

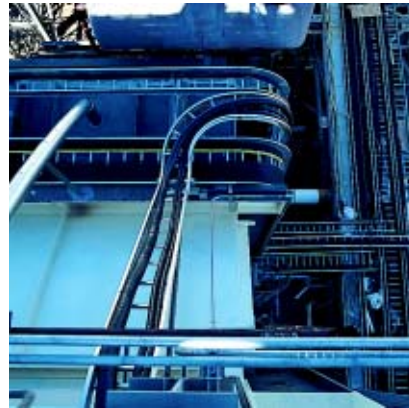
**Parflex Multitube<sup>®</sup>  
Instrument and Heat  
Trace Tubing Products**

*Catalog 4200-M-1/USA  
August 2003*



**The World Standard**

**Parflex Multitube<sup>®</sup>  
Instrument and Heat  
Trace Tubing Products**



 **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.

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".

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## Multitube® Instrument and Heat Trace Tubing Products

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









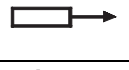
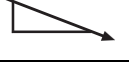

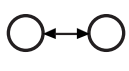



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### Definition of Symbols Used in Tables

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Armor O.D.		Nominal Throat Diameter
	Heat Loss		Number of Tubes
	Heat Gain		R-Factor
	Horizontal/Vertical Support Centers		Part Number
	Insulation Thickness		Process Tube O.D.
	Jacket Thickness		Product Weight
	Maximum Circuit Length		Shipping Weight
	Maximum Pulling Tension		Slope
	Minimum Bend Radius		Spacing
	Mounting Thread Size		Tracer Tube O.D.
	Nominal Product O.D.		

## ***Section A — Multitube® Metal and Plastic***

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# CT & SST Plastic Coated Single Metal Instrument and Control Tubing



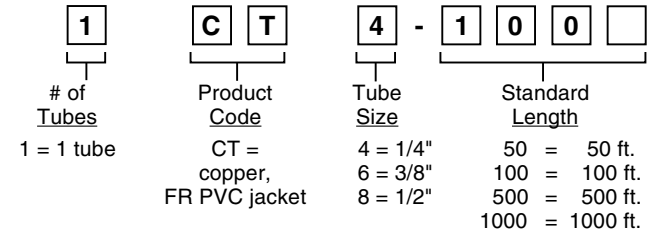
**General:** Parker Plastic Coated Single Metal Tubing contains a tube of copper or stainless steel covered with a jacket of corrosion-resistant PVC 1/32" (0.032") thick.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials, wall thicknesses and seamless stainless steel are available upon request. Consult Division for details. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog.

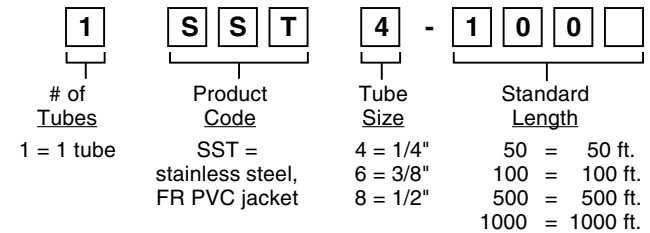
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Ordering Example for CT:**



**Ordering Example for SST:**



**Physical Data\***

Description	Part Number <b>#</b>	Nominal Product O.D. (in.) 	Standard Length (ft.)	Type of Package	Shipping Weight (lbs./100 ft.)** 	Minimum Bend Radius (in.) 	Product Weight (lbs./100 ft.) 
Copper Tubes: 1/4" O.D. x 0.030" Wall	‡ 1CT4-50	0.32	50	Coil	5.4	2	9.7
	‡ 1CT4-100		100	Coil	10.3		
	‡ 1CT4-500		500	Coil	10.0		
	‡ 1CT4-1000		1000	Coil	10.0		
Copper Tubes: 3/8" O.D. x 0.032" Wall	‡ 1CT6-50	0.44	50	Coil	5.8	3	15.8
	‡ 1CT6-100		100	Coil	16.8		
	‡ 1CT6-500		500	Coil	16.3		
	‡ 1CT6-1000		1000	Reel	16.3		
Copper Tubes: 1/2" O.D. x 0.035" Wall	‡ 1CT8-50	0.57	50	Coil	6.3	7	23.0
	‡ 1CT8-100		100	Coil	24.5		
	‡ 1CT8-500		500	Reel	23.9		
	‡ 1CT8-1000		1000	Reel	25.1		
Stainless Steel Tubes: 1/4" O.D. x 0.035" Wall	‡ 1SST4-50	0.32	50	Coil	5.4	2	19.9
	‡ 1SST4-100		100	Coil	20.4		
	‡ 1SST4-500		500	Coil	20.2		
	‡ 1SST4-1000		1000	Coil	20.1		
Stainless Steel Tubes: 3/8" O.D. x 0.035" Wall	‡ 1SST6-50	0.44	50	Coil	5.8	3	24.5
	‡ 1SST6-100		100	Coil	25.4		
	‡ 1SST6-500		500	Coil	24.9		
	‡ 1SST6-1000		1000	Reel	24.9		
Stainless Steel Tubes: 1/2" O.D. x 0.035" Wall	‡ 1SST8-50	0.57	50	Coil	6.3	7	53.4
	‡ 1SST8-100		100	Coil	54.8		
	‡ 1SST8-500		500	Reel	54.3		
	‡ 1SST8-1000		1000	Reel	55.4		

\* All values are nominal. Dimensional data to be used as reference only.

\*\* Except for 50' coils which is Wt. (lbs./50 ft.)

‡ Indicates stock item.

# CT & CTHW Multiple Copper Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Construction, is designed for general use both indoors and outdoors. Instrument Tubing is used for the transmission of hydraulic or pneumatic signals to monitor or control a process.

**Tubing:** Type 122 DHP Seamless Copper tubing is standard. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

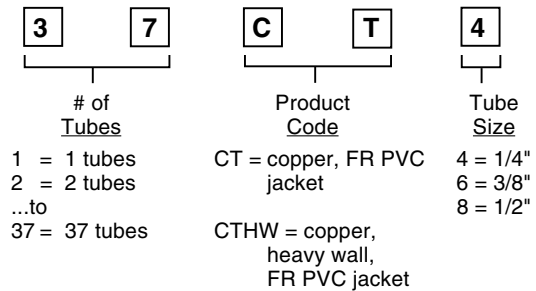
**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog.

CTHW Heavy Wall Construction, is designed with an extra heavy wall FR PVC jacket for direct burial applications. Other heavy wall configurations can be ordered on special request. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Ordering Example for CT:**



**Physical Data\***

Description	Part Number #	Number of Tubes # # # #	Jacket Thickness (in.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)	Maximum § Pulling Tension (lbs.)	Product Weight (lbs./100 ft.)	Horizontal/Vertical Support Centers (ft.)
Copper Tubes: 1/4" O.D. x 0.030" Wall	‡ 2CT4	2	.063	.64	2.5	300	25	8
	‡ 3CT4	3	.063	.74	2.5	600	43	8
	‡ 4CT4	4	.063	.74	2.5	600	43	8
	‡ 5CT4	5	.063	.82	3.0	750	53	8
	‡ 7CT4	7	.063	.89	3.5	1050	70	12
	‡ 8CT4	8	.063	.97	3.5	1200	81	12
	‡ 10CT4	10	.063	1.15	5.0	1500	98	12
	12CT4	12	.080	1.22	6.0	1800	119	12
	14CT4	14	.080	1.28	7.0	2100	137	12
	19CT4	19	.110	1.46	8.0	2850	186	12
37CT4	37	.110	2.02	11.0	5550	353	12	
Copper Tubes: 3/8" O.D. x 0.032" Wall	‡ 2CT6	2	.063	.89	5.5	500	40	8
	‡ 3CT6	3	.063	.95	6.0	750	55	8
	‡ 4CT6	4	.063	1.05	6.5	1000	70	8
	‡ 5CT6	5	.063	1.16	7.5	1250	85	8
	‡ 7CT6	7	.080	1.31	8.5	1750	118	12
	‡ 8CT6	8	.080	1.42	9.0	2000	138	12
	‡ 10CT6	10	.110	1.72	12.0	2500	171	12
	12CT6	12	.110	1.80	12.5	3000	206	12
	14CT6	14	.110	1.91	14.0	3500	232	12
	19CT6	19	.110	2.13	15.0	4750	310	12
Copper Tubes: 1/2" O.D. x 0.035" Wall	‡ 2CT8	2	.063	1.15	10.0	700	58	8
	‡ 3CT8	3	.080	1.26	11.0	1050	84	8
	‡ 4CT8	4	.080	1.36	12.0	1400	106	8
Copper Tubes: 1/4" O.D. x 0.030" Wall	4CTHW4	4	.125	.87	2.5	600	54	8
	5CTHW4	5	.125	.94	3.0	750	65	8
	7CTHW4	7	.125	1.02	3.5	1050	86	12
	8CTHW4	8	.125	1.18	3.5	1200	95	12
	10CTHW4	10	.125	1.27	5.0	1500	115	12
	12CTHW4	12	.188	1.46	6.0	1800	142	12
	19CTHW4	19	.188	1.65	8.0	2850	218	12
37CTHW4	37	.188	2.15	11.0	5550	388	12	

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).  
‡ Indicates stock item.

# CA Armored Multiple Copper Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Armored Construction, is designed for use where excellent mechanical protection for the tubing is required in storage or during and after installation. Instrument Tubing is used for the transmission of hydraulic or pneumatic signals to monitor or control a process.

**Tubing:** Type 122 DHP Seamless Copper tubing is standard. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

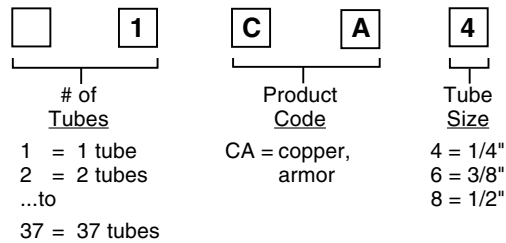
**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Armor:** A flexible, galvanized steel, interlocked armor is employed over the tubing core assembly, separated by a layer of black vinyl tape which cushions the tubes from the armor and protects the tubing and armor from electrogalvanic action.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at hook-up points.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Ordering Example for CA:**



**Physical Data\***

Description	Part Number #	Number of Tubes (#/#)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)	Maximum § Pulling Tension (lbs.)	Product Weight (lbs./100 ft.)	Horizontal/Vertical Support Centers (ft.)
Copper Tubes: 1/4" O.D. x .030" Wall	1CA4	1	.49	2.5	150	23	8
	2CA4	2	.74	2.5	300	44	8
	3CA4	3	.78	2.5	450	54	8
	4CA4	4	.84	2.5	600	66	8
	5CA4	5	.92	3.0	750	78	8
	7CA4	7	.99	3.5	1050	97	12
	8CA4	8	1.07	3.5	1200	111	12
	10CA4	10	1.25	5.0	1500	134	12
	12CA4	12	1.28	6.0	1800	152	12
	14CA4	14	1.34	7.0	2100	171	12
Copper Tubes: 3/8" O.D. x .032" Wall	19CA4	19	1.50	8.0	2850	220	12
	37CA4	37	2.00	11.0	5550	396	12
	1CA6	1	.61	5.5	250	33	8
	2CA6	2	.99	5.5	500	66	8
	3CA6	3	1.05	6.0	750	83	8
	4CA6	4	1.15	6.5	1000	102	8
	5CA6	5	1.26	7.5	1250	123	8
	7CA6	7	1.37	8.5	1750	153	12
	8CA6	8	1.49	9.0	2000	177	12
	10CA6	10	1.75	12.0	2500	212	12
Copper Tubes: 1/2" O.D. x .035" Wall	12CA6	12	1.81	12.5	3000	242	12
	14CA6	14	1.90	13.5	3500	275	12
	19CA6	19	2.12	15.0	4750	353	12
	1CA8	1	.74	9.0	350	45	8
	2CA8	2	1.25	10.0	700	91	8
Copper Tubes: 1/2" O.D. x .035" Wall	3CA8	3	1.32	11.0	1050	115	8
	4CA8	4	1.45	12.0	1400	143	8

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).  
‡ Indicates stock item.



# CAT Armored Multiple Copper Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Armored Construction, is designed for use where corrosion resistance and excellent mechanical protection for the tubing is required in transit, in storage, and during and after installation. Instrument Tubing is used for the transmission of hydraulic or pneumatic signals to monitor or control a process.

**Tubing:** Type 122 DHP Seamless Copper tubing is standard. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Armor:** A flexible, galvanized steel, interlocked armor is employed over the tubing core assembly, separated by a layer of black vinyl tape which cushions the tubes from the armor and protects the tubing and armor from electrogalvanic action between them.

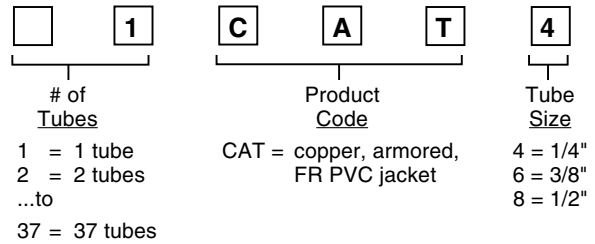
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For

Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at hook-up points.

**Ordering Example for CAT:**



**Physical Data\***

Description	Part Number #	Number of Tubes 	Armor O.D. (in.) 	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 	Horizontal/Vertical Support Centers (ft.) 
Copper Tubes: 1/4" O.D. x .030" Wall	1CAT4	1	.49	.063	.56	6.8	150	25	8
	2CAT4	2	.74	.063	.87	2.5	300	55	8
	3CAT4	3	.78	.063	.90	2.5	450	65	8
	4CAT4	4	.84	.063	.97	2.5	600	78	8
	5CAT4	5	.92	.063	1.05	3.0	750	91	8
	7CAT4	7	.99	.063	1.12	3.5	1050	111	12
	8CAT4	8	1.07	.063	1.20	3.5	1200	126	12
	10CAT4	10	1.25	.063	1.37	5.0	1500	151	12
	12CAT4	12	1.28	.078	1.44	6.0	1800	175	12
	14CAT4	14	1.32	.078	1.48	7.0	2100	211	12
Copper Tubes: 3/8" O.D. x .032" Wall	19CAT4	19	1.50	.078	1.66	8.0	2850	247	12
	37CAT4	37	2.00	.078	2.16	11.0	5550	444	12
	1CAT6	1	.61	.063	.67	8.0	250	35.9	8
	2CAT6	2	.99	.063	1.12	5.5	500	81	8
	3CAT6	3	1.05	.063	1.18	6.0	750	98	8
	4CAT6	4	1.15	.063	1.28	6.5	1000	119	8
	5CAT6	5	1.26	.063	1.38	7.5	1250	140	8
	7CAT6	7	1.37	.078	1.53	8.5	1750	179	12
	8CAT6	8	1.49	.078	1.65	9.0	2000	202	12
	10CAT6	10	1.75	.078	1.91	12.0	2500	244	12
Copper Tubes: 1/2" O.D. x .035" Wall	12CAT6	12	1.81	.078	1.96	12.5	3000	274	12
	14CAT6	14	1.90	.078	2.03	14.0	3500	324	12
	19CAT6	19	2.07	.078	2.28	15.0	4650	522	12
	1CAT8	1	.74	.063	.81	9.7	350	48.4	8
	2CAT8	2	1.25	.060	1.37	10.0	700	108	8
	3CAT8	3	1.32	.060	1.48	11.0	1050	138	8
4CAT8	4	1.45	.060	1.61	12.0	1400	169	8	

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).  
‡ Indicates stock item.

# CCT Multiple Copper Instrument and Control Tubing



## Combination Tube Size

**General:** Parker Instrument and Control Tubing Type CCT is designed to allow an instrument air supply line to be run in the same Multitube bundle as the signal lines. Suitable for general use, both indoors and outdoors.

**Tubing:** Type 122 DHP Seamless Copper tubing is standard. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

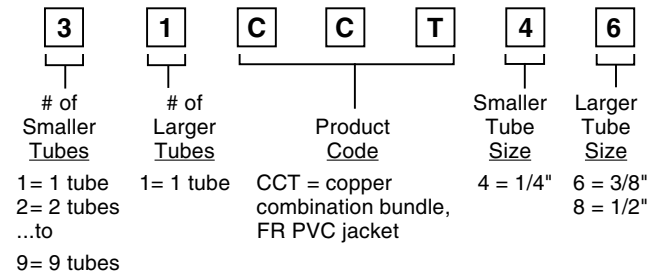
**Tubing Identification:** Each individual tube is printed with the tube number at two-inch intervals.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

## Ordering Example for CCT:



## Physical Data\*

Description	Part Number #	Number of Tubes # # # #	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 	Horizontal/Vertical Support Centers (ft.) 
Copper Tubes: (1-7) 1/4" x .030" (1) 3/8" x .032"	11CCT46	2	.063	.750	5.5	500	30	8
	21CCT46	3	.063	.750	6.0	750	37	8
	31CCT46	4	.063	.750	6.5	1000	46	8
	41CCT46	5	.063	1.000	7.5	1250	56	12
	51CCT46	6	.063	1.000	8.5	1250	65	12
	61CCT46	7	.063	1.000	8.5	1750	73	12
	71CCT46	8	.063	1.043	9.0	2000	81	12
Copper Tubes: (1-9) 1/4" x .030" (1) 1/2" x .035"	11CCT48	2	.063	.876	11.0	500	38	8
	21CCT48	3	.063	.876	12.0	750	46	8
	31CCT48	4	.063	.876	13.0	1000	54	8
	41CCT48	5	.063	.945	15.0	1250	63	12
	51CCT48	6	.063	.998	17.0	1250	71	12
	61CCT48	7	.063	1.049	17.0	1750	80	12
	71CCT48	8	.063	1.097	18.0	2000	89	12
81CCT48	9	.063	1.143	18.0	2000	97	12	
91CCT48	10	.063	1.188	24.0	2500	106	12	

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# SSA Armored Multiple Stainless Steel Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Armored Construction, is designed for use where excellent mechanical protection for the tubing is required in storage or during and after installation. Instrument tubing is used for the transmission of hydraulic or pneumatic signals whether they are to monitor or control a process.

**Tubing:** 316/316L Welded Stainless Steel is standard. Seamless stainless steel and additional wall thicknesses are available upon request. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

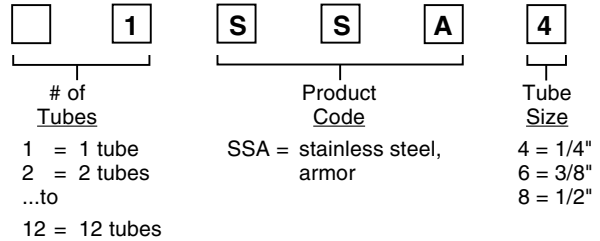
**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Armor:** A flexible, galvanized steel, interlocked armor is employed over the tubing core assembly, separated by a layer of black vinyl tape which cushions the tubes from the armor and protects the tubing and armor from electrogalvanic action.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for SSA:**



**Physical Data\***

Description	Part Number #	Number of Tubes # # # #	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 	Horizontal/Vertical Support Centers (ft.) 
Stainless Steel Tubes: 1/4" O.D. x .035" Wall	1SSA4	1	.49	6.0	250	22.7	8
	2SSA4	2	.74	5.2	500	40.7	8
	3SSA4	3	.78	5.5	750	50.5	8
	4SSA4	4	.84	5.9	1000	61.1	8
	5SSA4	5	.92	6.5	1250	72.7	8
	7SSA4	7	.99	7.0	1750	91.9	12
	8SSA4	8	1.07	7.5	2000	103.5	12
Stainless Steel Tubes: 3/8" O.D. x .035" Wall	10SSA4	10	1.25	8.8	2500	127.5	12
	12SSA4	12	1.28	9.0	3000	145.5	12
Stainless Steel Tubes: 3/8" O.D. x .035" Wall	1SSA6	1	0.61	7.3	400	32.6	8

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# SST Multiple Stainless Steel Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Construction, is designed for general use both indoors and outdoors. Instrument tubing is used for the transmission of hydraulic or pneumatic signals to monitor or control a process.

**Tubing:** 316/316L Welded Stainless Steel is standard. Seamless stainless steel and additional wall thicknesses are available upon request. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

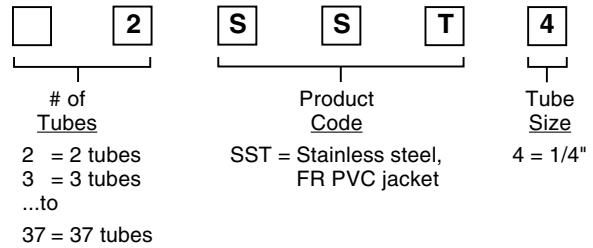
**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for SST:**



**Physical Data\***

Description	Part Number #	Number of Tubes # # # #	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 	Horizontal/Vertical Support Centers (ft.) 
Stainless Steel Tubes: 1/4" O.D. x .035" Wall	‡ 2SST4	2	.063	0.64	3.8	500	23.2	8
	‡ 3SST4	3	.063	0.68	4.0	750	31.8	8
	‡ 4SST4	4	.063	0.74	4.2	1000	40.4	8
	5SST4	5	.063	0.82	4.5	1250	49.5	8
	7SST4	7	.063	0.89	5.3	1750	66.5	12
	8SST4	8	.063	0.97	6.0	2000	75.6	12
	10SST4	10	.063	1.15	7.5	2500	93.9	12
	12SST4	12	.080	1.22	9.0	3000	110.8	12

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# SSAT Armored Multiple Stainless Steel Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Armored Construction, is designed for use where corrosion resistance and excellent mechanical protection for the tubing is required in transit, in storage, and during and after installation. Instrument tubing is used for the transmission of hydraulic or pneumatic signals whether they are to monitor or control a process.

**Tubing:** 316/316L Welded Stainless Steel is standard. Seamless stainless steel and additional wall thicknesses are available upon request. For Material Specifications for metal tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing (and armor) against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

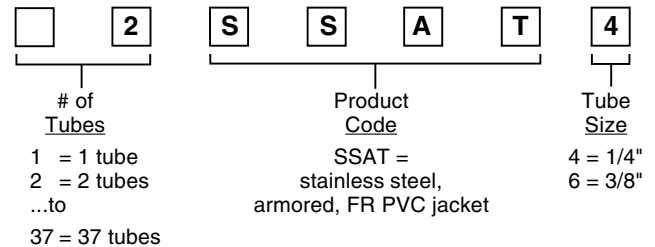
**Armor:** A flexible, galvanized steel, interlocked armor is employed over the tubing core assembly, separated from the core

by a layer of black vinyl tape which cushions the tubes from the armor and protects the tubing and armor from any electrogalvanic action occurring between the tubing and armor.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for SSAT:**



**Physical Data\***

Description	Part Number #	Number of Tubes ⊕ ⊕ ⊕ ⊕	Armor O.D. (in.) 	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) lbs	Horizontal/Vertical Support Centers (ft.) 
Stainless Steel Tubes: 1/4" O.D. x .035" Wall	1SSAT4	1	.49	.032	.56	6.8	250	25.2	8
	2SSAT4	2	.74	.063	.87	5.2	500	50.4	8
	3SSAT4	3	.78	.063	.90	5.5	750	60.7	8
	4SSAT4	4	.84	.063	.97	5.9	1000	72.0	8
	5SSAT4	5	.92	.063	1.05	6.5	1250	84.6	8
	7SSAT4	7	.99	.063	1.12	7.0	1750	104.7	12
	8SSAT4	8	1.07	.063	1.20	7.5	2000	117.0	12
	10SSAT4	10	1.25	.063	1.37	8.8	2500	143.5	12
	12SSAT4	12	1.28	.080	1.44	9.0	3000	161.5	12
Stainless Steel Tube: 3/8" O.D. x .035" Wall	1SSAT6	1	0.61	.032	0.67	8	400	35.4	8

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.



# PT Multiple Polyethylene Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing is designed for general use both indoors and outdoors. Instrument Tubing is used for the transmission of pneumatic signals to monitor or control a process.

**Tubing:** This polyethylene instrument tubing is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

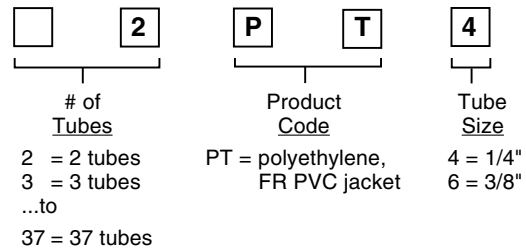
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for PT:**



**Physical Data\***

Description	Part Number #	Number of Tubes ⊕ ⊕ ⊕ ⊕	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
Polyethylene Tubes: 1/4" O.D. x .040" Wall	‡ 2PT4	2	.045	.59	1.5	90	8.6
	‡ 3PT4	3	.045	.60	1.5	110	11.4
	‡ 4PT4	4	.063	.74	2.0	140	12.8
	‡ 5PT4	5	.063	.88	2.0	170	15.1
	‡ 7PT4	7	.063	.89	2.5	195	17.5
	‡ 8PT4	8	.063	.97	2.5	235	19.5
	‡ 10PT4	10	.063	1.14	3.0	260	22.8
	‡ 12PT4	12	.063	1.14	3.5	300	25.4
	‡ 14PT4	14	.063	1.25	4.0	340	28.8
	‡ 19PT4	19	.080	1.40	5.0	425	36.8
‡ 37PT4	37	.080	1.96	9.0	880	74.5	
Polyethylene Tubes: 3/8" O.D. x .062" Wall	‡ 2PT6	2	.063	.89	2.0	160	13.9
	‡ 3PT6	3	.063	.89	2.0	195	17.9
	‡ 4PT6	4	.063	1.05	2.5	265	21.1
	‡ 5PT6	5	.063	1.16	3.0	295	24.6
	‡ 7PT6	7	.080	1.31	4.0	365	29.7
	‡ 10PT6	10	.080	1.72	5.0	515	44.2
	‡ 12PT6	12	.080	1.80	6.0	685	60.8
	‡ 19PT6	19	.080	2.13	10.0	900	85.5

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# FRPT Multiple Polyethylene Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing is designed for general use both indoors and outdoors. Instrument Tubing is used for the transmission of pneumatic signals to monitor or control a process.

**Tubing:** This flame-resistant polyethylene (FRPE) instrument tubing is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**FR Polyethylene Jacket:** Black, weather-resistant, high molecular weight, flame-resistant polyethylene (FRPE) compound which meets the UL94V-2 flame classification.

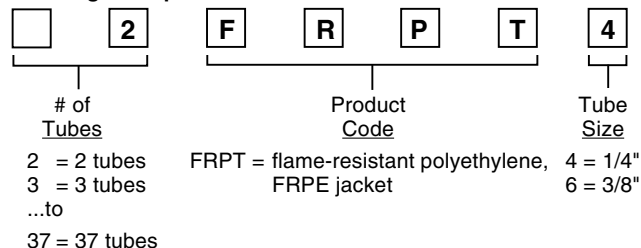
FR Polyethylene has excellent low temperature flexibility. It is also resistant to most chemicals and its low friction factor makes it easier to pull through conduit.

For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog. For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for FRPT:**



**Physical Data\***

Description	Part Number #	Number of Tubes #/#	Jacket Thickness (in.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)	Maximum § Pulling Tension (lbs.)	Product Weight (lbs./100 ft.)
FR Polyethylene Tubes: 1/4" O.D. x .040" Wall	2FRPT4	2	.045	.59	1.5	90	8.6
	3FRPT4	3	.045	.60	1.5	110	11.4
	4FRPT4	4	.063	.74	2.0	140	12.8
	5FRPT4	5	.063	.88	2.0	170	15.1
	7FRPT4	7	.063	.89	2.5	195	17.5
	8FRPT4	8	.063	.97	2.5	235	19.5
	10FRPT4	10	.063	1.14	3.0	260	22.8
	12FRPT4	12	.063	1.14	3.5	300	25.4
	14FRPT4	14	.063	1.25	4.0	340	28.8
	19FRPT4	19	.080	1.40	5.0	425	36.8
	37FRPT4	37	.080	1.96	9.0	880	74.5
FR Polyethylene Tubes: 3/8" O.D. x .062" Wall	2FRPT6	2	.063	.89	2.0	160	13.9
	3FRPT6	3	.063	.89	2.0	195	17.9
	4FRPT6	4	.063	1.05	2.5	265	21.1
	5FRPT6	5	.063	1.16	3.0	295	24.6
	7FRPT6	7	.080	1.31	4.0	365	29.7
	10FRPT6	10	.080	1.72	5.0	515	44.2
	12FRPT6	12	.080	1.80	6.0	685	60.8
	19FRPT6	19	.080	2.13	10.0	900	85.5

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# PA Armored Multiple Polyethylene Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Armored Construction, is designed for use where corrosion resistance and excellent mechanical protection for the tubing is required in transit, in storage and during and after installation. Instrument tubing is used for the transmission of pneumatic signals to monitor or control a process.

**Tubing:** This low density polyethylene instrument tubing is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with the tube number at two-inch intervals.

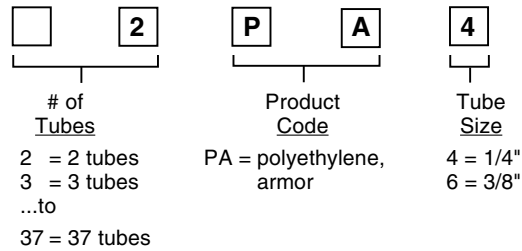
**Armor:** A flexible, galvanized steel, interlocked armor is employed over the tubing core assembly, separated by a layer of black vinyl tape which cushions the tubes from the armor. This armor provides protection from accidental damage to the tubing such as from falling tools, ladders and equipment and welding and cutting sparks or splatter.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for PA:**



**Physical Data\***

Description	Part Number #	Number of Tubes ## ##	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 	Horizontal/Vertical Support Centers (ft.) 
Polyethylene Tubes: 1/4" O.D. x .040" Wall	2PA4	2	.74	2.5	90	29	4
	3PA4	3	.78	2.5	110	32	4
	4PA4	4	.84	2.5	140	36	4
	5PA4	5	.92	3.0	170	40	4
	7PA4	7	.99	3.5	195	45	6
	8PA4	8	1.07	3.5	235	50	6
	10PA4	10	1.25	5.0	260	60	6
	12PA4	12	1.28	6.0	300	67	6
	14PA4	14	1.35	7.0	340	72	6
	19PA4	19	1.50	8.0	425	84	6
37PA4	37	2.00	11.0	880	127	6	
Polyethylene Tubes: 3/8" O.D. x .062" Wall	2PA6	2	.99	5.5	160	43	4
	3PA6	3	1.05	6.0	195	48	4
	4PA6	4	1.15	6.5	265	55	4
	5PA6	5	1.26	7.5	295	65	4
	7PA6	7	1.37	8.5	365	76	6
	8PA6	8	1.49	9.0	415	84	6
	10PA6	10	1.75	12.0	515	101	6
	12PA6	12	1.81	12.5	685	109	6
	19PA6	19	2.13	15.0	900	141	6

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# PAT Armored Multiple Polyethylene Instrument and Control Tubing



**General:** Parker Instrument & Control Tubing, Corrosion-Resistant Armored Construction, is designed for use where corrosion resistance and excellent mechanical protection for the tubing is required in transit, in storage and during and after installation. Instrument tubing is used for the transmission of pneumatic signals to monitor or control a process.

**Tubing:** This low density polyethylene instrument tubing is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

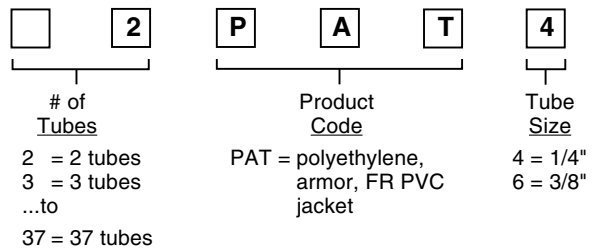
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalies and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for PAT:**



**Physical Data\***

Description	Part Number #	Number of Tubes #/#	Armor O.D. (in.) 	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
Polyethylene Tubes: 1/4" O.D. x .040" Wall	2PAT4	2	.74	.063	.87	2.5	90	39
	3PAT4	3	.78	.063	.90	2.5	110	42
	4PAT4	4	.84	.063	.97	2.5	140	47
	5PAT4	5	.92	.063	1.05	3.0	170	52
	7PAT4	7	.99	.063	1.12	3.5	195	58
	8PAT4	8	1.07	.063	1.20	3.5	235	64
	10PAT4	10	1.25	.063	1.37	5.0	260	76
	12PAT4	12	1.28	.080	1.44	6.0	300	88
	14PAT4	14	1.35	.080	1.51	7.0	340	94
	19PAT4	19	1.50	.080	1.65	8.0	425	108
37PAT4	37	2.00	.080	2.16	11.0	880	159	
Polyethylene Tubes: 3/8" O.D. x .062" Wall	2PAT6	2	.99	.063	1.12	5.5	160	56
	3PAT6	3	1.05	.063	1.18	6.0	195	62
	4PAT6	4	1.15	.063	1.28	6.5	265	70
	5PAT6	5	1.26	.063	1.38	7.5	295	81
	7PAT6	7	1.37	.080	1.53	8.5	365	98
	8PAT6	8	1.49	.080	1.65	9.0	415	108
	10PAT6	10	1.75	.080	1.91	12.0	515	129
	12PAT6	12	1.81	.080	1.96	12.5	685	138

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# NT Multiple Nylon Instrument and Control Tubing



**General:** Parker Multitube Type NT is designed for general use both indoors and outdoors. Instrument Tubing is used for the transmission of pneumatic signals to monitor or control a process.

