# HDO775 C-BAND DWDM FIBRE TRANSMITTER

HDO775 is a high performance directly modulated C-band DWDM transmitter for forward path fibre optic links in CATV and FTTx networks. It has an extended frequency range to fulfil DOCSIS 3.1 requirements. HDO775 is optimised for QAM and COFDM transmission and it can carry a full channel load up to 1.2 GHz. HDO775 can be also loaded with a limited amount of analog TV channels together with digital channels.


HDO775 transmitter contains an electrical dispersion compensator that is important when the transmission distance is longer. HDO775 is installed into HDX installation frame. It is available with different optical wavelengths in accordance with the ITU wavelength grid. The adjustable optical output power enables equalising channel powers in multi-wavelength systems containing optical amplifiers.

HDO775 has two identical inputs with individual level and slope adjustments to support broadcast and narrowcast signal distribution. The RF isolation between the inputs is high minimising the leakage of narrowcast signals to other narrowcast node segments. The power consumption is low but HDO775 still offers high performance and the widest variety of features.

## Features

- DOCSIS 3.1 compatible 1.2 GHz bandwidth
- ITU wavelengths in 100 GHz grid
- Optical output power adjustment for channel power equalising
- Electrical dispersion compensator provides a good CSO performance at longer transmission distances
- Standardised input and test point levels
- Low power consumption and high performance
- Two identical inputs with individual level and slope adjustments
- High isolation between inputs
- Unused input can be switched off for power saving and noise reduction
- Drive amplifier can be set to power save mode in narrowcast load conditions
- Integrated input amplifiers and laser driver amplifiers
- Automatic power control providing constant total OMI as standard feature
- Optional integrated xWDM filter to combine forward and return paths into one fibre or to combine various forward wavelengths into one fibre
- Optional spectrum analyser function enabling ALSC
- Fibre connectors can be located at the rear or at the front panel
- 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 adjustment and 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
- Drive amplifier power save mode on/off
- Link length setting
- LED indicators for signal and module statuses
- Internal temperature measurement and monitoring
- Intelligent fan speed control with monitoring
- Non-volatile logging of 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 | 1530…1560 nm (ITU ch59...21) | 1) |
| Output power, nominal value | +10 dBm | 2) |
| SBS suppression | +16 dBm | |
| Relative intensity noise | -154 dBc/Hz | 3) |
| OMI per channel | 2.6 % | 4) |
| Link length setting | 0...40 km | |
| Pass band of optional xWDM filter | | 5) |
| Pass channel | ±0.12 nm (DWDM) or ±6.5 nm (CWDM) | |
| Reflect channel, DWDM | 1520...1565 nm except the pass channel | |
| Reflect channel, CWDM | 1260...1620 nm except the pass channel | |
| Number of optical ports | 1 or 2 | |
| **RF parameters** | | |
| Frequency range | 47...1218 MHz | |
| RF impedance | 75 Ω | |
| Input return loss | 18 dB | 6) |
| Flatness | ±0.4 dB | 7) |
| Automatic power control (APC) | Yes | 8) |
| Laser test point level for 4.5 % OMI | 78 dBµV | 9) |
| Input level | 77 dBµV | 10) |
| Level adjustment range | -15…0 dB | |
| Equaliser adjustment range | -6…+1 dB | |
| Isolation between inputs | 50 dB | 11) |

## Spectrum analyser module (option)

| | | |
|---|---|---|
| Measurement range | 47…1218 MHz, 0.25 MHz steps | |
| Measurement bandwidth | 0.35 MHz | 12) |
| Dynamic range | 58…98 dBµV | 13) |
| Measurement accuracy | ±1 dB | 14) |

## Noise and distortion performance

| | | |
|---|---|---|
| MER | 40 dB | 15) |
| BER | $<10^{-9}$ | 16) |

## General

| | | |
|---|---|---|
| Power consumption | 8.2 W | 17) |
| Supply voltages | 25 V / 250 mA | 17) |
| | 6.3 V / 300 mA | 17) |
| RF connectors | F female | 18) |
| Optical connector | SC/APC, E-2000 | 19) |
| Cooling | Field replaceable fan | 20) |
| 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 | 21) |
| Enclosure classification | IP20 | |
| Operating temperature range | 0...+45 °C | |
| Storage temperature range | -20...+60 °C | |
| Operating relative humidity | 0…85 % | |

## Notes

1) ITU channels 59, 58, 57, ..., 21. Total number available 39 wavelengths. See the configuration map.

