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METRIC
Dimensions in this section are millimeters over inches

Catalog 1308940
Revised 5-03

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Dimensions are shown for reference purposes only. Specifications subject to change.

USA: 1-800-522-6752
Canada: 1-905-470-4425
Mexico: 01-800-733-8926
C. America: 52-55-5-729-0425

South America: 55-11-3611-1514
Japan: 81-44-900-5102
Singapore: 65-4866-151
UK: 44-1793-528171

Introduction

Tyco Electronics provides wire and cable solutions for challenging environments and demanding applications. The Raychem product range includes high-performance insulated wires, coaxial and data bus cables, power cables, electronics wire, and multicore cables.

- SPEC 44 wire is an economical yet rugged dual-wall insulation system rated at 150°C [221°F], with consistently low cost and reliable performance.
- SPEC 55 wire insulation provides high reliability in harsh environments from -65°C to +200°C [-85°F to +392°F]. Resistant to electrical arc tracking, it combines the easy handling of a flexible wire with excellent resistance to scrapes, abrasion, and cut-through.
- Type 99T dual-wall insulation system is a 105°C [221°F] rated wire that combines excellent chemical and mechanical resistance with limited fire hazard performance.
- ElectroLoss Filterline wire reduces the vulnerability of critical circuits to high-frequency electromagnetic interference.
- Cheminax coaxial and data bus cables allow system designers to optimize minimum size and weight with impedance and attenuation characteristics.
- Multiconductor (multicore) cables organize a variety of Raychem wire and cable products in controlled geometries for specific applications. Using a computer-aided design system, Tyco Electronics can quickly design multicore cables to meet your needs. A variety of cable jackets are available to suit most applications.

Raychem wire and cable products can meet your specific application needs. Here are just a few examples:

- Limited-fire-hazard wire and cable for mass transit and marine applications.
- High-performance, high temperature automotive wiring.
- Small, light hookup wires for high-temperature applications in commercial appliances, tools, and devices.
- Very flexible, rugged, thin-wall insulated power cables.
- Low-outgassing space-vehicle wiring.
- Lightweight, shielded wire and cable constructions for aerospace applications.
- Thermocouple extension cables with a range of our high-performance insulations materials.

Contact Tyco Electronics to find out more about wire and cable and our associated interconnection products.

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SPEC 44

Product Facts

- 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

Applications

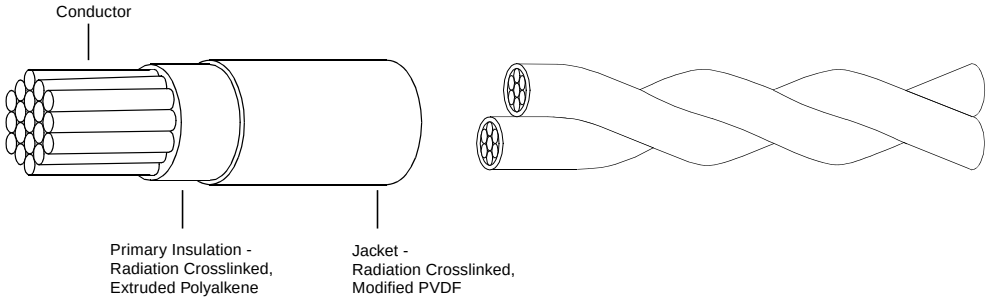
SPEC 44 wire has a dual wall construction which combines the outstanding physical and electrical characteristics of radiation crosslinked polyalkene with the excellent mechanical and chemical properties of radiation cross-linked polyvinylidene fluoride (PVDF).

The result is a wire insulation system that offers a 150°C [302°F] 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.



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SPEC 44 (Continued)

Physical Characteristics

Small Size

SPEC 44 equipment wire, 600 volt rated has a 0.19 [.008] nominal wall thickness compared to 0.25 [.010] and 0.38 [.015] 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/meter max
22 AWG PTFE equipment wire, MIL-W-22759
5.54 grams/meter 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.

Specifications/Approvals

MIL-W-81044, NEMA-WC-27500 (Cables)
Def Stan. 61-12 Part 18 Issue 4 - Type 1 pliable (Maintenance Range)
Def Stan. 61-12 Part 26 Issue 3 Type 2, 3, 8 & 9 & METS
VG 95218 Parts 20, 21, 22, 23 and 1000
NATO Stock Numbers (NSN's) exist for most standard constructions
Civil Aviation Authority Accessory Approval E11623
Lloyds Register of Shipping
NASA Preferred Product List
Raychem Specification 44

Typical Properties

Temperature rating	-65°C to +150°C [-85°F to +302°F]
Voltage rating (thin wall)	600 V
Voltage rating (thick wall)	2500 V
Tensile strength and elongation of insulation	30 N/mm2 , 230%
Notch propagation, 0.05mm notch	Pass
Solder iron resistance (370°C, 1 minute)	Pass
Shrinkage, 200°C	<1%
Low temperature bend	-65°C [-85°F]
Voltage withstand (thin wall)	2500 V
Insulation resistance (20°C)	1500 M ohms for 1 km
Resistance: fuels, oils, solvents	Pass

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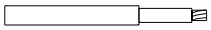
SPEC 44 (Continued)

Primary Wires/Twisted Pair



44A011X (600 V)
Primary Wire

44A021X (1000 V)
Primary Wire

Size	Stranding (mm)	#/AWG	CSA (mm^2)	44A011X (600 V)		44A021X (1000 V)	
				Nom. OD	Max. Weight (g/m) lb/kft	Nom. OD	Max. Weight (g/m) lb/kft
30	7/0.10	7/38	0.06	0.68 [0.027]	1.06 [0.71]	—	—
28	7/0.13	7/36	0.09	0.76 [0.030]	1.43 [0.96]	—	—
26*	19/0.10	19/38	0.15	0.86 [0.034]	2.08 [1.4]	1.02 [0.040]	2.38 [1.6]
24	19/0.13	19/36	0.25	1.02 [0.040]	2.98 [2.0]	1.17 [0.046]	3.57 [2.4]
22	19/0.16	19/34	0.40	1.19 [0.047]	4.46 [3.0]	1.37 [0.054]	5.20 [3.5]
20	19/0.20	19/32	0.60	1.40 [0.055]	6.70 [4.5]	1.57 [0.062]	7.59 [5.1]
18	19/0.25	19/30	1.00	1.65 [0.065]	10.12 [6.8]	1.85 [0.073]	11.46 [7.7]
16	19/0.29	19/29	1.25	1.83 [0.072]	12.80 [8.6]	2.06 [0.081]	14.58 [9.8]
14	19/0.36	19/27	2.00	2.26 [0.089]	19.64 [13.2]	2.49 [0.098]	21.88 [14.7]
12	37/0.32	37/28	3.00	2.74 [0.108]	30.06 [20.0]	2.97 [0.117]	32.89 [22.1]
10	37/0.40	37/26	5.00	3.28 [0.129]	46.28 [31.1]	3.71 [0.146]	52.98 [35.6]
8	133/0.29	133/29	—	—	—	5.23 [0.206]	91.97 [61.8]

*For 44A0211-26 the stranding is 7/0.16mm 7/34 AWG

44A031X (2500 V)
Primary Wire

44A081X (600 V)
Airframe Wire

44A012X (600 V)
Twisted Pair

44A031X (2500 V)		44A081X (600 V)		44A012X (600 V)	
Nom. OD	Max. Weight (g/m) lb/kft	Nom. OD	Max Weight (g/m) lb/kft	Nom. OD	Max. Weight (g/m) lb/kft
—	—	—	—	1.37 [0.054]	2.38 [1.6]
—	—	—	—	1.52 [0.060]	3.13 [2.1]
1.35 [0.053]	3.13 [2.1]	1.22 [0.048]	2.98 [2.0]	1.73 [0.068]	4.47 [3.0]
1.44 [0.057]	4.46 [3.0]	1.37 [0.054]	3.87 [2.6]	2.03 [0.080]	6.69 [4.5]
1.75 [0.069]	6.40 [4.3]	1.57 [0.062]	5.65 [3.8]	2.38 [0.094]	9.82 [6.6]
1.98 [0.078]	9.08 [6.1]	1.78 [0.070]	8.04 [5.4]	2.79 [0.110]	14.73 [9.9]
2.23 [0.088]	12.95 [8.7]	2.03 [0.080]	11.91 [8.0]	3.30 [0.130]	22.32 [15.0]
2.46 [0.097]	16.22 [10.9]	2.26 [0.089]	14.73 [9.9]	3.65 [0.144]	28.42 [19.1]
2.92 [0.115]	24.10 [16.2]	2.74 [0.108]	22.17 [14.9]	4.52 [0.178]	44.35 [29.8]
3.32 [0.131]	36.01 [24.2]	3.20 [0.126]	32.59 [21.9]	5.48 [0.216]	69.00 [46.5]
4.09 [0.161]	54.32 [36.5]	3.94 [0.155]	52.08 [35.0]	—	—
96.20 [0.219]	96.73 [65.0]	92.94 [0.214]	93.46 [62.8]	—	—

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SPEC 44 (Continued)

Shielded and Jacketed Cable

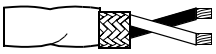
44A111X (600 V)
1 Conductor

44A121X (600 V)
1 Conductor

Size	Stranding (mm)	#/AWG	44A111X (600 V)		44A121X (600 V)	
			Nom. OD	Max. Weight (g/m) lb/kft	Nom. OD	Max. Weight (g/m) lb/kft
30	7/0.10	7/38	1.47 [0.058]	5.20 [3.5]	—	—
28	7/0.13	7/36	1.55 [0.061]	5.80 [3.9]	1.60 [0.063]	5.65 [3.8]
26	19/0.10	19/38	1.57 [0.065]	6.84 [4.6]	1.73 [0.068]	6.85 [4.6]
24	19/0.13	19/36	1.83 [0.072]	8.63 [5.8]	1.98 [0.078]	9.67 [6.5]
22	19/0.16	19/34	2.01 [0.079]	10.71 [7.2]	2.24 [0.088]	12.35 [8.3]
20	19/0.20	19/32	2.26 [0.089]	14.73 [9.9]	2.54 [0.100]	17.41 [11.7]
18	19/0.25	19/30	2.62 [0.103]	20.68[13.9]	2.82 [0.111]	22.62 [15.2]
16	19/0.29	19/29	2.79 [0.110]	24.55 [16.5]	3.02 [0.119]	26.64 [17.9]
14	19/0.36	19/27	3.22 [0.127]	34.08 [22.9]	3.45 [0.136]	36.16 [24.3]
12	37/0.32	37/28	3.70 [0.146]	47.77 [32.1]	4.14 [0.155]	49.56 [33.3]

Other sizes are also available in some constructions depending on conductor type and construction required.

44A181X (600 V)
1 Conductor



44A112X (600 V)
2 Conductor

44A181X (600 V)		44A112X (600 V)	
Nom. OD	Max. Weight (g/m) lb/kft	Nom. OD	Max. Weight (g/m) lb/kft
—	—	2.23 [0.088]	8.63 [5.8]
—	—	2.38 [0.094]	9.82 [6.6]
—	—	2.59 [0.102]	12.05 [8.1]
2.26 [0.089]	11.76 [7.9]	2.99 [0.118]	16.82 [11.3]
2.57 [0.101]	15.48 [10.4]	3.35 [0.132]	21.57 [14.5]
2.77 [0.109]	19.19 [12.9]	3.76 [0.148]	27.97 [18.8]
3.02 [0.119]	24.11 [16.2]	4.32 [0.170]	38.24 [25.7]
3.25 [0.128]	28.13 [18.9]	4.67 [0.184]	44.94 [30.2]
3.73 [0.147]	38.69 [26.0]	5.53 [0.218]	64.28 [43.2]
4.19 [0.165]	52.38 [35.2]	6.50 [0.256]	91.51 [61.5]

Other sizes are also available in some constructions depending on conductor type and construction required.

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NEMA WC-27500 Cable Part Numbering System

M27500 - AWG XX X X XX

Jacket Style and Material
00 = no jacket
08 = crosslinked, white PVDF
23 = crosslinked, white, modified ETFE

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

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

Basic Wire Spec (MIL-W-81044) and Slash Sheet
MD = /5 (44A0712)
ME = /6 (44A0711)
MF = /7 (44A0714)
MG = /8 (44A0812)
MH = /9 (44A0811)
MJ = /10 (44A0814)
MK = /11 (44A0112)
ML = /12 (44A0111)
MM = /13 (44A0114)

Example:

M27500-22ML3T08 = 44AM1131-22-9/96/93-9

Military Part No.

Raychem Part No.

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SPEC 44 (Continued)

Environmental Performance

Temperature Rating

SPEC 44 wire and cable is rated for continuous operation from -65°C to +150°C [-85°F to +302°F] and for short periods at temperatures as high as 300°C [572°F]. Heat ageing tests are routinely performed at temperatures of 200°C [392°F] (168 h) and 300°C [572°F] (6 h). In addition SPEC 44 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 oxidizers.

Cold Flow

Radiation cross-linking of SPEC 44 prevents cold flow of the insulation — a recognized 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	Federal Aviation Reg FAR-25	Pass
	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 meter of wire
	Toxicity Index, Def Stan 61-12 (18)	0.8 per meter of wire
	Oxygen Index, NES 714	30% Oxygen
	Temperature Index, NES 715	>300°C [572°F]

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Part Numbering System

44 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 (SPHSCA)
6 - Nickel-plated high strength copper alloy (NPHSCA)

Number of Conductors
1 to 9 0 = 10 conductor

Class of Wire
1 - 600 V equipment wire
2 - 1000 V equipment wire
3 - 2500 V equipment wire
7 - 600 V nominal weight wire
8 - 600 V medium weight wire

Constructions
0 - Primary wire and unshielded, unjacketed cables
1 - Round braid shielded and jacketed
2 - Flat braid shielded and jacketed
3 - Round braid, shielded, no jacket
4 - Jacketed, no shield
5 - Spirally shielded and jacketed
7-9 - Special constructions

Screen material same as conductor material except screen for type 4 conductor is tinned copper.

Type
I - 135¡C space wire
A - AWG conductor
CD - Custom Design
M - Metric conductor
B - Radiation crosslinked modified ETFE jacket in place of PVDF
AM - Designation for M27500 cables
D - Defense Standard 61-12 Part 2b Issue 3

Basic Specification Number

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 colors are kept in stock. In addition, many of the most commonly used single/pair and triple shielded cables are also stock items, as are some airframe constructions*. Other constructions and custom designed wire and cable are available on request.

*Europe only.

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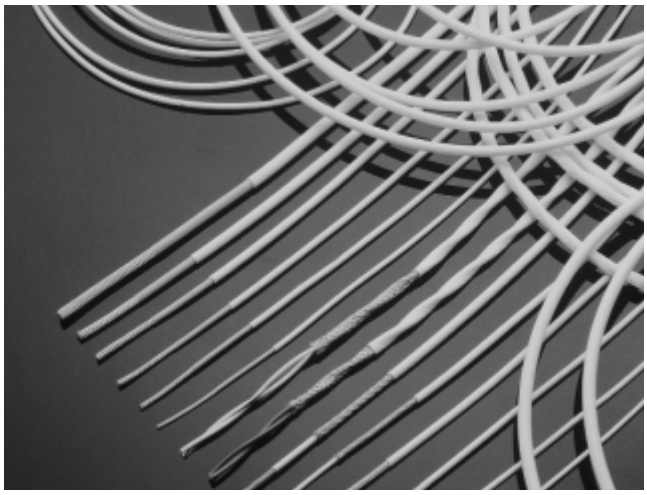
SPEC 55

Product Facts

- **Resistant to electrical arc tracking in wet or dry conditions**
- **Single or dual wall constructions**
- **Small size, ultra light weight**
- **Exceptional chemical resistance**
- **-65°C to 200°C [-85°F to 392°F]**



Applications

SPEC 55 wire is insulated with modified radiation cross-linked ETFE polymer. It has a temperature rating of -65°C to 200°C [-85°F to 392°F] 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 [.010] (55A08XX 10 mil) and 0.2 [.008] (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 [.004] (55/03XX 4 mil) and 0.15 [.006] (6 mil) wall thicknesses for use inside black boxes where flexibility and soldering 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 shielded and jacketed cables.

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 0.2 [.008] or 0.25 [.010] for robustness in unprotected harnesses and has excellent wire to wire abrasion properties.

The single wall equipment wire has a 0.15 [.006] 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 [.004] 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.

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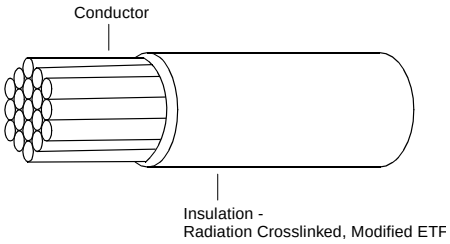
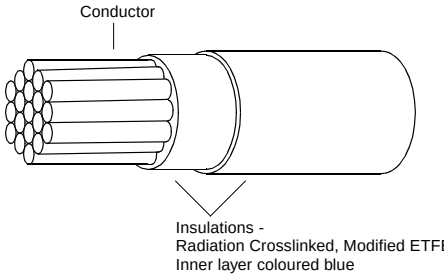
Singapore: 65-4866-151
UK: 44-1793-528171

SPEC 55 (Continued)

Specifications



SPEC 55 insulation system - single wall



SPEC 55 insulation system - dual wall

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

Typical Properties

Temperature rating	(Tin plated conductor)	-65°C to +150°C [-85°F to +302°F]
	(Silver or nickel plated conductor)	-65°C to +200°C [-85°F to +392°F]
Thermal endurance		200 °C [392°F], 10000 h
Scrape abrasion (BS 3G233)		>100 cycles at 150°C [302°F]
Flexing endurance (Boeing BSS 7324)		>1000 cycles
Voltage rating		600 V, 450V
Tensile strength + core elongation		(Airframe wire only) 35 N/mm2, 125%
Tensile strength + total elongation		(All primary wire) 35 N/mm2, 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) Burn length		~~0~~ 31 mm/20 in

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SPEC 55 (Continued)

Environmental Performance

Temperature Rating

SPEC 55 wire and cable is rated for continuous operation from -65°C to +200°C [--85°F to +392°F] and for short periods at temperatures as high as 400°C [752°F].

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.

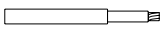
Flammability

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	Shielded & 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.

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SPEC 55 (Continued)

55A - AWG Conductor: Equipment/Interconnect Wires & Cables

Size	Stranding (mm)	55A011X		55A012X	
		Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
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]	2.08 [1.4]	1.67 [0.064]	4.16 [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]	4.17 [2.8]	2.23 [0.086]	8.63 [5.8]
20	19/0.203	1.27 [0.050]	6.40 [4.3]	2.66 [0.102]	13.24 [8.9]
18	19/0.25	1.52 [0.060]	9.67 [6.5]	3.20 [0.122]	20.09 [13.5]
16	19/287	1.73 [0.068]	12.35 [8.3]	3.58 [0.138]	25.75 [17.3]
14	19/0.36	2.20 [0.085]	19.34 [13.0]	4.47 [0.172]	39.58 [26.6]
12	37/0.32	2.62 [0.103]	29.32 [19.7]	5.38 [0.208]	59.97 [40.3]
10	37/0.403	3.25 [0.128]	47.32 [31.8]	6.65 [0.256]	96.58 [64.9]
8	133/0.287	4.77 [0.188]	87.50 [58.8]	9.80 [0.376]	178.58 [120.0]

Size	55A111X		55A112X	
	Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
30	1.51 [0.057]	5.06 [3.4]	2.12 [0.081]	7.74 [5.2]
28	1.59 [0.060]	5.80 [3.9]	2.27 [0.087]	8.90 [6.0]
26	1.71 [0.065]	6.85 [4.6]	2.53 [0.097]	11.32 [7.6]
24	1.84 [0.070]	8.19 [5.5]	2.80 [0.107]	13.84 [9.3]
22	1.99 [0.076]	10.27 [6.9]	3.07 [0.119]	17.86 [12.0]
20	2.20 [0.084]	13.40 [9.0]	3.50 [0.135]	23.81 [16.0]
18	2.45 [0.094]	17.86 [12.0]	4.10 [0.155]	32.60 [21.9]
16	2.67 [0.102]	21.73 [14.6]	4.43 [0.171]	39.73 [26.7]
14	3.10 [0.119]	30.36 [20.4]	5.30 [0.205]	57.00 [38.3]
12	3.55 [0.137]	42.41 [28.5]	6.30 [0.243]	81.10 [54.5]
10	4.20 [0.161]	62.65 [42.1]	—	—
8	5.80 [0.223]	110.42 [74.2]	—	—

55A - AWG Conductor: Airframe Wires & Cables

Size	Stranding (mm)	55A081X		55A082X	
		Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
26	19/102	1.01 [0.040]	2.5 [1.7]	2.10 [0.080]	5.06 [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]	14.73 [9.9]
18	19/0.25	1.78 [0.070]	10.7 [7.2]	3.63 [0.140]	21.88 [14.7]
16	19/287	1.96 [0.077]	13.4 [9.0]	4.06 [0.156]	27.53 [18.5]
14	37/0.36	2.40 [0.094]	20.5 [13.8]	4.90 [0.190]	42.26 [28.4]
12	37/0.32	2.82 [0.111]	30.5 [20.5]	5.80 [0.224]	63.00 [42.3]
10	37/0.403	3.40 [0.134]	48.3 [32.4]	7.10 [0.272]	98.96 [66.5]

Size	55A181X		55A182X	
	Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
26	1.71 [0.073]	7.89 [5.3]	2.63 [0.113]	14.29 [9.6]
24	1.84 [0.078]	9.37 [6.3]	2.8 [0.123]	16.37 [11.0]
22	1.99 [0.084]	11.76 [7.9]	3.07 [0.135]	20.68 [13.9]
20	2.2 [0.092]	14.88 [10.0]	3.5 [0.151]	27.08[18.2]
18	2.45 [0.103]	19.79[13.3]	4.1 [0.173]	36.46 [24.5]
16	2.67 [0.111]	23.81[16.0]	4.43 [0.189]	42.86 [28.8]
14	3.1 [0.128]	33.03 [22.2]	6.3 [0.225]	61.61 [41.4]
12	3.55 [0.145]	45.09 [30.3]	6.3 [0.259]	85.42 [57.4]
10	4.2 [0.168]	66.97[45.0]	— [0.308]	127.54 [85.7]

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SPEC 55 (Continued)

55PC - AWG Conductor: Statistical Process Controlled Airframe Wires & Cables

Size	Stranding (mm)	55A021X		55A022X	
		Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
26	19/102	0.087 [0.045]	2.05 [1.38]	—	—
24	19/127	1.00 [0.0395]	2.95 [1.98]	2.00 [0.079]	5.95 [4.00]
22	19/0.16	1.15 [0.0455]	4.31 [2.90]	2.31 [0.091]	8.74 [5.87]
20	19/0.203	1.37 [0.0540]	6.51 [4.38]	2.74 [0.108]	13.2 [8.87]
18	19/0.25	1.61 [0.0635]	9.81 [6.59]	3.22 [0.127]	19.84 [13.33]
16	19/287	1.80 [0.0710]	12.46 [8.37]	3.60 [0.142]	25.21 [16.94]
14	19/.036	2.18 [0.0860]	19.17 [12.88]	4.36 [0.172]	38.80 [26.07]
12	37/0.32	2.66 [0.1047]	29.36 [19.73]	5.30 [0.209]	59.42 [39.93]
10	37/0.403	3.27 [0.1290]	46.31 [31.12]	6.55 [0.258]	93.92 [63.11]

Size	55A121X		55A122X	
	Nom. OD	Max. Weight (g per m/lbs per kft)	Nom. OD	Max. Weight (g per m/lbs per kft)
26	1.52 [0.064]	6.54 [4.4]	2.33 [0.100]	11.34 [7.62]
24	1.65 [0.069]	7.86 [5.28]	2.89 [0.109]	13.90 [9.34]
22	1.80 [0.075]	9.81 [6.59]	2.89 [0.122]	17.89 [12.02]
20	2.00 [0.083]	12.83 [8.62]	3.30 [0.139]	23.84 [16.02]
18	2.23 [0.093]	17.01 [11.43]	3.78 [0.158]	32.10 [21.57]
16	2.44 [0.100]	20.36 [13.68]	4.16 [0.174]	39.00 [26.21]
14	2.79 [0.116]	28.69 [19.28]	4.92 [0.204]	55.21 [37.10]
12	3.30 [0.135]	40.73 [27.37]	5.92 [0.244]	80.23 [53.91]
10	3.98 [0.159]	59.90 [40.25]	7.39 [0.297]	123.65 [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.)

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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 unshielded, unjacketed cables
1 - Round braid shielded & jacketed cable
2 - Flat braid shielded & jacketed cable
3 - Round braid, shielded cable, no jacket
4 - Jacketed cable, no shield
5 - Spiral shielded and jacketed cable
8 - Special constructions (part numbers not coded)
9 - Special constructions including light weight

Shield material same as conductor material except all flat hields and shield 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

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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 Tyco Electronics. 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 [.006] Nominal Wall				
150°C [302°F]	Tin-coated copper	12–30	55A0111	M22759/32
200°C [392°F]	Silver-coated copper	12–28	55A0112	M22759/44
200°C [302°F]	Nickel-coated copper	12–28	55A0113	M22759/45
200°C [392°F]	Silver-coated high-strength alloy	20–30	55A0114	M22759/33
200°C [392°F]	Nickel-coated high-strength alloy	20–28	55A0116	M22759/46
600-V Lightweight Dual-wall Airframe Wire, .203 [.008] Nominal Wall				
150°C [302°F]	Tin-coated copper	6–26	55A0211	—
200°C [392°F]	Silver-coated copper	10–26	55A0212	—
200°C [392°F]	Nickel-coated copper	10–26	55A0213	—
200°C [392°F]	Silver-coated high-strength alloy	18–30	55A0214	—
200°C [392°F]	Nickel-coated high-strength alloy	16–26	55A0216	—
600-V Dual-wall Airframe Wire, .254 [.010] Nominal Wall				
150°C [302°F]	Tin-coated copper	00–24	55A0811	M22759/34
200°C [392°F]	Silver-coated copper	00–26	55A0812	M22759/43
200°C [392°F]	Nickel-coated copper	00–26	55A0813	M22759/41
200°C [392°F]	Silver-coated high-strength alloy	20–26	55A0814	M22759/35
200°C [392°F]	Nickel-coated high-strength alloy	20–26	55A0816	M22759/42
600-V Medium-Weight Dual-wall Airframe Wire, .381 [.015] Nominal Wall				
150°C [302°F]	Tin-coated copper	10–24	55A0711	—
200°C [392°F]	Silver-coated copper	16–24	55A0712	—
200°C [392°F]	Nickel-coated copper	16–24	55A0713	—
200°C [392°F]	Silver-coated high-strength alloy	16–24	55A0714	—
200°C [392°F]	Nickel-coated high-strength alloy	16–26	55A0716	—

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SPEC 55 Cable Constructions

Construction	Number of Components	Component Conductor[1]	Shield Material[1]	Part Number	
				Light Wt.[2]	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

[1]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

[2] X = no. of wire components
Y = color code
For complete part number, see Part Numbering System on page 11018.

