WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)

TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)

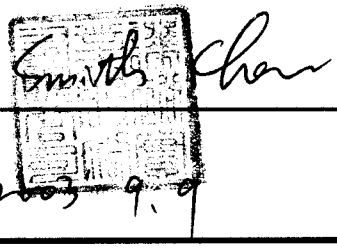
SPECIFICATION FOR APPROVAL

CUSTOMER: 中磊科技股份有限公司

PART NAME: RF Cable Assembly

PART NO: *REVISION:*

W. Y. P/NO.: C147-510027-A *REV.:* X1

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	2003.9.9	

WHA YU GROUP

WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
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Fax: + 86-21-59741347

INDEX

RF Cable Assembly

Specification

1. Electrical Properties :

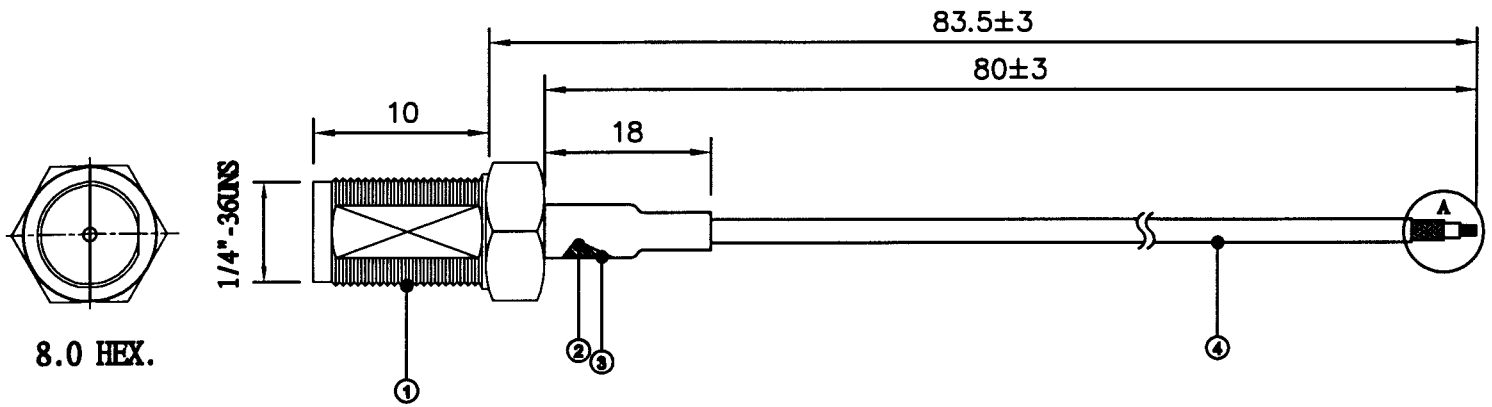
1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
1.2 Impedance ..... 50Ω Nominal
1.3 Insertion Loss..... <1.5 dB

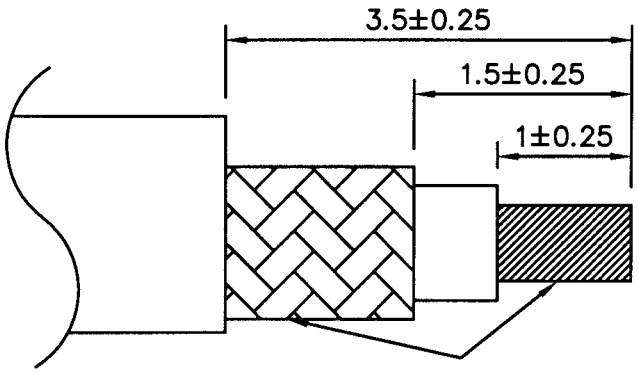
2. Physical Properties :

2.1 Cable..... RG-178 Coaxial Cable
2.2 Operating Temp. .....-20℃ ~ +65℃
2.3 Storage Temp. .....-30℃ ~ +75℃
2.4 Connector..... SMA Jack Reverse

