



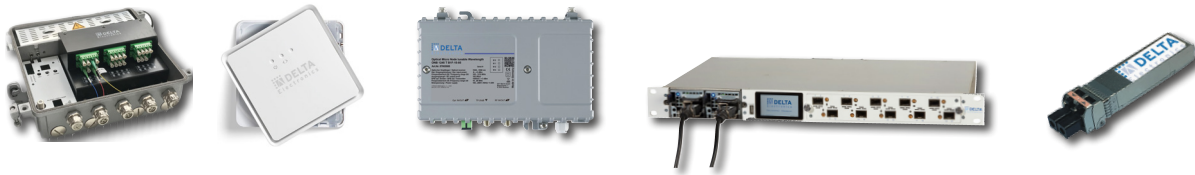
A SIMPLY
PERFECT
NETWORK.

OPTICAL NETWORKS

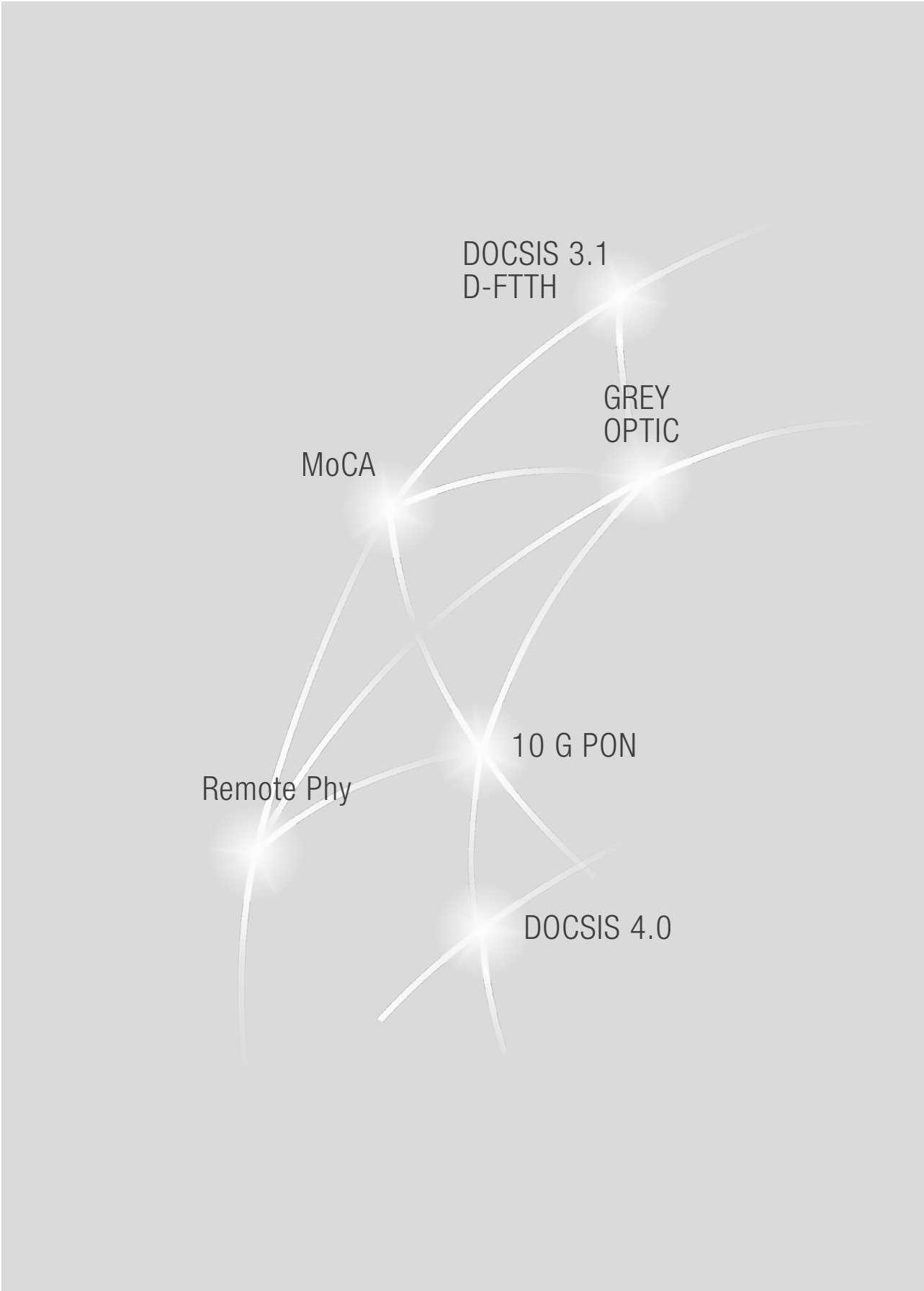


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O XFP TRANSMITTER CHASSIS AT A GLANCE



O XFP Chassis - Optical Transmitter

OT XFP
Broadcast



External modulated transmitter 1550nm
or
direct modulated transmitter 1550nm

OT XFP
Narrowcast



External modulated transmitter, tunable wavelength DWDM

OA XFP
Optical amplifier



Optical amplifier module
+17 dBm,
all DWDM wavelengths

OT XFP
HFC 1310 module



Direct modulated transmitter 1310nm
9/12dBm

Type	Item No.	Description
O XFP Chassis FP	57004248	Chassis, XFP-HF Transmitter, 1RU, 8 XFP-HF ports, front powered
O XFP Chassis BP	57004247	Chassis, XFP-HF Transmitter, 1RU, 8 XFP-HF ports, back powered
O UCH PS-AC	57003586	Power supply, AC 90-264 V
O UCH PS-DC	57003587	Power supply, DC 36-75 V
PC 012 MCX-FM	57003621	Patch cord 1.2 m, MCX male - F male, up to 2.5 GHz, 75 Ohm
PC 030 MCX(M)-F(M)	57004596	Patch cord 3 m, MCX male - F male, up to 2.5 GHz, 75 Ohm
OT XFP 1550 07 PC	57004451	XFP-RF TX-Module, Broadcast 1550nm, 1.2GHz, +7dBm, SBS 17 dBm, LC/PC
OT XFP DWDM PC	57004453	XFP-RF TX-Module, tunable wavelengths (ITU Grid), 1.2GHz, +4 dBm, LC/PC
OA XFP 16GF APC	57004493	XFP-RF EDFA-Module, 16 dBm., LC / APC, Gain Flattening filter integrated
OA XFP 17 APC	57004182	XFP-RF EDFA-Module, 17 dBm, LC /APC
OA XFP 17 PC	57004450	XFP-RF EDFA-Module, 17 dBm, LC /PC
OA XFP 19 APC	57004542	XFP-RF EDFA-Module, 19 dBm, LC / APC
OT XFP DM 1310 09	57004245	XFP-RF TX-Module, direct modulated Broadcast 1310nm, 1.2GHz, +9dBm, LC/APC
OT XFP DM 1310 12	57004246	XFP-RF TX-Module, direct modulated Broadcast 1310nm, 1.2GHz, +12dBm, LC/APC
OT XFP DM 1550 09	57004242	XFP-RF TX-Module, direct modulated Broadcast 1550nm, 1.2GHz, +9 dBm, LC/APC

0 XFP CHASSIS

PRODUCT FEATURES

- High-Density: 8 ports for 8 XFP-RF transmitters in 1 RU chassis
- Individual configuration of OMI, RF amplification, operating mode and SBS status for each of the 10 modules
- Energy efficient: maximally 6 W per module
- User-friendly web browser interface to set up and configure transmitters
- Ethernet SNMP port on the rear panel
- Compatible with SCTE HMS HE (MIB) specifications
- USB-port for firmware update
- Hot-pluggable redundant power supply AC or DC
- Power supply unit needs to be ordered separately
- Field-Replaceable Cooling Fan
- 8 x 75 Ω RF inputs on the rear of the chassis



APPLICATIONS

- 85 MHz to 1218 MHz RF- over fibre applications
- C- and L-Band transport and distribution
- All-Digital QAM networks
- Standard HFC- and RFoG networks
- DOCSIS 3.1 compatible
- Broadcast and Narrowcast services

The DELTA Electronics XFP Chassis is specifically designed around the new XFP transmitter module. The reduction of rack-spacing and power consumption in the headend is more than half in comparison to today's technologies.

Up to 8 XFP modules can be deployed in this 1 rack unit chassis and consume less than 50 W together.

KEY ADVANTAGES

- High Density: 8 transmitters / amplifier per rack-unit
- Power consumption per transmitter less than 6 W
- Redundant powering capability
- User-friendly web browser configuration tool

Via a web server, each XFP server can be individually monitored and controlled. The chassis can be integrated into the IP network via the Ethernet input.

The hot-pluggable power supplies are accessible from either the front or the rear. Redundantly connected, they protect the chassis against power failures.

Type		XFP Chassis
Item No.		57004248 (Power supplies, front) 57004247 (Power supplies, back)
RF Bandwidth	MHz	85 - 1218
RF Input level	dBμV	60 - 90 (per channel / Composite 87 - 112)
RF Flatness	dB	+/- 1.5
Return loss	dB	> 18
RF Input connection		F-Connector
RF Test point		Available for each Tx module
Dimensions		430 x 290 x 45
Operating temperature range	°C	-10 - +60
Storage temperature range	°C	-40 - 85
Power consumption	°C	50, max. (with 8 XFP modules)
Communications interfaces	W	Ethernet SNMP, RJ-45 on rear panel / USB port on front panel
Indicators	W	LED for each transmitter port (8) Composite power green/red Summary on OLED display

0 XFP TRANSMITTER 1550 nm

PRODUCT FEATURES

- DOCSIS 3.1 compatible with operating bandwidth up to 1218 MHz
- XFP form factor
- Direct modulated
- Transmission of up to 79 analogue plus 75 QAM channels
- Link distance of up to 35 km without optical amplification
- +9 dBm optical output Power
- LC/APC optical connection
- Power consumption < 3.5W
- Built- in digital diagnostic functions
- Compliant with SCTE 195 2013

APPLICATIONS

- Hybrid Fibre Coaxial (HFC) cable access networks
- Transmission of broadcast services
- RFoG technology



DELTA Electronics's XFP Transmitter is a pluggable optical module which can be fully loaded with 79 analogue AM-VSB channels plus 75 Digital QAM channels.

The direct modulated XFP transmitter is in a very small package. The small XFP module significantly increases the density and reduces power consumption for downstream transmitter which can be integrated into today's Hybrid-Fibre Coaxial (HFC) optical platforms and tomorrow's broadband infrastructure equipment.

The OT XFP 1550 09 transmitter modules can complement or replace today's legacy 1310 nm and 1550 nm broadcast transmitters.

Since the wavelength is at 1550 nm, the optical signal can be multiplexed with a legacy 1310 nm optical signal to cost-effectively double the capacity of the fibre to the nodes.

Due to lower fibre loss at 1550 nm, the 9 dBm transmitter can transport signals to a node over fibre up to 35 km regardless of optical dispersion thanks to the modern integrated external modulation technology.

Type	Item No.	Description
OT XFP DM 1550 09	57004242	XFP-RF TX-Module, direct modulated, Broadcast 1550nm, 1.2GHz, +9 dBm, LC/APC

TECHNICAL SPECIFICATIONS

Type		Min.	Typ.	Max.	Ref.
Optical					
OT XFP DM 1550 09	dBm	8.5		9.5	
Optical wavelength range	nm	1550		1558	
SBS suppression					
through 20 km of fibre	dBm			+14	1
through 40 km of fibre	dBm			+11	2
Electronical					
RF input level	dBμV	88	92	110	
Operating mode					AGC / MGC
MGC tuning range		-3		+3	

Notes:

1. SBS suppression measured with the following link: transmitter through EDFA, launch power of +14 dBm, 20 km of fibre, 0 dBm input power into receiver
2. SBS suppression measured with the following link: transmitter through EDFA, launch power of +11 dBm, 40 km of fibre, -1 dBm input power into receiver.

0 XFP TRANSMITTER 1310 nm

PRODUCT FEATURES

- DOCSIS 3.1 compatible with operating bandwidth up to 1218 MHz
- XFP form factor
- Direct modulated, no dispersion compensation required
- Transmission of up to 79 analogue plus 75 QAM channels
- Link distance of up to 35 km without optical amplification
- Transmitter version with +9 or +12 dBm Optical Output Power
- LC/APC optical connection
- Power consumption < 3.5W
- Built- in digital diagnostic functions
- Compliant with SCTE 195 2013

DELTA Electronics's XFP Transmitter is a pluggable optical module which can be fully loaded with 79 analogue AM-VSB channels plus 75 Digital QAM channels.

The direct modulated XFP transmitter is in a very small package. The small XFP module significantly increases the density and reduces power consumption for downstream transmitter which can be integrated into today's Hybrid-Fibre Coaxial (HFC) optical platforms and tomorrow's broadband infrastructure equipment.

APPLICATIONS

- Hybrid Fibre Coaxial (HFC) cable access networks
- Transmission of broadcast services
- RFoG technology



The OT XFP 1550 09 transmitter modules can complement or replace today's legacy 1310 nm and 1550 nm broadcast transmitters.

Since the wavelength is at 1550 nm, the optical signal can be multiplexed with a legacy 1310 nm optical signal to cost-effectively double the capacity of the fibre to the nodes.

Due to lower fibre loss at 1550 nm, the 9 dBm transmitter can transport signals to a node over fibre up to 35 km regardless of optical dispersion thanks to the modern integrated external modulation technology.

Type	Item No.	Description
OT XFP DM 1310 09	57004245	XFP-RF TX-Module, direct modulated, Broadcast 1310nm, 1.2GHz, +9dBm, LC/APC
OT XFP DM 1310 12	57004246	XFP-RF TX-Module, direct modulated, Broadcast 1310nm, 1.2GHz, +12dBm, LC/APC

TECHNICAL SPECIFICATIONS

Type		Min.	Typ.	Max.	Ref.
Optical					
Optical output level	dBm	8.5	9/12	12.5	
Optical wavelength range	nm	-3	1310	+3	
Electrical					
RF input level	dBμV	88		110	
Operating mode			92		
MGC tuning range		-3		+3	AGC / MGC

WAVELENGTH TUNABLE OT XFP DWDM TRANSMITTER

PRODUCT FEATURES

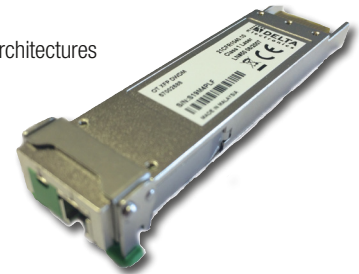
- DOCSIS 3.1 compatible with operating bandwidth up to 1218 MHz
- XFP form factor
- All-Digital 256 QAM loading up to 154 carriers
- Externally modulated, no dispersion compensation required
- SBS up to 20 dBm
- ITU channels adjustable at 100 GHz intervals (on request)
- Link distances up to 60 km
- LC/PC optical connection
- Power consumption < 3.5 W
- Built-in digital diagnostic functions
- Compliant with SCTE 195 2013

The DELTA Electronics XFP Transmitter is a pluggable optical module which can be fully loaded with 154 digital QAM channels. The external modulated XFP transmitter is in a very small package.

The small XFP module significantly increases the density and reduces power consumption for downstream transmitter which can be integrated into today's Hybrid-Fibre Coaxial (HFC) optical platforms and tomorrow's broadband infrastructure equipment.

APPLICATIONS

- Hybrid Fibre Coaxial (HFC) cable access networks
- 1550 nm Broadcast / DWDM Narrowcast overlay architectures
- All-Digital QAM networks



The wavelength of the transmitter can be tuned by the user within 500 ms. For this purpose there are up to 43 (on request) different Dense Wavelength Division Multiplexing wavelengths available. within the entire C-band.

This increases operational efficiencies in deploying DWDM networks and reduces inventory of transmitters at different fixed wavelengths.

Wavelength-Tunability also opens the possibility of novel HFC architectures that can dynamically route services and increases bandwidth capacity in the cable operator's access network.

Type	Item No.	Description
OT XFP 1550 07 PC	57004451	XFP-RF TX-Module, Broadcast 1550nm, 1.2GHz, +7dBm, SBS max. 17 dBm, LC/PC
OT XFP DWDM PC	57004453	XFP-RF TX-Module, tunable wavelengths (ITU Grid), 1.2GHz, +4 dBm, LC/PC

TECHNICAL SPECIFICATIONS

Type		Min.	Typ.	Max.	Ref.
Optical output power 9/125 SMF	dBm	6	7	8	
Optical wavelength range	nm	1529.55		1563.05	1
Optical wavelength spacing	GHz		100		2
RF input level	dBm	83		105	
Wavelength tuning time	seconds		0.5	3.0	
SBS suppression	dBm	13		20	3

Notes:

1. 57004453 ITU channel 21,22,24,26,28,33,36,39
2. Corresponds to approximately 0.8 nm
3. SBS suppression Item No. 57004451 fixed wavelength max. 17 dBm, Item No. 57004453 tuneable wavelength max. 14 dBm

0 XFP OPTICAL FIBRE AMPLIFIER 1550 nm

PRODUCT FEATURES

- DOCSIS 3.1 compatible
- XFP form factor
- High output power up to 17 dBm
- APC (automatic power control) and FLS (forced laser shutdown)
- LVTTL alarm
- Low power consumption
- Compatible with SCTE 195 2013



APPLICATIONS

- Compatible with DELTA Electronics XFP chassis
- Optimized for using in connection with OT XFP DWDM
- Broadcast and narrowcast application
- Narrowband amplification in C-band
- Amplification of DWDM-wavelengths in DWDM-networks due to integrated equalizer

The small, pluggable OA XFP DWDM is a full-functioning EDFA module with control circuitry packaged inside. It is totally compatible with the 0 XFP Chassis in respect of size and pin-map. Due to the small size and easy installation, the OA XFP DWDM is designed for single wavelength applications in fibre optic communication systems in core networks, access networks or CATV networks.