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NEMA WC-27500 Cable Part Numbering System

M27500 - AWG XX X X XX

Jacket Style and Material
00 = no jacket
08 = single jacket crosslinked, polyvinylidene floride (PVF2), white
23 = single jacket crosslinked, modified ETFE, white
58 = double jacket crosslinked, polyvinylidene floride (PVF2), 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: **M27500-22ML3T08 = 44AM1131-22-9/96/93-9**

Military Part No.

Raychem Part No.

Catalog 1308940
Revised 5-03

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Japan: 81-44-900-5102
Singapore: 65-4866-151
UK: 44-1793-528171

FlexLine

Product Facts

- **Reduced weight**
- **Flexibility**
- **Low outgassing**
- **Function over a broad temperature range**
- **Flammability**
- **Arc track resistance**
- **Resistance to atomic oxygen**
- **Radiation resistance**
- **High quality and reliability**
- **Ease of fabrication (into Harnesses due to flexibility)**
- **Agency approvals**
- **-65°C up to 200°C [-85°F up to 392°F]**
- **Small size**
- **600V rating**
- **Optional high strand count for increased flexibility**
- **Variety of insulation/jacket options**
- **Dual wall and single wall options**
- **Easy to install**
- **Mechanically tough**
- **Compliance with FAR 25 flammability requirements**
- **Resistance to harsh fluids & solvents per MIL-W-22759**

Applications

FlexLine (also known as SPEC 80) wire is insulated with a flexible modified radiation cross-linked ETFE polymer. It has a temperature rating of -65°C to 200°C [-85°F to 392°F] continuous using silver copper conductor, and combines the easy handling of our SPEC 55 wire and cable with additional flexibility. FlexLine is used in a broad range of applications, from Hook-up wire to Power Cables.

FlexLine constructions provide maximum flexibility similar to the MIL-W-22759 products in Mechanical, Chemical and Thermal properties.

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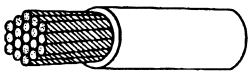
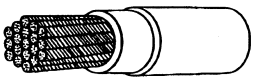
FlexLine Insulation System



Single Wall



Dual Wall

Single Wall 82 Wire
High strand count conductors
Light weight
AWG sizes 28 to 00
(6-mil nominal insulation thickness)

Dual Wall 81 Wire
Standard M22759 conductor stranding
Increased toughness
AWG sizes 28 to 000
(10-mil nominal insulation thickness)

Part Numbering System

8x X X X X X- Size- X/X- X

Jacket Color (in accordance with MIL-STD-681)

Primary Wire Insulation Color
(in accordance with MIL-STD-681)
0=Black 1=Brown 2=Red 3=Orange 4=Yellow
5=Green 6=Blue 7=Violet 8=Grey 9=White

Conductor Size

Conductor Type
1 - Tin-plated copper
2 - Silver-plated copper
3 - Nickel-plated copper
4 - Silver-plated high strength copper alloy (SPHSCA)
6 - Nickel-plated high strength copper alloy (NPHSCA)

Number of Conductors
1 to 9 0 = 10 conductor

Class of Wire
1 - 600 V equipment wire
8 - 600 V medium weight wire

Constructions
0 - Primary wire and unshielded, unjacketed cables
1 - Round braid shielded and jacketed
2 - Flat braid shielded and jacketed
3 - Round braid, shielded, no jacket
4 - Jacketed, no shield
6-9 - Special constructions

Type
A - AWG conductor

Basic Specification Number
81 - Standard conductor stranding
82 - High strand count conductor

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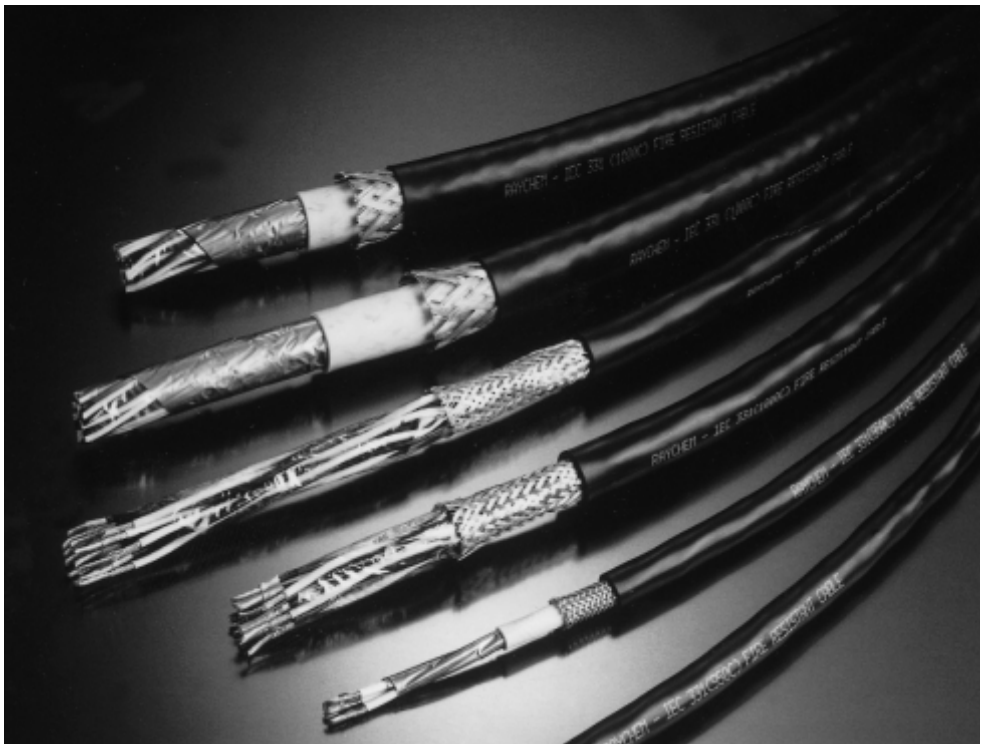
FR-1000

Halogen-Free, Fire Resistant Cable Range

Product Facts

- Highly flame retardant
- Halogen-free
- Low smoke generation
- Low toxicity index
- Low acid gas emission
- Low water uptake
- Compatible with Raychem System 100 heat-shrink components, heat-shrink tubing, molded parts and adhesives



Applications

Tyco Electronics has developed a new halogen-free, lightweight, small size, fire resistant Raychem cable to exceed the exacting fire resistant requirements of IEC 60331 (ie withstands 950°C [1742°F] for 3 hours as opposed to the 750°C [1382°F] requirement) and meet the flame-retardant requirements of IEC 60332-3 (Cat A), while maintaining significant size and weight savings over conventional materials.

FR-1000 cable consists of Raychem Type 95 primary wire with a Zerohal jacket and can be used throughout the installation, simplifying the selection for designers and electrical engineers. By a combination of our proven expertise in polymer and radiation chemistry, low fire hazard technology and precision extrusion capability, Tyco Electronics has been able to develop a range of Raychem cables featuring reduced size and weight over existing thickwall cables. This offers savings of approximately 30% and optimizes the space available. This results in lower installed costs by downsizing connectors, glanding, cable support structures, and reduced time on installation.

With increasing complexity of electronic systems, sensors, communications and safety equipment, more cables are required to fit into smaller spaces. FR-1000 small size cable can offer distinct advantages over conventional cables.

These include:

- Tough and flexible constructions aiding installation through smaller bend radii and extending service life.
- Controlled dimensions simplifying connector and transit selection.
- Resistance to widely used fluids such as diesel fuels, oils, and greases.

Operating Temperature Range

-30°C to 90°C
[-22°F to 194°F]

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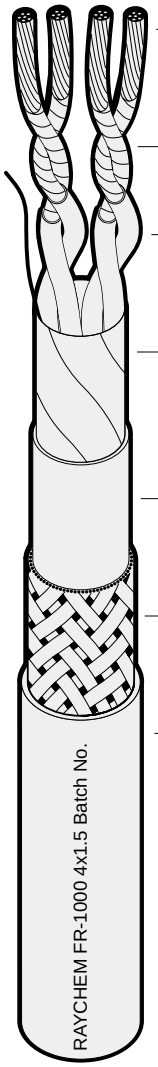
Generic Cable Construction



Example:
FR-1000 4x1.5 93497A

Conductors	Tin-plated copper to BS 6360.
Insulation	Mica based tape, halogen-free, low smoke material complying with Raychem spec WSD695.
Core Identification	Pairs – black and white and numbered. Triples – black, red and white and numbered. Multicore – white and numbered.
Shielding	Aluminized mylar tapewrap in contact with tinned copper drainwire.
Inner Sheath	Halogen-free, low smoke material complying with Raychem specification WCD51/1663 and WSD696.
Armor	Galvanized steel wire braid in accordance with Raychem specification WSD696 and BS6883 (BS1442).
Outer Sheath	Raychem Zerohal material complying with Raychem specification WSD696 and exceeding the requirements of BS6899, Type D. Flame retardant to IEC60332-3(CatA) and fire resistant to IEC60331 (enhanced to 950 ± 50°C [122°F], 3 hours). Sheath printed with Raychem number and size of conductors, IEC60331 (950°C [1742°fF). Sheath color black. Oxygen index >30% (BS2782). Temperature index >260°C [500°F] (BS2782). Smoke index <13 (BS6883). Toxicity index <2 (NES713).
Temperature Rating	90°C [194°F] maximum operating temperature.
Voltage Rating	600/1000V.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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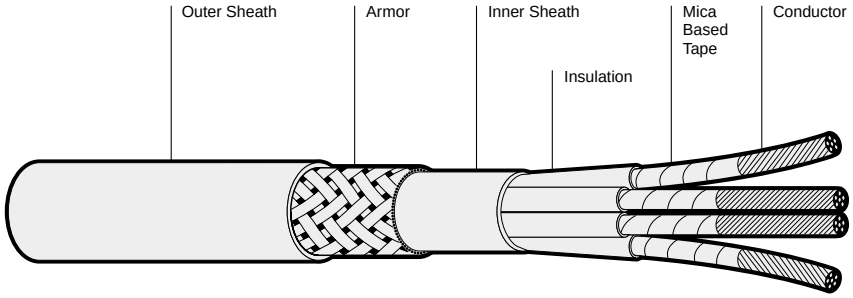
FR-1000 (Continued)

Halogen-Free, Fire Resistant Cable Range



FR-1000 Multicore Control Cables, Unshielded, Armored, 600/1000V*

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Diameter Over Inner Sheath	Cable			
					Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km	Jacket Color
87486A	2x1.5	19/0.32	1.5	6.6 [.260]	10.2 [.402]	11.2 [.441]	178	Black
87488A	3x1.5	19/0.32	1.5	7.1 [.280]	10.8 [.425]	11.6 [.457]	203	Black
87490A	4x1.5	19/0.32	1.5	7.7 [.303]	11.2 [.441]	12.4 [.488]	236	Black
87492A	7x1.5	19/0.32	1.5	9.4 [.370]	13.0 [.512]	14.4 [.567]	328	Black
87494A	12x1.5	19/0.32	1.5	12.5 [.492]	16.0 [.630]	17.6 [.693]	486	Black
87496A	19x1.5	19/0.32	1.5	14.7 [.579]	18.2 [.717]	20.2 [.795]	677	Black
87498A	27x1.5	19/0.32	1.5	17.9 [.705]	21.3 [.839]	23.5 [.925]	906	Black
87487A	2x2.5	7/0.67	2.5	7.7 [.303]	11.2 [.441]	12.4 [.488]	224	Black
87489A	3x2.5	7/0.67	2.5	8.2 [.323]	11.7 [.461]	12.9 [.508]	257	Black
87491A	4x2.5	7/0.67	2.5	9.0 [.354]	12.6 [.496]	14.0 [.551]	312	Black
87493A	7x2.5	7/0.67	2.5	10.9 [.429]	14.7 [.579]	15.7 [.618]	429	Black
87495A	12x2.5	7/0.67	2.5	14.6 [.575]	18.1 [.713]	20.1 [.791]	661	Black
87497A	19x2.5	7/0.67	2.5	17.5 [.689]	20.9 [.823]	23.1 [.909]	936	Black
87499A	27x2.5	7/0.67	2.5	21.1 [.831]	25.3 [.996]	27.3 [1.075]	1321	Black

*Cables are armored with an overall galvanized steel wire braid armor.

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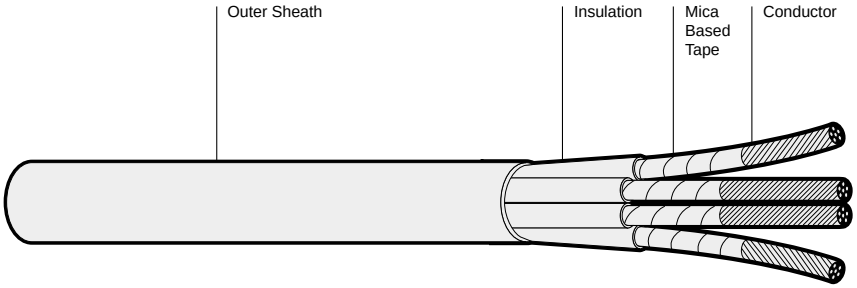
FR-1000 (Continued)



FR-1000 Multicore Control Cables, Unshielded, Unarmored, 600/1000V

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Cable			
				Outer Diameter		Nominal Weight kg/km	Jacket Color
				(min.)	(max.)		
87472A	2x1.5	19/0.32	1.5	7.5 [.295]	7.9 [.311]	87	Black
87474A	3x1.5	19/0.32	1.5	7.8 [.307]	8.6 [.339]	108	Black
87476A	4x1.5	19/0.32	1.5	8.4 [.331]	9.2 [.362]	134	Black
87478A	7x1.5	19/0.32	1.5	10.1 [.398]	11.1 [.437]	204	Black
87480A	12x1.5	19/0.32	1.5	13.3 [.524]	14.3 [.563]	332	Black
87482A	19x1.5	19/0.32	1.5	15.2 [.598]	16.8 [.661]	490	Black
87484A	27x1.5	19/0.32	1.5	18.5 [.728]	19.9 [.783]	684	Black
87473A	2x2.5	7/0.67	2.5	8.4 [.331]	9.2 [.362]	122	Black
87475A	3x2.5	7/0.67	2.5	8.8 [.346]	9.8 [.386]	150	Black
87477A	4x2.5	7/0.67	2.5	9.7 [.382]	10.7 [.421]	192	Black
87479A	7x2.5	7/0.67	2.5	11.5 [.453]	12.7 [.500]	288	Black
87481A	12x2.5	7/0.67	2.5	15.1 [.594]	16.7 [.657]	475	Black
87483A	19x2.5	7/0.67	2.5	17.9 [.705]	19.7 [.776]	720	Black
87485A	27x2.5	7/0.67	2.5	21.3 [.839]	23.5 [.925]	995	Black

Conductors	Tin plated copper to BS6360
Insulation	Mica based tape, halogen-free, low smoke material complying with Raychem specification WSD695
Core Identification	White and numbered
Inner Sheath	Halogen-free, low smoke material complying with Raychem specification WCD51/1663 and WSD696
Armor	Galvanized steel wire braid in accordance with Raychem specification WSD696 and BS6883 (BS1442)
Outer Sheath	Raychem Zerohal material complying with Raychem specification WSD696 and exceeding the requirements of BS6899, Type D. Flame retardant to IEC60332-3(Cat A) and fire resistant to IEC60331 (enhanced to 950 +/- 50°C [122°F], 3 hours) Sheath printed with number and size of conductors, IEC331, Raychem, voltage rating and EPD number Sheath color black Oxygen index >30% (BS2782), Temperature index > 260°C (BS2782), Smoke index <13 (BS6883) Toxicity Index <2 (NES713)
Temperature Rating	90°C [194°F] maximum conductor operating temperature
Voltage Rating	600/1000V

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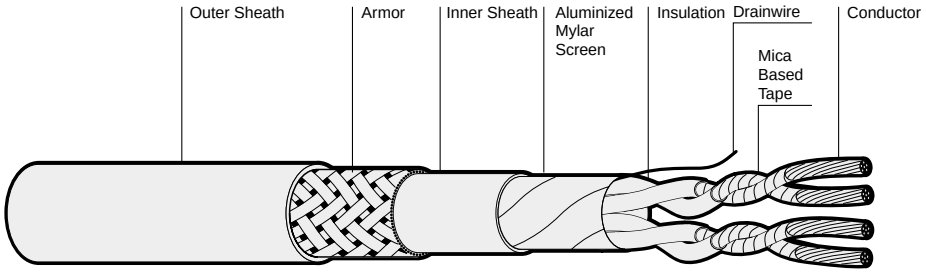
FR-1000 (Continued)

Halogen-Free, Fire Resistant Cable Range



FR-1000 Multipair Control Cables, Collectively Shielded and Armored 600/1000V*

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Diameter (Nominal)		Cable			
				Over Shield	Over Inner Sheath	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km	Jacket Color
93491A	3x2x0.75	19/0.23	0.75	9.7 [.382]	11.1 [.437]	14.6 [.575]	16.2 [.638]	319	Grey
93492A	7x2x0.75	19/0.23	0.75	13.1 [.516]	14.6 [.575]	18.1 [.713]	20.1 [.791]	484	Grey
93493A	12x2x0.75	19/0.23	0.75	16.4 [.646]	18.1 [.713]	21.5 [.846]	23.7 [.933]	685	Grey
93494A	20x2x0.75	19/0.23	0.75	21.2 [.835]	23.0 [.906]	26.8 [1.055]	29.6 [1.165]	1090	Grey
87500A	2x1.5	19/0.32	1.5	5.4 [.213]	6.7 [.264]	10.7 [.421]	11.3 [.445]	192	Black
87501A	2x2x1.5	19/0.32	1.5	7.2 [.283]	8.6 [.339]	12.3 [.484]	13.5 [.531]	267	Black
87502A	3x2x1.5	19/0.32	1.5	11.2 [.441]	12.7 [.500]	16.1 [.634]	17.9 [.705]	404	Black
87503A	5x2x1.5	19/0.32	1.5	13.8 [.543]	15.3 [.602]	18.8 [.740]	20.8 [.819]	541	Black
87504A	7x2x1.5	19/0.32	1.5	15.2 [.598]	16.9 [.665]	20.3 [.799]	22.5 [.886]	649	Black
87505A	10x2x1.5	19/0.32	1.5	17.5 [.705]	19.2 [.756]	22.5 [.886]	24.9 [.980]	817	Black
87506A	12x2x1.5	19/0.32	1.5	19.0 [.748]	20.7 [.815]	25.2 [.992]	26.6 [1.047]	999	Black
87507A	20x2x1.5	19/0.32	1.5	24.7 [.972]	26.5 [1.043]	30.5 [1.201]	33.7 [1.327]	1541	Black
87508A	24x2x1.5	19/0.32	1.5	26.6 [1.047]	28.6 [1.126]	33.6 [1.323]	35.6 [1.402]	1762	Black

*Cables have an overall aluminized mylar shield with drainwire and an overall galvanized steel wire braid armor.

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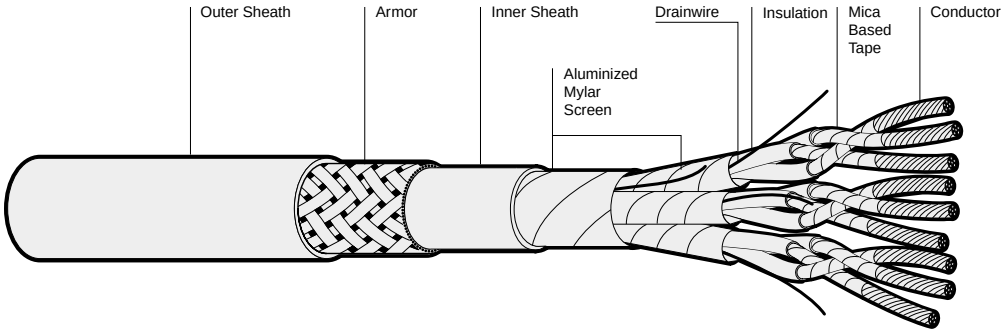
FR-1000 (Continued)



FR-1000 multitriple control cables, Collectively Shielded and Armored, 600/1000V*

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Diameter (Nominal)		Cable			
				Over Shield	Over Inner Sheath	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km	Jacket Color
87509A	1x3x1.5	19/0.32	1.5	5.9 [.232]	7.2 [.283]	10.7 [.421]	11.9 [.469]	216	Black
87510A	3x3x1.5	19/0.32	1.5	12.0 [.472]	13.5 [.531]	16.9 [.665]	18.7 [.736]	480	Black
87511A	7x3x1.5	19/0.32	1.5	16.2 [.638]	17.9 [.705]	21.3 [.839]	23.5 [.925]	815	Black
87512A	12x3x1.5	19/0.32	1.5	22.2 [.874]	24.0 [.945]	28.1 [1.106]	31.1 [1.224]	1357	Black

*Cables have an overall aluminized mylar shield with drainwire and an overall galvanized steel wire braid armor.

Conductors	Tin plated copper to BS6360
Insulation	Mica based tape, halogen-free, low smoke material complying with Raychem specification WSD695
Core Identification	Pairs – black and white and numbered. Triples – black, red and white and numbered
Shielding	Aluminized mylar tapewrap in contact with tinned copper drainwire
Inner Sheath	Halogen-free, low smoke material complying with Raychem specification WCD51/1663 and WCD696
Armor	Galvanized steel wire braid in accordance with Raychem specification WSD696 and BS6883 (BS1442)
Outer Sheath	Raychem Zerohal material complying with Raychem specification WSD696 and exceeding the requirements of BS6899, Type D. Flame retardant to IEC60332-3(Cat A) and fire resistant to IEC60331 (enhanced to 950 +/- 50°C [122°F]z, 3 hours) Sheath printed with number and size of conductors, IEC331, Raychem, voltage rating and EPD number Sheath color black Oxygen index >30% (BS2782), Temperature index > 260°C [482°F] (BS2782), Smoke index <13 (BS6883) Toxicity Index <2 (NES713)
Temperature Rating	90°C maximum conductor operating temperature
Voltage Rating	600/1000V

Notes: Users should independently evaluate the suitability of the product for their application.
Before ordering, contact Tyco Electronics for most current data.

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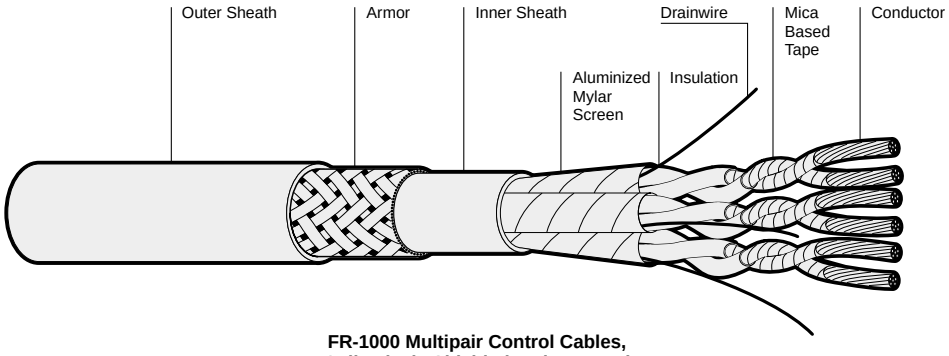
FR-1000 (Continued)

Halogen-Free, Fire Resistant Cable Range



FR-1000 Multipair Control Cables, Collectively Shielded and Armored 600/1000V*

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Diameter (Nominal)		Cable			
				Over Shield	Over Inner Sheath	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km	Jacket Color
93491A	3x2x0.75	19/0.23	0.75	9.7 [.382]	11.1 [.437]	14.6 [.575]	16.2 [.638]	319	Grey
93492A	7x2x0.75	19/0.23	0.75	13.1 [.516]	14.6 [.575]	18.1 [.713]	20.1 [.791]	484	Grey
93493A	12x2x0.75	19/0.23	0.75	16.4 [.646]	18.1 [.713]	21.5 [.846]	23.7 [.933]	685	Grey
93494A	20x2x0.75	19/0.23	0.75	21.2 [.835]	23.0 [.906]	26.8 [1.055]	29.6 [1.165]	1090	Grey
87500A	2x1.5	19/0.32	1.5	5.4 [.213]	6.7 [.264]	10.7 [.421]	11.3 [.445]	192	Black
87501A	2x2x1.5	19/0.32	1.5	7.2 [.283]	8.6 [.339]	12.3 [.484]	13.5 [.531]	267	Black
87502A	3x2x1.5	19/0.32	1.5	11.2 [.441]	12.7 [.500]	16.1 [.634]	17.9 [.705]	404	Black
87503A	5x2x1.5	19/0.32	1.5	13.8 [.543]	15.3 [.602]	18.8 [.740]	20.8 [.819]	541	Black
87504A	7x2x1.5	19/0.32	1.5	15.2 [.598]	16.9 [.665]	20.3 [.799]	22.5 [.886]	649	Black
87505A	10x2x1.5	19/0.32	1.5	17.5 [.689]	19.2 [.756]	22.5 [.886]	24.9 [.980]	817	Black
87506A	12x2x1.5	19/0.32	1.5	19.0 [.748]	20.7 [.815]	25.2 [.992]	26.6 [1.047]	999	Black
87507A	20x2x1.5	19/0.32	1.5	24.7 [.972]	26.5 [1.043]	30.5 [1.201]	33.7 [1.327]	1541	Black
87508A	24x2x1.5	19/0.32	1.5	26.6 [1.047]	28.6 [1.126]	33.6 [1.323]	35.6 [1.402]	1762	Black

*Cables have an overall aluminized mylar shield with drainwire and an overall galvanized steel wire braid armor.

