



# SENSONETICS

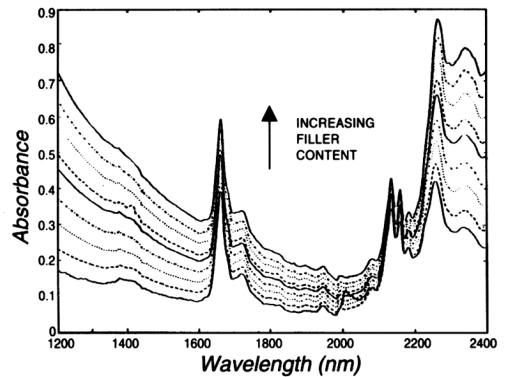
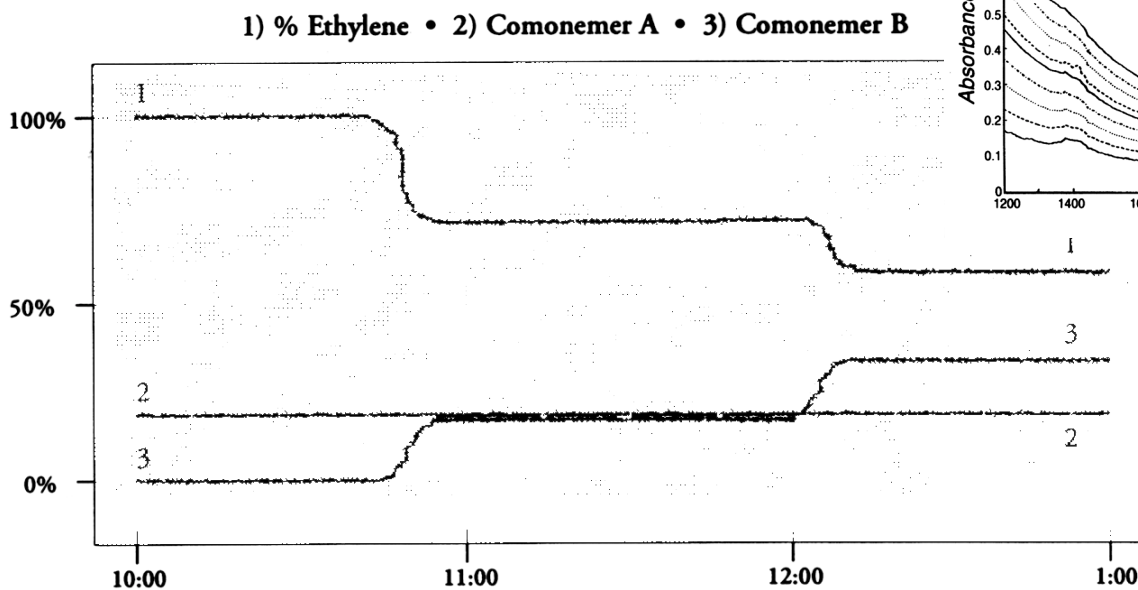
Sensing today...with tomorrow's technology

## SEN-2000 OPTICAL COMPOSITION PROBES

**Enable Real Time, In-Line Analysis**



**In Abrasive and Corrosive Environments  
at up to 1000°F and 60,000 psi continuous operation**



# SERIES 2000 OPTICAL COMPOSITION PROBE

## Origin of Sensonetics' Optical Probes

The Series 2000 Optical Composition Probes represent the most recent extension of Sensonetics' exclusive sapphire transducer technology. Besides withstanding unusually high pressures and temperatures, sapphire has the additional advantages of being chemically inert and permitting direct contact with corrosive and abrasive media.

In 1985, the first Silicon-on-Sapphire pressure transducers were introduced. These devices allowed much higher operating temperatures and provided much greater reliability in hostile environments. This was a significant advancement for the aerospace and petrochemical industries.

In 1990, these sensors responded to the needs of the polymer extrusion industry to eliminate mercury and other environmentally harmful fills commonly used to isolate pressure sensing elements from the melt stream environments.

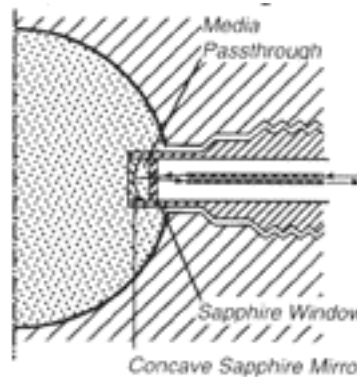
The result was the Series 400 Melt Pressure and Melt Pressure/Temperature Transmitters which employ Silicon-on-Sapphire measurement diaphragms located in the melt stream in direct contact with the polymer media.

In 1993, this new technology was applied to the new Series 2000 Optical Composition Probes which enabled for the first time a continuous, in-line analysis of chemical composition in corrosive and abrasive media streams while operating at up to 1000°F and 60,000 psi continuous operation. Pressure and temperature measurement can also be incorporated inside the probes to eliminate the need for additional mounting wells.

