HDO908 O-BAND DWDM CATV FIBRE TRANSMITTER

HDO908 is a high performance, linear directly modulated O-band DWDM DFB laser transmitter for forward path fibre optic links in CATV and FTTx networks. The transmitter has an extended frequency range to fulfil DOCSIS 3.1 requirements. The module is installed into HDX installation frame. HDO908 is available on different DWDM wavelengths in 1310 nm window to support a node segmentation. The product contains an optimised circuit that reduces the chirp-dispersion induced CSO. HDO908 is also available on different optical output power categories to fit various requirements. HDO908 has two equal input sections with level and slope adjustments to support broadcast and narrowcast signal distribution. The RF isolation between the input branches is high minimising the leakage of narrowcast signals into wrong node segments. The power consumption is low but HDO908 still offers the highest level of performance and the widest variety of features, including the internal spectrum analyser module.

Features

- DOCSIS 3.1 compatible
- Standardised input and test point levels
- Electrical dispersion compensator provides a good CSO performance at longer transmission distances
- First-class power consumption vs. signal performance rate
- Two inputs with level adjustments
- Equaliser in both inputs
- High isolation between inputs
- Unused input can be switched off for power saving and noise reduction
- Integrated input amplifiers and laser driver amplifiers
- Automatic power control providing constant total OMI as standard feature
- Optional spectrum analyser function
- Fibre connectors can be located at the rear or at the front panel
- Optional integrated DWDM 1-ch filter to combine various wavelengths into one fibre i.e. no need for separate DWDM multiplexer module
- Small form factor family, 2 RU height
- Local and remote software control of all adjustments
- Forced cooling through the unit

Management features

- Monitoring of APC (Automatic Power Control) functionality with user configurable offset
- Optical output power monitoring
- Laser bias current monitoring
- TEC (Thermo-Electric Cooler) current monitoring
- Laser temperature monitoring
- Signal level adjustment in both inputs
- Slope adjustment in both inputs
- Input 2 switch on/ off
- Link span setting for optimised CSO
- Channel level measurement when equipped with spectrum analyser option
- LED indicators for signal and module statuses
- Internal temperature measurement and monitoring
- Intelligent fan speed control with monitoring
- Non-volatile logging of 32 latest events, including alarms, alarming values, settings changes and application starts.
- Uptime and total uptime counters
- All adjustments and alarm limits fully user configurable
- Local PC connection through backplane HDO bus with HDX021 cable
- Remote IP connection through HDC100 controller module
- SNMP monitoring and configuration through HDC100 controller module

Technical specifications

Parameter	Specification	Note
Optical parameters		
Light source	Cooled DFB with optical isolator	
Peak wavelength	1330.459 nm (225.330 THz) 1329.220 nm (225.540 THz) 1327.249 nm (225.875 THz) 1325.782 nm (226.125 THz) 1323,587 nm (226,500 THz) 1322,828 nm (226,630 THz) 1318,725 nm (227,335 THz) 1317,740 nm (227,505 THz)	1)
Nominal output power	+8, +10 or +12 dBm	2)
1-ch filter	Pass band fits to laser wavelength	3)
Relative intensity noise	-154 dBc/Hz	4)
OMI per channel	4.5 % for PAL B/G 40 chs	5)
Number of optical ports	1 or 2	6)
RF parameters		
RF inputs	Two identical inputs	7)
Frequency range	47...1218 MHz	
RF impedance	75 Ω	
Input return loss	18 dB	8)
Flatness	±0.4 dB	9)
Automatic power control (APC)	Yes	10)
Laser test point level for 4.5 % OMI	78 dBµV	11)
Input level	77 dBµV	12)
Level adjustment range	10 dB	
Equaliser adjustment range	0…6 dB	
Isolation between inputs	50 dB	13)

Spectrum analyser module (option)

Measurement range	47…1218 MHz, 0.25 MHz steps	
Measurement bandwidth	0.35 MHz	14)
Dynamic range	58…98 dBµV	15)
Measurement accuracy	±1 dB	16)

Noise and distortion performance, CENELEC 42 chs

Link C/N with 0 dBm to receiver	53.5 dB	14)
CTB	67 dB	18)
CSO	62 dB	18)

General

Power consumption	8.5 W	19)
Supply voltages	25 V / 260 mA	19)
	6.3 V / 300 mA	19)
RF connectors	F female	20)
Optical connector	SC/APC, E-2000	21)
Cooling	Field replaceable fan	22)
Dimensions	2U x 7HP x 380 mm	h x w x d
	Occupies 1/12 of HDX installation frame	
Weight	1.5 kg	
EMC compliance	EN 50083-2	23)
Enclosure classification	IP20	
Operating temperature range	0...+45 °C	
Storage temperature range	-20...+60 °C	
Operating relative humidity	0…85 %	

Notes

1) Typical peak wavelength at 25°C.

