



Company Profile

Verity Instruments is an industry leading manufacturer of optical emission instruments and software applications for endpoint detection, advanced process control, and film thickness measurement.

Verity's optical emission-based instruments include spectrometers, monochromators and interference filter-based detectors. These products are used for endpoint determination in etch, ion beam etch, CVD etchback, photoresist strip, chemical/mechanical polishing (CMP) and other processes. Verity instrumentation also provides for plasma diagnostics, process development, process control and film thickness measurement.

The development of advanced signal processing algorithms permits Verity to offer solutions for low-exposed area endpoint and other complex signal processing applications.

The SD1024G™ spectrometer features a back-thinned 1024-element CCD detector array, which enables simultaneous measurement of all wavelengths from 200 to 800nm. When the SD1024G is combined with a xenon flashlamp, the resulting system can be used for in-situ or in-line film thickness or depth measurement.

General-purpose instruments, including manual monochromators, analyze a single wavelength at a time. Monochromators and compact, cost-effective interference filter-based detectors use a photomultiplier tube, or a lower cost photodiode, as a detector. This broad range of instruments allows Verity to supply customers with the level of performance required for their application.

Company History

In **1978**, Verity's first product line included sensors and controls to measure moisture content in cotton fibers and control the drying of the fibers in the ginning process for the agricultural industry.



In **1980**, Verity's product emphasis shifted to the semiconductor industry with the introduction of the Fingerprinter, a portable spectrograph for the analysis of plasma emissions. Following the Fingerprinter was the Endpointer®, a monochromator and radiometer system for detecting optical endpoints.

In **1987**, Verity introduced its first OEM monochromator for plasma etch endpoint detection. For the first time, the semiconductor industry could obtain a high resolution monochromator complete with electronics and detector in a package small enough to integrate into a single wafer system. To address the vacuum/optical interface, Verity designed a wide variety of fiber optic feed-throughs, fiber optic cables, lens couplers, and devices for shielding optical elements from condensing gases.



In **1992**, Verity introduced the iDAC1000, an industrial PC-based passive backplane computer complete with a color VGA monitor and full function keypad in a compact rectangular package. In later years, the VM3000 and VM3400 system controllers replaced the iDAC1000. The VM3000 is a DOS-based system and the

VM3400 is a Windows NT-based system. The VM series of system controllers runs Verity's proprietary ScanView application software.

In **1996**, Verity introduced its breakthrough Neural Net process control algorithm. This proprietary algorithm presents a revolutionary method of recognizing and learning process endpoint patterns with a simplified identify and train feature. With this development, process engineers do not have to become numerical algorithm experts to develop a robust endpoint detection scheme. One simply tags the endpoint pattern on several valid wafer run data files, and the neural network learns the pattern for robust, reliable endpoint detection. This software is now used by semiconductor manufacturers worldwide.

In **1998**, with the introduction of the SD100 Verity began offering a new breed of smart detectors - optical emission monitors that integrate sophisticated embedded processors. New software was developed to provide intelligent instrument control, data acquisition, and endpoint detection without requiring an additional interface computer to perform these functions. The SD100 Smart Scanning Monochromator is a high-performance photomultiplier tube-based spectrometer, which permits spectral scanning of its 185-925nm wavelength range. With an optical resolution better than 1nm, this combination DSP/microprocessor-controlled instrument provided high-performance, fully integrated smart optical monitoring and endpoint control.

In **1999**, Verity introduced the SD1024™ spectrometer, developed for the demanding requirements of semiconductor process control. Its optical system employs a 1024-element, scientific-grade CCD sensor array specifically designed for multi-channel spectroscopy, offering high performance at a moderate cost. The advantages of the SD1024 include its excellent UV response, stability against deterioration under UV exposure, high sensitivity, wide dynamic range and superior output linearity.



In **1999**, Verity also introduced a spectral interferometer/reflectometer. The SP2002 is used for etch endpoint, CMP endpoint, and CVD film thickness. The SP2002 is designed for real-time measurements, either in-line or in-situ.

In **2000**, Verity introduced a lower cost spectrometer targeting general purpose applications. The SD1024DL™ featured a 2048-element, one-dimensional-array CCD, while using the same application software and DSP-based smart card as the SD1024D™. In **2001**, Verity introduced a low cost spectrometer with twice the resolving capability of the SD1024DL. This instrument, the SD2048DL™, is ideal for bright plasma applications.

In **2004**, Verity introduced the SD2048PL™ an embedded smart spectrometer for low CPU requirement applications. This model does not require the addition of an applications computer for algorithm processing.

In **2007**, Verity introduced the RoHS compliant SD1024F™ and SP2006™ Spectral Reflectometer.

In **2008**, Verity released the Ultra Performance SD1024FH™ and in **2010**, Verity released the RoHS compliant SD1024FL™.

