

HDO903 CATV FIBRE TRANSMITTER

HDO903 is a high performance DFB laser transmitter for forward path (downstream) fibre optic links in CATV networks. It is installed into HDX installation frame. HDO903 is available on different optical output power and distortion categories to fit various performance requirements. Also CWDM wavelengths in 1310 nm window are available to support a node segmentation. An integrated WDM filter is available as an option for applications where 1310 nm forward path and CWDM return path is transmitted in one fibre. The output power range is from +2 dBm up to +15 dBm.



Features

- Standardised input and test point levels
- Two inputs with level adjustments
- Equaliser in both inputs
- High isolation between inputs
- Integrated input and laser driver amplifiers
- OMI value remains if the optical output power is changed
- Automatic power control as standard feature
- Optional spectrum analyser function
- Fibre connectors can be located at the rear or at the front panel
- Integrated WDM filter as an option
- 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
- 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 DVX012 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 and nominal output power	1290 nm 1310 nm 1330 nm	1), 2)	
	+2 dBm		
	+4 dBm		
	+6 dBm		
	+8 dBm +8 dBm +8 dBm		
	+10 dBm +10 dBm +10 dBm		
	+11 dBm		
	+12 dBm		
	+13 dBm		
	+14 dBm		
	+15 dBm		
Output power adjustment	Available at +8 and 10 dBm transmitter	3)	
Relative intensity noise	-155 dBc/Hz	4)	
OMI per channel	4.5% for CENELEC 42 chs loading	5)	
Pass bands of optional WDM filter	1270...1360 nm and 1460...1620 nm	6)	
Number of optical ports	1 or 2	7)	
RF parameters			
Frequency range	47...1000 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 (optional)			
Measurement range	50...860 MHz, 0.25 MHz steps		
Measurement bandwidth	1.5 MHz	14)	
Dynamic range	58...98 dBμV	15)	
Measurement accuracy	±1 dB	16)	
Noise and distortion performance			
<u>CENELEC, 42 unmodulated channels</u>	<u>Enhanced</u>	<u>Standard</u>	
Link C/N with 0 dBm to receiver	54 dB	54 dB	2), 17)
CTB, guaranteed value	68 dB	65 dB	18)
CSO, guaranteed value	63 dB	60 dB	18)
<u>NTSC-77, unmodulated channels</u>	<u>Enhanced</u>	<u>Standard</u>	
Typical link C/N with 0 dBm to receiver	54 dB	54 dB	2), 17)
CTB, typical value	70 dB	67 dB	19)
CSO, typical value	65 dB	62 dB	19)

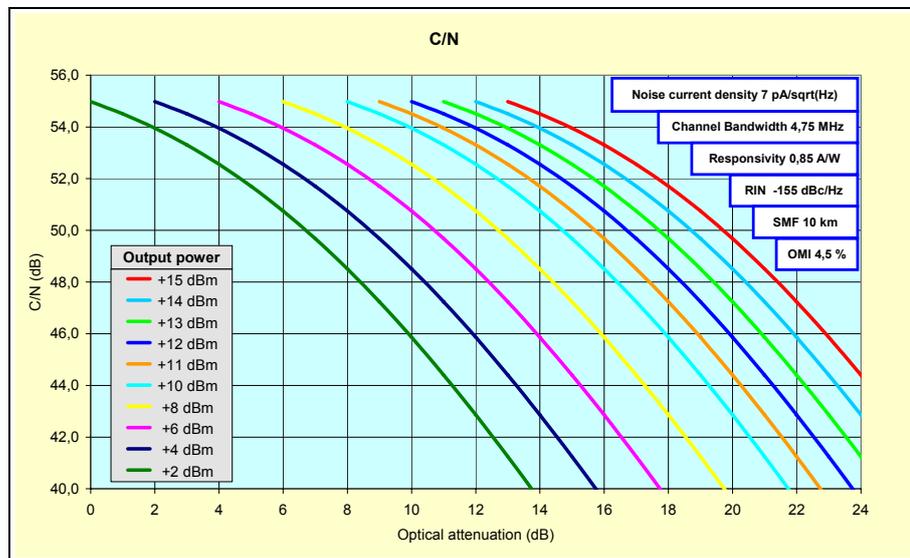
Enhanced category is available only at 1310 nm wavelength.
 CENELEC 42 chs assumes analogue loading up to 862 MHz.
 NTSC-77 assumes analogue loading up to 550 MHz.
 Digital channels can be placed everywhere in the frequency spectrum in both cases taking into account the loading they represent.