**Tubing:** This nylon instrument tubing is manufactured to close dimensional tolerances from high-grade, abrasion-resistant, heat-and-light-stabilized nylon. Resistance to cracking under temperature variations greatly exceeds that of ordinary nylon tubing. Extremely low level water absorption. This tubing is extruded black polyamide. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

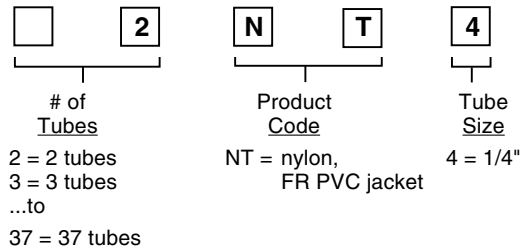
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for NT:**



**Physical Data\***

Description	Part Number #	Number of Tubes ⊕ ⊕ ⊕ ⊕	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
Nylon Tubes: 1/4" O.D. x .040" Wall	2NT4	2	.045	.59	1.5	90	8.9
	3NT4	3	.045	.60	1.5	110	11.7
	4NT4	4	.063	.74	2.0	140	13.2
	5NT4	5	.063	.88	2.0	170	15.5
	7NT4	7	.063	.89	2.5	195	18.1
	8NT4	8	.063	.97	2.5	235	20.2
	10NT4	10	.063	1.14	3.0	260	23.7
	12NT4	12	.063	1.14	3.5	300	26.5
	14NT4	14	.063	1.25	4.0	340	30.0
	19NT4	19	.063	1.40	5.0	425	38.5
37NT4	37	.094	1.96	9.0	880	77.8	

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.



# XPTU Multiple High Density Polyethylene Instrument and Control Tubing, Heavy Wall, Underground/Direct Burial



**General:** Parker Instrument & Control Tubing Type XPTU is designed with an extra heavy-wall FR PVC jacket for direct burial. This construction also gives adequate protection to the tubing from stray hot metal splash caused by welding or cutting operations.

**Tubing:** This high density polyethylene (HDPE) tubing is manufactured to close dimensional tolerances from high modulus, high density polyethylene and has proven to be satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

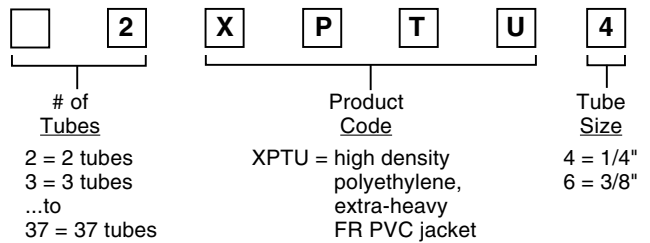
**Jacket:** The tough, extra heavy 3/16" thick, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalies and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

**Ordering Example for XPTU:**



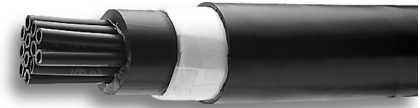
**Physical Data\***

Description	Part Number #	Number of Tubes ⊕ ⊕ ⊕ ⊕	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
High Density Polyethylene Tubes: 1/4" O.D. x .040" Wall	2XPTU4	2	0.90	3.5	90	17
	3XPTU4	3	0.94	3.5	105	18
	4XPTU4	4	1.00	4.0	140	19
	7XPTU4	7	1.15	4.5	190	28
	8XPTU4	8	1.22	4.5	210	30
	10XPTU4	10	1.40	5.0	250	37
	12XPTU4	12	1.43	6.0	290	39
	14XPTU4	14	1.50	7.0	340	45
	19XPTU4	19	1.65	9.0	425	53
	37XPTU4	37	2.15	12.0	750	84
High Density Polyethylene Tubes: 3/8" O.D. x .062" Wall	2XPTU6	2	1.15	4.0	150	25
	3XPTU6	3	1.21	4.5	190	29
	4XPTU6	4	1.30	5.0	250	31
	7XPTU6	7	1.52	8.0	375	47
	10XPTU6	10	1.90	11.0	500	63
	12XPTU6	12	1.96	11.0	575	69

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# XPTF Multiple Polyethylene Instrument and Control Tubing, Fire Resistant



**General:** Parker Instrument & Control Tubing Type XPTF is designed for use where several minutes of time delay is required in the event of a flash fire, allowing for shutdown of equipment before instrument lines fail. This tubing also gives adequate protection to the tubing from stray hot metal splash caused by welding or cutting operations.

**Tubing:** The high density polyethylene (HDPE) tubing is manufactured to close dimensional tolerances from high modulus, high density polyethylene and has been effective for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

**Inner FR PVC Jacket:** The tough, extra heavy 3/16" thick, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalines and most chemicals. Additional jackets are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Heat-Resistant Tapes:** A double layer of heat-resistant tapes are wrapped around the inner FR PVC jacket to act as an additional thermal barrier to further delay the conduction of heat from a flash fire through to the tubing.

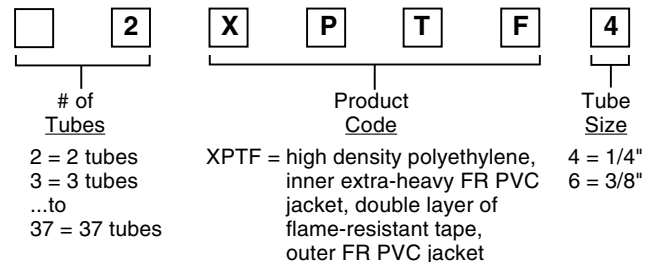
**Outer FR PVC Jacket:** A 1/16" thick outer FR PVC jacket is extruded over the tapes to protect them during storage, transit, construction and actual use. This is the same type FR PVC as mentioned above.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

### Ordering Example for XPTF:



### Physical Data\*

Description	Part Number #	Number of Tubes #/#/#/#	Inner Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
High Density Polyethylene Tubes: 1/4" O.D. x .040" Wall	2XPTF4	2	0.90	1.09	9	90	48
	4XPTF4	4	1.00	1.19	9	140	54
	7XPTF4	7	1.15	1.34	10	195	64
	8XPTF4	8	1.22	1.42	11	235	76
	10XPTF4	10	1.40	1.59	12	260	89
	12XPTF4	12	1.43	1.63	13	300	84
	14XPTF4	14	1.50	1.70	13	340	98
High Density Polyethylene Tubes: 3/8" O.D. x .062" Wall	19XPTF4	19	1.65	1.84	14	425	107
	37XPTF4	37	2.15	2.34	18	880	149
	2XPTF6	2	1.15	1.35	10	160	69
	4XPTF6	4	1.30	1.49	11	265	78
	7XPTF6	7	1.52	1.72	13	365	96
	10XPTF6	10	1.90	2.09	16	515	143
	12XPTF6	12	1.96	2.15	17	585	132

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

‡ Indicates stock item.

# PCT Multiple Polyethylene Instrument and Control Tubing



## Combination Tube Size

**General:** Parker Instrument & Control Tubing Type PCT is designed to allow an instrument air supply line to be run in the same Multitube bundle as the signal lines. Suitable for general use, both indoors and outdoors.

**Tubing:** This low density polyethylene instrument tubing is manufactured to close dimensional tolerances from high molecular weight polyethylene and has proved to be thoroughly satisfactory for relatively low pressure and vacuum installations where high ambient or occasional high temperatures are not encountered. For Material Specifications for plastic tubing, see [Technical Data in Section E](#) of the catalog.

**Tubing Identification:** Each individual tube is printed with tube number at two-inch intervals.

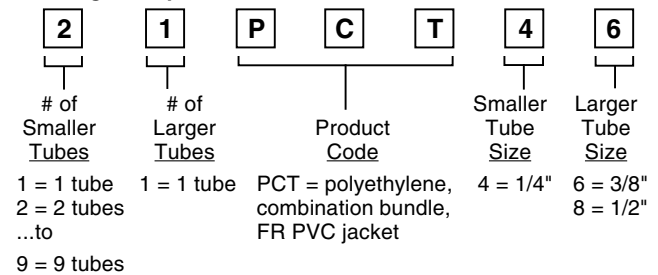
**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Multitube is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

For Temperature and Pressure Recommendations, see [Technical Data in Section E](#) of the catalog.

**Communications Wire (Optional):** Two insulated 22 AWG wires are optional in all Multitube assemblies to allow electrical connection of communications equipment (e.g. sound powered phones) at the hook-up points.

## Ordering Example for PCT:



## Physical Data\*

Description	Part Number #	Number of Tubes ⊕ ⊕ ⊕ ⊕	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bend Radius (in.) 	Maximum § Pulling Tension (lbs.) 	Product Weight (lbs./100 ft.) 
Polyethylene Tubes: (1-7) 1/4" x .040" (1) 3/8" x .062"	11PCT46	2	.045	.76	2.5	100	10.9
	21PCT46	3	.045	.76	2.5	100	12.9
	31PCT46	4	.060	1.10	3.0	250	14
	41PCT46	5	.060	1.10	3.0	250	15.1
	51PCT46	6	.060	1.10	3.0	260	16.2
	61PCT46	7	.060	1.10	3.0	260	17.3
	71PCT46	8	.060	1.10	3.0	300	18.4
Polyethylene Tubes: (1-9) 1/4" x .040" (1) 1/2" x .062"	11PCT48	2	.045	.85	3.5	160	11.8
	21PCT48	3	.045	.85	3.5	160	12.9
	31PCT48	4	.060	1.15	4.0	195	14
	41PCT48	5	.060	1.15	4.0	240	15.1
	51PCT48	6	.060	1.15	4.0	260	16.2
	61PCT48	7	.060	1.15	4.0	300	17.3
	71PCT48	8	.060	1.15	4.0	300	18.4
	81PCT48	9	.060	1.15	4.0	320	19.5
	91PCT48	10	.060	1.15	4.0	320	20.6

\* All values are nominal. Dimensional data to be used as reference only.  
§ Values refer to straight pulls only (not including sidewall loads from pulling around bends).

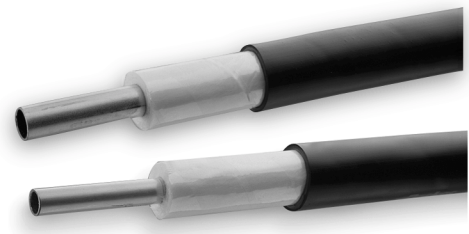
‡ Indicates stock item.

## ***Section B — Temptube®***

Preinsulated Tubing .....	B3 – B4
Preinsulated Tubing Specify & Order .....	B5

# 3000 Preinsulated Tubing

## Copper & Stainless Steel



**General:** Parker 3000 Temptube preinsulated tubing consists of a single tube thermally insulated with a non-hygroscopic fiberglass insulation and a 105°C flame-resistant PVC (FR PVC) jacket overall.

Parker 3000 Temptube is designed to provide an economical and highly efficient method of conveying steam or other hot materials through a plant facility and is intended to replace hard piping and field-installed insulation.

**Applications:** The 3000 products are typically used in steam supply lines, condensate return lines, cooling water lines, lubrication lines, refrigeration lines, and liquid nitrogen lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss. Optional insulation thicknesses are available. For .72" thick insulation order 3001- in place of 3000-part number. For .96" thick insulation order 3002- in place of 3000-part number. For other thicknesses consult factory.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temptube® is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for connecting multiple lengths of Temptube bundles and sealing bundle ends. Accessories for Temptube are identified on [page B5](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order see [page B5](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

### Physical Data§

Part Number #	Tubing		Insulation** Thickness (in.) 	Jacket Thickness (in.) 	Nominal Product O.D. (in.) 	Minimum Bending Radius (in.) 	Maximum Pulling Tension (lbs.) 	Product Weight (lbs./ 100 ft.) 	Horizontal/ Vertical Support Centers (ft.) 	
	Material	Size (in.)								
		O.D.								Wall
‡ 3000-104A030	Copper	1/4	.030	.20	.08	.81	8	150	21.6	5
‡ 3000-106A032	Copper	3/8	.032	.24	.08	1.015	10	250	31.7	6
‡ 3000-108A035	Copper	1/2	*.035	.24	.08	1.14	12	350	40.8	8
‡ 3000-204A035	Welded Stainless Steel	1/4	.035	.20	.08	.81	8	250	21.7	6
‡ 3000-204A035-001	Seamless Stainless Steel	1/4	.035	.20	.08	.81	8	250	21.7	6
‡ 3000-206A035	Welded Stainless Steel	3/8	.035	.24	.08	1.015	10	400	31.1	7
‡ 3000-206A035-001	Seamless Stainless Steel	3/8	.035	.24	.08	1.015	10	400	31.1	7
‡ 3000-208A035	Welded Stainless Steel	1/2	.035	.24	.08	1.14	12	550	38.5	8
‡ 3000-208A035-001	Seamless Stainless Steel	1/2	.035	.24	.08	1.14	12	550	38.5	8
3000-106A049	Copper	3/8	.049	.24	.08	1.015	10	250	37.8	6
‡ 3000-108A049	Copper	1/2	.049	.24	.08	1.14	12	350	47.9	8
3000-208A049	Welded Stainless Steel	1/2	.049	.24	.08	1.14	12	550	44.8	8
‡ 3000-208A049-001	Seamless Stainless Steel	1/2	.049	.24	.08	1.14	12	550	44.8	8

§All values are nominal. Dimensional data to be used as reference only. \*Available with .049" wall copper tubing.

\*\*Optional insulation thicknesses are available. For .72" thick insulation order 3001- in place of 3000-part number. For .96" thick insulation order 3002- in place of 3000-part number. For other thicknesses consult factory.

‡ Indicates stock item.

For performance characteristics [see next page](#).



# Temptube® Preinsulated Tubing

## Performance Characteristics

Steam Pressure and Temperature			50 PSIG @ 298°F		80 PSIG @ 329°F		100 PSIG @ 338°F		120 PSIG @ 350°F		150 PSIG @ 366°F		230 PSIG @ 400°F	
Ambient Temperature			80°F		80°F		80°F		80°F		80°F		80°F	
Tube O.D. (in.)	Nominal Product O.D. (in.)	Insul. Thick (in.)	Heat Loss*	Jacket Temp §	Heat Loss*	Jacket Temp §	Heat Loss*	Jacket Temp §	Heat Loss*	Jacket Temp §	Heat Loss*	Jacket Temp §	Heat Loss*	Jacket Temp §
1/4	.81	.20	28.5	120	31.9	125	33.7	128	35.3	130	37.4	133	41.8	139
3/8	1.015	.24	33.6	118	37.6	122	39.8	125	41.6	127	44.1	130	49.3	136
1/2	1.14	.24	40.4	121	45.3	125	47.8	128	50.1	130	53.0	133	59.3	140

\*Heat loss is measured in Btu/Hr., per linear foot of tubing §Jacket temperature measured at the surface in °F.

NOTE: The performance figures presented above have been calculated to be used as a guide only. Actual performance may vary with individual plant conditions.

## Performance Characteristics

Part Number #	Tubing Size (in.)		Insulation** Thickness (in.)	Jacket Thickness (in.)	Nominal Product O.D. (in.)	Heat Gain/Loss Rates & R-factors at 70°F ambient					
	O.D.	Wall				Process, LN2 = -320°F		Process, Liquid CO2 = -70°F		Process, Steam = 400°F	
						Heat Gain Rate, (BTU/hr) ft	R-factor, °F/(BTU/hr) ft	Heat Gain Rate, (BTU/hr) ft	R-factor, °F/(BTU/hr) ft	Heat Loss Rate, (BTU/hr) ft	R-factor, °F/(BTU/hr) ft
3000-104A030-CR	1/4	0.030	0.36	.08	1.13	18.3	21.3	10.7	13.0	30.9	10.7
3000-106A032-CR	3/8	0.032	0.36	.08	1.26	23.0	17.0	13.4	10.4	38.5	8.6
3000-108A035-CR	1/2	0.035	0.36	.08	1.38	27.5	14.2	16.0	8.8	45.7	7.2
3000-204A035-CR	1/4	0.035	0.36	.08	1.13	18.3	21.3	10.7	13.0	30.9	10.7
3000-206A035-CR	3/8	0.035	0.36	.08	1.26	23.0	17.0	13.4	10.4	38.5	8.6
3000-208A035-CR	1/2	0.035	0.36	.08	1.38	27.5	14.2	16.0	8.8	45.7	7.2
3001-104A030	1/4	0.030	0.72	.08	1.85	13.5	29.0	8.1	17.3	23.5	14.0
3001-106A032	3/8	0.032	0.72	.08	1.98	16.3	24.0	9.7	14.4	28.3	11.7
3001-108A035	1/2	0.035	0.72	.08	2.10	18.9	20.7	11.3	12.4	32.8	10.1
3001-204A035	1/4	0.035	0.72	.08	1.85	13.5	29.0	8.1	17.3	23.5	14.0
3001-206A035	3/8	0.035	0.72	.08	1.98	16.3	24.0	9.7	14.4	28.3	11.7
3001-208A035	1/2	0.035	0.72	.08	2.10	18.9	20.7	11.3	12.4	32.8	10.1
3002-104A030	1/4	0.030	0.96	.08	2.33	12.0	32.5	7.2	19.3	21.2	15.6
3002-106A032	3/8	0.032	0.96	.08	2.46	14.3	27.3	8.6	16.3	25.1	13.1
3002-108A035	1/2	0.035	0.96	.08	2.58	16.4	23.8	9.9	14.2	28.8	11.5
3002-204A035	1/4	0.035	0.96	.08	2.33	12.0	32.5	7.2	19.3	21.2	15.6
3002-206A035	3/8	0.035	0.96	.08	2.46	14.3	27.3	8.6	16.3	25.1	13.1
3002-208A035	1/2	0.035	0.96	.08	2.58	16.4	23.8	9.9	14.2	28.8	11.5

NOTE: The performance figures presented above have been calculated to be used as a guide only. Actual performance may vary with individual plant conditions.

# How To Specify & Order Temptube®

### 3000-104A030--Parker Temptube Preinsulated Tubing:

One 1/4" O.D. x .030" wall Type 122 seamless copper tube, patented air-spaced applied non-hygroscopic fiberglass thermal insulation for minimum heat loss, and an overall jacket of extruded, black, 105°C rated, flame resistant PVC (FR PVC). MTR\* of 400°F (204°C).

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperature in excess of this may damage the product or alter its performance.

### How to Order Temptube Tubing (3000, 3001, 3002):

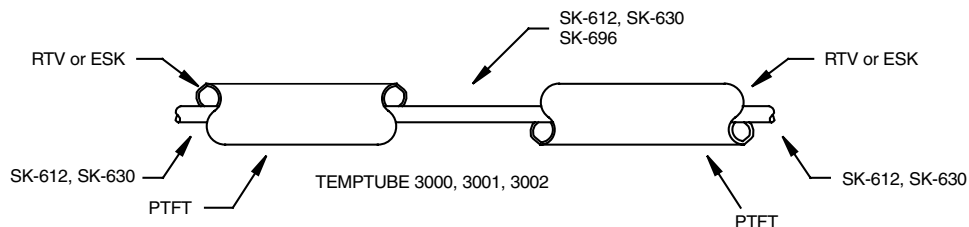
Product Family	Tube Type	Tube Size		Tube Quantity	Tube Wall Thickness		Specials
		English	Metric**		English	Metric**	
		3000-	X		XX	A	
3000- § 3001- § 3002-	1 = Copper 2 = W 316 SS 3 = W 304 SS 4 = Monel 400 5 = Hastelloy C22 6 = PFA 7 = 919 TFE Hose 9 = Special	02 = 1/8" 03 = 3/16" 04 = 1/4" 05 = 5/16" 06 = 3/8" 07 = 7/16" 08 = 1/2" 10 = 5/8" 12 = 3/4" 16 = 1"	06 = 6mm 08 = 8mm 10 = 10mm 12 = 12mm	A = 1	030 = .030" 032 = .032" 035 = .035" 049 = .049"	1.0 = 1mm 1.5 = 1.5mm .89 = 0.035"	-001 = Seamless 316 SS -002 = TPR Jacket -003 = TPR Jacket & Seamless 316 SS -004 = FR TPE Jacket -005 = FR TPE Jacket & Seamless 316 SS -M = Metric**

\*\*Add suffix -M to end of part number to indicate metric size tubing.

§ Optional insulation thicknesses are available. For .72" thick insulation order 3001- in place of 3000-part number. For .96" thick insulation order 3002- in place of 3000-part number. For other thicknesses consult factory.

## Temptube® Accessory Selections

Product Family	Series	Accessory P/N	Description	
Temptube®	3000 3001 3002	RTV-103BLK	End Sealant, 2.8 oz. tube, 400°F	
		RTV-103BLK-10.3	End Sealant, 10.1 oz. cartridge, 400°F	
		RTV-106RED	End Sealant, 2.8 oz. tube, 500°F	
			ESK0-	End Seal Kit (order by tube dash size, -4,-6,-8)
			SK-612	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 12")
			SK-630	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 30")
			SK-696	Insulation / jacket repair kit (Insulation dimensions - 6" x 96")
			PTFT1.45 PTFT2.42	Parker Temtrace Feed Through Seal Kit (.79" - 1.45") (1.45" - 2.42")



For detailed information about these accessories, see [Section F](#) of this catalog.

## ***Section C — Temptrace™ – Steam***

Heavy Steam .....	C3 – C6
Light Steam .....	C7 – C10
Temptrace Specify & Order .....	C11 – C12

‡ Indicates stock item.

# 3112 Heavy Steam Trace Tubing — Single Process Tube



**General:** Parker 3112 Temprace Steam Trace Tubing consists of a single process tube and tracer, non-hygroscopic glass fiber insulation and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

The 3112 Series Temprace is designed to be used with steam pressures of 15 PSIG (1 BAR) to 230 PSIG (15.8 BAR) and maintain a process tube temperature of from 200°F (93°C) at -40°F (-40°C) ambient to 355°F (179°C) at 80°F (26.6°C) ambient with product surface temperatures of less than 140°F (60°C) at 80°F (26.6°C) ambient. Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** The 3112 Temprace is used with high temperature steam to heat trace instrument size lines when elevated temperatures are required. Such applications as pressure transmission and analyzer sample lines carrying heavy oils or distillates, gases or vapors are ideal service for the 3112 products. The direct tracer to process tube contact produces higher process tube temperatures than the light trace product.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials, wall thicknesses and seamless stainless steel are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tube and tracer tube are the same size and material, each individual tube is printed with tube number at two-inch intervals.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temprace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for connecting multiple lengths of steam trace bundles and sealing bundle ends. Accessories for steam trace bundles are identified on [page C12](#). Detailed information can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page C11](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

## Physical Data\*

Part Number #	Process Tube O.D. (in.) 	Tracer Tube O.D. (in.) 	Nominal Product O.D. (in.) 	Product Weight (lbs./ft.) 	Minimum Bend Radius (in.) 	Horizontal/Vertical Support Centers (ft.) 	Slope 
‡ 3112-204A041	1/4	1/4	1.1	.376	8	5-6' 10-15'	1" in 8'
3112-206A041	3/8	1/4	1.3	.446	10	5-6' 10-15'	1" in 6'
3112-208A041	1/2	1/4	1.4	.520	12	5-6' 10-15'	1" in 3'
3112-206A061	3/8	3/8	1.3	.526	12	5-6' 10-15'	1" in 7'
‡ 3112-208A061	1/2	3/8	1.5	.594	14	5-6' 10-15'	1" in 6'

\* All values are nominal. Dimensional data to be used as reference only.

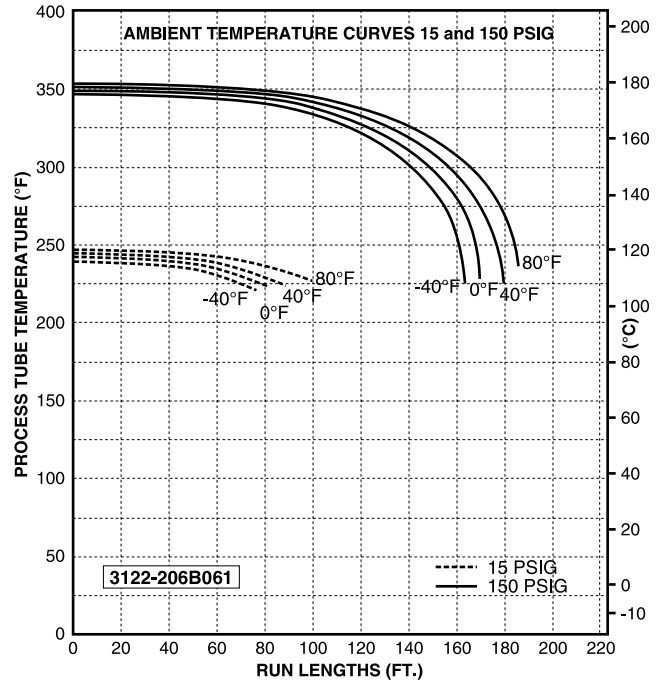
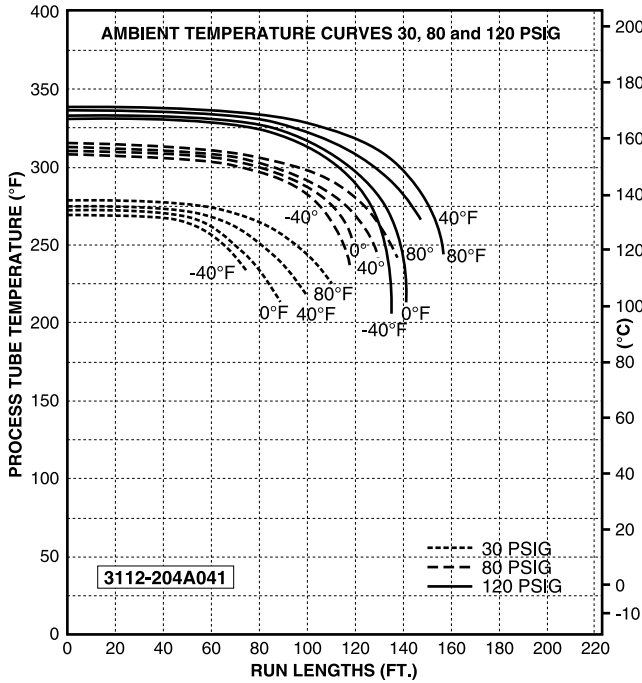
For performance characteristics [see next page](#).

‡ Indicates stock item.

# Performance Data

## 3112 Heavy Steam Trace Tubing

These performance graphs are based on a 1/4" process tube and a 1/4" tracer tube. Apply run length and temperature correction factors for other process and tracer tube sizes.



### Performance

Part Number	Process Tube O.D.	Tracer Tube O.D.	Heat Loss (BTU/hr ft.-°F) (ΔT = 100°F)
# 3112-204A041	1/4	1/4	15.3
3112-206A041	3/8	1/4	18.3
3112-208A041	1/2	1/4	20.7
3112-206A061	3/8	3/8	19.9
‡ 3112-208A061	1/2	3/8	23.1

### Correction Factors

Temperature	Run Length (ft.)
1	1
0.995	0.85
0.99	0.76
1.06	2.09
1.04	2.05

### Saturated Steam Pressure/Temperature

Mollier Chart	
Gauge Pressure (PSIG)	Saturation Temperature (Deg. F)
15	250
30	274
50	298
80	324
100	338
120	350
150	366

‡ Indicates stock item.

# 3122 Heavy Steam Trace Tubing — Multiple Process Tubes



**General:** Parker 3122 Temprace Steam Trace Tubing consists of multiple process tubes and tracer, non-hygroscopic thermal insulation, and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

The 3122 Series Temprace is capable of using steam pressures of 15 PSIG (1 BAR) to 230 PSIG (15.8 BAR) and maintain process tube temperatures of from 200°F (93°C) at -40°F (-40°C) ambient to 350°F (177°C) at 80°F (26.6°C) ambient with a product surface temperature of less than 140°F (60°C) at 80°F (26.6°C) ambient. Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** The 3122 products are typically used in D/P cell flow meter and flow transmitter applications to ensure that the fluid in each pressure line is maintained at identical temperature and viscosity.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials, wall thicknesses and seamless stainless steel are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tube and tracer tube are the same size and material, each individual tube is printed with tube number at two-inch intervals.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalies and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temprace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for connecting multiple lengths of steam trace bundles and sealing bundle ends. Accessories for steam trace bundles are identified on [page C12](#). Detailed information can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page C11](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

## Physical Data\*

Part Number #	Process Tube O.D. (in.) P	Tracer Tube O.D. (in.) T	Nominal Product O.D. (in.)	Product Weight (lbs./ft.) lbs	Minimum Bend Radius (in.) *	Horizontal/Vertical Support Centers (ft.) 	Slope 
3122-204B041	(2) 1/4	1/4	1.2	.479	12	5-6' 10-15'	1" in 8'
3122-206B041	(2) 3/8	1/4	1.4	.608	13	5-6' 10-15'	1" in 6'
3122-208B041	(2) 1/2	1/4	1.6	.743	13	5-6' 10-15'	1" in 3'
3122-206B061	(2) 3/8	3/8	1.5	.682	13	5-6' 10-15'	1" in 7'
3122-208B061	(2) 1/2	3/8	1.7	.812	14	5-6' 10-15'	1" in 6'

\* All values are nominal. Dimensional data to be used as reference only.

For performance characteristics [see next page](#).

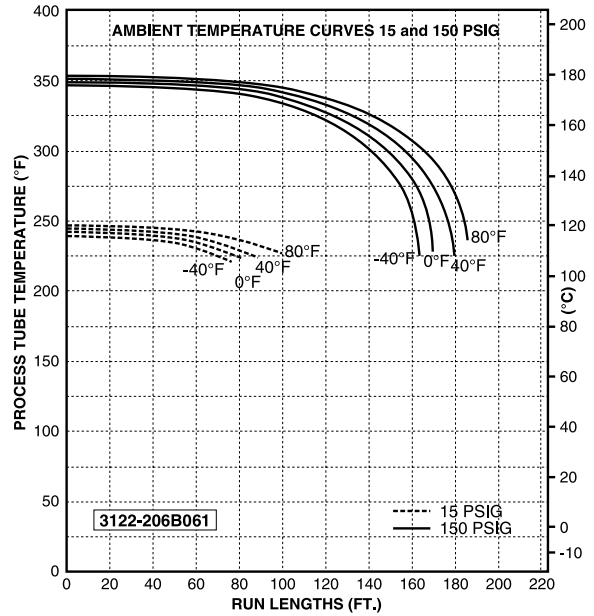
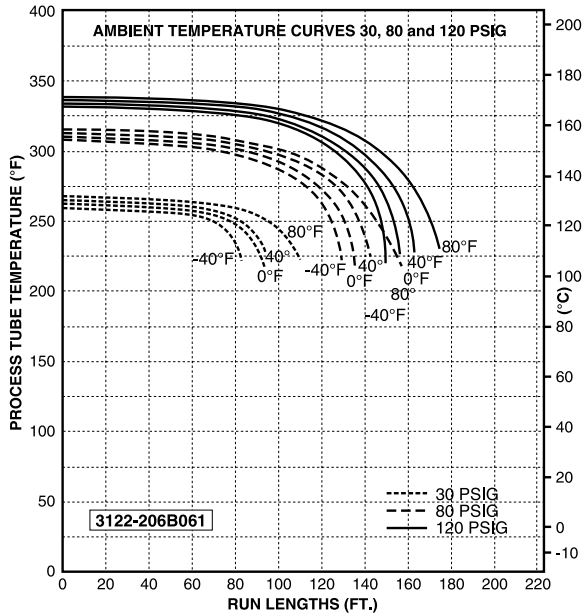
‡ Indicates stock item.



# Performance Data

## 3122 Heavy Steam Trace Tubing

These performance graphs are based on 3/8" process tubes and a 3/8" tracer tube. Apply run length and temperature correction factors for other process and tracer tube sizes.



### Performance

Part Number #	Process Tube O.D.	Tracer Tube O.D.	Heat Loss (BTU/hr ft-°F) (ΔT = 100°F)
3122-204B041	(2) 1/4	1/4	18
3122-206B041	(2) 3/8	1/4	21.9
3122-208B041	(2) 1/2	1/4	25.8
3122-206B061	(2) 3/8	3/8	25.8
3122-208B061	(2) 1/2	3/8	27.7

### Correction Factors

Temperature	Run Length (ft.)
--	--
--	--
--	--
1	1
0.996	0.90

### Saturated Steam Pressure/Temperature

Mollier Chart	
Gauge Pressure (PSIG)	Saturation Temperature (Deg. F)
15	250
30	274
50	298
80	324
100	338
120	350
150	366

‡ Indicates stock item.

