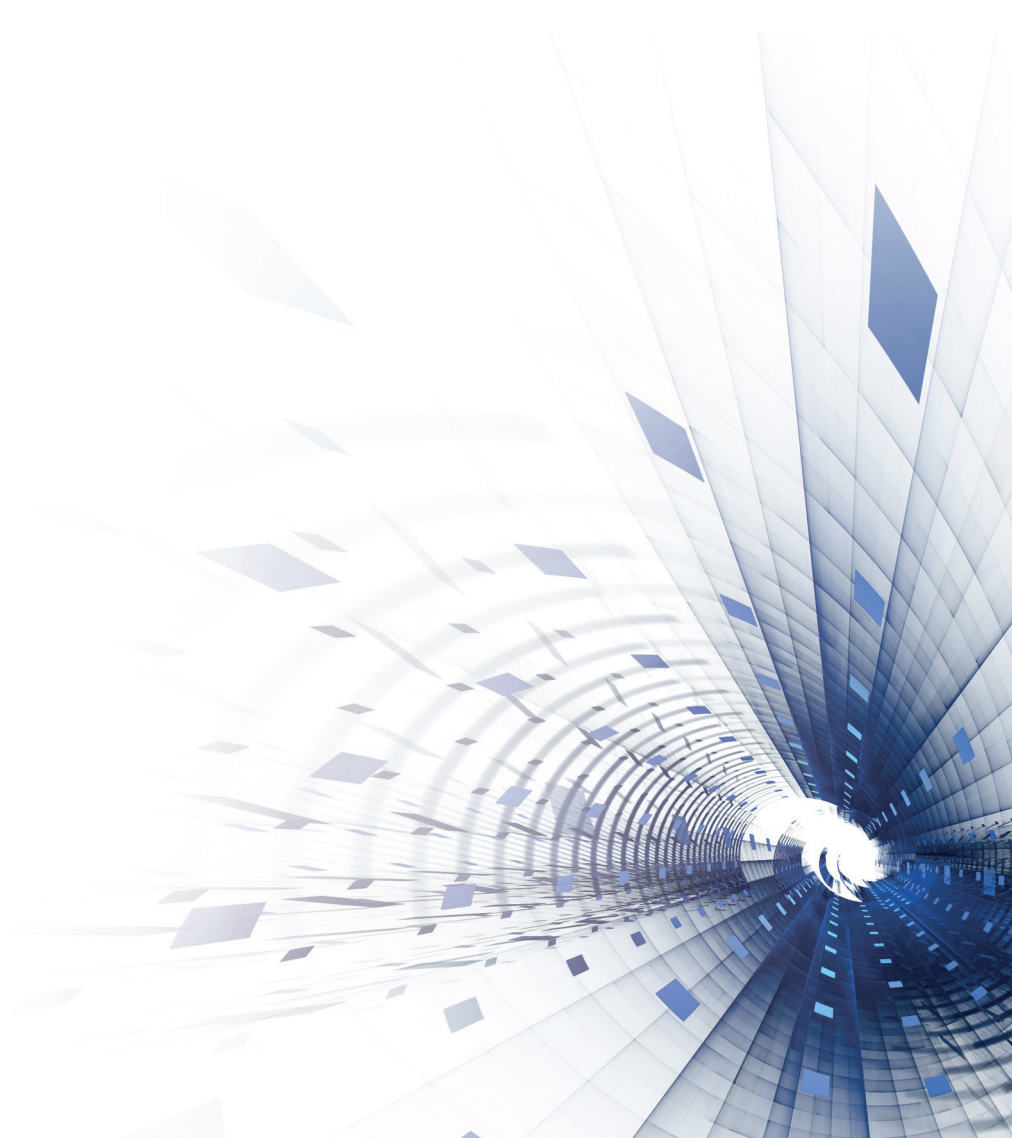


PASSIVE OPTICAL DEVICES

OPTICAL MULTIPLEXING.....	26
OPTICAL CIRCULATOR CR-3.....	28
CR-4, CR-8 MULTIPLEXER.....	28
MULTIPLESER WDM.....	29
MULTIPLESER FWDM.....	29
EWDM EDGE MULTIPLEXER.....	30
CWDM MULTIPLEXER/DEMULTIPLEXER.....	31
DWDM MULTIPLEXER/DEMULTIPLEXER.....	32
FBT COUPLERS.....	33
PLC SPLITTERS.....	34
OPTICAL ISOLATOR IZL.....	35
MPP0 (LGX) HOUSING.....	36
PPO FRAME.....	36
MS MODULE.....	37
SPLICE TRAYS WITH SPLITTERS.....	37



02

The obsolete optical communication systems need two optical fibres to provide a customer with a single service. The increasing number of connected customers proves, at some point, that the applied cable fibre counts are insufficient.

