UNITED FLEXIBLE

WILLCOX HOSE Composite Hose and Assemblies

GOODYEAR
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UNITED FLEXIBLE

Your one source for all your flexible requirements:

Metal, composite and fluoropolymer hose, tubing, bellows and assemblies

The strengths of five flexible fluid control companies – US Hose Corp., AmniTec Ltd, AmniTec BV, Habia Teknofluor AB and Fulton Bellows LLC – are being combined into a new company and new brand called United Flexible. United Flexible manufactures and markets a wide range of metallic braided, composite and fluoropolymer hose and tubing, precision bellows and engineered assemblies.

The new United Flexible reflects our commitment to provide you solutions expertise, high-quality products and the premier customer service you expect. With your input, we're continuing to broaden our portfolio of products and assemblies for your diverse applications needs. To meet your evolving needs, United Flexible brings you deep expertise in gas and fluid transfer applications, plus collaborative engineering resources and unique manufacturing processes.

To see the full breadth of our product and assembly capabilities, we invite you to visit our new website at www.unitedflexible.com. There you'll find new product catalogs and the widest range of flexible fluid transport solutions we've ever offered.

"Our Flexibility Is Your Strength."

John P. Devine
Chief Executive
United Flexible

tter from John P. Devine, CEO United Flexible

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Style designations (see product for specific availability):

AA Aluminum inner and outer wires
AG Aluminum inner and galvanized outer wire
GG Galvanized Steel inner and outer wires
PG Polypropylene coated inner wire; Galvanized Steel outer wire
PP Polypropylene coated Steel inner and outer wire
SG T316 Stainless Steel inner wire; Galvanized Steel outer wire
SS T316 Stainless Steel inner and outer wires
XXF Above wire combination with PTFE barrier layers
XXN Above wire combinations with nylon linings
XXP Above wire combinations with polypropylene lining

Willcox Composite Hose

Our Willcox Hose® brand has heritage dating back to the 1880's, which was truly the first producer of composite hose. It was known at the time as a "wire bound hose" that would not kink or collapse and is today supported by an extensive network of fabricating distributors nationally and internationally.

Construction Is Key

From inner bore to end connections, Willcox composite hose products are engineered to deliver the optimum in chemical compatibility and on-the-job performance.

The Labyrinth Seal

Multiple, tightly-wound component layers create a very long and complex course for fluids. Over a century of manufacturing techniques assure the proper gauge and pitch of the inner and outer wires. The "labyrinth seal" is self-energized by the internal pressure of liquids and the action of all material components.

> ***The result is flexible composite hose...***that is seepage-free and leak-proof, that doesn't kink or collapse, that has great hoop strength, exceptional service life and offers superior safety and performance.

The "Barrier Layers" and "Seamless" Tubes

Willcox composite hoses are manufactured with multiple wraps of both polar and non-polar thermoplastic fabrics and films. The "seamless" tube prevents permeations and effusion of both polar fluids (like toluene) and non-polar liquids (like gasoline).

> ***The result is composite hose...***with structural and cover layers that do not deteriorate due to chemical attack, that maintains maximum strength, flexibility and durability, and that is compatible with the widest range of chemicals.

Electrical Properties

Typically most hose assemblies have full end-to-end electrical continuity (10 ohms) achieved by bonding both inner and outer wires to the end connections. Assemblies are also available with specified electrical resistance or electrically discontinuous properties. For actual values, please contact United Flexible Engineering department.

> ***The result is composite hose...***that prevents sparking and arc-over hazards and meets the electrical properties requirements of your application.

Externally swaged end connections

Each Willcox end connection is specifically designed and manufactured to complement the unique construction and produce a perfect union with the hose. The ferrule and the tailpiece are permanently engaged by the external swage or crimp process.

> ***The result is...***hose and fittings designed to exceed rated burst pressure and assure 100% performance of the complete hose assembly.

Real Advantages For Your Applications

Compared to rubber hose and metal hose

Willcox composite hoses are light weight and flexible for user friendly handling. Their multi-later construction prevents catastrophic failures. Flexibility is retained at low and even cryogenic temperatures. Hoses are protected from corrosion and attack by other liquids, UV and ozone by their tough, PVC nylon impregnated outer covers.

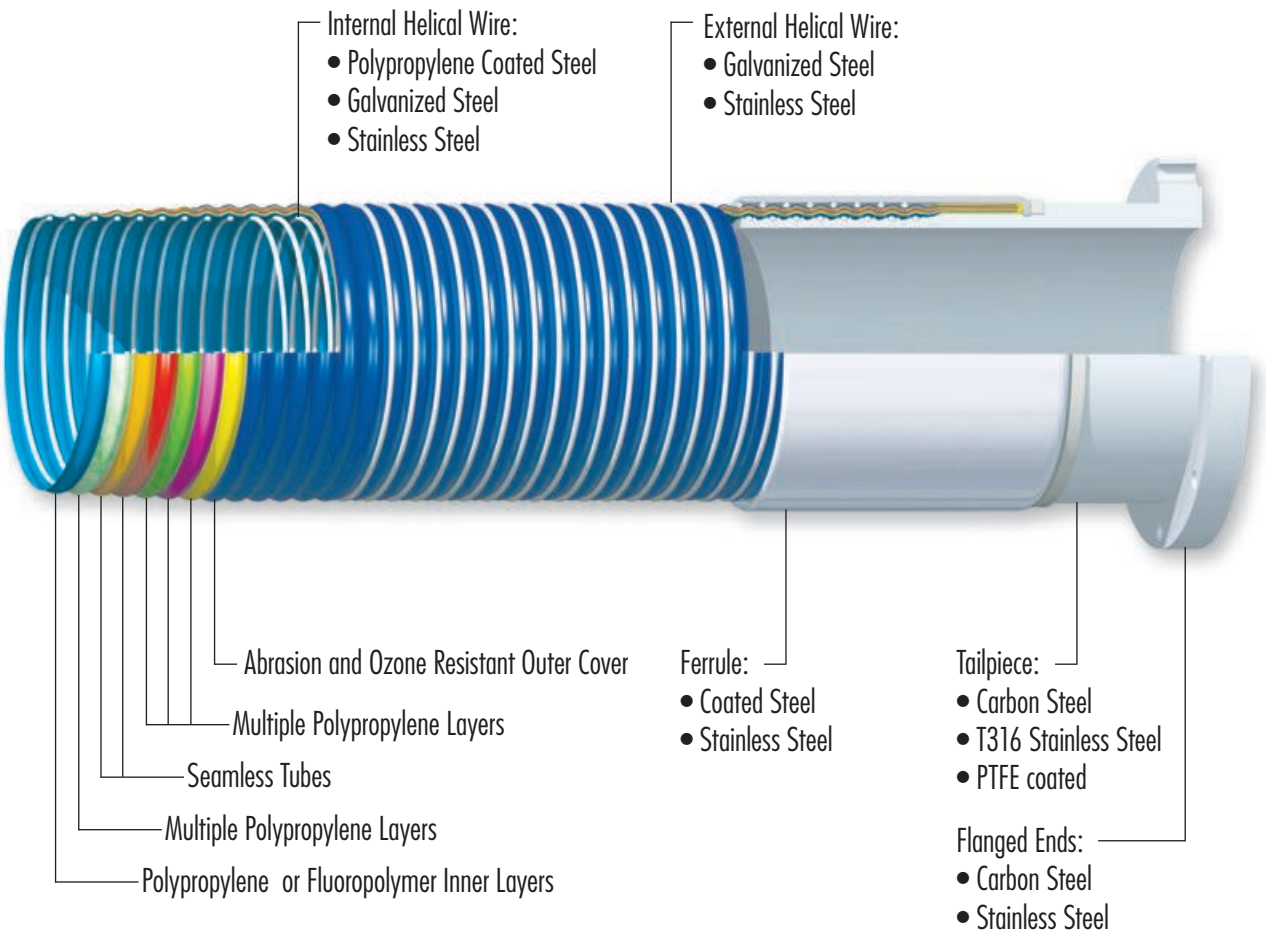
Engineered and Manufactured to High Standards

Willcox composite hoses comply with various US and international standards including U.S.C.G, BS5842, EN13765:2010, EN13766:2010, Heavy duty hoses for ocean going vessels can be approved to IMO Codes, BCH and IBC requirements.

From Acetaldehyde to Zinc Halides

And thousands of chemicals, liquids and compounds in between, Willcox composite hoses are specifically designed to meet your most challenging transfer applications.

Innovated Composite Hose Anatomy



3081PGP

Standard Duty Polypropylene Chemical Hose

Type 3081PGP

Applications: In-plant, tank truck, rail car liquid chemical suction and discharge.

Construction:

Color/Cover:	Royal Blue/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Black Polypropylene Coated Steel Wire
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Additional Options:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

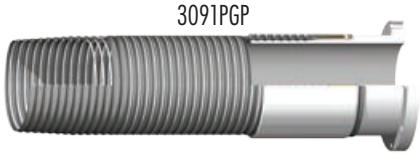
Standards: EN13765:2010, Type 2, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 3081PGP									
Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**200**	**14**	5.0	125	.9	1.3	100	30
1½	40	**200**	**14**	5.0	125	1.1	1.6	100	30
2	50	**200**	**14**	5.0	125	1.4	2.1	100	30
3	80	**200**	**14**	7.0	175	1.7	2.5	100	30
4	100	**200**	**14**	10.0	250	2.1	3.1	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

3091PGP



Heavy Duty Polypropylene Chemical Hose

Type 3091PGP

Applications: This type is designed for use as a more robust chemical transfer service in heavy use truck and railcar loading, polypropylene coated steel wire and polypropylene inner liner for maximum chemical resistance

Construction:

Color/Cover:	Gray/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Black Polypropylene Coated Steel Wire
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Additional Options:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

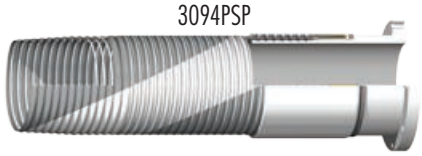
End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 3091PGP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**250**	**17.5**	5.0	125	.9	1.3	100	30
1½	40	**250**	**17.5**	6.0	150	1.1	1.6	100	30
2	50	**250**	**17.5**	7.0	175	1.4	2.1	100	30
3	80	**250**	**17.5**	8.0	225	2.1	3.1	100	30
4	100	**250**	**17.5**	11.0	275	2.5	3.8	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

3094PSP



Heavy Duty Polypropylene Chemical Hose

Type 3094PSP

Applications: This type is designed for use as a transfer hose for corrosive acids and aggressive chemicals for tank trucks, railcar and plant transfer hose.

Construction:

Color/Cover:	Gray white stripe/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Black Polypropylene Coated Steel Wire
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	T316 Stainless Steel
Additional Options:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 3094PSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**250**	**17.5**	5.0	125	.9	1.3	100	30
1½	40	**250**	**17.5**	6.0	150	1.6	1.6	100	30
2	50	**250**	**17.5**	7.0	175	2.1	2.1	100	30
3	80	**250**	**17.5**	9.0	225	3.1	3.1	100	30
4	100	**250**	**17.5**	11.0	275	3.8	3.8	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4091SGP

4094SSP

Heavy Duty Polypropylene Composite Hose
Type 4091SGP and 4094SSP

Applications: This type is designed for use as a tank truck, railcar, and in plant transfer hose suitable for use with a wide variety of chemicals with maximum resistant T316 Stainless Steel inner wire is required.

