Pre-Insulated Tubing Bundles

Electric-Traced and Steam-Traced

Features

- Simplified field installation
- 1/8 to 3/4 in. and 6 to 12 mm seamless or welded tubing sizes
- 316 / 316L stainless steel, copper, and PFA tube materials

Contents

Swagelok Bundled Tubing

Swagelok pre-insulated traced tubing bundles provide reliable process temperature maintenance in a variety of analytical and process instrumentation applications, including impulse lines, sample lines, and process lines. It is used to connect process lines to pressure transmitters and analyzers. The rugged elastomeric jacket offers excellent resistance to abrasion and many chemicals.

Swagelok pre-insulated tubing bundles provide an economical choice compared to field tracing and insulating. The parallel configuration—process and tracer lines are parallel inside the bundle—allows all tubes to bend together in as little as an 8 in. (20.3 cm) radius in tubing sizes up to 3/4 in. or 12 mm, so the bundle is easier to route and connect in the field than cabled bundles.

Choose from light steam-traced, heavy steam-traced, and electric-traced bundles for freeze protection, viscosity control, and process temperature maintenance.

Insulation Features

- Water soluble chlorides less than 100 ppm
- Absorption-resistant fibrous glass insulation
- Resists wicking

Jacket Material Specifications

PVC Jacket

This jacket material is an economical choice when ambient installation temperature is above –10°F (–23°C). It offers UV, corrosion, and abrasion resistance.

Urethane Jacket

This jacket material is a nonhalogenated thermoplastic urethane that can be installed in ambient temperatures as low as –40°F (–40°C). It also offers improved resistance to abrasion, aromatic hydrocarbons, and UV light.

Jacket Colors (Urethane Only)

The standard jacket color is black. Contact your authorized Swagelok sales and service representative for other available colors.

Jacket Properties	PVC	Urethane
Tensile strength, psi (bar)	2200 (151)	3800 (261)
Elongation	350 %	700 %
Hardness, Shore A	80	80
UL 94 flammability rating	V2	V2
UV resistance	750 h UL-1581	2000 h in accordance with QUV aging test

Tubing Bundle Technical Data

Fractional

Tube OD in.	Nominal Wall Thickness in.	PVC Jacket Temperature Ratings			Pressure Rating at –20 to 100°F (–28 to 37°C)④ psig (bar)		Min Bend Radius in. (cm)	Support Centers ft (m)		Max Continuous Length⑤ ft (m)	
		Max Jacket Rating① °F (°C)	Min Ambient Service Rating② °F (°C)	Min Ambient Installation Rating③ °F (°C)	Seamless	Welded		Horiz	Vert	Seamless	Welded
Stainless Steel (ASTM A269, A213⑥) TP 316/316L											
1/8	0.035	220 (104)	–30 (–34)	–10 (–23)	10 900 (751)	—	8.00 (20.3)	6.00 (1.80)	15.0 (4.60)	900 (274)	—
1/4	0.035				5 100 (351)	4080 (281)				2200 (671)	2500 (762)
	0.049				7 500 (516)	—				1300 (396)	—
3/8	0.035				3 300 (227)	2640 (181)					2500 (762)
	0.049				4 800 (330)	—				1000 (305)	—
1/2	0.035⑦				2 600 (179)	2080 (143)					2000 (610)
	0.049				3 700 (254)	2960 (203)				825 (251)	1000 (305)
	0.065				5 100 (351)	—				250 (76.2)	—
3/4	0.049⑦				2 400 (165)						
Copper (ASTM B68, B68M, B75, UNS 12200)											
1/4	0.030	220 (104)	–30 (–34)	–10 (–23)	1 400 (96.4)	—	8.00 (20.3)	6.00 (1.80)	15.0 (4.60)	2600 (792)	—
3/8	0.032⑦				900 (62.0)					2000 (610)	
1/2	0.035⑦				800 (55.1)					1000 (305)	
	0.049				1 100 (75.7)						
3/4	0.049⑦				700 (48.2)					500 (152)	
PFA											
1/4	0.030⑧	220 (104)	–30 (–34)	–10 (–23)	155 (10.6)	—	8.00 (20.3)	6.00 (1.80)	15.0 (4.60)	1000 (305)	—
3/8					95 (6.5)						
1/2	0.062				97 (6.6)						