# 3211 Light Steam Trace Tubing — Single Process Tube



**General:** Parker 3211 Temptrace Light Steam Trace Tubing consists of a single process tube insulated from a single tracer with non-hygroscopic glass fiber insulation and overall non-hygroscopic glass fiber insulation and black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

The 3211 Series Temptrace is designed to utilize saturated steam pressures to 230 PSIG (15.8 BAR) and 400°F (204.4°C) without generating a process tube temperature in excess of 200°F (93°C) or a jacket surface temperature greater than 140°F (60°C) at 80°F (26.6°C) ambient. Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** The 3211 Temptrace permits use of higher pressure steam to heat trace instrument lines carrying water, light oil, paraffin, paraffin-based fluids and temperature-sensitive chemicals. Parker 3211 Temptrace is ideal for simple instrument line freeze protection and viscosity maintenance applications.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials, wall thicknesses and seamless stainless steel are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss. The insulated tracer provides a more constant process tube temperature over long tubing runs.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalies and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.






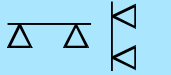

**Testing:** Each tube in every length of Parker Temptrace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for connecting multiple lengths of steam trace bundles and sealing bundle ends. Accessories for steam trace bundles are identified on [page C12](#). Detailed information can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page C11](#).

**NOTE:** It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.

## Physical Data\*

Part Number #	Process Tube O.D. (in.) 	Tracer Tube O.D. (in.) 	Nominal Product O.D. (in.) 	Product Weight (lbs./ft.) 	Minimum Bend Radius (in.) 	Horizontal/Vertical Support Centers (ft.) 	Slope 
3211-204A041	1/4	1/4	1.3	.385	10	5-6' 10-15'	1" in 8'
3211-206A041	3/8	1/4	1.4	.453	12	5-6' 10-15'	1" in 6'
‡ 3211-208A041	1/2	1/4	1.5	.519	14	5-6' 10-15'	1" in 3'
‡ 3211-206A061	3/8	3/8	1.5	.531	12	5-6' 10-15'	1" in 7'
‡ 3211-208A061	1/2	3/8	1.6	.598	14	5-6' 10-15'	1" in 6'

\* All values are nominal. Dimensional data to be used as reference only.

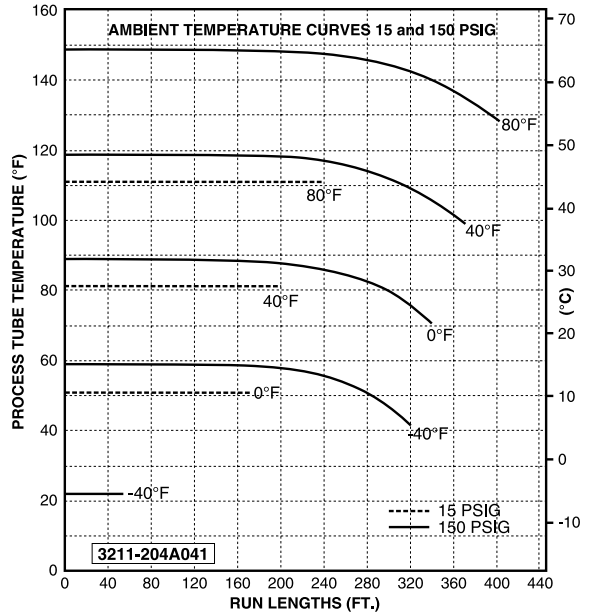
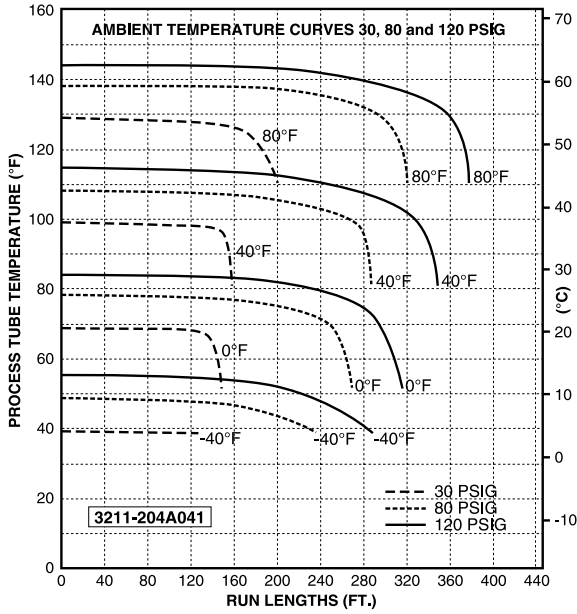
For performance characteristics [see next page](#).

‡ Indicates stock item.

# Performance Data

## 3211 Light Steam Trace Tubing

These performance graphs are based on a 1/4" process tube and a 1/4" tracer tube. Apply run length and temperature correction factors for other process and tracer tube sizes.



### Performance

Part Number #	Process Tube O.D.	Tracer Tube O.D.	Heat Loss (BTU/hr ft-°F) (ΔT = 100°F)
3211-204A041	1/4	1/4	10.9
3211-206A041	3/8	1/4	10.9
‡ 3211-208A041	1/2	1/4	10.9
‡ 3211-206A061	3/8	3/8	13.7
‡ 3211-208A061	1/2	3/8	13.7

### Correction Factors

Temperature	Run Length (ft.)
1	1
0.97	0.9
0.95	0.8
--	--
1.07	1.44

### Saturated Steam Pressure/Temperature

Mollier Chart	
Gauge Pressure (PSIG)	Saturation Temperature (Deg. F)
15	250
30	274
50	298
80	324
100	338
120	350
150	366

‡ Indicates stock item.

# 3221 Light Steam Trace Tubing — Multiple Process Tubes



**General:** Parker 3221 Temtrace Light Steam Trace Tubing consists of multiple process tubes with an insulated tracer, overall non-hygroscopic thermal insulation, and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

The 3221 Light Steam Trace Tubing is designed to utilize saturated steam pressures to 230 PSIG (15.8 BAR) and 400°F (204.4°C) without generating process tube temperatures in excess of 200°F (93°C) or a jacket surface temperature greater than 140°F (60°C) at 80°F (26.6°C) ambient. Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** The 3221 Temtrace permits use of higher pressure steam to heat trace instrument lines carrying water, light oil, paraffin, paraffin-based fluids and temperature-sensitive chemicals. Parker 3221 Temtrace is ideal for simple instrument line freeze protection and viscosity maintenance applications.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials, wall thicknesses and seamless stainless steel are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tubes are the same size and material, each individual tube is printed with tube number at two-inch intervals.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss. The insulated tracer provides a more constant process tube temperature over long tubing runs.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temtrace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for connecting multiple lengths of steam trace bundles and sealing bundle ends. Accessories for steam trace bundles are identified on [page C12](#). Detailed information can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page C11](#).

**NOTE:** It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.

## Physical Data\*

Part Number #	Process Tube O.D. (in.) 	Tracer Tube O.D. (in.) 	Nominal Product O.D. (in.) 	Product Weight (lbs./ft.) 	Minimum Bend Radius (in.) 	Horizontal/Vertical Support Centers (ft.) 	Slope 
3221-204B041	(2) 1/4	1/4	1.3	.473	14	5-6' 10-15'	1" in 8'
3221-206B041	(2) 3/8	1/4	1.5	.599	15	5-6' 10-15'	1" in 6'
3221-208B041	(2) 1/2	1/4	1.6	.778	16	5-6' 10-15'	1" in 3'
3221-206B061	(2) 3/8	3/8	1.6	.675	16	5-6' 10-15'	1" in 7'
‡ 3221-208B061	(2) 1/2	3/8	1.7	.803	18	5-6' 10-15'	1" in 6'

\* All values are nominal. Dimensional data to be used as reference only.

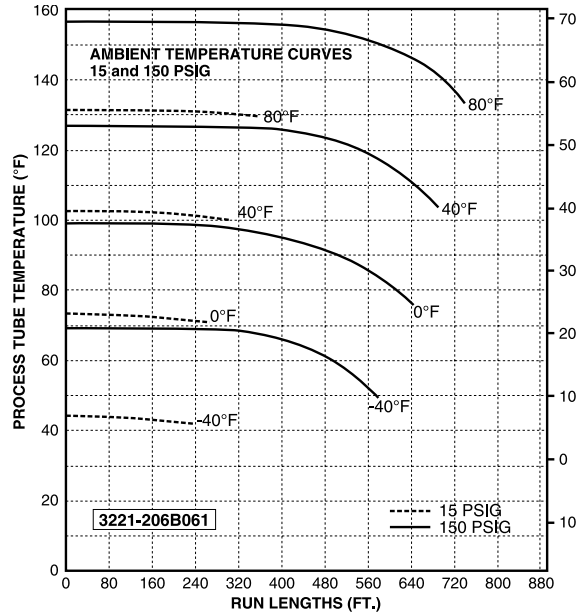
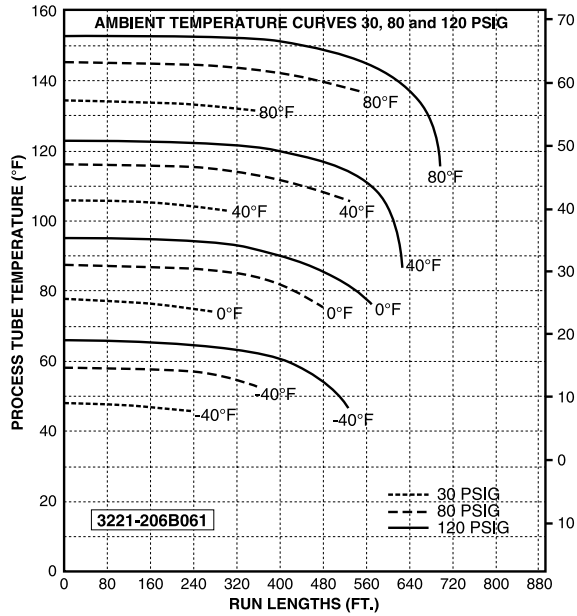
For performance characteristics see next page.

‡ Indicates stock item.

# Performance Data

## 3221 Light Steam Trace Tubing

These performance graphs are based on 3/8" process tubes and a 3/8" tracer tube. Apply run length and temperature correction factors for other process and tracer tube sizes.



### Performance

Part Number #	Process Tube O.D. 	Tracer Tube O.D. 	Heat Loss (BTU/hr ft-°F) (ΔT = 100°F) 
3221-204B041	(2) 1/4	1/4	10.9
3221-206B041	(2) 3/8	1/4	10.9
3221-208B041	(2) 1/2	1/4	10.9
3221-206B061	(2) 3/8	3/8	13.7
‡ 3221-208B061	(2) 1/2	3/8	13.7

### Correction Factors

Temperature	Run Length (ft.)
—	—
—	—
—	—
1	1
0.98	0.9

### Saturated Steam Pressure/Temperature

Mollier Chart	
Gauge Pressure (PSIG)	Saturation Temperature (Deg. F)
15	250
30	274
50	298
80	324
100	338
120	350
150	366

‡ Indicates stock item.

# How To Specify & Order Steam Trace Tubing

**Example: 3122-206B061—Parker Temptrace Steam Trace Tubing:** Two 3/8" O.D. x .035" wall Type 316 welded stainless steel process tubes, and a 3/8" O.D. x .032" wall Type 122 seamless copper tracer, helically wound, patented air-spaced applied non-hygroscopic fiberglass thermal insulation for minimum heat loss, and an overall jacket of extruded black, 105°C rated, flame-resistant PVC (FR PVC). MTR\* of 400°F (204°C).

**Example: 3211-208A041—Parker Temptrace Light Steam Trace Tubing:** One 1/2" O.D. x .035" wall Type 316 welded stainless steel process tube, and an insulated 1/4" O.D. x .030" wall Type 122 copper tracer, helically wound, patented air-spaced applied non-hygroscopic fiberglass thermal insulation for minimum heat loss, and an overall jacket of extruded black PVC (FR PVC). MTR\* of 400°F (204°C).

**Example: 3221-206B061—Parker Temptrace Light Steam Trace Tubing:** Two 3/8" O.D. x .035" wall Type 316 welded stainless steel process tubes, and an insulated 3/8" O.D. x .032" wall Type 122 seamless copper tracer, helically wound, patented air-spaced applied non-hygroscopic fiberglass thermal insulation for minimum heat loss, and an overall jacket of extruded black PVC (FR PVC). MTR\* of 400°F (204°C).

**Example: 3112-212A061-M—Parker Temptrace Steam Trace Tubing:** One 12mm O.D. x 1mm wall Type 316 welded stainless steel process tube, and a 6mm O.D. x 1mm wall Type 122 seamless copper tracer, helically wound, patented air-spaced applied non-hygroscopic fiberglass thermal insulation for minimum heat loss, and an overall jacket of extruded black, 105°C rated, flame-resistant PVC (FR PVC). MTR\* of 400°F (204°C).

\* Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperature in excess of this may damage the product or alter its performance.

**How To Order:**

**Steam Temptrace**

- 3112 – Series Heavy Steam Temptrace, Single Process Tube
- 3122 – Series Heavy Steam Temptrace, Multiple Process Tubes
- 3211 – Series Light Steam Temptrace, Single Process Tube
- 3221 – Series Light Steam Temptrace, Multiple Process Tubes

3XXX-	X	XX	X	XX	X	-XXX		
Product Family	Process Tube Material	Process Tube Size		Process Tube Quantity	Tracer Tube Size		Tracer Tube Material	Specials
		English	Metric**		English	Metric**		
3112-	1 = Copper	02 = 1/8"	06 = 6mm	A = 1	02 = 1/8"	06 = 6mm	1 = Copper	-001 = Seamless 316 SS
3122-	2 = W 316 SS	03 = 3/16"	08 = 8mm	B = 2	03 = 3/16"	08 = 8mm	2 = W 316 SS	-002 = TPR Jacket
3211-	3 = W 304 SS	04 = 1/4"	10 = 10mm	etc.	04 = 1/4"	10 = 10mm	3 = W 304 SS	-003 = TPR Jacket &
3221-	4 = Monel 400	05 = 5/16"	12 = 12mm		05 = 5/16"	12 = 12mm	4 = Monel 400	Seamless 316 SS
	5 = Hastelloy C22	06 = 3/8"			06 = 3/8"		5 = Hastelloy C22	-004 = FR TPE Jacket
	6 = PFA	07 = 7/16"			07 = 7/16"		9 = Special	-005 = FR TPE Jacket &
	7 = 919 TFE Hose	08 = 1/2"			08 = 1/2"			Seamless 316 SS
	9 = Special	10 = 5/8"						-M = Metric**
		12 = 3/4"						
		16 = 1"						

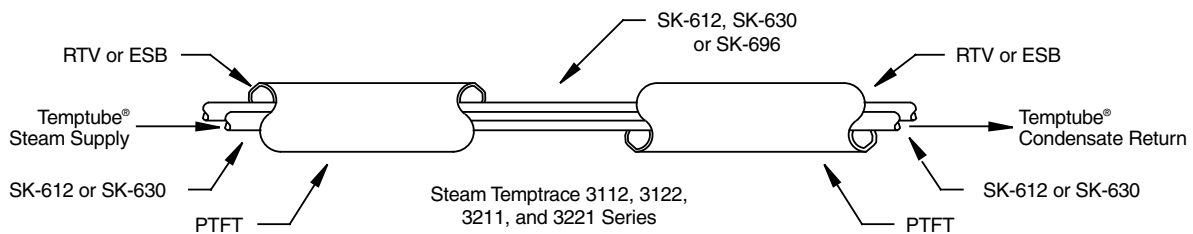
\*\*Add suffix -M to end of part number to indicate metric size tubing.

For Heat Trace Products Accessory Selections [see next page.](#)



# Temptrace Products Accessory Selections

Product Family	Accessory P/N	Description
3112	RTV-103BLK	End Sealant, 2.8 oz. tube, 400°F
3122	RTV-103BLK10.3	End Sealant, 10.1 oz. cartridge, 400°F
3211	RTV-106RED	End Sealant, 2.8 oz. tube, 500°F
3221	ESB	End Seal Boot, 400°F molded silicone
	SK-612	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 12")
	SK-630	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 30")
	SK-696	Insulation / jacket repair kit (Insulation dimensions - 6" x 96")
	PTFT1.45	Parker Temptrace Feed Through seal kit (.79" - 1.45")
	PTFT2.42	Parker Temptrace Feed Through seal kit (1.45" - 2.42")



For detailed information about these accessories, [see Section F](#) of this catalog.

## ***Section D — Temptrace™ – Electric***

Constant Wattage .....	D3 – D8
Self-Regulating .....	D9 – D14
Mineral Insulated .....	D15 – D18
Design Criteria Sheet .....	D19

# 4311/4312 Constant Wattage Electric Trace Tubing — Single Process Tube

◀FM▶ Approved

Factory Mutual approvals require the use of Parker components and accessories.



**General:** Parker 4311/4312 Constant Wattage Temtrace electric trace tubing consists of a single process tube traced with a constant wattage heating cable, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4311/4312 Constant Wattage Temtrace is designed for two temperature ranges:

- (1) 4311 for freeze protection and viscosity maintenance of 50°F (10°C) to 80°F (26.7°C) at ambient temperatures to -40°F (-40°C); and
- (2) 4312 for process temperature maintenance of 160°F (71.1°C) to 250°F (121.1°C) @ -40°F (-40°C) and 300°F (148.9°C) to 370°F (187.8°C) @ 80°F (26.7°C).

Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temtrace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for constant wattage bundles are identified on [page D8](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D7](#).

**NOTE:** It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.

Stock Items
4312-204A212
4312-206A212

**Electrical Specifications:**

Heater type	4 W./ft.	11.4 W./ft.
Insulation	FEP Teflon® 600 V rated	PFA Teflon® 600V rated
Bus wire size	12 AWG	12 AWG
Heating zone length**	18" (45.7 cm) and 24" (61 cm) (except 48" (121.9 cm) for high temperature Kapton® insulated heater wires)	

**\*\*Installation Note:**

**Caution:** Cutting beyond heating zone indentation will result in an unheated section of the heater wire for the balance of the heating zone length. The bus wires MUST NOT be connected together on the termination end!

Part Number Series	Power Consumption	Voltage	Maximum Circuit Length*** (ft.)	Current
4311	4 W./ft. (13.1 W./m.)	120V	340 ft. (103.6 m.)	.033 amps/ft. (.108 amps/m.)
		240V	680 ft. (207.3 m.)	.017 amps/ft. (0.55 amps/m.)
4312	11.4 W./ft. (37.4 W./m.)	120V	200 ft. (61 m.)	.095 amps/ft. (.312 amps/m.)
		240V	400 ft. (122 m.)	.0485 amps/ft. (.156 amps/m.)

\*\*\*Based on 10% power drop.

For recommended temperature controller, see [4012-01145 \(G.P. areas\)](#) and [4012-01147 \(Hazardous locations\)](#) in [Section F](#).

**Approvals:**

Ordinary Locations

◀FM▶ Approved

Hazardous (Classified) Locations

◀FM▶ Approved

Class I, Division 2, Groups B, C and D

Class II, Division 2, Groups F and G

Class III, Division 1 and 2

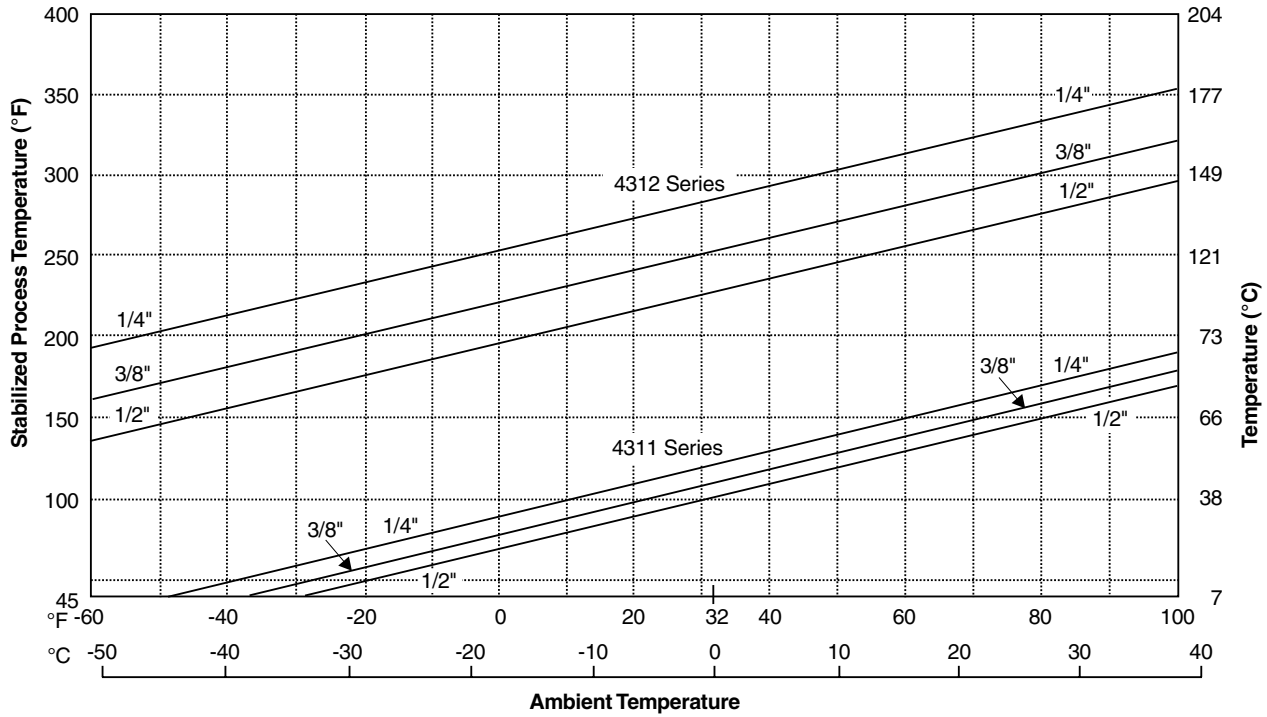
**Ground Fault Equipment Protection Devices (GFEPDs):**

The IEEE standard (515-1989) for heating cables requires 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."

**For performance characteristics see next page.**

Performance Data

4311/4312 Constant Wattage Electric Trace Tubing



Product Specifications

Process Tube O.D. (in.)	Product Weight (lbs./ft.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)
1/4"	.360	1.11"	6"
3/8"	.438	1.24"	8"
1/2"	.506	1.33"	10"

\* All values are nominal. Dimensional data to be used as reference only.

Installation Recommendations

Minimum Installation Temperature for:	
FR PVC Jacket	-35° F (-37.2° C)
Maximum Horizontal/Vertical Support Centers (ft.)	
Vertical:	15 ft. (4.5 m.)
Horizontal:	6 ft. (1.8 m.)

# 4321/4322 Constant Wattage Electric Trace Tubing — Multiple Process Tubes



Factory Mutual approvals require the use of Parker components and accessories.



**General:** Parker 4321/4322 Constant Wattage Temprace electric trace tubing consists of multiple process tubes traced with a constant wattage heating cable, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4321/4322 Constant Wattage Temprace is designed for two temperature ranges:

- (1) 4321 for freeze protection and viscosity maintenance of 40°F (4.4°C) to 80°F (26.7°C) at ambient temperatures to - 40°F (-40°C); and
- (2) 4322 for process temperature maintenance of 160° (71.1°C) to 225°F (107.2°C) @ -40°F (-40°C) and 260°F (126.7°C) to 350°F (176.7°C) @ 80°F (26.7°C).

Standard product has a Maximum Temperature Rating (MTR)\* of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tubes are the same size and materials, each individual tube is printed with tube number at two-inch intervals.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temprace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for constant wattage bundles are identified on [page D8](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D7](#).

**NOTE:** It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.

**Electrical Specifications:**

Heater type	4 W./ft.	11.4 W./ft.
Insulation	FEP Teflon® 600 V rated	PFA Teflon® 600V rated
Bus wire size	12 AWG	12 AWG
Heating zone length**	18" (45.7 cm) and 24" (61 cm) (except 48" (121.9 cm) for high temperature Kapton® insulated heater wires)	

**\*\*Installation Note:**

Caution: Cutting beyond heating zone indentation will result in an unheated section of the heater wire for the balance of the heating zone length. The bus wires MUST NOT be connected together on the termination end!

Part Number Series	Power Consumption	Voltage	Maximum Circuit Length*** 	Current
4321	4 W./ft. (13.1 W./m.)	120V	340 ft. (103.6 m.)	.033 amps/ft. (.108 amps/m.)
		240V	680 ft. (207.3 m.)	.017 amps/ft. (0.55 amps/m.)
4322	11.4 W./ft. (37.4 W./m.)	120V	200 ft. (61 m.)	.095 amps/ft. (.312 amps/m.)
		240V	400 ft. (122 m.)	.0485 amps/ft. (.156 amps/m.)

\*\*\*Based on 10% power drop.

For recommended temperature controller, see [4012-01145 \(G.P. areas\)](#) and [4012-01147 \(Hazardous locations\)](#) in [Section F](#).

**Approvals:**

Ordinary Locations

◀FM▶ Approved

Hazardous (Classified) Locations

◀FM▶ Approved

Class I, Division 2, Groups B, C and D

Class II, Division 2, Groups F and G

Class III, Division 1 and 2

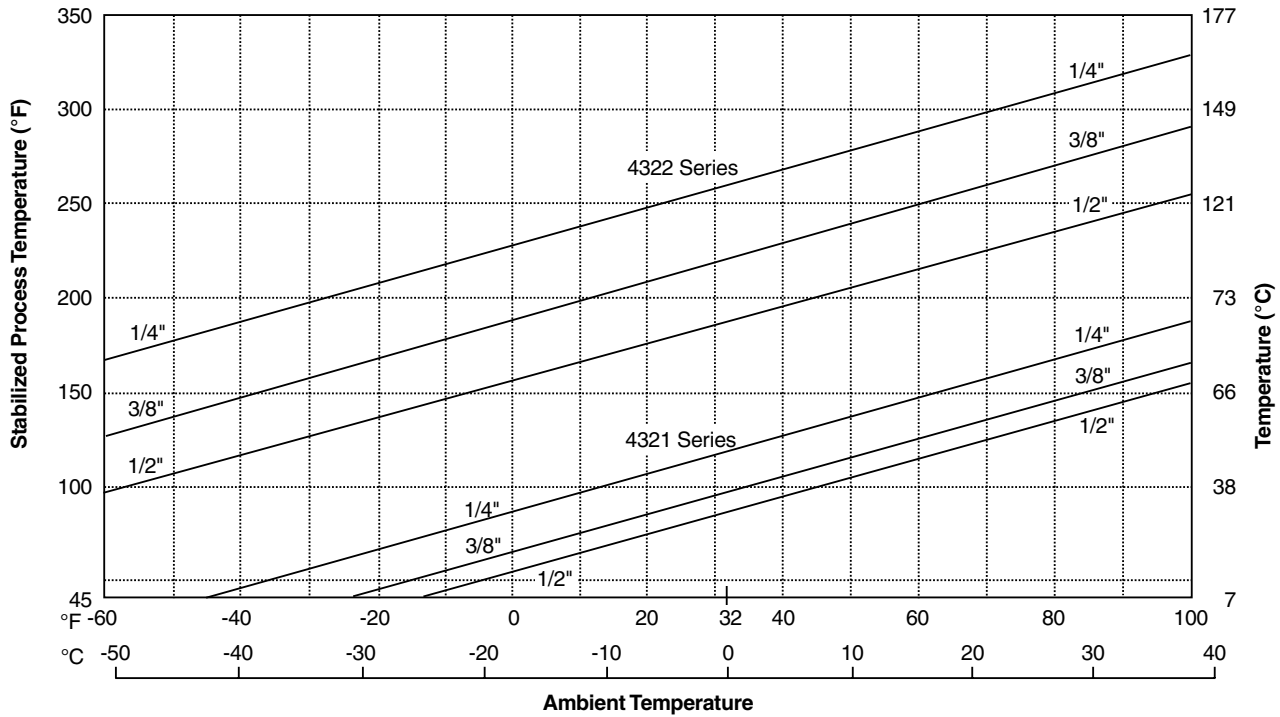
**Ground Fault Equipment Protection Devices (GFEPDs):**

The IEEE standard (515-1989) for heating cables requires 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."

**For performance characteristics see next page.**

Performance Data

4321/4322 Constant Wattage Electric Trace Tubing



Product Specifications

Process Tube O.D. (in.)	Product Weight (lbs./ft.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)	Slope Self Drainage
2 x 1/4"	.465	1.21"	8"	3-1/8" / 10'
2 x 3/8"	.599	1.38"	10"	4-3/8" / 10'
2 x 1/2"	.736	1.57"	12"	5-5/8" / 10'

\* All values are nominal. Dimensional data to be used as reference only.

Installation Recommendations

<b>Minimum Installation Temperature for:</b>	
FR PVC Jacket	-35° F (-37.2° C)
<b>Maximum Horizontal/Vertical Support Centers (ft.)</b>	
Vertical:	15 ft. (4.5 m.)
Horizontal:	6 ft. (1.8 m.)



# How to Specify & Order Constant Wattage Electric Trace Tubing



Factory Mutual approvals require the use of Parker components and accessories.

**Example: 4322-206B222—Parker Temptrace Constant Wattage Electric Trace Tubing:** Two helically wound 3/8" O.D. x .035" wall Type 316 welded stainless steel tubes, 11.4 watt/ft. @ 240 VAC, constant wattage heating cable, aluminum heat transfer foil patented air-spaced applied non-hygroscopic fiberglass insulation for minimum heat loss, and black, 105°C rated, flame-resistant PVC (FR PVC) jacket. Class I, Division 2, classification for temperature maintenance. MTR\* of 400°F (204.4°C).

**Example: 4311-206A412-M—Parker Temptrace Constant Wattage Electric Trace Tubing:** One 6mm O.D. x 1mm wall Type 316 welded stainless steel tube and 4 watt/ft. @ 120 VAC constant wattage heating cable, aluminum heat transfer foil wrap, patented air-spaced applied non-hygroscopic fiberglass insulation, aluminum heat transfer foil for minimum heat loss, and black, flame resistant PVC (FR PVC) jacket. General purpose classification, MTR\* of 400°F (204.4°C).

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperature in excess of this may damage the product or alter its performance.

**How To Order:**

**Constant Wattage Heater**

- 4311-Series Electric Temptrace, Constant Wattage, Single Process, Freeze Protection
- 4312-Series Electric Temptrace, Constant Wattage, Single Process, Temperature Maintenance
- 4321-Series Electric Temptrace, Constant Wattage, Multiple Process, Freeze Protection
- 4322-Series Electric Temptrace, Constant Wattage, Multiple Process, Temperature Maintenance

**43XX-      X                      XX                      X                      X                      X                      X                      -XXX**

Product Family	Process Tube Type	Process Tube Size		Process Tube Quantity	Cable Code		Area Classification***	Specials
		English	Metric**		Watts	Volts		
4311-	1 = Copper	02 = 1/8"	06 = 6mm	A = 1	• 4 = 4 Watts/ft.	1 = 120V (AC)	1 = Class I, Div. 1	-001 = Seamless 316 SS
4312-	2 = W 316 SS	03 = 3/16"	08 = 8mm	B = 2	8 = 8 Watts/ft.	2 = 220V (AC)	2 = Gen. Purpose or	-002 = TPR Jacket
4321-	3 = W 304 SS	04 = 1/4"	10 = 10mm		• 2 = 11.4 Watts/ft.	8 = 208V (AC)	Class I, Div. 2	-003 = TPR Jacket & Seamless 316 SS
4322-	4 = Monel 400	05 = 5/16"	12 = 12mm			7 = 277V (AC)		-004 = FR TPE Jacket
	5 = Hastelloy C22	06 = 3/8"						-005 = FR TPE Jacket & Seamless 316 SS
	6 = PFA	07 = 7/16"						-M = Metric**
	7 = 919 TFE Hose	08 = 1/2"						
	9 = Special	10 = 5/8"						
		12 = 3/4"						
		16 = 1"						

• Indicates standard heater cable.

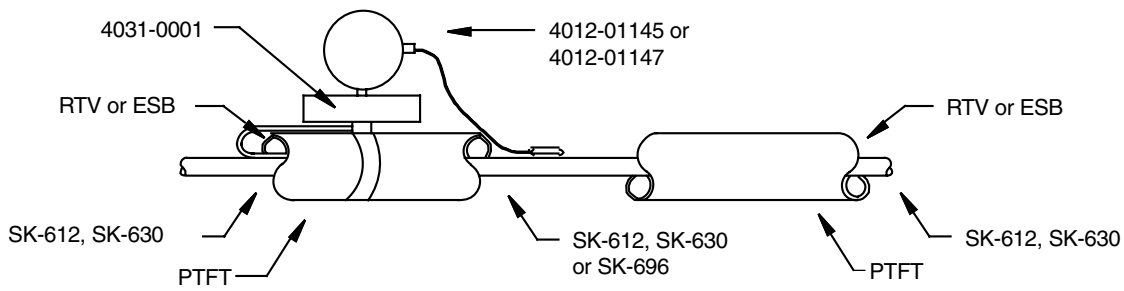
\*\* Add suffix -M to end of part number to indicate metric size tubing.