2) User can adjust the output power in the window +10 dBm...+8 dBm. The selected OMI value is retained over the adjustment range.

3) Worst case value at the nominal output power.

4) Typical value of QAM channel OMI when the total channel loading is 100 x 256-QAM channels. Equals to total OMI 26 %. Minimum value is 2.3 %. The factory setting (target offset value) is based on BER measurement.

5) DWDM filter is used if the return path is based on DWDM.
CWDM filter is used if the return path is based on CWDM.
xWDM filter decreases the output power 0.5 dB typically.

6) Typical value is 18 dB on the whole frequency band. The minimum value is 18 dB and above 47 MHz -1 dB/ octave.

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

8) APC is based on RF broadband detection. The total RF power into laser is measured and the total OMI is adjusted to target level. The offset can be set by a user.

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

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

11) The attenuation from one input to the other input. Above 862 MHz the isolation is higher than 40 dB.

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

13) 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)

14) 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.

15) Typical value when the load is 130 x 256-QAM channels and 8 wavelengths are transmitted in 30 km fibre. Minimum value is 39 dB.

16) At nominal loading i.e. total OMI is max. 26 %.

17) 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 W (6.3 V).

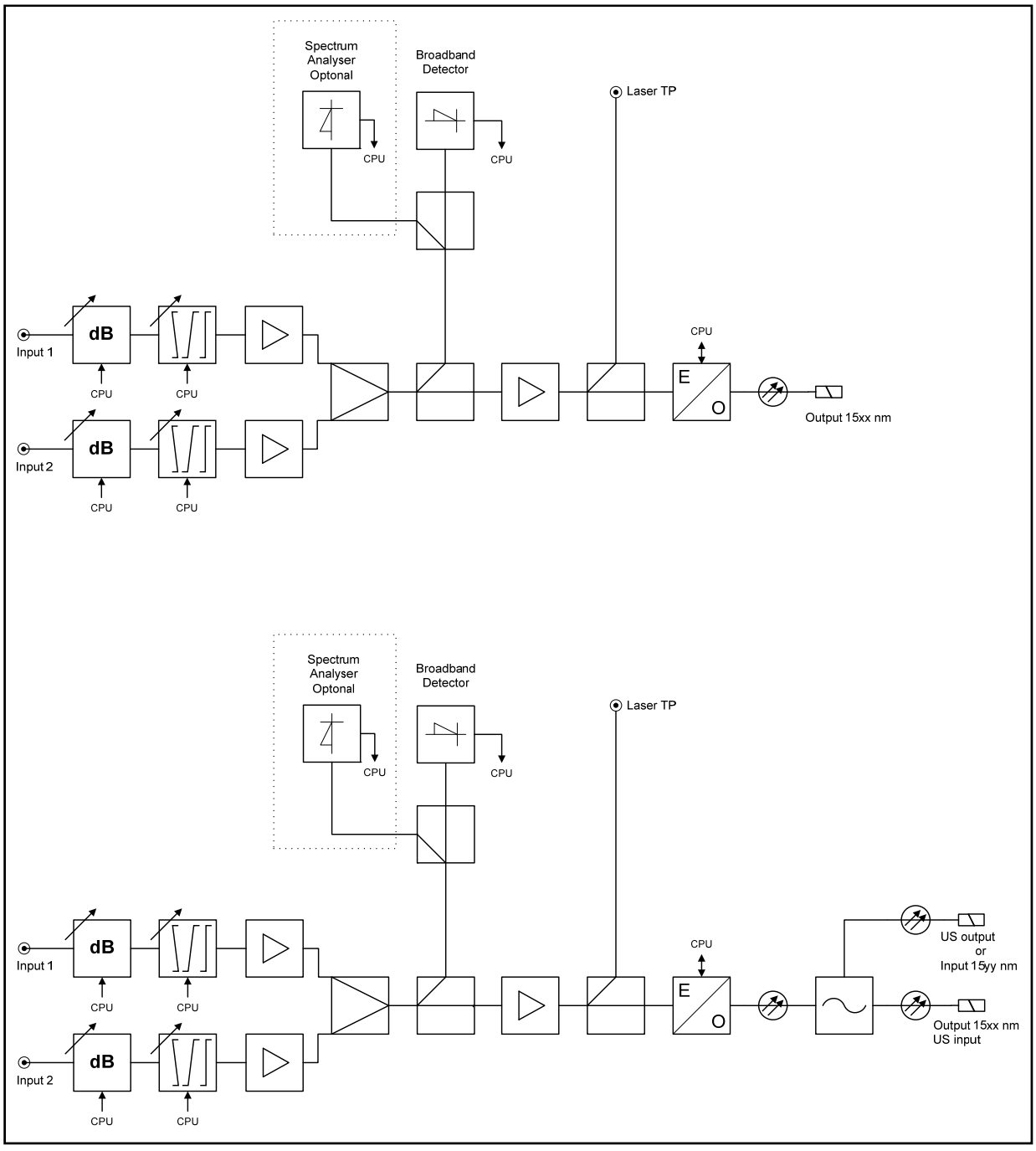
18) Fixed connections are located at the rear panel. Test points are located at the front panel.

