

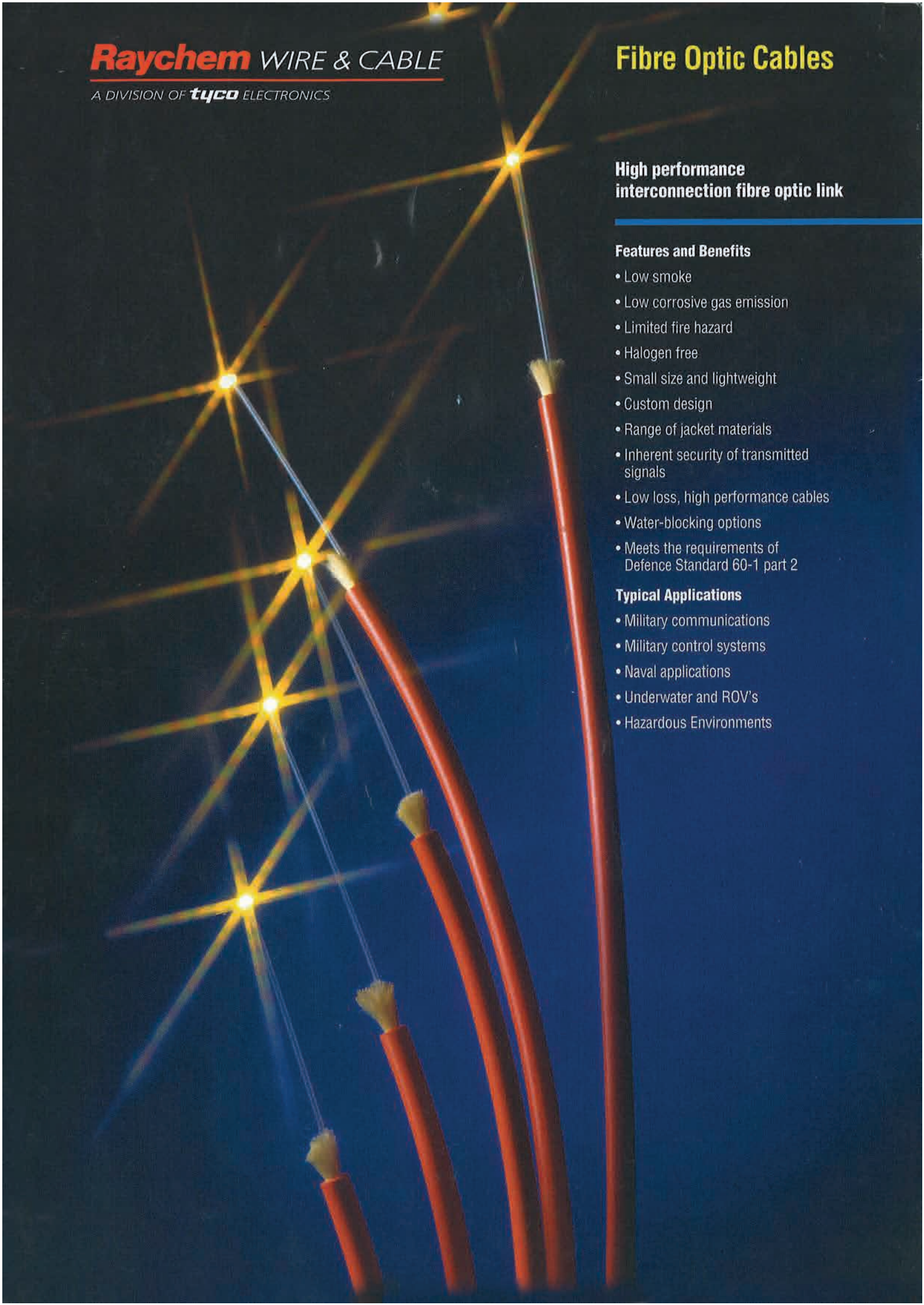
**High performance
interconnection fibre optic link**

Features and Benefits

- 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 Defence Standard 60-1 part 2

Typical Applications

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



Standard Fibre 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. Fibre optic links offer high performance and have many advantages over copper systems such as:

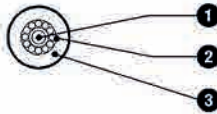
- interference immunity (EMI & RFI)
- high bandwidth (for improved message capacity)
- small size, lightweight
- low loss, durability
- security and safety

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

Raychem designs and manufactures a range of single and multi-core Fibre Optic Cables offering innovative solutions to interconnect problems. Raychem's leadership in the field of advanced material technology, coupled with more than 15 years experience of supplying ruggedised cables for marine and military applications, ensures superior performance levels in the harshest of environments.

