

- Dual wall construction
- 600, 1000 and 2500 voltage rating
- Small size, light weight
- Low smoke and low corrosive gas generation
- Resistant to most chemicals and electrical arc tracking

## Spec 44

### Wire and cable

Spec 44 wire has a dual wall construction which combines the outstanding physical and electrical characteristics of radiation crosslinked polyalkene with the excellent mechanical and chemical properties of radiation cross-linked polyvinylidene fluoride (PVDF).

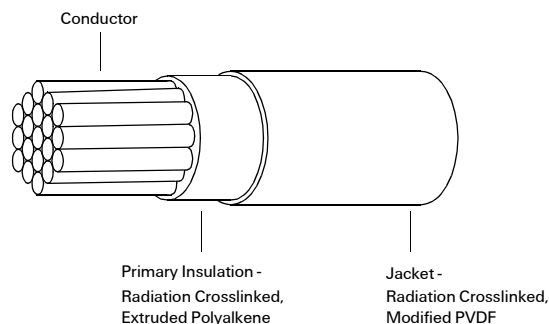
The result is a wire insulation system that offers a 150°C temperature rating, small size, light weight, solder iron resistance, and resistance to most solvents, fuels and lubricants. Spec 44 wire and cable is highly flame retardant, non-melting, does not cold flow, and though mechanically

very tough, is easy to handle and install using conventional tools.

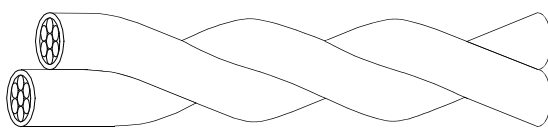
Originally developed for aerospace and military requirements in applications of high density and complex circuitry, Spec 44 wire and cable now finds wide use throughout industry, in commercial and military electronics, avionics, on satellites, aircraft, helicopters, ships, trains, and offshore platforms where environmental conditions demand consistently reliable performance. In airframe applications Spec 44 constructions can offer a modern dimensional replacement for PVC/Nylon/

Glass braid type wire and cables. Spec 44 wire is offered in a wide range of sizes in stranded conductors, standard materials available being tin or silver-plated copper and high strength copper alloy. Voltage ratings of 600, 1000 and 2500 volts are available as standard. Shielded and jacketed versions include single and multi-conductor constructions and flat braid shields where further size and weight savings are achieved.

#### 44 wire



#### 44 cable (twisted pair)



#### Specifications/Approvals

|                                                                       |
|-----------------------------------------------------------------------|
| Mil-W-81044, Mil-C-27500 (Cables)                                     |
| Def Stan. 61-12 Part 18 Issue 4 - Type 1 pliable (Maintenance Range)  |
| Def Stan. 61-12 Part 26 Issue 2 Type 1, 2, 3, 7, 8, 9 & METS 7, 8 & 9 |
| VG 95218 Parts 20, 21, 22, 23 and 1000                                |
| NATO Stock numbers (NSN's) exist for most standard constructions      |
| Civil Aviation Authority Accessory Approval E1 1623                   |
| Lloyds Register of Shipping                                           |
| NASA Preferred Product List                                           |
| Raychem Specification 44                                              |

# Spec 44

## Physical characteristics

### Small size

Spec 44 equipment wire, 600 volt rated has a 0.19 mm nominal wall thickness compared to 0.25 mm and 0.38 mm for equivalent PTFE and PVC wires in MIL-W-16878, MIL-W-22759 or BS G210.

### Light weight

Because of the thin wall and low density of the insulation materials considerable weight savings are made over similarly rated PTFE wires, eg:-

44A0111-22AWG equipment wire

4.62 grams/metre max

22AWG PTFE equipent wire,  
MIL-W-22759

5.54 grams/metre max

### General handling

The flexibility of Spec 44 and the ease with which it takes a 'set' makes it one of the easiest of the 'high performance' wires to install. Stripping is done with conventional die blade strippers.

For details of appropriate tools see separate wire handling guide. The tin-plated conductor usually specified is easily soldered or crimped. The insulation may be hot stamp marked or printed and does not need etching before potting.

### Lengths

Spec 44 is available in long continuous lengths and can be supplied for use on automatic cut and strip wire preparation machines.

