OverRides

& SUBDIVIDING EXISTING CONDUITS

dura·line

An Orbia Connectivity Solutions business.

Do You Have Untapped Potential?

As our reliance on broadband reaches new heights every day, millions of new fibre connections are being made. But did you know there could be significant untapped connectivity potential in your existing network?

There are lots of reasons to install new fibre in an existing conduit:

- Meet increased capacity demands
- Upgrade old cables and fibre
- Add redundancy or backhaul
- Sell dark fibre or bandwidth

There's no better way to get the most out of legacy conduits than with MicroTechnology:

MicroDucts

Protective pathways for miniaturised fibre-optic cables

FuturePath

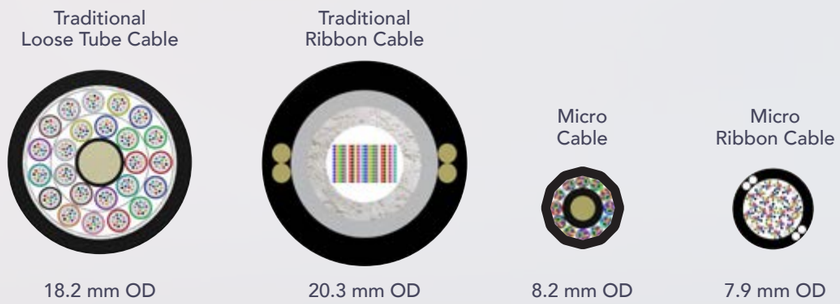
Multiple MicroDucts bundled under an oversheath

Accessories

For installing, opening, and coupling MicroDucts

MicroTechnology unlocks the latest in fibre-optic cable technology

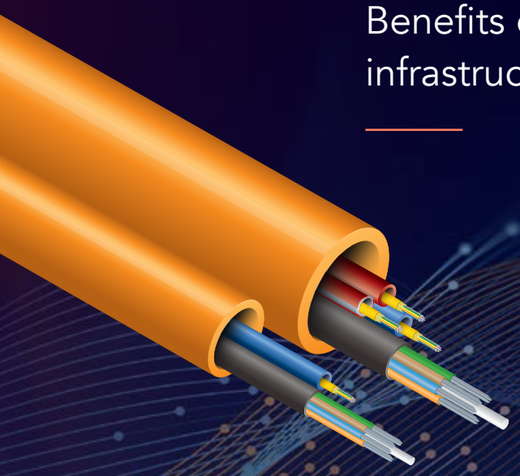
Micro cables are significantly smaller than traditional designs with the same number of fibres and constructions that enable single- or mass-fusion splicing:



Side-by-side comparison of different cable designs each containing 288 fibres

Images courtesy of Corning

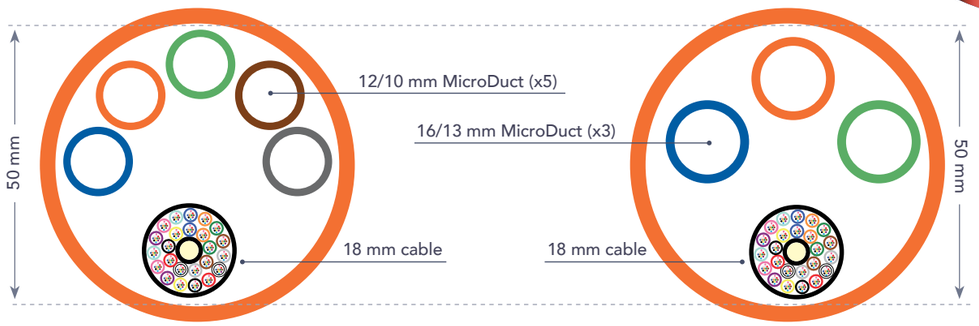
Benefits of rejuvenating existing infrastructure with MicroTechnology:



- ✓ No digging
- ✓ Lower cost
- ✓ Fewer/no permits required
- ✓ Instant additional fibre capacity
- ✓ Faster project timelines
- ✓ Environmentally friendly

Even occupied conduits can be upgraded with a MicroDuct OverRide:

MicroDucts can be installed alongside an existing cable quickly and easily. The exact number and sizes of MicroDucts depends on your fibre count and routing requirements. Always install all your MicroDucts at the same time.

