SUFLEX

Tubing Products

SUFLEX®

Tubing Products

INSULATION SOLUTIONS

QUIN-T GROUP

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Quality System Registered
ISO 9002, QS-9000
Certificate QSR-516, QSR-QS-030

ASTRATITE® Type AVF Tubing

85°C Shrink Temperature

Class 125°C • Very Flexible Polyolefin Tubing
UL Recognized Component: Class 125°C, VW-1 File No. E31622
MIL-I-23053/5, Class 3, Canadian Standards Association, File No. 37065

DESCRIPTION

ASTRATITE Type AVF cross-linked polyolefin tubing is an exceptionally flexible, highly flame retarded tubing with an exceptionally low recovery temperature. It will fully recover in approximately five minutes depending on oven conditions and item being covered. Type II tubing, clear, requires 110°C for full recovery. This low shrink temperature reduces energy costs, reduces cycle time, improves productivity and reduces the danger of damage to heat sensitive parts. During the shrinkage operation, this tubing will encapsulate any device previously inserted inside it, and will assume the contour of that device. It is useful for skin-tight covering of splices, resistors, diodes, mechanical parts, terminations, etc. AVF tubing is superior to other heat shrinkable polyolefin tubings in that it passes the very stringent flammability test of ASTM D876. Type II tubing is the corresponding very flexible, clear product which is flammable. Both Type I and Type II tubings are formulated for long-term heat and corrosion resistance. Type I tubing is also formulated for superior performance in flame resistance, low temperature flexibility and chemical resistance. Continuous operation range is –55°C to +125°C. Type I tubing conforms to SAE Aerospace Material Specification AMS 3587. Type II tubing conforms to Aerospace Material Specification AMS 3588.

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
3/64	.046	(1.17)	.023	(0.58)	.016	(0.41)
1/16	.063	(1.60)	.031	(0.79)	.017	(0.43)
3/32	.093	(2.36)	.046	(1.17)	.020	(0.51)
1/8	.125	(3.18)	.062	(1.60)	.020	(0.51)
3/16	.187	(4.75)	.093	(2.36)	.020	(0.51)
1/4	.250	(6.35)	.125	(3.18)	.025	(0.64)
3/8	.375	(9.52)	.187	(4.75)	.025	(0.64)
1/2	.500	(12.70)	.250	(6.35)	.025	(0.64)
3/4	.750	(19.05)	.375	(9.52)	.030	(0.76)
1	1.000	(25.40)	.500	(12.70)	.035	(0.89)
1 1/2	1.500	(38.10)	.750	(19.05)	.040	(1.02)
2	2.000	(50.80)	1.000	(25.40)	.045	(1.14)

STANDARD COLORS

Type I — 3/64"- 1/16"Black
3/32" - 1" Black, white, red
1 1/2" - 2" Black
Type II — Clear
Other sizes and colors available on special order subject to factory acceptance.

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D2671	2686 psi
% Elongation	ASTM D2671	398%
Dielectric Withstand	2500V / Min.	Pass
Dielectric Strength	500V / mil	800 V/mil
Flexibility		
Heat Shock	4 hr. 225°C	No cracking
Heat Resistance	168 hr. / 175°C	480% elongation
Low Temperature	4 hr. –55°C	No cracking
Copper Mirror Corrosion	16 hr. / 150°C	No corrosion
Copper Stability	168 hr. / 150°C	490% elongation
Color Stability	48 hr. / 175°C	MIL-STD-104
Flammability (Type I only)	ASTM D876	Self-extinguishing
Volume Resistivity	ASTM D2671	$4x10^{16}$ ohm-cm
Longitudinal Change	200°C / 3 min.	–5% Typ. –10% Max.
Secant Modulus	UL 224	10,000 psi
Water Absorption	ASTM D570	0.2%
Solvent Resistance	24 hrs. / 25°C	
JP 4		1700 psi
Skydrol 500		850 V/mil
Av Gas		
Hyd. Fluid		
Water		
Specific Gravity		
— Type I	ASTM D792	1.32
— Type II		0.96

PACKAGING

4 Foot Cut Lengths.
Spools of continuous lengths.
Cut to customer specifications.

ASTRATITE® Type AF Tubing

Class 125°C • Flexible Polyolefin Tubing
UL Recognized Component: File No. E31622
Canadian Standards Association: File No. 37065
ASTM D3149, Type I and Type II
M1L-I-23053/5, Class 1 and 2

DESCRIPTION

ASTRATITE Type AF is a flexible cross-linked polyolefin heat shrinkable tubing that will recover to half its original diameter when heated to 120°C or higher. During the shrinking operation, the tubing will encapsulate any device inside of it at the time, and will assume the contour of that device. It is useful for skin-tight covering of splices, resistors, diodes, mechanical parts, terminations, etc. Type I tubing is self-extinguishing when tested according to Federal Standard No. 228. Type II tubing is the corresponding clear tubing and is flammable. Both types are formulated for long-term heat and corrosion resistance. Type I tubing is also formulated for superior low temperature flexibility and chemical resistance. Continuous operating range is –55°C to +135°C. Type I tubing conforms to MIL-I-23053/5 and SAE Aerospace Material Specification AMS 3636. Type II tubing conforms to MIL-I-23053/5 and SAE Aerospace Material Specification AMS 3637.

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
3/64	.046	(1.17)	.023	(0.58)	.016	(0.41)
1/16	.063	(1.60)	.031	(0.79)	.017	(0.43)
3/32	.093	(2.36)	.046	(1.17)	.020	(0.51)
1/8	.125	(3.18)	.062	(1.60)	.020	(0.51)
3/16	.187	(4.75)	.093	(2.36)	.020	(0.51)
1/4	.250	(6.35)	.125	(3.18)	.025	(0.64)
3/8	.375	(9.52)	.187	(4.75)	.025	(0.64)
1/2	.500	(12.70)	.250	(6.35)	.025	(0.64)
3/4	.750	(19.05)	.375	(9.52)	.030	(0.76)
1	1.000	(25.40)	.500	(12.70)	.035	(0.89)
1 1/2	1.500	(38.10)	.750	(19.05)	.040	(1.02)
2	2.000	(50.80)	1.000	(25.40)	.045	(1.14)
3	3.000	(76.20)	1.500	(38.10)	.050	(1.27)
4	4.000	(101.60)	2.000	(50.80)	.055	(1.40)

PACKAGING

4 Foot Cut Lengths.

Spools of continuous lengths.

Cut to customer specifications.

STANDARD COLORS

Type I — 3/64"- 1/16" Black
3/32" - 1" Black, white, red, yellow, green and blue
1 1/2" - 4" Black
Type II — Clear
Other colors available on special order subject to factory acceptance.