## Typical properties

|                                               |                             |
|-----------------------------------------------|-----------------------------|
| Temperature rating                            | -65°C to +150°C             |
| Voltage rating (thin wall)                    | 600 V                       |
| Voltage rating (thick wall)                   | 2500 V                      |
| Tensile strength and elongation of insulation | 30 N/mm <sup>2</sup> , 230% |
| Notch propagation, 0.05mm notch               | Pass                        |
| Solder iron resistance (370°C, 1 minute)      | Pass                        |
| Shrinkage, 200°C                              | <1%                         |
| Low temperature bend                          | -65°C                       |
| Voltage withstand (thin wall)                 | 2500 V                      |
| Insulation resistance (20°C)                  | 1500 M ohms for 1 km        |
| Resistance: fuels, oils, solvents             | Pass                        |

## Environmental performance

### Temperature rating

Spec 44 wire and cable is rated for continuous operation from -65°C to +150°C and for short periods at temperatures as high as 300°C. Heat ageing tests are routinely performed at temperatures of 200°C (168 h) and 300°C (6 h). In addition Spec 44's insulation will not shrink back under repeated cycling.

### Mechanical performance

Spec 44 wire provides better cut through resistance than some wires with much thicker walls. 600 volt equipment wire 44A0111 (0.19 mm wall) has 40% greater cut through resistance than 600 volt PTFE insulated wire (0.25 mm wall).

### Solder iron/Overload resistance

The radiation crosslinking of the materials used in Spec 44 makes them non-melting at high temperature. As a result Spec 44 wire is resistant to prolonged contact with solder irons and is resistant to current overloads which would melt most thermoplastic insulations.

### Chemical resistance

The irradiated dual wall construction of Spec 44 wire is highly resistant to many acids, alkalis, hydrocarbon solvents, fuels, lubricants, water and many missile fuels and oxidisers.

### Cold flow

Radiation cross-linking of Spec 44 prevents cold flow of the insulation - a recognised problem of some uncrosslinked materials.

### Voltage ratings

Standard available voltage ratings for Spec 44 wire are 600 volts (0.19 mm wall thickness), 1000 volts (0.28 mm wall) and 2500 volts (0.48 mm wall).

### Electrical arc track resistance

Spec 44 insulation demonstrates a total resistance to arc tracking under both wet and dry conditions at aircraft system voltages.

### Low outgassing

For use in space applications, special constructions of Spec 44 wire are available with low outgassing characteristics, for use in an environment of high vacuum and high temperature.

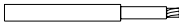
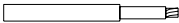
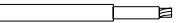
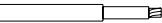
## Fire hazard performance

|                      |                                     |                       |
|----------------------|-------------------------------------|-----------------------|
| Flammability         | BS4066 vertical flammability        | Pass                  |
|                      | S424 14751 (Swedish chimney)        | Pass                  |
|                      | NFC 32070 (2) (French chimney)      | Pass                  |
|                      | IEC 332 part 3 (Cable ladder)       | Pass                  |
| Smoke/Toxicity Index | Smoke Index, Def Stan 61-12 (18)    | 6 per metre of wire   |
|                      | Toxicity Index, Def Stan 61-12 (18) | 0.8 per metre of wire |
|                      | Oxygen Index, NES 714               | 30% Oxygen            |
|                      | Temperature Index, NES 715          | >300°C                |