The OA XFP DWDM provides very stable output power of up to 17dBm and a noise figure of 6dB in C-band over a wide operating temperature range.

Over I²C all of the alarm-parameters such as output alarm, bias current, temperature and power supply can be analysed.

Type	Item No.	Description
OA XFP 16 AGC GF	57004493	XFP EDFA module, 16dBm optical output power, LC / APC, Gain Flattening filter integrated
OA XFP 17 APC	57004182	XFP EDFA module, 17dBm optical output power, LC/APC
OA XFP 17 PC	57004450	XFP EDFA module, 17dBm optical output power, LC/PC
OA XFP 19 APC	57004542	XFP EDFA module, 19dBm optical output power, LC / APC

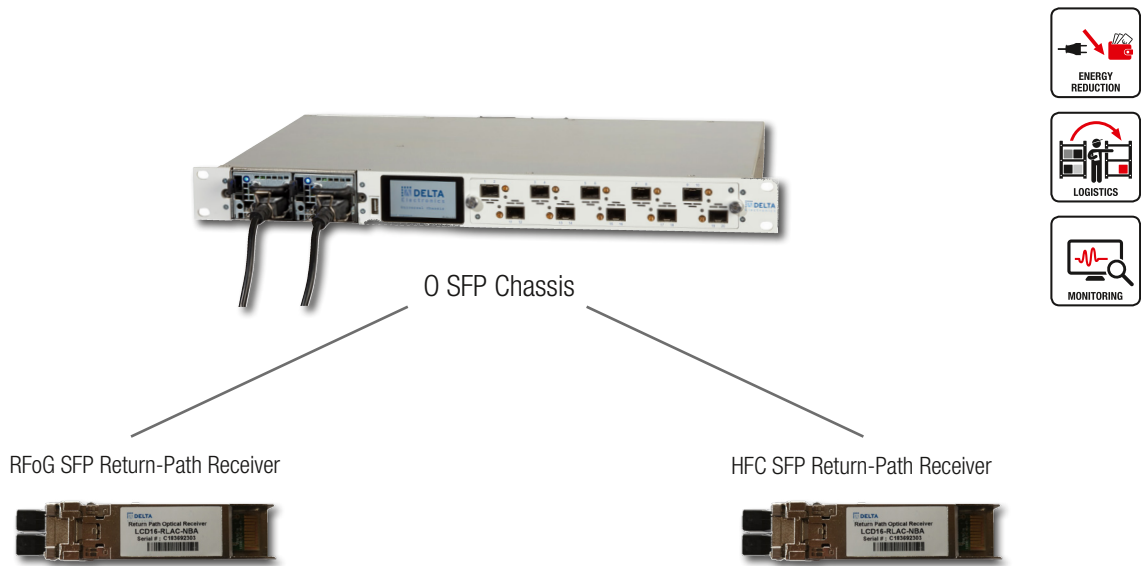
TECHNICAL SPECIFICATIONS

Type	Min.	Typ.	Max.	Ref.
OA XFP 17 optical output power	16.5		17.5	1
Tuning range	13.6		17.4	4
Optical output power adjustment range	-5		10	2 / 3
Multi wavelength gain flatness			+9	
Noise figure	5	5.5	6	
Optical isolation	30			5
Return loss	40			6
Optical interface 57004182	LC/APC			
Optical interface 57004450	LC/PC			

Notes:

1. Minimum optical input of 0 dBm at wavelength of 1555 nm. Operating at maximum output power.
2. Minimum optical input of -5 dBm at wavelength from 1528.77 nm to 1563.45 nm.
3. Optical amplifier is controlled using constant output power mode which maintains fixed output power regardless of optical input power.
4. Optical output power is adjustable.
5. Peak-to-peak for multiple wavelength signals from 1554.5 nm to 1561.0 nm. For OA XFP 17, optical input at + 9.0 dBm and optical output at + 17.0 dBm.
6. Test Conditions: Optical input power of + 6.0 dBm, optical wavelength =1555 nm, room temperature.

O SFP RECEIVER CHASSIS AT A GLANCE



Type	Item No.	Description
O SFP Chassis	57003439	SFP Chassis
O SFP Chassis / FP	57003764	SFP Chassis front powered
OR SFP H	57003440	HFC SFP Return-Path Receiver
OR SFP L	57003441	RFoG SFP Return-Path Receiver
O UCH PS-AC	57003586	Power supply for O SFP-Chassis AC
O UCH PS-DC	57003587	Power supply for O SFP-Chassis DC
PC 012 MCX-FM	57003621	Patch cord 1.2 m, MCX male - F male, up to 2.5 GHz, 75 Ohm
PC 030 MCX(M)-F(M)	57004596	Patch cord 3 m, MCX male - F male, up to 2.5 GHz, 75 Ohm
O SFP PR	57003971	Pull relief MCX connector

0 SFP CHASSIS

PRODUCT FEATURES

- High-Density: up to 10 SFP modules (20 Rx) in 1 RU chassis
- Energy Efficient: less than 1.5 W per return-path receiver module
- Hot-pluggable redundant power supply AC/DC
- Ethernet SNMP port on the rear panel
- USB-port for firmware update
- User-friendly GUI to monitor and configure the plugged-in modules
- Field-Replaceable Cooling Fan
- 20x75 Ω MCX RF outputs on the rear panel
- Power supply, MCX-F Adapter and Pull relief MCX connector need to be ordered separately



APPLICATIONS

- DOCSIS 3.1 compatible
- Headend / Street cabinet equipment
- Full DOCSIS upstream range coverage 5 to 204 MHz

The DELTA Electronics SFP Chassis enables the operator to pack 20 Return-Path Receivers in one 1RU chassis. The Chassis can be installed into the 19" Rack or in a telecom street cabinet.

10 SFP modules can be inserted into the chassis simultaneously that support RFoG / HFC network.

The embedded web server allows monitoring and controlling each SFP receiver. The chassis can be connected to the internal network using the Ethernet port.

Key Advantages

- DOCSIS 3.1
- Power consumption per receiver module less than 1.5 W
- HFC / RFoG networks compatible

The redundant power supply in the chassis makes a smooth power switching in case of a power outage.

The power supply can be provided in AC/AC, AC/DC, and DC/DC options. This gives a complete power redundancy solution in Headends or Hubs.

RFoG / HFC SFP RETURN - PATH RECEIVER

PRODUCT FEATURES

- DOCSIS 3.1 upstream compatible with operating bandwidth up to 204 MHz
- SFP module with two optical return-path receiver
- Automatic (AGC) and manual (MGC) RF level control
- 1260 nm to 1620 nm wavelength range
- LC / APC
- Power consumption < 1.5 W / module



The SFP has a very low power consumption, achieves a very high return path receiver density and it is compatible to DOCSIS 3.1 upstream.

The low power range SFP module is used for RFoG applications and the high power range SFP module is used for HFC applications.

Type		RFoG / OR SFP L	HFC / OR SFP H
RF			
RF bandwidth	MHz	5-204	
RF output level	dBμV	98 dBμV @ -22 ... -9 dBm @ OMI 8%/CH, QAM256, 8 MHz, rs: 6.9 MBaud	98 dBμV @ -9 ... +2 dBm @ OMI 8%/CH, QAM256, 8 MHz, rs: 6.9 MBaud
(3 dB Booster activated)		94 dBμV @ -22 ... -9 dBm @ OMI 5%/CH, QAM256, 8 MHz, rs: 6.9 MBaud	94 dBμV @ -9 ... +2 dBm @ OMI 5%/CH, QAM256, 8 MHz, rs: 6.9 MBaud
RF output stability	dB	± 1 dB @ OMI 8%/CH ± 1 dB @ OMI 5.7%/CH	
Attenuator	dB	31.5; 0.5 dB steps	
RF flatness	dB	± 0.75	
RF isolation	dB	57	
RF connectors		MCX	
Optical			
Wavelength	nm	1260...1620	
Optical inputs	dBm	-22...-7	-15...2
Equivalent input noise	pA√/Hz	<3	
Input return loss US	dB	45	
Connectors		LC/APC	
General			
Remote management		Web GUI / SNMP V2c (Ethernet port)	
1 RU 19" chassis power supply		110...240 VAC (50...60Hz) and/or -72 ... -36 VDC	
SFP power consumption	W	1.2	
Operating temperature	°C	0...+55	
Storage temperature	°C	-40...+85	
Dimensions	mm	286 x 482.6 x 43.6	
Enclosure classification		IP 20	

PLATFORM FOR DOCSIS 3.1

SFP / XFP Headend System



FEATURES

- || „Pay as you grow“
- || 1 Plattform and multiple slide-in cassettes
- || SFP Receiver Rx
- || SFP Digital Receiver RxD
- || XFP Transmitter Tx



GATEWAY FTTx

OHR - Optical Hybrid Repeater



FEATURES

- || OBI-free for 16 US receivers
- || Pluggable MDR with up to 32 ports
- || Upgrade to full optical
- || Optional integrated patch panel



MDR 0-MISO



FEATURES

- || Highest density in 1 RU
- || Best performance in DOCSIS 3.1



FTTC / ONC



FEATURES

- || Output level 107 dBµV
- || N + O architecture

OPTICAL NODES

ONB-T

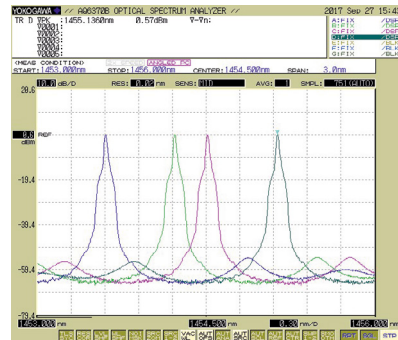


FEATURES

- Output level 103 dBμV
- 16 λ out of 4 types OBI-free
- Less power consumption



1 λ - 4 subchannels



FTTB / ONB



FEATURES

- RF Output level 103 dBμV
- HFC or RFoG networks

FTTH / ONH



FEATURES

- Selectable output 78 / 93 / 97,5 dBμV

OFT-DT



FEATURES

- Self-installation
- Various technologies (D,G,S)
- Output level 65/75 dBμV



OFT-D



ERBIUM DOPED FIBRE AMPLIFIER - EDFA

APPLICATIONS

- Optical amplification for the wavelength of 1550nm
- Realization of vast HFC- and RFoG-networks
- Decentral signal distribution / amplification in FTTx / xPON-networks
- CATV-overlay in FTTx and xPON-networks



PRODUCT FEATURES

- High optical output power of +18dBm or +21 dBm at each output port (other optical output levels on request)
- Optical attenuator up to 6 dB in 0.1 steps is integrated
- Optical MEMS switch for redundancy is integrated
- Up to 64 possible optical outputs
- Integrated optical isolation of the downstream wavelength of 1550 nm and all other possible wavelengths in upstream for the realization of standard-RFoG, CWDM-RFoG- or GPON-networks
- Low insertion loss in DS&US and high isolation of DS&US (>50dB)
- Low noise figure
- Parameter-Display: input/output optical power, pump-bias, temperature and voltage
- Supports SNMP monitoring and WebGUI
- Redundant power supply
- 19" rack version, 1 RU for up to 8 outputs and 2 RU for 16, 32 and 64 outputs



Typ	Item No.	Number of outputs	Optical output/ port (dBm)	W=WDM Filter	Connector CATV port	Connector xPON port	Connector COM port	Power supply	Front/back powered
OA 1-21-LA-GF	57004494	1	21				LC/APC		BP
OA 08-21-W-SA-LP-LA-DC	57004419	8	21	W	SC/APC	LC/PC	LC/APC	DC	BP
OA 04-18-LA-DC	57004449	4	18				LC/APC	DC	BP
OA 04-21-W-SA-LP-LA	57004295	4	21	W	SC/APC	LC/PC	LC/APC		BP
OA 08-21-W-SA-LP-LA	57004294	8	21	W	SC/APC	LC/PC	LC/APC		BP
OA 16-21-W-SA-SP-SA	57002009	16	21	W	SC/APC	SC/PC	SC/APC		BP
OA 32-21-W-SA-LP-LA-DC	57004317	32	21	W	SC/APC	LC/PC	LC/APC	DC	BP
OA 32-21-W-SA-LP-LA	57003982	32	21	W	SC/APC	LC/PC	LC/APC		BP
OA 64-21-W-SA-LP-LA	57004170	64	21	W	SC/APC	LC/PC	LC/APC		BP
OA 64-0-W-SA-LP-LA-DC	57004546	64	0	W	SC/APC	LC/PC	LC/APC	DC	BP



Type 19" , 1 or 2 RU
Up to 64 optical outputs

TECHNICAL SPECIFICATIONS

Performance		Min.	Typ.	Max.	
Optical features	Optical input wavelength (λ)	nm	1540	1550	1562
	Optical input level	dBm	-5	3	10
	Optical output power (at each output)	dBm		14-21	tunable
	Number of ports		1		64
	Noise ratio	dB			5.5
	Polarization dependent loss	dB		0.1	
	Polarization dependent gain	dB			0.5
	Insertion loss (DS&US)	dB	0.6	0.9	1.6
	(1550nm in DS, CWDM/ 1550 in US)				
	Isolation DS/US	dB		> 50	
Optical Switch (MEMS)	Insertion loss	dB	0.5		
	Switching time	ms	5		
General features	Remote management		Web GUI / SNMP V2 (Ethernet port)		
	Power supply	V AC	170	230	264
		VDC	40	48	57
	Power input	W			50
	Operating temperature	°C	-5		+55
	Storage temperature	°C	-20		85
	Dimensions	mm		240 x 482 x 44/88	
	Weight	kg		8	11

High isolation between DS/US necessary. Example:

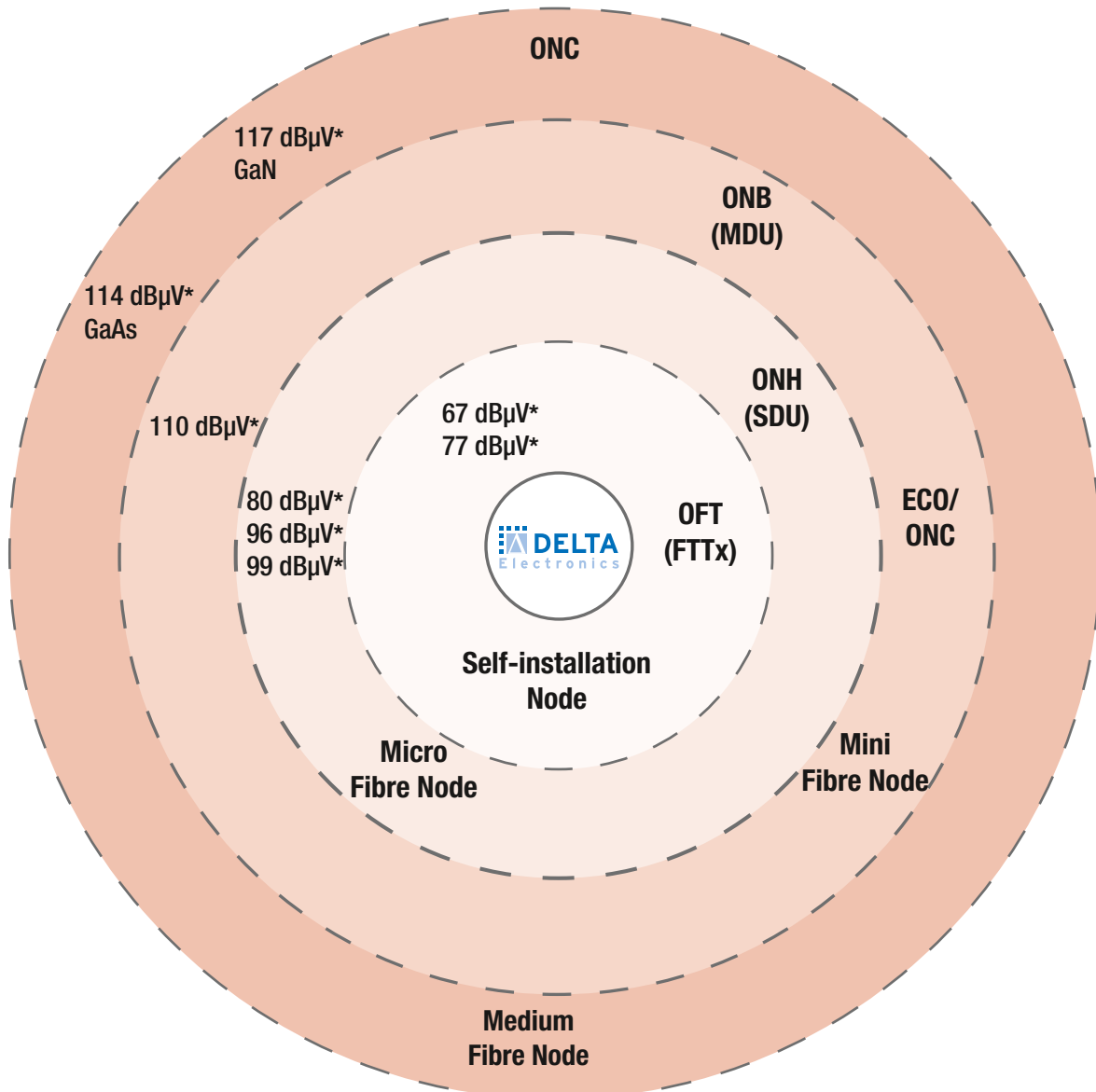
Return receiver (Rx) Input power (dBm)	Gain and isolation DS / US		Optical DS performance at the input of the Upstream-Rx	
	21 dB	30 dB		-9 dBm (noise) -29 dBm (noisefree)
	21 dB	50 dB		

PRODUCT OVERVIEW OPTICAL NODES

As a specialist for HFC- and RFoG-networks, DELTA Electronics offers a wide range of optical nodes. They are optimized for the individual applications at different locations. With the smallest optical nodes also a low number of users can be connected to the RFoG-network. Residential districts can be connected to the optical network with bigger nodes such as the ONB or ONC in a redundant concept.

