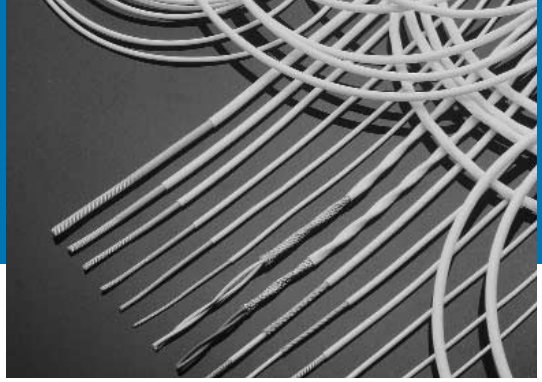


SPEC 55

Wire and cable

Applications

SPEC 55 wire is insulated with modified radiation cross-linked ETFE polymer. It has a temperature rating of -65°C to 200°C continuous using a silver plated copper conductor, and combines the easy handling of a flexible wire with excellent scrape abrasion and cut-through characteristics.

The dual wall airframe construction of SPEC 55 wire is currently used on numerous aircraft programs. It has a choice of two total wall thicknesses, 0.25 mm (55A08XX 10 mil) and 0.2mm (55A02XX 8 mil). Both have a contrasting core color to act as a damage indicator. Chosen for its balance of properties, SPEC 55 wire has outstanding resistance to chemicals and solvents, excellent electrical arc track resistance, and is not susceptible to UV and moisture degradation. Single wall equipment wire constructions are available in 0.10 mm (55/03XX 4 mil) and 0.15 mm (6 mil) wall thicknesses for use inside black boxes where flexibility and solder-iron resistance make it a wire which is very easy to install reliably.

Both single and dual wall insulated wires are available in twisted pairs, triples, etc., and as screened and jacketed cables.

Features and benefits

- Resistant to electrical arc tracking in wet or dry conditions.
- Single or dual wall constructions.
- Small size, ultra light weight.
- Exceptional chemical resistance.
- −65 to 200°C.

Physical characteristics

Size and weight

SPEC 55 wire provides one of the most comprehensive wiring product ranges for aerospace users, with a wide choice of conductor sizes and insulation wall thicknesses.The dual wall airframe wire has an insulation wall thickness of either 0.2mm or 0.25 mm for robustness in unprotected harnesses and has excellent wire to wire abrasion properties.

The single wall equipment wire has a 0.15 mm wall thickness for use inside equipment and protected harnesses. For high density, interconnect wiring, the 450 volt 55M041X series of equipment wire has a nominal 0.1 mm wall and provides considerable weight and size savings over other comparable wires.

Handling

The excellent flexibility and handleability makes SPEC 55 the ideal wire to install, both in new aircraft and equipment and for maintenance purposes. The wire is easily stripped with conventional tooling. The insulation is readily marked by hot stamp, ink jet or laser, and can be potted without pre-etching. For full descriptions of the appropriate tools see separate wire handling guide.

SPEC 55PC wire and cable insulation system

This product was originally developed to meet Boeing's material standard BMS13-48 for the 777 airliner. SPEC 55PC provides lightweight, compact insulation that matches the proven performance of our SPEC 55 wire. Today, 55PC is specified and utilized on the majority of aerospace platforms worldwide.

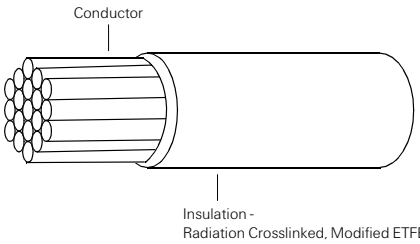
Tyco Electronics' rigorous, statistical-process-controlled manufacturing has produced Raychem wiring that is rugged and versatile enough for a wide range of commercial and defense aerospace applications, including electronic hook-ups in harsh, open airframe environments.

SPEC 55PC wire and cable systems feature an 8-mil airframe wire that is lighter and smaller than typical 10-mil wire, with little reduction in key mechanical performance features. SPEC 55PC wire offers flame resistance superior to FAA standards and also resists scrape abrasion, notch, propagation, cut-through, and electrical arc tracking.