The Series 2000 Optical Composition Probes interface directly with spectrophotometers, thus allowing real-time, in-line composition analysis in the UV, VIS, NIR and MIR ranges. Three types of probes are available to accommodate a wide variety of media and applications.

## Single-Immersion Optical Probe

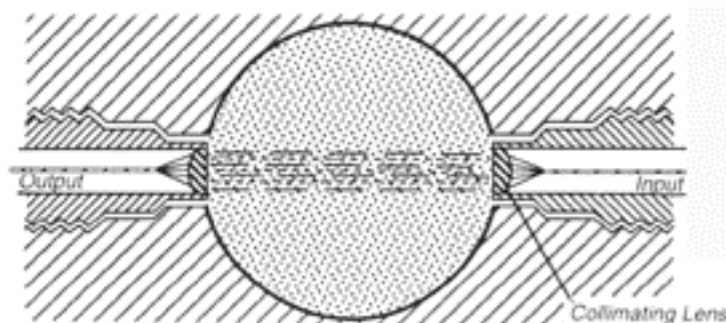
Sensonetics' SEN-2001 single-immersion design allows spectrographic analysis using a single probe. The light source passes through the sapphire window and the product stream and is reflected by a concave mirror at the tip of the probe to focus the return beam at the receiving fiber optic element. Wide selections of path lengths are available, up to one inch, to meet the needs of specific media.



The probe will withstand continuous operation at up to 1000°F and 60,000 psi. All probes are configured to fit the standard 1/2"-20UNF mounting holes used in extruders. SMA fiber optic connectors allow direct connection to spectrophotometers.

## Dual-Immersion Optical Probe

The SEN-2002 dual-immersion design uses a pair of optical probes mounted directly opposite each other. Each employs a convex sapphire lens in direct contact with the media stream. The transmitting lens collimates the beam for efficient transfer through the media. Dual probes may be used with any path length.

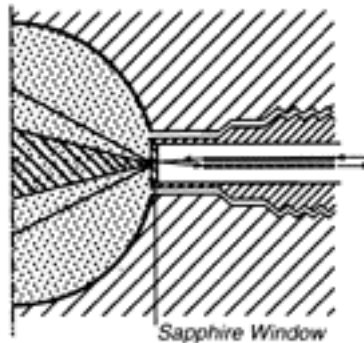


They support requirements where the path length will vary due to different media or for transfer of probes from one extruder to another. For purposes of economy, the two probes are identical and interchangeable.

# SERIES 2000 OPTICAL COMPOSITION PROBE

## High-Efficiency RAMAN Optical Probe

The SEN-2003 RAMAN probe allows users to make RAMAN analysis using just a single probe. The source is carried via an optical fiber and transmitted through a sapphire window into the product media. A second fiber collects the rays from the RAMAN effect. Collection of the electromagnetic emission stimulated by



the RAMAN effect is maximized by an innovative concept on which a patent is pending. RAMAN spectroscopy is particularly useful on high-density media. Sensonetics' vastly improved collection efficiency allows RAMAN analysis of media that could not be analyzed previously.

## Combined Optical/Pressure/Temperature

An economical advantage of the Sensonetics Series 2000 probe is the ability to include melt pressure and temperature measurements in the single-immersion and RAMAN probes. For users who prefer separate

pressure/temperature sensors, Sensonetics offers pre-drilled mounting flanges to accommodate many desired configurations.

ATR, diffused reflective and fluorescence probes are also available.

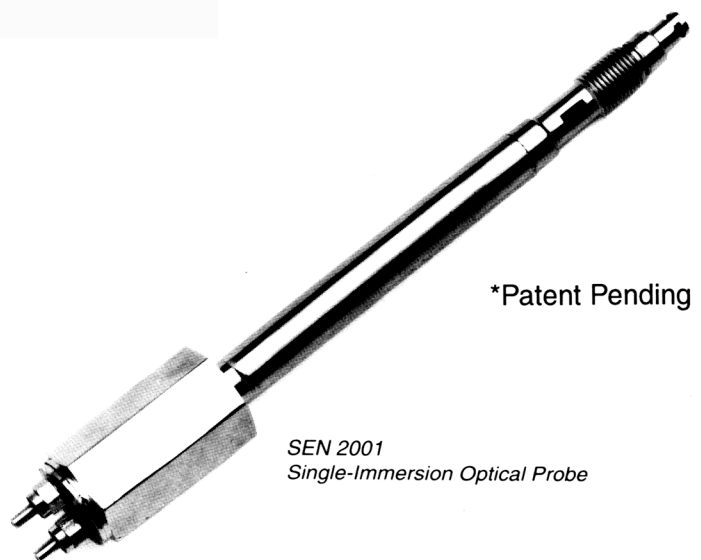
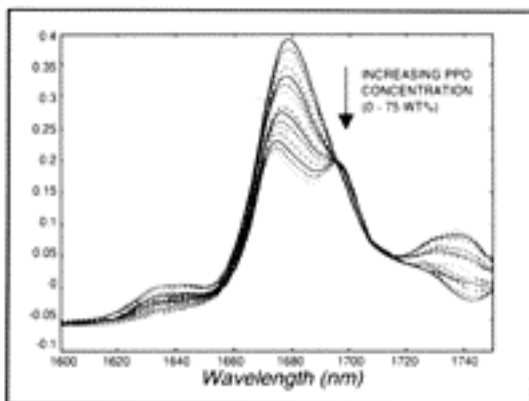
## User Advantages

