

# Optical FTTx Drop Cable

All Dielectric Design

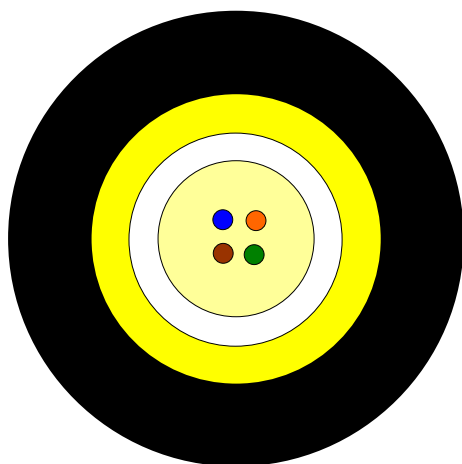
**MiDia® Monotube PLUS / K1-3659**



A Furukawa Company

Issue June 2019

according to **Customised OFS Generic Specification**



## Application

Customer drop cable for air-blown installation into Micro ducts (5,5/7 mm)

## Design

- Optical Fibres  
AllWave® FLEX Fibre G.657.A1
- Gel-filled Central Loose Tube
- Tensile Strength Elements
- PE-Jacket

## Features

- All Dielectric Cable
- Easy Fibre Access
- Light Weight - Optimised for Air-Blown Installation

Version illustrated is the 4 Fibre Cable

| Fibre Count | Outer Diameter [mm] | Cable Weight [kg/km] | Standard Length [m] | AT-Code*       |
|-------------|---------------------|----------------------|---------------------|----------------|
| 4           | 3.9                 | 15                   | 2000 / 4000 / 5000  | AT-5EE7XD4-004 |

This table shows nominal diameter and weight values which may differ in shipments.

\* Please refer to the OFS AT- Code.

## Sheath Marking

OFS OPTICAL CABLE MIDIA MONOTUBE PLUS PE [ID] [MM/YYYY] XXXF [Meter Marking]

## Identification

Fibre Colour Code:

|   |      |   |        |   |       |   |       |
|---|------|---|--------|---|-------|---|-------|
| 1 | Blue | 2 | Orange | 3 | Green | 4 | Brown |
|---|------|---|--------|---|-------|---|-------|

The tube is natural coloured.

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#### Mechanical Properties and Environmental Behaviour

Tests according to IEC 60794

|                                                           | Parameter                            | Requirement                                                                       | Value              |
|-----------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------|--------------------|
| <b>Tensile Performance:</b><br>IEC 60794-1-21-E1A and E1B | Long term load                       | - No attenuation increase*<br>- No fibre strain                                   | Load: 50 N         |
|                                                           | Short term load, during installation | - No changes in attenuation before versus after load*<br>- Max. fibre strain 0.6% | Load: 220 N        |
| <b>Crush Performance:</b><br>IEC 60794-1-21-E3A           | Short term load                      | - No changes in attenuation before versus after load*<br>- No damage**            | Load: 500 N        |
| <b>Bending Performance:</b><br>IEC 60794-1-21-E11         | Handling fixed installed             | - No attenuation increase*                                                        | Bend radius: 20 mm |
|                                                           | During installation (under load)     | - No changes in attenuation before versus after load*                             | Bend radius: 40 mm |
| <b>Temperatures:</b><br>IEC 60794-1-22-F1                 | Operation                            | Single-mode Fibres:                                                               | -20 to +60°C       |
|                                                           | Installation                         | - No attenuation increase*                                                        | - 5 to +40°C       |
|                                                           | Storage/Shipping                     |                                                                                   | -20 to +60°C       |

\*No changes in attenuation means that any changes in measurement value, either positive or negative within the uncertainty of measurement shall be ignored. The total uncertainty of measurement shall be less than or equal to 0.05 dB.

\*\* Mechanical damage – when examined visually without magnification, there shall be no evidence of damage to the sheath. The imprint of plates will not be considered as damage.

\*\*\* No changes in attenuation either positive or negative higher than 0.15 dB/km in the 1550 nm range according to the Microcable Standard IEC 60794-5-10:2014

#### Shipping Information

**Maximum Cable Length: 5000 m**

The information is believed to be accurate at time of issue.

