

3M™ Heat Shrink Tubing Selector Guide

Product	Material/Typical Applications	Application Specifications
THIN-WALL TUBINGS		
FP-301	Flexible Polyolefin (2:1 Shrink) tubing for general purpose insulation; identification; UL, CSA and MIL-I-23053/5 applications; cable and component covering. Rated to 135°C. (black, white, red, blue, clear, green and yellow)	MIL-I-23053/5, Class 1 and 2; AMS-3636; AMS-3637; File E39100; CSA LR38227
MFP	Semi-rigid, thin-wall (2:1 Shrink) heat-resistant transparent insulation and marking for electronic and appliance applications. Rated to 175°C.	MIL-DTL-23053/18, Class 1; MIL-DTL-23053/8; AMS-3632; UL File E-39100, VW-1, E69751; CSA LR38227 OFT
THIN-WALL ADHESIVE-LINED		
EPS-300	Flexible, polyolefin tubing (3:1 Shrink) with adhesive; insulation, strain relief and environmental protection for automotive and marine wire bundles and splices. Rated to 110°C. (black)	MIL-I-23053/4, Class 3; File 15227
MW	Semi-rigid, polyolefin tubing (2.5:1 Shrink) with adhesive; insulation strain relief and sealing electrical connections and electrical components. Rated to 110°C. (black)	MIL-I-23053/4, Class 1; AMS-3534 File 15227
MEDIUM-WALL		
IMCSN	Adhesive lined, medium wall polyolefin (3:1 Shrink). Split resistant tubing for electrical splices, connections; moisture seals and mechanical protection. Rated to 1000V. (black)	
MDT	Adhesive lined, thick wall polyolefin (3:1 Shrink). Flame-retardant, split resistant tubing for electrical splices, connections; mechanical and abrasion resistance. Rated to 1000V. (black, not printed)	MIL-I-23053/15, Class 2
HEAVY-WALL		
ITCSN	Adhesive lined, thick wall polyolefin (3:1 Shrink), split resistant tubing for electrical splices, connections; mechanical and abrasion resistance. Rated to 1000V. (black)	UL 486D, File E102356
HDT	Adhesive lined, medium wall polyolefin (3:1 Shrink). Flame-retardant, split resistant, tubing for electrical splices, connections; moisture seals and mechanical protection. Rated to 1000V. (black, not printed)	MIL-I-23053/15, Class 1
BUS BAR INSULATION		
BBI-A	See page 439	Conforms to requirements of ANSI/IEEE #C37.20

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Typical Properties	FP-301	MW	EPS-300	IMCSN
Operating Temperature Range	-67°F to +275°F (-55°C to +135°C)	-67°F to +230°F (-55°C to +110°C)	-67°F to +230°F (-55°C to +110°C)	-67°F to +230°F (-55°C to +110°C)
Shrink Temperature (Min.)	212°F (100°C)	275°F (135°C)	250°F (121°C)	250°F (121°C)
Shrink Ratio	2:1	2.5:1	3:1	3:1
Standard Sizes Expanded Diameter	3/64" to 4" (1,19 to 101,6 mm)	1/8" to 1" (3,18 to 25,4 mm)	1/8" to 1 1/2" (3,18 to 38,1 mm)	0.400" to 6" (10,16 to 152,4 mm)
Dielectric Strength (V/Mil)	900	900	700	500
Volume Resistivity (ohm-cm)	10 ¹⁵	10 ¹⁵	10 ¹⁴	10 ¹⁴
Tensile Strength (psi)	2400	2200	2100	2400
Elongation (%)	400	400	450	450
Longitudinal Change (± %)	±5%	+1, -10%	+1, -15%	+1, -10%
Specific Gravity	1.3	1.0	1.3	1.28
Flammability	Self-extinguish meets UL 224 flame test except clear	n/a	Outer jacket self-extinguish meets UL 224 flame test	N/A
Corrosive Effect	Non-corrosive	Non-corrosive	Non-corrosive	Non-corrosive
Abrasion Resistance	Good	Good	Good	Good
Fuel and Oil Resistance	Good	Good	Good	Good
Solvent Resistance	Excellent	Excellent	Good	Excellent
Resistance to Acids and Alkalis	Excellent	Excellent	Excellent	Excellent

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Typical Properties	ITCSN	HDT	MDT	MFP
Operating Temperature Range	-67°F to +230°F (-55°C to +110°C)	-67°F to +230°F (-55°C to +110°C)	-67°F to +230°F (-55°C to +110°C)	-67°F to +347°F (-55°C to +175°C)
Shrink Temperature (Min.)	250°F (121°C)	250°F (121°C)	250°F (121°C)	347°F (175°C)
Shrink Ratio	3:1	3:1	3:1	2:1
Standard Sizes Expanded Diameter	0.400" to 4.30" (10,16 to 152,4 mm)	0.300" to 7.00" (7,62 to 177,8 mm)	0.400" to 4.30" (10,16 to 152,4 mm)	3/64" to 2" (1,19 to 50,8 mm)
Dielectric Strength (V/Mil)	500	500	500	900
Volume Resistivity (ohm-cm)	10 ¹⁴	10 ¹⁴	10 ¹⁴	10 ¹⁴
Tensile Strength (psi)	2400	2400	2400	5500
Elongation (%)	475	475	475	350
Longitudinal Change (± %)	+1, -10%	+1, -10%	+1, -10%	+1, -10%
Specific Gravity	1.28	1.28	1.28	1.7
Flammability	N/A	Flame retardant	Flame retardant	Self-extinguish meets UL 224 VW-1 Test
Corrosive Effect	Non-corrosive	Non-corrosive	Non-corrosive	Non-corrosive
Abrasion Resistance	Good	Good	Good	Excellent
Fuel and Oil Resistance	Good	Good	Good	Excellent
Solvent Resistance	Good	Good	Good	Excellent
Resistance to Acids and Alkalis	Excellent	Excellent	Excellent	Excellent

