

Enterprise

END-TO-END SOLUTIONS



 **dura·line**
An Orbia business.

What's important in a communications network?

As bandwidth requirements are increasing at unpredictable rates, designing networks that can keep pace with the rapid changes are challenging.

Enterprise Networks designed with jetted fiber solutions, including FuturePath and MicroDucts from Dura-Line, take network design, architecture, and installation to a new level. Spread the investment of building the network over time, as the need grows.

Future expansions are possible with multiple pathways in place; and moves, additions, and changes are easily accommodated. Communication networks in facilities such as hospitals, corporate campuses, manufacturing facilities, data centers, and broadcast studios are now using jetted fiber solutions and experiencing the scalable, flexible, and financial advantages!



How does jetted fiber work?

Jetted fiber is a complete solution that utilizes FuturePath – a multi-celled, flexible conduit – with a MicroCable designed for optimal performance in air-jetting situations.

The solution allows for placing a pathway and installing only the fiber needed to meet current bandwidth requirements, while remaining scalable to easily accommodate larger fiber demands in the future.



Limit Capital Investment: Only install fiber needed today. No need to predict future bandwidth or install, terminate, and test dark or unused fibers.



Multiple Pathways: Increase the number of pathways for both today and future use. Maximizes the conduit infrastructure being placed while maintaining a low profile.



Jetted Fiber Solution Network Design: Efficient end-to-end cable placement that reduces time and money. Eliminates right-of-way access issues that occur with limited duct space. With over 18 enterprise configurations available, FuturePath eliminates the need to enter areas of disruptive access such as hospitals, jails, or environmentally sensitive locations.



Easy to Upgrade or Move, Add or Change: With a pathway in place, it's easy to remove, replace, or jet in additional fiber. Take advantage of new fiber technology as it's introduced.

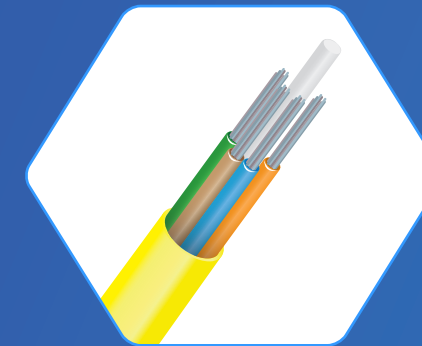


What are jetted fiber solution components?



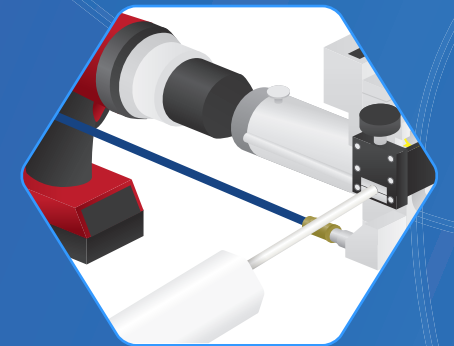
MicroDucts

- MicroDucts, either single or bundled as FuturePath (up to 24 MicroDucts)
- Riser, Plenum, LSZH (Low Smoke Zero Halogen) or HDPE/OSP material
- Armored configuration available for protection from rodents or harsh environments
- SILICORE™ for fast fiber installations