Construction:

Color/Cover:	4091SGP Royal Blue white stripe/PVC coated Nylon, Abrasion, Ozone resistant 4094SSP Royal Blue yellow stripe/PVC coated Nylon, Abrasion, Ozone resistant
Inner Wire:	T316 Stainless Steel Wire
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	4091SGP Galvanized Steel 4094SSP T304 or T316 Stainless Steel
Extra:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4091SGP AND 4094SSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**250**	**17.5**	5.0	125	0.9	1.3	100	30
1½	40	**250**	**17.5**	6.0	150	1.0	1.6	100	30
2	50	**250**	**17.5**	7.0	175	1.4	2.1	100	30
3	80	**250**	**17.5**	9.0	225	2.1	3.1	100	30
4	100	**250**	**17.5**	11.0	275	2.5	3.8	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4121SGF

4124SSF

Heavy Duty Fluoropolymer Chemical Hose

Type 4121SGF and 4124SSF

Applications: This type is designed for hazardous chemicals where a PTFE chemical resistant liner is required for tank truck, railcar, and in plant transfers suitable for use with a wide variety of chemicals

Construction:

Color/Cover:	4121SGF Light Blue/PVC coated Nylon, Abrasion, Ozone resistant
	4124SSF Light Blue yellow stripe/PVC coated Nylon, Abrasion, Ozone resistant
Inner Wire:	T316 Stainless Steel Wire
Inner lining:	PFA, FEP, ETFE
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	4121SGF Galvanized Steel
	4124SSF T316 Stainless Steel
Extra:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive
	≤2.5 ohm/m for sizes less than 2"
	≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

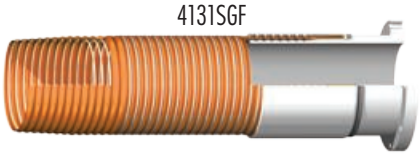
End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4121SGF AND 4124SSF

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**250**	**17.5**	5.0	125	0.9	1.3	100	30
1½	40	**250**	**17.5**	6.0	150	1.1	1.6	100	30
2	50	**250**	**17.5**	6.0	150	1.4	2.1	100	30
3	80	**250**	**17.5**	9.0	225	2.1	3.1	100	30
4	100	**250**	**17.5**	11.0	275	2.5	3.7	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4131SGF



4134SSF

High Temperature Fluoropolymer Chemical Hose

Type 4131SGF and 4134SSF

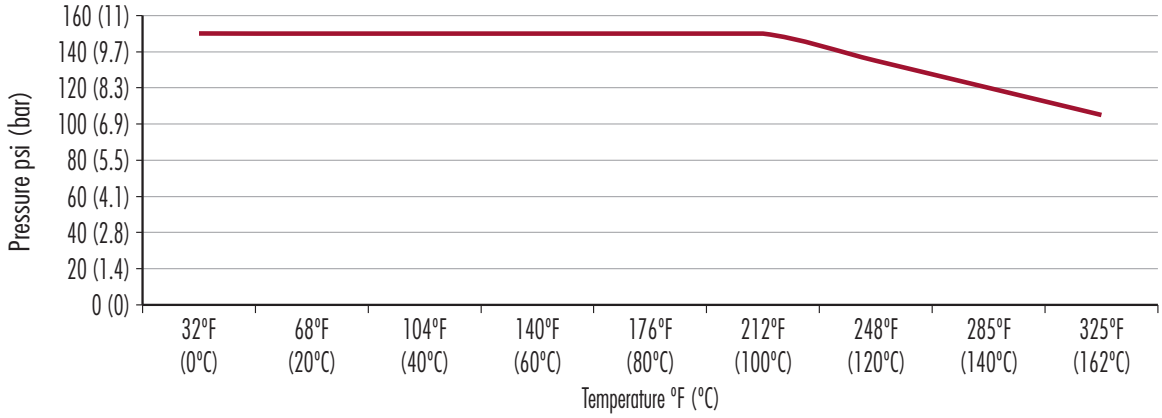
Applications: This type is designed specially for the conveyants at higher temperatures using PTFE and fiberglass materials. Suitable for hot lube oils and chemicals requiring higher temperatures

Construction:

Color/Cover:	4131SGF Orange/PVC coated Nylon, Abrasion, Ozone resistant 4134SSF Orange yellow stripe/PVC coated Nylon, Abrasion, Ozone resistant
Inner Wire:	T316 Stainless Steel Wire
Inner lining:	PFA, FEP, ETFE
Carcass:	Heat Resistant Fiberglass, Polypropylene fabrics, films and seamless tubes
Outer Wire:	4131SGF Galvanized Steel 4134SSF T316 Stainless Steel

Physical properties:

Temperature Range:	-22°F to +325°F (-30°C to +162°C)
Vacuum range:	26 inHg (660 mmHg), 0.9 bar



End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4131SG AND 4134SS									
Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**150**	**10**	8.0	200	0.9	1.3	100	30
1½	40	**150**	**10**	8.0	200	1.2	1.8	100	30
2	50	**150**	**10**	9.0	225	1.41	2.1	100	30
3	80	**150**	**10**	10.0	250	2.4	3.6	100	30
4	100	**150**	**10**	14.0	350	3.4	5.0	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly

1091GGP

Petromaster™

Polypropylene Composite Hose Type 1091GGP

Applications: This type is designed for use as a rigorous transfer hose ideal for lube plants, railcar and in plant applications.

Construction:

Color/Cover:	Black/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Galvanized Steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Extra:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1091GGP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**250**	**17.5**	5.0	125	0.9	1.3	100	30
1½	40	**250**	**17.5**	6.0	150	1.1	1.6	100	30
2	50	**250**	**17.5**	6.0	150	1.4	2.1	100	30
3	80	**250**	**17.5**	9.0	225	2.1	3.1	100	30
4	100	**250**	**17.5**	11.0	275	2.5	3.8	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1061GGP

Rackmaster™

Composite Hose Bottom Loading Hose Type 1061GGP

Applications: This type is designed exclusively for the bottom loading arm application for filling tank trucks suitable for all grades and blends of refined gasoline products with unique fiberglass flame resistant layer.

Construction:

Color/Cover:	Black/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Galvanized Steel
Inner lining:	High Grade Polypropylene
Carcass:	Fiberglass Flame-Resistant layer, Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Logo:	Rackmaster™

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m

Standards: EN13765:2010, Type 3, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

Lengths: For 1061GGP RackMaster Bottom Loading Hose measure the lengths as either "pressurized" or "empty". The effect of elongation must be calculated in order to produce the correctly manufactured length and price.

TECHNICAL DATA: TYPE 1061GGP									
Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
3	80	**200**	**14**	9.0	225	2.1	3.1	100	30
4	100	**200**	**14**	10.0	250	2.7	4.1	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

Vapor Recovery

Polypropylene Composite Hose Type 1321GGP and 3321PGP

Applications: This type is designed for use as a vapor recovery hose in hydrocarbon and chemical applications.

Construction:

Color/Cover:	1321GGP Yellow/PVC coated Nylon, Abrasion, UV and Ozone resistant 3321PGP Yellow black stripe/PVC coated Nylon, Abrasion and Ozone resistant
Inner Wire:	1321GGP Galvanized Steel 3321PGP Black Polypropylene coated steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Logo:	VAPOR

Physical properties:

Temperature Range:	-22°F to +180°F (-30°C to +80°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, Type 2, USCG, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1321GGP AND 3321PGP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**100**	**7**	4	100	0.65	1.00	100	30
1½	40	**100**	**7**	5.0	125	0.85	1.25	100	30
2	50	**100**	**7**	5.0	125	1.20	1.80	100	30
3	80	**100**	**7**	6.00	150	1.5	2.2	100	30
4	100	**100**	**7**	9.0	225	1.8	2.7	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4321SGP

4324SSP

Vapor Recovery

Polypropylene Composite Hose Type 4321SGP and 4324SSP

Applications: This type is designed for use in vapor recovery in tank truck, railcar and in plant applications.

Construction:

Color/Cover:	4321SGP Yellow white stripe/PVC coated Nylon, Abrasion, UV and Ozone resistant 4324SSP Yellow blue stripe/PVC coated Nylon, Abrasion and Ozone resistant
Inner Wire:	T316 Stainless Steel Wire
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	4321SGP Galvanized Steel 4324SSP T316 Stainless Steel
Logo:	VAPOR

Physical properties:

Temperature Range:	-22°F to +180°F (-30°C to +80°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, Type 2, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4321SGP AND 4324SSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**100**	**7**	4	100	0.65	1.00	100	30
1½	40	**100**	**7**	5	125	0.85	1.25	100	30
2	50	**100**	**7**	5	125	1.20	1.80	100	30
3	80	**100**	**7**	6	150	1.5	2.2	100	30
4	100	**100**	**7**	9	225	1.8	2.7	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1331GGF

4331SGF

4334SSF

Vapor Recovery

Fluoropolymer Composite Hose Type 1331GGF, 4331SGF and 4334SSF

Applications: This type is designed for use in aggressive chemical vapor service applications.

Construction:

Color/Cover:	1331GGF Yellow green stripe/2x PVC coated Nylon, Abrasion, Ozone resistant 4331SGF Yellow purple stripe/2xPVC coated Nylon, Abrasion, Ozone resistant 4334SSF Yellow red stripe/2x PVC coated Nylon, Abrasion. Ozone resistant
Inner Wire:	1331GGF Galvanized Steel 4331SGF, 4334SSF T316 Stainless Steel
Inner lining:	PFA, FEP or PTFE
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	1331GGF, 4331SGF Galvanized Steel 4334SSF T316 Stainless Steel
Logo:	VAPOR

Physical properties:

Temperature Range:	-22°F to +180°F (-30°C to +80°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, Type 2, IMO, IBC, BS5842, NAHAD-600:2005

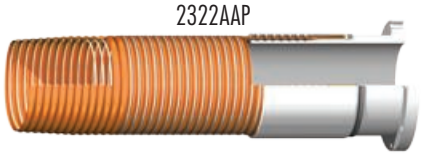
End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1331GGF, 4331SGF AND 4334SSF

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**100**	**7**	4	100	0.65	1.00	100	30
1½	40	**100**	**7**	5	125	0.85	1.25	100	30
2	50	**100**	**7**	5	125	1.20	1.80	100	30
3	80	**100**	**7**	6	150	1.5	2.2	100	30
4	100	**100**	**7**	9.0	225	1.8	2.7	100	30

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

2322AAP



Ultra Lightweight Drop Hose

Polypropylene Composite Hose Type 2322AAP

Applications: This type is designed for use as a lightweight gravity and vacuum applications such as tank truck, railcar, and in plant transfers.

Construction:

Color/Cover:	Orange/PVC coated Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Aluminum #5052
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Aluminum #5052 (Galvanized Steel, Stainless Steel available)
Logo:	VAPOR

Physical properties:

Temperature Range:	-22°F to +180°F (-30°C to +80°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: USCG, IMO, IBC, BS5842, NAHAD-600:2005

End Fittings: Fittings are designed with a specially machined helical shank which enables it to be screwed into the matching internal helix wire. The external ferrule can be either crimped or swaged.

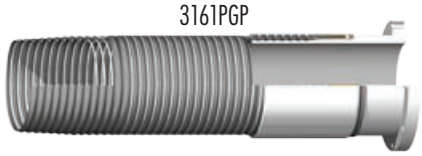
TECHNICAL DATA: TYPE 2322AAP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**100**	**7**	4	100	0.3	0.4	100	30
1½	40	**100**	**7**	5.25	130	0.5	0.7	100	30
2	50	**100**	**7**	6.25	165	0.7	1.0	100	30
3	80	**100**	**7**	7.00	175	1.2	1.8	100	30
4	100	**100**	**7**	10.00	250	1.6	2.4	100	30

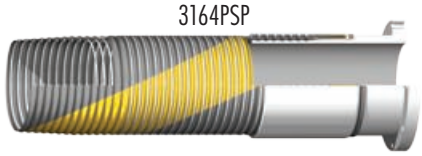
Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1151GGP

3161PGP



3164PSP



MarineMaster® Ship to Shore Transfer Hose

Composite Hose Type 1151GGP, 3161PGP and 3164PSP

Applications: This type is designed for use as a bulk hydrocarbon or chemical transfer hose from barges, ships, jetties or for heavy duty in-plant uses where high flexibility and resistance to kinking is required.

Construction:

Color/Cover:	1151GGP Royal Blue/Double PVC coated Nylon, Abrasion, UV and Ozone resistant 3161PGP Grey/Double PVC coated Nylon, Abrasion, UV and Ozone resistant 3164PSP Grey yellow stripe/Double PVC coated nylon, Abrasion, UV and ozone resistant
Inner Wire:	1151GGP Galvanized Steel 3161PGP, 3164PSP Black Polypropylene coated steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and Polypropylene/and seamless tubes
Outer Wire:	1151GGP, 3161PGP Galvanized Steel 3164PSP T316 Stainless Steel
Logo:	MarineMaster®

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.500

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1151GGP, 3161PGP AND 3164PSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**250**	**17.5**	16	400	4.4	6.5	100	30
6	150	**250**	**17.5**	20	500	7	10.5	100	30
8	200	**250**	**17.5**	29	740	12	18	100	30
10	250	**100**	**14**	36	920	15	23	40	12

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4161SGP

4164SSP

MarineMaster® Polypropylene

Composite Hose Type 4161SGP and 4164SSP

Applications: This type is designed for use as bulk chemical transfer hose from barges and ships, suitable for use with a wide variety of chemicals with maximum resistant polypropylene coated inner wire is required.

