Solutions

LAST MILE ACCESS NETWORKS

Telenco

Raising the challenges of FTTH roll-outs

All over the world, high speed broadband fibre optic networks allow the development of new digital uses and the development of territories in terms of education, health, public services, personal services, traffic and city management, safety,... The digital revolution is now a reality. The performance, reliability and durability of these fibre optic communication networks are therefore major challenges.

Telenco networks actively contributes to the construction of ultrafast broadband networks and in particular to the connection of subscriber's premises by providing reliable material for FTTH networks.

Applying ecodesign principles and using Computer Aided Design, Telenco networks designs and manufactures a range of quality connectivity products, reliable and easy to implement.
Telenco networks' products take into account all the technical and economic aspects of a roll-out project. They are engineered as genuine solutions for all type of network configurations, no matter the given architecture. Telenco networks' connectivity products are designed to optimise installation times and first and foremost, to anticipate issues such as area population density, type of dwelling to be connected (SDU, MDU).

In FTTH network access architectures, when focusing on existing buildings, each connection might be seen as unique. Parameters such as topographic conditions, cable pathways or the premises layout are variables to take into consideration for each and every case. With regard to new buildings or buildings under construction, the access to FTTH networks is possible by installing empty ducts or conduits in which cables are pulled or blown up to the connection points.

When looking at the existing buildings, which today represent the majority of deployment cases, we can then consider four main ways to physically connect the end-user premises to the fast broadband network:

- High density area, Multiple Dwelling Units
- Low density area, Multiple Dwelling Units
- Overhead lines, Single Dwelling Unit
- Underground installation, Single Dwelling Unit

Technical documentation is at your disposal on
www.telenco-networks.com

HIGH DENSITY AREA, MULTIPLE DWELLING UNITS

This first scenario shows a building having different levels and several flats per floor. The telecom fibre network access is available at the basement level. A splitter is located in the Building Entry Box **1**. An Eline® riser cable **2** brings the fibre to each level. The Eline® Floor Terminal Box **3** enables the extraction of the end-user fibre and its connection with the subscriber optical drop cable. **4**

The Droptic® subscriber cable runs up to an Eline® DTIO **5** (an OTO with the shape of a circuit breaker) which is located inside the communication gateway. In this case, a Droptic® pre-terminated LM1L drop cable **6** extends the network throughout the flat, commonly up to the living room, where the Eline® PTO 90 series **7** is mounted. A Droptic® patch cord **8** links the optical outlet to the ONT.

An alternative architecture consists into connecting the Eline® PTO, mounted in the living room, directly to the Eline® Floor Terminal Box by using a Droptic® LM1 or a LM2 drop cable.

Eline® PMI Building Entry Point **1**

Used for connecting the distribution cable to the riser, the Eline® PMI Building Entry Point has been designed for direct wall mount at the building's entrance. Equipped with numerous cable entries and splice trays, stackable BEPs enable the connection between ISP and commercial operators.

- Up to 72 splices
- Connection of up to 12 customers
- Available in splicing or preconnectorised versions
- Cable overlength management (preconnectorised versions)

Eline® DTIO **5**

This optical telecommunications outlet is an intermediate distribution point, usually located inside a residential communication gateway. The Eline® DTIO has the shape of a circuit breaker and mounts in one click on a DIN rail. This box enables an intermediate test control of the end-user communication line.

- Available in splicing or preconnectorised versions
- Safe, discreet and intuitive use
- Up to 4 optical connections enabling multi-service applications

Eline® PBI Floor Terminal Box ❸

The Eline® PBI Floor Terminal Box enables the connection between the riser and the optical subscriber cable. PBI can be installed in a riser technical duct or placed nearby a vertical cable rail. It presents a scalable fibre management system, as well as an integrated and optimised tube coiling tray for low bend radius fibre (G.657).

- Available in splicing or preconnectorised versions
- Connection of up to 12 customers
- Up to 32 splices
- Enables the pass-through or the termination of the riser cable

Eline® PTO 90 series ❼

The Eline® optical telecommunications outlet enables the management of bare or sheathed fibres on two separate sections. This offers an increased mechanical protection to splices and eases handlings.

Available in four different versions: bare, equipped, pre-cabled or pre-terminated, the ELINE® PTO suits to all type of configurations, in dwellings or offices.

- Bend radius control
- Various cable entries
- Increased mechanical protection
- Integrated protective flaps

Droptic® armoured patch cord ❽

This optical patch cord links the OTO to the customer's equipment. With its inner corrugated armoured construction, the Droptic® patch cord provides for an excellent mechanical strength. Built with a LSZH outer sheath and G.657.A2 fibre, the Droptic® armoured patch cord has a diameter of 2.8mm. This cable is pre-terminated with SC/APC connectors and Zirconia ferrules.