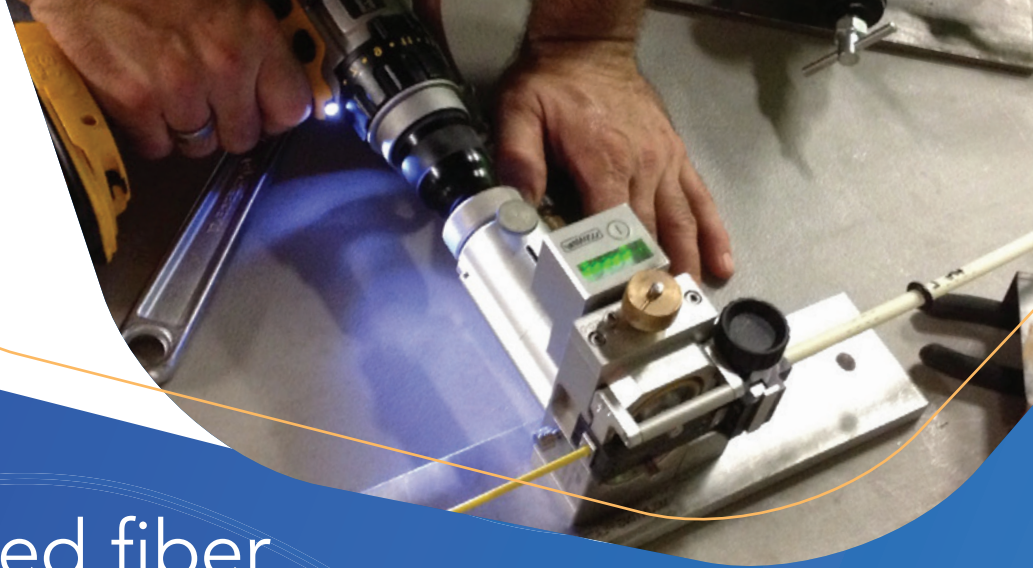
MicroCable

- Fiber counts range from 2–96 strands
- Jettable indoor/outdoor rated fiber
- Available in SMF and MMF (OM1, OM3, OM4, OM5)
- Fully GR-409 Compliant (TIA/EIA 568-C and ANSI/ICEA)
- NEC/NFPA Flame Rated (Riser and Plenum)
- Water-blocking feature inside cable
- Ribbon options available

