

Fiber To The Home 2012

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About us

Fibrain Ltd is a company offering proven access solutions **FTTx, FTTH**.

Self-concept, a unique solutions and the completeness of the products allow for a new look at the NGN building and access networks. An additional advantage of the company as a supplier is unique approach to the offered products. We do not supply only the materials but complete solutions starting from concept, through design, and services performed by our trained and certified contractors. As confirmation of the quality we can do certification of the ready network with performance measurements and full coverage of the guarantee of reliability

The product and solution range

As supplier of solutions we realize that implementation of FTTH networks today faces a great diversity of project areas requiring usage of not one but several technologies compatible with each other. Our offer includes solutions for practically every area and topology.

Outdoor solutions:

VertiJet - preconnectorized system base on micropipes with nanopatchcords

AirTrack - aerial access, based on ADSS cables for short and mid span

MetroJET - microducting system of FTTH application covering micro cables blown on demand

DDC - (Direct Access Duct Cables), **BURRY-DAC** (Direct Buried Direct Access Cables) - solution based on direct buried cables or/and preinstalled micropipes with cables

Indoor and building solutions

Vertiqio - easy access indoor riser cables with fiber module taping possibilities

VertiDrop - indoor Direct Access Subscriber Cables system

VertiJet - indoor micro ducts system with blown or pulled nanopatchcords

Vertiqio Facade - easy access outdoor riser cables system with fiber module taping possibilities



Passive solutions in FTTx NGN networks

- FBT couplers 1x2, 1x3, 1x4 and special design with 1x5, 1x6, 1x7, power differentiation
- PLC splitters 1xn, 2xn with different housing
- FWDM triplexers
- CWDM and DWDM solutions
- FBG filter for network active monitoring

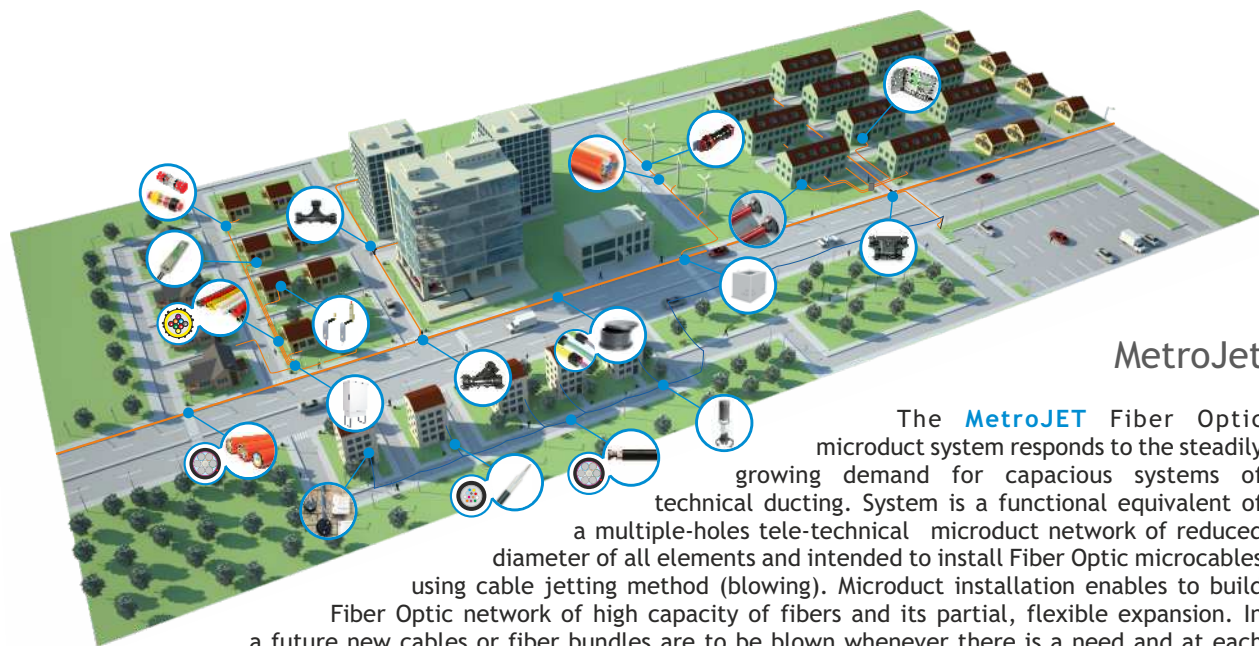
Active solutions in FTTx NGN networks

- GPON solution
- GEAPON solution
- 10GEAPON solution



FTTx Systems

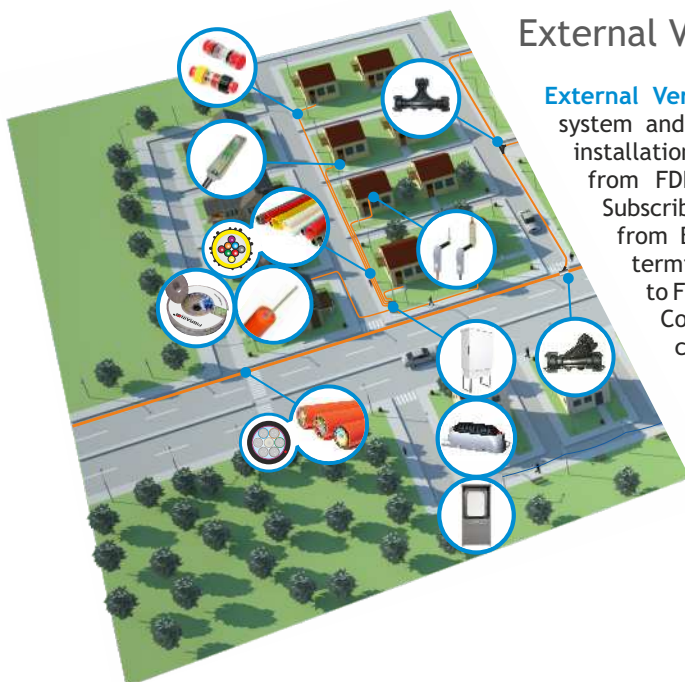
Given the characteristics of the FTTH common denominator of all the construction techniques will be to optimize expenditures on materials, but also for execution by simplifying the installation operations, reductions in the quantities propagation of fiber and passing the largest part of the installation tasks to the manufacturer of materials (the growing role of prefabricated materials). In our systems, this trend is particularly taken into account.



MetroJet

The **MetroJET** Fiber Optic microduct system responds to the steadily growing demand for capacious systems of technical ducting. System is a functional equivalent of a multiple-holes tele-technical microduct network of reduced diameter of all elements and intended to install Fiber Optic microcables using cable jetting method (blowing). Microduct installation enables to build Fiber Optic network of high capacity of fibers and its partial, flexible expansion. In a future new cables or fiber bundles are to be blown whenever there is a need and at each requested stage of a project. Microduct installation allows to design network with no unnecessary surplus. Allows to optimize construction scope, expenses on each stage of the project and what is the most important enable to provide fiber capacity which is required for next years.

External VertiJet

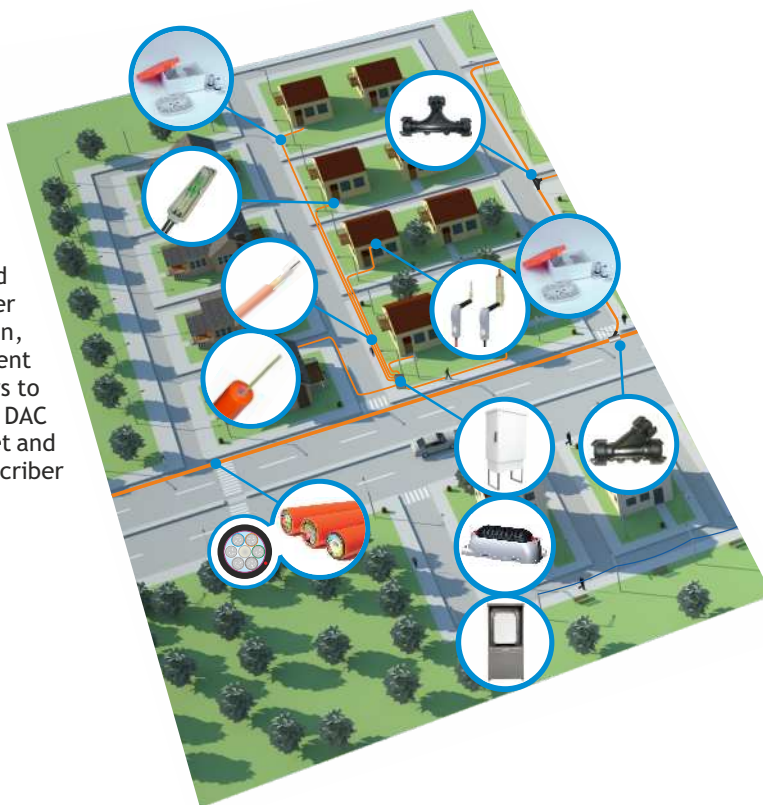


External VertiJET System is based on MetroJET microducting system and also building cabling system VertiJET. It involves installation of DB bundle of microducts in star method starts from FDH street cabinet up to particular family house. Subscriber connection is done by blowing of nanopatchcord from BX or CX cable family to the microduct. One side terminated nanopatchcord goes from subscriber place up to FDH street cabinet in which it is spliced with line cable. Connection type depends on transmission system chosen.



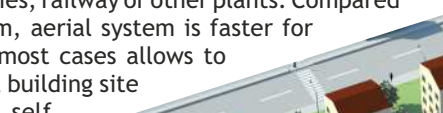
DDC / Burry DAC

Idea of **Burry DAC** system involves placing directly in the ground (similar then in External VERTIJET system) cables with special, adapted construction. Cable design allows easy installation and high durability to the crush and pulling. Fibers placed in the loose tube filled with hydrophobic jell and additional layer prevent longitudinal water penetration. To strengthen construction, aramid yarns and additional FRP element moulded in outer jacket are used. That allows to bend a cable just in one direction. Installed DAC Burry cable is terminated in FDH street cabinet and second side through the wall entry at the subscriber point.

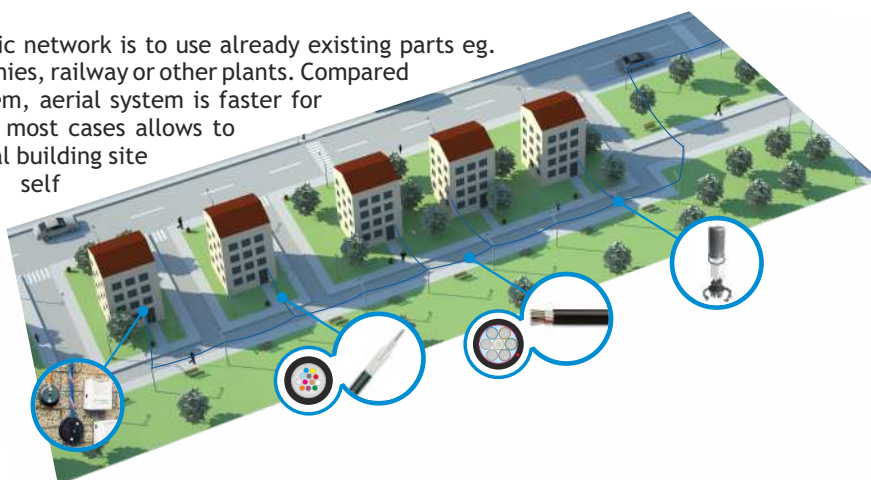


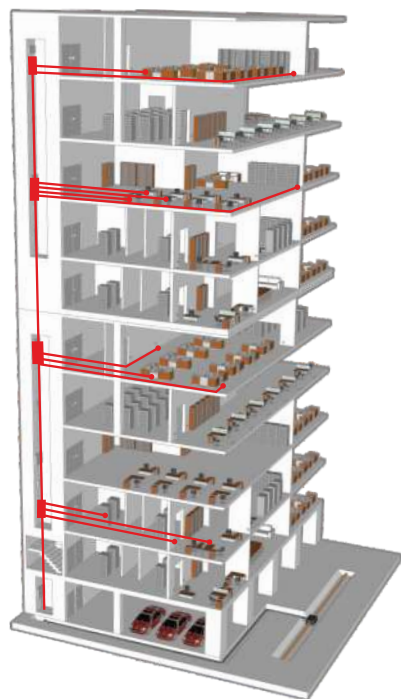
AirTrack

One of the idea to build Fiber Optic network is to use already existing parts eg. poles which belong to power companies, railway or other plants. Compared with direct buried microduct system, aerial system is faster for installation, less expensive and in most cases allows to avoid necessity of getting additional building site permissions. For aerial system self supported cables ADSS are used as well as Resilink Drop Cable, AERO cables, FO pole enclosures, anchoring clamps, suspension clamps, anchoring pole brackets and others. That is how FIBRAIN **AirTrack** works.



The diagram illustrates an aerial fiber optic network installation. It shows a street with buildings and a road. A series of poles are installed along the street, supporting fiber optic cables. The cables are shown running along the poles, with some sections being buried underground. The diagram also shows a cross-section of the cable and a close-up of the cable's internal structure, highlighting the use of self-supported cables (ADSS) and various components like suspension clamps and anchoring pole brackets.





Vertiqio

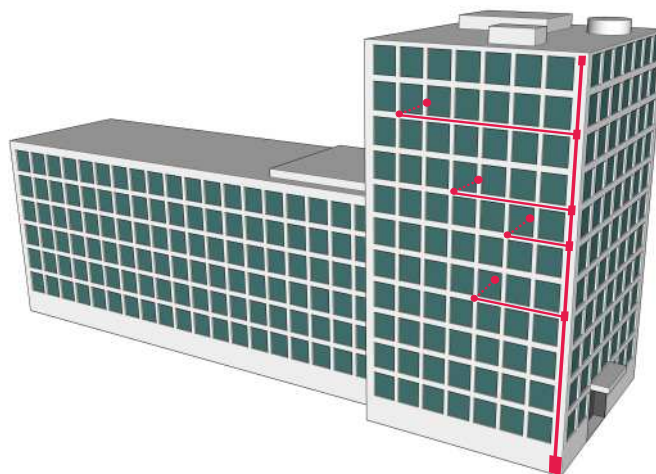
Vertiqio - is an innovative system that uses fiber buildings cables (indoor riser cables) with special design for easy fiber optic branch without the need for splicing at the branch. In addition to fiber optic cable system is equipped with a complete set of accessories such as distribution points, floor MDUs, riser boxes, customer outlets etc.

The system is ideal in high apartment buildings and office buildings. A key feature of this system is the easiness of building a indoor vertical building wiring, connecting each user to point of distribution (multi-dwelling unit MDU).

Vertiqio Facade

Facade - is an innovative system that uses fiber buildings cables (outdoor riser cables) with special design for easy fiber optic branch without the need for splicing at the branch. In addition to fiber optic cable system is equipped with a complete set of accessories such as distribution points, floor MDUs, riser boxes, customer outlets, etc.

The system is ideal in high apartment buildings and office buildings. A key feature of this system is the easiness of building a outdoor vertical building wiring, connecting each user to point of distribution (multi-dwelling unit MDU).

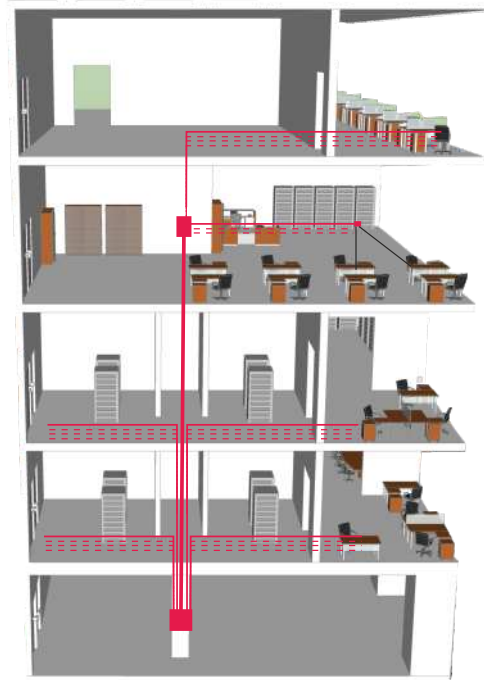




VertiDrop

VertiDrop - is an user-friendly system base on preterminated kits (customer outlet and drop cable). In addition to customer kits system is equipped with a complete set of accessories.

The system is ideal for small and medium apartment buildings or office buildings. Can also mix with Vertiqio or Facade systems as a ready solution for different floors or segment of the higher buildings. A key feature of this system is plug-and-play concept. All products are delivered as a preinstalled kits which save labor cost and installation time.



VertiJet

VertiJet - is a system which base on air blow fiber and preterminated nanopatchcord kits. The idea is similar to VertiDrop system but customer connection are done in a indoor microtubes not through drop cables. At the first stage of investment is possible to install only the tubes and in next step connect the customer by blowing or pulling the preterminated nanopatchcord.

This system idea save labor cost and installation time.

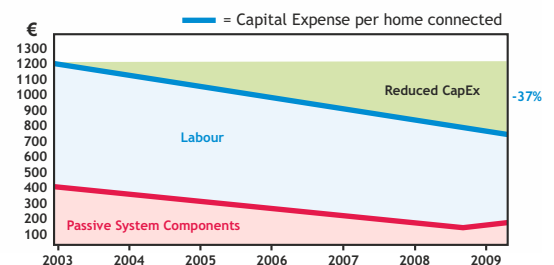
Why fiber is the best solution for the access network? Even so, that last mile can be extended by up to 10 or even 20 km from the vast reduction in the number of nodes required elevated operator.



Technical support, advisory and training

Introduction into Polish and European market many new telecommunication solutions, ideas, FO systems teaches us our lesson that important aspect of such implementation is technical and design knowledge. Years of experience allows us to offer to our customers technical and design support of special, dedicated Technical Support Department which focuses on telecommunication technology.

Cooperation with local governments and authorities gives us lots of experience and well references. We take care of implementation of new projects related to design of Information Society infrastructure. Our offer is based on years of experience in an internal and abroad market which creates database of case studies. Design is based on telecommunication norms as well as our own developed standards (PON network, microduct, FTTH building networks, etc.) referring to new technologies. Challenging projects require calculation and measurement of our Technical Support Department assisted by our own Optoelectronics Laboratory.



FTTH project characteristics

To successfully built and implement modern FTTH network you need to realize how big work must be done and especially define basic parameters of such system.

Design aspects

Design aspects:

At this stage you need to elaborate a conception and project which will be developed at the next stages. System must be uniformed, based on well known, checked solutions, which allows later management and maintenance.

Features that must be taken into account:

- Number of end points with small fiber count to the subscriber
- Number of branching ducts that demand fiber splicing
- Number of fibers that are required to connect all subscribers
- Project scale that covers from hundreds to thousands of subscribers at different locations
- Network topology that depends on TV and Ethernet signal providing technology
- Number of different locations that require different types of compatible networks working together
- Building of network not at operators site, which requires place to put connection points.



Logistic aspects:

- Implementation stages, cover primary stage, development and network expansion
- Project scale, volume of products ordered, uniformity of technology, future access to next products belonging to the network
- Important for project implementation is cost and work optimization which leads to minimizing of qualified installers and also use of expensive devices
- Striving to maximize prefabricated elements in deliveries

Installation aspects:

FTTH is young and still expanding solution. Installers knowledge who work in typical telecommunication market is very often incomplete, covering just particular area which can arise during bigger FTTH project implementation. To face such problems and cover all arising issues we arrange not just trainings but also project management and advice of Project Manager. The one who uses such help can be sure that all requirements of system are covered. Additionally such investment is implemented in easier and faster way with costs minimization.

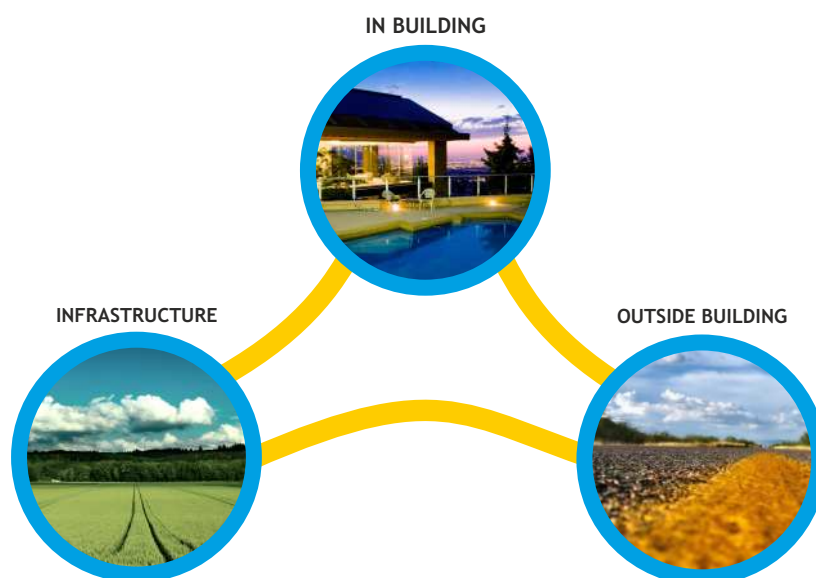
Project Manager also takes care of measurements and test verification.

FTTx installation technique types

To properly and easily build and run advanced FTTH networks in the early concepts must be aware of the enormity of the challenges that await us and to define the basic types and parameters of such a network.

The basic installation techniques and as well as quite different products used in this technique include:

- Direct burial
- Directional Drilling
- Inside Sever
- Mole ploughing
- Trenching
- Slot Cutting
- Aerial
- Semi-aerial



05

Fiber Optic housing estate

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Fiber To The Home
Fiber Optic housing estate



Fiber Optic housing estate

FO housing estate is a one of first in Poland complete conception. Such solutions is built of all telecommunication systems which are needed for present estate infrastructure with wide use of fiber optic as a medium.

MULTIMEDIA

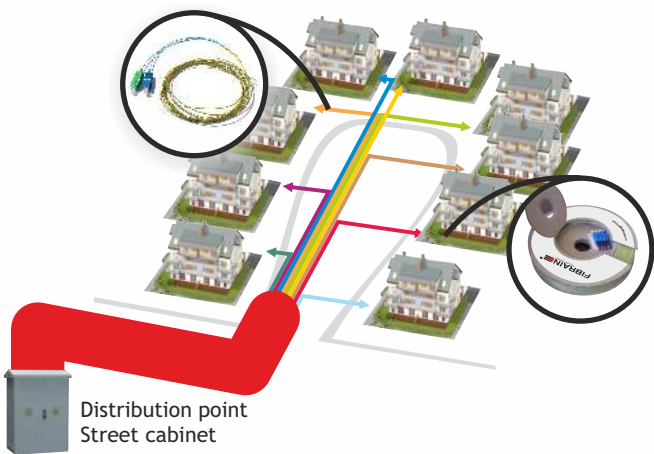
- cable TV
- internet access
- antennas
- multimedia services

MEDIAAND MEASUREMENTS

- estate automation
- testing systems
- backlight control

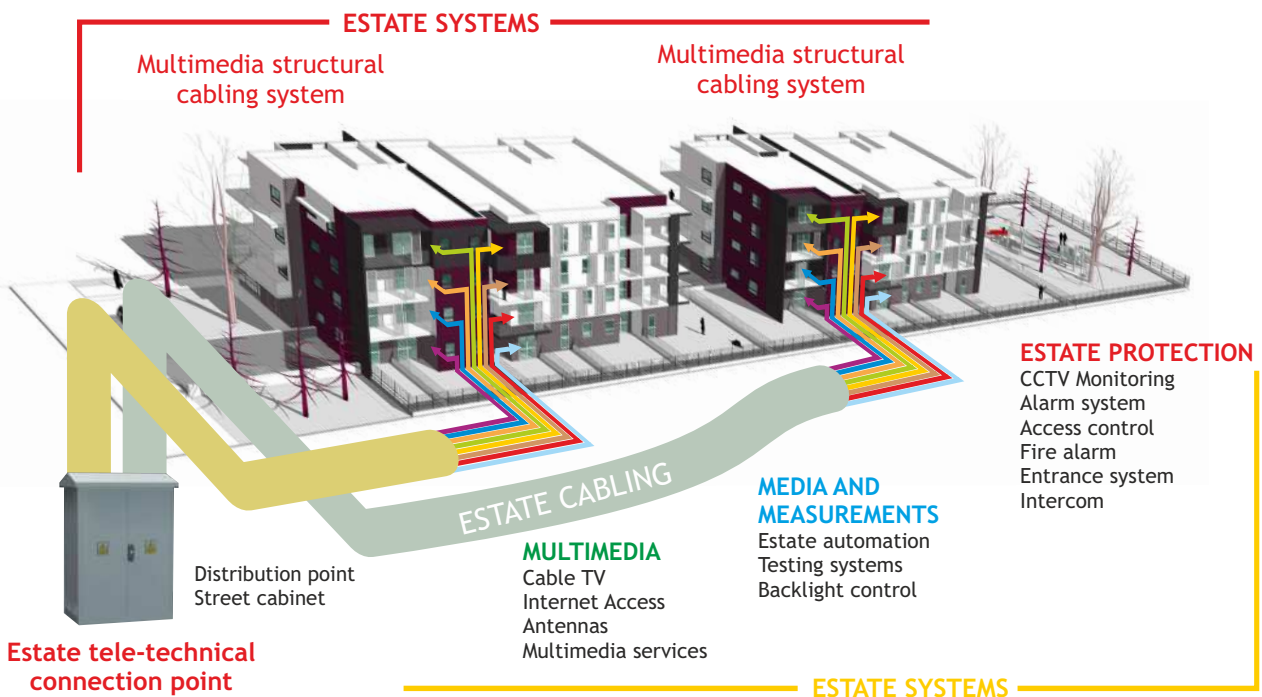
ESTATE PROTECTION

- CCTV monitoring
- alarm system
- access control
- fire alarm
- entrance system
- intercom



Choice of technology depends on answer to below questions:

- Is there a cheap way to lead Fiber Optic to the building?
- What are the coefficients of the initial and final fulfill?



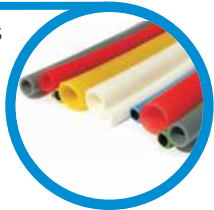


External VertiJET

External VertiJET System is based on MetroJET microducting system and also building cabling system VertiJET. It involves installation of DB bundle of microducts in star method starts from FDH street cabinet up to a particular family house. Subscriber connection is done by blowing of nanopatchcord from BX or CX cable family to the microduct. One side terminated nanopatchcord goes from subscriber place up to FDH street cabinet in which it is spliced with line cable. Connection type depends on transmission system chosen.

