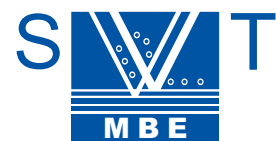


# SVT Associates, Inc.

## Components



*A Leader in the  
Innovation, Design and  
Production of MBE  
Technology*



*Engines for Thin Film Innovation*

## MBE SYSTEM COMPONENTS

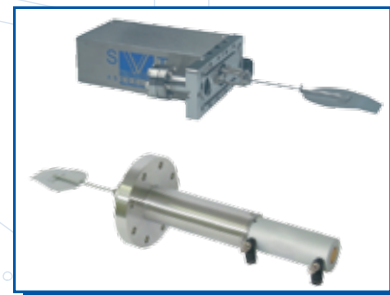
### Sample Manipulators

SVT Associates offers a comprehensive line of sample manipulators for MBE and MOCVD systems. SVT Associates sample manipulator is equipped with XY stage and Z manipulation to aid in substrate positioning and sample transfer. Each substrate heater module and holder is carefully designed for the intended growth environment. Motorized substrate rotation and temperature feedback controller are available for best heating and growth uniformity. Substrate sizes from 1" to 8" wafers are available.



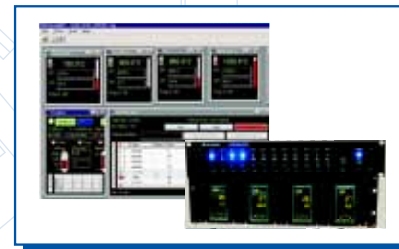
### Source Shutters

SVT Associates source shutters are designed for quick motion and long life. The source shutter assembly consists of an in-vacuum component, an external component and a shutter blade. SVT Associates offers two basic designs – a magnetically coupled design and a bellows coupled design. With the magnetically coupled design, the service life is longer than the bellows style type. Models are available in 3 or 4 inch stroke lengths and mounts on a 4.5" or 6.0" CF flange. The shutter blades are made of either Molybdenum or Tantalum. Other materials are available on request. SVT Associates also offers a full computer controllable shutter package that includes a 19" rack mountable control unit (SC200M).



### Process Software

RoboMBE™ is a powerful software package that gives the user the ability to automate and control the various hardware components of a semiconductor growth system. Using RoboMBE, the user can ensure run-to-run reproducibility by monitoring and adjusting growth parameters. This software automates repetitive tasks such as ramping of temperature profiles and sequencing of source shutters.



## DEPOSITION SOURCES

### RF Plasma Sources

SVT Associates RF Plasma Sources are used in a variety of applications including Nitride MBE, Oxide MBE, and other plasma processing techniques. Typically used to produce low energy beams of atomic nitrogen, oxygen, and hydrogen; the RF Plasma Source enables growth and processing of today's most advanced materials.



### Effusion Cells

The Effusion Cell (Knudsen Cell) is the staple of Molecular Beam Epitaxy technology. SVT Associates offers a wide selection of models and sizes to evaporate almost any elemental or compound material. Each Effusion Cell is manufactured from high purity materials with all ceramic and refractory metal hot zones. This ensures no undesired outgassing in a UHV environment as well as the longevity of the cells.



## DEPOSITION SOURCES *(continued)*

### Valved/Cracked Sources

For high vapor pressure materials such as As, P, Te, Sb, Se, S, and others, SVT Associates has engineered a series of Valved Sources to provide large capacity and a highly controlled deposition. Traditional evaporation sources rely on thermal stability and control to determine the deposition rate. With high vapor pressure materials, a small fluctuation in temperature can create a large fluctuation in deposition rate. The temperature fluctuations can be seen during ramping sequences or during shutter transients (due to shutter actuation). SVT Associates Valved Evaporation Sources have the advantage of integrating a mechanical valve to limit the conductance from the evaporation (sublimation) reservoir to the growth chamber. A constant temperature may be maintained and the valve position is used to control the flux, allowing for a stable and reproducible deposition rate.