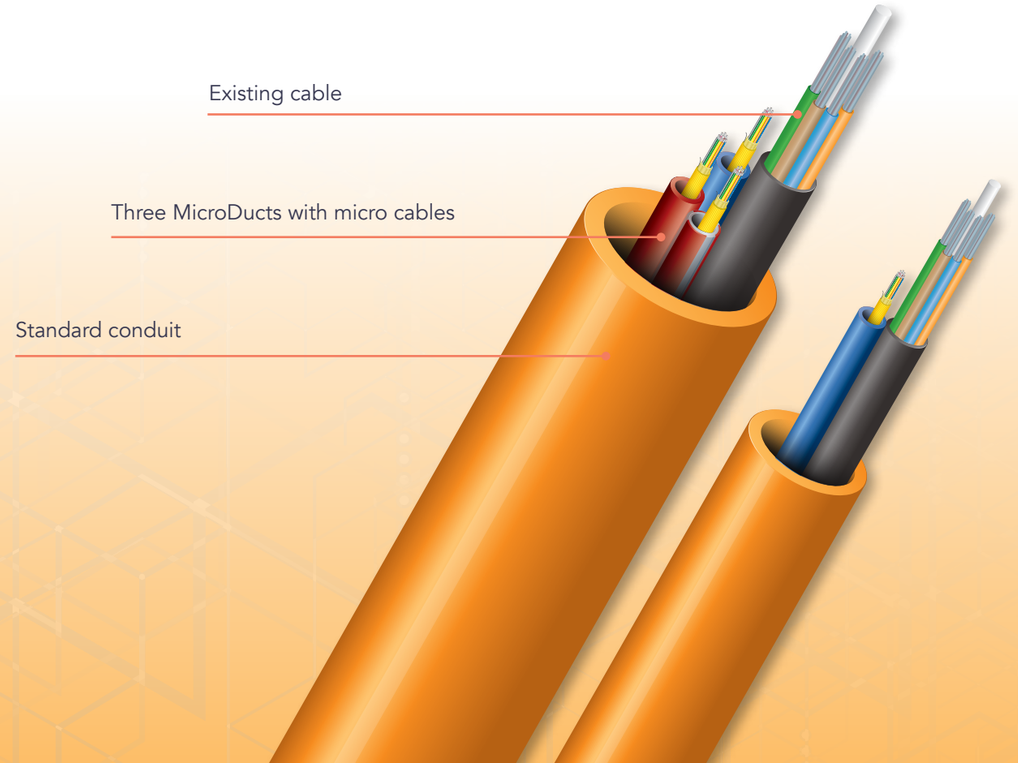


Option 1: More pathways, lower fibre counts

Example: dense urban network with distributed connectivity.

Option 2: Fewer pathways, higher fibre counts

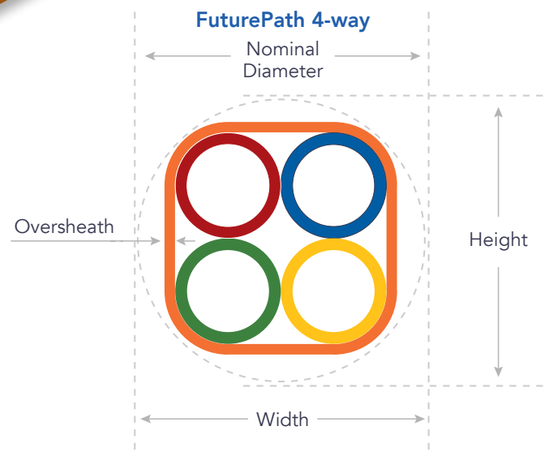
Example: backhaul network providing express transport.