Metric

Tube OD mm	Nominal Wall Thickness mm	PVC Jacket Temperature Ratings			Pressure Rating at –28 to 37°C (–20 to 100°F)④ bar (psig)		Min Bend Radius cm (in.)	Support Centers m (ft)		Max Continuous Length⑤ m (ft)	
		Max Jacket Rating① °C (°F)	Min Ambient Service Rating② °C (°F)	Min Ambient Installation Rating③ °C (°F)	Seamless	Welded		Horiz	Vert	Seamless	Welded
Stainless Steel (ASTM A269, A213⑥) TP 316/316L											
6	1.0	104 (220)	–34 (–30)	–23 (–10)	420 (6095)	—	20.3 (8.00)	1.80 (6.00)	4.60 (15.0)	300 (984)	—
8					310 (4499)					210 (688)	
10	1.0				240 (3483)					165 (541)	
	1.5				400 (5805)					150 (492)	
12	1.0				200 (2902)	160 (2322)					300 (984)
	1.5				330 (4789)	—				120 (393)	—
Copper (ASTM B68, B68M, B75, UNS 12200)											
6	1.0	104 (220)	–34 (–30)	–23 (–10)	94.0 (1364)	—	20.3 (8.00)	1.80 (6.00)	4.60 (15.0)	600 (1968)	—
8					60.0 (870)					455 (1492)	
12					54.0 (783)					300 (984)	

① The bundle is designed so that the jacket surface temperature will not exceed 140°F (60°C) with a process temperature of 400°F (204°C), an ambient temperature of 80°F (26°C), and a 10 mph (16 km/h) wind. The maximum jacket rating for urethane is 250°F (121°C).

② –60°F (–51°C) urethane jacket.

③ –40°F (–40°C) urethane jacket.

④ For elevated pressure-temperature ratings, see Swagelok *Tubing Data* (MS-01-107).

⑤ Standard tolerance for continuous length tubing is ±5 %.

⑥ Nominal wall thickness, not minimum wall thickness. Seamless metric sizes also meet DIN 17458 test 1 class material 1.4401/1.4404.

⑦ **Not recommended for use with tube fittings in gas service.**

⑧ Not recommended for use with Swagelok groove cutter tool or PFA fittings due to minimum wall thickness.

Electric-Traced Bundled Tubing

A simple and economical choice for applications where electric tracing is preferred, Swagelok electric-traced bundled tubing maintains consistent temperatures in long, continuous lengths of impulse and sample lines for freeze protection, temperature maintenance, or viscosity control. The standard Raychem® self-regulating tracer lowers heat output as the bundle gets warmer. For more precise temperature control, an optional line-sensing thermostat is available.

Features

- Raychem self-regulating electric tracers
- Tinned copper braided shield
- Fluoropolymer tracer jacket
- ATEX, FM®, and CSA® approved tracer for use in hazardous areas
- Maintains process temperatures up to 250°F (121°C)
- One or two process tubes available as standard

Technical Data—Tracer Specifications

High-Temperature Tracers

High-temperature tracers are used to maintain process temperatures or for viscosity control up to 250°F (121°C). They are also used for freeze protection or if the tracers will be exposed to intermittent temperatures up to 482°F (250°C), such as during steam cleaning.

Low-Temperature Tracers

Low-temperature tracers are used for freeze protection or maintaining temperatures up to 100°F (37°C) and can be exposed to continuous process temperatures of 150°F (65°C).