Thin-Wall Tubing

3M™ Thin-Wall Tubing FP-301

Shrink Ratio 2:1

3M Thin-Wall Tubing FP-301 is a heat shrinkable flexible polyolefin tubing that offers an outstanding balance of electrical, physical and chemical properties for a wide variety of industrial and military applications. Rated for 275°F (135°C) continuous operation. 3M tubing FP-301 is typically used as a shrink-fit electrical insulation over cable splices and terminations. It is also used for lightweight wire harness covering, wire marking, wire bundling, component packaging and fire resistant covering.

3M Clear Tubing FP-301 provides excellent visibility for component packing. All 3M Tubing FP-301 is split resistant, mechanically tough, easily marked and resists cold flow.

FP-301 is available in black, white, red, blue, yellow and clear in the standard lengths of 6-inch (15,2 cm) cut pieces, 48-inch (1,21 m) and small (8.5-inch core diameter) spools of 50 (15,24 m) and 100 (30,48 m) feet. Four-foot lengths of green tubing are available in sizes 1/16 inch to 1/2 inch. The Assorted Color Kit has a total of 133 pieces and contains seven colors: black, red, white, yellow, blue,



green and clear (see chart below). The Black Kit contains 102 pieces, all 6" (512,4 mm) lengths (see chart below). Additional sizes, colors and put-ups are available—please contact your 3M Electrical Products Sales Representative.

Application Specifications: UL Recognized and CSA Certified at 600 volts at 257°F(125°C); UL File No. E-39100 and CSA No. 38227. MIL-I-23053/5, Class 1,2. AMS 3636 (Type I) and AMS 3637 (Type II).

To Order: Reference specific product size, color and description on the following pages. Example: FP-301-1/4, white 6" (15,2 cm) pieces.

Specifications and Ordering Information for 3M Thin-Wall Tubing FP-301 Assortment Kits

Description	UPC (051135-)	Case Qty.
ASSORTED COLORS KIT	37677	5 kits
Kit Contents:	Kit Quantity:	
3/32" (2,35 mm)	35	—
1/8" (3,18 mm)	28	—
3/16" (4,75 mm)	21	—
1/4" (6,35 mm)	21	—
3/8" (9,53 mm)	14	—
1/2" (12,70 mm)	14	—
ASSORTED BLACK KIT	38139	5 kits
Kit Contents:	Kit Quantity:	
3/16" (4,8 mm)	30	—
1/4" (6,5 mm)	28	—
3/8" (9,6 mm)	20	—
1/2" (12,7 mm)	14	—
3/4" (19,1 mm)	6	—
1" (25,4 mm)	4	—

Specifications and Ordering Information for 3M™ Thin-Wall Tubing FP-301 Four-Foot Sticks (Small Box)

Product Number	Size	Color	UPC (051135-)	Description	Expanded/Recovered I.D.	Box Qty.
FP-301	3/64" (1,17 mm)	Black	36644	48" Sticks (1,22 m)	0.046/0.023" (1,17/0,58 mm)	25
		Clear	36645			
		White	36646			
		Red	36647			
		Blue	36649			
		Yellow	36648			
FP-301	1/16" (1,58 mm)	Black	36650	48" Sticks (1,22 m)	0.063/0.031" (1,6/0,79 mm)	25
		Clear	36651			
		White	36652			
		Red	36653			
		Blue	36655			
		Yellow	36654			
FP-301	3/32" (2,38 mm)	Black	36673	48" Sticks (1,22 m)	0.093/0.046" (2,36/1,17 mm)	25
		Clear	36674			
		White	36675			
		Red	36676			
		Blue	36678			
		Yellow	36677			
FP-301	1/8" (3,18 mm)	Black	36680	48" Sticks (1,22 m)	0.125/0.062" (3,18/1,57 mm)	25
		Clear	36681			
		White	36682			
		Red	36683			
		Blue	36685			
		Yellow	36684			
FP-301	3/16" (4,75 mm)	Black	36687	48" Sticks (1,22 m)	0.187/0.093" (4,75/2,36 mm)	25
		Clear	36688			
		White	36689			
		Red	36690			
		Blue	36692			
		Yellow	36691			
FP-301	1/4" (6,35 mm)	Black	36694	48" Sticks (1,22 m)	0.250/0.125" (6,35/3,18 mm)	12
		Clear	36695			
		White	36696			
		Red	36697			
		Blue	36699			
		Yellow	36698			
FP-301	3/8" (9,5 mm)	Black	36701	48" Sticks (1,22 m)	0.375/0.187" (9,53/4,75 mm)	12
		Clear	36702			
		White	36703			
		Red	36704			
		Blue	36706			
		Yellow	36705			
FP-301	1/2" (12,7 mm)	Black	36709	48" Sticks (1,22 m)	0.500/0.250" (12,7/6,35 mm)	12
		Clear	36710			
		White	36711			
		Red	36712			
		Blue	36714			
		Yellow	36713			
		Green	36715			