General

Power consumption	17 W	20)
Supply voltages	25 V / 450 (600) mA	20)
	6.3 V / 800 (1200) mA	20)
RF connectors	F female	21)
Optical connector	SC/APC, E-2000	22)
Cooling	Field replaceable fan	23)
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	24)
Enclosure classification	IP20	
Operating temperature range	0...+45 °C	
Storage temperature range	-20...+60 °C	
Operating relative humidity	0...85 %	

Notes

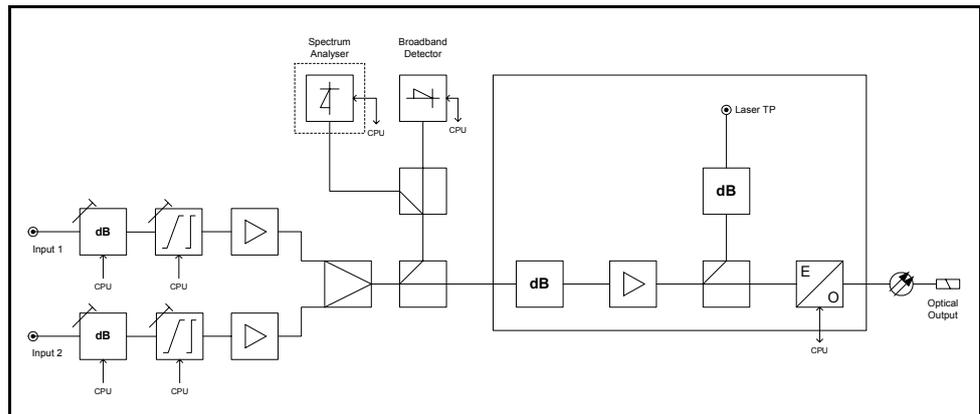
- 1) Typical peak wavelength at 25°C. The peak wavelength variation range between various transmitters is ±6 nm.
- 2) The inaccuracy of the output power is given to the nominal value. 2...8 dBm transmitters have -0.5/+1.9 dB inaccuracy and 10...15 dBm transmitters have -0.5/+0.9 dB inaccuracy. The C/N values are based on the fibre length up to 10 km and the noise current density of 7 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.



- 3) Output power of the transmitter can be adjusted -2 dB by a user. Reducing the power degrades RIN and C/N.
- 4) Worst case value at the nominal output power.
- 5) Typical value. The minimum value is 4.0 %. With NTSC-77 typical OMI value is 4.0 %.
- 6) WDM filter decreases the output power 0.5 dB.
- 7) There are two optical ports when WDM filter is available - 1310 nm output and 1550 nm output.
- 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 42 channels the resulted OMI/channel is 4.5 %. Off-set 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 -20 dB bandwidth is 2.5 MHz.
- 15) Level at laser (OMI) test point for modulated PAL signal. For QAM detection the dynamic range is approx. 6 dB higher. Nominal level denotes 4.5 % OMI. (0.45...45 % OMI range)
- 16) This is the typical performance over band 50...740 MHz for PAL signals. For PAL signals between 740...860 MHz and all QAM signals the accuracy is ± 2.0 dB.
- 17) Typical value with 10 km fibre. The minimum value is 53 dB with 4.5 % OMI. With NTSC-77 the CNR values are achieved with 4.0 % OMI.
- 18) Enhanced category is available only at 1310 nm wavelength. Minimum value at 25°C with CENELEC 42 channel raster. Standard performance transmitter has 1 dB lower distortion specification between 750 and 862 MHz, meaning 64 dB and 59 dB. With modulated channels the distortion distances are better, CTB typically 8 dB, CSO 6 dB. At wavelengths 1290 nm and 1330 nm CSO is reduced by 0.5 dB per 5 km because of the dispersion of a fibre and the chirp of a laser.
- 19) Enhanced category is available only at 1310 nm wavelength. With modulated channels the distortion distances are better, CTB typically 8 dB, CSO 6 dB.
- 20) Typical power consumption at 25°C. Highest power transmitters with spectrum analyser in extreme conditions can consume 22.5 W, absolute maximum current values in parenthesis.
- 21) Fixed connections are located at the rear panel. Test points are located at the front panel.
- 22) Fibre connectors can be located at the rear or at the front panel.
- 23) The fan can be replaced by the user without signal interruption.
- 24) Radiation limit is 20 dBpW.

Block diagram



Ordering information

HDO903 Configuration map

	1-1	2-1	3-1	4-1	5-1	6-1
HDO903	-	-	-	-	-	-

1-1 Wavelength	
A	1310 nm
C	1290 nm CWDM
D	1310 nm CWDM
E	1330 nm CWDM

2-1 Transmitter performance and output power	
AA02	Enhanced +2 dBm
AA04	Enhanced +4 dBm
AA06	Enhanced +6 dBm
AA08	Enhanced +8 dBm
AA10	Enhanced +10 dBm
AA11	Enhanced +11 dBm
AA12	Enhanced +12 dBm
AA13	Enhanced +13 dBm
AA14	Enhanced +14 dBm
AA15	Enhanced +15 dBm
BA02	Standard +2 dBm
BA04	Standard +4 dBm
BA06	Standard +6 dBm
BA08	Standard +8 dBm
BA10	Standard +10 dBm
BA11	Standard +11 dBm
BA12	Standard +12 dBm
BA13	Standard +13 dBm
BA14	Standard +14 dBm
BA15	Standard +15 dBm
BC08	1290 nm CWDM +8 dBm
BC10	1290 nm CWDM +10 dBm
BD08	1310 nm CWDM +8 dBm
BD10	1310 nm CWDM +10 dBm
BE08	1330 nm CWDM +8 dBm
BE10	1330 nm CWDM +10 dBm

3-1 Fibre location	
F	Front panel
R	Rear panel

4-1 Optopassive	
FX	None
RX	None

5-1 Fibre connector type	
B1	FC/APC
C1	E2000
D1	SC/APC, 8deg
H1	SC/APC, 8deg AMP

6-1 Signal monitoring	
X	None