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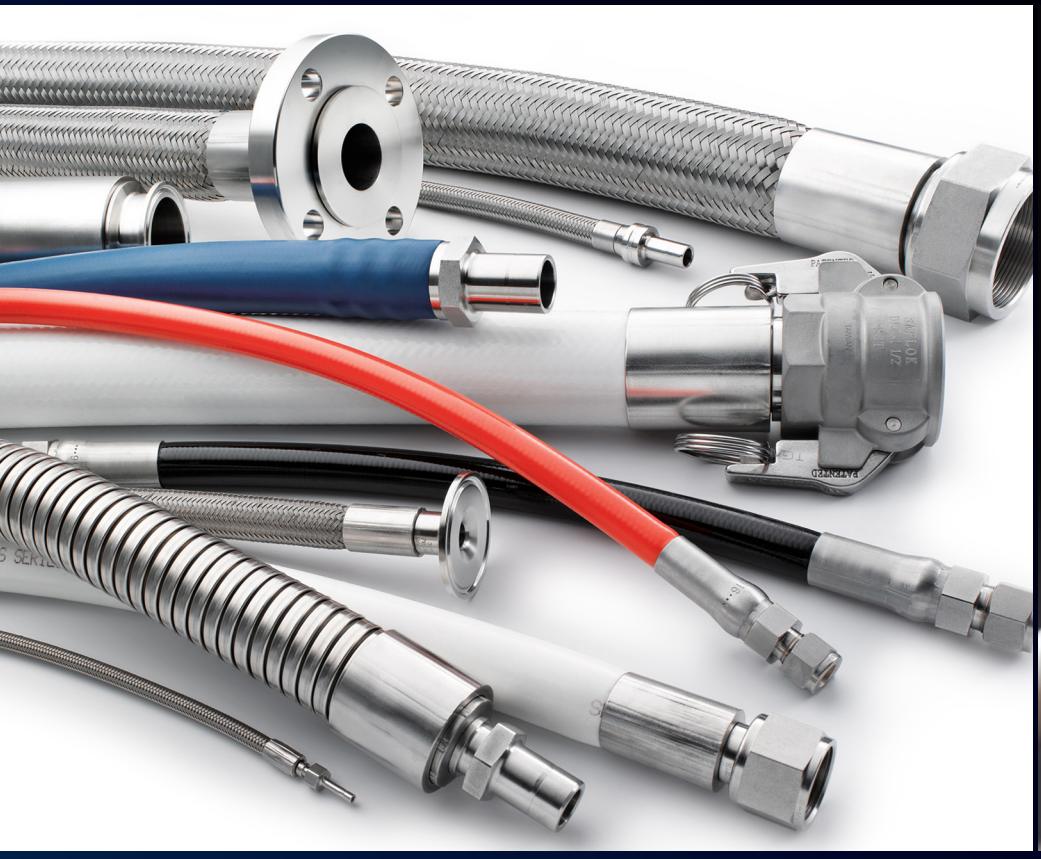
SWAGELOK® HOSE

HOSE & FLEXIBLE TUBING

SWAGELOK SOUTHWEST



Swagelok®

Swagelok Hose and Flexible Tubing Selection Guide

Metal Hose & Tubing

FX Series Metal Hose

FM Series Metal Hose

FJ Series Metal Hose

FL Series Metal Hose

AH Series Metal Hose

Fluoropolymer Hose & Tubing

T Series PTFE Hose

B Series PTFE Hose

X Series PTFE Hose

S Series PTFE Hose

C Series PTFE Hose

J Series PTFE Hose

N Series PTFE Hose

W Series PTFE Hose

F Series PTFE Hose

U Series PFA Hose

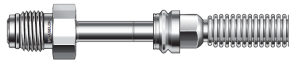
Nylon Hose

7R and 8R Series Nylon Hose

7N and 8N Series Nylon Hose

NG Series Nylon Hose

Hybrid Hose



FP Series Hybrid Hose

Other Hose & Flexible Tubing

PFA Series PFA Tubing

LT Series Vinyl Tubing

PB Series Rubber Hose

7P Series Polyethylene Hose

Convoluted Metal Tubing

Considerations for Selecting a Hose Assembly Solution

Temperature
Identify the minimum and maximum temperatures the hose assembly will be exposed to with regard to the system media and the environment.

Pressure
Identify the minimum and maximum pressures (or vacuum) within and outside the hose assembly.