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# AllWave® FLEX Fibre

Zero Water Peak



A Furukawa Company

**A New Standard in Optimized Bend Performance and Reliable Low Loss Transmission.**

## Overview

AllWave® FLEX ZWP Single-Mode Fibre is the first Zero Water Peak (ZWP) G.652D fibre to offer optimized bend performance for Fibre-to-the-Home (FTTX), enterprise networks, or any application where small bend diameters may be encountered. Fully compliant to the new ITU-T G.657 Class A specification, AllWave FLEX Fibre is completely compatible with all conventional single-mode fibres.

## Product Description

AllWave FLEX ZWP Fibre maintains very low bending loss across the full spectrum of wavelengths from 1260 to 1625 nm, while ensuring long-term fibre strength and reliability. It can be coiled into a 10 mm radius loop with < 0.5 dB incurred loss at 1625 nm and < 0.2 dB incurred loss at 1550 nm – five times better bend performance than conventional single-mode and leading Low Water Peak (LWP) fibres.

The macrobending and microbending loss improvements of AllWave FLEX ZWP Fibre offer a number of advantages for demanding access, enterprise, and central office applications. The fibre enables more compact cabinet and enclosure designs and protects the network against excessive loss resulting from inadvertent fibre bends. It is less susceptible to physical disturbances from cable flexing, pulling and crushing, as well as the intricate routing conditions within enclosures and cabinets. The optimized bend characteristics of AllWave FLEX ZWP Fibre also help improve cable performance in demanding high-stress and low-temperature environments by providing double the microbend protection of conventional single-mode fibres.

OFS maximizes the reliability of AllWave FLEX ZWP Fibre through the use of synthetic glass and our highly protective D-Lux® acrylate coating. This enables us to achieve significantly smaller bend diameters with five times lower loss and no detriment to fibre strength and long-term reliability.

AllWave FLEX ZWP Fibre retains all the performance benefits of OFS' AllWave ZWP Fibre, the first fibre to eliminate the water peak defect found in conventional single-mode fibre. AllWave FLEX ZWP Fibre has stable and permanent low loss, due to OFS' patented ZWP fibre manufacturing process, which eliminates hydrogen-aging defects. What's more, its ultra-low fibre Polarization Mode Dispersion (PMD) enables speed and distance upgrades.

## Features/Benefits:

- Saves space, time, and money through improved bend performance, even for L-Band wavelengths up to 1625 nm: added loss < 0.5 dB (1625 nm) and < 0.2 dB (1550 nm) at 10 mm radius
- Easier to install, handle, and store in space-constrained applications such as FTTX and premises networks
- Bend optimized design for tight, low loss bends without risking fibre strength and long-term reliability
- Tight geometry for very low splice loss and improved connectorization performance with G.652D embedded base
- Fully compatible with all conventional single-mode fibre international standards including G.657 Class A and G.652D
- Zero Water Peak fibre provides a 50% increase in usable optical spectrum enabling 16-channel CWDM and DWDM support

## Outstanding Macrobend Performance

- **100 turns on a 25 mm radius mandrel**  
≤ 0.01 dB @ 1550 nm  
≤ 0.05 dB @ 1625 nm
- **10 turns on a 15 mm radius mandrel**  
≤ 0.2 dB @ 1550 nm  
≤ 0.5 dB @ 1625 nm
- **1 turn on a 10 mm radius mandrel**  
≤ 0.2 dB @ 1550 nm  
≤ 0.5 dB @ 1625 nm

## Applications:

AllWave *FLEX* ZWP Fibre provides outstanding bend performance and design freedom for fibre management systems in:

- FTTX
- The central office
- High power applications
- Analog video
- Microcables
- Drop cables
- Closures
- Field management/storage apparatus located throughout the network
- At the customer premises
- Any application with transmission speeds of 40 Gb/s and beyond

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**1-888-fiberhelp** (from inside the USA). For regional assistance, contact the global location closest to you.



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## Product Specifications

### Physical Characteristics

|                                                                            |                            |
|----------------------------------------------------------------------------|----------------------------|
| Clad Diameter                                                              | 125.0 ± 0.7 µm             |
| Clad Non-Circularity                                                       | ≤ 0.7 %                    |
| Core/Clad Concentricity Error (Offset)                                     | ≤ 0.5 µm, < 0.2 µm typical |
| Coating Diameter (Uncolored)                                               | 235 - 245 µm               |
| Coating-Clad Concentricity Error (Offset)                                  | ≤ 12 µm                    |
| Tensile Proof Test ( <i>Other proof test levels available on request</i> ) | 100 kpsi (0.69 GPa)        |
| Coating Strip Force                                                        | Range: 1.0 N ≤ CSF ≤ 8.9 N |
| Standard Reel Lengths                                                      | 50.4 km (31.3 miles)       |