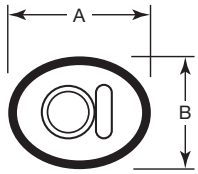
Tracer Type	Tracer Code	Voltage V (ac)	Maximum Process Temperature °F (°C)	Maximum Intermittent Exposure Temperature① °F (°C)	Power W/ft (W/m)	T Rating	Approvals
High-temperature	H1	120	250 (121)	420 (215)	5 (16)	T3	**FM** Class I, Div. 2, Groups A, B, C, D Class II②, Div. 2, Groups F, G Class III② **CSA** Class I, Div. 1 and 2, Groups A, B, C, D Class II, Div. 1 and 2, Groups E, F, G Class III **ATEX** Group II, Category 2G, EEx e II
					10 (32)		
					15 (49)	T2D	
					20 (65)	T2C	
	H2	240			5 (16)	T3	
					10 (32)		
					15 (49)		
					20 (65)	T2C	
Low-temperature	L1	120	150 (65)	185 (85)	5 (16)	T6	**FM** Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G Class III **CSA** Class I, Div. 1 and 2, Groups A, B, C, D Class II, Div. 1 and 2, Groups E, F, G Class III **ATEX** Group II, Category 2G, EEx e II
					8 (26)		
					10 (32)		
	L2	240			5 (16)		
					8 (26)		
					10 (32)		

① The temperature that the electric tracer can be exposed to for 1000 h during its lifetime.

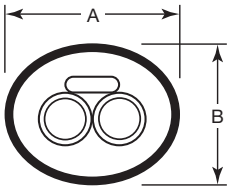
② The entire system requires approval for FM compliance.

Electric-Traced Bundled Tubing

Dimensions and Weight



One Process Tube



Two Process Tubes

Bundle Description	Dimensions, in. (mm) A	Dimensions, in. (mm) B	Nominal Weight lb/ft (kg/m)
One 1/4 in. process tube	1.20 (30.5)	1.20 (30.5)	0.3 (0.45)
One 3/8 in. process tube	1.40 (35.6)	1.30 (33.0)	0.4 (0.60)
One 1/2 in. process tube	1.50 (38.1)		0.5 (0.74)
Two 1/4 in. process tubes	1.30 (33.0)		0.4 (0.60)
Two 3/8 in. process tubes	1.60 (40.6)	1.40 (35.6)	0.6 (0.89)
Two 1/2 in. process tubes	1.80 (45.7)	1.60 (40.6)	0.8 (1.19)

Maximum Tracer Length Versus Circuit Breaker Rating

Example: Given a nominal tracer power output of 10 W/ft (32 W/m), a startup temperature of 0°F (–17°C), and a voltage of 120 V (ac) with a breaker size of 20 A, the maximum tracer length will be 130 ft (39.6 m).

To determine maximum tracer length in meters: m = ft × 0.3048.

Nominal Tracer Power Output W/ft (W/m)	Startup Temperature °F (°C)	Circuit Breaker Voltage									
		120 V (ac)					240 V (ac)①				
		Circuit Breaker Size									
		15 A	20 A	30 A	40 A	50 A	15 A	20 A	30 A	40 A	50 A
		Maximum Tracer Length, ft									
High-Temperature											
5 (16)	50 (10)	180	240	360	385	385	360	480	720	765	765
	0 (–17)	160	210	320			315	420	625		
	–20 (–28)	150	200	305			295	395	595		
	–40 (–40)	145	195	290			285	380	570	760	
10 (32)	50 (10)	110	145	220	270	270	220	295	440	540	540
	0 (–17)	95	130	195	260		195	260	385	515	
	–20 (–28)		125	190	250		185	245	370	495	
	–40 (–40)	90	120	180	240		175	235	355	470	
15 (49)	50 (10)	75	100	150	200	220	150	200	300	400	445
	0 (–17)	65	90	135	180		130	175	265	355	440
	–20 (–28)		85	130	170	215	125	165	250	335	420
	–40 (–40)	60	80	125	165	205	120	160	240	320	405
20 (65)	50 (10)	60	80	120	160	190	115	150	230	305	380
	0 (–17)	50	70	105	140	180	100	135	205	275	345
	–20 (–28)		65	100	135	170		130	200	265	330
	–40 (–40)				130	165	95	125	190	255	320
Low-Temperature											
5 (16)	50 (10)	230	270	270	270	270	460	540	540	540	540
	0 (–17)	140	190				285	380			
	–20 (–28)	125	165	250			250	330	500		
8 (26)	50 (10)	150	200	210	210	210	300	400	420	420	420
	0 (–17)	100	130	200			200	265	400		
	–20 (–28)	85	115	175			175	235	350		
10 (32)	50 (10)	120	160	180	180	180	240	315	360	360	360
	0 (–17)	80	110	160			160	215	325		
	–20 (–28)	70	95	140			145	190	285		

① 208 and 277 V (ac) will change the run lengths.