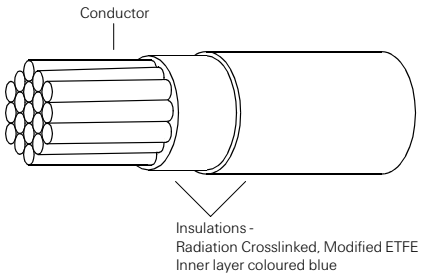
- Meets Boeing material standard BMS 13-48.
- Exceeds FAR 25 test requirements for flame resistance and smoke density.

Available in:	Americas	Europe	Asia Pacific
	■	■	■

SPEC 55 insulation system - single wall



SPEC 55 insulation system - dual wall



Specifications

MIL-W-22759/32-35 and /41 to /46 and NEMA-WC-27500 (Cables)
Defense Standard 61-12 Part 33
Part 1001 and Part 1002
VDE 9426, 9427, 9428
British Standard 3G233
Civil Aviation Authority Accessory Approval E11749
Boeing BMS 13-48
Airbus ABS 0820 to 0826
Underwriters Laboratory Style 3467
NASA preferred product list
European Space Agency 3901/012, 3901/020 and 3901/022
Raychem Specification 55

SPEC 55 (cont'd.)

Wire and cable

Typical properties	
Temperature rating (Tin plated conductor)	-65°C to +150°C
(Silver or nickel plated conductor)	-65°C to +200°C
Thermal endurance	200 °C, 10000 h
Scrape abrasion (BS 3G233)	>100 cycles at 150°C
Flexing endurance (Boeing BSS 7324)	>1000 cycles
Voltage rating	600 V, 450V
Tensile strength + core elongation	(Airframe wire only) 35 N/mm^2, 125%
Tensile strength + total elongation	(All primary wire) 35 N/mm^2, 75%
Notch propagation BS 3G230 0.05 mm notch	Pass
Solder iron resistance (370 °C, 1 minute)	Pass
Solderability - Tin plated copper conductor BS 3G233 conditions	<0.8 secs to wet
Shrinkage	<1%
Long term water resistance	Will not hydrolyze
Permitivity 1 KHz (ASTM D150)	2.7
Dissipation factor (ASTM D150)	0.001
FAR 25	
Afterburn (sec)	0
Burn length	31 mm/20 in

Environmental Performance

Temperature rating

SPEC 55 wire and cable is rated for continuous operation from -65 °C to +200 °C and for short periods at temperatures as high as 400 °C.

Mechanical performance

Radiation crosslinking of the SPEC 55 insulation significantly improves the following mechanical characteristics; scrape (sharp edges), cross wire abrasion, cut-through resistance and creep resistance.

Solder iron/overload resistance

Radiation crosslinking ensures that the insulation resists melting at high temperatures. As a result SPEC 55 wire is resistant to hot solder irons and current overloads which would melt most thermoplastic insulations.

Chemical resistance

SPEC 55 is unaffected by all commonly used chemicals, eg. fuels, hydraulic fluids, defluxing agents, cleaners, coolants and de-icers. It also shows excellent resistance to weathering (UV, ozone, pollutants, water).

Space wire

SPEC 55 is available in special versions suitable for use in outer space meeting both ESA and NASA requirements for outgassing.

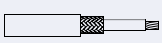
Flammability

Special additives increase the flame retardance of SPEC 55 compared to unirradiated ETFE so that it meets the latest high performance tests, eg. BS 3G230 vertical test FAR 25.

Electrical arc tracking resistance

SPEC 55 insulation demonstrates resistance to arc tracking under both wet and dry conditions at aircraft system voltages.

SPEC 55 wire & cable: standard constructions, nominal sizes, strandings, diameters and weights

Conductor	Primary wire	Twisted pair	Screened & jacketed	
			Single	Pair
				

55PC - extra light weight constructions

For applications where weight is critical, light weight tight tolerance conductors and insulations are available. These are manufactured using statistical process control methods and achieve weights that are equal or lighter than the equivalent polyimide/PTFE constructions.

