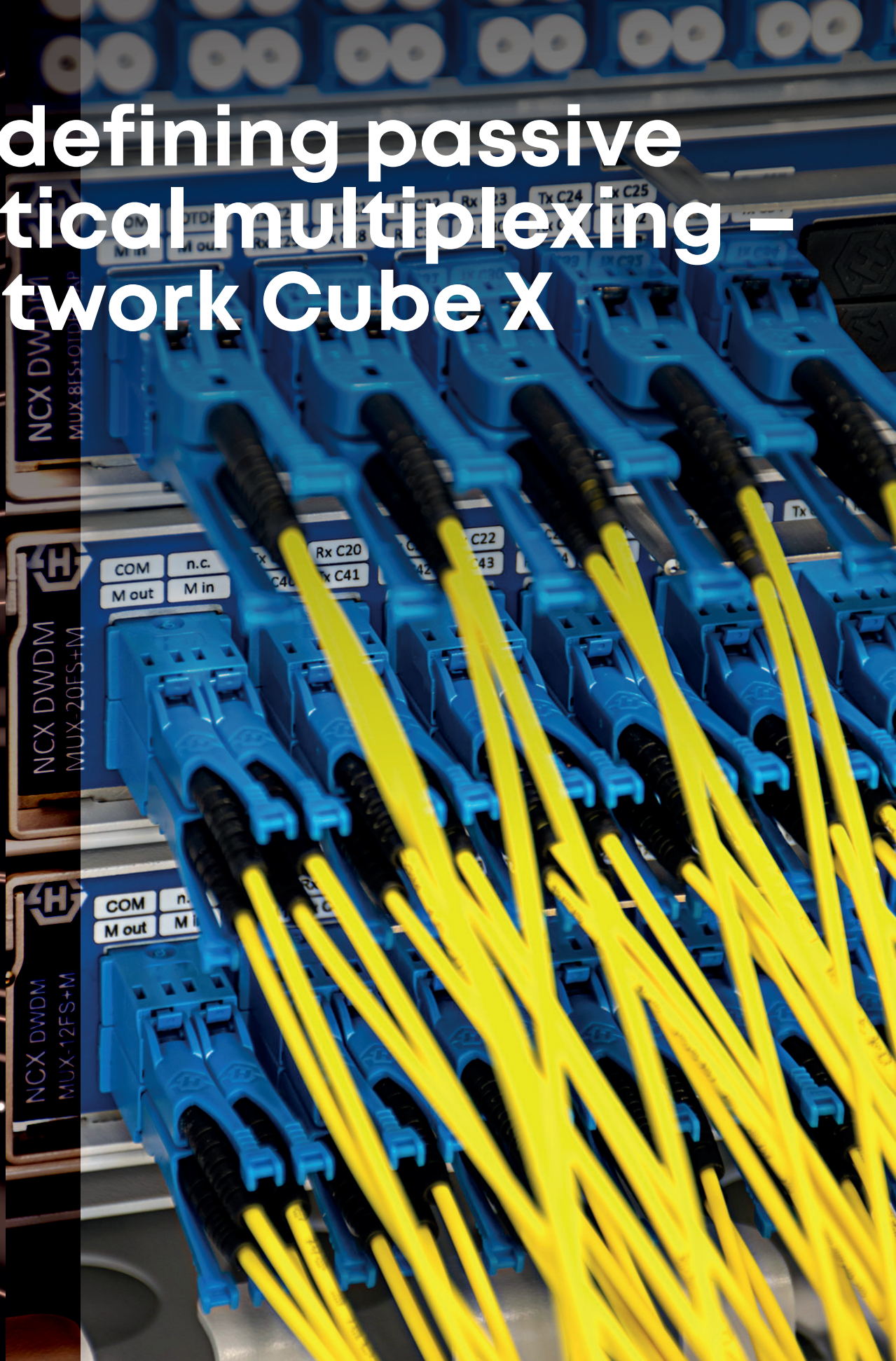


Redefining passive optical multiplexing – Network Cube X



Boost bandwidth instantly and ready your system for future upgrades

The Network Cube X (NCX) range redefines the passive optical multiplexer by introducing an innovative approach to the upgrade port. Based on expertise gained from collaborating with customers in countless projects for more than twenty years, the versatile range enables Wavelength-Division Multiplexing (WDM) setups that could previously only be solved by using custom designs.



Instant bandwidth expansion

- Immediate bandwidth expansion through proven WDM technology
- Off-the-shelf availability



Flexibility for growth

- Flexible channel expansion through a modular design
- Application-specific upgrade ports to combine modules
- Simple and intuitive installation and removal