### Optical Characteristics

| Attenuation | Maximum      | Typical      |
|-------------|--------------|--------------|
| at 1310 nm  | ≤ 0.35 dB/km | ≤ 0.33 dB/km |
| at 1385 nm  | ≤ 0.31 dB/km | ≤ 0.27 dB/km |
| at 1490 nm  | ≤ 0.24 dB/km | ≤ 0.21 dB/km |
| at 1550 nm  | ≤ 0.21 dB/km | ≤ 0.19 dB/km |
| at 1625 nm  | ≤ 0.24 dB/km | ≤ 0.20 dB/km |

#### Attenuation vs. Wavelength

| Range (nm)  | Reference (nm) λ | α    |
|-------------|------------------|------|
| 1285 – 1330 | 1310             | 0.03 |
| 1360 – 1480 | 1385             | 0.04 |
| 1525 – 1575 | 1550             | 0.02 |
| 1460 – 1625 | 1550             | 0.04 |

The attenuation in a given wavelength range does not exceed the attenuation of the reference wavelength (λ) by more than the value α.

|                                                                       |           |
|-----------------------------------------------------------------------|-----------|
| Attenuation Uniformity / Point Discontinuities at 1310 nm and 1550 nm | ≤ 0.05 dB |
|-----------------------------------------------------------------------|-----------|

#### Macrobending Attenuation:

The maximum attenuation with bending does not exceed the specified values under the following deployment conditions:

| Deployment Condition                | Wavelength | Induced Attenuation |
|-------------------------------------|------------|---------------------|
| 1 turn on a 10 mm radius mandrel    | 1550 nm    | ≤ 0.2 dB            |
|                                     | 1625 nm    | ≤ 0.5 dB            |
| 10 turns on a 15 mm radius mandrel  | 1550 nm    | ≤ 0.2 dB            |
|                                     | 1625 nm    | ≤ 0.5 dB            |
| 100 turns on a 25 mm radius mandrel | 1550 nm    | ≤ 0.01 dB           |
|                                     | 1625 nm    | ≤ 0.05 dB           |

#### Chromatic Dispersion

|                                              |                                |
|----------------------------------------------|--------------------------------|
| Zero Dispersion Wavelength (λ <sub>0</sub> ) | 1302 – 1322 nm                 |
| Zero Dispersion Slope (S <sub>0</sub> )      | ≤ 0.092 ps/nm <sup>2</sup> -km |
| Typical Dispersion Slope                     | 0.088 ps/nm <sup>2</sup> -km   |

#### Group Refractive Index

|            |       |
|------------|-------|
| at 1310 nm | 1.467 |
| at 1550 nm | 1.468 |

#### Mode Field Diameter

|            |                         |
|------------|-------------------------|
| at 1310 nm | 8.5 – 9.3 µm            |
| at 1550 nm | 9.4 – 10.4 µm (typical) |

|                                       |           |
|---------------------------------------|-----------|
| Cut-off Wavelength (λ <sub>cc</sub> ) | ≤ 1260 nm |
|---------------------------------------|-----------|

#### Polarization Mode Dispersion (PMD)<sup>1</sup>

|                                                |               |
|------------------------------------------------|---------------|
| Fibre PMD Link Design Value (LDV) <sup>2</sup> | < 0.06 ps/√km |
| Maximum Individual Fibre                       | < 0.1 ps/√km  |
| Typical Fibre LMC PMD                          | < 0.02 ps/√km |

<sup>1</sup> As measured with low mode coupling (LMC) technique in fibre form, value may change when cabled. Check with your cable manufacturer for specific PMD limits in cable form.

<sup>2</sup> The PMD Link Design Value complies with IEC 60794-3, September 2001 (N = 20, Q = 0.01%). Details are described in IEC 61282-3 TR Ed 2, October 2006.

### Environmental Characteristics (at 1310, 1550 & 1625 nm)

|                                                                 |              |
|-----------------------------------------------------------------|--------------|
| Temperature Cycling (-60° + 85° C)                              | ≤ 0.05 dB/km |
| High Temperature Aging (85 ± 2° C)                              | ≤ 0.05 dB/km |
| Temperature & Humidity Cycling (at -10° C to +85° C and 95% RH) | ≤ 0.05 dB/km |
| Water Immersion (23 ± 2° C)                                     | ≤ 0.05 dB/km |
| Dynamic Fatigue Stress Corrosion Parameter                      | (nd) ≥ 20    |