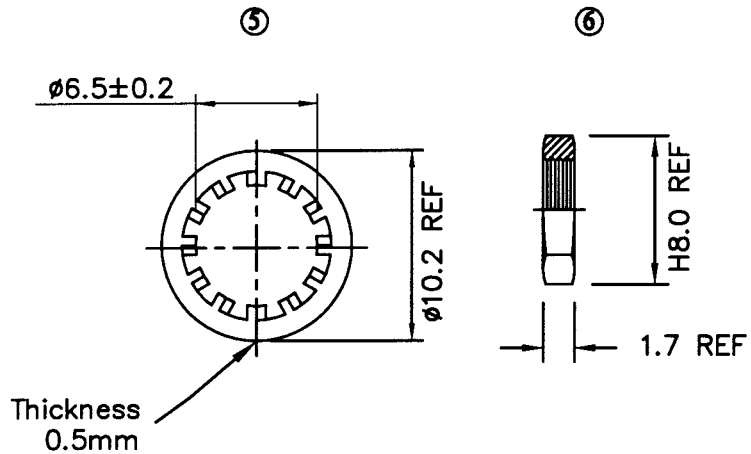
CG-XX

REV	DATE	DESCRIPTION
X1	08/13-2003	New Issue
X2	09/09-2003	Added Heat Shrink Tube DIM





DetailA



NO	DESCRIPTION		QTY	REMARK
6	Nut	Brass ; Gold Plated	1	
5	Washer	Brass ; Gold Plated	1	
4	Cable	RG-178 Cable	1	
3	Tube	Heat Shrink Tube	1	
2	Crimp Tube	Brass ; Gold Plated	1	
1	Connector	SMA Straight Jack/Reverse	1	

CUSTOMER'S SINGATURE

XX.	±3.0
X.	±2.0
X	±1.0
XX	±0.5
XXX	±0.1

APPROVED 9/9/03

CHECKED

DRAWING 09/09/03

CUSTOMER: 中磊科技股份有限公司

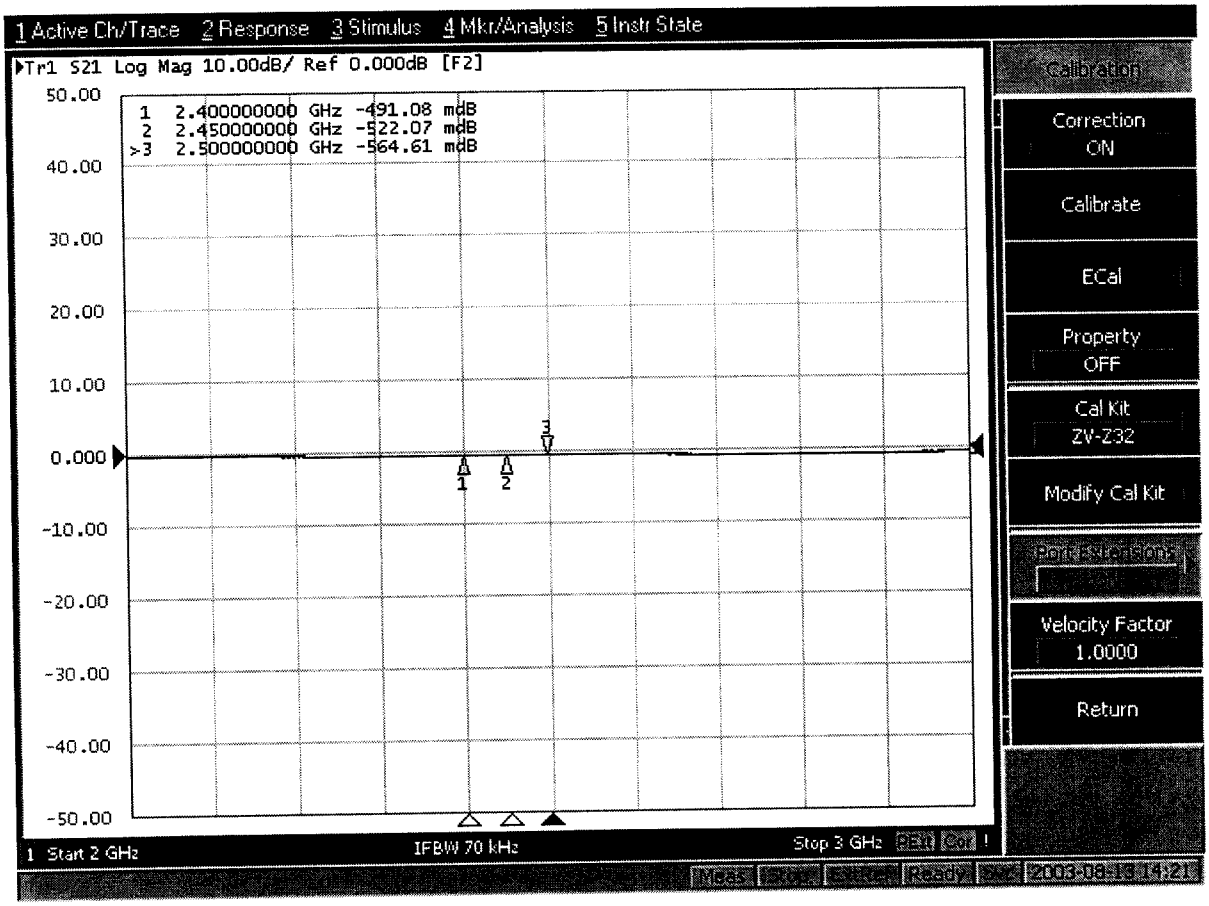
PART NO :

