



## Phase Monitor II

### For Supercritical Fluid Phase and Solubility Studies

- 30 ml Capacity View Cell
- Operation to 10,000 psi (68.9 MPa) and 150°C
- Variable Speed Mixer
- Captive Holder for Powder Samples
- Vertical Position for Solid Samples
- Horizontal Position for Liquid Samples
- Data Acquisition Software Available

#### ◀ SFT Phase Monitor II



The SFT Phase Monitor II is a powerful analytical tool for determining the solubility parameters of compounds and mixtures in subcritical and supercritical fluids. It provides direct, visual observation of materials under conditions precisely controlled by the researcher. Experiments can be performed in liquid or supercritical carbon dioxide and in other liquified gases. Additionally, the effect of co-solvents on the solubility of compounds in supercritical carbon dioxide can be investigated with this instrument. It allows the end user to view dissolution, precipitation, and crystallization of compounds over a wide range of pressures and temperatures. Experiments may be performed from a few hundred psi to 10,000 psi (68.9 MPa) and from ambient temperature to 150° Celsius.

The Phase Monitor II is extremely useful for determining the critical point of binary, tertiary, and complex mixtures. The changes in phase behavior as a function of temperature, pressure, and sample concentration can be investigated rapidly, saving time in the scale-up of supercritical fluid processes. The phase monitor can be utilized to

determine the processing conditions in which each compound in a homologous mixture solubilizes and/or precipitates. This data is useful for determining processing conditions for selective extraction, reaction, and/or fractionation of compounds of interest. Additionally, supercritical "anti-solvent" applications are possible.

The Phase Monitor II is useful for other supercritical fluid processing operations, such as crystallizations and reactions. For example, the Phase Monitor can be utilized to determine the solubility of reactants and products so that the conditions for running supercritical reactions can be determined. It is possible to perform small-scale batch reactions within the Phase Monitor II.

Other useful applications for the Phase Monitor II include determining the cloud point of polymers and the degree of polymer swelling in carbon dioxide and other liquified gases. More sophisticated applications include the determination of processing conditions for impregnating materials into swollen polymers and surface deposition experiments.

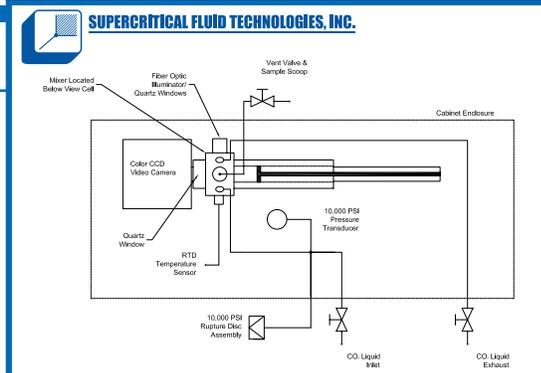
The SFT Phase Monitor II consists of a manually controlled syringe pump integrated within a 30 ml view cell. A CCD camera with a fiber optic light source allows clear viewing of the cell's interior. The view cell can be oriented in a horizontal position for solubility work with liquid materials and in a vertical configuration for solubility work with solid materials. The sample holder accommodates liquid, solid and powder samples. Materials such as fine powders and liquids may be placed in a small glass capillary tube which mounts in a holder recessed in the sample platform. Here, samples are held securely in the optimal viewing position for solubility and melting point studies.

Fluid mixing is achieved through rare earth magnets coupled to an internally mounted impeller. An internal RTD accurately and uniformly controls the heating of the view cell up to 150°C. All visual data acquired can be archived onto video tape. The temperature, pressure, time, and date, along with a text message can be displayed on the TV/VCR monitor by adding the optional Video Panel Display Module.

# Phase Monitor Specifications

## Pressure Vessel

Cell Body:	316 Stainless Steel
Windows:	3/8" Quartz
Max. Pressure:	10,000 psi (68.9 MPa)
Burst Disk Pressure:	11,500 psi (79.3 MPa)
Compression Ratio:	10:1
Cell Volume:	Variable, 3 ml to 30 ml
Pressure Precision:	+/- 2 psi (13.8 kPa)
Temperature Range:	Ambient to 150°C
Temperature Precision:	+/- 0.5°C
Heating Band Power:	500 Watts



Phase Monitor II Flow Diagram ▲

## Programmable Heater

User may set a heating rate and dwell time through a Fuzzy Logic Controller. Temperature is monitored and controlled by an internally mounted RTD. Temperature range: ambient to 150°C.

## Viewing

A variable focus, color CCD camera is attached directly to a quartz window. Illumination is provided by a variable intensity, fiber optic light source through a second window. The image may be displayed on a TV monitor or on a computer monitor if the optional digital imaging software is purchased.

## Video

Camera:	Color 1/3" CCD camera (85 mm)
Iris:	Auto, 5 lux
Focus:	12 mm manual lens

## Optional Digital Imaging Software

Real time video from the phase monitor may be converted into MPEG or AVI digital movies that can then be further digitally manipulated. Includes hardware, software and interface cables. Temperature and pressure are displayed along with the image inside the cell.

## System Requirements

Power Requirements:	110/220 VAC, 50/60 Hz.
Gas Supply:	Helium head space liquid CO <sub>2</sub> cylinder with dip tube.
Weight:	60 lbs. (27.2 kg)
Dimensions:	Width: 47cm, Depth: 43 cm, Height: 21cm

## Areas of Investigation

### Polymers

- Solubility determinations
- Extracting monomers and oligomers from polymers
- Infusion of materials into a polymer matrix
- Potential for polymer synthesis in supercritical fluids

### Foods

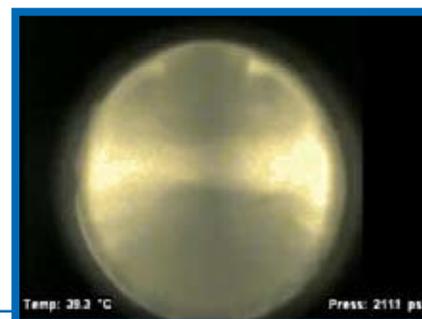
- Solubility of flavors and nutraceutical compounds
- Extraction of selected compounds

### Cleaning of Electronic Parts

- Cleaning chips, circuit boards and electronic components
- Supercritical and liquid carbon dioxide as an alternative to CFC and solvent cleaning methods

### Pharmaceuticals

- Solubility of pharmaceutical compounds in supercritical fluids
- Extraction of biologically active compounds from natural materials
- Improving reaction yields in supercritical fluids
- Infusion of drugs into delivery systems



Naphthalene dissolved in SF CO<sub>2</sub>



"Cloud Point" occurs as pressure drops