

A dynamic splash of water is captured against a deep blue background. The water is in motion, creating a sense of energy and fluidity. Numerous small droplets and bubbles are visible, some of which are illuminated by a warm, golden light, creating a shimmering effect. The overall composition is abstract and visually striking, with a strong contrast between the cool blue tones and the warm golden highlights.

smartoptics
It's really simple!

Passive
WDM Networking

Company Introduction

SmartOptics designs and markets all types of fibre optical transmission products. Headquartered in Oslo, Norway, we serve Storage, Data and Telecom Networks worldwide with a unique and cost effective portfolio of optical transmission components & Systems.

Customers are turning to SmartOptics because we have a product portfolio which allows them to build the most cost effective and reliable transmission networks possible. Whilst our customers are experts in their fields, they still appreciate the valuable knowledge and experience that SmartOptics offers for optical transmission solutions.

Optical transmission projects have historically been prohibitively expensive and complicated, but Smartoptics products allow solutions which are simple to design and easy to install.

The T-Series consists of a comprehensive range of active and passive WDM solutions to suit all network requirements in an incredibly compact form factor resulting in low space and power requirements.

SmartOptics products now make optical networking, especially 4G, 8G and 10G connectivity, simple and affordable.

Product portfolio:

C/DWDM transmission systems

- 32 x 10Gbps DWDM
- 128 x 1G Ethernet connections
- 32 x 4G Fibre Channel connections
- 16 x 8G Fibre Channel connections
- down to 2 Mbps

Passive WDM network solutions

- C/DWDM Mux/Demux and OADM units
- 19" or 23" rack mountable
- CWDM and DWDM for indoor and outdoor environments

Optical & electrical transceivers

- all bit rates
- all distances
- all form factors

Storage Networking

- 32 x 4G Fibre Channel DWDM
- 16 x 4G Fibre Channel CWDM
- 16 x 8G Fibre Channel CWDM

Terje Hallan, CEO



WDM Networking

Introduction to WDM

Wavelength Division Multiplexing (WDM) technology multiplies fiber capacity by multiplexing optical light signals of different wavelengths onto a single optical fiber. The technology is well standardized in the ITU G.695 and G.694 recommendations and widely used in datacom and telecom networks.

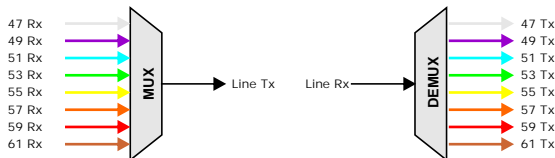


Figure 1: Illustration of CWDM function with 8 channels.

Due to the physical nature of light, the signals on WDM wavelengths are completely independent from each other and data streams with different line-rates and protocols can be transported on a single fiber or fiber pair. Traditional telecom signals (PDH, SDH/SONET), IP data (Ethernet, Gigabit Ethernet or 10G Ethernet) and storage data (8G/4G/2G/1G Fibre Channel) can therefore be transported over a single infrastructure without complex protocol conversion technologies.

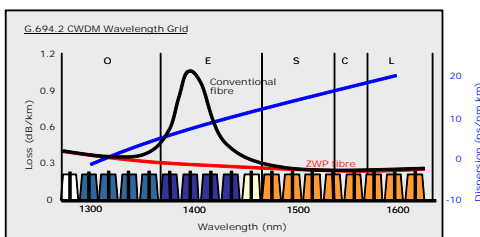
To build a passive WDM system, two types of components are required:

- **Optical Multiplexer Units (OMU's)** which combine and split light signals of WDM wavelengths
- **WDM transceivers**, which generate light signals of specific WDM wavelengths

CWDM and DWDM

WDM comes in two flavours; CWDM and DWDM.

Coarse WDM is a robust technology able to create 18 independent channels and was first to adapt a transceiver footprint. The CWDM channel spacing is 20 nm and a specific color coding is used which enables simple industry standard set-up procedures. CWDM is typically used for un-amplified transmission up to 200 km.



Dense WDM uses cooled lasers and can also be amplified. The channel spacing is typically 100 GHz (ca. 0.8 nm) and DWDM channels are usually used in the 1530 - 1560 nm band. Optical amplifiers and dispersion compensation modules allow DWDM transmission to be extended beyond the transceiver characteristics.

SmartOptics WDM filter products are designed and tested to the highest international telecom standards providing unparalleled functionality and reliability.

Passive Filters

Mux/Demux: A Mux/Demux unit terminates all wavelengths on the WDM system and is at the heart of point-to-point connections. The optical combining and splitting of wavelengths is a passive technology and a Mux/Demux unit requires neither electrical power nor software resulting in greatly increased reliability.

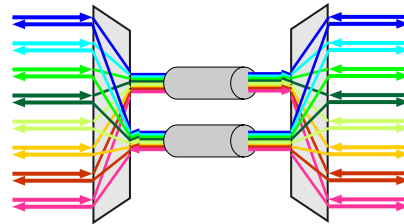


Figure 2: Wavelength signal paths in a 8 ch. Mux/Demux unit.

OADM: An **Optical Add/Drop Multiplexer (OADM)** unit terminates a limited subset of wavelengths in WDM systems. OADMs typically add/drop 1, 2 or 4 wavelengths and the remaining wavelengths are bypassed (expressed) through the fiber. It is possible to reuse the terminated wavelengths on the remaining span.

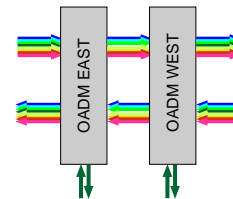


Figure 3: Signal paths in a 1ch. OADM with wavelength reuse.

The ability to reuse wavelengths in OADMs enables network designers to build redundant WDM networks. Protection switching is usually taken care of in the client equipment.

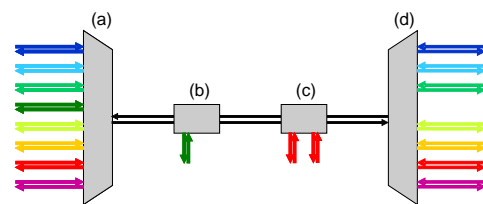


Figure 4: Point-to-Point link with two OADMs.