55A - AWG conductor: equipment/interconnect wires & cables

		55A011X		55A012X	
Size	Stranding (mm)	Nom. OD (mm/in)	Max. weight (g per m/lbs per ft)	Nom. OD (mm/in)	Max. weight (g per m/lbs per ft)
30	7/0.102	0.61/0.024	0.98/0.66	1.27/0.048	1.94/1.3
28	7/127	0.68/0.027	1.35/0.91	1.42/0.054	2.68/1.8
26	19/102	0.81/0.032	2.1/1.4	1.67/0.064	4.2/2.8
24	19/127	0.94/0.037	2.98/2.0	1.93 /0.074	5.96/4.0
22	19/0.16	1.09/0.043	4.2/2.8	2.23/0.086	8.6/5.8
20	19/0.203	1.27/0.050	6.4/4.3	2.66/0.102	13.26/8.9
18	19/0.25	1.52/0.060	9.7/6.5	3.2 /0.122	19.57/13.5
16	19/287	1.73/0.068	12.4/8.3	3.58/0.138	25.8/17.3
14	19/0.36	2.2/0.085	19.4/13.0	4.47/0.172	39.6/26.6
12	37/0.32	2.62/0.103	29.35/19.7	5.38/0.208	60/0/40.3
10	37/0.403	3.25/0.128	47.4/31.8	6.65/0.256	96.7/67.9
8	133/0.287	4.77/0.188	87.6/58.8	9.8/0.376	178.8/12.0

55A - AWG conductor: airframe wires & cables

		55A081X		55A082X	
26	19/102	1.01/0.040	2.5/1.7	2.1/0.080	5.1/3.4
24	19/127	1.14/0.045	3.4/2.3	2.33/0.090	6.84/4.6
22	19/0.16	1.27/0.050	4.8/3.2	2.64/0.102	9.98/6.7
20	19/0.203	1.47/0.058	7.0/4.7	3.07/0.118	14.75/9.9
18	19/0.25	1.78/0.070	10.7/7.2	3.63/0.140	21.9/14.7
16	19/287	1.95/0.079	13.4/9.0	4.06/0.156	27.5/18.5
14	37/0.36	2.4/0.094	20.5/13.8	4.9/0.190	42.3/28.4
12	37/0.32	2.82/0.111	30.5/20.5	5.8/0.224	63.0/42.3
10	37/0.403	3.4/0.134	48.3/32.4	7.1/0.272	99.1/66.5

55PC - AWG conductor: statistical process controlled airframe wires & cables

		55PC021X		55PC022X	
26	19/102	0.087/0.045	1.8/1.38	-	-
24	19/127	1.00/0.0395	3.2/1.98	2.0/0.079	6.3/0.082
22	19/0.16	1.15/0.0455	4.56/2.90	2.31/0.091	9.12/0.094
20	19/0.203	1.37/0.0540	6.8/4.38	2.74/0.108	13.66/0.111
18	19/0.25	1.61/0.0635	10.3/6.59	3.22/0.127	20.6/0.130
16	19/287	1.8/0.0710	12.96/8.37	3.6/0.142	26.0/0.145
14	19/.036	2.18/0.0860	19.86/12.88	4.36/0.172	39.9/0.176
12	37/0.32	2.66/0.1047	30.2/19.73	5.3/0.209	60.8/0.214
10	37/0.403	3.27/0.1290	47.9/31.12	-/0.258	-/0.266

55A111X		55A112X	
Nom. OD (mm/in)	Max. weight (g per m/lbs per ft)	Nom. OD (mm/in)	Max. weight (g per m/lbs per ft)
1.51/0.057	5.1/3.4	2.12/0.081	7.74/5.2
1.59/0.060	5.8/3.9	2.27/0.087	8.9/6.0
1.71/0.065	6.85/4.6	2.53/0.097	11.32/7.6
1.84/0.070	8.2/5.5	2.8/0.107	13.86/9.3
1.99/0.076	10.3/6.9	3.07/0.119	17.9/12.0
2.2/0.084	13.4/9.0	3.5/0.135	23.8/16.0
2.45/0.094	17.88/12.0	4.1/0.155	32.6/21.9
2.67/0.102	21.75/14.0	4.43/0.171	39.7/26.7
3.1/0.119	30.4/20.4	5.3/0.205	57.0/38.3
3.55/0.137	42.46/28.5	6.3/0.243	81.2/54.5
4.2/0.161	62.7/42.1	-	-
5.8/0.223	110.5/74.2	-	-