2) Three output power categories available. Optional 1-ch filter reduces the output power 0.5 dB. The wavelength A (1325.78 nm) is available at +14 dBm with the lowered CSO specification.

3) Optical filter is used for optical daisy chaining of transmitters i.e. optical multiplexer module is not needed for combining wavelengths.

4) Worst case value at the nominal output power when the 2nd input is switched off.

5) Typical value. The minimum value is 4.0 %.

6) Two optical connectors if 1-ch optical filter is included.

7) Input 2 can be switched on/ off. Input 2 is switched off as a factory setting.

8) Typical value is 18 dB on the whole frequency band. The minimum value is 18 dB and above 40 MHz -1 dB/ octave.

9) Typical value. Maximum value is ±0.75 dB.

10) APC is based on broadband detection in which the total laser driving power is measured and adjusted so that if the RF power is evenly divided into 40 channels the resulted OMI/channel is 4.5 %. Offset can be set by the user.

11) Typical accuracy is ±0.4 dB. Maximum value is ±0.75 dB.

12) Input level required to reach 4.5 % OMI with adjustments in 0 dB positions.

13) The attenuation from one input to the other input. Above 860 MHz the isolation is 40 dB or higher.

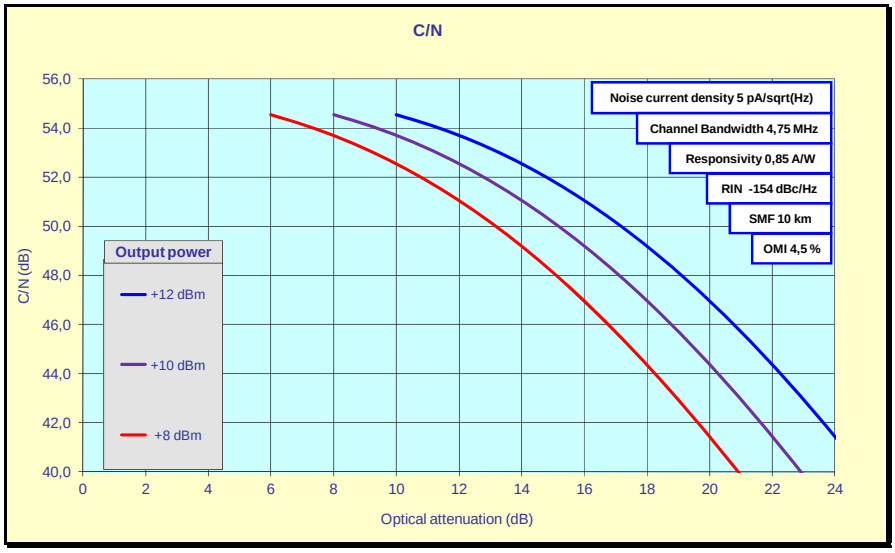
14) Typical -3 dB bandwidth. Typical -45 dB bandwidth is 0.5 MHz.

15) Level at laser (OMI) test point for modulated CW/ PAL signal. For QAM detection the dynamic range is approx. 6 dB higher. QAM detection measures a ~0.35 MHz band and the

level calculation assumes the carrier to be 6.875 Msymbols/s signal. Nominal level denotes 4.5 % OMI. (0.45…45 % OMI range)

16) This is the typical performance over band 50…740 MHz for CW/ PAL signals. For PAL signals above 740 MHz and all QAM signals the accuracy is ±1.7 dB.

17) Typical value with 10 km fibre. The minimum value is 52.5 dB with 4.5 % OMI. The values are valid when the 2nd input is switched off. When the 2nd input is switched on 0.5 dB lower C/N is allowed. C/N values are based the noise current density of 5 pA/√Hz. See graphs below. Longer fibres may have an impact on C/N depending on the input power of the receiver, the optical modulation index, the properties of the fibre and also the chirp characteristics of the laser. For instance the fibre of 25 km causes typically 1...1.5 dB penalty on C/N when 0 dBm is delivered to the receiver.



18) Typical value when two wavelengths are launched into 10 km fibre. A longer fibre, higher wavelength count and a higher launch power degrades CSO. CSO is degraded because of the dispersion-chirp as well as the nonlinearities and the optical crosstalk in the fibre. CTB and CSO performance is tested up to 1218 MHz. With modulated channels the distortion distances are better, CTB typically 8 dB and CSO 6 dB.
CTB minimum value is 64 dB and CSO minimum value is 58 dB.
The CSO minimum value of +14 dBm transmitter is 50 dB.

19) Typical power consumption at 25°C without the spectrum analyser module and the 2nd input switched off. The power save mode is enabled (-1.9 W). The 2nd input consumes 1.5 W and the spectrum analyser 1.5 W.