The decision for a certain optical node depends on several factors:

- Level of the maximum RF-loss after the optical node (passive splitters, length of coaxial cable, etc.)
- Number of fibres for down- and upstream
- Applied wavelength in both directions
- Operating mode of the laser (Burst- or Continuous-mode)
- Existing DOCSIS standard and DOCSIS operation in upstream (channel bonding)
- Remote-control with FOSTR-A (new RFoG Standard): DS ON/OFF, Burst Mode ON/OFF, Ingress Detection Switch 0 / 6 / 45 dB



*CENELEC : CTB,CSO > 60 dB

PRODUCT OVERVIEW OPTICAL NODES ACCESSORIES

Type	Item No.	Description
FOSTRA F V2 868.VER	57004089	FSK Receiver RX : 868.3 MHz
FOSTRA F V2.1 Tuneable VER	57003909	FSK Receiver RX : 860 - 890 MHz
FOSTRA F V2.5 Tuneable VER	57004321	FSK Receiver RX : 860 - 890 MHz
RLK 565-1	57002732	Diplexer, 5-65 / 85 - 1218 MHz
RLK 585-1	57002733	Diplexer, 5-85 / 105 - 1218 MHz
RLK 5200	57002776	Diplexer, 5-204 / 258 - 1218 MHz
VM 302	57002092	Splitter, two-way, 4.5 dB
AM 301-10 A	57002093	Tap 10 dB, Tap out
AM 301-10 B	57002117	Tap 10 dB, Line out
LPF 5-65	57002295	Low pass filter 5-65 MHz
LPF 5-85	57002296	Low pass filter 5-85 MHz
HPF 85-1	57002297	High pass filter 85-1218 MHz
HPF 105-1	57002298	High pass filter 105-1218 MHz
PAD 0/1...20	10161523/24...43	Attenuation PAD 0 dB/1 dB...20 dB

Available CWDM wavelengths					
27: 1270 nm	31: 1310 nm	41: 1410 nm	51: 1510 nm	61: 1610 nm	00: only DS (CATV)
29: 1290 nm	33: 1330 nm	43: 1430 nm	53: 1530 nm		
	35: 1350 nm	45: 1450 nm	57: 1570 nm		
	37: 1370 nm	47: 1470 nm	59: 1590 nm		
	39: 1390 nm	49: 1490 nm			

OPTICAL FIBRE TWIST NODE / RECEIVER

- Self-installation fibre node /receiver
- One base unit
- Various interfaces available (DOCSIS / GPON)



OFT **xx** - **12xx** - **xx** - **xx**

US wavelength		Frequency range		FOSTRA		
D:	67 dBµV fix	all CWDM except 1530-1570	65:	5-65/85	F:	FOSTRA module integrated
D1:	77 dBµV fix		85:	5-85/105	FT:	FOSTRA tunable module integrated
D2:	80 dBµV fix (only 1 output)		20:	2-204/258		
DT	no OFT form factor					

Typ	OFT D1	OFT D	OFT D RX	OFT DT	OFT G	OFT GC
Item-No.	57003998/ 57004565/ 57004566 / 57004567 57004568	57003336 / 57003570 / 57003923 / 57003924 / 57003922/57004482/ 57004483/57004484	57003573	57004027	57003574	57003575
	DOCSIS 3.1 Interface	DOCSIS 3.1 Interface	RF Overlay (5 ... 1218 MHz)	DOCSIS 3.1 Interface	GPON Interface	GPON Interface
Full Digital load*1	DS / US 77 dBµV fix	DS / US 67 dBµV fix	75 dBµV fix	DS / US 77 dBµV fix	DS / US	DS / US + RF Overlay

*1 Digital: EN 60728-3, 119 CH, 262-1214MHz, flat

Electrical and general data

Type	typ.	Remarks
Power supply type	external 12V	
Power cord type	Female	
Power consumption	V / W	11 ... 17, typ. 12 / 4.5
Power indicator	green LED on	
Brightness of diodes	4 levels	
Ambient temperature	°C	-20 ... +55
Output impedance	Ω	75
Safety requirements	acc. EN 60728-11	
EMC conditions	acc. EN 50083-2	
Protective system	IP 20	
Immunity to surge voltages	kV	2
MTBF	h	~ 200000
Conformity	CE	

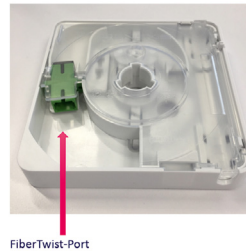
Mechanical data

Type	typ.	Remarks
Dimensions	mm	110 x 110 x 46
Optical port		1
DC power port		1
RF port		2

Fibre Twist box
SC / APC connector
P/NTK 18-001 2.0 DC JACK
75 Ohm F-female

Additional Accessory

Type	Item No.
FTU Fibre twist unit for wall mounting	57003555



FiberTwist-Port

Downstream Receiver

Type		OFT D OFT D1/D2/T	OFT D RX	Remarks
Optical wavelength	nm	1545-1565		other on request
Integrated WDM filter		yes	no	Bidi module
Equivalent input noise current density (NCD)	pA/√Hz	typ.3		
Responsivity R of photodiode	A/W	0.95		
Optical input power range	dBm	-8 ... 2		green LED on: within this range
Optical input return loss	dB	45		
Optical RX diode		PIN		
Optical level control (OLC)	dBm	-7 ... 1		
Frequency range	MHz	105 /258 ... 1218	47 ... 1218	fixed diplexer OFT D /D1/D2/DT 12xx
Ripple	dB	typ. +/- 0.5		
Gain tolerance over temperature	dB	max. +/- 1.5		
RF output level (full digital load) *1	dBμV	67 / OFT D1/T/RX: 77/D2:80		
Return loss RF output		≥18 - 1.5/Okt.		Reference 85 - 1218 MHz
DS Signal indications	dB	Diode in the middle : „ V „ (DS) - on/off (green LED)		blink: level to high, on: level ok, off: level to low

*1 Digital: EN 60728-3, 119 CH, 262-1214MHz, flat

Upstream Transmitter

Type		typ.	Remarks
Laser wavelength	nm	1610, 1470, 1450, 1410	
Optical power	dBm	3	
Laser type		Isolated DFB	
Relative intensity noise (RIN)	dB/Hz	< -160	
Laser turn-on time	nsec.	450	acc. IEC 60728-14
Laser rise time	nsec.	300	acc. IEC 60728-14
Laser turn-off delay time	nsec.	600	acc. IEC 60728-14
Frequency range	MHz	5 ... 85 / 204	depending on fixed diplexer
Ripple	dB	max. +/- 0.3	
Optical output return loss	dB	45	
Laser turn on RF level	dBμV	90	
Return loss RF input	dB	≥ 18	5 - 85 / 204 MHz
OMI per channel		10 % @ 99 dBμV	8 x 256 QAM / 8 MHz
Uplink signal indications		Diode on the right: “^” (US) blink: burst mode (green LED)	

OPR -OPTICAL PICO RECEIVER

The OPR is designed by DCT DELTA to terminate the CATV-signal in FTTH networks. The new OPR includes an additional passive filter to separate and forward the xPON signal to an xPON port. The implemented automatic gain control "AGC mode" keeps the RF output level constant for a wide optical input range. A tri-color LED emits red, green and yellow light and show in which range the optical connected power is.



Features

- RF output level of 76 dBuV @OMI=4% per channel
- Complete surge suppression circuit, anti-lightning strike and surge shock prevention ability
- Stable and reliable AGC control function
- Tri-color LED shows the range of the optical input power to the mFN-WF Node
- Total power consumption below 2.0W

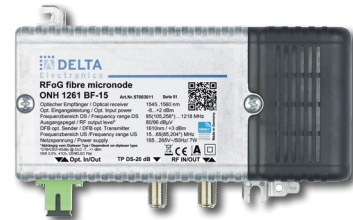
OPR-CATV-PON			
Optical Parameter	Receiving optical wavelength	nm	250 ~ 1620
	Receiving optical power	dBm	+2 ~ -16
	Optical reflection loss	dB	≥ 45
	Optical filter insertion loss	dB	max. 1.5
	LED optical monitoring display	dBm	Red > 2 dBm Yellow ≤ -8 dBm +2dBm ≥ green > -8 dBm
	Connector		LC/APC
RF Parameter	Frequency range	MHz	47 ~ 1006 / 1218
	Output RF impedance	Ohms	75
	Flatness	dB	+/-1
	RF return loss	dB	≥ 18
	Nominal output electrical level	dBuV	76 +- 2dB
	AGC control accuracy	dBm	-12 ~ +2
General	MER	dB	≥36 (93 DVB_c 256 QAM)
	External switch power		Input: 100 ~ 240VAC 50 – 60Hz Output: 5VDC 1A (12 V optional)
	Consumption	W	≤2.0W
	Operation temperature	°C	-20 ~ +60
	Operation humidity		20% ~ 90%, No Condensation
	IP safety class		IP 20
	Mechanical dimension	mm	118.6 x 78.6 x 29
	Colour		White
Optical feed-through xPON filter integrated		Compatible with GPON, XG(S)-PON, NG-PON2 PTP	

Type	Item No.	Description
OPR-12-LC-PON	57004228	Optical Pico Receiver with integrated feed-through xPON filter, LC/APC connectors
OPR-12-SC	57004272	Optical Pico Receiver with integrated xPON blocking filter, SC/APC connectors

RFoG MICRO NODE

Micronode for RFoG networks, FTTH/FTTB applications

- || Extremely low noise optical receiver
- || Constant RF output level at wide optical input power range
- || OLC function based on optical input power
- || Interstage attenuator and slope
- || Optical input power indicator and monitoring LED's
- || RF input and output test point
- || Ultra low noise DFB- laser with isolator in burst mode operation
- || Internal WDM filter US/DS wavelength for RFoG applications
- || Upstream available from 1270nm to 1610nm at CWDM grid to avoid OBI
- || Remote controllable in US due to FOSTRA-F receiver module



VERSIONS

ONH 12 xx Bx -xx -xx F

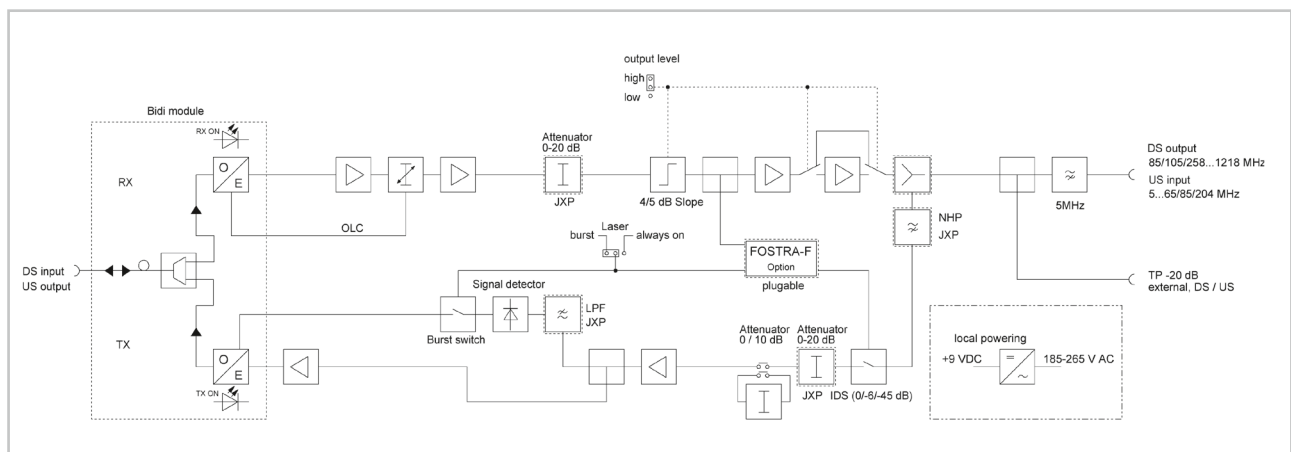
SDU 1/2 (single dwelling unit)

Frequency range (MHz)	US-wavelength	Laser operation, monitoring	DS-wavelength	Duplexer (MHz)	FOSTRA F
12: Up to 1218 MHz	all CWDM except of 1530-1570 nm	B: Burst und Continuous-Mode 1: 99 dBμV*1 / 97,5 dBμV*2 _: 96 dBμV*1 / 93 dBμV*2 S: 80 dBμV*1 / 78 dBμV*2	15: 1550 nm 13: 1310 nm (on request)	65: 565-1 (5-65/85) 85: 585-1 (5-85/105) 20: 5200 (5-204/258)	:- F: integrated FOSTRA F module FT: Integrated FOSTRA F module tunable

*1 CENELEC : CTB,CSO > 60 dB

*2 Digital: EN 60728-3,119 CH, 262-1214MHz, flat

Type	ONH 1200	ONH (R) 12xx BSF-xx	ONH 12xx BF-xx	ONH 12xx B1F-xx
Description	Optical Micro-Receiver, RX:1270-1620nm, 40-1218 MHz, (without return path)	DS: 1550nm US: CWDM	DS: 1550nm US: CWDM	DS: 1550nm US: CWDM
CENELEC*1	96 dBμV RF-Output level	80 dBμV RF-Output level	80/96 dBμV RF-Output level	99 dBμV RF-Output level
Digital*2	93 dBμV RF-Output level	78 dBμV RF-Output level	78/93 dBμV RF-Output level	97,5 dBμV RF-Output level



OPTICAL SYSTEMS

Type	ONH 12xx BSF-xx		ONH 12xx BF-xx		ONH 12xx B1F-xx	
Applications	FTTH, FTTB, DOCSIS-PON, RfOG					
Compact die-cast housing	mm	153 x 95 x 53 / IP 20, In-door				
Weight	kg	0.7				
Fibre connectors	SC/APC					
RF connectors	F-female					
Mains feeding	V~/ W	< 4.6	200...240 (50-60 Hz) / < 7.3		< 9.2	
Operating temperature	°C	-20...+55, free convection				
Adjustment elements	PAD and Jumper					
Internal WDM (Tx / Rx)	nm	DS / US				
Downstream	Optical wavelength	nm	1540...1565			
	Optical input power	dBm	-8...+1			
	Frequency range	MHz	85, 105, 204	85...1218		
	Frequency response	dB	± 0.75, max. ± 1			
	Optical level control (OLC)	dBm	-7...+1 (RF-output level ± 1 dB)			
	RF output level (CENELEC) *1	dBµV	80	80/96 (selectable)		99
	RF output level (digital) *2	dBµV	78	78/93 (selectable)		97.5
	C/N	dBc	50 @ -3 dBm, OMI 4%			
	RF level attenuator	dB	0...20 (PAD, 1 dB steps)			
	RF slope	dB	0 / 4 / 5 (switchable by jumper)			
	Test point RF output	dB	-20 (F-female, external)			
	Monitoring optical input	dBm	Green LED on: input -8...+2, flashing when > +2			
	Upstream	DFB-laser / optical power	dBm	3		
Laser operation		Burst Mode (Laser "Delay-Time" ≤ 0,8 µsec) SCTE compliant				
RF input dynamic range		dBµV	61...91 ("Laser ON"@ Min. input RF-Level 67 dBµV)			
Frequency range		MHz	5...85/105/204			
OMI per channel		8% @ 70 dBµV				
RF input level attenuator	dB	0...20 (PAD, 1 dB steps), 0 / 10 dB Jumper Att.				
Monitoring	HEC 2191 Controller	FSK-TX				
	FOSTRA F Control module	FSK Receiver				

*1 CENELEC : CTB,CSO > 60 dB

*2 Digital: EN 60728-3, 119 CH, 262-1214MHz, flat

Exemplary item numbers

Type	Item No.	Description
ONH 1200	57003016	Optical Micronode 96 dBµV, 5-1218 MHz
ONH 1237 BSF-15-20	57003263	1370 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, FOSTRA-F prepared, 80 dBµV
ONH 1239 BSF-15-20	57003264	1390 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, FOSTRA-F prepared, 80 dBµV
ONH 1245 BSF-15-20	57003216	1450 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, FOSTRA-F prepared, 80 dBµV
ONH 1257 BSF-15-20	57003221	1570 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, FOSTRA-F prepared, 80 dBµV
ONH 1261 BSF-15-85/FOSTRA	57003107	1610 in US, 1540-1565 in DS, 230 V~, 105-1218 MHz, incl. FOSTRA-F module, 80 dBµV
ONH 1229 BF-15-85	57002996	1290 in US, 1540-1565 in DS, 230 V~, 105-1218 MHz, FOSTRA-F prepared, 96dBµV
ONH 1257 BF-15-85	57003009	1570 in US, 1540-1565 in DS, 230 V~, 105-1218 MHz, FOSTRA-F prepared, 96dBµV
ONH 1261 BF-15-20/FOSTRA	57003113	1610 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, incl. FOSTRA-F module, 96dBµV
ONH 1261 BF-15-85/FOSTRA	57003112	1610 in US, 1540-1565 in DS, 230 V~, 105-1218 MHz, incl. FOSTRA-F module, 96dBµV
ONH 1227 B1F-15-65/FOSTRA	57003061	1270 in US, 1540-1565 in DS, 230 V~, 85-1218 MHz, incl. FOSTRA-F module, 99dBµV
ONH 1241 B1F-15-65/FOSTRA	57003068	1410 in US, 1540-1565 in DS, 230 V~, 85-1218 MHz, incl. FOSTRA-F module, 99dBµV
ONH 1251 B1F-15-65/FOSTRA	57003073	1510 in US, 1540-1565 in DS, 230 V~, 85-1218 MHz, incl. FOSTRA-F module, 99 dBµV
ONH 1257 B1F-15-65/FOSTRA	57003075	1570 in US, 1540-1565 in DS, 230 V~, 85-1218 MHz, incl. FOSTRA-F module, 99 dBµV
ONH 1261 B1F-15-20/FOSTRA	57003156	1610 in US, 1540-1565 in DS, 230 V~, 258-1218 MHz, incl. FOSTRA-F module, 99 dBµV