55A181X		55A182X	
1.71/0.073	6.85/5.3	2.63/0.113	11.32/9.6
1.84/0.078	8.2/6.3	2.8/0.123	13.86/11
1.99/0.084	10.3/7.9	3.07/0.135	17.9/13.9
2.2/0.092	13.4/10.0	3.5/0.151	23.8/18.2
2.45/0.103	17.88/13.3	4.1/0.173	32.6/24.5
2.67/0.111	21.75/16.0	4.43/0.189	39.7/28.8
3.1/0.128	30.4/22.2	6.3/0.225	57.0/41.4
3.55/0.145	42.46/30.3	6.3/0.259	81.2/57.4
4.2/0.168	62.7/45.0	-/0.308	-/85.7

55PC121X		55PC122X	
1.52/0.064	6.32/4.4	2.33/0.100	10.75/7.62
1.65/0.069	7.63/5.28	2.89/0.109	13.27/9.34
1.80/0.075	9.55/6.59	2.89/0.122	17.28/12.02
2.00/0.083	12.47/8.62	3.30/0.139	23.00/16.02
2.23/0.093	16.72/11.43	3.78/0.158	31.33/21.57
2.44/0.100	20.05/13.68	4.16/0.174	38.05/26.21
2.79/0.116	28.08/19.28	4.92/0.204	54.25/37.10
3.30/0.135	40.45/27.37	5.92/0.244	78.80/53.91
3.98/0.159	61.16/40.25	7.39/0.297	128.06/83.09

X = 1 - Tin plated copper conductor.
4 - Silver plated high strength copper alloy conductor. (Recommended for size 24 & 26 in airframe applications and mandatory for CAA release.)

Part numbering system

55 X X X X X- Size- X/X- X

Jacket color (in accordance with MIL-STD-681,white preferred)

Primary wire insulation color
(in accordance with MIL-STD-681)
0=Black 1=Brown 2=Red 2L=Pink 3=Orange 4=Yellow
5=Green 6=Blue 7=Violet 8=Grey 9=White
Additional number after base color indicates stripe

Conductor size

Conductor type
1 - Tin-plated copper 2 - Silver-plated copper
3 - Nickel-plated copper 4 - Silver-plated high strength copper alloy
6 - Nickel-plated high strength copper alloy

Number of conductors
0 = 10 conductors

Class of wire
1 - 600 V equipment wire, light weight
2 - 600 V airframe wire, light weight
4 - 450 V equipment wire (55M Only sizes 20-30)
8 - 600 V airframe wire, normal weight

Constructions
0 - Primary wire and shielded, unjacketed cables
1 - Round braid screened & jacketed cable †
2 - Flat braid screened & jacketed cable †
3 - Round braid, screened cable, no jacket †
4 - Jacketed cable, no screen
5 - Spiral screened and jacketed cable †
8 - Special constructions (part numbers not coded)
9 - Special constructions including light weight
† Screen material same as conductor material except all flat screens and screen for conductor types 4 and 6 shall be tin-plated copper. Other combinations are special. (Refer to Wire and Cable Division).

Type
A- AWG conductor M - Metric conductor
/ - Space wire PC - Process control
D - Defense Standard 61-12 Part 2b Issue 3

Basic specification number

Typical ordering example

3 conductors, red, yellow, blue, 600 volt equipment wire with overall round braid, 20 AWG tinned conductor and white jacket: total part number is 55A1131-20-2/4/6-9.

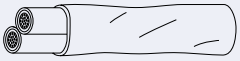
Ordering information

A list of stock policy items can be identified by contacting the relevant Product Specialist or Sales Order Office. Stock policy items are recognized by the use of a suffix, such as (300) defining the pack size, typically 55A0111-22-9(300). UK only.