## Spec 44

### Spec 44 wire and cable - nominal sizes, strandings and weights

#### Primary wires/Twisted pair

|      |                   |                           | 44A011X (600 V)<br>primary wire                                                   |                 | 44A021X (1000 V)<br>primary wire                                                  |                 | 44A031X (2500 V)<br>primary wire                                                   |                 | 44A081X (600 V)<br>airframe wire                                                    |                 | 44A012X (600 V)<br>twisted pair                                                     |                 |
|------|-------------------|---------------------------|-----------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|-----------------|
|      |                   |                           |  |                 |  |                 |  |                 |  |                 |  |                 |
| Size | Stranding<br>(mm) | CSA<br>(mm <sup>2</sup> ) | OD<br>(mm)                                                                        | Weight<br>(g/m) | OD<br>(mm)                                                                        | Weight<br>(g/m) | OD<br>(mm)                                                                         | Weight<br>(g/m) | OD<br>(mm)                                                                          | Weight<br>(g/m) | OD<br>(mm)                                                                          | Weight<br>(g/m) |
| 30   | 7/0.10            | 0.06                      | 0.68                                                                              | 1.00            |                                                                                   |                 |                                                                                    |                 |                                                                                     |                 | 1.37                                                                                | 2.12            |
| 28   | 7/0.13            | 0.09                      | 0.76                                                                              | 1.36            |                                                                                   | 1.49            |                                                                                    |                 |                                                                                     |                 | 1.52                                                                                | 2.90            |
| 26*  | 19/0.10           | 0.15                      | 0.86                                                                              | 1.98            | 1.02                                                                              | 2.23            |                                                                                    |                 |                                                                                     |                 | 1.73                                                                                | 4.10            |
| 24   | 19/0.13           | 0.25                      | 1.02                                                                              | 2.97            | 1.17                                                                              | 3.43            | 1.44                                                                               | 4.18            | 1.37                                                                                | 3.73            | 2.03                                                                                | 6.08            |
| 22   | 19/0.16           | 0.40                      | 1.19                                                                              | 4.38            | 1.37                                                                              | 4.92            | 1.75                                                                               | 6.12            | 1.57                                                                                | 5.52            | 2.38                                                                                | 8.91            |
| 20   | 19/0.20           | 0.60                      | 1.40                                                                              | 6.50            | 1.57                                                                              | 7.30            | 1.98                                                                               | 8.65            | 1.78                                                                                | 7.91            | 2.79                                                                                | 13.30           |
| 18   | 19/0.25           | 1.00                      | 1.65                                                                              | 9.90            | 1.85                                                                              | 10.90           | 2.23                                                                               | 12.38           | 2.03                                                                                | 11.49           | 3.30                                                                                | 20.21           |
| 16   | 19/0.29           | 1.25                      | 1.83                                                                              | 12.58           | 2.06                                                                              | 13.88           | 2.46                                                                               | 15.37           | 2.26                                                                                | 14.32           | 3.65                                                                                | 25.73           |
| 14   | 19/0.36           | 2.00                      | 2.26                                                                              | 19.65           | 2.49                                                                              | 20.90           | 2.92                                                                               | 23.13           | 2.74                                                                                | 22.08           | 4.52                                                                                | 40.15           |
| 12   | 37/0.32           | 3.00                      | 2.74                                                                              | 30.68           | 2.98                                                                              | 31.34           | 3.32                                                                               | 34.32           | 3.20                                                                                | 32.23           | 5.48                                                                                | 62.63           |
| 10   | 37/0.40           | 5.00                      | 3.28                                                                              | 46.28           | 3.73                                                                              | 50.4            | 4.09                                                                               | 54.02           | 3.94                                                                                | 51.80           |                                                                                     |                 |
| 8    | 133/0.29          |                           |                                                                                   |                 | 5.23                                                                              | 87.6            | 5.56                                                                               | 96.20           | 5.44                                                                                | 92.94           |                                                                                     |                 |