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D638	1775 psi
% Elongation	ASTM D638	395%
Dielectric Withstand	2500V / 1 Min.	Pass
Dielectric Strength	500V / mil	825 V/mil
Heat Aging	175°C / 168 hrs.	283% elongation
Heat Shock	250°C / 4 hrs.	No cracking
Heat Resistance	168 hr. / 175°C	480% elongation
Low Temperature Flexibility	–55°C / 4 hrs.	No cracking
Corrosive Effect (mirror)	150°C / 16 hrs.	No corrosion
Copper Stability	160°C / 168 hrs.	275% elongation
Color Stability	MIL-STD-104, 175°C / 4 hrs.	No change
Flammability — Type I only	Fed. Std. No. 228	Self-extinguishing
Volume Resistivity — Type I	ASTM D257	8×10^{14} ohm-cm
— Type II		1×10^{17} ohm-cm
Longitudinal Change	200°C / 3 min.	–3% Typ. 5% Max.
Secant Modulus	UL 224	1.9×10^{4} psi
Water Absorption	ASTM D570	0.3%
Solvent Resistance	25°C / 24 hrs.	
JP 4		1600 psi
Water		800 V/mil
Av Gas		
Hyd. Fluid		
Skydrol 500		
Specific Gravity — Type I	ASTM D882	1.25
— Type II	ASTM D882	0.93

ASTRATITE® TYPE ASR TUBING

Class 135°C • Semi-Rigid Polyolefin Tubing
UL Recognized Component: Class 125°C, File No. E31622
Canadian Standards Association: File No. 37065
ASTM D3149, Type III and Type IV
M1L-I-23053/6, Class 1 and 2

DESCRIPTION

ASTRATITE Type ASR tubing is a semi-rigid cross-linked polyolefin heat shrinkable tubing that will recover to half its original diameter when heated to 135°C or higher. During the shrinking operation, the tubing will encapsulate any device inside of it at the time and will assume the contour of that device. It is useful for skin-tight covering of splices, resistors, diodes, mechaical parts, terminations, etc. Type I tubing is self-extinguishing when tested according to Federal Standard No. 228. Type II tubing is the corresponding clear tubing and it is flammable. Both are formulated for long-term heat and corrosion resistance, low temperature flexibility and chemical resistance. Continuous operating range is –55°C to +135°C. Type I tubing conforms to MIL-I-23053/6 and SAE Aerospace Material Specification AMS 3638. Type II tubing conforms to MIL-I-23053/6 and SAE Aerospace Material Specification 3639.

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
3/64	.046	(1.17)	.023	(0.58)	.020	(0.41)
1/16	.063	(1.60)	.031	(0.79)	.020	(0.43)
3/32	.093	(2.36)	.046	(1.17)	.020	(0.51)
1/8	.125	(3.18)	.062	(1.60)	.020	(0.51)
3/16	.187	(4.75)	.093	(2.36)	.025	(0.51)
1/4	.250	(6.35)	.125	(3.18)	.025	(0.64)
3/8	.375	(9.52)	.187	(4.75)	.030	(0.64)
1/2	.500	(12.70)	.250	(6.35)	.030	(0.64)
3/4	.750	(19.05)	.375	(9.52)	.030	(0.76)
1	1.000	(25.40)	.500	(12.70)	.035	(0.89)

PACKAGING

4 foot cut lengths — Size ½" to 1".
Spools of continuous lengths — Size 3/64" to 3/8".
Cut to customer specifications.

STANDARD COLORS

Type I — Black
Type II — Translucent
Other colors available on special order.

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D638	2700 psi
% Elongation	ASTM D638	450%
Dielectric Withstand	2500 V/1 min	Pass
Dielectric Strength	500 V/mil	975 V/mil
Heat Aging	340°C / 168 h	275% elongation
Heat Shock	250°C / 4 h	No cracking
Low Temperature Flexibility	–55°C / 4 h	No cracking
Corrosive Effect (mirror)	175°C / 16 h	No corrosion
Color Stability	175°C / 48 h	No change
Flammability — Type I only	Fed. Std. No. 228	Self-extinguishing
Volume Resistivity — Type I — Type II	ASTM D257	10^{14} ohm-cm 10^{16} ohm-cm
Longitudinal Change	200°C / 3 min	–3% Typ. 5% Max.
Secant Modulus	UL 224	5 x 10^4 psi
Water Absorption	ASTM D570	0.15%
Solvent Resistance	25°C / 24 h	
JP 4		2200 psi
Water		1000 V/mil
Av Gas		
Hyd. Fluid		
Skydrol 500		
Specific Gravity — Type I	ASTM D792	1.20
— Type II		0.97

ASTRATITE® TYPE ASR-C TUBING

Commercial Grade Semi-Rigid Polyolefin Heat Shrinkable Tubing for Terminal Insulation
UL Recognized Component: Class 125°C, 600 Volt, File No. E31622

DESCRIPTION

ASTRATITE Type ASR-C tubing is a semi-rigid, cross-linked, commercial grade heat shrinkable tubing that will recover to approximately 43% of its original diameter when heated to 135°C or higher. During the shrinking operation, the tubing will encapsulate any device inside of it at the time and will assume the contour of that device. ASTRATITE ASR-C tubing is designed particularly as an electrical terminal insulation with mechanical support. It is flame retarded, heat resistant, corrosion resistant and solvent resistant. ASTRATITE ASR-C tubing exhibits outstanding abrasion and impact resistance, and is recommended where mechanical, as well as electrical protection of parts is required. ASTRATITE ASR-C tubing will meet the physical properties requirements of MIL-I-23053/6.

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D638	2700 psi
% Elongation	ASTM D638	450%
Dielectric Withstand	250 V/1 min	Pass
Dielectric Strength	500 V/mil	975 V/mil
Heat Aging	175°C / 168 h	275% elongation
Low Temperature Flexibility	-55°C / 4 h	No cracking
Corrosive Effect (mirror)	175°C / 16 h	No corrosion
Heat Shock	250°C / 4	No cracking
Color Stability	175°C / 48 h	No change
Flammability	Fed. Std. 228	Self-extinguishing
Volume Resistivity	ASTM D257	10^{14} ohm-cm
Longitudinal Change (during restricted recovery)	200°C / 3 min	-6% Typ. -10% Max.
Secant Modulus	UL 224	5 x 10^4 psi
Water Absorption	ASTM D570	0.15%
Solvent Resistance	25°C / 24 h	
	JP-4	2200 psi 1000 V/mil
	Water	
	Av. Gas	
	Hyd. Fluid (MIL-H-5606)	
	Skydrol 500	
Specific Gravity	ASTM D792	1.20

DIMENSIONS

Product Designation	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
ASR-C.22	.220	(5.58)	.095	(2.43)	.025	(0.63)
ASR-C.30	.300	(7.62)	.125	(3.17)	.025	(0.63)
ASR-C.35	.350	(8.89)	.150	(3.81)	.027	(0.68)
ASR-C.46	.460	(11.68)	.200	(5.08)	.030	(0.76)

APPLICATIONS

Terminal insulation.
Strain relief.

PACKAGING

4 foot cut lengths.
Cut to 1' lengths.
Cut or spooled to customer specifications.

STANDARD COLORS

Type I — Black
Other colors available on special order.

ASTRATITE® TYPE ACP TUBING

Class 90°C • Commercial Grade Flexible Polyolefin Heat Shrinkable Tubing

DESCRIPTION

ASTRATITE ACP tubing is a 90°C rated commercial grade, flexible, cross-linked heat shrinkable polyolefin tubing. It is designed for applications where cost is the dominant factor, and where the 125°C rating and flame retardance properties of considerably more expensive polyolefin tubings are not required.