Material
Identify the system media and the environment to which the hose assembly will be exposed. This will help determine the materials of construction best suited to the application demands and whether the hose requires a static dissipative core.

Movement
Confirm whether the hose assembly will be installed in dynamic applications as this will require different considerations than a static application.

Length
Determine the most likely route for installation of the hose, and use this to identify length requirements.

Cleanliness
Identify the need for cleanliness. Ease of cleaning the internal surfaces of the hose, as well as maintaining outside cleanliness may be of concern.

End Connection
Identify the type of end connections which are most compatible with the system requirements. End connections differ with regard to materials of construction and pressure ratings.

Orientation
Clarify space constraint concerns. Hose assemblies with elbows and union ball joints may help resolve space constraint issues.

Desired Flow
Consider desired flow. Hose connection size, core tube construction, and routed installation may impact flow.

Drainability
Consider core construction as this will impact drainability.

Test Reports
Identify the need for documentation in the form of test reports.

Special Testing
Many applications may require testing to requirements different from the production tests listed. For example, metal hose assemblies undergo an inboard helium leak test to a maximum leak rate of 1×10^{-5} std cm^3/s. If your application uses liquid at a positive pressure, you may request an additional hydrostatic proof test.

Special Marking
Discuss special marking requirements; there are different options available to readily identify hose assemblies.

Documentation and Regulatory Requirements
Identify the need for special regulatory approvals or documentation.

Additional Protection and Covers
Identify whether covers are necessary for additional protection of the hose assemblies or surrounding systems.

Additional Considerations

- Use of hose and tubing within applications and handling practices will affect how it performs over time. Catalog performance claims such as burst pressure, working pressure, static dissipation, moisture content, permeation rates, and cycle life apply to never-used products. For this reason, system maintenance and replacement schedules should be considered.

Cautions

⚠ **Nylon, PFA, polyethylene, PTFE, and rubber are permeable materials. Gases, vapors, and liquids may migrate through cores of these materials. The rate of permeation is affected by many application-specific variables.**

⚠ **Nonperforated covers may blister in gas service.**

⚠ **Thermal cycling of any nonmetal hose may affect its ability to maintain a positive seal. Testing should be performed to verify suitability in actual operating conditions.**

⚠ **All equipment must be properly grounded to allow static dissipation and help to prevent static sparking.**

⚠ **Nonconductive hoses can be conduits for electricity if they contain conductive fluids. Verify the conductive properties of the system media prior to use.**

Hose and Flexible Tubing Nomenclature

Absorption
Absorption occurs when media absorbs into and becomes part of a material. It can lead to contamination, as fluid absorbed into the walls of a core tube may remain there and leach out later.

Annular
A type of convoluted core, typical in metal cores, that features a series of connected rings. Annular metal cores are not well suited to operations in which they move in a repetitive pattern, as the movements can cause metal fatigue and breaking.

Bend Radius
A hose's minimum bend radius measures how far the hose can bend before kinking. This standard measurement is useful when comparing the flexibility of different hoses.

Conductivity
The ability of a material to transmit or conduct an electrical charge. Swagelok hoses constructed with a metallic braid layer have the potential to be conductive hoses.

Convoluted
With a convoluted core, the tube's inner wall is ridged, allowing it to bend like a flexible straw. This construction reduces a hose's kinking potential and is chosen when flexibility is the priority.

Core Tube
A hose's innermost layer—the one that comes into contact with the system media. Core tube material, which may be metal, silicone, fluoropolymer, thermoplastic, rubber or another material, should be selected based on its chemical, temperature and pressure compatibility with system media and cleaning practices.

Cover
A hose cover is an outer layer that protects underlying layers, personnel, and surrounding equipment. For example, general-purpose silicone covers help prevent fraying of the braids in stainless steel reinforcement layers, provide insulation, and enhance burn protection for operators.

Dynamic Application
An application in which the hose flexes or changes position.

Flexibility
The relative ease or difficulty of bending a nonpressurized hose or tubing assembly.

Fluoropolymer
Fluoropolymer cores are becoming the material of choice for sanitary applications, due to their chemical inertness, cleanability, and low absorption rates.

Force-to-Bend
The force required to bend an unpressurized hose is just as important as bend radius, but not as easy to measure. The best way to determine if the force-to-bend a hose is too great for an application is to test hose samples with your own hands.

Helical
A type of convoluted core, found primarily in fluoropolymer cores, that features a single convolution that spirals down the length of the hose. Helical cores promote flow maintenance and drainability, enabling better flow downstream than annular convolutions.