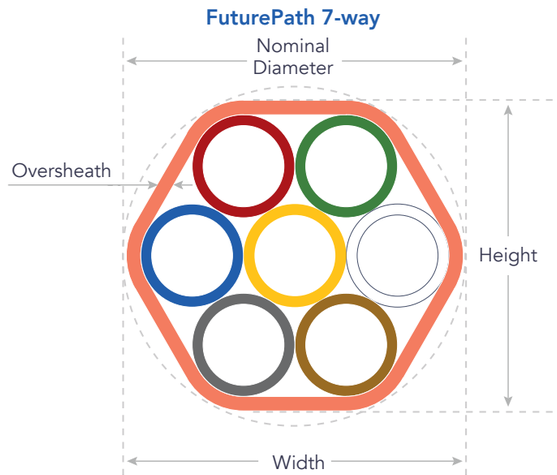


MicroDucts and FuturePath

MicroDucts are small pathways whose sizes are identified by their outer diameter (OD) and inner diameter (ID), with standard sizes ranging from 3 to 20 mm OD.

FuturePath is a bundle of MicroDucts with a protective oversheath and can be manufactured in HDPE, low smoke halogen free (LSHF), and fire-retardant materials, as well as aerial and Figure-8 configurations. In addition to single MicroDucts, FuturePath configurations are available with 2 to 24 pathways that allow for rapid deployment of fibre today with permanent pathways in place for future growth.





An array of sizes and configurations to meet an array of needs.

OD/ID (MM)	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
7/3.5	●	●	●	●	●	●	●
7/4	●	●	●	●	●	●	●
10/6	●	●	●	●	●	●	●
12/8	●	●	●	●	●		
14/10	●	●	●	●	●		
16/12	●	●	●	●	●		
20/16	●	●	●				

MICRODUCT SIZE (OD/ID MM)	ESTIMATED FIBRE COUNT (# FIBRES IN CABLE)	FIBRE CABLE OD RANGE (MM)
7/3.5	up to 12	1.8 - 2.6
7/4	up to 12	2 - 3
10/6	up to 48	3 - 4.5
12/8	up to 96	4 - 6
14/10	up to 144	5 - 7.5
16/12	up to 288	6 - 9
20/16	up to 864	8 - 12

Note: the above fibre counts are offered as a guide only. Some manufacturers may be able to offer higher fibre counts for a given MicroDuct size.

Sustainability is a modern prerequisite for investment in fibre infrastructure.

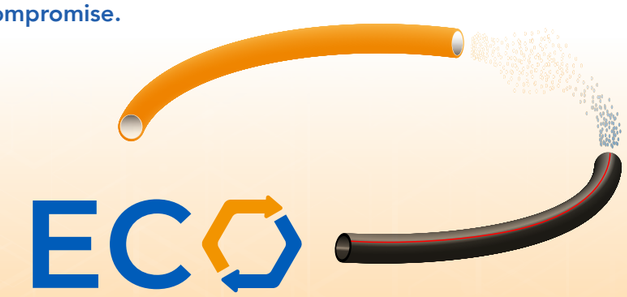
OverRiding or subdividing an existing conduit is already one of the most environmentally friendly fibre deployment methods. And now there's a way to lower your installation footprint even further.

MicroDucts and **FuturePath® ECO**, from Dura-Line, use up to 100% reground HDPE from our own internal manufacturing process.

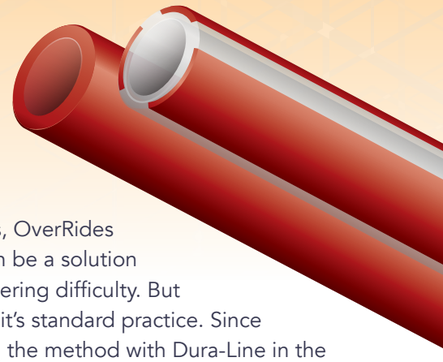
This range helps network owners reduce scope 3 emissions, which can account for up to 98% of their overall footprint.