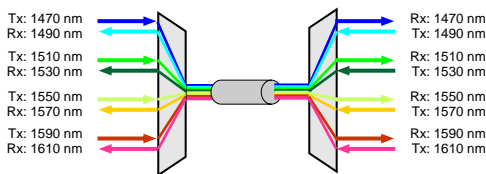
Figure 4. illustrates a point-to-point system with two OADMs. The first OADM creates one wavelength path from (a) to (b). The second OADM generates two wavelength paths from (a) to (c) and (c) to (d). The 8 ch. Mux/Demux units have six remaining wavelength paths. from (a) to (d).

Single fiber applications

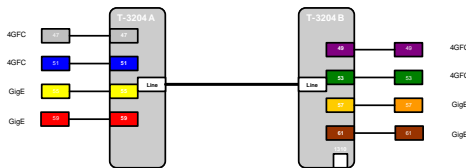
Fiber optic communication commonly uses fiber pairs for bi-directional communication. In WDM applications single fiber solutions are also possible and SmartOptics have developed the T-32xx series of single fibre mux/demux units to accommodate these requirements.

In single fiber applications different wavelengths are used to generate bi-directional connections. In the example below the wavelength pair 1470 nm and 1490 nm generate bidirectional connections. Both wavelength signals are propagating in opposite direction to each other in the same fiber.

Logical view:



Physical connections:



Optical receivers for singlemode applications are wavelength insensitive and accept all wavelength signals between 1100 nm and 1630 nm. In the above illustration of the connection scheme, a 1470 nm transceiver is used to transmit at 1470 nm and receive light signals at 1490 nm. A 1490 nm transceiver is used to transmit at 1490 nm and receive signals of 1470 nm.

Designing WDM Networks

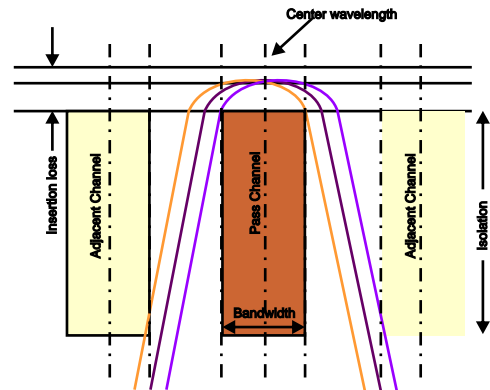
When comparing design complexity of a WDM and non-WDM network, only the additional WDM filter losses have to be taken into account. All other design parameters remain equal to a non-WDM approach.

Filter specifications for life-time, indoor and outdoor environments

In CWDM systems the laser wavelength is dependant on the environmental temperature of the transceiver. To be fully compliant with the CWDM standard and its variants the laser wavelength is allowed to drift by ± 6.5 nm and the filter passband bandwidth requires ± 7.0 nm around ITU center wavelengths.

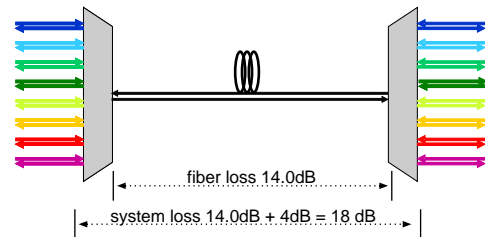
In DWDM systems the wavelength is controlled by using a TEC element which maintains stability. However, the filter passband drifts depending on the environmental conditions.

SmartOptics specified values are valid for the worst case and over the filter life-time (calculated for 20 years). The definition of typical filter values is shown in the illustration below.



Loss calculation example

The connector losses for both line and client site are included in the specified parameters. Thus in the example no extra loss has to be taken into account for the fiber patch cord from the WDM transceiver and for the patch cord towards the line fiber.



In this example the long distance fiber has a link loss of 14.0 dB. Additional 4 dB, caused by the Mux/Demux link loss (T-3009), must be added to the fiber link loss. An optical WDM transceiver will therefore experience an 18 dB loss in total. Please note that this is a worst case calculation and typical values are much better.

In summary, SmartOptics passive WDM solution portfolio is designed for interoperability, reliability and simplicity.

Product Overview

SmartOptics solution's for passive WDM networking

Smartoptics offers the industrys widest selection of WDM networking components including: -

- passive WDM filters
- all types and form factors of WDM transceiver
- active transmission equipment

The passive filters are available in an industry standard LGX building practise for a 1U height 19" and 23" mounting bracket or in filter cassettes for outdoor enclosures. Both building practises are illustrated below.



19" rack mounting system



Cassettes and enclosure for outdoor environments

Both platforms are available for CWDM and DWDM filters and various configurations exist supporting all applications. The standard temperature range for the outdoor enclosures is -40 °C to +85 °C. Smartoptics also supplies filter modules for sub-marine or CATV installations.

19" and 23" mounting platform

The mounting bracket and modules are passive and do not require electrical power for operation. Each mounting bracket offers space for two modules. A special fiber management add-on-bracket is available to give additional protection.



The mounting bracket is available in a 19" and a 23" version therefore addressing most installation requirements. All SmartOptics plug-in modules are compliant with these two versions.

Ease of use

SmartOptic's products are designed to make the life of its operators simple. Duplex connectors are used as standard fiber optic interconnectors. LC/UPC (UPC = ultra polished physical

connector, LC/APC (APC = angle polished physical connector) and SC/UPC and SC/APC versions are available.



When using duplex connector interfaces, it is recommended to use duplex patch cables between the transceiver and passive unit. Then there is no risk that the transmit or receive interfaces are swapped with each other and the most probable error source in the installation process is eliminated.

The connector adapters are angled at 30° to the front plate of the passive unit. This reduces the required space for the patch cords and significantly improves fiber handling.

Additionally, the line interfaces have a mechanical shutter to increase eye-safety.