### Electron Beam

The Compact E-Beam is a versatile component used for depositing thin layers of Carbon, Silicon, and Refractory Metals. It is an electron beam evaporator which provides researchers a simple and economical means of depositing high purity thin films. The source uses an electron beam power supply for electron emission and an integral flux monitor. Whether the source material is in solid rod or powder form, the resulting layers are ultra-pure. The materials of construction of the electron beam evaporation source are selected to be compatible with the intended growth material.



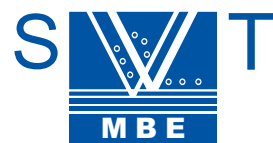
### Gas Injectors

SVT Associates gas injectors are designed for gas source thin film deposition systems such as silicon epitaxy, Nitride MBE, or Laser MBE systems. The gas injectors operate on the principle of gas cracking using a single filament gas tube furnace. These sources have very high dissociation efficiency even at low power levels due to careful design of the heating zone. A cooling shroud minimizes heat load into the system environment for ultra-low contamination levels.



### Atomic Hydrogen Source

SVT Associates Atomic Hydrogen Source is typically used for substrate cleaning, used in III-V MBE Systems or II-VI MBE Systems. It operates on the principle of electron beam heating. This UHV compatible source can produce temperatures up to 2,600° C. Hydrogen gas is introduced and thermally as well as catalytically cracked to produce atomic hydrogen with high efficiencies. An integral flux monitor allows replication of operating parameters. The source mounts on a 2.75" or 4.50" CF flange.



## PHOTOVOLTAIC DEPOSITION SOURCES

### Thermal Linear Deposition Sources

SVT Associates leverages more than 15 years of deposition source technology to offer the best in thermal evaporation sources for photovoltaic processes. SVT Associates unique Linear Evaporation Sources are engineered for in-line deposition processes to uniformly coat large area samples in a single pass. Each Linear Evaporation Source is engineered and fine tuned for the customer's specific application.



### Valved Deposition Sources for Photovoltaic Applications

SVT Associates Valved Deposition Sources enable instantaneous control of selenium and sulfur as well as other high vapor pressure materials. The proprietary valve design provides reproducible and precise flux profiles for the most demanding growth processes. Each source is engineered for the appropriate material with an optional thermal cracking region to improve material incorporation.



## THIN FILM PROCESS MONITORING

### AccuTemp™ In-Situ 4000 Process Monitor

The AccuTemp (In-Situ 4000) Process Monitor is an ideal solution for closed-loop monitoring and control of multilayer thin film growth applications such as MBE, MOCVD, and CIGS source monitoring. The AccuTemp system provides real-time and accurate information on the substrate temperature, film thickness, and growth rate using a single normal incidence view-port. Temperature is measured using a two color infrared pyrometer specifically designed to be insensitive to window coating and alignment errors. The radiometer compensates for changing emissivity and corrects the pyrometry measurements. An optional Bandgap Module allows for monitoring of low substrate temperatures, and easy calibration of the pyrometer. Two independent optical reflectometer signals are analyzed to provide thickness, growth rate, and refractive index in real-time.



### AccuFlux™ Deposition Flux Monitor

SVT Associates has developed the unique AccuFlux Process Controller as a real-time Deposition Flux Monitor in thin film deposition processes. Based on Atomic Absorption Spectroscopy, the system measures the atomic vapor flux density originating from solid and gas sources. This optical technique provides a nonintrusive *in-situ* flux monitor with high accuracy for excellent composition control better than 0.3%.



### RHEED

In a molecular beam epitaxy system, one necessary component is the Reflection High Energy Electron Diffraction (RHEED) System. SVT Associates RHEED is a fully UHV compatible instrument for diffraction studies and growth monitoring for a variety of MBE and UHV applications. The RHEED Electron Gun mounts on a 4.5" CF flange and provides an electron beam of small spot size and energies up to 10 keV. Robust filaments and magnetically shielded electron optics ensure reliable and uncomplicated operation. The RHEED Electron Gun Power Supply produces all necessary beam and focus voltages, emission current, filament current as well as X and Y deflection voltages in a compact enclosure. RHEED Screens are available for 6" CFF and 8" CFF viewports.