All of this, with equivalent performance to regular MicroDucts against key technical parameters.

That's sustainability without compromise.



Customer spotlight: CETIN



CETIN a.s. operates the largest telecommunications network in Czechia, covering 99.6% of the population with both fixed and mobile technologies, and providing international transit services to over 200 operators worldwide. It has over 1 million connections on its fixed network alone.

As a provider of wholesale infrastructure services, flexibility and scalability are of utmost importance to CETIN. That's why they choose to subdivide their nationwide underground conduit network with MicroDucts.

"Our philosophy is based on the principle of neutrality. We guarantee operations equal access to our services, equal business rules, and equal treatment", says Martin Sudík, CETIN's senior network infrastructure specialist.

For some operators, OverRides and subdividing can be a solution to a specific engineering difficulty. But for CETIN, it's standard practice. Since trialling the method with Dura-Line in the year 2000, the company has completed thousands of projects over 25 years across its backbone, metro, and FTTH networks.

"Previously, everything was based on large HDPE conduit and the only way to connect from a main route was to place a closure and splice. This took very careful planning and execution", says Sudik.

"But if we subdivide with, for example, 10 x 7/5.5 mm MicroDucts, we can connect up to ten places or objects very easily – both from an installation and maintenance perspective."

And by avoiding digging, CETIN has saved millions in construction costs and won back countless project days that might otherwise have been spent waiting for civil works permits.

There are two main MicroDuct installation methods for existing networks:

Both can be used to subdivide an empty conduit or perform an OverRide:

- **Mechanical Insertion:** uses a winch or rod to pull the MicroDucts.
- **Air-Jetting**: uses high-speed air, in combination with a tractor pusher, to propel the MicroDucts into the conduit.

The most appropriate MicroDuct installation method depends on:

- The **material** of the existing conduit
- The **size** of the existing conduit
- The **space** available inside
- The **distance** you need to deploy

Open the spread to learn more

Method 1: Mechanical Insertion

A long-established installation method with two variations:

1. Pulling

MicroDucts are pulled through the conduit with a rope or tape using a winch and capstan. Installation is relatively slow, but setup is minimal, making pulling ideal for larger, older conduit structures over relatively short distances, e.g., a congested downtown location.

2. Rodding

A fibreglass rod is pushed through the conduit by hand or a powered tractor belt and MicroDucts are pulled back through. Power rodding is typically twice as fast as winch pulling and can be particularly productive over relatively short distances of 300 metres, or less.