\*For 44A0211-26 the stranding is 7/0.16mm

#### Screened and jacketed cable

|      |                   | 44A111X (600 V)<br>1 conductor                                                    |                 | 44A121X (6000 V)<br>1 conductor                                                   |                 | 44A181X (600 V)<br>1 conductor                                                      |                 | 44A112X (600 V)<br>2 conductors                                                     |                 |
|------|-------------------|-----------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|-----------------|
|      |                   |  |                 |  |                 |  |                 |  |                 |
| Size | Stranding<br>(mm) | OD<br>(mm)                                                                        | Weight<br>(g/m) | OD<br>(mm)                                                                        | Weight<br>(g/m) | OD<br>(mm)                                                                          | Weight<br>(g/m) | OD<br>(mm)                                                                          | Weight<br>(g/m) |
| 30   | 7/0.10            |                                                                                   |                 |                                                                                   |                 |                                                                                     |                 | 2.23                                                                                | 8.20            |
| 28   | 7/0.13            |                                                                                   |                 | 1.60                                                                              | 5.33            |                                                                                     |                 | 2.38                                                                                | 9.40            |
| 26   | 19/0.10           | 1.57                                                                              | 5.82            | 1.73                                                                              | 6.51            |                                                                                     |                 | 2.59                                                                                | 12.05           |
| 24   | 19/0.13           | 1.83                                                                              | 8.20            | 1.98                                                                              | 9.18            | 2.26                                                                                | 11.69           | 2.99                                                                                | 16.12           |
| 22   | 19/0.16           | 2.00                                                                              | 10.30           | 2.24                                                                              | 12.35           | 2.57                                                                                | 15.39           | 3.35                                                                                | 21.50           |
| 20   | 19/0.20           | 2.26                                                                              | 14.02           | 2.54                                                                              | 17.40           | 2.77                                                                                | 19.09           | 3.76                                                                                | 27.97           |
| 18   | 19/0.25           | 2.62                                                                              | 19.70           | 2.82                                                                              | 22.61           | 3.02                                                                                | 23.98           | 4.32                                                                                | 38.24           |
| 16   | 19/0.29           | 2.79                                                                              | 23.40           | 3.02                                                                              | 26.63           | 3.25                                                                                | 27.97           | 4.67                                                                                | 44.93           |
| 14   | 19/0.36           | 3.22                                                                              | 32.50           | 3.45                                                                              | 36.15           | 3.73                                                                                | 38.48           | 5.53                                                                                | 64.28           |
| 12   | 37/0.32           | 3.70                                                                              | 45.67           | 4.14                                                                              | 49.55           | 4.19                                                                                | 52.10           | 6.50                                                                                | 91.51           |

Size 10 to 4 also available in some constructions depending on conductor type and construction required.