- Highly reliable products
- Excellent Crush and Tensile strength performances
- Optical performances controlled by our experts

Eline® riser cable ❷

The Eline® riser cable presents a large internal diameter and a non-stranded micro-bundle construction. By slitting its outer sheath at two different points, one can cut an optical tube at the first point and extract it at the second one.

- Full range of fibres count up to 144
- Modularity from 2 to 12 fibres per micro-bundle
- CPR compliant (Construction Products Regulation)
- Longitudinal marking indicating the FRP (Fibre Reinforced Plastic) position

Droptic® LM1 drop cable ❹

Droptic® LM1 is a drop cable engineered for indoor FTTH roll-outs. This fibre optic drop cable can be installed either by pulling or gluing techniques. Thanks to its small diameter, this cable suits for installation in congested or already occupied conduits.

- Small diameter
- Good Crush and Tensile strength thanks to its 2 FRP rod sheath construction
- LSZH-FR outer sheath, CPR compliant

Droptic® LM1L indoor drop ❻

This almost invisible drop cable is used for bringing optical signal up to the OTO. Droptic® LM1L fibre optic cable has been especially engineered for enabling connections inside premises. Thanks to its flexibility, this optical drop can be installed by using pulling or gluing techniques, alongside baseboards, door or window frames.

- Reduced diameter for time-effective and discreet indoor installations in SDUs and MDUs
- Good bending performances
- Compatible with Field Mountable Connectors Ø 3mm
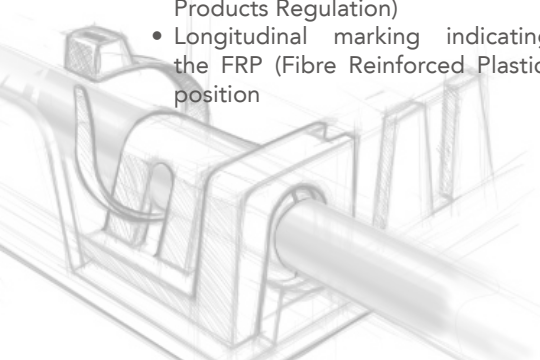
LOW DENSITY AREA, MULTIPLE DWELLING UNITS

In this case, we focus on typical downtown contiguous small buildings, built on one side and another of the street. An Optical Terminal Point ❶ mounted on pole (PBO T2) at the top of the street, enables the connection of the first 6 dwellings and the pass-through of a secondary network route. Remaining dwellings are reached thanks to one or several Optical Terminal Points ❶ (PBO T1) mounted on a facade.

Out of PBO T1 or T2, Droptic® LM2 drop cable ❷ runs alongside front walls or crosses the street in aerial configuration (short span) to reach the Eline® PTO 90 series ❸ without interruption.

Droptic® LM2 cable ❷

This outdoor/indoor drop cable presents 2 FRP rods in its outer sheath and offers high mechanical performances. UV resistant, Droptic® LM2 drop can be used for overhead layouts or for facade routes. Thanks to its longitudinal sealing construction, the LM2 drop can also be pulled into ducts, on short distances.

- One drop for outdoor, indoor, duct and facade FTTH roll-outs
- Compatible with all type of installation techniques: pulling, gluing, stapling
- Available in white or black colour

Eline® PTO 90 series ❸

This optical telecommunications outlet enables the management of bare or sheathed fibres on two separate sections. This feature offers an increased mechanical protection to splices while also simplifying handlings.

Available in four different versions: bare, equipped, pre-cabled or pre-terminated, the ELINE® PTO suits to all type of network configurations.

- Bend radius control
- Various cable entries
- Increased mechanical protection
- Integrated protective flaps

Eline® PBO T1/T2 ●1

The Eline® PBO is an outdoor/indoor optical access box designed for enabling the management of the distribution cable (fibre extraction, pass-through and termination). The Eline® PBO allows the connection of 6 end-users, as well as the installation of 2 secondary distribution cables that will further route to reach other subscribers. This optical distribution solution is designed with two separate compartments to enhance reliable installation, intervention and maintenance operations.

• Compact and rugged body construction
• Discreet and sleek design
• Fast and intuitive installation
• Installs on all type of pole/facade

TECHNICAL FOCUS

Droptic® Bend insensitive fibre

International Telecommunications Union organisation has established several categories of bend insensitive fibres, characterised by macrobending losses. Telenco networks takes into account the main challenges of last mile connections. To bring reliable solutions for buffer storage in outdoor or indoor boxes, cable running inside buildings or on facades, drops glued or stapled alongside baseboards, Telenco networks provides only for solutions compliant with ITU recommendations for G.657A2 or G.657B3 fibres.