Catalog 1308940
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Dimensions are in millimeters and inches unless otherwise specified. Values in brackets are U.S. equivalents.

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C. America: 52-55-5-729-0425

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Japan: 81-44-900-5102
Singapore: 65-4866-151
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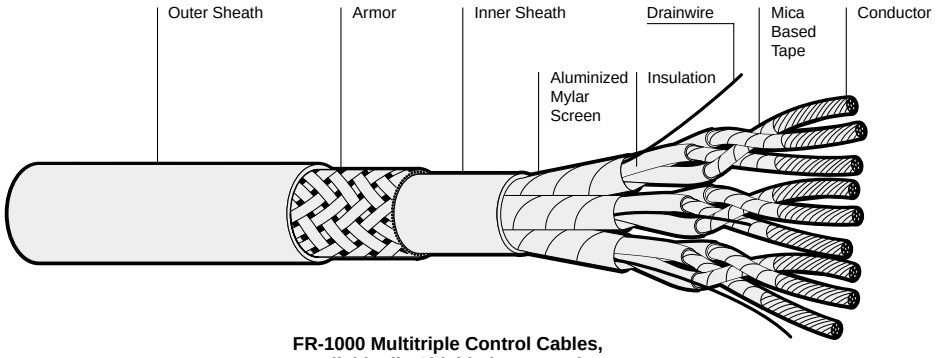
FR-1000 (Continued)



FR-1000 Multitriple Control Cables, Individually Shielded, Armored, 600/1000V*

Selection Table

Part No. EPD	Construction	Conductor Stranding	CSA Nominal mm^2	Diameter (Nominal) Over Inner Sheath	Cable			
					Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km	Jacket Color
93500A	3x3x0.75	19/0.23	0.75	12.4 [.488]	15.9 [.626]	17.5 [.689]	407	Grey
93501A	7x3x0.75	19/0.23	0.75	16.8 [.661]	20.2 [.795]	22.4 [.881]	682	Grey
93502A	12x3x0.75	19/0.23	0.75	22.6 [.890]	26.4 [1.039]	29.2 [1.150]	1111	Grey
93503A	3x1.00	19/0.25	1.0	6.6 [.260]	10.6 [.417]	11.6 [.457]	198	Grey

*Cables have pairs individually shielded with aluminized mylar and drainwire and an overall galvanized steel wire braid armor.

Conductors	Tin plated copper to BS6360
Insulation	Mica based tape, halogen-free, low smoke material complying with Raychem specification WSD695
Core Identification	Pairs – black and white and numbered. Triples – black, red and white and numbered
Shielding	Aluminized mylar tapewrap in contact with tinned copper drainwire
Inner Sheath	Halogen-free, low smoke material complying with Raychem specification WCD51/1663 and WSD696
Armor	Galvanized steel wire braid in accordance with Raychem specification WSD696 and BS6883 (BS1442)
Outer Sheath	Raychem Zerohal material complying with Raychem specification WSD696 and exceeding the requirements of BS6899, Type D. Flame retardant to IEC60332-3(Cat A) and fire resistant to IEC60331 (enhanced to 950 +/- 50°C [122°F], 3 hours) Sheath printed with number and size of conductors, IEC331, Raychem, voltage rating and EPD number Sheath color black Oxygen index >30% (BS2782), Temperature index > 260°C [500°F] (BS2782), Smoke index <13 (BS6883) Toxicity Index <2 (NES713)
Temperature Rating	90°C [194°F] maximum conductor operating temperature
Voltage Rating	600/1000V

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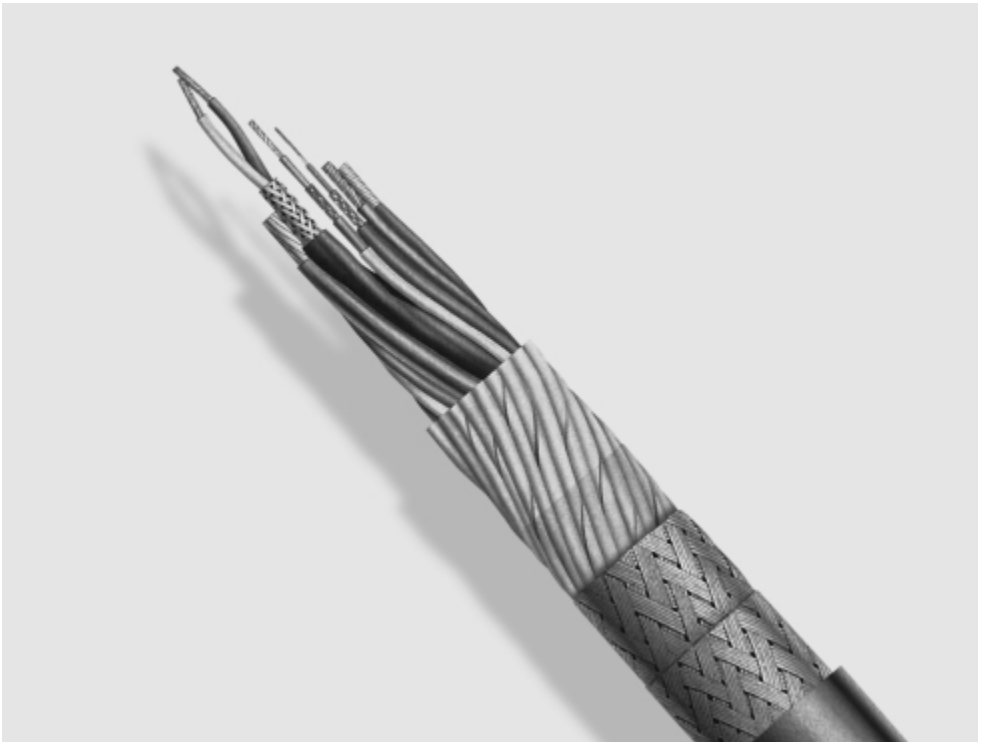
UK: 44-1793-528171

SeaLite SL105

Halogen Free, Flame-Retardant Cable Range

Product Facts

- **Reduced size**
- **Lightweight**
- **Flame retardant to IEC 60332-3 Category A**
- **Halogen free**
- **Low smoke generation**
- **Temperature rating -30°C to +85°C [-22°F to +185°F]**
- **600V rating**
- **Reduced amount of combustible materials**



Applications

Raychem SeaLite SL105 is a new range of small size, lightweight, low fire hazard cables for the commercial and offshore market place.

The SeaLite SL105 cable range is the first to be approved to the new Det Norske Veritas Standard for Lightweight Cables Type Approval Program No.6 – 827.11-1.

The SeaLite SL105 cable range is constructed from flame retardant, halogen-free cores and outer sheath meeting the requirements of SHF2 to IEC 60092-350.

Offering size and weight savings over traditional cables, the SeaLite SL105 cable range is suitable for use in general power, lighting, communication, control and instrumentation applications.

Agency Recognition

- DNV (Det Norske Veritas).
- Lloyds Register of Shipping.
- ABS (American Bureau of Shipping).
- GL (Germanischer Lloyd).
- BV (Bureau Veritas).

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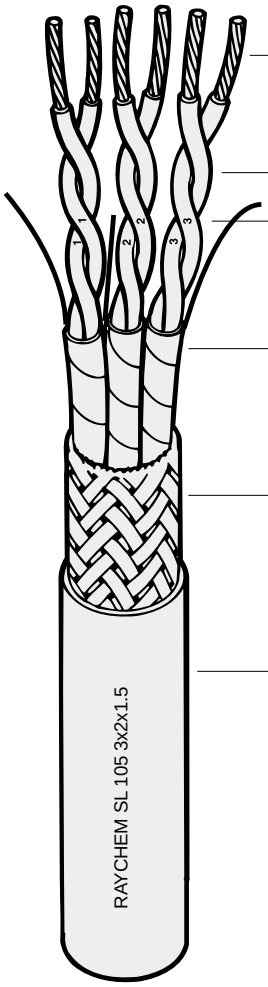
SeaLite SL105 (Continued)

Generic Cable Construction



Example:
SL105 3x2x1.5-P10

Conductors	Stranded tin coated copper conductor.
Insulation	Halogen-free, flame-retardant insulation.
Core Identification	Multicore - white and numbered. Pairs - Black and white and numbered. Triples - Black, red and white and numbered.
Component Shielding	Aluminized Mylar Wrap with tin coated copper drain wire.
Overall Cable Shielding	Tin coated copper.
Outer Sheath	Halogen-free low fire hazard SHF2 sheath. Sheath color black. Sheath printed with Raychem SL105 number and size of conductors, year and month of manufacture and manufacturer's batch number.

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SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range

Specification Summary

Examination or Test	Test Basis	Requirements	Test On
General Properties			
Braid coverage	IEC 60092-350	90% minimum coverage	Cable
Metallic coating of copper conductors	IEC 60092-350 by inspection	Conductor surface will be smooth and uniform. Insulation will not adhere to the conductor.	Conductor
Physical Properties			
Tensile strength and ultimate elongation	IEC 60811-1-1	20MPa minimum, 150% minimum (insulation) (speed 50±10 mm/min)	Insulation
Scrape abrasion resistance	NF F 63-808	500 cycles minimum (5N load, 0.45 mm diameter rod, 20°C [68°F], 55 cycles/minute)	Core
Dynamic cut through	NF F 63-808	50N minimum (90° 0.13 mm radius blade, 20°C [68°F], 100g/s load)	Core
Notch propagation	NF F 63-808	No dielectric breakdown (0.05 mm notch, 6X mandrel, 1.5kV ac for 1 minute)	Core
Mechanical/particular characteristic of sheathing compounds	IEC 60092-350, 12.4 IEC 60092-359 Table II & III	SHF1 or SHF2	Sheath
Thermal Properties			
Lifetime	BS 2G 230	>20000h @ 125°C [257°F]	Core
Accelerated ageing	IEC 60811-1-2	No cracks, no dielectric breakdown (168h @ 180°C [356°F], 1.5kV ac for 5 minutes)	Core
Insulation blocking	NF F 63-808	Cores must be easily separated (6h @ 150°C [302°F])	Core
Cold bend (Where outer diameter <12.5 mm)	IEC 60811-1-4	No cracks, no dielectric breakdown (-30°C, 10X mandrel, 1.5kV ac for 5 mins for 1m core) (-30°C, 10X mandrel, 3.5kV ac for 5 min. Sample of cable)	Core
Current overload	BS 2G 230	No cracks, no dielectric breakdown (30s @ 250°C [482°F], 6X mandrel, wind as in test 11, 1.5kV ac for 5 minutes)	Core
Electrical Properties			
AC and DC voltage tests	IEC 60092-350	No dielectric breakdown (2.5kV ac/4.5kV dc for 5 minutes for 1m of core)	Core
		(3.5kV ac/5 minutes for each delivery length of cable)	Cable
Insulation – continuity proof test	IEC 60092-350 Clause 9.3b	No dielectric breakdown At least 8kV impulse, 8kV dc or 5.3kV ac	Core
Insulation resistance at 20°C	IEC 60092-350	500MΩkm min. @ 20°C [68°F] (5m length, quote actual IR)	Core
Insulation resistance at 90°C	IEC 60092-350	1.5MΩkm min @ 90°C [194°F] (5m length, quote actual IR)	Core
Increase in a.c. capacitance after immersion in water	IEC 60092-350	C14-C1≤0.15C1, C14-C7≤0.05C7 (14 days @ 50°C [122°F] in tap water)	Core
Environmental Properties			
Ozone resistance	IEC 60092-350 IEC 60811-2-1	No crazing or cracking (250-300ppm, 25°C [77°F], 30h)	Core
Fluid immersion: 72h @ 70°C – IRM 902, Diesel (F-76), 3.5% salt water	BS 2G 230	No cracking or dielectric breakdown 5% max, swell (6X mandrel, soak in water, 1.5kV ac for 5 minutes)	Core
Fire Hazard Properties			
Flammability – small scale	IEC 60332-1	Charring confined between 50mm and 540mm from lower edge of top support (Single vertical wire)	Core
Flammability – large scale	IEC 60332-3	Category A, designation F	Cable
Halogen content	IEC 60684-2 cl, 45	Less than 0.5% for each non metallic component	Cable
Toxicity index	IMO FTPC Appendix 3	It of less than 2, report Lc value	Cable
Smoke emission – small scale	ISO 5659-2 Appendix 3	Ds4 150 max. and Dmax 150 max. VOF4 300 max.	Core
Smoke emission – Large scale	IEC 61034-2	70% minimum transmittance	Cable

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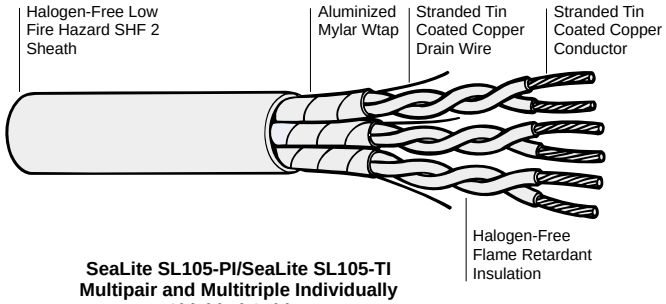
SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range



SeaLite SL105-PI/SeaLite SL105-TI Multipair and Multitriple Individually Shielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core Nominal Conductor CSA mm²	Minimum Insulation Thickness	Cable			Nominal Weight kg/km
		Number of Strands	Nominal Strand Diameter			Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	
SL105-1x2x0.75-PI	1x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.0 [.039]	4.9 [.193]	5.5 [.217]	46
SL105-2x2x0.75-PI	2x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.2 [.047]	8.5 [.335]	9.3 [.366]	110
SL105-3x2x0.75-PI	3x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.2 [.047]	8.6 [.339]	9.6 [.378]	128
SL105-7x2x0.75-PI	7x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	11.3 [.445]	12.5 [.492]	240
SL105-10x2x0.75-PI	10x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	13.5 [.531]	14.9 [.587]	334
SL105-14x2x0.75-PI	14x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	14.7 [.579]	16.3 [.642]	440
SL105-27x2x0.75-PI	27x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.5 [.059]	19.7 [.776]	21.7 [.854]	801
SL105-37x2x0.75-PI	37x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.5 [.059]	22.4 [.882]	24.8 [.976]	1066
SL105-3x2x1.0-PI	3x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.3 [.051]	9.4 [.370]	10.4 [.409]	158
SL105-7x2x1.0-PI	7x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.4 [.055]	12.4 [.488]	13.6 [.535]	300
SL105-12x2x1.0-PI	12x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.4 [.055]	14.8 [.583]	16.4 [.646]	474
SL105-1x2x1.5-PI	1x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.1 [.043]	6.1 [.240]	6.7 [.264]	73
SL105-2x2x1.5-PI	2x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.3 [.051]	10.6 [.417]	11.8 [.465]	176
SL105-3x2x1.5-PI	3x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.3 [.051]	10.8 [.425]	12.0 [.472]	208
SL105-7x2x1.5-PI	7x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	14.3 [.563]	15.9 [.626]	399
SL105-10x2x1.5-PI	10x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	16.8 [.661]	18.6 [.732]	547
SL105-14x2x1.5-PI	14x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.5 [.059]	18.7 [.736]	20.7 [.815]	741
SL105-27x2x1.5-PI	27x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.6 [.063]	25.1 [.988]	27.7 [1.091]	1363
SL105-37x2x1.5-PI	37x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.8 [.071]	29.2 [1.150]	32.2 [1.268]	1855
SL105-1x3x0.75-TI	1x3x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.0 [.039]	5.2 [.205]	5.8 [.228]	53
SL105-2x3x0.75-TI	2x3x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	9.2 [.362]	10.2 [.402]	133
SL105-4x3x0.75-TI	4x3x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	10.5 [.413]	11.7 [.461]	199
SL105-7x3x0.75-TI	7x3x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	12.7 [.500]	14.1 [.555]	300
SL105-12x3x0.75-TI	12x3x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	16.6 [.654]	18.4 [.724]	482

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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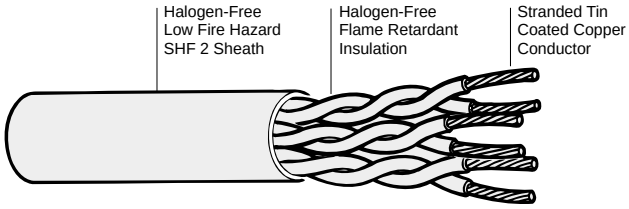
SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range



SeaLite SL105-PU Multipair Unshielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core		Cable			
		Number of Strands	Nominal Strand Diameter	Nominal Conductor CSA mm^2	Minimum Insulation Thickness	Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km
SL105-1x2x0.75-PU	1x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.0 [.039]	4.8 [.189]	5.4 [.213]	40
SL105-2x2x0.75-PU	2x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.0 [.039]	5.4 [.213]	6.0 [.236]	58
SL105-3x2x0.75-PU	3x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.2 [.047]	8.1 [.319]	8.9 [.350]	101
SL105-4x2x0.75-PU	4x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.2 [.047]	8.6 [.339]	9.6 [.378]	123
SL105-7x2x0.75-PU	7x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	10.4 [.409]	11.4 [.449]	184
SL105-10x2x0.75-PU	10x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	11.6 [.457]	12.8 [.504]	244
SL105-14x2x0.75-PU	14x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	13.5 [.531]	14.9 [.587]	331
SL105-19x2x0.75-PU	19x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	15.3 [.602]	16.9 [.665]	430
SL105-24x2x0.75-PU	24x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.4 [.055]	16.8 [.661]	18.6 [.732]	527
SL105-37x2x0.75-PU	37x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.5 [.059]	20.4 [.803]	22.6 [.890]	786
SL105-7x2x1.0-PU	7x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.3 [.051]	11.1 [.437]	12.3 [.484]	214
SL105-10x2x1.0-PU	10x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.4 [.055]	12.6 [.496]	14.0 [.551]	293
SL105-4x2x1.5-PU	4x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.3 [.051]	11.0 [.433]	12.2 [.480]	210
SL105-7x2x1.5-PU	7x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	13.2 [.520]	14.6 [.575]	315
SL105-10x2x1.5-PU	10x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	14.9 [.587]	16.5 [.650]	424
SL105-14x2x1.5-PU	14x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.5 [.059]	17.3 [.681]	19.1 [.752]	578
SL105-19x2x1.5-PU	19x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.5 [.059]	19.7 [.776]	21.7 [.854]	758
SL105-24x2x1.5-PU	24x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.6 [.063]	21.9 [.862]	24.3 [.957]	947
SL105-37x2x1.5-PU	37x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.8 [.071]	26.9 [1.059]	29.7 [1.173]	1433
SL105-4x2x2.5-PU	4x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.4 [.055]	12.7 [.500]	14.1 [.555]	292
SL105-7x2x2.5-PU	7x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.4 [.055]	15.1 [.594]	16.7 [.657]	437
SL105-10x2x2.5-PU	10x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.5 [.059]	17.2 [.677]	19.0 [.748]	604
SL105-14x2x2.5-PU	14x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.5 [.059]	19.9 [.783]	21.9 [.862]	815
SL105-24x2x2.5-PU	24x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.7 [.067]	25.5 [1.004]	28.1 [1.106]	1360
SL105-37x2x2.5-PU	37x2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.9 [.075]	31.3 [1.232]	34.5 [1.358]	2061

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

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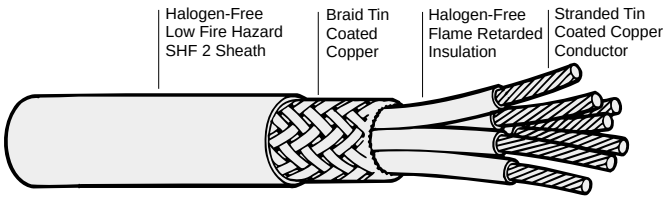
UK: 44-1793-528171

SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range



SeaLite SL105-SO Multicore Overall Shielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core		Cable				
		Number of Strands	Nominal Strand Diameter	Nominal Conductor CSA mm^2	Minimum Insulation Thickness	Nominal Braid Wire Diameter	Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km
SL105-2x1.0-SO	2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.0 [.039]	5.7 [.224]	6.3 [.248]	61
SL105-3x1.0-SO	3x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.1 [.043]	6.2 [.244]	6.8 [.268]	74
SL105-4x1.0-SO	4x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.1 [.043]	6.6 [.260]	7.2 [.283]	88
SL105-7x1.0-SO	7x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.2 [.047]	7.7 [.303]	8.5 [.335]	131
SL105-12x1.0-SO	12x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.3 [.051]	9.7 [.382]	10.7 [.421]	205
SL105-19x1.0-SO	19x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.3 [.051]	11.0 [.433]	12.2 [.480]	289
SL105-2x1.5-SO	2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.1 [.043]	6.6 [.260]	7.2 [.283]	83
SL105-3x1.5-SO	3x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	7.1 [.280]	7.9 [.311]	102
SL105-4x1.5-SO	4x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	7.6 [.299]	8.4 [.331]	123
SL105-7x1.5-SO	7x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	8.7 [.343]	9.7 [.382]	181
SL105-12x1.5-SO	12x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	11.1 [.437]	12.3 [.484]	288
SL105-19x1.5-SO	19x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.4 [.055]	12.9 [.508]	14.3 [.563]	422
SL105-27x1.5-SO	27x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	15.2 [.598]	16.8 [.661]	586
SL105-37x1.5-SO	37x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	16.8 [.661]	18.6 [.732]	762
SL105-2x2.5-SO	2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	7.5 [.295]	8.3 [.327]	110
SL105-3x2.5-SO	3x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	7.8 [.307]	8.6 [.339]	135
SL105-4x2.5-SO	4x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	8.4 [.331]	9.2 [.362]	161
SL105-7x2.5-SO	7x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	9.9 [.390]	10.9 [.429]	249
SL105-12x2.5-SO	12x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.13 [.005]	1.4 [.055]	12.7 [.500]	14.1 [.550]	399
SL105-19x2.5-SO	19x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	14.7 [.579]	16.3 [.642]	595
SL105-27x2.5-SO	27x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.20 [.008]	1.5 [.059]	17.8 [.701]	19.6 [.772]	841
SL105-37x2.5-SO	37x2.5	37	0.29 [.011]	2.5	0.20 [.008]	0.20 [.008]	1.5 [.059]	19.7 [.776]	21.7 [.854]	1099

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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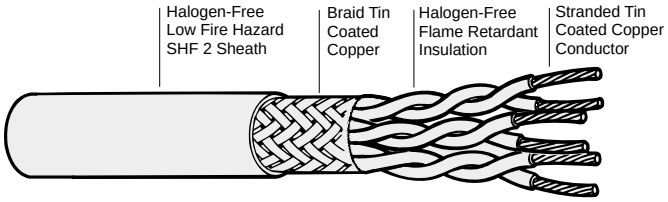
SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range



SeaLite SL105-PO Multipair Overall Shielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core		Cable				
		Number of Strands	Nominal Strand Diameter	Nominal Conductor CSA mm^2	Minimum Insulation Thickness	Nominal Braid Wire Diameter	Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km
SL105-2x2x0.75-PO	2x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.1 [.043]	6.2 [.244]	6.8 [.268]	78
SL105-3x2x0.75-PO	3x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.2 [.047]	8.6 [.339]	9.6 [.378]	127
SL105-7x2x0.75-PO	7x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.3 [.051]	10.9 [.429]	12.1 [.476]	219
SL105-14x2x0.75-PO	14x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.4 [.055]	14.1 [.555]	15.5 [.610]	377
SL105-19x2x0.75-PO	19x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.16 [.006]	1.4 [.055]	16.0 [.630]	17.6 [.693]	496
SL105-27x2x0.75-PO	27x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.20 [.008]	1.5 [.059]	18.7 [.736]	20.7 [.815]	694
SL105-37x2x0.75-PO	37x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.20 [.008]	1.6 [.063]	21.5 [.846]	23.7 [.933]	912
SL105-3x2x1.0-PO	3x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.3 [.051]	9.3 [.366]	10.3 [.406]	150
SL105-4x2x1.0-PO	4x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.3 [.051]	10.1 [.397]	11.1 [.437]	179
SL105-5x2x1.0-PO	5x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.3 [.051]	10.8 [.425]	12.0 [.472]	206
SL105-10x2x1.0-PO	10x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.13 [.005]	1.4 [.055]	13.2 [.520]	14.6 [.575]	335
SL105-12x2x1.0-PO	12x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.16 [.006]	1.4 [.055]	14.2 [.559]	15.8 [.622]	399
SL105-20x2x1.0-PO	20x2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	0.20 [.008]	1.5 [.059]	18.1 [.713]	19.9 [.783]	652
SL105-2x2x1.5-PO	2x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.2 [.047]	7.6 [.299]	8.4 [.331]	123
SL105-3x2x1.5-PO	3x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	10.7 [.421]	11.9 [.469]	202
SL105-4x2x1.5-PO	4x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	11.6 [.457]	12.8 [.503]	247
SL105-7x2x1.5-PO	7x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.4 [.055]	13.8 [.543]	15.2 [.598]	360
SL105-10x2x1.5-PO	10x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	15.6 [.614]	17.2 [.677]	488
SL105-12x2x1.5-PO	12x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	16.7 [.657]	18.5 [.728]	566
SL105-19x2x1.5-PO	19x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.20 [.008]	1.5 [.059]	20.5 [.807]	22.7 [.894]	868
SL105-20x2x1.5-PO	20x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.20 [.008]	1.5 [.059]	21.2 [.835]	23.4 [.921]	933
SL105-27x2x1.5-PO	27x2x1.5	37	0.23 [.009]	1.5	0.25 [.010]	0.25 [.010]	1.7 [.067]	24.3 [.957]	26.9 [1.059]	1230
SL105-37x2x1.5-PO	37x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.25 [.010]	1.8 [.071]	27.9 [1.098]	30.9 [1.217]	1622