PARTNAME: RF Cable Assembly

W.Y P/NO : C147-510027-A

REV	UNIT	FILE :	SSR-2015
X2	mm	SHEET :	1/1

Wha Yu
INDUSTRIAL CO.,LTD.
譁裕實業股份有限公司


1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Tr1 S21 Log Mag 10.00dB/ Ref 0.000dB [F2]
1 2.400000000 GHz -491.08 mdB
2 2.450000000 GHz -522.07 mdB
>3 2.500000000 GHz -564.61 mdB
50.00
40.00
30.00
20.00
10.00
0.000
-10.00
-20.00
-30.00
-40.00
-50.00
1 Start 2 GHz
IFBW 70 kHz
Stop 3 GHz
Calibration
Correction ON
Calibrate
ECal
Property OFF
Cal Kit ZV-Z32
Modify Cal Kit
Velocity Factor 1.0000
Return

Cable Specification

Cable : Mil-C-17 Coaxial Cable RG-178

1. Construction :
   - 1 Conductor..... 30AWG 7/38 SCCS
   - 2 Dielectric..... PTFE OD : 0.033"±0.002"
   - 3 Shielded.....38AWG SPC OD : 0.051" Nominal
   - 4 Jacket.....FEP OD : 0.071"±0.004"

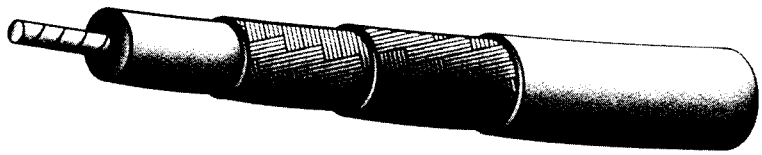
2. Physical Properities :
   - 1 Weight per 1000ft..... 6.3 lbs Maximum
   - 2 Bend Radius.....0.35" Mininum
   - 3 Operating Temperature Range -55℃~ 200℃