ASTRATITE ACP tubing has outstandingly high flexibility. Its clear bright colors give it an unusually high level of aesthetic appeal for consumer products. Its shelf life at normal storage temperatures is unlimited, with no change occurring in dimensions or in its 50% recovery ratio. It recovers to half its original inside diameter when heated to 135°C or higher.

ASTRATITE ACP tubing conforms to its substrate's contours, providing a skin-tight covering, when recovered over components or assemblies such as resistors, in-line fuses, terminations, splices, capacitors, bus bars, CB antennas, etc. This covering shields the part from dirt, moisture, corrosive agents, oxygen, etc., while providing a high level of electrical and mechanical protection (see table of performance characteristics).

PACKAGING

Spools of continuous lengths.
Cut to customer specifications.
*Made to order-minimums apply.

STANDARD COLORS

Standard — Black and white.
Other colors available on special order.

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
*3/64"	.046	(1.17)	.023	(0.58)	.016	(0.41)
1/16"	.063	(1.60)	.031	(0.79)	.017	(0.43)
3/32"	.093	(2.36)	.046	(1.17)	.020	(0.51)
1/8"	.125	(3.18)	.062	(1.60)	.020	(0.51)
3/16"	.187	(4.75)	.093	(2.36)	.020	(0.51)
1/4"	.250	(6.35)	.125	(3.18)	.025	(0.64)
3/8"	.375	(9.52)	.187	(4.75)	.025	(0.64)
1/2"	.500	(12.70)	.250	(6.35)	.025	(0.64)
*3/4"	.750	(19.05)	.375	(9.52)	.030	(0.76)
*1"	1.000	(25.40)	.500	(12.70)	.035	(0.89)

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D638	2700 psi
Elongation	ASTM D638	450%
Heat Aging	121°C / 168 h	350% elongation
Copper Stability	121°C / 168 h	300% elongation
Dielectric Withstand	2500V / 1 min	Pass
Heat Shock	136°C / 1 h	No cracking
Cold Bend	-10°C / 1 h	No cracking
Volume Resistivity	ASTM D257	10^{14} ohm-cm
Longitudinal Change	300°F / 3 min	5% Typ. - 10% Max.
Restricted Recovery	150°C / 1 h	No Cracking
Shelf Life	40°C / 14 days	I.D. does not change
Secant Modulus	UL 224	1.4 x 10^4 psi
Specific Gravity	ASTM D882	0.93
Eccentricity	—	15%

ASTRATITE® Type VC Tubing

Class 105°C • Heat Shrinkable Polyvinylchloride Tubing
UL Recognized Component: Class 105°C, VW-1 File No. E31622
Canadian Standards Association: File No. 37065
M1L-I-23053/2, Class 2, ASTM D3150, Type I

DESCRIPTION

ASTRATITE Type VC tubing is a polyvinylchloride heat shrinkable tubing that will recover to half its original diameter when heated to 135°C or higher. During the shrinking operation, the tubing will encapsulate any device inside of it at the time and will assume the contour of that device. It is useful for skin-tight covering of splices, resistors, diodes, mechanical parts, terminations, antennas, etc.
The tubing is self-extinguishing when tested according to UL 224, Table 25.5 VW-1. The tubing is designed for chemical resistance, 105°C heat resistance, corrosion resistance and low temperature flexibility. Continuous operating range is -35°C to +105°C. ASTRATITE VC tubing conforms to MIL-I-23053/2. ASTRATITE VC tubing has the following characteristics when tested according to UL 224, Table 25-5.

PERFORMANCE CHARACTERISTICS

Property	Typical Value
Tensile Strength	3,000 psi
Elongation	250%
Dielectric Withstand	Pass 2000V/1 min
Heat Aging	
(7 days/136°C)	
Flexibility	No cracking
Tensile Strength	3,000 psi
Elongation	220%
Copper Corrosion	No discoloration
Copper Stability	200% elongation
Dielectric Strength	800 V/mil
Deformation (1 h / 121°C)	30% wall decrease
Heat Shock (1 h/121°C/20% Elong.)	No cracking
Cold Bend (1 h/ -10°C)	No cracking
Flame Resistance (VW-1)	3 sec to extinguish
Volume Resistivity	10^{11} ohm-cm
Longitudinal Change (3 Min. / 150°C)	-15% typical,
(After unrestricted recovery)	-20% Max.
Restricted Recovery	5,000 V
Shelf Life (90 Days / 70°F)	Meets I.D. requirement
Secant Modulus UL 224	19,500 psi
Specific Gravity	1.25

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Recovered Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
3/64	.046	(1.17)	.023	(0.58)	.020	(0.51)
1/16	.063	(1.60)	.031	(0.79)	.020	(0.51)
3/32	.093	(2.36)	.046	(1.17)	.020	(0.51)
1/8	.125	(3.18)	.062	(1.60)	.025	(0.64)
3/16	.187	(4.75)	.093	(2.36)	.025	(0.64)
1/4	.250	(6.35)	.125	(3.18)	.025	(0.64)
5/16	.312	(7.92)	.156	(3.96)	.028	(0.71)
3/8	.375	(9.52)	.187	(4.75)	.030	(0.76)
1/2	.500	(12.70)	.250	(6.35)	.030	(0.76)
5/8	.625	(15.88)	.312	(7.92)	.035	(0.89)
3/4	.750	(19.05)	.375	(9.52)	.035	(0.89)
1	1.000	(25.40)	.500	(12.70)	.040	(1.02)
1 1/2	1.500	(38.10)	.750	(19.05)	.045	(1.14)
2	2.000	(50.80)	1.000	(25.40)	.050	(1.27)
2 1/2	2.500	(63.50)	1.250	(31.75)	.060	(1.52)
3	3.000	(76.20)	1.500	(38.10)	.060	(1.52)
4	4.000	(101.60)	2.000	(50.80)	.065	(1.65)

STANDARD PACKAGING

Spools of continuous lengths.
Cut to customer specifications.

STANDARD COLORS

3/64"- 1/16" Black
3/32" - 1" Black, white, and clear
1 1/2" - 4" Black
Other colors available on special order.

ASTRATITE® TYPE VC-TW TUBING

Class 105°C • Heat Shrinkable Polyvinylchloride Tubing
UL Recognized Component: Class 105°C, 600 Volt, VW-1, File No. E31622
MIL-I-23053/2, Class 2, Thin Wall

DESCRIPTION

ASTRATITE VC-TW tubing is a polyvinylchloride heat shrinkable tubing manufactured with a thin wall for use when the voltage is low and flexibility of the insulated part is required. The insulation is identical to ASTRATITE VC tubing, but wall thickness is less, providing improved flexibility. ASTRATITE VC-TW tubing recovers to approximately 40% of original diameter as opposed to 50% for the heavier-walled ASTRATITE VC tubing.