Color coding for CWDM

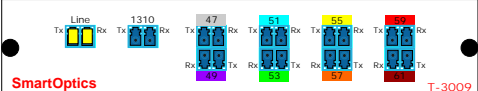
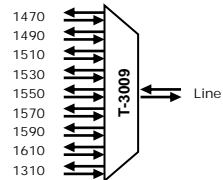
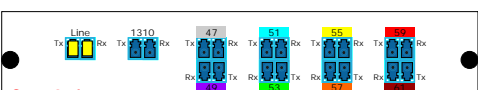
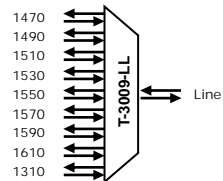

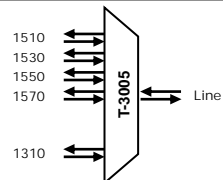

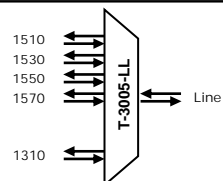

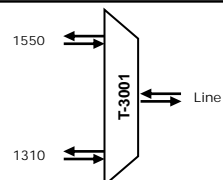
For CWDM systems an industry standard color coding scheme is used. The latches of the transceivers match the colored port indicators on the passive units therefore gauranteeing simple setup. Following color codes are valid for CWDM:

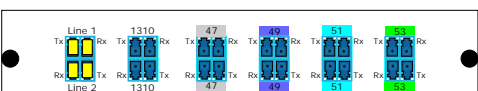
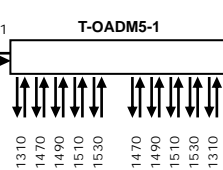

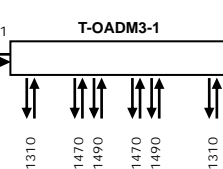


CWDM color coding

1270	light purple		1450	yellow orange	
1290	sky blue		1470	gray	
1310	yellow green		1490	violet	
1330	yellow ocher		1510	blue	
1350	pink		1530	green	
1370	beige		1550	yellow	
1390	white		1570	orange	
1410	silver		1590	red	
1430	black		1610	brown	

CWDM Solutions

T-Series: Mux/Demux and OADM units with 1310 nm expansion port

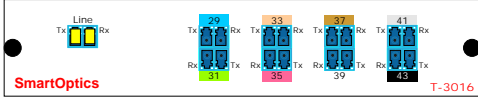
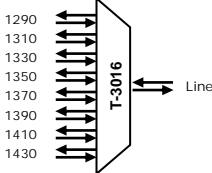
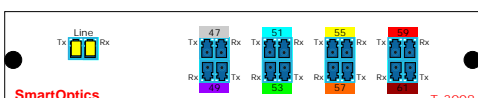
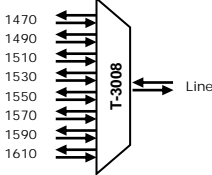

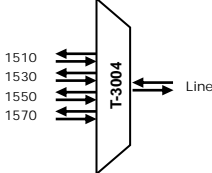
<p>T-3009</p>  <p>SmartOptics T-3009</p>		<p>8 channel + 1310 port, CWDM Mux/Demux</p> <p>C47, C49, C51, C53, C55, C57, C59, C61 + 1310 nm</p> <p>IL Link: <4.0 dB IL Link @ 1550 nm: <1.8 dB IL Link @ 1310 nm: <1.8 dB</p>
<p>T-3009-LL</p>  <p>SmartOptics T-3009-LL</p>		<p>Low Loss version of T-3009</p> <p>C47, C49, C51, C53, C55, C57, C59, C61 + 1310 nm</p> <p>IL Link: <2.5 dB IL Link @ 1310 nm: <1.8 dB</p>
<p>T-3005</p>  <p>SmartOptics T-3005</p>		<p>4 channel + 1310 port, CWDM Mux/Demux</p> <p>C51, C53, C55, C57 + 1310 nm</p> <p>IL Link: <3.0 dB IL Link @ 1550 nm: <1.8 dB IL Link @ 1310 nm: <1.8 dB</p>
<p>T-3005-LL</p>  <p>SmartOptics T-3005-LL</p>		<p>4 channel + 1310 port, CWDM Mux/Demux</p> <p>C51, C53, C55, C57 + 1310 nm</p> <p>IL Link: <2.5 dB IL Link @ 1310 nm: <1.8 dB</p>
<p>T-3001</p>  <p>SmartOptics T-3001</p>		<p>Wideband WDM Mux/Demux</p> <p>1310 band / 1550 CWDM band</p> <p>IL Link: <1.5 dB Passband @ 1550: 1460 nm - 1630 nm Passband @ 1310: 1270 nm - 1350 nm</p>

<p>T-OADM5-x</p>  <p>SmartOptics T-OADM5-1</p>		<p>4 channel + 1310 port, OADM (East & West)</p> <p>OADM5-1: C47, C49, C51, C53 & 1310 OADM5-2: C55, C57, C59, C61 & 1310 OADM5-3: C47, C49, C59, C61 & 1310</p> <p>IL bypass channel: <1.8 dB IL add/drop channel: <1.7 dB IL 1310 nm: <0.9 dB</p>
<p>T-OADM3-x</p>  <p>SmartOptics T-OADM3-1</p>		<p>2 channel + 1310 port, OADM (East & West)</p> <p>x=1: C47 & C49 x=2: C51 & C53 x=3: C55 & C57 x=4: C59 & C61</p> <p>IL bypass channel: <2.0 dB IL add/drop channel: <1.3 dB IL 1310 nm: <0.9 dB</p>
<p>T-OADM2-x</p>  <p>SmartOptics T-OADM2-1</p>		<p>1 channel + 1310 port, OADM (East & West)</p> <p>x=1: C47 x=2: C49 x=3: C51 x=4: C53 x=5: C55 x=6: C57 x=7: C59 x=8: C61</p> <p>IL bypass channel: <1.8 dB IL add/drop channel: <1.3 dB IL 1310 nm: <0.9 dB</p>

All units can be offered with LC/UPC or LC/APC connector interfaces.