Maximised performance

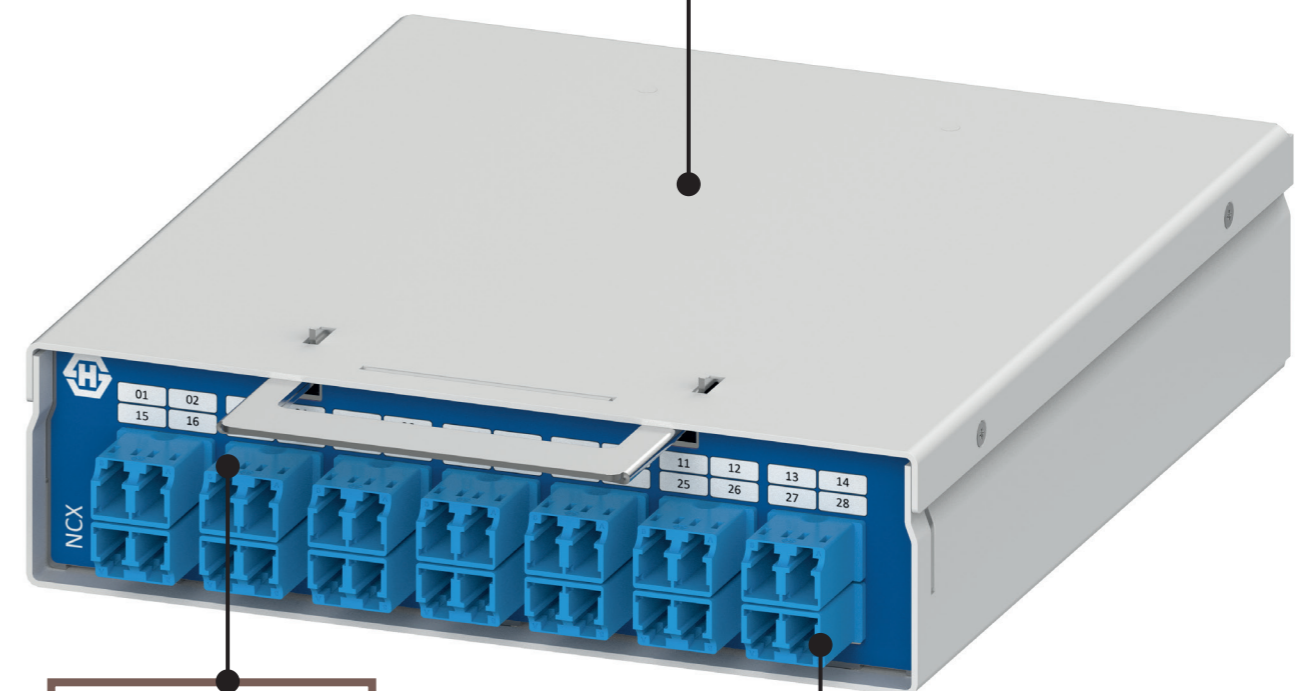
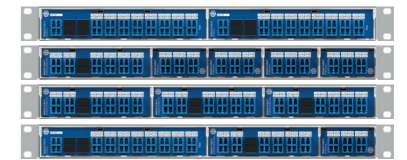
- Sublime optical performance even in challenging setups
- Meticulous module design based on decades of experience and know-how

The NCX

A range that redefines passive multiplexing

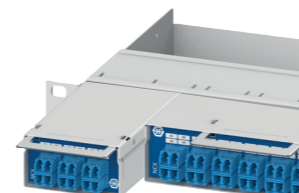
Modular design

With three standard module sizes, you can choose the most suitable dimensions to minimise the footprint of your setup while meeting your current needs and plans for expansion.



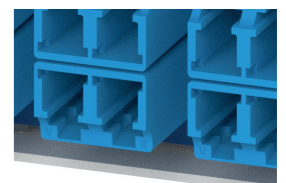
Flexible plug-and-play

The range is equipped with a convenient push-and-pull mechanism that makes installation, moving and removing simple and fast.



Innovative upgrade ports

Three types of application-specific upgrade ports enable you to maximise data transport capacity in line with your system design. And expand it over time.



A trusted technology with vast potential

Demand for data transport capacity is ever rising, and although massive amounts of fiber are already installed, it is not enough to answer current and future needs. Therefore, ways to expand existing fiber capacity are essential.

Bandwidth expansion or Wavelength-Division Multiplexing (WDM) is a reliable, cost-effective and future-proof way to to maximise the capacity of fiber. This is done by combining different wavelengths in a single fiber and separating them again. Data can therefore travel at different wavelengths through one single fiber.

Two main grids define the wavelengths used for bandwidth expansion. Coarse Wavelength Division Multiplexing (CWDM) is the traditional frequency spectrum and offers up to 18 channels. Dense Wavelength Division Multiplexing (DWDM) offers more than 100 channels. The CWDM grid can be considered in two wavelength areas: the lower-frequency or blue band and the higher-frequency or red band. When combining CWDM and DWDM multiplexers, the setup in relation to the two areas is essential, since DWDM will be located in the middle of the red CWDM band.

CWDM and DWDM grids

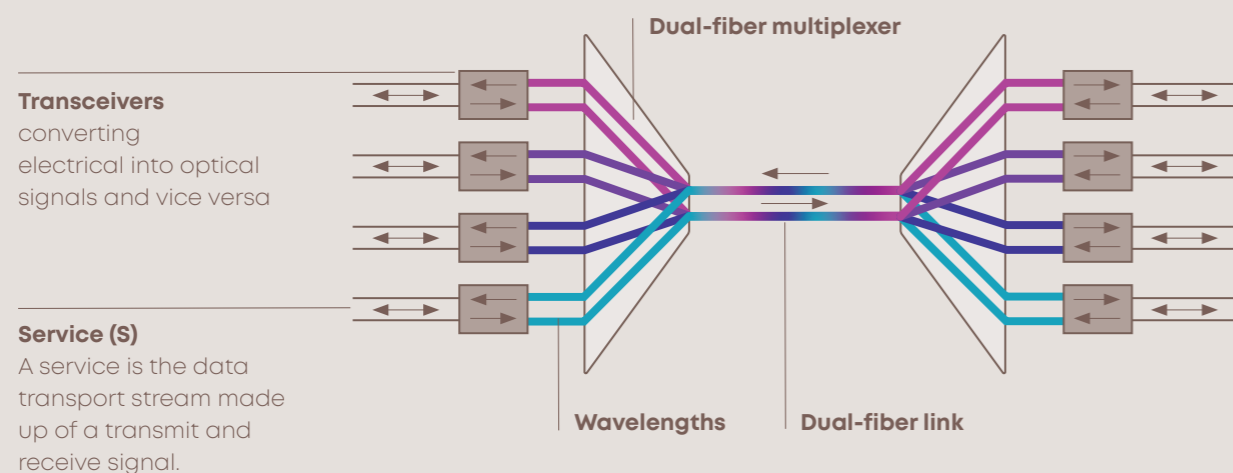
	Blue									Red								
CWDM	18 channels																	
Wavelengths	1270	1290	1310	1330	1350	1370	1390	1410	1430	1450	1470	1490	1510	1530	1550	1570	1590	1610
DWDM													100+ channels					

Channels

A channel is a technical term that describes the individual optical channels of the WDM. The identification of the CWDM channels is based on the 18 wavelengths, whereas the DWDM channels have a channel ID (C1 to C61 for the 100GHz grid) that is based on the frequency.