\*\*\* Class I, Division 1 and Division 2, areas as defined in the NEC Article 500, "Hazardous (Classified) Locations," are those in which flammable gases or vapors under normal operating conditions are confined within a closed system and are released only under accidental circumstances. See National Electric Code Article 500 for further details.

**For Heat Trace Products Accessory Selections see next page.**

**Heat Trace Products Accessory Selections**

Product Family	Series	Accessory P/N	Description
Constant Wattage Electric Temptrace	4311 4312 4321 4322	4031-0001	Electrical Input Power / End Termination Kit ◀FM▶ Approved
		4012-01145	Line sensing general purpose area NEMA 4X temperature controller
		4012-01147	Line sensing hazardous location NEMA 7 temperature controller
		RTV-103BLK RTV-103BLK10.3 RTV-106RED	End Sealant, 2.8 oz. tube, 400°F End Sealant, 10.1 oz. cartridge, 400°F End Sealant, 2.8 oz. tube, 500°F
		ESB	End Seal Boot, 400°F molded silicone
		SK-612	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 12")
		SK-630	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 30")
		SK-696	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 96")
		PTFT1.45 PTFT2.42	Parker Temptrace Feed Through seal kit (.79" - 1.45") (1.45" - 2.42")



Constant Wattage Electric 4311, 4312, 4321, 4322

**Specifications Conformance**

**Electric Trace Tubing Products**

Parker Multitube Temptrace electric trace products conform to *Articles 427 and 500 of the National Electric Code*. Article 427 is entitled, "Fixed Electric Heating Equipment for Pipelines and Vessels." Article 500 is entitled, "Hazardous (classified) Locations," and contains definitions of specific occupancies by Class, Division and Group Location.

Parker Multitube Temptrace electric trace products also conform to IEEE Standard 515 entitled, "IEEE Recommended Practice for the Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications."

**Ground Fault Equipment Protection Devices (GFEPDs):**

The IEEE standard (515-1989) for heating cables requires 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."

# 4411/4412 Self-Regulating Electric Trace Tubing — Single Process Tube



◀FM▶ Approved

Factory Mutual approvals require the use of Parker components and accessories.

**General:** Parker 4411/4412 Self-Regulating Temprace electric trace tubing consists of a single process tube traced with a self-regulating heating cable, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4411/4412 Self-Regulating Temprace is designed to provide freeze protection and viscosity maintenance of 40°F (4.4°C) to 140°F (60°C) at ambient temperatures to -40°F (-40°C). Standard product with a 5 watt/ft. heater has a Maximum Temperature Rating (MTR\*) of 150°F (65.6°C). It is T6 rated per Table 500-3(d) of the U.S. National Electrical Code (1996). Standard product with a 10 watt/ft. heater has an MTR of 250°F (121.1°C) and can be used in steam-cleaned applications. It is T3 rated. Both heating cables are FM and CSA approved.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Temprace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Electrical Specifications:**

Operating Voltage .....	120 VAC (240 VAC available)
Voltage Rating .....	600 Volts
Bus Wire Size .....	16AWG (5 watts/ft.)
.....	14 AWG (10 watts/ft.)

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for self-regulating bundles are identified on [page D14](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D13](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

Stock Items
4411-204A512
4411-206A512
4411-208A512

**Approvals:**

Ordinary Locations

◀FM▶ Approved

Hazardous (Classified) Locations

◀FM▶ Approved

Class I, Division 2, Groups B, C and D  
Class II, Division 2, Groups F and G  
Class III, Division 1 and 2

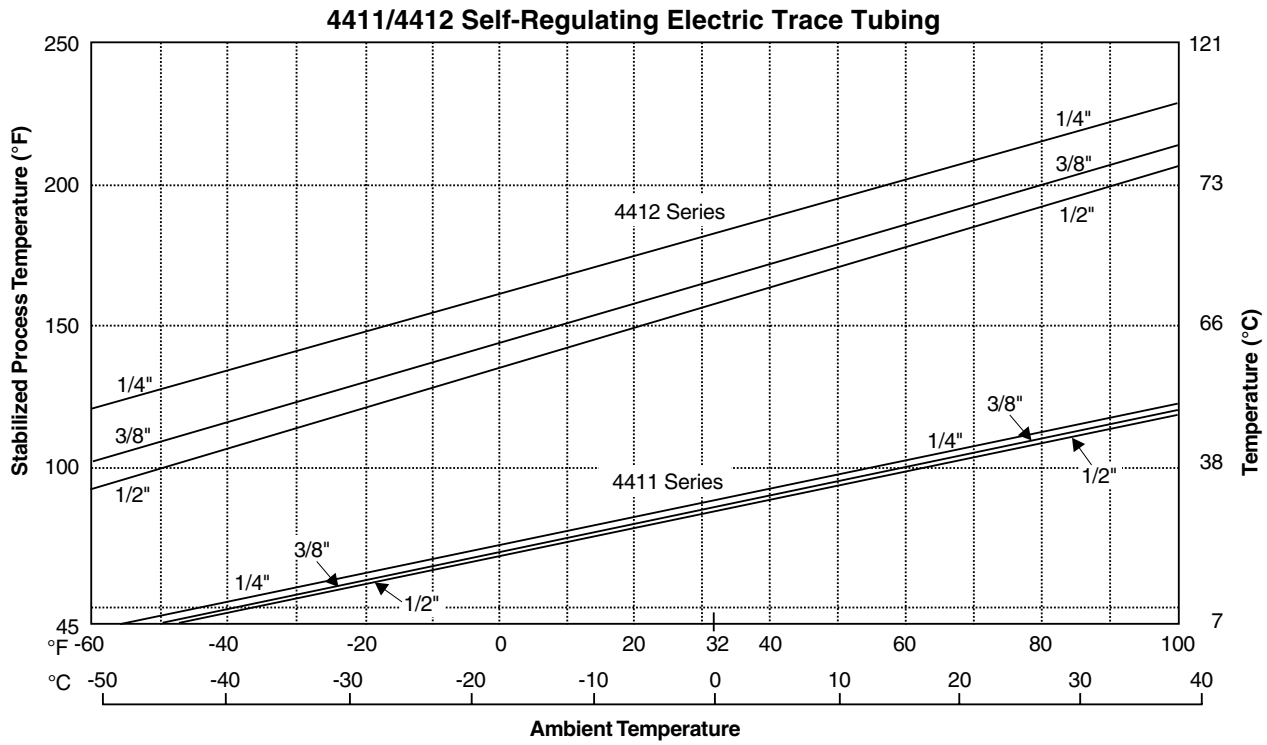
**Ground Fault Equipment Protection Devices (GFEPDs):** The IEEE standard (515-1989) for heating cables requires the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres."

Part Number Series	Watts/ft. @ 50°F (10°C)	Circuit Breaker Selection	Circuit Breaker Size vs. Maximum Circuit Length (ft.)					Operating Current (amps/ft.)				
			15A	20A	30A	40A	50A	50° F (10° C)	70° F (21.1° C)	90° F (32.2° C)	110° F (43.3° C)	250° F (121.1° C)
4411	5	PH - 5 Heater	15A	20A	30A	40A	—	50° F (10° C)	70° F (21.1° C)	90° F (32.2° C)	110° F (43.3° C)	—
		If started at 50° F	230	270	—	—	—	0.042	0.029	0.017	0.008	—
		If started at 0° F	150	200	270	—	—	0.042	0.029	0.017	0.008	—
4412	10	PH - 10 Heater	15A	20A	30A	40A	50A	50° F (10° C)	100° F (37.8° C)	150° F (65.6° C)	200° F (93.3° C)	250° F (121.1° C)
		If started at 50° F	110	145	220	270	270	0.083	0.075	0.063	0.050	0.042
		If started at 0° F	95	130	195	260	270	0.083	0.075	0.063	0.050	0.042
		If started at -20° F	90	120	185	145	270					

For recommended temperature controller, see [4012-01145](#) (G.P. areas) and [4012-01147](#) (Hazardous locations) in [Section F](#).

**For performance characteristics see next page.**

Performance Data



Product Specifications

Process Tube O.D. (in.)	Product Weight (lbs./ft.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)
1/4"	.350	1.16"	6"
3/8"	.425	1.28"	8"
1/2"	.482	1.32"	10"

\* All values are nominal. Dimensional data to be used as reference only.

Installation Recommendations

Minimum Installation Temperature for:	
FR PVC Jacket	-35° F (-37.2° C)
Maximum Horizontal/Vertical Support Centers (ft.)	
Vertical:	15 ft. (4.5 m.)
Horizontal:	6 ft. (1.8 m.)

# 4421/4422 Self-Regulating Electric Trace Tubing — Multiple Process Tubes



Factory Mutual approvals require the use of Parker components and accessories.



**General:** Parker 4421/4422 Self-Regulating Temtrace electric trace tubing consists of multiple process tubes traced with a self-regulating heating element, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4421/4422 Self-Regulating Temtrace is designed to provide freeze protection and viscosity maintenance of 40°F (4.4°C) to 140°F (60°C) at ambient temperatures to -40°F (-40°C). Standard product with a 5 watt/ft. heater has a Maximum Temperature Rating (MTR\*) of 150°F (65.6°C). It is T6 rated per Table 500-3(d) of the U.S. National Electrical Code (1996). Standard product with a 10 watt/ft. heater has an MTR of 250°F (121.1°C) and can be used in steam-cleaned applications. It is T3 rated. Both heating cables are FM and CSA approved.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tubes are the same size and materials, each individual tube is printed with tube number at two-inch intervals.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Electrical Specifications:**

Operating Voltage .....	120 VAC (240 VAC available)
Voltage Rating .....	600 Volts
Bus Wire Size .....	16AWG (5 watts/ft.)
.....	14 AWG (10 watts/ft.)

**Testing:** Each tube in every length of Parker Temtrace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for self-regulating bundles are identified on [page D14](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D13](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

Stock Items
4421-206B512
4421-208B212

**Approvals:**

- Ordinary Locations
- ◀FM▶ Approved
- Hazardous (Classified) Locations
- ◀FM▶ Approved

- Class I, Division 2, Groups B, C and D
- Class II, Division 2, Groups F and G
- Class III, Division 1 and 2

**Ground Fault Equipment Protection Devices (GFEPDs):** The IEEE standard (515-1989) for heating cables requires 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.”

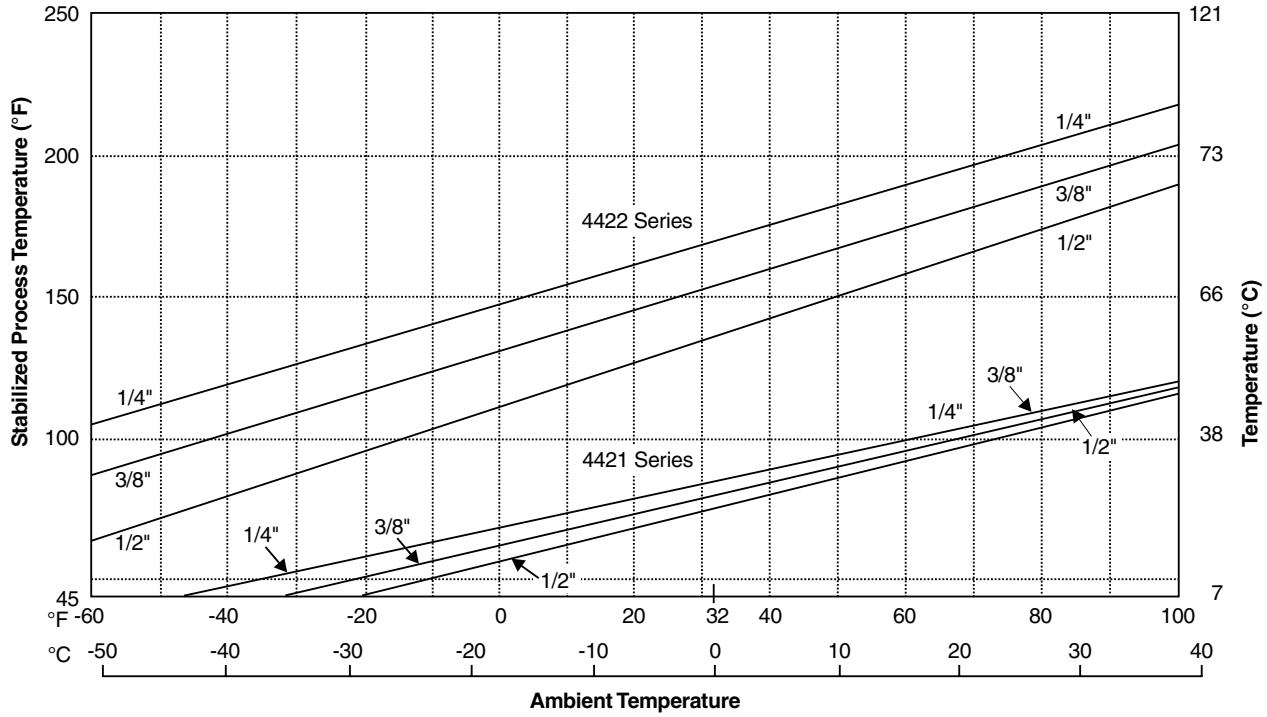
Part Number Series	Watts/ft. @ 50° F (10° C)	Circuit Breaker Selection	Circuit Breaker Size vs. Maximum Circuit Length (ft.)					Operating Current (amps/ft.)				
			15A	20A	30A	40A	50A	50° F (10° C)	70° F (21.1° C)	90° F (32.2° C)	110° F (43.3° C)	250° F (121.1° C)
4421	5	PH - 5 Heater	15A	20A	30A	40A	—	50° F (10° C)	70° F (21.1° C)	90° F (32.2° C)	110° F (43.3° C)	—
		If started at 50° F	230	270	—	—	—	0.042	0.029	0.017	0.008	—
		If started at 0° F	150	200	270	—	—	—	—	—	—	—
		If started at -20° F	130	170	260	270	—	—	—	—	—	—
4422	10	PH - 10 Heater	15A	20A	30A	40A	50A	50° F (10° C)	100° F (37.8° C)	150° F (65.6° C)	200° F (93.3° C)	250° F (121.1° C)
		If started at 50° F	110	145	220	270	270	0.083	0.075	0.063	0.050	0.042
		If started at 0° F	95	130	195	260	270	—	—	—	—	—
		If started at -20° F	90	120	185	145	270	—	—	—	—	—

For recommended temperature controller, see [4012-01145 \(G.P. areas\)](#) and [4012-01147 \(Hazardous locations\)](#) in [Section F](#).

**For performance characteristics see next page.**

Performance Data

4421/4422 Self-Regulating Electric Trace Tubing



Product Specifications

Process Tube O.D. (in.)	Product Weight (lbs./ft.)	Nominal Product O.D. (in.)	Minimum Bend Radius (in.)
2 x 1/4"	.451	1.25"	6"
2 x 3/8"	.584	1.41"	8"
2 x 1/2"	.727	1.62"	10"

\* All values are nominal. Dimensional data to be used as reference only.

Installation Recommendations

Minimum Installation Temperature for:	
FR PVC Jacket	-35° F (-37.2° C)
Maximum Horizontal/Vertical Support Centers (ft.)	
Vertical:	15 ft. (4.5 m.)
Horizontal:	6 ft. (1.8 m.)

# How to Specify & Order Self-Regulating Electric Trace Tubing



Factory Mutual approvals require the use of Parker components and accessories.

**Example: 4411-204A512—Parker Temptrace Self-Regulating Electric Trace Tubing:** One 1/4" O.D. x .035" wall Type 316/316L welded stainless steel tube and a 5 watt/ft @ 120 VAC braided and polyolefin over jacketed, self-regulating heating cable, aluminum heat transfer foil, patented air-spaced applied non-hygroscopic fiberglass insulation for minimum heat loss, black, 105°C rated, flame-resistant PVC (FR PVC) jacket. For freeze protection. MTR\* of 150°F (65.6°C).

**Example: 4422-106B112-M—Parker Temptrace Self-Regulating Electric Trace Tubing:** Two helically wound 3/8" O.D. x .032" wall Type 122 seamless copper tubes and a 10 watt/ft @ 120 VAC braided and fluoropolymer over jacketed, self-regulating heating cable capable of withstanding steam blowdown, aluminum heat transfer foil, patented air-spaced applied non-hygroscopic fiberglass insulation for minimum heat loss, 105°C rated, black, flame-resistant, PVC (FR PVC) jacket. For temperature maintenance. MTR\* of 380°F (193.3°C).

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperature in excess of this may damage the product or alter its performance.

**How To Order:**

**Constant Wattage Heater**

- 4411-Series Electric Temptrace, Self-Regulating, Single Process, Freeze Protection
- 4412-Series Electric Temptrace, Self-Regulating, Single Process, Temperature Maintenance
- 4421-Series Electric Temptrace, Self-Regulating, Multiple Process, Freeze Protection
- 4422-Series Electric Temptrace, Self-Regulating, Multiple Process, Temperature Maintenance

**44XX- X XX X X X X -XXX**

Product Family	Process Tube Type	Process Tube Size		Process Tube Quantity	Cable Code		Area Classification***	Specials
		English	Metric**		Watts	Volts		
4411-	1 = Copper	02 = 1/8"	06 = 6mm	A = 1	• 5 = 5 Watts / ft.	1 = 120V (AC)	1 = Class I, Div. 1	-001 = Seamless 316 SS
4412-	2 = W 316 SS	03 = 3/16"	08 = 8mm	B = 2	• 1 = 10 Watts / ft.	2 = 240V (AC)	2 = Gen. Purpose or	-002 = TPR Jacket
4421-	3 = W 304 SS	04 = 1/4"	10 = 10mm	etc.	A = 15 Watts / ft.	8 = 208V (AC)	Class I, Div. 2	-003 = TPR Jacket & Seamless 316 SS
4422-	4 = Monel 400	05 = 5/16"	12 = 12mm		D = 20 Watts / ft.	7 = 277V (AC)		-004 = FR TPE Jacket
	5 = Hastelloy C22	06 = 3/8"						-005 = FR TPE Jacket & Seamless 316 SS
	6 = PFA	07 = 7/16"						-M = Metric**
	7 = 919 TFE Hose	08 = 1/2"						
	9 = Special	10 = 5/8"						
		12 = 3/4"						
		16 = 1"						

• Indicates standard heater cable.

\*\* Add suffix -M to end of part number to indicate metric size tubing.

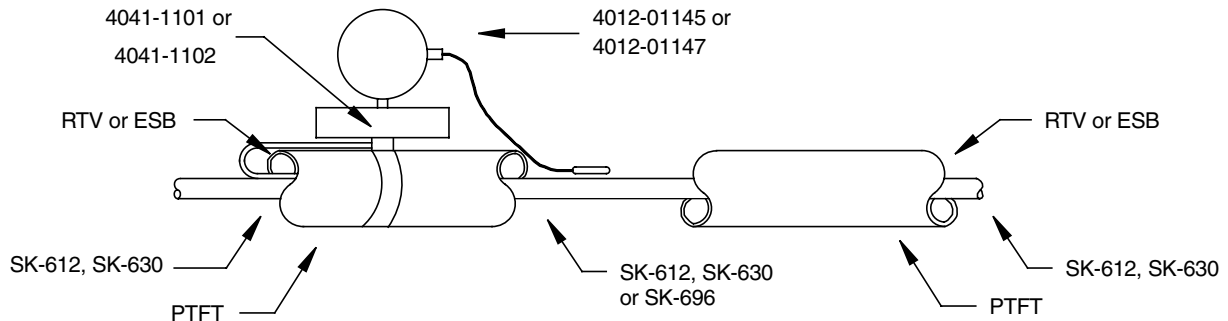
\*\*\* Class I, Division 1 and Division 2, areas as defined in the NEC Article 500, "Hazardous (Classified) Locations," are those in which flammable gases or vapors under normal operating conditions are confined within a closed system and are released only under accidental circumstances. See National Electric Code Article 500 for further details.

For Heat Trace Products Accessory Selections [see next page.](#)



**Heat Trace Products Accessory Selections**

Product Family	Series	Accessory P/N	Description
Self-Regulating Electric Temtrace	4411	4041-1101	Electrical connection kit for 4411/4412 single tube products
	4412	4041-1102	Electrical connection kit for 4421/4422 double tube products
	4421		products
	4422		◀FM▶ Approved
		4012-01145	Line sensing general purpose area
		4012-01147	NEMA 4X temperature controller Line sensing hazardous location NEMA 7 temperature controller
		RTV-103BLK	End Sealant, 2.8 oz. tube, 400°F
		RTV-103BLK10.3	End Sealant, 10.1 oz. cartridge, 400°F
		RTV-106RED	End Sealant, 2.8 oz. tube, 500°F
		ESB	End Seal Boot, 400°F molded silicone
		SK-612	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 12")
		SK-630	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 30")
		SK-696	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 96")
	PTFT1.45 PTFT2.42	Parker Temtrace Feed Through Seal Kit (.79" - 1.45") (1.45" - 2.42")	



Self-Regulating Electric 4411, 4412, 4421, 4422

**Specifications Conformance**

**Electric Trace Tubing Products**

Parker Multitube Temtrace electric trace products conform to *Articles 427 and 500* of the *National Electric Code*. Article 427 is entitled, "Fixed Electric Heating Equipment for Pipelines and Vessels." Article 500 is entitled, "Hazardous (classified) Locations," and contains definitions of specific occupancies by Class, Division and Group Location.

Parker Multitube Temtrace electric trace products also conform to IEEE Standard 515 entitled, "IEEE Recommended Practice for the Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications."

**Ground Fault Equipment Protection Devices (GFEPDs):**

The IEEE standard (515-1989) for heating cables requires 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."

# 4511/4512 Mineral Insulated Electric Trace Tubing — Single Process Tube

◀FM▶ Approved

Factory Mutual approvals require the use of Parker components and accessories.



**General:** Parker 4511/4512 Mineral Insulated order-to-length series resistance MI Trace electric trace tubing consists of a single process tube electrically traced with a series resistance mineral insulated heating cable, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation, and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4511/4512 Mineral Insulated MI Trace is designed for two temperature ranges:

- (1) 4511 for freeze protection and viscosity maintenance of 40°F (4.4°C) to 80°F (26.7°C) at ambient temperatures down to -60°F (-51.1°C); and
- (2) 4512 for process temperature maintenance of 120°F (48.9°C) to 170°F (76.7°C) at -60°F (-51.1°C) and 260°F (126.7°C) to 310°F (154.4°C) at 80°F (26.7°C).

Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded and Seamless Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation or high temperature composite dual insulation system for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Mineral Insulated trace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for mineral insulated bundles are identified on [page D18](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D17](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

#### Electrical Specifications:

Heater Type .....	Series resistance, order to length
Operating Voltage .....	120/208/240 VAC
MI Cable Construction .....	Alloy 825 outer sheath, nickel clad copper bus wires, magnesium oxide insulation and nichrome heating element.

#### Maximum Exposure Temperature (heater cable only):

1200° F (650° C) power off  
 1000° F (538° C) power on (30 watts/ft. load)  
 Area classification...General purpose, Class I, Division 2, Groups A, B, C and D.

For recommended temperature controller, see [4012-01145 \(G.P. areas\)](#) and [4012-01147 \(Hazardous locations\)](#) in [Section F](#).

#### Approvals:

Ordinary Locations

◀FM▶ Approved

Hazardous (Classified) Locations

◀FM▶ Approved

Class I, Division 2, Groups B, C and D

Class II, Division 2, Groups F and G

Class III, Division 1 and 2

#### Ground Fault Equipment Protection Devices (GFEPDs):

The IEEE standard (515-1989) for heating cables requires 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."

# 4521/4522 Mineral Insulated Electric Trace Tubing — Multiple Process Tubes



## ◀FM▶ Approved

Factory Mutual approvals require the use of Parker components and accessories.

**General:** Parker 4521/4522 Mineral Insulated order-to-length series resistance MI Trace electric trace tubing consists of multiple process tubes electrically traced with a series resistance mineral insulated heating cable, a heat transfer foil wrap, a non-hygroscopic glass fiber insulation, and a black, 105°C rated, flame-resistant PVC (FR PVC) jacket.

Parker 4521/4522 Mineral Insulated MI Trace is designed for two temperature ranges:

- (1) 4521 for freeze protection and viscosity maintenance of 50°F (10°C) to 85°F (29.4°C) at ambient temperatures down to -60°F (-51.1°C); and
- (2) 4522 for process temperature maintenance of 110°F (43.3°C) to 170°F (76.7°C) at -40°F (-40°C) and 230°F (110°C) to 290°F (143.3°C) at 80°F (26.7°C).

Standard product has a Maximum Temperature Rating (MTR\*) of 400°F (204.4°C). Higher temperature rated designs up to 1000°F (537.8°) are available. Consult Division for details.

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperatures in excess of this may damage the product or alter its performance.

**Applications:** Analyzer, impulse and instrument lines; small diameter process lines; stack gas sampling lines; and utility lines.

**Tubing:** Type 122 DHP Seamless Copper and 316/316L Welded Stainless Steel are standard. Additional materials and wall thicknesses are available upon request. For Material Specifications of metal tubing, see [Technical Data in Section E](#) of the catalog. Consult Division for details.

**Tubing Identification:** When process tubes are the same size and materials, each individual tube is printed with tube number at two-inch intervals.

**Heat Transfer Foil:** An aluminum heat transfer foil for even heat distribution for precise temperature control.

**Insulation:** Patented (U.S. Pat. No. 4,285,369) air-spaced, cross wrapped applied non-hygroscopic fiberglass thermal insulation or high temperature composite dual insulation system for minimum heat loss.

**Jacket:** The tough, black, 105°C rated, flame-resistant PVC (FR PVC) jacket protects the tubing against corrosive atmospheres, water, oils, acids, alkalis and most chemicals. Additional jacket materials are available upon request. For Material Specifications of jackets, see [Technical Data in Section E](#) of the catalog. Consult Division for additional details.

**Testing:** Each tube in every length of Parker Mineral Insulated trace is pressure tested prior to shipment to assure the instrument engineer a high quality, reliable, trouble-free product. For Testing Specifications, see [Technical Data in Section E](#) of the catalog.

**Accessories:** Accessories are available for electrical connections, bundle splicing and end terminations. Accessories for mineral insulated bundles are identified on [page D18](#). Detailed information on accessories can be found in [Section F](#).

**Ordering:** For information about how to specify and order, see [page D17](#).

**NOTE: It is absolutely necessary to seal the ends against contamination from moisture and/or corrosive liquids. Parker Hannifin cannot assume any liability for product damage caused by moisture from unsealed ends.**

### Electrical Specifications:

Heater Type ..... Series resistance, order to length  
 Operating Voltage ..... 120/208/240 VAC  
 MI Cable Construction ..... Alloy 825 outer sheath, nickel clad copper bus wires, magnesium oxide insulation and nichrome heating element.

### Maximum Exposure Temperature (heater cable only):

1200°F (650°C) power off  
 1000°F (538°C) power on (30 watts/ft. load)  
 Area classification...General purpose, Class I, Division 2, Groups A, B, C and D.

For recommended temperature controller, see [4012-01145 \(G.P. areas\)](#) and [4012-01147 \(Hazardous locations\)](#) in [Section F](#).

### Approvals:

Ordinary Locations  
 ▶FM▶ Approved  
 Hazardous (Classified) Locations  
 ▶FM▶ Approved

Class I, Division 2, Groups B, C and D  
 Class II, Division 2, Groups F and G  
 Class III, Division 1 and 2

### Ground Fault Equipment Protection Devices (GFEPDs):

The IEEE standard (515-1989) for heating cables requires 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.”

# How to Specify & Order MI Trace Tubing:

## ◀FM▶ Approved

Factory Mutual approvals require the use of Parker components and accessories.

**A design criteria must be completed and submitted to the division to determine correct design configuration and part number.**

**Example: 4511-208A612 Parker MI Trace Mineral Insulated Electric Trace Tubing:** One 1/2" O.D. x .035" wall Type 316 welded stainless steel tube; 6 watt/ft. at 120 VAC mineral insulated, order-to-length heating cable, heat transfer foil tape, patented air-spaced applied, non-hygroscopic glass fiber insulation; black, 105°C rated, flame-resistant PVC (FR PVC) jacket. Class I, Division 2, Group A, B, C, and D classification for freeze protection and blowdown to MTR\* 400°F (204.4°C).

\*Maximum Temperature Rating is the maximum allowable temperature of the tracing fluid. Temperature in excess of this may damage the product or alter its performance.

### How To Order:

#### Mineral Insulated Heater

- 4511-Series Electric MI Trace, Mineral Insulated, Single Process, Freeze Protection
- 4512-Series Electric MI Trace, Mineral Insulated, Single Process, Temperature Maintenance
- 4521-Series Electric MI Trace, Mineral Insulated, Multiple Process, Freeze Protection
- 4522-Series Electric MI Trace, Mineral Insulated, Multiple Process, Temperature Maintenance

**45XX-            X                            XX                            X                            XX                            X                            -XXX**

Product Family	Process Tube Type	Process Tube Size		Process Tube Quantity	Cable Code		Area Classification***	Specials
		English	Metric**		Watts	Volts		
4511-	1 = Copper	02 = 1/8"	06 = 6mm	A = 1	4 = 4 Watts /ft.	1 = 120V (AC)	1 = Class I, Div. 1	-001 = Seamless 316 SS
4512-	2 = W 316 SS	03 = 3/16"	08 = 8mm	B = 2	6 = 6 Watts /ft.	2 = 220V (AC)	2 = Gen. Purpose or	-002 = TPR Jacket
4521-	3 = W 304 SS	04 = 1/4"	10 = 10mm	etc.	8 = 8 Watts /ft.	8 = 208V (AC)	Class I, Div. 2	-003 = TPR Jacket & Seamless 316 SS
4522-	4 = Monel 400	05 = 5/16"	12 = 12mm		1 = 10 Watts /ft.	7 = 277V (AC)		-004 = FR TPE Jacket
	5 = Hastelloy C22	06 = 3/8"			A = 15 Watts /ft.			-005 = FR TPE Jacket & Seamless 316 SS
	6 = PFA	07 = 7/16"			D = 20 Watts /ft.			-M = Metric**
	7 = 919 TFE Hose	08 = 1/2"						
	9 = Special	10 = 5/8"						
		12 = 3/4"						
		16 = 1"						

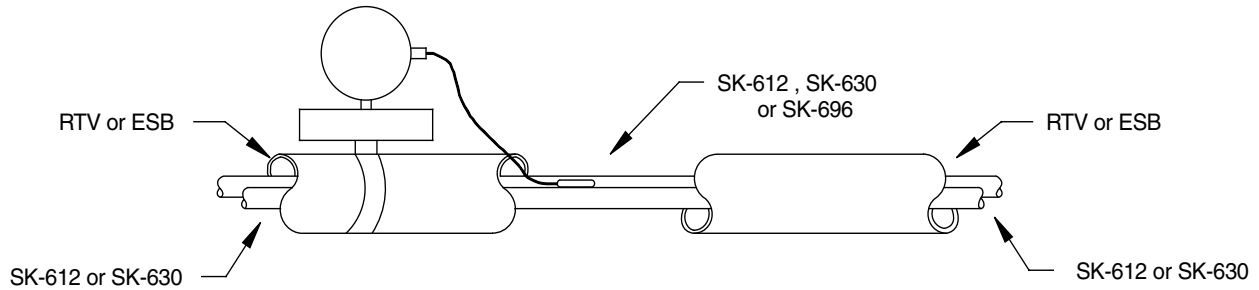
\*\*Add suffix -M to end of part number to indicate metric size tubing.

\*\*\*Class I, Division 1 and Division 2, areas as defined in the NEC Article 500, "Hazardous (Classified) Locations," are those in which flammable gases or vapors under normal operating conditions are confined within a closed system and are released only under accidental circumstances. See National Electric Code Article 500 for further details.

