OPTICAL TRANSPORT

SOLUTIONS BASED IN DWDM AND CWDM MULTIPLEXING TECHNOLOGIES,
INTENDED FOR OPERATOR NETWORKS AND ENTERPRISE MARKET

Televes®

OPTICAL TRANSPORT

OUR SOLUTIONS

At Televes we have been leading the markets for communications infrastructures in buildings and homes since 1985, always committed to the generation of technological knowledge in the distribution of television and data signals.

With the clear objective of meeting the exponential demand for high-capacity data transmission in today's businesses and organisations, we offer this new line of cutting-edge products. We thus provide solutions to the key needs of optical networks based on transport systems with DWDM (Dense Wavelength Division Multiplexing) and CWDM (Coarse Wavelength Division Multiplexing) technologies.

We are your complete provider of fibre optic telecommunications infrastructure, from large core networks to the user's home.

- Backbone Networks
- Lambda Alien Scenarios
- Metro Networks
- Aggregation Networks
- DCI Applications
- Access Networks
- Last Mile Connectivity

Our product ranges guarantee THE HIGHEST DEGREE OF RELIABILITY AND SECURITY, enabling **early detection of errors and prevention of incidents**, especially in networks where huge amounts of traffic with sensitive and critical data travels.

- HIGH CAPACITY AND LOW LATENCY
- HIGH TRAFFIC AND SENSITIVE DATA
- PREVENTION AND DETECTION OF INCIDENTS

DEZA SERIES

Self-contained equipment for high capacity last-mile solutions, designed for every kind of fiber-optic operator

Based on **DWDM** technology, they are especially suitable for corporations requiring demarcation equipment. Its **advanced management and diagnostic features** meet **the specific needs of fibre optic operators.**

Developed entirely in-house, they offer speeds ranging from 1 to 100 Gbps at:

- **LAST MILE AND ACCESS NETWORKS**
- **DATA CENTER INTERCONNECTION (DCI) SCENARIOS**
- **AGGREGATION NETWORKS**
- **METROPOLITAN NETWORKS**

Benefits and key features

High performance from start to finish: Capable of communications for up to 80 km over single-mode optical fibre, guaranteeing transmission at all times without the use of amplification.

More services on the same fibre: Thanks to their flexible transport and high scalability, they allow the integration of several channels of different devices in the same infrastructure, over a suitable optical spectrum. Extension modules allow the system capacity to be increased by up to 8 channels to carry more services over the same fibre.

Broad compatibility with external devices: Guaranteed to work with SFP, SFP+, SFP28 or QSFP28 modules for different brands.

Products in the Deza series

TRANSPONDERS

They ensure that **the signals are suitable for transmission over long distances, providing optimum output power and reception sensitivity throughout the entire process.** In the receiving stage, the connection to the client network equipment such as switches, routers and storage devices is made in order to carry out the desired communication.

They feature **comprehensive hardware adapted to the most demanding settings,** such as universal AC and DC48V power supplies, sliding lugs, telecom bottom (<300 mm) 1U, as well as front-rear forced ventilation.

Depending on the needs of the network, three transponder options are presented:

- **MC4**: offers **4 bidirectional channels from 1 to 10 Gbps** SFP/SFP+ compatible, as well as providing internal DWDM optical mixing an **option without optics** is available, as well as **extension units up to 8 channels.**

- **MC100**: this complete equipment allows the **channel combination of 2 bidirectional channels from 1 to 10 Gbps (SFP/SFP+ compatible) + 1 bidirectional channel from 25 Gbps (SFP28/SFP+ compatible) + 1 bidirectional channel 40 Gbps/100 Gbps (QSFP28 compatible)**. It provides DWDM optical mixing, and a non-optical option is also available.

- **MC400**: offers **4 bi-directional 100 Gbps channels** (QSFP28 compatible) Features optical mixing for PAM4 transceivers. There is the option **of extension equipment for up to 8 channels**.

NETWORK ELEMENTS

Equipment necessary to compensate for possible anomalies for the correct functioning of the system.