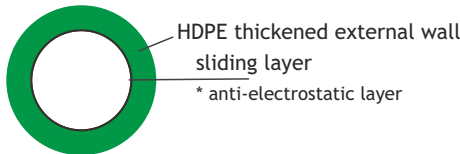
Direct Buried Microducts

MetroJET microducts are basic element of microcanalization. Appropriate selection determines parameters of whole system and influences cost and further development. Having on mind above we offer range of microducts made of best quality materials we gain product of pressure resistance minimum 12 bars.



Direct buried microducts			
Type [mm]		Outer diameter	Inner diameter
		[mm]	[mm]
7/3	MT-SD10-ASOH	7	3
7/3,5	MT-SD11-ASRH-R	7	3.5
8/3,5	MT-SD12-ASOH	8	3.5
10/5,5	MT-SD15-LR0H	10	5.5
12/8	MT-SD20-LR0H	12	8
14/10	MT-SD24-LR0H	14	10

Direct buried MT-SD



Ordering no.: MT-SDxx

Foiled microduct bundle MT-WDL, MT-WDB

Microduct bundles MT-WF Fibrain MetroJET system are microducts that are pre-fabricated with foil for easier laying. There are two types of foiling available: loose type in form of foil stripe or tight type where all micropipes in bundle are surrounded by one foil sheath MDPE.

Bundles include up to dozen or so standard configuration of microducts of different diameters. Choice of appropriate configuration depends on place in fiber optic network (frame pipes, distribution pipes or access pipes).



Direct Buried MT-WDL, MT-WDB		
Microducts arrangement		Reference
Qty	Type	
4 x	7/3.5	MT-WDL-0704-ASOH
7 x	7/3.5	MT-WDL-0707-ASOH
6 x	8/3.5	MT-WDL-0806-ASOH
6 x	10/5.5	MT-WDL-1006-ASOH
5 x	12/8.0	MT-WDL-1205-LR0H
6 x	12/8.0	MT-WDL-1206-LR0H
6 x	14/10.0	MT-WDL-1406-LR0H
3 x	8/3.5	MT-WDB-0803-ASOH
7 x	8/3.5	MT-WDB-0807-ASOH
3 x	12/8.0	MT-WDB-1203-LR0H
5 x	12/8.0	MT-WDB-1205-LR0H
7 x	12/8.0	MT-WDB-1207-LR0H

Ordering no.: MT-WDL,
MT-WDB

Features and Benefits

- Microducts bundles are surrounded by PE or LSOH sheath
- Microducts can be installed in primary, secondary canalization, can be direct buried or installed indoor including under plaster installation
- As on option microducts are available with antistatic layer
- As on option microducts can be equipped with rope for microbundle pulling

Preinstalled Direct Buried Microduct - PDBM DAC



PDBM DAC are preinstalled micro duct with microcable inside. Customer can order specified lengths with different types of cable inside. Such a solution reduce to the minimum labor cost during installation and necessary equipment which is needed for installation.

PDBM DAC					
MicroDuct type	MicroDuct lenght	Fiber count	Fibre type	Cable length	Con. type
7/3	1-1000 [m]	2F-12F	SM2 G652.D	1-1000 [m]	SC
7/3.5	1-1000 [m]	2F-12F	S7A-G657.A1	1-1000 [m]	SC/APC
8/3.5	1-1000 [m]	2F-12F	S72-G657.A2	1-1000 [m]	LC
			S7B-G657.B2		LC/APC
			S73-G657.B3		other

PDBM can be delivered from 1-1000 m length with cable from 2-12F preconnectorized or not.

Nanopatchcords



Nanopatchcord FTTH is multi-connectorised cable with minimized outer diameter up to: 1-2 mm. Fibers are pre-terminated with FO connectors. Nanopatchcords are classified as the last mile products for end- customer/subscriber connection. Provided as tailor made product according to the customer request where reduction of splice points is needed. There is plenty of different connectors configurations. Perfect for blowing into METRO Jet microducting system. Main application is FTTH system as well as structural building system and distribution points connections where large number of fibers is packed in the small space. It is used for servers wiring to multiply connections between cabinets.

Construction and application

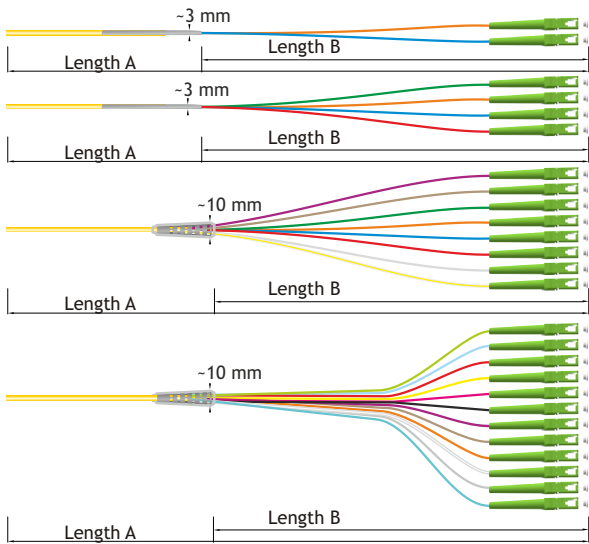
Due to small cable size and for an easy cable installation, fibers are provided on a cartoon reels. It guarantees protection of the terminated fibers. Additionally it simplifies installation process and prevents mixing up fibers together. Pre-connectorisation allows termination up to 12 fibers with diameter 250 µm. On each fiber additional 0.9 mm coating is pulled.

Application:

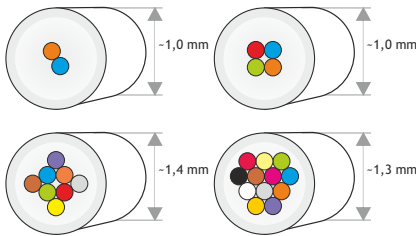
- Construction: 2, 4, 8, 12 fibers
- Terminated and provided onto light cartoon reel
- Small lateral cable dimensions, small units diameter. For pre- installation in microducts parameters for blowing purposes
- Different fiber types for different application
- Save of time when installing
- Save of splices
- Small weight for transportation purposes

Characteristics:

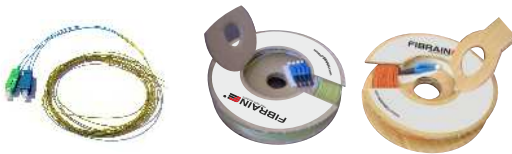
- Compact construction
- Possibility to install directly in microducts 5/3.5, 5/3.8, 4/3
- Different fiber types available
- Splices reduction up to 50%
- Easy and fast installation
- All connector type available
- Delivered onto cartoon reels that protects fiber terminations during transport and installation
- Fiber bundles up to 12 fibers



Cross-section of fiber bundle MK-BX2



Packing sample



Ordering no.: VFTO-A-xx

FDH cabinet - Fiber Distribution Terminal cabinet

Fibrain FDH cabinets are designed for redistribution of optic fibers lead in by major microcanalization fiber optic buses to the end users. Thanks to the simple construction those cabinets are ideal solution for ground-based endpoints. They facilitate splicing of distribution cables and drop cables or microcables bundles. Moreover it makes possible to place overlength of cables and tubes inside.



Features and Benefits

- Made of powder-coated steel
- IP34 or with use of additional casing for fusion splice field IP65
- Possible application of FlexyJET connection set for microtubes organization
- Equipped with lock
- Fusion splice field up to 144 splices

Application:

- urban networks
- FTTH
- Fiber optic micorcanalisation systems
- optic fibers distribution
- last mile connections

Ordering no.: FDH-02-96-00

SCAB cabinet - Street Cabinets

Fibrain Street Cabinets of standard 19” and 21” are made on basis of a aluminum profile of special construction providing housing maximum hermetic and modularity. Moreover cabinets capacity was increased up to 800 kg and overall weight decreased. Vibration and shock resistance tested according to IEC 61969-3 and shock resistance IEC 61969. Minimal proofness IP54.



Street cabinet 19” SCAB
Standard types*

Dimensions (W)x(D)x(H) [mm]	Height [U]	Reference
840x450x941	15	SCAB-19-15-12-S
840x450x1252	22	SCAB-19-22-12-S
1650x450x1202	22	SCAB-19-22-12-S

Applications:

- urban networks
- FTTH
- microducting
- CCTV
- telecommunication

* Special design available on demand.
More details look at Outdoor cabinets and Enclosures catalog.

Burly - DAC DBPOP

The DBPOP Fibre to the Home Distribution Closure is a direct buried closure developed for the application of 2 Ø14/10 mm direct buried feeder ducts and up to 48 direct buried FTTH subscriber drop cables. The closure provides an underground space for the over length of the blown 96FO minicables (microcables) and direct buried drop cables. Its compact size fits in the ditch and is easy to be installed by civil workers. A quick startup of the first phase can be achieved because the closure is independent of the FTTH conceptclosure is based on the special design sleeve, usually installed in sewer, with the same basics parts.



The standard location marker eases precise digging for each further process step. Cable over length enables fusion splicing in a controlled environment above the ground. The Fiber Management (FM) back plate provides an easy entry watertight seal and integrated cable retention for each individual cable. After the splicing the FM back plate is mounted watertight inside of the black protective lid and the cables are reeled in the underground closure. Suitable for 2 incoming 96 FO minicables (microcables) and maximum 48 direct buried drop cables. Maximum splice capacity 96 splice protectors heatshrink.

Technical data

Number of cable ports	2 feeder cables (1 in / 1 out) + 48 drop cable
Number of splice trays	8
Splice tray capacity	12 splice protectors heatshrink
Looping length of fibres (cm)	30
Crush resistance	50 000 N (on buried closure)
Water immersion	IP68, EN 60529
	Water depth 1 meter, 7 days, no leakage
Dimensions (cm)	90 x 35 x 30
Weight (kg)	10

Features and Benefits

- Compact in size
- Direct buried
- Standard with a location marker (Telecom) 101.4 kHz
- Protection of underground cable overlength
- Buried closure withstands 5.000 kg wheel load
- Impact resistant
- Halogen-free

Fiber To The Home
Fiber Optic housing estate - External VertiJET

Direct buried joints



System joints are used for connection of microducts made of HDPE (for MDPE pipes are separate ones) their diameters are selected accordingly to MetroJET microducts series. These elements guarantee sure and permanent connection that facilitates blowing fiber optic cables (pressure durability minimum 12 bars) and during maintenance period appropriate water resistance and cable duct integrity.

DB Straight Connector	
Microduct size	P/N
8 mm	MT-ZPD-08-HD (3,5 mm bore)
10 mm	MT-ZPD-10-HD
12 mm	MT-ZPD-12-HD
14 mm	MT-ZPD-14-HD (10 mm bore)

DB End Cap	
Microduct size	P/N
8 mm	MT-ZTD-08-HD
10 mm	MT-ZPD-10-HD
12 mm	MT-ZPD-12-HD
14 mm	MT-ZPD-14-HD

DBCCP - Direct buried customer connection point



- Features and Benefits**
- Tight and strong construction which allows direct buried application
 - IP 68 according to EN 60529
 - Allows to use as direct buried fixing enclosure or extension point of end user connection
 - Holders for cable strengthening elements
 - Ability to do 6 fiber optic splices
 - FO splice cassette included

Technical data	
Number of cable ports	2
Number of splices	6
Cables/Microducts diameter (mm)	4 - 11
IP Rating	Ip68 - EN 60529
Dimensions (mm)	120 x 95 x 55

Fiber Access Terminal for 8 drop cables



- Features and Benefits**
- Termination Box can be mounted internally or externally and is sealed to IP55
 - Removable cover for easy access and fitted with a lock for enhanced security
 - Single hinged splice tray enables access for working. The splice tray is supplied interchangeable inserts and can accommodate up to 8 fusion splice protectors of heat shrink or crimp type or 8 mechanical splices
 - Customer drop cables (patch cords) exit from the bottom of the unit and are sealed using a split grommet. Drop cables can also be routed through the wall
 - Up to 4 SC type pigtails and adapters or 8 LC type pigtails and adapters can be accommodated
 - All fibre are positively bend managed to a 30 mm minimum bend radius
 - External input cable enters the unit from the bottom. Cable up to 11 mm in diameter can be accommodated
 - For Blown Fibre applications a gas block connector can be housed within the box
 - A knock out is provided in the base of the unit for applications where the customer drop patch cords are required to be routed through the wall into the premises

Technical data	
Number of Splice Trays	1
Maximum Fibre Capacity	8
Maximum Input Cable Diameter	11 mm
Maximum No. of Input Cables	1
IP Rating	55
Max Output Cable Diameter	3.2 mm
Maximum No. of Output Cables	8
Dimensions	140x185x32
Operating temperature	-20°C - +50°C (5 to 95% RH)

External VertiJet FLEXIJET tubes

FlexiJET connection set is durable and flexible pipe with numbered micropipes. It is very practical solution for blown cables into street cabinets as well as for server rooms. It may be used as external micropipes lead into building. FlexiJET construction facilitates extension in easy way by blowing new microcables into empty micropipes.



Features:

- superior characteristic for blowing microcables
- easy installation process
- robust, high crush resistance
- micropipes easy identification
- high capacity of fibers within small microcable external diameter

Types:

Equipped with micropipes (mm): 3/2; 4/2; 5/3,5; 6/4; 7/5,5; 8/6; 10/8; 12/10,
FlexTube diameter: 16/11, 20/14.5, 25/19, 28/23, 32/25
Connectors types: straight, sealing, gas-proof, waterproof, etc.
Identification: each microduct has a ID no. at both sides
Length: To be consulted. On customer's demand

Construction:

Robust and flexible conduit with preinstalled microduct that are numbered on both sides for easier identification. As an option it may be equipped with stoppers (end connector) or straight connectors for connection with microduct.

Microduct	Types [mm]						
	3/2	4/3	5/3.5	7/5.5	8/6	10/8	12/10
6*	○	○	○	○	○	○	○
12*	○	○	○	○			
24*	○	○					

* Other constructions available on demand.

Specification:

- PVC
- norm: EN 50086-1 and 2-3, IEC-614
- resistance to crush of 320 N
- operation temperature: -30° C - +60° C

MT-CSxx	xx	- xxx.xx	-xx	.xx	.xx	.xx	
Qty	Micropipe type [mm]	Lenght [m]	Connectors				
			Side(s)	Stoppers	Straight	Waterproof	Gas-proof
06	03 - 3/2	002,00 m	Two	21	22	23	24
12	04 - 4/3		One	11	12	13	14
24	05 - 5/3,5		Without	00	00	00	00
	07 - 7/5,5						
	08 - 8/6						
	10 - 10/8						
	12 - 12/10						

Example: MT-CS2403-002.75-00.00.00.00 - flexiJET 24 x microduct 3/2 mm 2.75 m, without connectors

CLU - Customer Lead-in Unit

Features and Benefits

- Ergonomic design
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Prevents the accidental damage of optical cables during installation through walls, and therefore eliminates return to site costs due to fibre breaks / macro bending
- Gas / Water block facility for a single tube cable
- Removable cover for easy access
- Internal unit manufactured of fire resistant UL94-V0 rated material

Technical data

Number of cable ports	1
Maximum cable diameter (mm)	13
Maximum capacity	1 Tube (5 mm)
Maximum no. of customer feeds	1
Dimensions (Internal Unit - 1 Tube)	65x26x15
Dimensions (Internal Unit - Cable)	180x36x36
Dimensions (External Unit)	180x36x36
Operating temperature	-20° C - +50° C
IP Rating	Ip68
Weight (kg)	0.5



Fiber To The Home
Fiber Optic housing estate - External VertiJET

05

Customer Outlet VFTO-A - 2 fibers



Features and Benefits

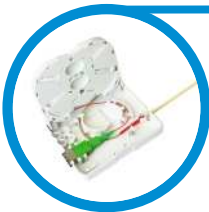
- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear or bottom
- All fibres are securely managed to maintain a 30 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit on bottom face and are protected by cover

Ordering no.: VFTO-A-xx

Technical data

Number of input cable ports	1
Maximum input cable diameter (mm)	10
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	120x100x24
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.095

Customer Outlet VFTO-B - 2 fibres



Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom or top
- All fibres are securely managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit on bottom face via shuttered SC adapters

Ordering no.: VFTO-B-xx

Technical data

Number of input cable ports	3
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	100x80x22
Operating temperature	-40C - +75° C
Material	UL94 HB
Weight (kg)	0.060

Customer Outlet VFTO-C - 4 fibres



Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom, top, left or right
- Supplied with a bracket for wall mounting or mounting directly onto a DIN Rail
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Supplied with a security screw to prevent unauthorised access
- Patchcords exit unit at bottom face via shuttered SC adapters

Ordering no.: VFTO-C-xx

Technical data

Number of input cable ports	2 bottom 1 rear 1 top 1 left 1 right
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	4
Maximum no. of customer feeds	4
Dimensions	83x100x27
Operating temperature	-20° C - +50° C
Material	UL94 V0
Weight (kg)	0.1

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Fiber To The Home
Fiber Optic housing estate - External VertiJET

Fiber To The Home

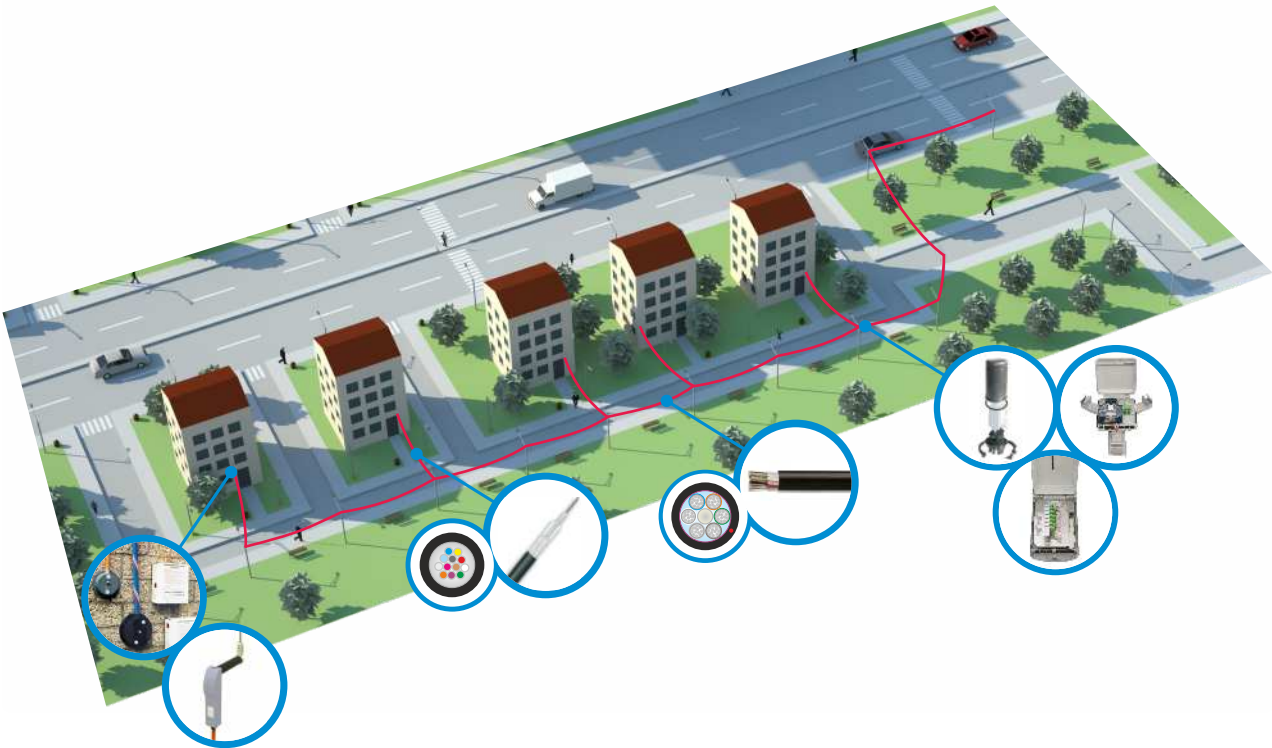
Fiber Optic housing estate - FIBRAIN AirTrack

05



FIBRAIN AirTrack

One of the idea to build Fiber Optic network is to use already existing infrastructure elements eg. poles which belong to power companies, railway or other plants. Compared to direct buried microduct system, aerial system is faster for installation, less expensive and in most cases allows to avoid necessity of getting additional, problematic building site permissions. For aerial system, ADSS self supported cables are used as well as Resilink Drop Cable, AERO cables, FO pole enclosures, anchoring clamps, suspension clamps, anchoring pole brackets and others.



Fiber To The Home
Fiber Optic housing estate - FIBRAIN AirTrack

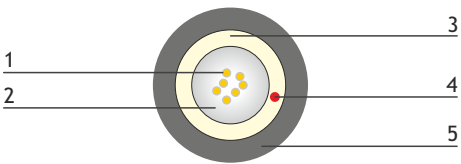
AirTrack Aero 1800N



Aerial cables designed for short spans (up to 50 m). Dedicated to connect last mile subscribers in FTTH networks. Construction with up to 24 fibers in central tube filled with hydrophobic gel. Cables are strengthened with fiberglass reinforcements. Cables are UV and moisture resistant what guarantees cable long life in external environment.

Construction:

- Central tube jelly filled
- Glass yarn reinforcement and anti rodent protection
- Water penetration resistance according to IEC 60794-1-F5
- Light and dense construction
- Completely dielectric
- UV resistance



- 1. 250 µm coating
- 2. Central tube jelly filled
- 3. Fiberglass reinforcement WB
- 4. Ripcord
- 5. Outer thermoplastic jacket PE

Application:

- Outdoor aerial FO installations
- FTTH networks
- Aerial connections for last mile subscribers

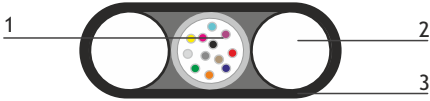
Technical parameters Cables AERO PE

Number of fibers	2	4	6	8	12	16	24
Weight (kg/Km)			40			50	
Outer diameter (mm)			7.0			7.9	
- error margin				±0.3			
Tensile load (N): - perm.				1000			
- Installation				1800			
Temperature range				-40° C - +70° C			
Crush (N)				1500			
Installation parameters							
Max span distance	20	30	40	50	105		
Wind speed (Km/h)	0	60	0	100	0		
Ice Thickness (mm)	15	10	10	0	5		

AirTrack ADSS Flat - F2



AirTrack ADSS Flat F2 cable - with outdoor destination - up to 12 fibres. Main features: excellent mechanical resistance, 100% dielectric, tough, resistance, available Aerial drop applications.



- 1. Fiber optics
- 2. FRP
- 3. Outer Jacket

Construction:

- Contains fiber optics, FRP and outer jacket
- Moisture protected
- Flame retardand
- Completely dielectric
- Light and dense construction
- Applications: outdoor, self-supported drop cable FTTx

Application:

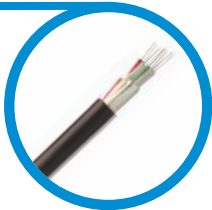
- Outdoor aerial FO installations
- FTTH networks
- Aerial connections for last mile subscribers

Technical data

Type	F200
Fibre Count	Up to 12
Fibre Type	G652D/G657A
Fibres Identification	Colour Code
Strength Members	FRP
Outer Jacket	Black PE
Weight (kg/km)	31
Outer diameter	3.8 mm x 7.0 mm
Max. Tensile Load	1200 N
Min. Bend. Radius	20 x OD / 30 x OD
Operating Temperature	-40° C - +70° C

AirTrack ADSS (4kN, 6kN, 9kN, 11kN, 16kN)

Dielectric cable with single jacket. Strengthen with fiberglass reinforcements. Characterized by opto, physical and mechanical features which allow to install it in tele-technical canalization. Cable can be installed by pneumatic method (blowing) or mechanical method (pulling).



