Raychem

- **Resistant to electrical arc tracking in wet or dry conditions**
- **Single or dual wall constructions**
- **Small size, ultra light weight**
- **Exceptional chemical resistance**

Spec 55

Wire and cable

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

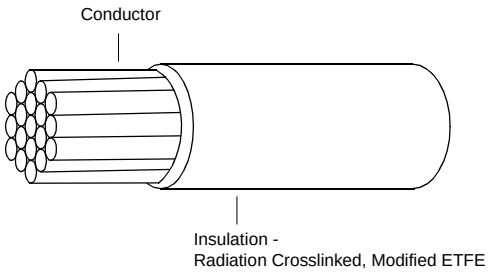
The dual wall airframe construction of Spec 55 wire is currently used on numerous aircraft programmes. It has a 0.25 mm total wall thickness and a contrasting core colour to act as a damage indicator. Chosen for its balance of properties, Spec 55 wire has outstanding resistance to chemicals and solvents, 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 and 0.15 mm wall thicknesses for use inside black boxes where flexibility and solder-iron resistance make it a wire which is very easy to reliably install.

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

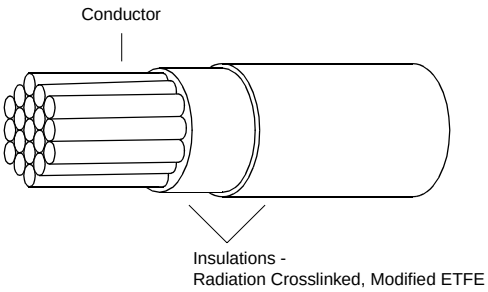
Specifications/Approvals

MIL-W-22759/32-35 and /41 to /46 and MIL-C-27500 (Cables)
Def Stan. 61-12 Part 33
VG95218 Part 20, Type D; Part 21, Type A; Part 22, Type A; Part 23, Type A, Part 1001 and Part 1002
VDE 9426, 9427, 9428
British Standard G233
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 3901/011 and 3901/012
Raychem Specification 55

Spec 55 Insulation system - Single wall



Spec 55 Insulation system - Dual wall



Spec 55

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 0.25 mm for robustness in unprotected harnesses and has excellent wire to wire abrasion properties. The 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 low resilience 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.

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 (BSG 233)	>100 cycles at 150°C
Flexing endurance (Boeing BSS 7324)	>1000 cyles
Voltage rating	600 V
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 BSG 230 0.05 mm notch	Pass
Solder iron resistance (370°C, 1 minute)	Pass
Solderability - Tin plated copper conductor BSG 233 conditions	<0.8 secs to wet
Shrinkage	<1%
Long term water resistance	Will not hydrolyse
Permittivity 1 KHz (ASTM D150)	2.7
Dissipation factor (ASTM D150)	0.001

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 reistance.

Solder iron/Overload resistance
Radiation crosslinking ensures that the insulation does not melt at high temperature. 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).

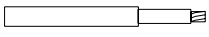
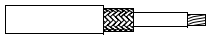
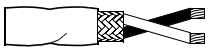
Space wire
Spec 55 is available in special versions suitable for use in outer space meeting both ESA and NASA requirements for outgassing.

Flammability
Special additives increase the flame retardance of Spec 55 compared to unirradiated ETFE so that it meets the latest high performance tests, eg. BSG 230 vertical test FAR 25.

Electrical arc tracking resistance
Spec 55 insulation demonstrates a total resistance to arc tracking under both wet and dry conditions at aircraft system voltages.

