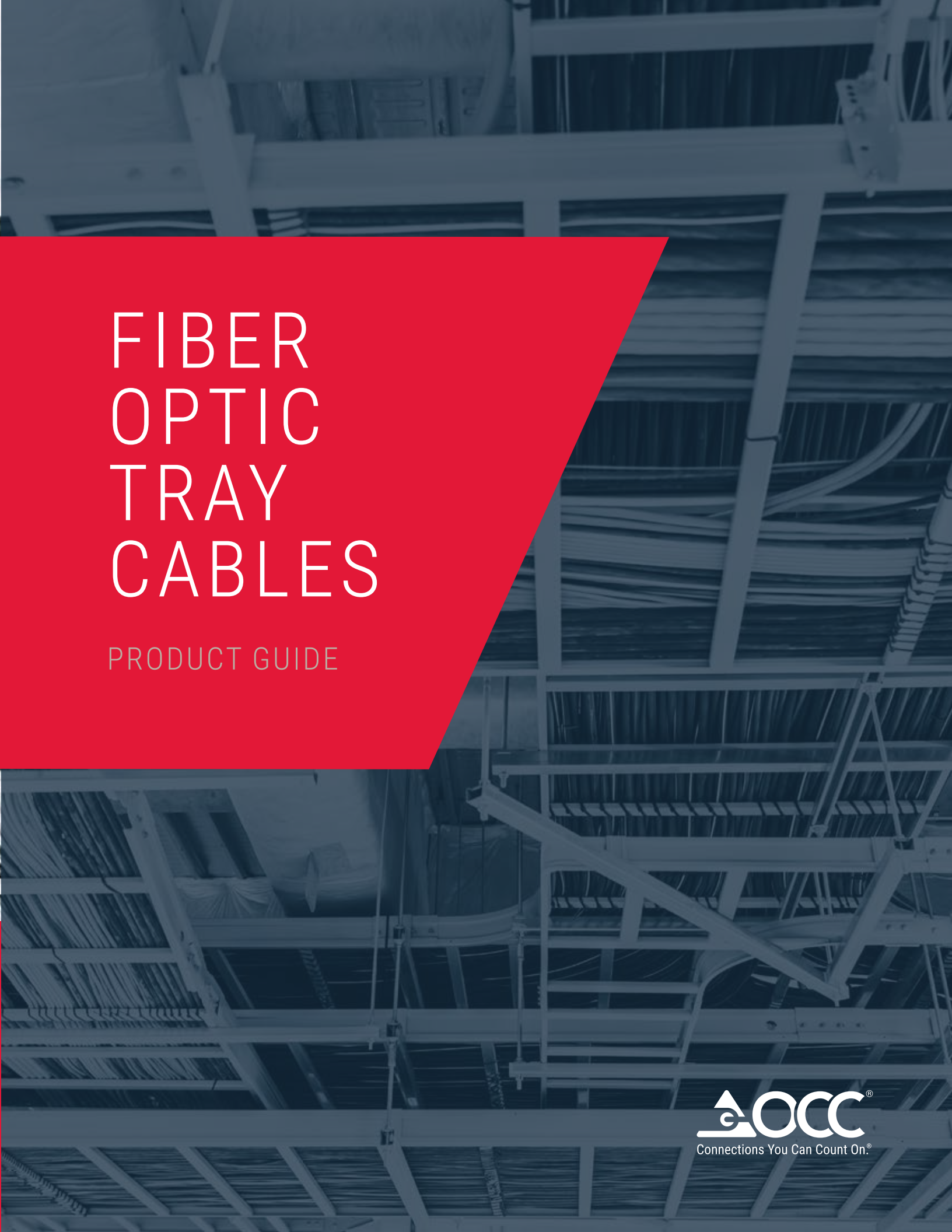