Quality controls for Droptic® range include the inspection of three wavelengths (1310nm, 1550nm and 1625nm) to ensure that the optical attenuation remains below standard values. This guarantees the optimal use of our fibre products with GPON access network technology and allows the anticipation of future applications with WDM PON or XGPON technologies.
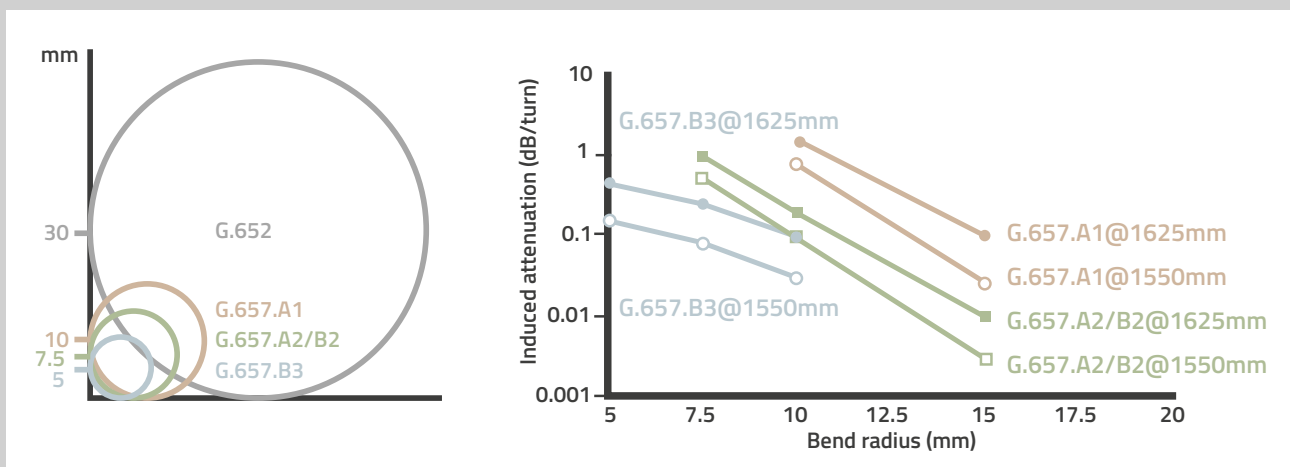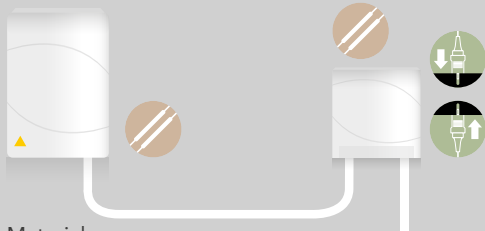

(source: ITU-T G657 recommendation – 11/2016)

OTO, FDB - which version to choose ?

In the following cases, the Floor Distribution Box (FDB) is supposed to be already mounted. Optical Telecommunications Outlet (OTO) has to be installed and fibres, connected to deliver fast broadband communications services.
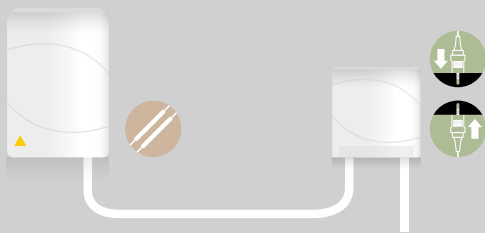
Bare OTO, bare FDB

All the operations are made on jobsite. Installation operations inside the OTO must be carried out by a technician.
Pigtail(s) and fibre optic protected by the drop cable must be spliced inside the OTO.
After installing the drop cable at the proper length, fibre optic from the drop cable must be spliced with another optical fibre inside the Floor Distribution Box.

☺ **Zero cable waste, cables are cut at the needed length**
☹ **Overall installation time**

Material:
- OTO
- FDB
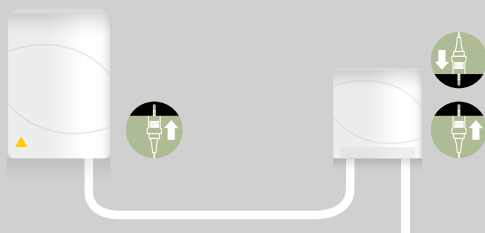- Drop cable

- Pigtail
- Adapter

Pre-cabled OTO, Fusion splice in FDB

From the factory, the connector is mounted on the drop cable and then plugged on the adapter. Both are placed inside the OTO. The cable's length is coiled.
On the field, OTO is wall-mounted. After cutting the cable at the proper length, the fibre optic within must be spliced to another fibre optic inside the Floor Distribution Box.

☺ **No splice required inside the OTO, optical budget optimisation**
☺ **Quality control on connectors**
☺ **Zero cable overlength management**
😐 **Overall installation time**
☹ **Cable waste**

Material:
- Pre-cabled OTO with a drop cable defined length

- Adapter
- FDB

Pre-connectorised FDB and OTO

From the factory, connectors are mounted at the drop cables' ends. One is plugged on the adapter placed inside the OTO. The cable overlength is coiled inside the OTO.
On the field, OTO is wall-mounted. After cable installation and cable overlength management, the pre-terminated cable is plugged into the preconnectorised FDB.