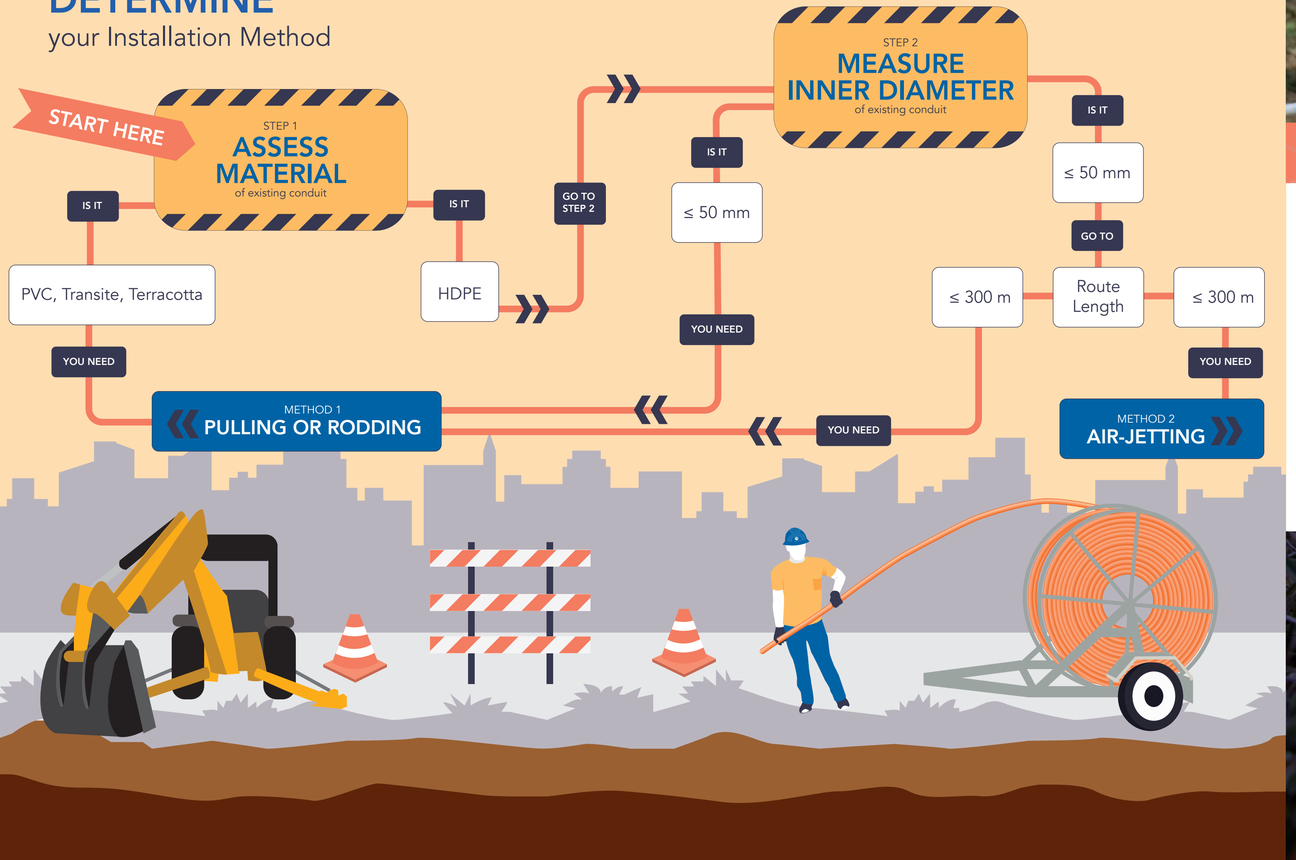
SAFE WORKING PULL STRENGTH (SWPS)

The maximum pulling force to be exerted on a MicroDuct or bundle, past which deformities can occur and impact jetting performance. SWPS varies by product, so always consult product information before installation.

KEY STEPS:

1. Feed pull rope, tape, or rod through the existing conduit
2. Attach pulling eye(s) and harness to the MicroDuct(s)
3. Pull MicroDuct(s) back through the conduit

DETERMINE
your Installation Method



Method 2: Air-Jetting

Enables faster fibre placement over longer distances than mechanical insertion, with three variations:

1. Jetting MicroDucts into an empty conduit (subdivision):

A one-pass process which eliminates the need to rope or rod the existing conduit. MicroDucts are propelled by a tractor belt and high-speed compressed air.

2. Jetting MicroDucts into an occupied conduit (OverRide):

A legacy cable can be isolated with a "Y-block" so that an already-occupied conduit can be pressurised for MicroDuct jetting.

3. Jetting micro cables into a MicroDuct:

With MicroDucts in place, fibre can be installed up to three times faster with air-jetting than mechanical insertion methods, over distances exceeding 2 km.

MICRODUCT PLACEMENT

Always install all your MicroDucts at the same time to avoid twisting and to optimise installation distance and speed – whether your existing conduit is empty or occupied.