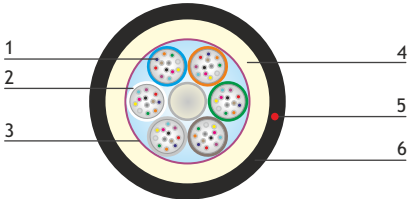
Construction:

- Multitube construction, tubes jelly filled
- Moisture resistant tape
- Fiberglass yarns
- Water penetration resistance according to IEC 60794-1-F5
- Completely dielectric
- UV and moisture resistance

Application:

- External FO connections
- Campus FO networks
- Distribution FO networks
- Terminals connections
- Primary and secondary ducting

AirTrack ADSS
4kN, 6kN

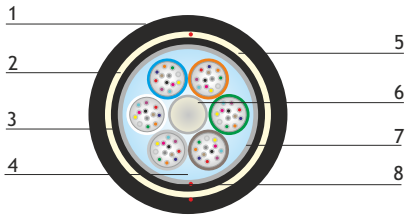


1. 250 µm coating
2. Central tube jelly filled
3. Moisture resistant tape
4. Aramid yarns
5. Ripcord
6. Outer thermoplastic jacket PE

Construction 4kN, 6kN:

Version	2T x 6F	4T x 6F	4T x 12F	6T x 12F	8T x 12F	12T x 12F	nT x 12F
Fibers: - number:	12	24	48	72	96	144	up to 288
Nominal Diameter (± 5%):	10.0 [mm]			11.8 [mm]		15.0 [mm]	*Inquiry
Nominal weight 4kN (± 10%):	83 [kg/km]			120 [kg/km]		165 [kg/km]	*Inquiry
Nominal weight 6kN (± 10%):	85 [kg/km]			125 [kg/km]		170 [kg/km]	*Inquiry
Standard lengths:	2 km, 4 km, 6 km			2 km, 4 km (other length on request)			
Non standard constructions:	available on request						

AirTrack ADSS
9kN, 11kN, 16kN



1. Black MDPE/HDPE outer sheath
2. Peripheral strength member
3. Black MDPE/HDPE inner sheath
4. Loose tube with fibers and jelly
5. Water blocking tape
6. FRP central strength member
7. Ws yarns
8. Ripcord(s)

Construction 9kN, 11kN, 16kN:

Version	2T x 6F	4T x 6F	4T x 12F	6T x 12F	8T x 12F	12T x 12F	nT x 12F
Fibers: - number:	12	24	48	72	96	144	up to 288
Nominal Diameter 9kN (± 5%):	13.5 [mm]			15.3 [mm]		17.2 [mm]	*Inquiry
Nominal Diameter 11kN (± 5%):	13.8 [mm]			15.5 [mm]		17.6 [mm]	*Inquiry
Nominal Diameter 16kN (± 5%):	14.5 [mm]			16.0 [mm]		18.1 [mm]	*Inquiry
Nominal weight 9kN (± 10%):	135 [kg/km]			160 [kg/km]		205 [kg/km]	*Inquiry
Nominal weight 11kN (± 10%):	140 [kg/km]			170 [kg/km]		225 [kg/km]	*Inquiry
Nominal weight 16kN (± 10%):	150 [kg/km]			185 [kg/km]		240 [kg/km]	*Inquiry
Standard lengths:	2 km, 4 km, 6 km			2 km, 4 km (other length on request)			
Non standard constructions:	available on request						

Mechanical and environmental parameters 4kN, 6kN, 9kN, 11kN, 16kN:

Parameter	Norm	Value
Max tensile load (N) - 4kN:	EN 187101, IEC 60794-1-2.E1,	4000 N
Max tensile load (N) - 6kN:	EN 187101, IEC 60794-1-2.E1,	6000 N
Max tensile load (N) - 9kN:	EN 187101, IEC 60794-1-2.E1,	9000 N
Max tensile load (N) - 11kN:	EN 187101, IEC 60794-1-2.E1,	11000 N
Max tensile load (N) - 16kN:	EN 187101, IEC 60794-1-2.E1,	16000 N
Crush (N):	EN 187101, IEC 60794-1-2-E3, no attn. rise	2000 N [N/10 cm]
Bending resistance:	EN 187101, IEC 60794-1-2-E11, no attn. rise	10 [cycles (15x D)]
Temperature range: (installation):	EN 187101, IEC 60794-1-2-F1, no attn. rise	-10... +50 [°C]
Temperature range: (operation):		-40... +60 [°C]
Temp. range: (transport & storage):		-40... +70 [°C]
Water penetration resistant:	IEC 60794-1-2-F5,	3m under water for 24h

Fibers' colors:

Colors:	red	green	blue	white	violet	orange	grey	yellow	brown	pink	black	turquoise
names	red	green	blue	white	violet	orange	grey	yellow	brown	pink	black	turquoise

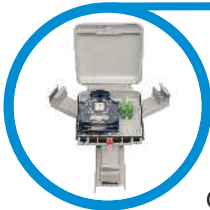
Tubes' colours in each layer*:

Colors:	blue	orange	green	brown	grey	white	red	black	yellow	violet	pink	turquoise
names	blue	orange	green	brown	grey	white	red	black	yellow	violet	pink	turquoise

*Once tubes number exceed 12, colour code will repeat.

Fiber To The Home
Fiber Optic housing estate - FIBRAIN AirTrack

OBP S1 v1



OBP-S1 Size 1 is designed for outdoor/indoor FTTH branch point for 12 to 36 fusion splices. Equipped with organizer, product is compatible with mechanical splice and splitters management too. Product is suitable for outside plant and building distribution. The organizer is a new concept that matches perfectly the requirement of FTTH management with splitters. The Hinged cover can be open up to 120° and remains opened, this allows an easily fibre connecting while the box is mounted. The closing is done by a latch and could be secured with security device if necessary. Contents of the standard product box, organizer with 3 trays equipped with splice holders, anchoring device for main cable and Drop cables. The wall and pole support need to be ordered separately.

Features and Benefits

- Versatile product for indoor or outdoor use
- Organizer with swivelling trays
- Anchoring device for main cable and Drop cable
- Wall or pole mounting
- Mid span access facility

Technical data

Fusion splices	36
Mechanical splices	30
Splitters 1/8	3
Splitters capacity	3
Dimensions	270x240x80 mm
Degree of protection	IP 54 / IK06
Material	Thermoplastic

OBP S1 v2



OBP-S2 Size 2 is designed for outdoor/indoor FTTH branch point for 36 to 144 fusion splices. Equipped with organizer, product is compatible with mechanical splice and splitters management too. Product is suitable for building distribution. The organizer is a new concept that matches perfectly the requirement of FTTH management with splitters. The Hinged cover can be open up to 120° and remains opened, this allows an easily fibre connecting while the box is mounted. The closing is done by a latch and could be secured with security device if necessary. Contents of the standard product box size 2, organizer 12 slots, anchoring device for main cable and drop cable. The splice trays and closure supports need to be ordered separately.

Features and Benefits

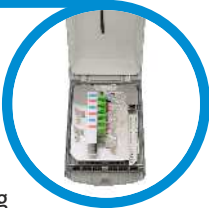
- Versatile product for indoor or outdoor use
- Organizer with swivelling trays
- Anchoring device for main cable and Drop cable
- Wall or pole mounting
- Mid span access facility

Technical data

Fusion splices	72
Mechanical splices	72
Splitters 1/8	6
Splitters 1/32	2
Splitters capacity	4 (PLC 4x4x40 mm)
Dimensions	400x255x86 mm
	400x255x116 mm (*v2)
Degree of protection	IP 54 / IK06
Material	Thermoplastic

MDT S1/S2/S3

MDT is designed for outdoor/indoor FTTH branch point/distribution point for 12 to 144 fusion splices and 12 to 48 adapters panel for cross connection splitters and customer drop cables. Equipped with organizer, product is compatible with mechanical splice and splitters management too. Product is suitable for installation: façade, aerial on pole, street cabinet and building distribution. The organizer is a new concept that matches perfectly the requirement of FTTH management with splitters.



The Hinged cover can be open up to 120° and remains opened, this allows an easily fibre connecting while the box is mounted. The closing is done by a latch and could be secured with security device if necessary. The splice trays and closure supports need to be ordered separately.

MDT is available in 3 versions S1, S2, S3 with different adapter count and sizes.




Features and Benefits

- Versatile product for indoor or outdoor use
- Organizer with swivelling trays
- Anchoring device for main cable and Drop cable
- Wall, Façade or pole mounting
- Mid span access facility

MDT versions

Version	No. of SC SX adapters	Dimensions [mm]	Slots and splices count*
MDT S1	12	400 x 255 x 86	7 (84)
MDT S2	24	400 x 255 x 116	12 (144)
MDT S3	48	400 x 255 x 146	12 (144)

Product composition

MDT S1	MDT S2	MDT S3
		
<ul style="list-style-type: none">• One box with hinged cover• One 7 slot organizer• One hinged support plate 12 SC/PC, SC/APC, LC/PC, LC/APC, E2K/PC, E2K/APC adapters• One cable strain relief anchor• One buffer storage section for 24 pigtails Pre-wiring• MDT S1 boxes are pre-wired in the factory with:<ul style="list-style-type: none">- trays inserted in the organizer and labeled- adapter panel- pigtails with label flags	<ul style="list-style-type: none">• One box with hinged cover• One 12 slot organizer• One hinged support plate 24 SC/PC, SC/APC, LC/PC, LC/APC, E2K/PC, E2K/APC adapters• One cable strain relief anchor• One buffer storage section for 30 pigtails Pre-wiring• MDT S2 boxes are pre-wired in the factory with:<ul style="list-style-type: none">- trays inserted in the organizer and labeled- adapter panel- pigtails with label flags	<ul style="list-style-type: none">• One box with hinged cover• One 12 slot organizer• One hinged support plate 48 SC/PC, SC/APC, LC/PC, LC/APC, E2K/PC, E2K/APC adapters• One cable strain relief anchor• One buffer storage section for 48 pigtails Pre-wiring• MDT S3 boxes are pre-wired in the factory with:<ul style="list-style-type: none">- trays inserted in the organizer and labeled- adapter panel- pigtails with label flags

AirTrack Anchoring clamps



Anchoring clamps are designed for self supporting cables. AirTrack Anchoring clamps are available in many different types. All of them are made with thermoplastic and ultraviolet resistant material with or without high resistant aluminium alloy.

Anchoring clamps used for figure 8 cables with steel messenger

AT-UOS6L



AT-UOS7L



AT-UOS10L



Specification

Ref.	Steel messenger diameter [mm]	L [mm]	Min. breaking load [daN]	Body material	Wedges material
AT-UOS6L	3-6	200	250	polymer ultraviolet resistant	thermoplastic material
AT-UOS7L	4-7	250	730	high resistant aluminium alloy	ultraviolet resistant
AT-UOS10L	7-10	300	1750		

Anchoring clamps used for figure 8 Self Supporting cables with steel or dialectical messenger

AT-UOD5L / AT-UOD7L / AT-UOD9L



Specification

Ref.	Outer messenger diameter [mm]	L [mm]	Min. breaking load [daN]	Weight [kg]	Body material	Wedges material
AT-UOD5L	3-5	200	250	0.13	thermoplastic material ultraviolet resistant	thermoplastic material ultraviolet resistant
AT-UOD7L	5-7	200	350			
AT-UOD9L	6-9	200	350			

Anchoring clamps used for Self Supporting ADSS concentric, strengthened cables

AT-UOD9L / AT-UO14L / AT-UO19L



Specification

Ref.	Outer messenger diameter [mm]	Min. breaking load [daN]	Weight [kg]
AT-UOD9L	6-9	350	0.13
AT-U14L	11-15.3	700	0.35
AT-U19L	14-19	700	0.60

AirTrack Suspension Clamps and accessories

Suspension clamp with close profile for ADSS and Figure 8 cables AT-ZPT25Z
Suspension clamp with opening profile for ADSS and Figure 8 AT-ZPT25K

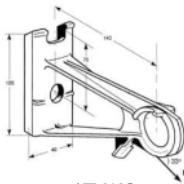


Specification			
Ref.	Tape width [mm]	Min. breaking load [daN]	Weight [kg]
AT-ZPT25Z	46	300	0.16
AT-ZPT25K	46	300	0.15



AT-WU

Universal anchoring pole bracket suitable for Anchoring clamps and Suspension clamps. Appropriate for round, square and polygonal poles.



AT-WO

Universal anchoring pole bracket. Specific construction allows to use for AT-ZPT25K Suspension clamp and for AT-UO14L and AT-UO19L Anchoring clamps.



AT-P

To hang simultaneously 2 cables on 1 pole.



AT-TSM

Steel tape with available width: 10-20 mm and thickness 0.4-0.7 mm in packages 50 m.



AT-TSK

Steel tape buckle made from stainless steel dedicated for steel tape AT-TSM.

CLU - Customer Lead-in Units

Crucial issue within FTTH micro-canalization systems is how to lead in single microducts or subscriber's cable into the building providing demanded pass gas/water tightness and banding radius. Important issue is also gas-tightness gap required by construction law.
Fibrain MetroJET offer full range of solutions of subscriber's bushings (Lead-in Thru) used within ordinary telecom systems, microcanalization and preconnectorized FTTH.



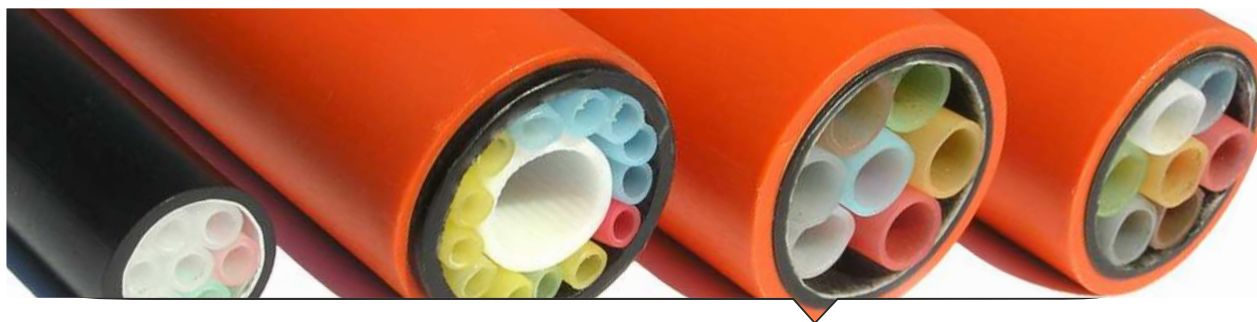
Technical data	
Number of cable ports	1
Maximum cable diameter (mm)	13
Maximum capacity	1 Tube (5 mm)
Maximum no. of customer feeds	1
Dimensions (Internal Unit - 1 Tube)	65x26x15
Dimensions (Internal Unit - Cable)	180x36x36
Dimensions (External Unit)	180x36x36
Operating temperature	-20 °C - +50 °C
IP Rating	Ip68
Weight (kg)	0.5

Application:

- subscriber's bushing in house basement wall or elevation wall
- wall bushings of easy access cables mounted to elevation wall
- cables sealing, bundles or single microducts in ground bushings and cables' wells
- control on bending radius of building internal wall bushing

Features and Benefits

- Ergonomic design
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Prevents the accidental damage of optical cables during installation through walls, and therefore eliminates return to site costs due to fibre breaks / macro bending
- Gas / Water block facility for a single tube cable
- Removable cover for easy access
- Internal unit manufactured from fire resistant UL94-V0 rated material



METROJET Microcanalization

The **MetroJET** Fiber Optic microduct system responds to the steadily growing demand for capacious systems of technical ducting. System is a functional equivalent of a multiple-holes tele-technical microduct network of reduced diameter of all elements and intended to install Fiber Optic microcables using cable jetting method (blowing).

An essential element of the system are **microducts** (colloquially called microtubes) made of HDPE. They have a size ranging typically from 3 to 16 mm and are installed as bundles in larger ducts. Microduct is an equivalent of a secondary pipe RHDPE in standard technical canalization. Fiber Optic microduct cables (with special jacket and diameter corresponding with microduct size) are installed inside tubes. Microducts can be formed in microducts bundles (loose, tight, foiled, prefabricated) and in such shape are usually delivered to the building site.

Microducts bundle can also be installed in already existing tele-technical canalization. Installation can be done using mechanical methods (pulling) or pneumatic ones.

Integrated part of MetroJET system are **fiber optic microcables** with specially chosen diameter and material of outer jacket for microduct application. We have in offer microcables with capacity of 2-24 fibers (diameter starts from 1,2 mm - 3 mm), through cables with capacity of 12-72/ 96 fibers (diameter max 5.7 mm - 6.6 mm) up to cables with 144-192 fibers and with diameter of such max 9.5 mm. There is also available special cables equipment as a part of station and line cable network (frames, enclosures etc.).

For microducts joining, sealing between microducts and HDPE pipe or microcable and microduct special joining and sealing accessories are needed. MetroJET includes all necessary accessories for all microducts diameters.

Particular duct bundles are ready, prefabricated ducts which include up to dozen of standard microtubes with configuration of different diameters. Choice of right configuration depends on the location within fiber optic network structure (connective tubes, tubes for a distribution networks, pipes in the access layer, etc.). Prefabricated pipes are available in three options: direct buried ducts with double jacket designed for underground lying (MT-DBP type) in the open trench or after plow layer, secondary pipe with single jacket (MT-DTP type) for a pulling into the existing pipe and also as a universal tubes HDPE with microduct bundle inside (MT-DSP type).



For more information please see separate "MetroJET Microcanalization" catalogue.

Fiber To The Home

Fiber Optic housing estate - Burry DAC

05

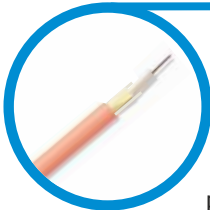


Burry DAC

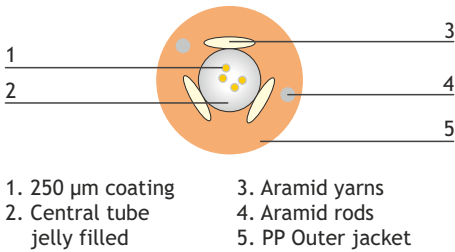
Idea of **Burry DAC** system involves placing directly in the ground (similar then in External VERTIJET system) cables with special, adapted construction. Cable design allows easy installation and high durability to the crush and pulling. Fibers placed in the loose tube filled with hydrophobic jell and additional layer prevent longitudinal water penetration. To strengthen the construction, aramid yarns and additional FRP element moulded in outer jacket are used. That allows to bend a cable just in one direction. Installed DAC Burry cable is terminated in FDH street cabinet and second side through the wall entry at the subscriber point.



BURRY-DAC (Customer Direct Buried Access cable)



Outdoor cables dedicated to direct buried application. Cable construction allows easy installation and high resistance to crush and stretching. Fibers placed in jelly filled (hydrofobe gel) loose tube construction, with additional protection to prevent horizontal water penetration. To strengthen the cable, aramid yarns have been applied as well as additional FRP strength members which are sunk inside outer jacket. Such construction allows to bend cable in one direction. Cables designed to connect subscribers of a last mile within FTTH network.



Construction:

- Central tube jelly filled. Additional tape to protect horizontal water penetration
- Aramid yarns reinforcement and anti rodent protection
- Polypropylene outer jacket
- FRP strength members inside outer jacket
- Light and dense construction
- Completely dialectic

Application:

- Outdoor FO connections
- FTTH networks
- Last mile subscribers connections
- Direct buried application

Technical parameters Cables BURY-DAC			
Number of fibers	2	4	
Weight (kg/km)	25		
Outer diameter (mm)	5.9		
- error margin	±0.3		
Tensile load (N): - perm.	650		
- Installation	1200		
Crush(N)	4000		
Fiber types*	SM2 - SM ITU652D, S7A - SM ITU657A, M50 - 50/125 OM2, M62 - 62/125 OM1, OM3 - 50/125 OM3		

PDBM DAC - Preinstalled Direct Buried Microduct



PDBM DAC are preinstalled micro duct with microcable inside. Customer can order specified lengths with different types of cable inside. Such a solution reduces to the minimum labor cost during installation and necessary equipment which is needed for installation.

PDBM DAC					
MicroDuct type	MicroDuct lenght	Fiber count	Fibre type	Cable length	Con. type
7/3	1-1000 [m]	2F-12F	SM2 G652.D	1-1000 [m]	SC
7/3.5	1-1000 [m]	2F-12F	S7A-G657.A1	1-1000 [m]	SC/APC
8/3.5	1-1000 [m]	2F-12F	S72-G657.A2	1-1000 [m]	LC
			S7B-G657.B2		LC/APC
			S73-G657.B3		other

PDBM can be delivered from 1-1000 m length with cable from 2-12F preconnectorized or not.

FDH cabinet - Fiber Distribution Terminal cabinet

Fibrain FDH cabinets are designed for redistribution of optic fibers lead in by major microcanalization fiber optic buses to the end users. Thanks to the simple construction those cabinets are ideal solution for ground-based endpoints. They facilitate splicing of distribution cables and drop cables or microcables bundles. Moreover it makes possible to place overlength of cables and tubes inside.



Features and Benefits

- Made of powder-coated steel
- IP34 or with use of additional casing for fusion splice field IP65
- Possible application of FlexyJET connection set for microtubes organization
- Equipped with lock
- Fusion splice field up to 144 splices

Application:

- urban networks
- FTTH
- Fiber optic micorcanalisation systems
- optic fibers distribution
- last mile connections

Ordering no.: FDH-02-96-00

SCAB cabinet - Street Cabinets

Fibrain Street Cabinets of standard 19”and 21” are made on basis of a aluminum profile of special construction providing housing maximum hermetic and modularity. Moreover cabinets capacity was increased up to 800 kg and overall weight decreased. Vibration and shock resistance tested according to IEC 61969-3 and shock resistance IEC 61969. Minimal proofness IP54.



Street cabinet 19” SCAB
Standard types*

Dimensions (W)x(D)x(H) [mm]	Height [U]	Reference
850x850x2250	42	SCAB-19-42-12-S
850x850x1650	28	SCAB-19-28-12-S
850x850x1300	22	SCAB-19-22-12-S
850x450x1300	22	SCAB-19-22-11-S
1650x450x1300	22	SCAB-19-22-21-S
850x850x800	12	SCAB-19-12-12-S

* Special design available on demand.

Applications:

- urban networks
- FTTH
- microducting
- CCTV
- telecommunication

Direct Buried POP for FTTH

The DBPOP Fibre to the Home Distribution Closure is a direct buried closure developed for the application of 2 Ø14/10 mm direct buried feeder ducts and up to 48 direct buried FTTH subscriber drop cables. The closure provides an underground space for the over length of the blown 96FO minicables (microcables) and direct buried drop cables. Its compact size fits in the ditch and is easy installed by civil workers. A quick startup of the first phase can be achieved because the closure is independent of the FTTH conceptclosure is based on the special design sleeve, usually installed in sewer, with the same basics parts.



The standard location marker eases precise digging for each further process step. Cable over length enables fusion splicing in a controlled environment above the ground. The Fiber Management (FM) back plate provides an easy entry watertight seal and integrated cable retention for each individual cable. After the splicing the FM back plate is mounted watertight on the inside of the black protective lid and the cables are reeled in the underground closure. Suitable for 2 incoming 96 FO minicables (microcables) and maximum 48 direct buried drop cables out. Maximum splice capacity 96 splice protectors heatshrink.

Technical data

Number of cable ports	2 feeder cables (1 in / 1 out) + 48 drop cable
Number of splice trays	8
Splice tray capacity	12 splice protectors heatshrink
Looping length of fibres (cm)	30
Crush resistance	50 000 N (on buried closure)
Water immersion	IP68, EN 60529
	Water depth 1 meter, 7 days, no leakage
Dimensions (cm)	90 x 35 x 30
Weight (kg)	10

Features Closure:

- Compact size
- Direct buried
- Standard with a location marker (Telecom) 101.4 kHz
- Protection of underground cable overlength
- Buried closure withstands 5.000 kg wheel load
- Impact resistant
- Halogen-free

SCUB-S1/S2 Fiber splice closure

05



Standard CUB is designed for outdoor FTTH branch point/distribution point for 12 to 288 fusion splices. This series enable to secure and manage the fiber optic joints and connection in outside plant (OSP). These joints are specially designed and fabricated for outdoor operations for both underground and aerial installation. CUB is suited to bear extreme weather conditions and provides well secured fiber joints of environmental protection IP 68.

CUBs are available in 2 versions: S1- short cup , S2 - long cup.

Dimensions

Ref.	Ports round + oval	Dimensions [mm]
SCUB S1	4+2	265(L) x 160(W) x 350 (H)
SCUB S2	4+2	265(L) x 160(W) x 450 (H)

Technical specification

Protection Performance	IP 68
Atmospherical pressure	70-150 Kpa and axial tension of > 2000 N (1 min)
Crush resistance	2500 N / 10 cm (1 min)
Operating temperature range	-40° C - +75° C
Material	Thermoplastic and metal

Features and Benefits

- Versatile product for outdoor use in different applications
- Easy and re-entry closing mechanism
- Anchoring device for main cable and Drop cable
- Wall, Façade, underground or pole mounting
- Mid span access facility
- Universal product
- One product matching all requirements
- No special tools required
- Each cable is well tight
- Enable to reach each splice without disturbing other fibres
- Pre-wired option with adapters, preconnectorized splitters and splice trays

Product composition

SCUB S1	SCUB S2
<ul style="list-style-type: none">• Designed for buried / aerial / underground applications• Accommodate up to 72 splices• Easy re-entry and closing by using mechanical plastic locking clamp• Water and dust proof lockable complying rated IP68• Resistant for chemicals and corrosive atmosphere• Provision for mounting pressure valve• Housing is made of polypropylene material• Accommodate entry of uncut cables through oval ports and have the facility to store the uncut loose tubes of this cable	<ul style="list-style-type: none">• Designed for buried / aerial / underground applications• Accommodate up to 288 splices• Easy re-entry and closing by using mechanical plastic locking clamp• Water and dust proof lockable complying rated IP68• Resistant for chemicals and corrosive atmosphere• Provision for mounting pressure valve• Housing is made of polypropylene material• Accommodate entry of uncut cables through oval ports and have the facility to store the uncut loose tubes of this cable

MCUB-S24/S32 Fiber splice closure

Multi CUB is designed for outdoor FTTH branch point/distribution point up 96 (144*) fusion splices. This series enable to secure and manage the fiber optic joints and connection in outside plant (OSP). These joints are specially designed and fabricated for outdoor operations for both underground and aerial installation. CUB provided to bear extreme weather conditions and provide well secured fiber joints with environmental protection IP 68. Unique body is designed for FTTH drop cables connection in two versions S24 and S32 which are able to connect 24 or 32 drop FTTH drop cables. MCUB's offer also special route to the main cable without complete cutting to avoid the extra cost of main cable splices.



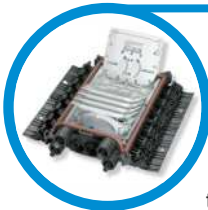
Dimensions		
Ref.	Ports round + oval + drop	Dimensions [mm]
MCUB S24	4 + 1 + 24	265(L) x 160(W) x 350(H)
MCUB S32	4 + 0 + 32	265(L) x 160(W) x 250(H)
MCUB S32	2 + 1 + 32	265(L) x 160(W) x 250(H)

Technical specification	
Protection Performance	IP 68
Atmospherical pressure	70-150 Kpa and axial tension of > 2000 N (1 min)
Crush resistance	2500 N / 10 cm (1 min)
Operating temperature range	-40°C - +75°C
Material	Thermoplastic and metal

- Features and Benefits**
- Versatile product for outdoor use in different applications
 - Easy and re-entry closing mechanism
 - Anchoring device for main cable and Drop cable
 - Wall, Façade, underground or pole mounting
 - Mid span access facility
 - Universal product
 - One product matching all requirements
 - No special tools required
 - Each cable is well tight
 - Enable to reach each splice without disturbing other fibres
 - Pre-wired option with adapters, preconnectorized splitters and splice trays

Product composition	
MCUB S24	MCUB S32
<ul style="list-style-type: none">• Designed for buried / aerial / underground applications• Accommodate up to 96 splices (144*)• Easy re-entry and closing by using mechanical plastic locking clamp• Water and dust proof lockable complying rated IP68• Resistant for chemicals and corrosive atmosphere• Provision for mounting pressure valve• Housing is made of polypropylene material• Accommodate entry of uncut cables through oval ports and have the facility to store the uncut loose tubes of this cable• Adapter plate panel• PLC Splitter assembled 1x2, 1x4, 1x8, 1x16, 1x32	<ul style="list-style-type: none">• Designed for buried / aerial / underground applications• Accommodate up to 96 splices (144*)• Easy re-entry and closing by using mechanical plastic locking clamp• Water and dust proof lockable complying rated IP68• Resistant for chemicals and corrosive atmosphere• Provision for mounting pressure valve• Housing is made of polypropylene material• Accommodate entry of uncut cables through oval ports and have the facility to store the uncut loose tubes of this cable• Adapter plate panel• PLC Splitter assembled 1x2, 1x4, 1x8, 1x16, 1x32

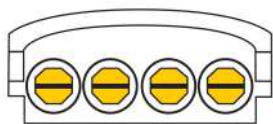
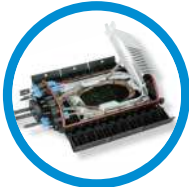
BPEO S1 - Distribution Fiber Splice Closure



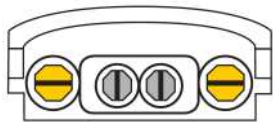
The concept of the BPEO product range is similar to the modular approach often used in copper connectivity modules and termination blocks. The S1 closures are delivered with a fibre organizer with a capacity of 12 splice tray slots depending on the size. The splice trays are a standard size taking up one or two slots (5 mm or 10 mm spacing). They can be mixed and matched at will, giving the product great flexibility. Additional wall brackets are available for fixing the closure securely in place. Finally, the unique mechanical cable sealing ECAM kits are available to enter the cables to the closure and seal it. Additional splice trays and cable entry kits can be installed whenever new cables are added to the closure.