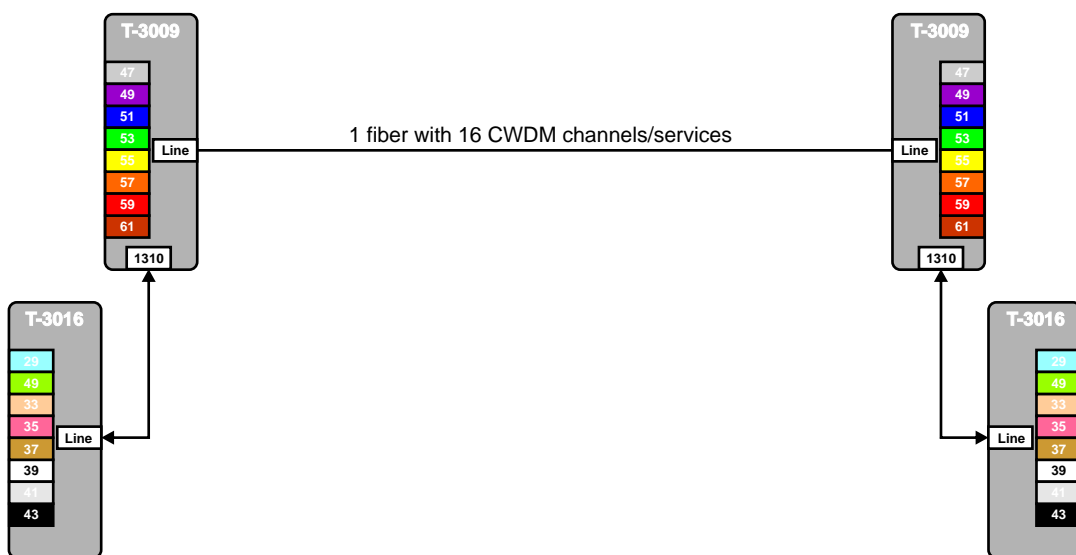
CWDM Solutions

T-Series without 1310 nm port

<p>T-3016</p>  <p>SmartOptics T-3016</p>		<p>8 channel port, CWDM Mux/Demux</p> <p>C29, C31, C33, C35, C37, C39, C41 & C43</p> <p>IL Link: <2.5 dB</p> <p>IL Link: <4.0 dB combined with T-3009</p>
<p>T-3008</p>  <p>SmartOptics T-3008</p>		<p>8 channel port, CWDM Mux/Demux</p> <p>C47, C49, C51, C53, C55, C57, C59 & C61</p> <p>IL Link: <3.5 dB</p> <p>IL Link @ 1550 nm: <1.8 dB</p>
<p>T-3004</p>  <p>SmartOptics T-3004</p>		<p>4 channel CWDM Mux/Demux</p> <p>C51, C53, C55, C57</p> <p>IL Link: <2.5 dB</p> <p>IL Link @ 1550 nm: <1.8 dB</p>

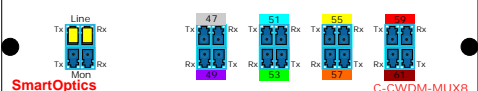
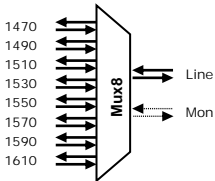
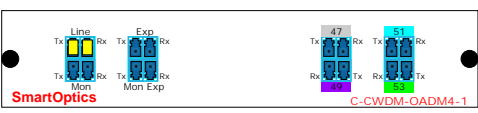
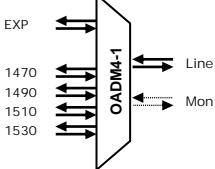

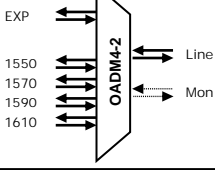
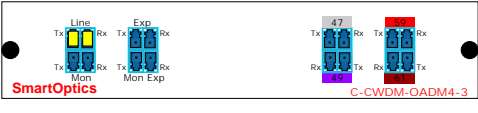
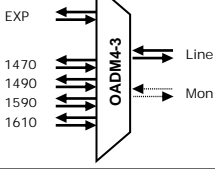
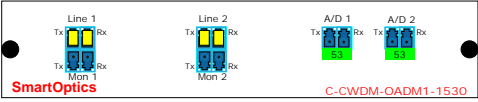
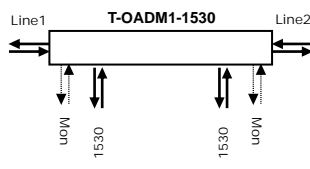
Application example: 16 channel CWDM system

The T-3009 and T-3016 offer a 16 channel CWDM system. It is possible to seamlessly upgrade a T-3009 by adding a T-3016 on the 1310 nm expansion port.