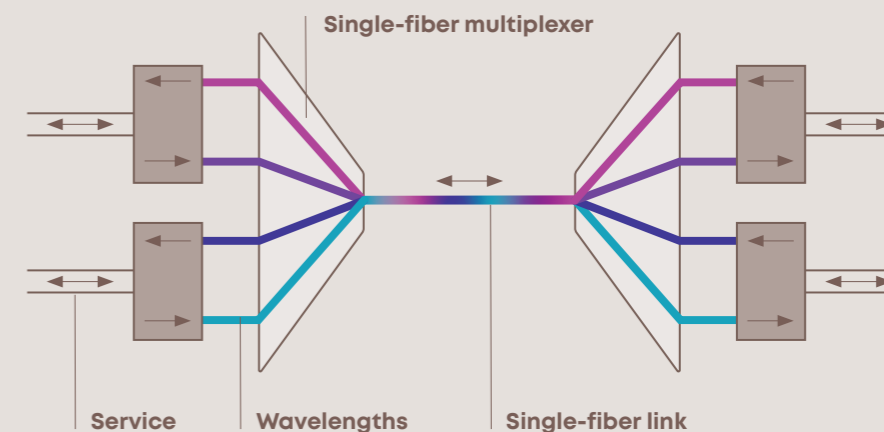
Principle of a dual-fiber multiplexer

Different wavelengths are combined in a single fiber and separated again. For each service two fibers are needed to allow data flow in both directions but only one wavelength.



Principle of a single-fiber multiplexer

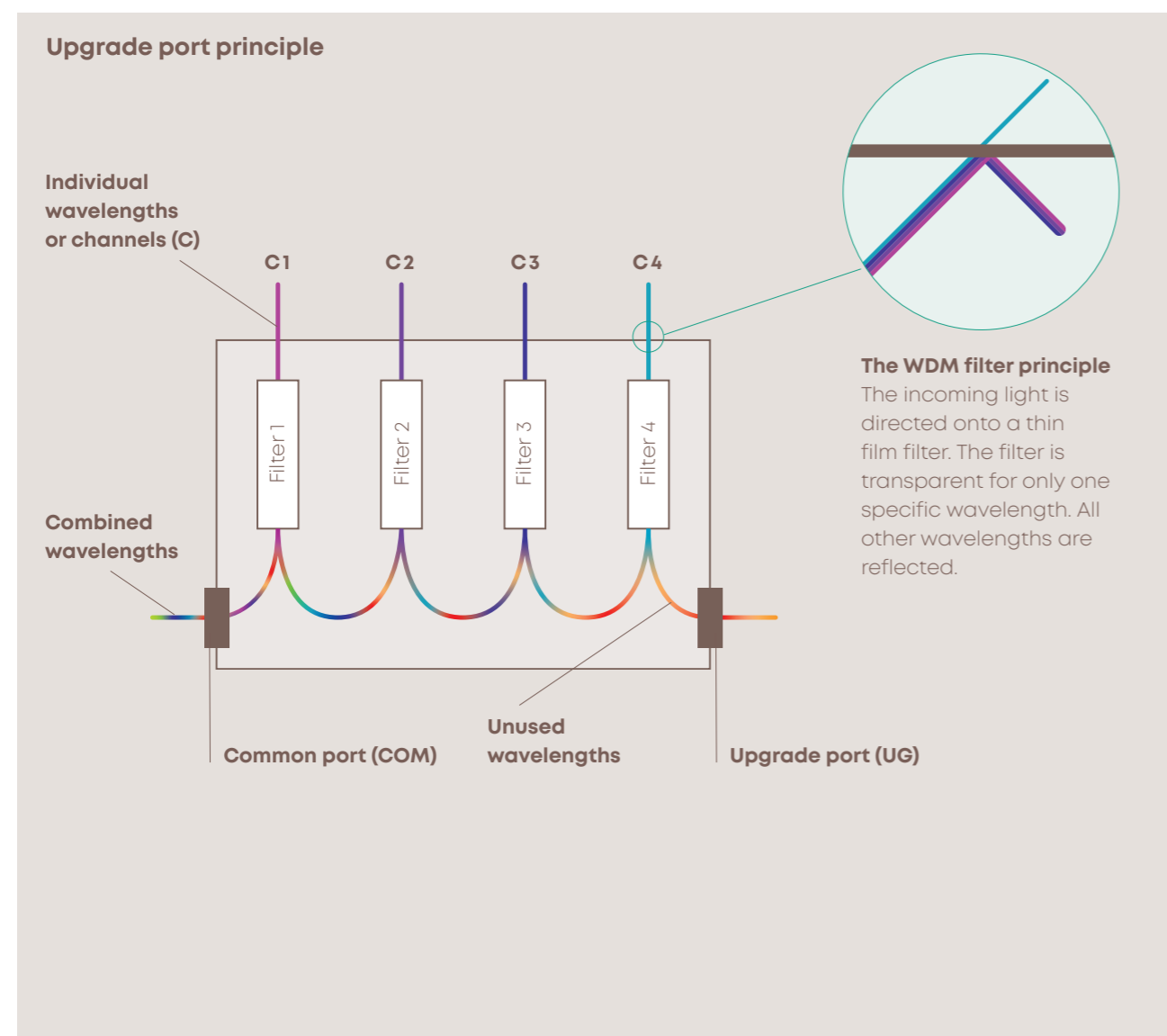
Here only one fiber is used for both directions. So two wavelengths are needed per service to allow data flow in both directions.