The organizer can be used with up to 12 splice trays for standard micro structures or 8 splice trays if loose tubes are used. Watertight splice closure for up to 72 mechanical splices or 144 fusion splices. Contents of the standard product ports included the double cable entry port. The organizer is fixed in the tubes and micro-structures, an installation tool and an inter splice tray bridge guide. The fibre bridge guide is used to route individual fibre from one splice tray active fibres and unused fibres. 100% of the closures are tested to 500 mbar flash test pressure.

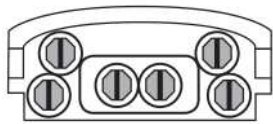
Technical data - BPEO S1				
General				
Sealing	80 mbar continuous and 500 mbar flash test; IP68			
Impact	20 joule; IK10			
Pull force	100 DecaNewton			
Dimensions (overall in mm)	Closure body			
Length	382			
Width	204			
Depth	92			
Entry configurations	EOC	CDP	EDP	FDP
Midspace entry	no	yes	yes	yes
Storage (tube/microcable)	yes	yes	yes	yes
Capacity	EOC	CDP	EDP	FDP
	# Tray	Fusion (10mm)	Fusion (5mm)	Rapid mechanical splice
Micro structure	12	72	144	72
Loose Tubes	8	48	96	48



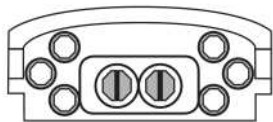
EOC Strait joint (End Of Cable)
4 single entries ECAM S5-18



CDP (Cable Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-20 and 2 single port ECAM S5-18.
- 2 single ECAM S5-18 and 2 single port ECAM S4-12



EDP (End Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-20 and 4 single port ECAM S4-12
- 6 single ports ECAM S4-12



FDP (Fibre Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-20 and 6 single ECAM S4-8
- 2 single ports ECAM S4-12 and 6 single ECAM S4-8



S18 single cable seal for diameters between 5-18 mm



S12 single cable seal for diameters between 4-12 mm



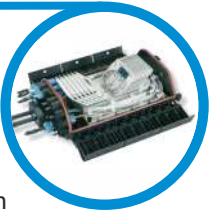
S08 single cable seal for diameters between 4-8 mm



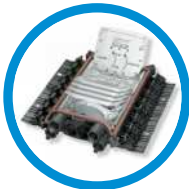
D20 double cable seal for diameters between 5-20 mm

BPEO S2, S3 - Distribution Fiber Splice Closure

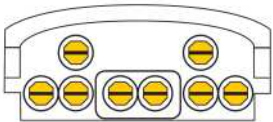
The concept of the BPEO product range is similar to the modular approach often used in copper connectivity modules and termination blocks. The S2, S3 closures are delivered with a fibre organizer with a capacity of 28 and 48 splice tray slots depending on the size. The splice trays are a standard size taking up one or two slots (5 mm or 10 mm spacing). They can be mixed and matched at will, giving the product great flexibility. Additional wall brackets are available for fixing the closure securely in place. Finally, the unique mechanical cable sealing ECAM kits are available to enter the cables to the closure and seal it. Additional splice trays and cable entry kits can be installed whenever new cables are added to the closure.



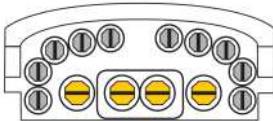
The organizer can be used with up to 28 or 48 splice trays for standard micro structures or 8 splice trays if loose tubes are used. Watertight splice closure for up to 168 and 288 mechanical splices or 336 and 576 fusion splices. Contents of the standard product ports included the double cable entry port. The organizer is fixed in the tubes and micro-structures, an installation tool and an inter splice tray bridge guide. The fibre bridge guide is used to route individual fibre from one splice tray active fibres and unused fibres. 100% of the closures are tested to 500 mbar flash test pressure.



Technical data - BPEO S2, S3				
General				
Sealing	80 mbar continuous and 500 mbar flash test; IP68			
Impact	20 joule; IK10			
Pull force	100 DecaNewton			
Dimensions (overall in mm)	Length	Width	Closure body	
Size 2	520	341	149	
Size 3	661	341	149	
Entry configurations	CDP	EDP	FDP	
Midspan entry (uncut)	yes	yes	yes	
Storage (tube/microcable)	yes	yes	yes	
Capacity	Capacity of the organizer (no. of splice trays)	Fusion splices K7-2slot-12fusion	Fusion splices K7-1slot-12fusion	Rapid mechanical splice
BPEO S1	12	72	144	72
BPEO S2	28	168	336	168
BPEO S3	48	288	576	288



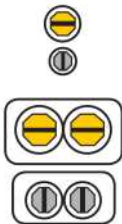
CDP (Cable Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-27 and 6 single ports ECAM S5-18.
- 8 single ports ECAM S5-18



EDP (End Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-27, 2 ports ECAM S5-18 and 10 ports ECAM S4-12
- 4 ports ECAM S5-18 and 10 ports for ECAM S4-12



BDP (Branch Distribution Point)
Two possible configurations:
- 1 double port ECAM D5-20 and 16 single ports ECAM S4-12,
- 18 single ports ECAM S4-12



S18 single cable seal for diameters between 5-18 mm
S12 single cable seal for diameters between 4-12 mm
D27 double cable seal for diameters between 5-27 mm
D20 double cable seal for diameters between 5-20 mm

BPEO Cable Entry Sealing Kits & accessories



Mechanical cable entry sealing kits for Single ports or Double ports (for uncut cable).
The kits are supplied complete with fixing wrench. Holders and anchors are on the closure.



ECAM D5-20
Double cable entry sealing for uncut cables
Double entry cable sealing for cables from 5 - 20 mm diameter

ECAM D5-27
Double cable entry sealing for uncut cables
Double entry cable sealing for cables from 5 - 27 mm diameter



ECAM S4-12
Single cable entry sealing for straight splices or cable distribution
Single entry cable sealing for cables from 4 - 12 mm diameter

ECAM S5-18
Single cable entry sealing for straight splices or cable distribution
Single entry cable sealing for cables from 5 - 18 mm diameter

DBCCP - Direct Buried Customer Connection Point



Features and Benefits

- Tight and strong construction which allows direct buried application
- IP 68 according to EN 60529
- Allows to use as direct buried fixing enclosure or extension point of end user connection
- Holders for cable strengthening elements
- Ability to do 6 fiber optic splices
- FO splice cassette included

Technical data

Number of cable ports	2
Number of splices	6
Cables/Microducts diameter (mm)	4 - 11
IP Rating	Ip68 - EN 60529
Dimensions (mm)	120 x 95 x 55

CLU - Customer Lead-in Unit



Features and Benefits

- Ergonomic design
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Prevents the accidental damage of optical cables during installation through walls, and therefore eliminates return to site costs due to fibre breaks / macro bending
- Gas / Water block facility for a single tube cable
- Removable cover for easy access
- Internal unit manufactured from fire resistant UL94-V0 rated material

Technical data

Number of cable ports	1
Maximum cable diameter (mm)	13
Maximum capacity	1 Tube (5 mm)
Maximum no. of customer feeds	1
Dimensions (Internal Unit - 1 Tube)	65x26x15
Dimensions (Internal Unit - Cable)	180x36x36
Dimensions (External Unit)	180x36x36
Operating temperature	-20° C - +50° C
IP Rating	Ip68
Weight (kg)	0.5

Customer Outlet VFTO-A - 2 fibers

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear or bottom
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit on bottom face and are protected by cover

Technical data

Number of input cable ports	1
Maximum input cable diameter (mm)	10
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	120x100x24
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.095



Ordering no.: VFTO-A-xx

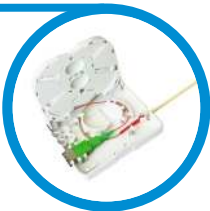
Customer Outlet VFTO-B - 2 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom or top
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit on bottom face via shuttered SC adapters

Technical data

Number of input cable ports	3
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	100x80x22
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.060



Ordering no.: VFTO-B-xx

Customer Outlet VFTO-C - 4 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom, top, left or right
- Supplied with a bracket for wall mounting or mounting directly onto a DIN Rail
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Supplied with a security screw to prevent unauthorised access
- Patchcords exit unit on bottom face via shuttered SC adapters

Technical data

Number of input cable ports	2 bottom 1 rear 1 top 1 left 1 right
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	4
Maximum no. of customer feeds	4
Dimensions	83x100x27
Operating temperature	-20° C - +50° C
Material	UL94 V0
Weight (kg)	0.1



Ordering no.: VFTO-C-xx

High resistance customer connection cable 1000 N

Features and Benefits

- 500-1000 N crush resistance cable available
- Safety usage at home and flats as a connection between customer outlet and ONU or STB
- Direct connectorisation on 4 mm cables without fanout
- Special boots and crimpsets for high diameter cable
- Tensile strength and crush resistance 5-times higher than standard patchcord

Technical data

Connectors type	SC, SC-APC, LC, LC-APC, *
DropCables type	VC-DCI, VC-DCS, VC-DCA
Operation temp.	-20C - +60C
Flame resistance	LSOH
Fibers count	1
IL (dB)	>0.3
RL (dB)	<55 (65 APC)
Cable length (m)	1-50



Ordering no.: A-xx

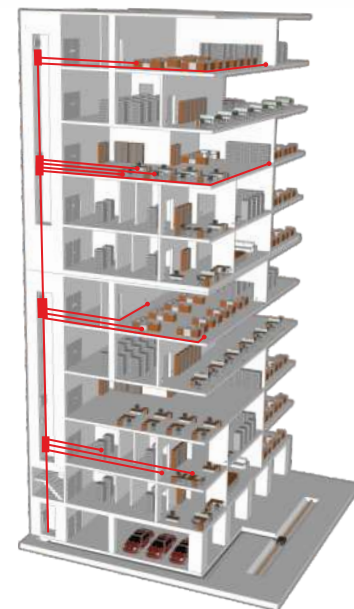
FTTH Solutions for multifamily units



Vertiqio

Vertiqio is an innovative fiber optic building cabling system using Riser Easy Access Cable. Special construction allows easy access to fibers by cutting a window in a cable outer jacket with no need of splicing at the place of branching. This method allows to take out ESFU fiber module on the particular floor of the building and depending on the installation way to conduct cable directly to the subscriber outlet. Except for cable there is also in offer complete Mounting and Branching Kit (outlets, distribution boxes, subscriber end points etc.).

System was designed by Research and Development Department with focus on conduction of FO units directly to the subscriber apartment, especially in high-rise office buildings or block of flats. The key point of Vertiqio system is possibility of easily build vertical structural cabling, which allows to connect each of the subscriber together with distribution point with minimizing of number and volume of additional branching devices.

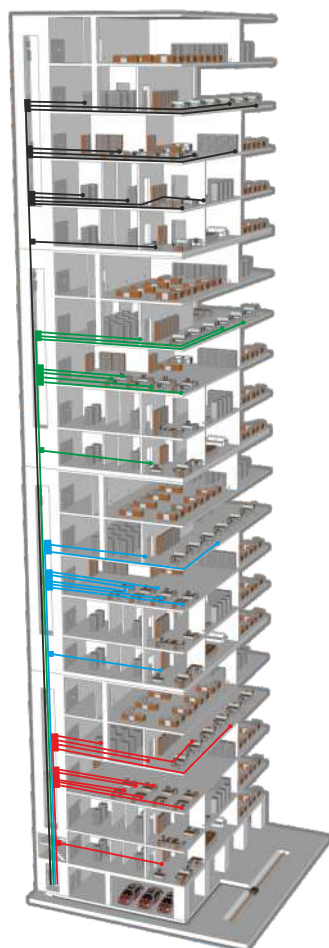


The advantage of Vertiqio system is also reduction of installation work and cutting down workmanship expenses.

Easier installation is also connected with lower qualifications which are needed to complete such work and shorter installation time. All these aspects have a great influence on FTTH network construction.

Fiber optic track of Vertiqio system involves new advanced Vertiqio Light Fibers which optimize bending radius to minimum. Fibers are compatible with ITU-T.G657A standard. Due to that maximum of efficiency of the FO track was gained. Also despite of many bandings on the fiber route, which are characteristic for building cabling system, parameters of fiber are guaranteed. Vertiqio Light fiber is also compatible with ITU-T.652D that ensures full cooperation and spliceability with an existing network.

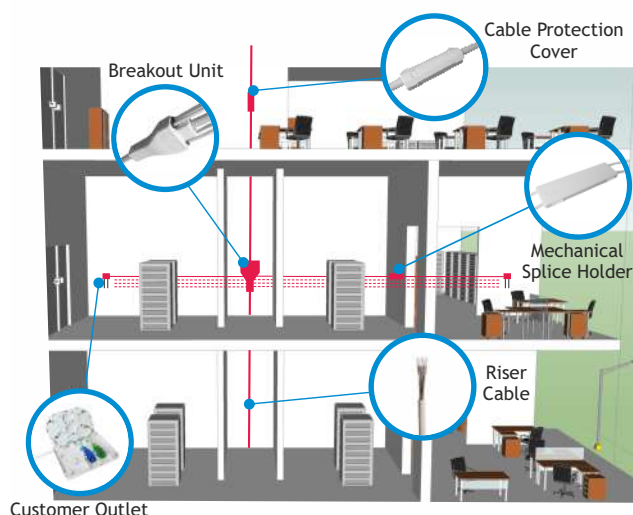
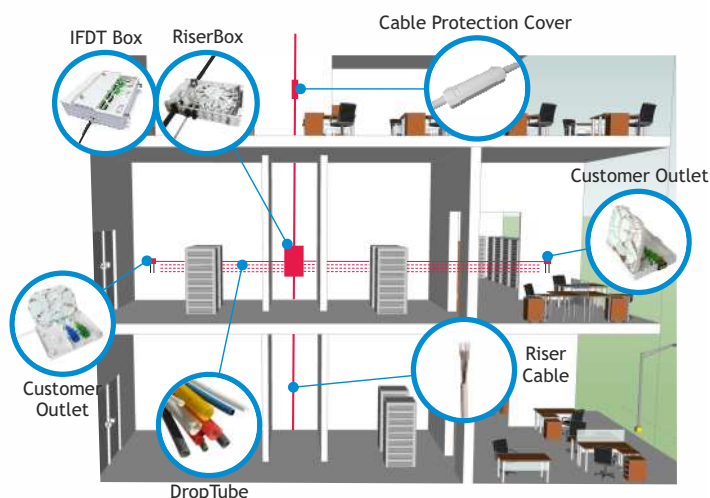
Analyses of economical and technical operation of such system, convinced that Vertiqio system is cheaper solution then many other FO building systems, especially in high-rise office buildings or block of flats. System can be used in mid-sized buildings and also high-rise buildings higher than 10 floors. Interesting proposal is to use such system in structural cabling system which connects open office spaces.



Three methods of installation

ESFU method

ESFU module from Riser Cable is conducted through the DropTube which goes directly to CTB or UCTB outlet at the subscriber apartment. Connection of the fibers from RC together with pigtail is done by mechanical splices in CTB or UCTB outlets. Branching at the staircase from vertical cable is done by Breakout Unit.

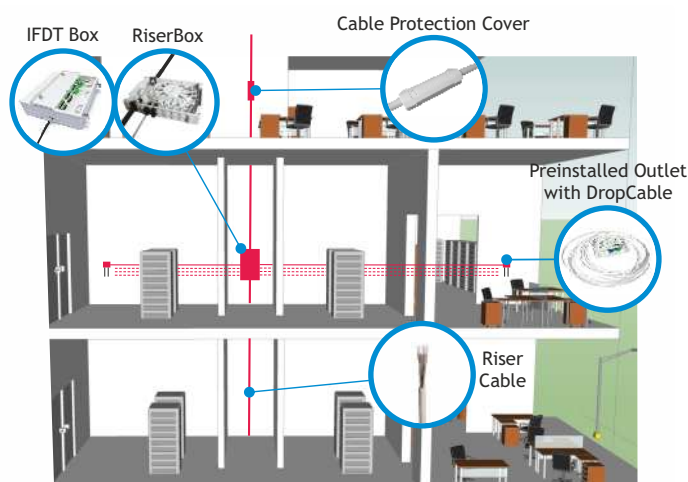


ESFU and MSH Method

ESFU module from Riser Cable is conducted through the DropTube which terminate in Mechanical Splice Holder MSH, which usually is mounted at the subscriber apartment just next to the staircase. Connection of fiber together with GPON device, CTB or UCTB outlet is done by mechanical splices inside of MSH box. Starts from MSH through the apartment special DropCable pre-terminated with connectors, in LSZH jacket is led. Branching at the staircase from vertical cable is done by BU Breakout Unit.

Drop Cable method

ESFU module from Riser Cable is connected in special splice IFDT outlet (4 splices) or Riser Box (up to 12 splices) which are mounted at the staircase. Inside Riser Box there is a place to put additional fiber reserve which is needed for a fiber splicing. Starts from IFDT Box or Riser Box special pre-connectorised DropCable in LSZH jacket is led. It is terminated in GPON device or connectorised at CTB or UCTB outlet.

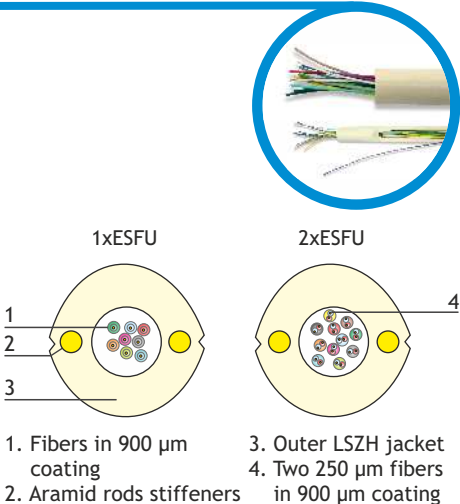


VQ-RC1 / VQ-RC2 - Riser Cables

Cables of easy access (Riser Cables) are designed for assembly FO cables in multi residential buildings, offices areas and also so called "open spaces". Special construction allows easy access to fibers by cutting a window in a cable outer jacket using a simply cutting device. This method allows to take out ESFU fiber module on the length of 25 meters. Cables are available in construction of 12-48F with single 1xESFU modules and 24-96F with double 2xESFU modules. Modules can be distinguished by colour code and printed black markers. Fibers in modules are coated with easy strip jacket to facilitate easy installation and termination. Cables are covered with non flammable LSZH jacket according to IEC 60332-1.





















Construction:

- 12-48 fibers x 1ESFU or 24-96 fibers 2xESFU,
- Aramid rods stiffeners,
- Construction allows window cut and easy access to the fibers,
- Construction protects fibers while window cutting,
- Possibility to take out ESFU fibers on the length of 25 m,
- LSZH jacket,
- G657A fibers with reduced bending radius in easy strip coating.

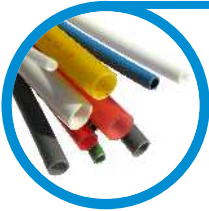


Application:

- Cable of easy access in FTTH network,
- Multi-residential building,
- Parking spaces, offices areas,
- Latest FTTH projects,
- Premises cables, indoor.

Technical specification:												
Module type:		1xESFU					2xESFU					
Cable reference number		VQ-RC1-12*	VQ-RC1-24*	VQ-RC1-48*	VQ-RC1-24*	VQ-RC1-48*	VQ-RC1-96*					
Fiber number:		12	24	48	24	48	96					
Outer diameter: (mm)		8.5	12	14.5	10	12	14.5					
Weight: (kg/km)		68	135	190	81	135	190					
Fiber types*		S7A - single mode ITU657A										
Temperature range - operation:		-10° C - +60° C										
Crush resistance:		500 N / 100 mm										
Min bending radius (mm):												
- While tension:		170	240	300	200	240	300					
- Without tension:		85	120	150	100	120	150					
Pulling force:		150 N				300 N						
Fibers and 1xESFU module tubes colour code:												
Fiber color:												
Number:	1	3	5	2	6	4	7	8	11	10	9	12
Tube color:												
												
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Customer DropTube LSOH with/without rope



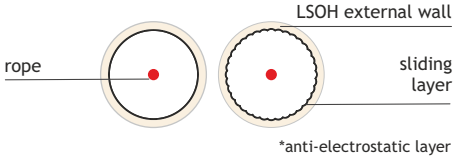
Features and Benefits

- Low Friction tube with an anti static bore
- Supplied with a pulling rope pre-installed for easy fibre installation
- Tube plugs are available to ensure access to the pulling rope when cutting the drop tube into lengths
- Available in internal and external formats. External format is the internal tube with an extra polyethylene sheath
- Reduced Fire Hazard Tube
- Excellent Crush Protection

Non-flammable DropTube LSOH

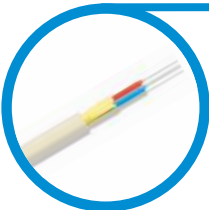
DropTube type [mm]		Outer diam. [mm]	Inner diam. [mm]
5/3.5	MT-SF09-LSOF	5	3.5
5/3.5	MT-SF09-LSRF	5	3.5

Non-flammable MT-SF



Ordering no.: MT-SF09-LSOF
MT-SF09-LSRF

Vertiqio DropCable VC-DCS/DCA/DCY



Cable description

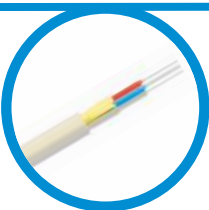
- Tight buffered fibre
- Aramid
- Outer Jacket

Fire resistance

- Flame retardant
- Halogen free
- Low smoke emission

Technical data	
Type	VC-DCI
Fibre count	1-2 F
Fibre type	G.657A1/2*
Outer diameter (mm)	3.0 +/- 0.1
Tensile load	
perm./install (N)	200/350
Crush (N/100mm)	500
Temp. range	-10°C - +70°C
Min. bending radius (mm)	5*Out. diam.

Ordering no.: VC-DCI-xx



Cable description

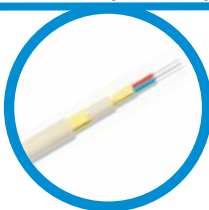
- Tight buffered fibre
- Aramid
- Outer Jacket

Fire resistance

- Flame retardant
- Halogen free
- Low smoke emission

Technical data	
Type	VC-DCS
Fibre count	1-2 F
Fibre type	G.657A1/2*
Outer diameter (mm)	4.0 +/- 0.1
Tensile load	
perm./install (N)	200/350
Crush (N/100mm)	700
Temp. range	-10°C - +70°C
Min. bending radius (mm)	5*Out. diam.

VC-DCS-xx



Cable description

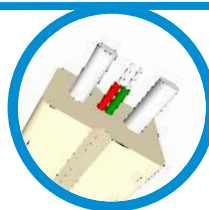
- Tight buffered fibre
- Aramid
- Inner Jacket
- Outer Jacket

Fire resistance

- Flame retardant
- Halogen free
- Low smoke emission

Technical data	
Type	VC-DCA
Fibre count	1-2 F
Fibre type	G.657A1/2*
Outer diameter (mm)	4.0;4.6 +/- 0.1
Tensile load	
perm./install (N)	350/650
Crush (N/100mm)	800
Temp. range	-10°C - +70°C
Min. bending radius (mm)	5*Out. diam.

VC-DCA-xx



Cable description

- 250 µm fibre
- FRP
- Outer Jacket

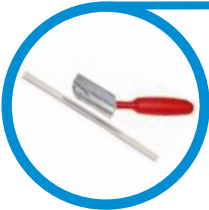
Fire resistance

- Flame retardant
- Halogen free
- Low smoke emission

Technical data	
Type	VC-DCY
Fibre count	1-2 F
Fibre type	G.657A1/2*
Outer diameter (mm)	2.0x3.0 +/- 0.1
Tensile load	
perm./install (N)	100
Crush (N/100mm)	1000
Temp. range	-30°C - +70°C
Min. bending radius (mm)	5*Out. diam.

VC-DCY-xx

Stripping Tool



Cutting devise which is needed to cut a window in an outerjacket of Riser Easy Access Cable. Changeable spare blades available.