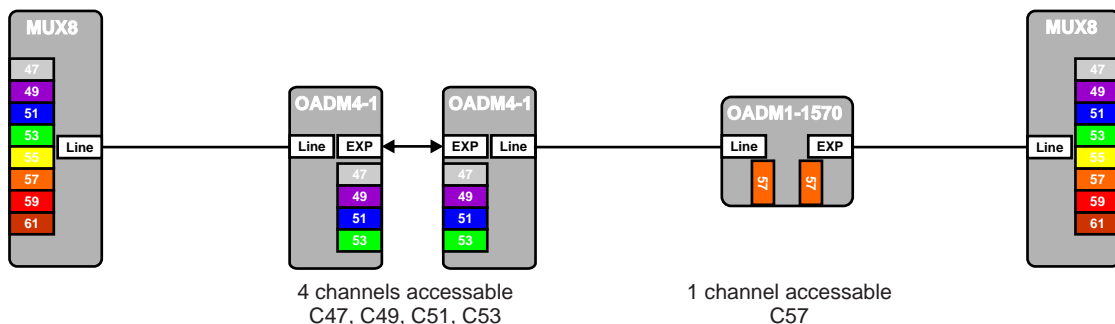
CWDM Solutions

C-Series of Mux/Demux and OADM units with monitoring ports

<p>C-CWDM-MUX8</p>  <p>SmartOptics C-CWDM-MUX8</p>		<p>8 channel CWDM Mux/Demux</p> <p>C47, C49, C51, C53, C55, C57, C59, C61</p> <p>IL Link: <4.0 dB IL unit: <2.0 dB</p>
<p>C-CWDM-OADM4-1</p>  <p>SmartOptics C-CWDM-OADM4-1</p>		<p>4 channel OADM or Mux/Demux with expansion port</p> <p>C47, C49, C51, C53</p> <p>IL Link: <3.0 dB IL express channels: <1.5 dB</p>
<p>C-CWDM-OADM4-2</p>  <p>SmartOptics C-CWDM-OADM4-2</p>		<p>4 channel OADM or Mux/Demux with expansion port</p> <p>C55, C57, C59, C61</p> <p>IL Link: <3.0 dB IL express channels: <1.5 dB</p>
<p>C-CWDM-OADM4-3</p>  <p>SmartOptics C-CWDM-OADM4-3</p>		<p>4 channel OADM or Mux/Demux with expansion port</p> <p>C47, C49, C59, C61 1550 band: 1504 nm - 1578 nm</p> <p>IL Link: <3.0 dB IL express channels: <1.5 dB</p>
<p>C-CWDM-OADM1-xxxx</p>  <p>SmartOptics C-CWDM-OADM1-1530</p>		<p>4 channel + 1310 port, OADM (East & West)</p> <p>xxxx = 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610</p> <p>IL bypass channel: <1.8 dB IL add/drop channel: <1.7 dB IL 1310 nm: <0.9 dB</p>

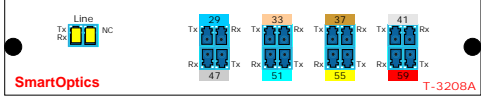
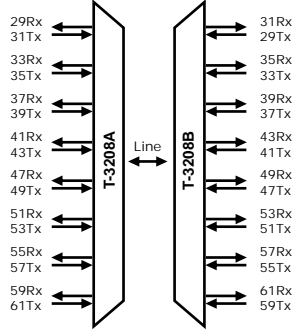

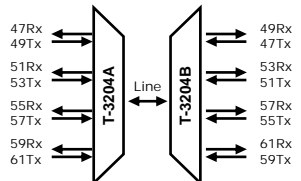
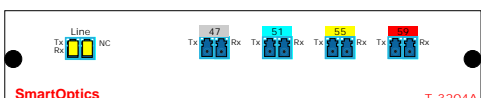
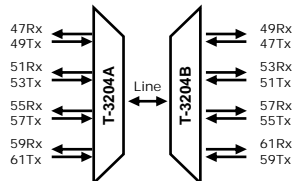

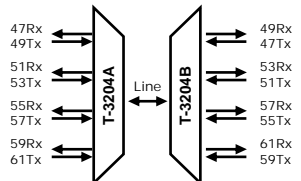
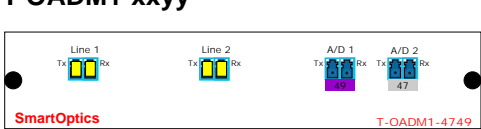
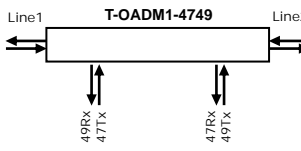
Application example: 8 channel point-to-point system with linear OADM's

The C-CWDM-OADM4-1 and C-CWDM-OADM1-1570 are used to add/drop 4 channels and 1 channel respectively at the interim locations.



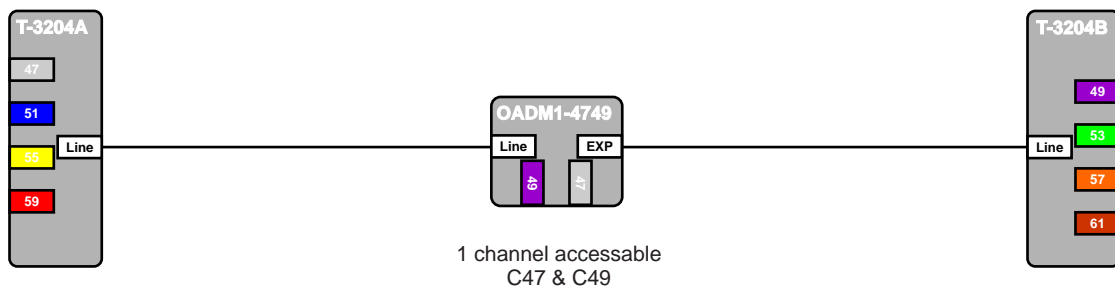
Single Fiber CWDM Solutions

T-Series of Single Fiber Mux/Demux and OADM units

<p>T-3208A</p>  <p>SmartOptics T-3208A</p>		<p>8 channel CWDM Mux/Demux</p> <p>C29, C33, C37, C41, C47, C51, C55, C59 for transceiver wavelengths</p> <p>IL Link: <4.0 dB Used together with T-3208B</p>
<p>T-3208B</p>  <p>SmartOptics T-3208B</p>		<p>8 channel CWDM Mux/Demux</p> <p>C31, C35, C39, C43, C49, C53, C57, C61 for transceiver wavelengths</p> <p>IL Link: <4.0 dB Used together with T-3208A</p>
<p>T-3204A</p>  <p>SmartOptics T-3204A</p>		<p>4 channel CWDM Mux/Demux</p> <p>C47, C51, C55, C59 for transceiver wavelengths</p> <p>IL Link: <3.0 dB Used together with T-3204B</p>
<p>T-3204B</p>  <p>SmartOptics T-3204B</p>		<p>4 channel CWDM Mux/Demux</p> <p>C49, C53, C57, C61 for transceiver wavelengths</p> <p>IL Link: <3.0 dB Used together with T-3204A</p>
<p>T-OADM1-xyxy</p>  <p>SmartOptics T-OADM1-4749</p>		<p>1 channel OADM (East & West)</p> <p>xyxy = 4749, 5153, 5557, 5961</p> <p>IL bypass channel: <1.5 dB IL add/drop channel: <1.5 dB</p>