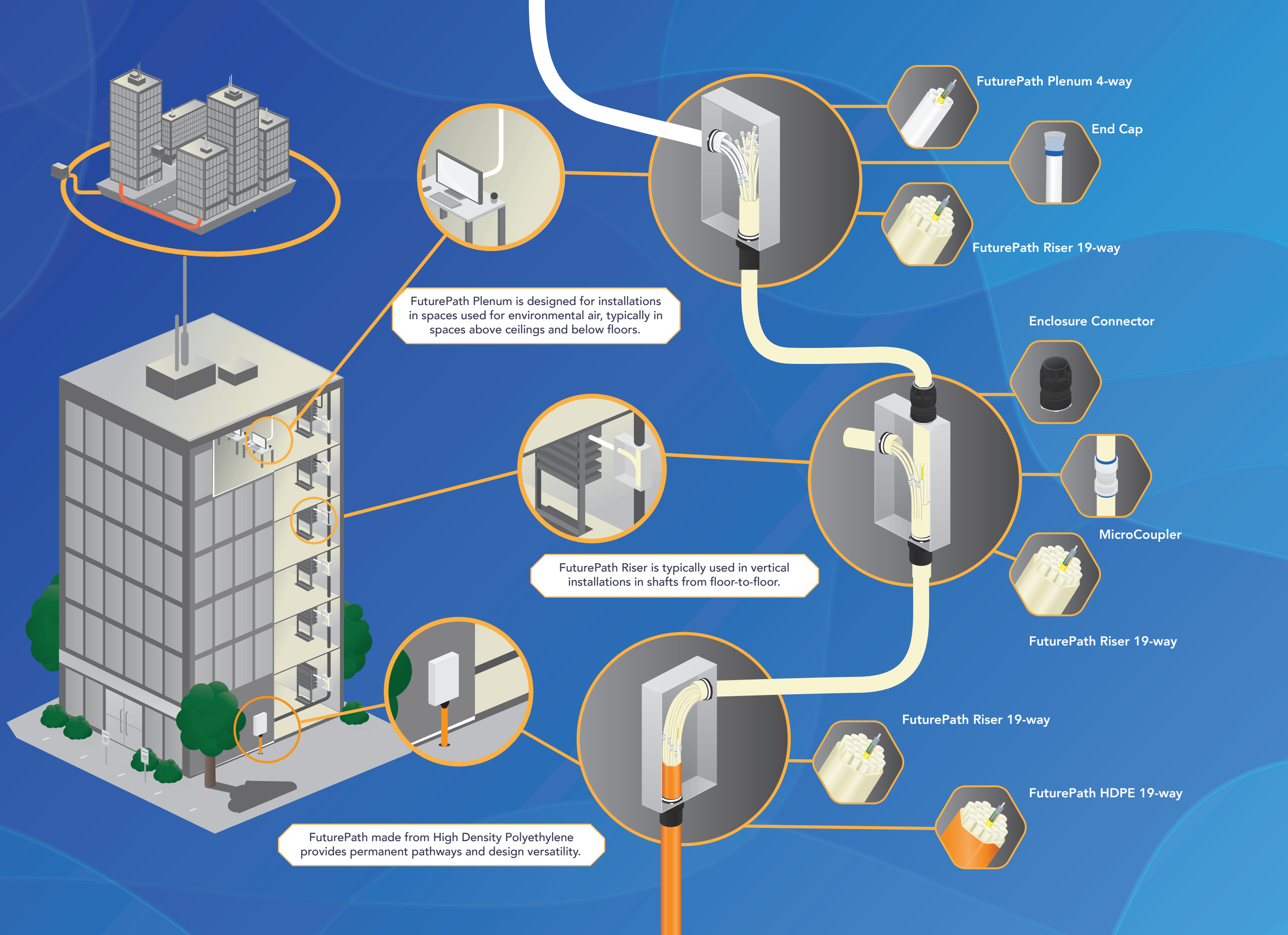


Jetting Equipment

- Microjet, Electric, or handheld units that are powered by standard cordless or corded drills
- Air-assisted jetting distances of up to 3,000 feet are possible
- Installation speeds of 150-200 feet/min are typical
- Easily and quickly installed by small crews of 3 people or less







Build a design that is Flexible, Scalable, Smart.

Complete Indoor/Outdoor Solution

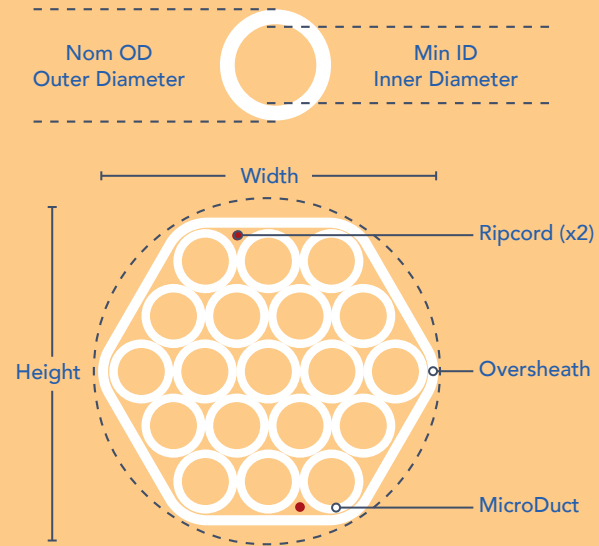
Take your network from outside to inside the building. Transition from HDPE/OSP MicroDucts to Riser MicroDucts inside a MicroDuct Distribution Box. No need for splicing OSP fiber to indoor fiber. With a complete range of accessories, network construction is simple. Quick, easy-to-use push-on couplers join MicroDucts with an air- and water-tight seal. Once the pathway is in place, jet in the fiber you need in a matter of minutes. Flexible, Scalable, Smart.

Pathway Design

Enterprise Networks are private networks that may pass from building to building, as well as run throughout the inside of the building. To accommodate the different spaces, the pathway handles the transitions from HDPE to Riser to Plenum. The MicroCable fiber is an indoor/outdoor cable that can be utilized throughout all the transitions.

Components Used

- | | | | |
|---|----------------------------------|---|------------------------------|
|  | FuturePath HDPE 19-way
p. 11 |  | MicroCoupler
p. 17 |
|  | FuturePath Riser 19-way
p. 12 |  | End Cap
p. 17 |
|  | FuturePath Plenum 4-way
p. 13 |  | Enclosure Connector
p. 19 |



MicroDucts and FuturePath

MicroDucts are small pathways whose sizes are identified by their outer diameter (OD) and inner diameter (ID) with standard sizes from 5mm to 27mm.

FuturePath is bundled MicroDucts with a protective oversheath and can be manufactured in HDPE, Riser, Plenum, LSZH, and Armored materials. In addition to single MicroDucts, FuturePath configurations are available with 2 to 24 pathways that allow for rapid deployment of fiber today with permanent pathways in place for future growth.