- **OADC Equipment**: **dual EDFA optical amplifiers**, capable of providing fibre attenuation correction. They include a dispersion compensator bay as well as active service channel bypass.
- **DC Equipment**: **dispersion compensators** capable of correcting chromatic dispersion distortions at distances greater than 80 km.
- **OS Equipment**: **optical redundancy switches** for 1- or 2-fibre systems, with the ability to handle the selection of the best fibre route between two possible routes. They include proprietary continuity pilot injection (1310 nm), proactive network analysis and programming of priorities and alarm thresholds.

ACCESSORIES

Additional elements to the equipment in the range, such as AC plug-in power supplies, DC power supplies, blind front panels or two-bay racks.

MANAGEMENT AND MONITORING SYSTEM WITH ADVANCED FUNCTIONALITIES

The **DEZA SERIES** headends offer an embedded Web Server application that allows the professional to configure and diagnose all the devices and the environment. Access can be local, through the browser and direct connection to the equipment, and also remote, for access from anywhere.

Thanks to **SNMP** (Simple Network Management Protocol) and **SYSLOG** (System Logging Protocol), the user can generate reports and collect critical data centrally, simplifying monitoring tasks and helping to improve network performance. In addition, this system also includes a channel for access to all nodes that do not have connectivity to an external network, or as redundant access to them for further backup.

EASE OF MANAGEMENT

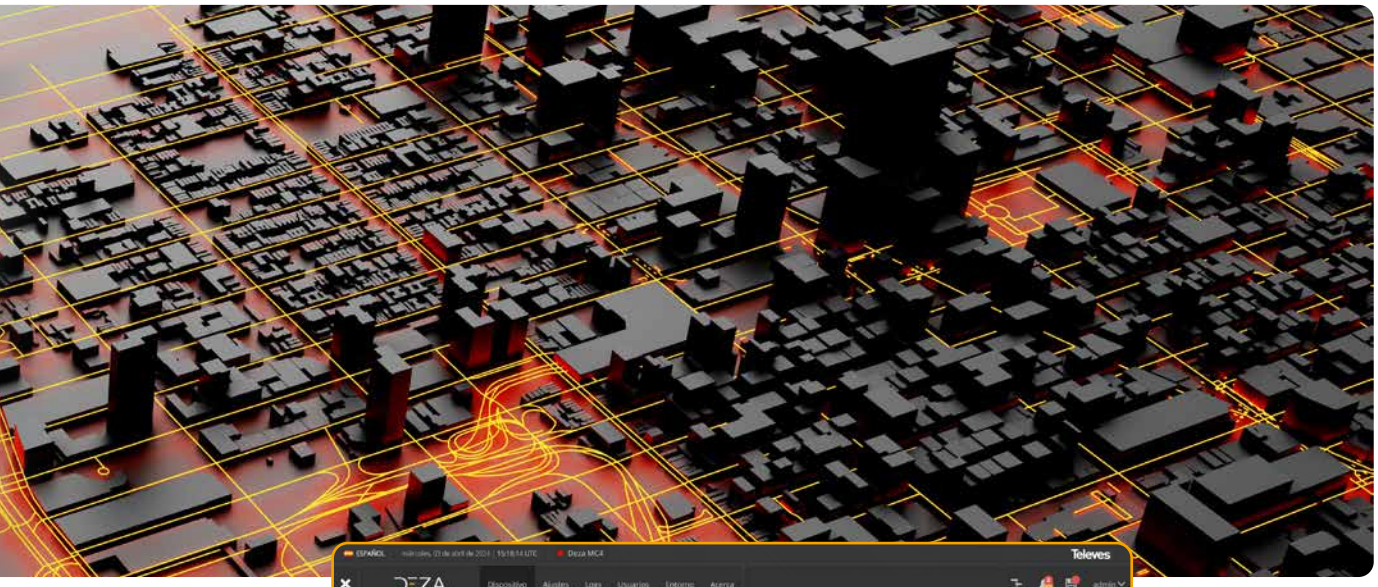
All system information at a glance thanks to an intuitive, powerful and comprehensive GUI interface, suitable for operation with the most widely used web browsers on the market.