In **2012**, Verity introduced the SD1024G™ Series and SD1024X™ Series spectrometers along with the FL2100 flashlamp. Unique in our industry, the SD1024X combines the functionality of a high performance spectrometer and an applications computer in the same size enclosure as Verity's standard spectrometers. Both the SD1024G Series and SD1024X Series are available in ultra performance, high performance, general purpose, and high resolution models.














In **2016**, Verity introduced the SE1024GL-CMOS, Value Line Spectrometer. This spectrometer provides a cost effective solution for general purpose applications. As compared the SD1024GL, cost is reduced by the use of simpler packaging, LCD removal, reduced connector count and a detector that can be driven using simpler electronics. Despite the cost reduction, the impact on performance is minimized. The primary advantage of the SD1024GL over the SE1024GL- CMOS is the wider dynamic range.



In **2017**, Verity released the SD1024GM and SD2048GH. The SD1024GM offers performance between the SD1024G and the SD1024GL. Also available is a high resolution version of the SD1024GM, the SD2048GM. The SD2048GH offers an industry leading, unique combination of high sensitivity and high resolution.

Spectrometers - Multi-wavelength

PRODUCT TYPE	Embedded Spectrometer	High Performance & High Resolution	High Performance Ultra Performance	Medium Performance High Resolution	General Purpose High Resolution	Value Line High Resolution	Near Infrared	Spectral Reflectometer
PHOTOGRAPH	 <i>Applications PC Not Required for Operation!</i>							
MODEL NAME	SD1024X Series	SD2048GH High Performance & High Resolution	SD1024G High Performance SD1024GH Ultra Performance	SD1024GM Medium Performance SD2048GM High Resolution	SD1024GL General Purpose SD2048GL High Resolution	SE1024GL CMOS Value Line SE2048GL CMOS High Resolution	SD512NIR	SP2100
APPLICATIONS	The SD1024X Series has equivalent models to any SD1024G Series spectrometer (as shown at right)	Optical Emission Spectroscopy					For NIR Applications (optical emission spectroscopy or spectral reflectometry)	For etch depth or film thickness measurement
USABLE RANGE	Same as G Series Equivalent	200–800 or 200-900 nm			200 – 800 nm		900–1700nm	225-800 nm Alternate Ranges Available
SENSITIVITY	Same as G Series Equivalent	Good	Very Good (SD1024G) Excellent (SD1024GH)	Fair-Good (SD1024GM) Okay (SD2048GM)	Fair (SD1024GL) Low (SD2048GL)	Fair (SE1024GL) Low (SE2048GL)	Good	Depends on spectrometer used
DETECTOR (CCD)	Same as SD1024G Series Equivalent	2048 x 248 pixels TE cooled -low noise Backthinned -UV sensitive Deep well -wide dynamic range	1024 x 122 pixel TE cooled -low noise Backthinned -UV sensitive Deep well -wide dynamic range	2048 x 64 pixel Not TEL cooled Backthinned- UV sensitive Deep well – wide dynamic range	2048 pixels Not TE cooled Front Illuminated – UV sensitive Somewhat deep well	2048 pixels Not TE cooled Front Illuminated – UV sensitive Somewhat deep well	512-element, linear Indium Gallium Arsenide Photodiode Array, TE Cooled	Depends on spectrometer used
RESOLUTION (200-800 nm unless indicated otherwise)	Same as SD1024G Series Equivalent	0.9 nm	1.33 nm	1.33 nm (SD1024GM) 0.9 nm (SD2048GM)	1.7 nm (SD1024GL) 0.8 nm (SD2048GL)	1.7 nm (SE1024GL) 0.8 nm (SE2048GL)	≤ 3nm	Depends on spectrometer selected

Single & Dual Wavelength Instruments			
TYPE	Monochromator	Photomultiplier Tube with Bandpass Filter	Photodiode with Bandpass Filter
PHOTOGRAPH			
Model Name	EP200Mmd Endpointer®	PM100/PM101/PM140 PM220/PM225	PD100/PD101
APPLICATIONS	Applications where high resolution is needed to remove the effect of adjacent spectra	Applications where adjacent spectra does not corrupt the endpoint signal	Applications where adjacent spectra does not corrupt the endpoint signal
USABLE RANGE	~ 185 to ~ 920nm manual adjustment	fixed wavelength(s) ~185 to ~ 830nm range	fixed wavelength ~ 200 to ~ 1100 nm
SENSITIVITY	Good	Good	Fair
DETECTOR	Photomultiplier Tube	Photomultiplier Tube	Photodiode
RESOLUTION	0.2–4nm	10nm (typical)	10 nm (typical)
VIEWING MODE	Direct Viewing or Optical Fiber Based	Direct Viewing or Optical Fiber Based (PM101 and PM225 only)	Direct Viewing (PD100) or Fiber Optic Cable (PD101)
ANCILLARY COMPUTER AND POWER SUPPLY	Customer Supplied		



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