Materials

- > HDPE
- > Riser
- > Plenum
- > LSZH
- > Armored

Packaging

- > Up to 6,000 feet per reel
- > Custom lengths available
- > MicroDucts consecutively numbered and printed every 2 inches

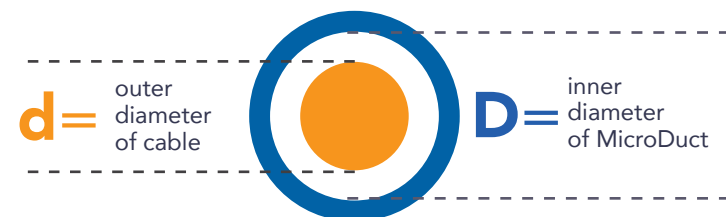
Fiber Capacity per MicroDuct

- > Range from 2 to 96 strand MicroCable
- > SM, MM
- > Fibers up to 4.5mm OD

Calculate $(d/D) * 100 = \% \text{ Cable Fill Ratio}$

$$(\text{OD cable} / \text{ID microduct}) * 100 = \% \text{ Cable Fill Ratio}$$

To calculate the fill ratio, divide the cable diameter (d) by the interior dimension (D) of the MicroDuct. To achieve maximum jetting performances, Dura-Line recommends a fill ratio between 50% and 75%. Several factors impact jetting performance, including the condition of route, bends, and equipment.



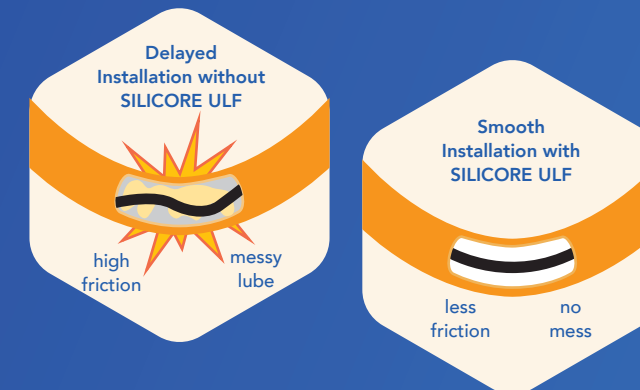
What makes Dura-Line MicroDucts different?

Quicker slicker faster better

Dura-Line's SILICORE® ULF is an ultra-low friction, permanent, co-extruded lining that allows cable to be installed safer, faster, and farther than ever.

The super-slick, non-greasy lining boasts a greater than 60% lower coefficient of friction¹ than standard HDPE conduit.

Testing at Dura-Line's state-of-the-art, world-class test track has shown that you can air-jet fiber optic cable into a MicroDuct lined with SILICORE ULF almost 5 times farther than without it.



Features

- > Permanent. Remains unchanged for life of conduit.
- > Lowest coefficient of friction available.
- > No performance loss in all temperature conditions.
- > Identifiable by its contrasting white color.
- > Available on HDPE MicroDucts only (regular SILICORE on Riser and Plenum)

Benefits

- > Bypass or eliminate handholes.
- > Reduce the need for permitting.
- > Scale down environmental impact.
- > Save time and money on messy lubricants.
- > Enjoy fewer jetting setups.

¹Compared to Dura-Line's SuperSilicone-lined conduit. Internal lab testing performed on 1.25" SDR Smoothwall conduits.

SILICORE^{ULF} Field-test Results

Air-Jetting Distance

16/12 mm MicroDucts (internal ribs)
HDPE vs SILICORE ULF

HDPE MicroDucts (no lining)

1,044 ft.

HDPE MicroDucts with SILICORE ULF

5,134 ft.

almost
5X
farther

Pulling Tension

1" SDR 13.5 HDPE Smoothwall Conduit
HDPE vs SILICORE ULF

637 lbs.

HDPE Conduit (no lining)

288 lbs.

Conduit with SILICORE ULF

55%
less pulling tension

FuturePath HDPE 8.5/6mm

- Orange oversheath with natural MicroDucts
- SILICORE ULF lining and rip cords are a standard feature
- Available with a 20-gauge locate wire
- All conduits produced to GR-3155-CORE



SINGLE MICRODUCT SPECIFICATIONS

Nom OD (mm/in)	8.5/0.34
Min ID (mm/in)	6.7/0.26

Available Configurations

	SINGLE	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
Nom OD (in)	0.340	0.770	0.850	0.930	1.130	1.480	1.800	2.130
Oversheath (in)	-	0.050	0.060	0.060	0.060	0.060	0.060	0.060
Weight (lb/ft)	0.018	0.075	0.110	0.136	0.207	0.322	0.472	0.579
Bend Radius Sup (in)	3	12	11	12	16	20	24	24
Bend Radius Unsup (in)	7	19	19	20	26	33	41	41
SWPS [†] (lbs)	96	404	593	733	1,112	1,727	2,528	3,099

