

ALL-BAND COMPONENT ANALYZER

12008

IQS-12008

R&D AND MANUFACTURING



Fast IL, ORL and PDL Measurements as a Function of Wavelength

- Continuous-sweep tunable laser covering the O, E, S, C, L and U bands
- Built for testing CWDM, FTTx and all broadband components
- Up to 32 channels
- High-speed auto-ranging detectors
- Three-year recommended calibration interval
- The only all-band component analyzer on the market

Component Characterization Over the Full Wavelength Range

Low-water-peak fiber, CWDM, passive optical networks, FTTx and WDM are all important technologies in today's and, more importantly, tomorrow's metro and access fiber-optic networks. They all target low-cost solutions putting as much bandwidth potential as possible in the hands of service providers and their customers.

Such solutions exploit several or all of the singlemode wavelength bands available for transmission. Depending on the network architecture, components must be designed, qualified and manufactured to cover various combinations of O, E, S, C, L and U bands. In many cases, broadband components—for example switches, splitters and attenuators—are required with guaranteed performance across all the bands. Without an all-band test system, comprehensive characterization has been a painful exercise of integration, data stitching and measurement compromise.

The Wait Is Over

EXFO's IQS-12008, an all-in-one component analyzer, uses a sweeping tunable laser source covering the 1260 to 1630 nm range to perform fast and accurate insertion loss (IL), optical return loss (ORL) and polarization-dependent loss (PDL) measurements as a function of wavelength.

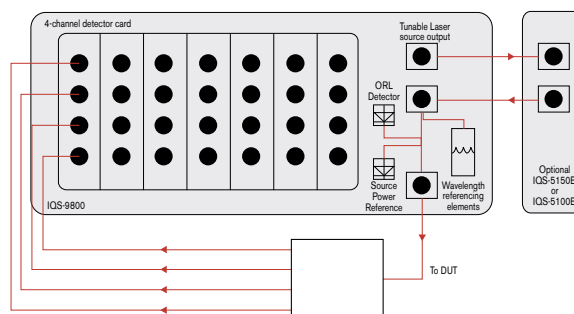


EXFO's IQS-12008 All-Band Component Analyzer performs IL, ORL and PDL measurements over a wavelength range of nearly 400 nm.

KEY FEATURES

- 1260 to 1630 nm wavelength coverage, ideal for testing FTTx, PON, CWDM and all broadband components at any singlemode wavelength
- Measurement performance and modular flexibility suitable for research, qualification and manufacturing applications
- Fast scan (> 200 nm/sec) performed with multichannel detectors, significantly reducing measurement time
- Comprehensive analysis functions for assessing key parameters including bandwidth of CWDM passbands, ripple, isolation, central wavelength, polarization-dependent central wavelength (PDCW) and polarization-dependent bandwidth (PDBW)
- Compact: based on the IQS-510P mainframe
- Ideal for a wide range of passive devices and test applications, including:
 - CWDM multiplexers and demultiplexers
 - FTTH/PON splitters
 - WDM filters and triplexers
 - Spectral attenuation of fiber spans
 - Broadband couplers
 - Fiber-optic switches and cross connects
 - Raman components
 - Attenuators and attenuator arrays
 - Isolators and circulators
 - Hybrid components
 - Depolarizers
 - Burn-in and qualification testing

System Overview



IQS-12008: Standard System Elements

IQS-510P Platform

As its controller platform, the IQS-12008 uses the IQS-510P mainframe, which houses a Pentium processor and 10 module slots—enough for a complete 32-channel IL, ORL and PDL test station. This very compact system can be operated as a benchtop unit or as part of a standard rackmount (4U, 19-inch).

IQS-500 platforms are based on standard industrial PC architecture, providing all the connectivity standards and tools required for easy integration into your test environment. This rugged hardware is readily adaptable to the most demanding optical T&M environments. An IQS-510E expansion unit can be connected to the main platform for applications requiring additional instruments (switches, DFB, attenuators, etc.).