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

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

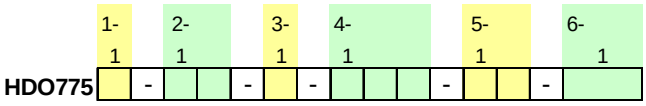
21) Radiation limit is 20 dBpW.

## Block diagrams, with and without WDM filter (optional)



## Ordering information

### HDO775 configuration map




| 1-1 Transmitter type | |
|---|---|
| **A** | Full QAM, ITU Ch 21...59 |

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

| 2-1 ITU ch and wavelength | |
|---|---|
| **18** | ITU Ch 18 1563.05 nm |
| **21** | ITU Ch 21 1560.61 nm |
| **22** | ITU Ch 22 1559.79 nm |
| **23** | ITU Ch 23 1558.98 nm |
| **24** | ITU Ch 24 1558.17 nm |
| **25** | ITU Ch 25 1557.36 nm |
| **26** | ITU Ch 26 1556.55 nm |
| **27** | ITU Ch 27 1555.75 nm |
| **28** | ITU Ch 28 1554.94 nm |
| **29** | ITU Ch 29 1554.13 nm |
| **30** | ITU Ch 30 1553.33 nm |
| **31** | ITU Ch 31 1552.52 nm |
| **32** | ITU Ch 32 1551.72 nm |
| **33** | ITU Ch 33 1550.92 nm |
| **34** | ITU Ch 34 1550.12 nm |
| **35** | ITU Ch 35 1549.32 nm |
| **36** | ITU Ch 36 1548.51 nm |
| **37** | ITU Ch 37 1547.72 nm |
| **38** | ITU Ch 38 1546.92 nm |
| **39** | ITU Ch 39 1546.12 nm |
| **40** | ITU Ch 40 1545.32 nm |
| **41** | ITU Ch 41 1544.53 nm |
| **42** | ITU Ch 42 1543.73 nm |
| **43** | ITU Ch 43 1542.94 nm |
| **44** | ITU Ch 44 1542.14 nm |
| **45** | ITU Ch 45 1541.35 nm |
| **46** | ITU Ch 46 1540.56 nm |
| **47** | ITU Ch 47 1539.77 nm |
| **48** | ITU Ch 48 1538.98 nm |
| **49** | ITU Ch 49 1538.19 nm |
| **50** | ITU Ch 50 1537.40 nm |
| **51** | ITU Ch 51 1536.61 nm |
| **52** | ITU Ch 52 1535.82 nm |
| **53** | ITU Ch 53 1535.04 nm |
| **54** | ITU Ch 54 1534.25 nm |
| **55** | ITU Ch 55 1533.47 nm |
| **56** | ITU Ch 56 1532.68 nm |
| **57** | ITU Ch 57 1531.90 nm |
| **58** | ITU Ch 58 1531.12 nm |
| **59** | ITU Ch 59 1530.33 nm |

| 4-1 Optopassive | |
|---|---|
| **F21** | ITU21 filter, front |
| **R21** | ITU21 filter, rear |
| **F22** | ITU22 filter, front |
| **R22** | ITU22 filter, rear |
| . | . |
| . | . |
| . | . |
| **F59** | ITU59 filter, front |
| **R59** | ITU59 filter, rear |
| **FC3** | 1531 nm filter, front |
| **RC3** | 1531 nm filter, rear |
| **FC5** | 1551 nm filter, front |
| **RC5** | 1551 nm filter, rear |
| **FXX** | None |
| **RXX** | None |

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

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

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