LASERWAY

Application Guide

**100% optical solution
for LAN networks.**

FURUKAWA ELECTRIC

INNOVATIVE
SUSTAINABLE
FLEXIBLE

Laserway is Furukawa's 100% optical solution
for LAN networks. It combines passive network,
easy installation and modularity.
And the best thing is: it's future-proof.

REDUCE
costs

SAVE
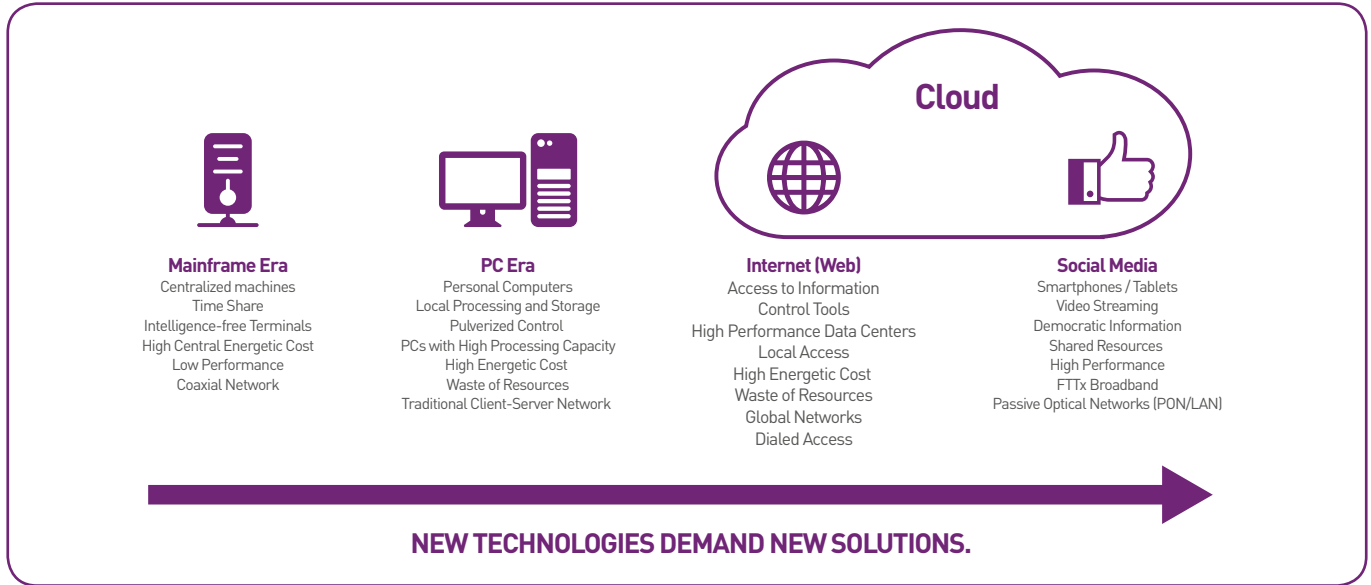## energy

CENTRALIZE
control

OPTIMIZE
infrastructure

LASERWAY

Technological Evolution

Cloud

Mainframe Era
Centralized machines
Time Share
Intelligence-free Terminals
High Central Energetic Cost
Low Performance
Coaxial Network

PC Era
Personal Computers
Local Processing and Storage
Pulverized Control
PCs with High Processing Capacity
High Energetic Cost
Waste of Resources
Traditional Client-Server Network

Internet (Web)
Access to Information
Control Tools
High Performance Data Centers
Local Access
High Energetic Cost
Waste of Resources
Global Networks
Dialed Access

Social Media
Smartphones / Tablets
Video Streaming
Democratic Information
Shared Resources
High Performance
FTTx Broadband
Passive Optical Networks (PON/LAN)

NEW TECHNOLOGIES DEMAND NEW SOLUTIONS.

The Laserway solution is an infrastructure innovation for LAN Networks.

The solution is based on **GPON (Gigabit Passive Optical Network)** technology, which is conceptually a **point-multipoint topology** network. And between a single network aggregation equipment (core) and the equipment in work areas, there are **only passive elements** that do not require either electric power supply nor cooling.

Savings, Control and Convergence.

In the Laserway solution, data is transmitted between an equipment unit called OLT (Optical Line Termination) situated in the equipment room and the ONT (Optical Network Termination) situated at the work area.

ONTs offer connectivity from metallic patch cords to any 10/100/1000 Base Ethernet end devices such as computers, IP telephones, automation systems, access control, etc. of the network.

In addition to **connectivity to IP equipment**, **services, such as analog telephone and video as well as IPTV**, are also offered.
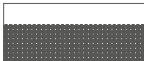
Between OLT and ONTs, there is the optical distribution network (ODN). In this network, there are single mode optical fibers and optical splitters.

The splitters **are passive equipment**, that **do not demand electric power supply or cooling**. Their function is to split the input optical signal coming from the OLT fiber into multiple outputs for the fibers that will connect to the ONTs in the work area.
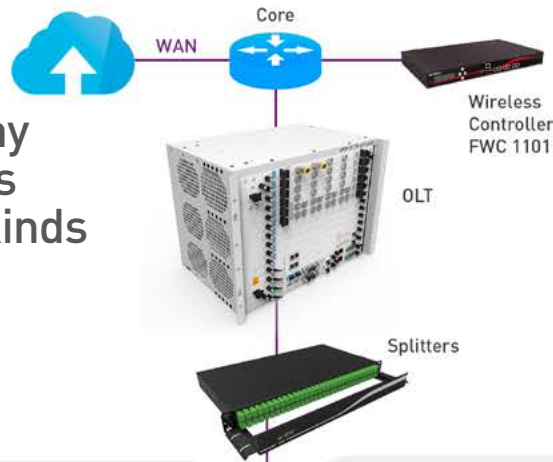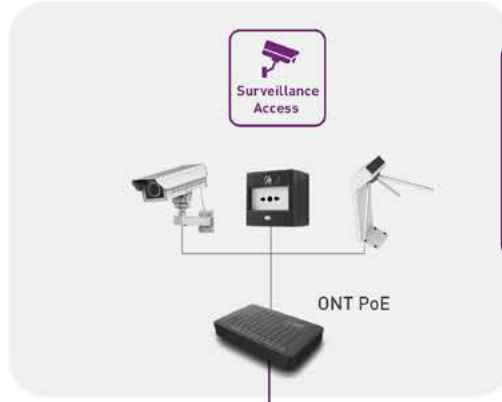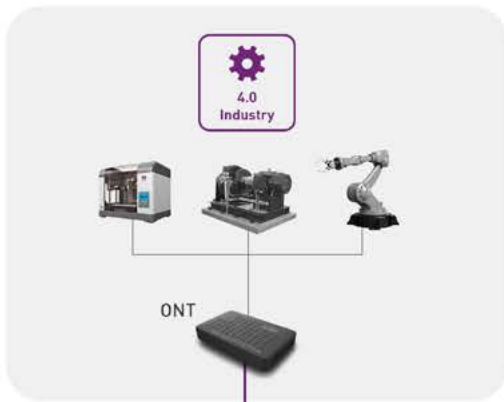
Your network more efficient and sustainable!
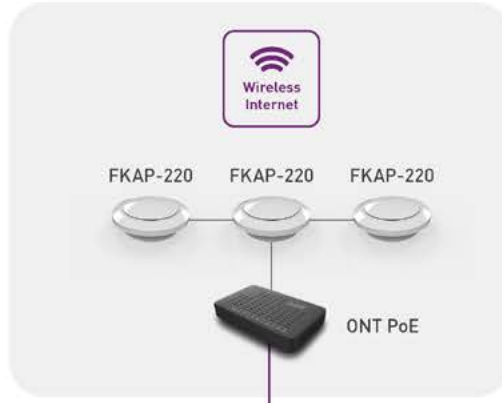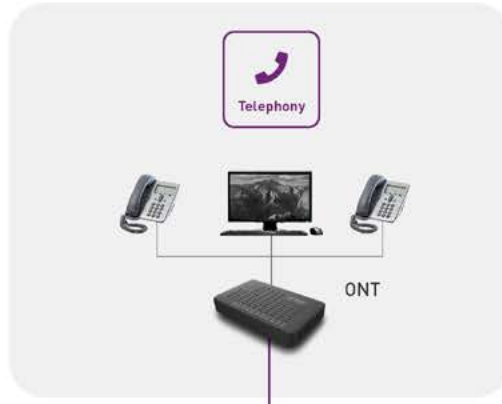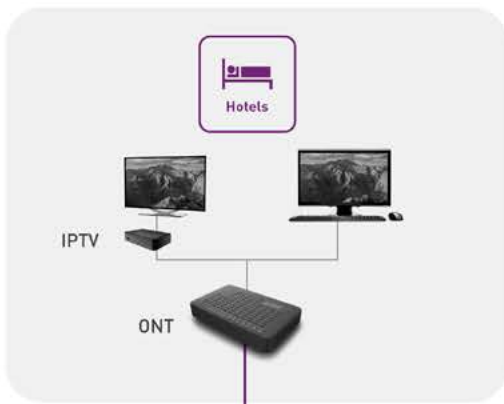Simulation of duct occupation:

Traditional Network
240 CAT.6 cables
Each 100 m = 960 kg

Horizontal Cabling - Laserway Network
60 Fiber-Lan 02F cables
84% less occupation
Each 100 m = 114 kg **(88% less)**

Distribution - Laserway Network
10 Fiber-Lan 12F cables
95% less occupation
Each 100 m = 40 kg **(95% less)**

The Laserway solution adds value to all kinds of business. Check it out!