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

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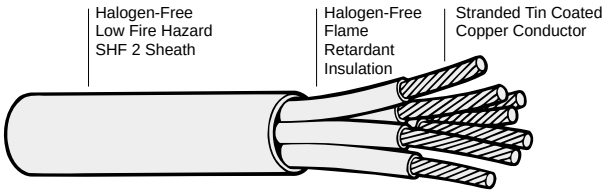
SeaLite SL105 (Continued)

Halogen Free, Flame-Retardant Cable Range



SeaLite SL105-SU Multicore Unshielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core		Cable			
		Number of Strands	Nominal Strand Diameter	Nominal Conductor CSA mm^2	Minimum Insulation Thickness	Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	Nominal Weight kg/km
SL105-7x0.75-SU	7x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.1 [.043]	6.5 [.256]	7.1 [.280]	91
SL105-12x0.75-SU	12x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.2 [.047]	8.4 [.331]	9.2 [.362]	147
SL105-19x0.75-SU	19x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	9.8 [.386]	10.8 [.425]	218
SL105-27x0.75-SU	27x0.75	19	0.23 [.009]	0.75	0.18 [.007]	1.3 [.051]	11.4 [.449]	12.6 [.496]	297
SL105-2x1.0-SU	2x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.0 [.039]	5.1 [.201]	5.7 [.224]	45
SL105-3x1.0-SU	3x1.0	19	0.25 [.010]	1.0	0.18 [.007]	1.0 [.039]	5.4 [.213]	6.0 [.236]	54
SL105-2x1.5-SU	2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.1 [.043]	6.0 [.236]	6.6 [.260]	64
SL105-3x1.5-SU	3x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.1 [.043]	6.4 [.252]	7.0 [.276]	78
SL105-4x1.5-SU	4x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.1 [.043]	6.8 [.268]	7.6 [.299]	97
SL105-5x1.5-SU	5x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.2 [.047]	7.6 [.299]	8.4 [.331]	122
SL105-7x1.5-SU	7x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.2 [.047]	8.2 [.323]	9.0 [.354]	155
SL105-12x1.5-SU	12x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.3 [.051]	10.5 [.413]	11.7 [.461]	253
SL105-14x1.5-SU	14x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.3 [.051]	11.0 [.433]	12.2 [.480]	288
SL105-19x1.5-SU	19x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	12.3 [.484]	13.7 [.539]	381
SL105-24x1.5-SU	24x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	14.2 [.559]	15.8 [.622]	474
SL105-27x1.5-SU	27x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	14.5 [.571]	16.1 [.634]	523
SL105-37x1.5-SU	37x1.5	37	0.23 [.009]	1.5	0.20 [.008]	1.4 [.055]	16.1 [.634]	17.9 [.705]	692
SL105-2x2.5-SU	2x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.1 [.043]	6.7 [.264]	7.5 [.295]	85
SL105-3x2.5-SU	3x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.2 [.047]	7.2 [.283]	8.0 [.315]	112
SL105-4x2.5-SU	4x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.2 [.047]	7.8 [.307]	8.6 [.339]	136
SL105-5x2.5-SU	5x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.2 [.047]	8.5 [.335]	9.3 [.366]	166
SL105-7x2.5-SU	7x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.3 [.051]	9.3 [.366]	10.3 [.406]	218
SL105-12x2.5-SU	12x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.3 [.051]	12.0 [.472]	13.2 [.520]	352
SL105-19x2.5-SU	19x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.4 [.055]	14.1 [.555]	15.5 [.610]	535
SL105-27x2.5-SU	27x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.4 [.055]	16.7 [.657]	18.5 [.728]	739
SL105-37x2.5-SU	37x2.5	37	0.29 [.011]	2.5	0.20 [.008]	1.5 [.059]	18.8 [.740]	20.8 [.819]	994

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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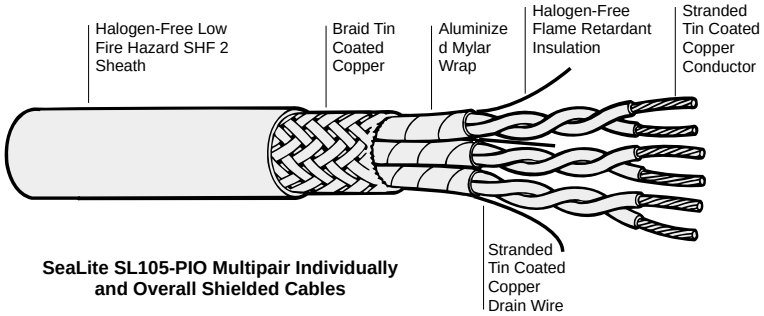
SeaLite SL105 (Continued)



SeaLite SL105-PIO Multipair Individually and Overall Shielded Cables

Field of application	Instrumentation and communication control General power and lighting
Voltage class	0.6/1kV
Temperature class	85°C [185°F]

Selection Table

Description	Construction	Conductor		Core Nominal Conductor CSA mm²	Minimum Insulation Thickness	Cable				Nominal Weight kg/km
		Number of Strands	Nominal Strand Diameter			Outer Shield Nominal Braid Wire Diameter	Nominal Outer Sheath Thickness	Outer Diameter (min.)	Outer Diameter (max.)	
SL105-2x2x0.5-PIO	2x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.13 [.005]	1.2 [.047]	8.4 [.331]	9.2 [.362]	117
SL105-4x2x0.5-PIO	4x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.13 [.005]	1.3 [.051]	9.3 [.366]	10.3 [.406]	163
SL105-7x2x0.5-PIO	7x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.13 [.005]	1.3 [.051]	10.9 [.429]	12.1 [.476]	231
SL105-10x2x0.5-PIO	10x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.13 [.005]	1.4 [.055]	12.8 [.504]	14.2 [.559]	313
SL105-12x2x0.5-PIO	12x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.13 [.005]	1.4 [.055]	13.1 [.516]	14.5 [.571]	355
SL105-19x2x0.5-PIO	19x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.16 [.006]	1.4 [.055]	15.8 [.622]	17.4 [.685]	530
SL105-24x2x0.5-PIO	24x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.20 [.008]	1.5 [.059]	17.7 [.697]	19.5 [.768]	672
SL105-37x2x0.5-PIO	37x2x0.5	19	0.18 [.007]	0.5	0.18 [.007]	0.20 [.008]	1.5 [.059]	21.0 [.827]	23.2 [.913]	966
SL105-1x2x0.75-PIO	1x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.0 [.039]	5.6 [.220]	6.2 [.244]	62
SL105-2x2x0.75-PIO	2x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.3 [.051]	9.2 [.362]	10.2 [.402]	142
SL105-4x2x0.75-PIO	4x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.3 [.051]	10.2 [.402]	11.2 [.441]	195
SL105-7x2x0.75-PIO	7x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.3 [.051]	11.9 [.469]	13.1 [.516]	279
SL105-10x2x0.75-PIO	10x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.13 [.005]	1.4 [.055]	14.1 [.555]	15.5 [.610]	380
SL105-14x2x0.75-PIO	14x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.16 [.006]	1.4 [.055]	15.4 [.606]	17.0 [.669]	504
SL105-19x2x0.75-PIO	19x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.20 [.008]	1.5 [.059]	17.9 [.705]	19.7 [.776]	679
SL105-24x2x0.75-PIO	24x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.20 [.008]	1.5 [.059]	19.5 [.768]	21.5 [.846]	824
SL105-37x2x0.75-PIO	37x2x0.75	19	0.23 [.009]	0.75	0.18 [.007]	0.25 [.010]	1.6 [.063]	23.7 [.933]	26.1 [1.028]	1237
SL105-1x2x1.5-PIO	1x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.1 [.043]	6.7 [.264]	7.5 [.295]	94
SL105-2x2x1.5-PIO	2x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	11.2 [.441]	12.4 [.488]	211
SL105-3x2x1.5-PIO	3x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.13 [.005]	1.3 [.051]	11.4 [.449]	12.6 [.496]	245
SL105-7x2x1.5-PIO	7x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.16 [.006]	1.4 [.055]	15.0 [.591]	16.6 [.654]	460
SL105-12x2x1.5-PIO	12x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.20 [.008]	1.5 [.059]	18.4 [.724]	20.4 [.803]	744
SL105-19x2x1.5-PIO	19x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.20 [.008]	1.6 [.063]	22.6 [.890]	25.0 [.984]	1141
SL105-24x2x1.5-PIO	24x2x1.5	37	0.23 [.009]	1.5	0.20 [.008]	0.25 [.010]	1.6 [.063]	24.9 [.980]	27.5 [1.082]	1391

CSA = Cross sectional area Note: For installation guidelines refer to Tyco Electronics installation guidelines document WT1189.

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tyco Electronics

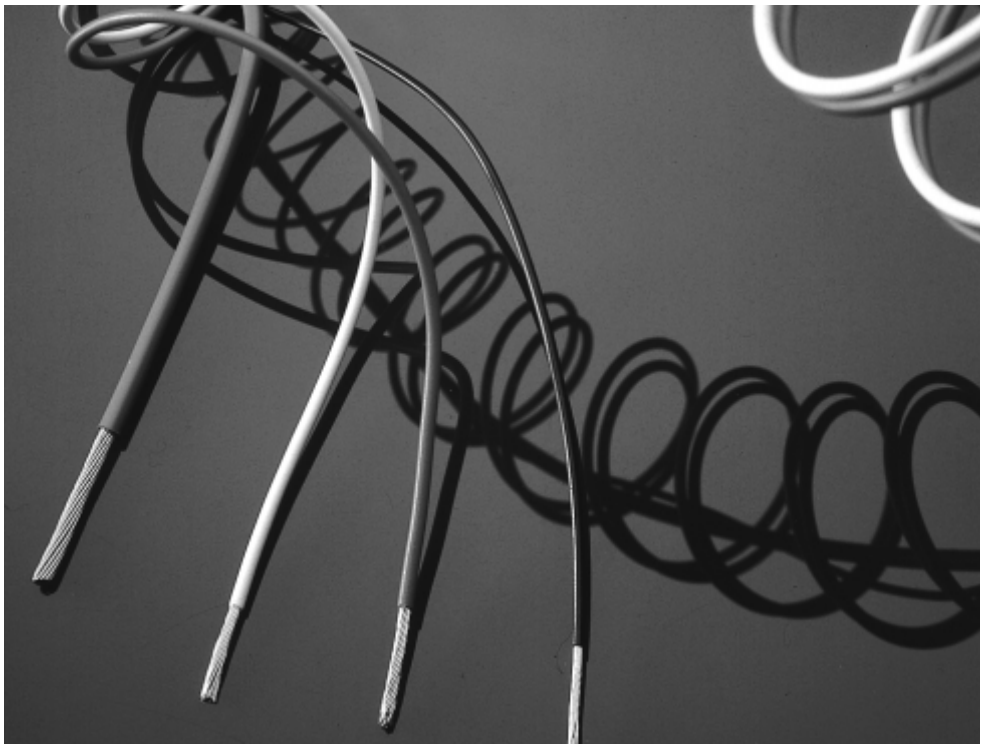
Low-Fire-Hazard Wire and Cable

Raychem

Type 99M

Product Facts

- Low flammability
- Low smoke generation
- Low toxicity index
- Low generation of corrosive gases
- Small size, lightweight



Applications

Type 99M wire has a dual wall construction of radiation cross-linked modified polyester. This combines excellent mechanical performance and chemical resistance with a range of enhanced fire hazard properties. Type 99M wire is designed to meet the stringent low hazard performance now being specified by many authorities, in particular for naval, mass transit and industrial control panel wiring.

During the 1980's there were major changes in the demands of many wire and cable specifications to reduce the risks associated with all aspects of firehazards. Specifications such as Def Stan 61-12 Part 18, have been developed over the last decade demanding improved performance of wires and cables under fire conditions.

This has led to a tightening of the requirements for flammability, smoke generation, corrosive gas generation and hazardous fume emission. Type 99M wire achieves these improvements in performance whilst retaining small size, light weight, flexibility, handleability, resistance to carbon arc tracking and resistance to chemicals and fluids.

Physical Characteristics

Handleability

Type 99M wire has been designed to be compatible with modern wiring and harnessing techniques. It is a flexible wire with virtually no springback once set. It is easily stripped with tools such as conventional die-blade strippers.

Small Size

Type 99M equipment wire has a nominal 0.2 mm insulation wall thickness which is comparable to other established thin wall wires such as SPEC 44 wire.

Light Weight

Type 99M wire is designed to have the same weights as SPEC 44 wire.

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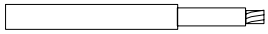
Type 99M (Continued)

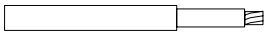
Approvals

Raychem WCD 281
Def Stan 61-12 Part 18 Issue 4 Type 1
Italian Navy STN-SR-01
Lloyds Register

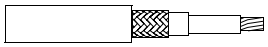
Type 99M Wire and Cable - Nominal Sizes, Strandings and Weights



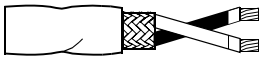
99M011X (600 V)
Primary Wire



99M021X (1000 V)
Primary Wire



99M1111
Shielded & Jacketed



99M1121
Shielded & Jacketed

Primary Wires/Shielded and Jacketed Cables - 99M

Size	Stranding (mm)	99M011X (600 V)		99M021X (1000 V)		99M1111		99M1121	
		OD	Weight (g/m)	OD	Weight (g/m)	OD	Weight (g/m)	OD	Weight (g/m)
26	19x0.10	0.88 [.035]	2.00	1.01 [.040]	2.2	1.80 [.071]	7.5	2.91 [.115]	13.3
24	19x0.12	0.98 [.039]	3.00	1.17 [.046]	3.4	1.90 [.075]	9.2	3.20 [.126]	16.6
22	19x0.15	1.13 [.044]	4.40	1.37 [.054]	4.9	2.05 [.081]	11.1	3.52 [.139]	20.5
20	19x0.20	1.40 [.055]	6.50	1.57 [.062]	7.3	2.30 [.091]	14.6	4.02 [.158]	27.7
18	19x0.25	1.65 [.065]	9.90	1.85 [.073]	10.9	2.55 [.100]	19.3	4.57 [.180]	37.1
16	19x0.30	1.90 [.075]	14.15	2.10 [.083]	14.5	2.95 [.116]	24.9	5.13 [.202]	48.5
14	37x0.25	2.25 [.089]	18.62	2.50 [.098]	21.8	3.13 [.123]	30.9	5.72 [.225]	60.5
12	37x0.32	2.60 [.102]	25.70	2.97 [.117]	31.3	3.48 [.137]	43.4	6.42 [.253]	86.0

Typical Properties

Test	Method	Typical value
Temperature rating	BS G230	125°C [257°F]
Voltage rating	Raychem	600 V thin wall
Tensile strength/elongation of insulation	—	30 MPa/250%
Notch propagation (0.05 mm notch)	BS G230	Pass
Shrinkage 200°C	BS G230	<1%
Low temperature bend	BS G230	-55°C [-67°F]
Voltage withstand	BS G230	2.5 kV
Insulation resistance (20°C [68°F])	BS G230	1000 M ohms km (min)
Pliability rating	Def Stan 61-12 (18)	82 - Pliable
Fluid resistance	Def Stan 61-12 (18)	
Fuels - aircraft		Pass
Oils - (ASTM No 3)		Pass
Solvents		Pass

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UK: 44-1793-528171

Type 99M (Continued)

Environmental Properties

Mechanical Performance

The scrape abrasion and cut through resistance of Type 99M wire out performs the well-established performance of SPEC 44 wire throughout its operating temperature range.

Fluid Resistance

Type 99M wire demonstrates outstanding resistance to most acids, alkalis, hydrocarbon solvents, fuels, lubricants and water.

Electrical Arc Tracking

Type 99M wire is resistant to electrical arc tracking under both wet and dry conditions.

Voltage Ratings

Standard available voltage ratings for Type 99M wire are 600 V (0.2 mm wall thickness) and 1000 V (0.3 mm wall thickness).

Fire Hazard Characteristics

Low Toxicity Index

Type 99M wire is designed to meet the low hazardous fume emission levels required in modern specifications. For example, the change in the Toxicity Index requirement from 1.5 to 0.2 between Issue 2 and Issue 3 of Def Stan 61-12 (Part 18), is met by Type 99M wire.

Flammability

Type 99M wire has passed some of the most stringent flammability tests, such as the test in IEC 332 Part 3 (ladder test) and Underwriter's Laboratory for VW1 (individual wire)

Smoke Generation

Type 99M wire has been designed to meet stringent smoke tests such as those specified in Def Stan 61-12 (Part 18) and in many mass transit specifications.

Corrosivity

Type 99M wire has a low corrosive gas emission, demonstrated by its low acid gas value and meets the latest requirements of low fire hazard specifications.

Fire Hazard Properties

Test	Method	Typical value
Flammability	IEC 332 Pt 3	Pass
Toxicity index	Def Stan 61-12 (18)	0.1 per meter of wire
Smoke index	Def Stan 61-12 (18)	8 per meter of wire
Acid gas equivalent	TDE 76/P/76	<1.5%

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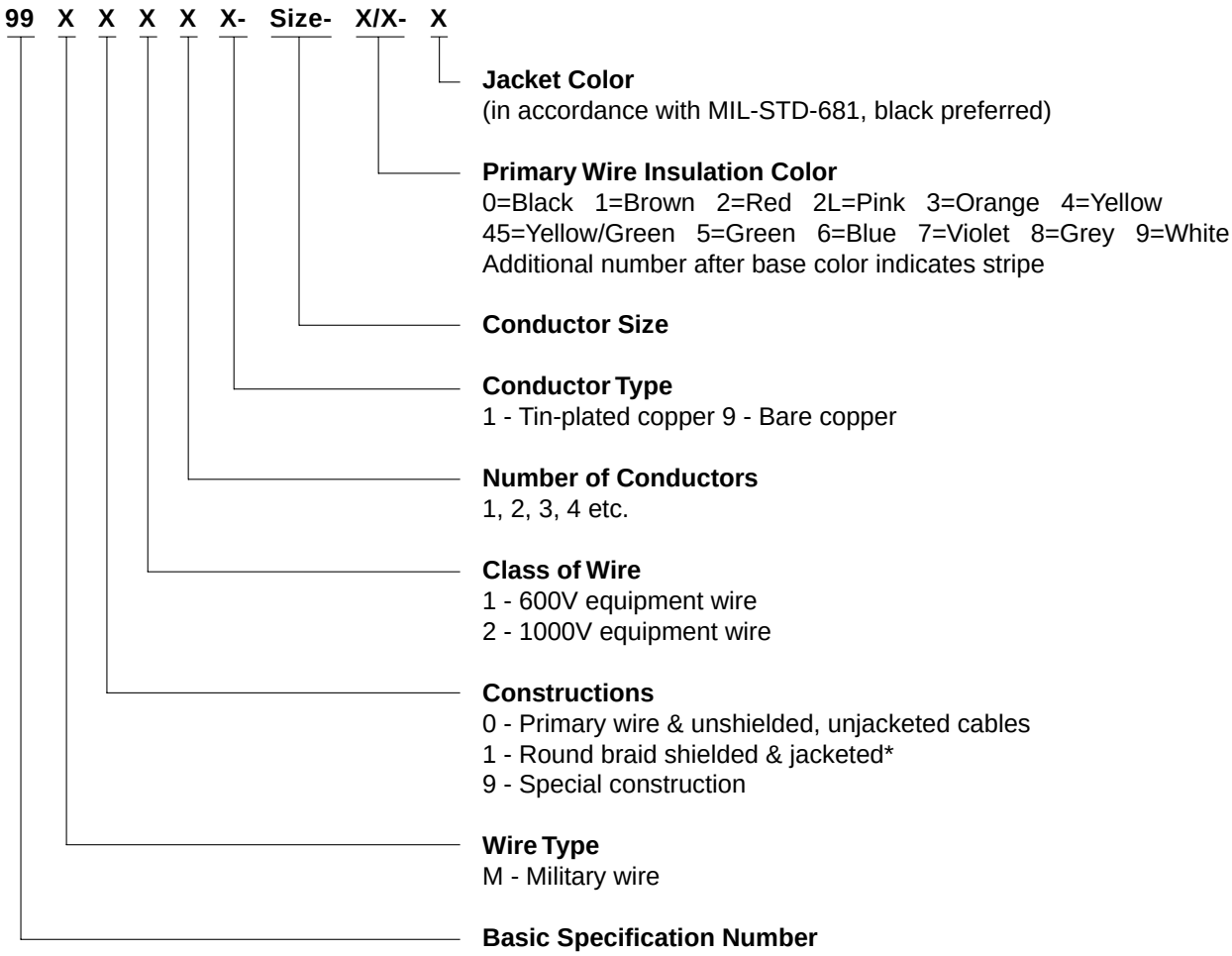
Part Numbering System



* The cable jackets are Raychem Zerohal and the preferred color is black.

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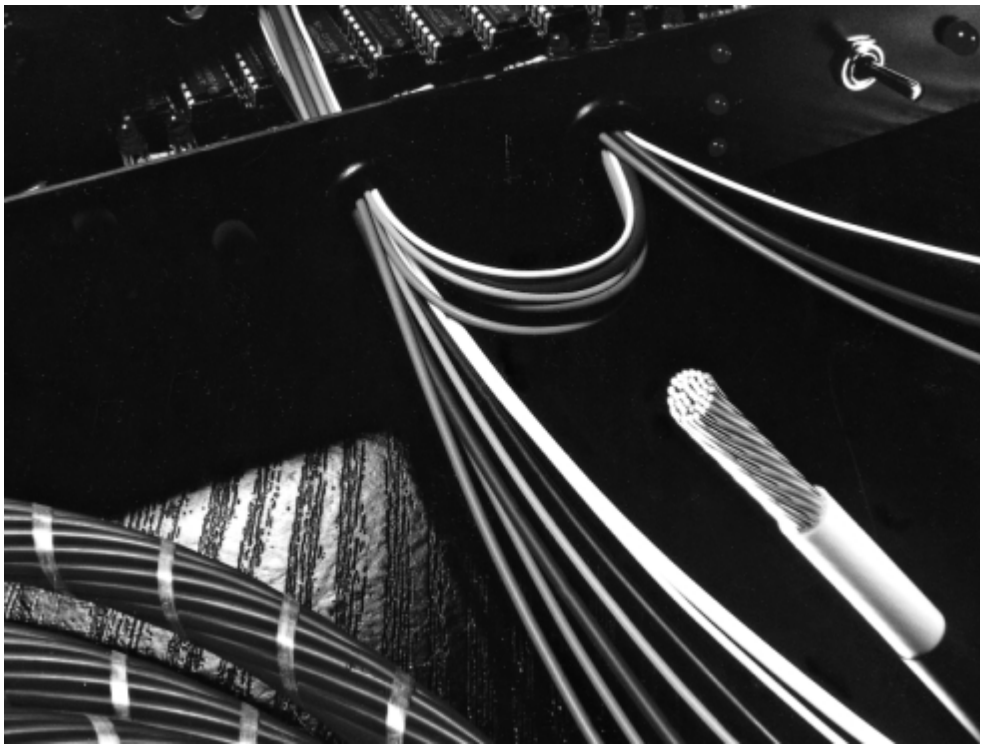
FLT

Flexible, Double Insulated, High Performance Wire for a Wide Range of Industrial Applications



Product Facts

- Highly flame retardant/non melting
- Limited fire hazard
- 600V rated
- Excellent fluid resistance
- Flexible
- Double insulation (for Class 2 equipment)
- Tough, thin wall
- Small size, light weight

Applications

FLT dual-wall wire combines flexibility with tough thin wall insulation to enable bundles to be routed through areas in which conventional wires cannot be used. Typical applications include control panels, instruments, lighting equipment, electrical appliances, electric motors, electric pumps, robotics, and the automotive industries.

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FLT (Continued)

Approvals

UL Styles 1385
CSA Class 5851
IEC 332-1

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

Physical Characteristics

Small Size

FLT equipment wire 600 volt rated has a 0.20 mm nominal wall thickness compared to 0.25mm and 0.38mm for equivalent PTFE and PVC wires in MIL-W-16878, MIL-W-22759 or BS3G210.

Light Weight

Due to the thin wall and low density of the insulation materials, considerable weight savings are made over similarly rated PTFE wires.

For Example: FLT0111 - 0.35 equipment wire 4.38 grams/meter max.

22 AWG PTFE equipment wire MIL-W-22759 5.54 grams/meter max.

General Handling

The flexibility of FLT 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 copper conductor usually specified is easily soldered or crimped.

Lengths

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

Typical Properties

Temperature rated	(Tin-plated conductor) -65°C to +150°C [-85°F to +302°F]
Rated at 125°C [257°F]	In UL style sheet 1385
Voltage rating	600V
No Voltage rating specified	In UL style sheet 1385
Tensile strength + elongation of insulation	30 N/mm 2 , 230%
Notch propagation BS 3G230 0.05 mm notch	Pass
Meets BS4066/IEC332-1 Flammability test	Pass
Solder iron resistance (370°C [698°F], 1 minute)	Pass
Shrinkage @ +150°C [+302°F]	< 1%
Low temperature bend	-65°C [-85°F]

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FLT (Continued)

Flexible, Double Insulated, High Performance Wire for a Wide Range of Industrial Applications

Environmental Performance

Temperature Rating

FLT wire is rated for continuous operation from -65°C to +150°C [-85°F to +302°F] and for short periods at much higher temperatures.