MINI FIBRE NODE

Mini Node for HFC and RFoG networks

FTTH / FTTB- Applications

- One fibre design with integrated CWDM filter *
- Constant output level over a wide range of optical input power
- OLC-function based on optical input power
- ONB T with up to 4 Sub-channels per one CWDM wavelength
- Low-noise CWDM DFB-Laser with Burst and CW-Mode (SCTE compliant)
- Testpoint and monitoring LED for optical input power
- Upstream with diplexer RLK565-1/585-1 selectable
- RF-testpoints for Upstream and Downstream
- Remote controllable in DS & US due to FOSTRA-F receiver module
- Optional remote power
- Available with GPON-Bypass



see ONB T on the image

* Special type 2-Fibre without CWDM on request



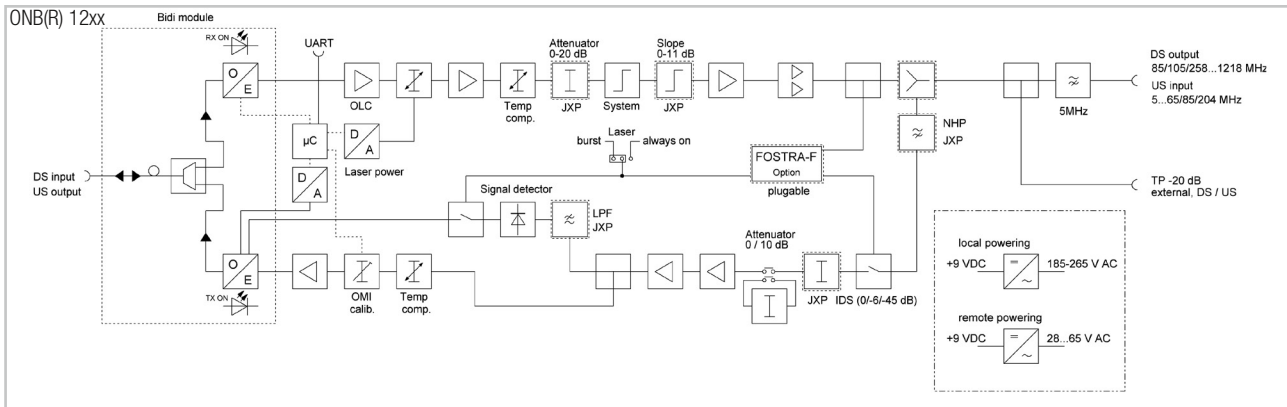
VERSIONS

ONB R 12xx Bx - xx - x - xx F

MDU 1/2 (multiple dwelling unit)

Powering (V~)	Frequency range (MHz)	US-wavelength	Laser operation, monitoring	DS-wavelength	Number of fibres	Diplexer (MHz)	FOSTRA F
-: Local powering 200-240 V~	12: Up to 1218 MHz	all CWDM except of 1530-1570 nm	B: Burst und Continous mode 1: Output level 110 dBµV 110 dBµV*1 / 107,5 dBµV* T : Tunable wavelength	15: 1550 nm 10: 1270 nm (on request)	1: One fibre for US and DS 2: Each 1fibre for US and DS	65: RLK 565-1 (5-65/85) 85: RLK 585-1 (5-85/105) 20: RLK 5200 (5-204/ 258)	-: F: Integrated FOSTRA F module FT: Integrated FOSTRA F module tunable

Type	ONB (R) 1200	ONB (R) 12xx B1F-X	ONB (R) 12xx T B1F-X
Description	Optical Mini receiver	DS: 1550nm / 1310nm US: CWDM	DS: 1550nm US: CWDM Subchannels
CENELEC*1	85...1218 MHz 110 dBµV RF-Output level	85...1218 MHz 110 dBµV RF-Output level	85...1218 MHz 110 dBµV RF-Output level
Digital*2	105 dBµV RF-Output level	105 dBµV RF-Output level	105 dBµV RF-Output level



Type	ONB 12xx B1F		ONB 12xx T B1F	
Applications	HFC, FTTC, DOCSIS-PON, RFoG			
Compact die-cast housing	cm	188 x 85 x 50 / IP 20, In-door	207 x 150 x 80 / IP53	
Weight	kg	0.9	1.8	
Fibre connectors	SC / APC: 1 pcs (with internal WDM), 2 pcs (without internal WDM)			
RF connectors	F-female			
Mains feeding	V~/W	200...240 (50-60 Hz) / 10,4	200...240 (50-60 Hz) / 11,5	
Operating temperature	°C	-20...+55 Free convection		
Adjustment elements	PAD and Jumper			
Internal WDM (Tx / Rx)	DS / US			
Downstream	Optical wavelength	nm	1540...1565	
	Optical input power	dBm	-8...+2	
	Frequency range	MHz	85...1218 (modular)	
	Frequency response	dB	± 0.75, max. ± 1	
	Optical level control (OLC)	dBm	-7...+1 (RF-output level ± 1 dB)	
	RF output level (CENELEC) *1	dBµV	110	
	RF output level (digital) *2	dBµV	105	
	C/N	dBc	50 @ -3 dBm, OMI 4%	
	RF level attenuator	dB	0...11 (PAD)	
	RF slope	dB	0...20 (PAD, 1 dB steps)	
Test point RF output	-20 (F-female, external)			
Monitoring optical input	dBm	Green LED on: input -8...+2, flashing when > +2		
Upstream	DFB Laser / optical power	dBm	+3 *3	
	Laser operation	Burst Mode, Laser „Delay-Time“ < 1 µSec		
	Wavelength	CWDM	1450, 1470, 1510, 1610	
	Number of Sub-channels	0	4	
	RF input dynamic range	dBµV	61...91 („Laser ON“ @ 67 dBµV)	
	Frequency range	MHz	15...204	
OMI per Channel	8% @ 70 dBµV			
RF input level attenuator	dB	0...20 (PAD, 1 dB steps), 0 / 10 dB Jumper Attn.		
Monitoring opt. output	Green LED on: Output power available			
Monitoring	HEC Controller	FSK-TX		
	FOSTRA F Control module	FSK Receiver		

*1 CENELEC : CTB, CSO > 60 dB

*2 Digital: EN 60728-3, 119 CH, 262-1214MHz, flat

*3 ONB12xx B1F also with +6 dBm on request

VERSIONS

Please use the following item numbers when ordering:

Type	Item No.	Description
ONB 1200	57003154	Optical Mini-Node 1260...1620 nm, 47...1218 MHz, -8...+2dBm
ONB 1227 B1F-15-20	57003925	1270 in US, 1545-1565 in DS, 230 V~, 15-204 MHz, FOISTRA-F prepared
ONB 1231 B1F-15-85	57003038	1310 in US, 1545-1565 in DS, 230 V~, 105-1218 MHz, FOISTRA-F prepared
ONB 1241 B1F-15-20	57003932	1410 in US, 1545-1565 in DS, 230 V~, 15-204 MHz, FOISTRA-F prepared
ONB 1247 B1F-15-20	57003935	1470 in US, 1545-1565 in DS, 230 V~, 15-204 MHz, FOISTRA-F prepared
ONB 1253 B1F-15-65 FT	57003690	1530 in US, 1545-1565 in DS, 230 V~, 15-65 MHz, incl. FOISTRA-F Tunable module
ONB 1257 B1F-15-85	57003050	1570 in US, 1545-1565 in DS, 230 V~, 105-1218 MHz, FOISTRA-F prepared
ONB 1259 B1F-15-85	57003051	1590 in US, 1545-1565 in DS, 230 V~, 105-1218 MHz, FOISTRA-F prepared
ONB 1261 B1F-15-65/FOISTRA	57003151	1610 in US, 1545-1565 in DS, 230 V~, 85-1218 MHz, inkl. FOISTRA-F Modul
ONB 1261 T B1F-15-20	57004543	1610 in US, 1545-1565 in DS, 28-65 V~, 15-204 MHz, FOISTRA-F prepared
ONB 1261 T B1F-15-65	57004191	1610 in US, 1545-1565 in DS, 28-65 V~, 15-65 MHz, FOISTRA-F prepared
ONBR 1200	57004215	Optical Mini-Node 1260...1620 nm, 85...1218 MHz, -8...+2dBm
ONBR 1237 B1F-15-85	57004334	1370 in US, 1545-1565 in DS, 230 V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1243 B1F-15-85	57004047	1430 in US, 1545-1565 in DS, 230 V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1245 T B1F-15-85	57004017	1450 in US, 1545-1565 in DS, 28-65V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1247 T B1F-15-85	57004018	1470 in US, 1545-1565 in DS, 28-65V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1251 B1F-15-85	57004051	1510 in US, 1545-1565 in DS, 230 V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1251 T B1F-15-85	57004019	1510 in US, 1545-1565 in DS, 28-65V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1259 B1F-15-85	57004052	1590 in US, 1545-1565 in DS, 230V~, 15-85 MHz, FOISTRA-F prepared
ONBR 1261 T B1F-15-85	57003965	1610 in US, 1545-1565 in DS, 28-65V~, 15-85 MHz, FOISTRA-F prepared

MEDIUM FIBRE NODE FOR HFC / FTTx

A Fibre Node for the modernisation of HFC-networks. Especially suitable for FTTLA in 1.2 GHz HFC-networks and reduction of the coaxial cluster.

- Compact node with modular return way laser 1x1
- High RF output level and dynamic range, 2 outputs
- Low noise impedance receiver
- Low noise DFB- laser in burst or CW mode operation
- Optical level control (OLC) based on optical input power
- 7-Segment display for various monitoring options and easy control
- Optional remote power
- Internal fibre splice management
- Return way transmitter available in CWDM-grid (1270 - 1610nm)
- Remote controllable in DS & US due to FOSTRA-F receiver module



VERSIONS

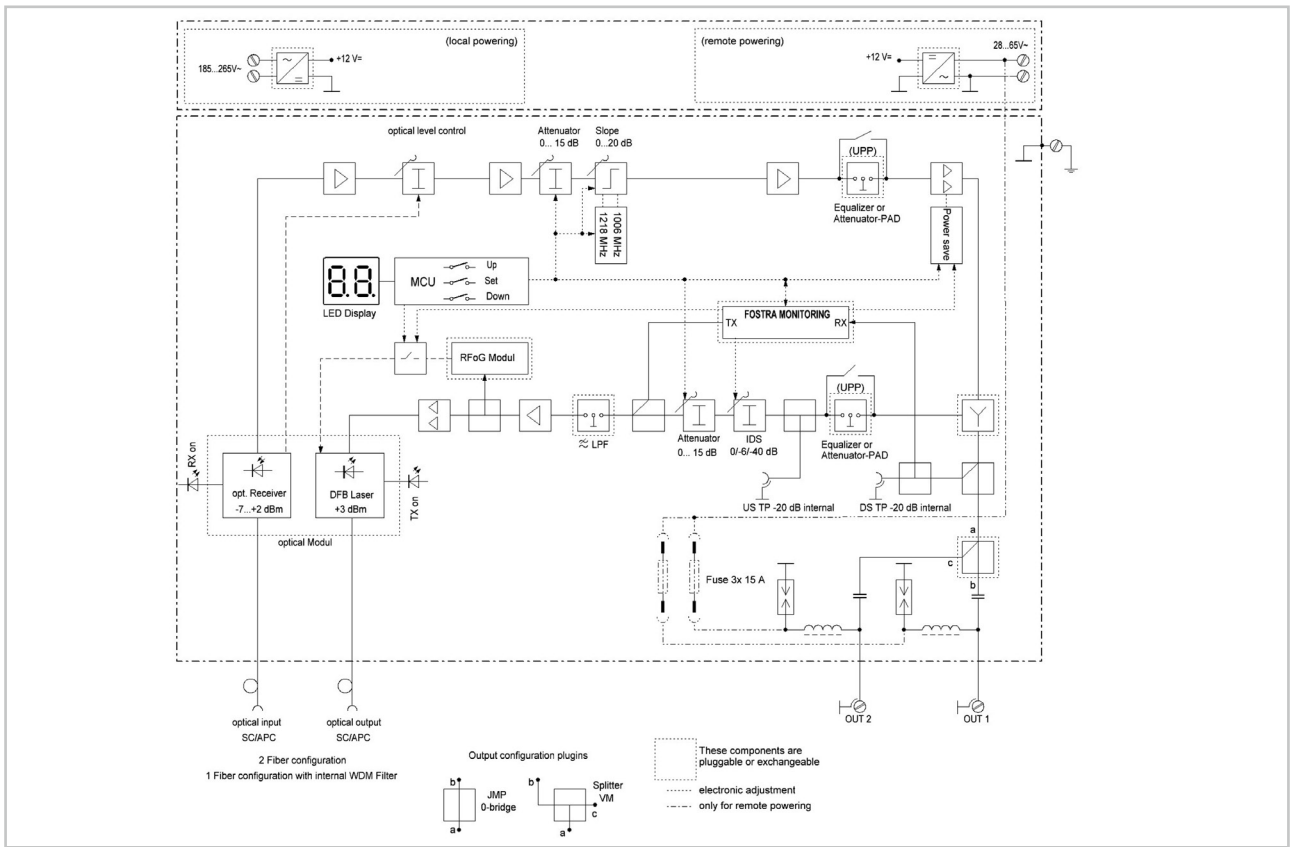
ONC R 12 xx - xx - x - xx - ECO

Powering (V~)	Frequency range (MHz)	US-wavelength	DS-wavelength	Number of fibres	Diplexer (MHz)	Power Consumption
-: Local powering 200-240 V~	12: up to 1218 MHz	all CWDM except of 1530-1570 nm	15: 1550 nm	1: one fibre for US and DS	65: RLK 565-1 (5-65/85)	- : 17 W
R: Remote powering 28-65 V~			10: 1260-1620 nm	2: one fibre for US and one fibre for DS	85: RLK 585-1 (5-85/105) 20: RLK 5200 (5-204/ 258)	ECO: 11 W GN: 21 W

Type	ONC (R) 12xx F ECO	ONC (R)1200	ONC (R) 12xx F	ONC (R) 12xx F GN
Description	DS: selectable US: CWDM 85...1218 MHz RF-output level	Optical receiver 85...1218 MHz RF-output level	DS: selectable US: CWDM 85...1218 MHz RF-output level	DS: selectable US: CWDM 85...1218 MHz RF-output level
CENELEC*1	111 dBµV	114 dBµV	114 dBµV	117 dBµV
Digital*2	107 dBµV	109 dBµV	109dBµV	113 dBµV

*1 CENELEC : CTB,CSO > 60 dB

*2 Digital: EN 60728-3,119 CH, 262-1214MHz, flat



Type		ONC ECO	ONC(R) 1200, ONC (R) 12xx F	ONC GN	
Applications		HFC, FTTC/FTTLA			
Compact die-cast housing	mm	225 x 195 x 95 / IP 65, out-door			
Fibre connectors (internal)		SC/APC (internal fibre slice management)			
Connectors		PG 11-RF output , PG 13.5 (optical fibre feed-through)			
Mains feeding	V~	200...240 (50-60 Hz)			
Mains feeding	W	11	17	21	
Remote feeding	V~	28...65			
Operating temperature	°C	-20...+55			
OLC	dBm	-7...+1 (RF output ±1dB)			
Adjustment elements	dB	0...15 (electronically adjustable in 1dB steps, 7-segm.display+micro)			
Return laser module		various available (3,6dBm DFB)			
RF outputs		1 or 2 (with 2-way splitter or tab module 10 or 20 dB)			
Downstream	Optical wavelength	nm	1260 ...1620		
	Optical input power	dBm	-8...+2		
	RF return loss	dB	≥ 20 -1.75/Okt. (65 - 1218 MHz) ≥ 20 -2/Okt. (85 - 1218 MHz) ≥ 20 -3/Okt. (204-1218 MHz) min 12 @ 1218 MHz		
	Frequency range	MHz	85...1218 MHz		
	Frequency response	dB	± 0.7 max. ±1		
	RF output level				
	(CENELEC) *1	dBµV	110	114	117
	(digital) *2	dBµV	107	109	113
	C/N	dBc	50 @ -3 dBm, OMI 4%		
	RF slope	dB	0...15 dB (electronically adjustable in 1dB steps)		
	RF level adjustment	dB	0...15 dB (electronically adjustable in 1dB steps)		
	RF test point	dB	-20 (internal)		
	Monitoring optical input	dBm	green LED on: input -8...+2, flashing when > +2		
	Optical input power		7-segment display, power meter function		
Upstream	Laser wavelength	nm	1270 - 1610		
	Optical Power	dBm	3		
	Optical return loss	dB	60		
	Frequency range	MHz	5...65 / 85 / 204 (Diplexer RLK 565-1 / 585-1 / 5200)		
	RF input level (CWDM)	dBµV	65, OMI 8% @ 0 dB attn		
	RF input level attenuator	dB	0...15 (electronically adjustable in 1 dB steps)		
RF test point	dB	-20 (internal)			