Identification
Customized hose identification—whether with tags, text, or cover colors—enables personnel to determine a hose's function at a glance, which helps with safety and plant efficiency.

Minimum Dynamic Bend Radius
The smallest bend radius that a hose is rated to perform in a dynamic application.

Permeation
The movement of a liquid, gas, or vapor through a solid. All materials are permeable to a degree and should be tested for application compatibility prior to installation.

Reinforcement Layer
Proper reinforcement layers improve pressure containment and flexibility in a hose. In most cases, the core tube is reinforced by a flexible, stainless steel woven braid, which is layered on top of the core tube.

Smooth Bore
In a smooth-bore core, the tube's inner wall is smooth, allowing for precise flow control and superior drainability because the wall has no irregularities to hinder flow.

Static Application
An application in which the hose is stationary and does not move in any plane.

Static Dissipation
The ability of a material to conduct an electrical charge to ground. Select Swagelok hoses are constructed with carbon black-filled nylon, PTFE, or PFA core material for static dissipation.

Product Catalog Information

Visit swagelok.com or ask you Swagelok representative for the Swagelok Hose and Flexible Tubing product catalog MS-01-180.

Warranty Information

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

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 users.

Caution: Do not mix or interchange parts with those of other manufacturers.

Hose and Flexible Tubing Installation and Use Guide

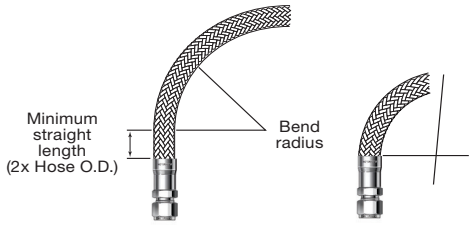
Inspection
Establish an inspection schedule based on system application and replacement history.

Electrostatic Discharge
Static electricity can be generated by fluid passing through the hose. Select hose with sufficient conductivity to ground the static electric charge and allow static dissipation. If static electricity generation is possible within an application, choose static dissipative hose and properly ground to earth.

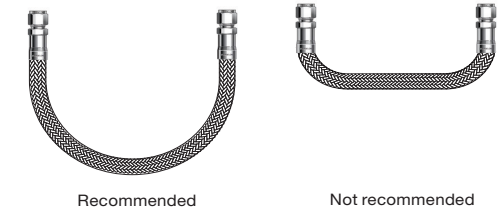
Vibration
Evaluate amount of system vibration when selecting hose. Metal hose may not be appropriate for systems with constant or severe vibration.

Length
Take into consideration hose movement, system pressurization, and thermal expansion when determining hose length. Installing hose that does not have sufficient length to accommodate these factors may reduce hose life.

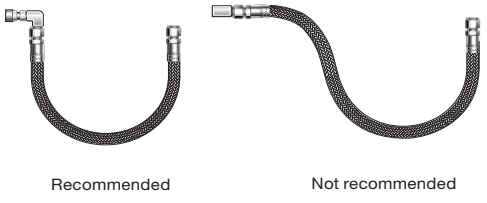
Minimum Bend Radius
Follow minimum bend radius requirements for your hose. Installing hose with smaller bends may kink hose and reduce hose life.



Hose rupture or leakage may result from bending too close to the hose/fitting connection.

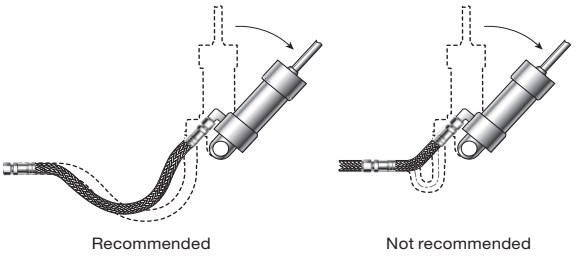


Hose Strain
Elbows and adapters can be used to relieve hose strain.

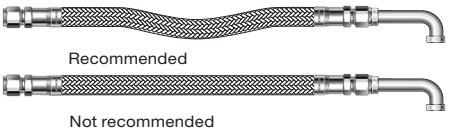


For additional information, see SAE J1273, *Recommended Practices for Hydraulic Hose Assemblies.*

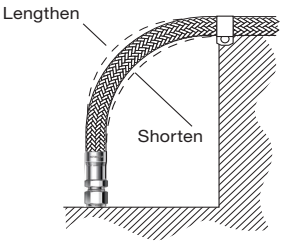
Motion Absorption
Distribute movement and prevent bends smaller than the hose's minimum bend radius by providing sufficient hose length.