☺ **Overall installation time**
☺ **Quality control on connectors**
☺ **No splice required inside the OTO**
☹ **Cable overlength management**

Material:
- Pre-cabled OTO with a drop cable defined length

- Adapter
- FDB

Conclusion:

The choice of FTTH equipment is related to the network architecture and to the criteria defined by the network manager: installation time, optical budget, reliability, environmental impact, etc.

| Priority settings	Solution
Installation time	Preconnectorised OTO
Optical budget	Fusion splicing compatible products
Quality and controlled connectors	Full pre-terminated solutions

OVERHEAD LINES, SINGLE DWELLING UNIT

This case shows the connection of an individual dwelling via an overhead deployment.
From an Optical Terminal Point ❶ (PBO G) located on a pole and including a splitter, premises can be reached by using the Droptic® LX030PU ❷ via a transition box (PTO Access ❸). This transition box protects the splice between the LX030PU and the indoor Droptic® LM1L subscriber cable ❹ and manages its potential overlength. The end of the Droptic® LM1L is connected to an Eline® PTO One ❺. Depending on the transition point's location, the PTO Access can be used as an Optical Telecommunications Outlet.

A more qualitative alternative consists into installing an aerial double sheathed drop cable, Droptic® LM4.
At the transition point, the LM4 outer sheath is stripped off and its inner cable (Droptic® LM1L) is ran further, inside the premises, up to an Eline® PTO 80 series. ❻
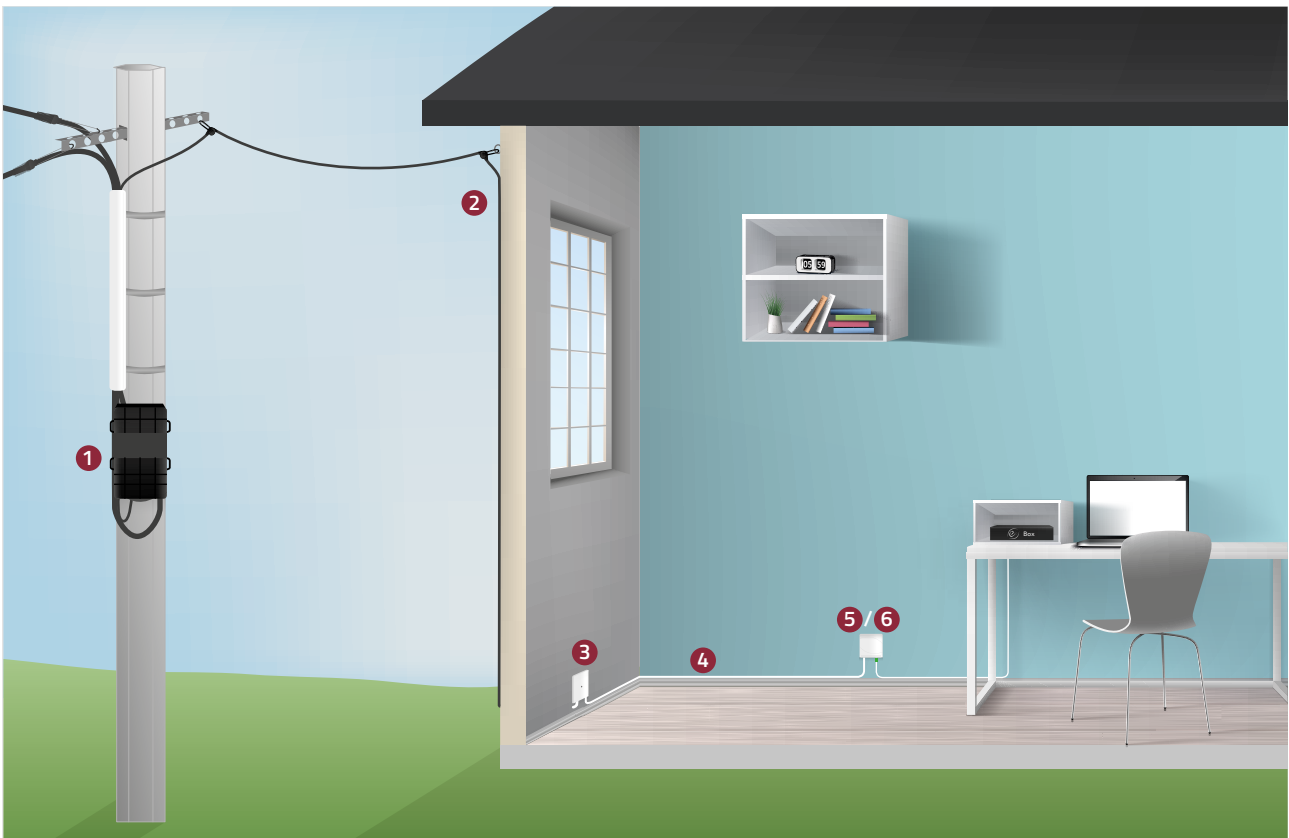
Pole line hardware for aerial FTTH roll-outs