The upgrade port – future-proofing your setup

An upgrade port passes on any wavelengths that are not used by a multiplexer. This makes it possible to add further multiplexers for these remaining wavelengths at any given time, setting the system up for future growth.

An optical multiplexer needs to be carefully designed, as it has a significant effect on the optical performance. The optical performance relates directly to achievable distance. A standard upgrade port does not involve any special filter design. This makes it the most cost-effective upgrade port, but with the least favourable optical performance.



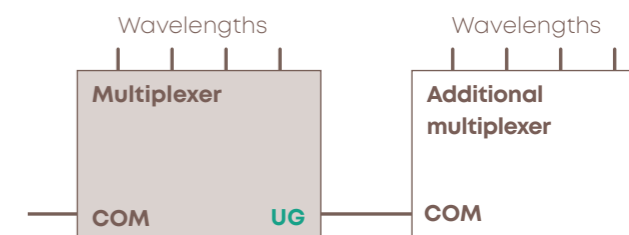
Basic upgrade port options

The NCX range offers two different types of basic upgrade ports.

Standard upgrade port (UG)

The NCX range includes a classic and cost-effective upgrade port that simply reflects the unused light of the multiplexer onto an additional multiplexer. It is appropriate for conventional setups.

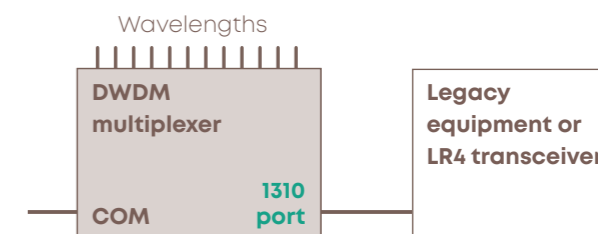
The standard upgrade port is available for both CWDM and DWDM NCX modules.



1310 port

A DWDM multiplexer can have a 1310 port, which exclusively passes the wavelengths at 1310nm. It can therefore be used to connect existing legacy equipment or a 100G service using an LR4 transceiver.

The 1310 upgrade port is available for DWDM NCX modules.



1310 port

Wavelengths	1270	1290	1310	1330	1350	1370	1390	1410	1430	1450	1470	1490	1510	1530	1550	1570	1590	1610
DWDM														100+ channels				

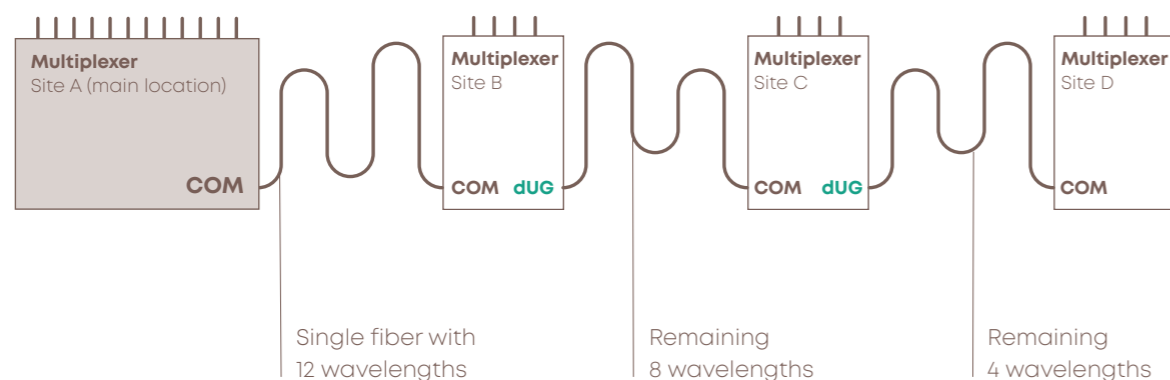
Enhancing the upgrade port

The NCX range makes use of the unrealised potential of the upgrade port and introduces three unique HUBER+SUHNER developed options. Each upgrade port has been developed to answer a distinct type of optical expansion scenario, for example for increasing efficiency or enhancing current topology.

Daisy-chain upgrade port (dUG)

Optical multiplexers can be used to build a daisy-chain topology via the upgrade port. In a daisy-chain setup, multiplexers are physically placed far apart. Therefore, the optical performance of a standard upgrade port will not be enough.

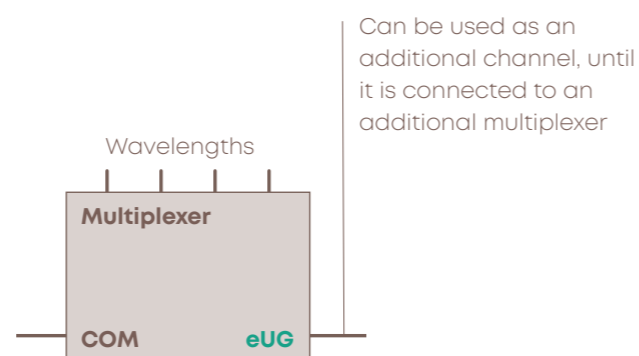
The daisy-chain upgrade port optimises the optical performance of the upgrade port with a specialised filter design that makes it ideal for daisy-chain setups. The daisy-chain upgrade port is available for DWDM NCX modules.



Enhanced upgrade port (eUG)

An upgrade port is most used to provide the possibility of adding a further multiplexer at a later point in time. However, until then, the upgrade port remains an unused port.