*1 CENELEC : CTB, CSO > 60 dB

*2 Digital: EN 60728-3, 119 CH, 262-1214MHz, flat

Please use the following item numbers when ordering:

Type	Item No.	Description
ONC 1200	57002895	Optical compact receiver, 5-1200 MHz, 230 V~
ONC 1231 F-15-1-65	57003236	1310 in US, 1540-1565 in DS, 230 V~, 85-1218 MHz, 1 fibre, FOISTRA-F vorbereitet
ONC 1255 F-10-1-65	57003950	1550 in US, 1260-1620 in DS, 230 V~, 85-1218 MHz, 1 fibre, FOISTRA-F prepared
ONC 1261 F-10-1-85	57003941	1610 in US, 1260-1620 in DS, 230 V~, 105-1218 MHz, 1 fibre, FOISTRA-F prepared
ONC 1231 F-10-2-65	57003242	1310 in US, 1260-1620 in DS, 230 V~, 85-1218 MHz, 2 fibres, FOISTRA-F prepared
ONC 1259 F-10-2-85	57004571	1590 in US, 1260-1620 in DS, 230 V~, 105-1218 MHz, 2 fibres, FOISTRA-F prepared
ONC 1261 F-10-2-20	57003174	1610 in US, 1260-1620 in DS, 230 V~, 105-1218 MHz, 2 fibres, FOISTRA-F prepared
ONC 1261 F-10-2-65	57003172	1610 in US, 1260-1620 in DS, 230 V~, 85-1218 MHz, 2 fibres, FOISTRA-F prepared
ONC 1261 F-10-2-85	57003173	1610 in US, 1260-1620 in DS, 230 V~, 105-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1200	57002896	Optischer Kompaktreceiver, 5-1200 MHz, 28-65 V~
ONCR 1227 F 15-1-85	57002897	1270 in US, 1540-1565 in DS, 28-65 V~, 105-1218 MHz, 1 fibre, FOISTRA-F prepared
ONCR 1239 F-15-1-85	57002903	1390 in US, 1540-1565 in DS, 28-65 V~, 105-1218 MHz, 1 fibre, FOISTRA-F prepared
ONCR 1261 F-15-1-20	57004195	1610 in US, 1540-1565 in DS, 28-65 V~, 285-1218 MHz, 1 fibre, FOISTRA-F prepared
ONCR 1231 F-10-2-20	57004083	1310 in US, 1540-1565 in DS, 28-65 V~, 258-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1241 F-10-2-85	57003969	1410 in US, 1540-1565 in DS, 28-65 V~, 105-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1245 GN-10-2-10FT	57004633	1450 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1249 GN-10-2-10FT	57004635	1490 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1251 F-10-2-20	57004084	1510 in US, 1540-1565 in DS, 28-65 V~, 285-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1251 GN-10-2-10FT	57004636	1510 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1253 F-10-2-20	57004085	1530 in US, 1540-1565 in DS, 28-65 V~, 285-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1253 GN-10-2-10FT	57004637	1530 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1255 F-10-2-20	57004086	1550 in US, 1540-1565 in DS, 28-65 V~, 285-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1257 F-10-2-20	57004087	1570 in US, 1540-1565 in DS, 28-65 V~, 285-1218 MHz, 2 fibres, FOISTRA-F prepared
ONCR 1257 GN-10-2-10FT	57004638	1570 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1261 10-2-10-6FT	57004647	1610 in US, 1540-1565 in DS, 28-65 V~, 126-1218 MHz, 2 fibres, incl. FOISTRA-F Tunable module
ONCR 1261 F-10-1-85ECO	57004315	1610 in US, 1540-1565 in DS, 28-65 V~, 105-1218 MHz, 1 fibre, FOISTRA-F prepared, ECO Mode
ONCR 1261 F-15-1-65-ECO	57003171	1610 in US, 1540-1565 in DS, 28-65 V~, 85-1218 MHz, 1 fibre, FOISTRA-F prepared, ECO Mode
ONCR 1261 F-15-1-65-ECO	57004197	1610 in US, 1540-1565 in DS, 28-65 V~, 85-1218 MHz, 1 fibre, FOISTRA-F prepared, ECO Mode
ONCR 1261 F-15-1-85ECO	57004223	1610 in US, 1540-1565 in DS, 28-65 V~, 105-1218 MHz, 1 fibre, FOISTRA-F prepared, ECO Mode
ONCR 1261 F-10-2-85-ECO	57004217	1610 in US, 1260-1620 in DS, 28-65 V~, 105-1218 MHz, 2 fibres, FOISTRA-F prepared, ECO Mode

OPTICAL COMPACT HEADEND

Basic unit with 2 pluggable modules



Pluggable modules

Module 1

Type	Transmitter Tx module
Description	Optical transmitter, 5 ... 2400MHz

Module 2

Type	Receiver Rx module
Description	Optical receiver, 5 ... 2400 MHz

Optical Compact Headend

- Compact Optical Headend with 2 pluggable modules
- Bandwidth 5 ... 2400 MHz
- Ready for analogue PAL TV channels, SAT QPSK distribution and QAM channels
- RF Input level attenuator 0-15 dB (indication and setting on LED display, 1 dB steps)
- Monitoring optical output: green LED (output power available)
- Fibre connectors: SC / APC
- RF connectors F female
- LNB Power supply 12.8 V / max. 500 mA
- Compact die-cast housing 225 x 190 x 86 mm
- Operating voltage VAC 200 - 240
- Weight 2 kg

Possible combinations

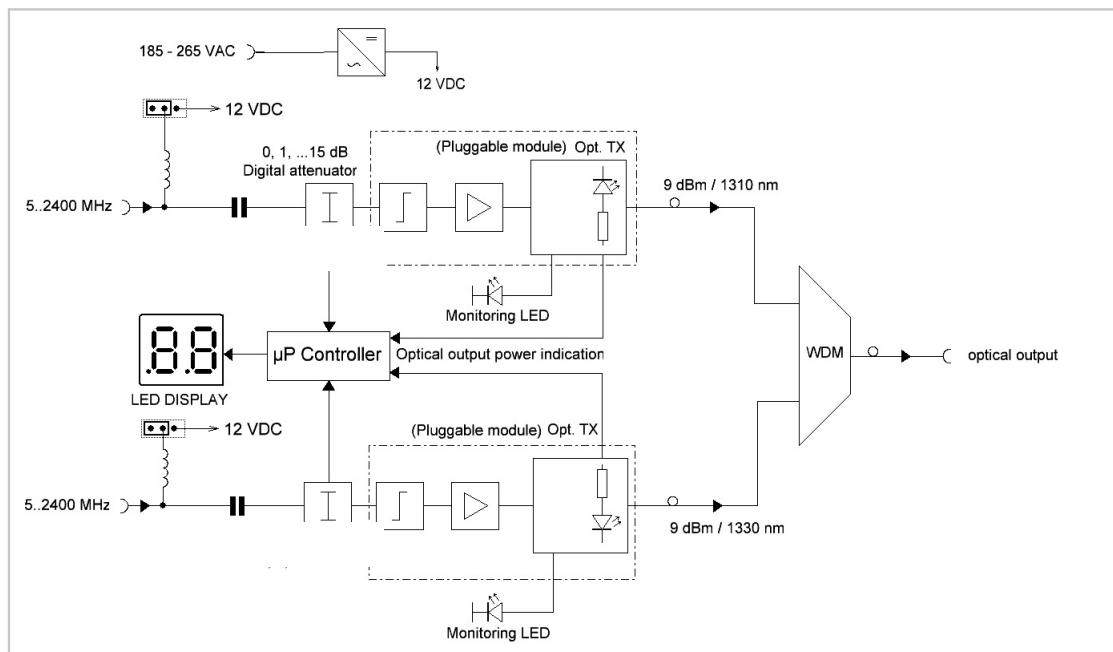
OCH **25** - **xx** - **xx** - **x**

Type	Item No.	Frequency range	Transmitter Tx module		Receiver Rx module
			wavelength 1310 nm	wavelength 1330 nm	wavelength 1260..1620 nm
OCH 25-31-31-0	57003785	5...2400 MHz	■ ■		
OCH 25-31-00-1	57003503	5...2400 MHz	■		■
OCH 25-00-00-1	57003784	5...2400 MHz			■

OPTICAL BK / SAT-IF TRANSMITTER

Module 1

- Optical compact transmitter for RF and IF over fibre
- High linearity, DFB Laser with internal optical isolator
- Low distortion wavelengths: 1310, 1330 nm
- 9 dBm optical output power

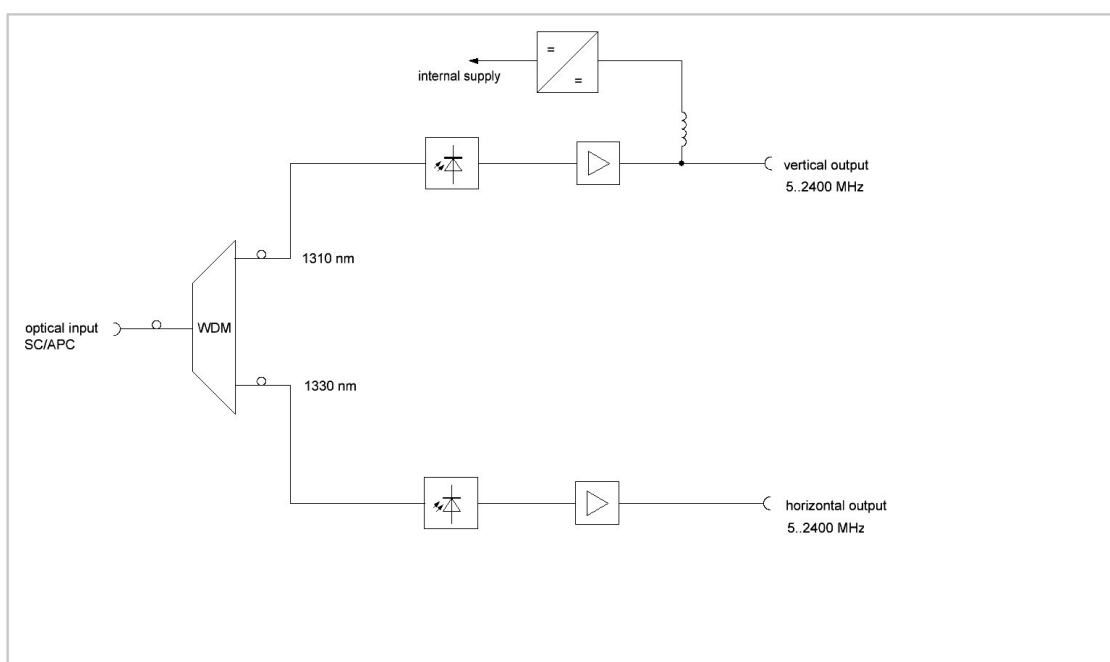


Type	Tx Module	
Applications	CATV and SAT over fibre	
Operation wavelength (λ)	nm	1310, 1330
Optical output power	dBm	+9 (Indication on LED display)
Laser class	1M, DIN EN 60825-1 (2008)	
RF bandwidth	MHz	5 ... 2400
Frequency flatness	dB	± 1.5 (5 – 2400 MHz)
RF input level PAL	dB μ V	70...85, ATT = 0...15 dB @ OMI 4%
Maximum input level	dB μ V	90
Laser type	un-cooled DFB	
RF return loss	dB	> 14, up to 2200 MHz
Optical return loss	dB	> 55
Optical Link SAT-IF		
Optical budget in combination with OR 25	dB	22
Power consumption	W	7 @ 230 VAC
Operating temperature	$^{\circ}$ C	-20...+55

OPTICAL BK / SAT-IF RECEIVER

Module 2

- || Optical compact receiver for RF and IF over fibre
- || Electronic control of RF output level attenuation for each module on the LED display
- || Monitoring LEDs



Type		Rx Module
Applications		CATV and SAT over fibre
Operation wavelength (λ)	nm	1260 ... 1620
Optical input power	dBm	-10 ... 0 (+2 dBm, absolute Max.)
RF bandwidth	MHz	5 ... 2400
Frequency flatness	dB	± 0.5 (5 – 2400 MHz)
RF output level	dB μ V	70 ... 85, OMI 12%
RF return loss	dB	> 14, up to 2200 MHz
Optical return loss	dB	> 55
Optical input power (digital)	dBm	-8.5 ... 0 (Indication on LED display)
Operating temperature	$^{\circ}$ C	-20 ... +55

OPTICAL REPEATER - MULTIPLE INPUTS SINGLE OUTPUT

O-MISO



O-MISO 4-61-1, 8-61-1, 16-61-1 and 32-61-1 is a DOCSIS 3.1 ready active optical repeater for signal splitting and signal processing for FTTx-Networks.



O-MISO R 4-61-2-6- OA/LC-FP

Powering	Split factor	US-wavelength	Number of fibres	Output	Gain	Amplifier	Connector	Powering-Position
-: local powering VAC: 200 - 240 R: remote powering VDC 28-65	4; 8; 16 or 32	61: 1610 nm 59: 1590 nm 57: 1570 nm 53: 1530 nm 51: 1510 nm 49: 1490 nm 47: 1470 nm 45: 1450 nm 43: 1430 nm 41: 1410 nm	1: 1 fibre for DS and US 2: 1 fibre each for DS / US 3: 2 fibre for DS / 1 fibre for US	3: 3 dBm 6: 6 dBm	-: Standard H: High Gain	-: without OA: integrated	-: SC connectors LC: LC connectors	-: back powered FP: front powered

Type	Item No.	Description
O-MISO 4-61-1-6	57002984	Optical Upstream Repeater 4 x Inputs, 1 x Output
O-MISO 8-61-1-6	57002926	Optical Upstream Repeater 8 x Inputs, 1x Output
O-MISO 16-61-1-6	57002816	Optical Upstream Repeater 16 x Inputs, 1x Output
O-MISO 32-61-1-6	57002927	Optical Upstream Repeater 32 x Inputs, 1x Output
O-MISO 8-59-2-6	57003209	Optical Upstream Repeater 8 x Inputs, 2 fibre system, 1590 nm
O-MISO 8-61-2-6	57003208	Optical Upstream Repeater 8 x Inputs, 2 fibre system, 1610 nm
O-MISO 16-2	57003421	Optical Upstream Repeater 16 x Inputs, 1 x RF Output 2 x DS
O-MISO 32-61-3-6 H	57003262	Optical Upstream Repeater 32 x Inputs, 2 x in DS, 1 x Out DS, high gain

Type		min.	typ.	max.	Remarks
Operating voltage	V AC	200	230	240	Switched mode PSU
Power consumption	W				
O-MISO 4x			4.0	4.5	
O-MISO 8x			4.5	5.0	
O-MISO 16x			5.8	6.3	
O-MISO 32x			8.0	8.5	
Length of power cable	m	1.3	1.5		
Mains plug			EURO		
Protection class			II		
Operating voltage, internal	V DC		9		19" case (1RU)
Indication power ON			LED green		
Operating temperature	°C	-20		+55	
IP class			IP 20		
Dimensions	mm	430 x 300 x 45 or 430 x 230 x 45			
Weight	kg				
Fibre connector			2.5		
RF connectors			SC/APC		
Conformity			CE		

OPTICAL REPEATER - MULTIPLE INPUTS SINGLE OUTPUT TECHNICAL DATA - DOWNSTREAM

Downstream

- Transparent for 1550 nm DS signals
- With / without integrated EDFA
- Redundant fibre concept possible with optical MEMS-switch
- Separate xPON output / xPON with RF overlay application

Downstream transparent		min.	typ.	max.	Remarks	
Optical wavelength	nm	1540	1550	1560		
Integrated WDM filter 1550 nm / CWDM			Yes		others on request	
Attenuation						
O-MISO 4x			7.5	8.0		
O-MISO 8x	dB		10.5	11.0		
O-MISO 16x			13.8	14.5		
O-MISO 32x			17.2	18.0		
Optical input power	dBm			22		
Optical input return loss DS	dB	45				
with FOSTRA-F	Optical receiver diode type		PIN			
	Decoupling attenuation	dB	0.3	0.5		
with EDFA	Optical input power range	dBm	0	+3	+6	
	Optical output power (total)	dBm		17.0		Laser Class 1M
	Power consumption	W		2.5	3.0	
with optical MEMS-Switch	Optical wavelength	nm	1240		1640	
	Insertion loss	dB		0.4	0.9	
	Switching time	ms		2	10	

Upstream active combiner		Unit	min.	typ.	max.	Remarks
Input	Optical receiver diode type			PIN		
	Optical input wavelength	nm	1240		1620	without 1530 - 1570
	Optical input power	dBm	-3		+3	HG: -4 to -10
	Optical input return loss US	dB	45			
Output	Optical transmitter diode type			DFB		Laser Class 1
	Optical output wavelength	nm	1605	1610	1615	18 CWDM - λ avail.
	Optical output power	dBm		+6		+3 dBm on request
Transmission Characteristic	Laser turn-on time	nsec		CW		continuous mode
	Frequency range	MHz	12	-	204	for DOCSIS 3.1
	Flatness	dB		± 0.5	± 0.75	
	Level drift between inputs	dB		± 0.75	± 1.0	
	Testpoint for OMI control	dB μ V	75		82	75dB μ V \pm 6% OMI 82dB μ V \pm 15% OMI
	Optical input dynamic range, adjustable with 10 dB Step-Att. (2dB Step)	dB	0		10	-2 dBm -> 0 dB 0 dBm -> 4 dB +3 dBm -> 10 dB
	CINR measurement *) @114 MHz 24 Ch.; QAM 64; 5.56 Msym/s	dB	40.0	>42.0		at: MER EUT > 45.0 dB BER EUT < 1E-9