Spec 55

Spec 55 wire & cable: Standard constructions, sizes, strandings, diameters and weights

Conductor	Primary wire	Twisted pair	Screened & jacketed	
			Single	Pair
				

55M - Metric conductor: Equipment/Interconnect wires & cables

Size	Stranding (mm)	55M011X OD (mm)	Weight (g/m)	55M012X OD (mm)	Weight (g/m)	55M111X OD (mm)	Weight (g/m)	55M112X OD (mm)	Weight (g/m)
26	19/0.10	0.81	2.10	1.62	4.32	1.52	6.84	2.46	11.34
24	19/0.12	0.94	2.97	1.87	6.11	1.65	7.84	2.72	13.82
22	19/0.15	1.09	4.20	2.18	8.64	1.78	10.33	3.02	17.70
20	19/0.20	1.29	6.50	2.59	13.38	1.93	13.40	3.43	23.81
18	19/0.25	1.55	9.78	3.09	20.20	2.32	17.86	3.94	32.63
16	19/0.30	1.75	13.67	3.50	28.20	2.43	21.73	4.30	39.72
14	37/0.25	2.18	19.60	4.36	40.50	2.83	29.86	5.21	56.00
12	37/0.32	2.64	30.03	5.28	61.77	3.48	42.42	6.13	80.91

55M - Metric conductor: Airframe wires & cables

Size	Stranding (mm)	55M081X OD (mm)	Weight (g/m)	55M082X OD (mm)	Weight (g/m)	55M111X OD (mm)	Weight (g/m)	55M112X OD (mm)	Weight (g/m)
26	19/0.10	-	-	1.99	5.29	1.52	6.84	2.46	11.34
24	19/0.12	-	-	2.28	6.30	1.65	7.84	2.72	13.82
22	19/0.15	1.29	4.77	2.59	10.08	1.78	10.33	3.02	17.80
20	19/0.20	1.50	6.99	3.00	14.40	1.93	13.40	3.43	23.81
18	19/0.25	1.78	10.73	3.55	22.76	2.32	17.86	3.94	32.63
16	19/0.30	2.02	15.26	3.96	31.44	2.43	21.73	4.30	39.72
14	37/0.25	2.33	21.00	4.83	43.22	2.83	30.46	5.21	56.90
12	37/0.32	2.84	30.50	5.69	61.24	3.48	42.42	6.13	80.91
10	37/0.40	3.45	47.06	6.80	96.94	-	-	-	-

55M - Metric conductor: Light weight equipment wires and cables

Size	Stranding (mm)	55M041X OD (mm)	Weight (g/m)	55M042X OD (mm)	Weight (g/m)	55M141X OD (mm)	Weight (g/m)	55M142X OD (mm)	Weight (g/m)
32	7/0.08	0.46	0.60	0.92	1.24	-	-	-	-
30	7/0.10	0.53	0.90	1.06	1.85	1.18	3.61	1.75	5.51
28	7/0.13	0.61	1.23	1.22	2.54	1.26	4.12	1.87	6.72
26	19/0.10	0.71	1.92	1.42	3.96	1.35	4.92	2.07	8.93
24	19/0.13	0.84	2.84	1.68	5.86	1.49	6.50	2.33	11.54

X = 1 - Tin plated copper.
4 - Silver plated high strength copper alloy.
Recommended for size 24 and smaller in airframe applications.

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.

Contact Wire & Cable Division for further details.

Spec 55

Part numbering system

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

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

Primary wire insulation colour
(in accordance with MIL-STD-681)

0=Black	3=Orange	7=Violet
1=Brown	4=Yellow	8=Grey
2=Red	5=Green	9=White
2L=Pink	6=Blue	

Additional number after base colour indicates stripe

Conductor size

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

Number of conductors
1 to 9

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 24-32)
8 - 600 V airframe wire, normal weight

Constructions
0 - Primary wire & unscreened, 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

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 55M1131-20-2/4/6-9.

Ordering information

The standard equipment wires (55M011X etc) are held as stock items between 26 and 20 gauge in a range of colours. Commonly used cables manufactured from these wires, such as screened twisted pairs and triples are also held in stock. The light weight equipment wire (55M041X etc) is also held in a range of colours. The dual-wall airframe wire is held as a stock item with white insulation in 24-16 gauge and 8-0 gauge for power wire. Other constructions and certain designed cables are available on request.

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