Due to a specialised filter design, the optical performance of the enhanced upgrade port has been optimised to enable it to be efficiently used as an additional channel until it is needed as an actual upgrade port. The enhanced upgrade port is available for both CWDM and DWDM NCX modules.



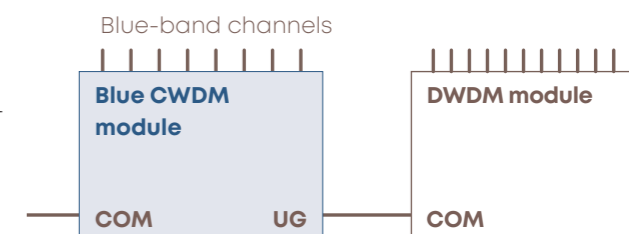
Express port (EXP)

It is possible to combine CWDM and DWDM, since DWDM sits in the top half (red band) of the CWDM grid. Usually when doing so, the DWDM module is connected to the upgrade port of the lower-band (blue) CWDM module. The result is that all nine channels of the red CWDM band are occupied, although DWDM actually only uses four of the CWDM wavelengths.

The express port is a special upgrade port for the red-band CWDM module. It only passes the wavelengths that are required for DWDM, making the remaining five CWDM channels available.

Standard setup

With a standard upgrade port, the DWDM module can only be connected to a blue CWDM module. The wavelengths of the red band can therefore not be used.



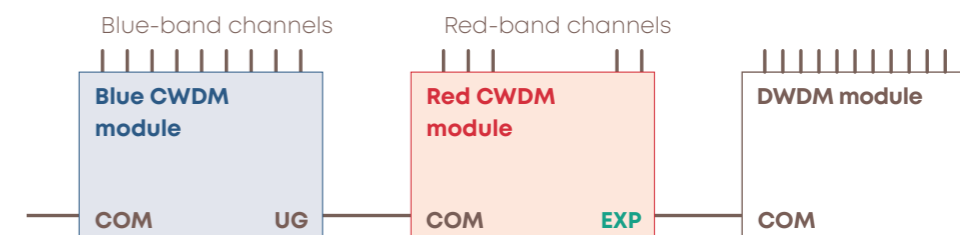
	Blue CWDM module									Red CWDM module								
CWDM	18 channels																	
Wavelengths	1271	1291	1311	1331	1351	1371	1391	1411	1431	1451	1471	1491	1511	1531	1551	1571	1591	1611
DWDM													DWDM band					

Express port

The express port cuts the wavelengths out of the CWDM grid which are actually needed for DWDM.

Express port setup

With the express upgrade port, the CWDM module is connected to the express port of a red CWDM module. This way, five additional wavelengths of the CWDM can be used.



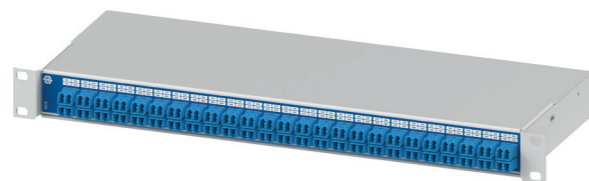
The NCX range

Mix and match to suit your setup today – and tomorrow

With three standard module sizes, you can choose the most suitable dimensions to minimise the footprint of your setup while meeting your current needs and plans for expansion.

Fixed unit

W 482.6 mm, D 169 mm, H 43.6 mm



Modules

S module

W 71.8 mm, D 161 mm, H 39.25 mm



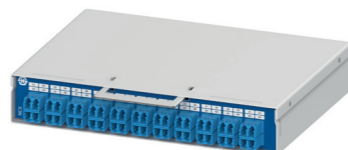
M module

W 144.3 mm, D 161 mm, H 39.25 mm



L module

W 216.8 mm, D 161 mm, H 39.25 mm



19" NCX shell

The simple auto latching mechanism locks the S, M and L modules in as soon as they have been pushed far enough into the shell. To remove the modules the lever at the top of the individual modules simply has to be pushed down.



Mix and match

The L, M and S modules can be mixed and matched in various combinations, within the 19" NCX shell.



The NCX range

Example packages

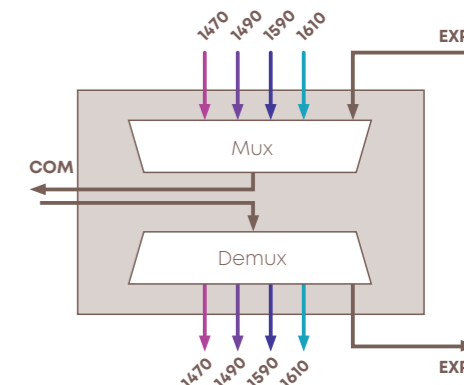
The NCX range offers a considerable amount of different options that can be combined to support various applications. The following example packages give an overview of some of our most popular configurations.

CWDM DF - MxDx-4+EXP



WDM-Channels 1470/1490/1590/1610
Product Code X10010-2CM04-4700-EXN1S-55

Channel width	CWDM > 13 nm EXP 1511 nm to 1571 nm
Insertion Loss with connectors [Max]	CWDM 2,20 dB EXP 1,00 dB
Link Loss [Max]	CWDM 3,60 dB EXP port 2 dB
Isolation	
CWDM adjacent channel	> 30 dB
CWDM non-adjacent channel	> 40 dB
CWDM Ch. @ EXP Por	> 28 dB
EXP Port @ CWDM ch.	> 30 dB
Isolation spectral range	1260 nm to 1620 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