Construction:

Color/Cover:	4161SGP Blue white stripe/2x PVC coated Nylon, Abrasion and Ozone resistant 4164SSP Blue yellow stripe/2xPVC coated Nylon, Abrasion, and Ozone resistant
Inner Wire:	T316 Stainless Steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and Polypropylene/nylon seamless tubes
Outer Wire:	4161SGP Galvanized Steel 4164SSP T316 Stainless Steel
Logo:	MarineMaster®

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.500

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4161SGP AND 4164SSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**250**	**17**	16	400	4.4	6.5	100	30
6	150	**250**	**17**	20	500	7	10.5	100	30
8	200	**250**	**17**	29	740	12	18	100	30
10	250	**200**	**14**	36	920	15	23	40	12

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1321GGP

3351PGP

MarineMaster® Polypropylene

Vapor Composite Hose Type 1321GGP and 3351PGP

Applications: This type is designed for use as a marine ship-to-shore or vessel-to-vessel vapor recovery hose suitable for large variety of hydrocarbon or chemical vapors.

of petrochemical vapors. And durable to withstand the rigorous handling on a marine or vessel.

Construction:

Color/Cover:	1321GGP Yellow/2x PVC coated Nylon, Abrasion and Ozone resistant 3351PGP Yellow black stripe/2xPVC coated Nylon, Abrasion, and Ozone resistant
Inner Wire:	1321GGP Galvanized Steel 3351PGP Black Polypropylene coated steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and Polypropylene/nylon seamless tubes
Outer Wire:	Galvanized Steel
USCG Markings:	Red/Yellow/Red ID Color each end, 2" VAPOR logo and .625 pilot holes

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.800 Vapor Line

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1321GGP AND 3351PGP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**100**	***7***	11	275	2.55	3.8	100	30
6	150	**100**	***7***	16	410	3.6	5.3	100	30
8	200	**100**	***7***	22	560	8.05	11.9	100	30
10	250	**100**	***7***	30	760	10.35	15.3	50	15

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

4321SGP

4324SSP

MarineMaster® Polypropylene

Vapor Composite Hose Type 4321SGP and 4324SSP

Applications: This type is designed for use as a marine vapor recovery hose for use with a wide variety of chemicals with chemically resistant T316 stainless steel inner wire.

Construction:

Color/Cover:	4321SGP Yellow white stripe/2x PVC coated Nylon, Abrasion and Ozone resistant 4324SSP Yellow blue stripe/2xPVC coated Nylon, Abrasion, and Ozone resistant
Inner Wire:	T316 Stainless Steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and Polypropylene/nylon seamless tubes
Outer Wire:	4321SGP Galvanized Steel 4324SSP T316 Stainless Steel
USCG Markings:	Red/Yellow/Red ID Color each end, 2" VAPOR logo and .625 pilot holes

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.800 Vapor Line

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4321SGP AND 4324SSP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**100**	***7***	11	275	2.55	3.8	100	30
6	150	**100**	***7***	16	410	3.6	5.3	100	30
8	200	**100**	***7***	22	560	8.05	11.9	100	30
10	250	**100**	***7***	30	760	10.35	15.3	50	15

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

MarineMaster® Fluoropolymer

Composite Hose Type 1171GGF, 4171SGF and 4174SSF

Applications: This type is recommended for heavy duty marine transfer service where a chemical resistance of PTFE lining is required. It is designed to handle liquid chemicals and acids not compatible with standard heavy duty polypropylene hoses and is suitable for dock, barge and ship transfer applications. A stainless steel outer wire is available for applications that need to withstand corrosive environments of petrochemical vapors and rigorous handling as used on a maritime vessel.

Construction:

Color/Cover:	1171GGF Black/2x PVC coated Nylon, Abrasion, UV and Ozone resistant 4171SGF Black white stripe/2xPVC coated Nylon, Abrasion and Ozone resistant 4174SSF Black yellow stripe/2x PVC coated Nylon, Abrasion and Ozone resistant
Inner Wire:	1171GGF Galvanized Steel 4174SGF, 4174SSF T316 Stainless Steel
Inner lining:	PTFE, PFA, FEP or ETFE
Carcass:	Polypropylene fabrics, films and Polypropylene/nylon seamless tubes
Outer Wire:	1171GGF, 4171SGF Galvanized Steel 4174SSF T316 Stainless Steel
Logo:	MarineMaster®

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.500

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1171GGF, 4171SGF AND 4174SSF

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**200**	**14**	16	400	4.4	6.5	100	30
6	150	**200**	**14**	20	500	7	10.5	100	30
8	200	**200**	**14**	29	740	12	18	100	30
10	250	**200**	**14**	36	920	15	23	50	15

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1331GGF

4331SGF

4334SSF

MarineMaster® Fluoropolymer

Vapor Composite Hose Type 1331GGF, 4331SGF and 4334SSF

Applications: This type is designed for use as a tank truck, railcar, and in plant transfer hose suitable for use with a wide variety of chemicals with maximum resistant polypropylene coated inner wire is required.

Construction:

Color/Cover:	1331GGF Yellow green stripe/2x PVC coated Nylon, Abrasion, Ozone resistant 4331SGF Yellow purple stripe/2xPVC coated Nylon, Abrasion, Ozone resistant 4334SSF Yellow red stripe/2x PVC coated Nylon, Abrasion. Ozone resistant
Inner Wire:	1331GGF Galvanized Steel 4331SGF, 4334SSF T316 Stainless Steel
Inner lining:	PTFE, PFA, FEP or ETFE
Carcass:	Polypropylene fabrics, films and Polypropylene/nylon seamless tubes
Outer Wire:	1331GGF, 4331SGF Galvanized Steel 4334SSF T316 Stainless Steel
USCG Markings:	Red/Yellow/Red ID Color each end, 2" VAPOR logo and .625 pilot holes

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13765:2010, IMO, IBC, BS5842, USCG 33CFR 154.500

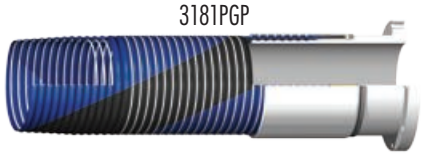
End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1321GGF, 4331SGF AND 4334SSF									
Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
4	100	**100**	**7**	11	275	2.55	3.8	100	30
6	150	**100**	**7**	16	410	3.6	5.3	100	30
8	200	**100**	**7**	22	560	8.05	11.9	100	30
10	250	**100**	**7**	30	760	10.35	15.3	50	15

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1181GGP

3181PGP



ROUGHNECK® Polypropylene

Composite Hose Type 1181GGP and 3181PGP

Applications: This type is designed for use as a Frac or Pump hose, User friendly to make tight effortless connections easer in a confined area. Unlike stiff rubber frac/pump hose Roughneck® is ozone resistant and remains flexible in all conditions, even subzero.

Construction:

Color/Cover:	1181GGP Blue/PVC coated Nylon, Abrasion, UV and Ozone resistant 3181PGP Blue black stripe/PVC coated Nylon, Abrasion and Ozone resistant
Inner Wire:	1181GGP Galvanized Steel 3181PGP Black Polypropylene coated steel
Inner lining:	High Grade Polypropylene
Carcass:	Polypropylene fabrics, films and seamless tubes
Outer Wire:	Galvanized Steel
Logo:	Roughneck®
Extra:	Special Color Coding and branding

Physical properties:

Temperature Range:	-22°F to +212°F (-30°C to +100°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤2.5 ohm/m for sizes less than 2" ≤1.0 ohm/m for size 2" and above

Standards: EN13765:2010, IMO, IBC, BS5842, NAHAD-600:2005

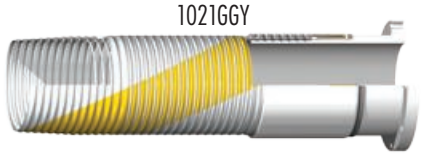
End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1181GGP AND 3181PGP

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
3	80	**200**	**14**	11	280	2.5	3.7	100	30
4	100	**200**	**14**	16	400	4.4	6.5	100	30
6	150	**200**	**14**	20	500	7.0	10.5	100	30
8	200	**200**	**14**	29	740	12.0	18.0	100	30
10	250	**200**	**14**	36	920	15.0	23.0	50	15

Pressure based on safety factor 4:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Inreased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

1021GGY



Cryoflex® 20 Cryogenic
Composite Hose Type 1021GGY

Applications: This type is designed for use as a liquid propane (LPG) Hose

Construction:

Color/Cover:	White w/yellow stripe, Nylon, Abrasion, UV and Ozone resistant
Inner Wire:	Galvanized Steel
Inner lining:	High Grade Polyamide
Carcass:	Polyamide, Nylon fabrics and films
Outer Wire:	High-tensile Galvanized Steel

Physical properties:

Temperature Range:	-20°F to +275°F (-30°C to +135°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m

Standards: CSA 8:1 M86-CAN/C9A Type 1

Approvals: Canadian Standards Authority CSA 8:1 M86-CAN/9A Type 1. CSA applicable through 2" diameter only. CRN Approvals based on standard end fitting configurations are available.

Complies with: IMO, IBC, BS5842, USCG 33CFR 127.1102.

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 1021GGY									
Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**350**	**25**	3.0	75	0.3	0.14	100	30
1½	40	**350**	**25**	4.0	100	0.8	0.36	100	30
2	50	**350**	**25**	5.5	140	1.3	2.0	100	30
3	75	**350**	**25**	8.0	200	2.0	3.0	100	30

Pressure based on safety factor 5:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)
3" Diameter hose is not covered by the requirements of CSA 8:1 M86-CAN/C9A Type 1.

4014SSN

Cryoflex® 50 Cryogenic
Composite Hose Type 4014SSN

Applications:

This type is designed for use the safe transfer of fully refrigerated conveyants down to -58°F (-50°C) in road and railcar, in plant and ship-to-shore or ship-to-ship transfer applications including the following Acetaldehyde, Ammonia (anhydrous), Butadiene, Butane/Propane, Butylene, Ethylamine, Ethylamine, Polypropylene, Refrigerant Gasses, Vinyl Chloride.

Also suitable for Liquid Ethane to -128°F (-89°C), Liquid Ethylene to -157°F (-105°C) and Liquid CO_2.

Construction:

Color/Cover:	White green stripe/Nylon (rope lagging for extra protection and insulation available)
Inner Wire:	T316 Stainless Steel
Inner lining:	High Grade Polypropylene
Carcass:	Polyamide, Nylon fabrics and films
Outer Wire:	T316 Stainless Steel
Logo:	Cryoflex® 50

Physical properties:

Temperature Range:	-128°F to +150°F (-88°C to +66°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	26 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13766:2010, USCG 33CFR 127.1102

Approvals: Bureau Veritas Type Approval for IGC & IBV Code and relevant requirements of the Society for handling Propane, Propylene, Butylene, Butane, Anhydrous Ammonia and Vinyl Chloride for 4" to 8" diameter hose.

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4014SSN

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**350**	**25**	6.0	150	0.6	0.9	100	30
1½	38	**350**	**25**	7.0	175	1.1	1.6	100	30
2	50	**350**	**25**	8.0	200	1.6	2.4	100	30
3	75	**350**	**25**	10.0	250	3.0	4.5	100	30
4	100	**350**	**25**	20.0	500	5.0	7.5	100	30
6	150	**350**	**25**	26.0	650	9.3	14.0	65	20
8	200	**350**	**25**	36.0	900	12.5	18.8	65	20
10	250	**150**	**14**	59	1500	15.1	22.3	50	15

Pressure based on safety factor 5:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies

4004SSN

Cryoflex® 200 Cryogenic
Composite Hose Type 4004SSN

Applications: This type is designed for use the safe transfer of fully refrigerated conveyants down to –321°F (-196°C) in road and railcar, in plant and ship-to-shore or ship-to-ship transfer applications including the following LNG Acetaldehyde, Ammonia (anhydrous), Butadiene, Butane/Propane, Butylene, Ethylamine, Ethylamine, Polypropylene, Refrigerant Gasses, Vinyl Chloride.

Construction:

Color/Cover:	White Nylon (rope lagging for extra protection and insulation available)
Inner Wire:	T316 Stainless Steel
Inner lining:	High Grade Nylon and Polyester
Carcass:	Polyamide, Nylon fabrics and BOPP films
Outer Wire:	T316 Stainless Steel
Logo:	Cryoflex® 200

Physical properties:

Temperature Range:	-321°F to +122°F (-196°C to +50°C)
Maximum elongation:	≤10% on test pressure
Vacuum range:	126 inHg (660 mmHg), 0.9 bar
Electrical properties:	Electrically Conductive ≤1.0 ohm/m for size 2"

Standards: EN13766:2010, USCG 33CFR 127.1102

End Fittings: Specially designed end fittings have been developed for use with Willcox Composite hoses that have a unique leak-proof sealing face and specially machined helical spiral shank which engages into the corresponding internal helix wire when secured into the hose by either crimping or swaging the external ferrules. See page 28 for more information about end connections.