When recovered, ASTRATITE VC-TW tubing will exhibit less longitudinal shrinkage than competitive tubings. Shelf stability is generally greater than competitive tubings. When recovered on a part, it will conform to the contour of that part providing a skin-tight covering that will shield the part from dirt, moisture, or corrosive environments. Resistors, capacitors, bus bars and antenna parts can be covered by ASTRATITE VC-TW tubing. This tubing can also be used as protection for antenna load coils. Abrasion resistance and thermal stability are excellent.

ASTRATITE VC-TW tubing is manufactured to conform to Underwriters Laboratories UL 224 Standard for Safety: Extruded Thermoplastic Insulating Tubing, Table 25.5 and passes the VW-1 flammability test. It is recommended for continuous use up to 105°C. Recommended shrinking conditions are 135°C for 3 minutes. ASTRATITE VC-TW tubing has the following characteristics when tested according to UL 224, Table 25.5.

DIMENSIONS

Size	Minimum Expanded I.D.		Maximum Recovered I.D.		Nominal Wall Recovered	
	Inch	(mm)	Inch	(mm)	Inch	(mm)
1/16"	.063	(1.60)	.037	(0.94)	.014	(.356)
3/32"	.093	(2.36)	.055	(1.40)	.014	(.356)
1/8"	.125	(3.18)	.075	(1.91)	.014	(.356)
3/16"	.187	(4.75)	.110	(2.79)	.018	(.457)
1/4"	.250	(6.35)	.150	(3.81)	.022	(.558)
3/8"	.375	(9.52)	.225	(5.72)	.022	(.558)
1/2"	.500	(12.70)	.300	(7.62)	.022	(.558)
5/8"	.625	(15.88)	.375	(9.52)	.022	(.558)
3/4"	.750	(19.05)	.450	(11.43)	.022	(.558)

Other sizes available subject to factory quotation and acceptance.

PERFORMANCE CHARACTERISTICS

Property	Typical Value
Tensile Strength	3,000 psi
Elongation	250%
Dielectric Withstand	Pass 2000 V/1 min
Heat Aging (7 days/136°C)	
Flexibility	No cracking
Tensile Strength	3,000 psi
Elongation	220%
Copper Corrosion (mirror)	No discoloration
Copper Stability	200% Elongation
Dielectric Strength	800 V/mil
Deformation (1 h / 121°C)	30% wall decrease
Heat Shock (1 h/121°C/20% Elong.)	No cracking
Cold Bend (1 h/ -10°C)	No cracking
Flame Resistance (VW-1)	3 sec to extinguish
Volume Resistivity	10^{11} ohm-cm
Longitudinal Change (3 Min. / 150°C)	-15% typical, -25% Max.
Restricted Recovery	5,000 V (breakdown)
Shelf Life (90 Days / 70°F)	Meets I.D. requirement
Secant Modulus UL 224	19,500 psi
Specific Gravity	1.25

PACKAGING

Spools of continuous lengths.
Cut to customer specifications.

STANDARD COLORS

Clear, Black.
Other colors available on special order.

ASTRATITE® Type ADM Tubing

65°C Shrink Temperature

Mechanical and Electrical Grade
Operating Temperature -70°C to +105°C

PROPERTIES

LOW TEMPERATURE FLEXIBILITY

ASTRATITE ADM tubing has an inherently elastomeric nature, which gives it a unique brittleness temperature of below -70°C. This property makes ASTRATITE ADM tubing fracture- and mar-resistant at sub-zero temperatures.

LOW SHRINK TEMPERATURE

ASTRATITE ADM tubing shrinks at 65°C (149°F), which is probably the lowest of any commercial heat shrinkable tubing's shrink temperature. This translates into economy of application. Almost any heat source — infrared lamps, convection or non-convection oven, hot water, heating tunnel — will do. No special skills are needed, and the low shrink temperature means low shrink time, and therefore low labor and energy input. The low shrink temperature reduces the risk of damage to temperature-sensitive substrates, such as coaxial cables and fiber optic cables during the shrink operation.

MOISTURE RESISTANCE

As shown in the table of Performance Characteristics, continuous immersion in water at 90°C (194°F) for over half a year (28 weeks) failed to cause changes in two very water-sensitive properties — dielectric constant and dissipation factor.

WEATHER RESISTANCE

The base polymer from which ASTRATITE ADM tubing is made is widely used in outdoor applications, and has proved itself as highly resistant to the deteriorating effects of exposure to the weather. This makes it well suited for applications which involve use, and even storage, out-of-doors.

STORAGE

ASTRATITE ADM tubing is dimensionally stable and will retain its original expanded inside diameter for a minimum of one year when stored at temperatures not exceeding 27°C (80°F).

ELECTRICAL PROPERTIES

Although ASTRATITE ADM tubing is primarily intended for mechanical applications, a review of its electrical properties, as presented in the Performance Characteristics table, shows it to be an excellent high voltage electrical insulation.

TYPICAL USES

ASTRATITE ADM is ideal for almost any application requiring a low shrink temperature to protect heat sensitive parts or where ease and speed of shrink are required.

- Battery packs
- Terminal insulation
- Covering of diodes and thermal switches
- Handle grips
- Cable jackets
- Weather protection

DIMENSIONS

Available on special order in expanded ID's from 3⁄32" through 2½", subject to minimum quantity requirements.

STANDARD COLORS

Black and red — other colors on special order subject to minimum quantity requirements.

PERFORMANCE CHARACTERISTICS

Property	Specification	Typical Value
Tensile Strength	ASTM D2671	2242 psi (15,500kPa)
Tear Strength	ASTM D624, Die C	980 lbs/inch thickness (171.5 kN/m)
Tear Strength	ASTM D470, Die D	150 lbs/inch thickness (26.2 kN/m)
Secant Modulus	ASTM D2671	2970 psi (20,000kPa)
Modulus @ 200% elongation	ASTM D412	1100 psi (8.270kPa)
Brittleness temperature	ASTM D746	-94°F (-70°C)
Durometer hardness, Shore A	ASTM D412	85
Specific gravity	ASTM D412	1.19
Longitudinal change unrestricted (100%) recovery	300°F (149°C) / 3 min	-25% nominal
Longitudinal change at 44% diameter recovery	300°F (149°C) / 3 min	-15% (typical)
Dielectric strength	ASTM D2671	694 v/mil (27.3kV/mm)
Volume resistivity	ASTM D2671	10^{15} ohm-cm
Dissipation factor	ASTM D150	0.32%
Dissipation factor after 28 weeks in 90°C water	ASTM D150	0.33%
Dielectric constant	ASTM D150	2.72
Dielectric constant after 28 weeks in 90°C water	ASTM D150	2.73

ASTRA® 703/105 PVC Tubing Test Data

Class 105°C • For General Purpose Heat-Resistant Applications
UL Recognized Component: Class 105°C, 300 and 600 Volt VW-1 File No. E31622
Canadian Standards Association: File No. 37065
MIL-I-631, Grade C, Form U, Subform Ua, Class I and II, Category 1, ASTM D922 Grade C

DESCRIPTION

ASTRA 703/105 is high heat-resistant, extruded polyvinyl-chloride plastic tubing designed for continuous use in 105°C applications. This material carries the Underwriters Laboratories recognition and is rated VW-1 by the Laboratories. ASTRA 703/105 PVC tubing is supplied in continuous lengths on spools and in cut pieces.