**For Heat Trace Products Accessory Selections [see next page.](#)**

# Heat Trace Products Accessory Selections

Product Family	Series	Accessory P/N	Description
MI Trace	4511	RTV-103BLK	End Sealant, 2.8 oz. tube, 400°F
	4512	RTV-103BLK10.3	End Sealant, 10.1 oz. cartridge, 400°F
	4521	RTV-106RED	End Sealant, 2.8 oz. tube, 500°F
	4522	ESB	End Seal Boot, 400°F molded silicone
		SK-612	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 12")
		SK-630	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 30")
	SK-696	Splice or fitting / valve end termination kit (Insulation dimensions - 6" x 96")	



Mineral Insulated Trace 4511, 4512, 4521, 4522 Series

# Parker Temptrace — Design Criteria

Date: \_\_\_\_\_ Customer Name: \_\_\_\_\_

Quantity \_\_\_\_\_ Run Lengths \_\_\_\_\_

Freeze protection only (-40°F and -40°C low ambient) \_\_\_\_\_ (check if "yes")

Temperature to maintain \_\_\_\_\_ °F (S & E) + \_\_\_\_\_ °F (H)  
 - \_\_\_\_\_ °F (H)

Ambient High \_\_\_\_\_ °F (S & E)  
 Low \_\_\_\_\_ °F (S & E)

Process fluid temperature \_\_\_\_\_ °F (S & E)  
 (Must equal maintenance temperature)

Steam Cleaned (Blowdown) \_\_\_\_\_ °F or psig (S & E)

Steam Pressure \_\_\_\_\_ psig (S) \_\_\_\_\_ °F temp. (H)

Process Tube Size (OD x wall) \_\_\_\_\_ (S & E)  
 Welded or Seamless \_\_\_\_\_ (S & E)  
 Material Type \_\_\_\_\_ (S & E)  
 No. of Process Tubes \_\_\_\_\_ (S & E)

Tracer Size (OD x wall) \_\_\_\_\_ (S)  
 Welded or Seamless \_\_\_\_\_ (S)  
 Material Type \_\_\_\_\_ (S)  
 No. of Tracer Tubes \_\_\_\_\_ (S)

Heater Type \_\_\_\_\_ constant wattage \_\_\_\_\_ self-regulating \_\_\_\_\_ Mineral Insulated (E)

Voltage \_\_\_\_\_ vac. (E)

Area Classification \_\_\_\_\_ General Purpose \_\_\_\_\_ Class I, Div. 1 \_\_\_\_\_ Class I, Div. 2 (E)

Approvals \_\_\_\_\_ FM \_\_\_\_\_ CSA \_\_\_\_\_ Other (E)

Jacket Material \_\_\_\_\_ 105°C FR PVC \_\_\_\_\_ Low Temp. 105°C FR PVC \_\_\_\_\_ TPR  
 \_\_\_\_\_ FR TPE \_\_\_\_\_ PUR \_\_\_\_\_ FR PUR \_\_\_\_\_ LDPE \_\_\_\_\_ FRPE (S&E)

**S = REQUIRED for (S)team Temptrace design.**

**E = REQUIRED for (E)lectric Temptrace design.**

**H = (H)elpful, but not necessary.**

Parker Hannifin Corporation  
 Parflex Division  
 1300 N. Freedom Street  
 Ravenna, OH 44266  
 Phone: (330) 296-2871  
 Fax: (330) 296-1829

## ***Section E — Technical Data***

Plastic Tubing Chemical Compatibility Chart.....	E2
Material Specifications for Plastic Tubing .....	E3
Burst Pressure/Temperature Charts.....	E4
Metal Tubing Chemical Compatibility Chart .....	E5
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Material Specifications for Jackets .....	E8 – E9



# Parflex Multitube® Instrumentation Tubing Products Compatibility Chart

Ratings Code:	
<b>G</b>	– Good to excellent. Little or no swelling, tensile or surface changes. Preferred choice.
<b>L</b>	– Marginal or conditional. Noticeable effects but not necessarily indicating lack of serviceability. Further testing suggested for specific application. Very long-term effects such as stiffening or potential for crazing should be evaluated.
<b>P</b>	– Poor or unsatisfactory. Not recommended without extensive and realistic testing.
—	– Indicates that this was not tested.

Materials Code for Parflex Multitube® Instrumentation Tubing Products	
<b>E</b>	Low Density Polyethylene
<b>HDPE</b>	High Density Polyethylene
<b>N</b>	Polymeric Flexible Nylon
<b>FRPE</b>	Flame Resistant Polyethylene

Chemical	LDPE	HDPE	N	FRPE
Acetone	P	L	G	L
Acetyl Bromide	L	L	P	-
Acetyl Chloride	L	L	P	-
Air	G	G	G	G
Alcohols	G	G	G	G
Aluminum Salts	G	G	G	G
Ammonia	G	G	G	L
Amyl Acetate	G	G	G	-
Aniline	L	G	P	-
Animal Oils (3)	P	L	G	-
Arsenic Salts	G	G	G	G
Aromatic Hydrocarbons	P	L	G	P
Barium Salts	G	G	G	G
Benzaldehyde	P	L	L	P
Benzene	P	L	G	P
Benzyl Alcohol	P	G	L	P
Bleaching Liquors	G	L	L	-
Boric Acid Solutions	G	G	G	G
Bromine	L	L	P	-
Butane (1)	L	G	G	-
Butanol	G	G	G	G
Butyl Acetate	G	G	G	G
Calcium Hypochlorite	L	L	P	L
Calcium Salts	G	G	G	G
Carbon Dioxide	G	G	G	G
Carbon Disulfide	L	L	L	-
Carbon Tetrachloride	P	P	L	P
Caustic Potash	G	G	G	-
Caustic Soda	G	G	G	-
Chloracetic Acid	L	G	L	-
Chlorine (Dry)	L	L	P	-
Chlorine (Wet)	L	L	P	-
Chlorobenzene	P	L	L	P
Chloroform	P	L	P	P
Chromic Acid	L	L	P	-
Copper Salts	G	G	G	G
Cresol	P	L	P	P
Cyclohexanone	L	L	L	-
Ethers	L	L	G	-
Ethyl Acetate	G	G	G	-
Ethyl Alcohol	G	G	L	G
Ethylamine	L	G	L	-
Ethyl Bromide	P	L	L	P
Ethyl Chloride	P	L	L	P
Fatty Acids	L	L	G	P
Ferric Salts	G	G	G	-
Formaldehyde	G	G	L	-
Formic Acid	G	G	P	G
Freon	L	L	G	-
Gasoline (1)	P	G	G	P
Glucose	G	G	G	G

Chemical	LDPE	HDPE	N	FRPE
Glycerin	G	G	G	G
Hydriodic Acid	L	G	P	-
Hydrochloric Acid. (Conc.)	L	G	L	-
Hydrochloric Acid. (Med. Conc.)	L	G	L	-
Hydrofluoric Acid	L	L	P	-
Hydrogen Peroxide (Conc)	L	G	L	-
Hydrogen Peroxide (Dil.)	L	G	G	-
Hydrogen Sulfide	G	G	G	-
Iodine	L	G	G	-
Kerosene (1)	L	L	G	-
Ketones	G	G	G	-
Lacquer Solvents	L	L	G	-
Lactic Acid	G	G	G	-
lead Acetate	G	G	G	-
Linseed Oil	L	G	G	-
Magnesium Salts	G	G	G	-
Naphtha	L	L	G	G
Natural Gas	L	L	G	-
Nickel Salts	G	G	G	-
Nitric Acid (Conc.)	P	L	P	G
Nitric Acid (Dil.)	P	G	L	P
Nitrobenzene	P	L	L	P
Nitrogen Oxides	L	L	L	-
Nitrous Acid	L	L	L	-
Oils (Animal and Mineral)	L	L	G	-
Oils (Vegetable)	L	L	G	-
Oxygen (2) (3)	G	G	G	G
Perchloric Acid	P	G	P	P
Phenols	P	G	P	P
Potassium Salts	G	G	G	G
Pyridine	L	L	L	-
Silver Nitrate	G	G	G	G
Soap Solutions	G	G	G	G
Sodium Salts	G	G	G	G
Stearic Acid	L	L	G	-
Sulfur Chloride	L	L	L	-
Sulfuric Acid (Conc.)	P	G	P	P
Sulfuric Acid (Dil.)	P	G	L	P
Sulfurous Acid	P	G	L	P
Tannic Acid	G	G	G	-
Tanning Extracts	G	G	G	-
Titanium Salts	G	G	G	G
Toluene	P	L	G	P
Trichloroacetic Acid	L	L	P	-
Trichloroethylene	P	L	L	P
Turpentine	P	P	G	-
Urea	G	G	G	-
Uric Acid	G	G	G	-
Water (3)	G	G	G	G
Xylene	P	L	G	P
Zinc Chloride	G	G	G	-

**Footnotes for Fluid Compatibility Guides:** The Fluid Compatibility Guides are simplified rating tabulations based on immersion tests at 75° F. Higher temperatures tend to reduce ratings. **Since final selection depends on pressure, fluid and ambient temperature and other factors not known to Parker Hannifin Co., no performance guarantee is expressed or implied.** Ratings do not imply compliance with specialized codes such as FDA, NSF, AGA or UL and do not cover possible fluid discoloration, taste or odor effects. For conveying foodstuffs use FDA sanctioned materials, and for potable water use NSF listed materials. For chemicals not listed, or for advice on particular applications, please consult Product Engineering, Parflex Div., Ravenna, Ohio. (1) Applications for these fluids must take into account legal and insurance regulations. This **does not** imply AGA or UL compliance. (2) Chemical compatibility does not imply low permeation rates. Consult the Parker factory for a recommendation for your specific requirement. (3) Does not imply NSF or FDA compliance.

## Polyethylene Tubing

### Series E: Instrument Grade—FDA, NSF Listed

#### Series EB: Ultraviolet Light Resistant

- Chemical Resistant
- Low Cost
- Five Tube Sizes
- Flexible
- Ten Colors
- Choice of Reel Lengths

Parflex flexible polyethylene thermoplastic tubing is extruded from high molecular weight resin for increased dimensional stability, uniformity and long-term strength. Its resistance to environmental stress cracking greatly exceeds that of ordinary polyethylene tubing as measured by ASTM D-1693 (10% IGEPAL).

Parflex E series polyethylene tubing is available in black as well as nine coding colors, as recommended by the Instrument Society of America. Black (EB) tubing contains an ultraviolet inhibitor which is recommended for use in sunlit areas and in close proximity to high ultraviolet light sources. Ingredients of E series natural and colored tubing (except EB series) meet FDA and NSF 51/61 requirements for food contact applications. Black polyethylene FDA and NSF 51/61 tubing is available upon special request. All tubing conforms to ASTM D-1248, Type I, Class A, Category 4, Grade E5.

Suggested operating temperature range is -80°F (-62°C) to +150°F (+66°C).

#### Series FRPE: Flame Resistant

Flame resistant polyethylene is manufactured from a distinctively formulated compound which meets the UL94 V-2 flame classification. It also meets the flame spread, fuel contribution and smoke density requirements of the ASTM E84-81a tunnel test.

Parflex Series FRPE tubing is the preferred product for pneumatic control applications in the heating, ventilating, air conditioning, energy conservation industry. It is also suitable for use in petrochemical plants, petroleum refineries, pulp and paper mills, mines, steel mills and other industries where protection against intermittent flame and hot sparks is necessary.

Suggested operating temperature range is -85°F (-65°C) to +150°F (+66°C).

#### Series HDPE: High Density

Parflex Series HDPE is manufactured from high strength, high density polyethylene. This semirigid tubing is inherently resistant to most chemicals, less easily cut or damaged and has a higher burst pressure rating than series E tubing.

Suggested operating temperature range is -80°F (-62°C) to +175°F (+80°C).

## Nylon Tubing

### Series N: Flexible

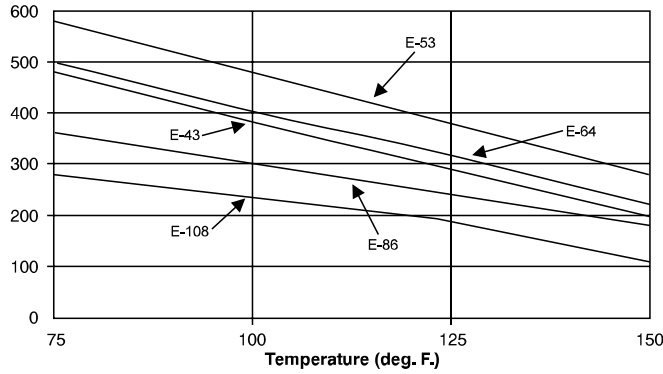
Parflex flexible nylon tubing is carefully made from high-grade, abrasion resistant, heat and light stabilized nylon. Resistance to stress cracking greatly exceeds that of ordinary nylon tubing. Parflex nylon also exhibits extremely low level water absorption.

Chemical resistant Parflex nylon tubing has the additional benefits of better flexibility, lighter weight and resistance to flexural fatigue. NN and NB tubing meets UL94HB flame resistance ratings in wall thicknesses of .033" and greater. Operating temperatures, depending upon conditions, are -65°F (-54°C) to +200°F (+93°C) continuous.

Available in natural (NN), red (RED), green (GRN), blue (BLU), yellow (YEL), and black (NB). Black tubing is recommended for use outdoors and in sunlit areas.

**Polyethylene Tubing**  
 Laboratory Grade E Series  
 1/4 through 5/8 O. D. inches

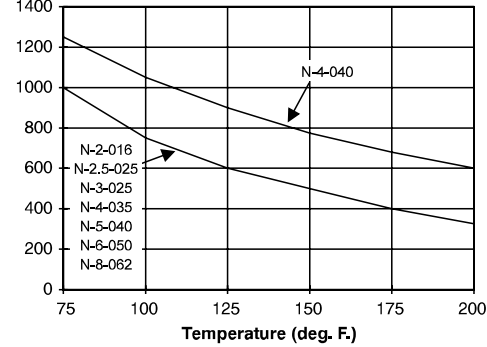
**Minimum  
 Burst  
 Pressure  
 (psig)**



**Nylon Flexible Tubing**

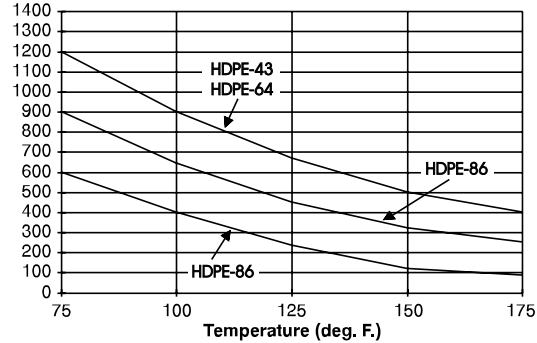
N Series (NN, NB)  
 1/8 through 1/2 O. D. inches

**Minimum  
 Burst  
 Pressure  
 (psig)**



**Polyethylene Tubing**  
 High Density HDPE Series  
 1/4 through 5/8 O. D. inches

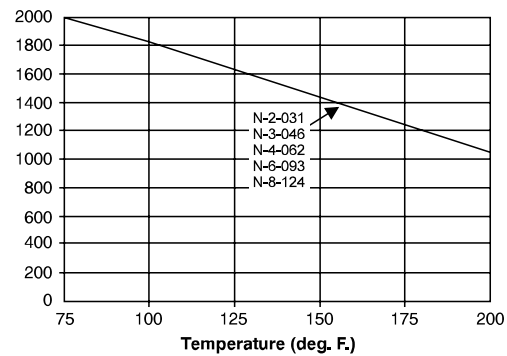
**Minimum  
 Burst  
 Pressure  
 (psig)**



**Nylon Flexible Tubing**

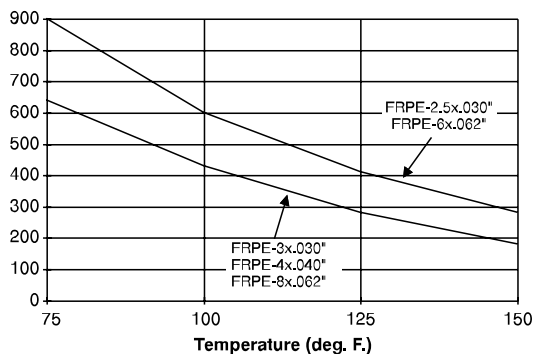
N Series  
 1/8 through 1/2 O. D. inches

**Minimum  
 Burst  
 Pressure  
 (psig)**



**Polyethylene Tubing**  
 Flame Resistant FRPE Series  
 5/32 through 1/2 O. D. inches

**Minimum  
 Burst  
 Pressure  
 (psig)**



Suggested working pressures of nylon are 1/4 of burst pressure at system operating temperature.

Suggested working pressures of polyethylene are 1/4 of burst pressure at system operating temperature.

# Parflex Multitube® Instrumentation Tubing Products Compatibility Chart

Ratings Code:	
<b>G</b>	– Good to excellent. Little or no swelling, tensile or surface changes. Preferred choice.
<b>L</b>	– Marginal or conditional. Noticeable effects but not necessarily indicating lack of serviceability. Further testing suggested for specific application. Very long-term effects such as stiffening or potential for crazing should be evaluated.
<b>P</b>	– Poor or unsatisfactory. Not recommended without extensive and realistic testing.
–	– Indicates that this was not tested.

Materials Code for Parflex Multitube® Instrumentation Tubing Products	
Copper	Copper Type DHP, Alloy No. 122, Soft Annealed Bright Seamless ATM B68 and B75
316SS	Stainless Steel, Type 316 Welded and Seamless per ASTM A-269
Hastelloy	Type C-22 per ASTM 3622 and B626
Monel	Type 400 per ASTM B165

Chemical	Copper	316SS	Hastelloy C	Monel
Acetone	G	G	G	G
Acetylene	P	G	G	G
Acetyl Chloride	P	G	G	L
Air	A	A	A	A
Alcohols	L	G	G	L
Aluminum Salts	-	-	-	-
Ammonia Aqueous	P	G	L	G
Amyl Acetate	P	G	G	G
Aniline	P	L	L	L
Arsenic Acid	L	L	L	P
Barium Carbonate	G	L	L	L
Benzaldehyde	L	L	G	L
Benzene	G	L	L	L
Benzyl Alcohol	-	G	G	G
Bleach 5% Active	-	G	G	G
Boric Acid 5%	L	L	G	L
Bromine Moist Gas	P	P	G	P
Butane (1)	L	G	G	G
Butyl Acetate	G	G	G	G
Calcium Hypochlorite 2% Boiling	P	L	L	L
Calcium Chloride Saturated	P	G	L	L
Carbon Dioxide	L	G	G	G
Carbon Disulfide	P	L	L	L
Carbon Monoxide	L	G	G	G
Caustic Potash	P	P	L	L
Caustic Soda	P	L	L	L
Chloracetic Acid	P	P	L	L
Chlorine (Dry)	P	P	P	P
Chlorine (Wet)	P	P	P	L
Chloroform	L	L	L	L
Chromic Acid Dilute	P	L	G	P
Copper Cyanide	P	L	L	L
Cresol	-	G	L	G
Cyclohexanone	-	G	G	-
Ethers	L	L	L	L
Ethyl Acetate	L	L	G	G
Ethyl Chloride Wet	L	G	L	L
Ethylamine	L	L	L	L
Ethyl Benzene	-	L	G	-
Ethyl Ether	L	L	L	L
Fatty Acids	P	G	G	L
Ferric Sulfate	P	G	L	P
Formaldehyde	L	L	L	L
Formic Acid	P	L	G	P
Freon Dry	G	G	G	L
Gasoline (1)	P	G	G	L
Glucose	G	G	-	G
Glycerin	G	G	G	G
Hydrochloric Acid. (Conc.) 40%	L	L	G	L

Chemical	Copper	316SS	Hastelloy C	Monel
Hydrochloric Acid. (Conc.) 50%	L	L	G	L
Hydrofluoric Acid Boiling	P	G	P	L
Hydrogen Peroxide	L	L	G	P
Hydrogen Peroxide (Dil.)	L	G	L	G
Hydrogen Sulfide	L	G	L	L
Iodine	P	P	G	-
Kerosene (1)	G	G	G	G
Ketones	-	L	G	G
Lacquer Solvents	G	G	G	G
Lactic Acid	L	L	L	P
lead Acetate	L	L	L	L
Linseed Oil	L	G	G	G
Magnesium Carbonate	G	G	L	G
Naphtha	L	G	L	G
Natural Gas	G	G	G	G
Nickel Sulfate	P	L	L	L
Nitric Acid	P	L	P	P
Nitric Acid Fuming>10%	P	P	P	P
Nitrobenzene	-	G	L	G
Nitrous Oxide	G	L	L	P
Nitrous Acid	P	L	G	P
Oils Animal	-	G	G	L
Oils Mineral	L	G	G	G
Oils (Vegetable)	L	G	G	G
Oxygen (2) (3)	G	G	G	G
Perchloric Acid	-	P	L	P
Phenols	-	L	G	L
Potassium Acetate	-	L	-	-
Pyridine	L	G	L	G
Silver Nitrate	P	L	L	P
Soap Solutions	L	G	G	G
Sodium Aluminate	-	G	L	L
Stearic Acid	L	G	L	L
Sulfur Chloride	P	P	G	P
Sulfur Dioxide Gas Dry	L	G	L	L
Sulfuris Trioxide	-	L	L	L
Sulfurous Acid	P	P	L	P
Tannic Acid	L	G	L	P
Tanning Liquor (Alum Solution)	-	G	L	-
Titanium Tetrachloride	L	L	L	L
Toluene	G	G	G	G
Trichloroacetic Acid	P	P	G	L
Trichloroethylene	P	L	L	L
Turpentine	L	G	L	L
Urea	-	L	L	-
Uric Acid	G	L	L	L
Water, Distilled	L	G	G	G
Xylene	G	G	G	G
Zinc Chloride	L	P	G	L

**Footnotes for Fluid Compatibility Guides:** The Fluid Compatibility Guides are simplified rating tabulations based on immersion tests at 75° F. Higher temperatures tend to reduce ratings. **Since final selection depends on pressure, fluid and ambient temperature and other factors not known to Parker Hannifin Co., no performance guarantee is expressed or implied.** Ratings do not imply compliance with specialized codes such as FDA, NSF, AGA or UL and do not cover possible fluid discoloration, taste or odor effects. For conveying foodstuffs use FDA sanctioned materials, and for potable water use NSF listed materials. For chemicals not listed, or for advice on particular applications, please consult Product Engineering, Parflex Div., Ravenna, Ohio. (1) Applications for these fluids must take into account legal and insurance regulations. This **does not** imply AGA or UL compliance. (2) Chemical compatibility does not imply low permeation rates. Consult the Parker factory for a recommendation for your specific requirement. (3) Does not imply NSF or FDA compliance.

# Material Specifications for Metal Tubing

Tubing Pressure Rating\*§

Tubing Type	Tube Size (in.)		Tubing Pressure Rating (in PSI) Versus Temperature											
			100° F		200° F		300° F		400° F		500° F		600° F	
	O.D.	Wall	Burst	Opr.	Burst	Opr.	Burst	Opr.	Burst	Opr.	Burst	Opr.	Burst	Opr.
Copper Type DHP, Alloy No. 122, Soft Annealed Bright Seamless ASTM B68 and B75	1/4	.030	7230	1450	6630	1330	5730	1150	3620	730	—	—	—	—
	3/8	.032	5040	1010	4620	930	3990	800	2520	510	—	—	—	—
	1/2	.035	4050	810	3710	750	3200	640	2020	410	—	—	—	—
	1/2	.049	5900	1180	5400	1080	4700	940	2950	590	—	—	—	—
Stainless Steel, Type 316 Welded per ASTM A-269	1/4	.035	20100	5025	20100	5025	18200	4550	16900	4225	16300	4075	15900	3975
	3/8	.035	12800	3200	12800	3200	11600	2900	10800	2700	10400	2600	10200	2550
	1/2	.035	9400	2350	9400	2350	8500	2125	7900	1975	7600	1900	7500	1875
Stainless Steel, Type 316 Seamless per ASTM A-269	1/4	.035	23650	5910	23645	5910	23300	5825	19880	4970	19180	4795	18700	4675
	3/8	.035	15060	3765	15060	3765	13640	3410	12700	3175	12240	3060	12000	3000
	1/2	.035	11060	2765	11060	2765	10000	2500	9300	2325	8940	2235	8820	2205
	1/2	.049	15880	3970	15880	3970	14480	3620	13420	3355	12820	3205	12580	3145

\*All values are nominal.

**Reference:** Pressure data for metal tubing is taken from American National Standard Code for Pressure Piping, "Power Piping, ANSI B31.1 –B30-1993A Edition." The values stated for operating (opr.) pressure are the maximum internal service pressure determined using the calculated burst pressure and an associated design factor. The equations and stress values were extracted from the above listed document.

Pressure data for Parker stainless steel tubing is derived from the relation:

$$\text{Burst Pressure} = K \frac{2st}{D-0.8t}$$

where K = efficiency of weld (0.85); (K = 1 for seamless)  
 s = tensile strength of stainless steel (psi)  
 D = tube O.D., in inches  
 t = tube wall thickness in inches

The operating pressure is taken to be 25% of the burst pressure, which is a 4 to 1 design factor.

## Notes:

### 1CT, 1SST

§Pressure data for temperatures above 200°F are included for reference only.

Plastic coated tubing should not be used at temperatures exceeding approximately 80°C due to the PVC (or PE) jacket employed.

### 1CA, 1CAT

§Pressure data for temperatures above 200°F are included primarily for where the tubing must withstand higher ambient temperatures. The assembly should not be used at temperatures exceeding approximately 80°C (176°F) due to the PVC tapes and jackets employed. Consult the Division if higher temperatures will be encountered.

### CT, CTHW, CCT

§Pressure data for temperatures above 200°F are included primarily for where single runs must withstand higher ambient temperatures than the Multitube bundle. The Multitube bundle should not be used at temperatures exceeding approximately 105°C due to the PVC jacket employed. Consult the Division if higher temperatures will be encountered.

### SSA, SST, SSAT

§Pressure data for temperatures above 200°F are included primarily for where single runs must withstand higher ambient temperatures than the Multitube bundle. The Multitube bundle should not be used at temperatures exceeding approximately 105°C due to the PVC jacket employed. Consult the Division if higher temperatures will be encountered.

## Testing Specifications for Metal Tubing:

All metal tubes used in the manufacture of Multitube are subject to stringent magnetic analysis using a special eddy current tester. Each tube, after eddy current analysis, is pressure tested at not less than 250 psi for 15 minutes without any sign of leakage.

When Multitube assemblies have completed the manufacturing process, each tube is again tested with dry N<sub>2</sub> at 250 psi for 5 minutes prior to shipment.

## Testing Specifications for Plastic Tubing:

All plastic used in the manufacture of Multitube are subject to rigorous Q.A. inspection and testing prior to shipment. Each tube is pressure tested at not less than 150 psi for 15 minutes without any sign of leakage.

When Multitube assemblies have completed the manufacturing process, each tube is again tested with dry N<sub>2</sub> at 125 psi for 5 minutes prior to shipment.

# Material Specifications for Jackets:

**Flame Resistant Polyvinyl Chloride (FR PVC) Jacket:** Black, 105C rated, flame-resistant, corrosion-resistant thermoplastic compound with excellent low-temperature flexibility properties. Meets or exceeds ASTM D-1047, IPCEA S-19-81, IPCEA S-61-401.

**Thermoplastic Rubber (TPR) Jacket:** Black, corrosion- and weather-resistant thermoplastic rubber material.

**Flame Resistant Thermoplastic Elastomer (FR TPE) Jacket:** Black, flame-retarding thermoplastic elastomer compound. UL94-V-0 flame classification. Passes IEEE vertical flame test. Meets ASTM D-2671 copper mirror corrosion test standards.

**Polyurethane (PUR) Jacket:** Black, abrasion- and corrosion-resistant compound with excellent hydrolytic stability.

**Flame Resistant Polyurethane (FR PUR) Jacket:** Black, flame-retarding, abrasion- and corrosion-resistant compound which exhibits excellent low-temperature properties, hydrolysis resistance, and fungus resistance which has a UL94 flame test rating of V-0.

**Low Density Polyethylene (LDPE) Jacket:** Black, weather-resistant grade, high molecular weight, low-density compound which meets the requirements of ASTM D-1248-72 as follows: Type I, Class A, Category 4, Grade E5.

**Flame Resistant Polyethylene (FR PE) Jacket:** Black, weather-resistant, high molecular weight, flame-resistant polyethylene compound which meets the UL94 V-2 flame classification.

## Selecting a Jacket Material

Parker Multitube Instrument and Heat Trace Tubing Products are currently offered with a choice of several jacket materials. The purpose of this report is to present the main properties of the standard thermoplastics and to discuss selection factors for various Multitube products.

The following table provides a summary of the main properties of the standard jacket materials. Additional details can be provided on request to the factory.

### Current Jacket Materials for Multitube Products

	105°C FR PVC	TPR	FR TPE	PUR	FR PUR	LDPE	FRPE
Hardness, Shore A	72	92	87	90	75	50D	90
Abrasion resistance	G	G	G	E	E	G	G
Mechanical resistance	G	F	G	E	E	G	G
Max. continuous service ° F	221	248	266	250	180	150	150
Low temp. brittleness ° F	-41	-55	-69	-40	-90	-80	-80
Rec. min. installation ° F	-35	-50	-60	-20	-70	-50	-60
<b>Environmental Resistance</b>							
Aliphatic hydrocarbons	F	P	G	G	G	G	G
Aromatic hydrocarbons	U	P	F	G	G	G	F
Haloogenated solvents	U	P	P	P	P	F-P	P
Acids	F	G	E	F	F	G	G
Alkalies	F	G	E	G	G	G	E
Oils	G	F	E	G	G	E	G
Water	G	E	E	G	G	E	E
Weathering	G*	F*	E*	E*	E*	G*	G*
<b>Flamability</b>							
Oxygen index	24	NFR	24.7	NFR	26	NFR	25
UL94 vertical flame tet	V-2	--	V-0	--	V-0	--	V-2
IEEE vertical tray flame test	Pass	--	Pass	--	Pass	--	Pass
Water absorption, 24 hours, %	.1	1.5	.3	1.0	1.5	.01	0.3

E = Excellent G = Good F = Fair P = Poor U = Unsatisfactory NFR = Not flame resistant

Note: Bundles may also be armored with galvanized steel, arch-shaped, spiral wound sheet metal designed for greater crush protection and pull-apart resistance.

Please refer to product bulletins in the Instrument Tubing and Pre-Insulated Tubing section of the Multitube catalog for data on standard Multitube products utilizing the jacket materials described in this engineering report.

\*Requires carbon black for ultraviolet (U.V.) resistance.

For Criteria for Selection see next page.



## Criteria for Selection

The main factors to be considered are:

1. Abrasion resistance.
2. Mechanical resistance to abuse such as tearing, cutting or impact.
3. Chemical resistance, including ozone, air pollutants, nuclear radiation and ultraviolet light.
4. Flammability properties.
5. Maximum continuous service temperature.
6. Minimum temperature for installation.
7. Low water absorption.

Abrasion resistance can be measured by standardized tests such as Taber Abrasion (ASTM C501) or NBS (ASTM D1630) or by more specialized methods such as the Parker Hose Abrader. A composite rating for the standard materials is given in [Table 1](#).

Resistance to cutting and tearing is a complex function of the tensile strength, hardness and toughness of the plastic. These properties are measured by tensile tests on molded samples, Shore Durometer measurements and Die C Tear data. A composite mechanical resistance rating is given in [Table 1](#).

Chemical and environmental resistance is a function of the chemical agents themselves, their concentration and temperatures, the presence of oxygen, light, water or other agents that can contribute to degradation processes and the level of mechanical stress to which the material is subjected while under attack. Some general ratings are given in [Table 1](#). For further details and recommendations for extraordinary environments, please consult the Division.

Flame resistance of thermoplastics is measured commonly by the UL94 test method. The 105°C PVC (polyvinyl chloride) is flame resistant, as are the FRPE and FRPUR (polyethylene and polyurethane) plastics. For special applications, it is possible to consider other flame-resistant plastics for jackets provided that they are commercially available and ready extruded.

The ultraviolet component of sunlight is a well-known initiator of degradation processes in some plastics. All Multitube jackets are protected by carbon black pigmentation which is the most effective protective agent known at this time.

Ozone and air pollutants (such as SO<sub>2</sub> and NO<sub>2</sub>) are now recognized as powerful degradation initiators. Vinyls, TPR and urethanes have excellent resistance to this attack. Urethane is also recognized for resistance to degradation due to nuclear radiation.

The maximum continuous service temperature in air is given in [Table 1](#). The rating is based on tensile strength and elongation measured as a function of temperature plus the retention of these properties after aging at elevated temperatures for extended test periods. The ratings in [Table 1](#) are a composite of data from our raw material sources, our own laboratory tests and field experience. These are maximum values when conditions of use are favorable; e.g., when there are no aggressive chemicals or air pollutants that can simultaneously attack the material. Traced Multitube products are designed with sufficient thermal insulation so that the jacket outer surface is always less than 140°F (60°C) (at 80°F (27°C) ambient and 400°F (204°C) tube temperature) and the jacket inner surface only slightly higher. Under these circumstances, any of the standard materials are satisfactory.

The recommended minimum installation temperature is based on ability to unwind the product from the delivery reel and readily install a long length that may have routing problems, sharp bends, etc. Obviously, excessively stiff materials or an excessively thick jacket will not only increase installation labor, but may cause kinking of the product.

Low water absorption is required to prevent wetting of thermal insulation, corrosion of copper tubing and similar undesirable effects. Water permeation resistance is increased by the provision of polyester tape barriers under the jacket in many Multitube products. This is especially necessary for urethane jacketed products.

**Section F — Accessories**

Entrance Fittings ..... F2

PTFT Feed-Through Seal Kits ..... F3

HSB-1, -2, -3 Heat Shrinkable Boots ..... F3

End Sealant..... F4

End Seal Boot Kit ..... F4

End Seal Kits ..... F4

Splice Kits ..... F5

Thermostats/Temperature Controllers..... F6

4031-0001 Electrical Connection Kit for Constant Wattage Bundles ..... F7

4041-2101 Temptrace Power Connection Kit with Junction Box ..... F8

4041-5300 Temptrace Universal Kit for Self-Regulating Bundles..... F9

4041-6101 Electrical End Termination Kit ..... F10

4041-8200 Electrical End Termination Kit ..... F10

## Entrance Fittings

Selected specifically for use with Parker Multitube. The entrance fittings shown here provide effective strain relief when terminating Multitube into junction boxes. Type CK is for use with Multitube construction with an overall interlocked armor. The type PWT and type G provide a moisture-proof seal when used with Multitube constructions with a plastic jacket overall.

