.30 (2.41")
FRT 75 16-12-16 HP	1"	3/4"	1"	16.00 (0.63")	136.80 (5.39")	68.40 (2.69")	68.40 (2.69")	62.50 (2.46")
FRT 75 20-16-20 HP	1 1/4"	1"	1 1/4"	16.00 (0.63")	173.00 (6.81")	86.50 (3.40")	86.50 (3.40")	70.00 (2.76")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



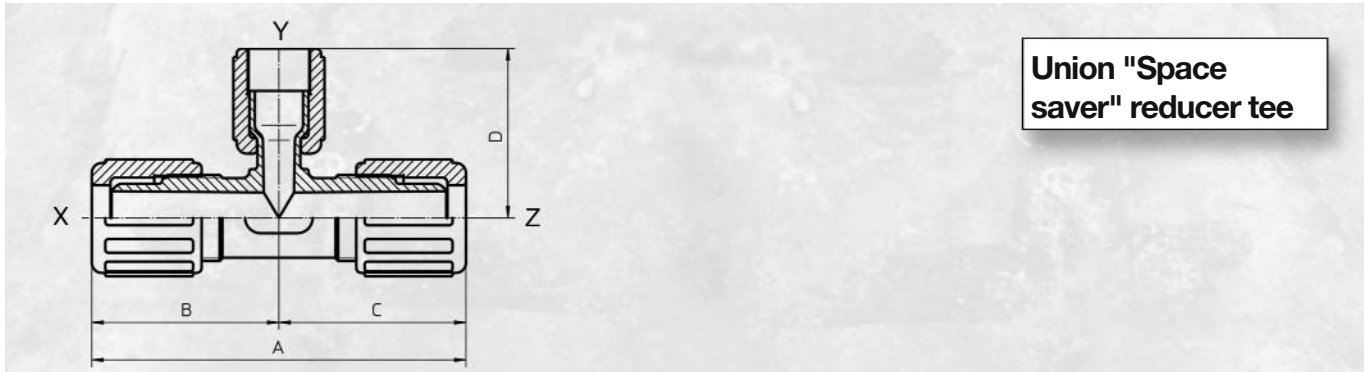
Union "Space saver" tee

Fitting type **	O.D. Tube size			Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
	X	Y	Z					
FUST 75 6-6-Z 6 HP	3/8"	3/8"	3/8" S	6.35 (0.25")	92.50 (3.64")	44.40 (1.75")	48.11 (1.89")	44.40 (1.75")
FUST 75 8-8-Z 8 HP	1/2"	1/2"	1/2" S	9.65 (0.38")	96.70 (3.80")	45.80 (1.80")	50.90 (2.00")	45.80 (1.80")
FUST 75 12-12-Z12 HP	3/4"	3/4"	3/4" S	16.00 (0.63")	117.00 (4.61")	56.10 (2.21")	60.90 (2.40")	56.00 (2.20")
FUST 75 16-16-Z16 HP	1"	1"	1" S	22.10 (0.87")	142.00 (5.59")	68.60 (2.70")	73.60 (2.89")	68.60 (2.70")
FUST 75X 8-8-Z 8 HP	1/2" S	1/2"	1/2" S	9.65 (0.28")	95.80 (3.77")	47.90 (1.88")	47.90 (1.88")	46.30 (1.82")
FUST 75X12-12-Z12 HP	3/4" S	3/4"	3/4" S	16.00 (0.63")	117.00 (4.52")	57.50 (2.26")	57.50 (2.26")	56.00 (2.20")
FUST 75X16-16-Z16 HP	1" S	1"	1" S	22.10 (0.87")	150.20 (5.95")	75.10 (2.95")	75.10 (2.95")	68.60 (2.70")
FUST 75 6-Y6-6 HP	3/8"	3/8" S	3/8"	6.35 (0.25")	88.80 (3.49")	44.40 (1.75")	44.40 (1.75")	43.10 (1.69")
FUST 75 8-Y8-8 HP	1/2"	1/2" S	1/2"	9.65 (0.38")	94.00 (3.70")	47.00 (1.85")	47.00 (1.85")	44.50 (1.75")
FUST 75 12-Y12-12 HP	3/4"	3/4" S	3/4"	16.00 (0.63")	112.00 (4.41")	56.00 (2.20")	56.00 (2.20")	45.00 (1.77")
FUST 75 16-Y16-16 HP	1"	1" S	1"	22.10 (0.87")	137.50 (5.41")	68.75 (2.70")	68.75 (2.70")	70.10 (2.75")
FUST 75 6-Y6-Z6 HP	3/8"	3/8" S	3/8"	6.35 (0.25")	87.50 (3.44")	44.40 (1.75")	43.10 (1.69")	43.10 (1.69")
FUST 75 16-Y16-Z16 HP	1"	1" S	1"	22.10 (0.87")	137.50 (5.41")	68.00 (2.67")	69.30 (2.72")	69.30 (2.72")
FUST 75 X12-Y12-Z12 HP	3/4"	3/4" S	3/4"	16.00 (0.63")	115.00 (4.52")	57.50 (2.26")	57.50 (2.26")	57.50 (2.26")