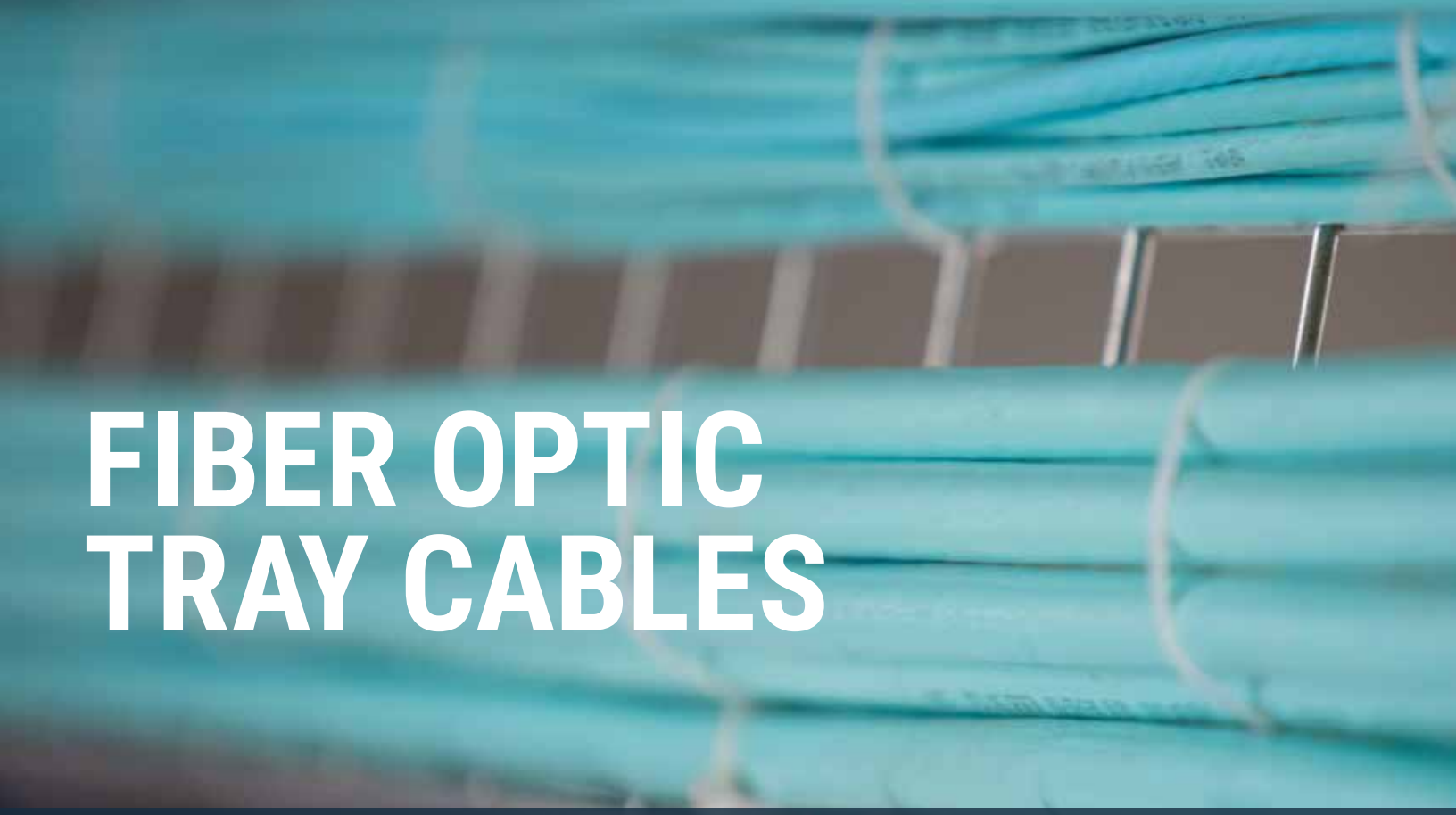