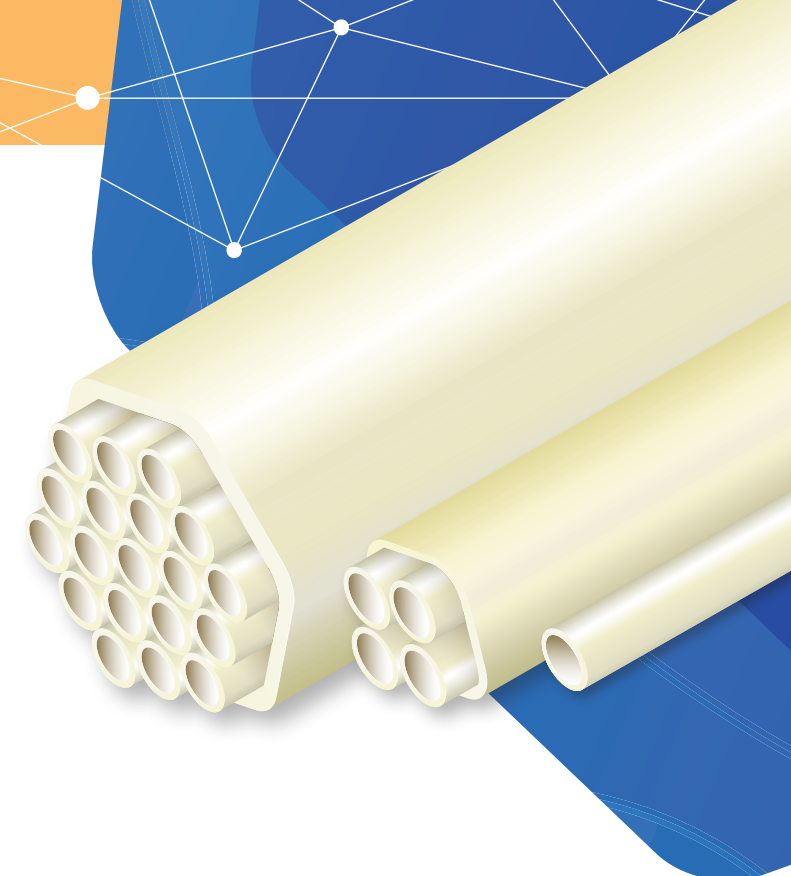
Feet per Reel and Part Numbers

1,000'		10008038	10009422	10009423	10008044	10009425	10009428	10009429
2,500'		10009435	10009436	10009424	10009431	10009426	10009433	10009434
5,000' *6,000'	10012088	10009421	10009437	10009438	*10009439	*10009427	*10009432	*10009430

*Unsupported Bend Radius guidelines should be followed during the installation process. The Supported Bend Radius are post-installation measurements.
[†]Safe Working Pull Strength (SWPS) is calculated at 80% of tensile or breaking strength.

FuturePath Riser 8.5/6mm

- Dull yellow oversheath and MicroDucts
- SILICORE lining and rip cords are a standard feature
- All conduits produced to GR-3155-CORE
- ETL LISTED UL 2024 & CSA C22.2 No.262-04 and UL-94 V-2 & CSA FT4



SINGLE MICRODUCT SPECIFICATIONS

Nom OD (mm/in)	8.5/0.34
Min ID (mm/in)	5.9/0.23

Available Configurations

	SINGLE	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
Nom OD (in)	0.340	0.770	0.850	0.930	1.130	1.480	1.800	2.130
Oversheath (in)	-	0.050	0.060	0.060	0.060	0.060	0.060	0.060
Weight (lb/ft)	0.022	0.091	0.134	0.165	0.251	0.392	0.576	0.706
Bend Radius Sup (in)	3	12	11	12	16	20	24	32
Bend Radius Unsup (in)	7	19	19	20	26	33	41	53
SWPS [†] (lbs)	89	419	165	749	1,119	1,724	2,502	3,050

Feet per Reel and Part Numbers

1,000'	10007320	10004866	10008987	10004591	10004592	10004596	10004599	10004601
2,500'	10009746	10004586	10008988	10004867	10008992	10008979	10008981	10008984
5,000' *6,000'	10015922	10008986	10008989	10008990	*10004594	*10008980	*10008982	*10008985

*Unsupported Bend Radius guidelines should be followed during the installation process. The Supported Bend Radius are post-installation measurements.
[†]Safe Working Pull Strength (SWPS) is calculated at 80% of tensile or breaking strength.