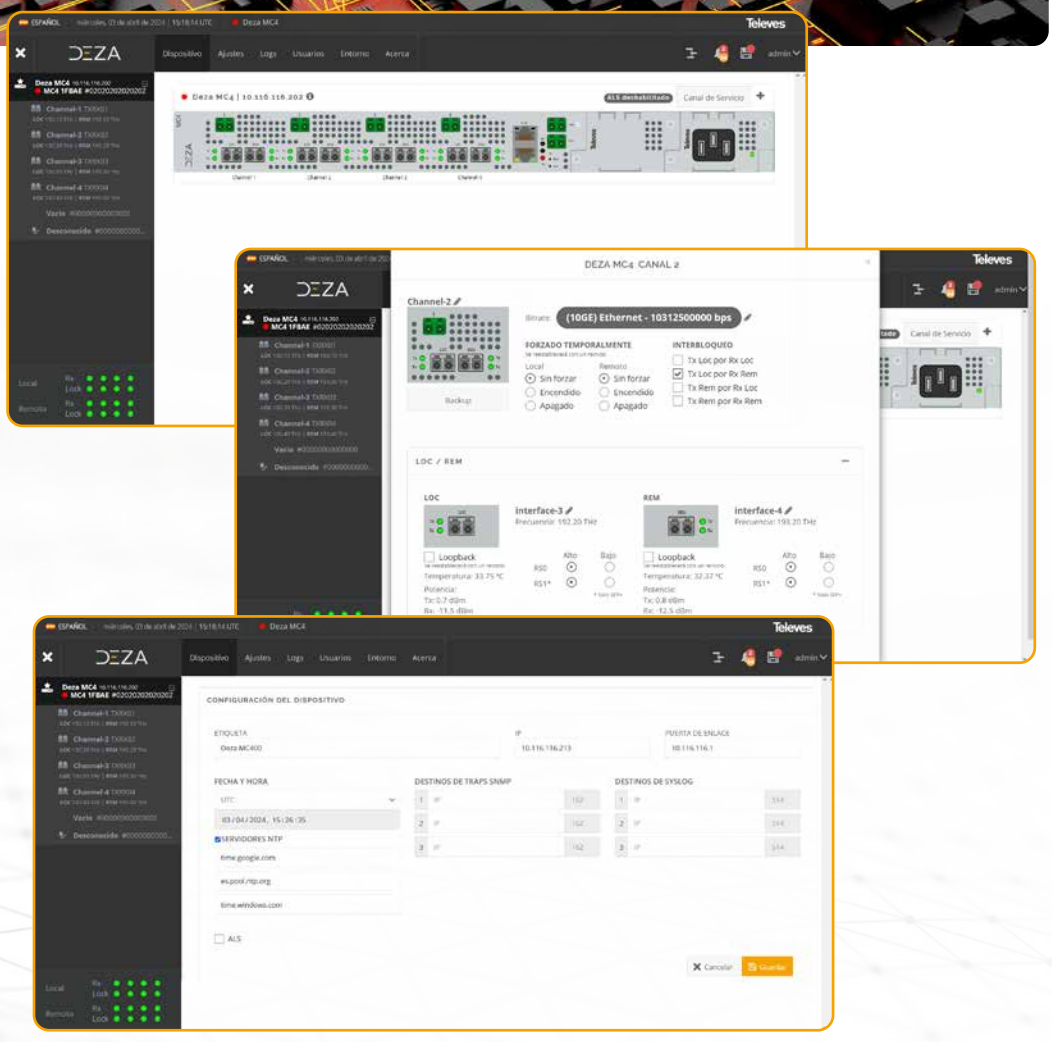
MONITORING 24 x 7

Connection to the cloud for remote access at any time, compatible with multi-vendor platforms