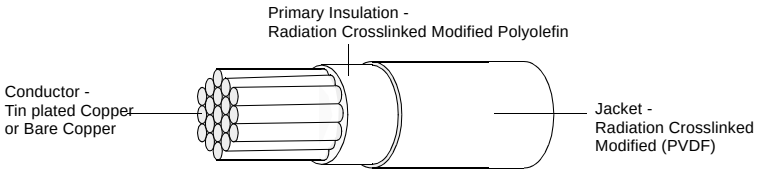
Mechanical Performance

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

Solder Iron/Overload Resistance

Radiation crosslinking ensures that the insulation does not melt at high temperature. As a result FLT wire is resistant to hot solder irons and current overloads which would melt most thermoplastic insulations.

Ordering Information



Nominal CSA mm²	Conductor Stranding No/Dia mm	Conductor Diameter		Finished Wire Maximum Resistance @20°C [68°F] ohms/km	Diameter		Nominal Weight kg/km	Ordering Description
		min.	max.		min.	max.		
0.25	19/0.127	0.55 [.022]	0.63 [.025]	83.6	0.91 [.036]	1.04 [.041]	2.96	FLT011X-0.25-Y
0.35	19/0.15	0.70 [.028]	0.80 [.031]	56.1	1.06 [.042]	1.21 [.048]	4.14	FLT011X-0.35-Y
0.50	19/0.19	0.82 [.032]	0.90 [.035]	40.1	1.18 [.046]	1.31 [.052]	6.63	FLT011X-0.50-Y
0.75	19/0.23	1.05 [.041]	1.15 [.045]	24.7	1.41 [.056]	1.56 [.061]	8.20	FLT011X-0.75-Y
1.00	19/0.25	1.17 [.046]	1.26 [.050]	20.0	1.55 [.061]	1.70 [.067]	10.86	FLT011X-1.00-Y
1.50	19/0.32	1.35 [.053]	1.60 [.063]	13.7	1.73 [.068]	2.06 [.081]	16.47	FLT011X-1.50-Y
2.00	19/0.36	1.66 [.065]	1.85 [.073]	9.9	2.12 [.083]	2.38 [.093]	20.32	FLT011X-2.00-Y
2.50	19/0.41	1.85 [.073]	2.05 [.081]	8.2	2.31 [.091]	2.61 [.103]	26.56	FLT011X-2.50-Y

Note: X = Conductor Type 1 = Tin Plated Copper 9 = Bare Copper
Y = Color (see color code on page 11043)

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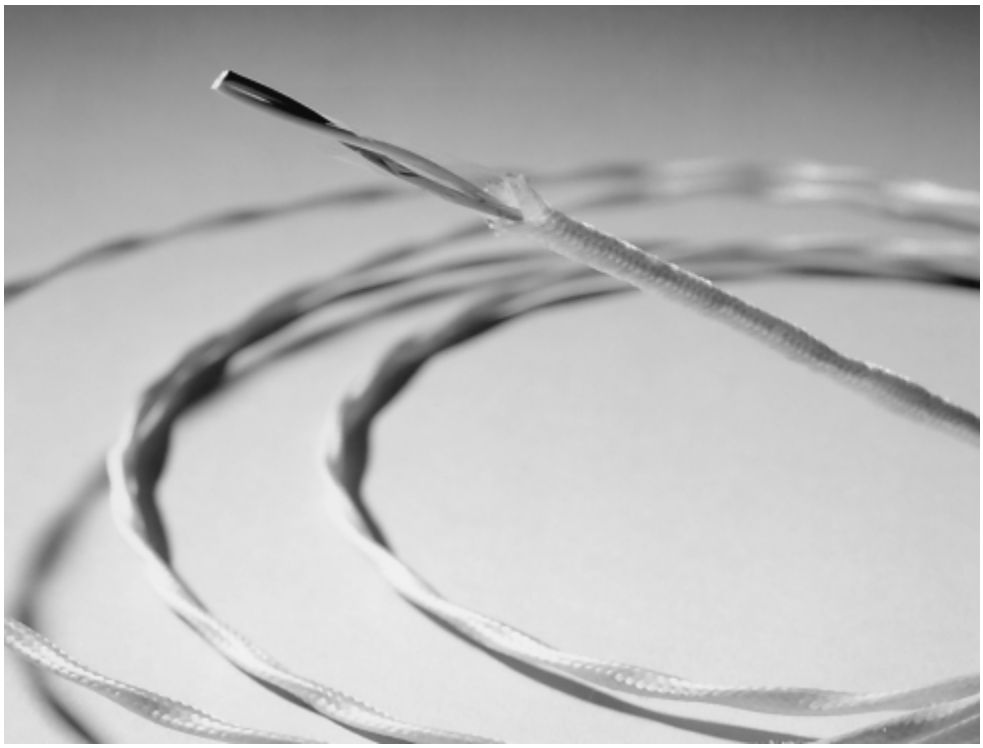
Thermocouple Extension Cable

Product Facts

- 19-strand conductor for flexibility



Applications

Tyco Electronics manufactures a broad range of Raychem thermocouple extension cables in four thermoelement combinations. Each provides accurate transmission of electromotive force (EMF) from a thermocouple element lead wire of the same conductor material to a thermometer, also known as a pyrometer.

All four types of thermocouple extension cables use 19-strand conductors and are available in twisted pair, jacketed twisted pair, and shielded and jacketed twisted pair configurations.

A range of cables is available from 16 AWG to 24 AWG.

Wires and cables are insulated and jacketed with radiation-crosslinked ETFE, which has a continuous operating temperature of -65°C to 200°C. This material, which is fully specified in Raychem SPEC 55, has excellent physical properties and is highly resistant to a wide range of chemicals.

Operating Temperature Range

-65°C to 200°C
[-85°F to 392°F]

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Thermocouple Extension Cable (Continued)

Properties

Extension Cable Type	Thermoelement Combination	Initial Calibration Tolerances for Thermocouple Extension Wires		
		Temperature Range	Limit of Range	EMF (mv)* (min.–max.)
EX	Chromel-Constantan	0°C to 200°C [0°F to 392°F]	±1.7°C [35.1°F]	6.18–6.45
JX	Iron-Constantan	0°C to 200°C [0°F to 392°F]	±2.2°C [36.0°F]	5.15–5.39
KX	Chromel-Alumel	0°C to 200°C [0°F to 392°F]	±2.2°C [36.0°F]	4.00–4.19
TX	Copper-Constantan	0°C to 100°C [0°F to 212°F]	±1.0°C [32.0°F]	4.24–4.32

Note: The above is in accordance with ANSI-MC-96.1-1982.
*EMF is measured in millivolts (mv) at 100°C [212°F] with reference junction at 0°C [0°F].

Product Dimensions** (Nominal)

AWG Size	Twisted Pair		Twisted, Jacketed Pair		Twisted, Shielded, 38 AWG Braid Strand, Jacketed Pair	
	Outside Diameter	Weight in kg/km (lb/1000 ft)	Outside Diameter	Weight in kg/km (lb/1000 ft)	Outside Diameter	Weight in kg/km (lb/1000 ft)
24	2.29 [.090]	7.3 [4.9]	2.67 [.106]	9.9 [6.7]	3.12 [.123]	16.5 [11.1]
22	2.60 [.102]	9.9 [6.7]	2.99 [.118]	13.0 [8.8]	3.43 [.135]	21.4 [14.4]
20	2.99 [.118]	14.4 [9.7]	3.40 [.134]	18.0 [12.1]	3.83 [.151]	27.8 [18.7]
18	3.56 [.140]	20.9 [14.1]	3.96 [.156]	25.1 [16.9]	4.34 [.173]	37.5 [25.2]
16	3.96 [.156]	26.3 [17.7]	4.37 [.172]	30.9 [20.8]	4.80 [.189]	44.9 [30.2]

**Dimensions for 19-strand-conductor thermocouple. Extension Types EX, JX, KX, and TX.

Extension Cable

Color-Coding

Thermocouple extension cables are available with the wires color-coded in accordance with four standards: MIL-STD-687, ANSI-MC-96.1, British Standard Code BS 1843, and Japanese JISC-C-1602.

Special Cables

Thermocouple extension cables are also available in solid-conductor and seven-strand-conductor configurations. They come in a variety of thermoelement combinations, gauges, insulations, and multiple-pair designs, and they are available for outer space applications. Contact Tyco Electronics for details.

Extension Cable

Type EX	Chromel +	Constantan -	Jacket (if present)	Color code Wire	Jacket
ANSI-MC-96.1	Violet	Red	Violet	7/2	7
British Std.-BS 1843	Brown	Blue	Brown	1/6	1
JISC-C-1602	Violet	Red	Violet	7/2	7
Type JX	**Iron +**	**Constantan -**	**Jacket**	**Wire**	**Jacket**
MIL-STD-687	Black	Yellow	White	0/4	9
ANSI-MC-96.1	White	Red	Black	9/2	0
British Std.-BS 1843	Yellow	Blue	Black	4/6	0
JISC-C-1602	Red	White	Yellow	2/9	4
Type KX	**Chromel +**	**Alumel -**	**Jacket**	**Wire**	**Jacket**
MIL-STD-687	White	Green	White	9/5	9
ANSI-MC-96.1	Yellow	Red	Yellow	4/2	4
British Std.-BS 1843	Brown	Blue	Red	1/6	2
JISC-C-1602	Red	White	Blue	2/9	6
Type TX	**Copper +**	**Constantan -**	**Jacket**	**Wire**	**Jacket**
MIL-STD-687	Red	Yellow	White	2/4	9
ANSI-MC-96.1	Blue	Red	Blue	6/2	6
British Std.-BS 1843	White	Blue	Blue	9/6	6
JISC-C-1602	Red	White	Brown	2/9	1

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C. America: 52-55-5-729-0425

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Japan: 81-44-900-5102
Singapore: 65-4866-151
UK: 44-1793-528171

Thermocouple Extension Cable (Continued)

Part Number Selection Table

The thermocouple cable options outlined in the table on the previous page can be ordered from the table below.

Tyco Electronics will assign a new part number on request for cables falling outside the range shown in the table.

Type	Twisted Pair	Twisted, Jacketed Pair	Shield Plating*	Twisted, Shielded, Jacketed Pair
EX	CTC-0077	CTC-0079	T	CTC-0074
			N	55A6169
JX	55A8131	CTC-0080	T	CTC-0044
KX	55A8002	CTC-0012	T	CTC-0018
			N	CTC-0015
			S	CTC-0057
TX	CTC-0078	CTC-0081	T	CTC-0073

*T = Tin-coated copper.
N = Nickel-coated copper.
S = Silver-coated copper.

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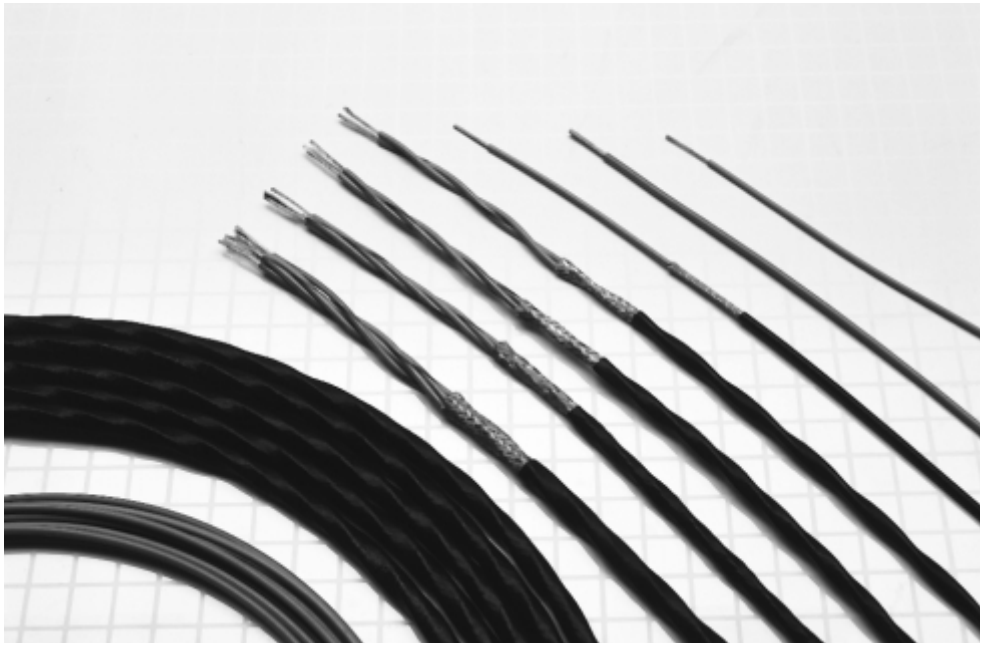
ElectroLoss Filterline

Lightweight, Ruggedized Filterline Wire and Cable

Product Facts

- **Suppresses EMI above 100 MHz**
- **Light weight, small size**
- **SPEC 55 insulation**
- **600 volt**
- **-65°C to 150°C † [-85°F to 302°F]**

† -65°C to 200°C [-85°F to 392°F] also available



Applications

Today's performance needs for military and commercial electronic systems require increasingly sophisticated equipment and greater use of composite structures and enclosures. As electronics become more sensitive, the EMI protection level for electrical equipment is increasing. The Raychem ElectroLoss filter line wire and cable provide a high degree of EMI protection while functioning as conventional electrical wiring.

ElectroLoss products include high-performance wire and cable, which when used as specified, suppress conducted and radiated EMI above 100 MHz.

A reliable alternative to conventional discrete filters and filter-pin connectors, ElectroLoss filter line cables are flexible, lightweight, and compatible with high-density connectors.

The Raychem filter line wire and cable meets the performance requirements of MIL-C-85485, a military specification developed to provide EMI protection for military electrical interconnects.

The absorptive layer in ElectroLoss filter line cable is constructed of a ferrite-loaded high-temperature polymer, which provides high-frequency EMI absorptive characteristics. Achieving maximum attenuation requires concentrating the electromagnetic fields in the absorptive layer — either with a metallic shield on each wire or by an overall metallic shield protecting a bundle of individual component wires.

Radiation-crosslinked, modified conductive EFTE jackets are used over shielded filter line cables to eliminate pathways between adjacent cable shields.

Application-driven alternative FilterLine constructions built to the same rigorous standards demanded of the MIL SPEC products are also available. These alternatives offer significant weight savings through the use of flat braids, improved laser mark contrast, and a broader choice of conductors.

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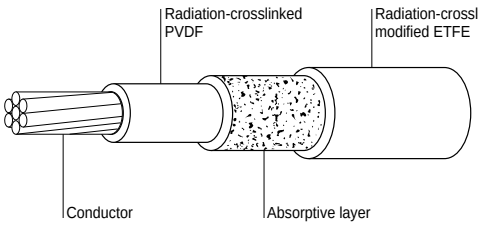

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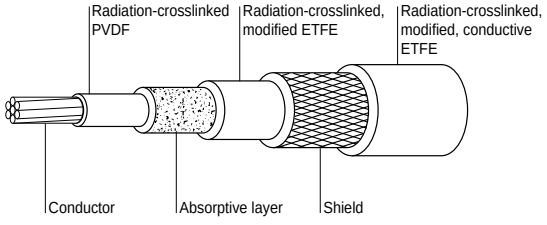

† -65°C to 200°C [-85°F to 392°F] also available.

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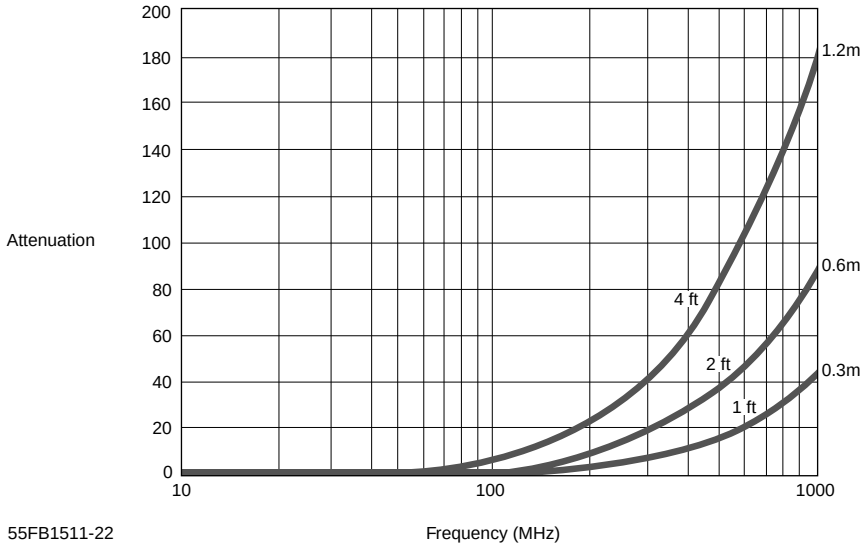
ElectroLoss Filterline (Continued)

Performance

Effective against conducted EMI ElectroLoss filter line wire and cable systems attenuate high-frequency EMI and allow low frequency signals to pass with minimum loss. When properly installed and used, filter line wire and cables function as low-pass electrical filters, attenuating both conducted and radiated EMI above 100MHz. The performance of ElectroLoss product is best demonstrated by measuring the attenuation (insertion loss) of a length of cable over a broad range of frequencies. Graph 1 depicts typical insertion loss characteristics.

Graph 1 - Typical insertion loss



Temperature rating	-65°C to +150°C † [-85°F to302°F]
Voltage rating	600V r.m.s

† -65°C to 200°C [-85°F to 392°F] also available

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Lightweight, Ruggedized Filterline Wire and Cable

Single Conductor Wire Specifications

AWG Size	Conductor Stranding (Number x AWG)	Maximum Outside Diameter mm (in)	Maximum Weight Kg/Km (lb/1000 ft)	MIL-SPEC Part Number	Raychem Part Number
24	19 x 36 silver coated high strength copper alloy	1.19 [.047]	4.46 [3.0]	M85485/10-24A	55FA0514-24-*
22	19 x 34 tin coated copper	1.37 [.054]	5.95 [4.0]	M85485/9-22A	55FA0511-22-*
20	19 x 32 tin coated copper	1.57 [.062]	8.63 [5.8]	M85485/9-20A	55FA0511-20-*
18	19 x 30 tin coated copper	1.85 [.073]	12.95 [8.7]	M85485/9-18A	55FA0511-18-*
16	19 x 29 tin coated copper	2.08 [.082]	16.67 [11.2]	M85485/9-16A	55FA0511-16-*
14	19 x 27 tin coated copper	2.51 [.099]	23.96 [16.1]	M85485/9-14A	55FA0511-14-*
12	37 x 28 tin coated copper	2.95 [.116]	35.71 [24.0]	M85485/9-12A	55FA0511-12-*
10	37 x 26 tin coated copper	3.58 [.141]	55.06 [37.0]	M85485/9-10A	55FA0511-10-*

* The color of component wire shall be light violet designated by 7L.
The designated colors for components in finished cable shall be light violet for component 1 and light violet with stripe designators for remaining component wires as follows:

Component wire	1	2	3	4	5
Color designator	7L	7L6	7L3	7L5	7L2

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ElectroLoss Filterline (Continued)

Unshielded, Unjacketed 2-5 Conductor Cable Specifications

AWG Size	Number of Conductor	Maximum Outside Diameter	Maximum Weight Kg/Km (lb/1000 ft)	MIL-SPEC Part Number	Raychem Part Number.
24	2	2.39 [.094]	9.08 [6.1]	M85485/11-24M2A	55FA0524-24-*
22	2	2.74 [.108]	12.20 [8.2]	M85485/11-22T2A	55FA0521-22-*
20	2	3.15 [.124]	17.56 [11.8]	M85485/11-20T2A	55FA0521-20-*
18	2	3.71 [.146]	26.34 [17.7]	M85485/11-18T2A	55FA0521-18-*
16	2	4.17 [.164]	33.93 [22.8]	M85485/11-16T2A	55FA0521-16-*
14	2	5.03 [.198]	48.81 [32.8]	M85485/11-14T2A	55FA0521-14-*
24	3	2.59 [.102]	13.69 [9.2]	M85485/11-24M3A	55FA0534-24-*
22	3	2.97 [.117]	18.15 [12.2]	M85485/11-22T3A	55FA0531-22-*
20	3	3.40 [.134]	26.34 [17.7]	M85485/11-20T3A	55FA0531-20-*
18	3	4.01 [.158]	39.58 [26.6]	M85485/11-18T3A	55FA0531-18-*
16	3	4.50 [.177]	51.03 [34.3]	M85485/11-16T3A	55FA0531-16-*
14	3	5.44 [.214]	73.36 [49.3]	M85485/11-14T3A	55FA0531-14-*
24	4	3.28 [.129]	18.15 [12.2]	M85485/11-24M4A	55FA0544-24-*
22	4	3.78 [.149]	24.25 [16.3]	M85485/11-22T4A	55FA0541-22-*
20	4	4.34[.171]	35.27 [23.7]	M85485/11-20T4A	55FA0541-20-*
18	4	5.11 [.201]	52.82 [35.5]	M85485/11-18T4A	55FA0541-18-*
16	4	5.74 [.226]	68.00 [45.7]	M85485/11-16T4A	55FA0541-16-*
14	4	6.91 [.272]	97.76 [65.7]	M85485/11-14T4A	55FA0541-14-*
24	5	3.58 [.141]	22.77 [15.3]	M85485/11-24M5A	55FA0554-24-*
22	5	4.11 [.162]	30.36 [20.4]	M85485/11-22T5A	55FA0551-22-*
20	5	4.72 [.186]	44.04 [29.6]	M85485/11-20T5A	55FA0551-20-*
18	5	5.56 [.219]	66.07 [44.4]	M85485/11-18T5A	55FA0551-18-*
16	5	6.25 [.246]	84.96 [57.1]	M85485/11-16T5A	55FA0551-16-*
14	5	7.54 [.297]	122.16 [82.1]	M85485/11-14T5A	55FA0551-14-*

* The color of component wire shall be light violet designated by 7L.
The designated colors for components in finished cable shall be light violet for component 1 and light violet with stripe designators for remaining component wires as follows:

Component wire	1	2	3	4	5
Color designator	7L	7L6	7L3	7L5	7L2

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Lightweight, Ruggedized Filterline Wire and Cable

Shielded, Jacketed 1-5 Conductor Cable Specifications

Electroloss Filterline Wire and Cable Light Weight Ruggedized Constructions

AWG Size	Number of Conductors	Shield Size AWG Tin Coated Copper	Maximum Outside Diameter mm (in)	Maximum Weight Kg/Km (lb/1000 ft)	MIL-SPEC Part Number	Raychem Part Number
24	1	38	2.13 [.084]	10.86 [7.3]	M85485/12-24U1A	55FB1514-24-*
22	1	38	2.31 [.091]	13.09 [8.8]	M85485/12-22T1A	55FB1511-22-*
20	1	38	2.51 [.099]	16.67 [11.2]	M85485/12-20T1A	55FB1511-20-*
18	1	38	2.79[.110]	22.17 [14.9]	M85485/12-18T1A	55FB1511-18-*
16	1	38	3.02 [.119]	26.78 [18.0]	M85485/12-16T1A	55FB1511-16-*
14	1	38	3.45 [.136]	35.86 [24.1]	M85485/12-14T1A	55FB1511-14-*
12	1	38	3.89 [.153]	49.40 [33.2]	M85485/12-12T1A	55FB1511-12-*
10	1	38	4.55 [.179]	71.57 [48.1]	M85485/12-10T1A	55FB1511-10-*
24	2	38	3.33 [.131]	19.34 [13.0]	M85485/12-24U2A	55FB1524-24-*
22	2	38	3.68 [.145]	23.81 [16.0]	M85485/12-22T2A	55FB1521-22-*
20	2	38	4.09 [.161]	30.50 [20.5]	M85485/12-20T2A	55FB1521-20-*
18	2	38	4.65 [.183]	41.37 [27.8]	M85485/12-18T2A	55FB1521-18-*
16	2	38	5.11 [.201]	50.59 [34.0]	M85485/12-16T2A	55FB1521-16-*
14	2	38	6.02 [.237]	69.49 [46.7]	M85485/12-14T2A	55FB1521-14-*
24	3	38	3.53 [.139]	25.30 [17.0]	M85485/12-24U3A	55FB1534-24-*
22	3	38	3.91 [.154]	31.10 [20.9]	M85485/12-22T3A	55FB1531-22-*
20	3	38	4.34 [.171]	41.07 [27.6]	M85485/12-20T3A	55FB1531-20-*
18	3	38	4.95 [.195]	56.54 [38.0]	M85485/12-18T3A	55FB1531-18-*
16	3	38	5.44 [.214]	69.94 [47.0]	M85485/12-16T3A	55FB1531-16-*
14	3	38	6.43 [.253]	96.87 [65.1]	M85485/12-14T3A	55FB1531-14-*
24	4	38	4.19 [.165]	31.69 [21.3]	M85485/12-24U4A	55FB1544-24-*
22	4	38	4.67 [.184]	39.58 [26.6]	M85485/12-22T4A	55FB1541-22-*
20	4	38	5.23 [.206]	52.68 [35.4]	M85485/12-20T4A	55FB1541-20-*
18	4	38	5.99 [.236]	72.91 [49.0]	M85485/12-18T4A	55FB1541-18-*
16	4	38	6.68 [.263]	91.36 [61.4]	M85485/12-16T4A	55FB1541-16-*
14	4	38	7.85 [.309]	125.59 [84.4]	M85485/12-14T4A	55FB1541-14-*
24	5	38	4.52 [.178]	37.80 [25.4]	M85485/12-24U5A	55FB1554-24-*
22	5	38	5.05[.199]	47.32 [31.8]	M85485/12-22T5A	55FB1551-22-*
20	5	38	5.66 [.223]	63.39 [42.6]	M85485/12-20T5A	55FB1551-20-*
18	5	38	6.55 [.258]	89.43 [60.1]	M85485/12-18T5A	55FB1551-18-*
16	5	38	7.24 [.285]	111.00 [74.6]	M85485/12-16T5A	55FB1551-16-*
14	5	38	8.53 [.336]	153.26 [103.0]	M85485/12-14T5A	55FB1551-14-*

* The color of component wire shall be light violet designated by 7L.
The designated colors for components in finished cable shall be light violet for component 1 and light violet with stripe designators for remaining component wires as follows:

Component wire	1	2	3	4	5
Color designator	7L	7L6	7L3	7L5	7L2

Fluid Resistance

Fluids	Hydrocarbons
	Fuels and lubricants
	Alcohols
	Cleaning fluids
	Glycols
	Synthetic fuels and lubricants
	Ketones

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Cheminax Coaxial Cables

Small, Lightweight Coaxial Cables

Product Facts

- **Light weight, small size**
- **Temperature range of -65°C to 200°C [-85°F to 392°F]**
- **Low capacitance and attenuation**
- **High velocity of propagation**
- **High flexibility**

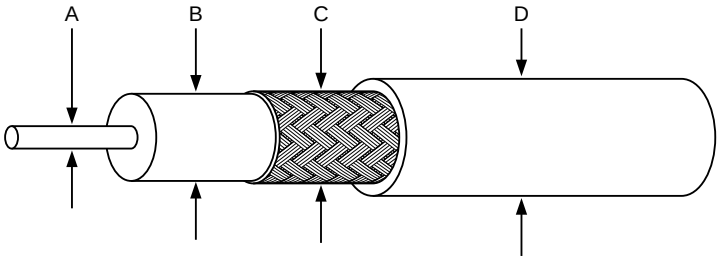
Applications

Cheminax controlled electrical cables are used in the aircraft and aerospace industries. They have a wide range of applications in missiles, avionics, radio-frequency and microwave systems, computers, security and surveillance systems, and communications.