FuturePath Plenum 8.5/6mm

- Opaque white oversheath and MicroDucts
- SILICORE lining and rip cords are a standard feature
- All conduits produced to GR-3155-CORE
- ETL LISTED UL 2024 & CSA C22.2 No.262-04 and UL-94 V-0 & CSA FT6



SINGLE MICRODUCT SPECIFICATIONS

Nom OD (mm/in)	8.5/0.34
Min ID (mm/in)	6.7/0.26

Available Configurations

	SINGLE	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
Nom OD (in)	0.340	0.710	0.770	0.850	1.060	1.410	1.740	2.070
Oversheath (in)	-	0.020	0.020	0.020	0.025	0.025	0.030	0.030
Weight (lb/ft)	0.024	0.076	0.106	0.134	0.229	0.369	0.577	0.713
Bend Radius Sup (in)	3	11	10	11	15	19	23	23
Bend Radius Unsup (in)	7	18	17	18	24	32	39	38
SWPS† (lbs)	89	377	508	626	1,057	1,644	2,552	3,111

Feet per Reel and Part Numbers

1,000'	10005367	10004851	10008950	10004853	10004856	10004857	10004858	10004859
2,500'	10009747	10010091	10010095	10010092	10010097	10010099	10010101	10010103
5,000' *6,000'	10008755	10010093	10010096	10010094	10010098	10010100	10010102	10010104

*Unsupported Bend Radius guidelines should be followed during the installation process. The Supported Bend Radius are post-installation measurements.
†Safe Working Pull Strength (SWPS) is calculated at 80% of tensile or breaking strength.

FuturePath LSZH 8.5/6mm

- Chalky white oversheath and MicroDucts
- MicroDucts ETL verified to UL1685-4 and IEC 60754-1



SINGLE MICRODUCT SPECIFICATIONS

Nom OD (mm/in)	8.5/0.34
Min ID (mm/in)	5.9/0.23

Available Configurations

	SINGLE	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
Nom OD (in)	0.340	0.770	0.850	0.930	1.130	1.480	1.800	2.130
Oversheath (in)	-	0.050	0.060	0.060	0.060	0.060	0.060	0.060
Weight (lb/ft)	0.022	0.088	0.129	0.159	0.242	0.376	0.553	0.647
Bend Radius Sup (in)	3	12	11	12	16	20	24	21
Bend Radius Unsup (in)	7	19	19	20	26	33	41	43
SWPS† (lbs)	89	354	518	634	951	1,461	2,127	2,567

Feet per Reel and Part Numbers

1,000'		10008934	10008937	10008940	10008943	10008925	10008928	10008931
2,500'		10008935	10008938	10008941	10008944	10008926	10008929	10008932
5,000' *6,000'		10008936	10008939	10008942	*10008945	*10008927	*10008930	*10008933

*Unsupported Bend Radius guidelines should be followed during the installation process. The Supported Bend Radius are post-installation measurements.
†Safe Working Pull Strength (SWPS) is calculated at 80% of tensile or breaking strength.

FuturePath Armored 8.5/6mm

- Encased in ZETABON® steel armor for protection from rodents or harsh environments
- Superior mechanical protection against rodents, ballistics, crushing, chemicals, moisture penetration and ground or soil heave
- SILICORE ULF lining and rip cords are a standard feature



SINGLE MICRODUCT SPECIFICATIONS

Nom OD (mm/in)	8.5/0.34
Min ID (mm/in)	5.9/0.23

Available Configurations

	4-WAY	7-WAY	19-WAY
Nom OD (in)	1.110	1.310	1.980
Oversheath (in)	0.060	0.060	0.060
Armored Oversheath (in)	0.070	0.070	0.070
Weight (lb/ft)	0.230	0.319	0.645
Bend Radius Sup (in)	11	13	20
Bend Radius Unsup (in)	22	26	40
SWPS† (lbs)	1,246	1,724	3,473

Feet per Reel and Part Numbers

1,000'	10004596	10004599	10004601
2,500'	10008979	10008981	10008984
5,000' *6,000'	*10008980	*10008982	*10008985

*Unsupported Bend Radius guidelines should be followed during the installation process. The Supported Bend Radius are post-installation measurements.
 †Safe Working Pull Strength (SWPS) is calculated at 80% of tensile or breaking strength.