### PWT Series

A galvanized steel fitting with a tapered synthetic rubber bushing provides a watertight seal against the outer plastic jacket of cabled Multitube assemblies.

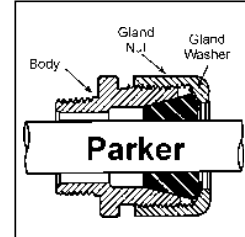
A locknut secures the fitting to the mounting surface and a blacknut compresses the bushing around the tubing bundle. A Neoprene washer is provided for sealing between the fitting and the mounting surface.



### PWT Series

#### PWT Series Fittings Installation:

1. Fasten body securely in mounting hole with locknut.
2. Slide gland nut, gland washer and bushing over Multitube assembly—in that order.
3. Install Multitube assembly through body far enough to allow for necessary tubing connections.
4. Install bushing in body, push gland washer against bushing, attach gland nut to body and tighten securely to cause bushing to grip cable firmly so liquid-tight seal is formed.



Part Number #	Tube Bundle O.D.		Mounting Thread Size (in.)
	Min. (in.)	Max. (in.)	
PWT33	.250	.375	1
PWT34	.375	.500	1
PWT35	.500	.625	1
PWT36	.625	.750	1
PWT37	.750	.875	1
PWT58	.875	1.000	1-1/2
PWT59	1.000	1.188	1-1/2
PWT511	1.188	1.375	1-1/2
PWT613	1.375	1.625	2
PWT715	1.625	1.875	2-1/2
PWT717	1.875	2.188	2-1/2
PWT720	2.188	2.500	2-1/2
PWT820	2.188	2.500	3

### G Series Grommets

Neoprene body with a stainless steel clamp. Suitable for use with plastic jacketed Multitube of limited size.

All G Series grommets fit a 1-7/8" hole size and are available for a variety of bundle sizes.



### CK Series

Constructed of Cadmium Plated Malleable iron, the series CK Entrance fitting has been designed for use with Multitube assemblies having an overall armor covering. A clamp fastens the fitting to the armor and a locknut secures the fitting to the mounting surface.

Tube abrasion is minimized by terminating the armor within the fitting. An insulating bushing further protects the tubing from the sharp edges of the mounting threads.

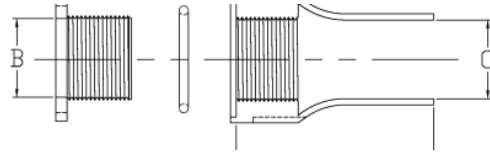


Part Number #	Grommet Through Hole Dimension (in.)	Mounting Hole Size (in.)
G-0670	0.67	1-7/8
G-0740	0.74	1-7/8
G-0820	0.82	1-7/8
G-0900	0.9	1-7/8
G-0980	0.98	1-7/8
G-1160	1.16	1-7/8
G-1280	1.28	1-7/8
G-1460	1.45	1-7/8
G-1550	1.55	1-7/8
G-1610	1.61	1-7/8
G-1650	1.65	1-7/8
G-1750	1.75	2-3/16

Part Number #	Armor O.D.		Nominal Throat Diameter (in.)	Mounting Thread Size (in.)
	Min. (in.)	Max. (in.)		
CK50	.500	.921	.591	1/2
CK51	.530	.820	.783	3/4
CK75	.875	1.093	.783	3/4
CK76	.690	1.070	.997	1
CK100	1.062	1.375	.997	1
CK125	.850	1.385	1.311	1-1/4
CK150	.930	1.530	1.530	1-1/2
CK200	2.125	2.500	1.964	2

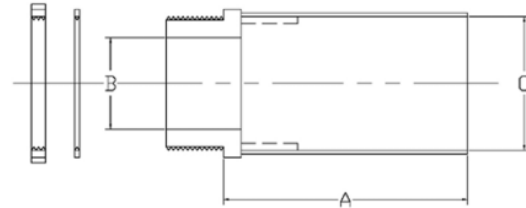
# Parker Temptrace™ Feed Through (PTFT) Kit

Parker PTFT kits provide a water tight seal where the heat trace tubing bundle enters into a junction box or instrument enclosure.



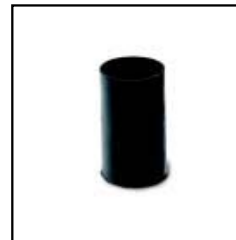
Molded Feed Through Part Number	Cable Range Min / Max	"A" Length Nominal	Cabinet Wall Thickness Max	Hole Size	"B" Feed Through Hole Size	"C" Minimum Expanded I.D.
PTFT1.50	0.75 - 1.50" (19 - 38 mm)	4.5" (11.4 cm)	0.375" (9.5 mm)	2" (5.1 cm)	1.60" (4.1 cm)	1.70" (4.3 cm)
PTFT2.00	0.75 - 2.00" (19 - 51 mm)	7.0" (17.8 cm)	0.375" (9.5 mm)	2.36" (6.0 cm)	2.10" (5.1 cm)	2.75" (7.0 cm)
PTFT2.75	0.75 - 2.75" (19 - 70 mm)	7.0" (17.8 cm)	1.0" (25.4 mm)	3.50" (8.9 cm)	2.75" (7.0 cm)	2.75" (7.0 cm)

PVC Pipe Fitting Style Part Number	"C" Cable Range Min / Max	"A" Length Nominal	Cabinet Wall Thickness Max	Drill Hole Size	"B" Feed Through Hole Size
PTFT3.25	1.50 - 3.25" (38 - 83 mm)	10" (25.4 cm)	1.125" (28.6 mm)	4.50" (11.4 cm)	3.50" (8.9 cm)
PTFT4.50	2.00 - 4.50" (51 - 114 mm)	10" (25.4 cm)	1.25" (28.6 mm)	5.00" (12.0 cm)	4.50" (11.4 cm)
PTFT5.00	2.00 - 5.00" (51 - 114 mm)	12" (30.5 cm)	1.125" (28.6 mm)	5.50" (13.2 cm)	5.00" (12.0 cm)



# Heat Shrinkable Boots (HSBs)

Parker heat shrink boots (HSB) are designed to prevent moisture from entering the ends of Parker Temptrace™ bundles. The dash number represents the number of breakouts in each boot. The boots can be used on 1/4", 3/8", or 1/2" tubes, or as a seal for the heating cable



HSB-1



HSB-2

Part Number	Before Heat Shrinking		After Heat Shrinking					
	Body I.D.	Leg(s) I.D.	Body			Leg(s)		
			I.D.	Thick	Length	*I.D.	Thick	Length
HSB-1	1.50	—	0.23	0.16	6.00	No Legs		
HSB-2	3.40	1.50	0.90	0/16	3.00	0.30	0.12	1.20
HSB-3	2.40	1.00	0.90	0.16	2.30	0.30	0.12	1.20
HSB-4	2.30	1.00	0.98	0.16	3.00	0.28	0.12	1.20
HSB-5	3.70	1.40	1.27	0.16	4.70	0.58	0.12	2.00
HSB-6	5.20	2.00	1.75	0.16	6.00	0.60	0.12	2.00

\*Where "After Shrinking" I.D. is larger than tube size in bundle, a silicone grommet or RTV should be used in conjunction with the boot to ensure a complete seal. (See grommet selection list below or RTV data listed in this catalog.)

Grommet Selection Chart	
Part Number	Tube Size O.D. (inches)
GESK0-2	1/8
GESK0-4	1/4
GESK0-6	3/8
GESK0-8	1/2

## End Sealant

**Description:** Parker end sealant is a paste material which becomes a tough, rubbery seal upon exposure to air. Total curing takes about 24 hours, at which time it has excellent resistance to weather, ozone, oil, many chemicals and extreme temperatures  $-75^{\circ}\text{F}$  ( $-60^{\circ}\text{C}$ ) to  $+400^{\circ}\text{F}$  ( $204.4^{\circ}\text{C}$ ). High temperature sealant to  $500^{\circ}\text{F}$  ( $260^{\circ}\text{C}$ ) available.

**To order:** Specify Parker room temperature vulcanizing (RTV) end sealant part numbers:

**Important:** All Parker steam products must have sealed ends to prevent contamination of insulation. Parker product ends are sealed at the factory and it is important that these seals be maintained during storage and that they are sealed upon installation. We will not assume liability for any corrosion or damage to the product caused by such contamination.



RTV-103BLK – 2.8 oz. tube,  $400^{\circ}\text{F}$  ( $204.4^{\circ}\text{C}$ ) rated



RTV-103BLK10.3 – 10.1 oz. cartridge,  $400^{\circ}\text{F}$  ( $204.4^{\circ}\text{C}$ ) rated



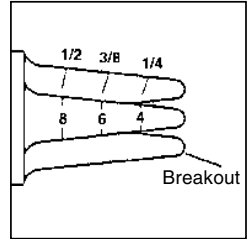
RTV-106RED – 2.8 oz. tube, high temperature  $500^{\circ}\text{F}$  ( $260^{\circ}\text{C}$ )

## End Seal Boot (ESB) Kit

**Parker end seal boot (ESB) kits** are designed to prevent moisture from entering the ends of Parker Temptrace bundles. Each boot allows up to three tube breakouts. These breakouts have marks to specify where to cut for either a  $1/4$ ",  $3/8$ " and  $1/2$ " tube.

**Each Kit contains:**

- (2) End Seal Boots
- (6) Stainless Steel Hose Clamps
- (2) Plastic Hose Clamps (1.47" - 1.72")
- (2) Plastic Hose Clamps (1.73"-2.02")
- (2) Mastic Sealant (3/4" wide x 9" long)



Refer to Section G for detailed installation instructions.

## End Seal Kits (ESK)

**Parker end seal kits (ESK)** are designed to prevent moisture from entering the ends of Parker 3000 series preinsulated Temptube. Each Kit contains: 10 grommets and 10 plastic clamps.

Parker 3000 Series products are sealed at the factory to prevent contamination of the non-hygroscopic fiberglass thermal insulation. After installing Parker Temptube, we recommend all exposed product ends be resealed to ensure maximum thermal efficiency, product performance, and service life.

Parker Part Number #	Fits Parker Series #	Fits Tube Dash Size/O.D.	
ESK0-4	3000	-4	1/4"
ESK0-6	3000	-6	3/8"
ESK0-8	3000	-8	1/2"

Refer to Section G for detailed installation instructions.



## Splice Kit SK-612

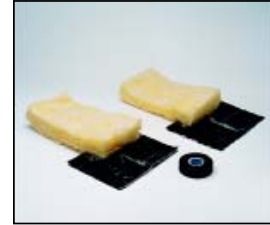
The SK-612 has been designed to provide long life, weatherproof thermal insulation and jacket over a tube fitting or instrument connection.

There is sufficient material in each SK-612 Splice Kit to insulate two (2) splices or bundle ends.

**Each Kit contains:**

- (2) 8" x 8" self-sealing rubber sheets with a 6" x 12" fiberglass pad.
- (1) Roll waterproof sealing tape.

Refer to Section G for detailed installation instructions.



## Splice Kit SK-630

The SK-630 has been designed to provide long life, weatherproof thermal insulation and jacket over a tube fitting or instrument connection.

There is sufficient material in each SK-612 Splice Kit to insulate two (2) splices or bundle ends.

**Each Kit contains:**

- (2) 8" x 30" self-sealing rubber sheets with a 6" x 30" fiberglass pad.
- (1) Roll waterproof sealing tape.

Refer to Section G for detailed installation instructions.



## Splice Kit SK-696

The SK-696 has been designed to provide long life, weatherproof thermal insulation and jacket for longer lengths up to 96" (8ft.) of bundles or multiple connections.

**Each Kit contains:**

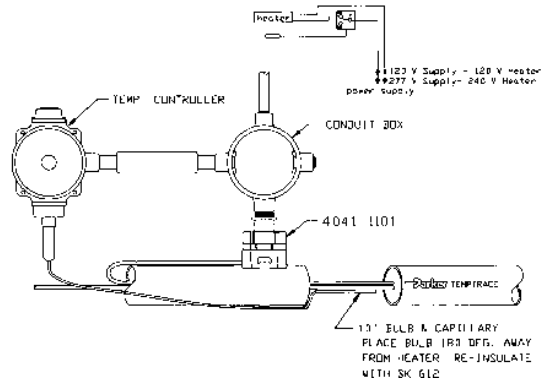
- (1) Roll 8" x 96" self-sealing rubber sheet.
- (1) Roll 6" x 96" fiberglass pad.
- (1) Roll waterproof sealing tape.

Refer to Section G for detailed installation instructions.



## Thermostats/Temperature Controllers

Each thermostat is an on/off mechanically actuated capillary and bulb type factory wired to open on temperature rise with terminal block wiring.



### 4012-01145 NEMA 4 Thermostat/ Temperature Controller



**Specifications:**  
 Temperature .... Field Adjustable, Tamper proof +25 to +325°F (-3 to +162°C)  
 Switch ..... 125/250/480 VAC – 22 amp SPDT Snap Acting  
 Accuracy ..... ±1% of full scale, approximately 3°F (1.6°C)  
 Capillary ..... a10 Ft. type 304 S.S.  
 Bulb ..... 1/8" O.D. x 5/8" long type 304 S.S.  
 Size ..... NEMA 4 x 4-1/4"H x 3-7/16W x 3-3/16D

Note: For further information and callout references, contact the Division.

### 4012-05145 NEMA 4x Thermostat/ Temperature Controller



**Specifications:**  
 Temperature ... Field Adjustable, Tamper proof -125 to +500°F (-85 to +265°C)  
 Switch ..... 120/240 VAC – 20 amp SPDT Snap Acting  
 Accuracy ..... ±1% of full scale, approximately 3°F (1.6°C)  
 Capillary ..... 6 Ft. type 304 S.S.  
 Bulb ..... 3/8" O.D. x 2-1/4" long type 304 S.S.  
 Size ..... NEMA 4 x 4-1/4"H x 3-7/16W x 3-3/16D

Note: For further information and callout references, contact the Division.

### 4012-01147 NEMA 7 Thermostat/ Temperature Controller



**Specifications:**  
 Temperature .... Field Adjustable, Tamper proof +25 to 325°F (-3 to +162°C)  
 Switch ..... 125/250/480 VAC – 22 amp SPDT Snap Acting  
 Accuracy ..... ±1% of full scale, approximately 3°F (1.6°C)  
 Capillary ..... 10 Ft. type 304 S.S.  
 Bulb ..... 1/8" O.D. x 5/8" long type 304 S.S.  
 Size ..... NEMA 7 5-1/16H x 5-1/8W x 5-1/4D

Note: For further information and callout references, contact the Division.

### 4012-06105 NEMA 4x Thermostat/ Temperature Controller



**Specifications:**  
 Temperature .... Field Adjustable, Tamper proof +15 to +140°F (-9 to +60°C)  
 Switch ..... 125/250/480 VAC – 22 amp SPDT Snap Acting  
 Accuracy ..... ±1% of full scale, approximately 3°F (1.6°C)  
 Bulb ..... Fluid filled stem  
 NEMA Rating ..... NEMA 4 x

Note: For further information and callout references, contact the Division.



## 4031-0001 Electrical Connection Kit for 4311, 4312, 4321 & 4322 Constant Wattage Temptrace



### Each Kit contains:

1 Connection Box	1 Bracket Assembly
1 Connection Box Gasket	2 Connector unions
1 Connection Box Cover	2 Heating cable grommets
1 Mounting Bracket	2 Plastic cable ties
1 3/4" Locknut	2 Non-insulated butt splice (12-10 AWG)
1 3/4" Pipe Plug	3 Non-insulated butt splice (16-14 AWG)
1 "Electric Trace" caution sticker	2 Heater termination boots
1 2.8 oz Black RTV Sealant	1 Roll 3/4" wide temperature tape

**Description:** Parker electrical connection kits are universal all-in-one connection kits for making the electrical connections (input power, splice, input power splice, and termination) for Parker electric trace tubing bundles. The kits contain all the necessary components and hardware to make one input connection, one splice connection or one input power splice connection as well as two termination connections. The connection kits are designed for use in ordinary locations and Class I, Division 2, Groups B, C, and D; Class II, Division 2, Groups F and G; Class III, Divisions 1 and 2 hazardous locations.

### Approvals:

FM – Factory Mutual Approved  
Ordinary Locations  
Hazardous (Classified) Locations

Class I, Division 2, Groups B, C and D  
Class II, Division 2, Groups F and G  
Class III, Division 1 and 2

**Ground Fault Equipment Protection Devices (GFEPDs):**  
The IEEE standard (515-1989) for heating cables requires 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."

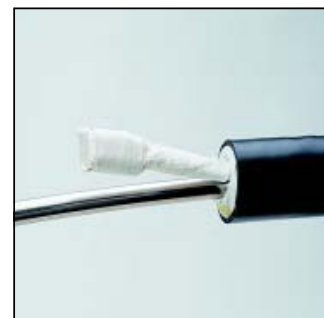
Refer to Section G for detailed installation instructions.



**Assembled Input Power  
Connection Kit**



**Assembled Input Power and  
Splice Connection Kit**



**Assembled Termination  
Connection Kit**

## 4041-2101 Temptrace Power Connection Kit with Junction Box

4041-2101 Temptrace Electrical Power Connection Kit for 4411, 4412, 4421, 4422 Series Self-Regulating Bundles



### Power Connection Kit Contains:

- 1 Molded junction box consisting of : Base - Box - Lid - Hardware
- 4 Heater grommets (grommet used based upon heater type)
- 1 Pipe strap 1" – 3-1/2"
- 1 RTV-103BLK
- 1 Three position terminal block
- 1 Mounting screw for terminal block
- 1 Caution label

### An easily installed combination power connection and waterproof seals for single and double tube bundles.

**Caution:** The heater will come in contact with the power feed wires in the junction box. Make sure that the temperature rating of the power feed wire insulation is adequate for the heater used.

### Approvals:

FM – Factory Mutual Approved  
 Ordinary Locations  
 UL Listed  
 Hazardous (Classified) Locations

Class I, Division 2, Groups B, C and D  
 Class II, Division 2, Groups F and G  
 Class III, Division 2

CSA Certified for use in ordinary areas and:  
 Class I, Division 2, Groups A, B, C and D  
 Class II, Division 2, Groups F and G

### Ground Fault Equipment Protection Devices (GFEPDs):

The IEEE standard (515-1989) for heating cables requires 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."

## 4041-5300 Temptrace Universal Kit for Self-Regulating Bundles

4041-5300 Temptrace Electrical Splice or Tee Connection Kit for 4411, 4412, 4421, 4422 Series Self-Regulating Bundles



### Connection Kit Contains:

- |   |                          |
|---|--------------------------|
| (1) 3/4" Pipe Stand                                   | (3) Ring Terminals       |
| (1) Sealing Grommet                                   | (2) Cable Entry Fittings |
| (4) Stainless Steel Pipe Straps<br>(2-large, 2-small) | (1) 3/4" Pipe Plug       |
| (1) 3 Hub Box   | (1) Grounding Screw      |
| (1) Box Cover   | (2) RTV-103BLK           |
| (6) Wire Nuts   | (1) SS Label             |
| (2) Butt Splice Connectors                            | (2) Reducing Bushings    |
| (1) SK-612 (Seal Patch Kit)                           | (3) 1" Heat Shrink Tubes |
| (3) 10" Heat Shrink Sleeves                           | (3) 3" Heat Shrink Tubes |

**Kit can be used to make one input power connection or one input power splice connection or one splice/tee connection as well as two end termination and RTV for bundle end seal.**

**An easily installed combination power splice and tee for Self-Regulating Bundle.**

**Caution:** The heater will come in contact with the power feed wires in the junction box. Make sure that the temperature rating of the power feed wire insulation is adequate for the heater used.

**Ground Fault Equipment Protection Devices (GFEPDs):**  
The IEEE standard (515-1989) for heating cables requires 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."

## 4041-6101 Electrical End Termination Kit for Self-Regulating Bundles

Parker electrical end termination kit (4041-6101) is designed to provide a method of terminating the non-powered end of the heating cable.

- 4041-6101 Use with Single Tube Bundle
- 4041-6102 Use with Two Tube Bundle
- 4041-6103 Use with Three Tube Bundle
- 4041-6104 Use with Four Tube Bundle



## 4041-8200 Electrical End Termination Kit for Self-Regulating Bundles



Parker electrical end termination kit (4041-8200) is designed to provide a method of terminating the non-powered end of the heating cable.

- Also in kit but not shown:
- 1 Caution label
  - 1 Roll glass tape
  - 3 Additional heat grommets

### Approvals:

FM – Factory Mutual Approved  
Ordinary Locations  
UL Listed  
Hazardous (Classified) Locations

Class I, Division 2, Groups B, C and D  
Class II, Division 2, Groups F and G  
Class III, Division 2

CSA Certified for use in ordinary areas and:  
Class I, Division 2, Groups A, B, C and D  
Class II, Division 2, Groups F and G



**Section G — Installation Instructions**

General Product Installation Tips .....	G2 – G3
End Seal Boot (ESB) Kit .....	G4 – G5
End Seal Kit (ESK) .....	G6
End Sealant.....	G7
PTFT Feed-Through Kit .....	G8 – G9
SK-612, SK-630, SK-696 .....	G10 – G11
4031-0001 Electrical Connection Kit .....	G12 – G21
4041-2101 Power Connection Kit.....	G22 – G24
4041-5300 Electrical Connection Kit .....	G25 – G30
4041-6101 Electrical End Termination Kit .....	G31 – G32
4041-8200 Electrical End Termination Kit .....	G33 – G34

## 3000 Preinsulated Tubing



**General:** Parker Temptube 3000 series preinsulated single-line tubing is ideal for use as steam supply and condensate return lines, hot water or heat transfer fluid supply lines or for any small diameter lines which require insulation against heat loss and for personnel protection.

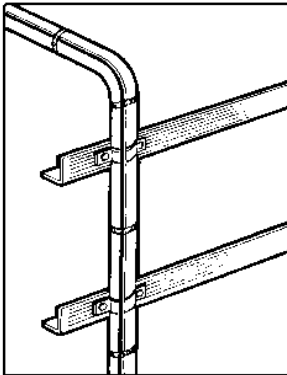
Preinsulated Temptube is available in long lengths for easier storage, handling and installation, and in a variety of alloys and tube sizes to reduce installation costs and conserve energy in a broad span of commercial, industrial and scientific applications.

Its prefabricated construction with both thermal insulation and

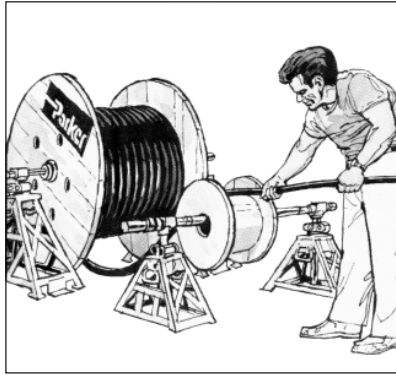
a weather- and chemical-resistant PVC jacket provides long service life and energy efficiency.

This installation guide includes suggestions on installation and bending procedures, securing methods, bundle end protection and problem areas to watch.

Inasmuch as circumstances and conditions vary from one installation to another, please contact the factory if additional assistance is needed.



A typical line installation illustrates the sweeping bend recommended for Temptube.



An idler helps in straightening Temptube as it comes off the delivery reel.



Workperson using a thin wall conduit bender with Temptube.

## Routing Recommendations

For optimum results, the routing of Temptube should keep the number of bends to a minimum and allow for generous sweeping bends when they are required.

For steam supply and condensate return applications, the use of a cable tray is advantageous in that it provides for a clear, unobstructed path for the Temptube. Because this application generally is centered around a manifold system with multiple Temptube runs, the total cable tray capacity can be utilized.

When running Temptube lines adjacent to one another, allow a minimum of 1/2" separation between lines. **Do not** bundle multiple Temptube lines together.

For one or two individual runs, existing cable trays, pipe racks or structural steel can be used for Temptube support.

## Unreeling Tubing

The manufacturing process used in producing Temptube allows Parker to provide the longest length tubing possible and to deliver it to the job site on ready-to-use wooden reels. Removing Temptube from the reel requires nothing more than putting the reel on a reel jack or A-frame, removing the reel wrap and cutting the Temptube end loose. It is now ready to be installed.

## Bending Tubes

Bending of the Parker Temptube can generally be done by hand when being installed in a cable tray or existing pipe racks.

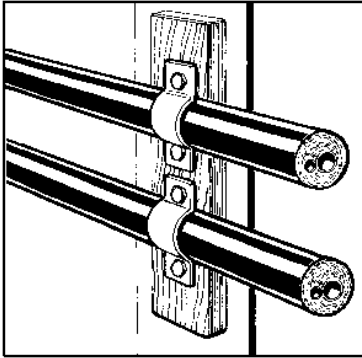
If the 3000 series Temptube is to be installed in short lengths (5-25 ft.) in confined conditions where tight bends are required, either of the following methods may be used.

1. The tubing can be pre-bent according to routing requirements and installed.

2. The tubing can be positioned in approximate location and bent to exact routing requirements in place.

For lengths over 25 feet, Method 2 above is suggested.

Pre-bending may be accomplished with a properly-sized mandrel, a sliding shoe cable, or a thin-wall conduit bender. When bending in position, either of the benders may be used.



All tubing is neatly routed and properly secured for most effective service.

## Securing Methods

Start by pulling the tubing through predetermined routing. Securing the Temptube should begin at one end after the tube has been connected. Securing should continue toward the free end until it is assured that enough Temptube is available for connection.

If there is concern of boiler shut-down, placement of the product may incorporate a slope for self-draining (1/2 inch in 10 feet).

Securing should be done with hardware which has a large bearing surface area and a fixed drawdown point.

The Temptube should be secured in accordance with support center and spacing information (see Table 1 below). Temptube should *not* be secured within any directional change to allow for movement from thermal expansion and to provide flexibility to withstand water hammer.

## Bundle End Protection

Temptube is a thermally insulated and jacketed tubing product and care must be taken to ensure that the thermal insulation is kept dry to preserve its insulating properties. Temptube Splice Kit SK-612, 630, 696 and End Sealant RTV-103BLK, 106RED and ESKs are all that are needed to ensure a completely sealed weatherproof system.

## Tube Preparation

Whether tubing is pre-bent, or bent to exact routing in place, tube preparation is the same. First, measure approximate length (be sure there is enough) and cut off. Prepare each end as follows. Cut the jacket laterally about 3 inches from end, then cut around jacket and remove. Cut and remove insulation. When using a tubing cutter, cut off and deburr tube. Then install fitting on end of tubing.

## Problem Area Guidelines

- Runs having an elevation rise should be limited to 15 ft. for every 10 psi of steam pressure (4.5M per 0.7 bar).
- Steam supply lines and condensate return lines should be one size larger than the steam tracer.
- Temptube should be kept clear of hot surfaces; e.g., boilers, heat exchangers, steam headers and high pressure steam lines.
- Abide by recommended minimum bend radii, support centers and clearance of 12" between support and a directional change.
- Use wide surface clamping devices or strap ties.
- Allow separation of Temptube in clustered runs.
- Use long sweeping bends.
- Be sure to seal all exposed ends.
- Allow sloping for self-draining.
- Consider adding drip leg and steam trap at transition from steam supply to tracer if supply runs are long.







Part Number #	Support Centers		Minimum Bend Radius (in.) 	Tube O.D. (in.) 	Product Weight (lbs./ft.) 	Spacing 
	Horizontal (ft.) 	Vertical (ft.) 				
1/4	4' - 6'	12' - 15'	8"	.81"	.2 lb/ft	1/2" Min.
3/8	4' - 6'	12' - 15'	10"	1.015"	.3 lb/ft	1/2" Min.
1/2	4' - 6'	12' - 15'	12"	1.14"	.4 lb/ft	1/2" Min.
5/8	4' - 6'	12' - 15'	14"	1.345"	.51 lb/ft	1/2" Min.

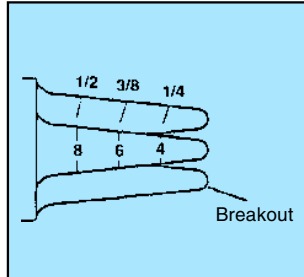
Table 1



## End Seal Boot (ESB) Kit Installation Instructions for Steam and Electric Temptrace Bundles

**NOTE:**

Each kit contains sufficient materials to seal two bundle ends. Each boot allows for up to three tube breakouts. Each breakout has marks to specify where to cut for either 1/4", 3/8" and 1/2" tubes.



1



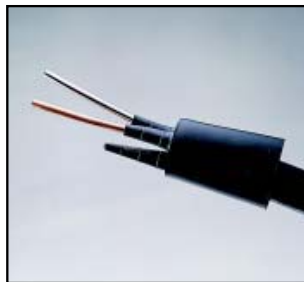
Cut and remove ends of tube breakouts corresponding to the quantity and size of tubes in the bundle.

2



Apply silicone spray or other type of compatible lubricant to tubing to help slide on end boot.

3



Pull end boot down over bundle to create a snug fit.

4



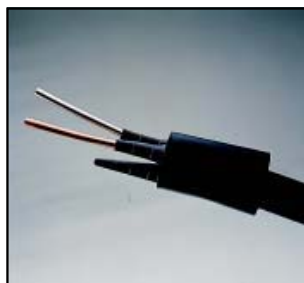
Roll back end boot to expose end of tube bundle.

5



Remove protective backing from mastic sealant and apply the whole length approximately 1" to 1 1/2" from end of bundle to be sealed. Overlap excess sealant after one revolution.

6



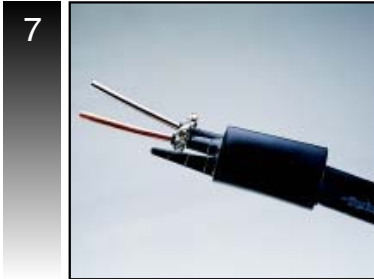
Unroll boot back down over the tube bundle covering sealant.

**CAUTION:**

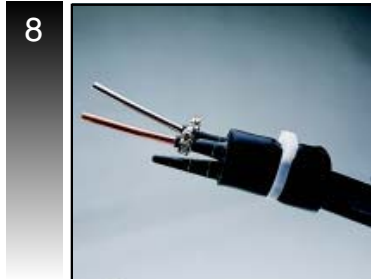
Do not overtighten stainless steel clamps or they will tear through rubber boot.

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## End Seal Boot (ESB) Kit Installation Instructions for Steam and Electric Temptrace Bundles *(Continued)*



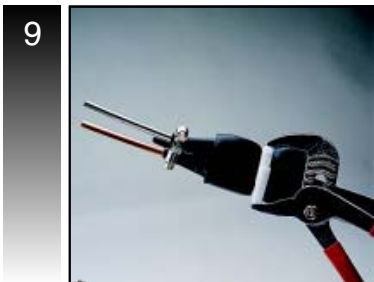
Using the stainless steel clamps, clamp remaining part of breakouts to the tubes.



Place plastic hose clamp over area where mastic sealant was applied.

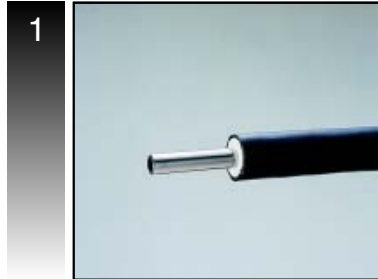
**NOTE:**

Make sure plastic hose clamp is fully tightened. Use channel lock pliers or some other appropriate tool if necessary.



Be sure clamp joins in a spot where mastic sealant is overlapped and tighten clamp.

## End Seal Kit (ESK) Installation Instructions



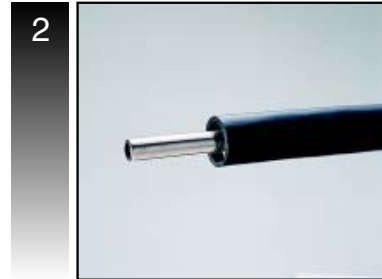
1

Using a sharp knife, cut jacket and insulation square and remove exposing desired length of tube. Take care not to cut or score the tube.



**NOTE:**

When pushing back insulation take care not to damage inside of jacket.



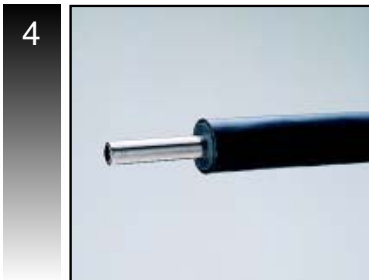
2

Push back insulation and polyester tape under jacket to a depth of 3/4".



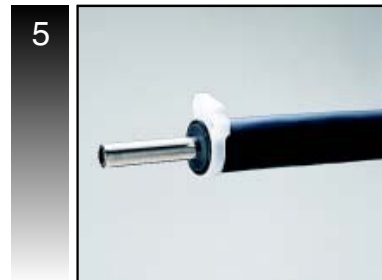
3

Apply a sufficient amount of sealant (RTV-103BLK) on tube O.D. and jacket I.D.