CALL CENTER
ENTERPRISE
AIRPORTS
HOTELS
INDUSTRY
LOGISTICS
UNIVERSITIES
PUBLIC FACILITIES

WAN — Core

Wireless Controller FWC 1101

OLT

Splitters

Hotels

IPTV

ONT

Telephony

ONT

Hospital

ONT

Wireless Internet

FKAP-220   FKAP-220   FKAP-220

ONT PoE

4.0 Industry

ONT

Surveillance Access

ONT PoE

DID YOU KNOW?
The Laserway solution allows integration with RF video systems.

WHY LASERWAY?

Advantages

Innovation and Technology
Fully Optical Structured Cabling Network

Green and Efficient Network
Reduction of Power Consumption Infrastructure Optimization

Future Proof Technology
Optical infrastructure with terabits per second (Tbps) capacity

Flexible Infrastructure
Easy to handle and expand

Logical and Physical Security
Native Standard Cryptography
Carrier standard of Reliability
Electromagnetic Immunity

Optimized Operation
Centralized Control
High Availability

The solution allows optimizations of up to*:

70% savings on cables **35%** savings on racks

80% savings on plastic **70%** savings on space

70% savings on power **95%** savings on doors

With Laserway solution, you actually use your space for your business! More work areas, more rooms, more hospital beds and more productivity for your company.

* Values may vary according to each project.

Understand the benefits:

☑ **Simplified Infrastructure:** the use of passive and compact optical elements along the network allows the reduction of technical rooms and the size of cable trays and ducts.

☑ **Reduction of Power Consumption:** due to the reduction in the number of technical rooms necessary for the local network, there is also a reduction in cooling and electrical feeding. Besides, Laserway solution equipments have low power consumption, because they transmit data through an optical medium.

☑ **Better Bandwidth Control:** as OLT and ONT equipments are located at the terminals of the optical network in the Laserway solution, the control of used bandwidth in each of the ONTs is facilitated. This feature of having an equipment switching the traffic at a central point of the network also fits perfectly with the traffic profile of the current local networks.

☑ **Future-proof Network:** the distribution network of the Laserway solution has a transmission capacity in Tbps (terabits per second). It is known that over time data transmission rates of active equipment increase significantly. The infrastructure implemented today with the Laserway solution is ready to support this future demand.

☑ **Network for Green Buildings:** the characteristics of the Laserway solution are essential to meet incentive programs to use efficient resources, because they contribute to the reduction of power consumption of cooling systems as well as the quantity of material used in cabling and accessories.

☑ **Investment Savings:** the Laserway solution brings important reductions in CAPEX (material costs) and OPEX (operating costs).

  ☑ **CAPEX:** project based on Laserway solution enables an optimization of the infrastructure allowing a reduction in the total initial investment in materials, installation and physical space used.

  ☑ **OPEX:** the operation and maintenance of the network is simplified, due to smaller technical rooms, reduced number of active equipment and control of all the served ports from a single central equipment. However, the major impact is over reduction of power consumption that may reach up to 70%.

UP TO
70%
LESS OPEX

UP TO
50%
LESS CAPEX

CONCEPTS AND INFRASTRUCTURE

The entire Laserway solution is based on structured cabling technical references and normatives aiming to standardize the project development and installation.

Technical References

ANSI/TIA-568.0-D - Generic Telecommunications Cabling for Customer Premises

ANSI/TIA-568.1-D - Commercial Building Telecommunications Infrastructure Standard

ANSI/TIA-568.3-D - Optical Fiber Cabling and Components Standard

ANSI/TIA-606 - Administration Standard for Telecommunication Infrastructure

ITU-T G.984 - Gigabit-capable passive optical networks (GPON): General characteristics

TDMM 13 - Volume 1 - Chapter 5: Horizontal Distribution Systems - Section 1: Horizontal Cabling Systems - Passive Optical Networks (PONs)

Passive Network Optical Division

1 SERVICE INPUT

The point in the building, where transition between external and internal network of the telecommunication services is done. This transition can be MAN or WAN service input brought by a telephone operator infrastructure connecting to the local cabling network. Or it can be the transition from the local network system to an external distribution cabling in a campus.

1 EQUIPMENT ROOM

A place for the central electronic telecommunication equipment (OLT, switches, routers, servers, modems, etc.). This room shall provide the space and environmental conditions required for the installation of this equipment.

2 BACKBONE (PRIMARY CABLING)

Optical cabling, which provides the physical connection between the Equipment Room and the Telecommunication Room / Cabinet.

3 TELECOMMUNICATION ROOM / CABINET

These are used as a point of transition between the primary network (Backbone) and the horizontal distribution network. The Telecommunication Rooms or Cabinets provide space and environmental conditions to make cross connections or interconnections of structured optical cabling through passive ODF elements, optical patch panels, optical patch cords and optical splitters.

4 5 HORIZONTAL CABLING

Physical connection between the Telecommunication Room / Cabinet and the Work Areas. It is composed by the permanent link, which is a network segment to be designed in a way to make any maintenance or measuring operation easy, not affecting the rest of the network. In the Horizontal Cabling, there are also Consolidation Points, which helps the strategic distribution of termination points and provides more flexibility on maintenance, expansion and layout changes.

6 WORK AREA / OPTICAL TERMINATION

Where the end user (work desk, surveillance cameras, Wi-Fi points) accesses the telecommunication services by means of an ONT (Optical Network Terminal). ONTs can be close to the user, or in concentration zones.
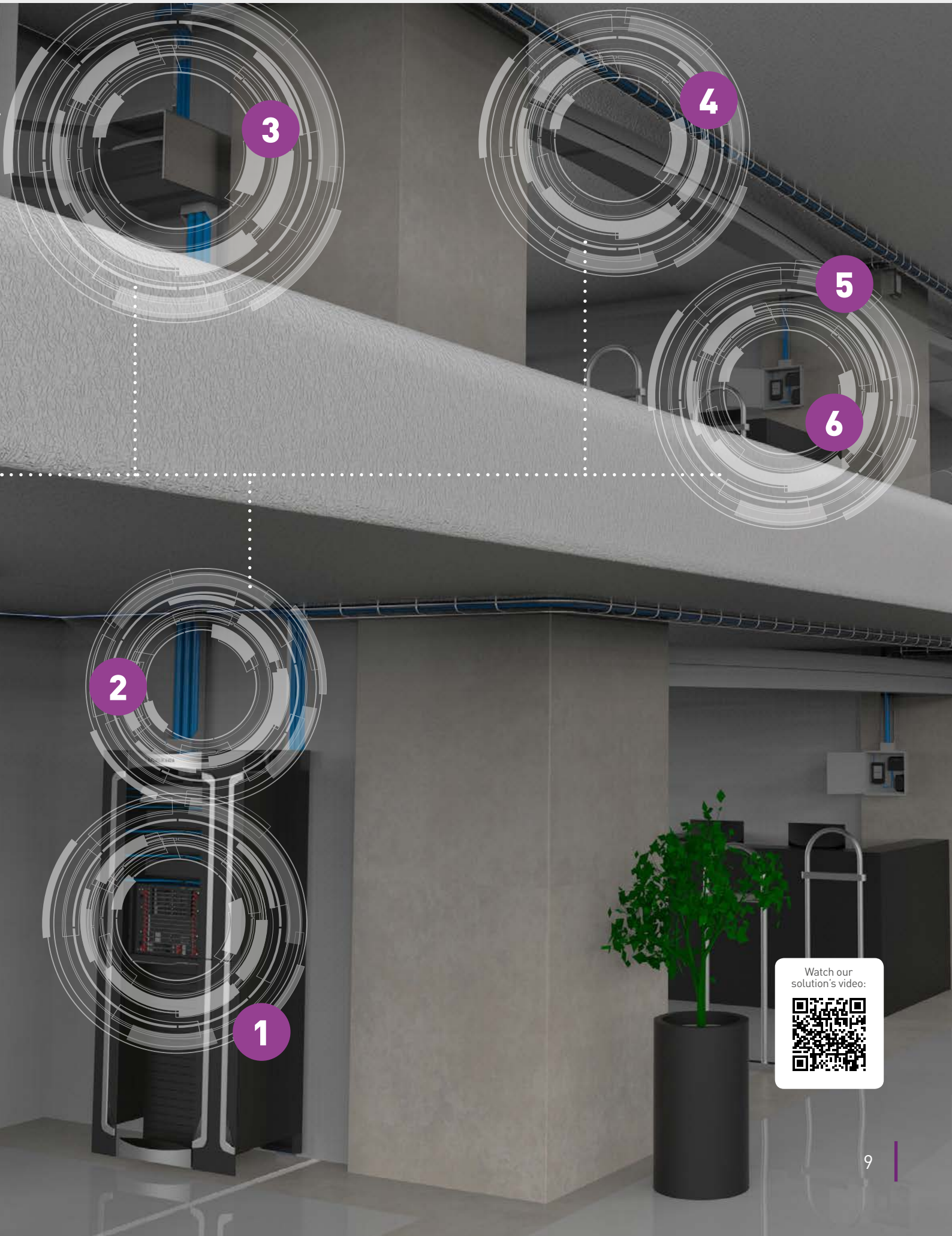
Watch our
solution's video:

Centralized Topology

In this topology, the optical splitters are centralized in the Equipment Room. On the figure below, 1:32 splitters are used in the Equipment Room.