TECHNICAL DATA: TYPE 4004SSN

Inside Diameter		Working Pressure		Min. Bend Radius		Approx Weight		Maximum Length	
Inches	mm	PSI	Bar	Inches	mm	lb/ft	kg/m	Feet	Meters
1	25	**150**	**10**	6.0	150	0.6	0.9	100	30
1½	40	**150**	**10**	7.0	175	1.1	1.6	100	30
2	50	**150**	**10**	7.5	185	1.55	2.3	100	30
3	80	**150**	**10**	11	280	2.95	4.4	100	30
4	100	**150**	**10**	20.0	500	4.95	1..3	65	20
6	150	**150**	**10**	26.0	660	9.45	14.0	65	20
8	200	**150**	**10**	37	940	12.75	18.9	65	20
10	250	**150**	**10**	59	1500	15.1	23	50	15

Pressure based on safety factor 5:1
Dimensions and weight are approximate and are subject to change
For additional technical data such as pressure drop, max. flow rates and tensile strength, please consult United Flexible engineering
Increased operating temperatures will reduce working pressure of the assemblies
Fitting pressure rating may limit or reduce the rated working pressure of the assembly
Rated working pressure is @ 70°F (21°C)

Color Code Chart*

3091PGP			3081PGP
4091SGP			4094SSP
3094PSP			1091GGP Petromaster
4121SGF			4131SGF
4124SSF			4134SSF
1061GGP Rackmaster			4334SSF
1091GGP			4161SGP
1151GGP			1171GGP
4164SSP			4174SSF
4171SGF			1181GGP Roughneck
3161PGP			3351PGP
3321PGP			1331GGF
1321GGP			1324SGP
4324SSP			4334SSF
4331SGF			4014SSN Cryoflex 50
2332AAP			3181PGP
1021GGY			4004SSN
			

Hose Couplings, Adapters and Accessories

Fitting Styles: Victaulic grooved tailpiece (12), Threaded tailpiece (13,16,10,3,4,6), Polypropylene ANSI drilled flanged tailpiece with steel backing ring (14,8), Aluminum female coupler tailpiece (15), Floating or swivel ANSI flange on a stub end tailpiece (11), Metallic ANSI RF fixed flange tailpiece (9), Self locking arm female coupler tailpiece (1,2), Quick disconnect male adapter tailpiece (5), Sanitary tailpiece (7)

Fittings: All fittings are designed assure 100% performance by each hose. Attachment methods are specifically developed for a perfect union and ensure performance up to rated burst pressure.

Double start threads, scrolls or serrations: Double start threads, scrolls or serrations engage the inner wire and ensure positive location of the outer wire after swaging. Precise machining assures maintenance of hose film pack and wire integrity.

Raised sealing face: Raised sealing face is vitial to a leakproof connection. Our external swage or crimp processes assures that the hose is permanently engaged and sealed to the fitting.

Comprehensive range of fittings available: Threaded or flanged stock connections, designed to current US and international standards. Fixed (weldneck or slip on) and swivel flanges to ANSI Class 150, 300 or DIN PN 10/16 or JIS 10K flanges are available. Propreitary quick release female couplers with self locking arms are available with male cam adapters. Sanitary fittings in both T316 Stainless Steel or polypropylene are available. With the ability to offer custom fittings designed for particular applications and compatibility requirements.

Materials: Carbon steel, Stainless Steel (T316 and T304), Brass, Aluminum, Hastelloy C-276, polypropylene and kynar are available.

Slings: Recommended for support in heavy dock and barge service. Full range of slings are warehoused and readily available.

Scuff guards: To protect hose from excessive abrasion in dockside and terminal operations. Available in 40 ft (12 meter) coils

Inspection, Testing and Maintenance

Inspection, testing and cleaning Willcox Hoses

Visual inspection – check hoses before each operation and before conducting hydraulic tests...

Hoses and hoses with rope lagging should be given a brief visual examination before each operation and a more thorough visual inspection at periods not exceeding six months. The inspection should pay attention to:

- Tears and abrasion of the hose cover or in the rope.
- Dents or kicks.
- Displacement of the hose reinforcing wires from their normal pitch or displacement and the rope exposing the hose below.
- Corrosion or abrasion of the hose outer wire.
- Signs of displacement of the end fittings or evidence of leakage at the ends.
- Any other abnormal features, including wear or damage to the end fittings.

Hydrostatic testing – annually or more frequently...

At periods not exceeding one year hoses should be hydraulically tested as follows:

- Drain and thoroughly clean hose.
- Carry out visual inspection. Hoses failing the visual inspection due to displacement of the hose wires, severe abrasion of the cover, or significant corrosion of the outer wire should not be tested.
- Lay the hose straight out on supports which allow free movement under pressure.
- Blank off the ends and fill the hose completely with water, ensure trapped air is released from the hose.
- Pressurize the assembly to 1-1/2 times the maximum rated working pressure of the hose and hold this pressure for 10 minutes (or as specified) while examining for leaks. Also test for electrical continuity between the end connections.
- Reduce pressure and drain hose.
- On completion of this test the hose should be tested again for electrical continuity.

NOTE: Thermoplastic composite hoses elongate under pressure compared to rubber hose. Elongation under pressure is not an indication of hose condition or failure of reinforcements.

CAUTION: Do not test hoses that fail visual inspection.

Inspection, Testing And Maintenance

Electrical continuity tests – every 6 months or more frequently...

In order to prevent the accumulation of static charge generated in use, all metal parts of the assembly have been electrically bonded together during manufacture. At periods not exceeding six months the following test should be carried out.

- Lay the hose flat on the ground. Avoid contact on metallic parts to earth.
- Check that the hose is electrically continuous from end to end. This can be done using a simple battery and bulb test or alternatively using an ohm meter. Resistance should be 10 ohms or less.

Cleaning – after use or prolonged storage, before testing...

- Hoses should be cleaned after use and certainly before prolonged storage or testing.
- Flushing out is sufficient in many circumstances using a variety of fluids, e.g. clean water, hot water detergents, common solvents at ambient temperature or seawater. If seawater is used for cleaning, this must be thoroughly drained out afterwards to minimize risk of corrosion on mild steel end fittings and on stainless or Galvanized Steel inner wires.
- Loose steam may be used but the hose must be open ended and the maximum working temperature must not be exceeded.
- Compressed air may be used but the hose must be open ended and the maximum working pressure must not be exceeded.
- During any cleaning operation the hose must be electrically earthed.
- Pigging must not be used under any circumstances.

CAUTION: High pressure steam or high pressure compressed air can be hazardous if hoses are restricted or clogged.

Hose repairs – consult Willcox Hose or your local distributor...

Depending on overall condition, it may be possible to repair hoses damaged in service. The repair of polypropylene hoses requires specialized knowledge and procedures.

NOTE: All repairs should be undertaken by trained and authorized personnel.

Electrical Properties of Marine Dock Hose Assemblies

Electrically Conductive Hose Assemblies

Low conductivity petroleum products and solvents such as gasoline & toluene become electrostatically charged when flowing through a pipeline and the pipeline itself acquires a charge of opposite polarity.

If the pipeline is earthed, the accumulated charge flows safely to ground. However, if the pipeline is not earthed, a charge could accumulate which may then be discharged instantaneously by an incendive spark to a nearby earthed conductor. If the spark has sufficient energy and an inflammable air/product mixture is present an explosion will result.

It is therefore normal practice for hoses generally to be specified that they be electrically conductive (with a maximum resistance of 10 ohms) so that the electrostatic charge is continuously drained away. Even so, it is common practice in the petroleum industry to specify a maximum flow velocity of 7m/sec when pumping low conductivity products to ensure that a charge is not generated more quickly than can be dissipated through normal arrangements.

Charges generated can be of many thousands of volts, but currents are of the order of a few microamps.

Insul-Flange: A Cast-Nylon Insulating Flange for use on Marine Docks and Terminals

If the piping system of a marine terminal is electrically conductive, an elecrical charge flows along the piping because of dock/pier-side cathodic protection systems. With the potential inductive effect of the piping system, a spark could occur at the moment when the hose is disconnected.

Insul-Flange controls undesirable electrical currents. The Insul-Flange prevents the heavy electrical flow in the piping system and eliminates the risk of an electrical arc when the hose is disconnected.

Construction: Insul-Flange is constructed of cast nylon and is resistant to most common solvents, lubricants, hydrocarbons, esters, key tones and aqueous solutions of acids and alkalies at pH5 to pH 11. For more severe chemical service, PTFE lining is an option. Melting Point: 428°F/220°C. Elect. Resistivity: 1012 ohm/cm.

- Insul-Flange retains the properties of insulating flange gasket kits, but they are much easier to install and inspect for the properties of non-conductivity.
- Provides greater electrical resistance than regular insulating gasket kits.
- Prevents any possibility of an electric arc upon disconnection of the hose.
- Eliminates the need for separate bonding wire.
- Complies with several standards:
  - California State Lands Commission, M.F.D. § 2380
  - U.S.C.G. 154.810 Vapor Line Connections, Section G - Facility Vapor Connections
  - ISGOTT Chapter 6 - Electrical Insulation

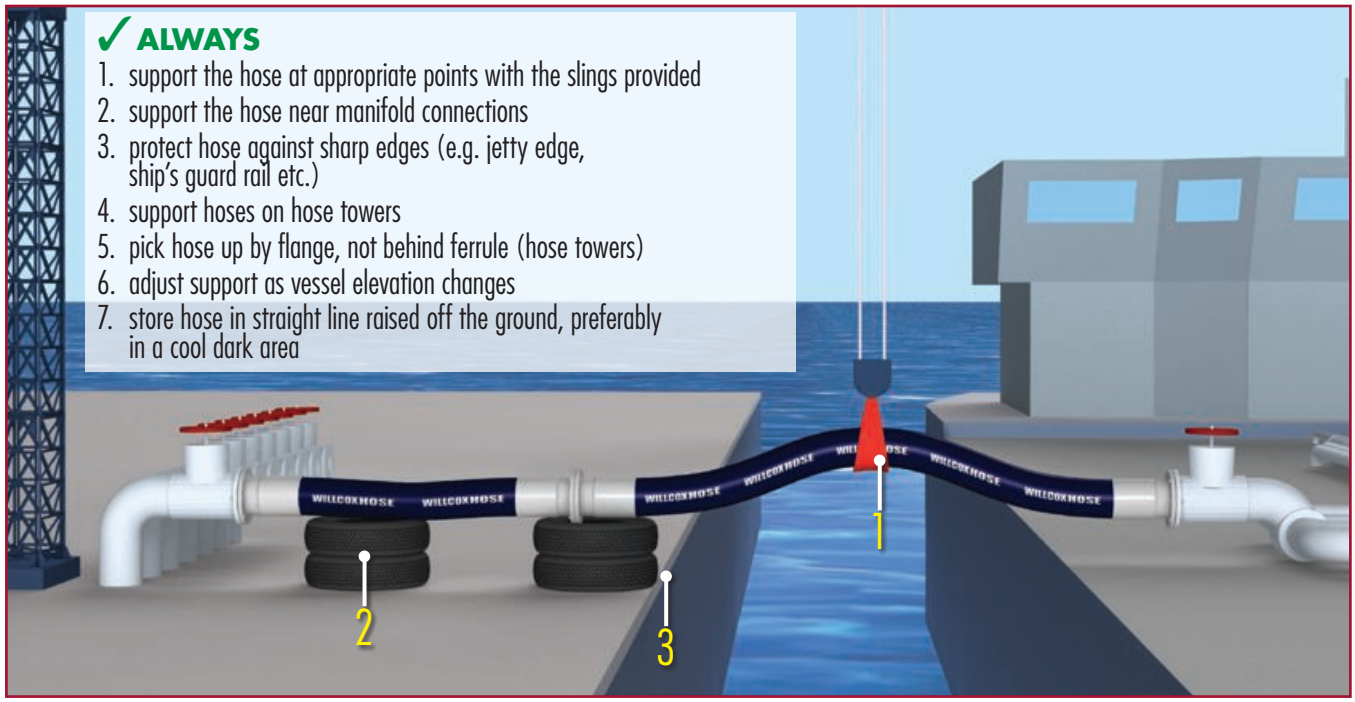
INSUL-FLANGE: ANSI CLASS 150 DRILLING						
Bore	O.D.	Length	No. of Bolts	Bolt Hole Diam.	Test Pressure (psi)	Longitudinal Stress (psi)
4	9	4¾	16	¾	750	600
6	11	9½	16	⅞	750	1221
8	13½	11¾	16	⅞	750	1333
10	16	14¼	24	1	750	1408
12	19	17	24	1	750	1273
16	23½	21¼	32	1⅛	750	1608

Willcox Hose Handling Guide

Willcox Hose is manufactured to the highest technical standards to meet the most exacting service conditions. To maximize the service life of these quality hoses, we recommend that you follow these simple guidelines for either dock or hose tower operations.