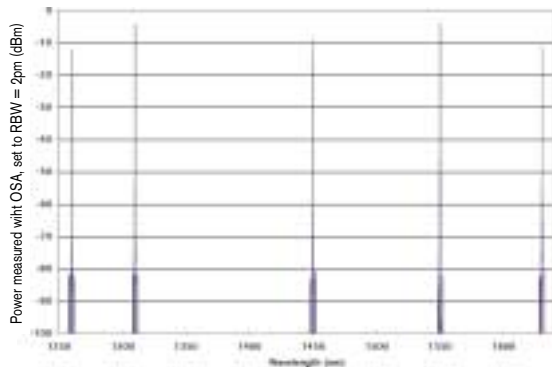
— IQS-9800 All-Band Multichannel Loss Meter

- Eight-slot module—the heart of the IQS-12008, incorporating the following subsystems:
 - All-band tunable laser source (TLS)
 - Wavelength and power reference
 - Optical return loss measurement
 - Source-detector synchronization
 - Houses detector mini-modules



— DET-1843 Four-Detector Mini-Module

- Four high-speed (80 KHz) autoranging detectors
- Up to 32 channels (eight cards) can be simultaneously operated in the system
- Low polarization dependence (0.01 dB), for accurate PDL measurements
- Can be installed by user (only a screwdriver needed)



TLS linewidth measured with an OSA at several wavelengths, demonstrating the very-low spontaneous source emission (SSE) level—key for accurately characterizing the isolation of wide passbands such as CWDMs.

Optional Measurement Tools

— IQS-5150B All-Band Polarization State Adjuster

- Two-slot module generating four orthogonal states of polarization
- Measures PDL using the Mueller Matrix method
- Designed around bulk optics components
- No fiber handling required

— IQS-5100B Polarization Scrambler

- One-slot module to be used at fixed wavelength (internal TLS or external IQS-2400)
- Very low activation-dependent loss (0.01 dB)
- Wide spectral range of 1260 to 1630 nm
- Covers 99 % of the Poincaré sphere in 2.5 seconds, providing fast, accurate PDL measurements at discrete wavelengths

Optional Switches and Single-Wavelength Sources

— IQS-2400 WDM Laser Source/IQS-2100 Light Source

- All ITU grid wavelengths from 1528 to 1606 nm—1308, 1490, 1625 and 1650 nm also available upon request
- Available power from 0 to 13 dBm
- Accuracy of up to ± 0.01 nm, depending on the model selected
- Coherence optimized for accurate and stable loss measurements

— IQS-9100 Optical Switch

- Available in various singlemode configurations: 1x2, 1x4, 1x8, 1x12, 1x16, 1x24, 1x32, 2x2 and 2x4
- Low-PDL option
- Repeatability of ± 0.01 dB

Accessory

Bare-Fiber Testing Device

Use this very handy accessory to connect bare-fiber components to the IQS-12008's detectors. Its unique gel-filled cartridge and multimode receiving filter allow for low loss and repeatable connection on the detectors.



Bare-fiber components can easily be connected to the detectors, with low loss and excellent repeatability.

When selecting the most appropriate test solution, test engineers and managers need to justify both the technical and financial aspects of their recommendations. Their technical evaluation revolves around measurement specifications, ease of use, reliability, and how easy it is to integrate the solution into their everyday working environment. Other than the initial purchase, their financial evaluation should include other elements such as the number of systems needed, production throughput, testing time, number of operators required, setup time, training, as well as calibration and maintenance requirements.

EXFO's IQS-12008 All-Band Component Analyzer comes with built-in speed and performance, and, more importantly, numerous **cost-saving features** that ensure the lowest cost of ownership on the market—now and in the long term.

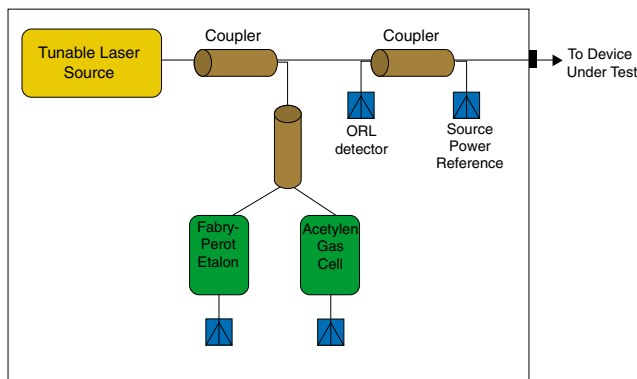


Diagram of the IQS-12008's power and wavelength-referencing elements.