PREVENTION AND DETECTION OF INCIDENTS

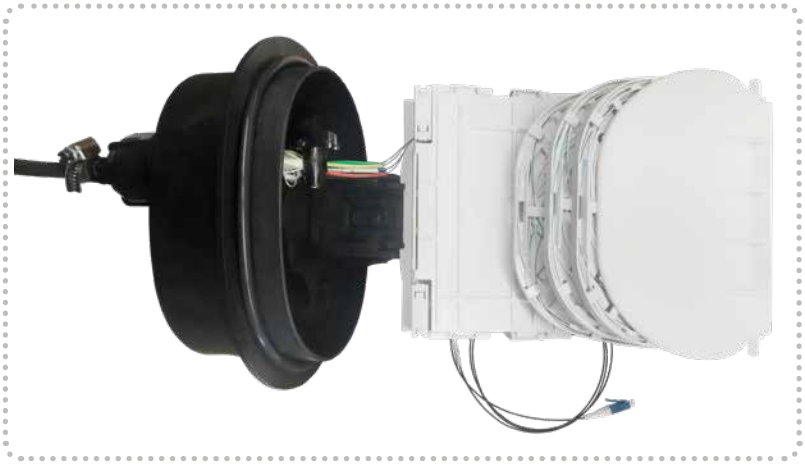
Scheduling of events and alarms in case of system irregularities, including accessible log files in the hardware.




DEZA
Televes
DEZA MC4 CANAL 2
Channel-2
(10GE) Ethernet - 10312500000 bps
CONFIGURACIÓN DEL DISPOSITIVO

TAMBO SERIES

Passive equipment designed for expanding the capacity of the existing fiber-optic network with little investment



Designed to **meet the needs of small operators, this flexible and compact solution allows for increasing the capacity of** existing **fibre with very little investment** in transport networks based on CWDM and DWDM optical filters, as in the scenarios:

- **LAST MILE AND ACCESS NETWORKS**
- **DATA CENTER INTERCONNECTION (DCI) SCENARIOS**
- **AGGREGATION NETWORKS**
- **METROPOLITAN NETWORKS**

Benefits and key features

More network capacity: It increases the potential of the fibre already deployed according to the number of lambdas that are multiplexed in the filters, based on the needs of the organisation to reach a larger number of users.

Minimum investment: High cost/benefit ratio and significant savings in CAPEX costs by having extra fibre capacity, without the need to invest in active transport equipment.

Optimal performance and small dimensions: Low insertion loss and high channel isolation ensure reliable transport of optical signals. In addition, their compact finish provides flexibility when installing them in different locations.

100% compatible with xWDM systems: Designed for operation in CWDM and DWDM transport applications, they guarantee optimal signal transport performance in both unidirectional (two fibres) and bidirectional (single fibre) systems.

Tambo Series Products

MODULES BASED ON OPTICAL FILTERS

MUX/DEMUX LGX 5+1Ch

MUX/DEMUX LGX 2x4Ch

MUX/DEMUX LGX 8Ch

These "stand-alone" devices **allow the transmission of multiple optical channels, regardless of the nature of the protocol or type of service (voice, data, storage, video, etc.) over one or two optical fibres,** optimising and maximising their use to simplify deployment.

At one end, the Multiplexer (MUX) combines the received data signals into a single light output, mixing numerous optical wavelengths for transmission over a single fibre. At the other end of the fibre, the Demultiplexer (DEMUX) receives the combined signals and separates them back into each individual data channel.

We offer different ad hoc configurations with xWDM filters according to customer requirements.

CWDM

- Combined 2nd and 3rd window multiplexer and demultiplexer filters for bidirectional and unidirectional transmission
- 8-channel CWDM 2nd window filters with UPG port for 3rd window
- 8-channel 3rd window CWDM filters with UPG for 2nd window
- 16- or 18-channel CWDM 2nd and 3rd window filters
- CWDM "n" channel filters with passband for the "C" band

DWDM

- Band spread filters for separating the transmission spectrum in network areas with "add&drop" points
- 4-channel DWDM Multiplexer or Demultiplexer filters
- 8-channel DWDM Multiplexer or Demultiplexer filters, with or without UPG port
- 8-channel DWDM Multiplexer and Demultiplexer filters, with or without UPG port
- 16-channel DWDM Multiplexer or Demultiplexer filters, with or without UPG port
- 16-channel DWDM Multiplexer and Demultiplexer filters, with or without UPG port

AUXILIARY EQUIPMENT

This range of equipment also includes solutions in chassis (**subracks with LGX format modules**), in torpedoes or in watertight enclosures (**ABS or special machining**), as well as a series of **"coloured" SFP and SFP+** optical transceivers compatible with a wide range of market equipment. In the same way, we offer a wide range of fibre optic kits for the correct development of installations from start to finish.