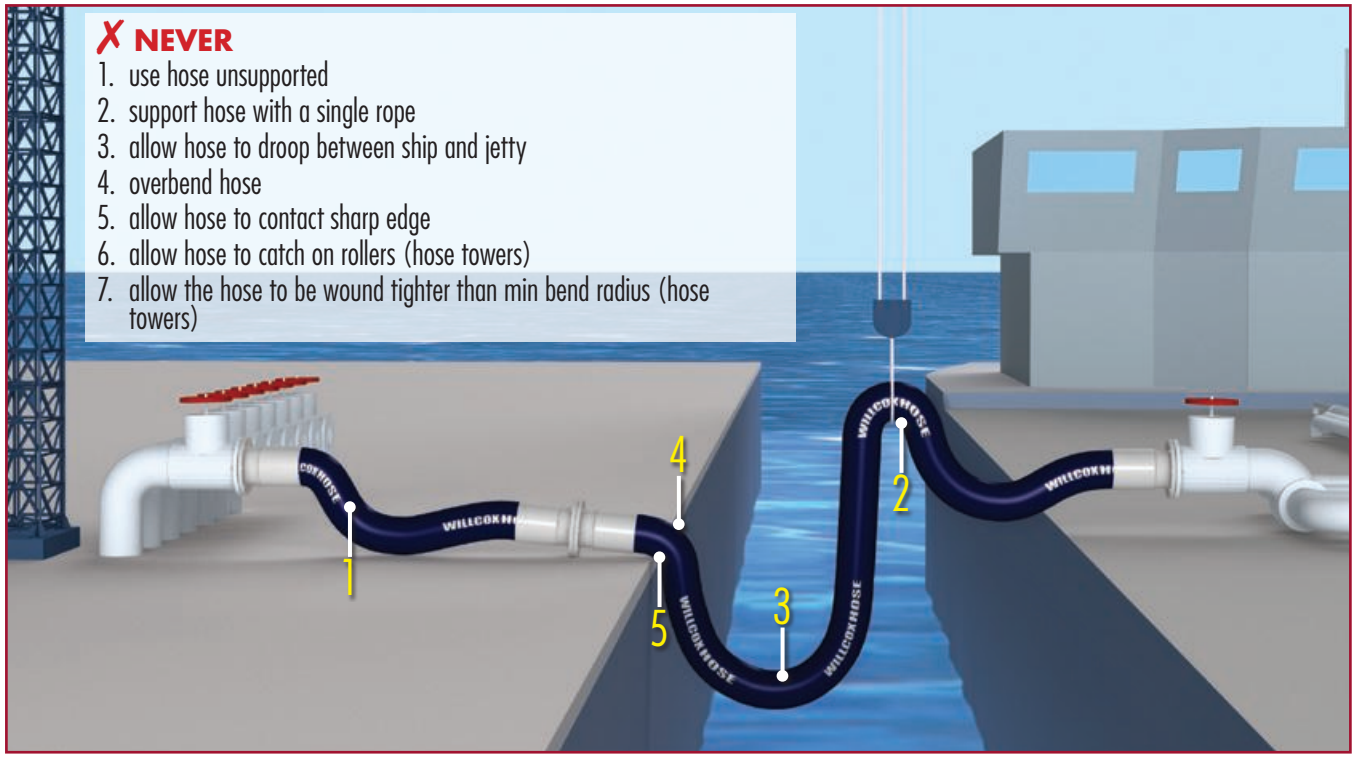
✓ ALWAYS

1. support the hose at appropriate points with the slings provided
2. support the hose near manifold connections
3. protect hose against sharp edges (e.g. jetty edge, ship's guard rail etc.)
4. support hoses on hose towers
5. pick hose up by flange, not behind ferrule (hose towers)
6. adjust support as vessel elevation changes
7. store hose in straight line raised off the ground, preferably in a cool dark area



✗ NEVER

1. use hose unsupported
2. support hose with a single rope
3. allow hose to droop between ship and jetty
4. overbend hose
5. allow hose to contact sharp edge
6. allow hose to catch on rollers (hose towers)
7. allow the hose to be wound tighter than min bend radius (hose towers)



Willcox Hoses are electrically continuous end to end thorough both inner and outer wires.
Against specific demand, insulating flanges are also available.

Chemical Compatibility Chart for Willcox Hose Polypropylene and PTFE PFA Lined Composite Hoses

The following charts shows the suitability of Willcox Hose polypropylene and PTFE PFA lined hoses and end fittings for use with various fluids. The information is based on the best data available. Recommendations are given only as a guide and apply only to the chemical compatability of the hose and end fitting material.

Please consult United Flexible Engineering Department for recommendations on applications in excess of 140°F (60°C), or for other extreme service conditions outside the scope of the catalog ratings. Composite hose must be derated, ie lower maximum pressure as temperature rises, please consult with the United Flexible Engineering Department for this information. Allowances must be made when selecting hoses for extreme service conditions. It is not advisable to select a hose which will be subjected simultaneously to pressure, temperatures and bending radii at the maximum ratings of the hose.

The description of a hose, or end fitting material, as "suitable" does not ensure that the hose complies with any regulations or operating requirements governing the handling of the chemical or the use of the hose.

A hose conveying a chemical having an oxidizing effect should be checked for internal discoloration particularly if the hose may be used on an application where color contaimination is not permissible.

Clients who are unfamiliar with the characteristics of composite constructed hose may express concern with the amount of elongation or growth of these hose types during pressurization.

Unlike rubber hoses, elongation as an indication of deterioration cannot be applied to composite hose.

In a composite hose, much of the elongation is due to 'non-elastic elongation' and arises from the inherent compressibility of the hose wall normal to their plane. This is recognized in both British and International Standards, please contact the United Flexible Engineering Department on details of these standards and engineering formulae related to it.

Contact the United Flexible Engineering Department regarding the maximum flow velocity of Willcox Hose composite hoses and calculations regarding pressure drop.

Inner Wire Composite Willcox Hose Polypropylene Hose

1. **Polypropylene Coated Carbon Steel** – 3081PGP, 3091PGP, 3094SPS, 3321PGP, 3161PGP, 3164PSP, 1183PGP
2. **T316 Stainless Steel** – 4091SGP, 4094SSP, 1324SGP, 4324SSP, 4161SGP, 4164SSP
3. **Galvanized** – 1091GGP, 1061GGP, 1321GGP, 1181GGP

Inner Wire Composition of Willcox Hose Fluoropolymer Hoses

4. **T316 Stainless Steel** – 4214SGF, 4124SSF,4131SGF, 4134SSF, 4171SGF, 4174SSF,4331SGF, 4334SSF

End Fitting Materials

CS **Carbon Steel**
SS **T316 Stainless Steel**
PP **Polypropylene**

Exotic materials and **aluminum** end fittings are also available. Contact factory for more details.

Suitability

Hose

A – SUITABLE for use at 140°F (60°C).

B – SUITABLE for use at worldwide AMBIENT temperatures.

C – SUITABLE for INTERMITTENT use at worldwide AMBIENT temperatures.

D – UNSUITABLE or no data available.

End Fittings

• – SUITABLE for the operating conditions applicable to the hose.

X – UNSUITABLE or no data available.

For fluids that are not listed or service conditions outside the scope of those described, please consult United Flexible Engineering Department.

United Flexible Inc. reserves the right to change specifications and ratings without notice.

The conditions or methods of storage, handling, use and testing of our products are beyond our control. We do not therefore accept responsibility and expressly disclaim liability for any loss, damage or expense arising from the storage, handling, use, testing and disposal of the product.