For all overhead deployments, Telenco networks provides a large range of telecom equipment meeting most of the requirements set by national Telcos such as Orange, BT/ Openreach, Deutsche Telekom and international standards.
To bring fibre to premises via a drop cable in overhead configuration, we recommend:

- AC560 drop clamp for Ø 5mm double sheathed drop
- 5/35 FTTH R or @clamp for round drop cable without FRP, Ø 3 - 6mm
- Hypoclamp for flat, FRP reinforced drop cable

Eline® PTO One ⑤

This optical telecommunications outlet meets all the requirements of FTTH and FTTO networks. Thanks to its compact and discreet design, this OTO blends in well with all installation environments. The Eline® PTO One enables the management of bare and sheathed fibres on two different levels.

• Compact, sleek and discreet design
• Bend radius control
• Increased mechanical protection
• Easy to install, time-effective re-interventions on site

PBO G ①

This outdoor optical splice protection enclosure enables the fibre extraction, pass-through or the termination of a distribution cable with maximum Ø 9mm. The PBO G mounts on all type of poles or facades and is compatible with installation in manholes (IP 67). Equipped with a splitter 1x8 SC/APC and 8 adaptors SC/APC, PBO G enables the direct connection of pre-terminated optical drops with maximum Ø 4mm.

• Enables the connection of up to 8 customers
• Up to 18 splices
• Safe, discreet and intuitive use

Eline® PTO Access ③

This optical telecommunications outlet is a versatile solution as it can be also used as a fibre optic transition box. Enabling the connection between an outdoor optical cable with an indoor drop, the Eline® PTO Access box is used for splicing applications, to plug in already pre-terminated optical cables or drops terminated with field mountable connectors.

• Bend radius control
• Increased mechanical protection
• Various cable entries

Eline® PTO 80 series ⑥

This optical telecommunications outlet enables fibre optic bend radius control. Designed with two separate compartments for a safe management of bare or sheathed fibres, the Eline® PTO 80 series offers an increased mechanical protection. Suits for installation in FTTH and FTTO configurations.

• Available in 4 versions: bare, equipped with adapters and pigtails, pre-wired, pre-terminated
• Compact, sleek design for intuitive use
• Enhanced ergonomics: various cable entries

Droptic® LM1L drop cable ④

Thanks to its optimised diameter (Ø 2.8mm) and its flexible construction, Droptic® LM1L fibre optic cable is an excellent solution for indoor applications. This drop can be installed alongside baseboards, window or door frames by using pulling or gluing techniques. Almost invisible, the LM1L drop brings optical signal all the way to the room where the OTO is mounted.

• Enables time-effective and discreet indoor installations
• Good bending performances
• Toolless access to the fibre
• Compatible with Field Mountable Connectors Ø 3mm

Droptic® LX030PU drop cable ②

The Droptic® LX030PU is an optical drop especially engineered for overhead line and facade FTTH roll-outs with spans up to 70 meters. UV resistant, this outdoor drop cable is built with a tight construction and a polyurethane sheath. Droptic® LX030PU presents a reduced diameter of 3mm and very good performances in terms of flexibility, crush and abrasion.

• High aerial performances with reduced diameter
• Compatible with Field Mountable Connectors Ø 3mm
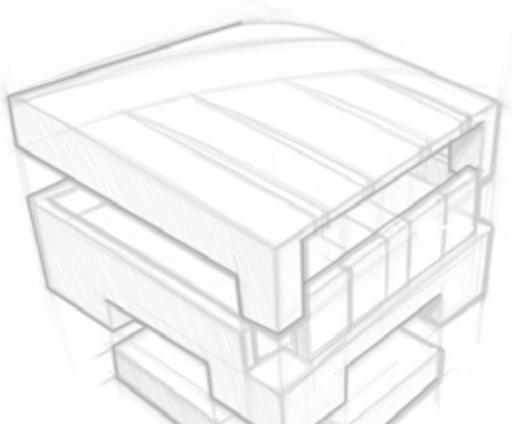
UNDERGROUND INSTALLATION, SINGLE DWELLING UNIT

Ideal case in residential area, where the infrastructure is already in place.
The OptiTap® Corning hardened preconnectorised optical terminal point (OTP) ❶ is already installed in the manhole.