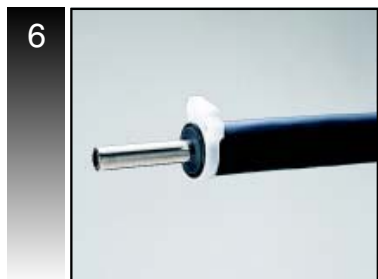
4

Slide grommet into place so it is flush with outer jacket.



5

Slide plastic clamp over jacket and latch tightly so it clamps grommet in place.



6

If necessary, wipe off any excess sealant.

## End Sealant Installation Instructions

1



Using a sharp knife, cut jacket and insulation cleanly and remove from end of tube. Take care not to cut or score the tube.

**NOTE:**

Cutting insulation at a 45° bevel presents more tube surface to the sealing agent.

2



Cut and remove insulation from jacket to tube at approximately a 45° angle.

**CAUTION:**

It is important to insure the sealing agent adheres to the tube and jacket. This prevents water or contaminants from entering insulation.

**NOTE:**

All surfaces must be clean and dry before filling beveled area with RTV sealant.

3



Apply recommended sealant to beveled area completely filling area.

4



Continue applying sealant along the tube surface sufficiently to maintain approximately a 45° angle from tube to jacket.

5



Smooth sealant with a putty knife to remove any void areas.

# PTFT Feed-Through Kit Installation Instructions

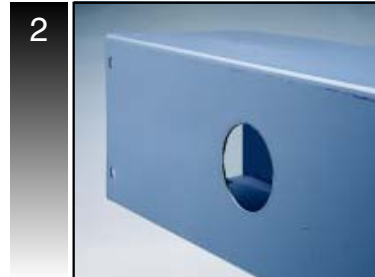
**Molded Feed Through Part:**

Part Number	Cable Range Min / Max	"A" Length Nominal	Wall Thickness Max	Drill Hole Size	"B" Feed Through Hole Size	"C" Minimum Expanded I.D.
PTFT1.50	0.75 - 1.50" (19 - 38 mm)	4.5" (11.4 cm)	0.375" (9.5 mm)	2" (5.1 cm)	1.60" (4.1 cm)	1.70" (4.3 cm)
PTFT2.00	0.75 - 2.00" (19 - 51 mm)	7.0" (17.8 cm)	0.375" (9.5 mm)	2.36" (6.0 cm)	2.10" (5.1 cm)	2.75" (7.0 cm)
PTFT2.75	0.75 - 2.75" (19 - 70 mm)	7.0" (17.8 cm)	1.0" (25.4 mm)	3.50" (8.9 cm)	2.75" (7.0 cm)	2.75" (7.0 cm)

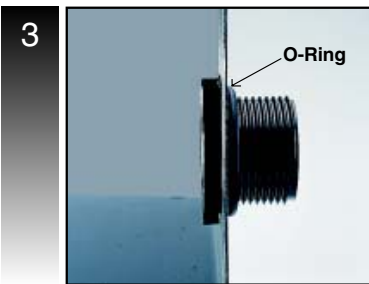
**PVC Pipe Fitting Style:**

PTFT3.25	1.50 - 3.25" (38 - 83 mm)	10" (25.4 cm)	1.125" (28.6 mm)	4.50" (11.4 cm)	3.50" (8.9 cm)	-
PTFT4.50	2.00 - 4.50" (51 - 114 mm)	10" (25.4 cm)	1.25" (28.6 mm)	5.00" (12.0 cm)	4.50" (11.4 cm)	-
PTFT5.00	2.00 - 5.00" (51 - 114 mm)	12" (30.5 cm)	1.125" (28.6 mm)	5.50" (13.2 cm)	5.00" (12.0 cm)	-

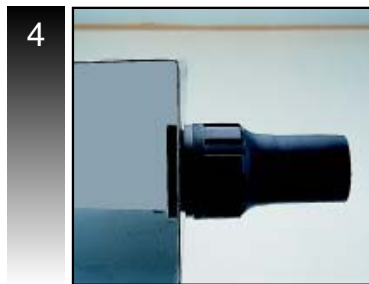
Check kit selection with dimensions shown in Table 1 above.



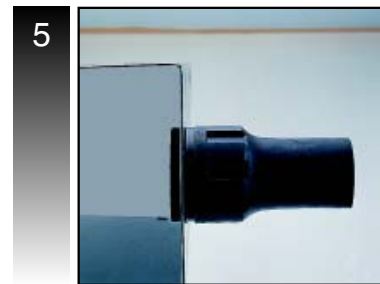
Inspect clearance of enclosure for proper size and remove any burrs or surface irregularities.



Insert externally threaded nut through enclosure hole so flange end is against inside enclosure surface. Install o-ring on outside of enclosure surface as shown.

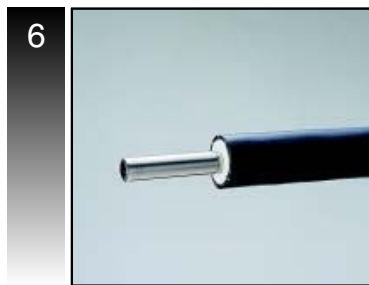


Install heat-shrinkable, internally threaded part onto nut and hand-tighten.



Using a spanner wrench, tighten the heat-shrinkable part an additional 1/4 - 1/2 turn to compress the o-ring. Do not over tighten.

**NOTE:**  
Bundle jacket or armor must extend completely through PTFT heat-shrinkable leg to allow leg to shrink and seal properly.



Using an oil-free solvent, clean from bundle end to seal area.



Insert clean bundle through installed PTFT and make necessary connections. Secure bundle extending out of PTFT as required before shrinking.

---

## PTFT Feed-Through Kit Installation Instructions (Continued)

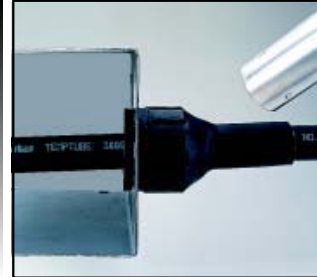
**NOTE:**

Either a hot air gun or propane torch may be used. A wide tipped flame must be used to prevent burning the heat shrink boot. When using a torch, keep flame moving to avoid scorching.

**WARNING:**

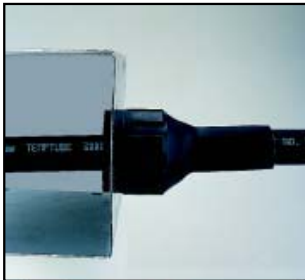
When using gas torches, follow the safety precautions from the torch manufacturer or standard, safe work practices. Provide adequate ventilation during installation.

8



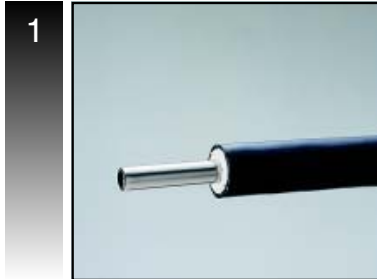
Apply uniform heat around leg of PTFT to shrink in place.

9

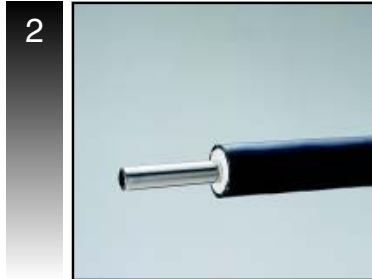


Shrinking is complete when PTFT leg conforms to bundle shape and adhesive is visible at end.

## SK-612, SK-630 and SK-696 Preinsulated Splice Kit Installation Instructions



1 Remove approximately 2 3/4" of jacket and insulation from each tubing end. Take care not to cut or score the tube.



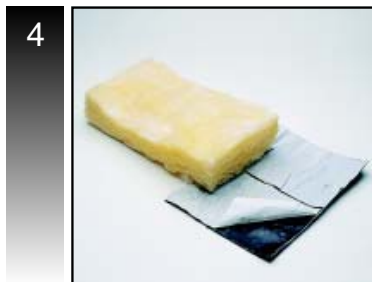
2 Properly prepare tube ends for use with a Parker CPI Union (type HBZ), Parker A-LOK (type SC), or similar high quality tube fitting.



3 Ensure the tube is bottomed in the fitting and the proper make-up procedure is followed in accordance with the manufacturer's recommendations.

**NOTE:**

When properly joined, fiberglass pad of splice kit should fit snugly between insulation ends.



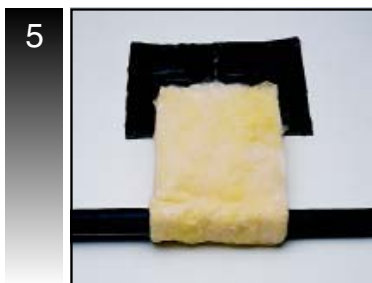
4 Remove protective backing from the self-stick rubber sheet.

**NOTE:**

For smaller diameter products it may be necessary to cut and remove some insulation to help keep O.D. of the splice the same as the O.D. of the existing ends.

**CAUTION:**

When using the SK-612, SK-630 or SK-696 on Light Steam Trace products (3211, 3221) ensure the tracer tube is insulated sufficiently prior to installing the splice kit.



5 Cover exposed tube and tube fitting with fiberglass pad and wrap fiberglass pad around tube and fitting.



6 Wrap until the rubber backing is completely overlapped and sealed.



---

## SK-612, SK-630 and SK-696 Preinsulated Splice Kit Installation Instructions (*Continued*)

7

**NOTE:**

The entire patch must be wrapped with the waterproof self-sealing tape. By stretching the tape to reduce its width by 1/3, sufficient tension will be applied to seal properly.

7



Remove the paper release backing from the tape and beginning approximately 1 1/2" from one end of the patch, wrap tape under tension with a 50% overlap.

8



Continue taping approximately 1 1/2" beyond other end of patch.

# Installation Instructions for Electrical Connection Kit 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant Wattage Electric Temptrace Bundles

## Input Power Connection

### NOTE

The IEEE standards (515-1998) for heating cables requires 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."

### CAUTION

When cutting jacket and insulation, take great care not to cut into heating cable. Cutting heating cable may cause electrical malfunctions.

1



Using a sharp knife carefully cut and remove approximately 8" of jacket, insulation and heat transfer foil from product exposing process tube(s) and heating cable.

### NOTE

Heating zones are located between nichrome wire/bus wire connections.

### NOTE

Nichrome wire/bus wire connections may be located at either 12", 18" or 24" intervals along the heating cable.

### CAUTION

To ensure proper installation, nichrome wire/bus wire connection must be outside of bundle as near to bundle end as possible. Ensure only one nichrome wire/bus wire connection is located outside bundle.

2  
2a



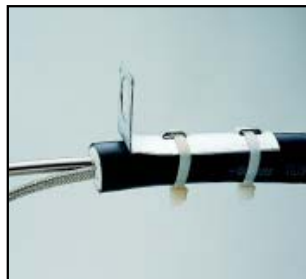
Locate nichrome wire/bus wire connection as follows:

Using thumb and index finger, move down heating cable to locate nichrome wire/bus wire connection. (Connection is identified by an indentation along one side of heating cable.)

2b

If nichrome wire/bus wire connection can't be felt, continue cutting back jacket, insulation and heat transfer foil until found. It may be necessary to cut back jacket 24" to find connection.

3



Hold bracket in place on product 1/2" beyond cut section and install cable ties.

4



Attach connection box to bracket with connector union and locknut. Position box as required.

**Installation Instructions for Electrical Connection Kit  
 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant  
 Wattage Electric Temptrace Bundles (Continued)**

**Input Power Connection (Continued)**

**NOTE**

Either a hot air gun or propane torch may be used when heating heat shrinkable tube. A wide tipped flame must be used to prevent burning tube. When using a torch, keep flame moving to avoid scorching.

**5**



Place heat shrinkable tube over heating cable (if heating cable does not have braid and over jacket) and using heat gun or torch, gently heat tube until it shrinks.

**6**



Feed heating cable through cap, washer and oval hole grommet.

**CAUTION**

When cutting heat shrinkable tube or over jacket, take care not to cut into wire braid. Cutting wire braid or bus wires may cause electrical malfunctions.

**7**

**7a**



Prepare heating cable for electrical leads as follows:

Carefully cut and remove approximately 2 1/2" of over jacket or heat shrink tube. Take care not to cut into wire braid.

**7b**



Separate wire braid from end of heating cable. Do not cut wire braid.

**7c**



Twist wire braid to form a ground wire.

**7d**



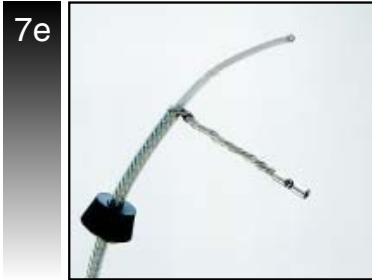
Crimp small terminal to end of wire braid.

**CAUTION**

When cutting heating cable inner jacket, take care not to cut into bus wires. Cutting bus wires may cause electrical malfunctions.

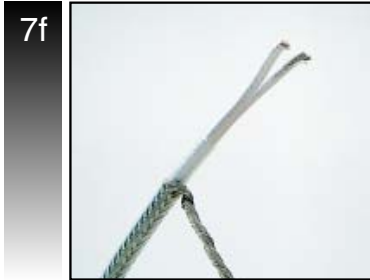
**Installation Instructions for Electrical Connection Kit  
 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant  
 Wattage Electric Temptrace Bundles (Continued)**

**Input Power Connection (Continued)**



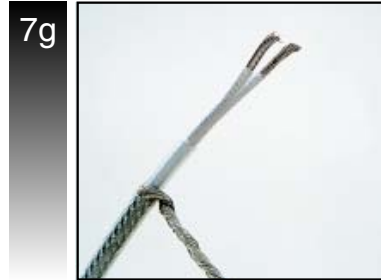
7e

Carefully cut and remove approximately 1 1/2" of inner jacket. Take care not to cut into bus wires.



7f

Remove excess nichrome wire and separate bus wires.



7g

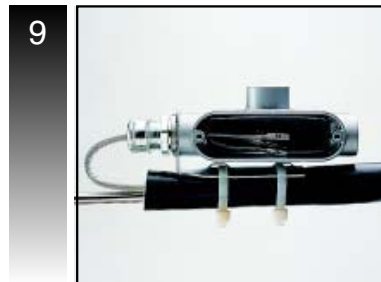
Strip jacket from each bus wire approximately 1/4" from end.



8

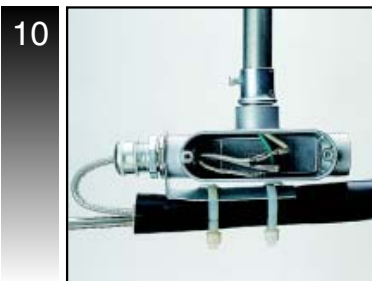
Crimp one large terminal to each bus wire.

**CAUTION**  
 Tighten cap securely to connector union to ensure a watertight connection. Failure to do this may cause electrical malfunctions.



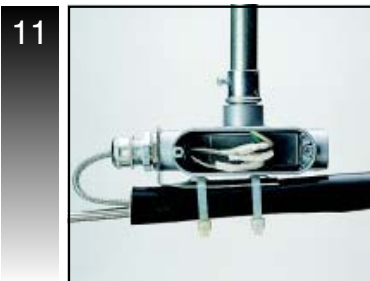
9

Insert heating cable with leads through connector union and tighten cap securely.



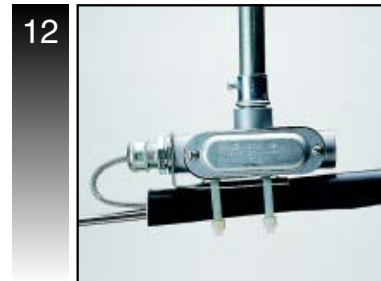
10

Install power leads (not furnished) through connection box opening and connect to heating cable leads with crimp terminals.



11

Using high temperature tape provided, wrap and insulate crimp terminals.



12

Install gasket and cover and tighten screws securely.

---

## Installation Instructions for Electrical Connection Kit 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant Wattage Electric Temptrace Bundles *(Continued)*

### Input Power Connection *(Continued)*

13



Insert plug into remaining opening of connection box.

14



Attach "CAUTION" sticker to connection box.

#### CAUTION

When pushing insulation back inside bundle end, take care not to damage heating element. Damage to heating element may cause electrical malfunctions.

15

Push thermal insulation, heat transfer foil and polyester tape inside bundle end approximately 1/4", and seal with RTV sealant.

## Installation Instructions for Electrical Connection Kit 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant Wattage Electric Temptrace Bundles (*Continued*)

### Input Power and Splice Connection

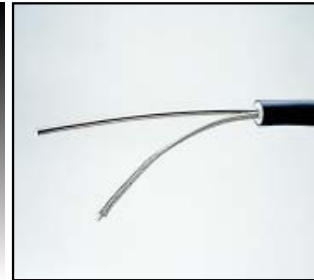
#### NOTE

The IEEE standards (5-15-1998) for heating cables requires 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."

#### CAUTION

When cutting jacket and insulation, take great care not to cut into heating cable. Cutting heating cable may cause electrical malfunctions.

1



Using a sharp knife carefully cut and remove approximately 8" of jacket, insulation and heat transfer foil from product exposing process tube(s) and heating cable.

#### NOTE

Heating zones are located between nichrome wire/bus wire connections.

#### NOTE

Nichrome wire/bus wire connections may be located at either 12", 18" or 24" intervals along the heating cable.

#### CAUTION

To ensure proper installation, nichrome wire/bus wire connection must be outside of bundle as near to bundle end as possible. Ensure only one nichrome wire/bus wire connection is located outside bundle.

2  
2a



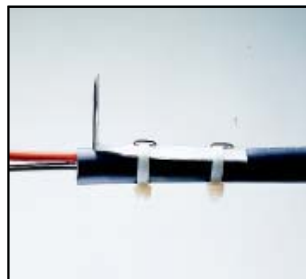
Locate nichrome wire/bus wire connection as follows:

Using thumb and index finger, move down heating cable to locate nichrome wire/bus wire connection. (Connection is identified by an indentation along one side of heating cable.)

2b

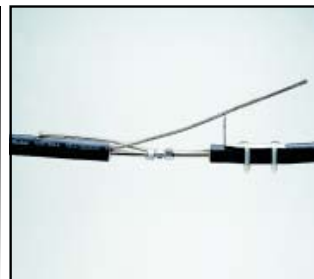
If nichrome wire/bus wire connection can't be felt, continue cutting back jacket, insulation and heat transfer foil until found. It may be necessary to cut back jacket 24" to find connection.

3



Hold bracket in place on product end 1/2" beyond cut section and install cable ties.

4



Connect tubes together with Parker A-LOK (type SC) or Parker CPI (type HBZ) tube union (not furnished) and secure according to manufacturer's recommendations.

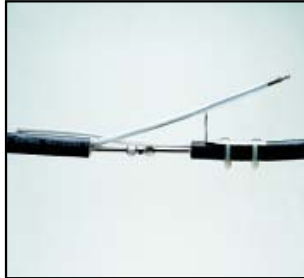
**Installation Instructions for Electrical Connection Kit  
 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant  
 Wattage Electric Temptrace Bundles (Continued)**

**Input Power and Splice Connection (Continued)**

**NOTE**

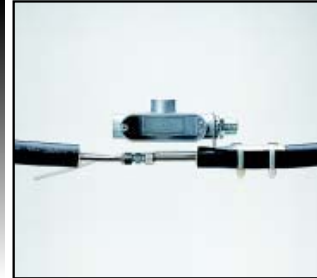
Either a hot air gun or propane torch may be used when heating heat shrinkable tube. A wide tipped flame must be used to prevent burning tube. When using a torch, keep flame moving to avoid scorching.

**5**



Place heat shrinkable tubes over both heating cables (if heating cable does not have braid and over jacket) and using heat gun or torch, gently heat tubes until they shrink.

**6**



Attach connection box to bracket with connector union and locknut. Position box as shown.

**7**



Install remaining connector union in connection box.

**8**



Feed each heating cable through a cap, washer and grommet.

**CAUTION**

When cutting heat shrinkable tube or over jacket, take care not to cut into wire braid. Cutting wire braid or bus wires may cause electrical malfunctions.

**9**

**9a**



Prepare heating cable for electrical leads on one heating cable only as follows:

Carefully cut and remove approximately 2 1/2" of over jacket or heat shrink tube. Take care not to cut into wire braid.

**9b**



Separate wire braid from end of heating cable. Do not cut wire braid.

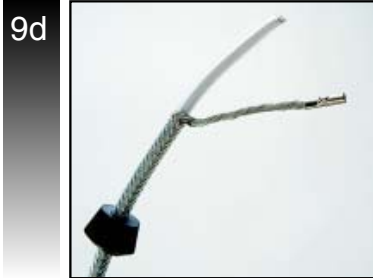
**9c**



Twist wire braid to form a grounding wire.

**Installation Instructions for Electrical Connection Kit  
 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant  
 Wattage Electric Temptrace Bundles (Continued)**

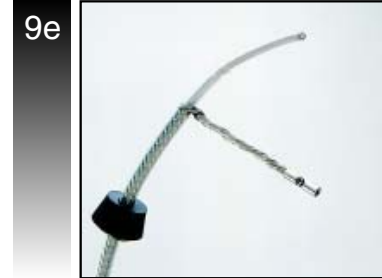
**Input Power and Splice Connection (Continued)**



9d Crimp small terminal to end of wire braid.

**CAUTION**

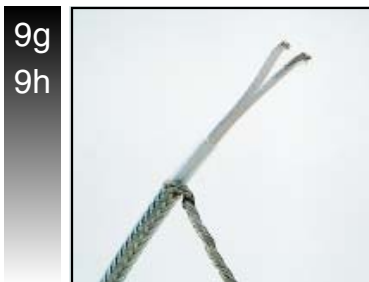
When cutting heating cable inner jacket, take care not to cut into bus wires. Cutting bus wires may cause electrical malfunctions.



9e Carefully cut and remove approximately 1 1/2" of inner jacket. Take care not to cut into bus wires.



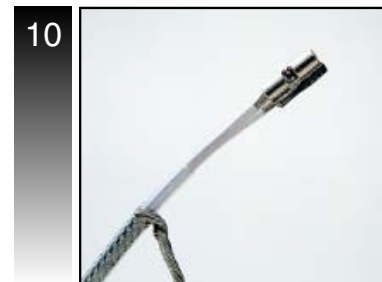
9f Remove excess nichrome wire and separate bus wires.



9g  
9h

Strip jacket from each bus wire approximately 1/4" from end.

Prepare remaining heating cable the same as in Steps 9 - 9g, only do not attach terminals to wires.

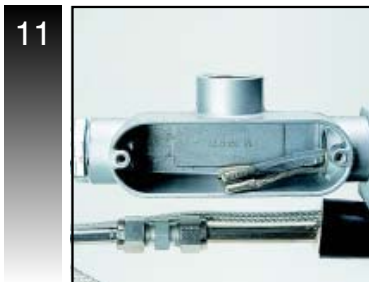


10

Crimp one large terminal to each bus wire.

**CAUTION**

Tighten cap securely to connector to ensure a watertight connection. Failure to do so may cause electrical malfunctions.



11

Insert heating cable with leads through connector union and tighten securely.



12

Insert remaining heating cable through second connector union and tighten securely.



**Installation Instructions for Electrical Connection Kit  
 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant  
 Wattage Electric Temptrace Bundles (Continued)**

**Input Power and Splice Connection (Continued)**

**NOTE**

For input power and splice connections, install power leads in remaining connection box opening and connect to both sets of heating cable bus wires. (Not shown)

**13**



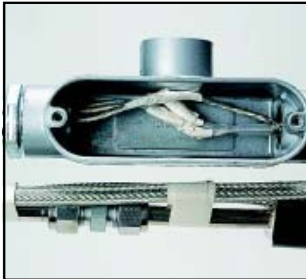
For splice connection only (no power leads required) insert stripped bus wires of heating cable into terminal ends of second heating element and crimp.

**14**



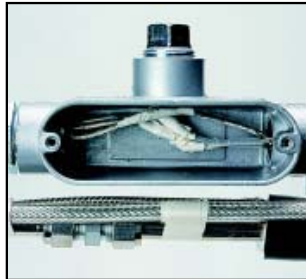
Using high temperature tape wrap and insulate crimp terminals.

**15**



Using high temperature tape, secure heating cables to bare tubing section.

**16**



Install plug into remaining connection box port.

**17**



Install gasket and cover and tighten screws securely.

**18**



Attach "CAUTION" sticker to connection box.

## Installation Instructions for Electrical Connection Kit 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant Wattage Electric Temptrace Bundles (*Continued*)

### Termination Connection

#### CAUTION

When cutting jacket and insulation, take great care not to cut into heating cable. Cutting heating cable may cause electrical malfunctions.

1



Using a sharp knife, carefully cut and remove approximately 8" of jacket, insulation and heat transfer foil from product exposing process tube(s) and heating cable.

#### NOTE

Heating zones are located between nichrome wire/bus wire connections.

#### NOTE

Nichrome wire/bus wire connections may be located at either 12", 18" or 24" intervals along the heating cable.

#### CAUTION

To ensure proper installation, nichrome wire/bus wire connection must be outside of bundle as near to bundle end as possible. Ensure only one nichrome wire/bus wire connection is located outside bundle.

2

Locate nichrome wire/bus wire connection as follows:

2a  
2b

Using thumb and index finger, move down heating cable to locate nichrome wire/bus wire connection. (Connection is identified by an indentation along one side of heating cable.)

If nichrome wire/bus wire connection can't be felt, continue cutting back jacket, insulation and heat transfer foil until found. It may be necessary to cut back jacket 24" to find connection.

3



Cut heating cable approximately 2 - 2 1/2" from bundle end.

4  
4a



Isolate heating cable bus wires as follows:

Carefully cut and remove approximately 1 1/2" of over jacket (if applicable) and wire braid.

#### CAUTION

When cutting heating cable inner jacket, take care not to cut into bus wires. Cutting bus wires may cause electrical malfunctions.

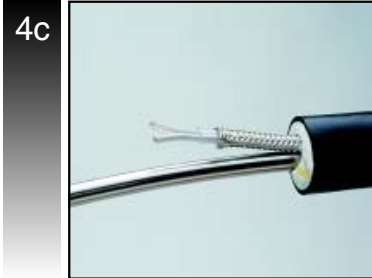
4b



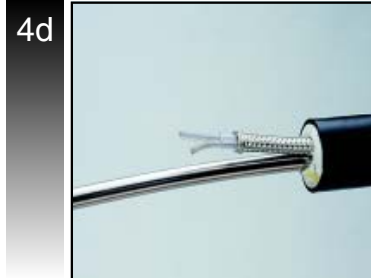
Carefully cut and remove approximately 1" of inner jacket. Take care not to cut into bus wires.

## Installation Instructions for Electrical Connection Kit 4031-0001 for use with 4311, 4312, 4321 and 4322 Constant Wattage Electric Temptrace Bundles (*Continued*)

### Termination Connection (*Continued*)



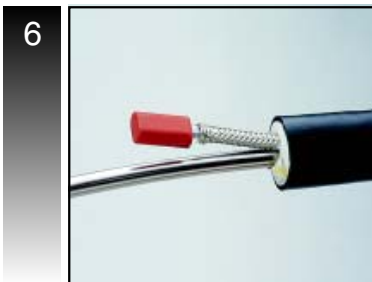
Remove excess nichrome wire and separate bus wires.



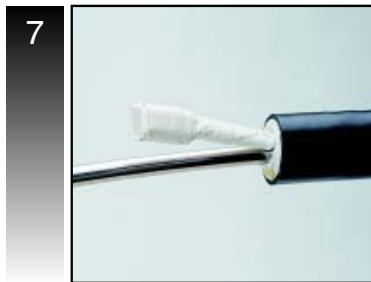
Cut one bus wire 1/4" from end.



Fill terminating boot with RTV sealant.



Separate heating cable bus wires from each and carefully slide termination boot over wires.



Secure termination boot with high temperature tape.

8 Cut and remove tube and leaving approximately 2 – 2 1/2" of tube and terminate with appropriate tube fitting or connection (not provided).

9 Install SK-612 kit to re-insulate bundle end.

## Installation Instructions for Power Connection Kit 4041-2101 for Self-Regulating Bundles

### NOTE

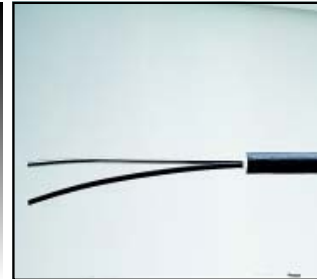
The IEEE standards (515-1998) for heating cables requires the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres."

1



Measure 24 inches from end of bundle and carefully cut around and lengthwise through jacket and insulation. Do not cut into heating cable or tubing.

2



Remove jacket, insulation and heat transfer foil.

### NOTE

The 4041-2101 is an electrical connection kit and provides a method to seal the end of the bundle with RTV.

### NOTE

If an HSB (heat shrinkable boot) or ESB (end seal boot) is used to seal the end of the bundle, the boot must be installed prior to installing the base of the heating cable.

3



Cut end of heating cable diagonally to make it easier to push through grommet in base.

4



Feed heating cable through the bottom of base. Slide cable grommet over end of cable and insert into base. Secure the base to bundle using appropriately sized pipe strap. Tighten pipe strap until the base is secured. DO NOT overtighten or squeeze insulation.

### CAUTION

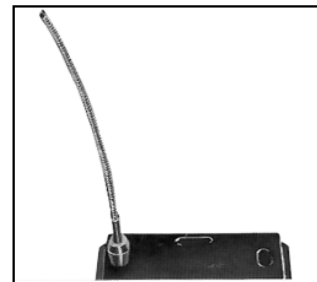
Appropriate grommet must be used depending upon heating cable in bundle. Reference heating cable part number on wire and choose proper grommet from chart shown on last page of this instruction.

5



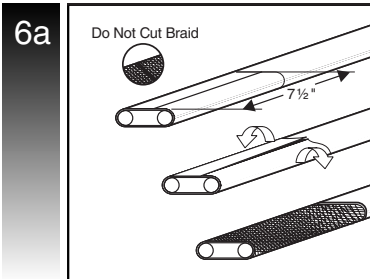
Secure base to bundle with clamp provided.

6



Score the outer insulation 7-1/2" from the end of cable. Remove the jacket to expose the metal braid. Warning: Do not damage the braid or the base cable insulation. (See Step 6a.)

## Installation Instructions for Power Connection Kit 4041-2101 for Self-Regulating Bundles *(Continued)*



Prepare heating cable with outer jacket as follows:

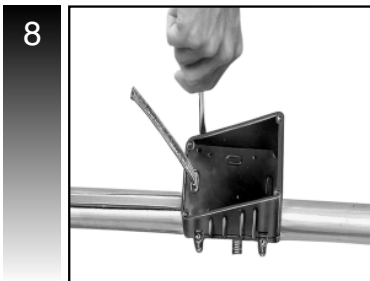
Measure approximately 7-1/2" from end of heating cable and using a sharp knife, lightly score around and lengthwise of outer jacket.

### CAUTION

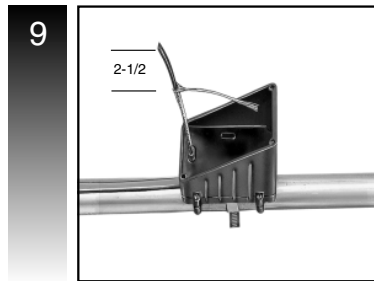
When scoring heating cable outer jacket do not cut wire overbraid. Cutting wire overbraid will prevent proper installation, and may cause electrical malfunctions.



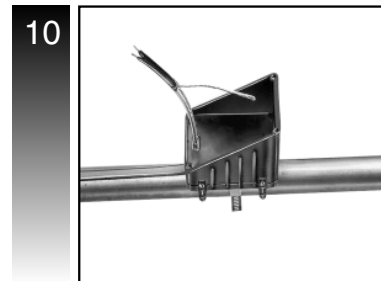
Punch out the knockouts on the bottom of the box which correspond to the openings in the base through which the heating cable passes. Be careful to punch out only those knockouts to be used. If one is mistakenly punched, blank grommets can be ordered to re-establish water-tight seal.



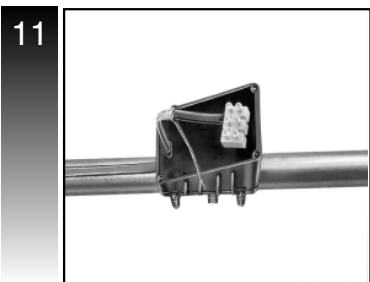
Feed the cables through the corresponding holes in the box. Secure box to base using all four (8-32) screws.



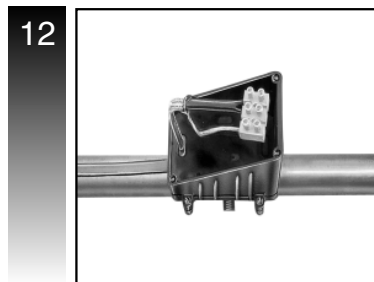
Starting from the end of the cable, unravel 2-1/2 inches of the braid. Twist the strands together to form a pigtail.



