

## HDO907 CATV FIBRE TRANSMITTER

HDO907 is a high performance, linear and directly modulated DFB laser transmitter for forward path fibre optic links in CATV and FTTx networks. HDO907 has an extended frequency range to fulfil DOCSIS 3.1 requirements. The transmitter is installed into HDX installation frame. HDO907 is available on different optical output power and distortion categories to fit various performance requirements. HDO907 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 unwanted narrowcast node segments. HDO907 power consumption is low but HDO907 still offers the highest level of performance and the widest variety of features, including the internal spectrum analyser module. 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. Different optical output power classes are available from +2 dBm up to +15 dBm.



### Features

- DOCSIS 3.1 compatible 1.2 GHz bandwidth
- Standardised input and test point levels
- 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
- 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
- Input 2 switch on/ off
- 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
<b>Optical parameters</b>		
Light source	Cooled DFB with optical isolator	
Peak wavelength	1310 nm	1)
Output power, nominal value	+2 dBm	2)
	+4 dBm	
	+6 dBm	
	+8 dBm	
	+10 dBm	
	+11 dBm	
	+12 dBm	
	+13 dBm	
	+14 dBm	
	+15 dBm	
Relative intensity noise	-154 dBc/Hz	3)
OMI per channel	4.5% for CENELEC 42 chs loading	4)
Pass bands of optional WDM filter	1270...1360 nm and 1460...1620 nm	5)
Number of optical ports	1 or 2	6)
<b>RF parameters</b>		
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)
<b>Spectrum analyser module (optional)</b>		
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)
<b>Noise and distortion performance</b>		
<u>CENELEC, 42 unmodulated channels</u>		
Link C/N with 0 dBm to receiver	53.5 dB	2), 17)
CTB, guaranteed value	65 dB	18)
CSO, guaranteed value	60 dB	18)
<u>NTSC-77, unmodulated channels</u>		
Typical link C/N with 0 dBm to receiver	53.5 dB	2), 17)

CTB, typical value	67 dB	19)
CSO, typical value	62 dB	19)

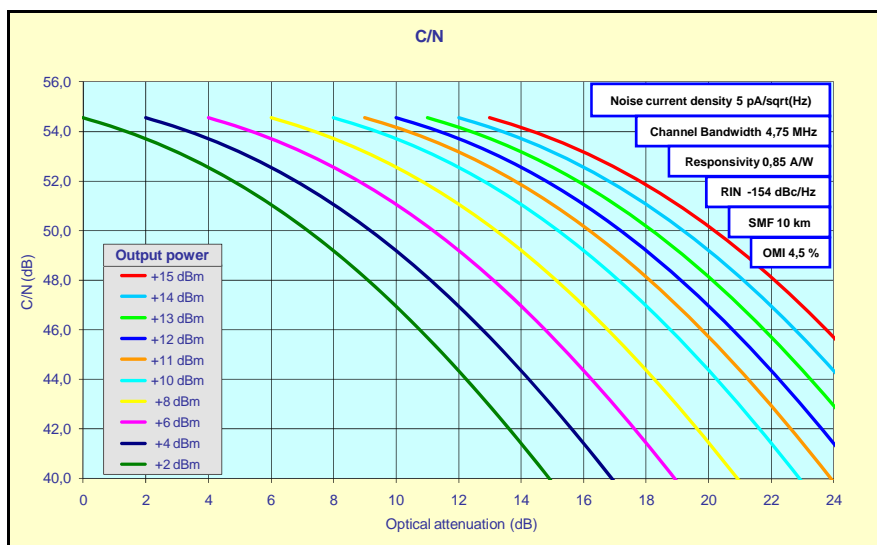
CENELEC 42 chs assumes analogue loading up to 862 MHz.  
 NTSC-77 assumes analogue loading up to 550 MHz.  
 Digital channels can be placed everywhere in the frequency spectrum in both cases taking into account the loading they represent.

### General

Power consumption	10 W	20)
Supply voltages	25 V / 300 mA	20)
	6.3 V / 400 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