Wavelength self-calibration ensures long-term wavelength accuracy of the tunable laser source, and consequently, of the entire system. Wavelength selection is performed by a tuning mechanism mounted on a precise, repeatable motor. Each time an IL or PDL reference is performed, the calibration offset is adjusted using a temperature-stabilized all-band Fabry-Perot interferometer and an acetylen gas cell.

Calibration of detector wavelength response relative to the first channel allows the system to correct any variation in sensitivity and spectral response of the detectors. References then need only to be performed on the first channel; references on other channels are calculated by the system.

Real-time source referencing enables source power fluctuations to be compensated in real time. An internal detector, perfectly synchronized with the external detectors, measures the power from the source. This reference power is then used, along with the output coupler's calibrated coupling ratio, to perform accurate loss measurements.

IL, ORL and PDL referencing is managed within the system, ensuring the compensation of any loss or spectral non-uniformity of the launch fiber conditions. All reference measurements are automatic, hands-free, and are performed quickly and accurately.

Detectors are calibrated for top linearity, ensuring accurate IL, PDL and ORL measurements. No absolute power calibration is needed, because all system measurements are relative. This minimizes initial costs and eliminates the often-redundant shipments to the factory for recalibration. With a 32-channel system, this can represent annual savings of US\$5000 to US\$10 000, not including the cost associated to downtime.

When it comes to optimizing production efficiency, testing time is also critical. This is why EXFO chose the multichannel approach, which enables the simultaneous measurement of up to 32 channels, as well as a TLS cruising speed of > 200 nm/second, allowing an all-singlemode-band coverage in less than 2 seconds.



Component Characterization: Comparing Available Solutions

The table below provides a comparative analysis of the available solutions for characterizing CWDM, PON or any broadband passive device over a wide wavelength range.

	IQS-12008	Swept-wavelength system	Broadband source and OSA	Discrete lasers and power meters	Monochromator
Product functionalities	All-band analyzer	Single- or dual-band TLS; often requires data stitching; incomplete wavelength coverage	Compromise between dynamic range and resolution; single-channel measurements	Good for basic measurements; complex setups when PDL/ORL required (tests supported by EXFO's IQS-12008)	Compromise between dynamic range and resolution; single-channel measurements; reduced performance
Wavelength range	Excellent	Fair to poor	Fair	Poor	Excellent
Dynamic range	Excellent	Excellent	Fair	Excellent	Poor
IL	✓	✓	✓	✓	✓
PDL	✓	✓		✓	
ORL	✓	✓		✓	
Wavelength self-calibration	✓	✓ (in some cases)	✓ (in some cases)		
Automated and easy referencing (IL, ORL and PDL)	✓	✓			
Number of "boxes" needed to achieve IL, ORL and PDL	1 180 mm x 440 mm x 500 mm	4 to 6	3 to 6	3 to 4	4 to 6
Testing time (eight channels, IL only)	< 15 seconds (370 nm range)	15 to 360 seconds (limited wavelength range)	10 minutes	< 10 seconds (discrete wavelengths)	10 minutes
Testing time (eight channels, IL and PDL)	< 60 seconds (370 nm range)	15 to 360 seconds (limited wavelength range)	N/A	< 40 seconds (discrete wavelengths)	N/A
Testing time (32 channels, IL only)	< 60 seconds (370 nm range)	15 to 360 seconds (limited wavelength range)	40 minutes	< 30 seconds (discrete wavelengths)	40 minutes
Typical number of eight-channel DUTs tested in an eight-hour shift (IL only)	360 (370 nm range)	160 to 360 (limited wavelength range)	76	410 (discrete wavelengths)	76
Typical number of test stations needed to match the IQS-12008	N/A	1 or 2 (with a limited wavelength range)	5	N/A (discrete wavelengths)	5

✓ Signifies function availability on the given solution.

User-Friendly Software and Extensive Function Library, IQS-12008 for Full Device Characterization

Performing fast and accurate IL, ORL and PDL measurements as a function of wavelength requires countless elements, including laser sweeping, synchronization, calibration and referencing, data acquisition and various calculations. The IQS-12008's OSA-like, user-friendly software interface performs all of these operations at the touch of a few buttons.