X, Y, Z indicates the position of the space saver(s) in the type key.  
S means space saver connection in the section "tube size".

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



**Union "Space saver" reducer tee**

Fitting type **	O.D. Tube size			Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
	X	Y	Z					
FRST 75 8-Y6-8 HP	1/2"	3/8" S	1/2"	6.35 (0.25")	91.00 (3.58")	45.50 (1.79")	45.50 (1.79")	43.10 (1.69")
FRST 75 12-Y8-12 HP	3/4"	1/2" S	3/4"	6.35 (0.25")	112.00 (4.41")	56.00 (2.20")	56.00 (2.20")	50.80 (2.00")
FRST 75 16-Y8-16 HP	1"	1/2" S	1"	9.65 (0.38")	138.90 (5.46")	69.45 (2.73")	69.45 (2.73")	53.90 (2.12")
FRST 75 16-Y12-16 HP	1"	3/4" S	1"	16.00 (0.63")	138.90 (5.46")	69.45 (2.73")	69.45 (2.73")	60.20 (2.37")

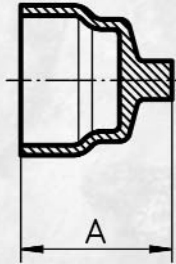
X, Y, Z indicates the position of the space saver(s) in the type key.

S means space saver connection in the section "tube size".

\*\*With PVDF nut (standard); with PFA nut = ref. no. 77.

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



**Cap  
(for male flare spigot)**

Fitting type **	O.D. Tube size	A mm (inch)
FLC 4 HP	1/4"	16.50 (0.65")
FLC 6 HP	3/8"	21.50 (0.85")
FLC 8 HP	1/2"	22.60 (0.89")
FLC 12 HP	3/4"	23.60 (0.93")
FLC 16 HP	1"	32.00 (1.26")
FLC 20 HP	1 1/4"	35.00 (1.38")



**Flaring mandrel**

Assembly tool for PFA  
flare connection

Type designation	O.D. Tube size	DN/mm
1098 4Z 01	1/4"	4
1098 6Z 01	3/8"	6
1098 8Z 01	1/2"	10
1098 12Z 01	3/4"	15
1098 16Z 01	1"	20
1098 20Z 01	1 1/4"	25

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.