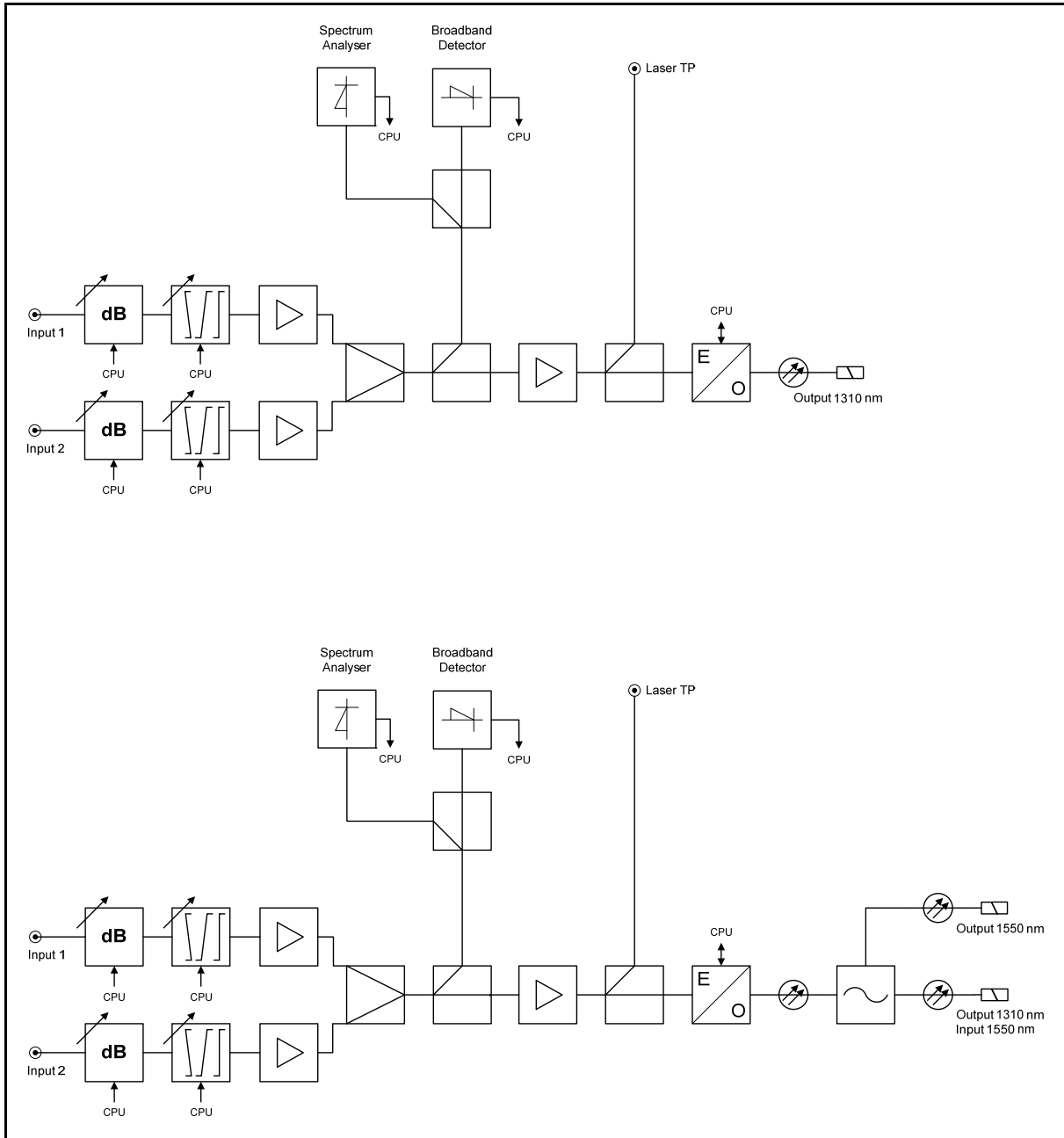
- 1) Typical peak wavelength at 25°C. The peak wavelength variation range of various transmitters is ±10 nm.
- 2) The inaccuracy of the output power is given to the nominal value. 2...8 dBm transmitters have -0.5/+1.9 dB inaccuracy and 10...15 dBm transmitters have -0.5/+0.9 dB inaccuracy. The C/N values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



- 3) Worst case value at the nominal output power when the 2<sup>nd</sup> input is switched off.
- 4) Typical value. The minimum value is 4.0 %.  
 With NTSC-77 typical OMI value is 4.0 %.
- 5) WDM filter decreases the output power 0.5 dB typically.

- 6) There are two optical ports when WDM filter is available: 1310 nm output to network direction and 1550 nm output to HE direction.
- 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  $\pm 0.75$  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/ 1 channel is 4.5 %. Offset can be set by the user.
- 11) Typical accuracy is  $\pm 0.4$  dB. Maximum value is  $\pm 0.75$  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  $\sim 0.35$  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  $\pm 1.7$  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 2<sup>nd</sup> input is switched off. When the 2<sup>nd</sup> input is switched on 0.5 dB lower C/N is allowed.  
With NTSC-77 the CNR values are achieved with 4.0 % OMI.
- 18) Minimum value at 25°C with CENELEC 42 channel raster. CTB and CSO performance is tested up to 1218 MHz. CSO minimum value is 58 dB below 150 MHz and above 862 MHz. With modulated channels the distortion distances are better. The modulation improvement is typically 8 dB for CTB and 6 dB for CSO.
- 19) With modulated channels the distortion distances are better, The modulation improvement is typically 8 dB for CTB and 6 dB for CSO.
- 20) Typical power consumption at 25°C without the spectrum analyser module. The highest power transmitters with spectrum analyser in extreme conditions can consume 14 W.
- 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, with and without WDM filter



Ordering information

**HDO907 Configuration map**

	1-1		2-1				3-1		4-1			5-1			6-1
HDO907	-					-					-				-

**1-1 Transmitter type**  
**A** Standard 1310 nm  
**T** Customer specific

**2-1 Transmitter performance and output power**  
**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

**3-1 Fibre location**  
**F** Front panel  
**R** Rear panel

**4-1 Optopassive**  
**FA** 1310/1550 WDM  
**RA** 1310/1550 WDM  
**FX** None  
**RX** None

**5-1 Fibre connector type**  
**A1** SC/APC, 9deg  
**A2** 2xSC/APC, 9deg  
**B1** FC/APC  
**B2** 2xFC/APC  
**C1** E2000  
**C2** 2xE2000  
**D1** SC/APC, 8deg  
**D2** 2xSC/APC, 8deg  
**H1** SC/APC with shutter, 8deg  
**H2** 2xSC/APC with shutter, 8deg

**6-1 Signal monitoring**  
**B** Spectrum analyser  
**X** None