FIBER OPTIC TRAY CABLES

PRODUCT GUIDE

OCC®
Connections You Can Count On.®



FIBER OPTIC TRAY CABLES

WHAT IS A FIBER OPTIC TRAY CABLE (FOTC)?

The term “tray cables” has gained significant market share recently, but a wide range of cables can be installed in a cable tray. There are many standards out there that sound like they apply to tray cables; some of these standards are directly applicable, while others don’t give much guidance.

CONNECTIONS YOU CAN COUNT ON.

When it comes to fiber-only cables that are to be installed in cable trays, there is a big gap in the standards and clarity on what these constructions look like and how they should be expected to perform under these conditions. **This brochure outlines how OCC’s cables meet or exceed the specified requirements for Tray Cables.**

TRAY CABLE (TC) describes a copper cable that has certain construction elements built-in to withstand the potential exposure from being installed in a tray.

TRAY CABLE OPTICAL FIBER (TC-OF) refers to a hybrid cable that has the same construction as above, but also contains a fiber optic element.

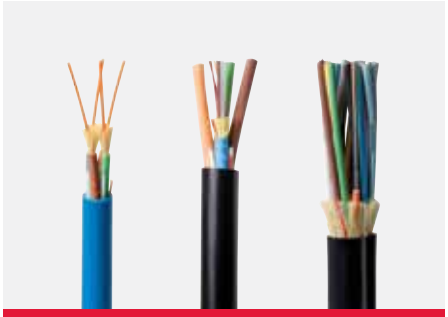
FIBER OPTIC TRAY CABLE (FOTC) is a cable that is fiber-only. These are built to perform under the same harsh environments as the previous cables (TC & TC-OF), only no power conductors.

TRAY CABLE (Type TC)

600 Volt Power Cable -Copper Only

TRAY CABLE OPTIC FIBER (Type TC-OF)

600 Volt Power Cable -Copper-Fiber Cable



FIBER OPTIC TRAY CABLE

No Copper Elements - Fiber Only

HOW IS FIBER FOR CABLE TRAYS EVALUATED?

CANADIAN STANDARDS AUTHORITY (CSA)

C22.2 No. 230 lists the most specific requirements for tray cables:

> Flame Test – FT4
> Impact – 5 lbs. of pressure, minimum 1 ft. drop.
> Crush – 4480N/cm using a 19mm round mandrel
> Temperature Performance – Cold -18°C to +60°C

NATIONAL FIRE PROTECTION AGENCY (NFPA):

NFPA 70, Article 770, simply states "Fiber cables shall be permitted to be installed in cable trays."

INSTITUTE FOR ELECTRONICS AND ELECTRICAL ENGINEERS

IEEE 383 provides guidance on fire resistance standards for fiber cabling run in trays established specifically for fiber cabling used in nuclear power plants. It does not address other performance criteria such as mechanical damage and weathering resistance.

HOW DID OCC ENGINEER FOTC?

When OCC first built our reputation as pioneers in fiber optic cable over 35 years ago, we made a commitment to quality, performance, and service. Initially known for our expertise in creating battle-tested products for the military, OCC has expanded into many other areas, including Fiber Optic Tray Cables. OCC manufactures our fiber-only cables by eliminating the copper elements in these hybrid cables, without reducing the durability or reliability. These cables maintain the same mechanical durability and are built to withstand the demands of cable installed in tray applications.

If we look to the Canadian Standards Authority (CSA), National Fire Prevention Agency (NFPA), and Institute for Electronics and Electrical Engineers (IEEE) for guidance, and not specified requirements, we can come to the conclusion that a Fiber Optic Tray Cable (FOTC) must address these five issues:

> Be able to withstand one or more impacts from falling debris.
> Be able to withstand being crushed by other cables against the metal rungs of the tray.
> Be able to withstand extreme temperatures.
> Be able to withstand exposure to UV and sunlight.
> Have flame resistance appropriate to the installation requirements. Most installations will require that the cable installed carry either a UL Riser rating or be a low smoke zero halogen (LSZH) construction.

Based on these criteria, OCC recommends our B-Series Breakout cables for use in cable trays. GX Series and HC Series Cables can also be used.

