

## HDO905 CATV FIBRE TRANSMITTER

HDO905 is a high performance, linear directly modulated DFB laser transmitter for forward path fibre optic links in CATV and FTTx networks. The module is installed into HDX installation frame. HDO905 is available on different optical output power and distortion categories to fit various performance requirements. HDO905 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. HDO905 power consumption is low but HDO905 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

- 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 DVX021 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...1006 MHz		
RF impedance	75 $\Omega$		
Input return loss	18 dB	8)	
Flatness	$\pm 0.4$ dB	9)	
Automatic power control (APC)	Yes	10)	
Laser test point level for 4.5 % OMI	78 dB $\mu$ V	11)	
Input level	77 dB $\mu$ V	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	50...860 MHz, 0.25 MHz steps		
Measurement bandwidth	1.5 MHz	14)	
Dynamic range	58...98 dB $\mu$ V	15)	
Measurement accuracy	$\pm 1$ dB	16)	
<b>Noise and distortion performance</b>			
<u>CENELEC, 42 unmodulated channels</u>			
Link C/N with 0 dBm to receiver	<u>Enhanced</u> 53.5 dB	<u>Standard</u> 53.5 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>			
Typical link C/N with 0 dBm to receiver	<u>Enhanced</u> 53.5 dB	<u>Standard</u> 53.5 dB	2), 17)
CTB, typical value	70 dB	67 dB	19)
CSO, typical value	65 dB	62 dB	19)

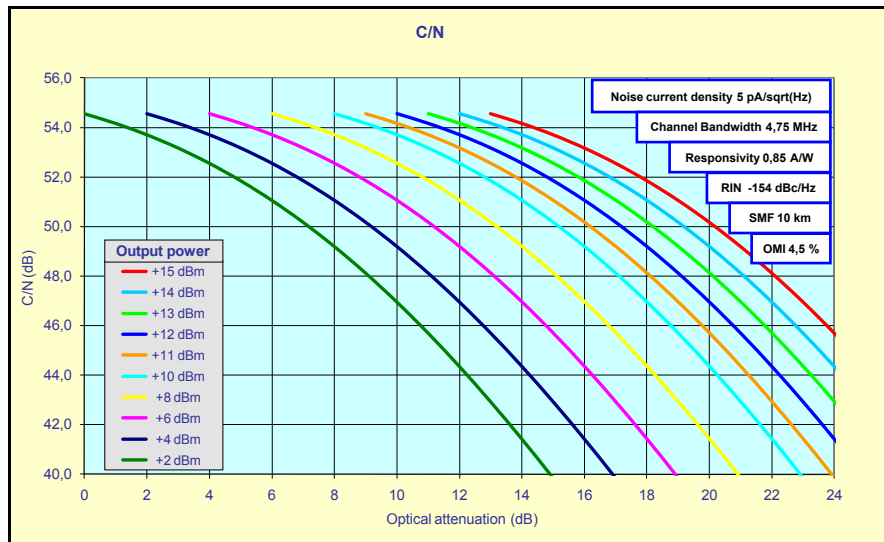
CENELEC 42 chs assumes analogue loading up to 862 MHz.  
 NTSC-77 assumes analogue loading up to 550 MHz.  
 Digital channels can be placed everywhere in the frequency spectrum in both cases taking into account the loading they represent.

