Prysmian Connectivity – Frequently asked Questions

General Questions

Q: What is optical connectivity?

A: A range of integrated fibre management products for the deployment of an optical network, connecting head end active equipment to the end user/ consumer active equipment. Basically, it is the equipment that joins, terminates, and distributes optical cables.

Q: What is optical fibre?

A: An optical fibre is a thin, flexible filament of transparent material, usually glass, able to transmit light signals over long distances and at high speeds, averaging over 100 gigabits per second — like downloading an entire HD movie in one second.

The light travelling in the optical fibre is reflected by the fibre's inner core, thereby maintaining its intensity and quality. In addition, the optical fibre is thinner than a human hair, with a diameter of about 0.1 millimetres.

It was invented in 1952 by Indian physicist Narinder Singh Kapany and today has multiple applications in medicine, art, military and space communication. In fact, one of its main advantages is that it allows the transfer of huge amounts of data in a very short time, ensuring a fast and stable Internet connection, which is essential in many different areas.

Q: What is optical cable used for?

A: To enable its use, the optical fibre needs to be inserted inside an optical cable. To date, an optical cable can contain between 1 and 6,912 optical fibres and is designed to protect them adequately, also depending on where and how it is installed.

Each fibre contained in a cable has to be colour-coded**,** so that each fibre can be uniquely identified at both ends of the cable. The colour-based recognition system is very similar to that used for electrical wires.

In fact, an optical cable usually contains more than one fibre, as the need for optical fibres is high and the spaces that can accommodate them are limited**.** To enable the installation of multiple fibres in a single duct, it is essential to reduce as much as possible the diameter of fibres and cables.

In addition, a higher fibre density produces other benefits, such as reduced costs — including packaging and transportation costs —, faster installations, and a lower carbon footprint.

However, it is essential that fibre performance is not compromised when size is reduced and density increased, and that compatibility with existing networks is guaranteed, meaning that the thin fibre can be joined to standard-diameter fibres.

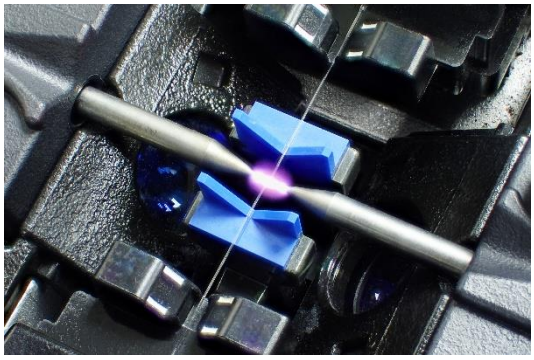
Q: What type of products do Prysmian offer?

A: Prysmian offers a full range of products from the central office to customer termination boxes. Within the Prysmian portfolio we have racks, Sub-racks/shelves/patch panels, closures, pre connectorized drop cables and wall boxes for internal and external applications. Prysmian also has a system for deploying fibres throughout a multi dwelling building, blown fibre and fibre to the room.

Fibre management and Splicing questions

Q: How are fibres spliced together?

A: Fibres are most commonly joined using a fusion splice machine. This involves the welding of the optical fibre cores together. An alternative to fusion splicing is mechanical splicing which involves precise alignment and gripping of the fibres.



Both methods require precise cutting, preparation, and alignment of the fibre, and both techniques require specialist equipment.

Q: What is a splice tray?

A: A splice tray is a piece of plastic or metal that is used to route, protect, and store optical fibres. The splice tray has a dedicated area to store the splices securely. Splice trays are used throughout the network.

Q: How are the splices protected?

A: There are various options available for protecting the splices. The most common in the UK is a heat shrink splice protector, typically measuring 2.2mm in diameter with a length of 45mm. These splice protectors are shrunk down around the splice using an oven that is attached to the splicing machine. The splice protector has a small metal bar inside to offer additional support to the splice. In Germany, crimp splices are the most common, in the USA they typically use splice protectors with a diameter of 3mm and a length of 60mm.

Q: How many splices can be stored on a splice tray?

A: It can vary. The most common is 12 splices, but some trays can store a far higher number.

Q: What happens in the central office / Telephone exchange?

A: The central office houses the active equipment which transmits the digital signals down the optical fibres. These are distributed across the network to the customers. The digital signals are transmitted using pules of laser light down the fibre at different wavelengths. Cross connection equipment is used to switch between various incoming and outgoing signals.

Q: What type of products are found in the central office?

- Racks – these can be used to house active equipment or for fibre flexibility.
- Patchcords
- Pigtails
- Connectors or Adapters
- Cables – sometimes these can be pre-connectorised.
- Trunking
- Splice Protectors
- Shelves / panels - these can be splice only or contain connectors.

Q: What is a rack?

A: A rack is a metallic frame that is used to house the fibre cross connect shelves or the active switch equipment. There are usually multiple racks inside the central office.

Q: What type of racks are available?

A: There is a wide range of racks available in multiple different sizes. The common footprint is 600x600mm and come in heights of 2000mm or 2200mm. The hight is sometimes referred to as 'U' Height: 42U and 47U the refers to number of shelves that can be fitted inside.

Inside the rack you get mounting rails. These come in two options however 19" is the most commonly used. The racks can also be fitted with other accessories such as lighting and cooling.