The remedies for that are time division multiplexing, wavelength division multiplexing (WDM, CWDM, DWDM), bidirectional transmission of optical signal in a single fibre with the use of optical circulators or fibre share by multiple users with the application of fibre optic splitters.

The above techniques are cheap and reliable methods of extending the use of fibre transmission potential.

OPTICAL MULTIPLEXING

Wavelength division multiplexing is based on multiple wavelength transmission via single fibre. It can be achieved with the use of passive optical components such as WDM, CWDM or DWDM multiplexers/demultiplexers. These devices provide different number of optical channels and different channel spacings.

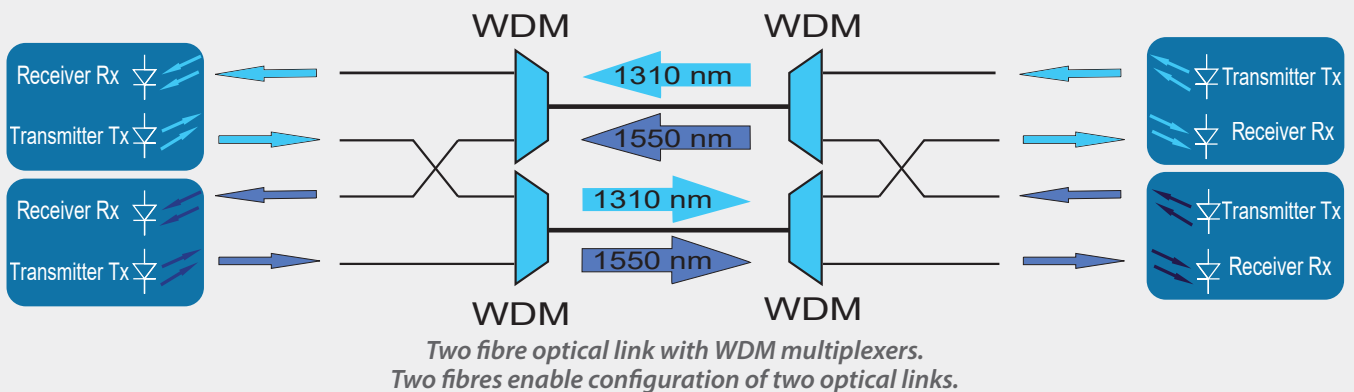
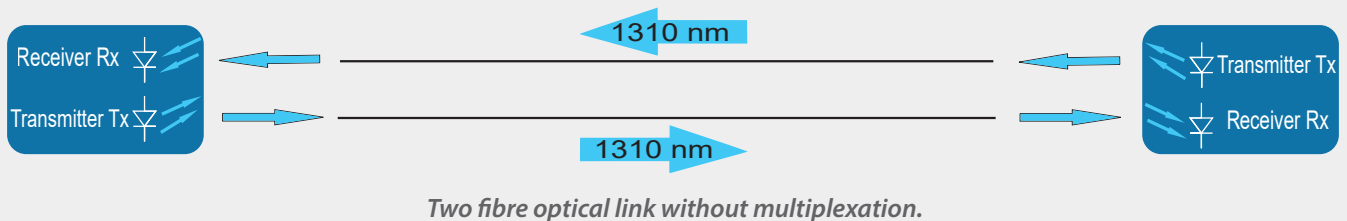
The WDM enables transmission of only two wavelengths in a single fibre. The most common wavelengths used in telecommunication transmission systems are 1310 nm and 1550 nm. The CWDM enables transmission of up to 18 channels with 20 nm channel spacing. Due to wide channel spacing the cheap laser transmitters can be used. WDM and CWDM are considered to be an inexpensive way of increasing the fibre optic network transmission capacity. The channel spacing in DWDMs is only 1.6 nm, 0.8 nm or even 0.4 nm. Due to very narrow channel spacing, application of expensive stabilised laser transmitters is required.