**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**

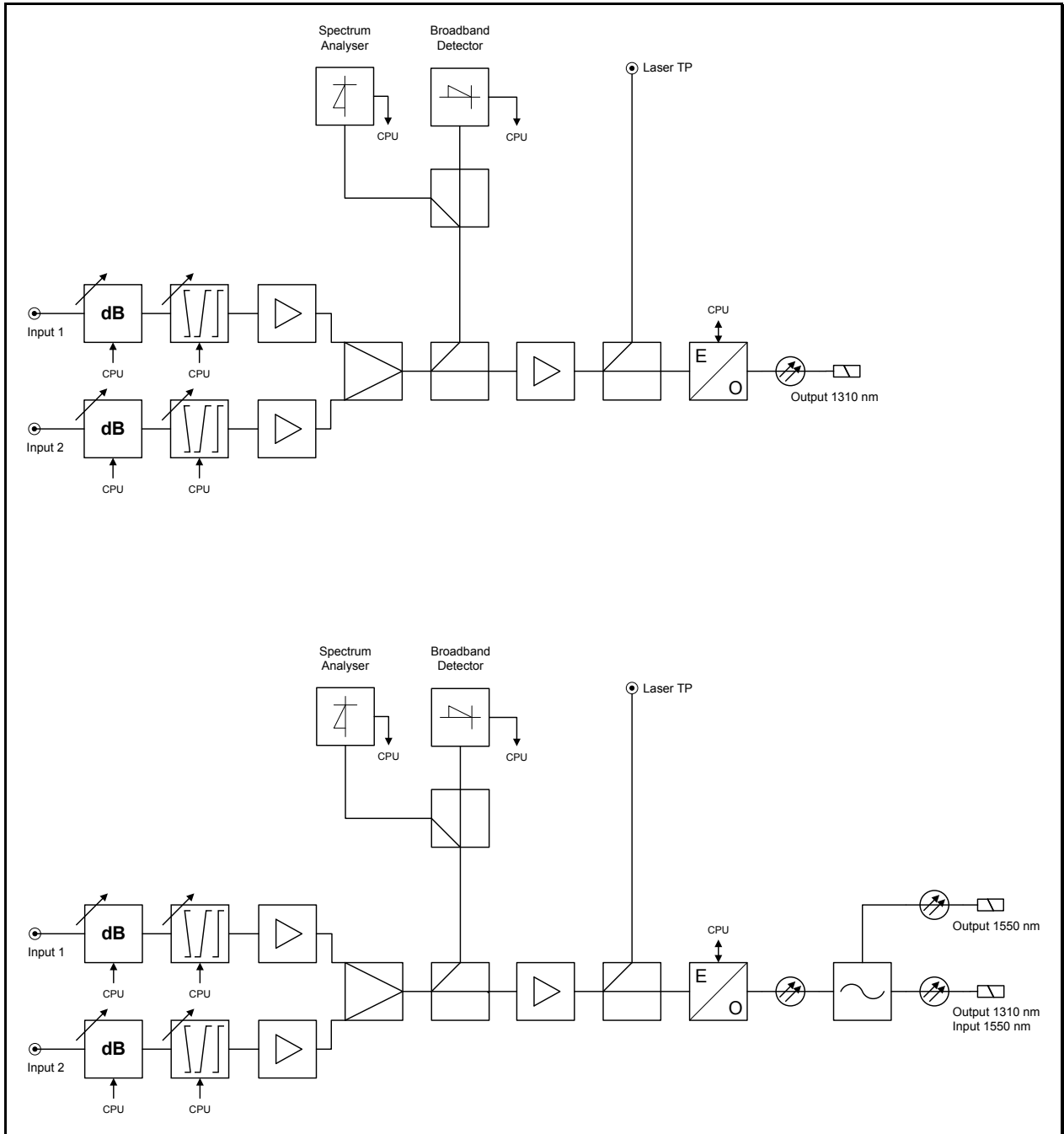
- 1) Typical peak wavelength at 25°C. The peak wavelength variation range of various transmitters is ±10 nm.
- 2) The inaccuracy of the output power is given to the nominal value. 2...8 dBm transmitters have -0.5/+1.9 dB inaccuracy and 10...15 dBm transmitters have -0.5/+0.9 dB inaccuracy. The C/N values 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/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 -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  $\pm 2.0$  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.  
Enhanced class transmitter's CSO limit is 62 dB for the 2<sup>nd</sup> input.  
Standard performance transmitter has 1 dB lower distortion specification between 750 and 862 MHz, i.e. 64 dB and 59 dB.  
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**

**HDO905 Configuration map**

	1-1	2-1	3-1	4-1	5-1
HDO905	-	-	-	-	-

<b>1-1 Wavelength</b>
A 1310 nm

<b>2-1 Transmitter performance and output power</b>
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

<b>3-1 Fibre location</b>
F Front panel
R Rear panel

<b>4-1 Optopassive</b>
FA 1310/1550 WDM
RA 1310/1550 WDM
FX None
RX None

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

<b>6-1 Signal monitoring</b>
A Spectrum analyser
X None