Jetting Equipment

Jetting equipment is the driving force in the jetted fiber solution.

From simple handheld units powered by variable speed drills to pneumatic- and hydraulic-powered machines, there are a variety of choices to fit your installation needs. The choice of jetting equipment is determined by the size of the cable to be placed and the outer diameter of the pathway. All machines have ranges of optimal performance as well as components to adapt to specific cable and conduit diameters.

The following is a list of industry-recognized manufacturers you can contact regarding the sale/rental/leasing of their jetting equipment offerings compatible for air jetting cables into the Dura-Line MicroDuct products.

When contacting manufacturers, be sure to provide the following information:

- ✓ Cable OD & fiber count
- ✓ Dura-Line FuturePath MicroDuct size (e.g., 8.5/6mm, 12.7/10mm, etc.)
- ✓ Any other MicroDuct sizes being used (e.g., 8/6mm, 10/8mm, etc.)
- ✓ Cable type: the structure of the cable (flat, round, etc) will make a difference on jetting capabilities



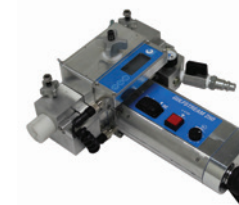
Plumettaz America Corporation

Soddy Daisy, TN 37379
 1-855-PLUMETT (758-6388)
 ussales@plumettaz.com



GMP (General Machine Products (KT), LLC

Trevoze, PA 19053
 (215) 630-2366
 www.gmptools.com



Condux International

Mankato, MN 56001
 (800) 533-2077
 www.condux.com



Fremco Fiber Blowing Machines Inc.

Tucker, GA 30084
 (770) 910-5010
 www.fremco-usa.com

Accessories

Dura-Line offers a complete line of Accessories designed to make your jetted cable installation successful.

Highlighted below are a few of our most popular products. Please visit our website or contact your sales representative for more details.



MicroCouplers and End Caps

- MicroCouplers are used to join two segments of MicroDucts; Straight and Transition Couplers are available
- End Caps and End Plugs keep MicroDucts clean and free of debris
- Gas Block Connectors provide a simple and effective gas seal between the MicroDuct and the fiber cable
- Divisible Duct Seals provide an air- and water-tight seal between the cable OD and the inner wall of the MicroDuct. The hard outer cover is divisible

DESCRIPTION	PART #
8.5mm Straight Coupler	20001834
8.5mm x 8mm Transition Coupler	20001884
8.5mm x 5mm Transition Coupler	20001883
8.5mm End Cap	20001819
8.5 End Plug (for Riser only)	20001523
8.5/6mm Gas Block Connector for Cable OD 3.3-4.0mm	20002104
8.5mm Divisible Duct Seal for cable OD 1.50mm-5.00mm (10/cv)	20005183
8.5mm Bulkhead Connector	20001712

From top:

- Coupler
- End Cap
- End Plug
- Gas Block Connector
- Divisible Duct Seal
- Bulk Head Connector

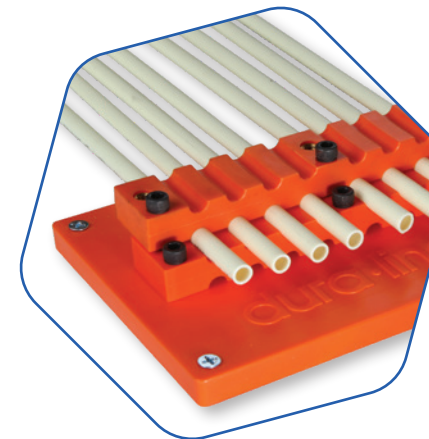


- From top:**
- Round Cutter
 - Straight Cutter
 - Ratchet Cutter
 - Longitudinal Slitter

MicroDuct Cutters

Using the correct tool for the job makes all the difference. Choose from a variety of cutters designed with a special purpose in mind – making the job go safely, smoothly, and quickly.