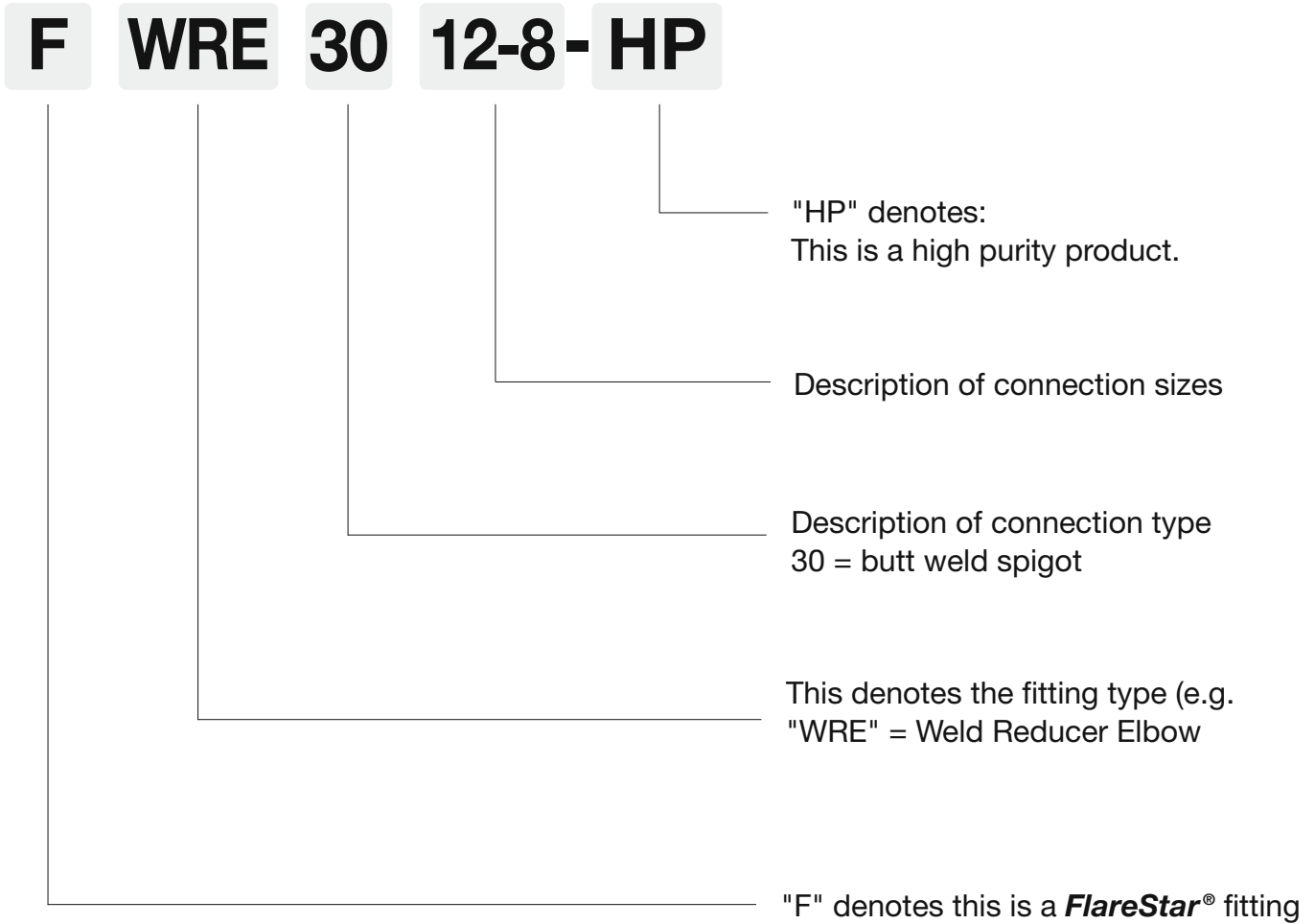
## ULTRA PURE PFA TUBE FITTINGS



PVDF			PFA		
Type designation	O.D. Tube size	DN/mm	Type designation	O.D. Tube size	DN/mm
CF 75 4Z HP	1/4"	4	CF 77 4Z HP	1/4"	4
CF 75 6Z HP	3/8"	6	CF 77 6Z HP	3/8"	6
CF 75 8Z HP	1/2"	10	CF 77 8Z HP	1/2"	10
CF 75 12Z HP	3/4"	15	CF 77 12Z HP	3/4"	15
CF 75 16Z HP	1"	20	CF 77 16Z HP	1"	20
CF 75 20Z HP	1 1/4"	25	CF 77 20Z HP	1 1/4"	25

CPFA nut on request

## ORDER EXAMPLE - WELD FITTINGS



## FlareStar® FITTING TYPES

- FWUE** Union elbow 90°
- FWRE** Reducer elbow 90°
- FWEA** Union elbow adapter, flare/butt weld spigot
- FWES** Union elbow adapter, space saver/butt weld spigot
- FWSR** Straight reducer
- FSA** Straight adapter, flare/butt weld spigot
- FWSA** Straight adapter, space saver/butt weld spigot
- FWUT** Union tee
- FWRT** Union reducer tee

## ULTRA PURE PFA TUBE FITTINGS



**Union elbow 90°**

Fitting type **	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
FWUE 30 8 HP	1/2"	15.40 (0.60")	56.00 (2.20")	21.30 (0.83")	15.40 (0.60")	37.00 (1.45")
FWUE 30 12 HP	3/4"	20.60 (0.81")	60.00 (2.30")	26.70 (1.05")	20.60 (0.81")	38.00 (1.50")
FWUE 30 16 HP	1"	26.30 (1.04")	62.00 (2.44")	33.40 (1.31")	26.30 (1.04")	38.00 (1.50")



**Reducer elbow 90°**

Fitting type **	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)	F mm (inch)
FWRE 30 8-4 HP	1/2" x 1/4"	9.00 (0.35")	38.00 (1.49")	38.00 (1.49")	21.30 (0.83")	15.40 (0.60")	13.70 (0.53")	9.00 (0.35")
FWRE 30 12-8 HP	3/4" x 1/2"	15.40 (0.60")	39.00 (1.53")	38.00 (1.49")	26.70 (1.05")	20.60 (0.81")	21.30 (0.83")	15.40 (0.60")