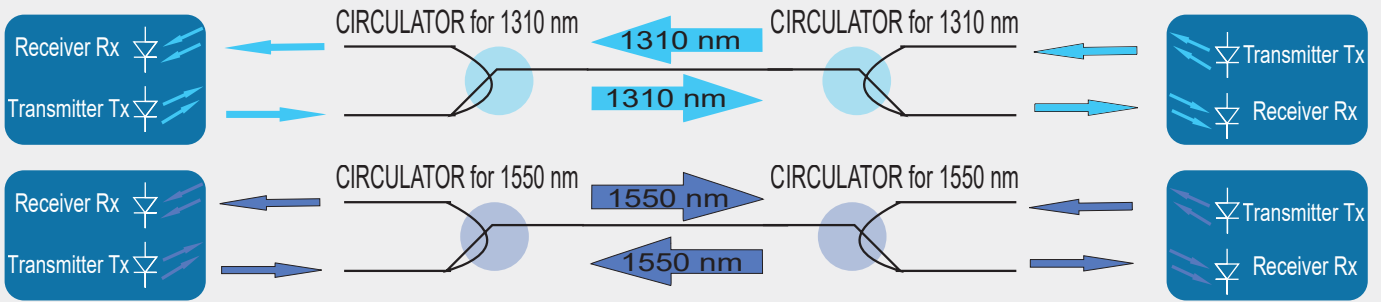
Another way of expanding the fibre transmission capacity is the application of optical circulators. These devices enable transmission of two signals with the same wavelength in opposite directions in a single fibre. Application of two circulators on both ends of a single fibre optic link allows to regain one fibre. This way the number of optical channels can be doubled. The bidirectional two fibre link can now be replaced with one fibre bidirectional link.

Application of passive optical devices is a very quick and cheap way of network development. Selecting passive components, special attention should be paid to choose the devices with high channel isolation. Low channel isolation, depending on the performance of active equipment, may lead to transmission malfunction. In case the isolation is insufficient there is a risk that the signal from the transmitter is received by the detector of the same device. In case of digital signal transmission OPTOMER recommends application of multiplexers with channel isolation equal to or higher than 45 dB.

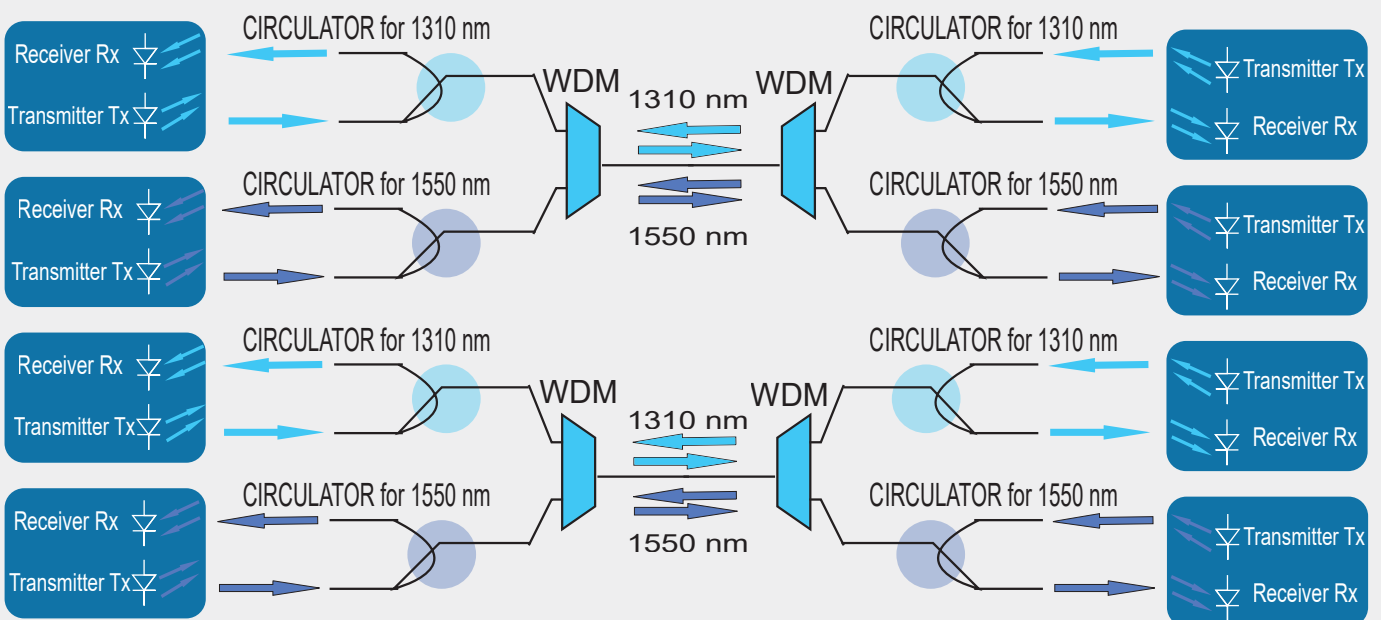
In order to simplify handling of passive components and their installation in existing optical distribution frames, OPTOMER offer passive optical components enclosed in LGX compatible modules with adapters mounted on the front plates, pigtailed MS modules as well as passive components installed on splice trays.