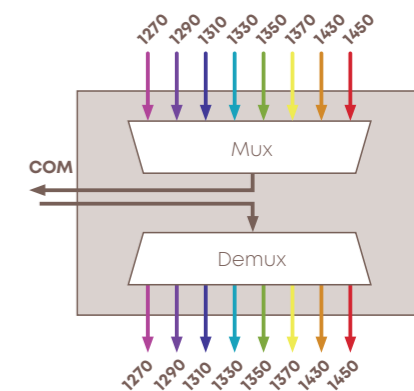


CWDM DF - MxDx-8



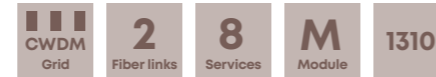
WDM-Channels 1270/1290/1310/1330/1350/1370/1430/1450
Product Code X10020-2CM08-2743-NNN1M-55

Channel width	CWDM > 13 nm
Insertion Loss with connectors [Max]	CWDM 2,6 dB
Link Loss [Max]	CWDM 3,6 dB
Isolation	
CWDM adjacent channel	> 30 dB
CWDM non-adjacent channel	> 40 dB
Isolation spectral range	1260 nm to 1620 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

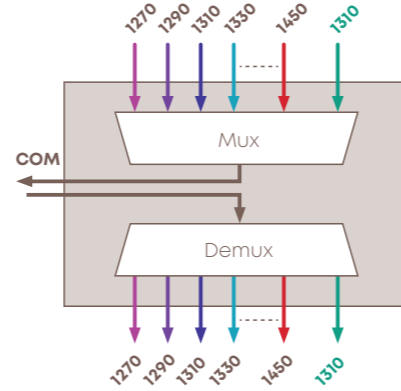


CWDM DF - MxDx-8+13

WDM-Channels 1470/1490/1510/1530/1550/1570/1590/1610
Product Code X10020-2CM08-4700-13NIM-55



Channel width	CWDM > 13 nm 1310 port 1260 nm to 1360 nm
Insertion Loss with connectors [Max]	CWDM 3,3 dB 1310 1,4 dB
Link Loss [Max]	CWDM 5 dB
Isolation	
CWDM adjacent channel	> 30 dB
CWDM non-adjacent channel	> 40 dB
CWDM @ 1310 port	> 30 dB
1310 port @ CWDM	> 30 dB
Isolation spectral range	1260 nm to 1620 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

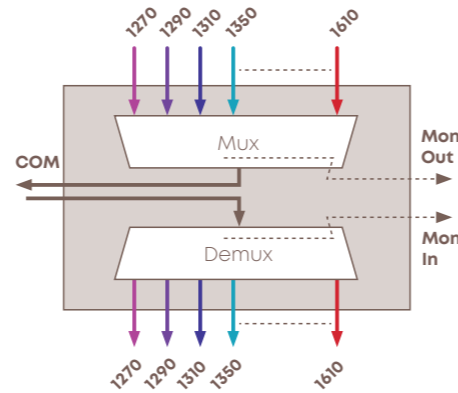


CWDM DF - MxDx-18+Mon

WDM-Channels 1270/1290/1310/1330/1350/1370/1390/1410/1430/
1450/1470/1490/1510/1530/1550/1570/1590/1610
Product Code X10130-2CM18-2747-NNMIL-55



Channel width	CWDM > 13 nm
Insertion Loss with connectors [Max]	CWDM 3,4 dB
Monitoring Port	(1%) 23,8 dB
Link Loss [Max]	CWDM 5,5 dB
Isolation	
CWDM adjacent channel	> 30 dB
CWDM non-adjacent channel	> 40 dB
Isolation spectral range	1260 nm to 1620 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

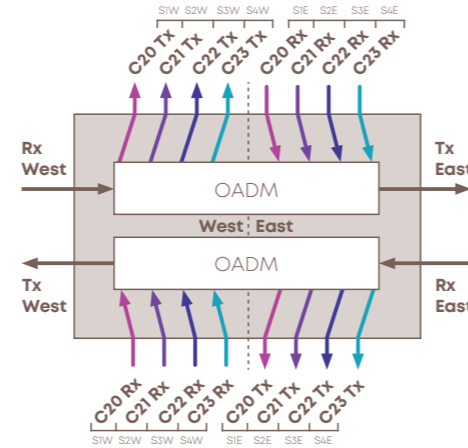


DWDM DF - OADM-4



WDM-Channels C20/C21/C22/C23
Product Code X20160-2DO04-2023-NNN1M-55

Channel width	DWDM 100 GHz
Insertion Loss with connectors [Max]	In/out to drop/add <2,7 dB
	In/out <1,2 dB
Isolation	
DWDM adj ch @ DWDM drop port	> 25 dB
DWDM non-adj ch @ DWDM drop port	> 40 dB
Add channels at drop ports	> 40 dB
Drop channels at output port	> 27 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

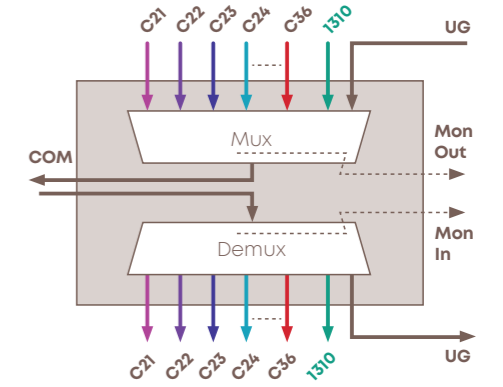


DWDM DF - MxDx-16+13+Mon+UG

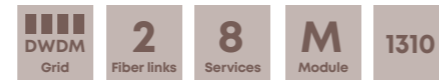


WDM-Channels C21-C36
Product Code X20040-2DM16-2100-3GM1L-55

Channel width	DWDM 100 GHz
	1310 port 1260 nm to 1360 nm
Insertion Loss with connectors [Max]	DWDM 4,4 dB
	1310 1,7 dB
	Mon (1%) 23,5 dB
	UG 3,7 dB
Link Loss [Max]	DWDM 7,3 dB
Isolation	
DWDM adjacent channel	> 28 dB
DWDM non-adjacent channel	> 40 dB
1310 @ DWDM	> 30 dB
DWDM @ 1310	> 30 dB
DWDM channel @ UG port	> 12 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