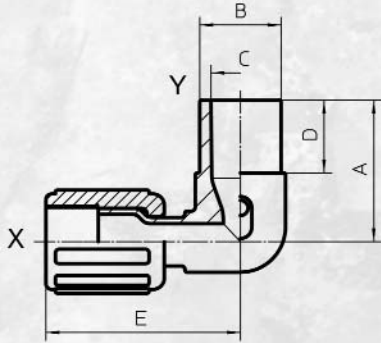


**Union elbow,  
flare/butt weld spigot**

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FWEA 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	37.00 (1.45")	21.30 (0.83")	15.40 (0.60")	19.00 (0.75")	49.80 (1.96")
FWEA 75 12-12 HP	3/4"	3/4"	16.00 (0.63")	43.00 (1.69")	26.70 (1.05")	20.60 (0.81")	19.00 (0.75")	62.20 (2.44")

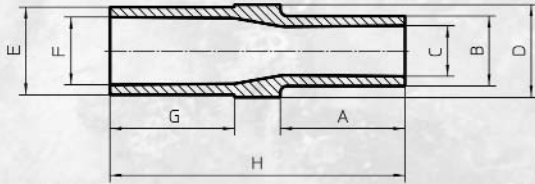
\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



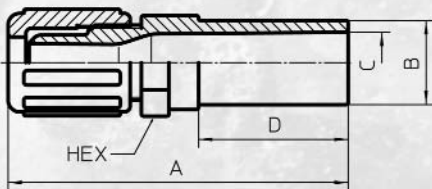
**Union elbow, space saver/butt weld spigot**

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FWES 75 X8-8 HP	1/2" S	1/2"	9.65 (0.38")	37.00 (1.45")	21.30 (0.83")	15.40 (0.60")	19.00 (0.75")	50.90 (2.00")
FWES 75 X12-12 HP	3/4" S	3/4"	16.00 (0.63")	43.00 (1.69")	26.70 (1.05")	20.60 (0.81")	19.00 (0.75")	63.20 (2.48")



**Straight reducer**

Fitting type **	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)	F mm (inch)	G mm (inch)	H mm (inch)
FWSR 30 12-8 HP	3/4" x 1/2"	15.40 (0.60")	39.00 (1.53")	21.30 (0.83")	15.40 (0.60")	28.60 (1.12")	26.70 (1.05")	20.60 (0.81")	38.00 (1.49")	90.00 (3.54")

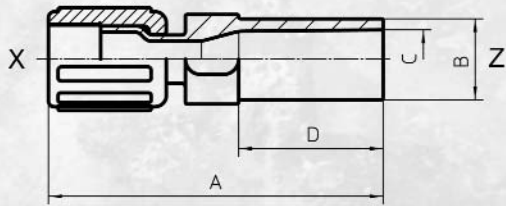


**Straight adapter, flare/butt weld spigot**

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	Hex
FSA 75 8-8 HP	1/2"	1/2"	9.65 (0.38")	85.80 (3.37")	21.30 (0.83")	15.40 (0.60")	38.00 (1.50")	15/16"
FSA 75 12-12 HP	3/4"	3/4"	16.00 (0.63")	90.20 (3.55")	26.70 (1.05")	20.60 (0.81")	38.00 (1.50")	1 3/16"
FSA 75 16-16 HP	1"	1"	22.10 (0.87")	97.10 (3.82")	33.40 (1.31")	26.30 (1.04")	38.00 (1.50")	1 7/16"
FSA 75 20-16 HP	1 1/4"	1"	25.40 (1.00")	105.00 (4.13")	33.40 (1.31")	26.30 (1.04")	38.00 (1.50")	-

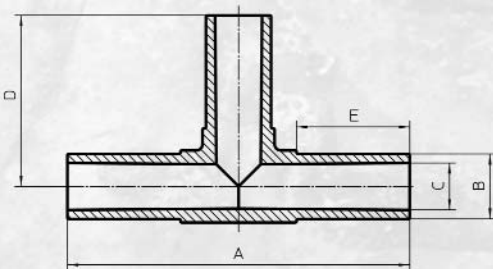
\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## ULTRA PURE PFA TUBE FITTINGS