LightPad® SERIES "powered by Padtec"

Long-range modular equipment intended for high-capacity multiservice transport in network operators

As a result of the strategic alliance with the company Padtec S.A., it is able to respond to the growing traffic demands of **network operators and the enterprise market** without interrupting traffic.

Through the i6400G LightPad® Platform we offer a Carrier-class **DWDM solution for multi-service transport of data channels with multi-protocol and high-capacity systems (100 Mbps...600 Tbps)** over tens of kilometres on all types of optical fibres, in accordance with ITU-T recommendations.

Its architecture **adapts to the increasingly changing traffic profile** of network operators by supporting the most diverse and demanding optical system applications:

- **LH AND ULH BACKBONE NETWORKS**
- **DATA CENTER INTERCONNECTION (DCI) SCENARIOS**
- **SUBMARINE SYSTEMS**
- **LAMBDA ALIEN SCENARIOS**

Benefits and key features

Scalability. Designed to allow for ease of growth on demand and without interruption of service at any time. It allows architectures from a few optical channels with different topologies and to expand solutions to more complex network configurations (meshed networks) and 600 Gbps channels.

Robust and secure infrastructure. It presents solutions aimed at high-availability environments with no single point of failure. It has redundancy systems that act against possible faults and errors in the fibre with service switching times of less than 15 ms.

Transparent and flexible solution. Compatible with any protocol and line speed (Ethernet, F.Channel, FICON, SDH, SDI, etc.) from 2 Mbps up to 600 Gbps and for different ranges (Metro, LH, etc.) required to meet the ever increasing demands of data transmission.

Centralised management system. It integrates the central NMS+ platform for the configuration, operation and monitoring of each of the elements that make up the transport network.

LightPad® series products

Characterised by a modular configuration, it has been designed to be housed in 2 to 4U chassis that support the different transmission, amplification, optics, control and power boards that make up each optical solution.

INTERFACE CARDS

Elements responsible for transmitting and receiving optical signals from data channels in a DWDM system. Depending on the needs of the network, two options are presented:

- **Muxponders**: Multiplex 8 to 12 optical signals on two optical network interfaces (several lower bit rate services combined into one or two higher bit rate output signals) for tunable line interfaces, coherent detection, FlexGrid Compatible, Fine Tuning, SD-FEC, etc., according to the ITU-T standardised DWDM grid.
- **Transponders**: They convert the customer-side optical signal into an electrical signal by performing 3R and converting it to line-side optical signal according to the ITU-T standardised DWDM grid.

LINE CARDS

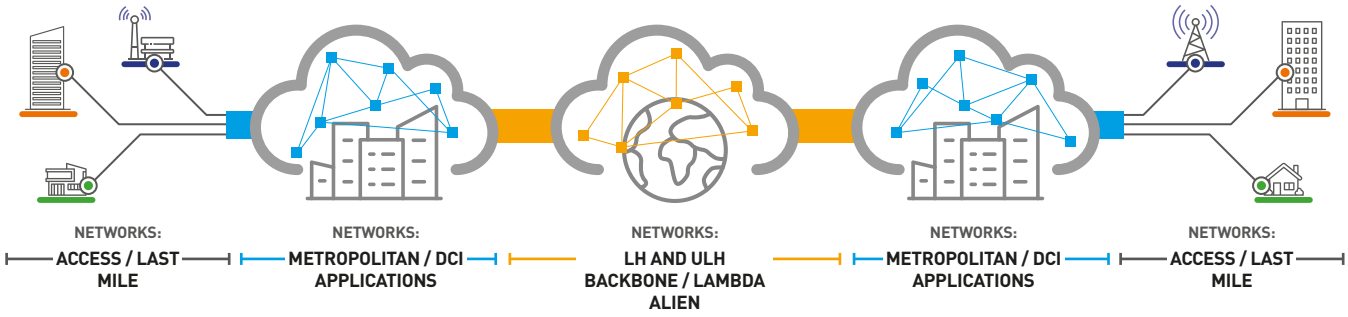
- **Combiners**: Elements of the architecture that mix optical signals. Different models are offered to cover the different multiplexing needs (50 GHz, 100 GHz, 200 GHz spacing, Colourless, etc.). Passive systems, active systems with VOAs, ROADMs, etc.
- **F.O. Switch**: They provide system protection and allow automatic switching between two optical fibres with multiplexed signals or directly between two DWDM optical channels.
- **Supervisory cards**: They are responsible for the complete management of the system's cards.
- **Amplifiers / Hybrid Amplifiers**: EDFA, RAMAN and hybrid cards for the amplification of optical signals in links where required. Different models are presented with different gain levels depending on the link requirements.
- **Dispersion Compensators**: They balance the chromatic dispersion accumulated in the optical link.