Electric-Traced Bundled Tubing

Ordering Number Reference

This ordering information is for reference only. To order, contact your authorized Swagelok representative.

SSE1 – 4W1 – L1SAF – FP4

Material
SS = Stainless steel
CU = Copper
P = PFA

Bundle Type
Electric-traced

Number of Process Tubes①
1 or **2**

① Up to four metal or up to six PFA process tubes may be available on request. Contact your authorized Swagelok representative.

Process Tube OD①

Fractional	*Metric*
2 = 1/8 in.	**6m** = 6 mm
4 = 1/4 in.	**8m** = 8 mm
6 = 3/8 in.	**10m** = 10 mm
8 = 1/2 in.	**12m** = 12 mm
12 = 3/4 in.②	

② 3/4 in. process tubes require urethane jacket material.

Process Tubing Construction
S = Seamless (SS, CU)
W = Welded (SS)
E = Extruded (PFA)

Process Tubing Wall Thickness①

A = 0.047 in.	**5** = 1.0 mm
1 = 0.035 in.	**6** = 1.5 mm
2 = 0.049 in.	**7** = 0.032 in.
3 = 0.065 in.	**8** = 0.062 in.
4 = 0.030 in.	

Temperature②
L = Low-temperature
H = High-temperature

Voltage②
1 = 100 to 130 V
2 = 200 to 277 V

Tracer Type②
Self-regulating

Nominal Tracer Power Output
A = 5 W/ft (16 W/m)
B = 8 W/ft (26 W/m)
C = 10 W/ft (32 W/m)
D = 15 W/ft (49 W/m)
E = 20 W/ft (65 W/m)

Tracer Jacket Material
Fluoropolymer

Units of Measure (Length)
F = Feet
M = Meters

Bundle Jacket Material
P = PVC
U = Urethane

Spooling Length Option
1 = Continuous length, ± 5 % tolerance
2 = Exact length, ± 0.5 % tolerance③
3 = Continuous length with exact length ± 0.5 % tolerance
4 = Standard length tolerance ± 5 %③

③ May contain more than one length of no less than 100 ft (30.5 m) each.

① To ensure that the part number is configurable, please reference the Technical Data on page 215.

② For available Electric Tracers see page 216.

Steam-Traced Bundled Tubing

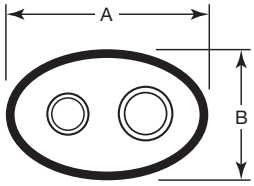
Light Steam-Traced

Swagelok light steam-traced bundled tubing is typically used for freeze protection of instrument impulse lines and analyzer transport lines. It can also maintain temperatures in smaller-diameter process lines. The process and tracer tubes are individually insulated to reduce the heat transfer rate, providing a more consistent tube temperature over long tubing lengths.

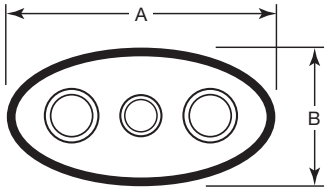
Features

- Maintains process temperatures from 50 to 200°F (10 to 93°C)
- Individually wrapped process and tracer tubes reduce heat transfer
- One or two process tubes available as standard

Dimensions and Weight



One Process Tube



Two Process Tubes

Process Tube Size in.	Tracer Tube Size in.	Dimensions, in. (mm)		Nominal Weight lb/ft (kg/m)
		A	B	
One Process Tube				
3/8	3/8	2.00 (50.8)	1.60 (40.6)	0.5 (0.74)
1/2	3/8	2.20 (55.9)	1.70 (43.2)	0.6 (0.89)
1/2	1/2			0.7 (1.04)
Two Process Tubes				
3/8	3/8	2.30 (58.4)	1.60 (40.6)	0.6 (0.89)
1/2	3/8	2.70 (68.6)	1.70 (43.2)	0.8 (1.19)
1/2	1/2			0.9 (1.34)

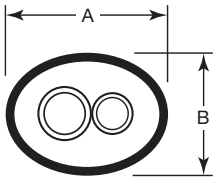
Heavy Steam-Traced

Swagelok heavy steam-traced bundled tubing is typically used to maintain higher process temperature or for viscosity control. Applications can include impulse, sampling, and process lines. The process tubing is in direct contact with the tracer, providing maximum heat transfer to help maintain higher process temperatures.