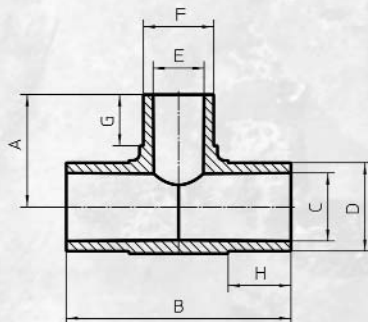
**Straight adapter, space saver/butt weld spigot**

Fitting type **	O.D. Tube size	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)
FWSA 75X8-8 HP	1/2" S	1/2"	9.65 (0.38")	88.00 (3.46")	21.30 (0.83")	15.40 (0.60")	38.00 (1.49")



**Union tee**

Fitting type **	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)
FWUT 30 8 HP	1/2"	15.40 (0.60")	112.00 (4.40")	21.30 (0.83")	15.40 (0.60")	56.00 (2.20")	37.00 (1.45")
FWUT 30 12 HP	3/4"	20.60 (0.81")	116.00 (4.56")	26.70 (1.05")	20.60 (0.81")	58.00 (2.28")	38.00 (1.49")



**Union reducer tee**

Fitting type **	Pipe size	Orifice mm (inch)	A mm (inch)	B mm (inch)	C mm (inch)	D mm (inch)	E mm (inch)	F mm (inch)	G mm (inch)	H mm (inch)
FWRT 30 12-8-12 HP	3/4" x 1/2" x 3/4"	15.40 (0.60")	34.00 (1.33")	68.00 (2.67")	20.60 (0.81")	26.70 (1.05")	15.40 (0.60")	21.30 (0.83")	15.50 (0.61")	19.00 (0.75")

\*\* With PVDF nut (standard); with PFA nut = ref. no. 77.

## PERMANENTLY CONTROLLED QUALITY

PURITY, PERFECTION, SAFETY

To assure the highest purity all UHP products are manufactured, cleaned, assembled and packed under cleanroom conditions.

### Injection molding

All high purity resins are molded in a separate cleanroom under laminar flow class 1000 conditions.

### Cleaning of high purity products



Fully automated 3-chamber cleaning system, precleaning with UPW/tenside, ultrasonic cleaning and final rinse with UPW ("all wetted parts" in PVDF and Halar), drying (hot air class 1000), 18.2 MΩ UPW.



## ASSURED QUALITY

The manufacture of GEMÜ high purity products is subject to a modern, continuous quality management system.

Constant reproducible quality in compliance with application and customer requirements is assured by e.g.

- Use of specified/controlled raw materials
- SPC - statistic process control
- Constant training of staff
- Supervision
- Customer audits
- Continuous improvement

**MANUFACTURED  
UNDER CLEANROOM  
CONDITIONS**

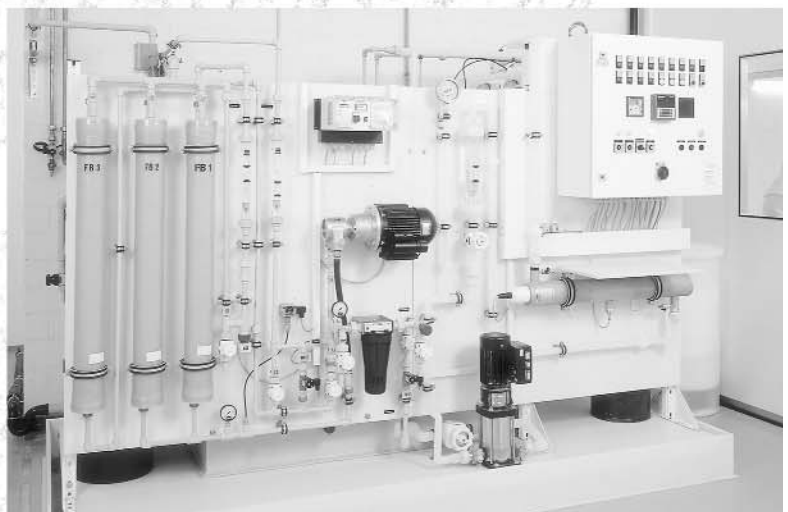
**THE VALVES WITH PURITY „DESIGNED IN“**

**Assembly, testing, packaging**  
under laminar flow cleanroom class 100.



**Ultra pure water  
treatment plant**

18.2 MΩ UPW water is used  
for cleaning and testing,  
softener, reverse osmosis,  
UV sterilization,  
ion exchanger, polisher,  
submicron filter, PVDF-HP  
recirculation loop.





**GEMÜ**® VALVES, ACTUATORS  
AND CONTROL SYSTEMS

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