PERFORMANCE CHARACTERISTICS

Property	Underwriters Laboratories, Inc. Subject 24		MIL-I-631 Grade CRequirements		Typical ASTRA 703/705 Performance
	Conditioning	Requirements	Conditioning	Requirements	
Dielectric Strength – Dry – Wet			C96/23/50 C-96/23/96	Min. 800V / mil Min. 85% of Dry	1180V / mil 94% of Dry
Shelf Aged Oven Aged	60 days @ 23°C 60 days @ 133°C	Min. 2500V for 1 min and then increase to breakdown Min. 50% of shelf aged			Exceeds requirements — Avg. Dielectric Breakdown 15,000 to 30,000V Avg. 88%
Dielectric Constant – Dry – Wet			C-96/23/50 C-96/23/96	Maximum 7.0 Maximum 8.0	2.96 3.71
Dissipation Factor – Dry Dissipation Factor – Wet			C-96/23/50 C-96/23/96	Maximum .14 Maximum .16	.050 .059
Insulation Resistance	Tap water @ 60°F	Mins. from 2.11 to 0.059 megaohms/ M ft. from #24 to 2-1/2"			Exceeds requirements
Volume Resistivity			None	Min. $1x10^{10}$ ohm-cm	308×10^{10}
Tensile Strength Unaged Shelf Aged Oven Aged	 60 days @ 23°C 60 days @ 113°C	 Min. 1500 psi Min. 70% of shelf aged	C-96/23/50	Min. 1800 psi	 3480 psi Over 3,000 psi 90 - 95%
Tensile Elongation Unaged Shelf Aged Oven Aged	 60 days @ 23°C 60 days @ 113°C	 100% Minimum Min. 70% of shelf aged	C-96/23/50 400 h 130°C	Min. 200% Max. 350% Max. 35% change	315% 250 - 350% 80 - 90% of Original
Heat Shock	1 h @ 136°C	No cracking			No cracking
Lengthwise Shrinkage			2 h 130°C	10% Max.	5%
Softening Temperature			None	Min. 70°C	100°C
Deformation	2 h @ 121°C	Max. decrease wall thickness 50%			22% decrease
Flexibility	60 days @ 113°C	No cracks — returns to round cross sections after creasing	200 h 100°C	No cracks 180° bend around 1/8" rod	No cracking — proper return to round cross section
Cold Performance	-10°C	No cracks — 6 turns around mandrel	50% brittle temp. impact method	Max. -10°C	No cracks at -25°C -35°C brittle point
Flame Resistance	Five 15 sec. flame applications	Not burn longer than 1 min after application	None	Max. 15 sec.	Self-extinguishing in 10 sec or less
Corrosion	7 days @ 186°C	No deleterious effect on copper or tubing	720 h 70°C high humidity	No corrosion, Max. 2% resistance increase of conductor.	Conforms 0.8% resistance increase
Oil Resistance			High swelling oil 200 h 50°C	No cracks, no oil penetration, max. 10° increase in dia.	Conforms 0.5% increase
Fungus Resistance			12 mos. 23°C 50% RH in fungus culture	No fungus growth	Conforms
Bursting Strength Increasing Pressure Continuous Pressure			 C-96/23/50 C-96/23/50	 + Min. 29 psi to 96 psi + Min. 15 psi to 48 psi	Exceeds all requirements by 90%

ASTRA® 703/105 PVC Tubing Dimensions

FEATURES

ASTRA 703/105 tubing has a high dielectric strength which is maintained to an excellent degree in conditions of heat and humidity. This material is also highly resistant to oils, aliphatic solvents, acids and alkalies. It swells slightly in aromatic hydrocarbons, but withstands normal dip and bake varnish cycles.

APPLICATIONS

ASTRA 703/105 tubing is widely used on transformer, motor and coil lead wires. It also finds applications in electronic apparatus and in consumer goods such as toys, blenders, food machines, outboard motors, lawn care equipment, stereos, lighting equipment, motorcycles, etc. ASTRA 703/105 tubing may also be used for vacuum or pressure hoses and transfer of compatible liquids.

DIMENSIONS

Size	I.D. Nominal		I.D. Max.		I.D. Min.		300 V. Grade Wall Inch	600 V Grade Wall Inch	1/32" Wall Grade, Inch*	Standard Package
	Inch	(mm)	Inch	(mm)	Inch	(mm)				
24	.022	(.5588)	.027	(.6858)	.020	(.5080)	.012 ± .002	—	—	1000' Spools
22	.027	(.6858)	.032	(.8128)	.025	(.6350)	.012 ± .002	—	—	1000' Spools
20	.034	(.8636)	.039	(.9906)	.032	(.8128)	.016 ± .003	.020 ± .003	.032 ± .004	1000' Spools
19	.038	(.9652)	.044	(1.1176)	.036	(.9144)	.016 ± .003	.020 ± .003	.032 ± .004	1000' Spools
18	.042	(1.0668)	.049	(1.2446)	.040	(1.0160)	.016 ± .003	.020 ± .003	.032 ± .004	1000' Spools
17	.047	(1.1938)	.054	(1.3716)	.045	(1.1938)	.016 ± .003	.025 ± .003	.032 ± .004	1000' Spools
16	.053	(1.3462)	.061	(1.5494)	.051	(1.2954)	.016 ± .003	.025 ± .003	.032 ± .004	1000' Spools
15	.059	(1.4986)	.067	(1.7018)	.057	(1.4478)	.016 ± .003	.025 ± .003	.032 ± .004	1000' Spools
14	.066	(1.6764)	.074	(1.8796)	.064	(1.6256)	.016 ± .003	.025 ± .003	.032 ± .004	500' Spools
13	.076	(1.9304)	.082	(2.0320)	.072	(1.8288)	.016 ± .003	.025 ± .003	.032 ± .004	500' Spools
12	.085	(2.1590)	.091	(2.3114)	.081	(2.0574)	.016 ± .003	.025 ± .003	.032 ± .004	500' Spools
11	.095	(2.4130)	.101	(2.5654)	.091	(2.3114)	.016 ± .003	.025 ± .003	.032 ± .004	500' Spools
10	.106	(2.6924)	.112	(2.8448)	.102	(2.5908)	.016 ± .003	.025 ± .003	.032 ± .004	500' Spools
9	.118	(2.9972)	.124	(3.1496)	.114	(2.8956)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
8	.133	(3.3782)	.141	(3.5814)	.129	(3.2766)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
7	.148	(3.7592)	.158	(4.0132)	.144	(3.6576)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
6	.166	(4.2164)	.178	(4.5212)	.162	(4.1148)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
5	.186	(4.7244)	.198	(5.0292)	.182	(4.6228)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
4	.208	(5.2832)	.224	(5.6896)	.204	(5.1816)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
3	.234	(5.9436)	.249	(6.3246)	.229	(5.8166)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
2	.263	(6.6802)	.278	(7.0612)	.258	(6.5532)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
1	.294	(7.4676)	.311	(7.8994)	.289	(7.3406)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
0	.330	(8.3820)	.347	(8.8138)	.325	(8.2550)	.020 ± .003	.025 ± .003	.032 ± .004	500' Spools
5/16"	.312	(7.9248)	.334	(8.4836)	.312	(7.9248)	.025 ± .003	025 ± .003	.032 ± .004	500' Spools
3/8"	.375	(9.5250)	.399	(10.1346)	.375	(9.5250)	.025 ± .003	.025 ± .003	.032 ± .004	300' Spools
7/16"	.438	(11.1252)	.462	(11.7348)	.438	(11.1252)	.025 ± .003	.025 ± .003	.032 ± .004	300' Spools
1/2"	.500	(12.7000)	.524	(13.3096)	.500	(12.7000)	.025 ± .003	.025 ± .003	.032 ± .004	300' Spools
5/8"	.625	(15.8750)	.655	(16.6370)	.625	(15.8750)	.030 ± .003	.030 ± .003	—	200' Spools
3/4"	.750	(19.0500)	.786	(19.9644)	.750	(19.0500)	.035 ± .003	.035 ± .003	—	200' Spools
7/8"	.875	(22.2250)	.911	(23.1394)	.875	(22.2250)	.035 ± .003	.035 ± .003	—	100' Spools
1"	1.000	(25.4000)	1.036	(26.3144)	1.000	(25.4000)	.035 ± .003	.035 ± .003	—	100' Spools
*1 1/4"	1.250	(31.7500)	1.290	(32.7660)	1.250	(31.7500)	.040 ± .005	.040 ± .005	—	100' Spools
*1 1/2"	1.500	(38.1000)	1.550	(39.1000)	1.500	(38.1000)	.045 ± .006	.045 ± .006	—	50' Spools
*1 3/4"	1.750	(44.6024)	1.812	(46.0480)	1.750	(44.6024)	.055 ± .008	.055 ± .008	—	50' Spools
* 2"	2.000	(50.8000)	2.070	(52.5780)	2.000	(50.8000)	.060 ± .010	.060 ± .010	—	50' Spools
*2 1/2"	2.500	(63.5000)	2.570	(65.2780)	2.500	(63.5000)	.070 ± .010	.070 ± .010	—	50' Spools