Centralized Topology

Data Center
Equipment Room

OLT GPON

Splitter 1x32   Splitter 1x32

ODF

ODF

12F Optical Cables

Consolidation Point

Rosettes

ONT's

MUTOA
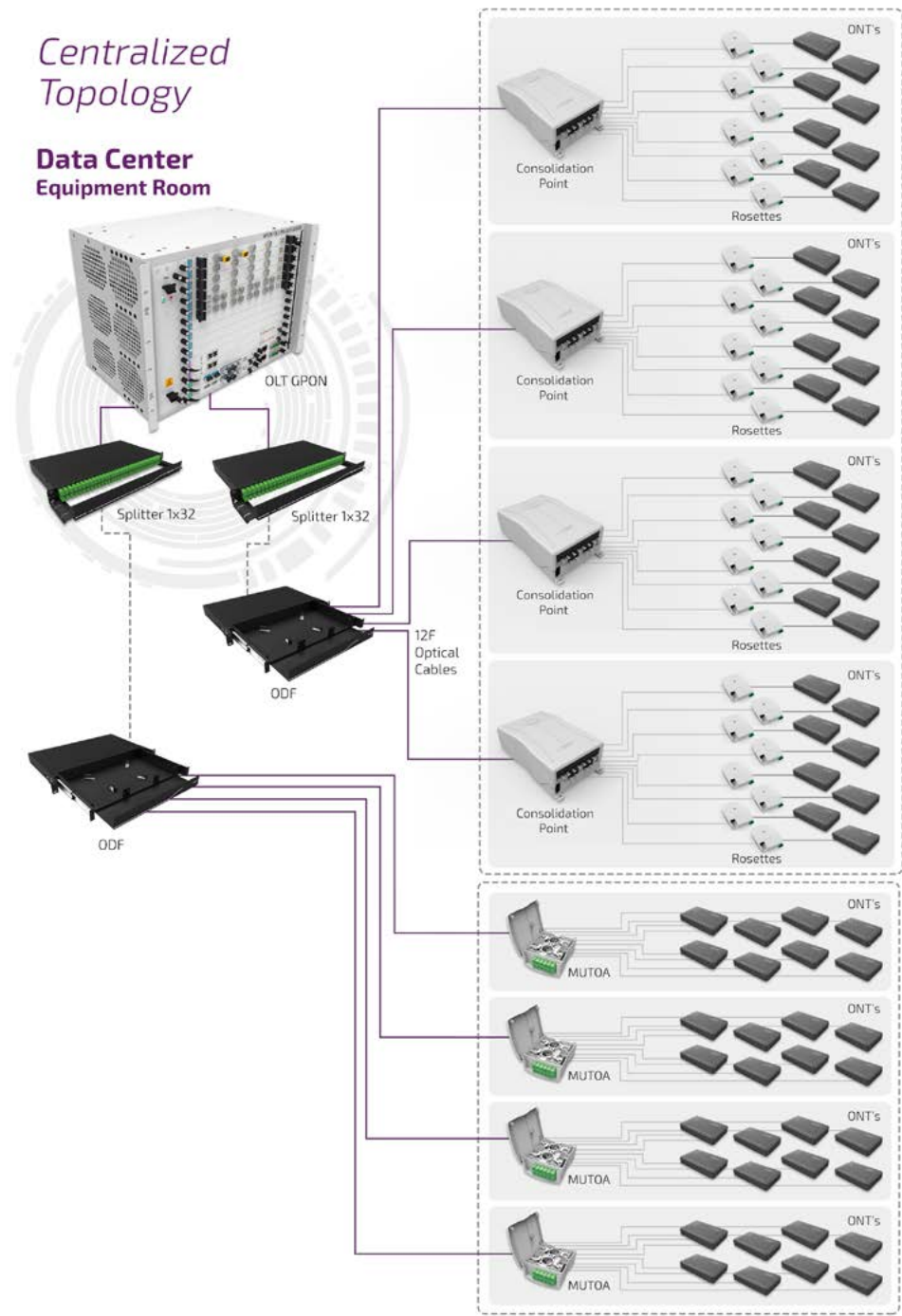
Network Flexibility.

100% of the splitter ports used.

From the Equipment Room, it is a point-to-point network.

Local Convergence Topology

The optical splitters are installed in the telecommunication rooms/cabinets. 1:32 splitters concentrated in a Telecommunication Cabinet are used below.

Local Convergence Topology

TECHNICAL ROOM 1 *Telecommunication Room*

Splitter 1x32

"Distribution" ODF

"Backbone" ODF

Data Center
Equipment Room

OLT GPON

ODFs

12F Optical Cables

Consolidation Point

Rosettes

ONT's

08F Optical Cables

"Backbone" ODF

Splitter 1x32

"Distribution" ODF
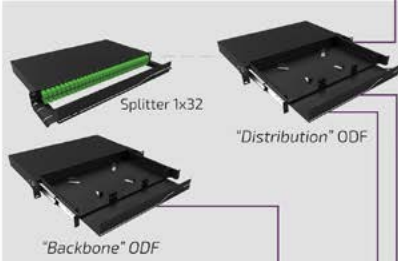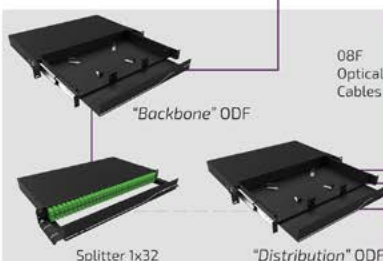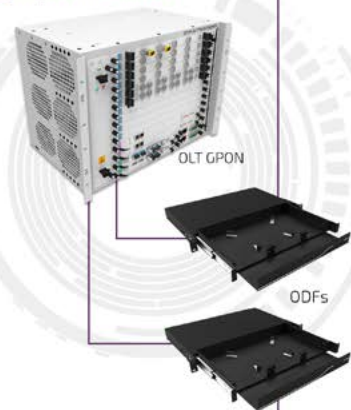
TECHNICAL ROOM 2 *Telecommunication Room*

MUTOA

ONT's

👍
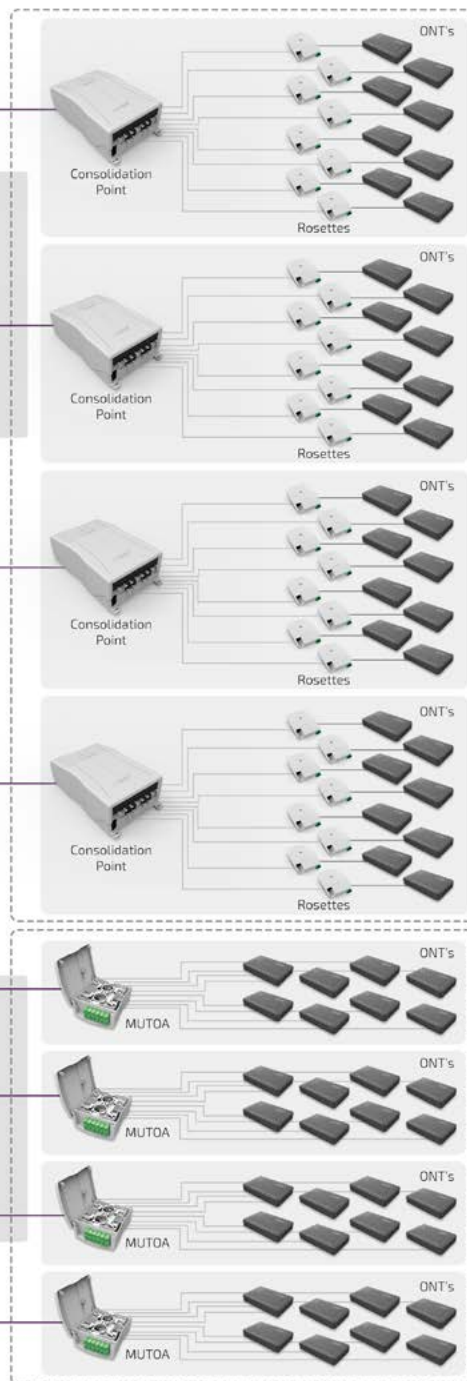
Backbone fiber reduction.