An OptiTap® pre-terminated Droptic® LM4 ❷ links the OTP to the OTO, located inside the residential communication gateway. OTO can be either an Eline® PTO 80 series mounted on a DIN rail or an Eline® DTIO (with a circuit breaker shape) ❸.
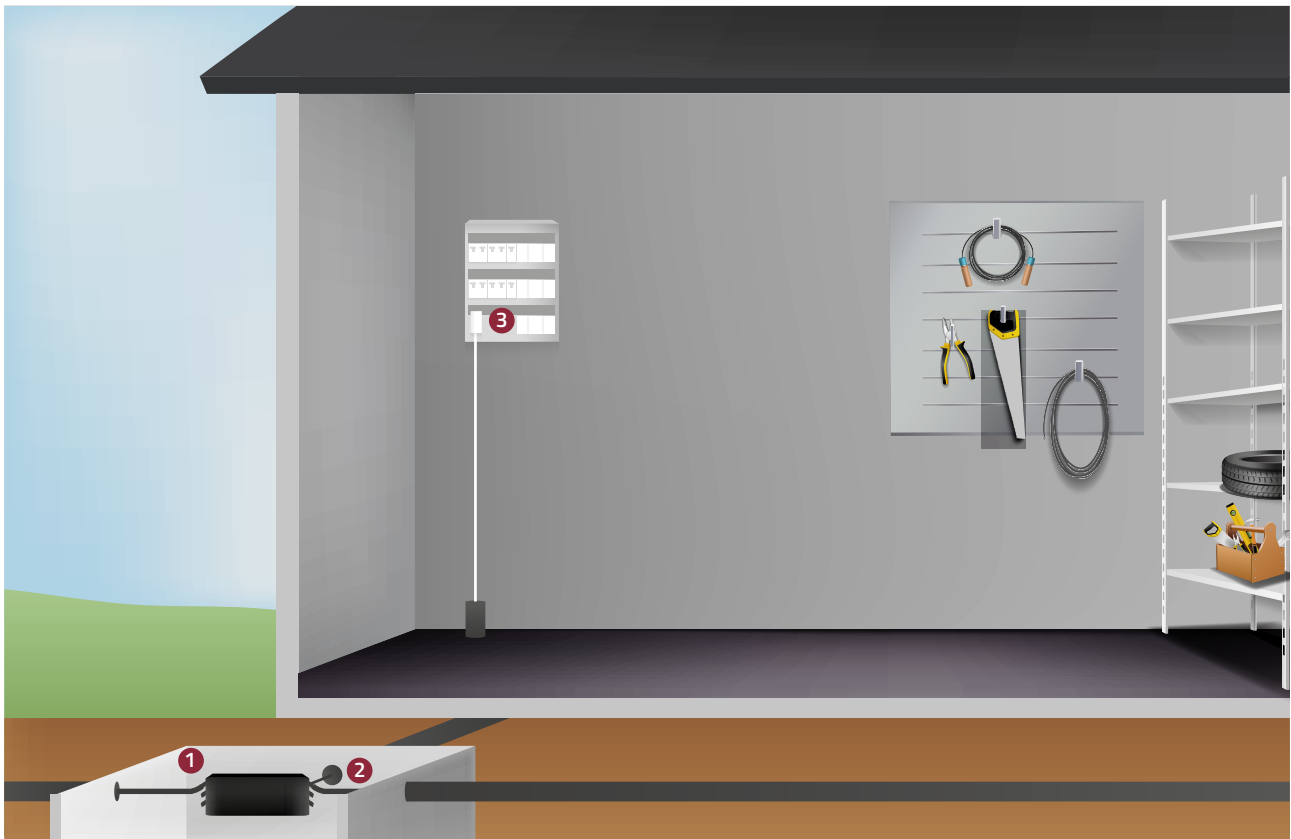
OptiTap® Corning Optical Terminal Point ❶

This Multipurpose enclosure for outside plant fibre access networks offers a sealed environmental protection while also providing for an easy and reliable way to connect future subscribers. This optical terminal point is used for distribution cable management applications (extraction, pass-through or termination) and is usually installed in manholes as it resists to long term immersions (IP68). Thanks to its preconnectorised version, this optical terminal point increases network speed deployement.

• Equipped with a splitter 1x4 or 1x8
• Time-effective connections
• Up to 48 splices
• Good immersion perfomances

OptiTap® pre-terminated Droptic® LM4 drop ❷

Factory terminated with OptiTap® connectors, this Droptic® LM4 enables fast and reliable connections through a simple plug into an OptiTap® Corning MultiPort. Especially engineered for easy and quick outdoor-indoor transitions, Droptic® LM4 optical cable presents a double sheathed construction. Built with rip cords, this cable's outer HDPE sheath can be removed in a couple of seconds. This operation gives access to an indoor Droptic® LM1L cable used for transmitting the optical signal all the way to the OTO, without optical splices.