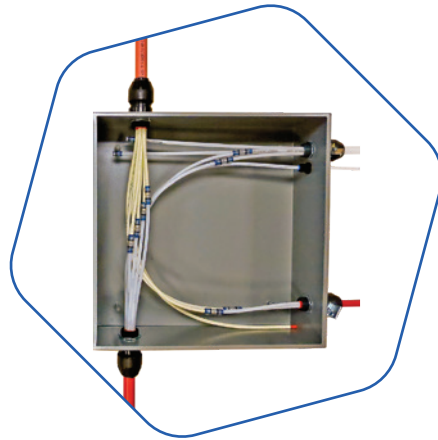
DESCRIPTION	PART #
MicroDuct Round Cutter	20005284
MicroDuct Straight Cutter	20001856
Ratchet Cutter for 3/4" to 1-1/2" Conduit	20001923
Ratchet Cutter for 2" Conduit	20001803
Longitudinal Sheath Slitter	20003768



MicroDuct Mounting Bracket

- Expandable modular system designed to organize multiple MicroDucts at termination
- Small and compact, requiring a minimum amount of mounting space
- Additional brackets can be added as needed; when ordering the Wall Mounting Plate Kit, please note you will also need to order a Top Mounting Bracket to complete the first row

DESCRIPTION	PKG	COLOR	PART #
8.5mm MicroDuct Wall Mounting Plate Kit (Secures a row of 8 MicroDucts. Includes a wall plate, 2 brackets, and 6 screws to complete a full first row)	each	orange	20093818
8.5mm MicroDuct Top Mounting Bracket (each bracket secures a row of 8 MicroDucts, with 3 screws)	each	orange	20001719



MicroDuct Distribution Box

The MicroDuct Distribution Box or MDB is a convenient indoor junction box where multiple MicroDucts can be joined together. For example, this would be used to drop a tube to an adjacent floor, while allowing other MicroDucts to pass through to the next MDB. The NEMA 12 box is a continuous hinge wall mount type box available in two sizes listed below. The box is used in conjunction with the FuturePath enclosure connectors.

DESCRIPTION	CONFIGURATION	PART #
Box 16x14x8 NEMA 12 JIC 1 Door Continuous Hinge Wall Mount - MDB	16 x 14 x 8 NEMA 12	20002884
Box 20x20x7 NEMA 12 JIC 1 Door Continuous Hinge Wall Mount - MDB	20 x 20 x 7 NEMA 12	20003021

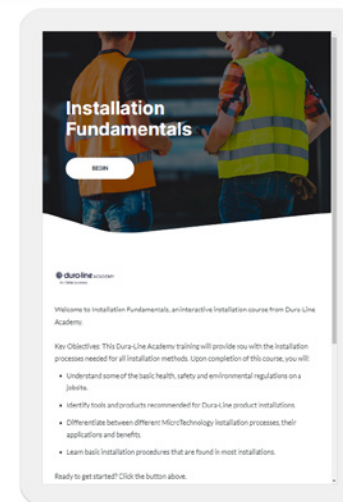


FuturePath Enclosure Connectors

CONFIGURATION	PART #
Enclosure Connector 8.5mm single	20003048
Enclosure Connector 8.5mm 2-way	20001915
Enclosure Connector 8.5mm 3-way	20003049
Enclosure Connector 8.5mm 4-way	20001916
Enclosure Connector 8.5mm 7-way	20001917
Enclosure Connector 8.5mm 12-way	20001918
Enclosure Connector 8.5mm 19-way	20001919
Enclosure Connector 8.5mm 24-way	20001920

Dura-Line Academy

Dura-Line Academy provides industry-leading training to design, deploy, and maintain networks flawlessly around the world.



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- Fiber Optics 101
- FuturePath 7-way Coupling Procedure
- HDPE vs PVC
- SILICORE ULF and Coefficient of Friction
- Understanding Bend Radius
- Clear-Lock Installation
- And many more...

Full Courses



Installation Fundamentals



MDU Installations



Micro Trench Installations



Trench Installations

For more information: contact academysupport@duraline.com
 Visit our website at academy.duraline.com





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