Q: What is a patchcord?

A: A patchcord is an optical cable that is used for linking (patching) between optical sources. The fibre cable has a connector terminated at both ends of the length of fibre cable. Cables with one or two fibres are typically classed as patchcords, and they are often referred to as Simplex (one fibre) or Duplex (two fibres).

Q: What is a pigtail?

A: A pigtail is used as an optical link between optical sources. With a pigtail only one end of the fibre cable has a connector, the other end is bare fibre and is spliced to a network fibre. Pigtails are most commonly found within wall boxes and splice and patch shelves.

Q: What does Insertion loss (IL) mean?

A: This is the measure of light loss at the connector interface and is measured in decibels (db). The loss is usually quoted as per mated pair of connectors. Typical IL losses would be between 0.2db and 0.5db, depending on the fibre type, grade of polish and connector type

Q: What does return loss (RL) mean?

A: This is the measurement of light "reflected" from the connector face and returned down the fibre. Sometimes this can be referred to as back reflection loss. Return loss is also measured in decibels (db). The higher the value of return loss the better, and a typical value is around 55db. As with insertion loss this number is affected by the connector type and quality of the polish. Return loss is only a measure for Single mode fibre where the light is sent via a laser.

Q: What types of connectors are available?

A: There are a range of connectors available, below are the most common that are used today

FC (Fibre connector) – this is an old connector but still widely used in the testing environment. These have a metal outer protective housing with the thread. There is an alignment pin on the connector that ensures accurate alignment of the two faces.

SC (Subscriber connector) – This is the most common connector used in the world. The SC connector has a plastic housing that has a moulded alignment pin on the top of the body. It is square in shape and clips into the adapter, unlike the FC which has the threaded body that is screwed into place. These connectors are lower cost than the FC and much quicker to install.

LC (Lucent Connector) – This is very similar to an SC but has a smaller footprint. It is approximately half the size of an SC. These connectors are often used when there is a need for higher fibre count in limited space.

Q: What is meant by the Connector end face type and finish?

A: The IL and RL measurements can be improved by altering the contact surface between the fibres and connector. Surfaces can be cut at different angles and polish to different levels. Below there are some further details on this:

PC (Physical contact) – this used to be the most common end face polish. The connector is supplied with a polished radiuses convex face to give physical contact at the fibre core interface.

UPC (Ultra polished physical contact) – Prysmian do not offer PC. If a request for PC is received the response will always be a UPC, as the shape of the end face is identical to a PC but during the polishing process an extra fine polish is added which gives an improved optical performance.

APC (Angled polished physical contact) – The end face geometry is different here to the PC or UPC. Here the ceramic ferrule is polished to an angle of typically 8 degrees, with same standard as a UPC. The angled face further improves the optical performance of the connector. It is important an APC connector is only used with an APC connector, trying to mate a UPC with an APC will give very high circuit losses. APC connectors are always coloured green.

Q: What are adapters for connectors?

A: The adapter (sometimes called a uniter) is used to link two connectors together.

There is a variety of adapters available to allow the connections of the array of connects described previously. The adapters are secured to a patch panel with precut holes. The adapters are provided with an internal sleeve to provide accurate alignment of the connectors. The sleeve material can be either Ceramic (Zirconia) or Phosphor Bronze. There is not a lot a difference in performance between the two types of sleeves.

SC and LC connectors come in a range of colours to help identify the fibre type and polish type, the most common are:

Blue – Single mode PC and UPC

Green – Single mode APC

Beige - Multimode

Q: What happens in the external network?

A: Cables from the exchange are routed around an area (such as a town or city), usually in a ring leading back to the exchange. External closures (sometimes called Joints, Domes or Nodes) are throughout the network to enable lengths of cables to be connected together. Other types of closures such as Spur, Distribution, and Drop, are used in various positions to enable fibres from the cable ring to be distributed to residential or business premises.

Q: Why are there different types of Closures?

A: There are different types for different applications.

A straight joint is used to join two pieces of cable together. The closure needs to be selected to ensure there is enough space to connect all the fibres.

A spur or branch joint is used to break one fibre cable down into lower fibre count cables, for instance a 432f cable in and 288f and two 144f out.

A drop closure is the one closest to the premise being connected, typically this will be a lower fibre count but with multiple cables exiting.

Closures often contain splitters to allow the splitting of the optical signal, they can also loop a cable through, which means that the cable can pass through the closures without the fibres need to be cut.

Prysmian has a wide range of closures covering multiple applications.

Q: What happens at the customer premises?

A: For a single dwelling unit (house) typically the external cable from the drop closure will be terminated on the outside wall of the premises. It is most common to splice the cable here to the cable that will enter the house.

For Multi-dwelling units (blocks of apartments and businesses) it is more common to have a higher fibre count cable enter the building in a central location. This cable is then terminated in a wall box and spliced to an internal grade of cable that is used within the building.

Q: What testing do Prysmian undertake?

A: We have a range of test facilities within our factories that allow us to conduct thorough testing prior to launching any product to the market. We usually test to IEC standards but can test to Telcordia and some customers request specific tests.

Some of the tests completed prior to product launch are: Change of temperature, Dry heat, Damp heat, Vibration, Shock, Impact, Ingress protection to name a few.