BASIC METHODS OF OPTICAL MULTIPLEXING

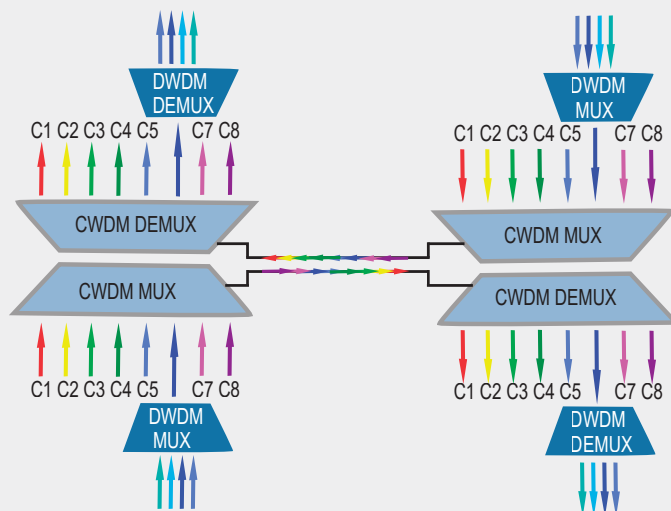




*A two fibre link with optical circulators.
Two fibres enable configuration of two optical links.*



*A two fibre link with a combination of optical circulators and WDM multiplexers.
Two fibres enable configuration of four optical links.*



A two fibre link with CWDM and DWDM multiplexers.

OPTICAL CIRCULATOR CR-3

FEATURES:

- bidirectional transmission of one wavelength in a single optical fibre
- doubles the wavelength capacity of a single optical fibre
- operating wavelengths: 1310 nm or 1550 nm
- increases network wavelength capacity without installation of new cables
- available in MPP0-1 LGX compatible module
- polarization independent

TECHNICAL SPECIFICATIONS:

Optical Circulator CR-3	
number of ports	3
operating wavelength [nm]	1310 lub 1550
insertion loss [dB]	0,8
channel isolation [dB]	≥50
PDL [dB]	≤0,1
PMD [ps]	0,05
return loss [dB]	≥50
maximum power of optical signal [mW]	500
operating temperature [°C]	0~+70
leads	typically 900 µm buffered fibre or mounted in MPP0-1
package dimensions	depend on the selected leads

NOTE: parameters in the above table are specified for unterminated device.



Cyrkulator optyczny CR-3
z leadsmi
włóknem 900 µm

CR-4, CR-8 MULTIPLEXER

FEATURES:

- 1310 nm and 1550 nm operating wavelengths
- increases network wavelength capacity without installation of new cables
- CR-4 module enables transmission of four wavelengths in a single fibre
- CR-8 module enables transmission of eight wavelengths in two fibres
- available in MPP0-1 LGX compatible module
- polarization independent

TECHNICAL SPECIFICATIONS:

	CR-4 Multiplexer	CR-8 Multiplexer
number of ports	5	10
operating wavelength [nm]	1310 i 1550	
insertion loss [dB]	1,6	
channel isolation [dB]	≥45	
PDL [dB]	≤0,25	
return loss [dB]	≥50	
maximum power of optical signal [mW]	500	
operating temperature [°C]	0~+70	
leads	mounted in MPP0-1	
package dimensions	depend on the selected leads	

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPP0-1-8/2xCR-1310/1550/K/E2A - four channel module, dedicated for two fibres, terminated with E-2000/APC connector



Four channel module dedicated for
two optical fibres

MUPLEKSER WDM

FEATURES:

- multiplexing/demultiplexing of two optical wavelengths
- transmission of two wavelength through a single optical fibre
- increases network wavelength capacity without installation of new cables
- available with 17 dB or 45 dB channel isolation grades
- the device is offered in MPP0-1 LGX compatible module

TECHNICAL SPECIFICATIONS:

Muplekser WDM		
operating wavelength range [nm]	1295~1325 and 1535~1565	
manufacturing technology	FBT	TFF
insertion loss [dB]	0,3	0,8
isolation [dB]	≥17	≥45
directivity [dB]	≥50	
PDL [dB]	≤0,1	
operating temperature [°C]	-40 ~ +85	
leads	250 µm fibre, 900 µm buffered fibre, 2 mm, 3 mm cables	
package dimensions	depend on the selected leads	

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPP0-1-2xWDM1x2/1310/1550/900/45/E2a - two WDM 1310/1550 nm multiplexers in MPP0-1 LGX compatible module, with six E2000/APC adapters, 45 dB isolation grade



1310/1550 nm WDM multiplexer with 900 µm buffered fibres



Two WDM multiplexers in MPP0-1 module

MUPLEKSER FWDM

FEATURES:

- two optical wavelengths multiplexer/demultiplexer
- 1550 nm wavelength add/drop function
- used in CATV optical networks
- offered in MPP0-1 LGX compatible modules