Point-to-point networks from the Entrance Room.

CONCEPTS AND INFRASTRUCTURE

Good Project Practices

A well-developed project shall:

- ☑ Assure the system's quality;
- ☑ Adequate the costs;
- ☑ Provide a range of alternatives;
- ☑ Balance three pillars (scope, deadline and costs).

Scope

Project

Deadlines

$ Costs

Project Methodology

Identification of Requirements and Targets	Logical Network Project	Physical Network Project	Test, Optimization and Documentation
Initial survey over existing structure, services needed, network traffic, requirements and restrictions. It is necessary to analyze all plants of the building, such as electric, hydraulic, roofs, gas, among others.	Development of the network topology, containing the addressing model and connections, switching and routing protocols. It also includes safety projects, management and the needed speed in each network segment.	Definition of the services provided to the work areas, the service speed and the network technology. Furthermore, it shall define how the connection between the floors and the different buildings shall be done.	After the project execution, analyze the obtained result and compare it to the original, in order to verify possible discrepancies. If there are any, it shall be updated. All test reports shall be attached to the project's documentation.

Good Project Practices

1 Equipment Room

- ☑ Environment dedicated exclusively to the telecommunication functions and support facilities.
- ☑ As it is a place for active equipment, it demands more complex support systems (cooling, stabilized power, no-break, etc.).
- ☑ The support systems shall be separated in environments adequate for each purpose.

2 Backbone

- ☑ Do not use elevator shafts, because of the high risk. Keep the access to the backbone closed, except when a technician is present.
- ☑ For indoor installations, always use LSZH (Low Smoke Zero Halogen) coated cables, in order to assure a safer environment.

3 Telecommunication Room/Cabinet

- ☑ There shall be a Telecommunication Room/Cabinet on every floor.
- ☑ Use vertical and horizontal cable guides to conduct and organize the optical maneuvering cords.
- ☑ Respect the bending radius and the mechanical stress limits of the cables.
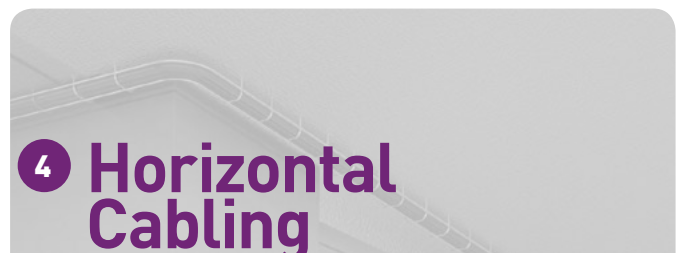
4 Horizontal Cabling

- ☑ Adopt appropriate measures for each place, without much excess.
- ☑ The splitters shall not be used in the horizontal cabling.
- ☑ Use LSZH coated cables for indoor environments, in order to guarantee a safer work environment.

5 Work Area

- ☑ Do not use splitters in the Work Areas.
- ☑ Plan slack optical cables to facilitate the maintenance of the termination points.
- ☑ Respect the minimum bending radius of the optical fibers and cables, according to the technical specification.

The best performance of your Laserway network depends on the best planning and proper installation. **We guarantee the technology!**

Equipment Room

Significant reduction on size and complexity.
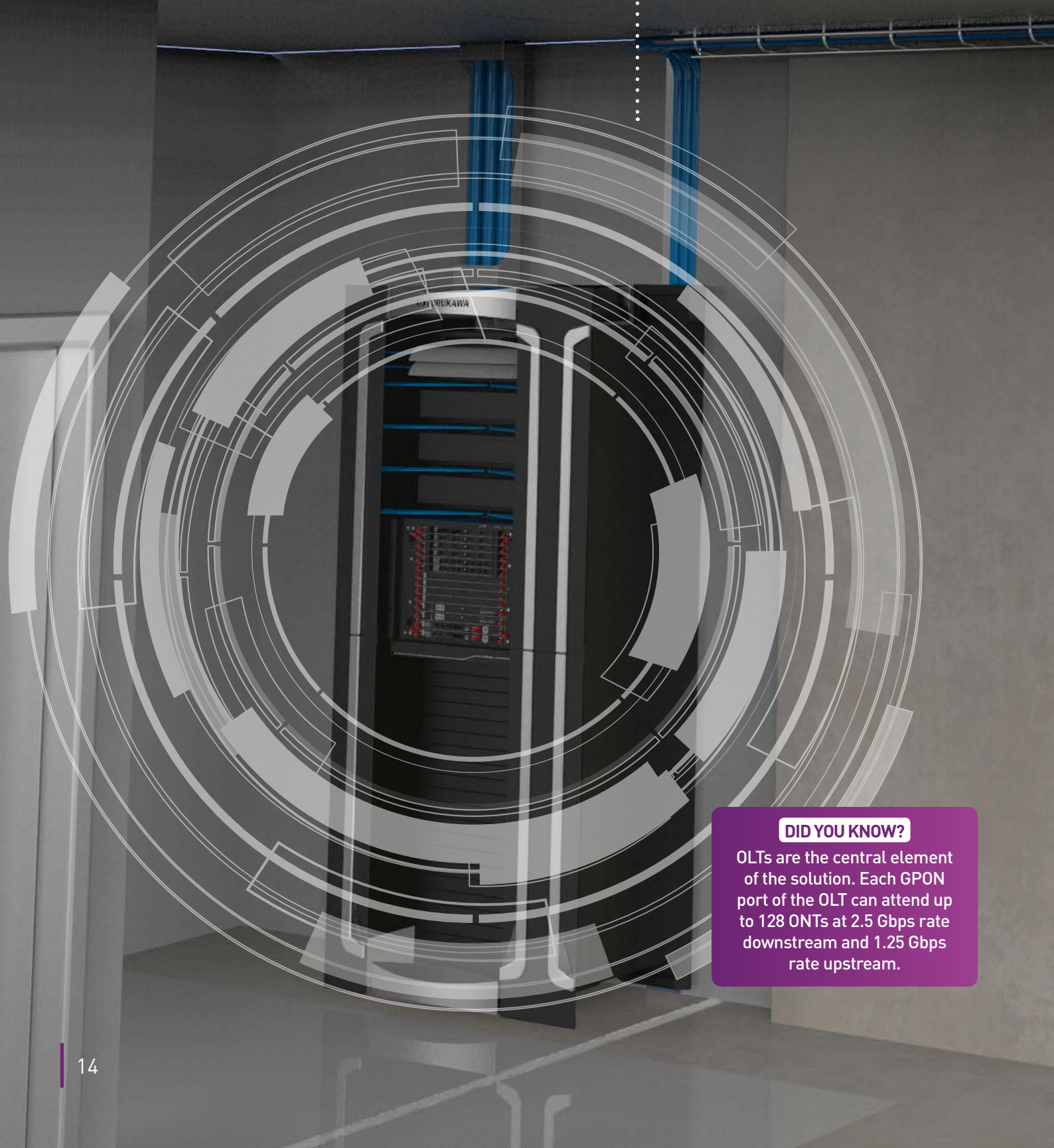
Enterprise Open Rack

- ☑ 36U or 45U;
- ☑ Fixed on the front or the rear part of equipment;
- ☑ Holes ½U;
- ☑ Unit identification U;
- ☑ Compatible to the 140 mm vertical guides;
- ☑ Possibility to use grounding rod;
- ☑ Easy assembly and installation.

Enterprise Closed Rack

- ☑ Front glass door;
- ☑ Key-lock system on all doors;
- ☑ Available in versions:
  - 600 mm x 600 mm x 22U or 42U.
  - 800 mm x 800 mm x 42U with vertical guides.

Optical Concentrator GPON FK-OLT-G2500

- ☑ Interfaces:
  - 10 slots for GPON service modules;
  - 4 Gigabit Ethernet SFP interfaces;
  - 2 10-Gigabit Ethernet XFP interfaces;
  - 2 slots for uplink modules;
  - 2 slots for switching and management modules.
- ☑ **Dimensions:** 19" wide, 7Us high;
- ☑ **Power Supply:** 2 redundant power supplies DC -48V;
- ☑ **Features:** L2 and L3;
- ☑ All modules can operate in redundancy.

GPON and Uplink Transceivers

Transceivers for use in Furukawa GPON service modules, as well as for Uplink interfaces (SFP, SFP+ and XFP).

Optical Concentrator GPON FK-OLT-G4S

- ☑ Interfaces:
  - 4 GPON ports;
  - 8 uplink combo ports;
  - 2 slots for power supplies;
- ☑ **Dimensions:** 19" wide, 1U high;
- ☑ **Power Supply:** 2 redundant AC or DC power supplies;
- ☑ **Features:** L2 and L3;
- ☑ RJ-45 interfaces and console for local management.