• High aerial performances
• Rugged, complete longitudinal sealing construction
• Pre-terminated with SC/APC connectors or OptiTap® connectors
• Available in different lengths or in pigtail version
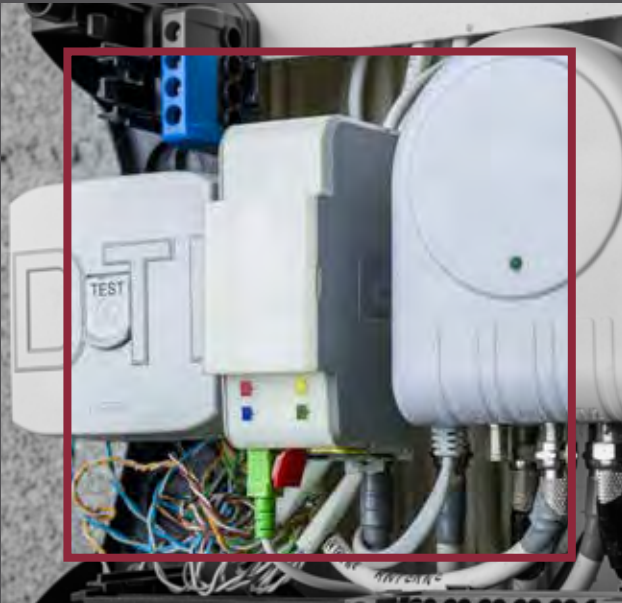
Eline® DTIO ③

This network access box is a versatile solution as it can be used upon convenience both as an optical telecommunications outlet and as an intermediate distribution point. Usually located inside a residential communication gateway, the Eline® DTIO has the shape of a circuit breaker and mounts in one click on a DIN rail. This product solution enables an intermediate test control of the end-user communication line.

- Available in splicing or preconnectorised versions
- Safe, discreet and intuitive use
- Up to 4 optical connections enabling multi-service applications

TECHNICAL FOCUS

## Droptic® LM4 – the drop cable solution enabling ZERO signal loss

In FTTH roll-outs, transitions between outside plant deployments and inside premises installations are nerve centers of the network architecture. Indeed, due to improperly performed splicing applications between outdoor and indoor drops, often optical budgets are overstretched.

To avoid this and ensure the fastest speeds to end-users, Droptic® LM4 double sheathed optical drop cable is an effective solution. Designed as a multi-purpose drop cable, the LM4 drop enables simple, fast and reliable outdoor-indoor transitions.

Offering a rugged and watertight construction, the LM4 drop suits for both aerial and duct deployments. In overhead FTTH configurations, LM4 can be installed for spans up to 70m. Moreover, the dimensions of this drop cable have been reduced for better wind behaviour performances and a compatibility with duct installation on several hundred of meters.

Built with a double sheath construction, Droptic® LM4 presents two ripcords that can be used to strip off its HDPE outer sheath in a couple of seconds. Thanks to this operation, a Low Smoke Zero Halogen Flame Retardant LM1L drop cable is reached. This can be used for performing effective indoor applications. No splice is thus required to make the transition between the LM4 drop and the LM1L indoor drop. This functional convenience makes possible a constant transmission of the optical signal from an outdoor distribution point up to the telecommunications outlet without weighing down the optical budget.

- One drop for aerial, facade, duct and indoor FTTH roll-outs
- High mechanical performances
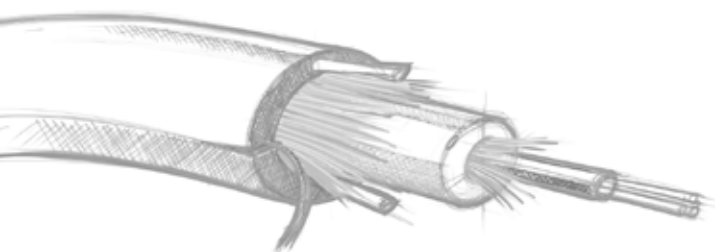
TELENCO: INNOVATION AT THE SERVICE OF WORLDWIDE NETWORKS

Telenco is a group of entities specialised in the design, manufacture and global marketing of future-proof solutions for telecom and connectivity infrastructures. Since 1999, the Group has organized its business activity on offering innovative solutions meeting the field challenges of each specific market.