A FIBER CABLE USED IN A TRAY MUST HAVE THESE MECHANICAL CAPABILITIES:

Absorbs IMPACT from falling debris

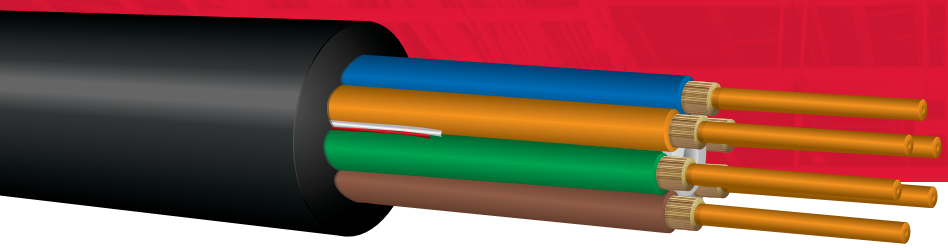
CRUSH resistant against other cables in the metal rungs of the tray

Able to handle extreme TEMPERATURES (hot/cold)

Able to withstand exposure to direct sunlight UV RESISTANT

FLAME resistance appropriate to the installation environment

B-SERIES BREAKOUT
RISER RATED FOTC



APPLICATIONS

> Ideal for installations requiring an extremely rugged and reliable cable design where maximum mechanical and environmental protection are necessary

> Easiest cable to install where direct termination of the subcable to a connector and a direct run to panels and equipment are desired

> Ideal for locations requiring low-temperature performance along with a flame rating

FEATURES

> Individual fibers and strength members protected in a subcable configuration

> Most rugged cable design with individual subcables for routing to diverse intelligent devices with direct connector termination at each device

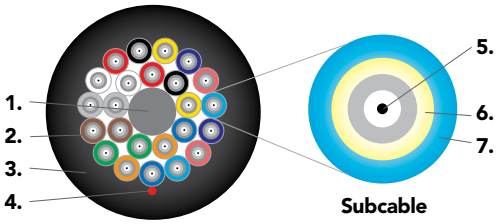
> Low-temperature PVC outer jacket (J material) provides excellent performance and flexibility at low temperatures
- Wide operating temperature range of -40°C to +85°C
- Oil resistant for use in industrial applications
- Designed to exceed the flammability requirements of Chapter 8of IEEE 383

> BE-Series cable meets all applicable standards for impact

> J-jacket is UV, fungus, and moisture resistant

MECHANICAL AND ENVIRONMENTAL PERFORMANCE

INDOOR/OUTDOOR B-SERIES (D-JACKET)	
OPERATING TEMPERATURE	-40°C to + 85°C
STORAGE TEMPERATURE	-55°C to + 85°C
INSTALLATION TEMPERATURE (CABLE TEMP)	-10°C to + 60°C
FLAME RETARDANCY	UL listed type OFNR (UL 1666) and FT4 (CSA C22.2 No. 232)
CRUSH RESISTANCE (TIA-455-41)	2,200 N/cm
FLEX RESISTANCE (TIA-455-104)	2,000 cycles



1.Central Filler/Strength Member
2.Subcable
3.Outer Jacket
4.Ripcord

SUBCABLE

5. 900µm Tight-Buffer Optical Fiber
6.Aramid Strength Member
7.Subcable Jacket

STANDARDS

OCC indoor/outdoor tight-buffered fiber optic cables meet the functional requirements of the following standards:

ICEA-S-83-596
ICEA-S-104-696
GR-409-CORE ISSUE 2
TIA-568
TIA-598
UL 1666

D JACKET: -40°C TO +85°C, SUN, OIL, & FUNGUS RESISTANT

FIBER COUNT	OM1 MULTI-MODE (62.5/125)	OM3 MULTI-MODE (50/125)	OS2 SINGLE MODE
2	BE002DWLS9KR	BE002DALT9KR	BE002DSLX9KR
6	BE006DWLS9KR	BE006DALT9KR	BE006DSLX9KR
12	BE012DWLS9KR	BE012DALT9KR	BE012DSLX9KR
24	BE024DWLS9KR	BE024DALT9KR	BE024DSLX9KR