* Other sizes & wall thicknesses available. Please contact factory.

STANDARD COLORS

Sizes #24-2: Clear and black.
Sizes #1-2½": Black.

OTHERS COLORS

Available on special order.

ASTRA® 601 PVC Tubing Test Data

Class 85°C • For Low Temperature Applications
MIL-I-7444 Types I and III, MIL-I-22076

DESCRIPTION

ASTRA 601 tubing is an extruded polyvinylchloride tubing manufactured to withstand temperatures as low as -70°C. The unpigmented product exhibits very high clarity, making possible easy identification of legends and color-coded wires jacketed with the product.

ASTRA 601 tubing is supplied in continuous lengths on spools or in cut pieces.

FEATURES

The low temperature characteristics of ASTRA 601 tubing produce unusual flexibility and high cut-through resistance with maintenance of dielectric strength. The upper thermal limit of 85°C is outstanding for this type of tubing.

APPLICATIONS

ASTRA 601 tubing is recommended for harnessing, cable or conduit installations, especially where very low temperatures are to be encountered such as airborne devices, aircraft, missiles and snow machine wiring harness jackets.

APPLICABLE SPECIFICATIONS

QPL MIL-I-7444 Types I and III, MIL-I-22076.

PERFORMANCE CHARACTERISTICS

Property	MIL-I-7444 Conditioning	MIL-I-7444 Requirements	Typical ASTRA 601 Performance
Dielectric Strength – Dry – Wet	None 24 h immersion in water	Min. 200 V/mil Min. 200 V/mil — 20% Max. change	545 V/mil 493 V/mil — 9.6% change
Tensile Strength – Unaged – Aged	None E-168/70°C	Min. 1800 psi 15% Max. change	2150 psi 2.8% change
Cold Brittleness – Unaged – Aged	None E-168/70°C	Max. -67.9°C (-90°F) Max. -65°C (-85°F)	-74°C (-101°F) -72°C (-98°F)
Elongation – Unaged – Aged	None E-168/70°C	Min. 200% 15% Max. change	352% 1.6% change
Flame Resistance	None	Max. 15 seconds	Self-extinguishing in 9.6 sec.
Oil Resistance	8 h immersion in oil @ 212°F	No tack or decomposition, No cracks 180° bend around ¼" rod.	Conforms
Corrosion Resistance	C-336/25/95	No corrosion of copper or aluminum	Conforms
Fungus Resistance	C-336/90/95	No fungus growth	Conforms
Transparency (Type I)	None	Max. #2 Hillige Color Comparator	#1 (in all size ranges)
Specific Gravity	None	Max. 1.45	1.19 Avg.

Standard colors - clear and black.
Standard package - spools only.
Standard sizes 24 to 1".

ASTRA® 701 PVC Tubing Test Data

Class 90°C • For General Purpose Applications
QPL MIL-I-631, Grades A and B, Form U, Subform Ua
Class I and II, Category 1, ASTM D922 Grades A and AFR

DESCRIPTION

ASTRA 701 PVC tubing is a high quality, general purpose, extruded polyvinylchloride tubing of exceptionally wide thermal range, from +90°C to -55°C.

FEATURES

ASTRA 701 tubing maintains a high dielectric strength, excellent flexibility, non-corrosiveness and fungus resistance over its full temperature range.

APPLICATIONS

ASTRA 701 tubing finds applications in appliances, electric motors, commercial and military aircraft, automotive components and a host of other installations. Its low temperature characteristics make it particularly useful in airborne equipment, electrical harnesses, motorcycles and snow machines.

APPLICABLE SPECIFICATIONS

QPL MIL-I-631, Grades A & B, Form U, Subform Ua, Class I and II, Category 1, ASTM D922, Grades A & AFR.

