



Unitrode-1™ Single-Electrode Reusable Sensor Specifications

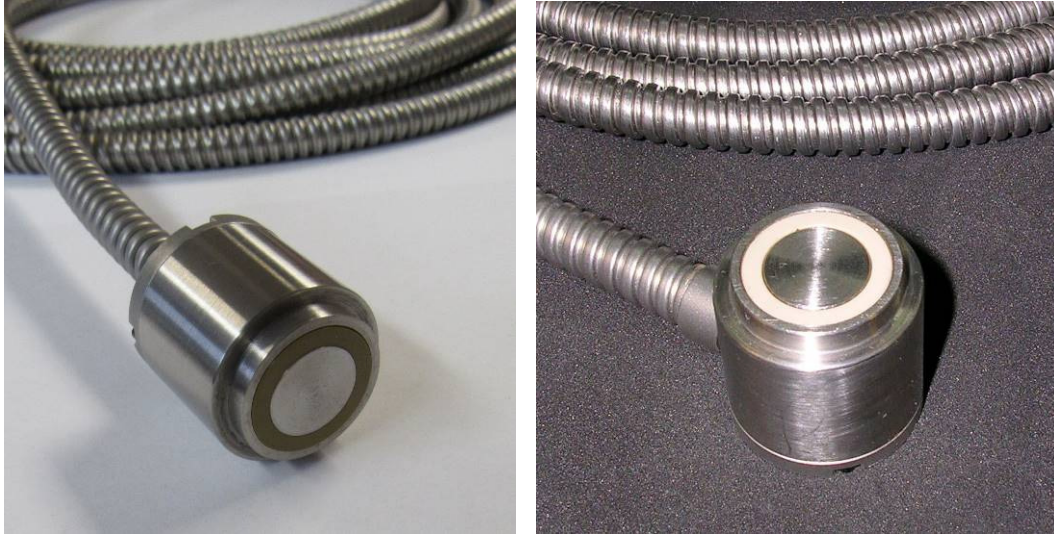


Figure 1

Unitrode-1" Dielectric/Conductivity Sensor Rear Exit (left), Side Exit (right)

DESCRIPTION

The Unitrode-1" is a rugged, reusable sensor designed for cure monitoring of thermoset composites like bulk molding compound (BMC), epoxy molding compound (EMC), sheet molding compound (SMC) or fiber reinforced prepreg (FRP) in presses, molds or harsh environments.

When used with a filter, which blocks conductive fillers and prevents short circuiting of the electrodes, the Unitrode-1" sensor may also be used to study the cure of carbon fiber prepreg (CFRP) or carbon fiber sheet molding compound (CF-SMC).

Available with side-exit or rear-exit configurations, the Unitrode-1" sensor may be mounted so the electrode is flush with a platen or mold surface, insuring no interference with the flow of material during processing. The high temperature polymer body is protected by a stainless steel sheath with a nominal 1.0" (2.54 cm) diameter. A thermocouple positioned just below the surface allows measurement of process temperatures. Dielectric and thermocouple signals are routed through a 10-foot (3 m) long stainless steel conduit to high temperature connectors. Sensor and cabling are rated for operation up to 220 °C and are suitable for R&D, QA/QC and manufacturing applications with repetitive operations.

SPECIFICATIONS

Dimensions (available with side or rear exit conduit):

Diameter, sensor head	: 1.0" (2.54 cm) nominal
Height, sensor head	: 1.0" (2.54 cm) nominal
Length, conduit	: 10' (3 m) nominal
Diameter, active face	: 0.69" (17.5 mm)
Diameter, electrode	: 0.50" (12.7 mm)

Composition:

Body	: High temperature polymer
Electrode	: Stainless steel
Sheath/conduit	: Stainless steel
Cabling	: Teflon insulated

Operational:

Temperature, maximum	: 220 °C (428 °F)
Frequency, mid-con mode	: 0.1 Hz – 100 KHz

Sensor Parameters (dependent on distance D to opposite platen or mold)

A/D ratio	D > 5 mm	: 3 cm
	D = 1.6 mm	: 14 cm
	D = 0.66 mm	: 32 cm
Base capacitance		: ~13 pF (actual value may vary)

