Sub-appendix

Access specification

Dark fiber Unbroken
Dark fiber Premium

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CONTENT

1. Passive Access Dark fiber Premium and Unbroken

1.1 TECHNICAL SPECIFIKATION (attribute)

The product type Passive Access Dark fiber Premium and Dark fiber Unbroken include the following products

Product category: Access products				
Product type: Passive Access Dark fiber				
	PRODUCTS			
ATTRIBUTE	**Dark fiber Unbroken Mono**	**Dark fiber Unbroken Pair**	**Dark fiber Premium Mono**	**Dark fiber Premium Pair**
Interface Single mode fiber, 10 / 125µm. The connection interface consists of LC / SC ballasts / connectors in ODF or alternatively in an termination box or fiber tail (patch).	X	X	X	X
Variant Spliced Dark fiber Unbroken is spliced if necessary, between connection point and node (product is called Dark fiber Unbroken Spliced).	X	X		
Variant Patched Dark fiber Unbroken is patched if necessary, between connection point and node (product is called Dark fiber Unbroken patched).	X	X		
Type Optical fiber according to the standard ITU-T Rec. G.652B or later (G.652C or D) or ITU-T G.657 Category A	X	X		
Type Optical fiber according to the standard ITU-T Rec. G.652C or later or ITU-T G.657 Category A			X	X
Attenuation Mean value in fiber cable for each wavelength range, including splice attenuation and excluding contact attenuation. 1285–1330 nm: ≤ 0.40 dB / km 1530–1570 nm: ≤ 0.28 dB / km 1570–1625 nm: ≤ 0.40 dB / km	X	X	X	X
Reflection Maximum reflection at any point - 50 dB. Reflection measurement is measured in OTDR measurement which can be ordered extra.	X	X	X	X
Weld / splice The average attenuation of the splice shall be 0.1 dB, and the attenuation of individual splice shall not exceed 0.2 dB.	X	X	X	X

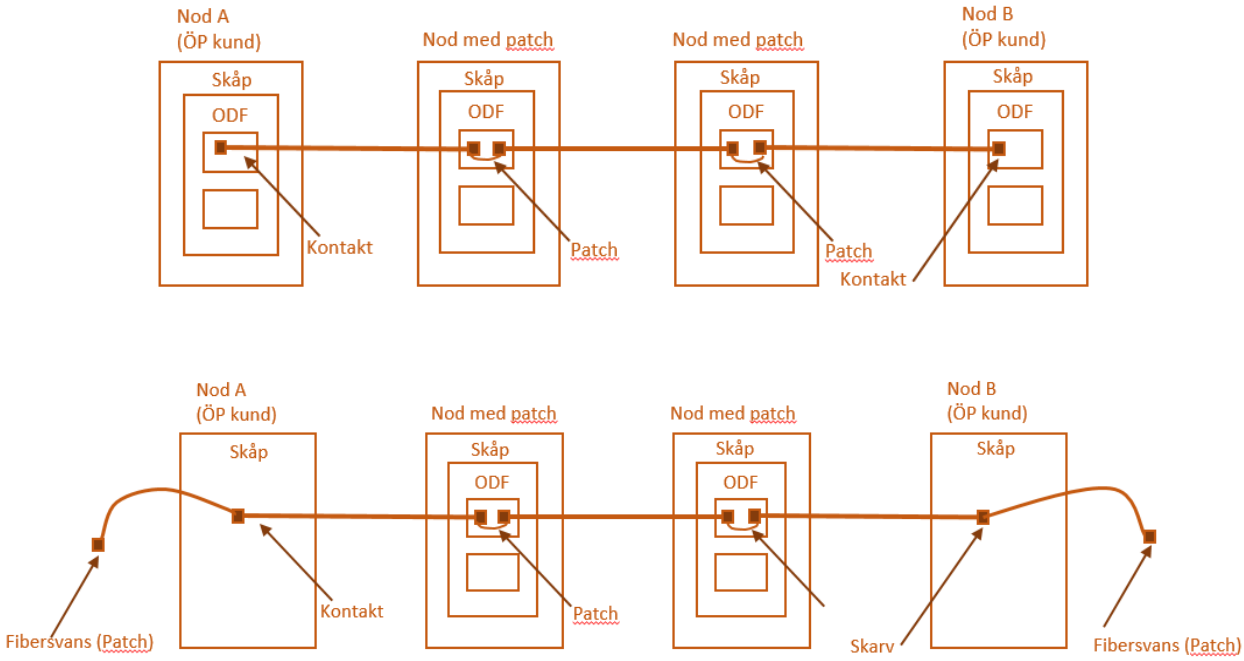
Connector Connector SC, according to ITU-T, of type SS-EN 61754-4 Connector LC, according to ITU-T, of type SS-EN 61754–20 Connector FC, according to ITU-T, of type SS-EN 61754–13 with reflection attenuation better than 40 dB. Contact attenuation shall be at most 0.3 dB.	X	X	X	X
Polarization mode dispersion (PMD) PMD is measured in a transmission direction at 1550 nm and should be max 0.5 ps / √km. PMD is measured at regional accesses (distance> 250km).	X	X	X	X

1.1.1 Specifikation access

An (1) access consists of one (1) fiber pair (two fibers) or one (1) fiber. An access has one A-end and a B-end in two different Nodes which are available to Buyers for connection to customer-owned equipment or fiber. Along the connection, there may be nodes where patching takes place. In these nodes, Buyers do not have access. Delivery point of Connection (ÖP) takes place in ODF or in fiber tail (patch).