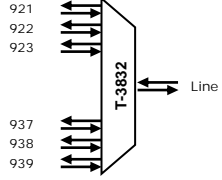

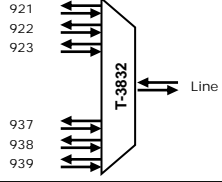

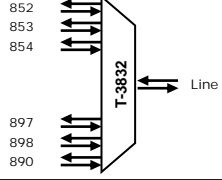
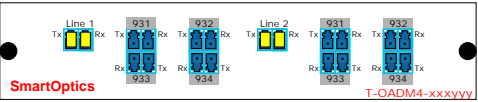
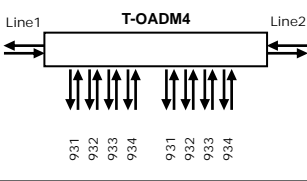
Application example: 4 channel point-to-point system with linear OADM's

The T-3204A and T-3204B are used to build a 4 channel CWDM system over a single fiber. The T-OADM1-4749 is used to access the interim location redundantly from both end-points.

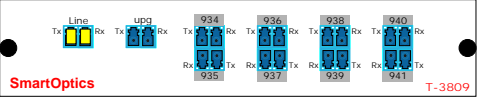
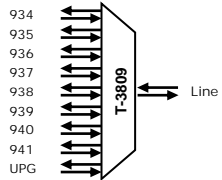
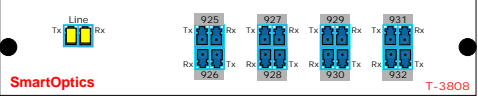
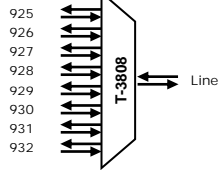
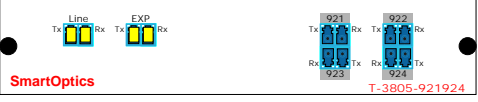
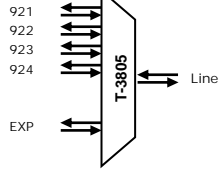

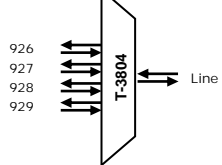


DWDM Solutions

T-Series: 32+32 DWDM Mux/Demux and OADM units

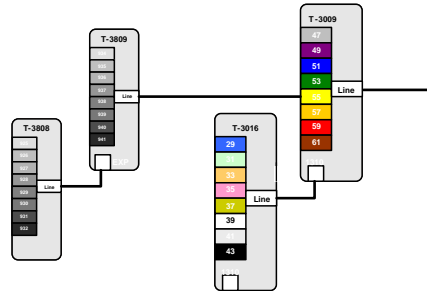
<p>T-3833</p> 		<p>32 channel DWDM Mux/Demux, OSC 1510, UPG port 921-924, 926-929, 931-934, 936-939, 941-944, 946-949, 951-954, 956-959</p> <p>IL Link: <8.0 dB IL Link @ 1510 nm OSC: <1.6 dB IL Link @ UPG port: <2.2 dB</p>
<p>T-3832-LB</p> 		<p>32 channel DWDM Mux/Demux - Low Band 921-924, 926-929, 931-934, 936-939, 941-944, 946-949, 951-954, 956-959</p> <p>IL Link: <7.2 dB</p>
<p>T-3832-HB</p> 		<p>32 channel DWDM Mux/Demux - High Band 852-855, 857-860, 862-865, 867-870, 872-875, 877-880, 882-885, 887-890</p> <p>IL Link: <7.2 dB</p>
<p>T-OADM4-xxxxyyy</p> 		<p>4 channel OADM, (EAST and WEST), 1310 nm port 4 DWDM channels xxx-yyy</p> <p>IL Link: <1.5 dB IL Add/drop: <4.5 dB IL 1310 nm: <1.5 dB</p>

T-Series: 8+8 DWDM Mux/Demux and 4+4 OADM units

<p>T-3809</p> 		<p>8+1 channel DWDM Mux/Demux 934, 935, 936, 937, 938, 939, 940, 941 + UPG</p> <p>IL Link: <5.5 dB IL Link @ UPG: <1.0 dB</p>
<p>T-3808</p> 		<p>8 channel DWDM Mux/Demux 925, 926, 927, 928, 929, 930, 931, 932</p> <p>IL Link: <4.5 dB</p>
<p>T-3805-xxxxyyy</p> 		<p>4+1 channel DWDM Mux/Demux 4 channels from T-3832 band</p> <p>IL EXP Link: < 1.6 dB IL Link: <4.5 dB</p>
<p>T-3804-xxxxyyy</p> 		<p>4 channel DWDM Mux/Demux 4 channels from T-3832 band expansion Mux/Demux for T-3805</p> <p>IL Link: <3.5 dB</p>

Hybrid D/CWDM System

The T-3809 and T-3808 can be used to upgrade an existing CWDM system with additional DWDM channels.