Results are available in both the tabular and graphical formats, and include basic loss data as well as advanced data analysis. They can be saved and exported into your data management system. The IQS-12008 comes with two software programs (All-Band Sweep and All-Band Discrete), each optimized for a specific system configuration.

All-Band Sweep

In conjunction with the internal all-band tunable laser, the All-Band Sweep provides continuous per-channel loss data across the user-specified wavelength range. Automatic detection of device characteristics (passband, notch or other) and subsequent analysis (bandwidth, central wavelength, isolation, ripple, etc.) with pass/fail masks makes this application particularly well-suited for CWDM devices.

What's more, this software program is perfect for performing continuous spectral measurements on couplers, splitters and other devices for which assessing loss (IL, ORL, PDL) uniformity at high spectral resolution is critical. It also lets you set the source at a specific wavelength and achieve real-time relative power readings on each detector—a key benefit for system troubleshooting or component alignment.

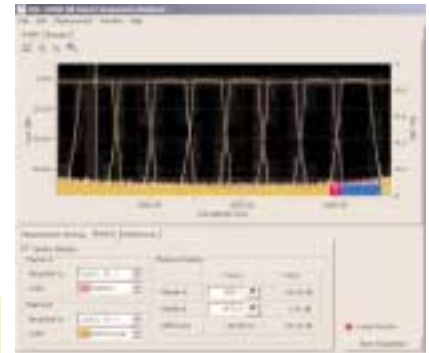
All-Band Discrete

Select this software application when using the system with EXFO's DFB lasers and switch (tunable laser not present in the system). The All-Band Discrete then becomes a subset of the All-Band Sweep program, with a table of results providing IL, ORL and PDL at up to eight user-selected wavelengths.

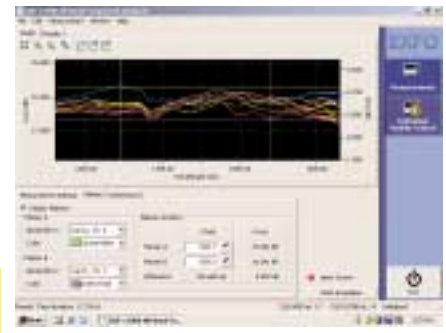
Function Library

The system's applications were developed using the IQS-12008 Function Library, a comprehensive set of DLL (COM/DCOM) functions designed for rapid software development and test-system integration requirements. All IQS-12008 calibration, reference, measurement and calculation parameters are available through the fully documented methods, functions and properties of the library. These powerful, flexible, high-level functions will allow your programmers to be up and running with your customized all-band measurement software in a matter of days.

You can also quick-start your IL, ORL and PDL measurements using a LabVIEW demo program, provided with the source code.



Spectral response for an eight-channel CWDM, showing better than 63 dB isolation (CWDM kindly provided by Finisar).



Insertion loss measured on eight ports of a 1 x 32 splitter.

SPECIFICATIONS¹

Wavelength range (nm)	1260 to 1630
Wavelength uncertainty (nm)	± 0.050
Wavelength resolution (nm)	0.025
IL uncertainty (dB)	± 0.05
IL dynamic range, sweep (dB)	> 55
IL dynamic range, step (dB)	Up to 70
ORL uncertainty (dB)	± 1
ORL range (dB)	> 55
PDL uncertainty (dB)	$\pm 0.03^2$
Number of channels	Up to 32
Testing time	IL: < 15 seconds on eight channels, over 370 nm (including acquisition, data transfer and measurement display)

Notes

1. Preliminary specifications; measured at $23\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$.
2. Typical for PDL of < 0.5 dB, between 1500 nm and 1550 nm.

