

1.3.2 Features

The laser fibers are connected via FC/APC connectors at the front of the module. (Other connectors optional).

Each module is protected against overheating of the output stage by an automatic shutdown. The LED "ERR" indicates that the module is switched off. After a decline in temperature of about 10 °C the LED "ERR" extinguishes and the output can be reactivated

The laser wavelength of the WDM and CWDM modules is directly adjustable, whereas the rated center wavelength of the LS8xxxx module is adjusted by operating the laser diode at a certain user controllable temperature. The user can change the temperature (thus the wavelength) by selecting a positive or negative temperature difference δT .

The PRO8000 (-4) / PRO800 contains a forced air cooling system with built-in fans. Depending on the temperature the air flow of the fans is adapted automatically.

All settings can be changed with the operating elements of the mainframe or via remote control from a PC.

The mains filter installed in the mainframe and the careful shielding of the transformer, the microprocessor as well as the module itself provide an excellent suppression of noise and ripple.

All PRO8000 (-4) / PRO800 modules can be supplied in a variety of versions, e.g. with different modulation options or wavelength.

➔ (refer to chapter 1.4, "Technical data" starting on page 9)

1.4 Technical data

(All technical data are valid at $23 \pm 5^\circ\text{C}$ and $45 \pm 15\%$ humidity)

1.4.1 Common technical data for the WDM modules

Laser source	DFB laser diode with isolator
Output power	20 mW ¹⁾
Setting range (attenuation)	10 dB
Resolution	0.01 dB
Optical output connector	PMF, FC/APC ²⁾
Operating temperature	0 ... + 35 °C (non condensing)
Storage temperature	- 40 ... + 35 °C
Warm-up time for rated accuracy	15 min
Mechanical width of module	1 slot
Weight	< 0.5 kg

Wavelength

Channel spacing	ITU grid (50 GHz)
Wavelengths	S, L and C band ³⁾
Wavelength accuracy	± 10 pm (typ.) / $< \pm 25$ pm
Stability (typ.)	< 2 pm / 24 h
Setting range	± 1 nm ⁴⁾
Resolution	1 pm
Spectral linewidth	< 10 MHz

Power

Stability (15 s)	< 0.002 dB
Stability (15 min)	< 0.005 dB
Stability (24 h)	< 0.01 dB
SMSR (side mode suppression ratio, at nominal power)	> 40 dB; typ. > 45 dB
RIN (Relative intensity noise)	typ. > 145 dB / Hz
Optical isolation	> 35 dB

Modulation (Standard)

Digital DC modulation (TTL, synchronous from mainframe))	0 ... 10 kHz
Internal sinus, mod. depth 0...100%	0 ... 50kHz
Internal square, "	0 ... 50 kHz
Internal ON/OFF	0 ... 50 kHz
Internal noise, mod. depth 0...10%	BW~ 0,2 ... 5 kHz
External analog LF modulation (optional)	DC ... 50 kHz

¹⁾ Other nominal power ratings on request

²⁾ PMF with aligned connector on request. Other connector styles on request

³⁾ Selected customer specific according to ITU

⁴⁾ Corresponds to about ± 10 °C (larger setting range on request)

Coherence Control

via internal modulation (noise, sine, square, triangle¹)
adjustable

optical BW up to 1GHz

1.4.2 Common technical data for the LS8xxxx modules

General data

Optical output connector	FC/APC
Operating temperature	0 ... + 35 °C (non condensing)
Storage temperature	- 40 ... + 35 °C
Warm-up time for rated accuracy	15 min
Mechanical width	1 slot
Weight	< 0.5 kg

Wavelength

Wavelength / power ²	1310 nm / 10 mW 1550 nm / 10, 20, 40 & 50 mW
Center wavelength tolerance	± 20 nm
Stability (typ.)	< 0.01 nm / 24 h
Spectral linewidth (typ.)	< 30 MHz

Power

Stability (24 h)	< 0.01 dB
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Setting of temperature

Setting range	± 5 °C
Resolution	0.001 °C

Modulation

TTL (all modules synchronous, BNC from mainframe)	DC ... 10 kHz
Analog modulation input (BNC) ³	DC ... 50 kHz
RF modulation (SMA) ²	0.2 ... 500 MHz
Type of modulation	direct modulation with bias T
Input impedance	50 Ω

¹ Triangle on request

² Other wavelengths and power on request

³ Either analog modulation input or RF BIAS-T modulation available

1.4.3 Common technical data for the CWDM modules

Output power	10 mW
Center wavelength tolerance	$\pm 3\text{nm}$ ($\pm 1\text{nm}$ optional)
Optical output connector	FC/APC ¹⁾
Operating temperature	0 ... + 35 °C (non condensing)
Storage temperature	- 40 ... + 35 °C
Warm-up time for rated accuracy	15 min
Mechanical width of module	1 slot
Weight	< 0.5 kg