	Mechanical Insertion: Pulling	Mechanical Insertion: Rodding	Air-jetting
Material of Existing Duct	HDPE, PVC, Transite, Terracotta	HDPE, PVC, Transite, Terracotta	HDPE
Size of Existing Duct	Any standard conduit size	Any standard conduit size	≤50 mm ID
Route/Section Length	≤ 300 m	≤ 300 m	≥ 300 m
Installation Speed	Good	Better	Best
Best for...	Short distances in older structures	Faster installs over short distances	Longer distances at high speed

Consideration 1: Fill Ratio

Two key calculations when populating conduits and MicroDucts with fibre:

For MicroDucts in Existing Ducts (including OverRides):

The ratio between the inner area of the existing conduit and the area of any existing cables and the new MicroDucts should not exceed 55%:

$$\left\{ \frac{\text{Cross-sectional area of existing cable(s)} + \text{Cross-sectional area of additional MicroDucts}}{\text{Inner area of existing duct}} \right\} \times 100$$

Cross-sectional area of cables, conduits, and MicroDucts is calculated using Area = πr^2

For Micro Cable Jetting:

For optimal jetting performance, the ratio between the inner diameter of a MicroDuct and the outer diameter of a micro cable should be between 50% and 75%:

$$\left\{ \frac{\text{Outer Diameter (OD) of cable}}{\text{Inner Diameter (ID) of MicroDuct}} \right\} \times 100$$

Fill Ratio Calculator

The days of "back of an envelope" calculations are gone!
Check out Dura-Line's fill ratio calculator and find the best conduit and cable solution in seconds.

www.duraline.com/odid-calculator

Consideration 2: Jetting Equipment

Three essential pieces of equipment:

1. Jetting Machine Used to jet both MicroDucts and optical fibre cable. Machines differ in size according to what they need to install but all typically have three key features:

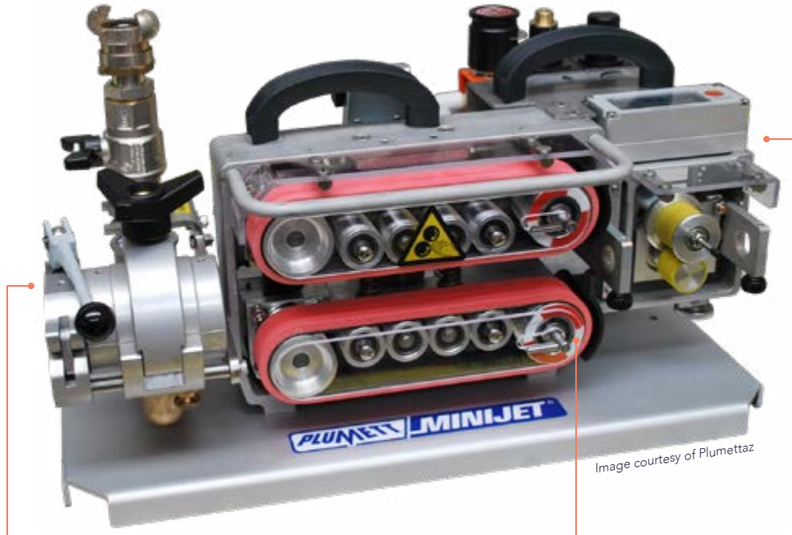


Image courtesy of Plumettaz

Cable Guide

Aligns the MicroDuct(s) or cable to be placed with the forward conduit or cable seal insert

Seal

Duct clamp, cable insert, and seals to secure the conduit to the jetting unit and prevent air loss around the cable and duct

Tractor Drive

Propels MicroDuct/cable through pathway

2. Air Compressor Supplies high-speed compressed air for jetting. A chiller and water separator may be required to optimise performance in humid climates.

3. Y-Block Isolates an existing cable in a conduit so the conduit can be pressurised and MicroDuct can be guided from the pusher to the Y-Block through a feed tube, thus "over-riding" the existing cable.