SPEC 55 Part numbering system

Temperature rating	Conductor material	AWG range available	Raychem part no.	MIL-SPEC no.
600-V lightweight single-wall hookup wire, .152 mm (.006 inch) nominal wall				
150°C	Tin-coated copper	12–30	55A0111	M22759/32
200°C	Silver-coated copper	12–28	55A0112	M22759/44
200°C	Nickel-coated copper	12–28	55A0113	M22759/45
200°C	Silver-coated high-strength alloy	20–30	55A0114	M22759/33
200°C	Nickel-coated high-strength alloy	20–28	55A0116	M22759/46
600-V lightweight dual-wall airframe wire, .203 mm (.008 inch) nominal wall				
150°C	Tin-coated copper	6–26	55A0211	
200°C	Silver-coated copper	10–26	55A0212	
200°C	Nickel-coated copper	10–26	55A0213	
200°C	Silver-coated high-strength alloy	18–30	55A0214	
200°C	Nickel-coated high-strength alloy	16–26	55A0216	
600-V dual-wall airframe wire, .254 mm (.010 inch) nominal wall				
150°C	Tin-coated copper	00–24	55A0811	M22759/34
200°C	Silver-coated copper	00–26	55A0812	M22759/43
200°C	Nickel-coated copper	00–26	55A0813	M22759/41
200°C	Silver-coated high-strength alloy	20–26	55A0814	M22759/35
200°C	Nickel-coated high-strength alloy	20–26	55A0816	M22759/42
600-V medium-weight dual-wall airframe wire, .381 mm (.015 inch) nominal wall				
150°C	Tin-coated copper	10–24	55A0711	
200°C	Silver-coated copper	16–24	55A0712	
200°C	Nickel-coated copper	16–24	55A0713	
200°C	Silver-coated high-strength alloy	16–24	55A0714	
200°C	Nickel-coated high-strength alloy	16–26	55A0716	

SPEC 55 cable constructions

Construction	Number of components	Component conductor[a]	Shield material[a]	Part number Light wt.[b]	Medium wt.
Unshielded, unjacketed 	2–10	1		55*01X1-AWG-Y	55*08X1-AWG-Y
		2		55*01X2-AWG-Y	55*08X2-AWG-Y
		3		55*01X3-AWG-Y	55*08X3-AWG-Y
		4		55*01X4-AWG-Y	55*08X4-AWG-Y
		6		55*01X6-AWG-Y	55*48X6-AWG-Y
Unshielded, unjacketed 	2–10	1		55*41X1-AWG-Y	55*48X1-AWG-Y
		2		55*41X2-AWG-Y	55*48X2-AWG-Y
		3		55*41X3-AWG-Y	55*48X3-AWG-Y
		4		55*41X4-AWG-Y	55*48X4-AWG-Y
		6		55*41X6-AWG-Y	55*18X6-AWG-Y
Shielded (round braid), jacketed 	1–10	1	1	55*11X1-AWG-Y	55*18X1-AWG-Y
		2	2	55*11X2-AWG-Y	55*18X2-AWG-Y
		3	3	55*11X3-AWG-Y	55*18X3-AWG-Y
		4	1	55*11X4-AWG-Y	55*18X4-AWG-Y
		6	3	55*11X6-AWG-Y	55*18X6-AWG-Y
Shielded (flat braid), jacketed 	1–10	1	1	55*21X1-AWG-Y	55*28X1-AWG-Y
		2	1	55*21X2-AWG-Y	55*28X2-AWG-Y
		3	1	55*21X3-AWG-Y	55*28X3-AWG-Y
		4	1	55*21X4-AWG-Y	55*28X4-AWG-Y
		6	1	55*21X6-AWG-Y	55*28X6-AWG-Y

[a]Type of conductor or shield material:
1 = tin-coated copper
2 = silver-coated copper
3 = nickel-coated copper
4 = silver-coated high-strength copper alloy
6 = nickel-coated high-strength copper alloy
* = A or PC

[b]X = no. of wire components
Y = color code
For complete part number, see Part Numbering System on page 9-17.

NEMA WC-27500 Cable Part Numbering System

M27500 - AWG XX X X XX

Jacket style and material
00 = no jacket
23 = crosslinked, modified ETFE, white
73 = double jacket crosslinked, modified ETFE, white

Shield material and style
U = no shield
T = tin-coated copper, round
J = tin-coated copper, flat
S = silver-coated copper, round
G = silver-coated copper, flat
N = nickel-coated copper, round
V = tin-coated copper, round, double shield
W = silver-coated copper, round, double shield

Number of components. 1 through 9; 10 components = 0.

Basic wire spec (MIL-W-81044) and slash sheet
SB = 32 = 55A0111
SC = 33 = 55A0114
SD = 34 = 55A0811
for 2 AWG and larger, use 55A8039
SE = 35 = 55A0814
SM = 41 = 55A0813
for 2 AWG and larger, use 55A8595
SN = 42 = 55A0816
SP = 43 = 55A0812
for 2 AWG and larger, use 55A6089
SR = 44 = 55A0112
SS = 45 = 55A0113
ST = 46 = 55A0116

Example:

M275001-20SB3T23 = 55A1131-20-9/96/93-9

Military part no.

Raychem part no.