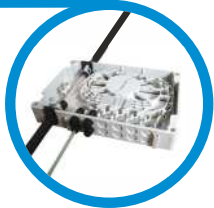
Vertiqio Riser Box

Features and Benefits

- Compact wall mounted unit allows installation within small spaces in residential and business premises alike
- Tamperproof cover security screws available as an option
- Removable cover for easy access
- Kit supplied complete including all components necessary to install an inline or butt cable
- Capacity is up to 12 fibre
- Cables up to 18.6 mm in diameter can be accommodated
- All fibres are positively managed to 30 mm minimum bend radius

Technical data

Max. fiber capacity	12
Max. splice capacity	12
Max. cable diameter (mm)	18.6
Dimensions (w)x(h)x(d)	220x150x50
Access type	DropCables
	DropTube
Operation temp.	-20° C - +50° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.55



Ordering no.: VQ-RB1-1
VQ-RB1-2

IFDT Unit

Features and Benefits

- Compact wall mounted unit allows installation within small spaces in residential and business premises alike
- Tamperproof cover security screws available as an option
- 3-version available - for 32, 64, 128 customers
- Two-section construction - line section and customer section
- Splitters installation ready
- Preconnectorised DropCable and DropTubes ready
- Secured with two locks for each section
- Possible to make splices: line cables-splitter, line cables-line cables, splitter-dropcables, risercable-splitter

Technical data	IFDT 32	IFDT 64	IFDT 128
Max. fiber capacity	72	144	288
Max. splice capacity	72	144	288
Max. customer count	32	64	128
Max. cable diameter (mm)	18.6	18.6	18.6
Dimensions (w)x(h)x(d)	450x252x100	466x470x136	466x470x196
Access type	DropCables	DropCables	DropCables
	DropTube	DropTube	DropTube
	RiserCable	RiserCable	RiserCable
Operation temp.	-20° C - +50° C	-20° C - +50° C	-20° C - +50° C
IP Rating	IP 54	IP 54	IP 54
Material type	Steel	Steel	Steel



Ordering no.: IFDT032-XX
IFDT064-XX
IFDT128-XX

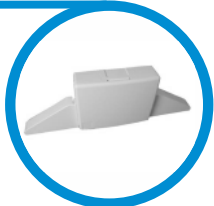
Vertiqio Internal Transition Box

Features and Benefits

- Allow splicing from cable to cable
- Suitable for one inline cable of up to 15 mm in diameter
- Up to 4 drop cables can be spliced to the in-line cable
- The cable entries are suitable for 5 mm outer diameter DropTubes and 2.5 - 5 mm DropCables
- Up to 4 fusion splices
- Cable management within the unit ensures the minimum 20 mm bend radius for optical fibre is not exceeded
- Input/output cables are secured at the cables entry levels

Technical data

Max. splice capacity	2 or 4
Max. cable diameter (mm)	15
Dimensions (w)x(h)x(d)	100x80x32
Access type	DropCables
	DropTube
No. of cable ports	1 Input cables
	4 Output cables
Operation temp.	-20° C - +50° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.1



Ordering no.: VQ-ITB

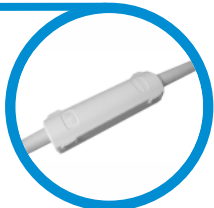
Vertiqio Cable Protection Cover

Features and Benefits

- Compact, low profile, wall mounted unit typically used in multi dwelling units or office fibre cabling systems
- Supplied with all of the components required to mount the unit to a wall and secure
- Can accommodate RiserCables up to 15 mm in diameter

Technical data

Max. cable diameter (mm)	15
Dimensions (w)x(h)x(d)	90x24x27
No. of cable ports	1 in-line
Operation temp.	-20° C - +50° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.03

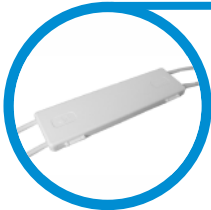


Ordering no.: VQ-CPC

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Vertiqio Mechanical Splice Holder



Features and Benefits

- Allows splicing from cable to cable for up to 2 fibres
- Suitable for cables of up to 6 mm diameter
- Hinge open cover for easy access
- Two mechanical splices or 4 heat shrink splices protectors can be accommodated
- Easily installed and fitted to the wall or inside a riser
- Input/output cables are secured at the cable entry levels

Ordering no.: VQ-MSH

Technical data

No. of cable ports	3 Input cable 3 Output cable
Max. splice capacity	2 or 4
Max. cable diameter (mm)	6
Dimensions (w)x(h)x(d)	165x46x13
Access type	DropCables DropTube
Operation temp.	-20° C - +60° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.07

Vertiqio 4-port Breakout Unit



Features and Benefits

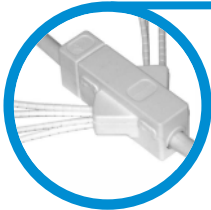
- Compact, low profile, wall mounted unit typically used in multi dwelling units
- Unit manufactured of fire resistant material to UL94-V0
- Supplied with all of the components required to wall mount the unit and secure an in-line cable
- Can accommodate RiserCable up to 15 mm diameter
- Can take out 4 drop tubes
- Can be supplied to accommodate drop tubes of 5 mm diameter

Ordering no.: VQ-BU4

Technical data

No. of input cabs	1 in-line
Max. cable diameter (mm)	15
Max. number of DropTubes	4
Max. diameter of DT (mm)	5
Tube/cable retention (N)	>70
Dimensions (w)x(h)x(d)	120x50x27
Operation temp.	-20° C - +60° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.045

Vertiqio 8-port Breakout Unit



Features and Benefits

- Compact, low profile, wall mounted unit typically used in multi dwelling units
- Unit manufactured of fire resistant material to UL94-V0
- Supplied with all of the components required to wall mount the unit and secure an in-line cable
- Can accommodate RiserCable up to 15 mm diameter
- Can take out 8 drop tubes
- Can be supplied to accommodate drop tubes of 3 mm diameter
- It's possible to reduce the length of the part breaking the top part following the grooves with cut pliers

Ordering no.: VQ-BU8

Technical data

No. of input cabs	1 in-line
Max. cable diameter (mm)	12
Max. number of DropTubes	8
Max. diameter of DT (mm)	3
Tube/cable retention (N)	>50
Dimensions (w)x(h)x(d)	71x45x25.5
Operation temp.	-20° C - +60° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.17

Vertiqio Bend Manager



Features and Benefits

- Used to control the bend radius of Internal Drop Tubes
- Bend Managers clip onto the 5 mm tube
- Can be used for a 90° internal or external bends, and also for pass through the wall applications
- Ensures fibre bend radius is not compromised
- Eases fibre installation, especially for long drop lengths with multiple bends
- Supplied with a cover for applications where the bend manager is used to pass a tube through the wall.

Ordering no.: VQ-BM

Technical data

Guaranteed Bend Radius (mm)	15
Dimensions (length)x(diam.)	80 x 8.2 mm
Operation temp.	-40° C - +80° C
IP Rating	IP 20
Material type	UL 94 V-0

Vertiqio Storage Reel

Features and Benefits

- Used to temporarily store an extracted fibre module
- Inner diameter of 180 mm ensures fibre bend radius is not compromised
- The fibre module can be wound on the reel as its extracted from the riser cable
- Light weight plastic construction

Technical data

Reel inner diameter (mm)	180
Reel flange diameter (mm)	230
Reel Height (mm)	65
Material	Polypropylene
Weight (kg)	0.25



Ordering no.: VQ-SR

Customer Outlet VFTO-A - 2 fibers

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear or bottom
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit at bottom face and are protected by cover

Technical data

Number of input cable ports	1
Maximum input cable diameter (mm)	10
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	120x100x24
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.095



Ordering no.: VFTO-A-xx

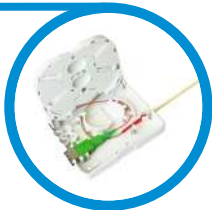
Customer Outlet VFTO-B - 2 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom or top
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit at bottom face via shuttered SC adapters

Technical data

Number of input cable ports	3
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	100x80x22
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.060



Ordering no.: VFTO-B-xx

Customer Outlet VFTO-C - 4 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom, top, left or right
- Supplied with a bracket for wall mounting or mounting directly onto a DIN Rail
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Supplied with a security screw to prevent unauthorised access
- Patchcords exit unit at bottom face via shuttered SC adapters

Technical data

Number of input cable ports	2 bottom 1 rear 1 top 1 left 1 right
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	4
Maximum no. of customer feeds	4
Dimensions	83x100x27
Operating temperature	-20° C - +50° C
Material	UL94 V0
Weight (kg)	0.1



Ordering no.: VFTO-C-xx

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Customer Kit - preconnectorised DropCables with customer outlet (coiled)



Features and Benefits

- Different customer outlets and DropCables available
- Reduces installation time
- Installation cost reduction
- Factory preterminated and preinstalled DropCable
- Easy to handle and install
- Customised DropCable length

Technical data

Outlets type	VFTO-A, VFTO-B, VFTO-C
DropCables type	VC-DCI, VC-DCS, VC-DCA, VC-DCY
Operation temp.	-20°C - +60°C
Fibers count	1, 2 or 4
IL (dB)	>0.3
RL (dB)	<55 (65 APC)
DropCables length (m)	1-100

Ordering no.: A-A1-xx, A-A2-xx, A-B1-xx, A-C1-xx

High resistance customer connection cable 1000 N



Features and Benefits

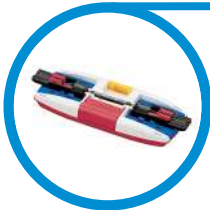
- 500-1000 N crush resistance cable available
- Safety usage at home and flats as a connection between customer outlet and ONU or STB
- Direct connectorisation of 4 mm cables without fanout
- Special boots and crimpsets for high diameter cable
- Tensile strength and crush resistance 5-times higher than standard patchcord

Technical data

Connectors type	SC, SC-APC, LC, LC-APC, *
DropCables type	VC-DCI, VC-DCS, VC-DCA
Operation temp.	-20°C - +60°C
Flame resistance	LS0H
Fibers count	1
IL (dB)	>0.3
RL (dB)	<55 (65 APC)
Cable length (m)	1-50

Ordering no.: A-xx

Mechanical Rapid Splice and Toolkit



Features and Benefits

- Universal construction allows execution of 250 µm and 900 µm fibers
- Highest quality of v-grooves execution facilities connection either singlemode and multimode
- Average splice attenuation at level 0.15 dB
- Time of connection execution about 2 minutes
- Possible one repetition of splice execution

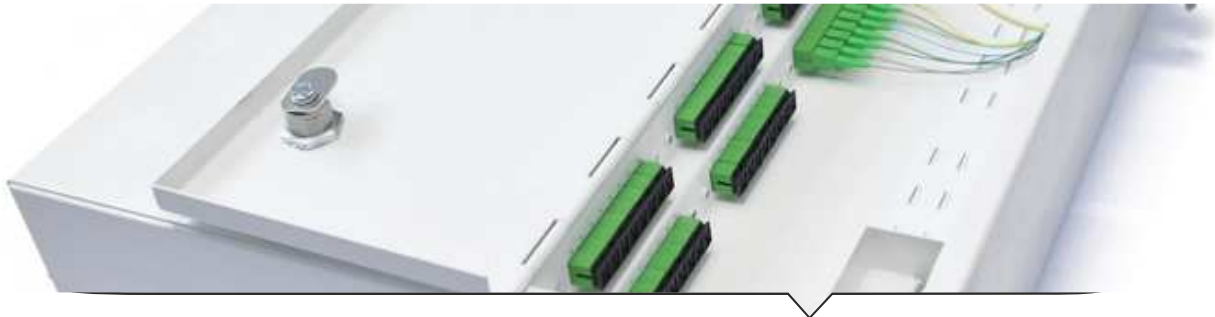
Technical data

Dimensions (mm)	4x4x40
Single fibers in coating	250 µm and 900 µm. Core dimensions 125 µm,
Fiber tolerance	240-265 µm and 850-950 µm
Operation temperature	-30°C - +60°C,
Maximum attenuation	< 0.5 dB,
Average reflectance	> 40 dB,
Fiber connections	50/125, 62.5/125 and singlemode 09/125

Ordering no.: FB-7195, FB-7197

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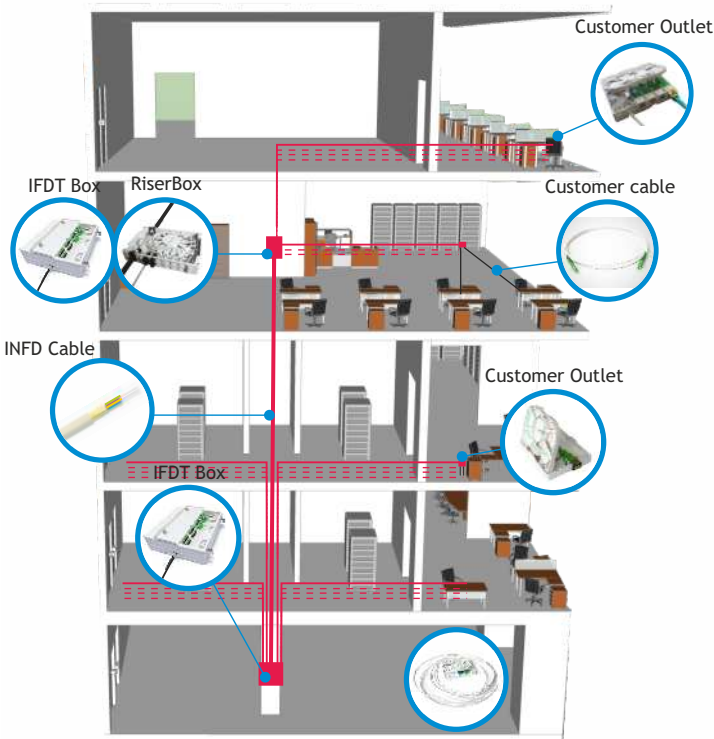
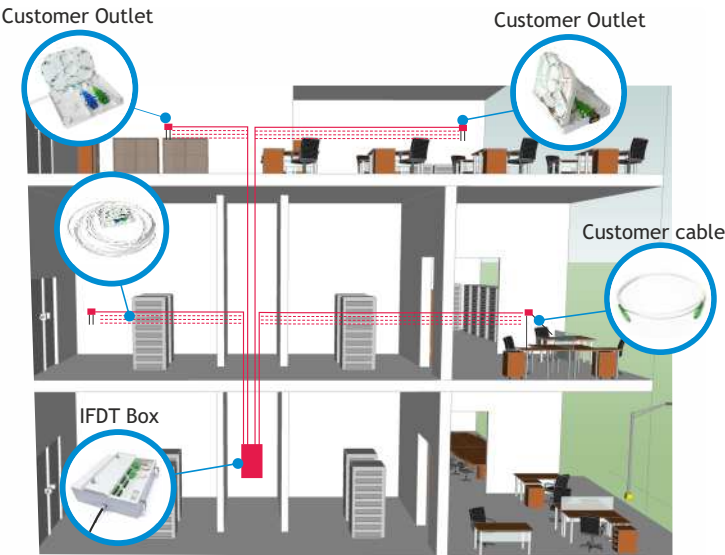


VertiDrop

VertiDrop system is a particular FO building system which uses pre-connectorised subscriber cables (DropCables).

An idea of VertiDrop system is to install pre-terminated with FO connectors DropCable, starts from FDT box up to subscriber outlet. Except for fiber optic cables also complete Kit of Mounting and Branching tools is in the offer (outlets, distribution boxes, subscriber end points etc.).

Subscriber cable must be done in a few available standards which are distinguished by outer jacket type. Construction of such cables is optimized so that cables are resistant to mechanical damage. Fibers are with minimized bending radius G.657A, G657B, G657B+, G657C, Clear Curve or HAF. Additionally each cable is made of Low Smoke, Halogen Free material (LSZH).

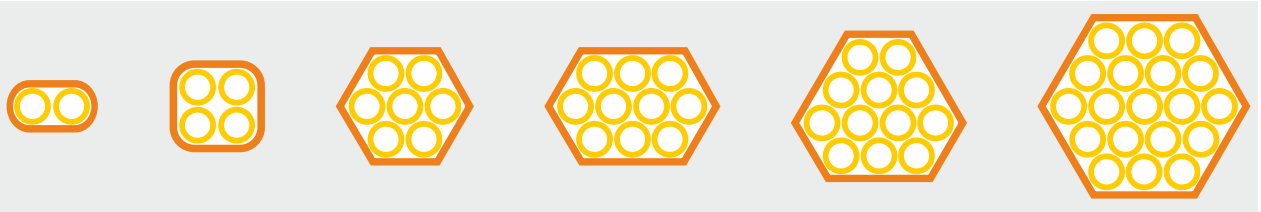




VertiJET

VertiJET - is an innovative fiber optic cabling system for buildings. System include indoor microducting and special pre-connectorised cables (nanopatchcords). Apart from fiber optic cables, complete sets of assembling devices and branching accessories are in offer (subscriber outlets, end-points, distribution boxes etc.).

VertiJET Building System is designed for fiber optic cabling system in residential buildings where bundles of fibers are blown to the microducts. Also micropipes with ropes for pulling FO units into the ducts, are in use (bring reduction of additional device costs). Moreover loose microducts VT-SF or foiled microduct bundles VT WFL (manufactured in various configurations), arranged in vertically cable line, can be applied. Cross sections of available tubes are shown below:



External VertiJet FLEXIJET tubes



FlexiJET connection set is durable and flexible pipe with numbered micropipes. It is very practical solution for blown cables into street cabinets as well as for server rooms. It may be used as external micropipes lead into building. FlexiJET construction facilitates extension in easy way by blowing new microcables into empty micropipes.

Features:

- superior characteristic for blowing microcables
- easy installation process
- robust, high crush resistance
- micropipes easy identification
- high capacity of fibers within small microcable external diameter

Types:

Equipped with micropipes (mm): 3/2; 4/2; 5/3.5; 6/4; 7/5.5; 8/6; 10/8; 12/10
FlexTube diameter: 16/11, 20/14.5, 25/19, 28/23, 32/25
Connectors types: straight, sealing, gas-proof, waterproof, etc.
Identification: each microduct has a ID no. at both sides
Length: To be consulted. On customer's demand

Construction:

Robust and flexible conduit with preinstalled microduct that are numbered on both sides for easier identification. As an option it may be equipped with stoppers (end connector) or straight connectors for connection with microduct.

Microduct	Types [mm]						
	3/2	4/3	5/3.5	7/5.5	8/6	10/8	12/10
6*	○	○	○	○	○	○	○
12*	○	○	○	○	○	○	○
24*	○	○	○	○	○	○	○

* Other constructions available on demand.

Specification:

- PVC
- norm: EN 50086-1 and 2-3, IEC-614
- resistance to crush of 320N
- operation temperature: -30°C - +60°C

MT-CSxx	xx	- xxx.xx	-xx	.xx	.xx	.xx
Qty	Micropipe type [mm]	Lenght [m]	Side(s)	Stoppers	Connectors	
					Straight	Waterproof
06	03 - 3/2	002.00 m	Two	21	22	23
12	04 - 4/3		One	11	12	13
24	05 - 5/3.5		Without	00	00	00
	07 - 7/5.5					
	08 - 8/6					
	10 - 10/8					
	12 - 12/10					

IFDT Unit

Features and Benefits

- Compact wall mounted unit allows installation within small spaces in residential and business premises alike
- Tamperproof cover security screws available as an option
- 3-version available - for 32, 64, 128 customers
- Two-section construction - line section and customer section
- Splitters installation ready
- Preconnectorised DropCable and DropTubes ready
- Secured with two locks for each section
- Possible to make splices: line cables-splitter, line cables-line cables, splitter-dropcables, risercable-splitter

Ordering no.: IFDT032-XX
IFDT064-XX
IFDT128-XX



Technical data	IFDT 32	IFDT 64	IFDT 128
Max. Fiber capacity	72	144	288
Max. Splice capacity	72	144	288
Max. Customer count	32	64	128
Max. Cable diameter (mm)	18.6	18.6	18.6
Dimensions (w)x(h)x(d)	450x252x100	466x470x136	466x470x196
Access type	DropCables	DropCables	DropCables
	DropTube	DropTube	DropTube
	RiserCable	RiserCable	RiserCable
Operation temp.	-20° C - +50° C	-20° C - +50° C	-20° C - +50° C
IP Rating	IP 54	IP 54	IP 54
Material type	Steel	Steel	Steel

Riser Box

Features and Benefits

- Compact wall mounted unit allows installation within small spaces in residential and business premises alike
- Tamperproof cover security screws available as an option
- Removable cover for easy access
- Kit supplied complete with all components necessary to install an in line or butt cable
- Capacity is up to 12 fibre
- Cables up to 18.6 mm in diameter can be accommodated
- All fibres are positively managed to 30 mm minimum bend radius

Ordering no.: VQ-RB1-2
VQ-RB1-2

Technical data

Max. fiber capacity	12
Max. splice capacity	12
Max. cable diameter (mm)	18.6
Dimensions (w)x(h)x(d)	220x150x50
Access type	DropCables
	DropTube
Operation temp.	-20° C - +50° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.55



Riser Box II

The Riser Box Multi Tray (RBMT) is designed for use within apartment blocks and mid/high rise office blocks. The unit houses either eight splice trays, or 4 splice trays and a module storage area. Each splice tray is able to accommodate 8 fibre splices. An in-line cable entry port enables the box to be installed onto an in-line riser cable and up to 24 drop ports are available for drop cables of up to 5mm in diameter. The inner tray module can be moved from left to right enabling the riser cable to be installed into the box on either the left or right hand side.

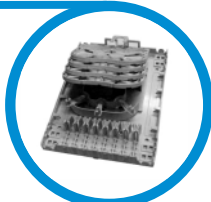
Features and Benefits

- Allows splicing from in line or butt cables to customer drop cables
- Suitable for two butt or one inline cable of up to 15 mm in diameter
- In line cables can enter/exit from the unit on the left or right hand side
- 24 drop cables (OD 5 mm) or 32 drop cables (OD 4.2 mm) can be spliced. Drop cables exit the unit from the bottom face
- The drop cable entries are suitable for cables or tubes from 2.5 to 5 mm in diameter
- Available in two sizes - RBMT4 with 4 trays and a module storage section, or RBMT8 with 8 trays
- Up to 8 fusion splices or 4 mechanical splices can be accommodated into each of the splice trays (total of 64 fusion or 32 mechanical splices for the RBMT8 and 32 fusion or 16 mechanical splices for the RBMT4)
- Easily installed and fitted to the wall or inside a riser
- Can be supplied with a keyed lock for secured applications

Ordering no.: VQ-RB2-1

Technical data

No of Splice Trays	4/8
Max capacity (fibres)	32/64
Max diameter of in line cable	15 mm
Max number of drop cables	24
Max diameter of drop cables	5 mm
Dimensions (mm)	176 x 130 x 60
Operation temp.	-20° C - +60° C
Material type	UL 94 V-0
Weight (kg)	0.34/0.39



Nanopatchcords

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Nanopatchcord FTTH is multi-connectorised cable with minimized outer diameter up to: 1-2 mm. Fibers are pre-terminated with FO connectors. Nanopatchcords are classified as the last mile products for end- customer / subscriber connection. Provided as tailor made product according to the customer request where reduction of spliced points is needed. There is plenty of different connectors' configurations. Perfect for blowing into METRO Jet microducting system. Main application is FTTH system as well as structural building system and distribution points connections where large number of fibers is packed in the small space. It is used for servers wiring, to multiply connections between cabinets.

Construction and application

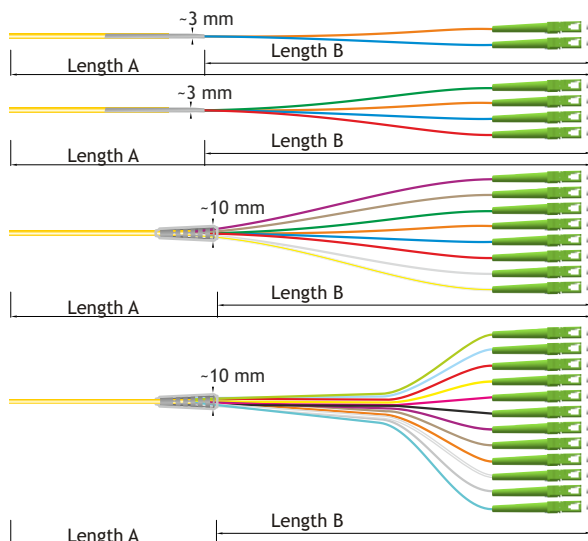
Due to small cable size and for an easy cable installation, fibers are provided onto a cartoon reels. It guarantees protection of the terminated fibers. Additionally it simplify installation process and prevents mixing up fibers together. Pre-connectorisation allows termination up to 12 fibers with diameter 250 µm. On each fiber additional 0.9 mm coating is pulled.