Image courtesy of Plumettaz

IMPORTANT CONSIDERATIONS: JETTING MACHINES

- Machines vary in size and power source requirements (hydraulic, pneumatic, or electric) according to the type of installation
- Some machines can be used to jet both MicroDucts and optical fibre cable
- Ensure appropriately sized fittings and seals for MicroDuct/cable
- Speed and air pressure controls vary according to machine and manufacturer. Most machines are also equipped with electronic speed/distance displays, and some have specialised data logging capabilities

Consideration 3: MicroDuct Preparation

Three best practices for flawless MicroDuct installation and cable jetting:

1. MicroDuct Inflation

Prior to MicroDuct insertion, place an end cap on the free end of each MicroDuct and inflate to 6-7 bar to provide stiffness for jetting.

2. MicroDuct Coupling

Make clean, straight cuts with an appropriate MicroDuct cutter and ensure MicroCoupler and MicroDuct sizes match.

3. MicroDuct Proofing

After MicroDucts have been installed, recommended proofing steps include:

1. Applying air pressure to validate the open-ended section's point-to-point connection
2. Jetting a sponge or foam spreader to clear out any water and debris
3. Pressurising to approx. 7 bar and observing for significant pressure loss due to cuts in the conduit or leaks at in-span couplers
4. Jetting through a proofing ball (plastic BB) sized 80% of the conduit ID to ensure no kinks or flattening issues

Popular Accessories

Dura-Line offers a complete line of accessories designed to make your cable jetting and MicroDuct installation successful.

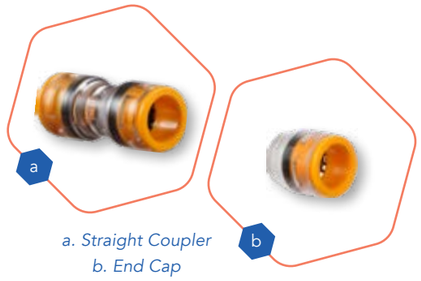
Highlighted below are a few of our most popular products. Please visit our website or contact your sales representative for more details.

a. MicroDuct Cutter
b. Scoring Tool for MicroDucts
c. FuturePath Jacket Cutter
d. 360° Rotary Duct Cutter
e. Duct Cutter

Conduit and 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 Cutter, 5 – 14 mm	20095313
Scoring Tool for MicroDucts 10/8, 12/10 mm	20095311
Scoring Tool for MicroDucts 14/10, 16/10 mm	20095312
FuturePath Jacket Cutter	20095316
360° Rotary Duct Cutter, 26 – 40 mm	20095319
360° Rotary Duct Cutter, 36 – 52 mm	20095318
Duct Cutter, 20 – 64 mm	20095315



a. Straight Coupler
b. End Cap

MicroDuct Connectors and End Stops

- Connectors make connections between MicroDucts quickly and easily without the need for tools.
- End stops provide a gas- and water-tight seal of a MicroDuct pathway to prevent moisture or debris from entering the conduit.
- An optional cover provides increased impact resistance.

DESCRIPTION	PART #
MicroDuct Connector 7 mm with clips	20073165
MicroDuct Connector 10 mm with clips	20073166
MicroDuct Connector 12 mm with clips	20073167
MicroDuct Connector 14 mm with clips	20073168
MicroDuct Connector 16 mm with clips	20073169
MicroDuct Connector 20 mm with clips	20073170
MicroDuct Connector 7 mm with cover	20073171
MicroDuct Connector 10 mm with cover	20073172
MicroDuct Connector 12 mm with cover	20073173

DESCRIPTION	PART #
MicroDuct Connector 14 mm with cover	20073174
MicroDuct Connector 16 mm with cover	20073175
MicroDuct Connector 20 mm with cover	20073176
MicroDuct End Stop 7 mm	20020006
MicroDuct End Stop 10 mm	20020005
MicroDuct End Stop 12 mm	20020015
MicroDuct End Stop 14 mm	20020035
MicroDuct End Stop 16 mm	20020057
MicroDuct End Stop 20 mm	20020227

DuraPack MicroDuct Seals

- Used to seal a sub-duct around a bundle of loose MicroDucts inside a standard duct following end- or mid-span access.
- Multiple configurations available according to combination of sub-duct and MicroDucts.