Industry can now perform in-line, real-time analysis where it was previously impossible to do so because of the temperature and pressure limitations of traditional optical probes. There is virtually no limit to where real-time Fourier-transform analyzers can be used to monitor the chemical composition of product streams up to 1000°F and 60,000 psi continuous operation.

Industry can significantly reduce costs by achieving tighter control of the composition of their

products. By enabling continuous, real-time documentation, Sensonetics' Series 2000 Optical Composition Probes make a particularly valuable contribution to your Six Sigma requirements.

Avoid catastrophic losses due to off-spec waste and the expensive material disposal costs.



# SERIES 2000 OPTICAL COMPOSITION PROBE

## Specifications

**Wave Length:** 250 to 4500 nm (other Mid-IR ranges available upon request)

**Fiber Type:** Silica/Silica; 200 to 1000  $\mu\text{m}$

**Efficiency:** 15% to 30%

**Operating Pressure:** 60,000 psi, maximum

**Operating Temperature:** 1000°F, maximum

**Path Length:** Single Immersion up to one inch  
Dual Immersion as desired

**Window/Lens:** Single-crystal sapphire

**Case Material:** 300 series stainless steel (other materials available)

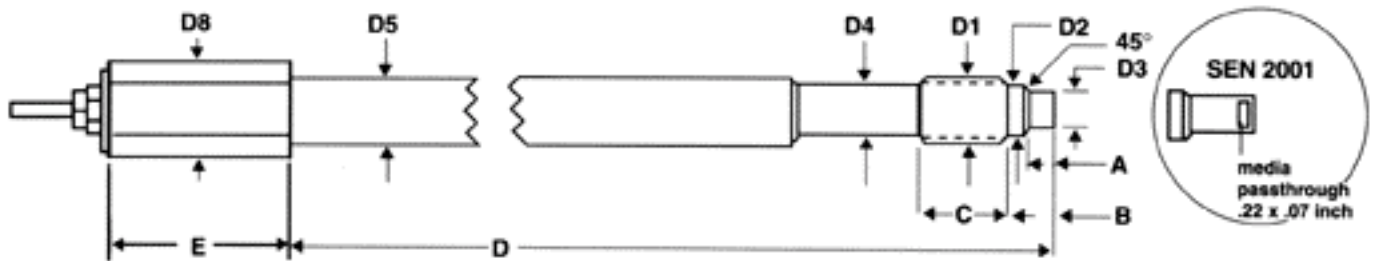
**Termination:** SMA connectors

**Stem Length:** 6-inch standard (other lengths available)

**Mounting Thread:** 1/2"-20 UNF-2A

**Available Accessories:** Mounting flanges.

Additional ports available for pressure and temperature sensors



OUT LINE DRAWING	D1	D2	D3	D4	D5	D8	A	B	C	D	E
SEN-2001	1/2 X 20 STD	.400	.300	.410	.500	3/4 HEX	As req'd	.590	.62	6" STD	1.25
SEN-2002 AND SEN-2003	1/2 X 20 STD	.400	.300	.410	.500	3/4 HEX	.277	.583	.62	6" STD	1.25

Dimensions in inches

## ORDERING GUIDE for SERIES 2000 Optical Composition Probes

MODEL	PATH LENGTH	OUTLINE	STEM LENGTH	CONNECTOR	THD MATERIAL
SEN-2001 (Single Immersion)	010 = 0.10 inch 025 = 0.25 inch 050 = 0.50 inch 100 = 1.00 inch	10 = No. 10 (1/2-20 UNF Metric adapter Available for M18 X 1.5 THD	03 = 3 inch 06 = 6 inch 09 = 9 inch 12 = 12 inch 15 = 15 inch 18 = 18 inch	SMA	H = Hastelloy C276  A = Armalloy
SEN-2002* (Dual immersion)	000 = N/A *specify 000				
SEN-2003* (RAMAN)					
<b>EXAMPLE</b>					
<b>SEN 2001-</b>	<b>025-</b>	<b>10-</b>	<b>06-</b>	<b>SMA-</b>	<b>H</b>