Application:

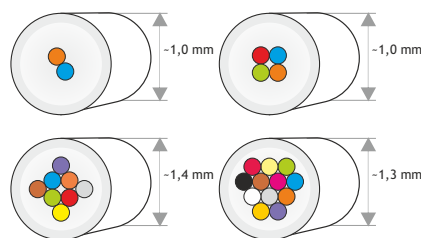
- Construction: 2, 4, 8, 12 fibers
- Terminated and provided on light cartoon reel
- Small lateral cable dimensions, small units diameter. For pre-installation in a microducts- parameters for blowing purposes
- Different fiber types for different application
- Save of time when installing
- Save of splices
- Small weight for transportation purposes

Characteristics:

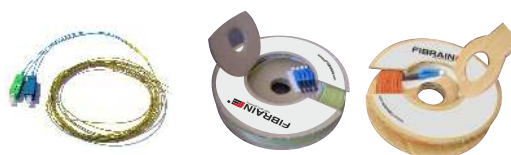
- Compact construction
- Possibility to install directly in microducts 5/3.5, 5/3.8, 4/3
- Different fiber types available
- Splices reduction up to 50%
- Easy and fast installation
- All connector type available
- Delivered on cartoon reels which protects fiber terminations during transport and installation
- Fiber bundles up to 12 fibers



Cross-section of fiber bundle MK-BX2



Packing sample



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Fiber To The Home
FTTH Solutions for multifamily units

Customer DropTube LSOH with/without rope

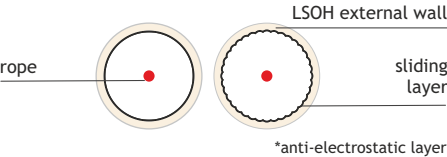
Features and Benefits

- Low Friction tube with an anti static bore
- Supplied with a pulling rope pre-installed for easy fibre installation
- Tube plugs are available to ensure access to the pulling rope when cutting the drop tube into lengths
- Available in internal and external formats. External format is the internal tube with an extra polyethylene sheath
- Reduced Fire Hazard Tube
- Excellent Crush Protection

Non-flammable DropTube LSOH

DropTube type [mm]		Outer diam. [mm]	Inner diam. [mm]
5/3.5	MT-SF09-LSOF	5	3.5
5/3.5	MT-SF09-LSRF	5	3.5

Non-flammable MT-SF



Ordering no.: MT-SF09-LSOF
MT-SF09-LSRF



4-port Breakout Unit

Features and Benefits

- Compact, low profile, wall mounted unit typically used in multi dwelling units
- Unit manufactured from fire resistant material to UL94-V0
- Supplied with all of the components required to mount the unit to a wall and secure an in-line Vertiqio cable
- Can accommodate RiserCables of up to 15 mm in diameter
- Can take out 4 drop tubes
- Can be supplied to accommodate drop tubes of 5 mm in diameter

Technical data

No. of input cabls	1 in-line
Max. cable diameter (mm)	15
Max. number of DropTubes	4
Max. diameter of DT (mm)	5
Tube/cable retention (N)	>70
Dimensions (w)x(h)x(d)	120x50x27
Operation temp.	-20° C - +60° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.045

Ordering no.: VQ-BU4



8-port Breakout Unit

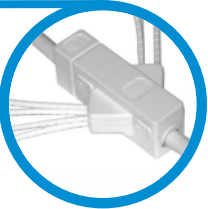
Features and Benefits

- Compact, low profile, wall mounted unit typically used in multi dwelling units
- Unit manufactured from fire resistant material to UL94-V0
- Supplied with all of the components required to mount the unit to a wall and secure an in-line Vertiqio cable
- Can accommodate RiserCables of up to 15 mm in diameter
- Can take out 8 drop tubes
- Can be supplied to accommodate drop tubes of 3 mm in diameter
- It's possible to reduce the length of the part breaking the top part following the grooves with cut pliers

Technical data

No. of input cabls	1 in-line
Max. cable diameter (mm)	12
Max. number of DropTubes	8
Max. diameter of DT (mm)	3
Tube/cable retention (N)	>50
Dimensions (w)x(h)x(d)	71x45x25.5
Operation temp.	-20° C - +60° C
IP Rating	IP 20
Material type	UL 94 V-0
Weight (kg)	0.17

Ordering no.: VQ-BU8



Customer Kit - preconnectorised DropCables with customer outlet (coiled)



Features and Benefits

- Different customer outlets and DropCables available
- Reduces installation time
- Installation cost reduction
- Factory preterminated and preinstalled DropCable
- Easy to handle and install
- Customised DropCable length

Technical data

Outlets type	VFTO-A, VFTO-B, VFTO-C
DropCables type	VC-DCI, VC-DCS, VC-DCA, VC-DCY
Operation temp.	-20°C - +60°C
Fibers count	1, 2 or 4
IL (dB)	>0.3
RL (dB)	<55 (65 APC)
DropCables length (m)	1-100

Ordering no.: A-A1-xx, A-A2-xx, A-B1-xx, A-C1-xx

High resistance customer connection cable 1000 N



Features and Benefits

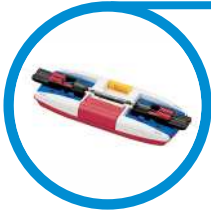
- 500-1000 N crush resistance cable available
- Safety usage at home and flats as a connection between customer outlet and ONU or STB
- Direct connectorisation on 4 mm cables without fanout
- Special boots and crimpsets for high diameter cable
- Tensile strength and crush resistance 5-times higher than standard patchcord

Technical data

Connectors type	SC, SC-APC, LC, LC-APC, *
DropCables type	VC-DCI, VC-DCS, VC-DCA
Operation temp.	-20°C - +60°C
Flame resistance	LSOH
Fibers count	1
IL (dB)	>0.3
RL (dB)	<55 (65 APC)
Cable length (m)	1-50

Ordering no.: A-xx

Mechanical Rapid Splice and Toolkit



Features and Benefits

- Universal construction allows execution of 250 µm and 900 µm fibers
- Highest quality of v-grooves execution facilities connection either singlemode and multimode
- Average splice attenuation at level 0.1 5dB
- Time of connection execution about 2 minutes
- Possible one repetition of splice execution

Technical data

Dimensions (mm)	4x4x40
Single fibers in coating	250 µm and 900 µm. Core dimensions 125 µm,
Fiber tolerance	240-265 µm and 850-950 µm
Operation temperature	-30°C - +60°C
Maximum attenuation	< 0.5 dB
Average reflectance	> 40 dB
Fiber connections	50/125, 62.5/125 and singlemode 09/125

Ordering no.: FB-7195, FB-7197

Fiber To The Home

FTTH Solutions for multifamily units - VertiDrop & VertiJET

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Customer Outlet VFTO-A - 2 fibers

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear or bottom
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit at bottom face and are protected by cover

Technical data

Number of input cable ports	1
Maximum input cable diameter (mm)	10
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	120x100x24
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.095



Ordering no.: VFTO-A-xx

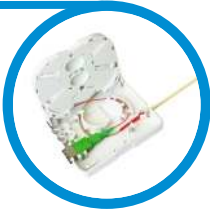
Customer Outlet VFTO-B - 2 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom or top
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Removable cover for easy access
- Tamperproof cover security screws available as an option
- Patchcords exit unit at bottom face via shuttered SC adapters

Technical data

Number of input cable ports	3
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	2
Maximum no. of customer feeds	2
Dimensions	100x80x22
Operating temperature	-40° C - +75° C
Material	UL94 HB
Weight (kg)	0.060



Ordering no.: VFTO-B-xx

Customer Outlet VFTO-C - 4 fibres

Features and Benefits

- Compact & attractive design for interior wall mounting
- Cables can enter unit from rear, bottom, top, left or right
- Supplied with a bracket for wall mounting or mounting directly onto a DIN Rail
- All fibres are positively managed to maintain a 20 mm minimum bend radius
- Optional and removable rear entry cable management
- Flip tray to allow access to connectorised tails and cable entry
- Supplied with a security screw to prevent unauthorised access
- Patchcords exit unit at bottom face via shuttered SC adapters

Technical data

Number of input cable ports	2 bottom 1 rear 1 top 1 left 1 right
Maximum input cable diameter (mm)	6
Maximum capacity of fibers	4
Maximum no. of customer feeds	4
Dimensions	83x100x27
Operating temperature	-20° C - +50° C
Material	UL94 V0
Weight (kg)	0.1

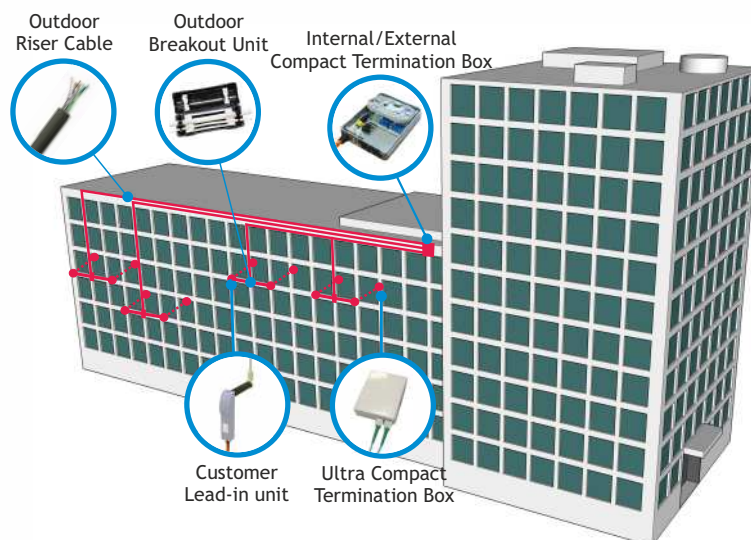
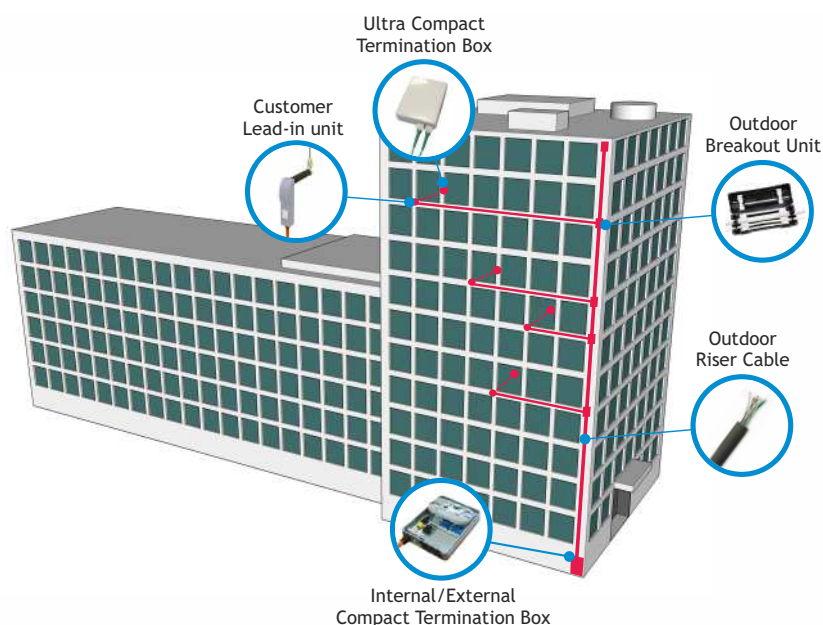


Ordering no.: VFTO-C-xx

Vertiqo FACADE

For building internal installation we offer Vertiqo system but in the case of building outdoor installation we provide up-to-date Vertiqo FACADE system. Similar to Vertiqo system the key point of Vertiqo FACADE system is a special Easy Access Cable adapted for an outdoor application. Cable jacket is UV resistant. Similarly as to Riser Cable there is configuration of 12, 24, 36, 48, 96 fibers available.

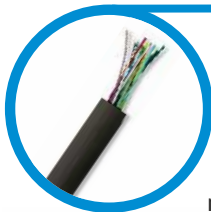
Easy Access Cable REAMC can be installed directly on the building facade and final subscribers are connected directly from branching boxes mounted on the outer side of the building. Cable is conducted through the wall entrance elements directly to the apartment. Unique cable construction enables easy remove of the outer jacket (open window) and taking out ESFU fiber module from the cable on the length of even 25 meters. There is possibility to provide it in pre-connectorised version.



Fiber To The Home

FTTH Solutions for multifamily units - Vertiqio FACADE

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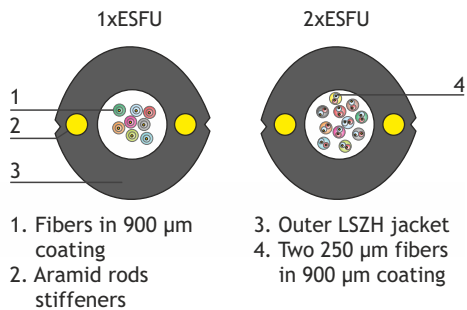


Cables of easy access (Riser Cables) in UV resistant layer are designed for assembly FO cables in multi residential buildings, offices areas and also so called "open spaces". Special construction allows easy access to fibers by cutting a window in a cable outer jacket using a simply cutting device. This method allows to take out ESFU fiber module on the length of 25 meters. Cables are available in construction of 12-48F with single 1xESFU modules and 24-96F with double 2xESFU modules. Modules can be distinguished by colour code and printed black markers. Fibers in modules are coated with easy strip jacket to facilitate easy installation and termination. Cables are covered with non flammable LSZH jacket according to IEC 60332-1.

Construction:

- 12-48 fibers 1xESFU or 24-96 fibers in 2xESFU
- Aramid rods stiffeners
- Construction allows window cut and easy access to the fibers
- Construction protects fibers while window cutting
- Possibility to take out ESFU fibers on the length of 25 m
- LSZH and UV resistant jacket
- G657A fibers with reduced bending radius in easy strip coating

VQ-FRC1 VQ-FRC2 - Riser Cables



Application:

- Cable of easy access in FTTx network
- Multi-residential building
- Parking spaces, offices areas
- Latest FTTH projects
- Premises cables, universal, indoor-outdoor

Technical specification:

Module type:	1xESFU			2xESFU		
Cable reference number	VQ-RC1-12*	VQ-RC1-24*	VQ-RC1-48*	VQ-RC1-24*	VQ-RC1-48*	VQ-RC1-96*
Fiber number:	12	24	48	24	48	96
Outer diameter: (mm)	8.5	12	14.5	10	12	14.5
Weight: (kg/km)	68	135	190	81	135	190
Fiber types*	S7A - single mode ITU657A,					
Temperature range - operation:	-10°C - +60°C					
Crush resistance:	500 N / 100 mm					
Min bending radius (mm):						
- While tension:	170	240	300	200	240	300
- Without tension:	85	120	150	100	120	150
Pulling force:	150 N			300 N		

Fibers and 1xESFU module tubes colour code:

Fiber color:	1	3	5	2	6	4	7	8	11	10	9	12
Tube color:	13	15	17	14	18	16	19	20	23	22	21	24
Tube color:	25	27	29	26	30	28	31	32	35	34	33	36
Tube color:	37	39	41	38	42	40	43	44	47	46	45	48

Fibers and 2xESFU module tubes colour code:

Fiber color:	1	3	5	2	6	4	7	8	11	10	9	12
Tube color:	13	15	17	14	18	16	19	20	23	22	21	24
Tube color:	25	27	29	26	30	28	31	32	35	34	33	36
Tube color:	37	39	41	38	42	40	43	44	47	46	45	48

Color name:

Color:	Blue	Red	Green	Yellow	Violet	White	Orange	Grey	Brown	Black	Aqua	Pink
Color:	Dark Green	Light Green	Red-blue									

FBU-S1/S2/S3 - Facade Breakout Unit

Facade Breakout Units - are used to breakout and distribute the fibres from an in-line riser easy access cable (REAC) into drop tubes, for routing to a customer premises. It is UV resistant and sealed to IP67, enabling it to be mounted in the outdoor environment. It has the capacity to accommodate an in-line 6,5 mm S1, 13 mm S2 and 18 mm REAC cables diameter. It enables a window to be cut in the cable to access the fibres, which can be spurred of into a drop tube of up to 6,5 mm and 8mm in diameter.



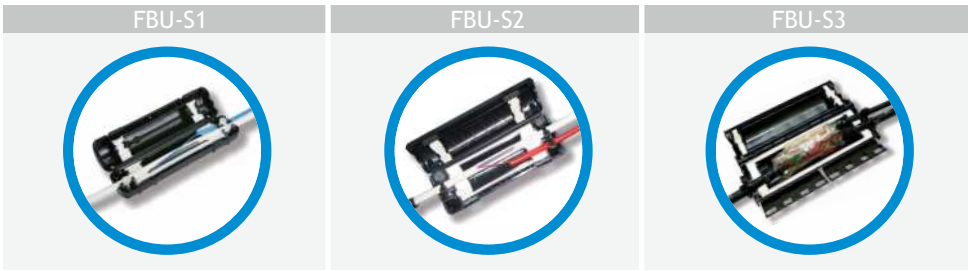
Features and Benefits

- For FTTx applications
- The FBU's are watertight protection for window cut cables. These closures are used in the distribution of REAC in mid span access application
- Designed for outdoor use, wall mounted or pole mounted
- Their small size allows them to be placed indoors or in distribution ducts

Technical data

	FBU S1	FBU S2	FBU S3
Cable diameters (mm)	6,5	13	13-18
Tubes diameters (mm)	2x6.5	2x6.5	2x9-13
Length (mm)	140	150	200
Width (mm)	36	50	80
Depth (mm)	30	40	50
Dimension cavity (mm)	16x68	30x75	55x176

Ordering no.: FBU-S1/2/3



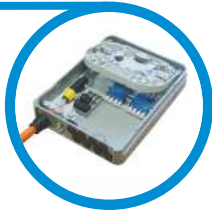
IECTB - Internal/External Compact Termination Box

Features and Benefits

- Termination Box can be mounted internally or externally
- Removable cover for easy access and fitted with a lock for enhanced security
- Unit manufactured of UV stabilised fire resistant UL94-V0 material allowing external installation
- Single hinged splice tray enables access for working. The splice tray is supplied interchangeable inserts and can accommodate up to 8 fusion splice protectors of heat shrink or crimp type, or 8 mechanical splices
- Customer drop cables (patch cords) exit from the bottom of the unit and are sealed using a split grommet. Drop cables can also be routed through the wall
- Up to 4 SC type pigtails and adapters or 8 LC type pigtails and adapters can be accommodated
- All fibres are positively bend managed to a 30 mm minimum bend radius
- External input cable enters the unit from the bottom. Cable up to 11 mm in diameter can be accommodated
- For Blown Fibre applications a gas block connector can be housed within the box

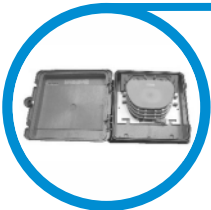
Technical data

Number of Splice Trays	1
Maximum Fibre Capacity	8
Maximum Input Cable Diameter (mm)	11
Maximum No. of Input Cables	1
Max Output Cable Diameter (mm)	3.2
Maximum No. of Output Cables	8
Dimensions	140x185x32
Operating temperature	-20°C - +50°C
IP Rating	Ip55
Weight (kg)	0.35



Ordering no.: VQ-ECTB-1

IECTB - Internal/External Compact Termination Box



Features and Benefits

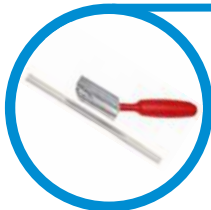
- Compact and Robust Internal/External wall box
- Single circuit versions available for 12, 24 and 36 fibre capacities
- Single element versions available for 48, 96 and 144 fibre capacities
- Splice trays hinge upwards for ease of installation and maintenance
- Lockable hinged lid for extra security
- Can be supplied to accommodate either heat shrink splice protectors or crimp splice protectors
- Cable entry gland sizes range from 13 mm up to 20 mm
- Up to 9 cable entry/exit points are provided
- All fibres are positively managed to a 30 mm minimum bend radius
- Compatible with Blown Fibre products

Technical data

Number of Splice Trays	4, 8 or 12 (single element)
	6, 12 or 20 (single circuit)
Maximum Fibre Capacity	48, 96 or 144 (single element)
	12, 24 or 36 (single circuit)
Max. Cable Diameter (mm)	12
IP Rating	Ip55
Dimensions	272x270x100
Operation temp.	-20C - +60C
Weight	1.5

Ordering no.: VQ-ECTB-2

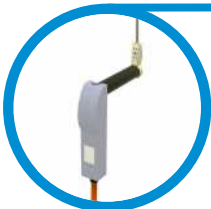
Stripping Tool



Cutting device which is needed to cut a window in an outer jacket of Riser Easy Access Cable. Changeable spare blades are available.

Ordering no.: VQ-ST

CLI - Customer Lead-in Unit



Features and Benefits

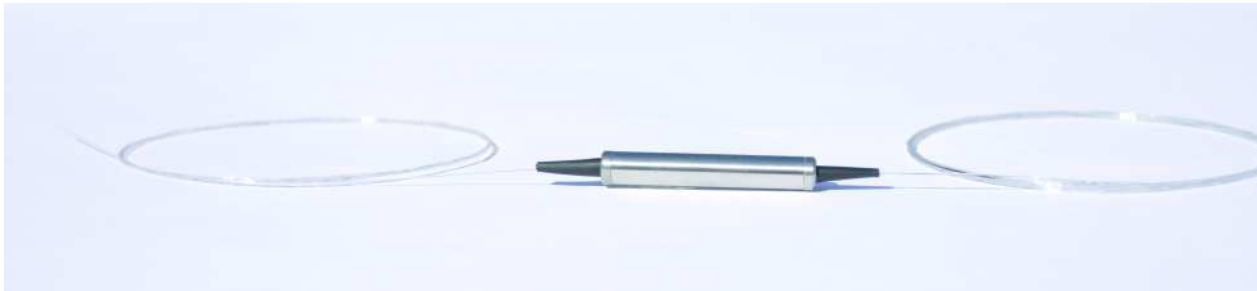
- Ergonomic design
- All fibres are positively managed to maintain a 30 mm minimum bend radius
- Prevents the accidental damage of optical cables during installation through walls, and therefore eliminates return to site costs due to fibre breaks / macro bending
- Gas / Water block facility for a single tube cable
- Removable cover for easy access
- Internal unit manufactured from fire resistant UL94-V0 rated material

Ordering no.: VC-XBFSC00092
VC-XBFSC00095

Technical data

Number of cable ports	1
Maximum cable diameter (mm)	13
Maximum capacity	1 Tube (5 mm)
Maximum no. of customer feeds	1
Dimensions (Internal Unit - 1 Tube)	65x26x15
Dimensions (Internal Unit - Cable)	180x36x36
Dimensions (External Unit)	180x36x36
Operating temperature	-20° C - +50° C
IP Rating	Ip68
Weight (kg)	0.5

PLC splitters and accessories



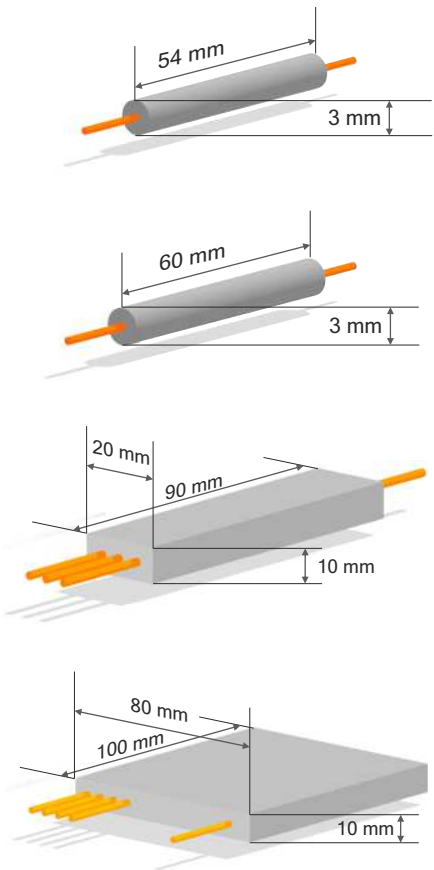
Passive optical devices and accessories for FTTx networks

Most often, FTTx networks are built in PON technology. They are of the point-to-multipoint type or, in other words, utilize the logical star topology. The physical topology employed depends, to an extent, on the subscribers population density. In single family housing areas, one possible approach is the bus topology. In multidwelling units the single-branching tree topology is typically the most efficient approach. In any case, the central points in the network are the optical splitters which split the signal from OLT between all subscribers. If bus topology is employed, the splitters could be of the FBT type. When tree topology is used, the preferred choice are the multiport PLC splitters. In networks with CATV overlay, WDM triplexers are required to separate the 1310, 1490 and 1550 nm waves. Additionally, Fibrain recommends using triplexers with OTDR 1625 monitoring port which (as explained later) simplify network maintenance and live network monitoring.

CPL Splitters/Couplers FBT

Fibrain splitters CPL series family are used for division of optical power transferred in optical fibers. They are available in different production variants. These series are made with use of FBT technology (Fused Biconical Tapering). These are characterized by high resistance to variable conditions occurring in external network and low insertion loss IL and low reflectance.

Technical data				
Standard single window				
Type	1x2; 2x2	1x3	1x4	
Power split	1-50%	33.3/33.3/33.3*	25/25/25/25*	
Wavelength	1310 / 1550 nm /other			
Bandwidth	±40 nm			
Uniformity	≤0.5 dB	≤1.1 dB	≤1.4 dB	
PDL max.	≤0.15 dB			
Max. Attenuation	≤3.3 dB 50/50	≤5.6 dB	≤7.2 dB	
Directivity	≥55 dB			
Temperature stability	0.002 dB/C			
Operating temperature	-40°C - +85°C			
*Another split available per individual order				
Dual window 1310&1550 nm				
Type	1x2; 2x2	1x3	1x4	
Power split	1-50%	33.3/33.3/33.3*	25/25/25/25*	
Wavelength	1310 / 1550 nm /other			
Bandwidth	±40 nm			
Uniformity	≤0,6 dB	≤1.1 dB	≤1.4 dB	
PDL max.	≤0.15dB			
Max. Attenuation	≤3.6 dB 50/50	≤5.8 dB	≤7.6 dB	
Directivity	≥55 dB			
Temperature stability	0.002 dB/C			
Operating temperature	-40°C - +85°C			
*Another split available per individual order				
Three window 1310 & 1550 & 1490 nm				
Type	1x2; 2x2	1x3	1x4	
Power split	1-50%	33.3/33.3/33.3*	25/25/25/25*	
Wavelength	1310 / 1550 / 1490 nm /other			
Bandwidth	±40 nm			
Uniformity	≤0.7 dB	≤1.4 dB	≤1.7 dB	
PDL max.	≤0.20 dB	≤0.30 dB	≤0.30 dB	
Max. Attenuation	≤3.7 dB 50/50	≤6.0 dB	≤7.8 dB	
Directivity	≥55 dB			
Temperature stability	0.002 dB/C			
Operating temperature	-40°C - +85°C			
*Another split available per individual order				





FPLC Splitters PLC (Planar Wave Circuit)

Fibrain splitters CPL family series are used for division of optical power transferred in optical duct. Planar technology facilitates devices production of signal split from 4 up to 128, at the same time guaranteeing small dimensions, very high operating stability at full bandwidth 1260-1650 nm. Additionally provides better transmission parameters as low DPL ration, high channels uniformity and thermal stability.

Technical data						
Characteristics of Splitters with Bare Fibers						
Parameter	Unit	Specification				
		1x2	1x3	1x4	1x6	1x8
Insertion Loss (Max. S/P)	dB	4.0/3.7	6.3/6.0	7.3/7.1	9.5/9.1	10.7/10.5
Uniformity (Max. S/P)	dB	0.8/0.6	0.6/0.1	0.6/0.5	0.8/0.7	1.0/0.8
PLD (Max. S/P)	dB	0.2/0.15	0.2/0.2	0.2/0.2	0.2/0.2	0.3/0.3
Return loss/Directivity	dB	>=55				
Operating Wavelength	nm	1260 ~1650				
Operating Temperature	°C	-40 ~ +85				
Optical Fiber	-	Bend Insensitive Fiber				

Parameter	Unit	Specification				
		1x12	1x16	1x24	1x32	1x64
Insertion Loss (Max. S/P)	dB	12.5/12.4	13.8/13.7	-	17.0/17.0	20.5
Uniformity (Max. S/P)	dB	1.1/1.0	1.2/1.0	-	1.3/1.1	2.0
PLD (Max. S/P)	dB	0.3/0.3	0.3/0.3	-	0.3/0.25	0.3
Return loss/Directivity	dB	>=55				
Operating Wavelength	nm	1260 ~1650				
Operating Temperature	°C	-40 ~ +85				
Optical Fiber	-	Bend Insensitive Fiber				

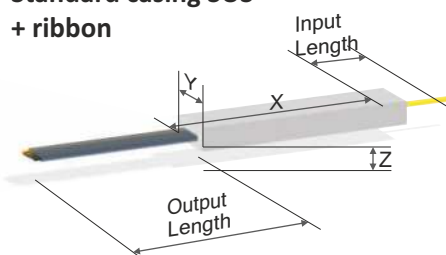
Applications:

- telecommunication networks,
- CATV networks,
- Fiber To The Home networks (FTTH).