Optical Concentrator GPON FK-OLT-G8S

- ☑ Interfaces:
  - 8 GPON ports and 8 uplink combo ports;
  - 2 SFP+ ports for 10GE uplink;
  - 2 slots for power supplies;
- ☑ **Dimensions:** 19" wide, 1U high;
- ☑ **Power Supply:** 2 redundant AC or DC power supplies;
- ☑ **Features:** L2 and L3;
- ☑ RJ-45 interfaces and console for local management.

Patch Panel LGX

- ☑ Made of steel;
- ☑ Highly scratch-resistant black epoxy painting finishing;
- ☑ Corrosion protected and resistant product, to use in indoor environments according to TIA-569-D;
- ☑ 19" wide;
- ☑ Allows the fixation of LGX MPO Cassettes and Optical LGX Plates;
- ☑ Allows the accommodation of optical cables and metallic cables in the same patch panel at the same time;
- ☑ Quick and simple. Perfect for pre-connectorized solutions.

ODF - B48

- ☑ Capacity for up to 36 SC-APC connections;
- ☑ Perfect for pre-connectorized or field termination solutions;
- ☑ Easy accommodation of fibers in projects where Tight Buffer cables are used;
- ☑ The organization of the front cords can be optimized by using an Optical Cord Accommodation Tray.

Modular Splitter 19"

- ☑ Appropriate for direct installation in 19" racks;
- ☑ Low insertion loss and excellent uniformity;
- ☑ High reliability;
- ☑ Special G-657A fiber;
- ☑ All optical adapter outputs have shutter, assuring the users' safety and the connector protection;
- ☑ Includes cable guide;
- ☑ Available in different configurations.

Wireless FWC-110 Controller

- ☑ Supports up to 10,000 local accounts and 10,000 accounts upon demand;
- ☑ Management of up to 150 APs;
- ☑ WAN and LAN ports to separate the networks;
- ☑ High availability with redundancy (1+1 or N+1);
- ☑ Hotspot Billing & Guest WiFi;
- ☑ Customizable captive portal;
- ☑ Login with social media;
- ☑ Browsing restriction by zones;
- ☑ Different policies for different kinds of users.

BLI Optical Cord

The GPON transceivers that connect to the OLT chassis ports are equipped with SC-UPC connectors. The rest of the GPON network optical connections are provided with APC-polished SC connectors. Therefore, optical cord SC-APC/SC-UPC is used only when connection from the GPON transceiver is made. Some characteristics:

- ☑ Bending-resistant;
- ☑ SC-APC/SC-UPC;
- ☑ 3 mm outer diameter;
- ☑ LSZH.
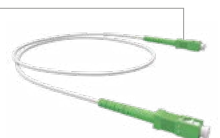
OLT	GPON Ports	Uplink 1 Gb Ethernet (Copper)	Uplink 1 Gb Ethernet (SFP)	Uplink 10 Gb Ethernet
FK-OLT-G2500	40	-	8	4 XFP
FK-OLT-G8S	8	8*	8*	2 SFP+
FK-OLT-G4S	4	8*	8*	-

* Combo ports R5-4S/SFP.

15

Photos for illustration purposes only. The products may be changed without prior notice. Always ask your Furukawa reseller.

Telecommunication Room/Cabinet

| Organized transition.

Enterprise Rack

- ☑ Front glass door;
- ☑ Key-lock system on all doors;
- ☑ Available in versions:
  - 6U x 600 mm x 450 mm.
  - 12U x 600 mm x 600 mm.

Patch Panel LGX

- ☑ Made of steel;
- ☑ Highly scratch-resistant black epoxy painting finishing;
- ☑ Corrosion protected and resistant product, to use in indoor environments according to TIA-569-D;
- ☑ 19" wide;
- ☑ Allows the fixation of LGX MPO Cassettes and Optical LGX Plates;
- ☑ Allows the accommodation of optical cables and metallic cables in the same patch panel at the same time;
- ☑ Quick and simple. Perfect for pre-connectorized solutions.

Direct/Reverse LGX Cassette

Pre-connectorized modules compatible to the LGX standard.

Modular Splitter 19"

- ☑ Appropriate for direct installation on 19" racks;
- ☑ Low insertion loss and excellent uniformity;
- ☑ High reliability;
- ☑ Special G-657A fiber;
- ☑ All optical adapter outputs have shutter, assuring the users' safety and the connector protection;
- ☑ Includes cable guide;
- ☑ Available in different configurations.
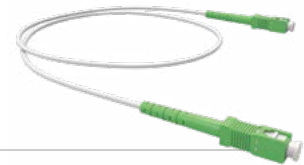
BLI Optical Cord

- ☑ Bending-resistant;
- ☑ SC-APC/SC-APC;
- ☑ Pre-connectorized option;
- ☑ 3 mm outer diameter.

Horizontal Cable Guide

- ☑ Allows horizontal accommodation of optical cables and cords;
- ☑ Made of high-impact ABS plastic;
- ☑ Available in 1 or 2 Us high.
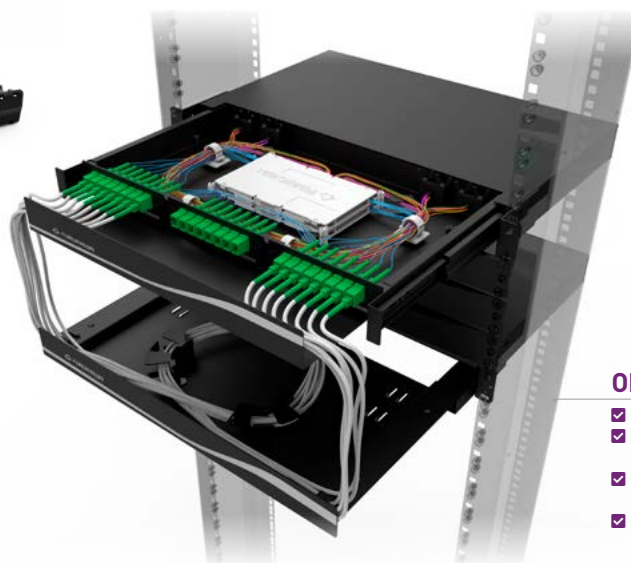
ODF - B48

- ☑ Capacity for up to 36 SC-APC connections.
- ☑ Perfect for pre-connectorized or field termination solutions.
- ☑ Easy accommodation of fibers in projects where Tight Buffer cables are used.
- ☑ The organization of the front cords can be optimized by using an Optical Cord Accommodation Tray or Cable Guide.
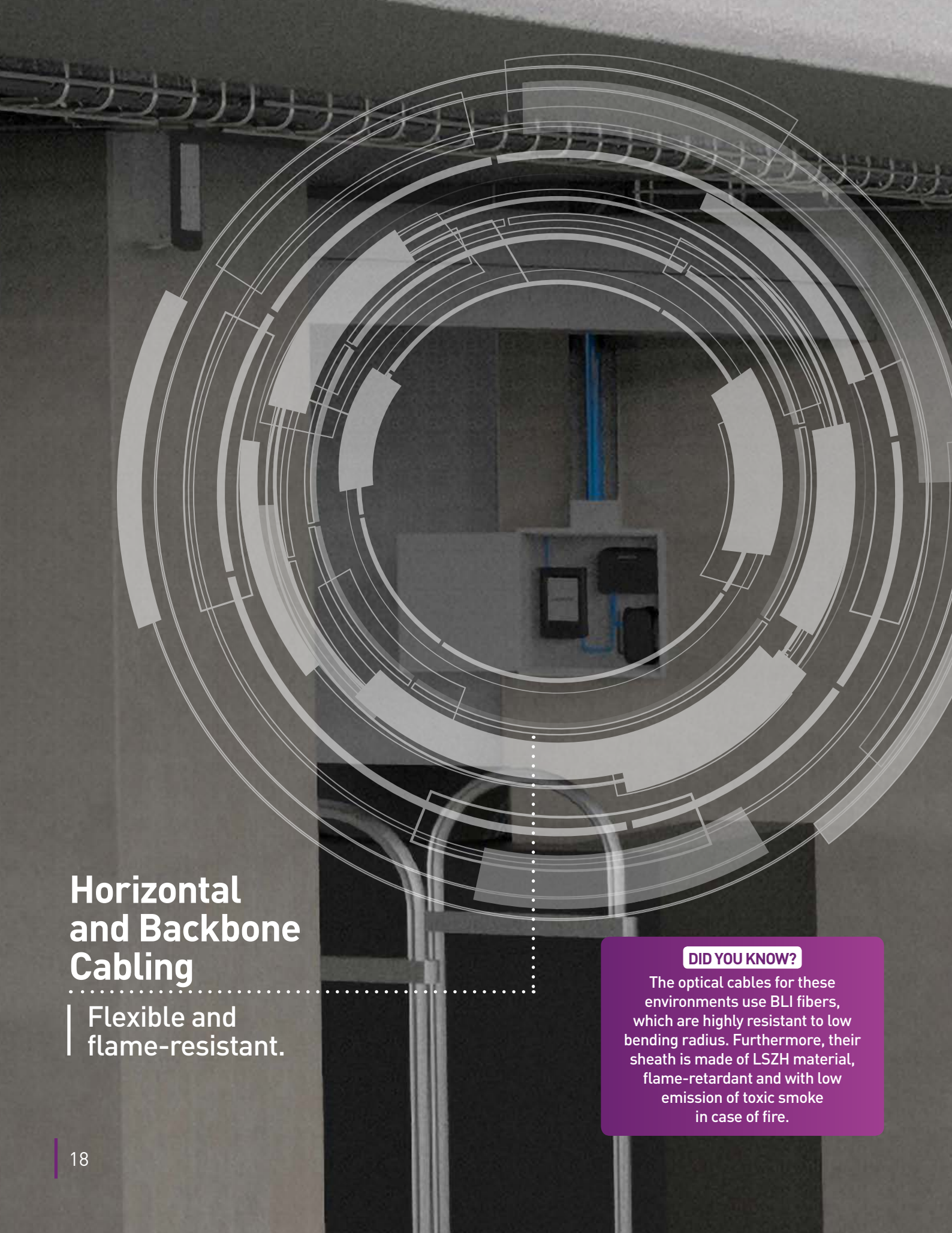
Horizontal and Backbone Cabling

Flexible and flame-resistant.