Cheminax coaxial cables were designed to solve interconnect problems in electronic systems, such as computers, military equipment, and other areas of high-density packing, where cables are required to perform to more exacting specifications than standard radio-grade (RG) or UL recognized (UR) constructions.

Tyco Electronics' advanced materials technology has allowed the design and development of Raychem Cheminax miniature coaxial cables that offer substantial savings in size and weight while improving mechanical performance and reducing attenuation.

Cables can be designed that are either smaller and lighter than standard RG and UR cables or provide significantly lower attenuation and capacitance with no significant increase in size.



A Conductor
B Dielectric
C Shield
D Jacket

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Cheminax Coaxial Cables (Continued)

Specifications/Approvals

Series	UL	Raychem
Cheminax cables	1837, 3258, 3259, and 3264	1200

Product Dimensions (Nominal)

Typical Product Part No.	Impedance (ohms)	Capacitance pF/m (pF/ft)	Attenuation at 400 MHz dB/100m (dB/100 ft)	A Conductor Diameter	B Dielectric Diameter	C Shield Diameter	D Jacket Diameter	Weight in kg/km (lb/1000ft)
5012E1339	50	98.4 [30.0]	14.8 [4.5]	2.26 [.089]	7.24 [.285]	7.98 [.314]	10.24 [.403]	162.2 [109.0]
5012M1612	50	82.0 [25.0]	16.1 [4.9]	2.26 [.089]	6.07 [.239]	6.60 [.260]	7.06 [.278]	74.5 [50.1]
5024A1311	50	83.7 [25.5]	50.3 [15.3]	0.62 [.025]	1.70 [.067]	2.18 [.085]	2.67 [.104]	11.8 [7.9]
5026D1027	50	88.9 [27.1]	63.7 [19.4]	0.48 [.019]	1.27 [.050]	1.70 [.067]	2.21 [.087]	11.8 [7.9]
5030A1317	50	90.2 [27.5]	97.5 [29.7]	0.30 [.012]	0.79 [.031]	1.12 [.044]	1.57 [.062]	4.5 [3.0]
5030A1424	50	100.4 [30.6]	94.5 [28.8]	0.30 [.012]	0.86 [.034]	1.19 [.047]	1.60 [.063]	5.7 [3.8]
7520A1311	75	56.1 [17.1]	20.0 [6.1]	1.02 [.040]	4.57 [.180]	5.11 [.201]	6.12 [.241]	43.2 [29.0]
7524A1311	75	56.4 [17.2]	31.8 [9.7]	0.62 [.025]	2.82 [.111]	3.25 [.128]	3.86 [.152]	19.2 [12.9]
7528H1424	75	54.5 [16.6]	44.0 [13.4]	0.32 [.013]	1.37 [.054]	1.73 [.068]	2.13 [.084]	8.9 [6.0]
7530A1317	75	60.4 [18.3]	58.8 [17.9]	0.30 [.012]	1.35 [.053]	1.78 [.07]	2.29 [.09]	8.3 [5.6]
7530H1424	75	57.4 [17.5]	58.1 [17.7]	0.30 [.012]	1.30 [.051]	1.73 [.068]	2.03 [.08]	8.5 [5.7]
9522A1311	95	44.3 [13.5]	19.7 [6.0]	0.79 [.031]	5.51 [.217]	6.05 [.238]	7.32 [.288]	55.1 [37.0]
9527J1528	95	44.3 [13.5]	31.8 [9.7]	0.43 [.017]	2.84 [.112]	3.18 [.125]	3.58 [.141]	19.2 [12.9]
9530H1014	95	44.3 [13.5]	44.3 [13.5]	0.30 [.012]	1.83 [.072]	2.26 [.089]	2.62 [.103]	13.1 [8.8]

Note: All values are nominal.

Product Characteristics

General	Conductor Range Operating Temperature Range*	12 AWG to 30 AWG -65°C to 200°C [-85°Fto 392°F]
Electrical	Impedance range Dielectric constant Velocity of propagation	50 ohms to 125 ohms 1.65–2.3 67%–80%

*Temperature rating varies depending on materials used in specific construction.

Small, Lightweight Coaxial Cables

Properties (per SCD)

Physical	Typical Value of Dielectric Material		
	Rayfoam L	Rayfoam H	Rayolin F
Tensile (min.)	6.8 MPa (1000 psi)	4.1 MPa (600 psi)	12.2 MPa (1800 psi)
Elongation (min.)	50%	50%	200%
Electrical			
Dielectric withstand (min.)	1000 V	1000 V	1000 V
Velocity of propagation (nom.)	78%	78%	67%
Dielectric constant	1.65	1.65	2.2

	Type Value of Jacket Material					
Physical	**Thermorad**	**SPEC 55**	**FlexLine**	**FEP**	**Zerohal**	**SPEC 44**
Tensile (min.)	13.6 MPa (2000 psi)	34 MPa (5000 psi)	20.4 MPa (3000 psi)	13.6 MPa (2000 psi)	8.2 MPa (1200 psi)	27.2 MPa (4000 psi)
Elongation (min.)	250%	50%	100%	200%	150%	200%
Temperature (max.)	125°C [257°F]	200°C [392°F]	200°C [392°F]	200°C [392°F]	125°C [257°F]	150°C [302°F]
Flammability*	Method C	Method B	Method B	Method B	Method B	Method B
Fluid category*	C	A	A	A	C	

*See Raychem specification WCD-1200 for details.

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Part Numbering System

50 26 A 1 3 1 4 - 0

Jacket Color

0 = Black	6 = Blue
1 = Brown	7 = Violet
2 = Red	8 = Gray
3 = Orange	9 = White
4 = Yellow	9X = Transparent white
5 = Green	

Conductor Type

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
7 = Tin-coated copper-clad steel
8 = Silver-coated copper-clad steel
9 = Bare copper
A = CS95

Dielectric

1 = Rayfoam L	4 = FEP (solid)
2 = Rayfoam H	6 = SPEC 55 (modified XL-ETFE)
3 = Rayolin F	0 = Other

Jacket

1 = General purpose PVF2	6 = SPEC 55
2 = Outerspace PVF2	7 = FlexLine
3 = Thermorad	8 = Zerohal
4 = FEP	9 = None
5 = Uncrosslinked ETFE	0 = Other

Construction

1 = Single round shield	6 = Triax - other
2 = Single flat shield	8 = Composite shield
3 = Double round shield	9 = Core only
4 = 2 shield (other)	0 = Other
5 = Triax-round shield	

Variation

Letter assigned by Raychem.
(This is not a revision indicator.)

Conductor Size (AWG)

Always two digits.

Impedance

Always two digits (if 100 ohms or higher, use last two digits only).

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Raychem Alternatives to RG Cables

RG/U	Raychem Alternative	Comments
4	5020A3311-0	Small/light
	5018D3311-0	Improved electricals
5	5018D3311-0	Small/light
8	5012E1339-0	Dimensionally similar
11	7518A1311-0	Small/light
29	5020A1311-0	Small/light
31	5012E1339-0	Dimensionally similar
55	5020A3311-0	Small/light
	5018D3311-0	Improved electricals
58	5021D1331-0	Dimensionally similar
	5020A1311-0	Small/light
	5018A1311-0	Improved electricals
59	7523D1331-0	Dimensionally similar
	7524A1311-0	Small/light
	7520A1311-0	Improved electricals
62	9524A1311-0	Small/light
63	2524A1311-0	Small/light
87	5012A3311-0	Small/light
89	5012A3311-0	Small/light
115	5012A3311-0	Small/light
122	5020A1311-0	Improved electricals
124	7524A1311-0	Small/light
133	9524A1311-0	Small/light
140	7524A1311-0	Small/light
141	5020A1311-0	Small/light
142	5019D3318-0	Small/light
	5018D3311-0	Improved electricals
144	7518A1311-0	Small/light
149	7518A1311-0	Small/light
159	5020A1311-0	Small/light
174	5026A1311-0	Small/light
	5024A1311-0	Improved electricals
178	5030A1317-0	Small/light
	5028A1317-0	Improved electricals
179	7530A1317-0	Small/light
	7528A1317-0	Improved electricals
180	9530E1014-0	Small/light
	9527A1318-9	Improved electricals
188	5026A1311-0	Small/light
	5024A1311-0	Improved electricals
210	9524A1311-0	Small/light
213	5012E1339-0	Dimensionally similar
214	5012A3311-0	Small/light
223	5019D3318-0	Small/light
	5018D3311-0	Improved electricals
225	5012A3311-0	Small/light
235	5012A3311-0	Small/light
279	7524A1311-0	Dimensionally similar
282	5024A1311-0	Small/light
302	7524A1311-0	Small/light
303	5020A1311-0	Small/light
304	5018A1311-0	Small/light
316	5026A1311-0	Small/light
	5024A1311-0	Improved electricals
393	5012A3311-0	Small/light
400	5020A3311-0	Small/light
	5018D3311-0	Improved electricals
403	5030A5314-0	Small/light

Note: To complement the mechanical and electrical features of Cheminax miniature coax cable, Tyco Electronics offers Raychem SolderSleeve, SolderTacts, and PinPak termination devices and RF connector devices. Controlled electrical cables and components are available for data bus systems.

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Cheminax — High Performance Alternatives to Standard Cables (Continued)

Raychem Alternatives to UR Cables

UR	Raychem Alternative	Comments
43	5020A1311-0	Small/light
57	7518A1311-0	Small/light
65	7518A1311-0	Small/light
67	5012E1339-0	Dimensionally similar
70	7524A1311-0	Small/light
72	5020A1311-0	Small/light
76	5020A1311-0	Small/light
84	7524A1311-0	Small/light
90	7522A1311-0	Small/light
95	5026A1311-0	Small/light
96	9524A1311-0	Dimensionally similar
102	5012E1339-0	Dimensionally similar
104	7522A1311-0	Small/light
105	7518A1311-0	Small/light
106	7222A1311-0	Small/light
107	5012E1339-0	Small/light
108	5020A1311-0	Small/light
109	5026A1311-0	Small/light
110	5030A1317-0	Small/light
111	7530A1317-0	Small/light
112	5012A3311-0	Small/light
113	7518A1311-0	Small/light
116	5026A1311-0	Small/light
117	7524A1311-0	Small/light
200	7524A1311-0	Dimensionally similar
201	7522A1311-0	Dimensionally similar
202	7522A1311-0	Dimensionally similar
203	7520A1311-0	Small/light
204	7518A1311-0	Dimensionally similar
205	7518A1311-0	Dimensionally similar
207	7524A1311-0	Small/light
208	7524A1311-0	Small/light
210	7524A1311-0	Small/light
301	5020A1311-0	Small/light
306	7524A1311-0	Small/light

Note: To complement the mechanical and electrical features of Cheminax miniature coax cable, Tyco Electronics offers Raychem SolderSleeve, SolderTacts, and PinPak termination devices and RF connector devices. Controlled electrical cables and components are available for data bus systems. For further information see the Electrical Interconnect Products section of this catalog.

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Cheminax Twin Axial Cable

Small, Lightweight Twin Axial Cables

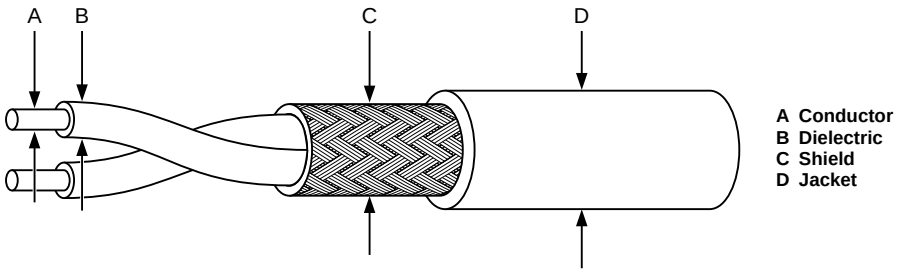
Product Facts

- **Light weight, small size**
- **Temperature range of -65°C to 200°C [-85°F to 392°F]**
- **Low capacitance**
- **High data rates**
- **Excellent shop handling**

Applications

These small, lightweight cables are specially designed for use in MIL-STD-1553 data bus applications. Raychem materials technology allows the design and construction of cables that meet rigorous electrical and environmental performance requirements while minimizing size and weight.

Cheminax twin axial cables provide elegant solutions to an increasing range of data bus and multiplex signal transmission applications.



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Cheminax Twin Axial Cable (Continued)

Specifications/Approvals

Series	UL	Raychem
Cheminax cables	1837, 3258, 3259, and 3264	1200

Product Dimensions*

Typical Product Part No.	Impedance (ohms)	Capacitance pF/m(pF/ft)	A Conductor Diameter	B Dielectric Diameter	C Shield Diameter	D Jacket Diameter	Weight in kg/km (lb/1000ft)
5024A1661	50	104.7 [31.9]	.64 [.025]	0.89 [.035]	2.21 [.087]	2.62 [.103]	14.4 [9.7]
5026A1664	50	136.2 [41.5]	.48 [.019]	0.66 [.026]	1.75 [.069]	2.16 [.085]	10.0 [6.7]
7520A1662	75	74.2 [22.6]	1.02 [.040]	2.03 [.080]	4.60 [.181]	5.05 [.199]	42.9 [28.8]
7526J1660	75	88.6 [27.0]	.48 [.019]	0.99 [.039]	2.41 [.095]	2.82 [.111]	14.9 [10.0]
7820D0331	78	67.3 [20.5]	1.02 [.040]	2.11 [.083]	4.75 [.187]	5.72 [.225]	46.9 [31.5]
7824E0422	78	55.1 [16.8]	.64 [.025]	1.19 [.047]	2.82 [.111]	3.33 [.131]	19.6 [13.2]
0022E0311	100	49.2 [15.0]	.79 [.031]	1.98 [.078]	4.39 [.173]	5.16 [.203]	30.5 [20.5]
0024A0024	100	44.3 [13.5]	.64 [.025]	1.30 [.051]	3.02 [.119]	3.63 [.143]	25.1 [16.9]
0026A0024	100	44.0 [13.4]	.48 [.019]	1.14 [.045]	2.72 [.107]	3.23 [.127]	18.7 [12.6]
2524H0524	125	39.4 [12.0]	.64 [.025]	1.83 [.072]	4.09 [.161]	4.50 [.177]	25.3 [17.7]
2526E1114	125	36.1 [11.0]	.48 [.019]	1.40 [.055]	3.33 [.131]	3.73 [.147]	21.7 [14.6]
2530A0314	125	39.4 [12.0]	.30 [.012]	0.86 [.034]	2.16 [.085]	2.67 [.105]	10.6 [7.1]
10595-24	70	91.9 [28.0]	.64 [.025]	1.19 [.047]	2.82 [.111]	3.23 [.127]	17.9 [12.0]
10606-26	75	91.9 [28.0]	.53 [.021]	0.99 [.039]	2.41 [.095]	2.82 [.111]	13.4 [9.0]
10612-24	77	91.9 [28.0]	.64 [.025]	1.22 [.048]	2.90 [.114]	3.30 [.130]	23.7 [15.9]
10613-24	77	91.9 [28.0]	.64 [.025]	1.22 [.048]	3.33 [.131]	3.73 [.147]	39.0 [26.2]
10614-24	77	91.9 [28.0]	.64 [.025]	1.22 [.048]	3.73 [.147]	4.09 [.161]	40.3 [27.1]

*All dimensions are nominal.

Small, Lightweight Twin Axial Cables

Product Characteristics

General	Conductor range Operating temperature range*	20 AWG to 30 AWG -65°C to 200°C [-85°F to 392°F]
Electrical	Impedance range Capacitance range	50 ohms to 125 ohms 30 pF/ft to 10 pF/ft

*Temperature rating varies depending on materials used in specific construction.

Properties (per SCD)

Physical	Typical Value of Dielectric Material				
	Rayfoam L	Rayfoam H	Rayolin F	FEP (solid)	Radiation-Crosslinked XL ETFE
Tensile (min.)	6.8 MPa (1000 psi)	9.1 MPa (600 psi)	12.2 MPa (1800 psi)	6.8 MPa (1000 psi)	34 MPa (5000 psi)
Elongation (min.)	50%	50%	200%	150%	50%
Electrical					
Dielectric withstand (min.)	1000 V	1000 V	1000 V	1000 V	1000 V
Velocity of propagation (nom.)	78%	78%	67%	69%	61%
Permittivity (nom.)	1.65	1.65	2.2	2.1	2.7

Physical	Typical Value of Jacket Material					
	Thermorad	SPEC 55	FlexLine	FEP	Zerohal	SPEC 44
Tensile (min.)	13.6 MPa (2000 psi)	34 MPa (5000 psi)	20.4 MPa (3000 psi)	13.6 MPa (2000 psi)	8.2 MPa (1200 psi)	27.2 MPa (4000 psi)
Elongation (min.)	250%	50%	100%	200%	150%	200%
Temperature (max.)	125°C [257°F]	200°C [392°F]	200°C [392°F]	200°C [392°F]	125°C [257°F]	150°C [302°F]
Flammability**	Method C	Method B	Method B	Method B	Method B	Method B
Fluid category**	C	A	A	A	C	B

*See Raychem specification WCD-1200 for details.

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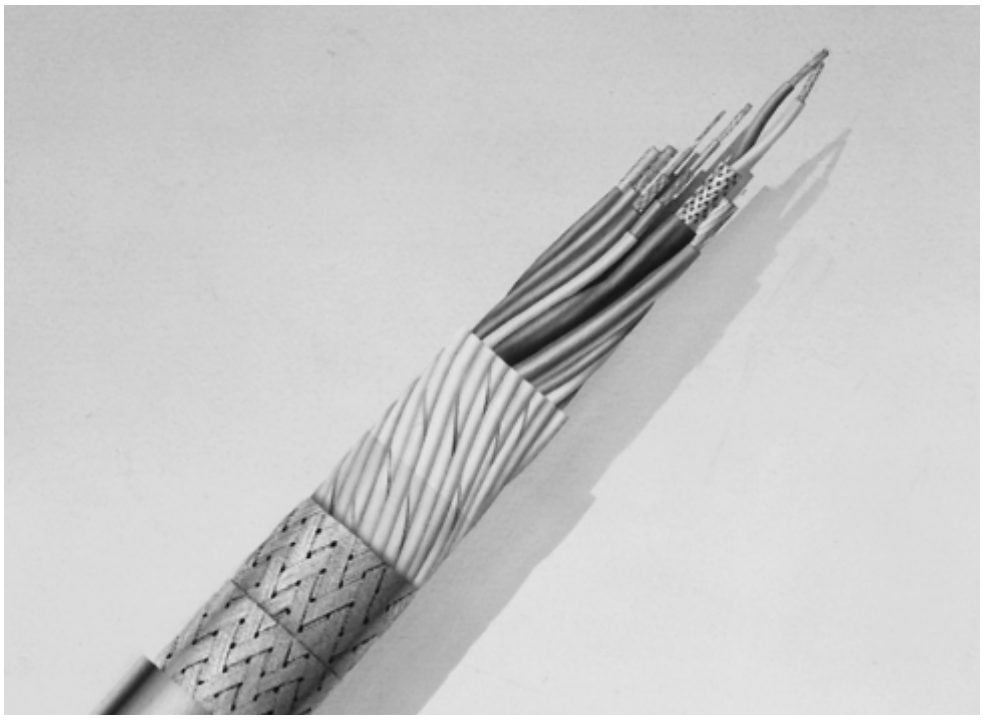
Introduction

Custom-Designed and Standard Multiconductor (Multicore) Cables

Product Facts

- **Temperature capability: -55°C to 200°C [-67°F to 392°F]**
- **Small size, lightweight**
- **System compatibility with other Raychem products**
- **Complete range of components**
- **Specially formulated jacket materials**
- **Special shielding to address EMI/EMC problems**
- **Custom designed and purpose built**
- **Fast response—design, pricing, and delivery**
- **Prototype length facility**
- **Raychem Dynalink extended flex-life and increased flexibility**
- **Fire-resistant: circuit integrity (IEC331, enhanced 950°C [1742°F], 3 hours)**
- **Small-size, lightweight, low-fire-hazard for modern high-speed vessels (Sealite)**



Applications

Tyco Electronics is the leading manufacturer of Raychem custom-designed, small-size, lightweight, high-performance multiconductor (multicore) cables. Applications are found in the aerospace, commercial marine (Sealite), naval, mass transportation, automotive, offshore, military ground vehicle, ground support, high-performance instrumentation, industrial, and commercial markets. Raychem multiconductor (multicore) cables have been approved to many standards demanding high performance criteria in service use.

Multiconductor (Multicore) Cables Purpose Built and Designed Using Raychem Components and Technology

Multiconductor cables are used in widely varying applications and environments. Careful consideration must be given to the selection of components with the right combination of physical, chemical, and electrical properties for specific applications.

Tyco Electronics' leadership in the technologies of polymer blending and subsequent radiation crosslinking has led to the development of a particularly broad range of Raychem cables. High-performance component wires and miniature coaxial cables are combined with unique cable jacket materials to meet the requirements of demanding environments.

Established as one of the leading manufacturers of special purpose Raychem cables, Tyco Electronics has continued to develop both its design and manufacturing expertise.

Development of a sophisticated CAD system has allowed increasingly rapid response to any design request, followed by manufacturing to the highest quality standards.

Planar Film-Bonded Cables

Tyco Electronics can custom-design and build a variety of Raychem component wires and cables onto high-performance carrier films. Components and carriers are matched to ensure temperature and environmental stability.