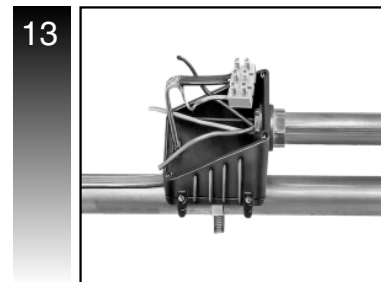
Using standard electrical cutters, cut a 3/4 inch long notch out of the cable between the conductor wires. Bare a 3/8 inch length of each conductor by stripping off the outside insulation and the inner black core material.



Insert the bared ends of the conductors into the openings in the terminal block. Tighten screws firmly to hold conductors in place.

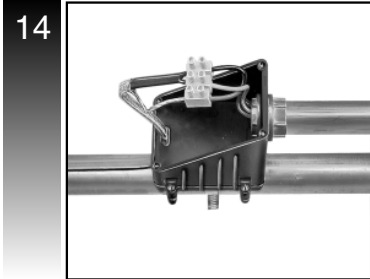


Insert the end of the braid pigtail into the remaining opening in the terminal block. Tighten screw firmly to hold the braid in place.

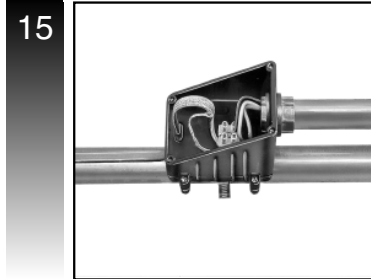


Connect conduit hub (not supplied with kit) to the box. Attach conduit to hub and bring power leads into box.

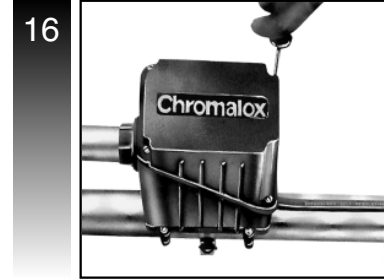
## Installation Instructions for Power Connection Kit 4041-2101 for Self-Regulating Bundles *(Continued)*



Strip 3/8 inch length off each conductor of the power cord. Insert the bared ends of the conductors into the corresponding openings on the unused side of the terminal block. Remember, the green (ground) wire must be opposite of the opening of the terminal block which is either empty or contains the metal braid.



Mount terminal block to bottom of the box by driving the 6-32 self-tapping screw into the mounting hole as shown.



Carefully push the wires into the box. Secure the lid to box.

### Grommet Selection Chart

Grommet Part Number	Use with Heating Cable Part Number	Cable Description
GR-1	SRL-C	Self-regulating, low temp with copper braid only
GR-2	SRL-CR, SRL-CT	Self-regulating, low temp with copper braid and overjacket
GR-7	SRM/E-C	Self-regulating, medium temp with copper braid only
GR-8	SRME-CT	Self-regulating, medium temp with copper braid and overjacket

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## Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles

**Bundle End Preparation:** Used in all connection types.

### NOTE

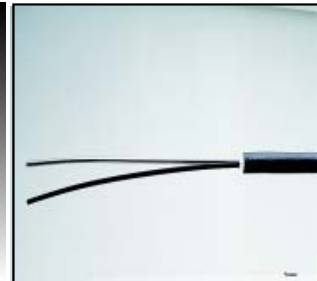
The IEEE standards (515-1998) for heating cables require the use of GFEPDs with a nominal 30 milliampere trip level for "piping systems in classified areas, those areas requiring a high degree of maintenance, or which may be exposed to physical abuse or corrosive atmospheres."

1



Measure 24 inches from end of bundle and carefully cut around and lengthwise through jacket and insulation. Do not cut into heating cable or tubing.

2



Remove jacket, insulation and heat transfer foil.

### NOTE

An HSB (heat shrinkable boot) or ESB (end seal boot) or RTV sealant is recommended for sealing the bundle end.

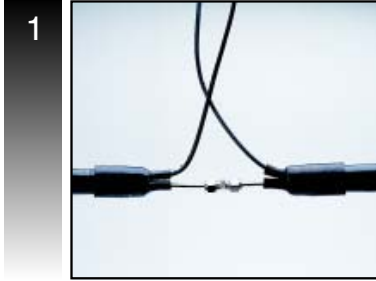
### NOTE

If an HSB (heat shrinkable boot) or ESB (end seal boot) is used to seal the end of the bundle, the boot must be installed prior to installing the base of the heating cable.

## Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles *(Continued)*

### Instructions for Splice or Tee Connections

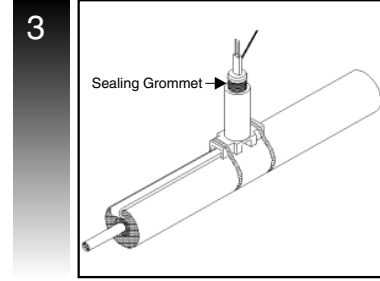
**Note:** These steps should be followed if making a splice connection.



Once you have completed steps 1 and 2 of the "Bundle Preparation" instructions, your bundles should look similar to the one shown here. Heat shrink boots are shown in this example as the end seal method; however, RTV can also be used. Use appropriate tube fitting available from Parker Instrumentation Connectors Division.

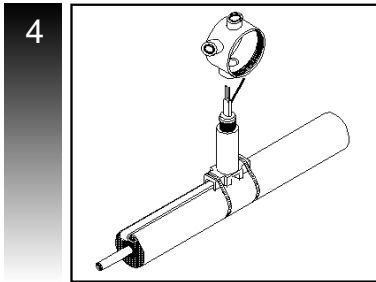


Cut end of heating cable diagonally to make it easier to push through grommet in base of pipe stand.

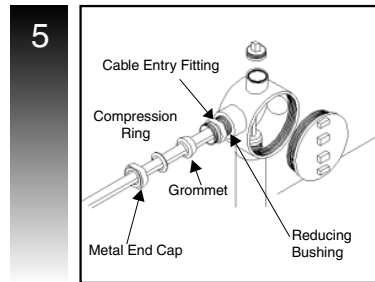


Mount the standoff to the bundle using pipe straps provided. Select the appropriate size depending upon the bundle size. Allow approximately 7 inches of heating cable to extend beyond sealing grommet for easier power termination.

Slide the seal grommet over the heating cable and position the grommet in the standoff. **Note: If heater wire is braided only, heat shrink sleeve must be shrunk on wire, then slid through grommet so that grommet opening is completely sealed.** Once in place, prepare heating cable end per "Heating Cable Preparation" steps 1-6.

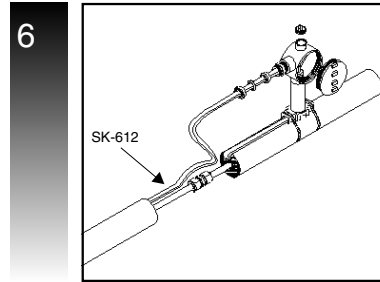


Place the junction box over the heating cable and braid; screw junction box to pipe standoff.



Separate the metal end cap, compression ring and sealing grommet from the cable entry fitting.

**Note: If heater wire is braided only, heat shrink sleeve must be shrunk on wire, then slid through grommet so that grommet opening is completely sealed.**



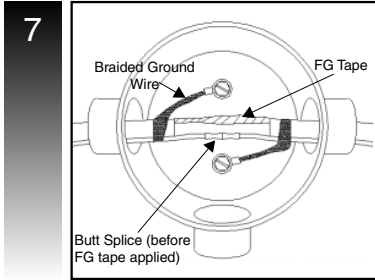
Feed the heating cable from the second bundle through the metal end cap, compression ring, grommet, cable entry fitting, reducing bushing and into the side port of junction box. (Use the top part as well when doing a Tee connection.)



# Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles *(Continued)*

## Instructions for Splice or Tee Connections (Continued)

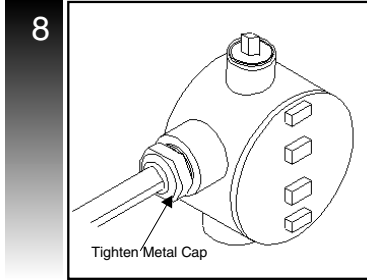
**Note:** These steps should be followed if making a splice connection.



Make electric splice connection inside box with heating cables from each bundle. Using two butt splice connectors, splice together heater bus wires. Follow "Heating Cable Preparation" at end of manual.

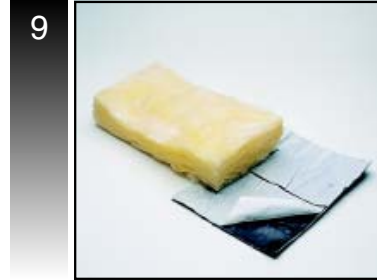
Using ring terminals, crimp terminal rings onto braided pigtails and tighten to back of box with ground screw. Note: One ground screw may be used for both wires if necessary.

Wrap bus wire connections with fiberglass tape. Bus wire connections must not touch inside box, otherwise a short circuit will occur.



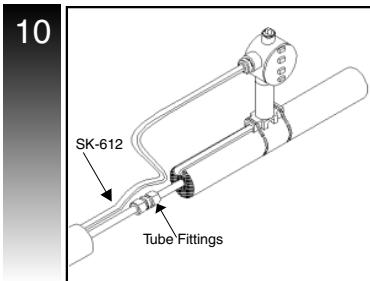
Slide silicone rubber grommet and seal fitting compression ring forward until it is flush with the junction box side port; tighten until metal cap bottoms out on cable entry fitting.

Plug top port with 3/4" conduit plug.



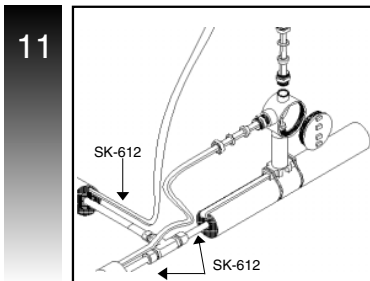
The exposed tube and heating cable area between bundles should be reinsulated and sealed using a Parker SK-612 Seal Patch Kit provided. Additional SK kits available in 3 different sizes at your local Parker Instrumentation Distributor.

### Typical Splice Connection



Tube fittings are available from your local Parker Instrumentation Distributor.

### Typical Splice – T Connection

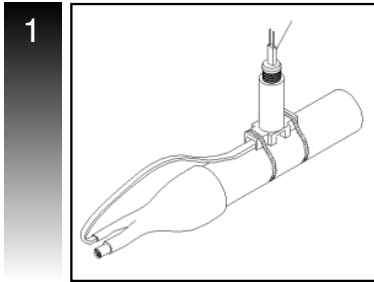


Please follow steps 1-8 in "Instructions for Splice or Tee Connections," except use a Tee union fitting available from your local Parker Instrumentation Distributor to bring in an additional bundle. Utilize top port of junction box with splice or Tee connection.

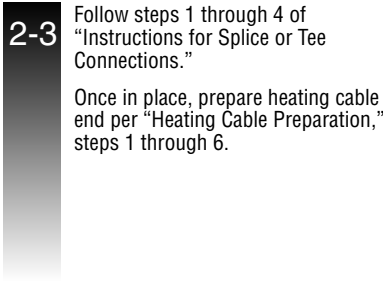
# Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles *(Continued)*

## Instructions for Power Connection

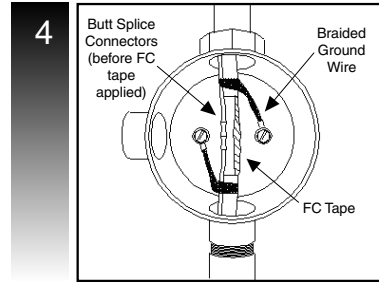
**Note:** These steps should be followed if making a power connection.



1  
 If using heat shrink boots, place heat shrink boot onto bundle and feed heater wire, tube, and other accessories through openings. Heat boot carefully until it shrinks down and all ends are completely sealed. (HSB-2 2-leg boot shown is sold separately. RTV-103BLK sealant supplied with kit can also be used instead of HSB's to seal bundle ends).



2-3  
 Follow steps 1 through 4 of "Instructions for Splice or Tee Connections."  
 Once in place, prepare heating cable end per "Heating Cable Preparation," steps 1 through 6.



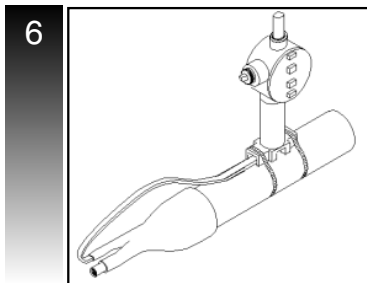
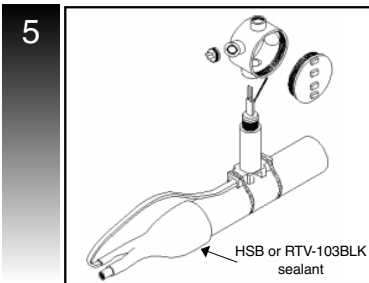
4  
 Once cable preparation is complete, twist junction box onto the pipe standoff.

Make electric splice connection inside box with heating cable and cable from power source. Using two butt splice connectors, splice heater bus wires to power source

Using ring terminals, crimp terminal rings onto braided pigtail and tighten to back of box with ground screw.

Wrap bus wire connections with fiberglass tape. Bus wire connections must not touch inside box, otherwise a short circuit will occur.

## Typical Power Connection:



5  
 Fitting used in connection can be obtained from your local Parker Instrumentation Distributor.

## Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles *(Continued)*

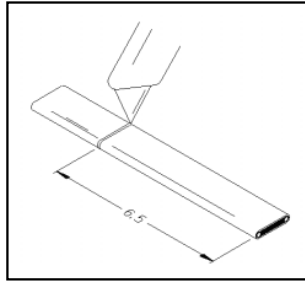
**Heating Cable Preparation:** Used in all connection types.

**Note:** These steps should be followed at the point where "Heating Cable Preparation" is noted in the instructions.

**WARNING**

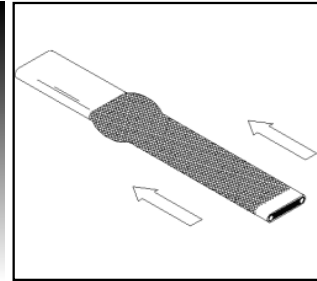
Do not cut through the metal braid of the heating cable. Effective ground cannot be made if the metal braid is removed.

**1**



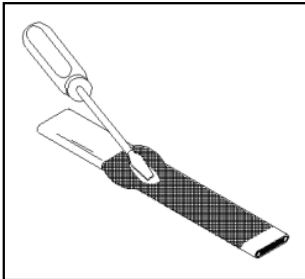
Score the outer insulation 6.5 inches from the end of the cable. Lightly cut the outer jacket up the center to the end of the heating cable and peel off the outer jacket.

**2**



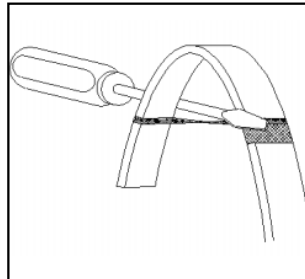
Push braid back toward outer jacket to create a pucker.

**3**



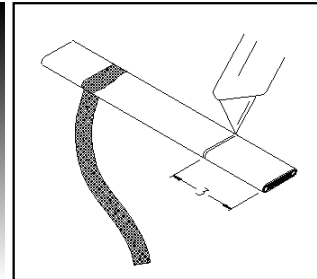
At the bulge, separate the braid to make an opening in the braid without cutting it.

**4**



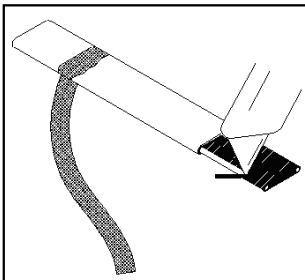
While bending the heating cable, work the cable through the braid opening. Pull the braid tight.

**5**



Score the inner jacket that is under the braid 3 inches from the end. Lightly cut the jacket up the center to the end of heating cable and peel away that section.

**6**



Shave the core material from outside of each bus wire.

## Installation Instructions for Electrical Connection Kit 4041-5300 for Self-Regulating Bundles *(Continued)*

**Heating Cable Electrical End Seal:** Used in all connection types. The following steps should be completed to seal the heating cable from moisture at the non-powered end.

**Note:** After following steps 1 through 5, the bundle insulated end must be sealed with either a heat shrink boot HSB or RTV-103BLK. RTV is supplied with kit; HSB's sold separately.

### CAUTION

When cutting jacket and insulation, take great care not to cut into heating cable. Cutting heating cable may cause electrical malfunctions.

1



Using a sharp knife, carefully cut and remove sufficient jacket, insulation and heat transfer foil for your application from end of product exposing process tube(s) and heating cable.

2



Cut heating cable approximately 3" from bundle end.

### CAUTION

When cutting heating cable over jacket, take care not to cut into bus wires. Cutting bus wires may cause electrical malfunctions.

3



Using a sharp knife, carefully score and cut away 2" of over jacket and wire braid.

### NOTE

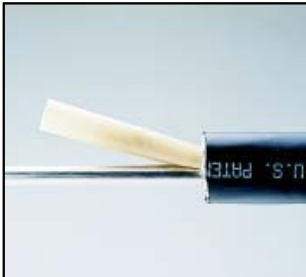
Either a hot air gun or propane torch may be used to shrink heat shrinkable tube. A wide tipped flame must be used to prevent burning the tube. When using a torch, keep flame moving to avoid scorching.

4



Place small yellow heat shrinkable tube over end of heating cable base strip and heat until tube shrinks around cable. Using pliers, while tube is still hot, pinch end of tube to seal.

5



Place long yellow heat shrinkable tube over previously installed shrinkable tube and entire heating cable visible. Heat until tube shrinks around cable. Using pliers, while tube is still hot, pinch end of tube to seal.

### NOTE

When heating shrinkable boot, begin applying heat at tube end first and completely shrink boot around tube. Once boot is enclosed around tube, move heat source towards bundle end. This will prevent heat shrinkable boot from pulling off bundle when applying heat.

## Installation Instructions for Electrical End Termination Kit 4041-6101 for Self-Regulating Bundles

### CAUTION

When cutting jacket and insulation, take great care not to cut into heating cable. Cutting heating cable may cause electrical malfunctions.

1



Using a sharp knife, carefully cut and remove sufficient jacket, insulation and heat transfer foil for your application from end of product exposing process tube(s) and heating cable.

2



Cut heating cable approximately 3" from bundle end.

### CAUTION

When cutting heating cable over jacket, take care not to cut into bus wires. Cutting bus wires may cause electrical malfunctions.

3

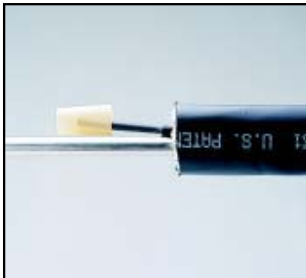


Using a sharp knife, carefully score and cut away 2" of over jacket and wire braid.

### NOTE

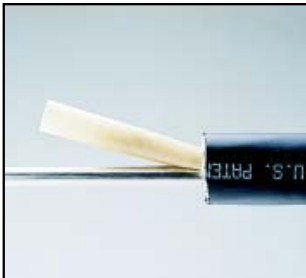
Either a hot air gun or propane torch may be used to shrink heat shrinkable tube. A wide tipped flame must be used to prevent burning the tube. When using a torch, keep flame moving to avoid scorching.

4



Place small yellow heat shrinkable tube over end of heating cable base strip and heat until tube shrinks around cable. Using pliers, while tube is still hot, pinch end of tube to seal.

5



Place long yellow heat shrinkable tube over previously installed shrinkable tube and entire heating cable visible. Heat until tube shrinks around cable. Using pliers, while tube is still hot, pinch end of tube to seal.

### NOTE

When heating shrinkable boot, begin applying heat at tube end first and completely shrink boot around tube. Once boot is enclosed around tube, move heat source towards bundle end. This will prevent heat shrinkable boot from pulling off bundle when applying heat.

## Installation Instructions for Electrical End Termination Kit 4041-6101 for Self-Regulating Bundles *(Continued)*

### NOTE

Either a hot air gun or propane torch may be used to shrink heat shrinkable boot. A wide tipped flame must be used to prevent burning boot. When using a torch, keep the flame moving to avoid scorching.

6



Install heat shrinkable boot over end of bundle and entire heating cable. Heat boot starting from the tube end first and work back towards bundle.

## Installation Instructions for Electrical End Termination Connection Kit 4041-8200 for Self-Regulating Bundles

**NOTE**

If bundle end will be sealed with a heat shrinkable boot, install boot prior to installing termination kit.

**1**



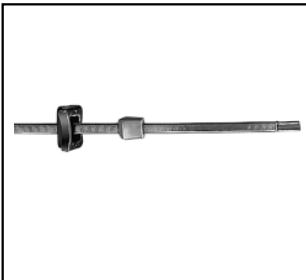
Push the braid back 3" to expose the base cable insulation.

**2**



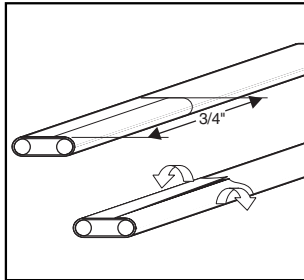
Slide the pressure plate and grommet over the end of the cable.

**3**



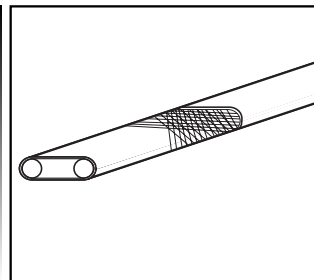
Score the outer jacket 1" from the end of the cable. Remove the jacket to expose the braid. Unravel and trim the braid flush with the outer jacket. Pull any strands of braid back towards the outer jacket.

**4**



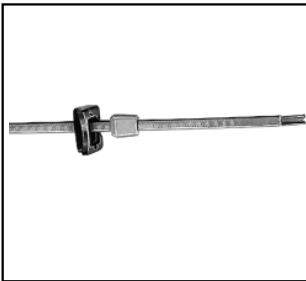
Lightly score outer jacket 3/4" from end of heating cable. Bend heating cable to break jacket at score and peel off outer jacket.

**5**



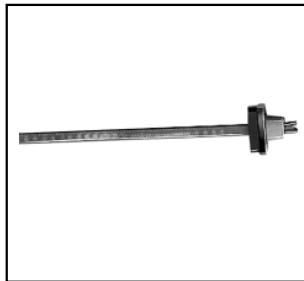
Remove exposed braid.

**6**



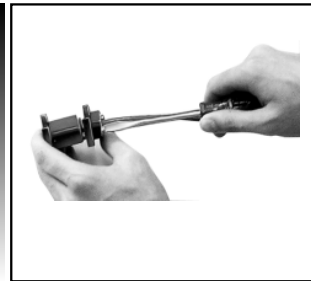
Using standard electrical cutters, cut a "VEE" notch between the buss wires.

**7**



Slide the pressure plate and grommet towards the end of the cable leaving 5/8" of the cable extending past the end of the grommet.

**8**



Slide the end cap over the grommet. Using a screwdriver, connect the pressure plate to the end cap.

## Installation Instructions for Electrical End Termination Connection Kit 4041-8200 for Self-Regulating Bundles (Continued)

9



Using a fastening device, fiber reinforced electrical tape, secure the assembly to the bundle. Wrap the tape around the assembly between the legs.

### NOTE

The pressure plate and end cap have different size curved surfaces on the top and bottom of each piece. These curved surfaces are designed to give a better fit on process equipment. The side with the smaller radius curve is for use on pipes with diameters up to 3" or on flat surfaces. The other side is for use on pipes with diameters of 3" or more.



Part Number	Page	Part Number	Page	Part Number	Page	Part Number	Page	Part Number	Page
CK50	F2	1CA6	A7	3FRPT4	A21	5CTHW4	A5	8NT4	A27
CK51	F2	1CA8	A7	3FRPT6	A21			8PA4	A23
CK75	F2					5FRPT4	A21	8PA6	A23
CK76	F2	1CAT4	A9	3NT4	A27	5FRPT6	A21		
CK100	F2	1CAT6	A9					8PAT4	A25
CK125	F2	1CAT8	A9	3PA4	A23	5NT4	A27	8PAT6	A25
CK150	F2			3PA6	A23				
CK200	F2	1CT4	A3	3PAT4	A25	5PA4	A23	8PT4	A19
		1CT6	A3	3PAT6	A25	5PA6	A23		
ESB	F4	1CT8	A3					8SSA4	A13
				3PT4	A19	5PAT4	A25		
ESK0-4	F4	1SSA4	A13	3PT6	A19	5PAT6	A25	8SSAT4	A17
ESK0-6	F4	1SSA6	A13						
ESK0-8	F4			3SSA4	A13	5PT4	A19	8SST4	A15
		1SSAT4	A17			5PT6	A19		
GESK0-2	F3	1SSAT6	A17	3SSAT4	A17	5SSA4	A13	8XPTF4	A31
GESK0-4	F3								
GESK0-6	F3	1SST4	A3	3SST4	A15	5SST4	A15	8XPTU4	A29
GESK0-8	F3	1SST6	A3						
		1SST8	A3	3XPTU4	A29			10CA4	A7
G-0670	F2			3XPTU6	A29			10CA6	A7
G-0740	F2	2CA4	A7			7CA4	A7	10CAT4	A9
G-0820	F2	2CA6	A7	4CA4	A7	7CA6	A7	10CAT6	A9
G-0900	F2	2CA8	A7	4CA6	A7				
G-0980	F2			4CA8	A7	7CAT4	A9	10CT4	A5
G-1160	F2	2CAT4	A9			7CAT6	A9	10CT6	A5
G-1280	F2	2CAT6	A9	4CAT4	A9				
G-1460	F2	2CAT8	A9	4CAT6	A9	7CT4	A5	10CTHW4	A5
G-1550	F2			4CAT8	A9	7CT6	A5		
G-1610	F2	2CT4	A5					10FRPT4	A21
G-1650	F2	2CT6	A5	4CT4	A5	7CTHW4	A5	10FRPT6	A21
G-1750	F2	2CT8	A5	4CT6	A5			10NT4	A27
				4CT8	A5	7FRPT4	A21		
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HSB-2	F3	2FRPT6	A21	4CTHW4	A5			10PA6	A23
HSB-3	F3					7NT4	A27	10PAT4	A25
HSB-4	F3	2NT4	A27	4FRPT4	A21			10PAT6	A25
HSB-5	F3			4FRPT6	A21	7PA4	A23		
HSB-6	F3	2PA4	A23	4NT4	A27	7PA6	A23	10PT4	A19
		2PA6	A23					10PT6	A19
PTFT1.50	F3			4PA4	A23	7PAT4	A25	10SSA4	A13
PTFT2.00	F3	2PAT4	A25	4PA6	A23	7PAT6	A25	10SSAT4	A17
PTFT2.75	F3	2PAT6	A25					10SST4	A15
PTFT3.25	F3			4PT4	A19	7SST4	A15	10XPTF4	A31
PTFT4.50	F3	2PT4	A19	4PT6	A19			10XPTF6	A31
PTFT5.00	F3	2PT6	A19	4SSA4	A13	7SST4	A15	10XPTU4	A29
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## Parker Safety Guide

# for Selecting and Using Hose, Tubing, Fittings, and Related Accessories

Parker Publication No. 4400-B.1

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**WARNING:** Failure or improper selection or improper use of hose, tubing, fittings, assemblies 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.
- Electrocutation from high voltage electric power lines.
- Contact with suddenly moving or falling objects that are controlled by the conveyed fluid.
- Injections by high-pressure fluid discharge.
- Dangerously whipping Hose.
- 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. Only Hose from Parker's Stratoflex Products Division is approved for in flight aerospace applications, and no other Hose can be used for such in flight applications.

### 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. All assemblies made with Hose are called "Hose Assemblies". All products commonly called "fittings" or "couplings" are called "Fittings". All related accessories (including crimping and swaging machines and tooling) are called "Related Accessories". 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.

**1.2 Fail-Safe:** Hose, and Hose 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 or Hose Assembly or Fitting will not endanger persons or property.

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

**1.4 User Responsibility:** Due to the wide variety of operating conditions and applications for Hose and Fittings, Parker and its distributors do not represent or warrant that any particular Hose 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 Hose and Fitting.
- Assuring that the user's requirements are met and that the application presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the Hose and Fittings 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 product being considered or used, or call 1-800-CPARKER, or go to [www.parker.com](http://www.parker.com), for telephone numbers of the appropriate technical service department.

### 2.0 HOSE AND FITTING 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 Fitting and the Hose/Fitting interface to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting Hose and Fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor. The electrical conductivity or nonconductivity of Hose 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 these 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 and Fittings that are selected are proper for the application. Do not use any Parker Hose or Fitting for any such application requiring nonconductive Hose, including but not limited to applications near high voltage electric lines, 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 and Fitting 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.

Parker manufactures a special Hose for certain compressed natural gas ("CNG") applications where static electricity buildup may occur. Parker CNG Hose assemblies comply with AGA Requirements 1-93, "Hoses for Natural Gas Vehicles and Fuel Dispensers". 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 at a maximum temperature of 180°F. Parker CNG Hose should not be used in confined spaces or unventilated areas or areas exceeding 180°F. Final assemblies must be tested for leaks. CNG Hose Assemblies should be tested on a monthly basis for conductivity per AGA 1-93.

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 selection must be made so that the published maximum recommended working pressure of the Hose is equal to or greater than the maximum system pressure. Surge pressures or peak transient pressures in the system must be below the published maximum working pressure for the Hose. 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. Temperatures below and above the recommended limit can degrade Hose to a point where a failure may occur and release fluid. 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 Assembly selection must assure compatibility of the Hose tube, cover, reinforcement, and Fittings 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 that is chemically compatible with a particular fluid must be assembled using Fittings and adapters containing likewise compatible seals.
- 2.6 Permeation:** Permeation (that is, seepage through the Hose) will occur from inside the Hose to outside when Hose 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 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 even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the Hose Assembly. Permeation of moisture from outside the Hose to inside the Hose will also occur in Hose 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.
- 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).
- 2.9 Environment:** Care must be taken to insure that the Hose 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 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. 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 than 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.
- 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 establishing a proper Hose length, motion absorption, Hose length changes due to pressure, and Hose and machine tolerances and movement must be considered.
- 2.14 Specifications and Standards:** When selecting Hose and Fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.
- 2.15 Hose Cleanliness:** Hose components may vary in cleanliness levels. Care must be taken to insure that the Hose 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 require use of the same type of Hose as used with petroleum base fluids. Some such fluids require a special Hose, while a few fluids will not work with any Hose at all. See instructions 2.5 and 1.5. The wrong Hose 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 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.
- 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 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.
- 2.19 Atomic Radiation:** Atomic radiation affects all materials used in Hose assemblies. Since the long-term effects may be unknown, do not expose Hose assemblies to atomic radiation.
- 2.20 Aerospace Applications:** The only Hose and Fittings that may be used for in-flight aerospace applications are Hose 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 couplings with disconnect sleeves can unintentionally disconnect if they are dragged over obstructions or if the sleeve is bumped or moved enough to cause disconnect. Threaded couplings should be considered where there is a potential for accidental uncoupling.
- 3.0 HOSE AND FITTING 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. 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 Reusable/Permanent:** Do not reuse any field attachable (reusable) 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 is damaged or improperly installed, use a Ground Fault Equipment Protection Device. Electrical fault currents may be insufficient to trip a conventional circuit breaker.  
**3.14a Ground Fault Protection:** The IEEE standard (515-1989) 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 HOSE AND FITTING MAINTENANCE AND REPLACEMENT INSTRUCTIONS**
- 4.1** 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. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.7.
- 4.2 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.
- 4.3 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.
- 4.4 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.
- 4.5 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.
- 4.6 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.
- 4.7 Elastomeric Seals:** Elastomeric seals will eventually age, harden, wear and deteriorate under thermal cycling and compression set. Elastomeric seals should be inspected and replaced.
- 4.8 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.
- 4.9 Compressed Natural Gas (CNG):** Parker CNG Hose Assemblies should be tested after installation and before use, and at least on a monthly basis per AGA 1-93 Section 4.2 "Visual Inspection Hose/Fitting". The recommended procedure is to pressurize the Hose and check for leaks and to visually inspect the Hose for damage.
- 4.10** 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.



## Offer of Sale

**1. Terms and Conditions of Sale:** All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

**2. Payment:** Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the rate of 1-1/2% for each month or a portion thereof that Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment

**3. Delivery:** Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

**4. Warranty:** Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 365 days from the date of shipment to Buyer, or 2,000 hours of use, whichever expires first. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

**5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.**

**6. Changes, Reschedules and Cancellations:** Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

**7. Special Tooling:** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. 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 apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**8. Buyer's Property:** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items

which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are 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. Taxes:** Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

**10. Indemnity For Infringement of Intellectual Property Rights:** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). 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 an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation.

Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

**11. Force Majeure:** Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

**12. Entire Agreement/Governing Law:** The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

The items described in this document are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

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