### Spec 44 wire and cable (Def Stan 61-12 Part 18 Issue 4 Type 1) (Maintenance)

#### Limited fire hazard equipment wire (pliable)

#### Cable electrical - Type 1SBM screened and jacketed

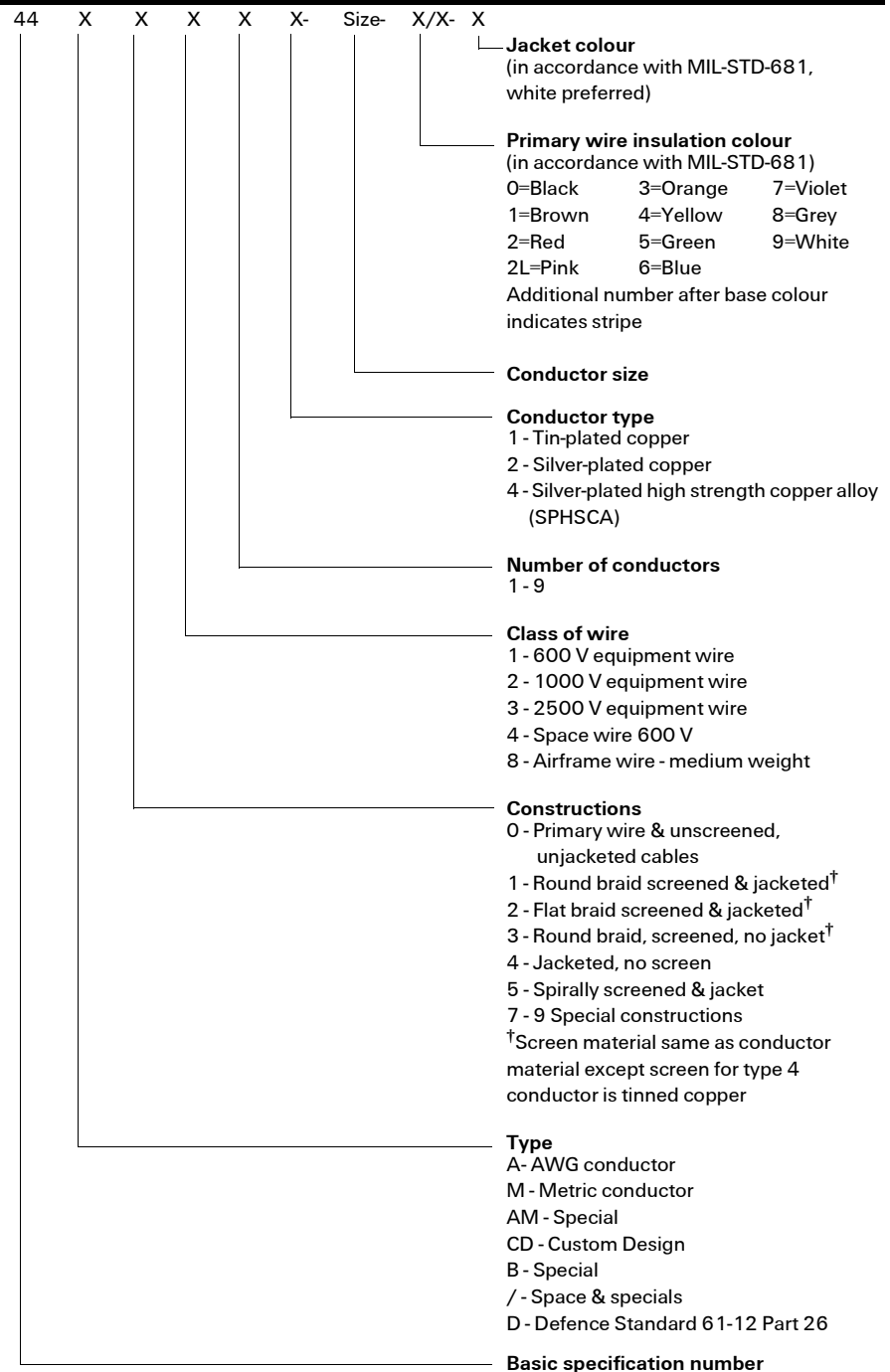
| Conductor size | Stranding (mm) | Diameter over insulation (mm) | Weight (gm/m) | Raychem part number | Diameter over screen (mm) | Diameter over jacket (mm) | Weight (gm/m) | Raychem part number |
|----------------|----------------|-------------------------------|---------------|---------------------|---------------------------|---------------------------|---------------|---------------------|
| 30             | 7/0.10         | 0.68                          | 1.00          | 44M9976-30-†        |                           |                           |               |                     |
| 28             | 7/0.12         | 0.73                          | 1.40          | 44M9976-28-†        |                           |                           |               |                     |
| 26             | 19/0.10        | 0.88                          | 2.00          | 44M9976-26-†        | 1.33                      | 1.80                      | 7.5           | 44M9995-26-†-†      |
| 24             | 19/0.12        | 0.98                          | 3.00          | 44M9976-24-†        | 1.43                      | 1.90                      | 9.2           | 44M9995-24-†-†      |
| 22             | 19/0.15        | 1.13                          | 4.40          | 44M9976-22-†        | 1.58                      | 2.05                      | 11.1          | 44M9995-22-†-†      |
| 20             | 19/0.20        | 1.40                          | 6.55          | 44M9976-20-†        | 1.83                      | 2.30                      | 14.6          | 44M9995-20-†-†      |
| 18             | 19/0.25        | 1.65                          | 9.90          | 44M9976-18-†        | 2.08                      | 2.55                      | 19.3          | 44M9995-18-†-†      |
| 16             | 19/0.30        | 1.90                          | 14.15         | 44M9976-16-†        | 2.48                      | 2.95                      | 24.9          | 44M9995-16-†-†      |
| 14             | 37/0.25        | 2.25                          | 18.62         | 44M9976-14-†        | 2.65                      | 3.13                      | 30.9          | 44M9995-14-†-†      |
| 12             | 37/0.30        | 2.60                          | 25.70         | 44M9976-12-†        | 3.00                      | 3.48                      | 43.4          | 44M9995-12-†-†      |

The cable jackets on type 1SBM are specified black to Def. Stan. 61-12 pt 31, other colours are available.

†Colour code suffix - see part numbering system. Single and multicore screened and jacketed cables are available using Type 1 components.

# Spec 44

## Part numbering system



## Typical ordering example

3 conductors, brown, yellow with green stripe, blue, white jacket. If 600 volt, round braid, 20 AWG tinned conductor, total part number is 44A1131-20-1/45/6-9.

## Ordering information

Standard equipment wires (44A0111 12 to 30 AWG) in most common AWGs and colours are kept in stock. In addition, many of the most commonly used single/pair and triple screened cables are also stock items, as are some airframe constructions. Other constructions and custom designed wire and cable are available on request.

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