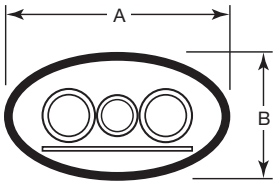
Features

- Maintains process temperatures from 200 to 400°F (93 to 204°C)
- Maximum tracer temperature of 400°F (204°C)
- Process and tracer tubes are in direct contact to maximize higher heat transfer
- One or two process tubes available as standard

Dimensions and Weight



One Process Tube



Two Process Tubes

Process Tube Size in.	Tracer Tube Size in.	Dimensions, in. (mm)		Nominal Weight lb/ft (kg/m)
		A	B	
One Process Tube				
3/8	3/8	1.50 (38.1)	1.10 (27.9)	0.5 (0.74)
1/2	3/8	1.60 (40.6)	1.20 (30.5)	0.6 (0.89)
1/2	1/2	1.70 (43.2)		0.7 (1.04)
Two Process Tubes				
3/8	3/8	1.90 (48.3)	1.10 (27.9)	0.6 (0.89)
1/2	3/8	2.10 (53.3)	1.20 (30.5)	0.7 (1.04)
1/2	1/2	2.20 (55.9)		0.8 (1.19)

Steam-Traced Bundled Tubing

Ordering Number Reference

This ordering information is for reference only. To order, contact your authorized Swagelok representative.

SSL2 – 4S1 – CU4S4 – FP4

Material
SS = Stainless steel
CU = Copper
P = PFA

Bundle Type
L = Light traced
H = Heavy traced

Number of Process Tubes①
1 or **2**

① Three metal or up to six PFA process tubes may be available on request. Contact your authorized Swagelok representative.

Process Tube OD①

Fractional	*Metric*
2 = 1/8 in.	**6m** = 6 mm
4 = 1/4 in.	**8m** = 8 mm
6 = 3/8 in.	**10m** = 10 mm
8 = 1/2 in.	**12m** = 12 mm
12 = 3/4 in.②	

② 3/4 in. process tubes require urethane jacket material.

Process Tubing Construction
S = Seamless (SS, CU)
W = Welded (SS)
E = Extruded (PFA)

Process Tubing Wall Thickness①

A = 0.047 in.	**5** = 1.0 mm
1 = 0.035 in.	**6** = 1.5 mm
2 = 0.049 in.	**7** = 0.032 in.
3 = 0.065 in.	**8** = 0.062 in.
4 = 0.030 in.	

Spooling Option
1 = Continuous length, ± 5 % tolerance
2 = Exact length, ± 0.5 % tolerance③
3 = Continuous length with exact length ± 0.5 % tolerance
4 = Standard length tolerance ± 5 %③

③ May contain more than one length of no less than 100 ft (30.5 m) each.

Bundle Jacket Material
P = PVC
U = Urethane

Units of Measure (Length)
F = Feet
M = Meters

Tracer Tubing Wall Thickness①

1 = 0.035 in.	**5** = 1.0 mm
2 = 0.049 in.	**6** = 1.5 mm
3 = 0.065 in.	**7** = 0.032 in.
4 = 0.030 in.	

Tracer Tube Construction
S = Seamless (SS, CU)
W = Welded (SS)

Tracer Tube OD①

Fractional	*Metric*
4 = 1/4 in.	**6m** = 6 mm
6 = 3/8 in.	**8m** = 8 mm
8 = 1/2 in.	**10m** = 10 mm
	12m = 12 mm

Tracer Tube Material
SS = Stainless steel
CU = Copper

① To ensure that the part number is configurable, please reference the Technical Data on page 215 Not all size combinations are configurable.