OPTICAL REPEATER SEGMENTABLE

MOVE THE LIGHT - NOT THE CABLE



GENERAL FEATURES

- || Multidiode receiver to avoid OBI in US
- || Continuous wave noise cancellation functionality (CW-NC) to maximize signal performance for DOCSIS 3.1
- || Pay as you growth optimised design
- || Max. 2 EDFA to amplify up to 2 DS signals
- || Allows easy bandwidth increase by using segmentation
- || Enable OFDMA signals in US and DS for new and existing customers
- || No need for the complicated Burst mode in fibre nodes
- || Manageable via telnet web GUI and SNMP 3
- || New compact housing for small street cabinets

O-MISO-S

- || Remote US segmentation using up to 4 US wavelengths
- || Make your installed nodes OFDMA ready

O-MISO-S INVERTED NODE

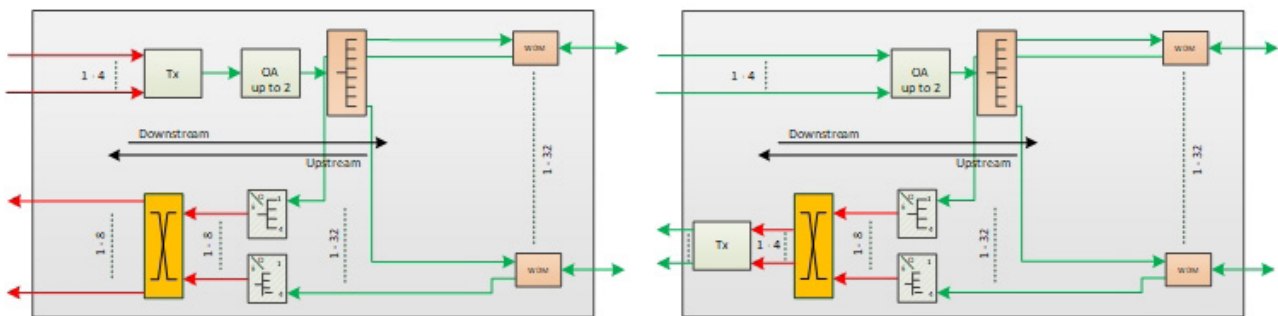
- || Grey optics to realize multiwavelengths architecture in DS
- || Handling of up to 4 DS and 8 US signals provided by 4 R-Phy cores
- || Optimized for R-Phy based FTTB networks

O-MISO-S **xx** - **xx** - **xx** - **xxx** - **xx**

	Number of ports	Number of transmitter	Number of amplifier (EDFA)	Powering position
- : Optical / Optical	32: 32 optical ports to customer	4T: 4 optical transmitter	- : without EDFA	- : Backpowered
IN: Inverted Node	16: 16 optical ports to customer	2T: 2 optical transmitter	10A: 1 EDFA	FP: Frontpowered
		X: XFP-transmitter module	20A: 2 EDFA	

O-MISO-S

O-MISO-S INVERTED NODE



ELECTRICAL AND GENERAL DATA

Type		Min.	typ.	Max.	Remarks
Operating voltage	V AC	185	230	265	0 Hz, OR-NG
		28	50	65	50 Hz, OR-NG-R
Length of power cable	m		1.1		
Mains plug			EURO		
Protection class			II		
Operating temperature	°C	-20		+55	+65 on request At 230 V local powering
IP class			IP 20		
Fibre connector			LC / APC		
Conformity			CE		
Dimensions			1 RU with 23 cm depth		

O-MISO-S

TECHNICAL DATA

Type	Min.	typ.	Max.	Remarks	
Upstream					
Optical input wavelength	nm	1600	1610	1620	1260-1620 on request
Optical input power	dBm	-7		+3	
Optical input return loss US	dB	45			
Optical receiver diode type			PIN		integrated CWDM-MUX
Optical output wavelength (4x Tx)	nm		1610, 1470, 1510, 1450		
Segmentation			4-1; 4-2; 4-4		
Optical output power per Tx	dBm	2.5	3	3.5	-20...+55 °C
Optical power over temperature	dB		± 0.3	± 0.5	Continuous mode
Laser turn-on time			CW		
Frequency range	MHz	12	-	204	
Flatness	dB		± 0.5	± 1.0	for 8 or 16 outputs
Responsivity variance of MDR	dB		± 0.5	± 1.25 ± 1.50	for 32 outputs
OMI over temperature	dB		± 1.0	± 1.25	-20 ... +55 °C
OMI – transparency in / output	dB		± 1.0	± 1.25	

Type	Min.	typ.	Max.	Remarks	
Downstream					
Optical input wavelength	nm	1539	1550	1565	Extended version
Integrated WDM filter			Yes		
Total attenuation					
1-8		10.5		11.0	
1-16	dB	13.5		14.0	
1-32		17.0		17.5	
Optical DC ripple DS	dB		± 0.5	± 0.75	
Optical input power	dBm			22	
Optical input return loss DS	dB		45		
With EDFA					
Optical input power range	dBm	0	+3	+6	
Optical output power EDFA	dBm		17		
Output power per output					
1-8		6.0	6.5	10.0 *)	*) with two EDFA modules
1-16	dBm	3.0	3.5	7.0 *)	
1-32		-0.5	0.0	3.0 *)	
Mains power			2.5	3.0	with one EDFA module
	W		5.0	6.0	with two EDFA modules

O-MISO-S INVERTED NODE ELECTRICAL-OPTICAL NETWORKS

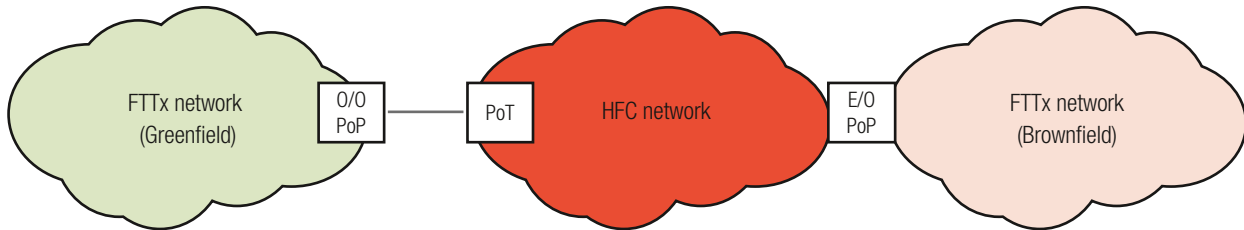
Type		Min.	typ.	Max.	Remarks
Upstream					
Optical input wavelength	nm	1600	1610	1620	1260-1620 on request
Optical input power	dBm	-7		+3	
Optical input return loss US	dB	45			
Optical receiver diode type MDR			PIN		
Number of electrical US outputs		1		8	
Segmentation			8-1; 8-2; 8-4; 8-8		
Electrical output level per output	dB μ V	79	80	81	@8% OMI per channel
Frequency range	MHz	12	-	204	
Flatness	dB		± 0.5	± 1.0	
Responsivity variance of MDR	dB		± 0.5	± 1.25 ± 1.50	for 8, or 16 outputs for 32 outputs
Electrical US loss	dB	0		10	0.1 dB steps

Type		Min.	typ.	Max.	Remarks
Downstream					
Optical input wavelength	nm	1552	1550	1555	Others on request
Integrated WDM filter			Yes		
Optical DS ripple	dB		± 0.5	± 0.75	
Electrical input level per input	dB μ V	69	70	71	@2.0% OMI per channel
Number of Tx in DS		1		4	
Optical output power per Tx	dBm	8,5	9	9,5	
Optical output power per port with 32 ports					
without EDFA, 4x Tx and 4x 1:8 splitted	dBm	-2	-1,5	-1	
with 1 EDFA, 1x Tx and 1x 1:32 splitted	dBm	-1	0	1	
with 2 EDFA, 2x Tx and 2x 1:16 splitted	dBm	2	3	4	
With EDFA					
Optical output power EDFA	dBm		17,0		
Mains power	W		2,5 5,0	3,0 6,0	with one EDFA module with two EDFA modules
Electrical DS loss	dB	0		20	
Frequency range	MHz	54		1218	
Flatness	dB		± 0.6	± 0.8	

Type	Item-No.	Description
OMIS-S 32-2T-10A-FP	57004528	Optical Repeater segmentable, 32 In / 2 Out, 19" 1HE, LC/APC
OMIS-S 32-4T-10A	57004623	Optical Repeater segmentable, 32 In DS/ 4 Out US
OMIS-S 32-4T-20A-FP	57004302	Optical Repeater segmentable , 2 In DS/ 4 Out US, 1 HE
OMIS-S IN-32-4T-FP	57004540	Optical Repeater segmentable Inverted Node, 32 In / 4xDS, 8xUS, 19" 1HE, LC/APC

THE DELTA HYBRID REPEATER for future oriented DOCSIS 3.1 networks

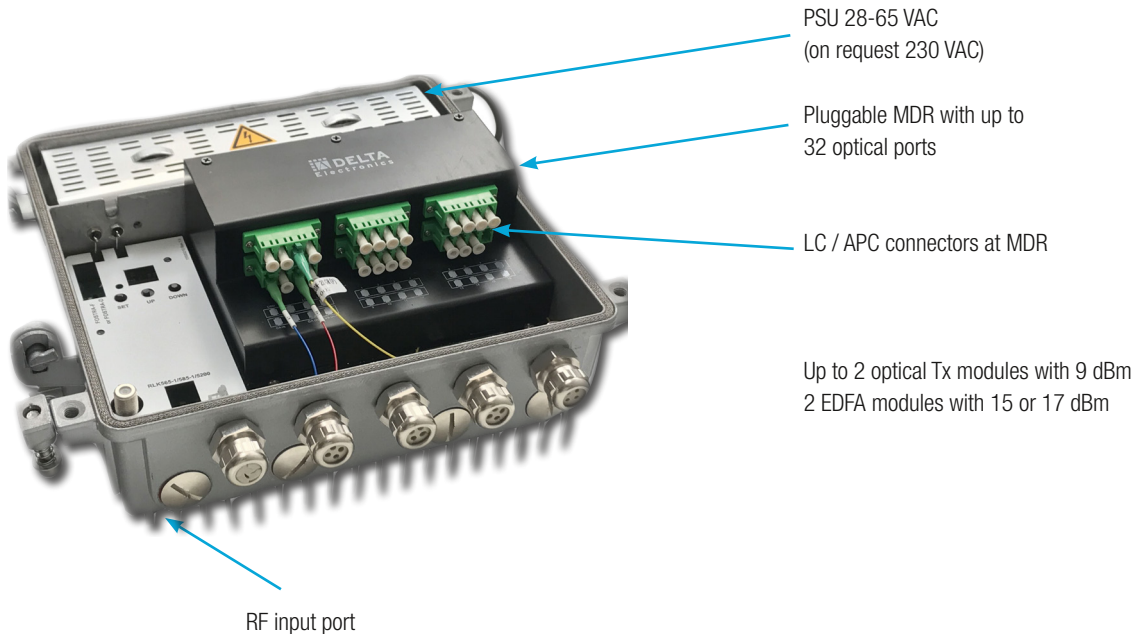
The DELTA Electronics Hybrid Repeater ensures a suitable migration path and cost-effectively connection of customers to fibre optics without overbuilding the coaxial footprint of cable network operators.



The DELTA Hybrid Repeater:

- Connects optical FTTx networks (Greenfields / Brownfields) to existing coaxial HFC networks cost-effectively
- Extends range of deployed FTTx networks
- Provides a suitable migration path towards 100% fibre-optic expansion

Innovative and flexible design reduces installation efforts



The DELTA Hybrid Repeater:

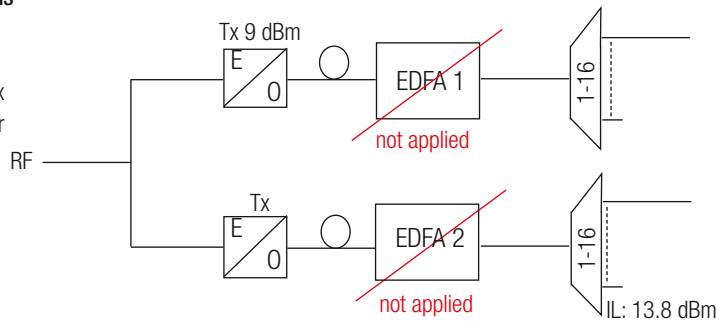
- Easily exchange of MDR box in case of upgrade or service
- Reduction of service times and user-friendly

THE DELTA HYBRID REPEATER

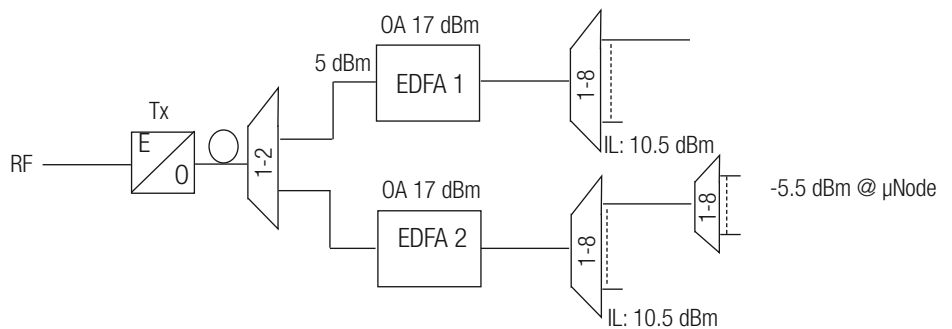
for future oriented DOCSIS 3.1 networks

Various settings fitting various applications

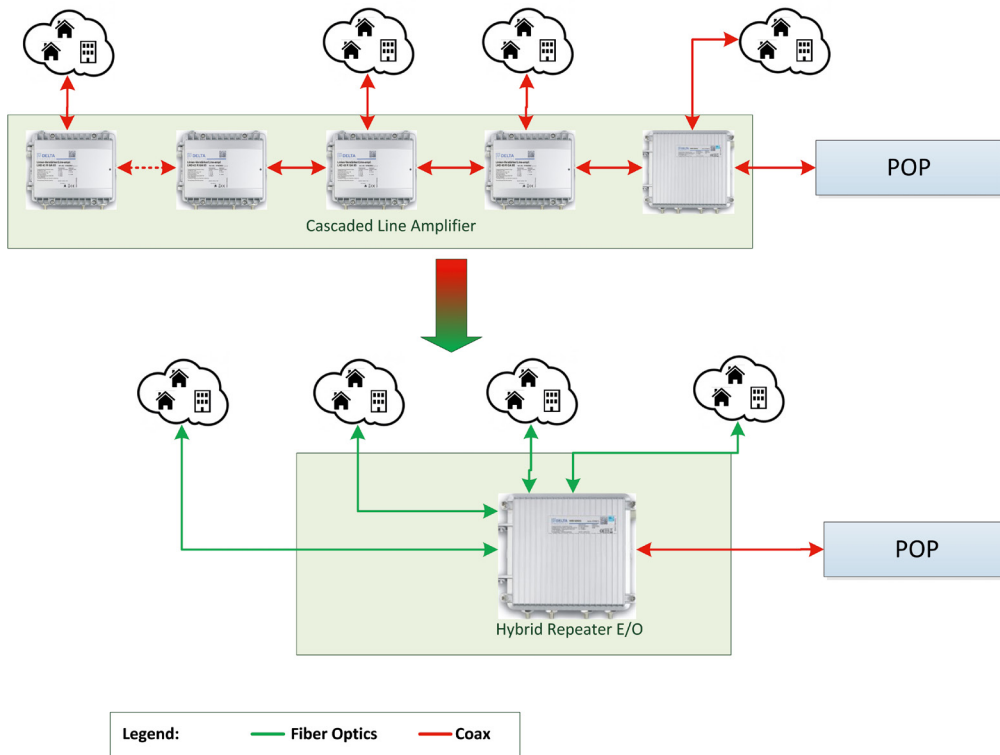
- Pluggable optical DS module with 1 or 2 Tx
- 9 dBm optical output power per transmitter
- Increasing optical DS budget by 3.7 dB
- Up to **32** nodes **without** EDFA module
- Cost-efficient design



- Up to 2 pluggable EDFA modules
- Optical output power 15 or 17 dBm
- Power consumption per module 2.3 W
- Up to 64 nodes per EDFA module
- In total up to 128 nodes



Application example: Hybrid Repeater in Brownfield



The DELTA Hybrid Repeater:

- Replaces cascaded line amplifiers
- Increases range of PoP through fibre optics
- Reduces number of optical repeater with lower attenuation

THE DELTA HYBRID REPEATER for future oriented DOCSIS 3.1 networks

Housing IP 65 plus MDR



Compact die-cast housing

- Safety class IP65
- Designed for outdoor applications
- Size 260 x 220 x 122 mm
- Avoids OBI totally
- Increase of CNR

Multi Diode Receiver (MDR)

- New design of fibre management box
- Pluggable into IP65 housing
- Up to 32 optical ports
- Size 145 x 100 x 55 mm