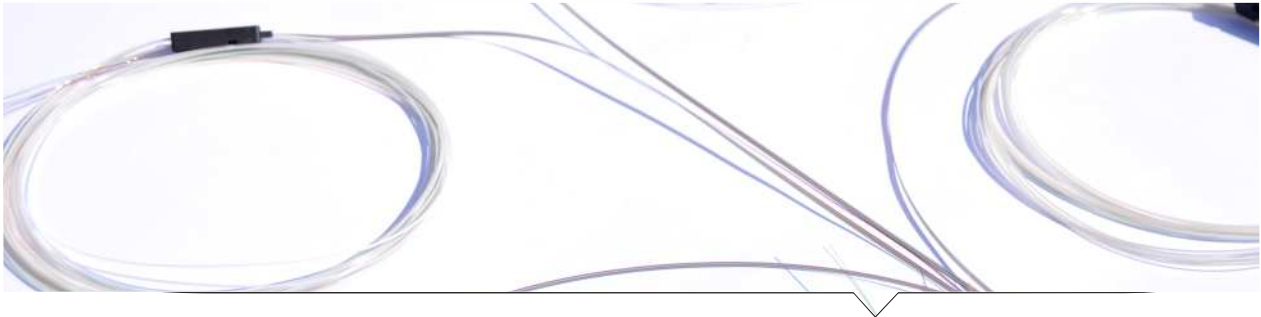
Features:

- low insertion loss,
- low uniformity,
- wide operational scope,
- compact casings,
- low PDL ratio.

Standard casing SUS + ribbon



Casing				
Standard Package				
Parameter	1x2, 1x3, 1x4, 1x6, 1x8	2x2, 2x4, 2x8	1x12, 1x16, 1x32 2x16, 2x32	1x64
Material	Stainless Steel (SUS)			
Dimension (mm)	40x4x4	50x5x4	60x7x4 or 55x7x4	58x12x4
Fun-out Kit				
Dimension (mm)	35x15x7 with PVDF 900 μm Loose Tube, Color of Tube is White			
Mini Box-1 Package				
Parameter	1x2, 1x3, 1x4, 1x6, 1x8, 2x4	1x12, 1x16, 2x8	1x32, 2x16	2x32, 1x64
Material	Stainless Steel (SUS)			
Dimension (mm)	55x7x4	58x12x4	80x20x6	120x30x12
Protected Tube	PVDF 900um Loose Tube, Color of Tube is White			
Mini Box-2 Package				
Parameter	1x2, 1x3, 1x4, 1x6, 1x8, 2x4	1x12, 1x16, 2x8	1x32, 2x16	2x32, 1x64
Material	Plastic			
Dimension (mm)	100x20x10	100x30x10	120x30x15	100x30x12
Protected Tube	PVDF 900um Loose Tube, Color of Tube is White			
Mini Box-3 Package				
Parameter	1x2, 1x3, 1x4, 1x6, 1x8, 2x4	1x12, 1x16, 2x8	1x32, 2x16	2x32, 1x64
Material	Plastic			
Dimension (mm)	100x20x10	100x30x10	120x30x15	100x80x20
Protected Tube	PVC 2.0 mm Jacked cord, Color of cord is Yellow			



Color of Fiber

Ribbon Fiber can be distinguished each fiber by using method of coloring

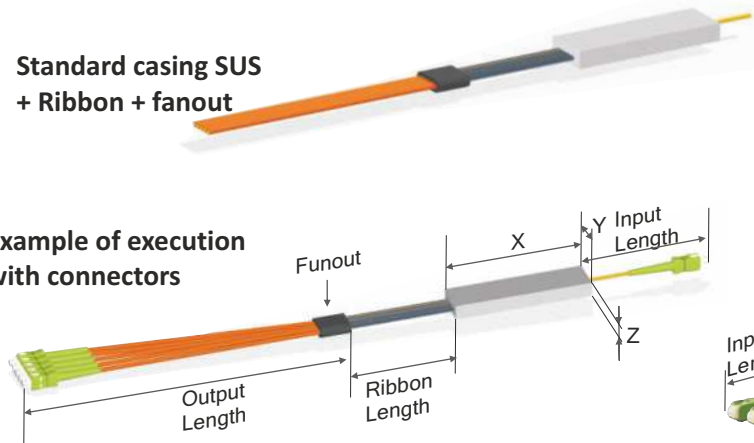
Channel (Output)	Fiber Number							
	1	2	3	4	5	6	7	8
4ch Ribbon Fiber	Blue	Yellow	Green	Red	-	-	-	-
8ch Ribbon Fiber	Blue	Yellow	Green	Red	Orange	Violet	Brown	Black
Channel (Input)	Fiber Number							
	1				2			
1ch	Clear				None			
2ch	Blue				Clear			

Output ribbon fiber Configuration

Splitter Type	1x3	1x4/2x4	1x6	1x8/2x8
1ea - 4ch Ribbon	1ea - 4ch Ribbon	1ea - 4ch Ribbon	2ea - 4ch Ribbon	1ea - 8ch Ribbon & 2ea - 4ch Ribbon
1x12	1x16/2x16	1x32/2x32	1x64	
2ea - 8ch Ribbon	2ea - 8ch Ribbon	4ea - 8ch Ribbon	8ea - 8ch Ribbon	

Standard casing SUS
+ Ribbon + fanout

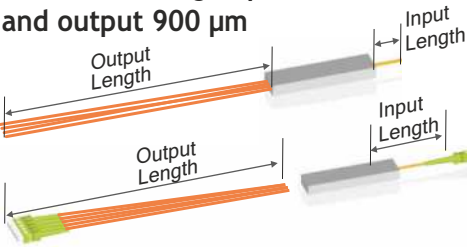
Example of execution
with connectors



Casing:

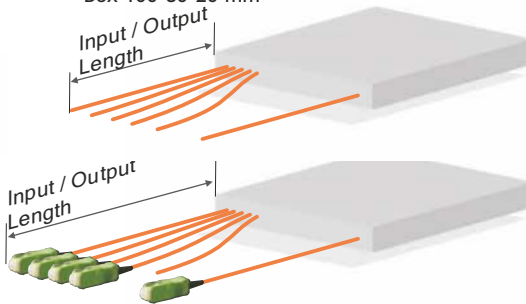
3*54 mm 1x2; 2x2; 250 μm, 900 μm
3*54 mm 1x3; 1x4; 250 μm
3*60 mm 1x3; 1x4; 900 μm
Box 90x20*10 mm 1x2; 2x2 2,0 mm lub 3.0 mm
Box 100*80*10 mm 1x3 1x4; 2,0 mm lub 3.0 mm
Other 19" shelf 1U i 2U, LGX housing

Minibox1 casing input
and output 900 μm



Execution:

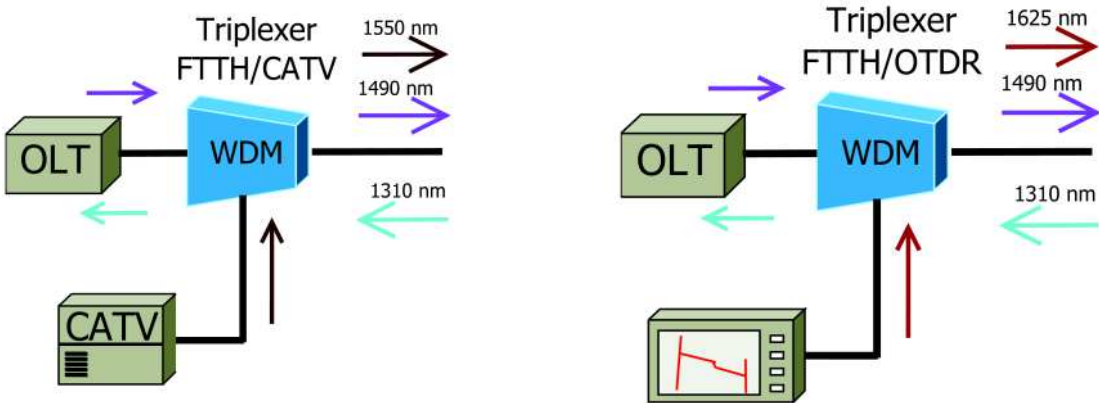
Box 100*20*10 mm
Box 100*30*10 mm
Box 120*30*15 mm
Box 100*80*20 mm



Fiber: 1-G652D 2-G657A 3-G657B 4-MM50 5-OM3 6-M62,5		Input fiber: 25 - 250 μm 90 - 900 μm 20 - 2.0 mm 30 - 3.0 mm		Output fiber: 1- ribbon 2- ribbon + fanout 900 μm 3- fanout 900 μm 4- fanout 2.0 mm 5- fanout 3.0 mm		Casing type: 1 - 40x4x4 mm 8 - 50x5x4 mm 2 - 60x4x7 mm 9 - 55x7x4 mm 3 - 58x4x12 mm 10 - 120x30x12 mm 4 - 57x7x4 mm 11 - 100x20x10 mm 5 - 80x20x6 mm 12 - 100x30x10 mm 6 - 100x80x10 mm 13 - 120x30x15 mm 7 - 100x80x20 mm x - other				
FPLC - G0 - 1 - 14 - 90 - 0 - 2 - 1 - 11 - SC - SC										
Quality: S0/S1 G0/G1 T0/T1 P0/P1		Split: 12 - 1X2 22 - 2X2 13 - 1X3 14 - 1X4 18 - 1X8 116 - 1X16 132 - 1X32 164 - 1X64 ITD.		Input lenght: 0 - 0.5MB 1 - 1.0MB 2 - 2.0MB		Output lenght: 0x - 0.5 MB ribbon x0 - 0.5 MB fanout 00 - 0.5 MB ribbon + 0.5 fanout x1 - 1 MB fanout		Connector type: ST SC SCA FC FCA LC LCA E20 E2A x - other		Connector type: ST SC SCA FC FCA LC LCA E20 E2A x - other

WDM Triplexers for FTTx (Fibrain FWDM series)

WDM triplexers for FTTx networks are based on the trusted and proven TFF (thin film filters) technology. Thanks to its flexibility, it allows adding new services and functionalities to help operators leverage their investments. The most common application is coupling the CATV 1550 nm signal with the native PON wavelengths or providing 1625/1650 nm ports for OTDR monitoring of the live network.



FBG filters for live network monitoring (Fibrain FBG series)

FBG filters for FTTx applications are reflective filters integrated in the LC or SC adapters, which reflect the 1625 nm wavelength and transmit all other (i.e. 1310, 1490 and 1550 nm). They can be used to monitor live network utilizing OTDR operating at 1625 or 1650 nm. End-to-end OTDR measurements from OLT to ONT are typically difficult due to the high point insertion loss introduced by the splitter and due to the required very good spatial resolution. The use of the 1625 nm reflectors is an efficient and cost-effective way of reducing the required dynamic range of the OTDR. The 1625 nm reflectors are currently considered the best way of implementing real time end-to-end (OLT to ONT) monitoring of the optical layer in live FTTx networks.



Technical data					
Parameter		Specification			Marks
		MIN.	TYP.	MAX.	
Wave length	Band. 1310	1260-1360			nm
	Band. 1310	1480-1500			nm
	Band. 1310	1610-1650			nm
Attenuation			0.6	0.9	dB @1310+1490
Isolation		25	35		dB
Reflectance loss				5	dB @1625
		20			dB @1310+1490

Passive FWDM solutions - multiplexers

At the heart of the Fibrain FWDM family of solutions is the well-known and field-proven TFF (thin film filter) technology. Our products utilizing this technology are characterized by very high interchannel isolation, good temperature stability and low insertion loss. Multiplexers manufactured in this technology are used to combine or separate channels at different wavelengths, most often 980, 1310, 1490 and 1550 nm in different combinations.

Applications:

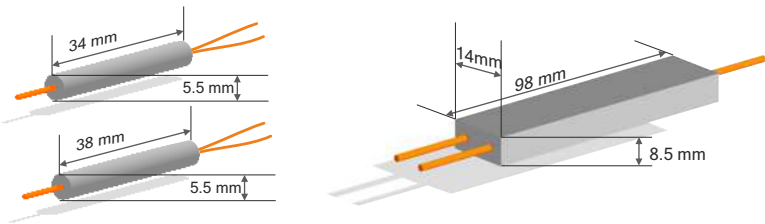
- bidirectional WDM systems,
- telecommunication networks,
- CATV networks.

Features:

parameters high temperature stability, low insertion loss and polarization loss, channel isolation.

Technical data				
Type	1310/1550	980/1550	1480/1550nm	1550/1310&1490nm
Pass channel	1260-1360 nm(1520-1600 nm)	1520-1600 nm	1440-1490 nm (1530-1580 nm)	1550-1600 nm
Reflect channel	1520 nm-1600 nm(1260-1360 nm)	965-1000 nm	1530-1580 nm (1440-1490 nm)	1260-1360 nm & 1460-1500 nm
Pass channel attenuation[dB]	<=0.8	<=1.0	<=0.6	<=0.7
Reflect channel attenuation[dB]	<=0.8	<=0.6	<=0.5	<=0.6
Pass channel isolation [dB]			>30	
Reflect channel isolation [dB]	>15	>18	>15	>20
PDL [dB]	0.1		0.15	
PMD [ps]			0.1	
Directivity		>=60 dB		>=50
Reflect loss RL [dB]			>= 50	
Thermal stability			0.005 dB/C	
Storage temperature			-40°C - +85°C	
Operating temperature			-20°C - +70°C	
Fiber type	SM 09/125 G.652D	Corning HI 1060 flex	SM 09/125 G.652D	SM 09/125 G.652D
Max. power [MW]			300	

Casing:			
Fiber type	250 µm	900 µm	900 µm, 2.0 mm lub 3.0 mm
Dimensions	Fi 34*5.5 mm	Fi 38*5.5 mm	98x14x8.5 mm



Quality: S0/S1 G0/G1 T0/T1 P0/P1		Split: 12 - 1x2		Wavelength: 3155 - 1310/1550 9855 - 980/1550 4855 - 1480/1550 5538 - 1550/1310 &1480 xxxx - other		Casing type: 1 - 34x5.5 mm 2 - 38x5.5 mm 3 - 98x14x8.5 mm x - other	
FWDM - G0 - 1 - 12 - 0 - 3155 - 25 - 1 - SC - SC							
Fiber: 1 - G652D 2 - G657A 7 - HI 1060		Length: 0 - 0.5 m 1 - 1 m 2 - 2 m		Fiber type: 25 - 250 μm 90 - 900 μm 20 - 2.0 mm 30 - 3.0 mm		Connector type: ST SC SCA FC FCA LC LCA E20 E2A x - other	
						Connector type: ST SC SCA FC FCA LC LCA E20 E2A x - other	



PON-PZSP 19” integrated patch panels

Integrated patch panels Fibrain PON facilitate easy management of elements installed in telecommunication and providers networks. Variety of products available and tailored solutions additional effects flexibility of PON systems and provides future extension of systems.

- Available casing of standard 19” and 21“ dedicated for:
- integrated splitters shelves for CATV operator,
 - integrated splitters shelves FTTH,
 - hybrid solutions.

Casings dimensions		
Type	PZPON-1U	PZPON-2U
Height	1U	2U
Depth [mm]	280	
Width [mm]	436	
Mounting	19” lub 21”	
Color	RAL7035*	

*Other colors available on request

- Applications:**
- WDM systems
 - telecommunication networks
 - CATV networks
 - optic amplifiers
 - measuring equipment

- Features:**
- easy management of PON elements
 - clear description of PON elements installed
 - possible installation of 1U and 2U in 19” and 21“
 - dedicated and hybrid solutions

**Technical data of splitters FBT and PLC see products cards.
Examples of execution:



Quality:
S0/S1
G0/G1
T0/T1
P0/P1

Height:
1- 1U
2- 2U

Type:
S - single window
D - dual windows
T - three windows
F - full band
M - multimode
P - PLC

PZSP-G0-1-1-1612-D-35-50-SC-SC

Fiber:
1 - G.652D
2 - G.657A

Qty / type:
0812 – 8x1/2
1612 – 16x1/2
0414 – 4x1/4
0814 – 8x1/4
02116 – 2x1/16
xxxx – other

Wavelength:
85 - 850 nm
98 - 980 nm
10 - 1060 nm
13 - 1310 nm
15 - 1550 nm
35 - 1310/1550 nm
345 - 1310/1490/
1550 nm
XX - other

Power split:
50 - 50/50
70 - 70/30
3333 - 33/33/33
for 1x3
2525 - 25/25/25/25
for 1x4

Connector type:
ST
SC
SCA
FC
FCA
LC
LCA
E20
E2A
x - other

Connector type:
ST
SC
SCA
FC
FCA
LC
LCA
E20
E2A
x - other

PZSP-G0-1-1-1612-D-35-50-SC-SC
Example: integrated patch panel 19” 1U, 16x1/2 splitters, dual window, 1310/1550nm 50/50% 48”SC/UPC.



Optical splitters in LGX casing

Fibrain LGX solution facilitate easy management of optical passive elements installed in telecommunication and providers networks. Additional chief asset is very easy extension as well as flexibility of demanded configuration adjustment.

LGX products offer possibility of mounting within one frame integrated FBT and PLC splitters, combiners.

Applications:

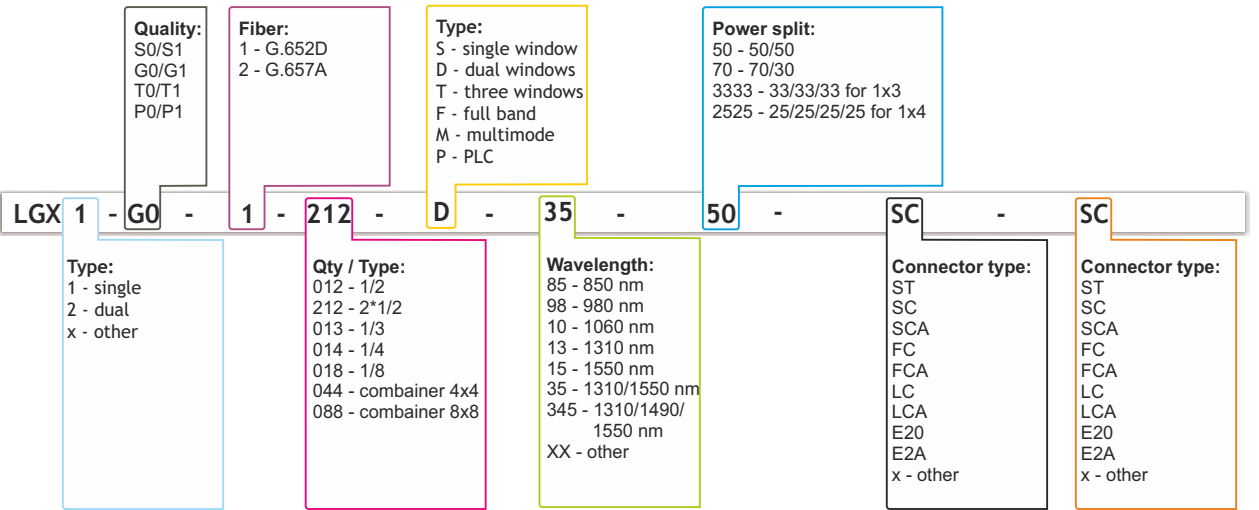
- WDM systems
- telecommunication networks
- CATV networks
- optic amplifiers
- measuring equipment
- metropolitan networks

Features:

- easy management of PON elements,
- clear description of PON elements installed,
- easy extension and development,
- dedicated and hybrid solutions.

LGX casing:		
Type	LGX1	LGX2
Height [mm]	100	
Depth [mm]	158,50	
Width [mm]	29	58
Mounting	19" lub 21"	
Color	RAL7035*	
*Other colors available on request		

Shelves options for LGX modules:				
Type	Height[mm]	Depth [mm]	Width [mm]	Color
LGX-1U-3-P	43.70	53.40	483	RAL7035*
LGX-2U-6-P	89	70	483	RAL7035*
LGX-3U-14-P	132	40	483	RAL7035*
LGX-4U-14-P	178	70	483	RAL7035*
LGX-1U-3-R	43.70	180	483	RAL7035*
LGX-2U-6-R	89	197	483	RAL7035*
LGX-3U-14-R	132	197	483	RAL7035*
LGX-4U-14-R	187	197	483	RAL7035*

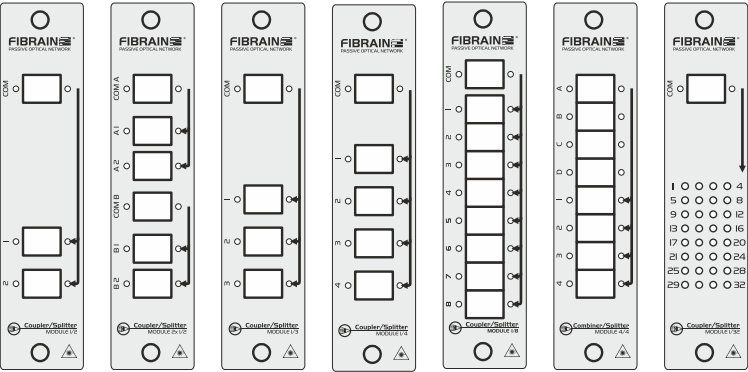


LGX1-G0-1-212-50-MUX-35-SC-SC

Example: Optical splitter MUX 2*1/2, power split 50/50, fiber G.652D, single casing, wavelength 1310/1550 nm, connector type SCxSC



LGX Modules with installed splitters examples:

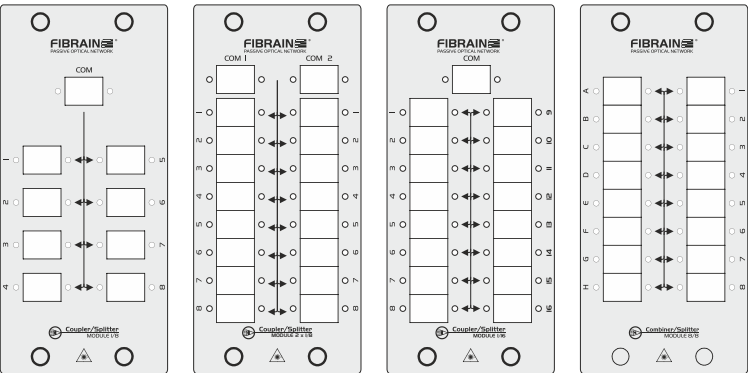


LGX1 Modules Examples:

- 1. Module LGX1 splitter 1/2
- 2. Module LGX1 splitter 2 x 1/2
- 3. Module LGX1 splitter 1/3
- 4. Module LGX1 splitter 1/4
- 5. Module LGX1 splitter 1/8
- 6. Module LGX1 combainer 4/4
- 7. Module LGX1 splitter 1/32

LGX2 Modules Examples:

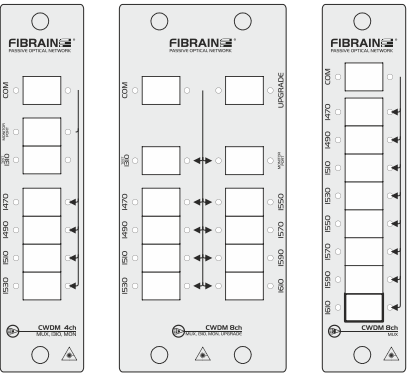
- 8. Module LGX2 splitter 1/8
- 9. Module LGX2 splitter 2 x 1/8
- 10. Module LGX2 splitter 1/16
- 11. Module LGX2 combainer 8/8



LGX2 Modules Examples:

- 12. Module LGX1 CWDM 4ch + 1310 nm + Port monitor
- 13. Module LGX2 CWDM 8ch + 1310 nm + Port monitor + Upgrade
- 14. Module LGX1 CWDM 8ch

* Available another solutions.



05

Installation and inspection tools and accessories

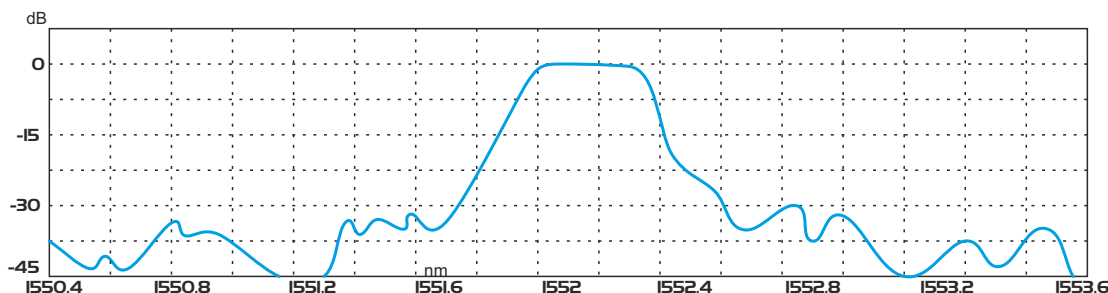
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Fiber To The Home
Installation and inspection tools and accessories

Fiber To The Home

Installation and inspection tools and accessories

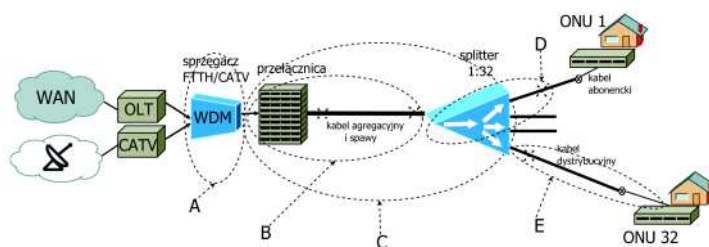
05



Importance and role of control measurements and testing in FTTx networks

As FTTx are access networks, they should be simple to design and install. Additionally, their operation and maintenance should be trouble free. These are obvious requirements for any access technology, which by default is the interface point between the operator and end-user, who doesn't need to be familiar with telecommunication technologies and simply wants to have a reliable, high quality service at reasonable price. Correctly built FTTx networks fulfill the above requirements. As per usual, the catch is in the "correctly built" phrase. Only FTTx projects realized with partner and integrator, who has the required knowledge, experience and references guarantee short time to service, high network quality and low OPEX costs.