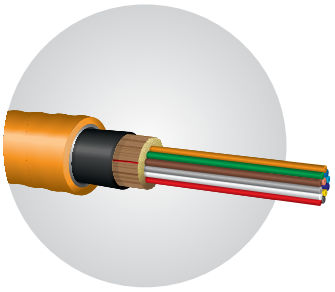
Z JACKET: LOW SMOKE ZERO HALOGEN, SUN, & FUNGUS RESISTANT

FIBER COUNT	OM1 MULTI-MODE (62.5/125)	OM3 MULTI-MODE (50/125)	OS2 SINGLE MODE
2	BE002ZWLS9KE	BE002ZALT9KE	BE002ZSLX9KE
6	BE006ZWLS9KE	BE006ZALT9KE	BE006ZSLX9KE
12	BE012ZWLS9KE	BE012ZALT9KE	BE012ZSLX9KE
24	BE024ZWLS9KE	BE024ZALT9KE	BE024ZSLX9KE

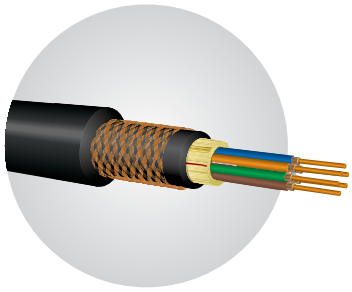
J JACKET: -50°C TO +75°C, SUN, OIL, AND FUNGUS RESISTANT

FIBER COUNT	OM1 MULTI-MODE (62.5/125)	OM3 MULTI-MODE (50/125)	OS2 SINGLE MODE
2	BE002JWLS9KR	BE002JALT9KR	BE002JSLX9KR
6	BE006JWLS9KR	BE006JALT9KR	BE006JSLX9KR
12	BE012JWLS9KR	BE012JALT9KR	BE012JSLX9KR
24	BE024JWLS9KR	BE024JALT9KR	BE024JSLX9KR

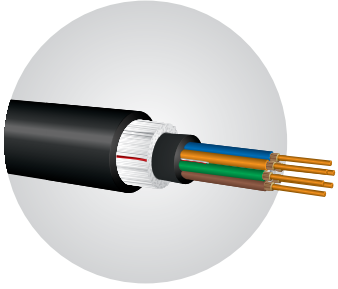
CABLE ARMORING OPTIONS



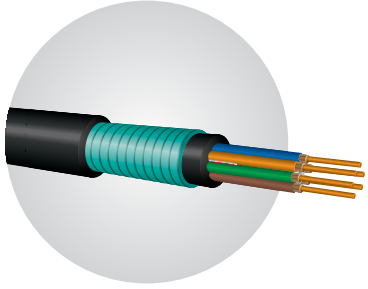
INTERLOCKING ARMOR



BRAIDED CABLES



ALL DIELECTRIC ARMOR



CORRUGATED STEEL TAPE

*Contact your OCC Sales Representative for mechanical and environmental performance details of armored cables

IMPACT:

Our B-series cables, which are most appropriate for tray usage, meet all applicable standards.

CRUSH:

Our B-series cables, which are most appropriate for tray usage, are tested to 2200 N/cm, similar to the crush force defined by the CSA C22.2 No 230 standards.

EXTREME TEMPERATURES:

OCC tests cables to determine their performance at extreme cold and hot temperatures. Our B-series cables with "J" jackets are tested over the range of -50°C to +75°C (-58°F to 167°F), and are an excellent choice for cable trays in cold environments. Our B-series cables with "D" jackets are tested over a range of -40°C to +85°C (-40°F to 185°F), and are an excellent choice for cable trays in hot environments. Both jacket types far exceed the -18°C to +60°C range called for by CSA C22.2 No 230.