Wavelength

Channel spacing	20 nm
Center Wavelengths	1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 nm
Stability (typ.)	< 2 pm / 24 h
Setting range	$\pm 0.5\text{ nm}$ ²⁾
Resolution	0.01 nm
Spectral linewidth	< 30 MHz

Power

Stability (15 s)	< 0.002 dB
Stability (15 min)	< 0.005 dB
Stability (24 h)	< 0.01 dB
SMSR (side mode suppression ratio, at nominal power)	> 36 dB; typ.>40 dB
Optical isolation	> 35 dB

Modulation (Standard)

Digital DC modulation (TTL, synchronous from mainframe))	0 ... 10 kHz
Internal sinus, mod. depth 0...100%	0 ... 50kHz
Internal square, "	0 ... 50 kHz
Internal ON/OFF	0 ... 50 kHz
Internal noise, mod. depth 0...10%	BW~ 0,2 ... 5 kHz

Coherence Control

via internal modulation (noise, sine, square, triangle ³⁾)	
adjustable	optical BW up to 1GHz

¹⁾ Other standards on request

²⁾ Corresponds to about $\pm 5\text{ °C}$ (larger setting range on request)

³⁾ Triangle on request

2 Operating the PRO8000 (-4) / PRO800 optical source modules

2.1 Operating elements on front panel

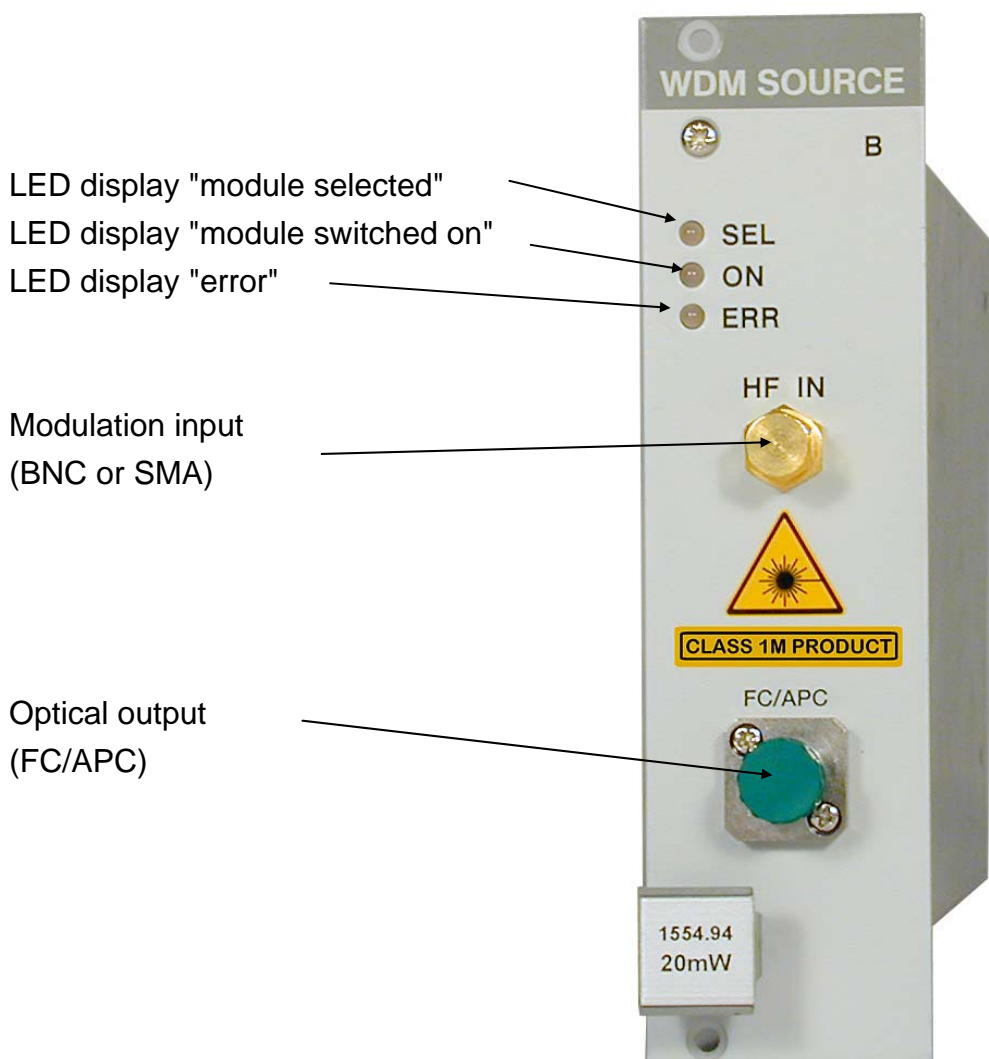


Figure 1 Front view of WDM, CWDM and LS plug-in modules