20) Fixed connections are located at the rear panel. Test points are located at the front panel.

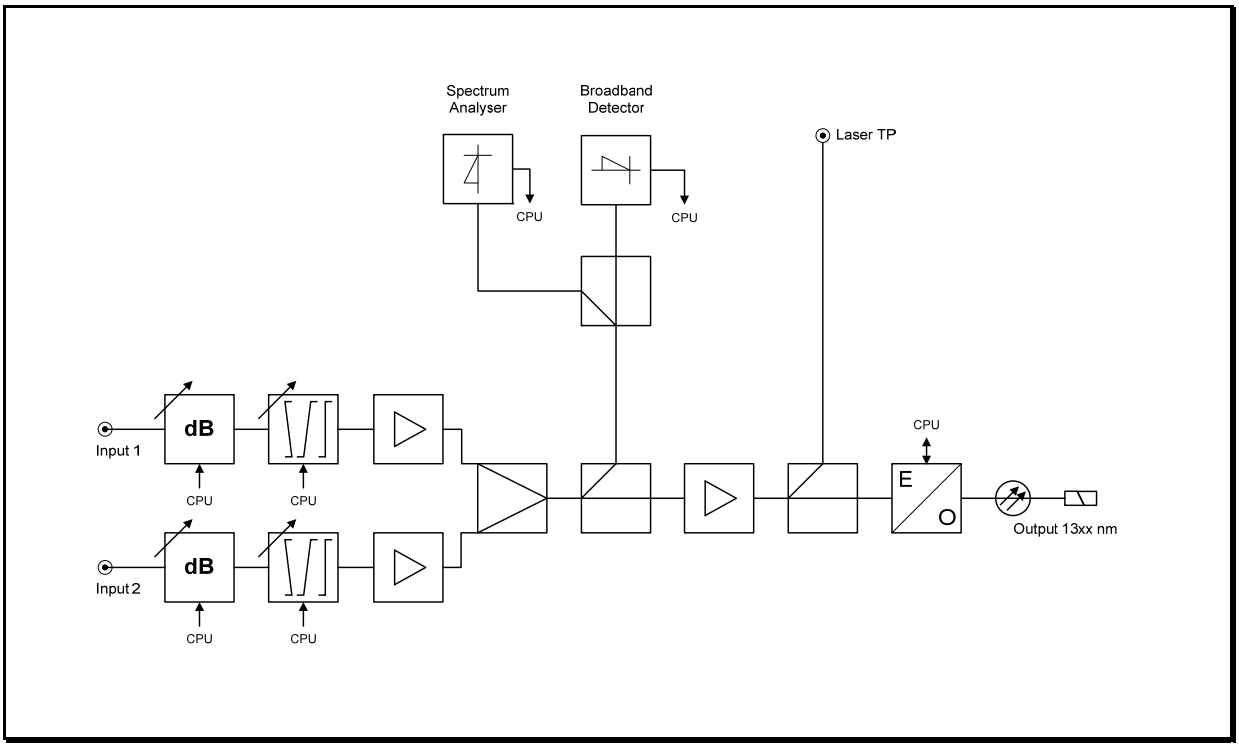
21) Fibre connectors can be located at the rear or at the front panel.

22) The fan can be replaced by the user without signal interruption.

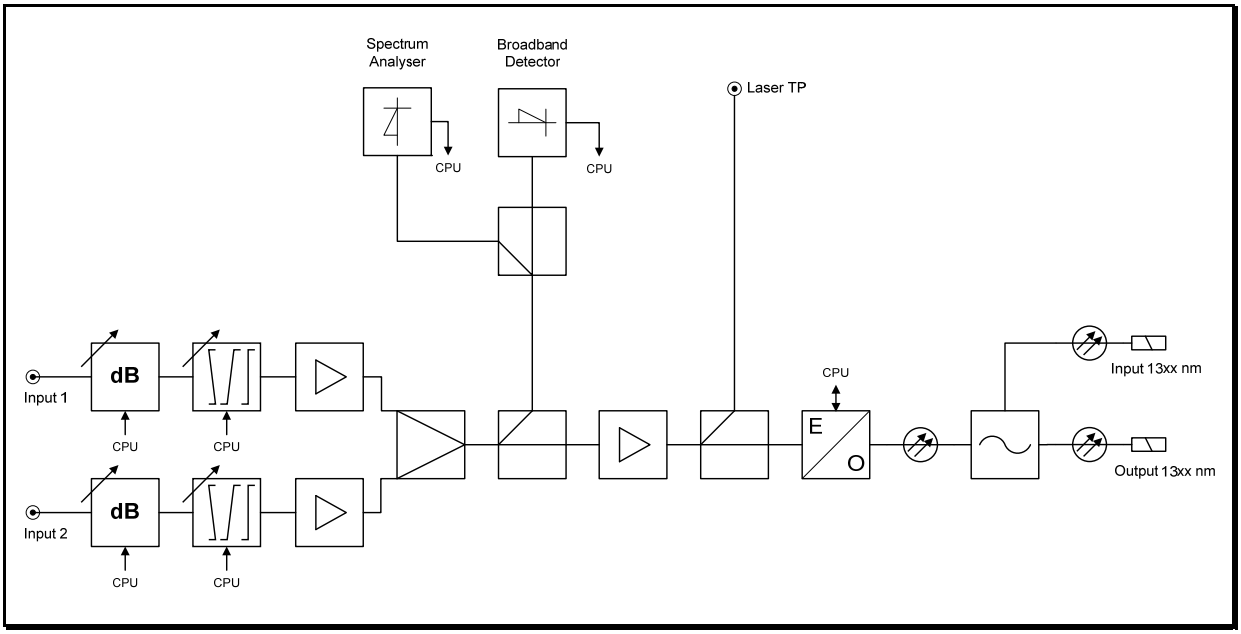
23) Radiation limit is 20 dBpW.