A PROVEN EXPERTISE

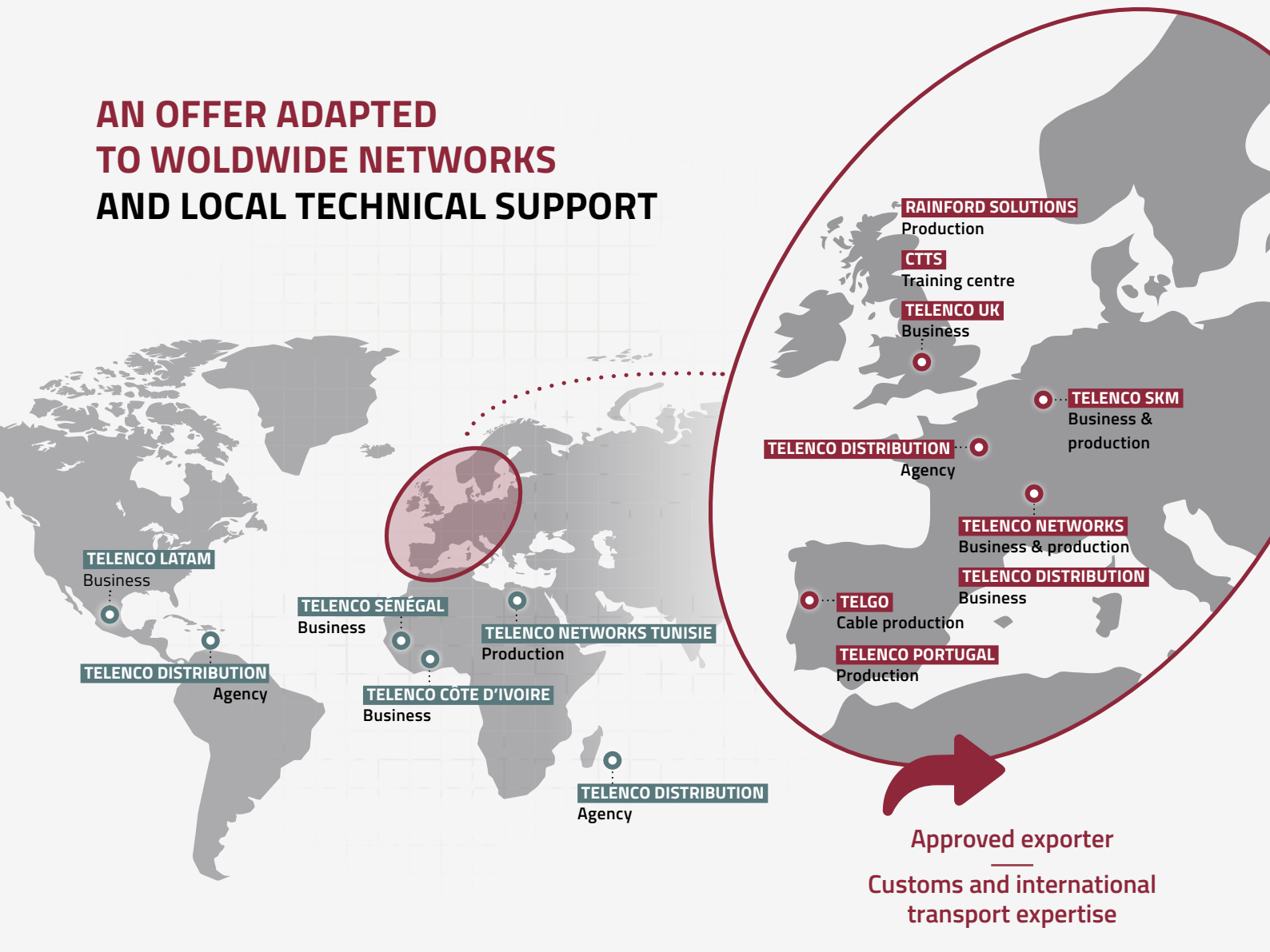| DESIGN	MANUFACTURE	LOGISTICS
Over **20 years** of R&D expertise and an integrated test laboratory	**18 000 m²** of production units in Europe and Tunisia	**21 000 m²** of storage area in the world

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...AT THE CORE OF A NETWORKS OF EXPERTS IN TELECOMMUNICATIONS

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CREDO

Member of Fibre to the Home Council Europe

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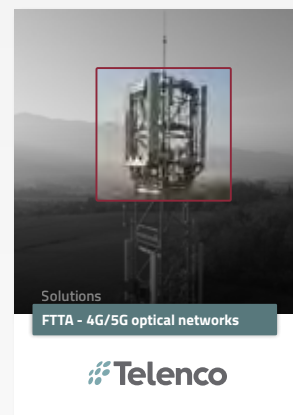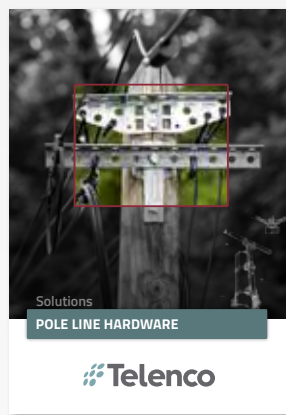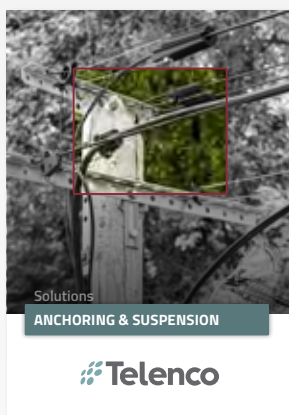# A RESPONSIBLE & SUSTAINABLE COMPANY

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