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Acetaldehyde	C	C	D	A	X	•	•
Acetic acid (60%)	A	A	D	A	X	•	•
Acetic acid (glacial)	B	B	D	A	X	•	•
Acetic anhydride	B	B	D	A	X	•	•
Acetoacetic ester	C	C	D	A	•	•	•
Acetone	A	A	A	A	•	•	•
Acetone cyanohydrin	B	B	D	A	•	•	•
Acetonitrile	B	B	B	A	•	•	•
Acetophenone	B	B	B	A	•	•	•
Acetylacetone	B	B	B	A	•	•	•
Acetyl chloride	D	D	D	A	X	•	X
Acetylene dichloride	B	B	B	A	•	•	•
Acetylene tetrachloride	C	C	C	A	•	•	•
Acrolein (acrylaldehyde)	B	B	B	A	•	•	•
Acrylamide (50% in solution)	C	C	D	A	•	•	•
Acrylic acid	B	B	D	A	X	•	•
Acrylonitrile	A	A	D	A	•	•	•
Adipic acid (aqueous)	A	A	A	A	X	•	•
Adiponitrile	B	B	B	A	•	•	•
Alcohols	B	B	B	A	•	•	•
Alkyl acrylate vinyl pyridine copolymer in toluene	C	C	C	A	•	•	•
Alkyl benzene sulphonic acid	C	C	D	A	X	•	•
Allyl alcohol	A	A	A	A	•	•	•
Allyl bromide	C	C	C	A	•	•	•
Allyl chloride	C	C	C	A	•	•	•
Alums (aqueous - saturated)	A	A	A	A	•	•	•
Aluminum salts (excluding halides - saturated)	A	B	D	A	•	•	•
Aluminum chloride (saturated)	A	D	D	D	X	X	•
2-(2-Aminoethoxy) ethanol	C	C	D	A	•	•	•
Aminoethyl ethanolamine	B	B	D	A	•	•	•
n-Aminoethylpiperazine	C	C	D	A	•	•	•
Ammonia (28% in solution)	A	A	D	A	•	•	•
Ammonium chloride (saturated)	A	C	D	A	•	•	•
Ammonium nitrate (93% in solution)	D	C	C	A	X	•	X
Ammonium salts (excluding halides - saturated)	A	B	D	A	•	•	•
Ammonium sulphide (<45% in solution)	C	C	D	A	X	•	•
Amyl acetate (commercial)	C	C	C	A	•	•	•
n-Amyl acetate	C	C	C	A	•	•	•
sec-Amyl acetate	C	C	C	A	•	•	•
Amyl alcohol	B	B	B	A	•	•	•
Amyl chloride	C	C	C	A	•	•	•
Amyl Chloronaphthalene	D	D	d	A	X	•	X
Anhydrous Ammonia	Use Cryoflex 50				X	•	X
Aniline (dedicated hose)	C	B	D	A	•	•	•
Animal oils	A	A	A	A	•	•	•
Anisole	C	C	C	A	X	•	•
Antimony chloride	B	D	D	A	X	•	•
Aqua regia	C	D	D	A	X	•	•
Aviation fuel	C	C	C	A	•	•	•
Barium salts (saturated)	A	B	D	A	•	•	•
Benzaldehyde	C	C	D	A	X	•	•
Benzene	C	C	C	A	•	•	•
Benzene sulphonyl chloride	D	D	D	D	X	X	X
Benzene sulphonic acid	C	C	D	A	X	•	X
Benzoic acid	A	A	D	A	•	•	•
Benzoyl chloride	C	C	C	A	•	•	•
Benzyl alcohol	A	A	A	A	•	•	•
Benzyl butyl phthalate	B	B	B	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Black liquor	C	C	D	A	X	•	•
Bleach (12.5%Cl)	C	C	D	A	•	•	•
Borax (aqueous)	A	A	A	A	•	•	•
Boric acid (aqueous)	A	A	D	A	X	•	•
Brine (saturated)	A	C	D	A	X	•	•
Bunker 'C' Fuel Oil	A	A	A	A	•	•	•
Bunker Oil	A	A	A	A	•	•	•
Butadiene	B	B	B	A	•	•	•
Butane liquid	Use Cryoflex 50					•	
Butanediol	B	B	B	A	•	•	•
Butyl alcohol	A	A	A	A	•	•	•
n-Butyl acetate	C	C	C	A	•	•	•
n-Butyl acrylate	B	B	B	A	•	•	•
n-Butylamine	B	B	D	A	•	•	•
Butyl benzene	B	B	B	A	•	•	•
Butyl benzyl phthalate	B	B	B	A	•	•	•
Butyl bromide	D	D	D	A	X	•	X
Butyl butyrate	B	B	B	A	•	•	•
Butyl carbitol	A	A	A	A	•	•	•
Butyl carbitol acetate	C	C	C	A	•	•	•
Butyl cellosolve	A	A	A	A	•	•	•
Butyl cellosolve acetate	C	C	C	A	•	•	•
Butyl chloride	D	D	D	A	X	•	X
Butyl/decyl/cetyl-eicosylmethacrylate mixture	C	C	C	A	•	•	•
Butylene glycol	A	A	A	A	•	•	•
n-Butyl ether	B	B	B	A	•	•	•
Butyl ethyl ether	B	B	B	A	•	•	•
Butyl methacrylate	C	C	C	A	•	•	•
Butyl methoxyethyl ether	C	C	C	A	•	•	•
Butyl phthalate	A	A	A	A	•	•	•
Butyl stearate	B	B	B	A	•	•	•
n-Butyraldehyde	C	C	D	A	•	•	•
Butyric acid (20%)	B	B	B	A	•	•	•
Butyrolactone	C	C	C	A	•	•	•
Calcium salts (excluding halides & hypochlorite - saturated)	A	B	D	A	•	•	•
Calcium alkyl salicylate solution	A	A	D	A	•	•	•
Calcium chloride (saturated)	A	C	D	A	X	•	•
Calcium hypochlorite (12.5% CL)	C	C	D	C	X	•	•
Calcium naphthenate in mineral oil	C	C	C	A	•	•	•
Camphor oil	C	C	C	A	•	•	•
Caprylic acid	A	A	A	A	•	•	•
Carbinols	B	B	B	A	•	•	•
Carbitol acetate	C	C	C	A	•	•	•
Carbitols	B	B	B	A	•	•	•
Carbolic acid	A	A	D	A	X	•	•
Carbolic oil (middle oil)	C	C	C	A	•	•	•
Carbon dioxide (liquid)	Use Cryoflex 50				X	•	X
Carbon disulphide	C	C	C	D	•	•	•
Carbonic acid	A	A	D	A	X	•	•
Carbon tetrachloride	C	C	C	A	•	•	•
Cashew nut shell oil	B	B	B	A	•	•	•
Caustic potash (<50%)	A	B	D	A	•	•	•
Caustic soda (<50%)	A	B	D	A	•	•	•
Cellosolve	B	B	B	A	•	•	•
Cetyl-eicosyl methacrylate mixture	C	C	C	A	•	•	•
Chloroacetic acid (<80%)	B	D	D	D	X	X	•
Chlorobenzene	C	C	C	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Chlorohydrins (crude)	C	C	C	A	•	•	•
o-Chloronitrobenzenes	C	C	C	A	•	•	•
Chloroprene	C	C	C	A	X	•	•
2- or 3-Chloropropionic acid	C	C	D	A	X	•	•
Chlorosulphonic acid	D	D	D	A	X	•	•
o- or m- or p-Chlorotoluene	C	C	C	A	•	•	•
Chlorotoluenes (mixed isomers)	C	C	C	A	•	•	•
Chrome alum (saturated)	A	A	D	A	•	•	•
Chromic acid (<50% - aqueous)	C	C	D	A	X	•	•
Citric acid	A	A	D	A	X	•	•
Coal tar naphtha	B	B	B	A	•	•	•
Copper salts (excluding halides - saturated)	A	A	D	A	•	•	•
Copper chloride (saturated)	A	D	D	D	X	X	•
Corn Oil	A	A	D	A	X	•	•
Corn Syrup	A	A	D	A	X	•	•
Creosote (wood or coal tar)	B	B	B	A	•	•	•
Cresols (<90% - mixed isomers)	A	A	A	A	•	•	•
Crotonaldehyde	C	C	C	A	•	•	•
Cumene (Isopropyl Benzene)	B	B	B	A	•	•	•
Cutting Oil	A	A	A	A	•	•	•
Cyclohexane	B	B	B	A	•	•	•
Cyclohexanol	B	B	B	A	•	•	•
Cyclohexanone	C	C	C	A	•	•	•
Cyclohexylamine	B	B	D	A	•	•	•
Cyclopentane	B	B	B	A	•	•	•
p-Cymene	B	B	B	A	•	•	•
Decalin	D	D	D	A	X	•	X
Decene	C	C	C	A	•	•	•
Decyl acrylate	B	B	D	A	•	•	•
Decyl alcohol	B	B	B	A	•	•	•
Detergents	A	A	A	A	•	•	•
Dextrin	A	A	A	A	•	•	•
Diacetone alcohol	B	B	B	A	•	•	•
Diaminoethylamine	B	B	C	A	•	•	•
Diamylamine	B	B	C	A	•	•	•
Dibromoethane	B	B	D	A	•	•	•
Dibutylamine	B	B	C	A	•	•	•
Dibutyl ether	C	C	C	A	•	•	•
Dibutyl phthalate	B	B	B	A	•	•	•
Dibutyl sebacate	B	B	B	A	•	•	•
Dichloroacetic acid	C	D	D	D	X	X	•
o-Dichlorobenzene	C	C	C	A	•	•	•
Dichlorobutane	C	C	C	A	•	•	
Dichlorodifluoromethane	Use Cryoflex 50				X	•	X
1,1-Dichloroethane	C	C	C	A	•	•	•
Dichlorethylene	C	C	C	A	•	•	•
Dichloroethyl ether	C	C	C	A	•	•	•
2-2-Dichloroisopropyl ether	C	C	C	A	•	•	•
Dichloromethane	C	C	C	A	•	•	•
2-4-Dichlorophenol	C	C	D	A	X	•	•
2,4-Dichlorophenoxyacetic acid, diethanolamine salt solution	C	C	D	A	•	•	•
2,4-Dichlorophenoxyacetic acid, dimethyl amine salt solution (<70% dimethylamine salt)	C	C	D	A	•	•	•
2,4-Dichlorophenoxyacetic acid, triisopropanolamine salt solution	C	C	D	A	•	•	•
1,2-Dichloropropane	C	C	C	A	•	•	•
1,3-Dichloropropane	C	C	C	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
2,2-Dichloropropionic acid	C	C	D	A	•	•	•
Dichloropropylene	C	C	C	A	•	•	•
Dicyclopentadiene	D	D	D	D	X	X	X
Diesel Emissions Fluid	B	B	A	A	X	•	•
Diesel oil	B	B	B	A	•	•	•
Diethanolamine	A	A	D	A	•	•	•
Diethylamine	B	B	D	A	•	•	•
Diethylamino ethanol	B	B	C	A	•	•	•
Diethyl benzene	B	B	B	A	•	•	•
Diethylene dioxide	B	B	B	A	•	•	•
Diethylene glycol	A	A	A	A	•	•	•
Diethylene glycol diethyl ether	B	B	B	A	•	•	•
Diethylene glycol methyl ether	C	C	C	A	•	•	•
Diethylene glycol monobutyl ether	C	C	C	A	•	•	•
Diethylene glycol monobutyl ether acetate	C	C	C	A	•	•	•
Diethylene glycol monoethyl ether	C	C	C	A	•	•	•
Diethylene glycol monoethyl ether acetate	C	C	C	A	•	•	•
Diethylene glycol monomethyl ether	C	C	C	A	•	•	•
Diethylene glycol monomethyl ether acetate	C	C	C	A	•	•	•
Diethylenetriamine	B	B	D	A	•	•	•
Diethyl ethanolamine	B	B	D	A	•	•	•
Diethyl ether	B	B	B	A	•	•	•
Di(2-ethylhexyl) phosphoric acid	C	C	D	A	X	•	•
Diethyl ketone	B	B	B	A	•	•	•
Diethyl oxalate	B	B	B	A	•	•	•
Diethyl phthalate	A	A	A	A	•	•	•
Diethyl sebacate	A	A	A	A	•	•	•
Diethyl sulphate	B	B	D	A	•	•	•
Diglycidyl ether of bisphenol A	C	C	C	A	•	•	•
Diisobutylamine	B	B	B	A	•	•	•
Diisobutylene	B	B	B	A	•	•	•
Diisobutyl ketone	B	B	B	A	•	•	•
Diisobutyl phthalate	B	B	B	A	•	•	•
Diisooctyl adipate	B	B	B	A	•	•	•
Diisooctyl phthalate	A	A	A	A	•	•	•
Diisopropanolamine	B	B	D	A	•	•	•
Diisopropylamine	B	B	D	A	•	•	•
Diisopropyl benzene (all isomers)	C	C	C	A	•	•	•
Diisopropyl ether (DIPE)	B	B	B	A	•	•	•
Diisopropyl ketone	B	B	B	A	•	•	•
Dimethylamine (<45% - aqueous)	B	B	D	A	•	•	•
Dimethylamine (45%-55% in solution)	C	C	D	A	•	•	•
Dimethylamine (55%-65% in solution)	C	C	D	A	•	•	•
n,n-Dimethylcyclohexylamine	C	C	D	A	•	•	•
Dimethyl ethanolamine	B	B	D	A	•	•	•
Dimethyl formamide	A	A	A	A	•	•	•
Dimethyl hydrogen phosphite	C	C	D	A	X	•	•
Dimethyl ketone	A	A	A	A	•	•	•
Dimethyl phthalate	B	B	B	A	•	•	•
Dimethyl sulphate	B	B	D	A	•	•	•
Dimethyl sulphide	B	B	B	A	•	•	•
Dinitrobenzene	C	C	C	A	•	•	X
Dinitrotoluene (molten)	D	D	D	D	X	X	X
Dioctylamine	B	B	B	A	•	•	•
Dioctyl phthalate	B	B	B	A	•	•	•
Dioctyl sebacate	B	B	B	A	•	•	•
1 A-Dioxane	C	C	C	A	•	•	
DIPE (See Diisopropyl ether)	B	B	B	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Diphenylmethane diisocyanate	B	B	B	A	•	•	•
Diphenyl phthalate	B	B	B	A	•	•	•
Diphenyl oxide/diphenyl phenyl ether mixture	D	D	D	D	X	X	X
Di-n-propylamine	B	B	B	A	•	•	•
Dipropylene glycol	A	A	A	A	•	•	•
Dipropylene glycol monomethyl ether	C	C	C	A	•	•	•
Disulphuric acid	D	D	D	A	X	•	X
Dodecene (all isomers)	C	C	C	A	•	•	•
Dodecyl alcohol	B	B	B	A	•	•	•
Dodecyl benzene	B	B	B	A	•	•	•
Dodecyl benzene sulphonic acid	C	C	D	A	X	•	•
Dodecyl diphenyl oxide disulphonate solution	C	C	C	A	•	•	•
Dodecyl methacrylate	D	D	D	D	X	X	X
Dodecyl-pentadecyl methacrylate mixture	C	C	C	A	•	•	•
Dodecyl phenol	B	B	B	A	•	•	•
Epichlorohydrin	B	B	B	A	•	•	•
Epoxy Resin	A	A	D	A	X	•	•
Ethanol	B	B	B	A	•	•	•
Ethyl alcohol	A	A	A	A	•	•	•
Ethanolamine	A	A	B	A	•	•	•
Ethoxy ethanol	C	C	C	A	•	•	•
2-Ethoxyethyl acetate	C	C	C	A	•	•	•
Ethoxy propanol	C	C	C	A	•	•	•
Ethyl acetate	C	C	C	A	•	•	•
Ethyl acrylate	B	B	B	A	•	•	•
Ethyl aluminum dichloride	D	D	D	A	X	•	X
Ethylamine	B	B	C	A	•	•	•
Ethyl benzene	B	B	B	A	•	•	•
Ethyl butanol	B	B	B	A	•	•	•
n-Ethyl butylamine	B	B	C	A	•	•	•
Ethyl chloride	C	C	C	A	•	•	•
Ethyl cyclohexane	C	C	C	A	•	•	•
n-Ethyl cyclohexylamine	C	C	C	A	•	•	•
Ethylene carbonate	B	B	C	A	•	•	•
Ethylene chloride	C	C	C	A	•	•	•
Ethylene chlorohydrin	B	B	B	A	•	•	•
Ethylene cyanohydrin	B	B	B	A	•	•	•
Ethylene diamine	B	B	B	A	•	•	•
Ethylene dibromide	B	B	C	A	•	•	•
Ethylene dichloride	C	C	C	A	•	•	•
Ethylene glycol	A	A	A	A	•	•	•
Ethylene glycol methyl butyl ether	B	B	B	A	•	•	•
Ethylene glycol monobutyl ether	A	A	A	A	•	•	•
Ethylene glycol monobutyl ether acetate	B	B	B	A	•	•	•
Ethylene glycol monoethyl ether	A	A	A	A	•	•	•
Ethylene glycol monomethyl ether	B	B	B	A	•	•	•
Ethylene glycol monomethyl ether acetate	B	B	B	A	•	•	•
Ethylene glycol monophenyl ether	B	B	B	A	•	•	•
Ethylene oxide (dedicated hose)	B	B	D	A	X	•	•
Ethylene oxide/propylene oxide mixtures (<30% ethylene oxide)	C	C	D	A	X	•	•
Ethyl ether	B	B	B	A	•	•	•
Ethyl formate	B	B	D	A	•	•	•
Ethyl hexanoic acid	B	B	D	A	X	•	•
Ethyl hexyl alcohol	A	A	A	A	•	•	•
2-Ethyl hexyl acrylate	B	B	C	A	•	•	•
2-Ethyl hexylamine	B	B	C	A	•	•	X
Ethylidene norbonene	C	C	C	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Ethyl methacrylate	C	C	C	A	•	•	•
2-Ethyl-3-propylacrolein	C	C	C	A	•	•	•
Ethyl propyl ether	B	B	B	A	•	•	•
Ethyl propyl ketone	C	C	C	A	•	•	•
Ethyl silicate	A	A	A	A	•	•	•
Ethyl sulphate	B	B	B	A	•	•	•
Ethyl vinyl ether	B	B	B	A	•	•	•
Fatty acids	A	A	D	A	X	•	•
Fatty alcohols	A	A	A	A	•	•	•
Ferrous, ferric salts (excluding halides)	A	B	D	A	•	•	•
Fluorinated refrigerants — Use Cryoflex 50	D	D	D		X	•	X
Fluorine — Use S/S Hose PTFE	D	D	D		X	•	X
Fluosilicic acid	A	D	D	D	X	•	•
Formaldehyde solution (<45%)	A	A	A	A	•	•	•
Formamide	A	B	D	A	X	•	•
Formic acid	A	A	D	A	X	•	•
Freons — Use Cryoflex 50	D	D	D		X	•	X
Fructose	A	A	A	A	•	•	•
Fruit juices	A	A	D	A	•	•	•
Fuel oil	B	B	B	A	•	•	X
Fumaric adduct of rosin (water dispersion)	C	C	C	A	•	•	•
Furfural	B	B	B	A	•	•	•
Furfuryl alcohol	B	B	B	A	•	•	•
Gallic acid solution	A	A	C	A	•	•	•
Gasoline	B	B	B	A	•	•	•
Gelatine (aqueous)	A	A	A	A	•	•	•
Gluconic acid	A	A	C	A	•	•	•
Glucose (aqueous)	A	A	A	A	•	•	•
Glue	B	B	D	A	•	•	•
Gluteraldehyde solutions (50% or less)	C	C	C	A	•	•	•
Glycerine	A	A	A	A	•	•	•
Glycidyl ester of C10 trialkyacetic acid	C	C	C	A	•	•	•
Glycolic acid (<37% - aqueous)	A	A	D	A	•	•	•
Glycols (aqueous)	A	A	A	A	•	•	•
Grease	B	B	B	A	•	•	•
Green sulphate liquor	B	B	D	A	X	•	•
Heptane	B	B	B	A	•	•	•
Heptanoic acid	B	B	D	A	X	•	•
Heptanol (all isomers)	A	A	A	A	•	•	•
Heptanone	B	B	B	A	•	•	•
Heptene (mixed isomers)	A	A	A	A	•	•	•
Hexamethylene diamine	B	B	D	A	•	•	•
Hexamethyleneimine	C	C	D	A	•	•	•
Hexamethylene tetramine	B	B	D	A	•	•	•
1-Hexane	B	B	B	A	•	•	•
Hexanol	A	A	A	A	•	•	•
Hexene	A	A	A	A	•	•	•
Hexyl acetate	C	C	C	A	•	•	•
Hexylamine	B	B	D	A	•	•	•
Hexylene glycol	A	A	A	A	•	•	•
Hydrazine hydrate	B	B	D	A	X	•	
Hydrobromic acid (<50%)	A	D	D	D	X	X	•
Hydrochloric acid (<37%)	C	D	D	D	X	X	•
Hydrofluoric acid (<50%)	C	D	D	D	X	X	•
Hydrofluosilicic acid	A	A	D	A	X	•	•
Hydrogen peroxide (<50%)	B	B	D	A	X	•	•
Hydrogen sulphide (aqueous - saturated)	A	D	D	D	X	•	•
Hydroquinone	A	A	A	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Iodine solution	B	D	D	D	•	•	•
Iron halides	A	D	D	D	X	X	•
Iron salts (excluding halides - saturated)	A	B	D	A	•	•	•
Isoamyl acetate	B	B	B	A	•	•	•
Isoamyl alcohol	B	B	B	A	•	•	•
Isoamyl bromide	B	D	D	D	X	•	•
Isoamyl butyrate	B	B	B	A	•	•	•
Isoamyl chloride	C	C	D	A	X	•	•
Isoamyl ether	B	B	B	A	•	•	•
Isobutyl acetate	B	B	B	A	•	•	•
Isobutyl acrylate	B	B	B	A	•	•	•
Isobutyl alcohol	A	A	A	A	•	•	•
Isobutylamine	B	B	D	A	•	•	•
Isobutyl bromide	B	D	D	D	X	X	•
Isobutyl chloride	B	D	D	D	X	X	•
Isobutyl ether	C	C	C	D	•	•	•
Isobutyl formate	C	C	C	A	•	•	•
Isobutyl methyl ketone	B	B	B	A	•	•	•
Isobutyraldehyde	B	B	D	A	•	•	•
Isodecyl alcohol	A	A	A	A	•	•	•
Isooctane	C	C	C	A	•	•	•
Isopentane	C	C	C	A	•	•	•
Isopentene	C	C	C	A	•	•	•
Isophorone	B	B	B	A	•	•	•
Isophorone diamine	C	C	D	A	•	•	•
Isophorone diisocyanate	C	C	C	A	•	•	•
Isoprene	B	B	B	A	•	•	•
Isopropanolamine	B	B	D	A	•	•	•
Isopropyl acetate	C	C	C	A	•	•	•
Isopropyl alcohol	A	A	A	A	•	•	•
Isopropylamine	B	B	D	A	•	•	•
Isopropyl benzene	B	B	B	A	•	•	•
Isopropyl chloride	B	D	D	A	X	•	•
Isopropyl ether	C	C	C	A	•	•	•
Isopropyl toluene	B	B	B	A	•	•	•
Isovaleraldehyde	C	C	C	A	•	•	•
Jams	A	A	B	A	•	•	•
Jet fuel	C	C	C	A	•	•	•
Kerosene	B	B	B	A	•	•	•
Ketones	B	B	B	A	•	•	•
Lacquers	B	B	D	A	X	•	•
Lactic acid (<20%)	A	B	D	A	•	•	•
Lanolin	A	A	A	A	•	•	•
Lard	A	A	A	A	•	•	•
Latex (low viscosity)	A	A	A	A	•	•	•
Lauryl alcohol	B	B	B	A	•	•	•
Lead salts (saturated)	A	B	D	A	X	•	•
Ligroin	C	C	C	A	•	•	•
Limonene	B	B	B	A	•	•	•
Linseed oil	A	A	A	A	•	•	•
Liquefied Carbon Dioxide	Use Cryoflex 50				X	•	X
Liquefied Petroleum Gas	Use Cryoflex 50	D	D	D	•	•	X
Lubricating oil	B	B	B	A	•	•	•
Magnesium salts (saturated)	A	B	D	A	X	•	•
Maleic acid solution	A	B	D	A	X	•	•
Maleic anhydride solution	B	B	D	A	X	•	•
Malic acid solution	B	B	D	A	X	•	•
Manganese salts (saturated)	A	B	D	A	X	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Mercaptobenzothiazol, sodium salt solution	C	C	C	A	•	•	•
Mercuric chloride (saturated)	A	D	D	D	X	X	•
Mesityl oxide	A	A	B	A	•	•	•
Methacrylic acid	B	B	D	A	•	•	•
Methacrylonitrile	C	C	C	A	•	•	•
Methanol	C	C	C	A	•	•	•
Methyl acetate	C	C	C	A	•	•	•
Methyl aceto acetate	C	C	D	A	X	•	•
Methyl acetone	B	B	B	A	•	•	•
Methyl acrylate	B	B	B	A	•	•	•
Methyl alcohol	A	A	A	A	•	•	•
Methylamine	B	B	C	A	•	•	•
Methyl amyl acetate	C	C	C	A	•	•	•
Methyl amyl alcohol	B	B	B	A	•	•	•
Methyl amyl ketone	B	B	B	A	•	•	•
Methyl butyl ketone (MBK)	B	B	B	A	•	•	•
Methyl butyraldehyde	D	D	D	A	X	•	X
Methyl cellosolve	B	B	B	A	•	•	•
Methyl cellosolve acetate	C	C	C	A	•	•	•
Methyl chloride	D	D	D	A	X	•	•
Methyl cyanide	B	B	B	A	•	•	•
Methyl cyclohexane	B	B	B	A	•	•	•
Methylene bromide	C	C	D	A	•	•	•
Methylene chloride	C	C	C	A	•	•	•
Methyl ethyl ketone (MEK)	C	C	C	A	•	•	•
Methyl ethylpyridine	C	C	C	A	•	•	•
2-Methyl-5-ethylpyridine	C	C	C	A	•	•	•
Methyl formate	C	C	C	A	•	•	•
2-Methyl-2-hydroxy-3-butyne	C	C	C	A	•	•	•
Methyl isobutyl ketone	C	C	C	A	•	•	•
Methyl methacrylate	C	C	C	A	•	•	•
Methyl nitrobenzene	B	B	B	A	•	•	•
Methyl pentene	B	B	B	A	•	•	•
2-Methyl-1-pentene	C	C	C	A	•	•	•
2-Methyl pyridine	B	B	B	A	•	•	X
4-Methyl pyridine	C	C	C	A	•	•	X
n-Methyl-2-pyrrolidone	C	C	C	A	•	•	X
Methyl salicylate	C	C	C	A	•	•	•
α-Methylstyrene	B	B	B	A	•	•	•
Methyl tert-butyl ether (MTBE) See also MTBE-Master	C	C	C	A	•	•	•
Mineral jelly	A	A	A	A	•	•	•
Mineral oil	B	B	B	A	•	•	•
Mineral spirits	B	B	B	A	•	•	•
Molasses	A	A	A	A	•	•	•
Molten Sulphur	D	D	D	D	D	•	X
Monochlorbenzene	D	D	D	A	X	•	X
Monoethanolamine	A	A	B	A	•	•	•
Monoethylamine	B	B	C	A	•	•	•
Monoisopropanolamine	B	B	D	A	•	•	•
Mononitrobenzene	B	B	B	A	•	•	•
Morpholine	B	B	C	A	•	•	•
Motor fuel anti-knock compounds (unleaded)	B	B	B	A	•	•	
Motor Oil	A	A	A	A	•	•	•
MTBE (See Methyl tert-butyl ether)	A	A	A	A	•	•	•
Naphtha	B	B	B	A	•	•	•
Naphtha solvent	C	C	C	A	•	•	•
Naphthalene solution	A	A	A	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Neohexane	B	B	B	A	•	•	•
Nickel chloride (saturated)	A	D	D	D	X	•	X
Nickel salts (excluding chlorides - saturated)	A	B	D	A	X	•	•
Nitrating acid (mixture of sulphuric & nitric acids)	D	D	D	D	X	X	X
Nitric acid (<10%)	A	A	D	A	X	•	X
Nitric acid (10%-60%)	C	C	D	A	X	•	X
Nitric acid (>60%)	D	D	D	A	X	•	X
Nitrobenzene	B	B	B	A	•	•	•
o-Nitrophenol solution	A	A	D	A	•	•	•
o-Nitrophenal (molten)	D	D	D	D	X	X	•
1- or 2-Nitropropane	B	B	B	A	•	•	•
Nitropropane/nitroethane (60/40 mixture)	C	C	C	A	•	•	•
o-Nitrotoluene	B	B	B	A	•	•	X
p-Nitrotoluene	D	D	D	D	X	X	•
Nonane	B	B	B	A	•	•	•
Nonyl alcohol	B	B	B	A	•	•	•
Nonylphenol	B	B	C	A	•	•	•
Octane	B	B	B	A	•	•	•
Octanol (all isomers)	B	B	B	A	•	•	•
Octene (all isomers)	C	C	C	A	•	•	•
Octyl acetate	C	C	C	A	•	•	•
Octyl acrylate	B	B	B	A	•	•	•
Olefins (straight chain mixtures)	C	C	C	A	•	•	•
a-Olefin mixtures	C	C	C	A	•	•	•
Oils (most commercial)	B	B	B	A	•	•	•
Oleic acid	B	B	D	A	X	•	•
Oleum (Sulphuric acid - fuming)	D	D	D	A	X	•	•
Oils (most commercial)	B	B	B	A	•	•	•
Oxalic acid (<50%)	B	B	D	A	X	•	•
Paint	A	A	A	A	•	•	•
Palm oil	B	B	B	A	•	•	•
Paraffin wax	A	A	A	A	•	•	•
Paraldehyde	C	C	C	A	•	•	•
Paraxylene	C	C	C	A	•	•	•
Pentachloroethane	C	C	C	A	•	•	•
1,3-Pentadiene	C	C	C	A	•	•	•
n-Pentane	B	B	B	A	•	•	•
Pentanol	A	A	A	A	•	•	•
Pentanone	B	B	B	A	•	•	•
Pentene (all isomers)	B	B	B	A	•	•	•
Perchloric acid (<50%)	B	D	D	D	X	•	•
Perchloroethylene	C	C	C	A	X	•	•
Petrolatum	A	A	A	A	•	•	•
Petroleum	A	A	A	A	•	•	•
Petroleum (to max 320F/160C)	D	D	D	D	•	•	X
Petroleum ether	C	C	C	A	•	•	•
Petroleum naphtha	C	C	C	A	•	•	•
Phenol	C	A	B	A	X	•	•
Phenoxyethanol	C	C	C	A	•	•	•
Phenylhydrazine	C	C	D	A	X	•	•
1-Phenyl-1-xylyl ethane	C	C	C	A	•	•	•
Phosphoric acid (<95%)	A	A	D	A	X	•	•
Phosphorus (yellow or white)	D	D	D	D	X	X	X
Phosphorus oxychloride	C	D	D	D	X	X	•
Phosphorus pentoxide	A	B	D	A	X	•	X
Phosphorus trichloride	B	D	D	D	X	•	X
Phthalic acid (<50%)	B	B	D	A	X	•	X
Phthalic anhydride	D	D	D	D	X	X	X