Preliminary

ORDERING INFORMATION

IQS-12008-XX-XX-XX-EA-EUI-XX-FOA-XX

Model

IQS-12008-00 : IQS-12008 system, without internal tunable laser source, with one four-channel DET-1843
 IQS-12008-02 : IQS-12008 system, with O- and E-band tunable laser source (1260 nm to 1415 nm), with one four-channel DET-1843
 IQS-12008-03 : IQS-12008 system, with S-, C-, L- and U-band tunable laser source (1455 nm to 1630 nm), with one four-channel DET-1843
 IQS-12008-23 : IQS-12008 system, with O-, E-, S-, C-, L- and U-band tunable laser source (1260 nm to 1630 nm), with one four-channel DET-1843

Polarization option

Description

00	Without polarization option
A	All-band polarization-state adjuster; includes one IQS-5150B-xx module, interconnecting patchcords and calculation software (Mueller Matrix)
B	IQS-5100B Polarization Scrambler
AB	IQS-5150B All-Band Polarization State Adjuster and IQS-5100B Polarization Scrambler

Channel count

Description

04-XX	4 channels; includes one DET-1843 Four-Detector Mini-Module
08-XX	8 channels; includes two DET-1843 Four-Detector Mini-Modules
12-XX	12 channels; include three DET-1843 Four-Detector Mini-Modules
16-XX	16 channels; includes four DET-1843 Four-Detector Mini-Modules
20-XX	20 channels; includes five DET-1843 Four-Detector Mini-Modules
24-XX	24 channels; includes six DET-1843 Four-Detector Mini-Modules
28-XX	28 channels; includes seven DET-1843 Four-Detector Mini-Modules
32-XX	32 channels; includes eight DET-1843 Four-Detector Mini-Modules

EA-EUI-28
 EA-EUI-89
 EA-EUI-91
 EA-EUI-95

APC universal DIN interface
 APC universal FC interface (narrow key)
 APC universal SC interface
 APC universal E2000 interface

FOA-316
 FOA-322
 FOA-328
 FOA-332
 FOA-340
 FOA-354
 FOA-376
 FOA-384
 FOA-396
 FOA-397
 FOA-398
 FOA-399
 FOA-U12
 FOA-U25

Ultra-low-reflection SMA 906
 Ultra-low-reflection NTT-FC
 Ultra-low-reflection DIN 2.5 (LSA)
 Ultra-low-reflection AT&T ST
 Ultra-low-reflection HMS-0, HFS-3
 Ultra-low-reflection SC
 Ultra-low-reflection HMS-10/AG
 Ultra-low-reflection Diamond HMS-10, HFS-13
 Ultra-low-reflection E2000
 Ultra-low-reflection LX.5
 Ultra-low-reflection LC
 Ultra-low-reflection MU
 For universal 1.25 mm ferrule
 For universal 2.5 mm ferrule

Example: IQS-12008-23-A-08-EA-EUI-89-FOA-322

Notes

- The IQS-9800 All-Band Multichannel Loss Meter can be purchased separately (if you already own an IQS-510P platform).
- The DET-1843 Four-Detector Mini-Module can be purchased separately to add channels to an existing system.

Corporate Headquarters > 400 Godin Avenue, Vanier (Quebec) G1M 2K2 CANADA | Tel.: 1 418 683-0211 | Fax: 1 418 683-2170 | info@exfo.com

Toll-free: 1 800 663.3936 (USA and Canada) | www.exfo.com

EXFO America	4275 Kellway Circle, Suite 122	Addison, TX 75001 USA	Tel.: 1 800 663-3936	Fax: 1 972 836-0164
EXFO Europe	Le Dynasteur, 10/12 rue Andras Beck	92366 Meudon la Forêt Cedex FRANCE	Tel.: +33.1.40.83.85.85	Fax: +33.1.40.83.04.42
EXFO Asia-Pacific	151 Chin Swee Road, #03-29 Manhattan House	SINGAPORE 169876	Tel.: +65 6333 8241	Fax: +65 6333 8242
EXFO China	Beijing New Century Hotel Office Tower, Room 1754-1755 No. 6 Southern Capital Gym Road	Beijing 100044 P. R. CHINA	Tel.: +86 (10) 6849 2738	Fax: +86 (10) 6849 2662

EXFO is certified ISO 9001 and attests to the quality of these products. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices. **Contact EXFO for prices and availability or to obtain the phone number of your local EXFO distributor.** For the most recent version of this spec sheet, please go to the EXFO website at <http://www.exfo.com/specs> In case of discrepancy, the Web version takes precedence over any printed literature.