Options and Accessories

Bending Tools

Similar to a common electrical conduit bender, this tool is compact and easy to use and has the required 8 or 12 in. (20.3 or 30.5 cm) minimum bend radius. A 3/4 in. NPT threaded handle is needed.

Ordering numbers: **MS-BBT** (8 in. [20.3 cm])
MS-BBT-12 (12 in. [30.5 cm])①

① Use **MS-BBT-12** when:
- the bundle contains two or more 3/4 in. tubes
- the smallest bundle dimension is >1.75 in. (44.4 mm)
- the bundle contains a tube ≥1 in. (25.4 mm) OD.

Heat-Shrink End-Seal Boots

Made of thermally stabilized, modified polyolefin, these heat-shrink end-seal boots provide a weatherproof end seal. They are recommended for all exposed ends to protect against moisture ingress.

To order, see the table below to locate the proper designator based on process and tracer tube type and size and add it to basic ordering number **MS-HSB-.**

Example: **MS-HSB-D2** for a heavy steam-traced bundle with one 1/4 in. process tube and one 1/4 in. tracer tube

Tracer Tube, in.	Process Tube Sizes, in.				
	1/8	1/4	3/8	1/2	3/4
Electric-Traced					
—	1 Process Tube				
	D2	D2	C2	C2	C2
	2 Process Tubes				
	B3	B3	B3	A3	A3
Heavy Steam-Traced					
	1 Process Tube				
1/4	D2	D2	D2	D2	C2
3/8	D2	D2	C2	C2	C2
1/2	D2	D2	C2	C2	C2
3/4	C2	C2	C2	C2	L2
	2 Process Tubes				
1/4	B3	B3	B3	A3	A3
3/8	B3	B3	B3	A3	A3
1/2	B3	B3	A3	A3	A3
3/4	A3	A3	A3	A3	A3
Light Steam-Traced					
	1 Process Tube				
1/4	—	C2	D2	C2	—
3/8		L2	C2	L2	
1/2		L2	L2	L2	
	2 Process Tubes				
1/4	—	A3	A3	A3	—
3/8		A3	A3	A3	
1/2		A3	A3	A3	

Jacket Patch Kit

The jacket patch kit can be used to seal a splice in tubing or to repair any incidental field damage to the insulation and jacket. Each kit contains thermal insulation, fiberglass tape, and a self-sealing patch.

Ordering numbers: **MS-JP-KIT-1**
(8 by 12 in. [20.3 by 30.5 cm])
MS-JP-KIT-2
(8 by 96 in. [20.3 by 244 cm])

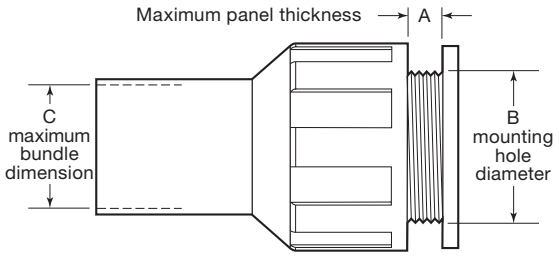
Center Line Tool

This tool brings the process tubes to the proper 2 1/8 in. center line to connect a standard transmitter.

Ordering number:
MS-CLT

Heat-Shrink Entry-Seal Boots

Made of thermally stabilized, modified polyolefin, these heat-shrinkable entry-seal boots provide a waterproof seal where the tubing enters an enclosure.



Dimensions, in. (mm)			Ordering Number
A	B	C	
0.50 (12.7)	2.00 (50.8)	0.75 to 1.60 (19.0 to 40.6)	MS-HSS-4-KIT
1.00 (25.4)	2.38 (60.5)	0.75 to 2.10 (19.0 to 53.3)	MS-HSS-4S-KIT
	3.50 (88.9)	1.43 to 2.75 (36.3 to 69.8)	MS-HSS-5-KIT
	4.50 (114)	1.50 to 3.50 (38.1 to 88.9)	MS-HSS-6X-KIT

Silicone Sealant

This silicone RTV sealant can be used to seal ends of bundled tubing from moisture and offers excellent resistance to weather, oil, and many chemicals. One tube will seal approximately 10 ends; each kit contains 8 tubes.