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Pine oil	B	B	B	A	•	•	•
Plasticisers (most commercial)	B	B	B	A	•	•	•
Polyethylene glycol	B	B	B	A	•	•	•
Polyethylene polyamines	C	C	D	A	X	•	•
Polymethylene polyphenyl isocyanate	B	B	B	A	•	•	•
Polypropylene glycol	B	B	B	A	•	•	•
Potassium halides	A	D	D	D	X	•	•
Potassium hydroxide solution	C	C	D	A	X	•	•
Potassium salts (excluding halides - saturated)	A	B	D	A	X	•	•
Propane	Use Cryoflex		D	D	D	•	•	X
n-Propanolamine	C	C	D	A	X	•	•
Propenoic acid	B	B	D	A	X	•	•
b-Propiolactone	C	C	C	A	•	•	•
Propionaldehyde	C	C	C	A	•	•	•
Propionic acid	B	B	D	A	X	•	•
Propionic anhydride	C	C	D	A	X	•	•
Proprionitrile	C	C	C	A	•	•	•
Propyl acetate	C	C	C	A	•	•	•
Propyl alcohol	A	A	A	A	•	•	•
Propylamine	B	B	D	A	•	•	•
Propylene (tetramer & trimer)	C	C	C	A	X	•	•
Propylene dimer	C	C	C	A	•	•	•
Propylene glycol	A	A	A	A	•	•	•
Propylene glycol monoethyl ether	B	B	B	A	•	•	•
Propylene glycol monomethyl ether	B	B	B	A	•	•	•
Propylene oxide (dedicated hose)	B	B	D	A	•	•	•
Prussic acid	A	A	D	A	X	•	•
Pyridine	B	B	D	A	•	•	X
Pyrosulphuric acid	D	D	D	A	X	•	X
Rosin	C	C	C	A	•	•	•
Rosin soap solution (disproportionated)	C	C	C	A	•	•	•
Salt solutions (excluding halides)	A	B	D	A	•	•	•
Sea water	A	D	D	A	X	•	•
Sewage	B	B	D	A	•	•	•
Shellac	B	B	D	A	X	•	
Silicon oil	A	A	A	A	•	•	
Silver halides (saturated)	A	D	D	D	X	X	•
Silver salts (excluding halides - saturated)	A	B	D	A	•	•	•
Soap solutions	A	A	B	A	•	•	X
Sodium borohydride/sodium hydroxide solution (15% or less sodium hydroxide)	C	C	D	A	•	•	•
Sodium chlorate solution (50% or less)	A	A	D	A	X	•	•
Sodium chloride (saturated)	A	B	D	A	X	•	•
Sodium chromate	B	B	B	A	•	•	•
Sodium dichromate solution (70% or less)	C	C	D	A	X	•	•
Sodium Hexochlorate	Consult Engineering						
Sodium hydrosulphide solution (45% or less)	A	B	D	A	•	•	•
Sodium hydrosulphidelammonium sulphide solution	C	C	D	A	X	•	•
Sodium hypochlorite (<15%)	C	C	D	A	X	•	•
Sodium hydroxide solution	A	A	C	A	•	•	•
Sodium salts (excluding halides - saturated)	A	B	D	A	•	•	•
Stannous, stannic salts (excluding halides)	A	B	D	A	•	•	•
Starch (aqueous)	A	A	B	A	•	•	•
Styrene monomer	B	B	B	A	•	•	•
Sugar syrup	A	A	A	A	•	•	•
Sulphamic acid	A	A	D	A	X	•	•
Sulpholane	D	D	D	D	X	X	X
Sulphonyl chloride	D	D	D	D	X	X	X