General features

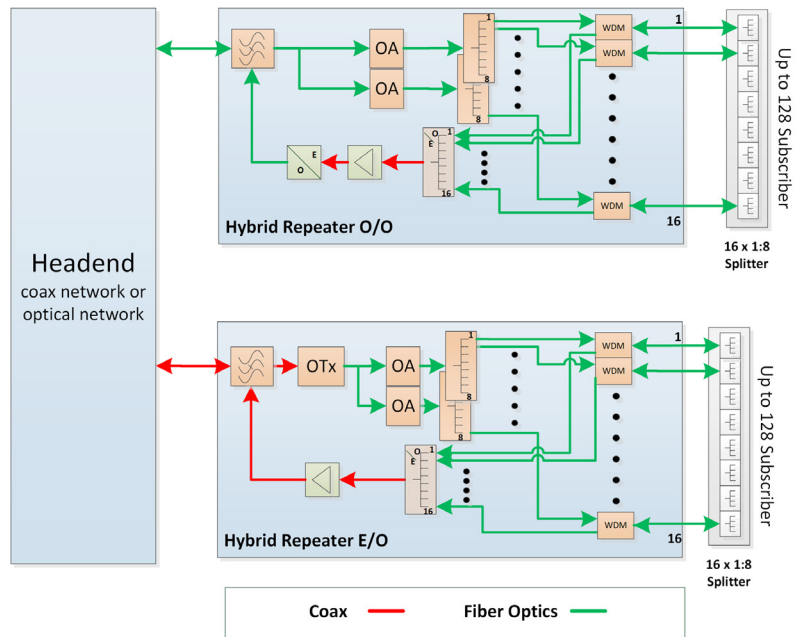
- 2,4,8,16 or 32 * optical entry ports
- High gain or standard gain version selectable
- Enables connection of up to 128 nodes / apartments
- Downstream: XFP EDFA module with 15 / 17 dBm optional

Hybrid Repeater (O/O)

- Active optical repeater for signal splitting and processing in optical - optical networks
- Pluggable optical US Tx module

Hybrid Repeater (O/E)

- Active electro-optical repeater for signal splitting and processing in electro - optical networks
- Pluggable optical DS Tx module
- Pluggable RF diplexer
- Upgrade towards Hybrid Repeater (O/O) possible, no new device or technique required



* Based on OHR -8 and 8 x integrated 4-way splitters

OHR **xx** - **xx** - **x** - **OA xx** - **R** - **x**

Split factor	Optical transmitter module	Fibre connector	Optical Amplifier	Powering	Monitoring
2; 4; 8; 16 or 32 *	Upstream module (O-MISO): 47: 1470 nm 51: 1510 nm 59: 1590 nm 61: 1610 nm Downstream module (Inverted node): RF: 1x Tx on 1550 nm RF2: 2x Tx on 1550 nm	S: Single patch cable M: MPO plug	- : without EDFA OA 17: 1x EDFA 17 dBm OA 25: 2x EDFA 15 dBm OA 27: 2x EDFA 17 dBm	- : Local powering R: Remote powering	-: FOSTR-F prepared FOSTR-F: FOSTR-F integrated

Type	Item-No.	Description
OHR 2-61-S	57003661	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, local powered
OHR 16-61-S	57003658	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, local powered
OHR 4-61-S-OA17	57003516	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, local powered, EDFA 17dBm
OHR 8-61-S-OA17	57004169	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, local powered, EDFA 17dBm
OHR 16-61-S-OA17	57003660	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, local powered, EDFA 17dBm
OHR 2-61-S-R	57003515	Optical Hybrid Repeater O/O, Tx. 1610nm, FOSTR-F prepared, remote powered
OHR 16-61-S-R	57003638	Optical Hybrid Repeater O/O, Tx. 1610nm, FOSTR-F prepared, remote powered
OHR 4-61-S-OA17-R	57003988	Optical Hybrid Repeater O/O, Tx. 1610nm, FOSTR-F prepared, EDFA 17dBm, remote powered
OHR 8-61-S-OA17-R	57003517	Optical Hybrid Repeater O/O, Tx. 1610nm, FOSTR-F prepared, EDFA 17dBm, remote powered
OHR 16-47-S-OA27-R	57004168	Optical Hybrid Repeater O/O, Tx 1470nm, FOSTR-F prepared, remote powered, 2xEDFA 17dBm
OHR 16-51-S-OA27-R	57004167	Optical Hybrid Repeater O/O, Tx 1510, FOSTR-F prepared, remote powered, 2xEDFA 17dBm
OHR 16-59-S-OA27-R	57004166	Optical Hybrid Repeater O/O, Tx 1590, FOSTR-F prepared, remote powered, 2xEDFA 17dBm
OHR 16-61-S-OA17-R	57003390	Optical Hybrid Repeater O/O, Tx. 1610nm, FOSTR-F prepared, EDFA 17dBm, remote powered
OHR 16-61-S-OA27-R	57004165	Optical Hybrid Repeater O/O, Tx 1610nm, FOSTR-F prepared, remote powered, 2xEDFA 17dBm
OHR 2-RF-S	57004090	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered
OHR 4-RF-S	57003946	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered
OHR 8-RF-S	57003662	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered
OHR 16-RF-S	57003659	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered
OHR 8-RF-S-OA17	57003759	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered, EDFA 17dBm
OHR 32-RF-S-OA17	57003675	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, local powered, EDFA 17dBm
OHR 2-RF-S-R	57003563	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered
OHR 4-RF-S-R	57003533	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered
OHR 8-RF-S-R	57003518	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered
OHR 16-RF-S-R	57003564	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered
OHR 8-RF-S-OA17-R	57004081	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered, EDFA 17dBm
OHR 16-RF-S-OA17-R	57003778	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered, EDFA 17dBm
OHR 32-RF-S-OA17-R	57003674	Optical Hybrid Repeater O/E, RF input level 70-80 dBμV, FOSTR-F prepared, remote powered, EDFA 17dBm

* Based on OHR-8 and 8 x integrated 4-way splitters

THE DELTA HYBRID REPEATER (O/O)

Electrical and general data

Type		min.	typ.	max.	Remarks
Operating voltage by remote feeding	V ~	28	50	65	230 V on request without EDFA
Power consumption	W				
OHR 1x2 Splitter			6.5	7	
OHR 1x4 Splitter			6.5	7	
OHR 1x8 Splitter			7.5	8	
OHR 1x16 Splitter			9.5	10	
Protection class			II		
Operating voltage, internal	V DC		3.3 / 9		direct feeding
Indication power ON			LED, green		
Operating temperature	°C	-20		+55	
IP class			IP 65		
Dimensions	mm		260 x 220 x 122		NVD housing
Weight	kg		3.2		
Fibre connector			LC/APC		
Conformity			CE		

TECHNICAL DATA - DOWNSTREAM AND UPSTREAM

Downstream transparent		min.	typ.	max.	Remarks
Optical wavelength	nm	1539 1542	1550	1567 1558	Extended λ DS Standard λ DS
Integrated WDM Filter 1550 nm/CWDM			Yes		
Attenuator DS passive splitter	dB				
OHR 1x2			4.5	5	
OHR 1x4			7.5	8	
OHR 1x8			10.5	11	
OHR 1x16			13.5	14	
OHR 1x32			17	17.5	
Optical input power	dBm			22	
Optical input return loss DS	dB	45			
with FO STRA-F					
Optical receiver diode type			PIN		
Decoupling attenuation	dB		0.3	0.5	
with EDFA					
Optical input power range	dBm	0	+3	+6	
Optical output power (total)	dBm		17	17.5	
Power consumption	W		2.5	3.0	

Upstream Active Combiner		min.	typ.	max.	Remarks
Optical receiver diode type			PIN		
Optical input wavelength	nm	1240		1620	Standard without λ 1540 - 1560 Extended without λ 1530 - 1570
Optical input power	dBm	-9		+3	adjustable with Micro-Controller
Optical input return loss US	dB	45			Laser Class 1
Optical transmitter diode type			DFB		4 CWDM λ available
Optical output wavelength	nm	1605	1610	1615	
Optical output power	dBm		+6		Continuous Mode
Laser turn-on time	nsec		CW		for DOCSIS 3.1
Frequency range	MHz	12	-	204	
Flatness	dB		± 0.5	± 1.0	
Level drift between inputs	dB		± 0.5	± 1.25	
Testpoint for OMI control	dB μ V	68	69	70	@ 10% OMI per Channel

THE DELTA HYBRID REPEATER (O/E)

Electrical and general data

Type		min.	typ.	max.	Remarks
Operating voltage by remote feeding	V ~	28	50	65	230 V on request
Power consumption	W				
OHR 1x2 Splitter			9.5	10.0	
OHR 1x4 Splitter			9.5	10.0	
OHR 1x8 Splitter			10.5	11.0	
OHR 1x16 Splitter			12.5	13.0	
Protection class			II		
Operating voltage, internal	V DC		3.3 / 9		direct feeding
Indication Power ON			LED, green		
Operating temperature	°C	-20		+55	
IP Class			IP 65		
Dimensions	mm		260 x 220 x 122		NVD housing
Weight	kg		3.2		
Fibre connector			LC / APC		
RF connector			PG11m-Ff PG11m 3.5/12f		Local powering Remote powering
Conformity			CE		

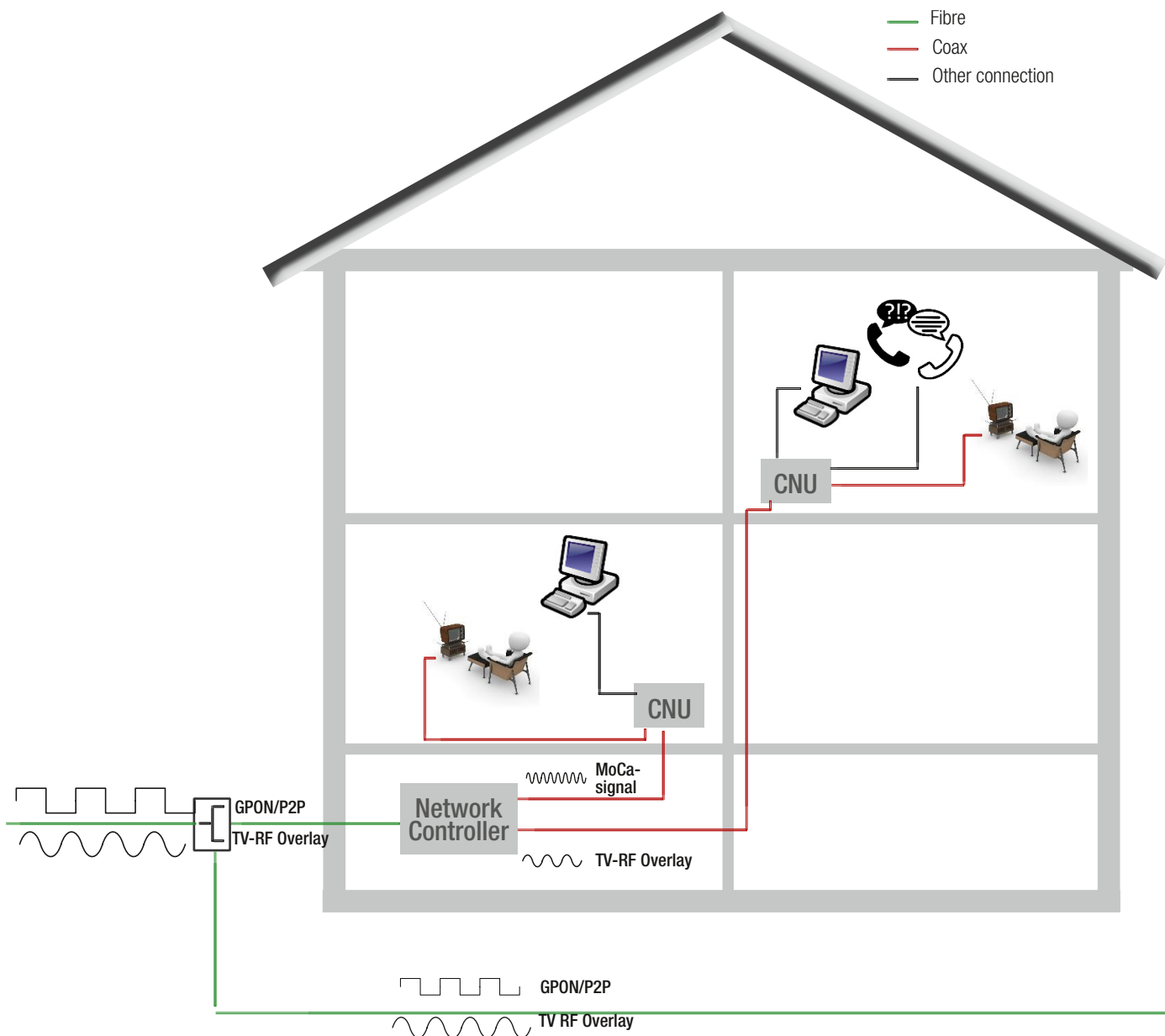
TECHNICAL DATA - DOWNSTREAM AND UPSTREAM

Downstream			min.	typ.	max.	Remarks
RF Features	RF bandwidth	MHz	85		1218	depends on diplexer
	RF input level	dBμV	70		90	
	RF flatness	dB		± 1.25		
	Pre emphasis / slope	dB	0		20	
	Return loss	dB		≥ 18		
Optical Features	Link noise figure	dB		< 20		
	Optical wavelength	nm		1550		
	Type of modulation			direct		
	Optical output power, only Tx	dBm		9		
	Optical output power per port					
	1x2	dBm	4.0	4.5		
1x4	dBm	1.0	1.5			
1x8	dBm	-2.0	-1.5			
1x16	dBm	-5.0	-4.5			
with EDFA	Optical output power	dBm		17.0		
	Power consumption	W		2.5	3.0	

Upstream			min.	typ.	max.	Remarks
Optical input wavelength						without λ1540 - 1560 MDR with Standard or extended filter
	nm		1240		1620	
Optical input power	dBm		-9		+3	
Optical input return loss US	dB		45			
Optical receiver diode type				PIN		
Frequency range						depends on diplexer
	MHz		12	-	204	
Flatness	dB			±0.5	±1.0	
Level drift between Inputs	dB			±0.5	±1.25	TP for calibration
Testpoint for OMI control	dBμV		68	69	70	10 % OMI / Channel
RF output level	dBμV		75		100	10 % OMI / Channel

FOSTRA and Monitoring with DOCSIS Modem 3.1 optionally

G@Co-LIGHT



G@Co-Light 2.5

- Broadband with conventional available SFP+ modules (e.g. GPON / P2P-Ethernet)
- OLT compatibility through corresponding SFP+ modules
- Per each coaxial cable 2.5 Gbps for up to 31 end users
- At 10 Gbps SFP+ up to 4 x 2.5 Gbps coaxial
- Full data rate up to 43dB attenuation (typ. ~300m)
- Range can be extended by cascading (optical and coaxial cable)
- RF Overlay for CATV
- Outdoor housing for outdoor installations (IP65)
- Reverse power function for installations without power supply in outdoor areas
- Manageable via REST API, TR-069 and VLAN

G@Co-Light, a versatile and cost efficient solution for the last meter on existing coax infrastructure.

The high bandwidths resulting from network upgrades must reach the end customer to meet the increasing demand. Often the broadband expansion stops at the curb of the street or at the house handover point. Necessary modernizations often fail due to the high costs and heterogeneous owner interests.

G@Co-Light follows the MoCA-Standard to overcome these obstacles of the last meters and enable forwarding high data rate to the end user using the existing in-house coax networks.

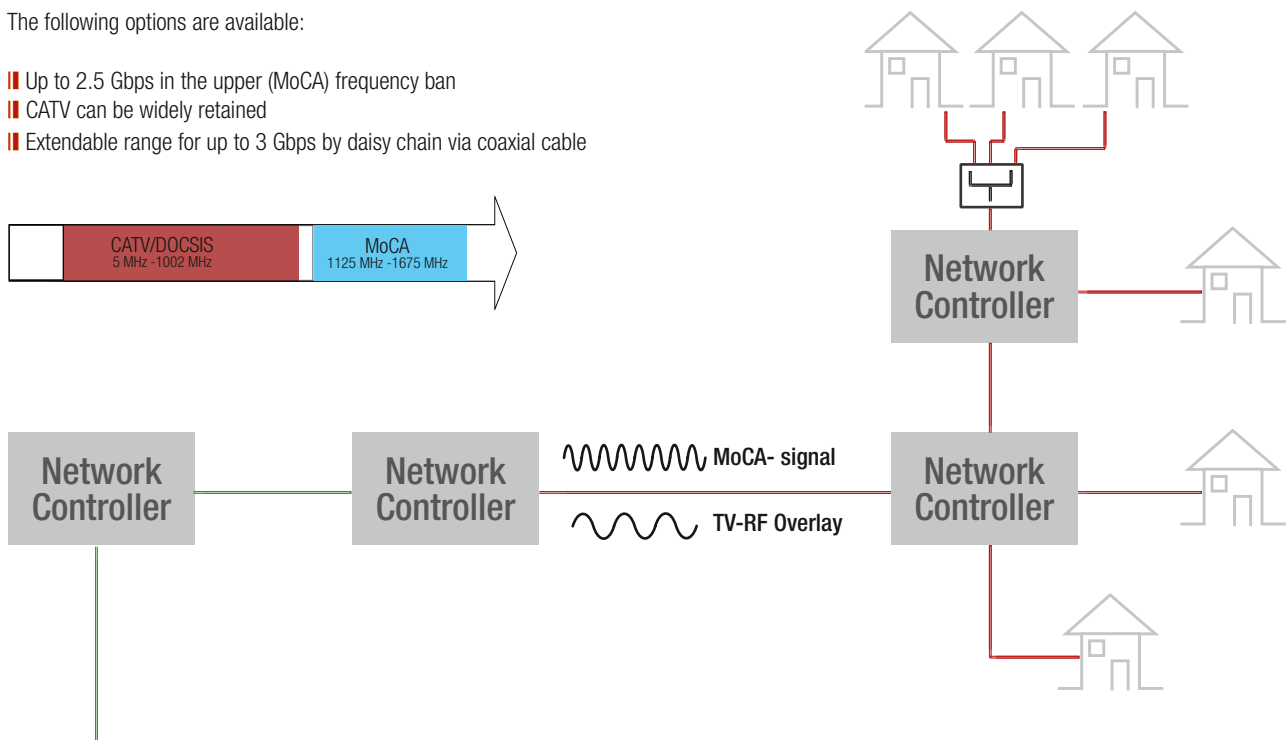
The idea behind G@Co Light is simple, a MoCA Gateway converts the high-speed optical IP signal to an electrical OFDM-modulated QAM signals. The new QAM signal is fed into the existing coax network and provides up to 2.5 Gbps to end users. In other words the MoCA Gateway turns the legacy coax network into a 2.5 Gbps super highway.