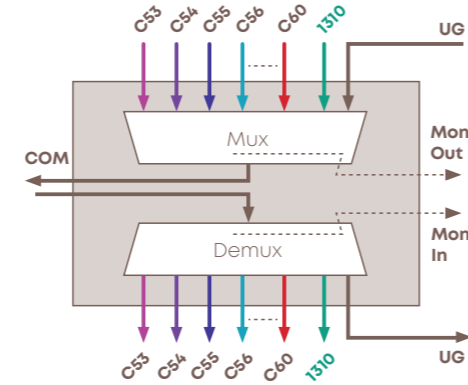


DWDM DF - MxDx-8+13+Mon+UG



WDM-Channels C53/C54/C55/C56/C60
Product Code X20030-2DM08-5300-3GM1M-55

Channel width	DWDM 100 GHz
	1310 Port 1260 nm to 1360 nm
Insertion Loss with connectors [Max]	DWDM 3,5 dB
	1310 Port 1,7 dB
	Mon 21,5 dB
	UG 3,1 dB
Link Loss [Max]	DWDM < 5,5 dB
Isolation	
DWDM adjacent channel	> 28 dB
DWDM non-adjacent channel	> 40 dB
DWDM @ 1310 port	> 30 dB
1310 port @ DWDM	> 30 dB
DWDM channel @ UG port	> 12 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

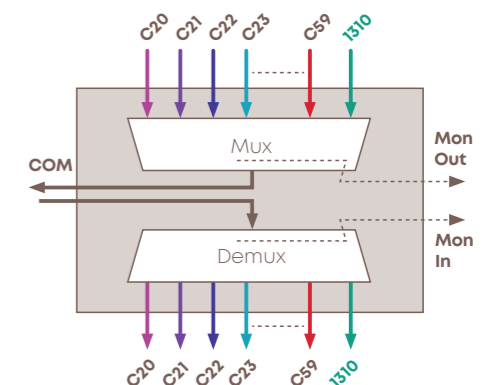


DWDM DF - MxDx-40+13+Mon



WDM-Channels C20-C59
Product Code X20060-2DM40-2000-13M1U-55

Channel width	DWDM 100 GHz
	1310 port 1260 nm to 1360 nm
Insertion Loss with connectors @ ITU center wavelength [max]	4,3 dB
Within ref. Passband	4,8 dB
1310 port	1,7 dB
Monitoring ports (1%) [max]	23,5 dB
Insertion Loss Uniformity @ ITU center wavelength [max]	1,2 dB
Link Loss @ ITU center wavelength [max]	8,5 dB
Within ref. Passband [max]	9,5 dB
Passband	@ 1 dB >= 0,23 nm
	@ 3 dB >= 0,42 nm
Isolation	
DWDM adjacent channel	> 30 dB
DWDM non-adjacent channel	> 40 dB
Total integrated isolation	1260 nm to 1620 nm
DWDM @ 1310 port	> 45 dB
1310 @ DWDM	> 30 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC



DWDM SF - OADM-2 – East/West

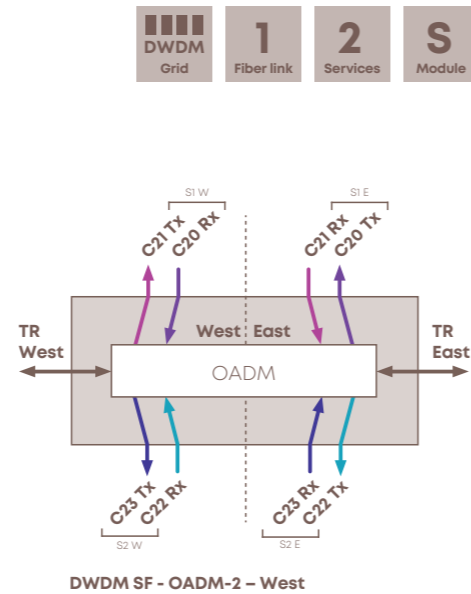
WDM-Channels East TX C20/C22
RX C21/C23

Product Code East X20220-1DO02-2021-NNNIS-55

WDM-Channels West TX C21/C23
RX C20/C22

Product Code West X20220-1DO02-2120-NNNIS-55

Number of channels	32
Insertion Loss with connectors [max]	
@ ITU center wavelength	3,4 dB
Within ref. Passband	3,9 dB
Insertion Loss Uniformity [max]	
@ ITU center wavelength	1,2 dB
Link Loss	
@ ITU center wavelength	6,8 dB
Within ref. Passband	7,8 dB
Passband	
@ 1 dB	>= 0,23 nm
@ 3 dB	>= 0,42 nm
Isolation	
DWDM adjacent channel	> 27 dB
DWDM non-adjacent channel	> 30 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC



DWDM SF - MxDx-8+OTDR + Mon – East/West

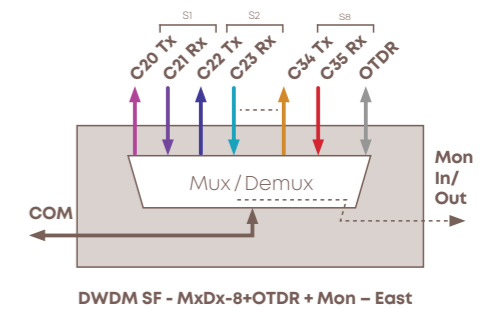
WDM-Channels East TX C20/C22/C24/C26/C28/C30/C32/C34
RX C21/C23/C25/C27/C29/C31/C33/C35