Single fiber DWDM Solutions

Optical Single Fiber DWDM Multiplexers


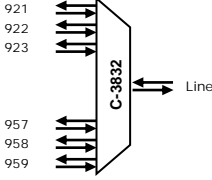

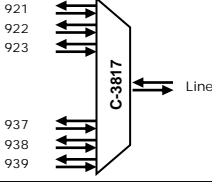

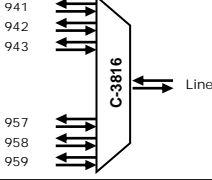
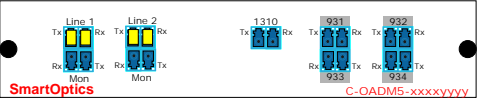
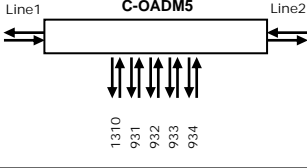
<p>C-3909A</p> <p>SmartOptics</p>		<p>8+1 channel DWDM Mux/Demux</p> <p>D939, D937, D934, D932, D929, D927, D924 & D922 for transceiver wavelengths IL Link: <5.0 dB IL Link @ UPG port: <3.0 dB Used together with C-3909B</p>
<p>C-3909B</p> <p>SmartOptics</p>		<p>8+1 channel DWDM Mux/Demux</p> <p>D938, D936, D933, D931, D928, D926, D923 & D921 for transceiver wavelengths IL Link: <5.0 dB IL Link @ UPG port: <3.0 dB Used together with C-3909A</p>
<p>C-3908A</p> <p>SmartOptics</p>		<p>8 channel DWDM Mux/Demux</p> <p>D959, D957, D954, D952, D949, D947, D944 & D942 for transceiver wavelengths IL Link: <4.5 dB Used together with C-3908B</p>
<p>C-3908B</p> <p>SmartOptics</p>		<p>8 channel DWDM Mux/Demux</p> <p>D958, D956, D953, D951, D948, D946, D943 & D941 for transceiver wavelengths IL Link: <4.5 dB Used together with C-3908A</p>

Application example: 16 channel DWDM system (using 32 lambdas on a single fiber)

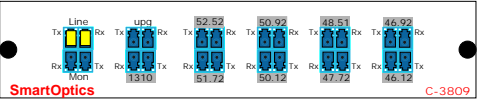
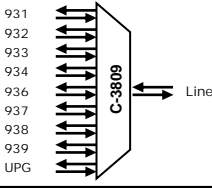
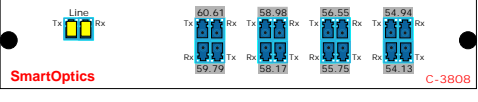
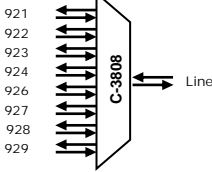
The T-3909A&B and T-3908A&B offer a 16 channel single fiber DWDM system. It is possible to seamlessly upgrade a T-3909A&B by adding a T-3908A&B on the "UPG" expansion port. The solution offers TX and RX monitoring ports.

DWDM Solutions

C-Series: DWDM Mux/Demux


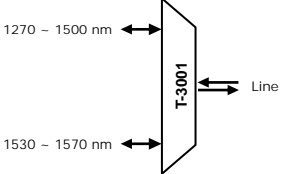
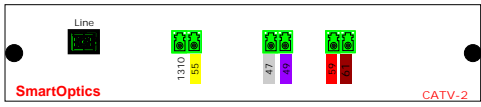
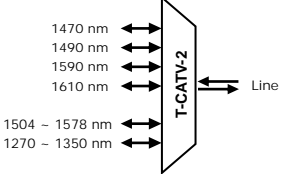
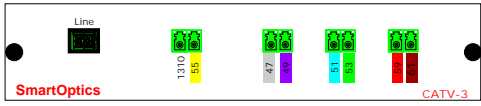
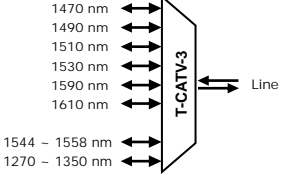
<p>C-3832</p> 		<p>32+1 channel DWDM Mux/Demux, 1310 nm port 921~924, 926~929, 931~934, 936~939, 941~944, 946~949, 951~954, 956~959</p> <p>IL Link: <8.0 dB IL Link @ 1310 nm OSC: <1.6 dB Monitoring port</p>
<p>C-3817</p> 		<p>16+1 channel DWDM Mux/Demux, 1310 nm port 921~924, 926~929, 931~934, 936~939</p> <p>IL Link: <8.0 dB IL Link @ upg port: <3.0 dB IL Link @ 1310 nm OSC: <1.6 dB Monitoring port</p>
<p>C-3816</p> 		<p>16 channel DWDM Mux/Demux, 1310 nm port 941~944, 946~949, 951~954, 956~959</p> <p>IL Link: <5.0 dB</p>
<p>C-OADM5-xxxxyyy</p> 		<p>4 channel OADM, 1310 nm port</p> <p>4 DWDM channels xxx-yyy IL Link: <2.5 dB IL Add/Drop: <4.5 dB</p> <p>Monitoring port</p>

C-Series: 8+8 DWDM Mux/Demux

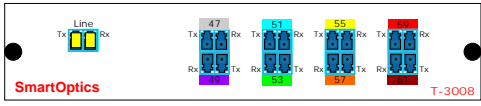
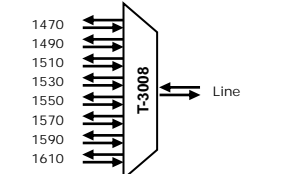
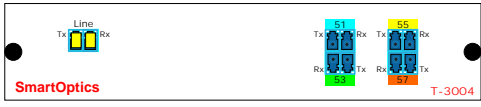
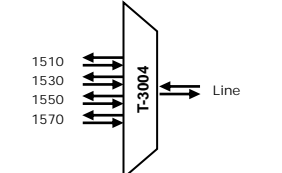
<p>C-3809</p> 		<p>8+1 channel DWDM Mux/Demux</p> <p>931, 932, 933, 934, 936, 937, 938, 939 + UPG</p> <p>IL Link: <6.1 dB IL Link @ UPG: <2.6 dB Monitoring port</p>
<p>C-3808</p> 		<p>8 channel DWDM Mux/Demux</p> <p>921, 922, 923, 924, 926, 927, 928, 929</p> <p>IL Link: <3.5 dB</p>

CATV Solutions

Optical Single Fiber CWDM Multiplexers for CATV

<p>T-3001-CATV1</p>  <p>SmartOptics T-3001</p>		<p>Wideband CATV WDM Mux/Demux 1310+1490 band / 1550 CATV band data traffic 1310/1490 added to CATV signals 1550 nm</p> <p>IL Link: <1.5 dB Passband @ 1550: 1530 nm - 1570 nm Passband @ 1310/1490: 1270 nm - 1500 nm</p>
<p>T-CATV-2</p>  <p>SmartOptics CATV-2</p>		<p>Wideband CATV WDM Mux/Demux 1310 band and 1550 CATV band data traffic added on 4 CWDM channels</p> <p>IL Link: <2.5 dB Passband @ 1550: 1504 nm - 1578 nm Passband @ 1310: 1270 nm - 1350 nm</p>
<p>T-CATV-3</p>  <p>SmartOptics CATV-3</p>		<p>Wideband CATV WDM Mux/Demux 1310 band and 1550 CATV band data traffic added on 6 CWDM channels</p> <p>IL Link: <3.0 dB Passband @ 1550: 1544 nm - 1558 nm Passband @ 1310: 1270 nm - 1350 nm</p>