Specifications/Approvals

Agency	Industry	Military	Raychem
Underwriters' Laboratories	Lloyd's Register of Shipping	Def. Stan. 61-12 Pt 25	WCD series
BSENISO9001	Det Norske Veritas	VG 95218 Pts 27 and 28	—
MSV 34410-34413, 34435,34436	—	—	—

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Design Flexibility

Components

- SPEC 44 wire and cable
- SPEC 55 wire and cable
- Type 99 wire and cable
- Coaxial cables
- ElectroLoss Filterline cables
- Flexible power cables
- Optical fibers
- Special components

Wraps and Braids

- Fabric and film tapes
- Kevlar or steel strength members
- Full range of electrical screens (including SuperScreens)

Jacket Materials

- FDR 25 - Fluid resistant, flexible, high temperature
- Thermorad - General purpose
- Thermorad HTF/ - Very high temperature, Fluoroelastomer fluid resistant
- Raythane C - Tough and flexible
- Raythane FR - Tough, flexible, flame-retardant
- Rayolin - Low moisture transmission
- Neoprene - Low-temperature flexibility

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Properties and Specifications

Specifications and Approvals (Components and Jacket Materials)

Specifications UK Designation	FDR 25	Zerohal	Fluoro-elastomer	Thermorad	Rayolin	Raythane C	AFR	Neoprene	44 Wire	55 Wire	100 Wire	99 Wire	Hytrel
US Designation		**Zerohal**	**Thermorad HTF**	**Thermorad F**		**Raythane FR**		**Thermorad NTFR**	**44 Wire**	**55 Wire**	**100 Wire**		
Def Stan 61-12 Part 31, NES 518		X											
NES 525		X							X				
Def Stan 61-12 Part 18 type 1 (issue 4) (Maintenance range)									X				
Def Stan 61-12 Part 18 type 1 (issue 4)		X										X	
Def Stan 61-12 Part 25		X										X	
Def Stan 61-12 Part 26									X				
MSV 34401									X				
MSV 34410, 34411				X					X				
MSV 34412, 34413, 34430													
34435, 34436		X							X				
VG 95218 Part 20, 21, 22 and 23									X	X			
VG 95218 Part 24, 25 and 26	X												
VG 95218 Part 27 and 28	X	X							X		X		
VG 95218 Part 1000									X				
VG 95218 Part 1001 and 1002										X			
MIL-C-24640 (PMS 400)		X							X				
MIL-W-81044/MIL-C-27500									X				
MIL-W-22759/MIL-C-27500										X			
A014000		X										X	
NES 517		X			X				X				
Approvals													
Lloyds Register of Shipping/DNV		X		X		X			X			X	
Bureau Veritas	X	X	X	X		X	X	X	X	X			
UL				X		X (FR)	X		X	X			
CAA									X	X			
BWB	X			X					X	X			
VDE	X			X					X	X			
Det Norskeveritas													
German Islher Lloyds		X									X		
American Bureau of Shipping		X									X		
Lloyds		X									X		
Bureau Veritas		X									X		

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Japan: 81-44-900-5102
Singapore: 65-4866-151
UK: 44-1793-528171

Properties and Specifications (Continued)

Major Cable Specifications

Country	Cable Specification	Specification Description	Approved Jacket
UK	Def Stan 61-12 Part 25	Royal Navy/Airforce specification covering limited fire hazard thin-wall insulated electric cables using Def-Stan 61-12 Part 18 approved wire. Signal, control and light power circuits.	Zerohal
Germany	VG 95218 (parts 27 and 28)	Military ground systems specification for signal, control and power cables. Wire to VG 95218 Parts 20-23 and 1000.	FDR-25
Netherlands	MSV 34410, 34411	Royal Netherlands Navy specification. Signal , control and light power cables. Wire to MSV 34401.	Thermorad
	MSV 34412, 34413, 34430, 34435, 34436	Royal Netherlands navy specification. Signal, control and light power cables. Wire to MSV 34401.	Zerohal
USA	MIL-C-24640 (PMS 400)	Navy specification covering limited fire hazard thin-wall insulated electric cables for signal, control and light power circuits. Wire to MIL-W-81044.	Zerohal

Summary of Typical Cable Jacket Properties

UK Designation	US Designation	Property				Chemical Resistance		
		Temperature Range °C*	Abrasion Resistance	Flexibility	Flame Resistance	Acid	Alkaline	Hydrocarbon
FDR25	—	-40 to 150	Fair	Very good	Self-ext;ing	Good	Good	Very Good
Zerohal	Zerohal UK & US	-30 to 105	Good	Good	Self-ext;ing	Good	Good	Good
Fluoroelastomer	Thermorad HTF	-20 to 200	Good	Good	Nonburning	Excellent	Excellent	Excellent
Thermorad	Thermorad F	-55 to 125	Good	Good	Self-ext;ing	Good	Good	Good
Raythane C	—	-25 to 80	Excellent	Excellent	Self-ext;ing	Fair	Fair	Excellent
—	Raythane FR	-65 to 90	Excellent	Excellent	Self-ext;ing	Fair	Fair	Excellent
Neoprene	Thermorad NTFR	-55 to 110	Very Good	Excellent	Self-ext;ing	Good	Good	Good
Rayolin	—	-55 to 95	Very Good	Fair	—	Good	Good	Good
AFR	—	-40 to 105	Excellent	Good	Self-ext;ing	Good	Good	Good
—	Thermorad LS	-30 to 105	Good	Good	Self-ext;ing	Good	Good	Good
—	Thermorad O	-55 to 125	Good	Good	Self-ext;ing	Good	Good	Good
—	Thermorad 300	-65 to 200	Very Good	Fair	Self-ext;ing	Excellent	Excellent	Excellent
Polyvinylidene Fluoride	Thermorad K	-65 to 150	Very Good	Fair	Self-ext;ing	Excellent	Good	Excellent
Modified ETFE	Thermorad HT	-65 to 200	Very Good	Fair	Self-ext;ing	Excellent	Excellent	Excellent
Modified Flexible ETFE	Thermorad FL	-55 to 200	Very Good	Good	Self-ext;ing	Excellent	Excellent	Excellent

*Operating temperatures for cables are application dependent. Figures shown are for guidance only. In many cases the limits shown may be extended at both ends of the temperature range. Consult Tyco Electronics for guidance.

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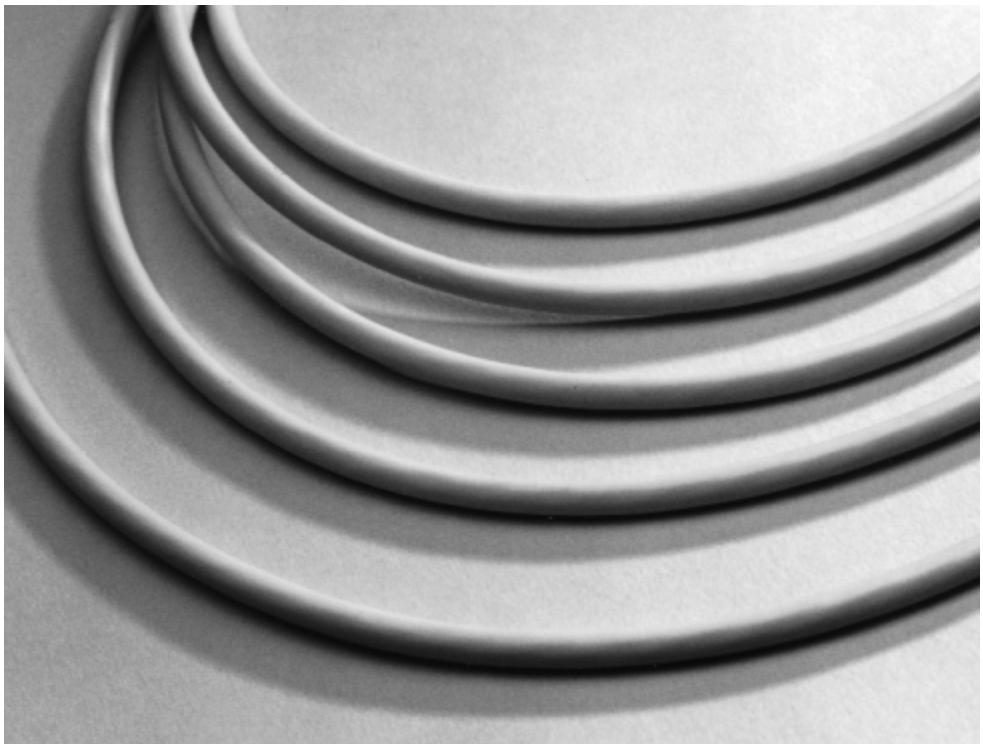
FDR25

Flexible, Diesel Resistant Wire and Cable Jacket Material

Product Facts

- Highly flame retardant
- Compatible with Raychem System 25 tubing, molded parts and adhesives
- Qualified to VG and MTV standards

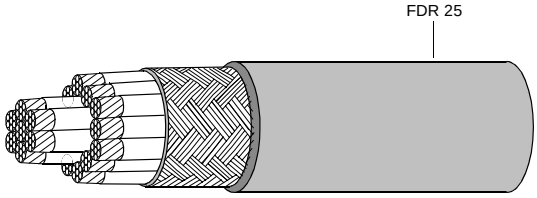


Applications

FDR 25 cable jacket was originally developed for the Leopard II main battle tank to provide an exceptional range of properties. Used in compartments exposed to hot diesel fuels and vibration, FDR 25 resists a wide range of aggressive fluids and offers excellent low temperature flexibility. These properties have also led to a widespread use of FDR 25 on other military vehicles and in many applications such as test and communications equipment. FDR 25 is fully compatible with Raychem's high performance harnessing system — System 25.

Operating Temperature Range

-40°C to 150°C [-40°F to 302°F]



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FDR25 (Continued)

Typical Characteristics when Tested in Accordance with Raychem Specification WCD 2002 (UK) and WCD 3304 (US)

Mechanical	Tensile strength (MPa) Elongation (%) Tear strength (N/mm) Abrasion resistance (1.6 kg load) Cold bend	20 500 5 40 scrapes min. -40°C [-40°F]	
Thermal ageing	Endurance IEC 216 Heat aging 120h, 175°C [347°F] Heat shock 4 h at 225°C [437°F]	2500 h 150°C [302°F] TS 8 MPa (min). Eb 150% (min) No cracks, drips or flowing, 6 mm total shrinkage in 300 mm	
Fluid resistance	24 h immersion	% Retention of properties Tensile strength	Elongation
	Diesel fuels 70°C [158°F]	70	70
	Hydraulic fluids 50°C [122°F]	70	70
	Lubricating oils 100°C [212°F]	70	80
	Cleaning fluids 23°C [73°F]	90	95
	Deicing fluids 23°C [73°F]	90	95
Electrical	Insulation resistance 20°C [68°F] M ohm.km min.	2	
Other	45° flammability	30 s (max) afterburn 100 mm (max) burn length	
	Vertical flammability	Self extinguishing	
	Acid gas	4% HCl equivalent (max.)	

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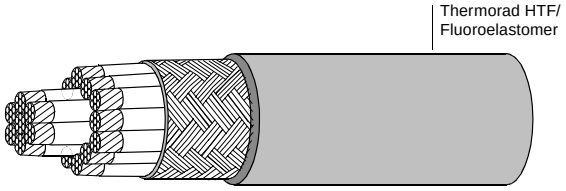
Thermorad HTF/ Fluoroelastomer

High Temperature Performance Wire and Cable Jacket Material

Product Facts

- **High temperature capability -20°C to +200°C [-4°F to 392°F]**
- **Excellent chemical resistance**
- **Flame retardant**
- **Continuous aircraft fuel immersion**



Applications

Thermorad HTF/ Fluoroelastomer is a material specially formulated for use in applications where exceptional performance is required.

It displays excellent stability during continuous high temperature exposure to adverse chemical environments.

Thermorad HTF/ Fluoroelastomer has a continuous operating temperature of up to 200°C, and finds applications in aircraft fuel tanks and on high performance engine cables. Thermorad HTF/ Fluoroelastomer cable jackets are compatible with the Raychem high temperature harnessing systems — System 200.

System

- System 200

Typical Characteristics when Tested in Accordance with Raychem Specification WCD 51/1632

Mechanical	Tensile strength Elongation Abrasion resistance (1.6 kg load) Cold bend -0°C ± 3°C [37°F]	12 MPa 400% 40 scrapes min. No cracking	
Thermal aging	Heat age	168 h 250°C [482°F]	
	Heat shock 4 h at 300°C ± 3°C [572°F ± 37°F]	No cracks, drips or flowing, 6 mm total shrinkage in 300 mm	
Fluid resistance	72 h immersion	% Retention	
		Tensile strength	Elongation
	Diesel oil 100°C [212°F]	60	60
	ASTM No 2 oil 100°C [212°F]	60	60
Electrical	Insulation resistance 20°C [68°F] M ohms. km (min)	10	
Other	45° flammability	30 s (max) afterburn 100 mm (max) burn length	
	Vertical flammability	Self extinguishing	

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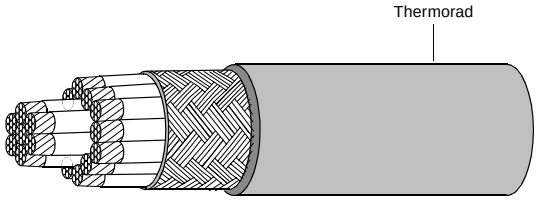
Thermorad/Thermorad F

General Purpose Wire and Cable Jacket Material

Product Facts

- Temperature rating -55° C to +125° C [-67°F to 257°F]
- Highly flame retardant
- Resistant to fuels, oils and greases
- Resistant to NBC decontaminant
- UL approved



Applications

Thermorad is a general purpose jacket material which is unaffected by most common chemicals and solvents and is suitable for use during N.B.C. decontamination. Thermorad is highly flame retardant and has an overall balance of physical and chemical properties.

Thermorad cables find widespread use in industrial, commercial and military applications. This includes railways, commercial vehicles, medical equipment, communication equipment and commercial electronics. Thermorad cable jackets are compatible with Raychem polyolefin tubings, molded parts and adhesives.

Typical Characteristics when Tested in Accordance with Raychem Specification WCD 51/1602 (UK) and WCD 3310 (US)

Mechanical	Tensile strength Elongation Abrasion resistance (1.6 kg load) Cold bend	22 MPa 550% 300 scrapes min. -55°C [-67°F]	
Thermal aging	Heat aging 120 h, 170°C [338°F]	60% min. retention of TS and Eb	
	Heat shock 4 hours at 225°C [437°F]	No cracks, drips or flowing, 6 mm total shrinkage in 300 mm	
Fluid resistance	72 hour immersion, 50°C [122°F]	% Retention of properties	
		Tensile strength	Elongation
	IRM 902	60	60
	Skydrol	60	60
Electrical	Insulation resistance 20°C [68°F] M ohms km (min)	100	
Other	45° flammability	30 s (max.) afterburn 75 mm (max.) burn length	
	Acid gas	4% HCl equivalent (max.)	

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics with factory for most current data.

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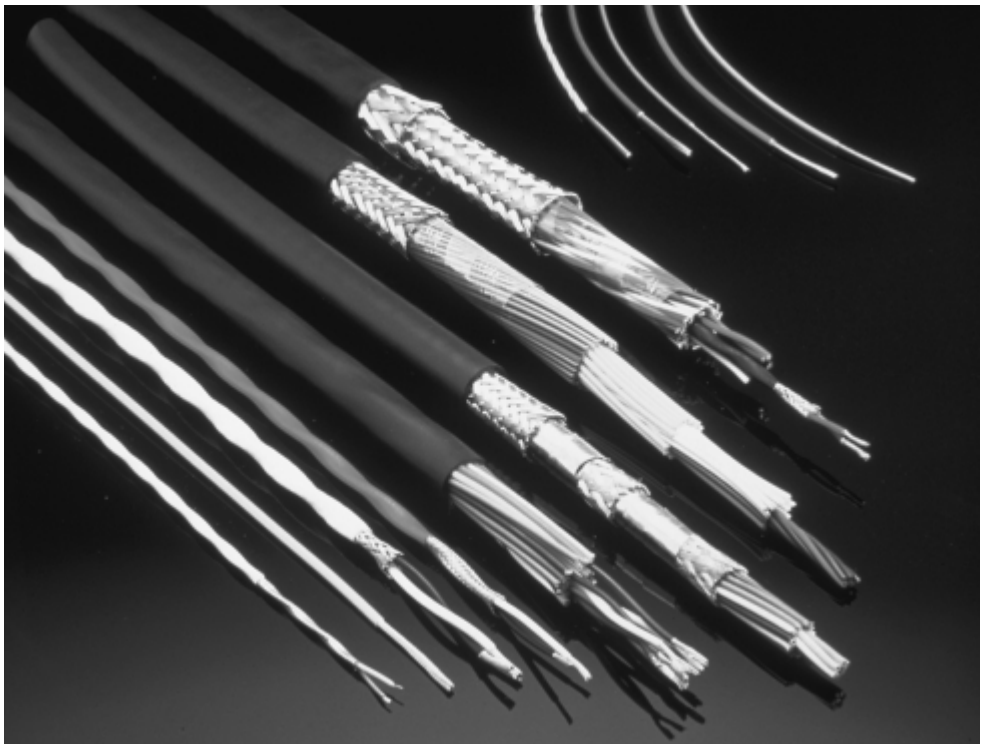
Raythane, Neoprene, Rayolin and AFR

Specialized Wire and Cable Jacket Material



Product Facts

Raythane C and Raythane FR

- **-25°C to +80°C [-13°F to +176°F]**
- **Mechanically tough**
- **Can be overmolded**

Rayolin

- **-55°C to +95°C [-67°F to +203°F]**
- **Excellent long term water immersion**
- **Can be overmolded**
- **Compatible with Raychem's underwater cable splices**

Neoprene (US designation Thermorad NTFR)

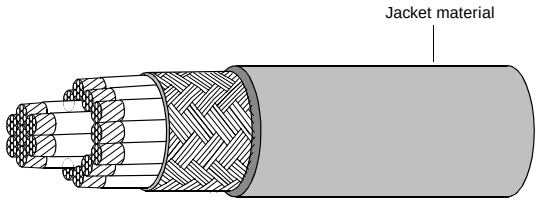
- **-55°C to +90°C [-67°F to +194°F]**
- **Extreme flexibility**
- **Highly flexible at low temperatures**

AFR

- **-40°C to +105°C [-40°F to +221°F]**
- **Abrasion resistant**
- **Fuel resistant**
- **Flame retardant**

Applications

In addition to the preferred cable jacket materials, Tyco Electronics offers a variety of Raychem cable jackets for specialized applications. For example, specialized materials are available for extreme low temperature flexibility or for enhanced abrasion resistance, or non-cross-linked materials for cable splicing or overmolding.



Typical Characteristics when Tested in Accordance with Raychem Specification WCD

		WCD51/1625 Raythane C	WCD3310 Raythane FR	WCD51/147 Neoprene*	WCD51/1601 Rayolin	WCD51/1619 AFR
Mechanical	Tensile strength (MPa)	45	45	12	14 12	
	Elongation (%)	400	400	400	250	150
	Abrasion resistance (1.6 kg load)	500 scrapes	500 scrapes	30 scrapes	300 scrapes	200 scrapes
	Cold bend	-25°C [-13°F]	-15°C [5°F]	-55°C [-67°F]	-55°C [-67°F]	-40°C [-40°F]
Thermal aging	Endurance (10000 h)	80°C [176°F]	90°C [194°F]	90°C [194°F]	95°C 203°F]	105°C [221°F]
Fluid resistance	24 h immersion Diesel fuels 50°C [122°F]	Excellent	Excellent	Good	—	Good
	Skydrol 50°C [122°F]	—	—	Excellent	Excellent	Excellent
	IRM 902 100°C [212°F]	Excellent	Excellent	Good	Good	Good
Electrical	Insulation resistance 20°C [68°F] M ohms. km (min)	1	1	5	100	100
Other	45° flammability	Pass	Pass	Pass	—	Pass

* In the US use Thermorad NTFR to WCD 3314.

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Electrical Shielding

Interference — Designing for the Threat

Applications

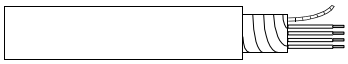
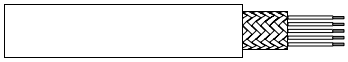
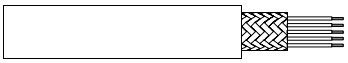
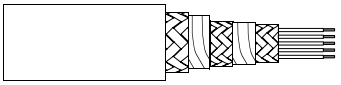
In many applications, shielding of cables is important, whether it be to minimize cross-talk within the cable, to prevent interference from external sources, or to eliminate radiation from the cable itself.

The design of cables to provide effective shielding over a broad frequency spectrum is complex, and cables must be tailored to specific electromagnetic environments. From simple aluminized Mylar that provides electrostatic shielding, progressively more complex shielding can be designed incorporating plated copper braids and Mu metal wraps.

Optimization

Performance of conventional braiding can be significantly improved by computer optimization. This tightly controlled process can give many times the shielding performance of a basic braided shield without weight penalty or increase in optical coverage. Supershielded cables combine Mu metal wraps with optimized braids to provide even further enhanced performance, especially at low frequencies.

Available Shields

Shield type	Construction	Typical Application
Aluminized Mylar		Electrostatic shielding
Single Braid		Low level EMI Low sensitivity
Single Optimized Braid		Sensitive lines High EMI
Double Optimized Braid		Highly sensitive lines Severe EMI
Supershielded		EMP/Tempest
Double Supershielded		Severest of applications

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Electrical Shielding (Continued)

Measuring Shielding Efficiency

Surface Transfer Impedance (Zt)

To assess the effectiveness of a shield, Tyco Electronics has adopted the line injection method as described in IEC 1196-1 to measure the surface transfer impedance (Zt) of a cable shield. This relates the open circuit voltage generated on a component wire inside the cable to the current injected on the overall shield. The unit of Zt is Ohms per meter, thus the voltage coupling is length dependent and long cables exhibit more leakage than similar but shorter length ones. To determine the surface transfer impedance across a range of frequencies, a drive signal is generated by the internal tracking generator of a spectrum analyzer, and amplified. The voltage is induced on the center conductor of the sample which is amplified and returned to the signal generator for measurement. The understanding of leakage mechanisms has enabled Tyco Electronics to design Raychem cables with guaranteed minimum Zt values for the desired operating environment.

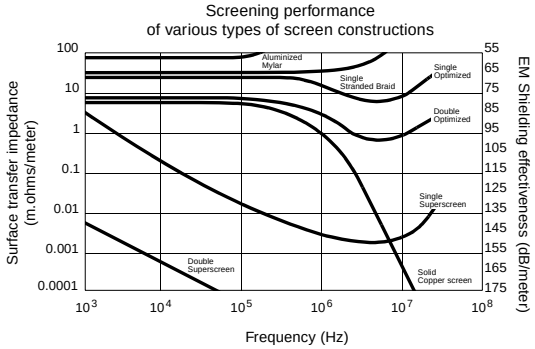
Supershielding

EMP Hardened Cables

The requirements for nuclear hardened cables present the engineer with a range of problems. The waveform of the EMP is such that the majority of power is dissipated in a frequency band between 1 KHz and 5 MHz, where little protection is given by conventionally shielded cables. Tyco Electronics has solved this problem with a range of supershielded cables which give shielding performance at these frequencies by incorporating materials which change the inductance of the shield and lower the transfer impedance. Raychem supershielded cables have a sandwich construction of Mu metal tapes between optimized braids. Mu metal is a ferro-magnetic material which has a high permeability over a wide range of field strengths. It is applied to the cable in a way which maintains cable flexibility and minimizes work hardening and any consequent reduction in permeability. Supershielded cables not only give protection against EMP but also other major interference modes, Surface transfer impedance (m. ohms/ meter).

Shielded Cables

Controlling the Threat



Testing

Tyco Electronics EMC test facilities have the capability for bulk current injection and radiation field testing in addition to surface transfer impedance measurements. The installation is a proven facility in characterising new design parameters.

Design and Manufacturing Expertise

The problems of shielding cables are complex. However, with the introduction of optimized braids and supershielded cables, Tyco Electronics has the capability to solve the most difficult shielding problems. Shielding of cables without degrading cable flexibility can be provided for coaxial and multiconductor cables for all EMC and EMP conditions. To complement this range of cables, Tyco Electronics manufactures Raychem cable terminations and connector back fittings to give total interconnection system shielding performance.

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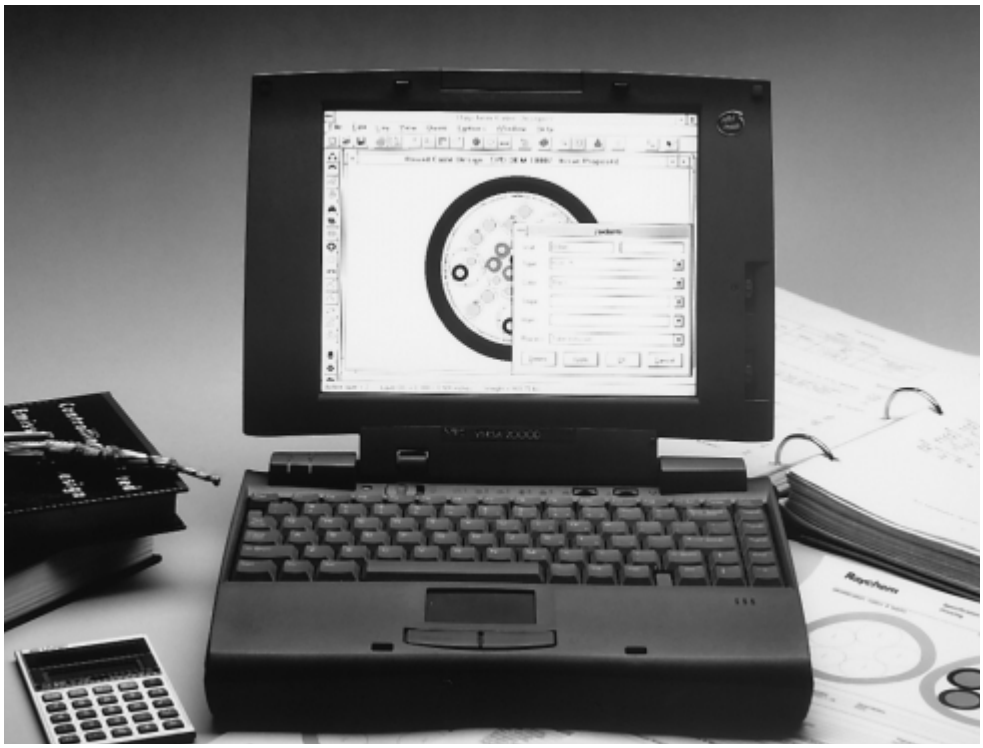
Computer Aided Design

Custom Design Capability



Applications

Every year, Tyco Electronics designs and builds several thousand custom, high-performance, multiconductor cables that meet unique product needs.

Design staff can draw on an extensive range of high-performance cable components and jacket materials, while incorporating both color-coding and alphanumeric marking techniques for component identification. These options, combined with a full range of EMI shields, lead to a huge variety of construction possibilities.

Tyco Electronics developed computer-aided design tools to provide a fast response to design requests. The software, used by factory engineers or product specialists in the field, can generate cable design proposals with drawings and quotations in minutes. A design drawing details all the cable data and can be used as the input to harness or cable splice (joint) design. The resulting cable is tailored to customers' exact needs in an efficient design that is superior to the compromise cable selected from a product catalog.

Quality Assurance

Raychem WCD and WSD cable specifications ensure that performance and quality standards are maintained to the highest level. Tyco Electronics manufacturing sites have obtained the highest available quality system approvals, including ISO 9000 and QS9000. Raychem cables are manufactured to meet the requirements of several major specifications.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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Power Cables

Product Facts

- Choice of jacket materials
- -55°C to 125°C [-67°F to 257°F]
- Size and weight savings
- Excellent flexibility
- Resistance to solvents and chemicals

Applications

Tyco Electronics offers a range of flexible Raychem power cables that are insulated and jacketed using materials that provide improved performance over other materials, such as CSP/EPR, silicone, or PCP/Butyl. Four different types of cable are available:

Type TR is a general purpose, single-wall, 125°C [257°F] construction normally specified for use inside cabinets in protected areas.