DESCRIPTION	PART #
DuraPack MicroDuct Seal 50/7x10 mm	20020021
DuraPack MicroDuct Seal 50/7x12 mm	20020022
DuraPack MicroDuct Seal 40/5x10 mm	20040012

Lubricant

- Prelube 2000™ is a high-performance lubricant designed to coat the inner wall of a conduit or MicroDuct prior to cable installation.

DESCRIPTION	PART #
Prelube 2000™ 950 ml	20095346
Prelube 2000™ 3.8 l	20095344
Prelube 2000™ 19 l	20095347

MicroDuct Installations Key Equipment List

Mechanical Insertion: Pulling

- ✓ Winch and capstan
- ✓ Pull rope/tape, harness, and swivel
- ✓ MicroDuct pulling eyes
- ✓ MicroDuct couplers and end caps
- ✓ Appropriate MicroDuct cutters
- ✓ Reel stand
- ✓ Power supply (if using electric capstan)

Mechanical Insertion: Rodding

- ✓ Rodder (may be accompanied by powered tractor unit)
- ✓ Feed tube
- ✓ MicroDuct pulling grips
- ✓ MicroDuct couplers and end caps
- ✓ Appropriate MicroDuct cutters
- ✓ Reel stand
- ✓ Power supply (if using powered rodder)

Air-Jetting

- ✓ Jetting machine with appropriate belt and inserts for MicroDuct jetting
- ✓ Air compressor (with cooler and water separator for humid climates)
- ✓ Feed tube
- ✓ Y-Block
- ✓ MicroDuct couplers and end caps
- ✓ Appropriate MicroDuct cutters
- ✓ Reel stand
- ✓ Power supply

There is significant untapped connectivity potential in existing conduit assets.

Revitalising them with MicroTechnology bypasses some of the major challenges facing network expansion via lower labour and material requirements compared with new-build infrastructure.

And doing so is easy with two installation methods that can be employed according to the material and size of the existing duct, the space available inside, and the distance you need to deploy.

Learn more about MicroTechnology and OverRides at www.duraline-europe.com

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OverRide Installations

Plumettaz MiniJet Installations

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For more information: contact academysupport@duraline.com
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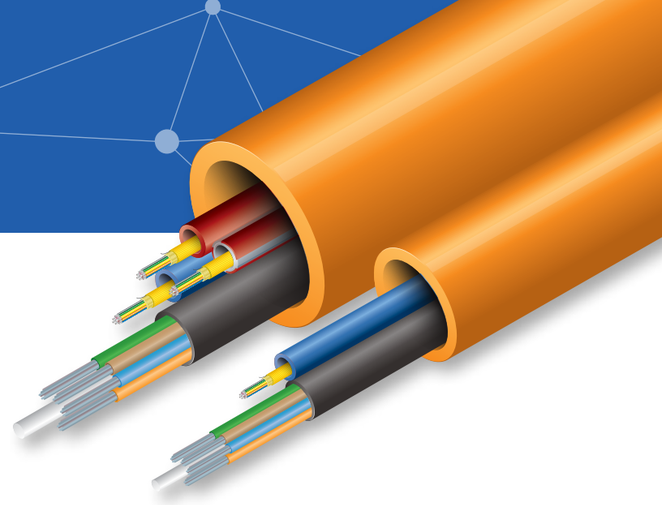
Notes



Dura-Line is the leading global manufacturer of communication infrastructure products including conduit, MicroDucts and accessories. We have been making connections possible across telecom, CATV, wireless, and enterprise networks for more than 50 years. With our innovative product solutions, unparalleled customer insight, strong production capabilities and high-quality standards, Dura-Line is perfectly poised to support aerial MicroDuct solutions for efficient FTTH deployments.

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