UV/SUNLIGHT:

All of OCC's tray-appropriate cables have jackets that contain UV-stabilizing compounds. This means the cable can withstand years of direct sunlight or without jacket degradation.

FLAME RESISTANCE:

Cables made with "D" and "J" jacket materials are UL Riser rated and are available in 2 to 72 fiber configurations. Cables made with "Z" jacket material are riser-rated and meet IEC requirements for flame, smoke, and zero halogen content. LSZH cables are available in 2 to 24 fiber configurations.

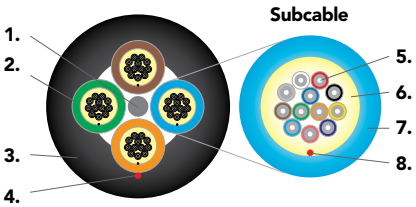
G-SERIES SUBGROUPING
RISER RATED FOTC

APPLICATIONS

> Ideal for installations requiring a rugged and reliable cable design where maximum mechanical and environmental protection are necessary
> Typical industrial uses are factory automation, power generation and other utilities, oil and gas refining, and surface mining

FEATURES

> Design allows multi-fiber subcables to be routed to multiple locations such as wiring racks and closets
> Low-temperature PVC outer jacket (J material) provides excellent performance and flexibility at low temperatures
> High crush and tensile load ratings
> Oil resistant for use in industrial applications
> Designed to exceed the flammability requirements of Chapter 8 IEEE 383
> G-Series cable meets all applicable standards for impact
> J-jacket is UV, fungus, and moisture resistant



1.Central Filler/Strength Member
2.Subcable
3.Outer Jacket
4.Ripcord

SUBCABLE

5. 900µm Tight-Buffer Optical Fiber
6.Aramid Strength Member
7.Subcable Jacket
8. Ripcord

MECHANICAL AND ENVIRONMENTAL PERFORMANCE

INDOOR/OUTDOOR G-SERIES (D-JACKET)	
OPERATING TEMPERATURE	-40°C to + 75°C
STORAGE TEMPERATURE	-55°C to + 85°C
INSTALLATION TEMPERATURE (CABLE TEMP)	-10°C to + 60°C
FLAME RETARDANCY	UL listed type OFNR (UL 1666) and FT4 (CSA C22.2 No. 232)
CRUSH RESISTANCE (TIA-455-41)	2,100 N/cm
FLEX RESISTANCE (TIA-455-104)	2,000 cycles

STANDARDS

OCC indoor/outdoor tight-buffered fiber optic cables meet the functional requirements of the following standards:

ICEA-S-83-596
ICEA-S-104-696
GR-409-CORE ISSUE 2
TIA-568
TIA-598
UL 1666
CSA C22.2 NO. 232
CSA C22.2 NO. 230

G-SERIES SUBGROUPING TRAY CABLE WITH 12-FIBER SUBCABLES (5.5MM SUBCABLES)

FIBER COUNT	DIAMETER MM (IN)	WEIGHT KG/KM (LBS/1,000')	TENSILE LOAD		MINIMUM BEND RADIUS	
			INSTALLATION* N (LBS)	OPERATIONAL N (LBS)	INSTALLATION CM (IN)	LONG-TERM CM (IN)
24	16.6 (0.65)	274 (184)	4,600 (1,030)	1,500 (340)	24.9 (9.8)	16.6 (6.5)
36	16.6 (0.65)	272 (183)	5,900 (1,330)	1,050 (440)	24.9 (9.8)	16.6 (6.5)
48	16.6 (0.65)	270 (181)	7,200 (1,620)	2,400 (540)	24.9 (9.8)	16.6 (6.5)

*Installation loads in excess of 2,700 N (600 lbs.) are not recommended.