PERFORMANCE CHARACTERISTICS

Property	MIL-I-631 Conditioning Grade A & B	MIL-I-631 Requirements		Typical ASTRA 701 Performance
		Grade A	Grade B	
Dielectric Strength – Dry – Wet	C96/23/50 C-96/23/96	Min. 800 V/mil Min. 90% of dry	Min. 750 V/mil Min. 85% of dry	1000 V/mil 95% of dry
Dielectric Constant – Dry – Wet	C-96/23/50 C-96/23/96	Maximum 7.0 Maximum 8.0		3.22 3.61
Dissipation Factor – Dry – Wet	C-96/23/50 C-96/23/96	Maximum .14 Maximum .16		.043 .057
Volume Resistivity	24 h immersion 23°C	Min. 1×10^{10} ohm-cm		31.5×10^{10} ohm-cm
Tensile Strength	C-96/23/50	Min. 1800 psi	Min. 1450 psi	3000 psi
Elongation – Unaged – Aged	C-96/23/50 400 h 100°C	Minimum 200% – Maximum 450% Maximum change 35%		350% 3.4%
Softening Temperature	C-96/23/50	Min. 75°C	Min. 70°C	88°C
Lengthwise Shrinkage	2 h 100°C	Maximum 10%		2.6%
Flexibility	200 h 100°C	No cracks after 180° bend around ⅛" mandrel		Conforms
Ultra-Violet Resistance	120 h under S-1 lamp	Not required	No cracks 180° bend around ⅛" mandrel	Conforms
Cold Brittleness	2.5 minutes	-30°C	-46°C	-57°C
Flame Resistance	None	Maximum 15 sec		0 sec
Oil Resistance	High swelling oil 200 h at 50°C	No cracks, no oil penetration Max. 10% increase in diameter		Conforms 0.5% increase
Corrosion Resistance	720 h 70°C high humidity	No corrosion of conductor. 2% max. increase in resistance of conductor		Conforms +1.2% increase
Fungus Resistance	12 mos. 23°C 50% RH in fungus culture	No fungus growth		Conforms
Bursting Strength (increasing pressure) Bursting Strength (continuous pressure)	C-96/23/50 C-96/23/50	Min. 29 psi to 96 psi Min. 15 psi to 48 psi		Exceeds all requirements by 96%

Standard colors - clear and black.
Standard package - spools only.
Standard sizes 24 to 1".

ASTRA® 077 General Purpose Tubing Test Data

Polyvinylchloride Tubing
Japanese Industrial Standard: C-2410
Ford ESB M4D 103A
National Highway Safety Administration D.O.T. FMVSS 302

DESCRIPTION

ASTRA 077 tubing is a specially formulated polyvinylchloride tubing designed for continuous operation in the -35°C to +85°C temperature range. It is self extinguishing and does not support combustion. As shown in the chart to the right, ASTRA 077 has good oil resistance and outstanding deformation resistance at 120°C. It remains flexible at extremely low temperature, making it ideal for automotive and recreational vehicle harnesses. It is available in both AWG and METRIC sizes on request.

APPLICATIONS

- Automotive harnesses
- Snowmobiles
- Aircraft
- Campers
- Motorcycles
- Motor boats
- All terrain vehicles (ATV)
- Truck harnesses
- Boat trailers
- Motor homes

STANDARD COLORS

Black. Other colors available; clear not available.

Standard package - spools.

Can be cut to customer requirements.

Standard sizes 24 to 1".

TYPICAL PROPERTIES

Property	Test Method	Typical Value
Tensile Strength, psi	MIL-I-631	2400
Ultimate Elongation %	MIL-I-631	350
Cold Brittleness	UL 224	-35°C
Heat Aging, 168 h @ 121°C	UL 224	110% tensile retention
		80% elongation retention
Oil Resistance	4 h @ 70°C	70% tensile retention
	ASTM #2 oil	70% elongation retention
Flame Resistance	Vertical flame exposure	Pass
	Extinguish within 15 sec	
Deformation	UL 224 120°C, 1 hour	0%
Insulation Resistance	ASTM D149	$2x10^{8}$ ohm-cm
Specific Gravity	ASTM D792	1.34
Hardness	Shore A ASTM D676	80

Standard Dimensions for Astra 601 & 701 PVC Tubings

DIMENSIONS

Size	I.D. Nominal		I.D. Max.		I.D. Min.		Wall	
	Inch	(mm)	Inch	(mm)	Inch	(mm)	Inch	(mm)
24	.022	(.56)	.027	(.69)	.020	(.51)	.012 ± .002	(0.30)
22	.027	(.69)	.032	(.81)	.025	(.64)	.012 ± .002	(0.30)
20	.034	(.86)	.039	(.99)	.032	(.81)	.016 ± .003	(0.41)
19	.038	(.97)	.044	(1.12)	.036	(.91)	.016 ± .003	(0.41)
18	.042	(1.07)	.049	(1.24)	.040	(1.02)	.016 ± .003	(0.41)
17	.047	(1.19)	.054	(1.37)	.045	(1.19)	.016 ± .003	(0.41)
16	.053	(1.35)	.061	(1.55)	.051	(1.30)	.016 ± .003	(0.41)
15	.059	(1.50)	.067	(1.70)	.057	(1.45)	.016 ± .003	(0.41)
14	.066	(1.68)	.074	(1.88)	.064	(1.63)	.016 ± .003	(0.41)
13	.076	(1.93)	.082	(2.03)	.072	(1.83)	.016 ± .003	(0.41)
12	.085	(2.16)	.091	(2.31)	.081	(2.06)	.016 ± .003	(0.41)
11	.095	(2.41)	.101	(2.57)	.091	(2.31)	.016 ± .003	(0.41)
10	.106	(2.69)	.112	(2.84)	.102	(2.59)	.016 ± .003	(0.41)
9	.118	(3.00)	.124	(3.15)	.114	(2.90)	.020 ± .003	(0.51)
8	.133	(3.38)	.141	(3.58)	.129	(3.28)	.020 ± .003	(0.51)
7	.148	(3.76)	.158	(4.01)	.144	(3.66)	.020 ± .003	(0.51)
6	.166	(4.22)	.178	(4.52)	.162	(4.11)	.020 ± .003	(0.51)
5	.186	(4.72)	.198	(5.03)	.182	(4.62)	.020 ± .003	(0.51)
4	.208	(5.28)	.224	(5.69)	.204	(5.18)	.020 ± .003	(0.51)
3	.234	(5.94)	.249	(6.32)	.229	(5.82)	.020 ± .003	(0.51)
2	.263	(6.68)	.278	(7.06)	.258	(6.55)	.020 ± .003	(0.51)
1	.294	(7.47)	.311	(7.90)	.289	(7.34)	.020 ± .003	(0.51)
0	.330	(8.38)	.347	(8.81)	.325	(8.26)	.020 ± .003	(0.51)
5/16″	.313	(7.94)	.334	(8.48)	.312	(7.92)	.025 ± .003	(0.64)
3/8″	.375	(9.53)	.399	(10.13)	.375	(9.53)	.025 ± .003	(0.64)
7/16″	.438	(11.11)	.462	(11.73)	.438	(11.13)	.025 ± .003	(0.64)
1/2″	.500	(12.70)	.524	(13.31)	.500	(12.70)	.025 ± .003	(0.64)
5/8″	.625	(15.88)	.655	(16.64)	.625	(15.88)	.030 ± .003	(0.76)
3/4″	.750	(19.05)	.786	(19.96)	.750	(19.05)	.035 ± .005	(0.89)
7/8″	.875	(22.23)	.911	(23.14)	.875	(22.23)	.035 ± .005	(0.89)
1″	1.000	(25.40)	1.036	(26.31)	1.000	(25.40)	.035 ± .005	(0.89)
1 1/4″	1.250	(31.75)	1.290	(32.77)	1.250	(31.75)	.040 ± .005	(1.02)
1 1/2″	1.500	(38.10)	1.550	(39.37)	1.500	(38.10)	.045 ± .006	(1.14)
1 3/4″	1.750	(44.45)	1.812	(46.02)	1.750	(44.45)	.055 ± .008	(1.40)
2″	2.000	(50.80)	2.070	(52.58)	2.000	(50.80)	.060 ± .010	(1.52)
2 1/2″	2.500	(63.50)	2.570	(65.28)	2.500	(63.50)	.070 ± .010	(1.78)

Other sizes & Wall Thicknesses available. Please contact factory.