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Sulphur dioxide	C	C	D	A	X	•	•
Sulphuric acid (<20%)	B	B	D	A	•	•	•
Sulphuric acid (20%-85%)	B	D	D	D	X	X	•
Sulphuric acid (>85%)	C	C	D	A	•	•	•
Sulphuric acid (fuming - see Oleum)							
Sulphuric acid (spent)	C	C	D	A	X	•	•
Sulphurous acid	B	B	D	A	•	•	•
Sulphuryl chloride	D	D	D	D	X	X	X
TAEE (See Tertiary amyl ethyl ether)	C	C	C	A	•	•	•
Tall oil (crude and distilled)	A	A	A	A	•	•	•
Tall oil fatty acid (<20% resin acids)	C	C	C	A	X	•	•
Tallow	A	A	A	A	•	•	
TAME (See Tertiary amyl methyl ether)							•
Tannic acid (<10%)	A	A	D	A	X	•	•
Tartaric acid	A	B	D	A	X	•	X
Tertiary amyl ethyl ether (TAEE)	C	C	C	A	•	•	•
Tertiary amyl methyl ether (TAME)	C	C	C	A	•	•	•
Tetrachloroethane	C	C	C	A	•	•	•
Tetrachloroethylene	C	C	C	A	•	•	•
Tetraethylene glycol	B	B	B	A	•	•	•
Tetraethylene pentamine	C	C	D	A	•	•	•
Tetrahydrofuran	C	C	C	A	•	•	X
Tetrahydronaphthalene	C	C	C	A	•	•	X
Thionyl chloride	D	D	D	D	X	X	X
Tin halides	A	D	D	D	X	X	•
Tin salts (excluding halides - saturated)	A	B	D	A	•	•	
Titanium tetrachloride	C	D	D	D	X	X	•
Toluene	C	C	C	A	•	•	X
Toluene diamine	D	D	D	D	X	X	•
Toluene diisocyanate	B	B	B	A	•	•	X
o-Toluidine	B	B	C	A	•	•	•
Transformer oil	B	B	B	A	•	•	•
Transmission oil	B	B	B	A	•	•	•
Tributylamine	B	B	B	A	•	•	•
Tributyl phosphate	B	B	B	A	•	•	
Trichloroacetic acid (10% or less)	A	B	D	D	X	X	•
1,2,4-Trichlorobenzene	C	C	C	A	•	•	•
1, 1, 2-Trichloroethane	C	C	C	A	•	•	•
1, 1, 1-Trichloroethane	C	C	C	A	•	•	•
Trichloroethylene	C	C	C	A	•	•	•
Trichloropropane	C	C	C	A	•	•	•
1, 1, 2-Trichloro-1 , 2, 2-trifluoroethane	D	D	D	D	X	X	X
Tricresyl phosphate (<1% ortho isomer)	B	B	B	A	•	•	•
Tridecanol	B	B	B	A	•	•	•
Triethanolamine	B	B	D	A	•	•	•
Triethylamine	B	B	D	A	•	•	•
Triethylbenzene	B	B	B	A	•	•	•
Triethylene glycol	A	A	A	A	•	•	•
Triethylene tetramine	B	B	D	A	•	•	•
Triethyl phosphite	C	C	D	A	X	•	•
Triisopropanolamine	B	B	D	A	•	•	•
Trimethyl acetic acid	A	A	D	A	•	•	•
1,2,4-Trimethylbenzene	B	B	B	A	•	•	•
Trimethylhexamethylene diamine (2, 2, 4- & 2, 4, 4-isomers)	C	C	D	A	•	•	•
Trimethylhexamethylene diisocyanate (2, 2, 4- & 2, 4, 4-isomers)	C	C	C	A	•	•	•
2, 2, 4-Trimethyl-1 , 3-pentanediol-1-isobutyrate	C	C	C	A	•	•	•

Chemical	Hose				Fittings		
	1	2	3	4	CS	SS	PP
Tripropylene glycol	A	A	A	A	•	•	•
Tripropylene glycol monomethyl ether	C	C	C	A	•	•	•
Tritolyl phosphate	B	B	B	A	•	•	•
Trixylenyl phosphate	B	B	B	A	•	•	•
Tung Oil	B	B	B	A	x	•	•
Turpentine	C	C	C	A	•	•	•
1-Undecene	C	C	C	A	•	•	•
Undecyl acid	C	C	C	A	•	•	•
Urea (aqueous)	A	B	B	A	•	•	•
Urea/ammonia salt solutions	A	B	B	A	•	•	•
Urea/ammonia solutions	A	B	B	A	•	•	•
n-Valeraldehyde	C	C	C	A	•	•	•
Varsol	A	A	A	A	•	•	•
Vaseline	A	A	A	A	•	•	•
Vegetable oils	A	A	A	A	•	•	•
Vinegar	A	A	D	A	X	•	•
Vinyl acetate	B	B	C	A	•	•	
Vinyl chloride monomer (VCM) Use Cryoflex 50	D	D	D	X	•	X	
Vinyl ethyl ether	C	C	C	A	•	•	•
Vinylidene chloride	C	C	C	A	•	•	•
Vinyl neodecanoate	C	C	C	A	•	•	•
Vinyl toluene	B	B	C	A	•	•	•
Water	A	A	A	A	•	•	•
White spirit (low aromatic 15% - 20%)	B	B	B	A	•	•	•
Wine	B	B	D	A	X	•	•
Xylene	C	C	C	A	•	•	•
Xylenols	B	B	B	A	•	•	•
Yeast (aqueous)	A	A	D	A	X	•	
Zinc halides	A	D	D	D	X	X	•
Zinc salts (excluding halides - aqueous)	A	B	D	A	•	•	

NOTES

NOTES

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NOTES

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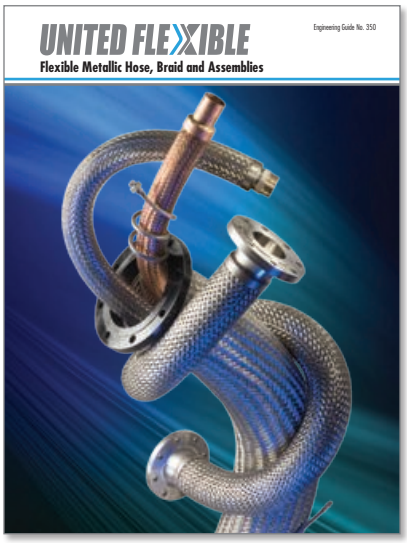
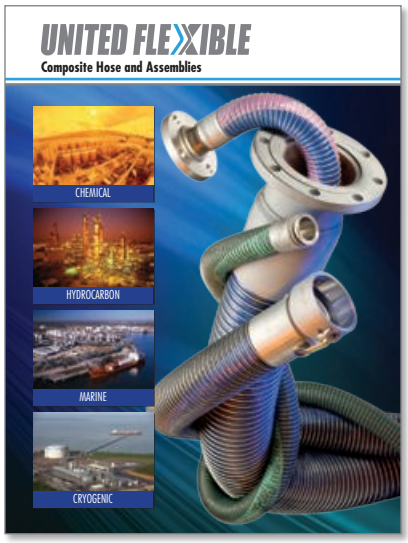
Metal



Fluoropolymer

Composite



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