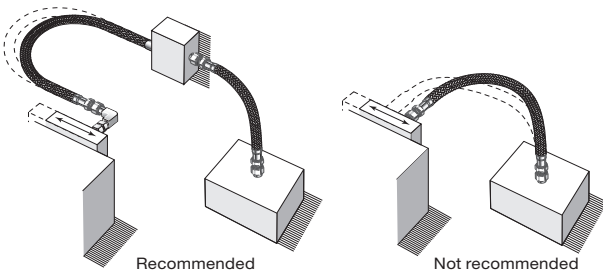
Machine Tolerance
Allow for changes in length resulting from machine motion and tolerances.



System Pressure Changes
Allow sufficient hose length to accommodate changing system pressures. Do not connect high- and low pressure hoses



Bending in One Plane
Avoid twisting the hose by bending it in one plane only. For a compound bend, use multiple hose pieces or other isolation methods.



Hose Selection Guide

Series	Materials of Construction			Catalog Page
	Core	Reinforcement	Cover	
Metal Hose				
FX	Convoluted 316L SS	321 SS braid standard; 316L SS braid available	—	11
FM	Convoluted 316L SS	316L SS braid	—	16
FJ	Convoluted 316L SS	304 SS braid standard; 316L SS braid available	—	22
FL	Convoluted 316L SS	321 SS braid (1/4 and 1/2 in.) 316L SS braid (all other sizes)	—	27
AH	Convoluted C-276	316L SS braid	—	33
Metal Flexible Tubing				
Convoluted Tube	Convoluted 321 SS	—	—	37
Fluoropolymer Hose				
T	Smooth-bore PTFE①	304 SS braid standard; 316L SS and alloy 400 braid available	—	45
B	Smooth-bore PTFE	304 SS braid	—	51
X	Smooth-bore PTFE①	Fiber braid with 304 SS braid	—	53
S	Smooth-bore PTFE①	Fiber braid with 304 SS braid	Silicone	55
C	Convoluted PTFE①	304 SS braid	No cover standard; silicone cover available	57
N	Convoluted, carbon black-filled PTFE	Insulating wrap and aramid fiber braid	—	61
W	Smooth-bore, carbon black-filled PTFE	Fiber braid with insulating wrap and 304 SS braid	Silicone	63
F	Smooth-bore PTFE①	Fiber braid	—	65
U	Smooth-bore PFA②	302 SS braid	Silicone	67
PFA Tubing				
PFA	Smooth-bore PFA	—	—	79
Vinyl Tubing				
LT	Smooth-bore clear vinyl	—	—	81
Nylon Hose				
NG	Smooth-bore, static dissipative nylon	Fiber braid	Perforated black polyurethane	85
7R	Smooth-bore nylon	Fiber braid	Perforated black polyurethane	90
8R	Smooth-bore nylon	Fiber braid	Perforated black polyurethane	90
7N	Smooth-bore, nonconductive nylon	Fiber braid	Nonperforated orange polyurethane	91
8N	Smooth-bore, nonconductive nylon	Fiber braid	Nonperforated orange polyurethane	91
Polyethylene Hose				
7P	Smooth-bore polyethylene	Fiber braid	Nonperforated blue polyurethane	96
Rubber Hose				
PB	Smooth-bore Buna N	Synthetic fiber braid	Blue Buna N (other colors available)	98

① Carbon black-filled PTFE core is available for applications that require static dissipation.
② Carbon black-filled PFA core is available for applications that require static dissipation.