3. Electrical Properities:
   - 1 Impedance..... 50±2 ohms
   - 2 Capacitance..... 32 pF/ft Maximum
   - 3 Cut off Frequency..... 116 GHz
   - 4 Attenuation.....45.0 dB/100ft @ 1GHz
     64.4 dB/100ft @ 2GHz
     79.7 dB/100ft @ 3GHz
     92.7 dB/100ft @ 4GHz
     104.3 dB/100ft @ 5GHz
     115.0 dB/100ft @ 6GHz

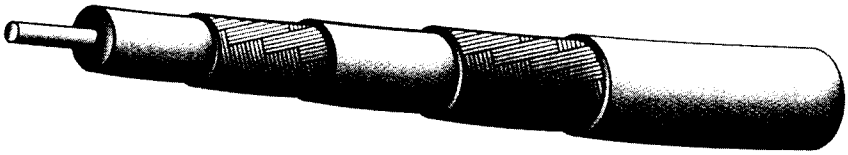
Mil-C-17 Coaxial Cable QPL Approved

Single braid

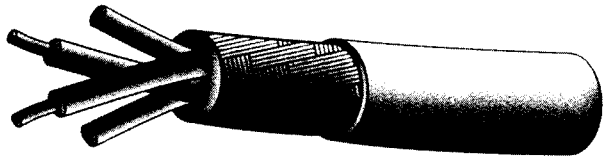
Double braid



Triax



Twinax



Harbour supplies a complete line of high temperature, high performance QPL approved MIL-C-17 coax cables for the military, commercial and industrial applications. The specific M17 constructions referenced are manufactured in accordance with the most recent revision of the MIL-C-17 specification. The MIL-C-17 specification defines complete physical and electrical characteristics for each M17 part number, including dimensional parameters, dielectric materials, shield construction, maximum attenuation, and VSWR levels.

VSWR Sweep Testing

When selecting a 50 ohm coaxial cable, constructions with VSWR requirements are recommended. Manufacturing and sweep testing cables with concern for VSWR ensures a quality cable free of spikes over the referenced frequency range. (Note the test frequencies specified in the electrical characteristics section.)

Precision PTFE Dielectrics

All of the high temperature, high performance coax cables listed have PTFE dielectrics with high dielectric strength and low capacitance in proportion to the dielectric constant. All PTFE dielectrics are manufactured with tolerances tighter than the MIL-C-17 specification to ensure uniformity of electrical characteristics, especially impedance, attenuation and VSWR.

Tape wrapped PTFE Constructions

Harbour also manufactures PTFE tape wrapped cables to a previous revision of the MIL-C-17 specification. These constructions can withstand operating temperatures up to 250° C. versus 200° C. for FEP jacketed cables. Also, PTFE tape wrapped cables are generally more flexible than their FEP jacketed counterparts.

UL Approvals

All of Harbour's M17 part numbers manufactured to the MIL-C-17 specification may be ordered with UL and FT4 approvals.

Mil-C-17 Coaxial Cables

Physical Characteristics:

M17 Number	Center Conductor	PTFE Dielectric Diameter	Shield	Jacket	Overall Diameter	Minimum Recommended Bend Radius	Operating Temperature (°C)	Weight (lb/1000 ft)	
M17/60-RG142	.037" SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	43.0	
M17/93-RG178	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	
M17/93-00001	.0120"(7/.004")SCCS	.033"	SPC	PFA	.071"	0.4"	-55 +230	6.3	M17/93-RG178 w/extended temp. ra
M17/94-RG179	.0120"(7/.004")SCCS	.063"	SPC	FEP	.100"	0.4"	-55 +200	10.8	
M17/95-RG180	.0120"(7/.004")SCCS	.102"	SPC	FEP	.141"	0.7"	-55 +200	19.8	
M17/110-RG302	.0253"SCCS	.146"	SPC	FEP	.202"	1.0"	-55 +200	40.0	
M17/111-RG303	.037"SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	31.0	
M17/112-RG304	.059" SCCS	.185"	SPC(2)	FEP	.280"	1.4"	-55 +200	94.0	
M17/113-RG316	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	12.2	
M17/127-RG393	.094"(7/.0312")SC	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	165.0	
M17/128-RG400	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	50.0	
M17/131-RG403	.0120"(7/.004")SCCS	.033"	SPC(2)	FEP(2)	.116"	0.6"	-55 +200	15.0	Triaxial M17/93-RG
M17/152-00001	.0201"(7/.0067")SCCS	.060"	SPC(2)	FEP	.114"	0.6"	-55 +200	18.5	Double shielded M17/113-RG316
M17/158-00001	.037"SCCS	.116"	SPC(2)	FEP	.195"	1.0"	-55 +200	56.0	Unswept M17/60-RC
M17/169-00001	.0120"(7/.004")SCCS	.033"	SPC	FEP	.071"	0.4"	-55 +200	6.3	Unswept M17/93-RC
M17/170-00001	.037"(SCCS	.116"	SPC	FEP	.170"	0.9"	-55 +200	39.0	Unswept M17/111-RC
M17/172-00001	.0201"(7/.0067")SCCS	.060"	SPC	FEP	.098"	0.5"	-55 +200	11.5	Unswept M17/113-RC
M17/174-00001	.094"(7/.0312")SCCS	.285"	SPC(2)	FEP	.390"	2.0"	-55 +200	175.0	Unswept M17/127-RC
M17/175-00001	.0384"(19/.008")SC	.116"	SPC(2)	FEP	.390"	1.0"	-55 +200	50.0	Unswept M17/128-RC
M17/176-00002	.0235"(19/.005")SPA(2)	.042"	SPA	PFA	.129"	0.6"	-55 +230	18.0	Controlled impedar twinax
PTFE Tape Wrap Jacketed RG Cables									
RG 187 A/U	.0120"(7/.004)SCCS	.063	SPC	PTFE	.100"	0.5"	-55 +250	10.0	Flexible, 250° C. rat
RG 188 A/U	.0201"(7/.0067)SCCS	.060	SPC	PTFE	.100"	0.5"	-55 +250	11.0	Flexible, 250° C. rat
RG 195 A/U	.0120"(7/.004)SCCS	.102	SPC	PTFE	.141"	0.7"	-55 +250	18.0	Flexible, 250° C. rat
RG 196 A/U	.0120"(7/.004)SCCS	.034	SPC	PTFE	.067"	0.4"	-55 +250	6.0	Flexible, 250° C. rat

Electrical Characteristics:

M17 Number	Impedence (ohms)	Capacitance (pF/ft)	Max. Operating Voltage (RMS)	Maximum attenuation (dB/100 ft) 100 MHz	400 MHz	1 GHz				
M17/60-RG142	50 +/- 2	29.4	1900	5.5	11.7	19.0	35.0	48.0	-	17.4
M17/93-RG178	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/93-00001	50 +/- 2	29.4	1000	16.0	33.0	52.0	94.0	-	-	3.0
M17/94-RG179	75 +/- 3	19.4	1200	-	21.0	-	-	-	-	-
M17/95-RG180	95 +/- 5	16.4	1500	-	17.0	-	-	-	-	-
M17/110-RG302	75 +/- 3	19.4	2300	-	8.0	-	26.0	-	-	-
M17/111-RG303	50 +/- 2	29.4	1900	3.9	8.0	15.0	28.0	-	-	-
M17/112-RG304	50 +/- 3	29.4	3000	2.7	6.4	11.1	22.0	30.0	-	8.0
M17/113-RG316	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3.0
M17/127-RG393	50 +/- 2	29.4	2500	2.4	5.0	8.8	18.0	24.6	37.0	11.0
M17/128-RG400	50 +/- 2	29.4	1900	4.5	10.5	17.0	38.0	50.0	78.0	12.4
M17/131-RG403	50 +/- 2	29.4	1000	-	37.0	-	-	-	-	10.0
M17/152-00001	50 +/- 2	29.4	1200	11.5	24.0	40.0	75.0	110.0	170.0	12.4
M17/158-00001	50 +/- 2	29.4	1900	-	9.5	-		-	-	-
M17/169-00001	50 +/- 2	29.4	1000	-	29.0	-	-	-	-	-
M17/170-00001	50 +/- 2	29.4	1900	-	8.6	-	-	-	-	-
M17/172-00001	50 +/- 2	29.4	1200	-	21.0	-	-	-	-	-
M17/174-00001	50 +/- 2	29.4	2500	-	5.0	-	-	-	-	-
M17/175-00001	50 +/- 2	29.4	1900	-	10.5	-	-	-	-	-
M17/176-00001	77 +/- 7	19.0	1000	-	-	-	-	-	-	-
PTFE Tape Wrap Jacketed RG Cables										
RG 187 A/U	75 +/- 3	19.4	1200	-	21.0	-		-	-	3
RG 188 A/U	50 +/- 2	29.4	1200	11.0	21.0	38.0	58.0	-	-	3
RG 195 A/U	95 +/- 5	15.4	1500	-	17.0	-		-	-	3
RG 196 A/U	50 +/- 2	29.4	1000	-	29.0	-		-	-	-