ORDERING INFORMATION

G									9	K	R
1	2	3	4	5	6	7	8	9	10	11	12

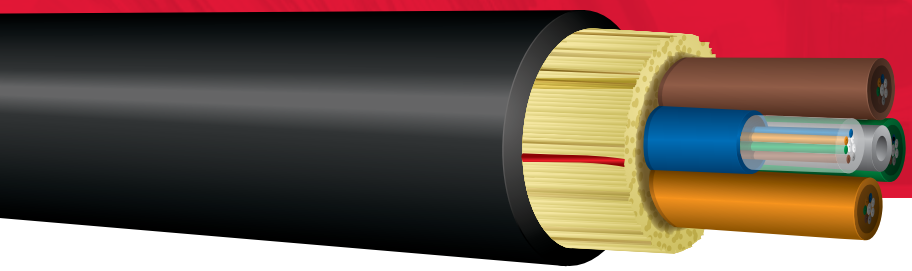
Digit No:

1	Subgrouping Series Ultra-Fox = **G**
2	6-fiber subcables = **B**; 12-fiber subcables = **X**
3 – 5	Fiber count: 6-fiber subcables = **012–036**, 12-fiber subcables = **024–144**
6	Jacket type: Low-Temp PVC = **J**, PVC = **D**
7 – 9	Fiber type: Multiple options available. Please see OCC Catalog for complete listing.
10	Ultra-Fox fiber with 900µm tight-buffer = **9**
11	Standard jacket colors: Black = **K** (other jacket colors available upon request)
12	Rating: Riser = **R**

Example: 48-fiber riser rated tray cable (12-fiber subcables) using 62.5µm standard Laser Ultra-Fox fiber, black jacket, low-temp

G	X	0	4	8	D	W	L	S	9	K	R

HC-SERIES HIGH DENSITY
INDOOR/OUTDOOR FOTC



The HC-Series cables, featuring OCC's unique tight-buffered fiber units, are the ideal solution for campus networks and indoor/outdoor installations. The HC-Series of cables combines the ruggedness of tight buffers with high-fiber density, resulting in cables that have an outer diameter much smaller than conventional cables using buffer tubes. No other cable matches the mechanical and environmental performance while maintaining a small diameter and high-duct efficiency.

APPLICATIONS

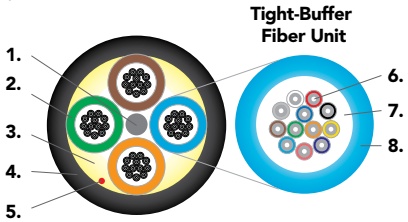
> Installation in underground duct for data transmission between nodes or hubs
> Can also be routed vertically inside buildings
> High-density network backbone

FEATURES

> Rugged tight-buffer fiber unit construction
> Core-Locked™ outer jacket design for installation survivability
> Cable can be terminated with 900µm fanout kit for LC construction
> Option available for direct termination of sub-units to MPO/MTP connectors
> HC-Series cable meets all applicable standards for impact

MECHANICAL AND ENVIRONMENTAL PERFORMANCE

INDOOR/OUTDOOR G-SERIES	
OPERATING TEMPERATURE	-40°C to + 85°C
STORAGE TEMPERATURE	-55°C to + 85°C
INSTALLATION TEMPERATURE (CABLE TEMP)	-10°C to +60°C (D Jacket) -20°C to +60°C (J Jacket)
FLAME RETARDANCY	UL listed type OFNR (UL 1666) and
CRUSH RESISTANCE (TIA-455-41)	1,800 N/cm
FLEX RESISTANCE (TIA-455-104)	2,000 cycles



1.Central Filler/Strength Member
2.Tight-Buffer Fiber Unit
3.Aramid Strength Member
4.Outer Jacket
5.Ripcord

TIGHT-BUFFER FIBER UNIT

6. 250µm Acrylate Fiber
7.Fiber Unit
8.Tight-Buffer Fiber Unit

STANDARDS

OCC indoor/outdoor tight-buffered fiber optic cables meet or exceed the functional requirements of the following standards:

ICEA-S-104-696
ICEA-S-83-596
TIA-568
TIA-598
UL 1666

CABLE CHARACTERISTICS: HC-SERIES HIGH-DENSITY RISER CABLES (WITH 2.0MM FIBER UNITS)

FIBER COUNT	DIAMETER MM (IN)	WEIGHT KG/KM (LBS/1,000')	TENSILE LOAD		MINIMUM BEND RADIUS	
			INSTALLATION N (LBS)	OPERATIONAL N (LBS)	INSTALLATION CM (IN)	LONG-TERM CM (IN)
48	7.6 (0.30)	72 (48)	2,700 (600)	600 (135)	11.4 (4.5)	7.6 (3.0)
96	10.3 (0.41)	111 (75)	2,700 (600)	600 (135)	15.5 (6.1)	10.3 (4.1)
144	11.7 (0.46)	146 (98)	2,700 (600)	600 (135)	17.6 (6.9)	11.7 (4.6)
288	15.0 (0.59)	218 (147)	2,700 (600)	600 (135)	22.8 (9.0)	15.0 (5.9)

ORDERING INFORMATION

H	C										R
1	2	3	4	5	6	7	8	9	10	11	12

Digit No:

1 – 2	High Count Series with 12-fiber bundled fiber units 2.0mm in diameter = **HC**
3 – 5	Fiber count: (see cable characteristics chart)
6	Jacket types: Indoor/Outdoor Oil Resistant Low-Temp PVC = **J**, Indoor/Outdoor PVC = **D**
7 – 9	Fiber type: **SLA, ALT, ALE, WLS**. Please see OCC Catalog for complete listing
10	Jacketed fiber unit: **A** = Aramid within subunit, **C** = No Aramid within subunit
11	Standard jacket color: Black = **K**
12	Rating: Riser = **R**

Example: 24-fiber cable with 12-fiber units, 2.0mm in diameter using bend-insensitive, single-mode fiber, low temperature oil-resistant indoor/outdoor PVC, black jacket riser rated, printed in feet

H	C	0	2	4	D	S	L	A	C	K	R

CUSTOMER SUPPORT

TECHNICAL AND DESIGN-BUILD EXPERTISE

Instead of relying on OCC just for products, more and more of our customers rely on our design-build expertise. Our design engineers and technical staff provide unprecedented service, support, and assistance.

ONE-STOP SHOP

Since we provide one of the largest network solutions portfolios in the industry, many of our customers rely on OCC as their one-source solutions provider from the most reliable end-to-end cabling and connectivity systems down to the shortest patch cable. We can meet your every network need.

CUSTOMER-DERIVED INNOVATIONS

We partner with you, our customer, and listen to your needs. Thanks to our customers, we've designed, innovated, and customized some of the best solutions in the industry for the speed, immediate scalability, space savings, and ultra-high performance demanded by zero downtime networks of all sizes.

COMPETITIVE WARRANTY PROGRAMS

OCC, in conjunction with certified Multimedia Design and Integration Specialist (MDIS) installers around the world, is able to offer various competitive warranty and extended warranty programs. OCC has developed warranty plans that offer a flexible approach to a lasting network installation.

QUICK SHIPPING

SAME DAY SHIPPING
ON IN-STOCK ITEMS IF ORDERED BY 12PM, EST.

CONNECTIONS YOU CAN **COUNT ON.**™

GLOBAL PARTNERS & LOCATIONS

OCC ROANOKE, VA

Corporate Headquarters and Fiber Optic Cable Manufacturing Facility

5290 Concourse Drive
Roanoke, VA 24019 USA
540.265.0690 or 800.622.7711

OCC DALLAS, TX

Harsh Environment and Specialty Connectivity Manufacturing Facility

1700 Capital Avenue, Suite 150
Plano, TX 75074 USA
972.509.1500 or 877.509.1500

OCC ASHEVILLE, NC

Enterprise Connectivity Manufacturing Facility

33 Superior Way
Swannanoa, NC 28778 USA
828.298.2260 or 800.880.7674

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