The main mistake made by many inexperienced installers is neglecting the need for testing and measurements in designing and realizing FTTx networks. The assumption that "it's going to work, it's only a 10 km link" is often very shortsighted. Quality control is absolutely crucial at any stage of the project. From the quality control point of view, there are four important testing phases:



- qualification tests, performed before a supplier is selected,
- installation tests, conducted during the roll-out phase,
- final acceptance tests, carried out and documented by the installer for the operator
- maintenance and troubleshooting, when network is in service.

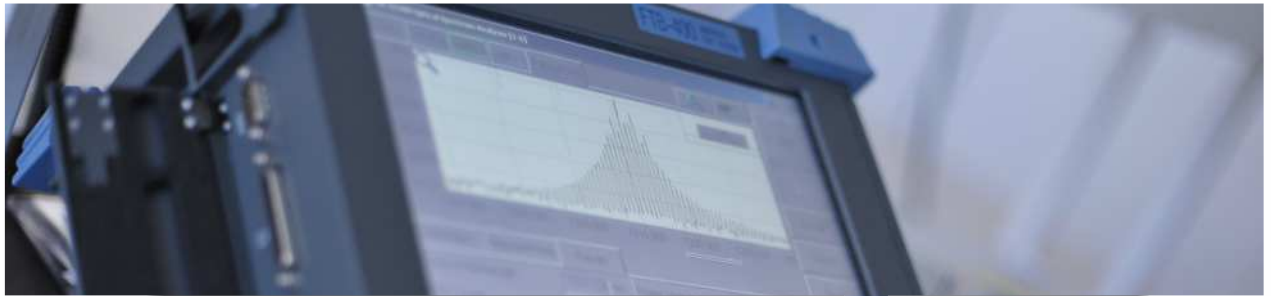
Qualification tests should answer the question if the supplier and product can meet the functional and quality requirements and if they comply with relevant standards. In the simplest case, the answer may be based on certificates and test reports provided by the manufacturer but the preferred approach for the operator is to perform their own tests or to use an external testing laboratory. In FTTx projects, both passive devices (like splitters, filters, multiplexers, patchcords or connectors) and active elements should be qualified. Fibrain, having well equipped laboratory and highly qualified staff, can offer field and laboratory measurement services.

Installation measurements should be performed on completion of every rollout phase. That's the only way to guarantee that all problems are detected and fixed at early stages. This way the network (often fairly wide) is segmented into smaller measurement and functional sections. The graph below shows typical network segmentation for testing purposes.

To be able to carry out at every rollout stage the required measurements, specialized testing equipment is necessary. Later on, the required testing kit is discussed. Now, it should be mentioned that it is worth considering at the design stage implementing some mechanisms in the network, which will allow fast problem detection and network monitoring in the future. This is the best way to minimize the OPEX costs. Here is when the integrator's knowledge and experience pays off. Fibrain recommends installing WDM triplexers with OTDR 1625 monitoring ports. It may be interesting to know that this approach, recommended by Fibrain for a long time, is now being proposed to the IEC for standardization.

The acceptance tests may be based on the final installation measurements (provided they were correctly documented) but most often they are conducted on project completion in the presence of operator representative. It is of paramount importance that they are properly documented. Only measurements carried out using testing equipment of adequate quality are meaningful. Fibrain recommends performing bidirectional OTDR measurements at two wavelengths, to improve accuracy. We can help operators with the required OTDR measurements, as well as insertion loss measurements.

Maintenance and monitoring measurements should be carried out on a periodic basis to make sure any network degradation is detected at early stage. If a fault does occur, troubleshooting is required and here it is when well-documented acceptance tests and WDM monitoring triplexers (installed in strategic points) are indispensable. Most often, these measurements are performed by the operator's staff, hence it is important that they have the required knowledge. Fibrain can help in this respect, offering training courses covering all aspects of FTTx technology.



Test equipment required to test FTTx networks

As mentioned before, testing and measurements at different phases constitute an integral part of any FTTx project. It is therefore critical that the future operator selects a partner (installer) with sufficient resources in terms of testing capabilities as any problems overlooked at the roll-out phase are certain to come back and hamper network operations in the future. Therefore, in this paragraph the required test kit is discussed.

During the installation phase, the absolutely necessary test equipment includes optical loss testsets, video microscopes for connector inspection, visual fault locator, optical time domain reflectometer (OTDR) and optionally the reflection loss meter. Similar equipment is required for conducting the acceptance tests, with emphasis on the optical loss testsets and OTDRs. It is worth noting that the above test equipment is only suitable for testing the passive infrastructure. During the operation and maintenance, it is beneficial to be able to test both the passive and active part of the network. Therefore, even though the OTDR, video microscope and visual fault locator are still indispensable, it is worth investing in the PON power meter, rather than in the standard optical loss testset. The PON power meter is unique in the sense it can work in the transparent mode and provides accurate power readings for short transmission slots (burst operation mode).

Video-microscopes: the importance of connector cleanliness in FTTx networks cannot be overestimated. About 70% of network problems are related in one way or another to dirty or low-quality connectors. By far, it is the most common source of problems, yet the importance of cleanliness still remains largely overlooked. It is important that the microscope allows inspecting both APC and PC types of connectors. The high-end products integrate power meter and cleaning accessories with the main unit, which extremely simplifies the job of installers and technicians. Broad range of exchangeable tips is required to ensure that every connector type can be inspected. Fibrain offer Lightel's modular and reconfigurable video-microscopes.

A wide selection of options allows fine-tuning to find the optimal solution:

-**DI-1000-B2:** basic version consists of inspection probe with exchangeable tips, which is connected to any USB port. The software allows saving captured pictures for example to generate a report

-**CI-1000-A2:** inspection probe with portable folded LCD screen

The higher-end versions consist of the main handheld unit with LCD screen, inspection port and cleaning accessories and can be equipped with power meter and inspection probe. In the last configuration, the technician is able to inspect connector in adapter (female) and male coconnector without the need to change tips, which significantly reduces time required to inspect for example a populated patchpanel:

-**VC-6100:** entry version handheld with set of 1.25 mm and 2.5 mm universal PC adapters

-**VC-6100-OPM:** with optical power meter and set of 1.25 mm and 2.5 mm universal PC adapters

-**VC-6100-PL:** with inspection probe (tips to inspect female FC PC, SC PC and LC PC included) and set of 1.25 mm and 2.5 mm universal PC adapters

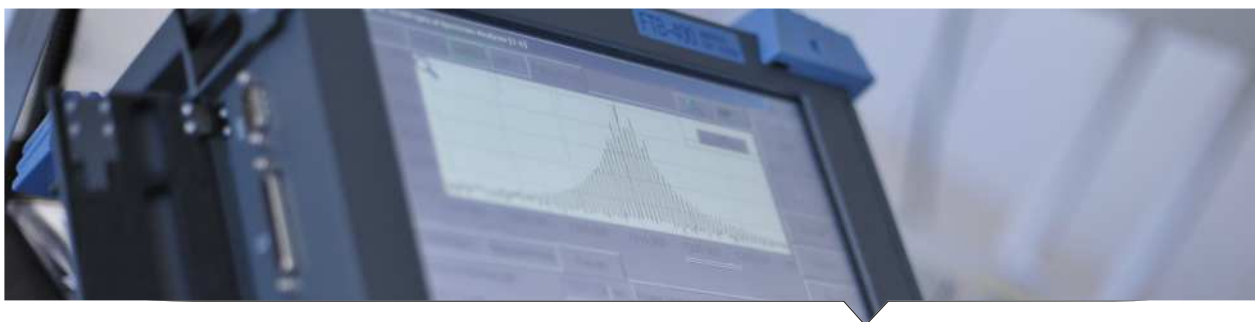
-**VC-6100-PL-OPM:** with inspection probe (tips to inspect female FC PC, SC PC and LC PC included), power meter and set of 1.25 mm and 2.5 mm universal PC male adapters

Additionally, specialized tips for any other connector standard are available.



Fiber To The Home

Installation and inspection tools and accessories



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Optical loss test set consists of a stable light source (preferably outputting at 1310 nm, 1490 nm and 1550 nm) and a power meter (calibrated for the same wavelengths). It is used to measure insertion loss of every section in the link and the end-to-end loss to ensure that loss budget is not exceeded. Please inquire if you are looking for an optical loss test set.

OTDR is used to verify integrity of the optical path. It can localize and pinpoint events like fiber breaks, splices, connectors or reflection points. OTDR measurements should be performed at least at two wavelengths, most often 1310 nm and 1550 nm. Measurements at two wavelengths help identifying macrobends (where bending radius is too small) and determine power budgets for upstream and downstream transmission. Typically, OTDR measurements are done from the ONT to OLT to simplify trace interpretation. OTDR needs to be specifically optimized for FTTx to allow making end-to-end measurements as the presence of the optical splitter means high-point losses, which are interpreted by conventional OTDRs as end of link. OTDRs used for maintenance and monitoring should optimally allow measuring live network without traffic interruption. In order to ensure this, they use the 1625 nm or 1650 nm wavelengths and have optical filters to filter out the PON wavelengths (1310, 1490, 1550 nm). To be able to monitor the optical layer in real time on live network, it is necessary to use the FBG reflective filters, discussed previously.

Visual fault locator outputs red visible light, which is then coupled into fiber. This way it can be used to verify integrity of short lengths of the link. Any discontinuity will manifest itself as the red light leak, which is easily seen. Normally, this device has limited dynamic range but allows verifying connections from ONT to splitter. Please inquire if you are looking for visual fault locators.

Reflectance meters are used to measure reflectance of optical components, such as splices, connectors or splitters. Too high a reflectance will reduce transmission quality and may cause damage to active elements in the ONT and OLT. CATV transmission is especially sensitive to back reflections. This meter, although useful, is probably not critical, as similar functionality is offered by OTDRs. Additionally video-microscopes provide information about quality of the connectors.

PON power meter is used to measure power levels in active link. It should allow simultaneous bidirectional measurements at the 1310, 1490 and 1550 nm wavelengths. Simultaneous measurement requires transparent mode of operation, which means that the meter does not interrupt optical transmission. This is important, as ONT will adjust its output power to the required level only after it has established communication with the OLT. Moreover, the meter should support the burst mode of operation, as every ONT transmits only in a short dedicated time windows. For bursty signal, measurements performed using standard CW meter are very inaccurate.

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Fiber To The Home
Installation and inspection tools and accessories



Launching box



Lunching box is designed to be helpful during diagnostics of fiber optic cable with use of OTDR in order to minimize effects of launching impulse casing measurement uncertainty.

Fiber is available of every length up to 4000 m in tough and waterproof siutcase.

It is a simple: give us required fiber kind its length and connectors types for signal input and output.

- Application:
- OTDR lunching cable
 - Devices calibration
 - Simulation of loss and time delay as well as system reflectance

- Features:
- Used as impulse choke, delaying line, OTDR lunching cable, products presentation, calibration
 - Prevents fiber from damage during transport
 - Continuous reel of fiber
 - Tough and portable suitcase
 - Portable construction possible to use outdoor
 - Configuration available on customer's demand for OTDR applications
 - Single mode fibers, multimode fibers 62.5/125 and 50/125 OM2

- Specification:
- Dimensions [mm]: 216 x 180 x 102
 - Material: SR Polipropylen
 - Fiber sections: 1 (continuous)
 - Length: up to 4000 m
 - Operation temperature: -40C to +55C
 - Humidity: 0 do 95%, non-condensing
 - Typical loss: <0.5 dB @ 1310 nm for 1000 meters
 - Weigth: 0.68 kg (without fiber).



Casing: 0 - solid mobile case 1	Fiber type: SM - G.652D SM S7 - G.657A SM M5 - MM 50/125 OM2 M6 - MM 62,5/125 OM1 MO - MM 50/125 OM3	Fun out width: 20 - 2.0 mm	Connector type:	Connector type:		
LBO 0 -	01 SM -	200 -	20 -	05 -	SCA -	SCA
Type: 01 - single canal 02 - double canal		Length [m]	Input and output length [m]:			

Sample: LB00-01SM-200-20-05-SCA-SCA

Fibrain Rapid Splice Connectors

Fibrain rapid splice series facilitates connectorisation in filed conditions within time lower then 30s. Additional advantage of connectors is fact that they do not need to be polished and glued as well as heat.

Rapid splice connectors are supplied polished without any need to do that in filed. They are equipped with mechanical internal splice for precise fiber lead by v-groove, high transmission parameters and long life-span are guaranteed.

Features:

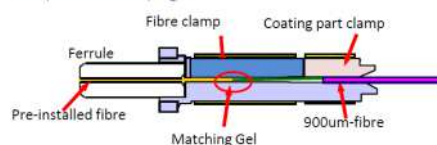
- Possible use in outdoor conditions,
- Do not require polishing,
- Do not require gluing and heating,
- Universal construction for 250 μ m and 900 μ m fibers,
- Possible use for cables >2.0 mm and >3.0 mm.



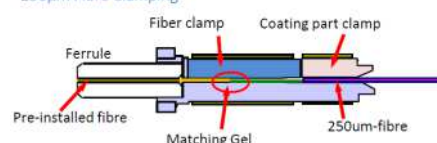
Applications:

- Industry
- Mines
- Structural cabling systems
- CCTV solutions
- FTTH networks

900 μ m Fibre Clamping



250 μ m Fibre Clamping



Universal mechanical splices RAPID SPLICE

Mechanical splices FIBRAIN RAPID SPLICE facilitates execution of high quality connection of optic fibers.

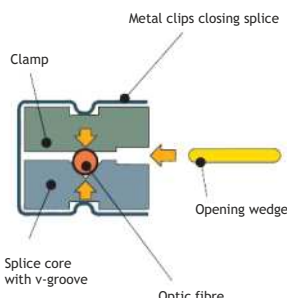
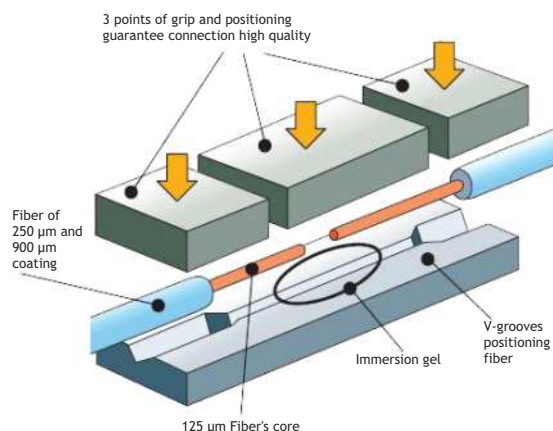
They are characterized by small dimensions and short time of connection execution. The most up to date technology make them universal solution either for singelmode and multimode fibers.

Features:

- 3 points for fiber positioning,
- Universal construction allows execution of 250 μ m and 900 μ m fibers,
- Highest quality of v-grooves execution facilities connection either singelmode and multimode,
- Average splice attenuation at level 0.15 dB,
- Splice reflectance >40 dB,
- Small dimensions 4x4x40mm,
- Time of connection execution about 2 minutes,
- Possible one repetition of splice execution.

Specification:

- dimensions 4x4x40 mm,
- single fibers in coating 250 μ m and 900 μ m. Core dimensions 125 μ m,
- fiber tolerance 240-265 μ m and 850-950 μ m
- operation temperature -30°C - +60°C,
- maximum attenuation < 0.5 dB,
- average reflectance > 40 dB,
- fiber connections 50/125, 62.5/125 and singelmode 09/125.



FB7197 Fibrain Rapid Splice

A set for mechanical splices including all tools for fibers and cables preparation and processing.



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Cables and fiber processing utility



FO-101-S Stripper for optical fibers.
For the coating:
250 µm -> 125 µm



FO-CFS-2 Stripper for optical fibers and patchcord cables.

For the coating:
250 µm -> 125 µm
900 µm -> 125 µm
2 mm - 3 mm



FO-102-D Stripper for optical fibers and patchcord cables.

For the coating:
250 µm -> 125 µm
2 mm - 3 mm



FO-KV1 Scissors for cutting Kevlar or glass fibers in fiber optic cables.



FO-102-P for optical fibers and fiber optic pigtails 900 µm.

For the coating:
250 µm -> 125 µm
900 µm -> 250 µm



FO-KV2 Scissors for cutting kevlar or glass fibers in fiber optic cables.



FO-KV3 Scissors for cutting kevlar or glass fibers in fiber optic cables.



FO-103-A Stripper for optical fibers, pigtails and patchcord cables.

For the coating:
250 µm -> 125 µm
900 µm -> 250 µm
2 mm - 3 mm



FO-PCS Stripper for external coatings of patchcord cables.

For the coating:
0.6 mm - 3.0 mm



FO-104-A Stripper for optical fibers, pigtails and patchcord cables.

For the coating:
250 µm -> 125 µm
900 µm -> 250 µm
900 µm -> 125 µm
2.0 mm - 2.4 mm
2.8 mm - 3.0 mm



FO-RCS Stripper for external coatings for round cables.

For the coating:
4.5 mm - 28 mm

Cleaning tools



FB9100 Dusting wipes for optical fibers cleaning 280 pcs / box



FB9101 Wet wipes for optical fibers cleaning, gel, etc. 50 pcs / box



FB9102 Qbe dusting wipes for optical fibers cleaning, for impregnating. 200 pcs / box



FB9104 Wet wipes for cleaning gel from optical fibers 25 pcs / box



FB9105 Cleaning kit for connectors, ferrules, V-grooves



FB9106 Cletop-S cassette for cleaning fiber optic connectors with a replaceable cartridge.

The additional refill: FB9106.1



FB9107 Cletop-S cassette for cleaning fiber optic connectors with a replaceable cartridge.

The additional refill: FB9107.1



FO-CL-25 Tool for ferrule cleaning, 2.5 mm adapters



FB9110 Sticks for cleaning V-Grooves



FB9111 Sticks mirrors cleaning in the welder.



FB9115 Sticks for cleaning adapters and ferrules 2.5 mm.



FB9116 Sticks for cleaning adapters and ferrules 1.25 mm.



FB9131 Epotek 353ND adhesive for fiber optic connectors with a bottle of hardener.



FB9130 Epotek 353ND adhesive for fiber optic connectors, sachet with hardener.



FB9136 Fiber Optic Disposal Unit

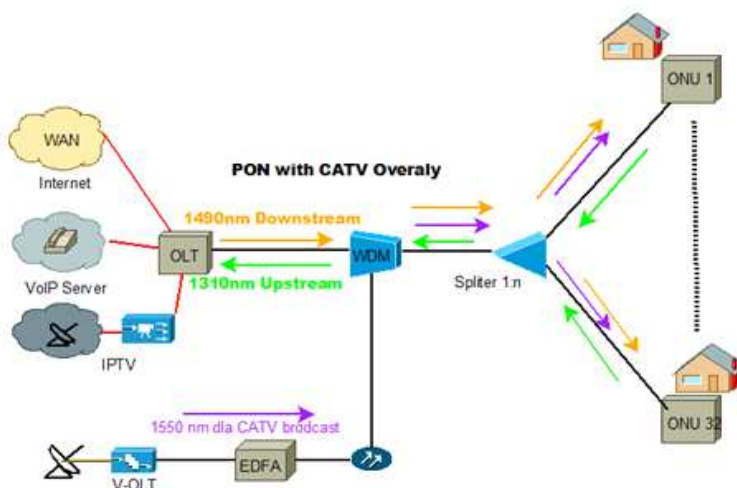


FB9137 Automatic Alcohol Dispensing Bottle IPA.

Active FTTH systems

Active FTTH systems

A passive optical network (PON) is a point-to-multipoint network (P2MP) topology connecting via optical fiber cables carrier Central Office and subscriber premises. PON is a ideal technology for the bottleneck of “last mile” giving opportunity to deliver to customer house high speed internet, voice and video including HDTV. PON adds new feature and functionality targeted at improving performance and interoperability, and adds support for new applications, service, and deployment scenarios. Among these changes are improvements in data rate and reach performance, diagnostics, and stand-by mode, to name a few. PON a cost-effective FTTH service comparable to PtP Fiber topology. The reason is its usage of a passive splitter rather than an active switching system. That's why we call these kind of network as passive because there is no need of power supply in the field. These cut the cost of maintenance and increase the reliability of the network.



Optical Line terminal (OLT), at CO terminates the traffic coming from the subscribers lines where Optical Network Terminal (ONT) is located and consolidates it on one or more uplink ports. PON utilize WDM technology for bidirectional transmission in one fiber to customer house where three wavelengths are used:

- 1310 nm (1260 nm-1360 nm) for ONT to OLT transmission (for GPON/GPON standard)
- 1490 nm (1480 nm-1500 nm) for OLT to ONT transmission (for GPON/GPON standard)
- 1550 nm for CATV broadcast to ONT (optional)



Signal from ONT to OLT use Time-Division Multiplexing Access (TDMA) to prevent collision in upstream direction. Using TDMA each GPON ONT send its traffic only over correlated timeslots, assigned by the OLT to a certain ONT in accordance to Dynamic Bandwidth Allocation algorithm. Bandwidth allocates is flexible according to the amount of upstream traffic. Therefore, unused bandwidth can be dynamically allocated to other ONT's. As the feature of the provided service depending on this function, PON achieves a balance between high bandwidth efficiency and low delay.

Maximum reach for PON technology depend on power budget and splitting ratio but it should not exceed 60 km with limitation that the distance between first and the last ONT is not bigger then 20 km.

For couple of years few organizations developed couple of PON standard. As for now two organization has the biggest impact and they develop concurrent standards as like:

- 1310 nm (1260 nm-1360 nm) for ONT to OLT transmission (for GPON/GPON standard)
- 1490 nm (1480 nm-1500 nm) for OLT to ONT transmission (for GPON/GPON standard)
- 1550 nm for CATV broadcast to ONT (optional)

On each of these standard the bandwidth is dynamically divided among connected subscribers connected to the same strand fiber. Each of these standard offer encryption of data exchange via PON network. Dasan Networks implement additional feature for both standard as like support of Daying Gasp. Which give additional diagnostic abilities to PON Operators. These can avoid the cost of truck rolls when the problem occur or when rogue ONT will be detected.



GEPON IEEE 802.3ah

Standard well adopted in Japan and South Korea as well as other part of the world. Since 2005 offer 1Gbit symmetrical throughput that is shared among connected ONT. By a GEPON technology, up to 64 ONT can be connected to one OLT port. The downstream transmission is based on the original Ethernet mechanism keeping a minimum inter-frame-gap. An OLT broadcast MAC frames to every ONT, however, a two-octet frame-header called Local Loop ID (LLID) contains address information. As a result, only the addressed ONT reads its MAC frames; ONTs discards frames that are not addressed to them. On the other hand in the upstream direction OLT allocates a transmission windows called a gate to each ONT. When an ONT receives the gate frames, it transmits MAC frames at a rate of 1Gbit/s during the time slots assigned by the gate. The key protocol used in these standard is Multipoint Control Protocol (MPCP). MPCP contains the gate allocation for each ON, gate request from the ONT, and discovery and registration of ONTs with the GE-PON.




ITU G.984.x GPON

GPON is a third standard developed by Full Service Access Network (FSAN) organization that is adopted by ITU-T. First two were utilizing ATM frame only which with each year has been less popular, that why ITU-T introduce GPON. GPON standard offer 2.488Gb/1.244Gbps data rate on single OLT port and it introduce new frame type called GPON Encapsulation Method (GEM). Even if GPON support legacy ATM and TDM traffic through GPON ODN network most vendors implement in them equipment only support for GEM These mean that voice is transmitted with usage of VoIP technology and in most cases there was no upgrade path from previous standard into GPON. G.984.x support even 1:128 split ratio depending on limitation of each vendor. GPON even if encapsulate the Ethernet traffic offer higher efficiency and interoperability among different vendors. The main protocol that is responsible for discovering, registering, bandwidth allocation, interoperability is OMCI. GPON add as well new topology into PON which is Protection Switching were You can use 2xn splitter for redundant fiber stand. Support of Forward Error Correction can theoretical increase the optical budget for 3 dB.

PON OLT portfolio				
	V5724G	V5812G	V5848G	V8200
MAX GEPON ports	22	-	-	72
MAX GPON ports	-	4	16	72
Support for XG-PON/ 10GEPON cards	No	No	No defined - backplane ready	Yes
MAX UPLINK ports	22 GbE	8 GbE	24 GbE; 4 XFP	24 GbE; 4 XFP
Chassis	5U	1U	7U	10U
L2	16K	16K	32K	32K
L2/L3 MCAST	1K/1K	4K/4K	4K/4K	1K/4K
DUAL AC/ DC	Yes	Yes	Yes	Yes
SFU redundancy	No	No	Yes	Yes
Switching capacity	48 Gbps	36 Gbps	176 Gbps	220 Gbps
Throughput	35.7 Mpps	26.8 Mpps	131 Mpps	-
Maximum number of ONT's	1408 ONT's	256 ONT's	1024 ONT's	4608 ONT's

GEPON/GPON specification


V5812G



4 G-PON + 8 Combo GbE
Layer 2/3 features
Dual Modular PWR

Small


V5848G



Full Redundancy System
48 GbE + 4 x 10GbE (24 GbE)
16 G-PON
Layer 2/3 features
MPLS/PWE3 support

Medium

V8200



Full Redundancy System
72 GbE + 4 x 10GbE (32 GbE)
72 G-PON, 72 E-PON support
Layer 2/3 features
Carrier Ethernet features
MPLS/PWE3 support

Large

GEPON OLT portfolio			
	H615G	H635G	H635V
Number of LAN ports	1x10/100	4x10/100	4x10/100
Number of FXS ports	-	-	2
VLAN (2-4094) support	Yes, up to 16 active	Yes, up to 16 active	Yes, up to 16 active
QoS	Yes - 802.1p	Yes - 802.1p	Yes - 802.1p
IGMP Snooping v2/v3	Yes	Yes	Yes
Indoor type	Yes	Yes	Yes
Optical port type	SC/PC	SC/PC	SC/PC

GPON OLT portfolio				
	H645	H640V	H640VR	H640W
Number of LAN ports	2x10/100/1000	4x10/100	4x10/100	4x10/100/1000
Number of FXS ports	-	2	2	2
VLAN	Yes	Yes	Yes	Yes
IGMP Snooping v2/v3	Yes	Yes	Yes	Yes
Indoor type	Yes	Yes	Yes	Yes
L3	No	No	No	Yes
Wireless	No	No	No	Yes
Optical port type	SC/APC	SC/APC	SC/APC	SC/APC

Fiber To The Home 2011

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