Service Temperature: –60 to 400°F (–51 to 204°C)

Cure Time: approximately 24 h at 77°F (25°C) and 50 % relative humidity.

Ordering number: **MS-RTV-SEAL-KIT**

Options and Accessories

Power Connection Kits

Power connection kits provide a junction for connecting an electric tracer to the power source.

Compatible Tracers	Approvals	Kit Contents	Ordering Number
Low-temperature	**FM and CSA** Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G Class III **NEMA 4X**	Junction box with surface mounting feet and bundle mounting bracket with adjustable straps	MS-PC-F-C-KIT
High-temperature	**FM and CSA** Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G Class III **NEMA 4X**		
All	**ATEX** Group II, Category 2G, EEx e II	Fitting and seals to connect to customer-supplied junction box with M25 hub	MS-PC-A-KIT

Tracer Termination Kits

Tracer termination kits are used to seal off the tracer end opposite the power connection.

Compatible Tracers	Approvals	Kit Contents	Ordering Number
All	**FM and CSA** Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G Class III **NEMA 4X**	Seal housing that is fastened together with two supplied screws	MS-ETT-F-C-KIT
Low-temperature	**ATEX** Group II, Category 2G, EEx e II	Sleeves to heat shrink onto the tracer	MS-ETT-LT-A-KIT
High-temperature			MS-ETT-HT-A-KIT

Tracer Splice / Tee Connection Kit

The tracer splice/tee kit provides an enclosure to join two or three electric tracers together.

Compatible Tracers	Approvals	Ordering Number
All	**FM and CSA** Class I, Div. 2, Groups A, B, C, D Class II, Div. 1 and 2, Groups E, F, G Class III **NEMA 4X** **ATEX** Group II, Category 2G, EEx e II	MS-ETST-F-C-A-KIT

Options and Accessories

Thermostats

Thermostats with a stainless steel sensor are available to monitor the temperature of the process tubes or monitor the ambient temperature. The set point can be adjusted to control the power to an electric tracer to achieve the desired temperature.

Description	Adjustable Set-Point Temperature °F (°C)	Sensor Exposure Limits °F (°C)	Switch Rating A	Voltage V (ac)	Switch Type	Capillary Length	Approval	Ordering Number
Ambient sensing	15 to 140 (–8 to 60)	–40 to 160 (–40 to 71)	22	125 250 480	SPDT	—	**FM, CSA, and UL** Class I, Div. 1 and 2, Groups B, C, D Class II, Div. 1 and 2, Groups E, F, G Class III① **NEMA** 4, 7, and 9	MS-AST-F-C
	32 to 120 (0 to 48)	–58 to 131 (–50 to 55)	16	110 230 254			**ATEX** Group II, Category 2G, EEx emia IIC T6	MS-AST-A
Process line sensing	25 to 325 (–3 to 162)	–40 to 420 (–40 to 215)	22	125 250 480		9 ft (2.7 m)	**FM, CSA, and UL** Class I, Div. 1 and 2, Groups B, C, D Class II, Div. 1 and 2, Groups E, F, G Class III① **NEMA** 4, 7, and 9	MS-LST-F-C
		–58 to 419 (–50 to 215)		250		3 m (9.84 ft)	**ATEX** Group II, Category 2G, EEx IIC T6	MS-LST-A

① Class III does not apply to UL approval.

Tubing Material and Size

Other materials and sizes of tubing and tracers are available. Contact your authorized Swagelok representative.

Additional Products

For information on additional products, see the following Swagelok catalogs:

- *Multijacketed Tubing, Single-Jacketed Tubing, and Insulated Tubing* (MS-02-188)
- *Steam Trap Test Station with Universal Mount,* MS-02-221
- *Gaugeable Tube Fittings and Adapter Fittings* (MS-01-140)
- *Tubing Data* (MS-01-107)

About this document

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Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit your Swagelok Web site or contact your authorized Swagelok representative.