Thermocouple : Type J standard, Type K avail. upon request

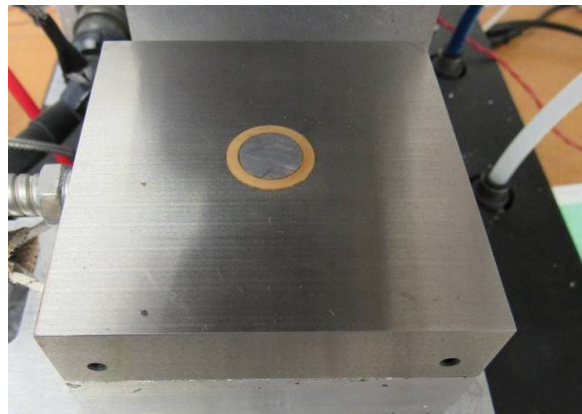


Figure 2
Unitrode-1" sensor in press platen



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OPERATING MODES

The Unitrode-1" may be used with all Lambient Technologies dielectric instruments in either mid-conductivity or high-conductivity mode. The sensor makes a bulk measurement of material between the central electrode, shown close-up in Figure 3, and the surrounding, grounded mold and/or the opposite mold face. Figure 4 illustrates the sensor in relation to the mold. Maximum depth of measurement is about 5 mm, and the A/D ratio depends on the distance D to the upper platen.



Figure 3
Close-up view of Unitrode-1" sensor head
(side exit version shown)

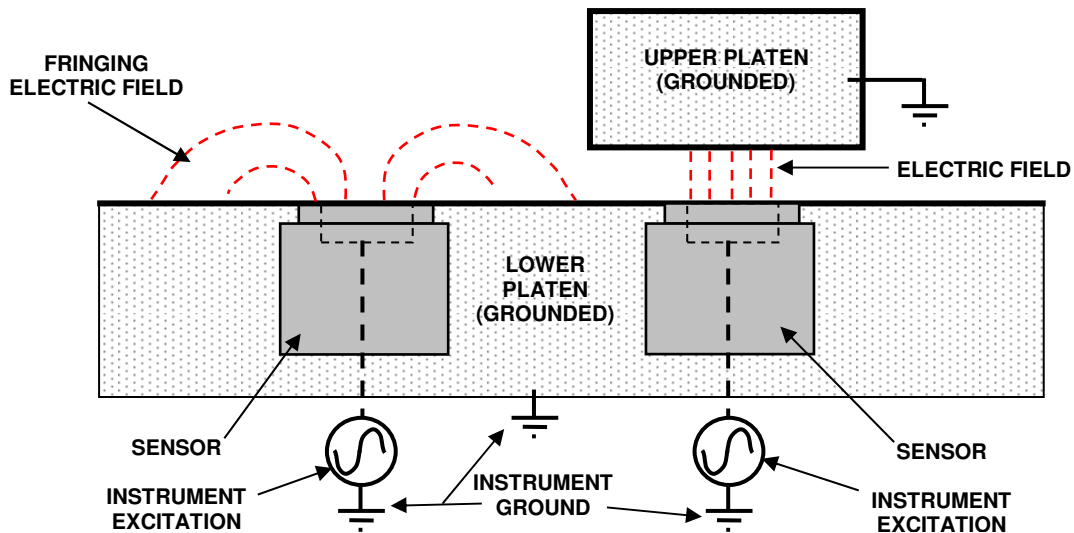


Figure 4
Unitrode-1" sensor using nearby grounded surface as second electrode

FORM FACTORS

The Unitrode-1" may be specified with the conduit exiting from the side or the rear as shown in Figure 5. Contact Lambient Technologies for current mechanical dimensions of the sensor.