Multimode Solutions

<p>T-3008-MM</p>  <p>SmartOptics T-3008</p>		<p>8 channel port, CWDM Mux/Demux C47, C49, C51, C53, C55, C57, C59 & C61 IL Link: <3.5 dB IL Link @ 1550 nm: <1.8 dB</p>
<p>T-3004-MM</p>  <p>SmartOptics T-3004</p>		<p>4 channel CWDM Mux/Demux C51, C53, C55, C57 IL Link: <2.5 dB IL Link @ 1550 nm: <1.8 dB</p>

SmartOptics, the complete resource for optical transmission networks

SmartOptics has a proven track record in designing optical transmission networks. Our success is based on our expert knowledge in the three key networking disciplines

- passive WDM,
- optical transceivers,
- active WDM equipment.

This gives us and our customers a unique advantage and results in high performance and cost optimized network solutions.

SmartOptics products now make optical networking, especially 4G, 8G and 10G connectivity, simple and affordable.

Optical transceivers

SmartOptics has a complete portfolio of optical transceivers. Product highlights include:

- C/DWDM 10G Xenpak's, X2's and XFP's
- CWDM 8G/10G SFP+'s
- C/DWDM 4G SFP's
- 160 km, 200 km & 210 km CWDM 1G SFP's
- 250 km CWDM 100M SFP's



Active WDM equipment

SmartOptics offers an extremely compact C/DWDM subsystem completing the portfolio. Key benefits are:

- optical amplification (EDFAs),
- 3R regeneration for all types of protocols
- performance monitoring (optical and bit level)



Thank You,

Your SmartOptics Team



Customer Feedback:

Our philosophy at SmartOptics is that business should be simple. We are proud to be working with some of the biggest names in the storage world: -

“Just a quick update message to let you know that the CWDM is installed and working within T-Systems. It was a very smooth and quick installation and within hours we had increased their cross site capacity from 96Gb/s using 24 dark fibres to 192Gb/s using just 4 dark fibres. This solution is far more cost effective than the 2Gb/s solution previously used and other alternative “active” DWDM systems. Now that Brocade have changed their approach to third party SFP usage, and locked out all other third party SFP vendors except for SmartOptics, SmartOptics can potentially be an important supplier for our Brocade applications where distance extensions are required. We already have other possibilities for your equipment which we hope to close soon.”

HP, UK

“I had the CWDM up and running within minutes, I really can't believe how simple this is. A typical configuration to extend the fabric is to implement a single SAN over distances to provide geographic separation of server and storage. Normally we would do this with a DWDM system, but we used the SmartOptics embedded CWDM solution and are delighted with the results.”

SUN Microsystems, UK

“The SmartOptics Product line is the perfect companion to our own portfolio. We are seeing more and more 4Gbps opportunities and by working with SmartOptics we have been able to satisfy these requirements over long distances using Embedded CWDM solutions. By having a long distance 4Gbps solution, it also means that our customers can now use their switches at the full line rate for which they were originally intended and maximise their investment.”

Acal, UK

“We were amazed at just how simple the SmartOptics system is and also how reliable the solution is as well. Normally we spend a lot of time configuring DWDM channels but with the SmartOptics solution we just plugged the optics in to our switches and we were up and running within minutes. Another reason why we chose the SmartOptics solution was the reliability of the system. There is a completely passive solution so the reliability figures are amazing compared to what we have been used to, and therefore we do not have to worry about expensive Service contracts and software licences.

Integrated Network Solutions, Norway



CWDM channel wavelengths

ITU channel no.	Wavelength nm
27	1270
29	1290
31	1310
33	1330
35	1350
37	1370

ITU channel no.	Wavelength nm
39	1390
41	1410
43	1430
45	1450
47	1470
49	1490

ITU channel no.	Wavelength nm
51	1510
53	1530
55	1550
57	1570
59	1590
61	1610

DWDM channel wavelengths

ITU channel no.	Wavelength nm	Frequency THz	SO channel ID
61	1528.77	196.10	9610
60	1529.55	196.00	9600
59	1530.33	195.90	9590
58	1531.12	195.80	9580
57	1531.90	195.70	9570
56	1532.68	195.60	9560
55	1533.47	195.50	9550
54	1534.25	195.40	9540
53	1535.04	195.30	9530
52	1535.82	195.20	9520
51	1536.61	195.10	9510
50	1537.40	195.00	9500
49	1538.19	194.90	9490
48	1538.98	194.80	9480
47	1539.77	194.70	9470
46	1540.56	194.60	9460
45	1541.35	194.40	9450
44	1542.14	194.40	9440
43	1542.94	194.30	9430
42	1543.73	194.20	9420
41	1544.53	194.10	9410
40	1545.32	194.00	9400

ITU channel no.	Wavelength nm	Frequency THz	SO channel ID
39	1546.12	193.90	9390
38	1546.92	193.80	9380
37	1547.72	193.70	9370
36	1548.51	193.60	9360
35	1549.32	193.50	9350
34	1550.12	193.40	9340
33	1550.92	193.30	9330
32	1551.72	193.20	9320
31	1552.52	193.10	9310
30	1553.33	193.00	9300
29	1554.13	192.90	9290
28	1554.94	192.80	9280
27	1555.75	192.70	9270
26	1556.55	192.60	9260
25	1557.36	192.50	9250
24	1558.17	192.40	9240
23	1558.98	192.30	9230
22	1559.79	192.20	9220
21	1560.61	192.10	9210
20	1561.42	192.00	9200
19	1562.23	191.90	9190
18	1563.05	191.80	9180