STANDARD PACKAGING

Size 24 through 15 – 1000 ft. spools
Size 14 through 5/16″ – 500 ft. spools
Size 3/8″ through 1/2″ – 300 ft. spools
Size 9/16″ through 3/4″ – 200 ft. spools
Size 7/8″ through 1 1/4″ – 100 ft. spools
Size 1 1/2″ through 2 1/2″ – 50 ft. spools

Specification Index

U.S. MILITARY SPECIFICATIONS		RECOMMENDED SUFLEX PRODUCT
MIL-I-631	Grade A	Astra® 701
	Grade B	Astra® 701
	Grade C	Astra® 703/105
MIL-I-003190	/ 2	Vinylglas® Grade A
	/ 3	Acryflex ® Grade A
	/ 5	Silicone Resin HD Grade A
	/ 6	Flexicone® 200 Grade A and Silicone Rubber HD Grade A
MIL-I-7444	Type 1	Astra 601® Clear
	Type 3	Astra 601® Colors
MIL-I-18057		Silicone Rubber HD Grade A
MIL-I-21557		Vinylglas® Grade A
MIL-I-22076		Astra® 601
MIL-I-23053 / 1		None — Neoprene
MIL-I-23053 / 2	Class 1	None
	Class 2	Astratite® VC
MIL-I-23053 / 3		None — Semi-Rigid PVC
MIL-I-23053 / 4		None
MIL-I-23053 / 5	Class 1	Astratite® AF Colors
	Class 2	Astratite® AF Clear
	Class 3	Astratite® AVF Colors
MIL-I-23053 / 6	Class 1	Astratite® ASR Colors
	Class 2	Astratite® ASR Clear
	Class 3	None
MIL-I-23053 / 7		None — Spiral-Wrapped Mylar
MIL-I-23053 / 8		None — Kynar†
MIL-I-23053 / 9		None — Viton*
MIL-I-23053 / 10		None — Silicone Rubber
MIL-I-23053 / 11		None — Teflon FEP*
MIL-I-23053 / 12		None — Teflon TFE*
MIL-I-23053 / 13		None — Fluoroelastomer
MIL-I-23053 / 14		None — Tefzel - ETFE*
MIL-I-23053 / 15		None — Polyolefin with Adhesive
MIL-I-23053 / 16		None — Elastomeric Polyolefin
MIL-R-46846	Type 5	Astratite® AVF
MIL-Y-1140	Form 1	None
	Form 3	Flat Braid 8A-150 and 6B-150

AEROSPACE MATERIAL SPECIFICATIONS	RECOMMENDED SUFLEX PRODUCT
AMS 3582	None
AMS 3587	Astratite® AVF Colors
AMS 3588	Astratite® AVF Clear
AMS 3636	Astratite® AF Colors
AMS 3637	Astratite® AF Clear
AMS 3638	Astratite® ASR Colors
AMS 3639	Astratite® ASR Clear

COMMERCIAL SPECIFICATIONS		RECOMMENDED SUFLEX PRODUCT
NEMA VS-1	Type 1	Acryflex-F®
	Type 2	Acryflex-F®
	Type 3	Vinylglas®
	Type 4	Silicone Resin HD
	Type 5	Silicone Rubber HD
	Type 6	Acryflex-F®
ASTM D372	Type 2	Acryflex-F®
	Type 3	Vinylglas®
	Type 4	Silicone Resin HD
	Type 5	Silicone Rubber HD and Flexicone® 200
	Type 6	Acryflex-F®
ASTM D922		Astra® 703/105 - Astra® 701
ASTM D3149	Type 1	Astratite® AF Colors
	Type 2	Astratite® AF Clear
	Type 3	Astratite® ASR Colors
	Type 4	Astratite® ASR Clear

† (Kynar is the registered trademark of ELF Atochem.)
* (Viton, Teflon FEP, Teflon TFE, Tefzel-ETFE are registered trademarks of E.I. du Pont de Nemours & Company.)

Sleeving and Extruded Tubing Recognitions

Product	Underwriters Laboratories, Inc.	File No.	Canadian Stds. Assoc.	File No.
Acryflex-155®	600V - 155°C Grade A only	E66526	600 Volt 155°C Grade A	LR-37065
Acryflex-F®	600V - 155°C Grade A only VW-1 Grade C-3 only	E66526 E51556	600 Volt 155°C Grade A Sizes 24 to 1"	LR-37065
Acryflex® VPI	None		None	
Silicone Rubber HD	600V - 200°C Grade A only VW-1	E66526	600V - 200° Grade A Sizes 24 to 1"	LR-37065
Silicone Resin HD	600V - 200°C Grade A only VW-1	E66526	600V - 200° Grade A Sizes 24 to 1"	LR-37065
Flexicone® 200	600V - 200°C VW-1 Grade A VW-1 Grades B and C	E66526 E51556	600 Volt 200°C Grade A OFS Flame Retardant Sizes 24 to 1"	LR-37065
Vinylglas®	600V - 105°C VW-1 Grade A only VW-1 Grades B and C	E66526 E51556	600 Volt 105°C Grade A OFS Flame Retardant Sizes 24 to 1"	LR-37065
Silverflex® Natural & T&D	VW-1	E51556	None	
Extendo PETFR125°C	VW-1	E118600	None	
Astra 703/105®	300V and 600V 105°C VW-1 Sizes #24 to 2½"	E31622 E66389	105°C Class 1, 2 and 3 Sizes #24 to 2½"	LR-37065
Astra 601®	None		None	
Astra® 701	None		None	

Heat Shrink Tubing Recognitions

Product	Underwriters Laboratories, Inc.	File No.	Canadian Stds. Assoc.	File No.
Astratite® VC	600V - 105°C VW-1 3/64 to 4" All colors and clear	E31622 E66389	600V - 105°C 3/64 to 1" – colors and clear	LR-37065
Astratite® VC-TW	600V - 105°C VW-1 1/16 to ½" All colors and clear	E31622 E66389	None	
Astratite® VCB	600V - 105°C VW-1 3/64 to 4"	E31622 E66389	None	
Astratite® AVF	600V - 125°C VW-1 3/64 to 1" – colors only Clear not approved	E31622 E66389	600V - 125°C 3/64 to 3" – colors only Clear not approved	LR-37065
Astratite® AF	600V - 125°C 3/64 to 3" – colors only Clear not approved	E31622 E66389	600V - 125°C 3/64 to 3" – colors only Clear not approved	LR-37065
Astratite® ASR Astratite® ASR-C	600V - 125°C 3/32 to 1" - Black only Clear not approved	E31622 E66389	600V - 125°C 3/64 to 1" Clear not approved	LR-37065
Astratite® ACP	None		None	

VW-1 – UL designation for highly flame-retarded material.
OFS – CSA designation for highly flame-retarded sleeving.

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