The new QAM signals are transmitted at frequencies of 1125MHz – 1675MHz and therefore can be transmitted in parallel to any existing CATV or even DOCSIS 3.1 signal.

At the customer's site, the MoCA QAM signal is terminated by a standard and cost-efficient MoCA end unit.

The following options are available:

- Up to 2.5 Gbps in the upper (MoCA) frequency ban
- CATV can be widely retained
- Extendable range for up to 3 Gbps by daisy chain via coaxial cable



G@Co-LIGHT

G@Co-light - **X** **XX** **X** - **XX** - **X**

Product type	Functions	Power Supply	MoCA- Standard	Output
G: Gateway (µNode)	- : RJ45-Ethernet only	- : only local	11: Standard 1.1+	µNode
T: Terminal (CNU)	WA: Wireless Access Mode	R: local and Reverse Power	25: Standard 2.5	4: 4x HF-Ports
B: Back2Back (CNU-link)	WM: Wireless Mesh Mode	Function		CNU
NMS: Network Management License				E: 2.5 Gbps Ethernet GE: 1.0 Gbps Ethernet
				Wireless 4-GE: 4x1 Gbps Ethernet

Type	Item-No.	Description
G@Co-light-G-25-4	57004229	MoCA 2.5 µNode, 4 HF Ports
G@Co-light-GR-25-4	57004071	MoCA 2.5 µNode, 4 HF Ports, RPF
G@Co-light-T-25-E	57004072	MoCA 2.5 CNU, RF-Pass-Through, 2.5 Gbps Ethernet
G@Co-light-TR-25-E	57004082	MoCA 2.5 CNU, RF-Pass-Through, 2.5 Gbps Ethernet, RPF
G@Co-light-T-25-GE	57004249	MoCA 2.5 CNU, RF-Pass-Through, 1 Gbps Ethernet
G@Co-light-B-25-E	57004261	MoCA 2.5 Back2Back-CNU, RF-Pass-Through, 2.5 Gbps Ethernet
G@Co-light-TWA-25-4-GE	57004259	MoCA 2.5 CNU, WiFi-Access-Mode, 4x1 Gbps Ethernet
G@Co-light-TWM-25-4-GE	57004260	MoCA 2.5 CNU, WiFi-Mesh-Mode, 4x1 Gbps Ethernet
G@Co-light-Starter Kit	57004230	1x NMS (4 Verbindungen), 1 µNode (F-25-4), 4x CNU (T-25-E)
G@Co-light-Starter Kit-Upgrade	57004268	4x CNU (T-25-E), 4x license extension
G@Co-light -NMS +50/250/500/1000/5000/unlimited	57004262/63..67	License extension for further 50 licenses
RLK 51000 Diplexer	57004239	F-connector, CATV+DOCSIS/G@Co-light, 5-1002/1125-1675 MHz

8-WAY FAN-OUT CABLE WITH WATERPROOF ADAPTOR

Features	OMPC 8x 025 LC OHR 57003899	OMPC 8x 15 LC OHR 57003898	OMPC 8x 025 LC/SC 57004036
Length	2,5 m	15 m	2,5 m
Connectors	8 x LC/APC	8 x LC/APC	8 x LC/APC / 8 x SC/APC
Fan-out pigtails		8 x G.675.A2, 0.9 mm colour coded	
Fan-out length	150 mm	150 mm	150 mm / 300 mm
Adaptor		waterproof 5/8" UNEF	
Jacket		black, diameter 5 mm	
Accessory		10161204 PG 11 – 5/8" reducing adaptor	



OTB FTTH COVER

The DELTA Electronics Fibre Termination Box (OTB) combines the node plate, the base plate with the fibre management unit and the protection cover for the optical node in one enclosure.

The inner construction is designed to enable an easy mounting of optical fibres and optical nodes.

For a more appealing look, the cable routings are hidden, so that the box can be installed in various places.

Features

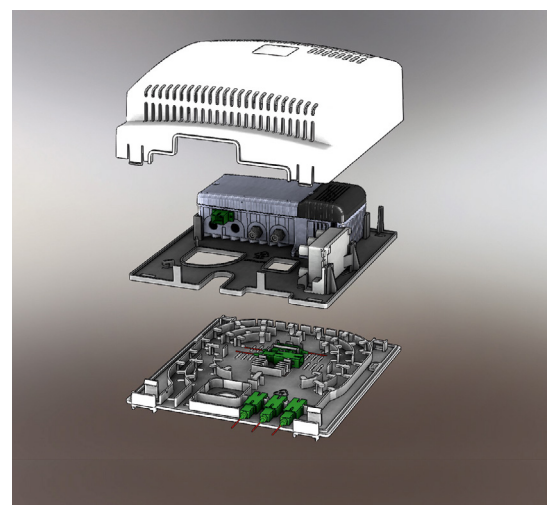
- Optimized protection of fibres and splices
- Excellent ventilation of the installed node
- Modern and appealing design
- Up to four optical connection possibilities
- Customer specific labelling possible
- Dimensions: 220 x 205 x 80 mm
- Item No. 57003633

3-level design

Cover

Node plate

Base plate



OPTICAL ATTENUATOR

Fibre optical attenuator reduces optical signal in fixed attenuation values

- Low insertion loss
- High stability
- Connector type attenuator SC, FC / APC
- Use in optical fibre networks and test equipments



Type	OATN-01 SC	OATN-02 SC	OATN-03 SC	OATN-06 SC	OATN-10 SC
Item No.	57002674	57004521	57000910	57000911	57000912
Description	Optical attenuator, -1 dB, SC/APC	Optical attenuator, -2 dB, SC/APC	Optical attenuator, -3 dB, SC/APC	Optical attenuator, -6 dB, SC/APC	Optical attenuator, -10 dB, SC/APC

Type	OATN-01 LC	OATN-03 LC	OATN-06 LC
Item No.	57003757	57003665	57003758
Description	Optical attenuator, -1 dB, LC/APC	Optical attenuator, -3 dB, LC/APC	Optical attenuator, -6 dB, LC/APC

Type	OATN xx-SC		OATN xx-LC
Attenuation value	dB	1,3,6,10 ± 0.5 (others on request)	1,3,6 ± 0.5 (others on request)
Operation wavelength (λ)	nm	1200 - 1600	1200 - 1600
Return loss	dB	≥ 60 APC ≥ 55 PC	≥ 60 APC ≥ 55 PC
Max. optical input power	dBm	26.5	26.5
Fibre type		SC, FC / APC	LC / APC
Operation temperature	°C	-30 - +75	-30 - +75
Storage temperature	°C	-40 - +85	-40 - +85

POWER INSERTER

Power inserter for subscriber amplifiers

Type	PI - Power Inserter	
Item No.	57003295	
Frequency range	MHz	5-1675
Insertion loss	dB	0.5 - 2.5
Return loss IN minimum	dB	20
Return loss OUT minimum	dB	20
Operating voltage	VDC	8 - 18
Dimensions	mm	229 x 534 x 229
Weight	g	35

OPTICAL FIBRE PATCH CORD

- Excellent mechanical endurance and low insertion loss
- Standard exact plastic material, good exchangeability
- Cable diameter: Ø 3mm
- Single mode cable type SC, FC, LC, E2000/APC
- FTTx, Optical fibre CATV and test equipments



Type	OMPC 015 SC-LC	OMPC 02 E2-FC	OMPC 02 SC-FC	OMPC 02 SC-SC
Item No.	57003185	57000920	57000922	57000923
Description	SC/APC - LC/APC, 1.5 meters	E2000/APC - FC/APC, 2 meters	SC/APC - FC/PC, 2 meters	SC/APC - SC/APC, 2 meters

Type	OMPC 02 SC/APC-LC/PC	OMPC 02 LC/APC-LC/PC	OMPC 02 LC/PC-LC/PC
Item No.	57004459	57004460	57004461
Description	SC/APC - LC/PC, 2 meters	LC/APC - LC/PC, 2 meters	LC/PC - LC/PC, 2 meters

Type	OMPC 02 SC-LC	OMPC 02 LC-LC	OMPC 025 SC-LC	OMPC 05 SC-LC
Item No.	57002917	57002918	57003175	57003176
Description	LC/APC - SC/APC, 2 meters	LC/APC - LC/APC, 2 meters	SC/APC - LC/APC, 2.5 meters	SC/APC - LC/APC, 5 meters

Type	OMPC 05 SC-SC	OMPC 10 SC-LC	OMPC 15 SC-LC	OMPC 20 SC-LC
Item No.	57003210	57003431	57003432	57003433
Description	SC/APC - SC/APC, 5 meters	SC/APC - LC/APC, 10 meters	SC/APC - LC/APC, 15 meters	SC/APC - LC/APC, 20 meters

Type	OMPC 15 SC-LC	OMPC 40 SC-FC	OMPC 40 SC-SC	OMPC 50 SC-FC	OMPC 100 SC-FC
Item No.	57003656	57004241	57004226	57004293	57004240
Description	SC/APC - LC/APC, 15 meters, armored	SC/APC - FC/PC, 40 meters, armored	SC/APC - SC/APC, 40 meters, armored	SC/APC - FC/PC, 50 meters, armored	SC/APC - FC/PC, 100 meters, armored

Type	OMPC 02 xx-yy	
Insertion loss	dB	< 0.2
Return loss	dB	≥ 45
Mode-Operation		Single mode, 9 / 125 µm
Type		8 ° APC
Operating temperature	°C	-40 - +75
Storage temperature	°C	-40 - +85
Length	m	up to 20

OPTICAL PLC SPLITTER 1260...1620NM

- Wide operation wavelength 1260...1620nm
- Good uniformity and low insertion loss
- Low polarization dependent loss
- 1 x 2, 1 x 4, 1 x 8, 1 x 16, 1 x 32 and 1 x 64 type splitters with SC/APC or LC/APC connectors in 19" 1 RU chassis



Type	OCP 1-02	OCP 1-04	OCP 1-08 SC	OCP 1-16	OCP 1-32	OCP 1-64 SC
Item No.	57001894 (SC) 57004364 (LC)	57001895 (SC) 57004522 (LC)	57001896 (SC) 57004103 (LC)	57001576 (SC) 57004104 (LC)	57001577 (SC) 57004105 (LC)	57001900
Description	Optical PLC splitter 1200..1620nm, 1 Input, 2 outputs, SC/APC, LC/APC 19"RU	Optical PLC splitter 1200..1620nm, 1 Input, 4 Outputs, SC/APC, LC/APC 19"RU	Optical PLC splitter 1200..1620nm, 1 Input, 8 Outputs, SC/APC, LC/APC 19"RU	Optical PLC splitter 1200..1620nm, 1 Input, 16 Outputs SC/APC, LC/APC 19" 1RU	Optical PLC splitter 1200..1620nm, 1 Input, 32 Outputs, SC/APC, LC/APC 19" 1RU	Optical PLC splitter 1200..1620nm, 1 Input, 64 Outputs, SC/APC, 19" 1RU

Type	OCP 1-xx SC / LC	
Operation wavelength (λ)	nm	1260...1620
Insertion loss		
1 x 2 splitter	dB	3.7
1 x 4 splitter	dB	7.2
1 x 8 splitter	dB	10.5
1 x 16 splitter	dB	13.8
1 x 32 splitter	dB	17.2
1 x 64 splitter	dB	20.5
Polarization dependent loss	dB	< 0.3
Uniformity		
1 x 2 Splitter	dB	< 0.6
1 x 4 Splitter	dB	≤ 0.8
1 x 8 Splitter	dB	≤ 1.0
1 x 16 Splitter	dB	≤ 1.5
1 x 32 Splitter	dB	≤ 1,8
1 x 64 Splitter	dB	< 2.5
Return loss	dB	≥ 55
Optical fibre connector	SC/APC or LC/ APC	
Fibre type	SMF-28e	
Operating temperature	°C	-40 ~ +85
Storage temperature	°C	-40 ~ +85
Max. input power	dBm	24.5
Dimensions	mm	482 x 225 x 44 (19" 1RU)

OPTICAL WAVELENGTH DIVISION MULTIPLEXER

Optical wavelength- division multiplexer multiple optical carrier signals on a single optical fibre by using different wavelengths to carry different signals.

- CWDM- channels available
- Low insertion loss
- Wide pass band
- High channel isolation
- High stability and reliability
- Compatible with any FTTH PON technology

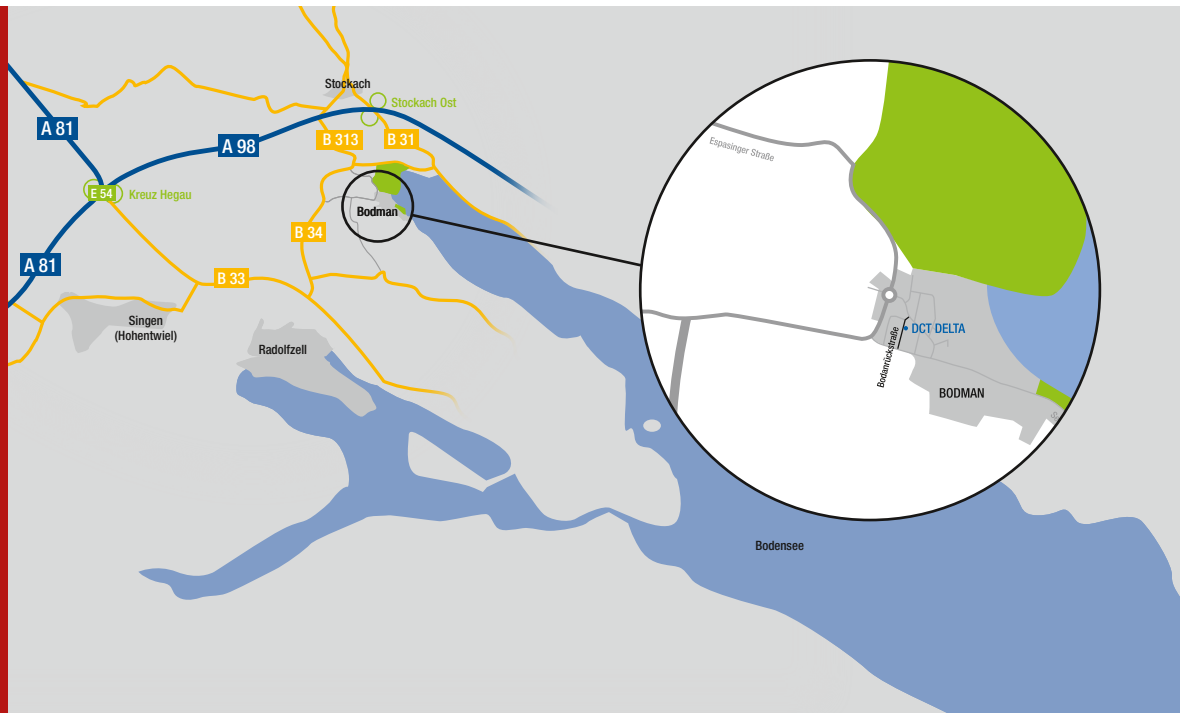


Type	OWDM 1-02 SC-MT	OWDM 1-02 SC RFOG E
Item No.	57002340	57003412
Description	Opt. WDM, 1250-1620 / DS DS: 1540-1560 SC/APC mini tube	Opt. WDM, 1250-1620 / DS DS: 1530-1570 SC/APC mini tube

Type	ODWDM MUX 1-8	ODWDM DEMUX 1-8	ODWDM MUX 1-4	ODWDM DEMUX 1-4
Item No.	57003012	57003013	57003014	57003015
Optical DWDM	DWDM multiplexer	DWDM de-multiplexer	DWDM multiplexer	DWDM de-multiplexer
MUX/DEMUX	8 ITU-channels	8 ITU-channels	4 ITU-channels	4 ITU-channels
C Band: (1528,77 -1563,86)	ITU 21, 22, 24, 26, 28, 33, 36, 39	ITU 21, 22, 24, 26, 28, 33, 36, 39	ITU 44, 48, 52, 54	ITU 44, 48, 52, 54
L Band: (1569,59 - 1604,03)	on request	on request	on request	on request

Type		OWDM 1-xx SC	OWDM (DE)MUX 1-x
Operation wavelength (λ)	nm	1250 ...1620, CWDM- channels (ITU-T G.694.2)	C-band / L-band
Center wavelength	nm	± 0.5	± 0.03
Channel spacing	nm	20 (CWDM- Network)	ITU ± 0.11
Insertion loss			
1 x 2	dB	< 0.7	< 1.4
1 x 3	dB	< 1.4	-
1 x 4	dB	< 1.5	< 2.0
1 x 8	dB	< 3.0	< 3.0
1 x 16	dB	<3.8	max. 5.2
Channel ripple	dB	≤ 0.3	≤ 0.5
Isolation	dB	≥ 40	adjacent ≥ 25; non-adjacent ≥ 45
Return loss	dB	≥ 45	≥ 50
Max. input power	dBm	24.5	24.5
Operating temperature	°C	0 ~ +70	0 ~ +70
Storage temperature	°C	-40 ~ +85	-40 ~ +85
Dimensions	mm	482 x 225 x 44 or Mini Tube	120 x 80 x 12 or 1 RU

NOTES



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