AUXILIARY EQUIPMENT

Remaining elements that make up the DWDM system and are part of all configurations, such as redundant AC or DC power supplies, ventilation systems, modules for obtaining redundancy, chassis, subracks, etc.

APPLICATION AREAS AND USE CASES

Find the optical transport solution that best fits the technological requirements of your application scenario.



LAST MILE CONNECTIVITY AND LAN / SAN / SDI EXTENSIONS

Links requiring few DWDM channels and lower bit rates (dedicated connectivity for transporting GbEthernet, 10GbEthernet, 100GbEthernet, etc).

Deza Series configuration:

Up to 8 DWDM channels from 1 to 14.25 Gbps

- 2 x MC4 (4 DWDM Channels)
- 8 Channels by adding 2 x MC4 extensions
- From 1 to 14.25 Gbps Ethernet, Fibre Channel and others
- Up to 80 km without amplification
- Mux & Demux WDM included (without extra RU)

ACCESS NETWORKS

End-to-end links and connections to provide network connectivity from different environments (5G, FTTH, IoT networks, Cloud Services, etc.) to infrastructures, buildings and homes.

Deza Series configuration:

Up to 4 WDM channels from 1 to 14.25 Gbps, 25G, 40G & 100G

- 2 x MC100 (4 WDM Channels, different rates)
- From 1 to 14.25 Gbps Ethernet, Fibre Channel and 25G, 40G, 100G Ethernet
- Up to 80 km without amplification (40 km for 25G Ethernet with FEC)
- Mux & Demux WDM included (without extra RU)

METROPOLITAN TRAFFIC AGGREGATION NETWORKS

Connections between nodes that require multi-service links for cross-connection and have continuous and increasing bandwidth requirements.

Deza Series configuration:

Up to 8 DWDM channels of 40G and 100G

- 2 x MC400 (4 DWDM Channels)
- 8 Channels by adding 2 x MC400 extensions
- 40G & 100G Ethernet
- Up to 80 km with EDFA and DCM
- Mux & Demux WDM included

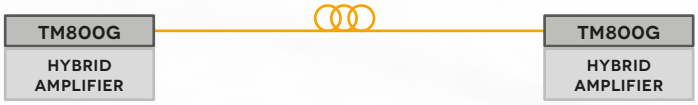
LH AND ULH BACKBONE NETWORKS (LONG DISTANCE)

They require advanced amplification solutions, high bit rates (> 400 Gbps) and traffic switching through automatic path protection mechanisms at the optical level.

Long distance and high-capacity scenario (LH)

End-to-end data transport over long distances (up to 600 km) using DWDM channels up to 400G, thanks to the use of Muxponders TM800G.

Configuration with LightPad® Series
"powered by Padtec":



Channels of 400 Gbps

- 2 x TM800G
- 2 x Hybrid amplifiers
- 2 x DWDM Channels of 400 Gbps
- 800 Gbps total capacity
- Up to 600 km range

Ultra long distance and high-capacity scenario (ULH)

End-to-end data transport of up to 100G between networks separated by distances of up to 10,000 km, using TM800G and TM1200G Muxponders.