Hose Selection Guide

Series	Nominal Hose Size, in. — Working Pressure at 70°F (20°C), psig (bar)④ 1/8	3/16	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	Temperature Range °F (°C)④	Catalog Page
Metal Hose												
FX	—	—	6000 (413)	5000 (344)	4500 (310)	3600 (248)	3000 (206)	2600 (179)	2200 (151)	1675 (115)	–325 to 1000 (–200 to 537)	11
FM	—	—	3100 (213)	2000 (137)	1800 (124)	1500 (103)	1200 (82.6)	950 (65.4)	900 (62.0)	500 (34.4)	–325 to 850 (–200 to 454)	16
FJ	—	—	1600 (110)	1470 (101)	1110 (76.4)	860 (59.2)	680 (46.8)	680 (46.8)	520 (35.8)	450 (31.0)	–325 to 800 (–200 to 426)	22
FL	—	—	1500 (103)	1470 (101)	1200 (82.6)	860 (59.2)	680 (46.8)	645 (44.4)	520 (35.8)	380 (26.1)	–325 to 850 (–200 to 454)	27
AH	—	—	—	—	1110 (76.4)	860 (59.2)	680 (46.8)	—	520 (35.8)	450 (31.0)	–325 to 800 (–200 to 426)	33
Metal Flexible Tubing												
Convoluted Tube	—	—	100 (6.8)	25 (1.7)	25 (1.7)	25 (1.7)	25 (1.7)	—	25 (1.7)	—	70 to 1000 (20 to 537)	37
Fluoropolymer Hose												
T	—	—	3000① (206)	2500 (172)	2000 (137)	1500 (103)	1000 (68.9)	—	—	—	–65 to 450 (–53 to 230)	45
B	3000 (206)	—	—	—	—	—	—	—	—	—		51
X	—	—	3500 (241)	3000 (206)	1800 (124)	1250 (86.1)	1000 (68.9)	—	—	—		53
S	3000 (206)	—	3500 (241)	3000 (206)	1800 (124)	1250 (86.1)	1000 (68.9)	—	—	—	–65 to 400 (–53 to 204)	55
C	—	—	—	—	1500 (103)	1100 (75.7)	750 (51.6)	—	700 (48.2)	525 (36.1)	–65 to 450② (–53 to 230)	57
N	—	—	—	1250 (86.1)	750 (51.6)	375 (25.8)	—	—	—	—		61
W	—	—	—	750 (51.6)	750 (51.6)	500 (34.4)	—	—	—	—	–65 to 400 (–53 to 204)	63
F	—	—	800 (55.1)	650 (44.7)	450 (31.0)	325 (22.3)	—	—	—	—	–65 to 450 (–53 to 230)	65
U	—	—	—	—	300 (20.6)	300 (20.6)	250 (17.2)	—	200 (13.7)	150 (10.3)	–65 to 400 (–53 to 204)	67
PFA Tubing												
PFA	275 (18.9)	—	275 (18.9)	180 (12.4)	125 (8.6)	83 (5.7)	61 (4.2)	—	—	—	70 to 400 (20 to 204)	79
Vinyl Tubing												
LT	40 (2.7)	30 (2.0)	25 (1.7)	15 (1.0)	10 (0.68)	—	—	—	—	—	–40 to 165 (–40 to 73)	81
Nylon Hose												
NG	—	—	5000 (344)	5000 (344)	5000 (344)	—	—	—	—	—	–40 to 150 (–40 to 65)	85
7R	—	—	2750 (189)	2250 (155)	2000 (137)	—	—	—	—	—	–40 to 200 (–40 to 93)	90
8R	—	—	5000 (344)	4000 (275)	3500 (241)	2250 (155)	2000 (137)	—	—	—	–40 to 200 (–40 to 93)	90
7N	—	—	2750 (189)	2250 (155)	2000 (137)	—	—	—	—	—	–40 to 200 (–40 to 93)	91
8N	—	—	—	—	—	2250 (155)	—	—	—	—	–40 to 200 (–40 to 93)	91
Polyethylene Hose												
7P	—	—	2750 (189)	2250 (155)	2000 (137)	1500 (103)	1500 (103)	—	—	—	–10 to 150 (–23 to 65)	96
Rubber Hose												
PB	—	—	350 (24.1)	300 (20.6)	300 (20.6)	300 (20.6)	300 (20.6)	—	—	—	–40 to 200③ (–40 to 93)	98

① T series hose with alloy 400 braid is rated to 1500 psig (103 bar).

② C series hose is rated from –20 to 340°F (–28 to 171°C) in the 1 1/2 and 2 in. nominal hose sizes.
C series hose is rated from –65 to 400°F (–53 to 204°C) for hose with a silicone cover.

③ PB series hose is rated from –20 to 200°F (–28 to 93°C) in the 1 in. nominal hose size.

④ Pressure-temperature ratings may be limited by the end connections.

ENGINEERED TO PERFORM UNDER PRESSURE

Hose Advisory Services (HAS)

Operators often overlook hoses even though the consequences of failures are serious. These consequences include down time, wasted product, environmental damage and human injury.

Our trained specialists will visually inspect the hoses at your facility and help determine the best function and fit for your application. These inspections can assist in reducing the costs and downtime of your systems.

Contact us to get started.

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