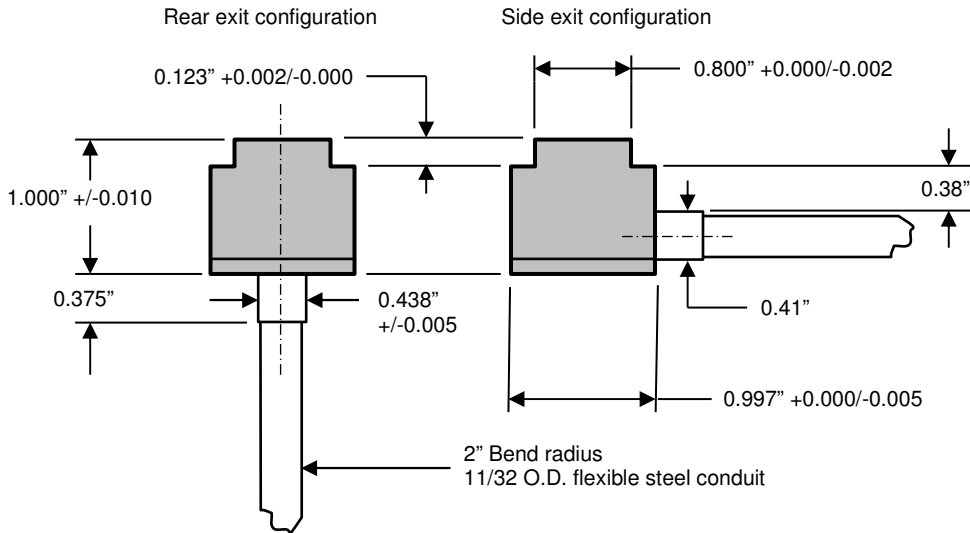


Figure 5
Nominal sensor form factors

INSTALLATION

The Unitrode-1" is designed for optimal mounting from the rear side of a mold or platen as shown in Figure 6.

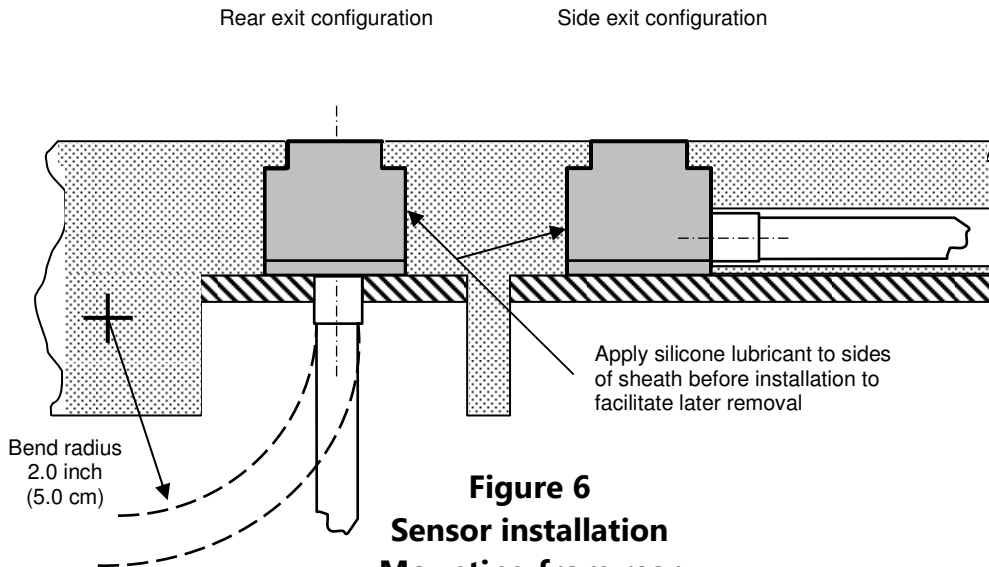


Figure 6
Sensor installation
Mounting from rear

It is important to support the bottom plate of the sensor to prevent high pressures from pushing it out of position. To facilitate removal when necessary, silicone lubricant may be applied to the side of the sheath before installation.

CARE AND HANDLING

Always apply mold release to the surface of the sensor before use with curing material. A silicone based mold-release is recommended to reduce conductive effects on the measurement. Damage to the sensor may result if mold release is not used and cured material is peeled from the surface.

Do not apply excessive tension to sensor conduit. Tugging on the conduit may damage the internal sensor leads.

CLEANING

Careful use of a spatula or other scraping tool to remove samples will not damage the sensor, provided that mold release was applied to the sensor before curing.

Clean sensors with acetone, trichlorethylene or other solvent to remove oils and contaminants. Solvents or water adsorbed onto the surface of the ceramic normally will not interfere with cure monitoring because it is released at elevated temperature, and would not be present at typical process temperatures.

At room temperature, however, adsorbed solvent or water will appear as an additional conductive component and may dominate the measurement. In this case the gains in air may be elevated (less negative, approaching 0 dB at low frequencies) and phases may be significantly negative. Heating the sensor above 100 °C for a short time should remove adsorbed material.



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