Special patching occurs for Dark fiber Fiber Unbroken, see section 1.8

Picture: Connection with normal patching and termination



1.1.2 Ledningskollen and quality system

The network in which the seller intends to lease or leases Access to the Buyer shall, unless otherwise stated, be reported to Ledningskollen.

1.2 Test/measurement protocol

1.2.1 Test of access and measurement protocol

Document the type of fiber used and verify the termination points of the fiber.
Document that attenuation measurement in all fiber links / feed units has been performed.
Attenuation measurement shall be performed with a calibrated instrument and measurement shall be performed in both directions, see SS-EN 61280–4.

1.3 BUYER'S COMMITMENTS

In cases where the Seller is to install equipment in the Buyer's premises (technology space, ground well, etc.), the Buyer is responsible for ensuring that space in ODF is available at no cost to the Seller.

1.4 SELECTIVE CHARACTERISTICS (Variables)

The product type Passive Access Dark fiber Premium and Dark fiber Fiber Unbroken include the following products.

Product category: Access (passive)				
Product type: Passive access Dark fiber Unbroken and Dark fiber Premium				
	Dark fiber Unbroken Mono	**Dark fiber Unbroken Pair**	**Dark fiber Premium Mono**	**Dark fiber Premium Pair**
Access: Point to point (P-P)	X	X	X	X
Variant Spliced/Patched	X	X		
Quantity	X(mono)	X(pair)	X(mono)	X(pair)
Service level				
SN 0 - 99,5% Holiday free weekdays	X	X	X	X
SN 1 – 99.7%	X	X	X	X
SN 2 – 99.9%	X	X	X	X
Connector type				
SC/APC	X	X	X	X
SC/UPC	X	X	X	X
LC/APC	X	X	X	X
LC/UPC	X	X	X	X
FC/APC	X	X	X	X
FC/UPC	X	X	X	X
One-time-fee/Contract period				
Connection fee (fixed fee for connection of point)	X	X	X	X
Digging cost (digging cost. etc. for connection. of point)	X	X	X	X
Contract period	X	X	X	X

1.5 Measurement period

Measurement period refers to a 12-month period and the time that the Seller undertakes to perform Troubleshooting during service time according to the agreed Service Level for products specified in this service specification.

1.6 Access safety

1.6.1. Connection of an Dark fiber Premium

Special cleaning applies to Connections of Dark Fiber Premium. See section 1.7.1

1.6.2. Disconnection of an access

On the day when the lease for a certain Access expires, the Buyer shall switch off the Access light signal to enable safe disconnection of the Connection. This must be notified to the Seller's NOC.

1.7 Specific regarding Dark fiber Premium

The purpose of the *fiber access Dark fiber Premium* is to be able to handle high transmission capacities with support for both short and long distances. One technical solution most commonly used in such a connection is optical amplification. This enables increased transmission capacity.

These optical amplifiers are primarily used in the transport network, but all transport networks end up in access networks. The introduction of Optical Amplifiers significantly increases the effect on the transmitted signal in the fiber infrastructure and thus places increased demands on the infrastructure's robustness, functionality and security.

1.7.1 Cleaning of connectors in ODF

When connecting the Access, the contacts must always be inspected and cleaned in accordance with the current version of the Guide Optical amplification with high-power laser for fiber optic access.
The guide can be downloaded from the Swedish City Network Association's website.

https://www.ssnf.org/nat-i-varldsklass/robust-digital-infrastruktur/

1.7.2 Measurement

Bidirectional OTDR measurement with measurement protocol is included in the delivery of Access.

1.8 Specific regarding Dark fiber Unbroken

The purpose of *Fiber access Dark fiber unbroken* is to enable operators to reach many end customers from as few nodes in the access network as possible. By extending access from the nearest node and cross-connecting or straight-welding connections directly to selected area nodes and / or Meetme points, the need to establish placement on smaller nodes is reduced and establishment takes place in a larger node where more types of access and placement options are offered to operators.

It is also sometimes necessary to minimize the risk of espionage and other damage to an Access. Splicing and patching as little as possible on a Access is part of the solution in risk minimization.

1.8.1 Termination in central node / MeetMe

A Dark Fiber Unbroken terminates in nodes selected by the city network where operators can establish themselves and activate a Connection. Termination takes place by cross-connection from end customer to larger node alternative splicing or a combination of these. It must be clear how the connection is established before ordering.

1.8.2 Measurement

OTDR measurement with measurement protocol does not include delivery of Connection but can be ordered as an option.