Configuration with LightPad® Series
"powered by Padtec":

Channels of 100 Gbps

- 2 x TM1200G
- 2 x TM800G
- 4 x DWDM Channels of 100 Gbps
- 200 Gbps total capacity
- Up to 10,000 km range

DCI APPLICATIONS FOR THE CONNECTIVITY OF BIG DATA CENTERS AND CRITICAL ENVIRONMENTS

Links that require a high level of redundancy, a large number of DWDM channels, multi-protocol networks for transport of network and storage environment, low latency and maximum reliability to ensure end-to-end information integrity.

Interconnection scenario of large data centres and critical environments at a maximum distance of 80 km, ensuring efficient and secure point-to-point data transmission with channels up to 600G, using Muxponders TM1200G.

Configuration with LightPad® Series
"powered by Padtec":

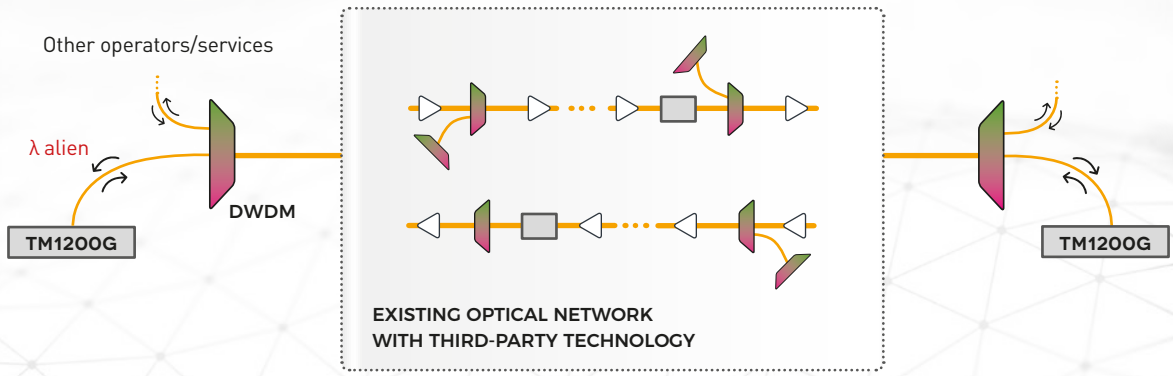
Channels of 600 Gbps

- 2 x TM1200G
- 2 x DWDM Channels of 600 Gbps
- 600 Gbps initial capacity
- 1.2 Tbps total capacity
- Up to 80 km range

ADAPTED LAMBDA ALIEN SCENARIOS

They consist of using the customer's entire transport network using another vendor's technology to expand capacity through free optical ports in the available spectrum.

Configuration with LightPad® Series
"powered by Padtec":



INTEGRAL TURNKEY PROJECTS

Your project is special and we will accompany you through the whole process.

In addition to offering you a customised solution to the architecture and configuration of your project, **our qualified engineering teams will accompany you at all times. We provide you with the support you need throughout the whole process: start-up, implementation, configuration and after-sales support**.

Our aim is to offer you comprehensive after-sales advice and technical support with the highest level of commitment through a wide range of professional services:

CHARACTERISATION OF FIBRE LINKS

Our team of engineers is at your disposal to carry out measurements on the state of the fibre sections and generate the corresponding reports for the correct implementation of the xWDM network.

INSTALLATION AND COMMISSIONING

Our Operations team has the knowledge and means to ensure that the installation and configuration of each network element is carried out successfully. During this phase, the team is responsible for the study of the nodes and the network, the installation of the equipment and its verification, the integration of the management platform, the activation of the after-sales service and the complete documentation of the project.

SUPPORT AND MAINTENANCE

Through Televes Global Services we centralise the proactive and reactive support of your services, available 24 hours a day, 365 days a year. We also have a complete strategic spare parts supply in the different geographical areas to guarantee the rapid replacement of critical elements for our customers.

TRAINING

We offer you a portfolio of courses that include both theoretical training and a practical part focused on the configuration, operation and maintenance of the deployed systems.

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