DID YOU KNOW?

The optical cables for these environments use BLI fibers, which are highly resistant to low bending radius. Furthermore, their sheath is made of LSZH material, flame-retardant and with low emission of toxic smoke in case of fire.

Slimbox™ 12F (CEIP 12)

Often used as a consolidation point and for providing connection from its optical adapters, it can also be installed as a MUTOA:

- ☑ Responsible to accommodate and protect the cable and its optical connections;
- ☑ Capacity for up to 12 fibers;
- ☑ Made of high-resistant and flame-retardant plastic;
- ☑ Connector panels included;
- ☑ Supplied with plastic bracers, rubber protectors, fixing screws/bushings, fiber identification label and splice protectors;
- ☑ Corrosion resistant and protected product, to use in indoor environment according to TIA-569.

Consolidation Point and LGX Cassette

Along the horizontal distribution cabling, following the fast and reliable installation concept. The LGX solution is the main element of the passive network.

- ☑ Easy to install in raceways and walls;
- ☑ Made of stainless steel, assuring the product durability and safety;
- ☑ Compact plug-and-play solution;
- ☑ MPO connectors on the rear part and SC-APC on the front part;
- ☑ Enables installation 100% free of optical splicing, providing fast and easy installation.

Slimbox™ 12F (BW12)

Optical plastic distributor for use in field-assembly or pre-connectorized systems. Mounted on flat surfaces and can be adapted for use in DIN rail.

Trunk Cable

The Laserway solution distribution cabling, both vertical and horizontal, can be terminated with field connectors or pre-connectorized cables tested in factory, called trunk cables:

- ☑ Available with 12 fibers;
- ☑ Mounted on both ends with multifiber connectors (MPO);
- ☑ 10 m to 100 m long (others upon inquiry);
- ☑ High performance on Insertion Loss (IL) and Return Loss (RL);
- ☑ Exceeds the performance requirements provided in the EIA/TIA-568-C.3 standard.
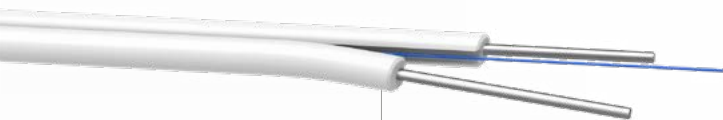
Low Friction + EZ!Connector

The set composed of the Low Friction cable and the field connector EZ!Connector makes deploying the cable and installing the network easy, enabling distances according to the need:

- ☑ Optical unit with 2 metal traction bipartite elements;
- ☑ Compact flat figure 8 profile construction;
- ☑ Low friction characteristic;
- ☑ No need of special tools, epoxy or polishing for field connectorization;
- ☑ High optical and mechanical performance.

Fiber-Lan + EZ!Connector 0.9

A set of an insulated fiber optical cable with internal dielectric traction element and optical field connector.

- ☑ Immune to electromagnetic interference;
- ☑ Completely dielectric, assuring protection of the active transmission equipment against propagation of atmospheric electric discharge;
- ☑ BLI (low bending sensitivity) fiber;
- ☑ Sheath with Low Smoke emission and Zero Halogen - LSZH (Low Smoke Zero Halogen);
- ☑ Connector with no need of special tools, epoxy or polishing for field connectorization.

Work Area

Easy installation
and performance.

Optical Rosette

Works as a termination point of the optical network.

- ☑ Compact size;
- ☑ Compatible to EZ!Connector field connector;
- ☑ Up to 2 connections can be accommodated;
- ☑ Made of highly mechanically resistant plastic.

Optical Cord BLI SC-APC/SC-APC LSZH

- ☑ Single mode optical fiber;
- ☑ Acrylate as primary coating of the fiber;
- ☑ Thermoplastic as secondary coating;
- ☑ Non-metallic traction element;
- ☑ Distributed under outer coating (dielectric fibers);
- ☑ Flame-retardant;
- ☑ 3 mm outer diameter for higher robustness in installations.

ONT LD110-44B

- ☑ Interfaces:
  - 1 SC-APC optical port;
  - 4 RJ-45 Gigabit Ethernet ports;
  - 4 FXS interfaces.
- ☑ Characteristics:
  - QoS support;
  - VLANS support;
- ☑ Remote firmware update;
- ☑ Services and bandwidth configurable by port.

Internal Access Point FKAP-220

- ☑ Centralized or stand-alone operation mode;
- ☑ Technology 802.11 a/b/g/n/ac;
- ☑ Fed by PoE (802.3 at) - Type 2;
- ☑ Maximum online users simultaneously (384/AP);
- ☑ Embedded antenna 2.4 GHz and 5 GHz;
- ☑ Dual-radio: 2 radios in 1 AP;
- ☑ Dynamic channel selection;
- ☑ Flexible to mount in different types of installations (wall, ceiling, flat surfaces, etc.).

Switch Industrial Lightbolt LB5008 + Optical Modem SFP Lightdrive GPON LD500+10B

- ☑ 6P Ethernet 1 GE, which 4P are UPoE, supplies up to 60 W per port and 240 W total;
- ☑ 2 ports Uplink SFP (1G) for Optical Modem SFP Lightdrive GPON LD500+10B;
- ☑ Mounted on DIN rail;
- ☑ Operation temperature: +40 °C to 75 °C;
- ☑ SFP ONT 1G GPON Module (sold separately).

Patch Cord CAT.6

- ☑ Performance assured for up to 6 connections in channel of up to 100 meters;
- ☑ Exceeds the TIA/EIA 568 C.2-1 characteristics for CAT.6 and ISO/IEC 11.801;
- ☑ Supplied with LSZH in blue, black, red, green and other colors upon inquiry.

ONT - G400B / PoE S2

- ☑ Interfaces:
  - 1 SC-APC optical port;
  - 4 RJ-45 Gigabit Ethernet ports;
- ☑ Characteristics:
  - QoS support;
  - VLANS support;
  - Remote firmware update;
  - Services and bandwidth configurable per port.
- ☑ Power Supply: 48V adapter included;
- ☑ Support to PoE complying with the 802.3 af (PoE) and 802.3 at (PoE+) standards.

Photos for illustration purposes only. The products may be changed without prior notice. Always ask your Furukawa reseller.

WARRANTY AND SERVICES

Furukawa Extended Warranty

The good quality of the components of a communication network infrastructure is a mandatory, not an optional characteristic. Furukawa together with its installers and distribution channels offers its Extended Warranty Program, which guarantees the performance of the installed passive optical network for up to 25 years.

The Program guarantees the three parts involved in the process to deliver a quality network, which assures the functioning into multiple different applications and equipment at high rate and availability for a long period of time, optimizing the investment.

To obtain the Extended Warranty, the end customer shall request it to its Furukawa Solution Provider (FSP) of his preference, which will start the process at Furukawa. There is no additional cost for this process, which aggregates the following advantages for the customer:

- ☑ Warranty of all passive network components (as long as the active components are Furukawa as well);
- ☑ Installation validation - it assures that the installed infrastructure solution meets the network deployment requirements;
- ☑ Preventive analysis of disaster risks - it verifies the correct use of cables adequate for the deployment, including inflammability class;
- ☑ Network service availability expansion - it verifies the bending radius and/or stress on cables and connectors, avoiding disconnection due to fatigue or excess of stretching or compression;
- ☑ Guaranteed technical and as-built records, which makes future expansion easy;
- ☑ The warranty enters into force as of the date of issuance of the **Extended Warranty** Certificate, which is granted upon approval of the presented documentation and audit of the works carried out by Furukawa or an authorized company.

25 Years
Reliable Passive Optical Network

Higher Performance
Complete Certification of the Passive Optical Network

Response Time Reduction
Modifications or Expansion made easier

After the process is complete, the generated records are filed and available for the customer and the integrator. Further clarifications can be obtained at the Furukawa channels.