Product Code East X20100-1DM08-2021-NNR1M-55

WDM-Channels West TX C21/C23/C25/C27/C29/C31/C33/C36
RX C20/C22/C24/C26/C28/C30/C32/C34

Product Code West X20100-1DM08-2120-NNR1M-55

Channel width	DWDM 100 GHz
Insertion Loss with connectors [max]	
OTDR 1625 nm to 1670 nm	
DWDM 3,4 dB	
OTDR 3,4 dB	
Mon (1%) < 23.5 dB	
Link Loss max	DWDM 3,8 dB
Isolation	
DWDM adjacent channel	> 25 dB
DWDM non-adjacent channel	> 40 dB
Isolation spectral range	1528.38 nm – 1670 nm
OTDR port	> 30 dB
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC



DWDM SF - MxDx-6+dUG + Mon – East/West

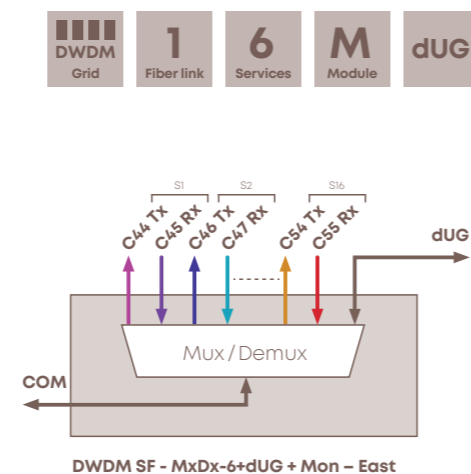
WDM-Channels East TX C44/C46/C48/C50/C52/C54
RX C45/C47/C49/C51/C53/C55

Product Code East X20090-1DM06-4445-UON1M-55

WDM-Channels West TX C45/C47/C49/C51/C53/C55
RX C44/C46/C48/C50/C52/C54

Product Code West X20090-1DM06-4544-UON1M-55

Channel width	DWDM 100 GHz
Insertion Loss with connectors [max]	
DWDM 3,1 dB	
dUG 1,1 dB	
Link Loss max	DWDM 5,1 dB
Isolation	
DWDM adjacent channel	> 28 dB
DWDM non-adjacent channel	> 40 dB
DWDM ch. @ dUG	> 12 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC

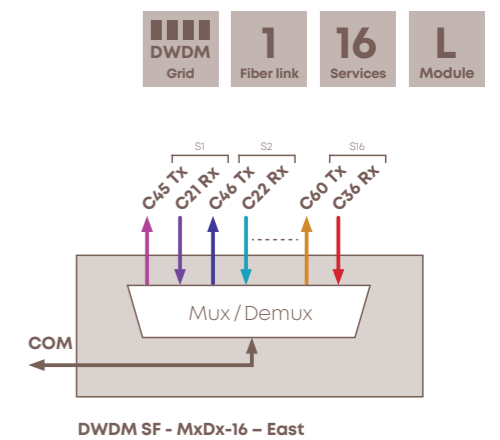


DWDM SF - MxDx-16 – East/West

WDM-Channels East C45-C60_C21-C36
Product Code East X20120-1DM16-4521-NNN1L-55

WDM-Channels West C21-C36_C45-C60
Product Code West X20120-1DM16-2145-NNN1L-55

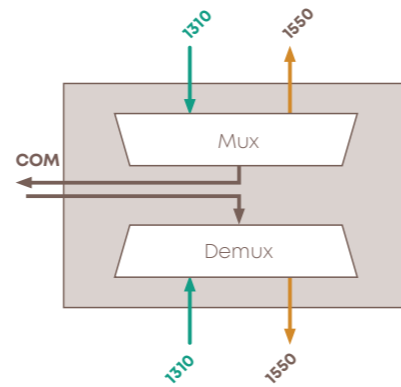
Number of channels	32
Insertion Loss with connectors [max]	
@ ITU center wavelength	3,4 dB
Within ref. Passband	3,9 dB
Insertion Loss Uniformity [max]	
@ ITU center wavelength	1,2 dB
Link Loss	
@ ITU center wavelength	6,8 dB
Within ref. Passband	7,8 dB
Passband	
@ 1 dB	>= 0,23 nm
@ 3 dB	>= 0,42 nm
Isolation	
DWDM adjacent channel	> 27 dB
DWDM non-adjacent channel	> 30 dB
Isolation spectral range	1528.38 nm – 1563.45 nm
Optical Return Loss	> 45 dB (for the component, also depends on connectors)
Connector Type	LC/UPC



WWDM DF - Bandsplitter Hi-Iso

WDM-Channels 1310/1550
Product Code X10080-2WI02-1315-NNNIS-55

Channel width	1310 nm port 1260 to 1360 nm
	1550 nm port 1460 to 1620 nm
Insertion Loss with connectors [Max]	< 1.0 dB for 1310 nm and 1550 nm port
	< 1.0 dB for common port
Isolation	
1550 nm @ 1310 nm port	> 45 dB
1310 nm @ 1550 nm port	> 45 dB
Connector Type	LC/UPC



The NCX range

Consultancy services and global support

Find peace of mind by working with a global partner with deep expertise and attention to detail. Our consultancy services are complimentary, and we support you in creating a network design that includes the solutions that best suit your needs. So that you can optimise your setup today while also delivering on your future plans.





Connecting – today and beyond

About HUBER+SUHNER

We are a leading global supplier of components and systems solutions. With our broad range of products and our extensive expertise, we serve the industry, communications and transportation markets with applications from the three technologies of radio frequency, fiber optics and low frequency. And as a global company with a presence in over 80 countries, we're always close to our customers.

HUBER+SUHNER Cube Optics AG
Eindhoven-Allee 3
55129 Mainz, Germany
+49-6131-4995-100
info.cubo@hubersuhner.com
cubeoptics.com