"Maximum frequencies" are those as referenced on individual slant sheets of the MIL-C-17 specification. No values are given for unswept constructions as the specification recommends these cables should not be used above 400 MHz. (All figures referenced above are nominal unless otherwise specified.)

RF SMA Connector

Specification

1. Electrical Properties :

1.1 Frequency Rang.....0 ~ 6GHz
1.2 Impedance ..... 50Ω Nominal
1.3 VSWR .....1.5 Max.
1.4 Voltage rating ..... AC 500V
1.5 Withstanding Voltage .....AC 1000V one minute
1.6 Insulation Resistance 5000MΩ

2. Mechanical Properties :

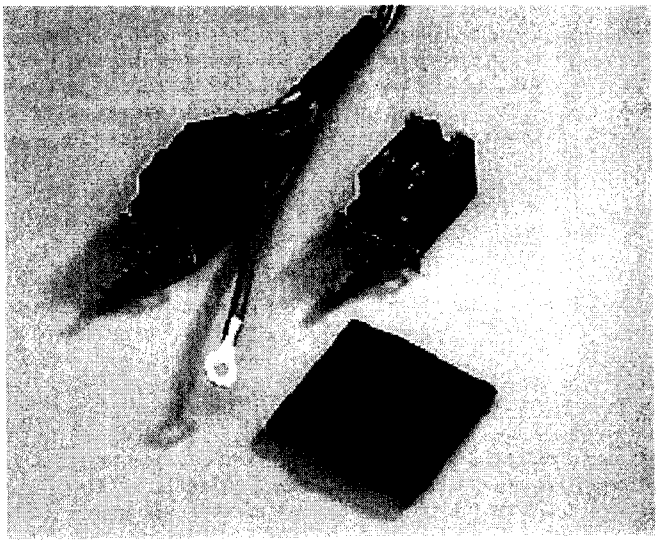
2.1 Mating / unmating force .. 2 inch-lb
2.2 Mating Torque ..... 7~10 inch-lb
2.3 Contact Retention .....4 lbs min. axial force
2.4 Cable Retention ..... 15lb for RG316 ; 9lb for RG178
2.5 Durability ..... 500 cycles Minimum

3. Environment Properties :

3.1 Temperature Range..... -40℃ ~ +85℃
3.2 Thermal Shock.....MIL-STD-202, Method 107, Condition B
3.3 Shock.....MIL-STD-202, Method 213, Condition I
3.2 Vibration .....MIL-std-202 Method 204, Test Condition D

Versafit V2

Highly flame-retardant, very flexible, low-shrink-temperature polyolefin tubing



Fax-on-Demand: (800) 260-9099
(650) 361-6523

Before ordering check with factory for most current data.