Premium Support Service 24x7

The purpose of the Premium Support Service 24x7 is to provide remote technical support at any time, 7 days a week upon SLA (Service Level Agreement) at service level N1 to N3, according to the criticality level of the occurrence.

The occurrences of customers' tickets, from who contract hires the Premium Support Service 24x7 will have priority over standard warranty occurrences tickets, which are handled by Furukawa's support team, carried out remotely by telephone and/or remote access.

* This service is hired under request, please consult us for availability in your region.

Risk Reduction

Quick Troubleshooting

On-Site Service Pack for Equipment / Laserway

Upon acquisition of the service pack, the customer will have 32 hours for start-up, training and assisted operation for equipment. 24 of the total hired hours can be provided *in loco* and the other 8 are available for remote work, such as kick-off meetings, project alignment and preparation of support material and tools.

Service FSS 3Y 8x5 Plus

FSS (Furukawa Support and Services) was developed to help maximizing the benefits of IT investments, for the structure to remain the most stable as possible, contributing to achieve business goals and projects, such as reduction of operational costs and transferring human resources to other priority tasks.

Incidents demand quick and efficient response from local or outsourced team, in order to minimize the impact on the business. After investigating its cause, the manufacturer may be contacted to provide due support by opening a call ticket open (on the website). Customers, who have hired Furukawa's support, will have priority in remote services carried out by a specialized Furukawa support technician. Furthermore, when direct relation between the incident and the acquired equipment is discovered, the equipment will be replaced.

*This service is hired under request, please consult us for availability in your region.

Furukawa Technology Institute

Qualification and Continued Education Program

Furukawa has been gradually innovating the training model and aiming at professional specialization, it develops trainings supported by universities, instructors and technological partners, in order to optimize the qualification time and increase the professional knowledge.

Upon the lack of experienced professionals, practical courses become a solution to speed up the learning process, reducing errors and increasing productivity because of technical qualification.

This provides to companies the possibility to have more qualified professionals in their staff in a shorter period of time.

To meet this market demand, Furukawa Technology Institute was created; it is a Continued Education System, which has already trained more than 70 thousand professionals by means of remote education and in-person courses carried out by Furukawa, Training Centers and Universities.

Created to support the professional on comprehension, installation and design of connectivity solutions, Furukawa Technology Institute has more than 236 hours in-person courses, which aim to qualify the professionals on the best practices of using connectivity solutions. The whole program is internationally recognized by BICSI (Building Industry Consulting Service International), a professional association, which supports the communication and the information technology progress, attesting the quality of our training.

Currently our available courses on Laserway are:

Laserway Concepts and Projects (16h)

- ☑ **Pre-requirement:** Knowledge on installation and design of LAN Networks with optical solutions.
- ☑ **Goals:** To qualify professionals to know and specify the components used in the Laserway solution.
    - ☑ Optical Network Concepts;
    - ☑ Projects and Systemic Calculations in PON LAN Networks;
    - ☑ Topology and Deployment.

Laserway Equipment (16h)

- ☑ **Pre-requirement:** Basic knowledge on IP networks, to have been approved at the Laserway Concept and Project training course, knowledge on network active element configuration.
- ☑ **Goals:** Theoretical and practical qualification on configuration and installation of Laserway equipment.
    - ☑ GPON Technology concepts;
    - ☑ Laserway Solution Overview;
    - ☑ Equipment Configuration and Operation.

Partnership with Universities
Professional Specialization

236
Hours
In-Person Courses
Experience

20
Years
+70,000 Professionals
trained

Bicsi
Building Industry
Consulting Service
International
International
Recognition

REFERENCE

Equipment Room and Technical Rooms

Open Racks

OPEN RACK 19" x 36U ENTERPRISE

VERTICAL GUIDE CLOSED ENTERPRISE (36U)

OPEN RACK 19" x 45U ENTERPRISE

VERTICAL GUIDE CLOSED ENTERPRISE (45U)

UPPER CABLE GUIDE ENTERPRISE | **For 36 and 45 U Racks**

Closed Floor Racks

CLOSED RACK ENTERPRISE 22U x 600 mm x 600 mm - DISASSEMBLED

CLOSED RACK ENTERPRISE 42U x 600 mm x 600 mm - DISASSEMBLED

CLOSED RACK ENTERPRISE WITH GUIDES 42U x 800 mm x 800 mm - DISASSEMBLED

CLOSED RACK ENTERPRISE WITH GUIDES 42U x 800 mm x 1000 mm - DISASSEMBLED

Closed Wall Racks

CLOSED WALL RACK ENTERPRISE 12U x 600 mm x 600 mm - DISASSEMBLED

CLOSED WALL RACK ENTERPRISE 6U x 600 mm x 450 mm - DISASSEMBLED

Cable Organizer

CLOSED HORIZONTAL CABLE GUIDE PLASTIC 1 U

WiFi Controller

WIRELESS CONTROLLER FWC-1101

Optical Concentrators (OLTs) Chassis

OPTICAL CONCENTRATOR CHASSIS LIGHTDRIVE GPON FK-OLT-G2500

SWITCH AND MANAGEMENT MODULE FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

SERVICE MODULE 4 PORTS GPON SFP FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

SERVICE MODULE 4 PORTS GPON SFP W/ REDUNDANCY FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

UPLINK MODULE 2 PORTS 10 GE+ 4 PORTS GE SFP FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

DC POWER MAINS FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

BLIND PANEL - SERVICE MODULE FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

BLIND PANEL - SWITCH AND MANAGEMENT MODULE FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

BLIND PANEL - UPLINK MODULE FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

BLIND PANEL - DC POWER MAINS FOR OPTICAL CONCENTRATOR CHASSIS GPON 7U

Optical Concentrators (OLTs) Standalone and Power Supplies

STANDALONE OPTICAL CONCENTRATOR GPON FK-OLT-G4S

STANDALONE OPTICAL CONCENTRATOR GPON FK-OLT-G8S

AC POWER SUPPLY FOR STANDALONE OPTICAL CONCENTRATOR GPON

DC POWER SUPPLY FOR STANDALONE OPTICAL CONCENTRATOR GPON

POWER CABLE 1.8 m NBR 14136 / IEC C13 / 2-PIN

GPON Optical Transceiver

SFP MODULE CLASS B+2.5 GBPS LR 1490 nm SC-IPC 0 (20 km)

Optical Transceivers for Uplink

SFP MODULE 1GE LX 1310 nm W/DDM (10 km)

SFP MODULE 1GE LX 1310 nm (20 km)

SFP MODULE 1GE LX 1310 nm (40 km)

SFP MODULE 1GE SX 850 nm (550 m)

SFP+ MODULE 10GE SX 1310 nm (10 km) | **For OLT G8S**

XFP MODULE 10GE LR 1310 nm (10 km) | **For OLT Chassis**

Splitters for Rack

RACK 19" WITH OPTICAL SPLITTER 1 X 1X32 G-657A SC-APC/SC-APC

RACK 19" WITH OPTICAL SPLITTER 2 X 1X32 G-657A SC-APC/SC-APC | **2 Splitters 1x32**

RACK 19" WITH OPTICAL SPLITTER 1 X 2X32 G-657A SC-APC/SC-APC | **Splitter 2x32 for Redundancy**

SC-APC/SC-UPC Cords | **For connection OLT <> Splitter or ODF**

SINGLE FIBER CONNECTORIZED CORD 0 BLI A/B G-657A SC-APC-SC-UPC 1.5 m - LSZH - WHITE - D3

SINGLE FIBER CONNECTORIZED CORD 0 BLI A/B G-657A SC-APC/SC-UPC 2.5 m - LSZH - WHITE - D3

SC-APC/SC-APC Cords

SINGLE FIBER CONNECTORIZED CORD 0 BLI A/B G-657A SC-APC/SC-APC 1.5 m - LSZH - WHITE - D3

SINGLE FIBER CONNECTORIZED CORD 0 BLI A/B G-657A SC-APC/SC-APC 2.5 m - LSZH - WHITE - D3

ODF and Cassette for Pre-connectorized Solution | **Up to 3 Cassettes per Patch Panel**

MODULAR PATCH PANEL LGX

ODF CASSETTE LGX 12F SM G-652D SC-APC/MPO-APC(F) TYPE B DIRECT/REVERSE

ODF for Field Melting Connectorization

ODF B48 BASIC MODULE

ANCHORAGE AND ACCOMMODATION KIT FOR ODF B48

KIT 3X PLATES LGX 12 POSITIONS LC/SC

Melting Connectorization

SPLICE TRAY KIT STACK 36F

CONNECTORIZED OPTICAL EXTENSION 01F BLI A/B G-657A SC-APC 1.5 m - COG - WHITE - D0.9

CONNECTORIZED OPTICAL EXTENSION 06F BLI A/B G-657A SC-APC 1.5 m - COG - WHITE - D0.9

Field Connectorization | **For Fiber-Lan cables**

KIT WITH 10 OPTICAL FIELD CONNECTORS SM SC-APC EZ!CONNECTOR FOR INSULATED FIBER 900 UM

Backbone and Horizontal Cabling

Optical Cable 12F Backbone (Field Connectorization)
OPTICAL CABLE CFOI-BLI-A/B-ED 12F LSZH AZ (FIBER-LAN INDOOR)
OPTICAL CABLE CFOI-BLI-A/B-ED 12F LSZH AZ (FIBER-LAN INDOOR EZ!LUX)