Simplex Fibre Optic Cable

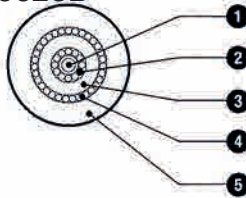
FCE75034B



Component	Fibre size	Qty/Diameter
1. Secondary Buffered Fibre	(62.5/125)	1
2. Strength Member		1.5 mm
3. Zerohal Sheath		2.7 ± 0.2 mm

Ruggedised Simplex Fibre Optic Cable

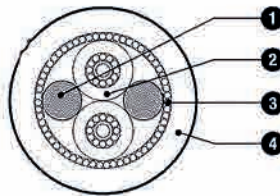
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Component	Fibre size	Qty/Diameter
1. Secondary Buffered Fibre	(62.5/125)	1
2. Strength Member		1.5 mm
3. Zerohal Sheath		2.7 mm
4. Strength Member		3.3 mm
5. Zerohal Sheath		5.3 ± 0.2 mm

2 Channel Ruggedised Fibre Optic Cable

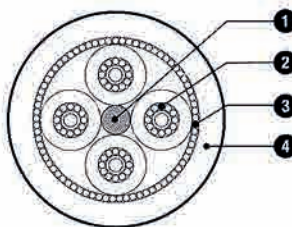
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Component	Fibre size	Qty/Diameter
1. Strength Member		2
2. Simplex Cable	(62.5/125)	2
3. Strength Member		6.0 mm
4. Zerohal Sheath		8.2 ± 0.3 mm

4 Channel Ruggedised Fibre Optic Cable

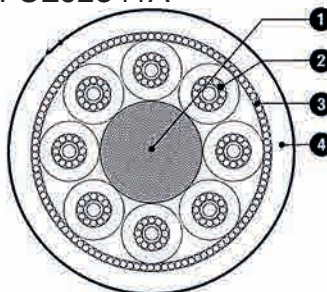
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Component	Fibre size	Qty/Diameter
1. Strength Member		1
2. Simplex Cable	(62.5/125)	4 / 6.7 mm
3. Strength Member		7.3 mm
4. Zerohal Sheath		9.5 ± 0.5 mm

8 Channel Ruggedised Fibre Optic Cable

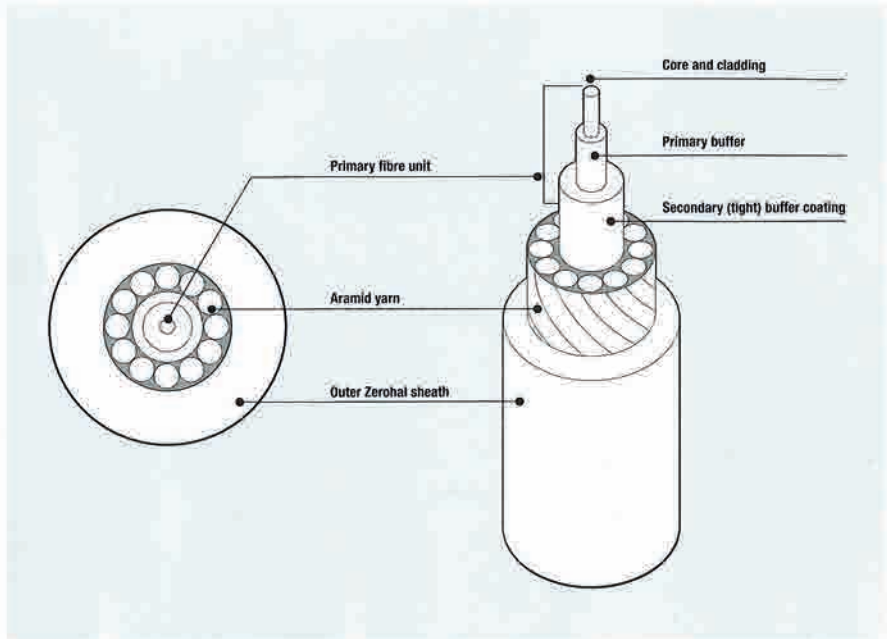
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Component	Fibre size	Qty/Diameter
1. Strength Member		1
2. Simplex Cable	(62.5/125)	8 / 9.8 mm
3. Strength Member		10.4 mm
4. Zerohal Sheath		12.5 ± 0.5 mm



Typical 2-channel cable



Simplex fibre optic equipment cable

The diagram above 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 opposite.

The fibre used is a high performance tight buffer type comprising an all silica fibre, with multiple coatings designed to provide mechanical and environmental protection, micro-bend resistance and ease of handling in the field. Most common fibre types are readily available (see table below) and more specialised fibres are available on request.

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

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

Whilst offering a standard range of tight buffered multi and single mode fibre optic cables we also offer the option of custom design for specific applications. These cables capitalise on the small size of the fibre thereby enabling efficient, ergonomic and reliable interconnection.

Fibre Types and Common Features

Type	Attenuation	Bandwidth	Dispersion Slope	Numerical Aperture
	dB/km@850/1300/1550nm	MHz-km@850/1300nm	ps/(nm ² -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 fibres 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 fibre types listed above.

Table of requirements and results from Defence Standard 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.	12.5 mm radius, 1kg hammer, 100 mm height 100 impacts. 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	Deionised water	28 days @ 50°C	Pass
		10		80		80	Deionised 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/mm ² 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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