



The Power of Precision in WDM Wavelength Testing

## MULTI-WAVELENGTH METER

## 428 Series

**Test your WDM signals with the confidence that results from reliable accuracy.**

Bristol Instruments, the leader in optical wavelength measurement instrumentation, offers a family of multi-wavelength meters for WDM test applications. The 428 Series Multi-Wavelength Meter combines proven Michelson interferometer-based technology with fast Fourier transform analysis in order to measure the wavelength, power, and OSNR of as many as 1000 discrete optical signals. With features such as high accuracy, straightforward operation, and rugged design, the model 428 satisfies the needs of both the R&D scientist and the manufacturing engineer.



### KEY FEATURES

- Simultaneously measures wavelength and power of up to 1000 discrete optical signals.
- Optical wavelength measured to an accuracy as high as  $\pm 0.3$  pm.
- Continuous calibration with a built-in wavelength standard.
- Measurement confidence level of  $\geq 99.7\%$ .
- Traceable to NIST standards.
- Power measured to an accuracy of  $\pm 0.5$  dB.
- Automatically calculates OSNR to  $> 40$  dB.
- Operation from 1270 to 1650 nm covers the important C and L optical bands.
- Measurement rate of 4 Hz.
- High sensitivity of -40 dBm (0.1  $\mu$ W) with automatic electronic gain control.
- Operates with CW and modulated signals.
- Convenient front panel display reports measurement data in a variety of formats.
- Interfacing via SCPI using USB, Ethernet, or GPIB.
- Rugged design for manufacturing environments.

**It's Our Business to be Exact!**

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# SPECIFICATIONS

# 428 Series

MODEL	428A	428B
<b>OPTICAL SIGNAL</b>	CW and modulated	
<b>WAVELENGTH</b>		
Range	1270 – 1650 nm (182 – 236 THz)	
Accuracy <sup>1, 2, 3</sup>	± 0.2 parts per million (± 0.3 pm at 1550 nm)	± 0.65 parts per million (± 1.0 pm at 1550 nm)
Differential Accuracy <sup>4</sup>	± 0.15 parts per million	± 0.5 parts per million
Minimum Resolvable Separation <sup>3, 4</sup>	10 GHz (equal power lines input)	
Repeatability <sup>4, 5, 6</sup>	± 0.03 parts per million (± 0.05 pm at 1550 nm)	± 0.1 part per million (± 0.15 pm at 1550 nm)
Calibration	Continuous - built-in stabilized single-frequency HeNe laser	Continuous - built-in standard HeNe laser
Display Resolution	0.0001 nm	
Units <sup>7</sup>	nm, cm <sup>-1</sup> , THz	
<b>POWER</b>		
Calibration Accuracy	± 0.5 dB (± 30 nm from 1310 and 1550 nm)	
Flatness <sup>4</sup>	± 0.2 dB (1270 – 1600 nm), 30 nm from any wavelength	
Linearity <sup>4</sup>	± 0.3 dB (1270 – 1600 nm), lines above -30 dBm	
Polarization Dependence	± 0.5 dB (1270 – 1600 nm)	
Display Resolution	0.01 dB	
Units	dBm, mW, μW	
<b>SIGNAL-TO-NOISE RATIO</b> <sup>4, 8</sup>	> 40 dB (100 averages), ≥ 100 GHz channel spacing > 35 dB (100 averages), ≥ 50 GHz channel spacing	
<b>OPTICAL INPUT SIGNAL</b>		
Sensitivity	Single line input Multiple lines input <sup>4</sup>	-40 dBm (1270 – 1600 nm), -30 dBm (1600 – 1650 nm) 30 dB below total input power, but not less than single line input sensitivity
Maximum Power	+ 10 dBm, sum of all lines input (displayed level), + 18 dBm, sum of all lines input (safe level)	
Return Loss	35 dB (UPC connector), 50 dB (APC connector)	
Maximum Number of Lines <sup>9</sup>	1000	
<b>MEASUREMENT RATE (TIME)</b> <sup>10</sup>	4 Hz (0.25 s)	
<b>MEASUREMENT MODES</b>		
Data Mode	Single channel, list by wavelength table, list by power table	
Delta Mode	Delta wavelengths from ITU grid, delta wavelengths and powers from reference channel	
Drift Mode	Maximum, minimum, delta (max-min) of wavelengths and powers over time Current, start, drift (current-start) of wavelengths and powers over time	
<b>INPUTS/OUTPUTS</b>		
Optical Input	9/125 μm single-mode fiber (FC/UPC or FC/APC)	
Instrument Interface	Library of commands (SCPI) via USB 2.0, Ethernet, and optional GPIB	
<b>ENVIRONMENTAL</b> <sup>4</sup>		
Warm-Up Time	< 15 minutes	None
Temperature   Pressure   Humidity	+15°C to +30°C (-10°C to +70°C storage)   500 – 900 mm Hg   ≤ 90% R.H. at + 40°C (no condensation)	
<b>DIMENSIONS AND WEIGHT</b>		
Dimensions (H x W x D)   Weight	3.5" x 17.0" x 15.0" (89 mm x 432 mm x 381 mm)   17 lbs (7.65 kg)	
<b>POWER REQUIREMENTS</b>	90 - 264 VAC, 47 - 63 Hz, 80 VA max	

- (1) Defined as measurement uncertainty, or maximum wavelength error, with a confidence level of ≥ 99.7%.
- (2) Traceable to an NIST standard (SRM 2517a).
- (3) For multi-wavelength measurement, ≥ 15 GHz channel separation is required to achieve specified wavelength accuracy.
- (4) Characteristic performance, but non-warranted.
- (5) For 428A, standard deviation for a 10 minute measurement period.
- (6) For 428B, standard deviation for a 1 minute measurement period. Long-term measurement variations are < ± 0.4 ppm.
- (7) Data in units of nm and cm<sup>-1</sup> are given as vacuum values.
- (8) For lines above -25 dBm, 0.1 nm noise bandwidth.
- (9) OSNR is reduced as the number of lines is increased.
- (10) For single line input. Multiple lines input may reduce the measurement rate.



Bristol Instruments reserves the right to change the detail specifications as may be required to permit improvements in the design of its products. Specifications are subject to change without notice.