FAX ID	Description
2222	Data sheet
2221	RT-1136

Applications

Cost-effective choice for many commercial and military applications; electrically insulates and protects in-line components, disconnect terminals, and splices. Bundles wires for very flexible light-duty harnesses. Strain-relieves electrical wire connections for commercial applications. Identifies or color-codes wires, cables, terminals, and components.

Operating Temperature Range

–55°C to 125°C

Features/Benefits

- 2:1 shrink ratio.
- Low shrink temperature reduces installation time and the risk of damage to temperature-sensitive components.
- Very flexible; doesn't easily wrinkle when bent.
- Hot stamps extremely well.
- Free of polybrominated biphenyls (PBBs) and polybrominated biphenyl oxides and ethers (PBBOs and PBBEs), which are classified as environmentally hazardous substances.
- Higher temperature rating, better thermal stability, and higher resistance to physical abuse than noncrosslinked materials.

Installation

Minimum shrink temperature: 70°C
Minimum full recovery temperature: 90°C

Specifications/Approvals

Series	UL	CSA	Raychem
Versafit	E35586 VW-1 600 V, 125°C	LR31929 OFT 600 V, 125°C	RW-3023

Product Dimensions (mm)

Size	As supplied: Inside diameter	As supplied: Wall thickness (nominal)	After shrinkage: Inside diameter (max.)	After shrinkage: Wall thickness* (min.)
1.0	1.6 ±0.2	0.2	0.5	0.33
1.5	2.1 ±0.2	0.2	0.75	0.35
2.0	2.6 ±0.2	0.25	1.0	0.43
2.5	3.1 ±0.2	0.25	1.25	0.43
3.0	3.6 ±0.2	0.25	1.5	0.43
3.5	4.1 ±0.3	0.25	1.75	0.43
4.0	4.6 ±0.3	0.25	2.0	0.43
5.0	5.6 ±0.3	0.3	2.5	0.56
6.0	6.6 ±0.3	0.3	3.0	0.56
7.0	7.6 ±0.3	0.3	3.5	0.56
8.0	8.6 ±0.3	0.3	4.0	0.56
9.0	9.6 ±0.3	0.3	4.5	0.56
10.0	10.4 ±0.3	0.3	5.0	0.56

Size	As supplied: Inside diameter	As supplied: Wall thickness (nominal)	After shrinkage: Inside diameter (max.)	After shrinkage: Wall thickness* (min.)
11.0	11.4 ±0.3	0.3	5.5	0.56
12.0	12.7 ±0.3	0.3	6.0	0.56
13.0	13.5 ±0.3	0.35	6.5	0.66
14.0	14.4 ±0.4	0.35	7.0	0.68
15.0	15.7 ±0.4	0.35	7.5	0.68
16.0	16.9 ±0.4	0.35	8.0	0.68
18.0	19.0 ±0.4	0.4	9.0	0.76
20.0	21.4 ±0.4	0.4	10.0	0.76
22.0	23.2 ±0.4	0.45	11.0	0.89
25.0	26.8 ±0.4	0.45	12.5	0.89
27.0	28.2 ±0.5	0.45	12.5	0.89
28.0	30.0 ±0.5	0.45	14.0	0.89
30.0	32.1 ±0.5	0.45	15.0	0.89

*Wall thickness will be less if tubing recovery is restricted during shrinkage.

Ordering Information

Color	Standard	Black (-0), white (-9), red (-2), blue (-6), yellow (-4), green (-5)
	Nonstandard	Orange (-3), violet (-7), brown (-1), gray (-8)
Size selection	Always order the largest size that will shrink snugly over the component to be covered. Special order sizes are available upon request.	
Standard packaging	On spools.	
Marking	Marked with UL/CSA/-F- legends.	
Ordering description	Specify product name, size, and color (for example, Versafit V2-3.0-0).	