TECHNICAL SPECIFICATIONS:

Muplekser FWDM		
pass band [nm]	1550~1560	
reflected band[nm]	1260~1360 and 1480~1500	
insertion loss [dB]	common - pass	≤1,0
	common - reflected	≤1,0
isolation [dB]	common - pass λ	≥40
	common - reflected λ	≥30
return loss [dB]	≥50	
directivity [dB]	≥50	
PDL [dB]	≤0,2	
operating temperature [°C]	-40~+85	
leads	250 µm fibre, 900 µm buffered fibre, 2 mm, 3 mm cables	
package dimensions	depend on the selected leads	

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPP0-1-2XFWDM1X2/1310/1490/1550/900/SCA - two FWDM multiplexers in fulfilling LGX standard MPP0-1 closure, with six SC/APC adapters

WDM1x2/1310/1490/1550/900 - FWDM multiplexer with one meter of 900 µm fibre endings



Nine FWDM multiplexers in 19 inch patch panel

EWDM EDGE MULTIPLEXER

FEATURES:

- operating wavelength ranges: 1260 nm - 1360 nm, 1460 nm - 1620 nm
- used to add 8 CWDM channels to existing transmission systems utilising 1310 nm wavelength
- available in MPPO-1 LGX compatible modules

TECHNICAL SPECIFICATIONS:

EWDM EDGE MULTIPLEXER		
operating wavelength range [nm]		1260 – 1360
		1460 – 1620
type 1 [nm]	pass band λ_1	1260 – 1360
	reflected band λ_2	1460 – 1620
type 2 [nm]	pass band λ_1	1460 – 1620
	reflected band λ_2	1260 – 1360
insertion loss [dB]	pass band λ_1	<1,0
	reflected band λ_2	<1,0
channel isolation [dB]	reflected band λ_2	>40
	pass band λ_1	>20
channel uniformity [dB]	pass band λ_1	<0,5
	reflected band λ_2	<0,5
PDL [dB]		<0,2
directivity [dB]		<50
return loss [dB]		>45
maximum optical power [mW]		<300
operating temperature range [°C]		0 ~ +70

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPPO-1-2xEWDM1x2/1260 – 1360/1460 – 1620/900/SCA - two multiplexers EWDM in MPPO-1 housing, compliant with LGX standard, equipped with 6 adapters SC/APC

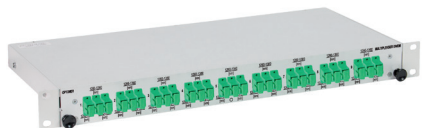
EWDM1x2/1260 – 1360/1460 – 1620/900 – EWDM multiplexer, 900 μ m buffered fibre leads, 1 m long



*EWDM Multiplexer
with 900 μ m buffered fibre leads*



*Two EWDM multiplexers
in MPPO-1 module*



*Nine EWDM multiplexers
in 19 inch patch panel*

CWDM MULTIPLEXER/DEMULTIPLEXER

FEATURES:

- up to 16 wavelengths in a single fibre
- 20 nm channel spacing
- increases network wavelength capacity without installation of new cables
- available in multiplexer, demultiplexer and add/drop multiplexer configurations
- offered in MPPO-1 LGX compatible modules

TECHNICAL SPECIFICATIONS:

CWDM Multiplexer/Demultiplexer		
number of optical channels	2, 4, 8 or 16	(2, 4, or 8) +broadband channel 1310 nm
operating wavelength range [nm]	1260~1620	
channel central wavelengths [nm]	1271, 1291...1471, 1491...1571, 1591, 1611	1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611
1310 nm channel wavelength range [nm]	-	1260~1360
channel spacing [nm]	20	
CWDM channels' band [nm]	$\lambda \pm 6,5$	
insertion loss (line - 1310 nm channel) [dB]	-	$\leq 0,8$
insertion loss (line - CWDM channel)	2-channel	$\leq 1,0$
	4-channel	$\leq 1,5$
	8-channel	$\leq 3,0$
	16-channel	$\leq 4,5$
channel uniformity [dB]	$\leq 0,5$	
isolation (demultiplexer) [dB]	adjacent channels	≥ 30
	non-adjacent channels	≥ 40
return loss [dB]	≥ 50	
directivity [dB]	≥ 50	
PMD [ps]	$\leq 0,2$	
PDL [dB]	$\leq 0,2$	
operating temperature [°C]	0 ~ +70	