Type ZHI is a halogen-free 105°C [221°F] cable with good oil resistance. It is particularly suitable for use in offshore, ship, and mass transit applications where low-fire-hazard performance is required. Refer to Raychem specification WCD 2015.

Type FTR is a dual-wall, 125°C [257°F], diesel-oil-resistant cable originally developed for tank engine compartment applications. It meets the German BWB VG 95218 specification. Refer to Raychem specification WCD 2002.

Type AFR is a 105°C [221°F], single-extrusion, abrasion-resistant, flame- and fuel-resistant,radiation-crosslinked polyolefin.

Each offers particular advantages for specific applications and each is also available in multiconductor constructions and shielded and jacketed versions. Cables offer size and weight savings, good resistance to abrasion and cut-through, and the ability to operate in difficult environments.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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Power Cables (Continued)

Specifications/Approvals*

Series	Agency	Military	Raychem
TR	—	Def. Stan. 61-12 Part 31 (jacket material)	WCD 2003, WCD 51/160
ZHI	—	—	WCD 2015
FTR	—	BWB VG 95218 Types G, H, and K	WCD 2002
AFR	UL style 3496	—	WCD 2011, WCD 51/160

*See specifications listed for details of performance.

Conductors (Tinned Soft Copper)

Conductor Size mm²	Stranding				Max. Resistance at 20°C in Ω/km (Ω/1000 ft) Class 5/6
	IEC Class 5		IEC Class 6		
	No. x mm	Nom. Dia.	No. x mm	Nom. Dia.	
1.5	30 x 0.25	1.49 [.05]	85 x 0.15	1.53 [.06]	13.20 [4.02]
2.5	50 x 0.25	1.90 [.07]	140 x 0.15	2.40 [.09]	7.82 [2.38]
4.0	56 x 0.30	2.49 [.10]	228 x 0.15	2.90 [.11]	4.85 [1.48]
6.0	84 x 0.30	3.00 [.12]	189 x 0.20	3.60 [.14]	3.23 [0.98]
10.0	80 x 0.40	4.60 [.18]	324 x 0.20	4.55 [.18]	1.88 [0.57]
16.0	126 x 0.40	5.70 [.22]	513 x 0.20	5.50 [.22]	1.19 [0.36]
25.0	196 x 0.40	7.10 [.28]	783 x 0.20	7.30 [.29]	0.78 [0.24]
35.0	276 x 0.40	8.50 [.33]	1107 x 0.20	8.55 [.34]	0.55 [0.17]
50.0	396 x 0.40	10.30 [.41]	702 x 0.30	10.15 [.40]	0.39 [0.12]
70.0	360 x 0.50	12.40 [.49]	999 x 0.30	12.00 [.47]	0.27 [0.08]
95.0	475 x 0.50	14.50 [.57]	1332 x 0.30	14.05 [.55]	0.20 [0.06]
120.0	608 x 0.50	16.00 [.63]	1702 x 0.30	16.30 [.64]	0.15 [0.05]
150.0	777 x 0.50	18.00 [.71]	2109 x 0.30	17.40 [.68]	0.13 [0.04]
185.0	925 x 0.50	20.00 [.79]	2590 x 0.30	20.00 [.79]	0.10 [0.030]
240.0	1221 x 0.50	23.00 [.91]	—	—	0.08 [0.024]
300.0	1554 x 0.50	26.00 [1.0]	—	—	0.06 [0.018]
400.0	2035 x 0.50	30.00 [1.2]	—	—	0.05 [0.015]

Note: Types TR and FTR use IEC Class 6 conductors.
Types ZHI and AFR use IEC Class 5 conductors.

Materials Performance Summary

Material	Tensile Strength N/mm² typical	Abrasion Resistance	Cut Through	Temperature Rating °C 10000 h	Preferred Color
TR	20	Excellent	Good	125	Black
ZHI	9	Good	Very Good	105	Black
FTR	18	Good	Good	125	Black
AFR	18	Excellent	Very Good	105	Grey

Note: Where a higher operating temperature is required, Raychem SPEC 55 provides outstanding performance up to 200°C continuous operating temperature. For these or other special applications, please contact Tyco Electronics.

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Table 1. Nominal Diameters and Maximum Weights

Conductor Size (mm^2)	TR 16			FTR 16		
	Part No.	Nom. OD in mm (in)	Max. weight in kg/km (lb/1000 ft)	Part No.	Nom. OD in mm (in)	Max. weight in kg/km (lb/1000 ft)
1.5	—	—	—	—	—	—
2.5	TR 16-2.5	3.9 [.15]	34.0 [22.8]	—	—	—
4.0	-4	4.5 [.17]	51.0 [34.2]	FTR 16-4	5.6 [.22]	69.0 [46.2]
6.0	-6	5.2 [.20]	73.0 [48.9]	-6	6.3 [.25]	94.0 [63.0]
10.0	-10	6.2 [.24]	117.0 [78.4]	-10	7.5 [.29]	147.0 [98.5]
16.0	-16	7.4 [.29]	182.0 [121.9]	-16	8.8 [.35]	220.0 [147.4]
25.0	-25	9.3 [.37]	274.0 [183.6]	-25	10.7 [.42]	323.0 [216.4]
35.0	-35	10.6 [.42]	383.0 [256.6]	-35	12.1 [.48]	444.0 [297.5]
50.0	-50	12.5 [.49]	542.0 [363.1]	-50	14.0 [.55]	619.0 [414.7]
70.0	-70	14.6 [.57]	765.0 [512.6]	-70	16.2 [.64]	861.0 [576.9]
95.0	-95	17.0 [.67]	1020.0 [683.4]	-95	18.8 [.74]	1148.0 [769.2]
120.0	—	—	—	-120	21.3 [.84]	1484.0 [994.3]

Table 2. Nominal Diameters and Maximum Weights

Conductor Size (mm^2)	ZHI 15			AFR 35		
	Part No.	Nom. OD in mm (in)	Max. Weight in kg/km (lb/1000 ft)	Part No.	Nom. OD in mm (in)	Max. Weight in kg/km (lb/1000 ft)
1.5	ZHI 15 -1.5	4.09 [.16]	33.5 [22.4]	AFR 35-1.5	2.8 [.11]	31.0 [20.8]
2.5	-2.5	4.69 [.18]	48.8 [32.7]	-2.5	3.9 [.15]	42.0 [28.1]
4.0	-4	5.49 [.22]	72.1 [48.3]	-4	4.8 [.19]	61.0 [40.9]
6.0	-6	6.16 [.24]	99.8 [66.9]	-6	6.2 [.24]	92.0 [61.6]
10.0	-10	8.20 [.32]	159.0 [106.5]	-10	7.0 [.28]	143.0 [95.8]
16.0	-16	9.30 [.37]	223.0 [149.4]	-16	8.1 [.32]	211.0 [141.1]
25.0	-25	10.90 [.43]	331.0 [221.8]	-25	10.3 [.41]	333.0 [223.1]
35.0	-35	12.30 [.48]	448.0 [300.2]	-35	11.7 [.46]	452.0 [302.8]
50.0	-50	14.70 [.58]	631.0 [422.8]	-50	13.7 [.54]	634.0 [424.8]
70.0	-70	16.80 [.66]	852.0 [570.8]	-70	16.0 [.63]	885.0 [593.0]
95.0	-95	19.10 [.75]	1108.0 [742.4]	-95	18.5 [.73]	1165.0 [780.6]
120.0	-120	21.00 [.83]	1438.0 [963.5]	-120	20.4 [.80]	1480.0 [991.6]
150.0	-150	23.00 [.91]	1748.0 [1171.2]	-150	22.6 [.89]	1825.0 [1222.8]
185.0	-185	25.60 [1.01]	2088.0 [1399.0]	-185	24.8 [.98]	2215.0 [1484.1]
240.0	-240	28.60 [1.13]	2705.0 [1812.4]	-240	27.8 [1.1]	2875.0 [1926.3]
300.0	-300	32.00 [1.26]	3363.0 [2253.2]	-300	32.0 [1.2]	3645.0 [2442.2]
400.0	-400	36.40 [1.43]	4396.0 [2945.3]	-400	36.0 [1.4]	4730.0 [3169.1]

Notes: Users should independently evaluate the suitability of the product for their application.
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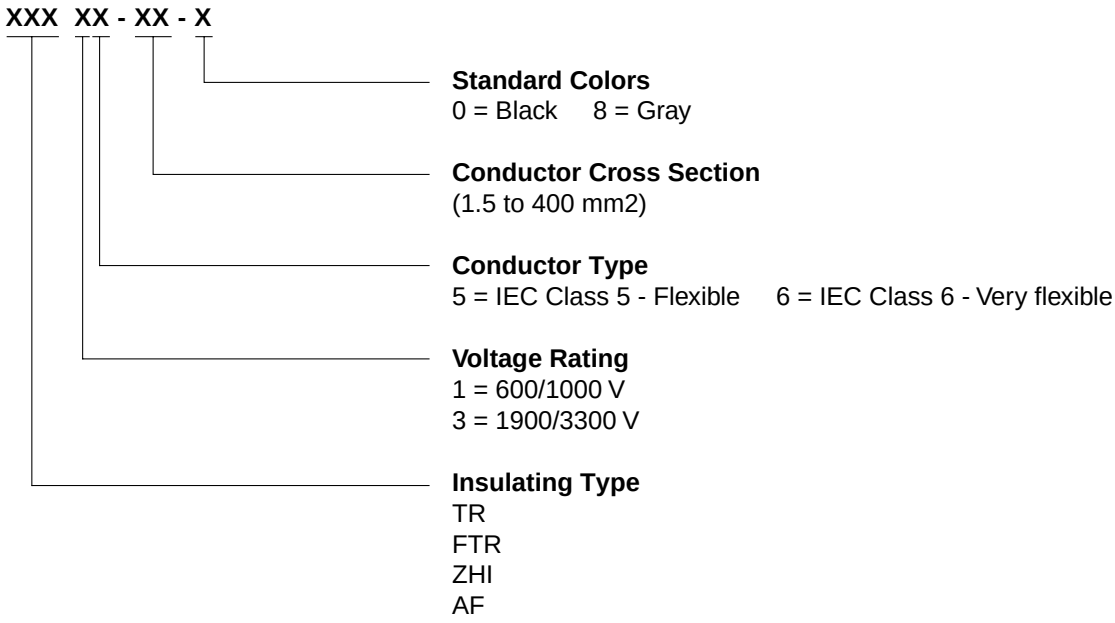
Part Numbering System



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Conductor Sizes, Strandings, and Resistance Values

Applications

The conductors used with Raychem wires are concentric in construction and are specifically designed for use with thin-wall insulations. The table on the next page gives nominal values for tin-plated copper, silver-plated copper, and silver-plated high-strength copper alloy (SPHSCA) constructions. Typically, tin-plated copper is suitable for use in applications up to 150°C [302°F] and silver-plated copper in applications up to 200°C [392°F] (SPEC 55 wire only).

The current-carrying capacities assume a maximum 60°C [140°F] increase in temperature of a single wire in free air at 40°C [04°F]. For details of performance in conditions other than 40°C [104°F], contact Tyco Electronics.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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Conductor Sizes, Strandings, and Resistance Values

Nominal Values of American Wire Gauge (AWG) and Metric Conductors

Size AWG	Size mm²	Stranding No./mm	Stranding No./AWG	Outside Diameter (min.–max.)		Max Resistance in Ω/km (Ω/1000 ft) Tin-copper	Silver-copper	SPHSCA	Current-Carrying Capacity (amps)
30	0.06	7/0.10	7/38	0.28-0.31	[0.011-0.012]	347 [106]	324 [99]	377 [115]	3.0
28	0.09	7/0.13	7/36	0.36-0.39	[0.014-0.015]	220 [67]	205 [62]	239 [73]	4.0
26	0.15	19/0.10	19/38	0.46-0.49	[0.018-0.019]	133 [40]	123 [37]	144 [44]	5.5
24	0.25	19/0.13	19/36	0.55-0.62	[0.022-0.024]	84 [26]	78 [24]	91 [28]	7.5
22	0.40	19/0.15	19/34	0.70-0.76	[0.028-0.030]	51 [16]	49 [15]	56 [17]	10.0
20	0.60	19/0.20	19/32	0.92-0.97	[0.036-0.038]	31 [9]	30 [9]	34 [10]	13.0
18	1.00	19/0.25	19/30	1.18-1.26	[0.046-0.050]	20 [6]	20 [6]	—	17.5
16	1.20	19/0.30	19/29	1.34-1.48	[0.053-0.058]	15 [4]	15 [4]	—	20.0
14	2.00	37/0.25	37/30	1.65-1.72	[0.065-0.068]	10 [3]	10 [3]	—	28.0
12	3.00	37/0.32	37/28	2.12-2.18	[0.083-0.086]	7 [2]	7 [2]	—	3705
10	4.50	37/0.40	37/26	2.69-2.74	[0.106-0.108]	4 [1]	4 [1]	—	53.0
8	9.00	133/0.29	133/29	4.01-4.20	[0.158-0.165]	2 [0.6]	2 [0.6]	—	78.0
6	13.5	133/0.36	133/27 [5.30]	5.03-5.48	[0.198-0.216]	1.4 [0.4]	1.4 [0.4]	—	105.0
4	21.0	133/0.45	133/25 [6.62]	6.35-6.96	[0.250-0.274]	0.9 [0.3]	0.9 [0.3]	—	142.0
2	33.0	665/0.25	665/30 [8.54]	8.13-8.64	[0.320-0.340]	0.6 [0.2]	0.6 [0.2]	—	196.0
0	51.0	1045/0.25	1045/30 [10.87]	10.00-10.80	[0.394-0.425]	0.4 [0.1]	0.4 [0.1]	—	266.0

Note: Abbreviations:

Cond. = Conductor
SPHSCA = Silver-plated high-strength copper
Tin-copper = Tin-plated copper
Silver-copper = Silver-plated copper
N/A = Not available

For product details, please refer to relevant specification control drawing.

Current Derating Factors for Wire Bundles in Free Air

No. of wires	2	3	4	7	9	12	15	18	21	24	27	30	37
Derating factor	.825	.73	.66	.54	.49	.43	.39	.36	.33	.31	.29	.28	.26

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Fiber Optic Cables

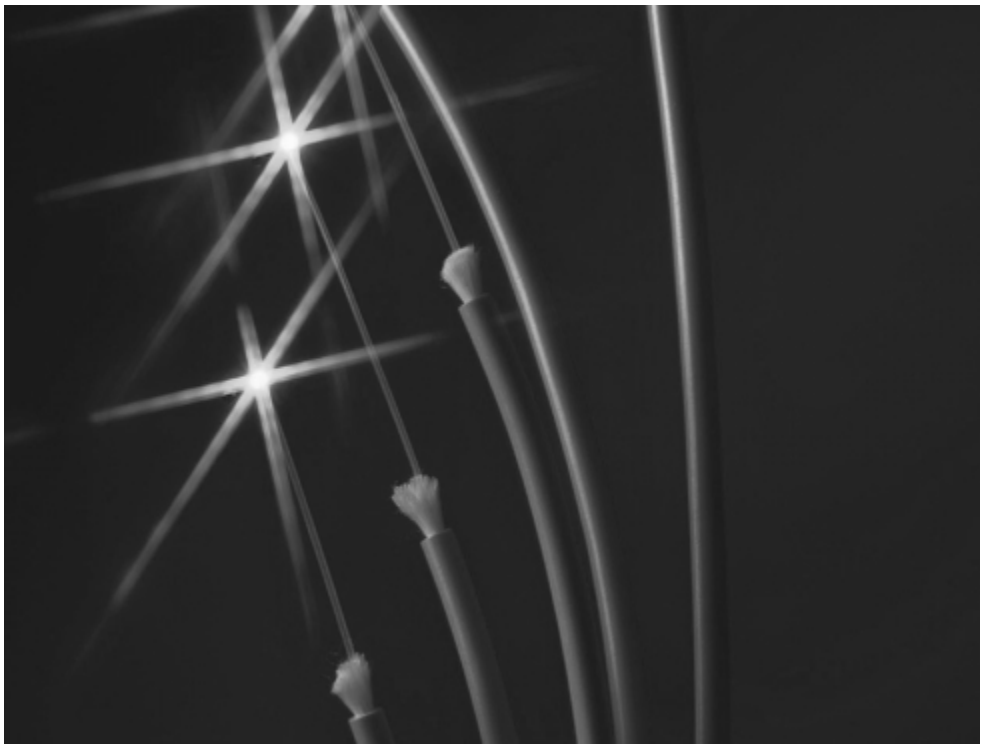
High Performance Interconnection Fiber Optic Link

Product Facts

- Low smoke
- Low corrosive gas emission
- Limited fire hazard
- Halogen free
- Small size and lightweight
- Custom design
- Range of jacket materials
- Inherent security of transmitted signals
- Low loss, high performance cables
- Water-blocking options
- Meets the requirements of Def Stan 60-1 part 2

Typical applications

- Military communications
- Military control systems
- Naval applications
- Underwater and ROV's
- Hazardous Environments



Standard Fiber Optic Cable Constructions

The use of increasingly sensitive and more sophisticated equipment in marine and military applications means a corresponding requirement for high performance interconnection links. Fiber optic links offer high performance and have many advantages over copper systems such as:

- Interference immunity (EMI & RFI).
- High bandwidth (for improved message capacity).
- Small size, lightweight.
- Low loss, durability.
- Security and safety.

However, to ensure the reliability of a fiber system the cable design, materials and interconnection accessories employed are all extremely important.

Tyco Electronics provides a range of single and multicore Fiber Optic Cables offering innovative solutions to interconnect problems. Tyco Electronics leadership in the field of advanced material technology, coupled with more than 15 years experience of supplying ruggedized cables for marine and military applications, ensures superior performance levels in the harshest of environments.

Notes: Users should independently evaluate the suitability of the product for their application. Before ordering, contact Tyco Electronics for most current data.

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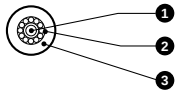
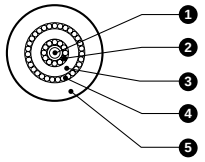
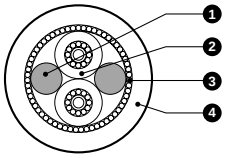
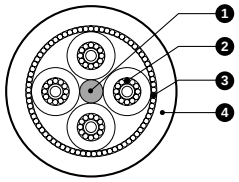
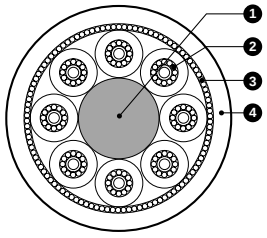
Fiber Optic Cables (Continued)

Simplex Fiber Optic Cable	Component	Fiber Size	Qty/Diameter
	1. Secondary Buffered Fiber	(62.5/125)	1
	2. Strength Member	—	1.5 mm
	3. Zerohal Sheath	—	2.7 ± 0.2 mm

Ruggedized Simplex Fiber Optic Cable	Component	Fiber size	Qty/Diameter
	1. Secondary Buffered Fiber	(62.5/125)	1
	2. Strength Member	—	1.5 mm
	3. Zerohal Sheath	—	2.7 mm
	4. Strength Member	—	3.3 mm
	5. Zerohal Sheath	—	5.3 ± 0.2 mm

2 Channel Ruggedized Fiber Optic Cable	Component	Fiber size	Qty/Diameter
	1. Strength Member		2
	2. Simplex Cable	(62.5/125)	2
	3. Strength Member		6.0 mm
	4. Zerohal Sheath		8.2 ± 0.3 mm

4 Channel Ruggedized Fiber Optic Cable	Component	Fiber size	Qty/Diameter
	1. Strength Member	—	1
	2. Simplex Cable	(62.5/125)	4 / 6.7 mm
	3. Strength Member	—	7.3 mm
	4. Zerohal Sheath	—	9.5 ± 0.5 mm

8 Channel Ruggedized Fiber Optic Cable	Component	Fiber size	Qty/Diameter
	1. Strength Member	—	1
	2. Simplex Cable	(62.5/125)	8 / 9.8 mm
	3. Strength Member	—	10.4 mm
	4. Zerohal Sheath	—	12.5 ± 0.5 mm

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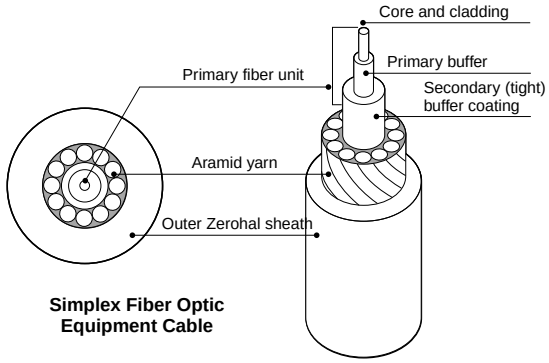
Fiber Optic Cables (Continued)

High Performance Interconnection Fiber Optic Link

Fiber Optic Equipment Cable

The diagram on the right shows a typical equipment cable, which can also be used as a sub-unit or simplex component for the larger multi-core cables, as shown in the diagrams on the previous page.
The fiber used is a high performance tight buffer type comprising an all silica fiber, with multiple coatings designed to provide mechanical and environmental protection, microbend resistance, and ease of handling in the field. Most common fiber types are readily available (see table below) and more specialized fibers are available on request.

The equipment cable has a layer of served aramid yarn providing high flexibility and tensile strength, while the outer sheath provides environmental and mechanical protection, along with low smoke emission and chemical resistance.



Simplex Fiber Optic Equipment Cable

The materials and types of designs employed have been thoroughly tested to Def Stan 60-1 (see test data on the next page) and Def Stan 61-12 Part 31 which demonstrate the suitability of the cables and fibers for use in high performance and critical marine applications.

While offering a standard range of tight buffered multi and single mode fiber optic cables, Tyco Electronics also offers the option of custom design for specific applications. These cables capitalize on the small size of the fiber thereby enabling efficient, ergonomic and reliable interconnection.

Typical 2-Channel Cable

Fiber Types and Common Features

Type	Attenuation	Bandwidth	Dispersion Slope	Numerical Aperture
—	dB/km@850/1300/1550nm	MHz-km@850/1300nm	ps/(nm2-km)	—
8/125	—/0.4/0.25	n/a	0.093	0.1
50/125	3.5/1.2/—	400/600	n/a	0.20
62.5/125	3.5/1.2/—	160/500	n/a	0.275
100/140	4.5/2.0/—	200/200	n/a	0.29

All fibers supplied with a high performance three layer tight buffer. Cables can be supplied with water-blocking and marking to suit customer requirement, and any combination of the fiber types listed above.

Notes: Users should independently evaluate the suitability of the product for their application.
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Table of Requirements and Results from Def Stan 60 – 1 Part 2

Definition	Requirements								Part 2
Cable tensile strength	<0.5% cable elongation no increase in attenuation at full load and after test compared to pre-test value.						1000N applied at 100N/minute		Pass
Cable bend	No cracking or deformation of cable sheath. <0.5dB change after test.						20N load, 10 cycles of wind and unwind. 6 wraps.		Pass
Cold bend	No cracking or deformation of cable sheath. <0.5dB change after test.						20N load, 10 cycles of wind and unwind. 6 wraps, -30°C.		Pass
Cyclic bend	No cracking or deformation of cable sheath. <0.5dB change after test.						40N, 1000 cycles.		Pass
Cable impact	No cracking or deformation of cable sheath. <0.5dB change after test. 100 impacts.						12.5 mm radius, 1kg hammer, 100 mm height		Pass
Cable crush	No cracking or deformation of cable sheath. <0.5dB change after test <20% reduction from original diameter.						2000N/5 min		Pass
Cable snatch	No cracking or deformation of cable sheath. <0.5dB change after test <20% reduction from original diameter.						1kg, 10 cycles		Pass
Dynamic cut through	≥ 25N						85°C, 60N/minute, 0.45mm diameter needle blade		Pass
Tear resistance	5 N/mm						—		Pass
Shrinkage	<3mm total						16 hrs at -30°C and 16 hrs at 85°C		Pass
Scrape abrasion	500 cycles minimum						5N, 85°C, 0.45 mm diameter needle blade		Pass
Fluids	Volume	25	TS ret	60	Eb ret	60	Diesel F76	28 days @ 20°C	Pass
	swell	15	min %	60	min %	60	OX-30	28 days @ 50°C	Pass
	max %	15		60		60	OX-40 HS200X	28 days @ 50°C	Pass
		10		60		60	OMD-113	28 days @ 50°C	Pass
		50		50		50	OX-28	28 days @ 50°C	Pass
		10		80		80	Deionized water	28 days @ 50°C	Pass
		10		80		80	Deionized water + 3.5% NaCl	28 days @ 50°C	Pass
Accelerated ageing	<20% change in TS/Eb/tear between 14 and 28 days. Eb ≥ 150%						110°C for 14 and 28 days.		Pass
Arrhenius plot	40,000 hours at 85°C						End point measurement: 50% absolute elongation		Pass
Stability	175% max. elongation, 25% max. permanent elongation.						105°C, 0.2N/mm2 stress.		Pass
Pressure	Indentation not to exceed 50%.						85°C for 4 hrs.		Pass
Ozone	No cracks with normal vision.						80 – 100ppm for 120 hrs		Pass
UV light resistance	≤ 80% Eb change, ≤ 20% TS change.						8 hrs UV 55°C, 4 hrs humidity 40°C, (UV-B) 1000 hrs.		Pass
Smoke Index	20 maximum						NES 711		Pass
Toxicity index	5 maximum						NES 713		Pass
Halogen index	No detectable halogens.						Sodium fusion test (Lassaigne)		Pass
Oxygen index	29 minimum						BS 2782 Part 1 Method 141D		Pass
Temperature index	250°C minimum						Nes 715		Pass
Flammability	Not to reach within 50 mm of the lower clamp.						BS 4066 Part 1		Pass

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Canada: 1-905-470-4425
Mexico: 01-800-733-8926
C. America: 52-55-5-729-0425

South America: 55-11-3611-1514
Japan: 81-44-900-5102
Singapore: 65-4866-151
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