MPO Pre-terminated Cables
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 10.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 15.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 20.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 25.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 30.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 35.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 40.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 45.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 50.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 55.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 60.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 70.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 80.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 90.0 m - UT - LSZH - BLUE - TYPE B
TRUNK CABLE 12F BLI A/B G-657A MPO12-APC(M)/MPO12-APC(M) 0.8D3/0.8D3 100.0 m - UT - LSZH - BLUE - TYPE B

MUTOA (Pre-terminated Solution)
CONSOLIDATION POINT 1 POSITION LGX
ODF CASSETTE LGX 12F SM G-6520 SC-APC/MPO-APC(F) TYPE B DIRECT/REVERSE

Consolidation Point / MUTOA (Field Connectorization)
CEIP 12 (INTERNAL WALL SPLICE BOX FOR 12F - 12 PIGTAILS SC-APC ABNT)
CEIP 12 (INTERNAL WALL SPLICE BOX FOR 12F - BASIC MODULE)
ODF BW12 BASIC MODULE GREY
OPTICAL ROSETTE 2P 4X2 SURFACE MOUNTED - WHITE
OPTICAL ROSETTE FLEX 1P SURFACE MOUNTED W/ 1 ADAP SC-APC - WHITE
KIT OF OPTICAL ADAPTERS 01F SM SC-APC WITH SIDE SHUTTER (KIT 8 PS)

Optical Cable 01F Horizontal (Field Connectorization)
OPTICAL CABLE CFOI-BLI-A/B-CM-01-BA-LSZH - RIB 500 m (MICRO INDOOR LOW FRICTION)

Field Connector for Optical Cable 01F Low Friction
KIT OF 10 OPTICAL FIELD CONNECTORS SM SC-APC EZ!CONNECTOR FOR FLAT CABLES 1.6X5 mm AND 3X2 mm

Optical Cords
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657A SC-APC/SC-APC 1.5 m - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657A SC-APC/SC-APC 2.5 m - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657A SC-APC/SC-APC 5.0 m - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657A SC-APC/SC-APC 10.0 m - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657B SC-APC/SC-APC 15.0 m - TIGHT - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657B SC-APC/SC-APC 20.0 m - TIGHT - LSZH - WHITE - D3
SINGLE FIBER CONNECTORIZED CORD BLI A/B G-657B SC-APC/SC-APC 30.0 m - TIGHT - LSZH - WHITE - D3

For distances over 10 m, Robust Cord D3.8 is recommended.

REFERENCE

Work Areas

ONTs	
OPTICAL MODEM LIGHTDRIVE GPON LD110-44B	**Replaces the G420R model**
OPTICAL MODEM GPON FK-ONT-G400B/PoE S2	
SWITCH ETHERNET INDUSTRIAL LIGHTBOLT LB5008	
OPTICAL MODEM SFP LIGHTDRIVE GPON LD500-10B	
POWER SUPPLY 48-55 VDC 240 W FOR SWITCH LIGHTBOLT LB5008	
POWER SUPPLY ADAPTER STANDARD NBR/CE FOR OPTICAL MODEM	

Access Point
INTERNAL ACCESS POINT FKAP-220 - STANDARD 802.11 B/G/N/AC, ANTENNA 3X3.3

Metallic Connectivity - RJ-45 ONTs Outputs
PATCH CORD U/UTP GIGALAN CAT.6 - LSZH - T268A/B - 0.5 m - RED
PATCH CORD U/UTP GIGALAN CAT.6 - LSZH - T268A/B - 2.5 m - RED
PATCH CORD U/UTP GIGALAN CAT.6 - LSZH - T268A/B - 5.0 m - RED
PATCH CORD U/UTP GIGALAN CAT.6 - LSZH - T268A/B - 10.0 m - RED
FEMALE CONNECTOR GIGALAN CAT.6 T268A/B 90/180 - WHITE
SOCKET 1P - WHITE
SOCKET 2P - WHITE
SOLID EXTENSION RJ-45 U/UTP GIGALAN PREMIUM CAT.6 - LSZH - T568B - 10.0 m - RED
SOLID EXTENSION RJ-45 U/UTP GIGALAN PREMIUM CAT.6 - LSZH - T568B - 15.0 m - GREY
SOLID EXTENSION RJ-45 U/UTP GIGALAN PREMIUM CAT.6 - LSZH - T568B - 20.0 m - GREY
SOLID EXTENSION RJ-45 U/UTP GIGALAN PREMIUM CAT.6 - LSZH - T568B - 25.0 m - GREY

Optical Cleaning Tools
CLEANING TOOL - SC/ST/FC/E2000
CLEANING TOOL - MPO

PREMIUM SUPPORT 24x7

Services

Progress and Support Replacement Services 8x5 Plus
SERVICE FSS 3Y 8x5 PLUS - 35510190, 35510124 - OPTICAL CONCENTRATOR STANDALONE GPON FK-OLT-G4S
SERVICE FSS 3Y 8x5 PLUS - 35510249 - OPTICAL CONCENTRATOR STANDALONE GPON FK-OLT-G8S
SERVICE FSS 3Y 8x5 PLUS - 35510125 - AC POWER MAINS FOR OPTICAL CONCENTRATOR STANDALONE GPON
SERVICE FSS 3Y 8x5 PLUS - 35510126 - DC POWER MAINS FOR OPTICAL CONCENTRATOR STANDALONE GPON
SERVICE FSS 3Y 8x5 PLUS - 35510205, 35510151 - CHASSIS OPTICAL CONCENTRATOR GPON FK-OLT-G2500
SERVICE FSS 3Y 8x5 PLUS - 35510206, 35510152 - SWITCH AND MANAGEMENT MODULE FOR CHASSIS OPTICAL CONCENTRATOR GPON FK-OLT-G2500
SERVICE FSS 3Y 8x5 PLUS - 35510187, 35510121 - SERVICE MODULE 4 PORTS GPON SFP FOR CHASSIS OPTICAL CONCENTRATOR GPON 7U
SERVICE FSS 3Y 8x5 PLUS - 35510185, 35510118 - UPLINK MODULE 2 PORTS 10 GE + 4 PORTS GE SFP FOR CHASSIS OPTICAL CONCENTRATOR GPON 7U
SERVICE FSS 3Y 8x5 PLUS - 35510181, 35510113 - DC POWER MAINS FOR CHASSIS OPTICAL CONCENTRATOR GPON 7U
SERVICE FSS 3Y 8x5 PLUS - 35510136, 35510197, 35510292 - SFP MODULE CLASS B + 2.5 Gbps LR 1490 NM SC-UPC (20 km)
SERVICE FSS 3Y 8x5 PLUS - 35510178, 35510110 - FAN FOR CHASSIS OPTICAL CONCENTRATOR GPON 7U

Services 24x7
1 YEAR SERVICE 24x7 - OLT STANDALONE COMBO 1 - FROM 1 TO 3 OLTS
1 YEAR SERVICE 24x7 - OLT CHASSIS - FROM 1 TO 2 OLTS
1 YEAR SERVICE 24x7 - OLT STANDALONE COMBO 2 - FROM 4 TO 9 OLTS
1 YEAR SERVICE 24x7 - OLT STANDALONE COMBO 3 - FROM 10 TO 20 OLTS
1 YEAR SERVICE 24x7 - WI-FI CONTROLLER - FROM 1 TO 2 CONTROLLERS
1 YEAR SERVICE 24X7 - WI-FI ACCESS POINT

Start-up Services
START-UP - SERVICE PACK FOR FTTX / VIDEO OVERLAY / LASERWAY / SOFTWARE EQUIPMENT - SOUTH - SOUTHEAST - CENTER-WEST
START-UP - SERVICE PACK FOR FTTX / VIDEO OVERLAY / LASERWAY / SOFTWARE EQUIPMENT - NORTHEAST
START-UP - SERVICE PACK FOR FTTX / VIDEO OVERLAY / LASERWAY / SOFTWARE EQUIPMENT - NORTH
1 YEAR SERVICE 24X7 - OLT STANDALONE COMBO 3 - FROM 10 TO 20 OLTS
1 YEAR SERVICE 24x7 - WI-FI CONTROLLER - FROM 1 TO 2 CONTROLLERS
1 YEAR SERVICE 24X7 - WI-FI ACCESS POINT

Call us for further information on services!

FURUKAWA WIRELESS SOLUTION FOR ENTERPRISE NETWORKS

COMPLEMENTARY FOR YOUR LASERWAY NETWORK

LASERWAY

Login by Social Media
Integrated Billing
High Availability
All in One

NOTES

NOTES

For further
information, scan:

![FURUKAWA ELECTRIC]

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