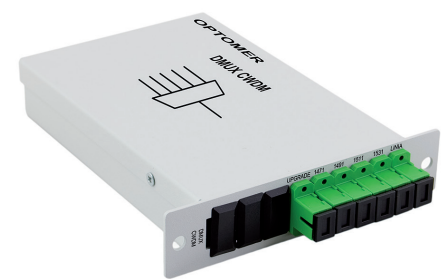
NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPPO-1-1xCWDM-4Ch-M-SCa - four channel CWDM multiplexer, in fulfilling LGX standard MPPO-1 closure, with five SC/APC adapters, channels according to client's demand



CWDM multiplexer with 900 μm buffered fibre leads



CWDM demultiplexer in MPPO-1 module



CWDM Multiplexer/Demultiplexer in 19inch patch panel

DWDM MULTIPLEXER/DEMULTIPLEXER

FEATURES:

- up to 16 wavelengths in a single fibre
- 100 GHz or 200 GHz channel spacing
- increases network wavelength capacity without installation of new cables
- Offered in MPPPO-1 closure, fulfilling LGX standard
- high temperature stability
- low insertion loss
- high channel isolation

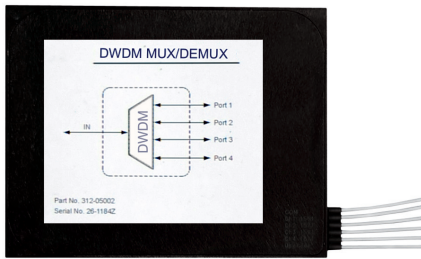
TECHNICAL SPECIFICATIONS:

DWDM MULTIPLEXER/DEMULTIPLEXER						
number of channels	4	8	16	4	8	16
filter type	100 GHz		200 GHz			
channel bandwidth [nm]	$\lambda \pm 0,11$		$\lambda \pm 0,25$			
max. insertion loss [dB]	2,5	3,5	4,8	2,2	3,3	4,6
channel uniformity [dB]	$\leq 1,5$					
adjacent channel isolation (demultiplexer) [dB]	≥ 25		≥ 30			
non-adjacent channel isolation (demultiplexer) [dB]	≥ 35		≥ 40			
PDL [dB]	$\leq 0,1$					
PMD [ps]	0,1					
directivity [dB]	≥ 55					
return loss [dB]	≥ 45					
central wavelength stability [nm/°C]	0,002					
thermal stability [dB/°C]	0,006					
maximum optical signal power [mW]	300					
operating temperature [°C]	-5 ~ +70					

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

PS-19/12-1xDWDM-4CH100-M/D-SCA – four channel DWDM multiplexer/demultiplexer in PS-19/12 patch panel, SC/



DWDM multiplexer with 900 μ m buffered fibre leads



DWDM Multiplexer/Demultiplexer in 19 inch patch panel

FBT COUPLERS

FEATURES:

- used for division of signal's optical power
- as a monolithic device, available with 1x2, 2x2, 1x3 and 1x4 configurations
- available symmetric or asymmetric power division
- standard spectral operation range is 1310 ± 40 nm and 1550 ± 40 nm
- offered in MPP0-1 closure, fulfilling LGX standard

TECHNICAL SPECIFICATIONS:

FBT Couplers with equal splitting ratio				
configuration	1x2	2x2	1x3	1x4
splitting ratio	equal			
operating wavelength range [nm]	1310±40 1490±10 1550±40		1310±40 1550±40	
insertion loss typical/maximum [dB]	3,4/3,7		5,8/6,2	6,6/7,4
return loss [dB]	55			
directivity [dB]	55			
PDL [dB]	0,2	0,2	0,25	0,25
operating temperature [°C]	-40 ~ +85			
leads	250 µm primary coated fibre, 900 µm buffered fibre, 2 mm, 3 mm cable			
package dimensions	depend on the selected leads			

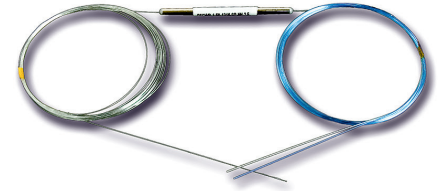
NOTE: parameters in the above table are specified for unterminated device.

FBT COUPLERS 1x2 asymetryczny		
splitting ratio	maks. insertion loss [dB]	PDL
1/99	23,0/0,25	0,20/0,05
2/98	19,0/0,30	0,20/0,05
5/95	15,0/0,45	0,20/0,10
10/90	11,3/0,65	0,15/0,10
20/80	7,85/1,25	0,15/0,15
30/70	6,00/2,00	0,15/0,15
40/60	4,70/2,70	0,15/0,15

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPP0-1-2-1x2-SCA - two 1x2 FBT couplers in MPP0-1 LGX compatible module with 6 SC/APC adapters
 SPL1x2/1316/900/SCA - 1x2 FBT coupler, equal splitting ratio, 1 m long SC/APC terminated 900 µm buffered fibre leads