Block diagrams

No optical filter:



Optical filter for combining various transmitters without an optical multiplexer module:



Ordering information

	1-1		2-1					3-1		4-1			5-1			6-1
HDO908		-					-		-			-			-	

1-1 Wavelength

A	1325.78 nm
B	1327.25 nm
C	1329.22 nm
D	1330.46 nm
E	1323.59 nm
F	1322.83 nm
G	1318.73 nm
H	1317.74 nm

2-1 Transmitter output power

AA08	O-band DWDM 1325.78 nm, +8 dBm
AA10	O-band DWDM 1325.78 nm, +10 dBm
AA12	O-band DWDM 1325.78 nm, +12 dBm
AA14	O-band DWDM 1325.78 nm, +14 dBm
BA08	O-band DWDM 1327.25 nm, +8 dBm
BA10	O-band DWDM 1327.25 nm, +10 dBm
BA12	O-band DWDM 1327.25 nm, +12 dBm
CA08	O-band DWDM 1329.22 nm, +8 dBm
CA10	O-band DWDM 1329.22 nm, +10 dBm
CA12	O-band DWDM 1329.22 nm, +12 dBm
DA08	O-band DWDM 1330.46 nm, +8 dBm
DA10	O-band DWDM 1330.46 nm, +10 dBm
DA12	O-band DWDM 1330.46 nm, +12 dBm
EA08	O-band DWDM 1323.59 nm, +8 dBm
EA10	O-band DWDM 1323.59 nm, +10 dBm
EA12	O-band DWDM 1323.59 nm, +12 dBm
FA08	O-band DWDM 1322.83 nm, +8 dBm
FA10	O-band DWDM 1322.83 nm, +10 dBm
FA12	O-band DWDM 1322.83 nm, +12 dBm
GA08	O-band DWDM 1318.73 nm, +8 dBm
GA10	O-band DWDM 1318.73 nm, +10 dBm
GA12	O-band DWDM 1318.73 nm, +12 dBm
HA08	O-band DWDM 1317.74 nm, +8 dBm
HA10	O-band DWDM 1317.74 nm, +10 dBm
HA12	O-band DWDM 1317.74 nm, +12 dBm

3-1 Fibre location

F	Front panel
R	Rear panel

4-1 Optopassive

FX	None
FA	1325.78 nm Filter, Front
FB	1327.25 nm Filter, Front
FC	1329.22 nm Filter, Front
FD	1330.46 nm Filter, Front
FE	1323.59 nm Filter, Front
FF	1322.83 nm Filter, Front
FG	1318.73 nm Filter, Front
FH	1317.74 nm Filter, Front
RX	None
RA	1325.78 nm Filter, rear
RB	1327.25 nm Filter, rear
RC	1329.22 nm Filter, rear
RD	1330.46 nm Filter, rear
RE	1323.59 nm Filter, rear
RF	1322.83 nm Filter, rear
RG	1318.73 nm Filter, rear
RH	1317.74 nm Filter, rear

5-1: Fibre connector type

A1	SC/APC, 9deg
B1	FC/APC
C1	E2000
D1	SC/APC, 8deg
H1	SC/APC with shutter, 8 deg
J1	SC/APC with shutter, 9 deg
A2	2xSC/APC, 9deg
B2	2xFC/APC
C2	2xE2000
D2	2xSC/APC, 8deg
H2	2xSC/APC with shutter, 8deg
J2	SC/APC with shutter, 9 deg

6-1 Signal monitoring

B	Spectrum analyser
X	None

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