FBT Coupler
 FBT Couplers with equal splitting ratio



FBT Coupler with 2 mm cable leads



Two 1x2 FBT couplers
 in MPP0-1 module

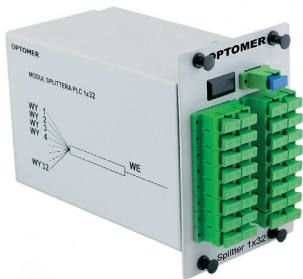
PLC SPLITTERS



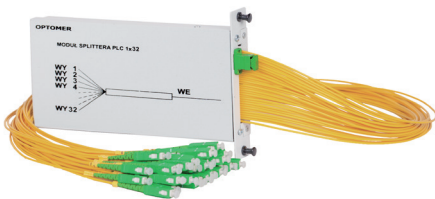
**1x32 PLC splitter
with ribbon fibre leads**



**1x8 PLC splitter
with 2 mm diameter cable leads**



**1x32 PLC Splitter
in MPP0-3 Module**



**1x32 PLC Splitter
in MPP0-1-MS-Z Module**

FEATURES:

- splits power of an optical signal
- available configurations: 1x2 up to 1x128
- available with equal splitting ratio
- available with equal splitting ratio
- operating wavelength range: 1260 nm to 1650 nm
- offered in MPP0-1 LGX compatible module

TECHNICAL SPECIFICATIONS:

	PLC SPLITTER					
	1x2	1x4	1x8	1x16	1x32	1x64
operating wavelength range [nm]	1260 ~ 1650					
max. uniformity [dB]	3,8	7,1	10,4	13,7	17	20,3
type. insertion loss [dB]	3,5	6,9	9,8	13,5	16,5	20,0
uniformity [dB]	0,4	0,7	1,0	1,3	1,6	1,9
return loss [dB]	≥55					
directivity [dB]	≥55					
max. PDL [dB]	0,2		0,3		0,4	
operating temperature [°C]	-40 ~ +85					
leads	250 µm fibre, ribbon, 900 µm buffered fibre, 2 mm cable					
package dimensions	depend on the selected leads i krotności podziału					

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

MPP0-2-1x16-SCA - 1x16 PLC splitter, equal splitting ratio in MPP0-2 LGX compatible module with SC/APC adapters
 SPL1x64/1316/2.0/64SCA - 1x64 PLC splitter, equal splitting ratio, 1 m long SC/APC terminated 2mm cable leads

ACCESS

FTTx

PON

OPTICAL ISOLATOR IZL

FEATURES:

- reduces reflection and backscattering on unterminated ports
- available as one stage and double stage
- polarisation independent
- low insertion loss
- high return loss
- high thermal stability
- mounted on splice trays, MPPPO or MS modules

TECHNICAL SPECIFICATIONS:

Isolator IZL		
isolation level	single stage	dual stage
central wavelength [nm]	1310 lub 1550	
operating band [nm]	±20	
minimum isolation at 23°C [dB]	28	45
typical insertion loss at 23°C [dB]	0,4	0,5
maximum return loss at -5°C do -7°C [dB]	0,6	0,8
manimum return loss [dB]	55/55	55/55
maximum PDL [dB]	0,05	0,1
maximum optical power [mW]	300	
operating temperature [°C]	-5~+70	

NOTE: parameters in the above table are specified for unterminated device.

ORDERING:

IZL1-13-300-90-SCA - single stage optical isolator, 1310 nm operating wavelength, 1 m long SC/APC terminated 900 µm buffered fibre leads

CATV



*Optical isolator
with 900 µm buffered fibre leads*

MPPO (LGX) HOUSING



LGX compatible MPPO modules

FEATURES:

- compliant with LGX standard
- mechanical protection for passive optical devices
- optical passive device terminals available on the module front plate, adapter standard upon request
- fixed in 1U, 2U, 3U PPO-1 frames to be installed in 19" racks or 19" cabinets
- fixed in PPO-48, PPO-72 frames to be installed in PSU-1 cabinets
- MPPO-1-MS, MPPO-1-MS-Z modules with connectorised cable leads on the panel front

TECHNICAL SPECIFICATIONS:

MPPO Housing				
	MPPO-1	MPPO-2	MPPO-3	MPPO-4
adapter capacity	10	18	34	66
dimensions width/height/depth [mm]	30/130/158	60/130/158	90/130/158	180/130/158
MPPO capacities, E-2000/SC terminations				
optical circulators CR-3	2 pcs	6 pcs	11 pc	22 pcs
optical circulators CR-4	1 pc	3 pcs	6 pcs	12 pcs
optical circulators CR-8	1 pc	3 pcs	6 pcs	12 pcs
WDM multiplexers	3 pcs	6 pcs	11 pc	22 pcs
CWDM/DWDM multiplexers/demultiplexers	one 8 channel MUX/DEMUX	one 8/16 channel MUX/DEMUX	one 16 channel MUX/DEMUX	-
FBT Couplers	3 pcs	6 pcs	11 pc	22 pcs
PLC Splitters	3 pcs 1x2 2 pcs 1x4 1 pc 1x8	1 pc 1x16	1 pc 1x32	1 pc 1x64

ORDERING:

MPPO-1 - LGX compatible module for passive optical components

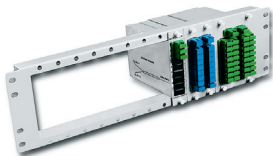
PPO FRAME



19" PPO-19/1U frame



19" PPO-19/2U frame



19" PPO-19/3U frame



PPO-48, PPO-72 frames

FEATURES:

- dedicated for LGX compatible MPPO modules
- for installation in 19" or 21"/23" racks or cabinets with the use of AD-19 adapters
- PPO-48, PPO-72 frames dedicated for MPPO modules installation in PSU-1 cabinets

TECHNICAL SPECIFICATIONS:

	PPO-19			PPO-48	PPO-72
	PPO-19/1U	PPO-19/2U	PPO-19/3U		
capacity	3 pcs MPPO-1	3 pcs MPPO-2 6 pcs MPPO-1	2 pcs MPPO-4 4 pcs MPPO-3 7 pcs MPPO-2 14 pcs MPPO-1	2 pcs MPPO-3 2 pcs MPPO-2 6 pcs MPPO-1	1 pcs MPPO-4 2 pcs MPPO-3 4 pcs MPPO-2 8 pcs MPPO-1

ORDERING:

PPO-19/1U - 19" 1U frame dedicated for installation of maximum 3 MPPO-1 modules



MS MODULE

FEATURES:

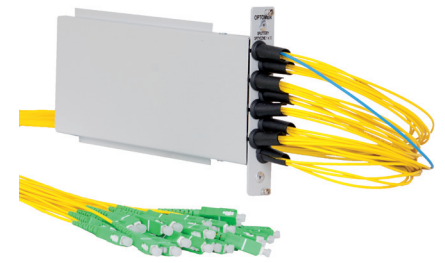
- mechanical protection for passive devices installed inside the module
- connectorised 2 mm diameter cable leads, connector standard upon request
- to be installed in PSM-19/144 frame

TECHNICAL SPECIFICATIONS:

MS Module			
dimensions width/height/depth [mm]		20/100/240	35/100/240
number of optical splitters per one MS module	1 x 2	8	-
	1 x 4	6	-
	1 x 8	4	-
	1 x 16	1	-
	1 x 32	1	-
	1 x 64	-	1
number of MS modules per one PSM-19/144 frame		21	14

ORDERING:

MS-1x8/3U - optical splitter module, 2 mm cable diameter, no connectors, dedicated for PSM-19/144 frame



MS Module



PSM-19/144 frame with MS modules

SPLICE TRAYS WITH SPLITTERS

FEATURES:

- mechanical protection for passive optical devices
- 250 µm fibre leads (dedicated for splicing), 900 µm buffered fibre terminated with customer defined connectors
- dedicated for installation in a wide range of ODFs and splice closures from OPTOMER product portfolio

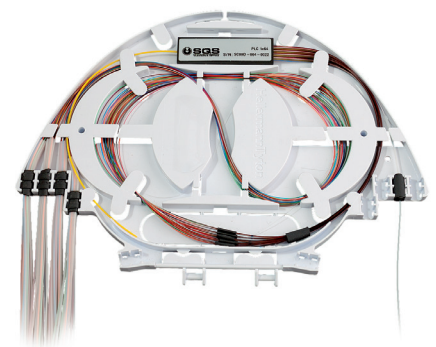
ORDERING:

KS-S-SPL1x1x4/1316/1.5m/900/5E2A - splice tray with built in 1x4 splitter, 1.5 m, 900 µm buffered fibre leads terminated with E-2000/APC connectors

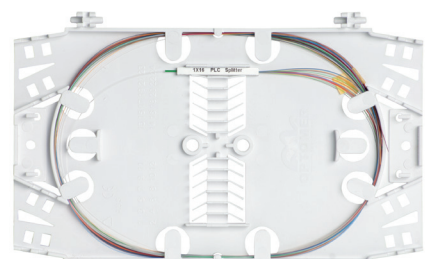
FTTx

PON

xWDM



KSH splice tray with built in PLC 1x16 splitter



KS-24 splice tray with built in PLC 1x16 splitter